Stormwater Report

30-32 Wall Street, Foxborough, MA

Prepared by:

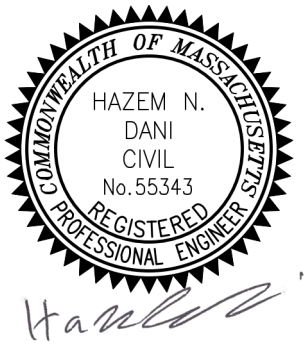
HD Design

161 W. High Street,

Avon, MA 02322

Cell: (508) 840-1045

Email: hazem.dani87@gmail.com



September, 18, 2023

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Avon, MA 02322
Cell: (508) 840-1045
Email: hazem.dani87@gmail.com

Stormwater Narrative
Proposed Site Redevelopment at 30-32 Wall St, Foxborough

This narrative aims to assess the proposed stormwater management system and BMPs for the project in accordance with MA Stormwater Regulations and Foxborough Stormwater Regulations. The site is located on a commercial lot in the General Business Zoning District. We assessed the existing and proposed stormwater conditions, and the results are summarized below.

A. Existing Conditions:

The lot is located on the corner of Cocasset Street and Wall Street in Foxborough, MA. The lot has approximately area of 7,400 square feet of land area. A 2-story mixed-use dilapidated building currently occupies the site with an approximate building footprint of 1,920 square feet and paved parking and landscape areas. The lot has a uniform downgradient sloped topography. The highest point is located on the western portion of the lot, with an approximate elevation of 286, and the lowest point is at the eastern part of the site, near the roadway, with an approximate elevation of 285. The site is currently severed with an onsite septic system. There is no stormwater management system currently existing onsite. Stormwater runoff drains toward Wall Street with no mitigation.

B. Proposed Project & BMP Improvements:

The project consists of a site redevelopment project that involves demolishing portions of the existing building, construction of building additions to include a total of 4 residential units while maintaining the existing commercial space, reconfiguration of the parking spaces, removal of the nonconforming septic system, connecting to sewer, and installation of underground infiltration system. The new building footprint is approximately 3,600 square feet.

A net decrease of impervious area, 450 square feet, is proposed. As a redevelopment project that does not propose new impervious areas, the site is required to meet the Massachusetts Stormwater Management Standards to the maximum extent practicable. However, the project proposes to collect the roof runoff and send it to an onsite underground infiltration system that will provide infiltration and groundwater recharge. Runoff from the proposed roof is piped and directed into an underground infiltration system (UG-1) StormTech® chambers with an overflow to Wall Street. UG-1 can store and infiltrate roof runoff up to the 2-year storm event. Additionally, the project proposes a grass swale with an underdrain to mitigate stormwater runoff on the north and west sides of the building. The proposed project reduces the peak discharge rates and infiltrates roof runoff. Overall, the site design reduces the amount of stormwater runoff and peak discharge rates toward the Right of Way and exceeds the required mitigation for a redevelopment project.

According to the NRCS, the onsite soils consist of Urban land with no Hydraulic Soil Group designation. An infiltration rate of 0.52 inch per hour for loam was utilized for the infiltration BMPs per Table 2.3.3 of the Massachusetts Stormwater Regulations 1982 Rawls Rates.

C. Objective of Calculations

The purpose of this stormwater analysis is to assess and quantify the existing and proposed stormwater runoff conditions from the site based upon the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the applicable provisions of the City of Framingham Regulations. The project goals of the stormwater management system are to provide improved water quality, reduce post-development peak runoff rates as compared to pre-development peak runoff rates, maximize infiltration to the maximum extent practicable, and to protect the surrounding area from any potential flooding and/or environmental impacts. The following stormwater routing calculations were performed using the 2-year, 10-year, 25-year, and 100-year frequency. Type III, 24-hour SCS design storms and were compared for both pre-development and post-development conditions. Hydrology calculations were determined assuming a 5-minute (direct entry) time of concentration (T_c).

D. Methodology

The HydroCAD Stormwater Modeling System computer program, Version 10.2, by Applied Microcomputer Systems, Inc. is used to develop stormwater runoff rates and volumes for the existing and proposed conditions of the project site. The HydroCAD software is a hydrograph generation and routing program similar the U.S. Soil Conservation Service (SCS) TR-20 hydrologic analysis model. For this project, HydroCAD settings were fixed to use the SCS TR-20 Unit Hydrograph Methodology. This drainage analysis was developed utilizing the Type III, 24-hour storm as developed by SCS. Information regarding the equations and calculation procedures utilized in HydroCAD will be made available upon request. The following basic steps are employed in the procedure:

1. A rainfall distribution is selected which indicates how the storm depth will be distributed over time. This is the standardized Type III SCS distribution based upon the project location.
2. The design storm depth is determined from the rainfall frequency atlas based upon the return period being modeled. Combined with the distribution of rainfall, the cumulative depth at each period during the storm can be determined.
3. Based upon the Time of Concentration (T_c), the storm is divided into bursts of equal duration. For each burst, the SCS runoff equation and the average Curve Number are used to determine the portion of that burst that will appear as runoff.
4. A unit hydrograph representing the runoff resulting from one inch of precipitation excess generated uniformly over the watershed in conduction with the Time of Concentration is used to determine how the runoff from a burst is distributed over time. The result is a runoff hydrograph for a single burst.
5. Individual hydrographs are added together for all bursts in the storm yielding the complete runoff hydrograph for each storm.

The SCS rainfall distributions are derived from observations that were used to develop the Intensity-Duration-Frequency (I-D-F) relationship or curve. By studying the Weather Bureau's Rainfall Frequency Atlases, the SCS developed four "mass curves" that could be used to represent the characteristics of the rainfall distribution throughout the continental United States. The mass curve is a dimensionless distribution of rainfall over time, which indicates the fraction of the rainfall event that occurs at a given time within a 24-hour precipitation event. This synthetic distribution develops peak rates for storms of varying durations and intensities. The SCS distribution provides a cumulative rainfall at any point in time and allows volume-dependent routing runoff calculations to occur.

The HydroCAD software has the additional capability to describe shallow concentrated flow. The "NEH-4 Upland Method" included in the HydroCAD software is applicable for conditions which occur in the headwaters of a watershed up to 2000 acres. The NEH-4 Upland Method allows the Time of Concentration (T_c) to reflect ground conditions such as overland flow, grassed waterways, paved areas and upland gullies. This results in a model that more accurately reflects the ground surface for shallow concentrated flow conditions than TR-20, which is limited to distinguishing only paved and unpaved surfaces. T_c is the time required for water to flow from the most distant point on a runoff area to the measurement or collection point. In instances where the watersheds are small and impervious, T_c has been directly entered as a 5-minute minimum. This is consistent with standard engineering practice and Technical Release (TR-55) Urban Hydrology for Small Watersheds graphical method. A lower boundary of 5 minutes will yield a conservative yet practical measure of stormwater runoff flow for small watersheds contained within the development. The curve number (CN) is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct stormwater runoff. Based upon the cover in each sub-watershed, a weighted average CN value was determined. The area, CN values, and time of concentration were entered into HydroCAD to develop hydrographs for the pre and post-developed conditions.

E. Low Impact Development (LID)

The site design, as a redevelopment project, include multiple Low-Impact Development Techniques to the maximum extent practicable, such as:

- Reduction of Impervious Surfaces
    - The site design removes an approximate area of 450 square feet of existing pavement and utilizes this area for previous surface.
- Maximizing open space
    - As indicated above, the site design increased the previous area and provided green space consisting of lawn areas.

- Minimizing land disturbance
    - The site design limits the amount of land disturbance by maintaining the existing building's footprint and keeping most of the existing parking layout.
- Providing Groundwater Recharge Practices
    - Currently, the site has no stormwater attenuation or detention. To the maximum extent practicable, the proposed design provides underground infiltration systems that recharge groundwater.

F. SUMMARY OF HYDROLOGY & STORMWATER CALCULATIONS

The results of the pre-and post-development hydrology calculations provided in the attached hydroCAD calculations are summarized in the following tables. The table corresponds to the design point (DP-1) indicated in the Hydrology Exhibits and hydrograph routing calculations.

Summary of Design Point 1 (DP-1):

TOTAL RUNOFF PEAK FLOW RATE (CFS) - DESIGN POINT 1 (DP-1)

STORM SCS 24-HR	EXISTING	PROPOSED	DIFFERENCE
2-YEAR	0.44	0.14	-0.30
10-YEAR	0.72	0.28	-0.44
25-YEAR	0.87	0.54	-0.33
100-YEAR	1.09	0.91	-0.18

TOTAL RUNOFF VOL. (AC-FT) - DESIGN POINT 1 (DP-1)

STORM SCS 24-HR	EXISTING	PROPOSED	DIFFERENCE
2-YEAR	0.029	0.010	-0.019
10-YEAR	0.049	0.028	-0.021
25-YEAR	0.060	0.039	-0.021
100-YEAR	0.077	0.055	-0.022

Stormwater Management Performance Standards:

The following section explains how the proposed project would address the 2008 MassDEP Stormwater Management Policy and the.

Standard 1: *No new stormwater system conveyances will discharge untreated runoff or cause erosion in wetlands or waters of the Commonwealth.*

As a redevelopment project with a net decrease of 450 square feet of impervious area, the site will not discharge new untreated runoff. The roof runoff will also be collected and infiltrated using the proposed infiltration chambers UG-1. UG-1 is equipped with an overflow pipe that is connected to the City's drainage system. No untreated stormwater will flow from the site to downstream areas, and this Standard is met.

Standard 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

The post-development discharge rates do not exceed the pre-development peak discharge rates (refer to the attached hydroCAD report and C-Hydro Plan for more information). This Standard is met.

Standard 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

The project meets this Standard as a redevelopment project with a net decrease of 450 square feet of impervious area. Additionally, the recharge provided by the proposed subsurface infiltration system exceeds the requirement of the recharge volume. The total provided Recharge Volume in UG-1 below the overflow invert equals 565 cu. ft.

Standard 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:*

a. *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained;*
b. *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
c. *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

As a redevelopment project, the project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: MassDEP Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

However, MassDEP Stormwater Regulations recognize that small site constraints often make it challenging to comply with all the Standards for a redevelopment site. These constraints can be as follows: lack of space, soil conditions, and underground utilities. For this specific site, lack of space is the biggest hurdle; installation of any additional stormwater Best Management Practices (BMPs) is likely not feasible.

Standard 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.*

This Standard is not applicable to this site. The project is not considered a LUHPL (Land Use with Higher Potential Pollutant Load).

Standard 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near1 or directed to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply…*

This Standard is not applicable to this project. There will be no untreated stormwater discharge to a Critical Area as this site is not located within Critical Areas, according to MASSGIS.

Standard 7*: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

The project involves redevelopment with a net decrease in impervious areas of 450 square feet. Additionally, the site provides an underground stormwater system to infiltrate roof runoff and provide groundwater recharge. The project is designed to meet the MA Stormwater Standards. All reasonable efforts were explored to achieve compliance with MA Stormwater Standards.

Standard 8: *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

This project disturbs an approximate land area well below the 1-acre threshold. Thus, the project is not covered by an NPDES Construction General Permit, and a SWPPP would not be required.

Standard 9: *A long-term operation and maintenance plan shall be developed and implemented to ensure that Stormwater Management Systems function as designed.*

A Long-Term Operation and Maintenance Plan has been prepared for the project. Provisions to maintain runoff control devices have been assured through non-structural, structural, and construction management approaches.

Standard 10: *Prohibition of Illicit Discharges – All illicit discharges to the stormwater management system are prohibited.*

The project is designed so that illicit discharge to the stormwater system. An illicit discharge compliance statement is attached.

G. Long-Term Stormwater Pollution Prevention and Operation & Maintenance Plan To Comply With Stormwater Standards 4, 6, & 9:

This section identifies constituents of concern that have the potential to contaminate stormwater runoff from the proposed project site and provides a framework of Best Management Practices (BMPs) for handling stormwater runoff. It also outlines an inspection and maintenance program to ensure the continued effectiveness of the stormwater management system. The used BMPs are shown on the plans prepared by CHA, 101 Accord Park Drive, Norwell, Massachusetts.

OWNER AND RESPONSIBLE PARTY:

Owner:

Day-to-day Operation and Maintenance:

1) CONSTRUCTION MANAGEMENT:

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work-related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas and any conditions of approval from the local conservation commission.

The design incorporates measures to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities. The information contained herein and within the engineering drawings identifies construction period pollution prevention measures, responsible parties, erosion control measures (straw bales and silt fence, etc.), BMPs for collecting and treating runoff and groundwater during construction[1], site stabilization measures (i.e. gravel, seed, pavement, etc.), an operations and maintenance plan & long-term pollution prevention plan contained herein.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used when operating over top of buried utilities or drains, or chambers.

[1] Should the need for de-watering arise during construction at the site, groundwater will be pumped directly from the work area into geotextile filter bags, temporary settling basins, or portable fractionation tanks (depending on the nature and volume of water encountered) which will act as sediment traps during construction. Discharge points will be setback outside of all resource areas and buffers monitored by qualified personnel (wetland scientist, licensed site professional, civil engineer, etc.) to ensure no impacts to resource areas and compliance with applicable Federal and state regulations. All discharges will be free from visible floating, suspended, and settleable solids that would impair the functions of the nearby drainage systems, wetlands, or downstream rivers. Refer to the details provided on the drawing set for additional information.

2) ON-GOING MAINTENANCE CONTRACT:

The non-structural and structural approaches recommended below in sections 8 & 9, as well as the required BMP maintenance, will be completed by an appropriate contractor. Adequate personnel with appropriate training and access to proper equipment will be available to complete the tasks. Future responsible parties must be notified of their responsibility to operate and maintain the system in perpetuity.

3) LIVING DOCUMENT PROVISIONS:

This document shall be updated as necessary to reflect new procedures, technologies or requirements.

4) MAINTENANCE LOG:

The Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records will be maintained for at least 3 years and be made available for viewing to the Massachusetts Department of Environmental Protection in accordance with the provisions of the Massachusetts Stormwater Handbook.

5) GOOD HOUSEKEEPING PRACTICES DURING CONSTRUCTION:

The Responsible Party shall maintain good housekeeping practices by maintaining a clean and orderly facility to prevent potential pollution sources, including debris, from coming into contact with stormwater and degrading water quality. It includes establishing protocols to reduce the possibility of mishandling materials or equipment and training employees in good housekeeping techniques. Common areas where good housekeeping practices should be followed shall include material storage, vehicle and equipment maintenance, and loading areas. Good housekeeping practices must include a designated and secure location for garbage. A schedule for regular pickup and disposal of garbage and waste materials and routine inspections of containers for leaks and structural integrity shall be developed.

Specific good housekeeping practices that will be implemented include routine removal of trash. Items including scrap, metal, wood, plastic, miscellaneous trash, paper, glass, insulation, misc. building materials and packaging. Additional practices include securing and covering any containers, supplies, or equipment that could become sources of stormwater pollution.

6) MINIMIZING EXPOSURE DURING CONSTRUCTION:

The Responsible Party will minimize exposure of potential pollutant sources, including debris, from coming into contact with precipitation and being picked up by stormwater and carried into drains and surface waters using the following steps:

- Storing all containerized materials in a protected, secure location away from drains and plainly labeled.
- Containing all activities that can generate sources of contaminants from reaching the receiving water or the stormwater management system.
- Securing any equipment or supplies so they are not transported into receiving waters or stormwater management systems during storm events.

7) BEST MANAGEMENT PRACTICES MAINTENANCE POST-CONSTRUCTION:

The following Best Management Practices are proposed to be incorporated into the stormwater management system treatment train design to reduce source runoff and improve stormwater runoff discharge quality. A description of the non-structural and structural approaches to be incorporated are indicated below. The Responsible Party will regularly inspect all BMPs to ensure they are operating properly. If any deficiencies are identified during these inspections, action to resolve it will be initiated and documented on the maintenance log.

8) NON-STRUCTURAL BEST MANAGEMENT PRACTICES (BMPs):

STREET/ PARKING LOT SWEEPING:

As street sweeping is a BMP under MassDEP guidelines, this non-structural BMP effectively removes Total Suspended Solids (TSS) in a comprehensive stormwater management program. At the property owner's discretion, a maintenance program of street sweeping with a High-Efficiency Vacuum Sweeper or a Regenerative Air Sweeper can reduce sediment accumulation in the deep sump catch basins and subsurface systems. Sweeping can be conducted semi-annually (primarily in the spring and fall) to keep downstream treatment train BMPs operating effectively.

GRADING:

The impervious areas of the site shall be graded as gently as possible to reduce runoff velocities. Steep slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H: 1V without providing additional reinforcement. Steep slopes may require soil reinforcement and additional vegetation.

SNOW STORAGE AND DEICING:

Snow storage is anticipated to occur around the perimeter of the paved areas. The landscaping has been designed accordingly. During larger snow events, the use of a snow pile area within the less utilized portion of the main parking lot shall be utilized.

FERTILIZER:

Slow-release organic fertilizers are recommended to be used in landscape areas to limit nutrient transport to groundwater. It is recommended that application be limited to 5 lbs. per 1000 square feet of lawn area.

9) STRUCTURAL BEST MANAGEMENT PRACTICES:

Prior to final completion and full occupancy of the development, it is recommended that a representative of the Contractor, Manufacturer, and/or Engineer either designing or building the facility for the Owner properly instruct the Responsible Party as to the maintenance practices required to maintain the effectiveness of the drainage system responsibly. These frequencies and requirements are recommendations to maintain minimum effectiveness in most typical environments. Ultimately, the Responsible Party will implement the procedures and frequencies as they see fit under their current plan and inspect the systems as needed to maintain minimum effectiveness as the manufacturer recommends. The following maintenance of structural BMPs will be implemented:

UNDERGROUND INFILTRATION UG-1

Refer to the attached Operation and Maintenance Plan by StormTech.

Illicit Discharge Statement

ILLICIT DISCHARGE COMPLIANCE STATEMENT
FOR
REDEVELOPMENT PROJECT
30-32 WALL STREET, FOXBOROUGH MA

Standard 10: Massachusetts Stormwater Standards Handbook

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

To our knowledge and professional belief, no illicit discharges to the stormwater system, surface waters, or wetland resource areas will remain on the site after construction. We will agree to implement a pollution prevention plan to prevent illicit discharges into the stormwater management system. Based on the plans prepared by HD Design, Avon, MA, the site's design shows a separation and no direct connection between the stormwater management systems and the wastewater and/ or groundwater on the site. To the maximum extent practicable, the design prevents the entry of illicit discharges into the stormwater management system.

Engineer's Name: Hazem Dani, PE

Engineer's Signature: _____ Date: 07/15/2023

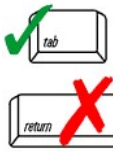
Stormwater Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

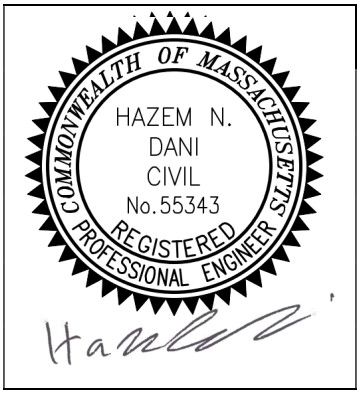
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



09/18/2023
Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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): Underground Infiltration Practice

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

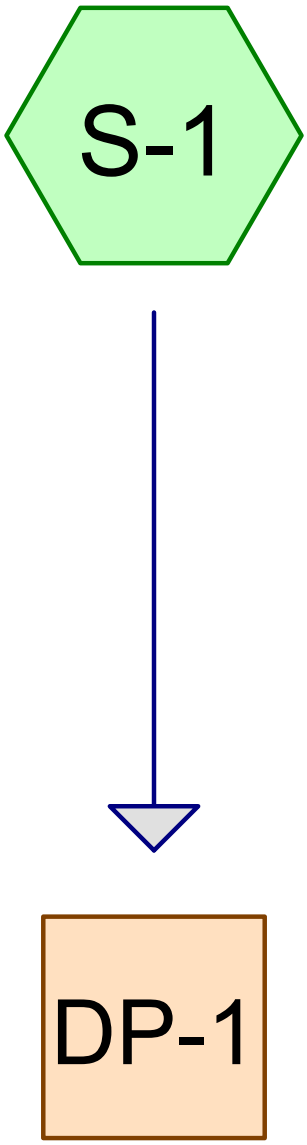
Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

Pre-Development
HydroCAD Model Calculations



Subcat Reach Pond Link

Routing Diagram for
30-32 Wall St_Existing HydroCAD

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.70	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.50	2
4	100-Year	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.043	61	>75% Grass cover, Good, HSG B (S-1)
0.137	98	Impervious Surfaces (S-1)
0.180	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.043	HSG B	S-1
0.000	HSG C	
0.000	HSG D	
0.137	Other	S-1
0.180		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.043	0.000	0.000	0.000	0.043	>75% Grass cover, Good	S-1
0.000	0.000	0.000	0.000	0.137	0.137	Impervious Surfaces	S-1
0.000	**0.043**	**0.000**	**0.000**	**0.137**	**0.180**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S-1: Runoff Area=7,830 sf 75.99% Impervious Runoff Depth>1.95"
Tc=5.0 min CN=89 Runoff=0.44 cfs 0.029 af

Reach DP-1: Inflow=0.44 cfs 0.029 af
Outflow=0.44 cfs 0.029 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.029 af Average Runoff Depth = 1.95"
24.01% Pervious = 0.043 ac 75.99% Impervious = 0.137 ac

Summary for Subcatchment S-1:

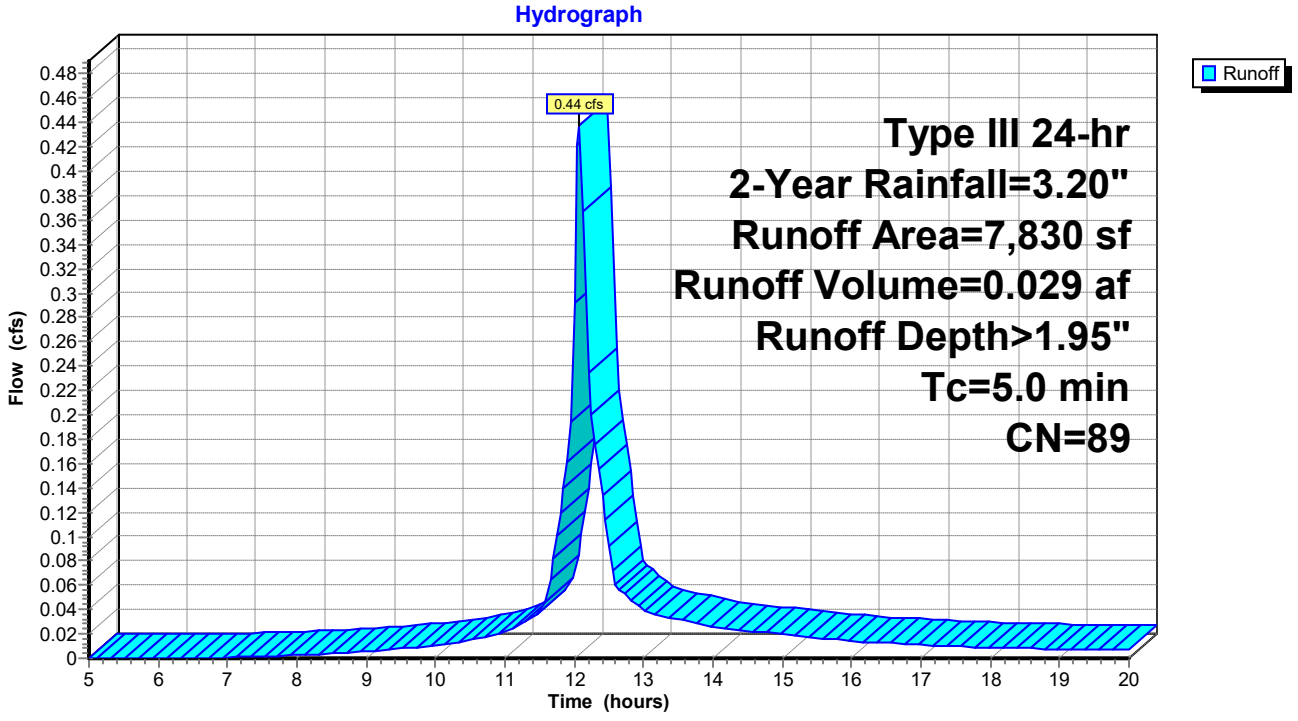
Runoff = 0.44 cfs @ 12.07 hrs, Volume= 0.029 af, Depth> 1.95"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	5,950	98	Impervious Surfaces
	1,880	61	>75% Grass cover, Good, HSG B
	7,830	89	Weighted Average
	1,880		24.01% Pervious Area
	5,950		75.99% Impervious Area

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

Subcatchment S-1:



Hydrograph for Subcatchment S-1:

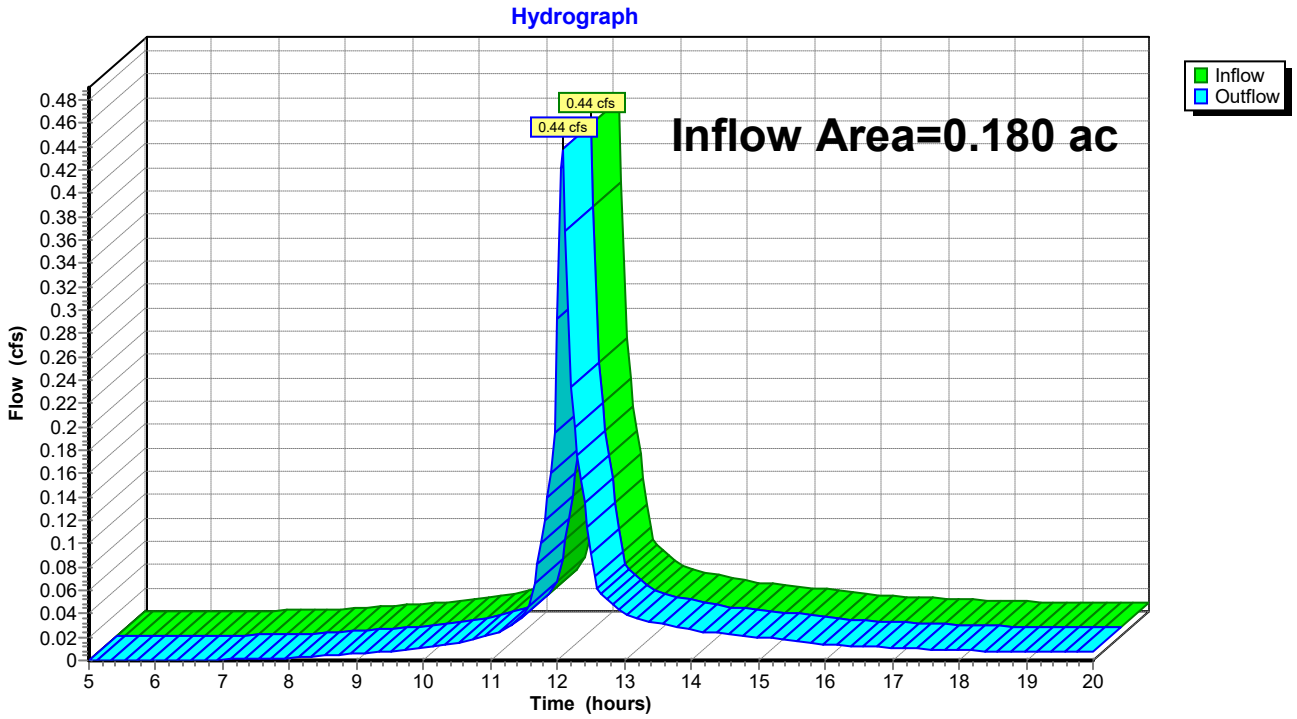
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.18	0.00	0.00
5.25	0.19	0.00	0.00
5.50	0.21	0.00	0.00
5.75	0.22	0.00	0.00
6.00	0.23	0.00	0.00
6.25	0.24	0.00	0.00
6.50	0.26	0.00	0.00
6.75	0.27	0.00	0.00
7.00	0.29	0.00	0.00
7.25	0.31	0.00	0.00
7.50	0.33	0.00	0.00
7.75	0.34	0.01	0.00
8.00	0.36	0.01	0.00
8.25	0.39	0.01	0.00
8.50	0.41	0.02	0.00
8.75	0.44	0.03	0.00
9.00	0.47	0.03	0.01
9.25	0.50	0.04	0.01
9.50	0.53	0.05	0.01
9.75	0.57	0.07	0.01
10.00	0.60	0.08	0.01
10.25	0.65	0.10	0.01
10.50	0.69	0.12	0.02
10.75	0.74	0.14	0.02
11.00	0.80	0.17	0.02
11.25	0.87	0.21	0.03
11.50	0.95	0.26	0.04
11.75	1.14	0.37	0.10
12.00	1.60	0.71	**0.29**
12.25	2.06	1.08	**0.20**
12.50	2.25	1.24	0.09
12.75	2.33	1.31	0.05
13.00	2.40	1.37	0.04
13.25	2.46	1.42	0.03
13.50	2.51	1.46	0.03
13.75	2.55	1.50	0.03
14.00	2.60	1.54	0.03
14.25	2.63	1.57	0.02
14.50	2.67	1.60	0.02
14.75	2.70	1.63	0.02
15.00	2.73	1.66	0.02
15.25	2.76	1.69	0.02
15.50	2.79	1.71	0.02
15.75	2.81	1.73	0.02
16.00	2.84	1.75	0.01
16.25	2.86	1.77	0.01
16.50	2.87	1.79	0.01
16.75	2.89	1.80	0.01
17.00	2.91	1.82	0.01
17.25	2.93	1.83	0.01
17.50	2.94	1.85	0.01
17.75	2.96	1.86	0.01
18.00	2.97	1.87	0.01
18.25	2.98	1.88	0.01
18.50	2.99	1.89	0.01
18.75	3.01	1.91	0.01
19.00	3.02	1.92	0.01
19.25	3.03	1.93	0.01
19.50	3.04	1.94	0.01
19.75	3.05	1.95	0.01
20.00	**3.06**	**1.96**	0.01

Summary for Reach DP-1:

Inflow Area = 0.180 ac, 75.99% Impervious, Inflow Depth > 1.95" for 2-Year event
Inflow = 0.44 cfs @ 12.07 hrs, Volume= 0.029 af
Outflow = 0.44 cfs @ 12.07 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.00		0.00
7.75	0.00		0.00
8.00	0.00		0.00
8.25	0.00		0.00
8.50	0.00		0.00
8.75	0.00		0.00
9.00	0.01		0.01
9.25	0.01		0.01
9.50	0.01		0.01
9.75	0.01		0.01
10.00	0.01		0.01
10.25	0.01		0.01
10.50	0.02		0.02
10.75	0.02		0.02
11.00	0.02		0.02
11.25	0.03		0.03
11.50	0.04		0.04
11.75	0.10		0.10
12.00	**0.29**		**0.29**
12.25	**0.20**		**0.20**
12.50	0.09		0.09
12.75	0.05		0.05
13.00	0.04		0.04
13.25	0.03		0.03
13.50	0.03		0.03
13.75	0.03		0.03
14.00	0.03		0.03
14.25	0.02		0.02
14.50	0.02		0.02
14.75	0.02		0.02
15.00	0.02		0.02
15.25	0.02		0.02
15.50	0.02		0.02
15.75	0.02		0.02
16.00	0.01		0.01
16.25	0.01		0.01
16.50	0.01		0.01
16.75	0.01		0.01
17.00	0.01		0.01
17.25	0.01		0.01
17.50	0.01		0.01
17.75	0.01		0.01
18.00	0.01		0.01
18.25	0.01		0.01
18.50	0.01		0.01
18.75	0.01		0.01
19.00	0.01		0.01
19.25	0.01		0.01
19.50	0.01		0.01
19.75	0.01		0.01
20.00	0.01		0.01

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S-1: Runoff Area=7,830 sf 75.99% Impervious Runoff Depth>3.29"
Tc=5.0 min CN=89 Runoff=0.72 cfs 0.049 af

Reach DP-1: Inflow=0.72 cfs 0.049 af
Outflow=0.72 cfs 0.049 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.049 af Average Runoff Depth = 3.29"
24.01% Pervious = 0.043 ac 75.99% Impervious = 0.137 ac

Summary for Subcatchment S-1:

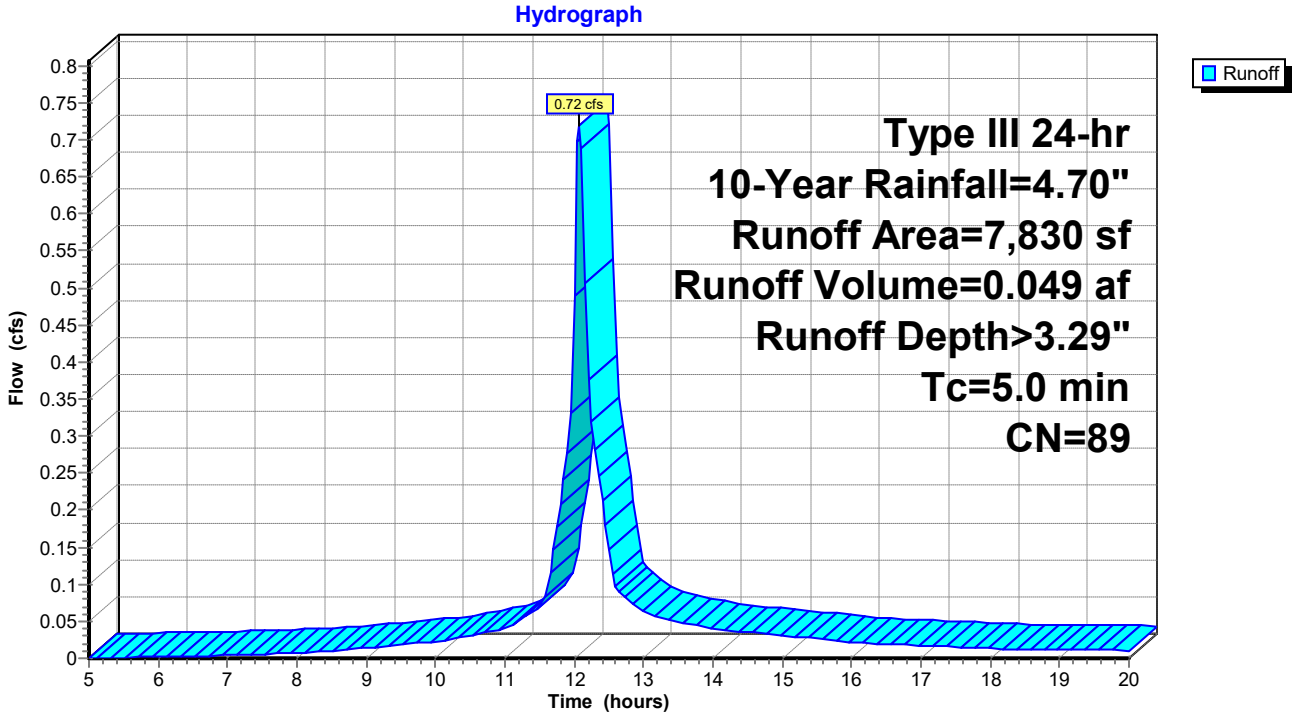
Runoff = 0.72 cfs @ 12.07 hrs, Volume= 0.049 af, Depth> 3.29"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	5,950	98	Impervious Surfaces
	1,880	61	>75% Grass cover, Good, HSG B
	7,830	89	Weighted Average
	1,880		24.01% Pervious Area
	5,950		75.99% Impervious Area

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

Subcatchment S-1:



Hydrograph for Subcatchment S-1:

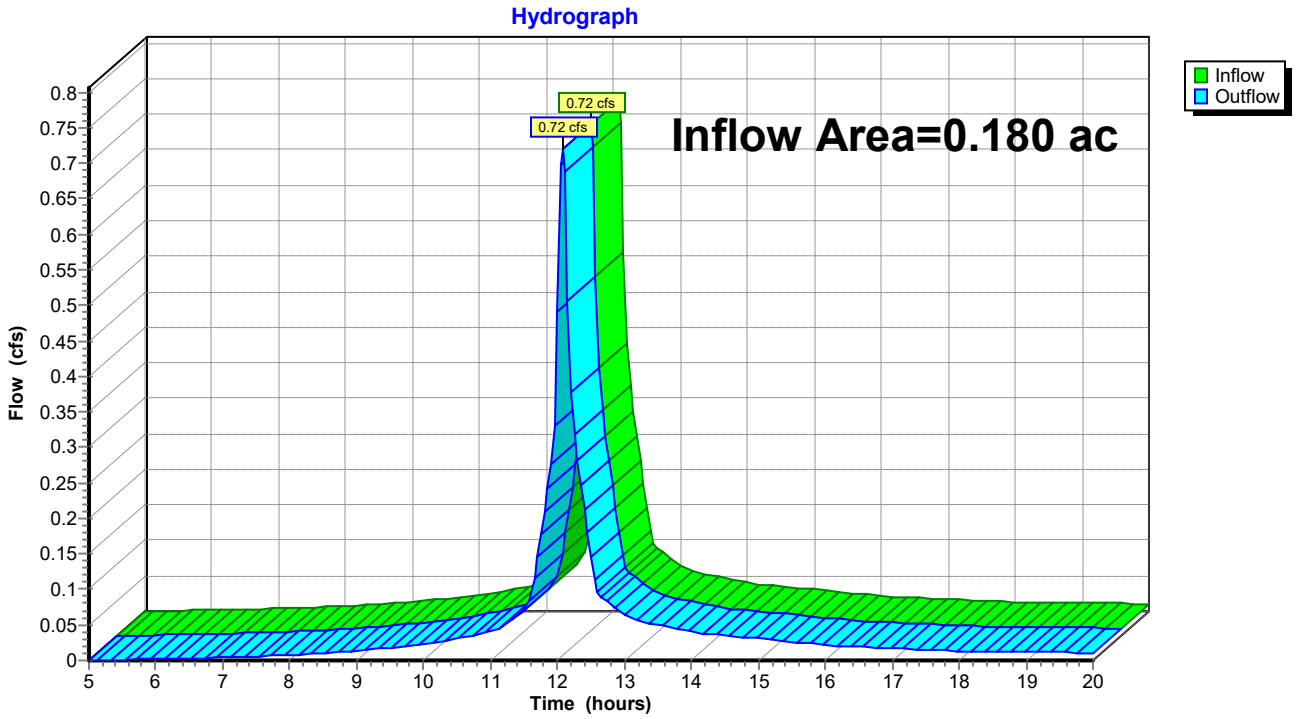
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.27	0.00	0.00
5.25	0.28	0.00	0.00
5.50	0.30	0.00	0.00
5.75	0.32	0.00	0.00
6.00	0.34	0.01	0.00
6.25	0.36	0.01	0.00
6.50	0.38	0.01	0.00
6.75	0.40	0.02	0.00
7.00	0.43	0.02	0.00
7.25	0.45	0.03	0.00
7.50	0.48	0.04	0.01
7.75	0.51	0.04	0.01
8.00	0.54	0.05	0.01
8.25	0.57	0.07	0.01
8.50	0.60	0.08	0.01
8.75	0.64	0.10	0.01
9.00	0.69	0.11	0.01
9.25	0.73	0.14	0.02
9.50	0.78	0.16	0.02
9.75	0.83	0.19	0.02
10.00	0.89	0.22	0.02
10.25	0.95	0.25	0.03
10.50	1.02	0.30	0.03
10.75	1.09	0.34	0.04
11.00	1.18	0.40	0.04
11.25	1.27	0.47	0.05
11.50	1.40	0.56	0.07
11.75	1.67	0.76	0.18
12.00	2.35	1.32	**0.49**
12.25	3.03	1.93	**0.32**
12.50	3.30	2.17	0.15
12.75	3.43	2.29	0.08
13.00	3.52	2.38	0.06
13.25	3.61	2.46	0.05
13.50	3.68	2.53	0.05
13.75	3.75	2.59	0.05
14.00	3.81	2.65	0.04
14.25	3.87	2.70	0.04
14.50	3.92	2.75	0.04
14.75	3.97	2.79	0.03
15.00	4.01	2.84	0.03
15.25	4.06	2.88	0.03
15.50	4.10	2.91	0.03
15.75	4.13	2.95	0.02
16.00	4.16	2.98	0.02
16.25	4.19	3.01	0.02
16.50	4.22	3.03	0.02
16.75	4.25	3.06	0.02
17.00	4.27	3.08	0.02
17.25	4.30	3.10	0.02
17.50	4.32	3.13	0.02
17.75	4.34	3.15	0.01
18.00	4.36	3.16	0.01
18.25	4.38	3.18	0.01
18.50	4.40	3.20	0.01
18.75	4.42	3.22	0.01
19.00	4.43	3.23	0.01
19.25	4.45	3.25	0.01
19.50	4.47	3.26	0.01
19.75	4.48	3.28	0.01
20.00	**4.50**	**3.29**	0.01

Summary for Reach DP-1:

Inflow Area = 0.180 ac, 75.99% Impervious, Inflow Depth > 3.29" for 10-Year event
Inflow = 0.72 cfs @ 12.07 hrs, Volume= 0.049 af
Outflow = 0.72 cfs @ 12.07 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.00		0.00
7.00	0.00		0.00
7.25	0.00		0.00
7.50	0.01		0.01
7.75	0.01		0.01
8.00	0.01		0.01
8.25	0.01		0.01
8.50	0.01		0.01
8.75	0.01		0.01
9.00	0.01		0.01
9.25	0.02		0.02
9.50	0.02		0.02
9.75	0.02		0.02
10.00	0.02		0.02
10.25	0.03		0.03
10.50	0.03		0.03
10.75	0.04		0.04
11.00	0.04		0.04
11.25	0.05		0.05
11.50	0.07		0.07
11.75	0.18		0.18
12.00	**0.49**		**0.49**
12.25	**0.32**		**0.32**
12.50	0.15		0.15
12.75	0.08		0.08
13.00	0.06		0.06
13.25	0.05		0.05
13.50	0.05		0.05
13.75	0.05		0.05
14.00	0.04		0.04
14.25	0.04		0.04
14.50	0.04		0.04
14.75	0.03		0.03
15.00	0.03		0.03
15.25	0.03		0.03
15.50	0.03		0.03
15.75	0.02		0.02
16.00	0.02		0.02
16.25	0.02		0.02
16.50	0.02		0.02
16.75	0.02		0.02
17.00	0.02		0.02
17.25	0.02		0.02
17.50	0.02		0.02
17.75	0.01		0.01
18.00	0.01		0.01
18.25	0.01		0.01
18.50	0.01		0.01
18.75	0.01		0.01
19.00	0.01		0.01
19.25	0.01		0.01
19.50	0.01		0.01
19.75	0.01		0.01
20.00	0.01		0.01

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S-1: Runoff Area=7,830 sf 75.99% Impervious Runoff Depth>4.02"
Tc=5.0 min CN=89 Runoff=0.87 cfs 0.060 af

Reach DP-1: Inflow=0.87 cfs 0.060 af
Outflow=0.87 cfs 0.060 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.060 af Average Runoff Depth = 4.02"
24.01% Pervious = 0.043 ac 75.99% Impervious = 0.137 ac

Summary for Subcatchment S-1:

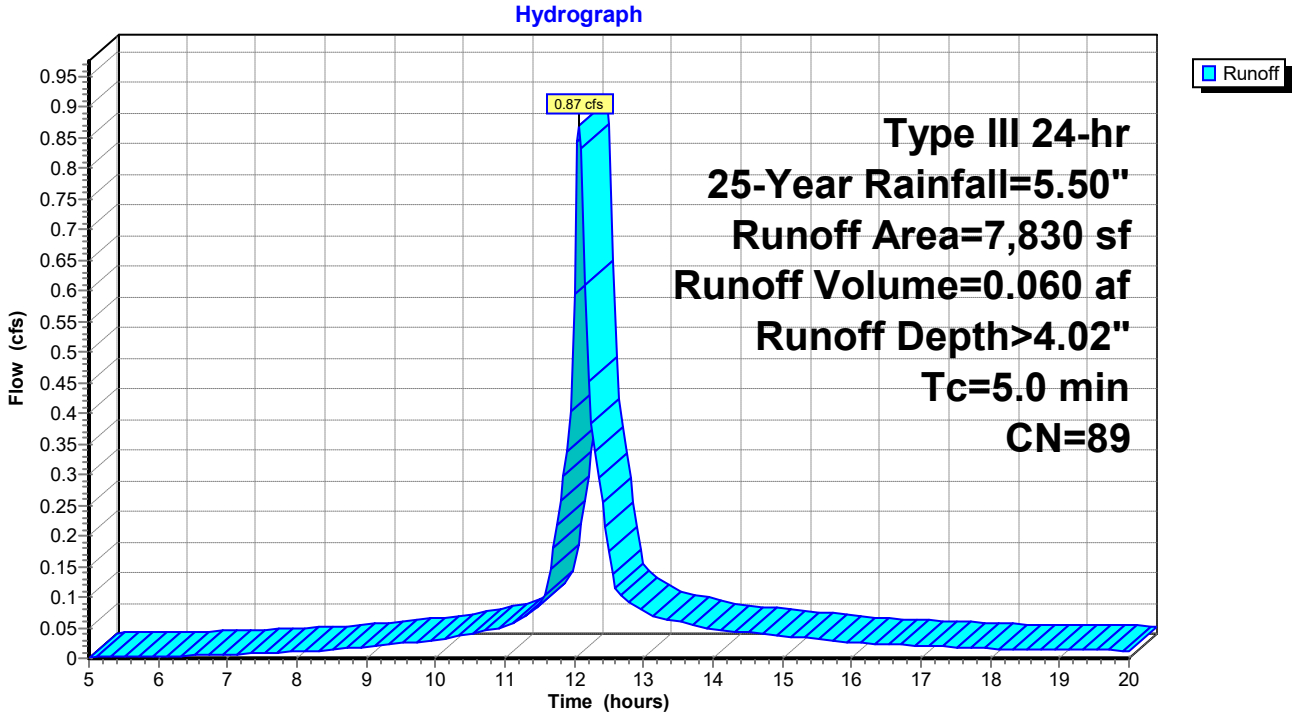
Runoff = 0.87 cfs @ 12.07 hrs, Volume= 0.060 af, Depth> 4.02"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	5,950	98	Impervious Surfaces
	1,880	61	>75% Grass cover, Good, HSG B
	7,830	89	Weighted Average
	1,880		24.01% Pervious Area
	5,950		75.99% Impervious Area

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

Subcatchment S-1:



Hydrograph for Subcatchment S-1:

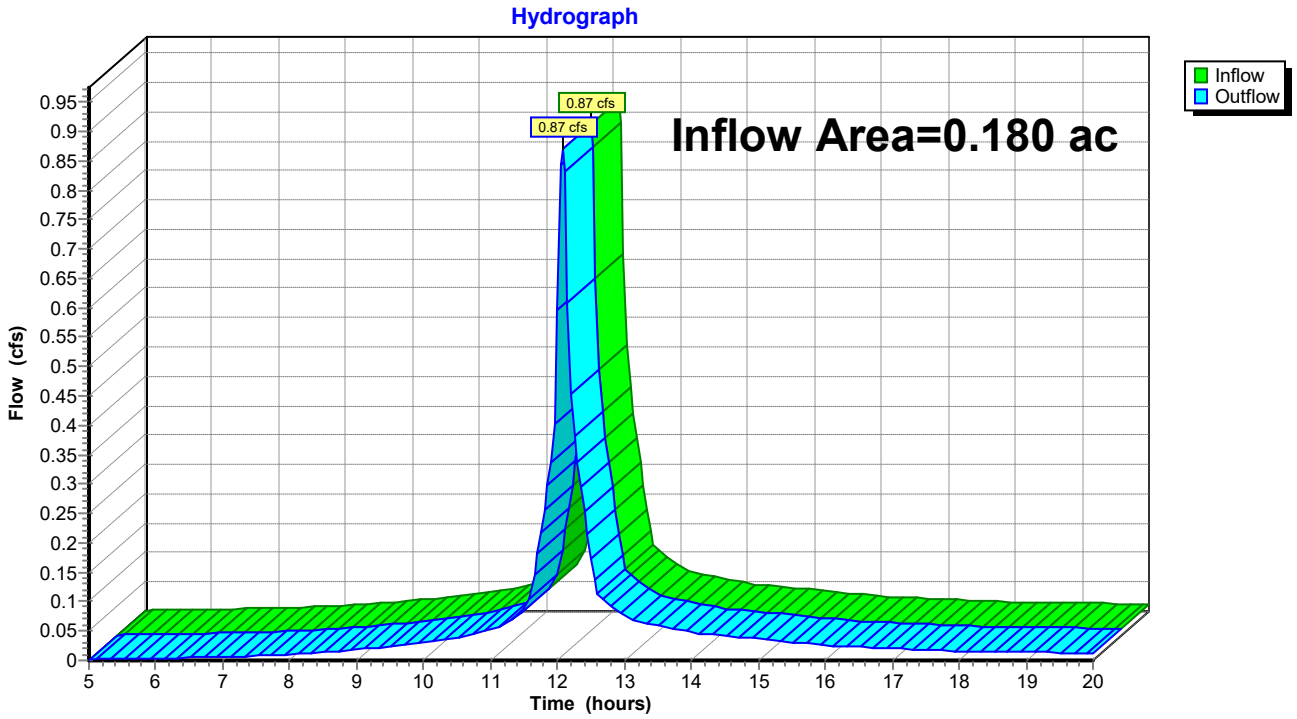
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.31	0.00	0.00
5.25	0.33	0.01	0.00
5.50	0.35	0.01	0.00
5.75	0.37	0.01	0.00
6.00	0.40	0.02	0.00
6.25	0.42	0.02	0.00
6.50	0.44	0.03	0.00
6.75	0.47	0.03	0.01
7.00	0.50	0.04	0.01
7.25	0.53	0.05	0.01
7.50	0.56	0.06	0.01
7.75	0.59	0.08	0.01
8.00	0.63	0.09	0.01
8.25	0.66	0.11	0.01
8.50	0.71	0.12	0.01
8.75	0.75	0.15	0.02
9.00	0.80	0.17	0.02
9.25	0.86	0.20	0.02
9.50	0.91	0.23	0.02
9.75	0.97	0.27	0.03
10.00	1.04	0.31	0.03
10.25	1.11	0.36	0.03
10.50	1.19	0.41	0.04
10.75	1.28	0.47	0.05
11.00	1.37	0.54	0.05
11.25	1.49	0.62	0.07
11.50	1.64	0.74	0.09
11.75	1.95	0.99	0.22
12.00	2.75	1.68	**0.60**
12.25	3.55	2.40	**0.38**
12.50	3.86	2.69	0.17
12.75	4.01	2.83	0.10
13.00	4.12	2.94	0.08
13.25	4.22	3.03	0.06
13.50	4.31	3.11	0.06
13.75	4.39	3.19	0.05
14.00	4.46	3.26	0.05
14.25	4.53	3.32	0.04
14.50	4.59	3.38	0.04
14.75	4.64	3.43	0.04
15.00	4.70	3.48	0.04
15.25	4.75	3.53	0.03
15.50	4.79	3.57	0.03
15.75	4.84	3.61	0.03
16.00	4.87	3.65	0.03
16.25	4.91	3.68	0.02
16.50	4.94	3.72	0.02
16.75	4.97	3.75	0.02
17.00	5.00	3.77	0.02
17.25	5.03	3.80	0.02
17.50	5.06	3.83	0.02
17.75	5.08	3.85	0.02
18.00	5.10	3.87	0.02
18.25	5.13	3.89	0.02
18.50	5.15	3.91	0.01
18.75	5.17	3.93	0.01
19.00	5.19	3.95	0.01
19.25	5.21	3.97	0.01
19.50	5.23	3.99	0.01
19.75	5.25	4.01	0.01
20.00	**5.26**	**4.02**	0.01

Summary for Reach DP-1:

Inflow Area = 0.180 ac, 75.99% Impervious, Inflow Depth > 4.02" for 25-Year event
Inflow = 0.87 cfs @ 12.07 hrs, Volume= 0.060 af
Outflow = 0.87 cfs @ 12.07 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.00		0.00
6.25	0.00		0.00
6.50	0.00		0.00
6.75	0.01		0.01
7.00	0.01		0.01
7.25	0.01		0.01
7.50	0.01		0.01
7.75	0.01		0.01
8.00	0.01		0.01
8.25	0.01		0.01
8.50	0.01		0.01
8.75	0.02		0.02
9.00	0.02		0.02
9.25	0.02		0.02
9.50	0.02		0.02
9.75	0.03		0.03
10.00	0.03		0.03
10.25	0.03		0.03
10.50	0.04		0.04
10.75	0.05		0.05
11.00	0.05		0.05
11.25	0.07		0.07
11.50	0.09		0.09
11.75	0.22		0.22
12.00	**0.60**		**0.60**
12.25	**0.38**		**0.38**
12.50	0.17		0.17
12.75	0.10		0.10
13.00	0.08		0.08
13.25	0.06		0.06
13.50	0.06		0.06
13.75	0.05		0.05
14.00	0.05		0.05
14.25	0.04		0.04
14.50	0.04		0.04
14.75	0.04		0.04
15.00	0.04		0.04
15.25	0.03		0.03
15.50	0.03		0.03
15.75	0.03		0.03
16.00	0.03		0.03
16.25	0.02		0.02
16.50	0.02		0.02
16.75	0.02		0.02
17.00	0.02		0.02
17.25	0.02		0.02
17.50	0.02		0.02
17.75	0.02		0.02
18.00	0.02		0.02
18.25	0.02		0.02
18.50	0.01		0.01
18.75	0.01		0.01
19.00	0.01		0.01
19.25	0.01		0.01
19.50	0.01		0.01
19.75	0.01		0.01
20.00	0.01		0.01

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment S-1: Runoff Area=7,830 sf 75.99% Impervious Runoff Depth>5.12"
Tc=5.0 min CN=89 Runoff=1.09 cfs 0.077 af

Reach DP-1: Inflow=1.09 cfs 0.077 af
Outflow=1.09 cfs 0.077 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.077 af Average Runoff Depth = 5.12"
24.01% Pervious = 0.043 ac 75.99% Impervious = 0.137 ac

Summary for Subcatchment S-1:

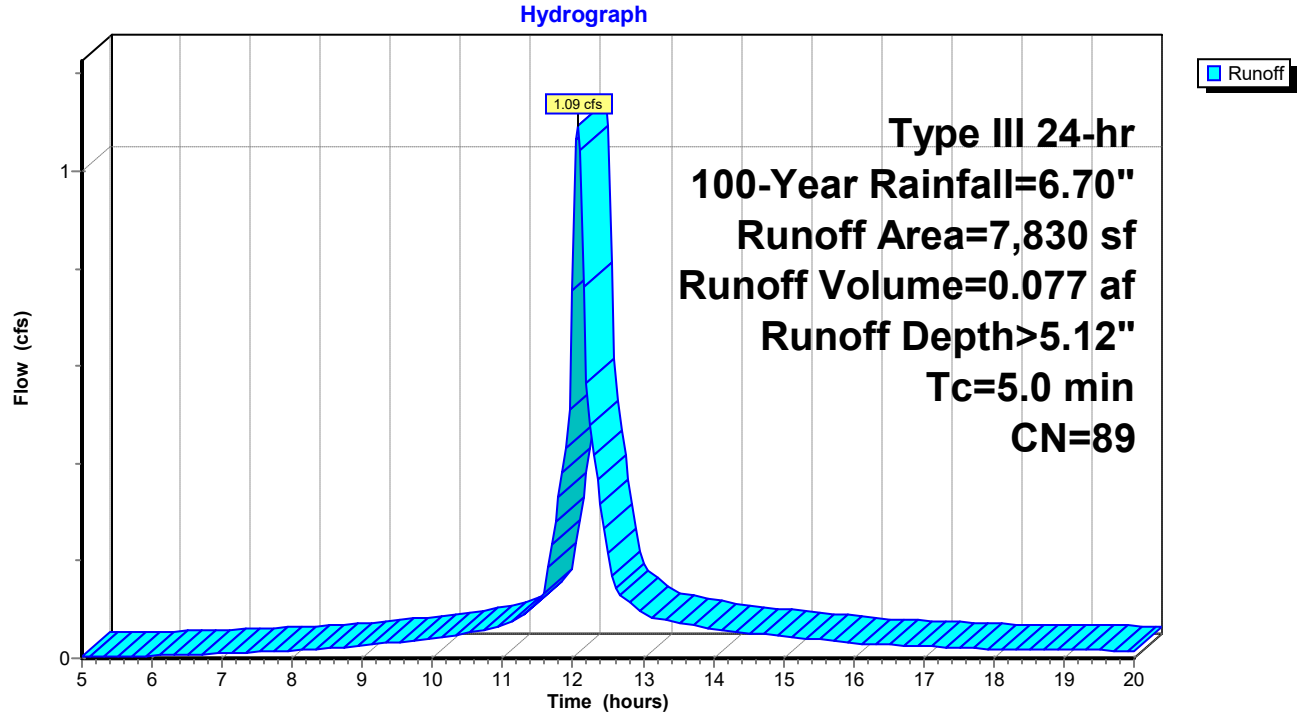
Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.077 af, Depth> 5.12"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	5,950	98	Impervious Surfaces
	1,880	61	>75% Grass cover, Good, HSG B
	7,830	89	Weighted Average
	1,880		24.01% Pervious Area
	5,950		75.99% Impervious Area

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

Subcatchment S-1:



Hydrograph for Subcatchment S-1:

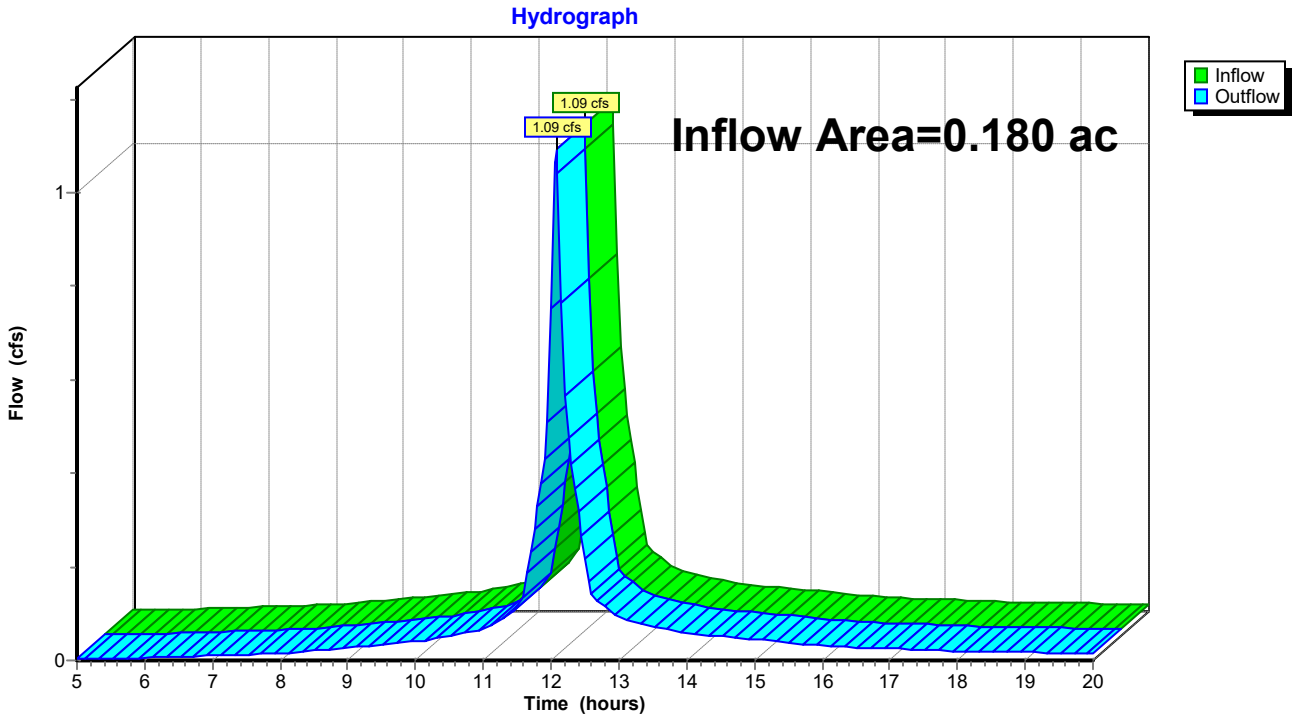
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
5.00	0.38	0.01	0.00
5.25	0.40	0.02	0.00
5.50	0.43	0.02	0.00
5.75	0.46	0.03	0.00
6.00	0.48	0.04	0.01
6.25	0.51	0.05	0.01
6.50	0.54	0.06	0.01
6.75	0.57	0.07	0.01
7.00	0.61	0.08	0.01
7.25	0.64	0.10	0.01
7.50	0.68	0.11	0.01
7.75	0.72	0.13	0.01
8.00	0.76	0.15	0.02
8.25	0.81	0.18	0.02
8.50	0.86	0.20	0.02
8.75	0.92	0.23	0.02
9.00	0.98	0.27	0.03
9.25	1.04	0.31	0.03
9.50	1.11	0.36	0.03
9.75	1.19	0.41	0.04
10.00	1.27	0.46	0.04
10.25	1.35	0.52	0.05
10.50	1.45	0.59	0.05
10.75	1.56	0.67	0.06
11.00	1.67	0.77	0.07
11.25	1.82	0.88	0.09
11.50	2.00	1.03	0.11
11.75	2.38	1.35	0.28
12.00	3.35	2.22	**0.75**
12.25	4.32	3.12	**0.48**
12.50	4.70	3.49	0.22
12.75	4.88	3.66	0.12
13.00	5.02	3.80	0.09
13.25	5.14	3.91	0.08
13.50	5.25	4.01	0.07
13.75	5.35	4.10	0.07
14.00	5.43	4.19	0.06
14.25	5.51	4.27	0.06
14.50	5.59	4.34	0.05
14.75	5.66	4.40	0.05
15.00	5.72	4.47	0.05
15.25	5.78	4.53	0.04
15.50	5.84	4.58	0.04
15.75	5.89	4.63	0.03
16.00	5.94	4.67	0.03
16.25	5.98	4.71	0.03
16.50	6.02	4.75	0.03
16.75	6.06	4.79	0.03
17.00	6.09	4.83	0.03
17.25	6.13	4.86	0.02
17.50	6.16	4.89	0.02
17.75	6.19	4.92	0.02
18.00	6.22	4.95	0.02
18.25	6.24	4.97	0.02
18.50	6.27	5.00	0.02
18.75	6.30	5.02	0.02
19.00	6.32	5.05	0.02
19.25	6.34	5.07	0.02
19.50	6.37	5.09	0.02
19.75	6.39	5.11	0.02
20.00	**6.41**	**5.14**	0.02

Summary for Reach DP-1:

Inflow Area = 0.180 ac, 75.99% Impervious, Inflow Depth > 5.12" for 100-Year event
Inflow = 1.09 cfs @ 12.07 hrs, Volume= 0.077 af
Outflow = 1.09 cfs @ 12.07 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

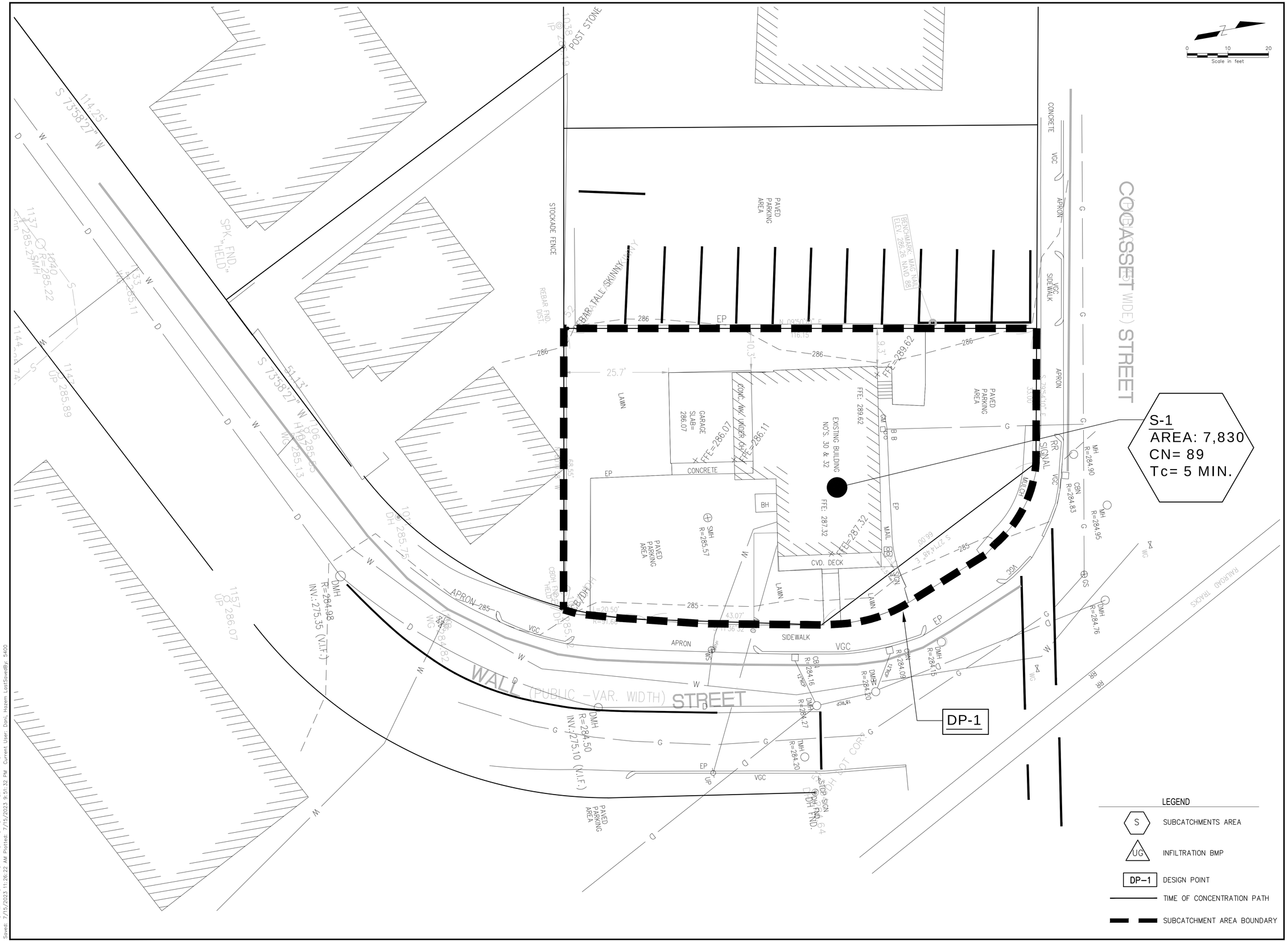
Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
5.00	0.00		0.00
5.25	0.00		0.00
5.50	0.00		0.00
5.75	0.00		0.00
6.00	0.01		0.01
6.25	0.01		0.01
6.50	0.01		0.01
6.75	0.01		0.01
7.00	0.01		0.01
7.25	0.01		0.01
7.50	0.01		0.01
7.75	0.01		0.01
8.00	0.02		0.02
8.25	0.02		0.02
8.50	0.02		0.02
8.75	0.02		0.02
9.00	0.03		0.03
9.25	0.03		0.03
9.50	0.03		0.03
9.75	0.04		0.04
10.00	0.04		0.04
10.25	0.05		0.05
10.50	0.05		0.05
10.75	0.06		0.06
11.00	0.07		0.07
11.25	0.09		0.09
11.50	0.11		0.11
11.75	0.28		0.28
12.00	**0.75**		**0.75**
12.25	**0.48**		**0.48**
12.50	0.22		0.22
12.75	0.12		0.12
13.00	0.09		0.09
13.25	0.08		0.08
13.50	0.07		0.07
13.75	0.07		0.07
14.00	0.06		0.06
14.25	0.06		0.06
14.50	0.05		0.05
14.75	0.05		0.05
15.00	0.05		0.05
15.25	0.04		0.04
15.50	0.04		0.04
15.75	0.03		0.03
16.00	0.03		0.03
16.25	0.03		0.03
16.50	0.03		0.03
16.75	0.03		0.03
17.00	0.03		0.03
17.25	0.02		0.02
17.50	0.02		0.02
17.75	0.02		0.02
18.00	0.02		0.02
18.25	0.02		0.02
18.50	0.02		0.02
18.75	0.02		0.02
19.00	0.02		0.02
19.25	0.02		0.02
19.50	0.02		0.02
19.75	0.02		0.02
20.00	0.02		0.02

TABLE OF CONTENTS



HD Design
161 W. High Street,
Avon, MA 02322

No.	Submittal / Revision	Appr'd.	By	Date
0	OWNERS COMMENTS	HD	HD	06/07/23
1	SITE PLAN REVIEW / APP.	HD	HD	07/15/23

APPLICANT / OWNER

TNC DEVELOPMENT LLC

58 WILLOW STREET
NORWOOD, MA 02062

SITE PLANS
BUILDING EXPANSION
MIXED-USE BUILDING
30-32 WALL STREET, FOXBOROUGH, MA

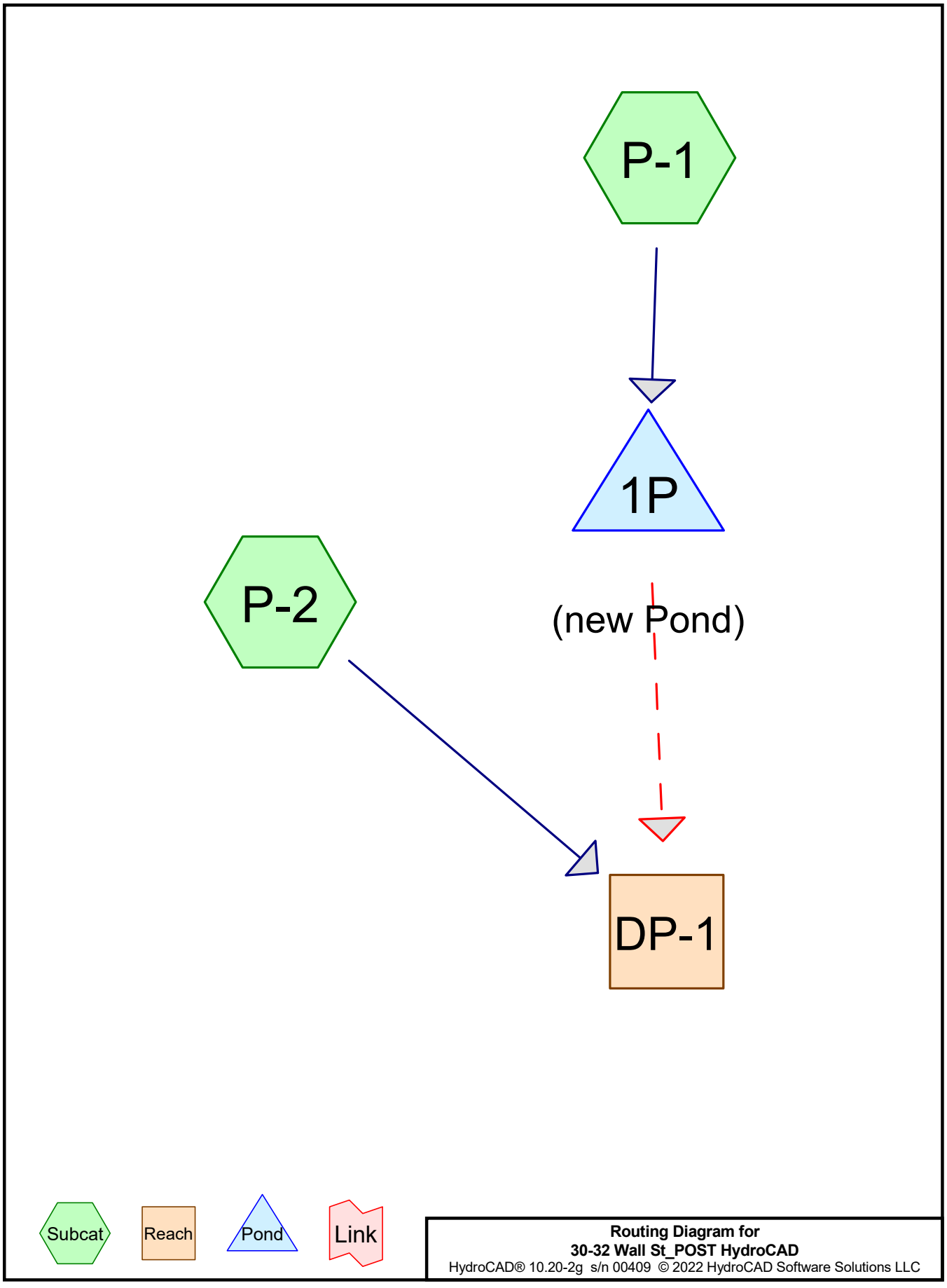
EXISTING HYDROLOGY PLAN

Designed By:	Drawn By:	Checked By:
HD	HD	-
Issue Date:	Project No:	Scale:
04/01/2023	12022	1"=10'

Drawing No:
PRE-HYDRO

File: W:\DH_DATA\OFFICES\NMA78\CIVIL\HD\FOXBORO_SHEET FILES\EX-HYDRO.DWG
Saved: 7/15/2023 11:26:22 AM Plotted: 7/15/2023 9:31:32 PM Current User: Dan, Hazem Last Saved By: 5400

Post-Development
HydroCAD Model Calculations



Routing Diagram for
30-32 Wall St_POST HydroCAD

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.70	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.50	2
4	100-Year	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.053	61	>75% Grass cover, Good, HSG B (P-2)
0.044	98	Impervious Surfaces (P-2)
0.083	98	ROOF (P-1)
0.180	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.053	HSG B	P-2
0.000	HSG C	
0.000	HSG D	
0.126	Other	P-1, P-2
0.180		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.053	0.000	0.000	0.000	0.053	>75% Grass cover, Good	P-2
0.000	0.000	0.000	0.000	0.044	0.044	Impervious Surfaces	P-2
0.000	0.000	0.000	0.000	0.083	0.083	ROOF	P-1
0.000	**0.053**	**0.000**	**0.000**	**0.126**	**0.180**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	281.50	280.00	50.0	0.0300	0.012	0.0	6.0	0.0

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment P-1: Runoff Area=3,600 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.24 cfs 0.020 af

Subcatchment P-2: Runoff Area=4,230 sf 44.92% Impervious Runoff Depth=1.27"
Tc=5.0 min CN=78 Runoff=0.14 cfs 0.010 af

Reach DP-1: Inflow=0.14 cfs 0.010 af
Outflow=0.14 cfs 0.010 af

Pond 1P: (new Pond) Peak Elev=281.49' Storage=562 cf Inflow=0.24 cfs 0.020 af
Discarded=0.01 cfs 0.020 af Secondary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.020 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.031 af Average Runoff Depth = 2.05"
29.76% Pervious = 0.053 ac 70.24% Impervious = 0.126 ac

Summary for Subcatchment P-1:

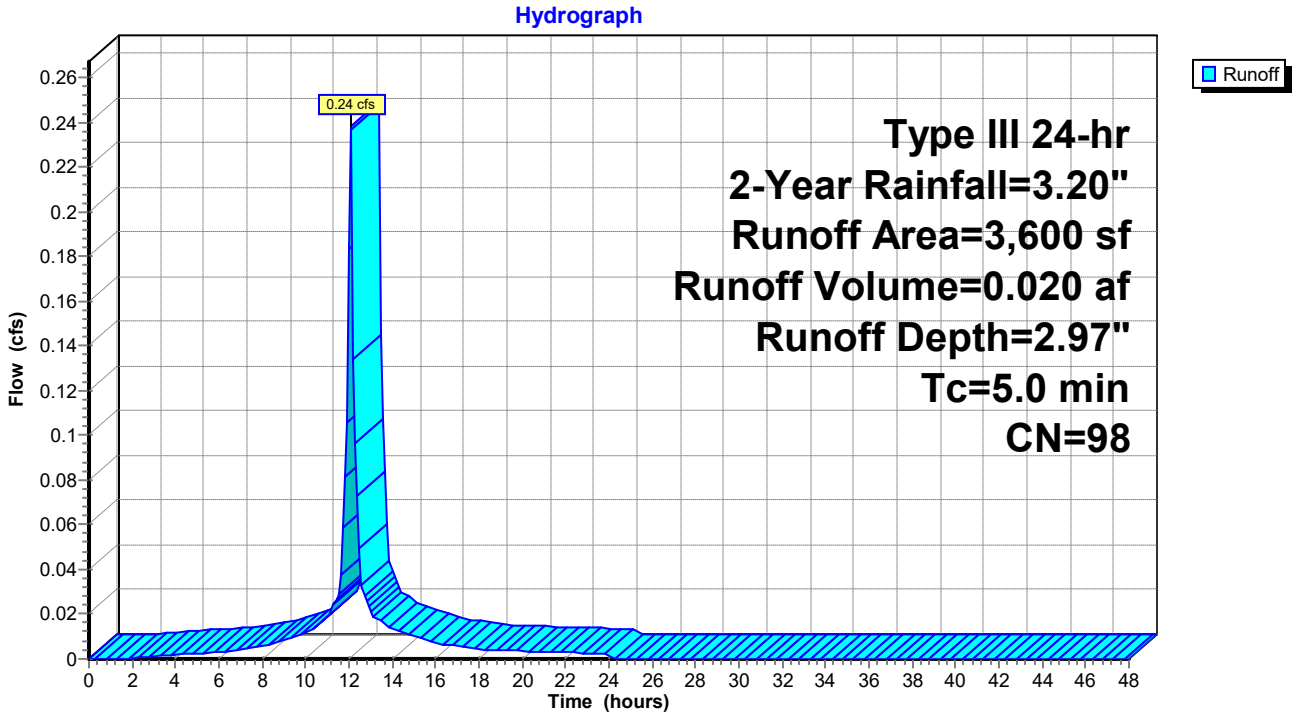
Runoff = 0.24 cfs @ 12.08 hrs, Volume= 0.020 af, Depth= 2.97"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	3,600	98	ROOF
	3,600		100.00% Impervious Area

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

Subcatchment P-1:



Hydrograph for Subcatchment P-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.02	0.00	0.00
1.00	0.03	0.00	0.00
1.50	0.05	0.00	0.00
2.00	0.06	0.00	0.00
2.50	0.08	0.01	0.00
3.00	0.10	0.01	0.00
3.50	0.12	0.02	0.00
4.00	0.14	0.03	0.00
4.50	0.16	0.04	0.00
5.00	0.18	0.06	0.00
5.50	0.21	0.07	0.00
6.00	0.23	0.09	0.00
6.50	0.26	0.11	0.00
7.00	0.29	0.14	0.00
7.50	0.33	0.17	0.01
8.00	0.36	0.20	0.01
8.50	0.41	0.24	0.01
9.00	0.47	0.29	0.01
9.50	0.53	0.35	0.01
10.00	0.60	0.41	0.01
10.50	0.69	0.50	0.01
11.00	0.80	0.60	0.02
11.50	0.95	0.75	0.03
12.00	1.60	1.38	**0.18**
12.50	2.25	2.02	**0.05**
13.00	2.40	2.17	0.02
13.50	2.51	2.28	0.02
14.00	2.60	2.37	0.01
14.50	2.67	2.44	0.01
15.00	2.73	2.50	0.01
15.50	2.79	2.56	0.01
16.00	2.84	2.60	0.01
16.50	2.87	2.64	0.01
17.00	2.91	2.68	0.01
17.50	2.94	2.71	0.01
18.00	2.97	2.74	0.00
18.50	2.99	2.76	0.00
19.00	3.02	2.79	0.00
19.50	3.04	2.81	0.00
20.00	3.06	2.83	0.00
20.50	3.08	2.85	0.00
21.00	3.10	2.87	0.00
21.50	3.12	2.89	0.00
22.00	3.14	2.91	0.00
22.50	3.16	2.92	0.00
23.00	3.17	2.94	0.00
23.50	3.19	2.95	0.00
24.00	**3.20**	**2.97**	0.00
24.50	3.20	2.97	0.00
25.00	3.20	2.97	0.00
25.50	3.20	2.97	0.00
26.00	3.20	2.97	0.00
26.50	3.20	2.97	0.00
27.00	3.20	2.97	0.00
27.50	3.20	2.97	0.00
28.00	3.20	2.97	0.00
28.50	3.20	2.97	0.00
29.00	3.20	2.97	0.00
29.50	3.20	2.97	0.00
30.00	3.20	2.97	0.00
30.50	3.20	2.97	0.00
31.00	3.20	2.97	0.00
31.50	3.20	2.97	0.00
32.00	3.20	2.97	0.00
32.50	3.20	2.97	0.00
33.00	3.20	2.97	0.00
33.50	3.20	2.97	0.00
34.00	3.20	2.97	0.00
34.50	3.20	2.97	0.00
35.00	3.20	2.97	0.00
35.50	3.20	2.97	0.00
36.00	3.20	2.97	0.00
36.50	3.20	2.97	0.00
37.00	3.20	2.97	0.00
37.50	3.20	2.97	0.00
38.00	3.20	2.97	0.00
38.50	3.20	2.97	0.00
39.00	3.20	2.97	0.00
39.50	3.20	2.97	0.00
40.00	3.20	2.97	0.00
40.50	3.20	2.97	0.00
41.00	3.20	2.97	0.00
41.50	3.20	2.97	0.00
42.00	3.20	2.97	0.00
42.50	3.20	2.97	0.00
43.00	3.20	2.97	0.00
43.50	3.20	2.97	0.00
44.00	3.20	2.97	0.00
44.50	3.20	2.97	0.00
45.00	3.20	2.97	0.00
45.50	3.20	2.97	0.00
46.00	3.20	2.97	0.00
46.50	3.20	2.97	0.00
47.00	3.20	2.97	0.00
47.50	3.20	2.97	0.00
48.00	3.20	2.97	0.00

Summary for Subcatchment P-2:

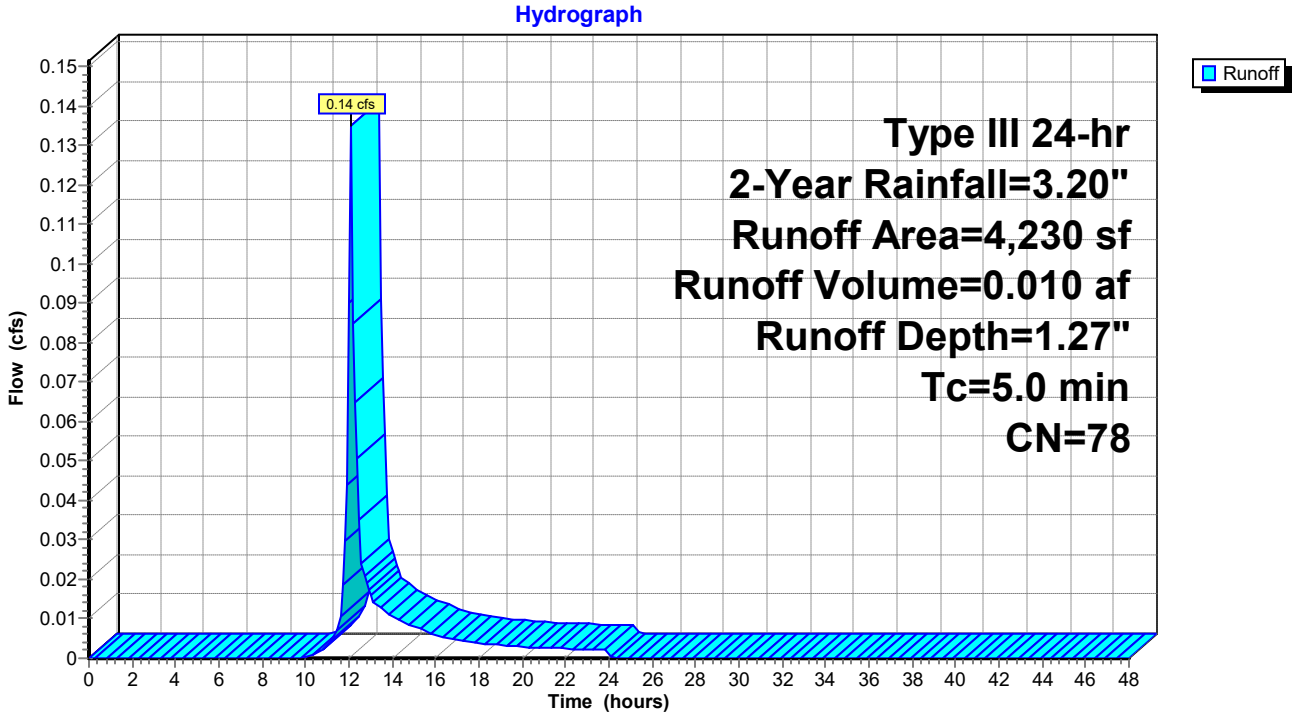
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.27"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,900	98	Impervious Surfaces
	2,330	61	>75% Grass cover, Good, HSG B
	4,230	78	Weighted Average
	2,330		55.08% Pervious Area
	1,900		44.92% Impervious Area

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

Subcatchment P-2:



Hydrograph for Subcatchment P-2:

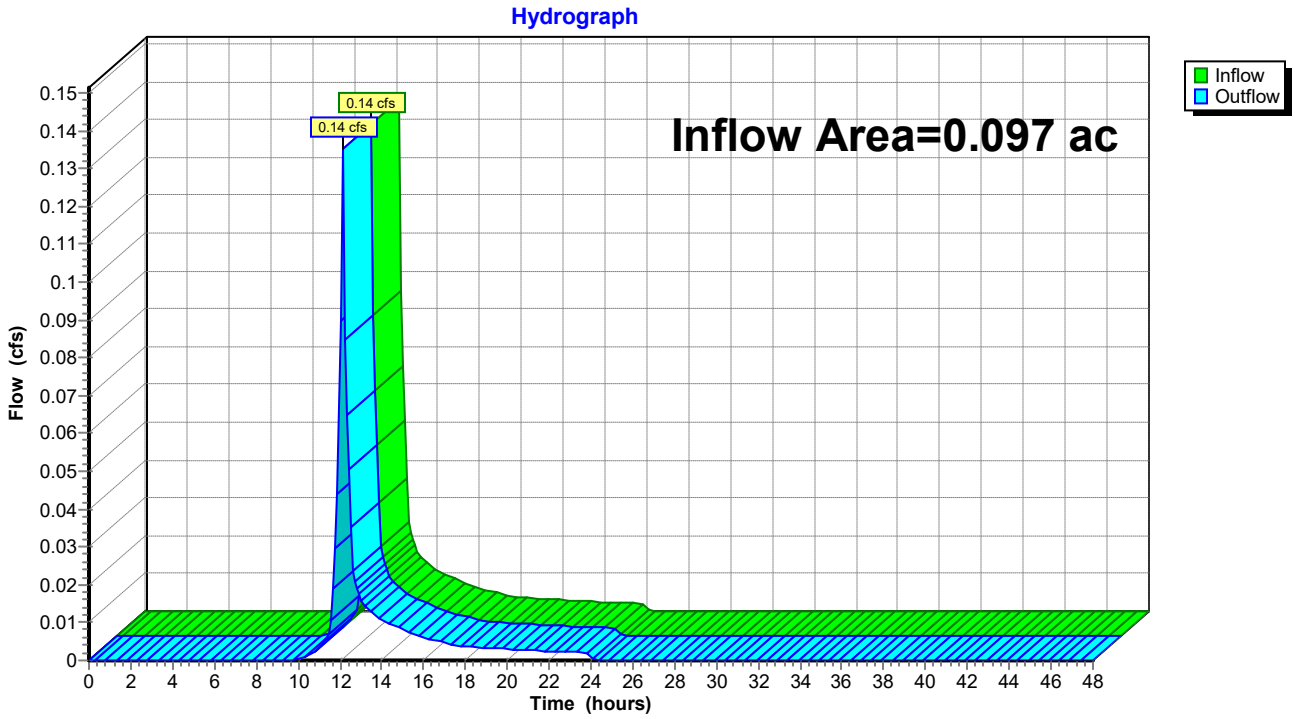
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.02	0.00	0.00
1.00	0.03	0.00	0.00
1.50	0.05	0.00	0.00
2.00	0.06	0.00	0.00
2.50	0.08	0.00	0.00
3.00	0.10	0.00	0.00
3.50	0.12	0.00	0.00
4.00	0.14	0.00	0.00
4.50	0.16	0.00	0.00
5.00	0.18	0.00	0.00
5.50	0.21	0.00	0.00
6.00	0.23	0.00	0.00
6.50	0.26	0.00	0.00
7.00	0.29	0.00	0.00
7.50	0.33	0.00	0.00
8.00	0.36	0.00	0.00
8.50	0.41	0.00	0.00
9.00	0.47	0.00	0.00
9.50	0.53	0.00	0.00
10.00	0.60	0.00	0.00
10.50	0.69	0.01	0.00
11.00	0.80	0.02	0.00
11.50	0.95	0.05	0.01
12.00	1.60	0.28	**0.09**
12.50	2.25	0.63	**0.04**
13.00	2.40	0.72	0.02
13.50	2.51	0.79	0.01
14.00	2.60	0.85	0.01
14.50	2.67	0.90	0.01
15.00	2.73	0.94	0.01
15.50	2.79	0.98	0.01
16.00	2.84	1.01	0.01
16.50	2.87	1.04	0.01
17.00	2.91	1.07	0.00
17.50	2.94	1.09	0.00
18.00	2.97	1.11	0.00
18.50	2.99	1.12	0.00
19.00	3.02	1.14	0.00
19.50	3.04	1.16	0.00
20.00	3.06	1.17	0.00
20.50	3.08	1.19	0.00
21.00	3.10	1.20	0.00
21.50	3.12	1.22	0.00
22.00	3.14	1.23	0.00
22.50	3.16	1.24	0.00
23.00	3.17	1.25	0.00
23.50	3.19	1.26	0.00
24.00	**3.20**	**1.27**	0.00
24.50	3.20	1.27	0.00
25.00	3.20	1.27	0.00
25.50	3.20	1.27	0.00
26.00	3.20	1.27	0.00
26.50	3.20	1.27	0.00
27.00	3.20	1.27	0.00
27.50	3.20	1.27	0.00
28.00	3.20	1.27	0.00
28.50	3.20	1.27	0.00
29.00	3.20	1.27	0.00
29.50	3.20	1.27	0.00
30.00	3.20	1.27	0.00
30.50	3.20	1.27	0.00
31.00	3.20	1.27	0.00
31.50	3.20	1.27	0.00
32.00	3.20	1.27	0.00
32.50	3.20	1.27	0.00
33.00	3.20	1.27	0.00
33.50	3.20	1.27	0.00
34.00	3.20	1.27	0.00
34.50	3.20	1.27	0.00
35.00	3.20	1.27	0.00
35.50	3.20	1.27	0.00
36.00	3.20	1.27	0.00
36.50	3.20	1.27	0.00
37.00	3.20	1.27	0.00
37.50	3.20	1.27	0.00
38.00	3.20	1.27	0.00
38.50	3.20	1.27	0.00
39.00	3.20	1.27	0.00
39.50	3.20	1.27	0.00
40.00	3.20	1.27	0.00
40.50	3.20	1.27	0.00
41.00	3.20	1.27	0.00
41.50	3.20	1.27	0.00
42.00	3.20	1.27	0.00
42.50	3.20	1.27	0.00
43.00	3.20	1.27	0.00
43.50	3.20	1.27	0.00
44.00	3.20	1.27	0.00
44.50	3.20	1.27	0.00
45.00	3.20	1.27	0.00
45.50	3.20	1.27	0.00
46.00	3.20	1.27	0.00
46.50	3.20	1.27	0.00
47.00	3.20	1.27	0.00
47.50	3.20	1.27	0.00
48.00	3.20	1.27	0.00

Summary for Reach DP-1:

Inflow Area = 0.097 ac, 44.92% Impervious, Inflow Depth = 1.27" for 2-Year event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.00		0.00	36.50	0.00		0.00
11.00	0.00		0.00	37.00	0.00		0.00
11.50	0.01		0.01	37.50	0.00		0.00
12.00	**0.09**		**0.09**	38.00	0.00		0.00
12.50	**0.04**		**0.04**	38.50	0.00		0.00
13.00	0.02		0.02	39.00	0.00		0.00
13.50	0.01		0.01	39.50	0.00		0.00
14.00	0.01		0.01	40.00	0.00		0.00
14.50	0.01		0.01	40.50	0.00		0.00
15.00	0.01		0.01	41.00	0.00		0.00
15.50	0.01		0.01	41.50	0.00		0.00
16.00	0.01		0.01	42.00	0.00		0.00
16.50	0.01		0.01	42.50	0.00		0.00
17.00	0.00		0.00	43.00	0.00		0.00
17.50	0.00		0.00	43.50	0.00		0.00
18.00	0.00		0.00	44.00	0.00		0.00
18.50	0.00		0.00	44.50	0.00		0.00
19.00	0.00		0.00	45.00	0.00		0.00
19.50	0.00		0.00	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

Summary for Pond 1P: (new Pond)

Inflow Area = 0.083 ac,100.00% Impervious, Inflow Depth = 2.97" for 2-Year event
Inflow = 0.24 cfs @ 12.08 hrs, Volume= 0.020 af
Outflow = 0.01 cfs @ 16.05 hrs, Volume= 0.020 af, Atten= 97%, Lag= 237.8 min
Discarded = 0.01 cfs @ 16.05 hrs, Volume= 0.020 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Peak Elev= 281.49' @ 16.05 hrs Surf.Area= 378 sf Storage= 562 cf
Flood Elev= 285.00' Surf.Area= 378 sf Storage= 840 cf

Plug-Flow detention time= 792.4 min calculated for 0.020 af (100% of inflow)
Center-of-Mass det. time= 791.7 min (1,547.2 - 755.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	278.50'	565 cf	**13.83'W x 27.31'L x 5.00'H Field A** 1,889 cf Overall - 276 cf Embedded = 1,613 cf x 35.0% Voids
#2A	279.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 2 Rows
		840 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	278.50'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 273.00'
#2	Secondary	281.50'	**6.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 281.50' / 280.00' S= 0.0300 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 16.05 hrs HW=281.49' (Free Discharge)
1=Exfiltration (Controls 0.01 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=278.50' (Free Discharge)
2=Culvert (Controls 0.00 cfs)

Pond 1P: (new Pond) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

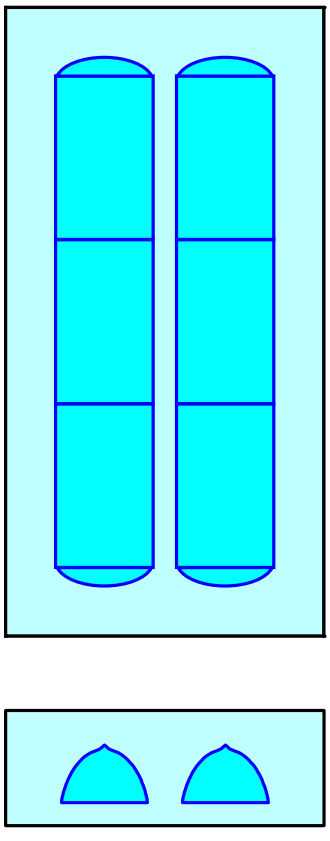
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +26.0" End Stone x 2 = 27.31' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 26.0" Side Stone x 2 = 13.83' Base Width
12.0" Stone Base + 30.0" Chamber Height + 18.0" Stone Cover = 5.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

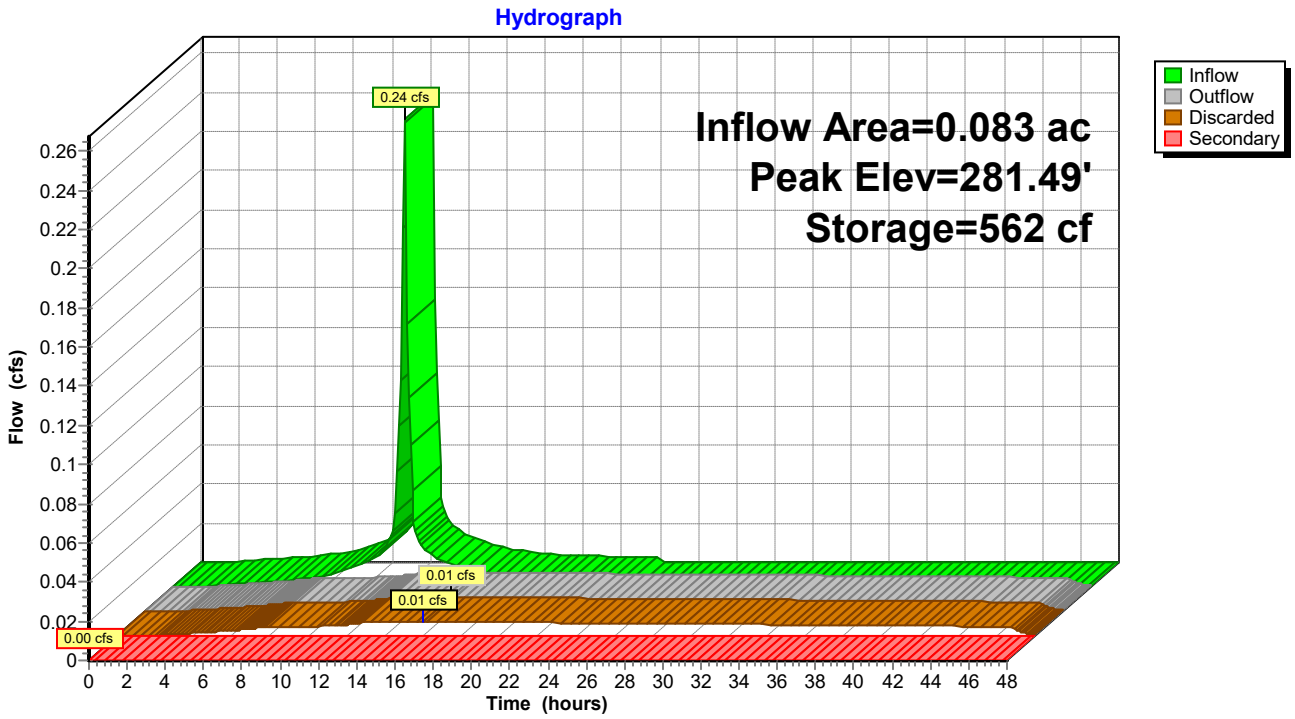
1,888.9 cf Field - 275.6 cf Chambers = 1,613.3 cf Stone x 35.0% Voids = 564.7 cf Stone Storage

Chamber Storage + Stone Storage = 840.3 cf = 0.019 af
Overall Storage Efficiency = 44.5%
Overall System Size = 27.31' x 13.83' x 5.00'

6 Chambers
70.0 cy Field
59.8 cy Stone



Pond 1P: (new Pond)



Hydrograph for Pond 1P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Secondary (cfs)
0.00	0.00	0	278.50	0.00	0.00	**0.00**
1.00	0.00	0	278.50	0.00	0.00	0.00
2.00	0.00	0	278.50	0.00	0.00	0.00
3.00	0.00	2	278.51	0.00	0.00	0.00
4.00	0.00	3	278.52	0.00	0.00	0.00
5.00	0.00	4	278.53	0.00	0.00	0.00
6.00	0.00	5	278.54	0.00	0.00	0.00
7.00	0.00	7	278.55	0.00	0.00	0.00
8.00	0.01	10	278.57	0.00	0.00	0.00
9.00	0.01	19	278.64	0.00	0.00	0.00
10.00	0.01	39	278.79	0.00	0.00	0.00
11.00	0.02	75	279.07	0.01	0.01	0.00
12.00	**0.18**	238	279.95	0.01	0.01	0.00
13.00	**0.02**	504	281.18	0.01	0.01	0.00
14.00	0.01	539	281.36	0.01	0.01	0.00
15.00	0.01	557	281.46	0.01	0.01	0.00
16.00	0.01	**562**	**281.49**	**0.01**	**0.01**	0.00
17.00	0.01	560	281.47	0.01	0.01	0.00
18.00	0.00	553	281.44	0.01	0.01	0.00
19.00	0.00	543	281.38	0.01	0.01	0.00
20.00	0.00	531	281.32	0.01	0.01	0.00
21.00	0.00	518	281.25	0.01	0.01	0.00
22.00	0.00	505	281.18	0.01	0.01	0.00
23.00	0.00	490	281.11	0.01	0.01	0.00
24.00	0.00	475	281.03	0.01	0.01	0.00
25.00	0.00	452	280.92	0.01	0.01	0.00
26.00	0.00	429	280.81	0.01	0.01	0.00
27.00	0.00	405	280.70	0.01	0.01	0.00
28.00	0.00	383	280.60	0.01	0.01	0.00
29.00	0.00	360	280.49	0.01	0.01	0.00
30.00	0.00	338	280.39	0.01	0.01	0.00
31.00	0.00	316	280.30	0.01	0.01	0.00
32.00	0.00	295	280.20	0.01	0.01	0.00
33.00	0.00	273	280.11	0.01	0.01	0.00
34.00	0.00	252	280.01	0.01	0.01	0.00
35.00	0.00	232	279.92	0.01	0.01	0.00
36.00	0.00	211	279.84	0.01	0.01	0.00
37.00	0.00	191	279.75	0.01	0.01	0.00
38.00	0.00	171	279.66	0.01	0.01	0.00
39.00	0.00	151	279.58	0.01	0.01	0.00
40.00	0.00	132	279.50	0.01	0.01	0.00
41.00	0.00	113	279.35	0.01	0.01	0.00
42.00	0.00	94	279.21	0.01	0.01	0.00
43.00	0.00	76	279.07	0.01	0.01	0.00
44.00	0.00	58	278.94	0.00	0.00	0.00
45.00	0.00	40	278.80	0.00	0.00	0.00
46.00	0.00	23	278.68	0.00	0.00	0.00
47.00	0.00	7	278.55	0.00	0.00	0.00
48.00	0.00	1	278.51	0.00	0.00	0.00

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment P-1: Runoff Area=3,600 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=0.35 cfs 0.031 af

Subcatchment P-2: Runoff Area=4,230 sf 44.92% Impervious Runoff Depth=2.46"
Tc=5.0 min CN=78 Runoff=0.26 cfs 0.020 af

Reach DP-1: Inflow=0.28 cfs 0.028 af
Outflow=0.28 cfs 0.028 af

Pond 1P: (new Pond) Peak Elev=281.79' Storage=612 cf Inflow=0.35 cfs 0.031 af
Discarded=0.01 cfs 0.022 af Secondary=0.17 cfs 0.008 af Outflow=0.17 cfs 0.030 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.051 af Average Runoff Depth = 3.38"
29.76% Pervious = 0.053 ac 70.24% Impervious = 0.126 ac

Summary for Subcatchment P-1:

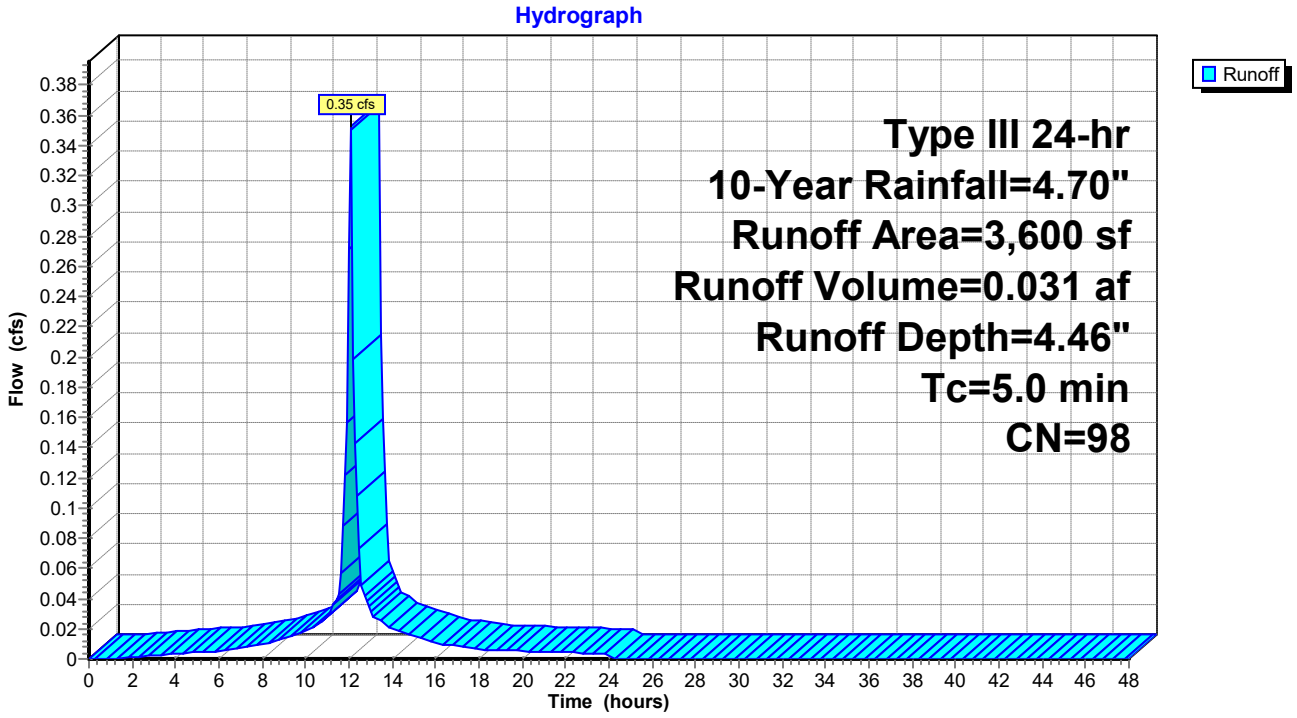
Runoff = 0.35 cfs @ 12.08 hrs, Volume= 0.031 af, Depth= 4.46"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	3,600	98	ROOF
	3,600		100.00% Impervious Area

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

Subcatchment P-1:



Hydrograph for Subcatchment P-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.02	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.07	0.00	0.00
2.00	0.09	0.01	0.00
2.50	0.12	0.02	0.00
3.00	0.14	0.03	0.00
3.50	0.17	0.05	0.00
4.00	0.20	0.07	0.00
4.50	0.23	0.09	0.00
5.00	0.27	0.12	0.00
5.50	0.30	0.15	0.00
6.00	0.34	0.18	0.01
6.50	0.38	0.21	0.01
7.00	0.43	0.25	0.01
7.50	0.48	0.30	0.01
8.00	0.54	0.35	0.01
8.50	0.60	0.41	0.01
9.00	0.69	0.49	0.01
9.50	0.78	0.58	0.02
10.00	0.89	0.68	0.02
10.50	1.02	0.81	0.02
11.00	1.18	0.96	0.03
11.50	1.40	1.18	0.04
12.00	2.35	2.12	**0.27**
12.50	3.30	3.07	**0.07**
13.00	3.52	3.29	0.03
13.50	3.68	3.45	0.02
14.00	3.81	3.58	0.02
14.50	3.92	3.69	0.02
15.00	4.01	3.78	0.01
15.50	4.10	3.86	0.01
16.00	4.16	3.93	0.01
16.50	4.22	3.99	0.01
17.00	4.27	4.04	0.01
17.50	4.32	4.09	0.01
18.00	4.36	4.13	0.01
18.50	4.40	4.16	0.01
19.00	4.43	4.20	0.01
19.50	4.47	4.23	0.01
20.00	4.50	4.26	0.01
20.50	4.53	4.29	0.00
21.00	4.56	4.32	0.00
21.50	4.58	4.35	0.00
22.00	4.61	4.37	0.00
22.50	4.63	4.40	0.00
23.00	4.66	4.42	0.00
23.50	4.68	4.44	0.00
24.00	**4.70**	**4.46**	0.00
24.50	4.70	4.46	0.00
25.00	4.70	4.46	0.00
25.50	4.70	4.46	0.00
26.00	4.70	4.46	0.00
26.50	4.70	4.46	0.00
27.00	4.70	4.46	0.00
27.50	4.70	4.46	0.00
28.00	4.70	4.46	0.00
28.50	4.70	4.46	0.00
29.00	4.70	4.46	0.00
29.50	4.70	4.46	0.00
30.00	4.70	4.46	0.00
30.50	4.70	4.46	0.00
31.00	4.70	4.46	0.00
31.50	4.70	4.46	0.00
32.00	4.70	4.46	0.00
32.50	4.70	4.46	0.00
33.00	4.70	4.46	0.00
33.50	4.70	4.46	0.00
34.00	4.70	4.46	0.00
34.50	4.70	4.46	0.00
35.00	4.70	4.46	0.00
35.50	4.70	4.46	0.00
36.00	4.70	4.46	0.00
36.50	4.70	4.46	0.00
37.00	4.70	4.46	0.00
37.50	4.70	4.46	0.00
38.00	4.70	4.46	0.00
38.50	4.70	4.46	0.00
39.00	4.70	4.46	0.00
39.50	4.70	4.46	0.00
40.00	4.70	4.46	0.00
40.50	4.70	4.46	0.00
41.00	4.70	4.46	0.00
41.50	4.70	4.46	0.00
42.00	4.70	4.46	0.00
42.50	4.70	4.46	0.00
43.00	4.70	4.46	0.00
43.50	4.70	4.46	0.00
44.00	4.70	4.46	0.00
44.50	4.70	4.46	0.00
45.00	4.70	4.46	0.00
45.50	4.70	4.46	0.00
46.00	4.70	4.46	0.00
46.50	4.70	4.46	0.00
47.00	4.70	4.46	0.00
47.50	4.70	4.46	0.00
48.00	4.70	4.46	0.00

Summary for Subcatchment P-2:

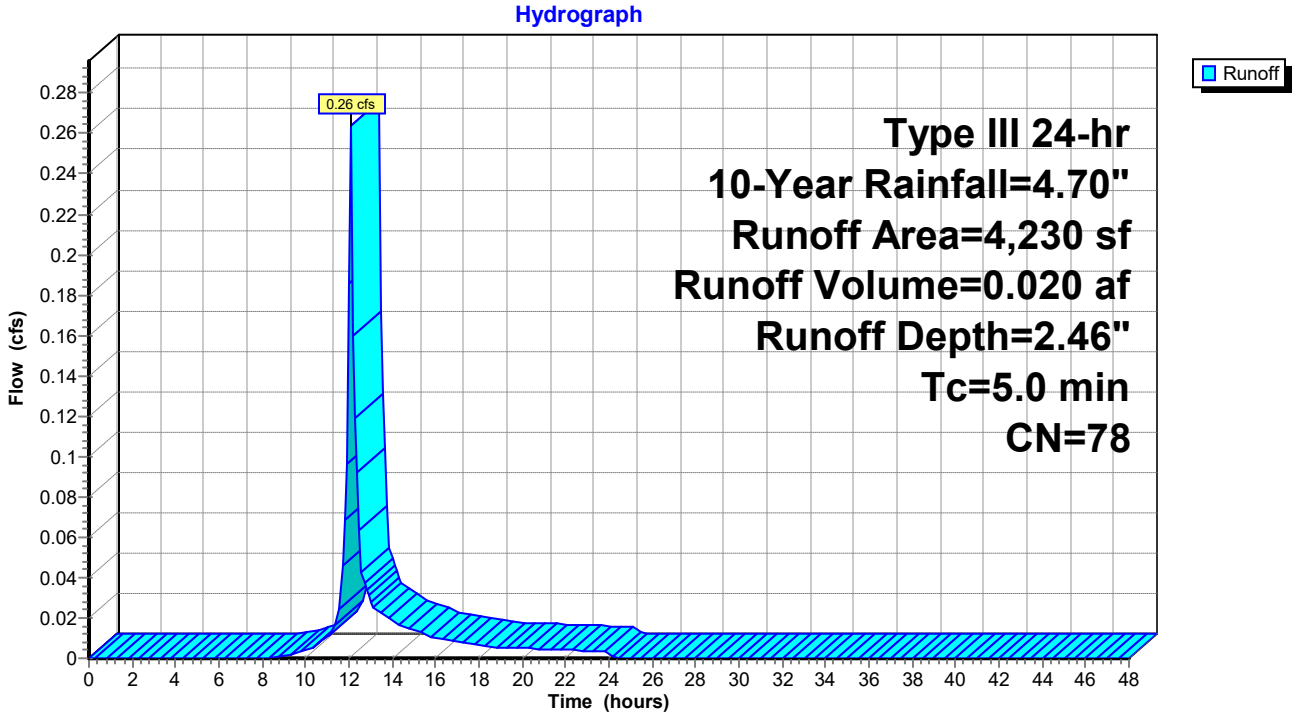
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 2.46"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,900	98	Impervious Surfaces
	2,330	61	>75% Grass cover, Good, HSG B
	4,230	78	Weighted Average
	2,330		55.08% Pervious Area
	1,900		44.92% Impervious Area

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

Subcatchment P-2:



Hydrograph for Subcatchment P-2:

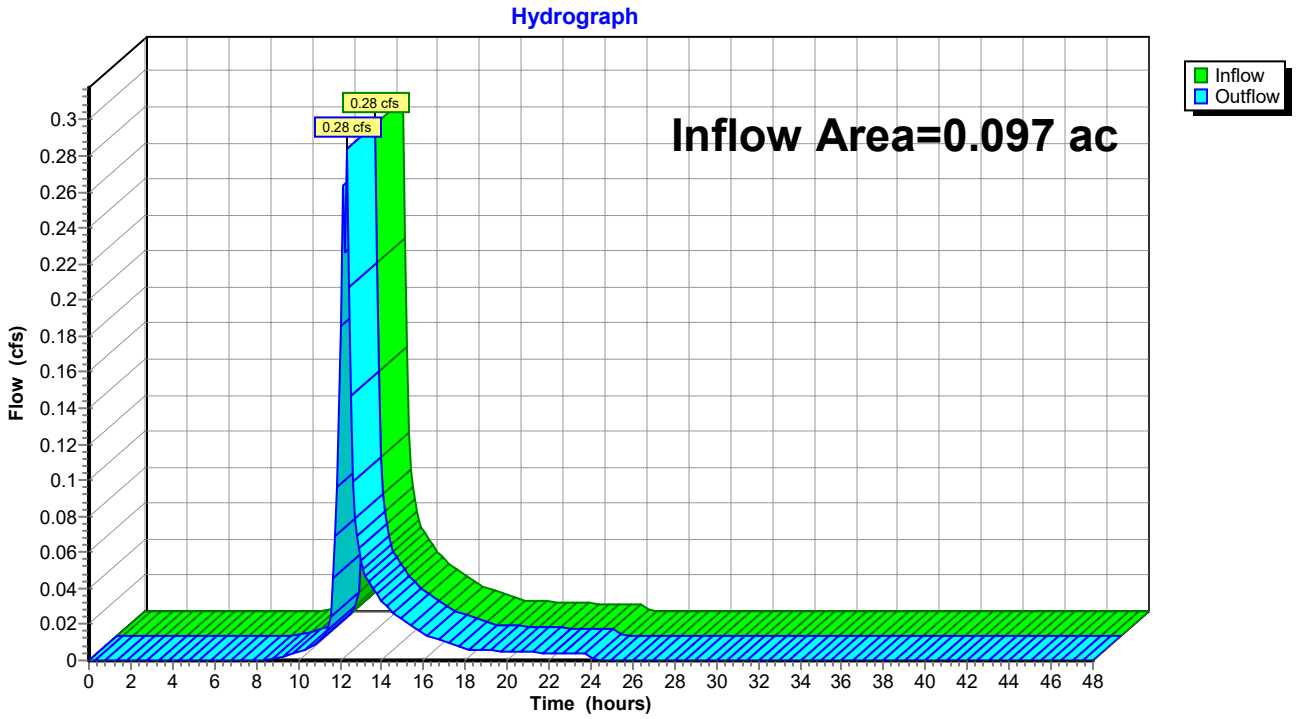
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.02	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.07	0.00	0.00
2.00	0.09	0.00	0.00
2.50	0.12	0.00	0.00
3.00	0.14	0.00	0.00
3.50	0.17	0.00	0.00
4.00	0.20	0.00	0.00
4.50	0.23	0.00	0.00
5.00	0.27	0.00	0.00
5.50	0.30	0.00	0.00
6.00	0.34	0.00	0.00
6.50	0.38	0.00	0.00
7.00	0.43	0.00	0.00
7.50	0.48	0.00	0.00
8.00	0.54	0.00	0.00
8.50	0.60	0.00	0.00
9.00	0.69	0.00	0.00
9.50	0.78	0.02	0.00
10.00	0.89	0.03	0.00
10.50	1.02	0.06	0.01
11.00	1.18	0.11	0.01
11.50	1.40	0.19	0.02
12.00	2.35	0.69	**0.19**
12.50	3.30	1.35	**0.06**
13.00	3.52	1.52	0.03
13.50	3.68	1.64	0.02
14.00	3.81	1.74	0.02
14.50	3.92	1.82	0.02
15.00	4.01	1.90	0.01
15.50	4.10	1.96	0.01
16.00	4.16	2.02	0.01
16.50	4.22	2.07	0.01
17.00	4.27	2.11	0.01
17.50	4.32	2.15	0.01
18.00	4.36	2.18	0.01
18.50	4.40	2.21	0.01
19.00	4.43	2.24	0.01
19.50	4.47	2.27	0.01
20.00	4.50	2.29	0.00
20.50	4.53	2.32	0.00
21.00	4.56	2.34	0.00
21.50	4.58	2.36	0.00
22.00	4.61	2.38	0.00
22.50	4.63	2.40	0.00
23.00	4.66	2.42	0.00
23.50	4.68	2.44	0.00
24.00	**4.70**	**2.46**	0.00
24.50	4.70	2.46	0.00
25.00	4.70	2.46	0.00
25.50	4.70	2.46	0.00
26.00	4.70	2.46	0.00
26.50	4.70	2.46	0.00
27.00	4.70	2.46	0.00
27.50	4.70	2.46	0.00
28.00	4.70	2.46	0.00
28.50	4.70	2.46	0.00
29.00	4.70	2.46	0.00
29.50	4.70	2.46	0.00
30.00	4.70	2.46	0.00
30.50	4.70	2.46	0.00
31.00	4.70	2.46	0.00
31.50	4.70	2.46	0.00
32.00	4.70	2.46	0.00
32.50	4.70	2.46	0.00
33.00	4.70	2.46	0.00
33.50	4.70	2.46	0.00
34.00	4.70	2.46	0.00
34.50	4.70	2.46	0.00
35.00	4.70	2.46	0.00
35.50	4.70	2.46	0.00
36.00	4.70	2.46	0.00
36.50	4.70	2.46	0.00
37.00	4.70	2.46	0.00
37.50	4.70	2.46	0.00
38.00	4.70	2.46	0.00
38.50	4.70	2.46	0.00
39.00	4.70	2.46	0.00
39.50	4.70	2.46	0.00
40.00	4.70	2.46	0.00
40.50	4.70	2.46	0.00
41.00	4.70	2.46	0.00
41.50	4.70	2.46	0.00
42.00	4.70	2.46	0.00
42.50	4.70	2.46	0.00
43.00	4.70	2.46	0.00
43.50	4.70	2.46	0.00
44.00	4.70	2.46	0.00
44.50	4.70	2.46	0.00
45.00	4.70	2.46	0.00
45.50	4.70	2.46	0.00
46.00	4.70	2.46	0.00
46.50	4.70	2.46	0.00
47.00	4.70	2.46	0.00
47.50	4.70	2.46	0.00
48.00	4.70	2.46	0.00

Summary for Reach DP-1:

Inflow Area = 0.097 ac, 44.92% Impervious, Inflow Depth = 3.50" for 10-Year event
Inflow = 0.28 cfs @ 12.29 hrs, Volume= 0.028 af
Outflow = 0.28 cfs @ 12.29 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.00		0.00	36.00	0.00		0.00
10.50	0.01		0.01	36.50	0.00		0.00
11.00	0.01		0.01	37.00	0.00		0.00
11.50	0.02		0.02	37.50	0.00		0.00
12.00	**0.19**		**0.19**	38.00	0.00		0.00
12.50	**0.15**		**0.15**	38.50	0.00		0.00
13.00	0.06		0.06	39.00	0.00		0.00
13.50	0.04		0.04	39.50	0.00		0.00
14.00	0.03		0.03	40.00	0.00		0.00
14.50	0.03		0.03	40.50	0.00		0.00
15.00	0.02		0.02	41.00	0.00		0.00
15.50	0.02		0.02	41.50	0.00		0.00
16.00	0.01		0.01	42.00	0.00		0.00
16.50	0.01		0.01	42.50	0.00		0.00
17.00	0.01		0.01	43.00	0.00		0.00
17.50	0.01		0.01	43.50	0.00		0.00
18.00	0.01		0.01	44.00	0.00		0.00
18.50	0.01		0.01	44.50	0.00		0.00
19.00	0.01		0.01	45.00	0.00		0.00
19.50	0.01		0.01	45.50	0.00		0.00
20.00	0.00		0.00	46.00	0.00		0.00
20.50	0.00		0.00	46.50	0.00		0.00
21.00	0.00		0.00	47.00	0.00		0.00
21.50	0.00		0.00	47.50	0.00		0.00
22.00	0.00		0.00	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

Summary for Pond 1P: (new Pond)

Inflow Area = 0.083 ac,100.00% Impervious, Inflow Depth = 4.46" for 10-Year event
Inflow = 0.35 cfs @ 12.08 hrs, Volume= 0.031 af
Outflow = 0.17 cfs @ 12.32 hrs, Volume= 0.030 af, Atten= 51%, Lag= 13.9 min
Discarded = 0.01 cfs @ 12.32 hrs, Volume= 0.022 af
Secondary = 0.17 cfs @ 12.32 hrs, Volume= 0.008 af
Routed to Reach DP-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Peak Elev= 281.79' @ 12.32 hrs Surf.Area= 378 sf Storage= 612 cf
Flood Elev= 285.00' Surf.Area= 378 sf Storage= 840 cf

Plug-Flow detention time= 582.1 min calculated for 0.030 af (98% of inflow)
Center-of-Mass det. time= 575.1 min (1,323.3 - 748.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	278.50'	565 cf	**13.83'W x 27.31'L x 5.00'H Field A** 1,889 cf Overall - 276 cf Embedded = 1,613 cf x 35.0% Voids
#2A	279.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 2 Rows
		840 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	278.50'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 273.00'
#2	Secondary	281.50'	**6.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 281.50' / 280.00' S= 0.0300 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 12.32 hrs HW=281.77' (Free Discharge)
1=Exfiltration (Controls 0.01 cfs)

Secondary OutFlow Max=0.15 cfs @ 12.32 hrs HW=281.77' (Free Discharge)
2=Culvert (Inlet Controls 0.15 cfs @ 1.41 fps)

Pond 1P: (new Pond) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

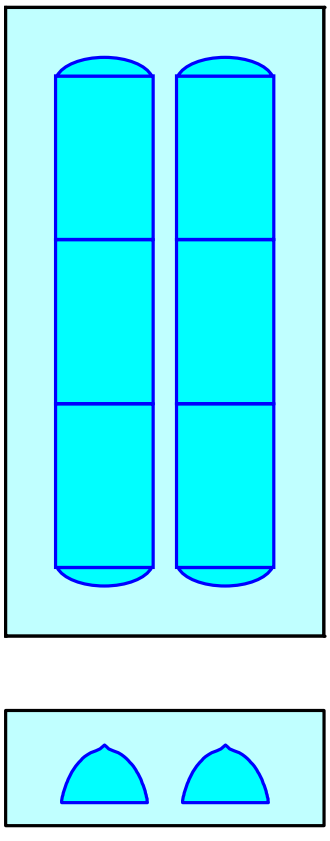
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +26.0" End Stone x 2 = 27.31' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 26.0" Side Stone x 2 = 13.83' Base Width
12.0" Stone Base + 30.0" Chamber Height + 18.0" Stone Cover = 5.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

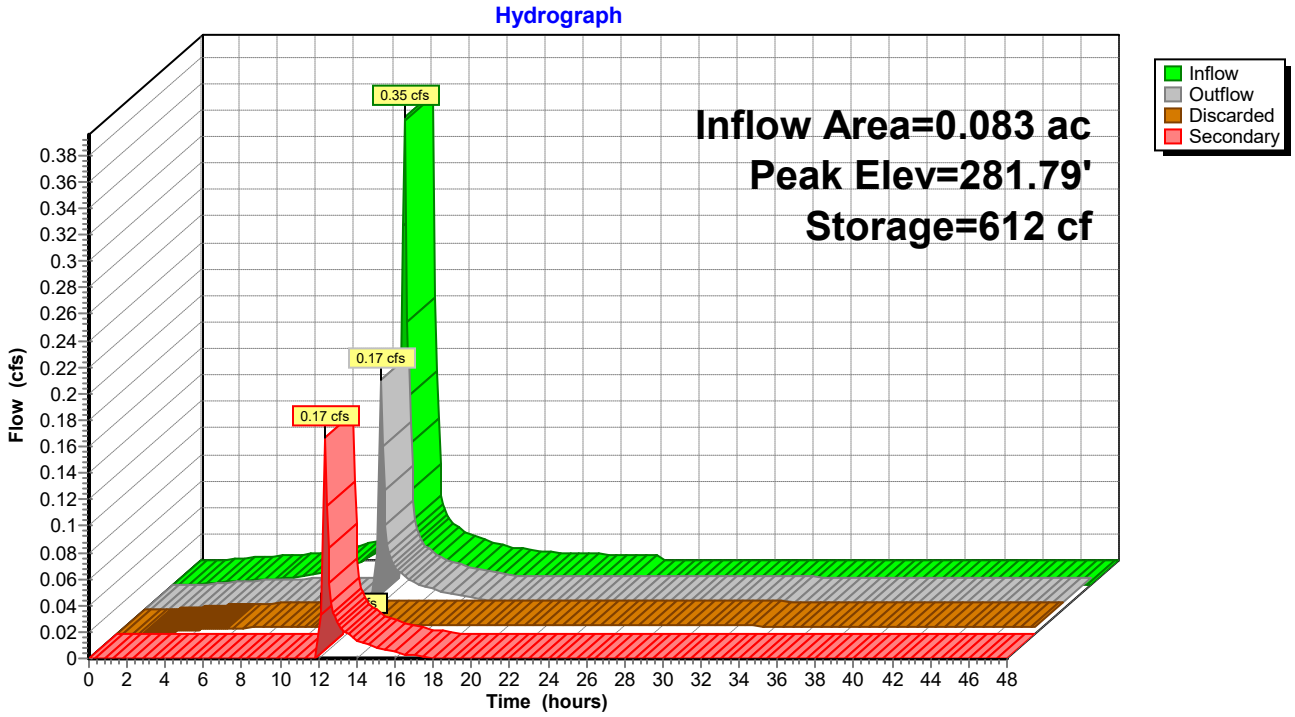
1,888.9 cf Field - 275.6 cf Chambers = 1,613.3 cf Stone x 35.0% Voids = 564.7 cf Stone Storage

Chamber Storage + Stone Storage = 840.3 cf = 0.019 af
Overall Storage Efficiency = 44.5%
Overall System Size = 27.31' x 13.83' x 5.00'

6 Chambers
70.0 cy Field
59.8 cy Stone



Pond 1P: (new Pond)



Hydrograph for Pond 1P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Secondary (cfs)
0.00	0.00	0	278.50	0.00	0.00	0.00
1.00	0.00	0	278.50	0.00	0.00	0.00
2.00	0.00	2	278.51	0.00	0.00	0.00
3.00	0.00	4	278.53	0.00	0.00	0.00
4.00	0.00	5	278.54	0.00	0.00	0.00
5.00	0.00	7	278.55	0.00	0.00	0.00
6.00	0.01	9	278.57	0.00	0.00	0.00
7.00	0.01	14	278.61	0.00	0.00	0.00
8.00	0.01	27	278.70	0.00	0.00	0.00
9.00	0.01	50	278.88	0.00	0.00	0.00
10.00	0.02	89	279.17	0.01	0.01	0.00
11.00	0.03	151	279.58	0.01	0.01	0.00
12.00	**0.27**	**401**	**280.68**	**0.01**	**0.01**	**0.00**
13.00	**0.03**	**583**	**281.61**	**0.03**	**0.01**	**0.03**
14.00	0.02	578	281.58	0.02	0.01	0.01
15.00	0.01	575	281.56	0.02	0.01	0.01
16.00	0.01	571	281.54	0.01	0.01	0.00
17.00	0.01	567	281.52	0.01	0.01	0.00
18.00	0.01	565	281.50	0.01	0.01	0.00
19.00	0.01	561	281.48	0.01	0.01	0.00
20.00	0.01	555	281.45	0.01	0.01	0.00
21.00	0.00	548	281.41	0.01	0.01	0.00
22.00	0.00	539	281.36	0.01	0.01	0.00
23.00	0.00	529	281.31	0.01	0.01	0.00
24.00	0.00	517	281.25	0.01	0.01	0.00
25.00	0.00	494	281.13	0.01	0.01	0.00
26.00	0.00	470	281.01	0.01	0.01	0.00
27.00	0.00	446	280.89	0.01	0.01	0.00
28.00	0.00	423	280.78	0.01	0.01	0.00
29.00	0.00	400	280.67	0.01	0.01	0.00
30.00	0.00	377	280.57	0.01	0.01	0.00
31.00	0.00	354	280.47	0.01	0.01	0.00
32.00	0.00	332	280.37	0.01	0.01	0.00
33.00	0.00	311	280.27	0.01	0.01	0.00
34.00	0.00	289	280.18	0.01	0.01	0.00
35.00	0.00	268	280.08	0.01	0.01	0.00
36.00	0.00	247	279.99	0.01	0.01	0.00
37.00	0.00	226	279.90	0.01	0.01	0.00
38.00	0.00	206	279.81	0.01	0.01	0.00
39.00	0.00	186	279.73	0.01	0.01	0.00
40.00	0.00	166	279.64	0.01	0.01	0.00
41.00	0.00	146	279.56	0.01	0.01	0.00
42.00	0.00	127	279.46	0.01	0.01	0.00
43.00	0.00	108	279.31	0.01	0.01	0.00
44.00	0.00	89	279.17	0.01	0.01	0.00
45.00	0.00	71	279.04	0.00	0.00	0.00
46.00	0.00	53	278.90	0.00	0.00	0.00
47.00	0.00	36	278.77	0.00	0.00	0.00
48.00	0.00	19	278.64	0.00	0.00	0.00

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment P-1: Runoff Area=3,600 sf 100.00% Impervious Runoff Depth=5.26"
Tc=5.0 min CN=98 Runoff=0.41 cfs 0.036 af

Subcatchment P-2: Runoff Area=4,230 sf 44.92% Impervious Runoff Depth=3.14"
Tc=5.0 min CN=78 Runoff=0.34 cfs 0.025 af

Reach DP-1: Inflow=0.54 cfs 0.039 af
Outflow=0.54 cfs 0.039 af

Pond 1P: (new Pond) Peak Elev=281.95' Storage=636 cf Inflow=0.41 cfs 0.036 af
Discarded=0.01 cfs 0.022 af Secondary=0.34 cfs 0.013 af Outflow=0.34 cfs 0.036 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.062 af Average Runoff Depth = 4.12"
29.76% Pervious = 0.053 ac 70.24% Impervious = 0.126 ac

Summary for Subcatchment P-1:

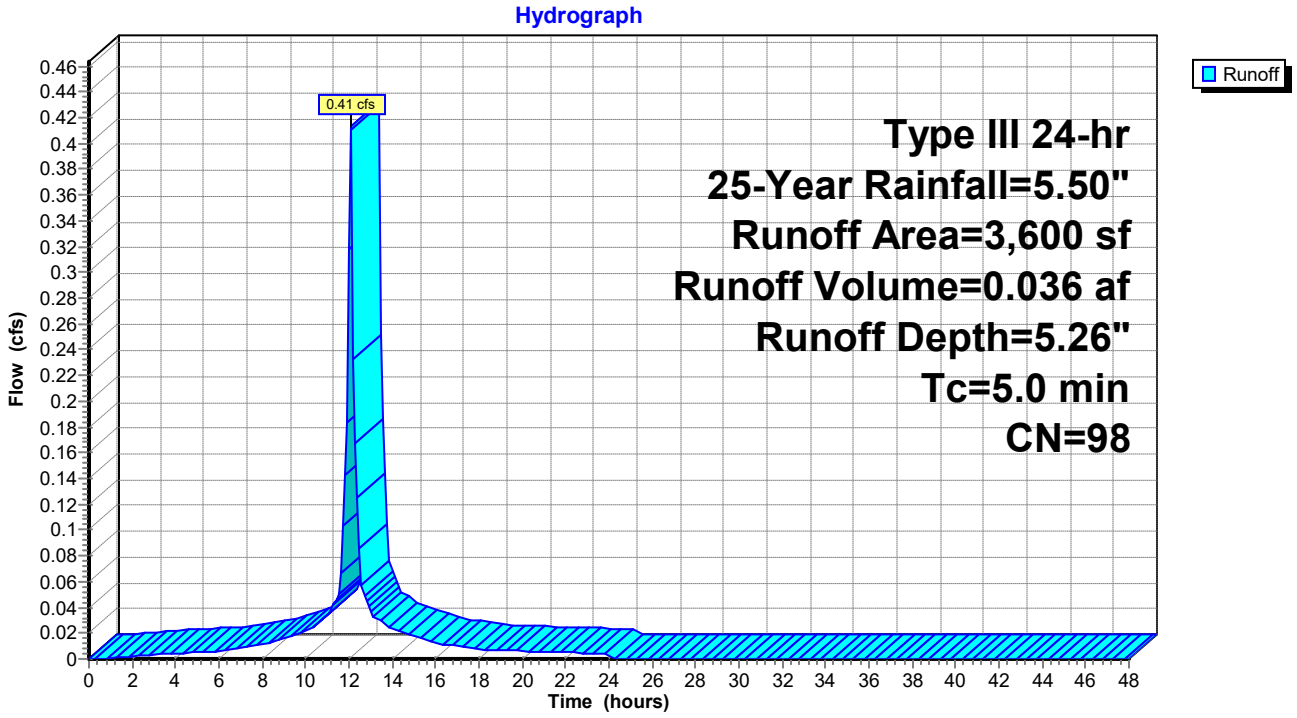
Runoff = 0.41 cfs @ 12.08 hrs, Volume= 0.036 af, Depth= 5.26"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	3,600	98	ROOF
	3,600		100.00% Impervious Area

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

Subcatchment P-1:



Hydrograph for Subcatchment P-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.08	0.01	0.00
2.00	0.11	0.02	0.00
2.50	0.14	0.03	0.00
3.00	0.17	0.05	0.00
3.50	0.20	0.07	0.00
4.00	0.24	0.10	0.00
4.50	0.27	0.12	0.00
5.00	0.31	0.15	0.01
5.50	0.35	0.19	0.01
6.00	0.40	0.23	0.01
6.50	0.44	0.27	0.01
7.00	0.50	0.32	0.01
7.50	0.56	0.37	0.01
8.00	0.63	0.43	0.01
8.50	0.71	0.51	0.01
9.00	0.80	0.60	0.02
9.50	0.91	0.71	0.02
10.00	1.04	0.83	0.02
10.50	1.19	0.98	0.03
11.00	1.37	1.16	0.03
11.50	1.64	1.42	0.05
12.00	2.75	2.52	**0.32**
12.50	3.86	3.63	**0.09**
13.00	4.12	3.89	0.04
13.50	4.31	4.07	0.03
14.00	4.46	4.22	0.02
14.50	4.59	4.35	0.02
15.00	4.70	4.46	0.02
15.50	4.79	4.56	0.01
16.00	4.87	4.64	0.01
16.50	4.94	4.70	0.01
17.00	5.00	4.77	0.01
17.50	5.06	4.82	0.01
18.00	5.10	4.87	0.01
18.50	5.15	4.91	0.01
19.00	5.19	4.95	0.01
19.50	5.23	4.99	0.01
20.00	5.26	5.03	0.01
20.50	5.30	5.06	0.01
21.00	5.33	5.09	0.01
21.50	5.36	5.13	0.01
22.00	5.39	5.16	0.00
22.50	5.42	5.19	0.00
23.00	5.45	5.21	0.00
23.50	5.48	5.24	0.00
24.00	**5.50**	**5.26**	0.00
24.50	5.50	5.26	0.00
25.00	5.50	5.26	0.00
25.50	5.50	5.26	0.00
26.00	5.50	5.26	0.00
26.50	5.50	5.26	0.00
27.00	5.50	5.26	0.00
27.50	5.50	5.26	0.00
28.00	5.50	5.26	0.00
28.50	5.50	5.26	0.00
29.00	5.50	5.26	0.00
29.50	5.50	5.26	0.00
30.00	5.50	5.26	0.00
30.50	5.50	5.26	0.00
31.00	5.50	5.26	0.00
31.50	5.50	5.26	0.00
32.00	5.50	5.26	0.00
32.50	5.50	5.26	0.00
33.00	5.50	5.26	0.00
33.50	5.50	5.26	0.00
34.00	5.50	5.26	0.00
34.50	5.50	5.26	0.00
35.00	5.50	5.26	0.00
35.50	5.50	5.26	0.00
36.00	5.50	5.26	0.00
36.50	5.50	5.26	0.00
37.00	5.50	5.26	0.00
37.50	5.50	5.26	0.00
38.00	5.50	5.26	0.00
38.50	5.50	5.26	0.00
39.00	5.50	5.26	0.00
39.50	5.50	5.26	0.00
40.00	5.50	5.26	0.00
40.50	5.50	5.26	0.00
41.00	5.50	5.26	0.00
41.50	5.50	5.26	0.00
42.00	5.50	5.26	0.00
42.50	5.50	5.26	0.00
43.00	5.50	5.26	0.00
43.50	5.50	5.26	0.00
44.00	5.50	5.26	0.00
44.50	5.50	5.26	0.00
45.00	5.50	5.26	0.00
45.50	5.50	5.26	0.00
46.00	5.50	5.26	0.00
46.50	5.50	5.26	0.00
47.00	5.50	5.26	0.00
47.50	5.50	5.26	0.00
48.00	5.50	5.26	0.00

Summary for Subcatchment P-2:

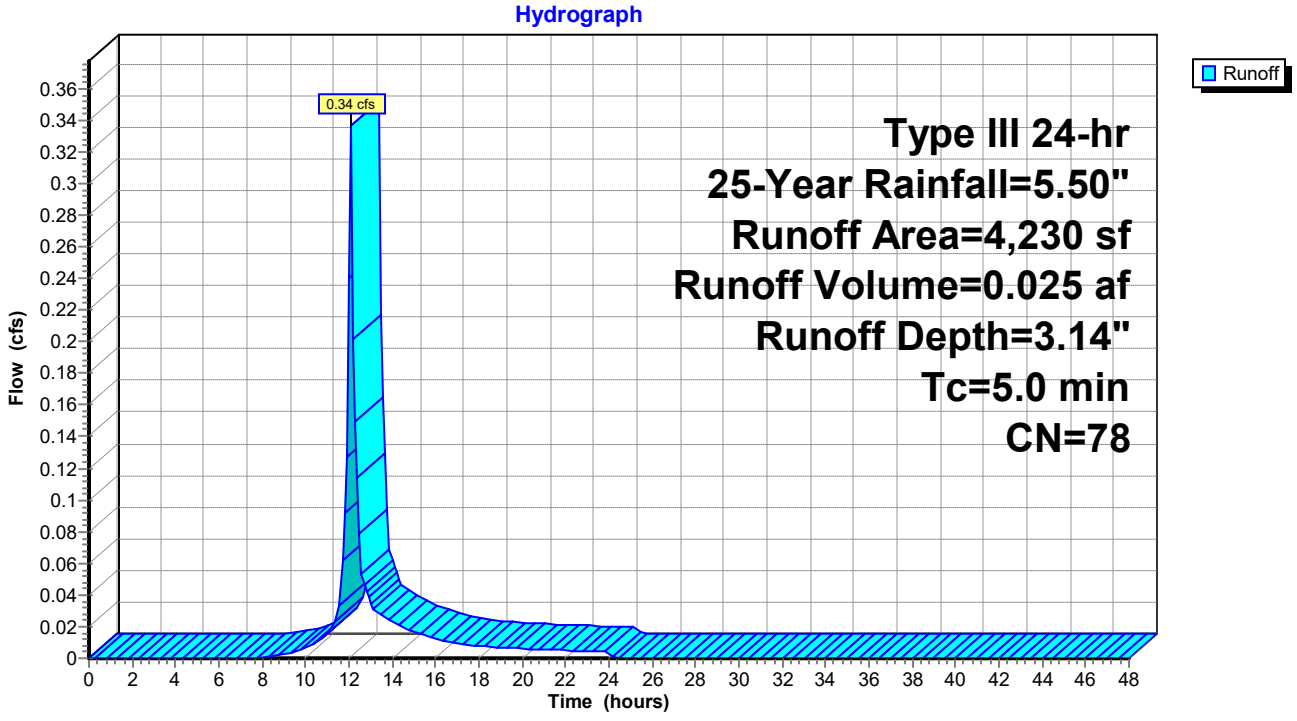
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 3.14"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,900	98	Impervious Surfaces
	2,330	61	>75% Grass cover, Good, HSG B
	4,230	78	Weighted Average
	2,330		55.08% Pervious Area
	1,900		44.92% Impervious Area

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

Subcatchment P-2:



Hydrograph for Subcatchment P-2:

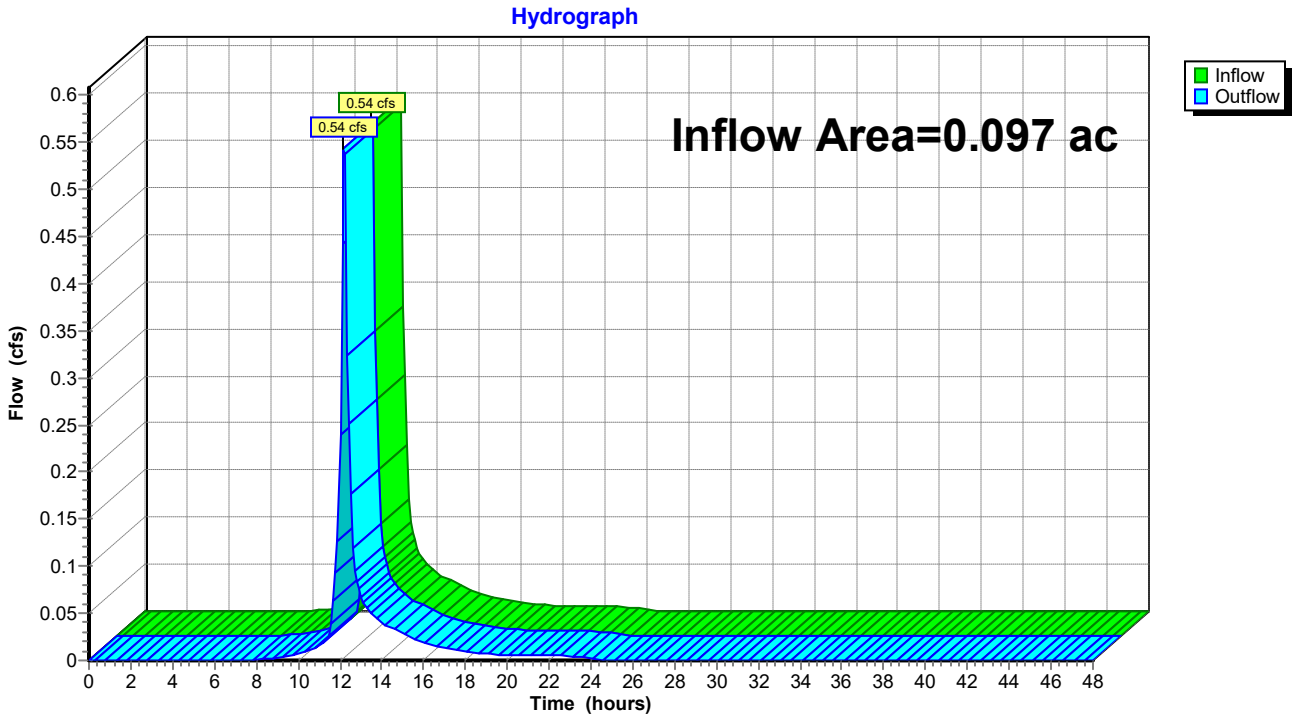
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.08	0.00	0.00
2.00	0.11	0.00	0.00
2.50	0.14	0.00	0.00
3.00	0.17	0.00	0.00
3.50	0.20	0.00	0.00
4.00	0.24	0.00	0.00
4.50	0.27	0.00	0.00
5.00	0.31	0.00	0.00
5.50	0.35	0.00	0.00
6.00	0.40	0.00	0.00
6.50	0.44	0.00	0.00
7.00	0.50	0.00	0.00
7.50	0.56	0.00	0.00
8.00	0.63	0.00	0.00
8.50	0.71	0.01	0.00
9.00	0.80	0.02	0.00
9.50	0.91	0.04	0.00
10.00	1.04	0.07	0.01
10.50	1.19	0.11	0.01
11.00	1.37	0.18	0.01
11.50	1.64	0.30	0.03
12.00	2.75	0.95	**0.24**
12.50	3.86	1.78	**0.08**
13.00	4.12	1.99	0.03
13.50	4.31	2.14	0.03
14.00	4.46	2.26	0.02
14.50	4.59	2.37	0.02
15.00	4.70	2.46	0.02
15.50	4.79	2.54	0.01
16.00	4.87	2.60	0.01
16.50	4.94	2.66	0.01
17.00	5.00	2.71	0.01
17.50	5.06	2.76	0.01
18.00	5.10	2.80	0.01
18.50	5.15	2.84	0.01
19.00	5.19	2.87	0.01
19.50	5.23	2.91	0.01
20.00	5.26	2.94	0.01
20.50	5.30	2.97	0.01
21.00	5.33	3.00	0.01
21.50	5.36	3.02	0.01
22.00	5.39	3.05	0.01
22.50	5.42	3.07	0.00
23.00	5.45	3.10	0.00
23.50	5.48	3.12	0.00
24.00	**5.50**	**3.14**	0.00
24.50	5.50	3.14	0.00
25.00	5.50	3.14	0.00
25.50	5.50	3.14	0.00
26.00	5.50	3.14	0.00
26.50	5.50	3.14	0.00
27.00	5.50	3.14	0.00
27.50	5.50	3.14	0.00
28.00	5.50	3.14	0.00
28.50	5.50	3.14	0.00
29.00	5.50	3.14	0.00
29.50	5.50	3.14	0.00
30.00	5.50	3.14	0.00
30.50	5.50	3.14	0.00
31.00	5.50	3.14	0.00
31.50	5.50	3.14	0.00
32.00	5.50	3.14	0.00
32.50	5.50	3.14	0.00
33.00	5.50	3.14	0.00
33.50	5.50	3.14	0.00
34.00	5.50	3.14	0.00
34.50	5.50	3.14	0.00
35.00	5.50	3.14	0.00
35.50	5.50	3.14	0.00
36.00	5.50	3.14	0.00
36.50	5.50	3.14	0.00
37.00	5.50	3.14	0.00
37.50	5.50	3.14	0.00
38.00	5.50	3.14	0.00
38.50	5.50	3.14	0.00
39.00	5.50	3.14	0.00
39.50	5.50	3.14	0.00
40.00	5.50	3.14	0.00
40.50	5.50	3.14	0.00
41.00	5.50	3.14	0.00
41.50	5.50	3.14	0.00
42.00	5.50	3.14	0.00
42.50	5.50	3.14	0.00
43.00	5.50	3.14	0.00
43.50	5.50	3.14	0.00
44.00	5.50	3.14	0.00
44.50	5.50	3.14	0.00
45.00	5.50	3.14	0.00
45.50	5.50	3.14	0.00
46.00	5.50	3.14	0.00
46.50	5.50	3.14	0.00
47.00	5.50	3.14	0.00
47.50	5.50	3.14	0.00
48.00	5.50	3.14	0.00

Summary for Reach DP-1:

Inflow Area = 0.097 ac, 44.92% Impervious, Inflow Depth = 4.78" for 25-Year event
Inflow = 0.54 cfs @ 12.18 hrs, Volume= 0.039 af
Outflow = 0.54 cfs @ 12.18 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.00		0.00	35.00	0.00		0.00
9.50	0.00		0.00	35.50	0.00		0.00
10.00	0.01		0.01	36.00	0.00		0.00
10.50	0.01		0.01	36.50	0.00		0.00
11.00	0.01		0.01	37.00	0.00		0.00
11.50	0.03		0.03	37.50	0.00		0.00
12.00	**0.24**		**0.24**	38.00	0.00		0.00
12.50	**0.18**		**0.18**	38.50	0.00		0.00
13.00	0.07		0.07	39.00	0.00		0.00
13.50	0.05		0.05	39.50	0.00		0.00
14.00	0.04		0.04	40.00	0.00		0.00
14.50	0.03		0.03	40.50	0.00		0.00
15.00	0.03		0.03	41.00	0.00		0.00
15.50	0.02		0.02	41.50	0.00		0.00
16.00	0.02		0.02	42.00	0.00		0.00
16.50	0.02		0.02	42.50	0.00		0.00
17.00	0.01		0.01	43.00	0.00		0.00
17.50	0.01		0.01	43.50	0.00		0.00
18.00	0.01		0.01	44.00	0.00		0.00
18.50	0.01		0.01	44.50	0.00		0.00
19.00	0.01		0.01	45.00	0.00		0.00
19.50	0.01		0.01	45.50	0.00		0.00
20.00	0.01		0.01	46.00	0.00		0.00
20.50	0.01		0.01	46.50	0.00		0.00
21.00	0.01		0.01	47.00	0.00		0.00
21.50	0.01		0.01	47.50	0.00		0.00
22.00	0.01		0.01	48.00	0.00		0.00
22.50	0.00		0.00				
23.00	0.00		0.00				
23.50	0.00		0.00				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

Summary for Pond 1P: (new Pond)

Inflow Area = 0.083 ac,100.00% Impervious, Inflow Depth = 5.26" for 25-Year event
Inflow = 0.41 cfs @ 12.08 hrs, Volume= 0.036 af
Outflow = 0.34 cfs @ 12.21 hrs, Volume= 0.036 af, Atten= 17%, Lag= 7.5 min
Discarded = 0.01 cfs @ 12.21 hrs, Volume= 0.022 af
Secondary = 0.34 cfs @ 12.21 hrs, Volume= 0.013 af
Routed to Reach DP-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Peak Elev= 281.95' @ 12.21 hrs Surf.Area= 378 sf Storage= 636 cf
Flood Elev= 285.00' Surf.Area= 378 sf Storage= 840 cf

Plug-Flow detention time= 507.5 min calculated for 0.035 af (98% of inflow)
Center-of-Mass det. time= 497.5 min (1,243.1 - 745.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	278.50'	565 cf	**13.83'W x 27.31'L x 5.00'H Field A** 1,889 cf Overall - 276 cf Embedded = 1,613 cf x 35.0% Voids
#2A	279.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 2 Rows
		840 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	278.50'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 273.00'
#2	Secondary	281.50'	**6.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 281.50' / 280.00' S= 0.0300 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 12.21 hrs HW=281.94' (Free Discharge)
1=Exfiltration (Controls 0.01 cfs)

Secondary OutFlow Max=0.32 cfs @ 12.21 hrs HW=281.94' (Free Discharge)
2=Culvert (Inlet Controls 0.32 cfs @ 1.78 fps)

Pond 1P: (new Pond) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

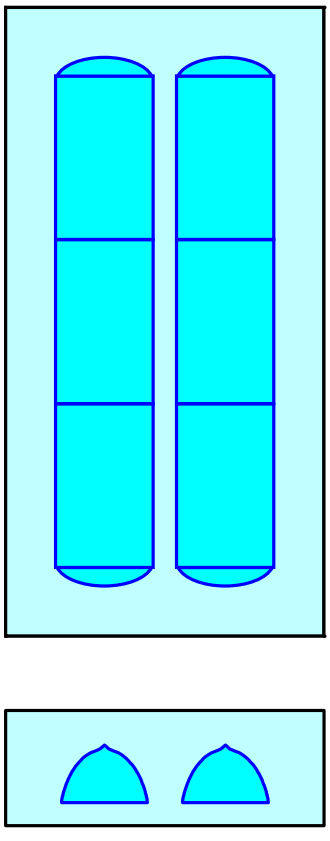
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +26.0" End Stone x 2 = 27.31' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 26.0" Side Stone x 2 = 13.83' Base Width
12.0" Stone Base + 30.0" Chamber Height + 18.0" Stone Cover = 5.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

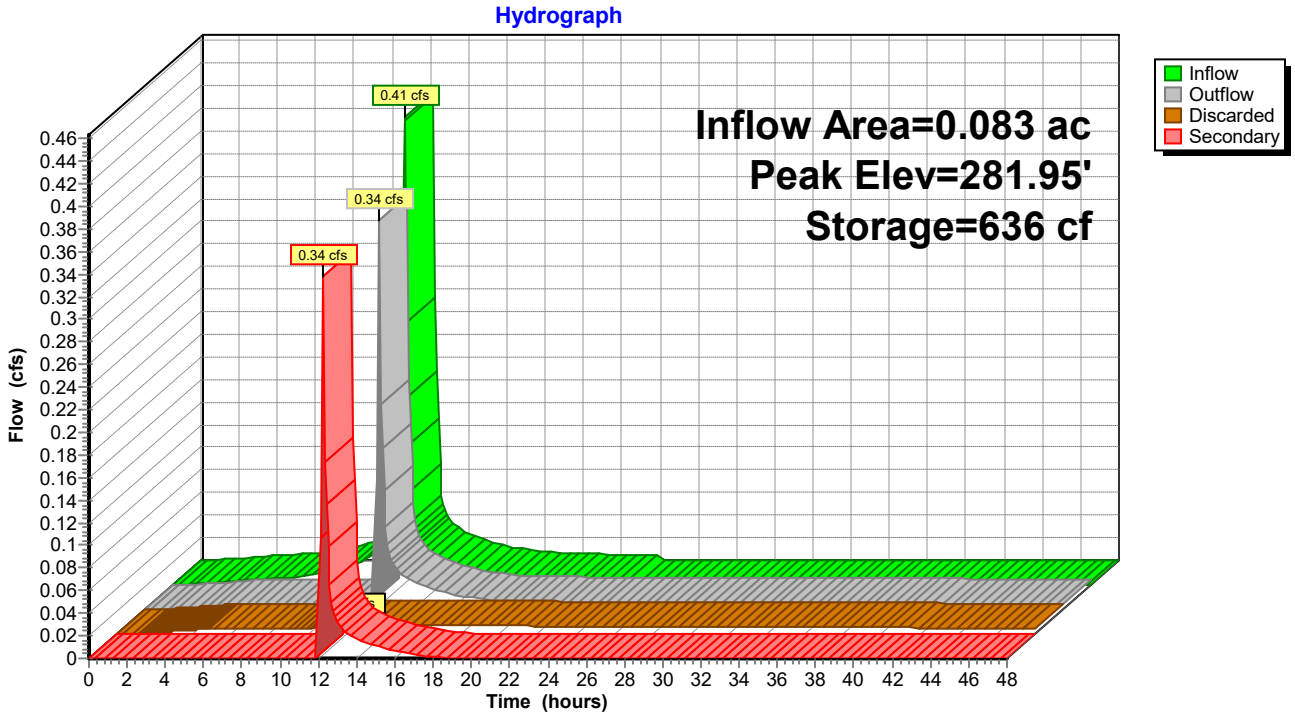
1,888.9 cf Field - 275.6 cf Chambers = 1,613.3 cf Stone x 35.0% Voids = 564.7 cf Stone Storage

Chamber Storage + Stone Storage = 840.3 cf = 0.019 af
Overall Storage Efficiency = 44.5%
Overall System Size = 27.31' x 13.83' x 5.00'

6 Chambers
70.0 cy Field
59.8 cy Stone



Pond 1P: (new Pond)



Hydrograph for Pond 1P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Secondary (cfs)
0.00	0.00	0	278.50	0.00	0.00	0.00
1.00	0.00	0	278.50	0.00	0.00	0.00
2.00	0.00	2	278.52	0.00	0.00	0.00
3.00	0.00	5	278.54	0.00	0.00	0.00
4.00	0.00	7	278.55	0.00	0.00	0.00
5.00	0.01	9	278.57	0.00	0.00	0.00
6.00	0.01	13	278.60	0.00	0.00	0.00
7.00	0.01	23	278.67	0.00	0.00	0.00
8.00	0.01	41	278.81	0.00	0.00	0.00
9.00	0.02	72	279.04	0.00	0.00	0.00
10.00	0.02	120	279.41	0.01	0.01	0.00
11.00	0.03	196	279.77	0.01	0.01	0.00
12.00	**0.32**	**493**	**281.12**	**0.01**	**0.01**	**0.00**
13.00	**0.04**	**585**	**281.62**	**0.04**	**0.01**	**0.03**
14.00	0.02	580	281.58	0.02	0.01	0.02
15.00	0.02	576	281.57	0.02	0.01	0.01
16.00	0.01	573	281.55	0.01	0.01	0.01
17.00	0.01	569	281.53	0.01	0.01	0.00
18.00	0.01	566	281.51	0.01	0.01	0.00
19.00	0.01	565	281.50	0.01	0.01	0.00
20.00	0.01	562	281.49	0.01	0.01	0.00
21.00	0.01	558	281.46	0.01	0.01	0.00
22.00	0.00	551	281.43	0.01	0.01	0.00
23.00	0.00	543	281.38	0.01	0.01	0.00
24.00	0.00	533	281.33	0.01	0.01	0.00
25.00	0.00	510	281.21	0.01	0.01	0.00
26.00	0.00	486	281.09	0.01	0.01	0.00
27.00	0.00	462	280.97	0.01	0.01	0.00
28.00	0.00	438	280.86	0.01	0.01	0.00
29.00	0.00	415	280.75	0.01	0.01	0.00
30.00	0.00	392	280.64	0.01	0.01	0.00
31.00	0.00	369	280.54	0.01	0.01	0.00
32.00	0.00	347	280.43	0.01	0.01	0.00
33.00	0.00	325	280.34	0.01	0.01	0.00
34.00	0.00	303	280.24	0.01	0.01	0.00
35.00	0.00	282	280.14	0.01	0.01	0.00
36.00	0.00	261	280.05	0.01	0.01	0.00
37.00	0.00	240	279.96	0.01	0.01	0.00
38.00	0.00	219	279.87	0.01	0.01	0.00
39.00	0.00	199	279.79	0.01	0.01	0.00
40.00	0.00	179	279.70	0.01	0.01	0.00
41.00	0.00	159	279.61	0.01	0.01	0.00
42.00	0.00	140	279.53	0.01	0.01	0.00
43.00	0.00	120	279.41	0.01	0.01	0.00
44.00	0.00	102	279.27	0.01	0.01	0.00
45.00	0.00	83	279.13	0.01	0.01	0.00
46.00	0.00	65	278.99	0.00	0.00	0.00
47.00	0.00	47	278.86	0.00	0.00	0.00
48.00	0.00	30	278.73	0.00	0.00	0.00

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment P-1: Runoff Area=3,600 sf 100.00% Impervious Runoff Depth=6.46"
Tc=5.0 min CN=98 Runoff=0.50 cfs 0.044 af

Subcatchment P-2: Runoff Area=4,230 sf 44.92% Impervious Runoff Depth=4.20"
Tc=5.0 min CN=78 Runoff=0.45 cfs 0.034 af

Reach DP-1: Inflow=0.91 cfs 0.055 af
Outflow=0.91 cfs 0.055 af

Pond 1P: (new Pond) Peak Elev=282.14' Storage=660 cf Inflow=0.50 cfs 0.044 af
Discarded=0.01 cfs 0.023 af Secondary=0.47 cfs 0.021 af Outflow=0.48 cfs 0.044 af

Total Runoff Area = 0.180 ac Runoff Volume = 0.079 af Average Runoff Depth = 5.24"
29.76% Pervious = 0.053 ac 70.24% Impervious = 0.126 ac

Summary for Subcatchment P-1:

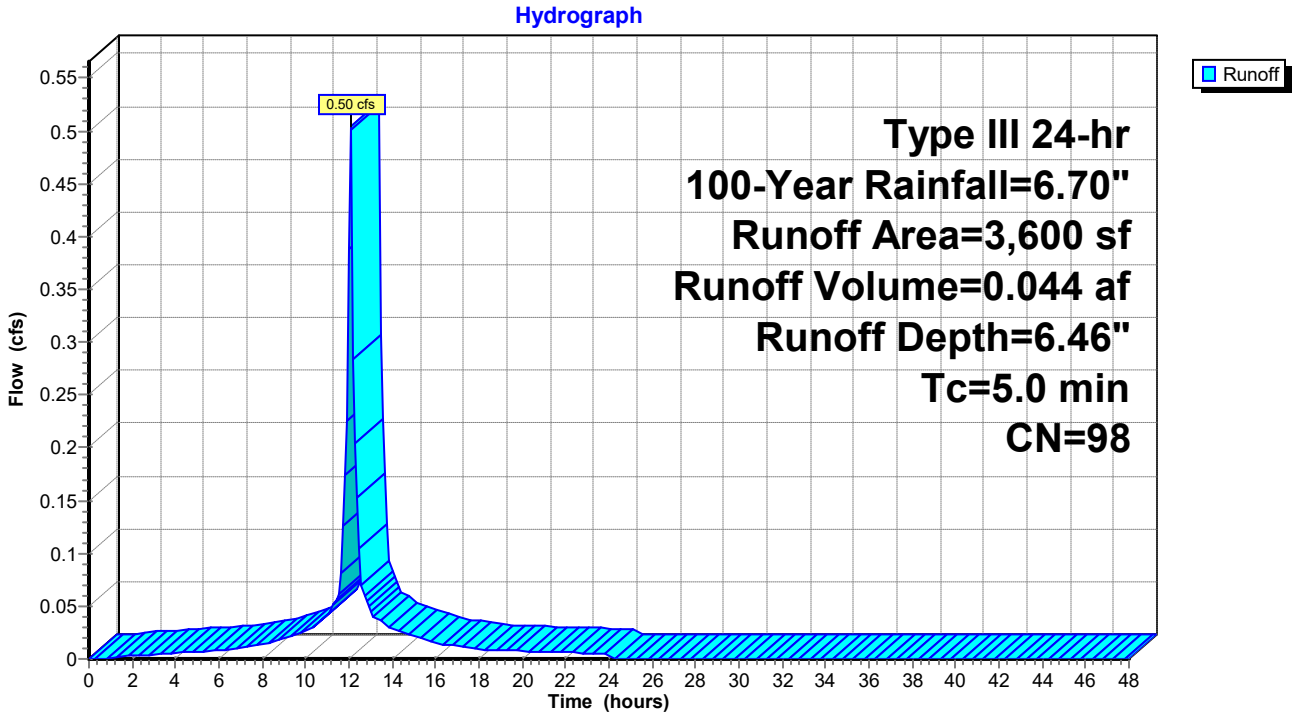
Runoff = 0.50 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 6.46"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	3,600	98	ROOF
	3,600		100.00% Impervious Area

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

Subcatchment P-1:



Hydrograph for Subcatchment P-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.07	0.00	0.00
1.50	0.10	0.01	0.00
2.00	0.13	0.03	0.00
2.50	0.17	0.05	0.00
3.00	0.21	0.07	0.00
3.50	0.25	0.10	0.01
4.00	0.29	0.14	0.01
4.50	0.33	0.17	0.01
5.00	0.38	0.21	0.01
5.50	0.43	0.26	0.01
6.00	0.48	0.30	0.01
6.50	0.54	0.35	0.01
7.00	0.61	0.42	0.01
7.50	0.68	0.49	0.01
8.00	0.76	0.56	0.01
8.50	0.86	0.66	0.02
9.00	0.98	0.77	0.02
9.50	1.11	0.90	0.02
10.00	1.27	1.05	0.03
10.50	1.45	1.23	0.03
11.00	1.67	1.45	0.04
11.50	2.00	1.77	0.06
12.00	3.35	3.12	**0.39**
12.50	4.70	4.47	**0.10**
13.00	5.02	4.79	0.04
13.50	5.25	5.01	0.04
14.00	5.43	5.20	0.03
14.50	5.59	5.35	0.02
15.00	5.72	5.49	0.02
15.50	5.84	5.60	0.02
16.00	5.94	5.70	0.01
16.50	6.02	5.78	0.01
17.00	6.09	5.86	0.01
17.50	6.16	5.92	0.01
18.00	6.22	5.98	0.01
18.50	6.27	6.03	0.01
19.00	6.32	6.08	0.01
19.50	6.37	6.13	0.01
20.00	6.41	6.17	0.01
20.50	6.45	6.22	0.01
21.00	6.50	6.26	0.01
21.50	6.53	6.30	0.01
22.00	6.57	6.33	0.01
22.50	6.61	6.37	0.01
23.00	6.64	6.40	0.01
23.50	6.67	6.43	0.01
24.00	**6.70**	**6.46**	0.00
24.50	6.70	6.46	0.00
25.00	6.70	6.46	0.00
25.50	6.70	6.46	0.00
26.00	6.70	6.46	0.00
26.50	6.70	6.46	0.00
27.00	6.70	6.46	0.00
27.50	6.70	6.46	0.00
28.00	6.70	6.46	0.00
28.50	6.70	6.46	0.00
29.00	6.70	6.46	0.00
29.50	6.70	6.46	0.00
30.00	6.70	6.46	0.00
30.50	6.70	6.46	0.00
31.00	6.70	6.46	0.00
31.50	6.70	6.46	0.00
32.00	6.70	6.46	0.00
32.50	6.70	6.46	0.00
33.00	6.70	6.46	0.00
33.50	6.70	6.46	0.00
34.00	6.70	6.46	0.00
34.50	6.70	6.46	0.00
35.00	6.70	6.46	0.00
35.50	6.70	6.46	0.00
36.00	6.70	6.46	0.00
36.50	6.70	6.46	0.00
37.00	6.70	6.46	0.00
37.50	6.70	6.46	0.00
38.00	6.70	6.46	0.00
38.50	6.70	6.46	0.00
39.00	6.70	6.46	0.00
39.50	6.70	6.46	0.00
40.00	6.70	6.46	0.00
40.50	6.70	6.46	0.00
41.00	6.70	6.46	0.00
41.50	6.70	6.46	0.00
42.00	6.70	6.46	0.00
42.50	6.70	6.46	0.00
43.00	6.70	6.46	0.00
43.50	6.70	6.46	0.00
44.00	6.70	6.46	0.00
44.50	6.70	6.46	0.00
45.00	6.70	6.46	0.00
45.50	6.70	6.46	0.00
46.00	6.70	6.46	0.00
46.50	6.70	6.46	0.00
47.00	6.70	6.46	0.00
47.50	6.70	6.46	0.00
48.00	6.70	6.46	0.00

Summary for Subcatchment P-2:

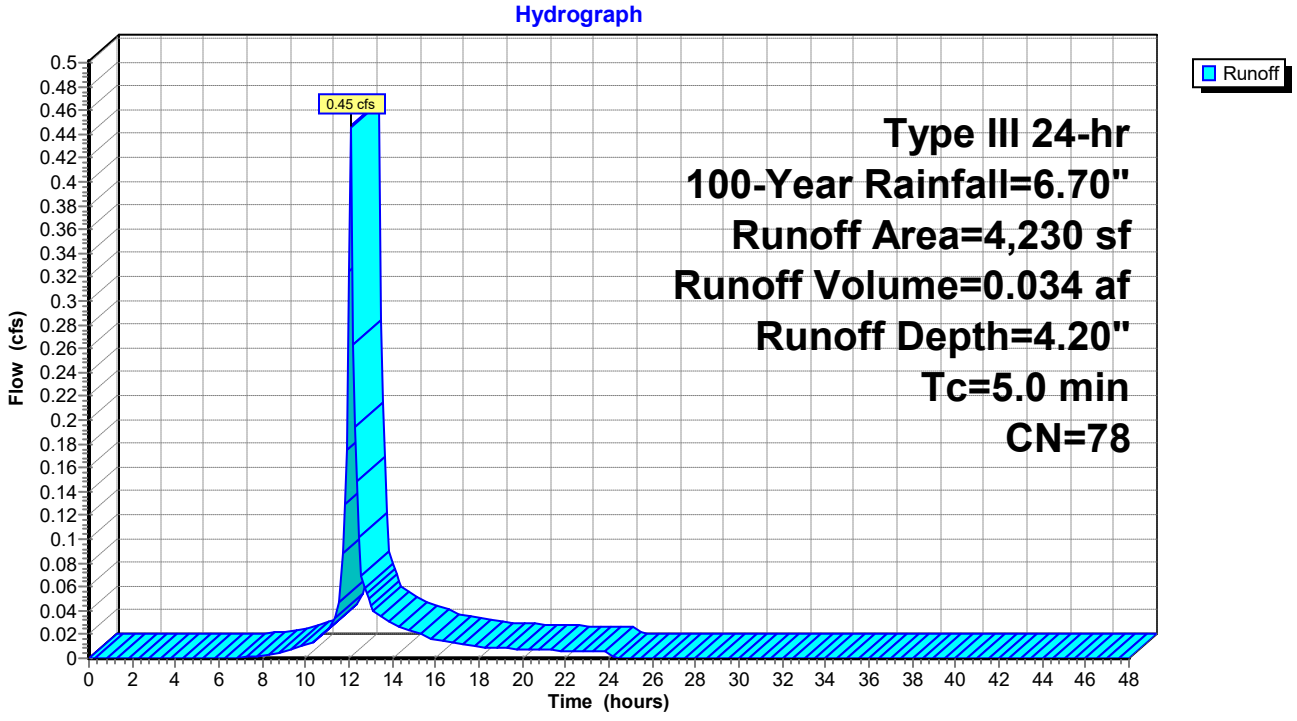
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 4.20"
Routed to Reach DP-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	1,900	98	Impervious Surfaces
	2,330	61	>75% Grass cover, Good, HSG B
	4,230	78	Weighted Average
	2,330		55.08% Pervious Area
	1,900		44.92% Impervious Area

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

Subcatchment P-2:



Hydrograph for Subcatchment P-2:

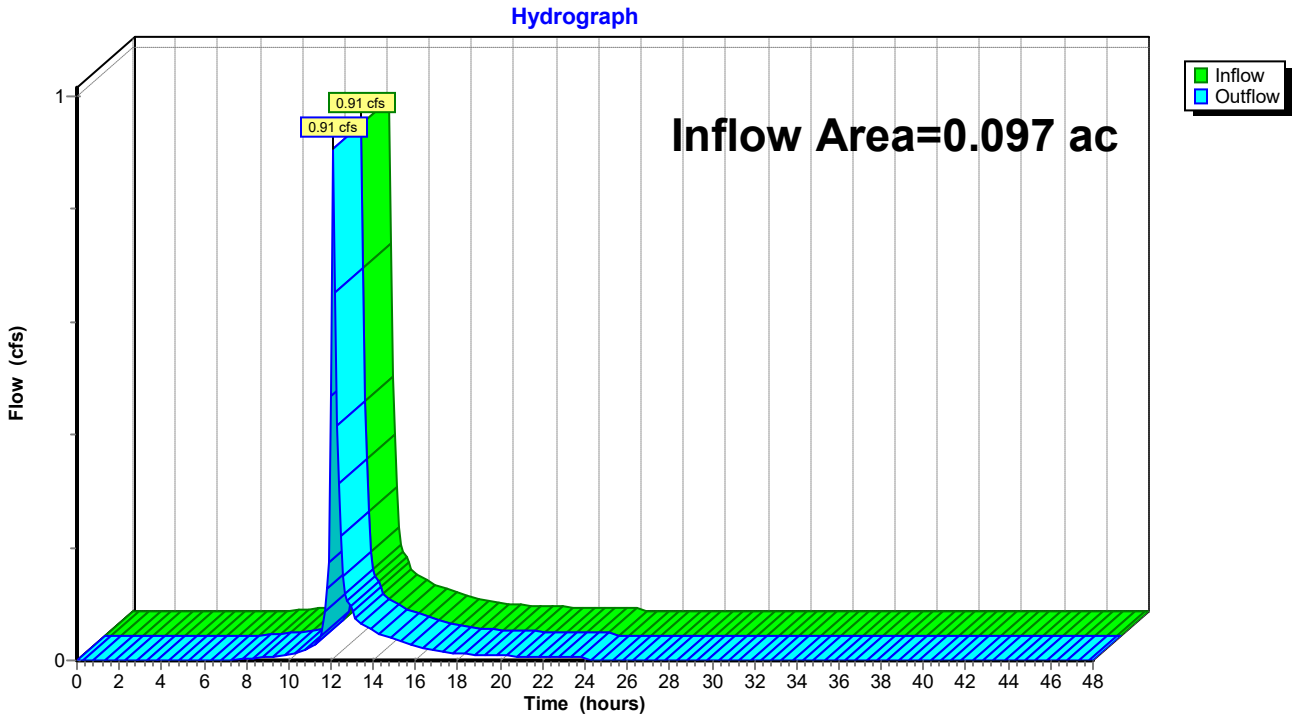
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.03	0.00	0.00
1.00	0.07	0.00	0.00
1.50	0.10	0.00	0.00
2.00	0.13	0.00	0.00
2.50	0.17	0.00	0.00
3.00	0.21	0.00	0.00
3.50	0.25	0.00	0.00
4.00	0.29	0.00	0.00
4.50	0.33	0.00	0.00
5.00	0.38	0.00	0.00
5.50	0.43	0.00	0.00
6.00	0.48	0.00	0.00
6.50	0.54	0.00	0.00
7.00	0.61	0.00	0.00
7.50	0.68	0.00	0.00
8.00	0.76	0.01	0.00
8.50	0.86	0.03	0.00
9.00	0.98	0.05	0.01
9.50	1.11	0.09	0.01
10.00	1.27	0.14	0.01
10.50	1.45	0.21	0.02
11.00	1.67	0.31	0.02
11.50	2.00	0.48	0.04
12.00	3.35	1.38	**0.32**
12.50	4.70	2.46	**0.10**
13.00	5.02	2.73	0.04
13.50	5.25	2.92	0.04
14.00	5.43	3.08	0.03
14.50	5.59	3.22	0.03
15.00	5.72	3.34	0.02
15.50	5.84	3.44	0.02
16.00	5.94	3.52	0.02
16.50	6.02	3.60	0.01
17.00	6.09	3.66	0.01
17.50	6.16	3.72	0.01
18.00	6.22	3.77	0.01
18.50	6.27	3.82	0.01
19.00	6.32	3.86	0.01
19.50	6.37	3.90	0.01
20.00	6.41	3.95	0.01
20.50	6.45	3.98	0.01
21.00	6.50	4.02	0.01
21.50	6.53	4.05	0.01
22.00	6.57	4.09	0.01
22.50	6.61	4.12	0.01
23.00	6.64	4.15	0.01
23.50	6.67	4.18	0.01
24.00	**6.70**	**4.20**	0.00
24.50	6.70	4.20	0.00
25.00	6.70	4.20	0.00
25.50	6.70	4.20	0.00
26.00	6.70	4.20	0.00
26.50	6.70	4.20	0.00
27.00	6.70	4.20	0.00
27.50	6.70	4.20	0.00
28.00	6.70	4.20	0.00
28.50	6.70	4.20	0.00
29.00	6.70	4.20	0.00
29.50	6.70	4.20	0.00
30.00	6.70	4.20	0.00
30.50	6.70	4.20	0.00
31.00	6.70	4.20	0.00
31.50	6.70	4.20	0.00
32.00	6.70	4.20	0.00
32.50	6.70	4.20	0.00
33.00	6.70	4.20	0.00
33.50	6.70	4.20	0.00
34.00	6.70	4.20	0.00
34.50	6.70	4.20	0.00
35.00	6.70	4.20	0.00
35.50	6.70	4.20	0.00
36.00	6.70	4.20	0.00
36.50	6.70	4.20	0.00
37.00	6.70	4.20	0.00
37.50	6.70	4.20	0.00
38.00	6.70	4.20	0.00
38.50	6.70	4.20	0.00
39.00	6.70	4.20	0.00
39.50	6.70	4.20	0.00
40.00	6.70	4.20	0.00
40.50	6.70	4.20	0.00
41.00	6.70	4.20	0.00
41.50	6.70	4.20	0.00
42.00	6.70	4.20	0.00
42.50	6.70	4.20	0.00
43.00	6.70	4.20	0.00
43.50	6.70	4.20	0.00
44.00	6.70	4.20	0.00
44.50	6.70	4.20	0.00
45.00	6.70	4.20	0.00
45.50	6.70	4.20	0.00
46.00	6.70	4.20	0.00
46.50	6.70	4.20	0.00
47.00	6.70	4.20	0.00
47.50	6.70	4.20	0.00
48.00	6.70	4.20	0.00

Summary for Reach DP-1:

Inflow Area = 0.097 ac, 44.92% Impervious, Inflow Depth = 6.76" for 100-Year event
Inflow = 0.91 cfs @ 12.11 hrs, Volume= 0.055 af
Outflow = 0.91 cfs @ 12.11 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Reach DP-1:



Hydrograph for Reach DP-1:

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.00	0.00		0.00	26.00	0.00		0.00
0.50	0.00		0.00	26.50	0.00		0.00
1.00	0.00		0.00	27.00	0.00		0.00
1.50	0.00		0.00	27.50	0.00		0.00
2.00	0.00		0.00	28.00	0.00		0.00
2.50	0.00		0.00	28.50	0.00		0.00
3.00	0.00		0.00	29.00	0.00		0.00
3.50	0.00		0.00	29.50	0.00		0.00
4.00	0.00		0.00	30.00	0.00		0.00
4.50	0.00		0.00	30.50	0.00		0.00
5.00	0.00		0.00	31.00	0.00		0.00
5.50	0.00		0.00	31.50	0.00		0.00
6.00	0.00		0.00	32.00	0.00		0.00
6.50	0.00		0.00	32.50	0.00		0.00
7.00	0.00		0.00	33.00	0.00		0.00
7.50	0.00		0.00	33.50	0.00		0.00
8.00	0.00		0.00	34.00	0.00		0.00
8.50	0.00		0.00	34.50	0.00		0.00
9.00	0.01		0.01	35.00	0.00		0.00
9.50	0.01		0.01	35.50	0.00		0.00
10.00	0.01		0.01	36.00	0.00		0.00
10.50	0.02		0.02	36.50	0.00		0.00
11.00	0.02		0.02	37.00	0.00		0.00
11.50	0.04		0.04	37.50	0.00		0.00
12.00	**0.47**		**0.47**	38.00	0.00		0.00
12.50	**0.22**		**0.22**	38.50	0.00		0.00
13.00	0.09		0.09	39.00	0.00		0.00
13.50	0.06		0.06	39.50	0.00		0.00
14.00	0.05		0.05	40.00	0.00		0.00
14.50	0.04		0.04	40.50	0.00		0.00
15.00	0.04		0.04	41.00	0.00		0.00
15.50	0.03		0.03	41.50	0.00		0.00
16.00	0.02		0.02	42.00	0.00		0.00
16.50	0.02		0.02	42.50	0.00		0.00
17.00	0.02		0.02	43.00	0.00		0.00
17.50	0.02		0.02	43.50	0.00		0.00
18.00	0.01		0.01	44.00	0.00		0.00
18.50	0.01		0.01	44.50	0.00		0.00
19.00	0.01		0.01	45.00	0.00		0.00
19.50	0.01		0.01	45.50	0.00		0.00
20.00	0.01		0.01	46.00	0.00		0.00
20.50	0.01		0.01	46.50	0.00		0.00
21.00	0.01		0.01	47.00	0.00		0.00
21.50	0.01		0.01	47.50	0.00		0.00
22.00	0.01		0.01	48.00	0.00		0.00
22.50	0.01		0.01				
23.00	0.01		0.01				
23.50	0.01		0.01				
24.00	0.00		0.00				
24.50	0.00		0.00				
25.00	0.00		0.00				
25.50	0.00		0.00				

Summary for Pond 1P: (new Pond)

Inflow Area = 0.083 ac,100.00% Impervious, Inflow Depth = 6.46" for 100-Year event
Inflow = 0.50 cfs @ 12.08 hrs, Volume= 0.044 af
Outflow = 0.48 cfs @ 12.13 hrs, Volume= 0.044 af, Atten= 5%, Lag= 2.9 min
Discarded = 0.01 cfs @ 12.13 hrs, Volume= 0.023 af
Secondary = 0.47 cfs @ 12.13 hrs, Volume= 0.021 af
Routed to Reach DP-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Peak Elev= 282.14' @ 12.13 hrs Surf.Area= 378 sf Storage= 660 cf
Flood Elev= 285.00' Surf.Area= 378 sf Storage= 840 cf

Plug-Flow detention time= 429.2 min calculated for 0.044 af (98% of inflow)
Center-of-Mass det. time= 415.4 min (1,158.0 - 742.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	278.50'	565 cf	**13.83'W x 27.31'L x 5.00'H Field A** 1,889 cf Overall - 276 cf Embedded = 1,613 cf x 35.0% Voids
#2A	279.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 6 Chambers in 2 Rows
		840 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	278.50'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 273.00'
#2	Secondary	281.50'	**6.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 281.50' / 280.00' S= 0.0300 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 12.13 hrs HW=282.09' (Free Discharge)
1=Exfiltration (Controls 0.01 cfs)

Secondary OutFlow Max=0.43 cfs @ 12.13 hrs HW=282.09' (Free Discharge)
2=Culvert (Inlet Controls 0.43 cfs @ 2.21 fps)

Pond 1P: (new Pond) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

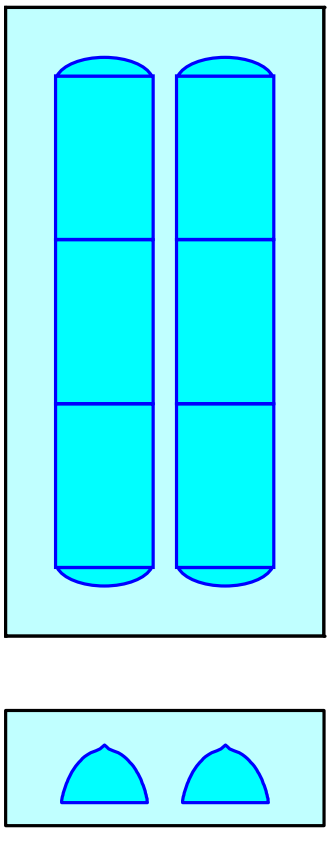
3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +26.0" End Stone x 2 = 27.31' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 26.0" Side Stone x 2 = 13.83' Base Width
12.0" Stone Base + 30.0" Chamber Height + 18.0" Stone Cover = 5.00' Field Height

6 Chambers x 45.9 cf = 275.6 cf Chamber Storage

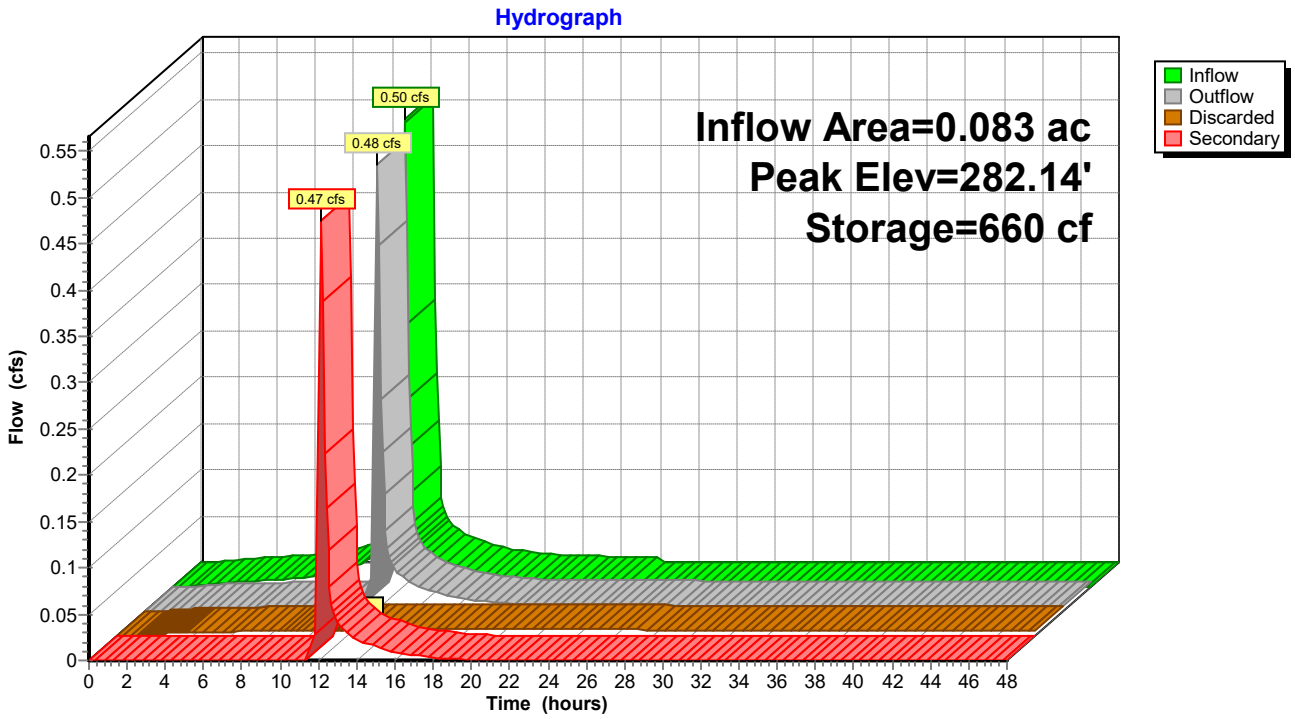
1,888.9 cf Field - 275.6 cf Chambers = 1,613.3 cf Stone x 35.0% Voids = 564.7 cf Stone Storage

Chamber Storage + Stone Storage = 840.3 cf = 0.019 af
Overall Storage Efficiency = 44.5%
Overall System Size = 27.31' x 13.83' x 5.00'

6 Chambers
70.0 cy Field
59.8 cy Stone



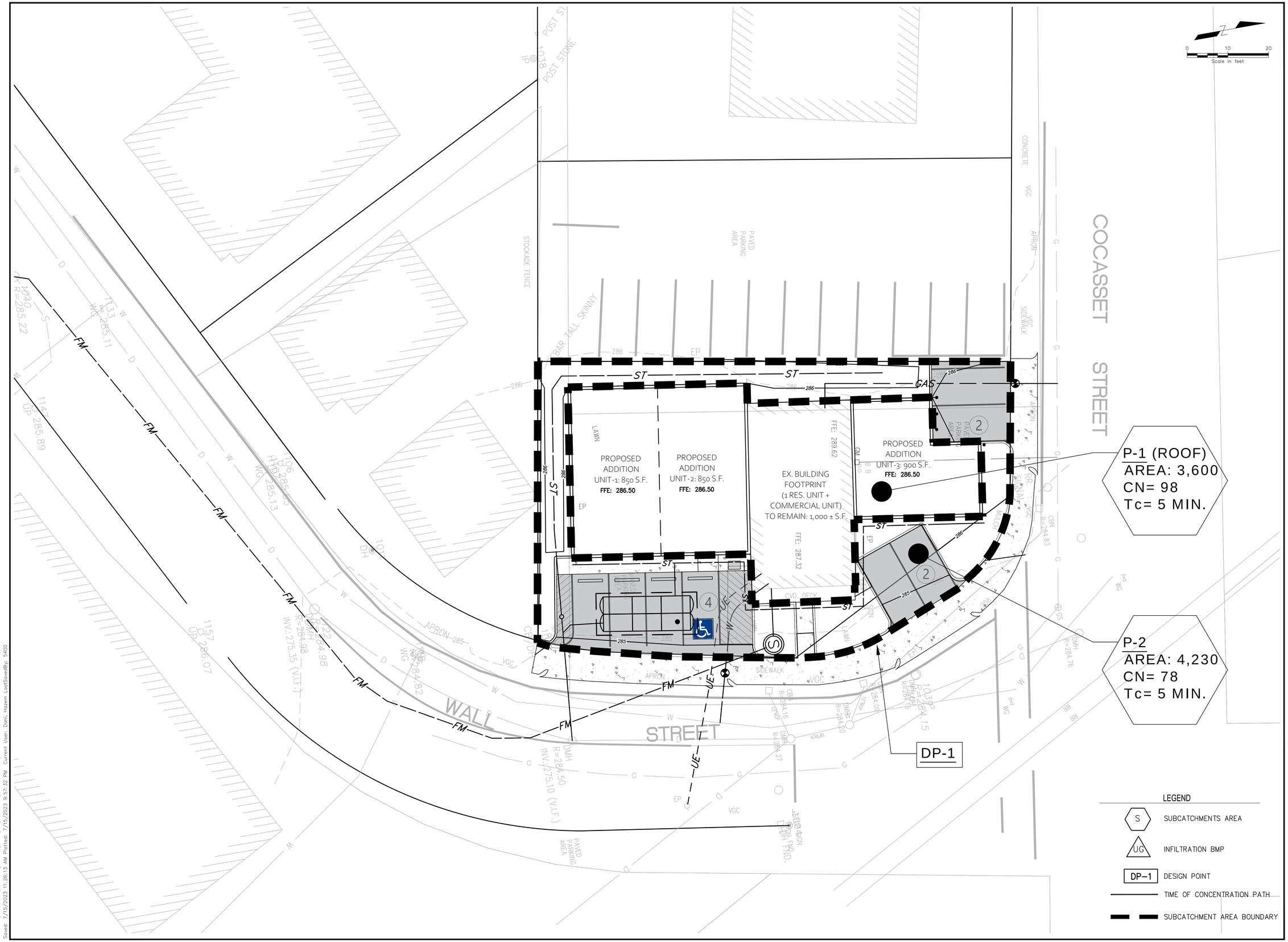
Pond 1P: (new Pond)



Hydrograph for Pond 1P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Secondary (cfs)
0.00	0.00	0	278.50	0.00	0.00	0.00
1.00	0.00	0	278.50	0.00	0.00	0.00
2.00	0.00	4	278.53	0.00	0.00	0.00
3.00	0.00	7	278.55	0.00	0.00	0.00
4.00	0.01	10	278.57	0.00	0.00	0.00
5.00	0.01	15	278.62	0.00	0.00	0.00
6.00	0.01	25	278.69	0.00	0.00	0.00
7.00	0.01	42	278.81	0.00	0.00	0.00
8.00	0.01	68	279.01	0.00	0.00	0.00
9.00	0.02	109	279.32	0.01	0.01	0.00
10.00	0.03	172	279.67	0.01	0.01	0.00
11.00	0.04	269	280.09	0.01	0.01	0.00
12.00	**0.39**	**609**	**281.76**	**0.15**	**0.01**	**0.15**
13.00	**0.04**	**588**	**281.63**	**0.05**	**0.01**	**0.04**
14.00	0.03	582	281.60	0.03	0.01	0.02
15.00	0.02	579	281.58	0.02	0.01	0.02
16.00	0.01	575	281.56	0.02	0.01	0.01
17.00	0.01	572	281.54	0.01	0.01	0.01
18.00	0.01	569	281.52	0.01	0.01	0.00
19.00	0.01	567	281.51	0.01	0.01	0.00
20.00	0.01	565	281.50	0.01	0.01	0.00
21.00	0.01	564	281.50	0.01	0.01	0.00
22.00	0.01	562	281.49	0.01	0.01	0.00
23.00	0.01	557	281.46	0.01	0.01	0.00
24.00	0.00	551	281.42	0.01	0.01	0.00
25.00	0.00	527	281.30	0.01	0.01	0.00
26.00	0.00	503	281.17	0.01	0.01	0.00
27.00	0.00	478	281.05	0.01	0.01	0.00
28.00	0.00	455	280.94	0.01	0.01	0.00
29.00	0.00	431	280.82	0.01	0.01	0.00
30.00	0.00	408	280.71	0.01	0.01	0.00
31.00	0.00	385	280.61	0.01	0.01	0.00
32.00	0.00	363	280.51	0.01	0.01	0.00
33.00	0.00	341	280.41	0.01	0.01	0.00
34.00	0.00	319	280.31	0.01	0.01	0.00
35.00	0.00	297	280.21	0.01	0.01	0.00
36.00	0.00	276	280.12	0.01	0.01	0.00
37.00	0.00	255	280.03	0.01	0.01	0.00
38.00	0.00	234	279.94	0.01	0.01	0.00
39.00	0.00	213	279.85	0.01	0.01	0.00
40.00	0.00	193	279.76	0.01	0.01	0.00
41.00	0.00	173	279.67	0.01	0.01	0.00
42.00	0.00	153	279.59	0.01	0.01	0.00
43.00	0.00	134	279.51	0.01	0.01	0.00
44.00	0.00	115	279.37	0.01	0.01	0.00
45.00	0.00	96	279.23	0.01	0.01	0.00
46.00	0.00	78	279.09	0.01	0.01	0.00
47.00	0.00	60	278.95	0.00	0.00	0.00
48.00	0.00	42	278.82	0.00	0.00	0.00

TABLE OF CONTENTS



HD Design
161 W. High Street,
Avon, MA 02322

No.	Submittal / Revision	Appr'd.	By	Date
0	OWNERS COMMENTS	HD	HD	06/07/23
1	SITE PLAN REVIEW / APP.	HD	HD	07/15/23

APPLICANT / OWNER

TNC DEVELOPMENT LLC

58 WILLOW STREET
NORWOOD, MA 02062

SITE PLANS
BUILDING EXPANSION
MIXED-USE BUILDING
30-32 WALL STREET, FOXBOROUGH, MA

PROPOSED HYDROLOGY PLAN

Designed By:	Drawn By:	Checked By:
HD	HD	-
Issue Date:	Project No:	Scale:
04/01/2023	12022	1"=10'

Drawing No:
POST-HYDRO

File: V:\DH_DATA\OFFICES\NMA78\CIVIL\HD\FOXBORO_SHEET FILES\PROPOSED HYDRO.DWG
Saved: 7/15/2023 11:26:13 AM Plotted: 7/15/2023 9:57:32 PM Current User: Dan, Herem Last Saved By: 5400

Drawdown Time Calculations

72-HOUR DRAWDOWN NARRATIVE & CALCULATIONS

Use the same infiltration rate that is used for sizing the infiltration BMP to confirm that the infiltration BMP will drain entirely within 72 hours. For the "*Static"* and "*Simple Dynamic"* Methods, the Rawls Rates associated with the slowest of the Hydrologic Soil Groups determined to exist at the point where recharge is actually proposed shall be used. For the "*Dynamic Field"* Method, 50% of the lowest value obtained from the test results for *saturated hydraulic conductivity* measured in the field at the actual location and soil layer where recharge is proposed shall be used.

To determine whether an infiltration BMP will drain within 72 hours, the following formula must be used[1]:

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

Where:
Rv = Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). For the "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.
Bottom Area = Bottom Area of Recharge Structure[2]

1. UG-1 Stone Reservoir Drawdown Calculation:

Rv = 565 cu. ft., K = 0.52 in/hr, Bottom Area = 25 X 11 = 275 sq. ft.

Time = 565 cu. ft. / [(0.52 in/hr (1ft/12in)) * 275 sq. ft.]

Time = 47.50 Hours

Conclusion:

The drawdown calculations for the infiltration BMP's show that each BMP will drain within the required 72-Hour timeframe. The project satisfies Standard 3 of the Mass DEP Stormwater Reqs.

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[1] In some cases, the infiltration structure may be designed to treat the *Required Water Quality Volume* and/or to attenuate peak discharges in addition to infiltrating the *Required Recharge Volume*. In that event, the storage volume of the structure must be used in the formula for determining drawdown time in place of the *Required Recharge Volume*.

[2] **To account for the porosity of the stone, a different formula is required to determine whether the Required Recharge Volume drains within 72 hours if the infiltration structure is a trench filled with stone. In that event, the drawdown time would be calculated as follows with n = porosity of the stone:**

$$Time_{drawdown} = \frac{Rv}{(K)(Trench\ Bottom\ Area)(n)}$$

Recharge Calculations

RECHARGE Calculation Sheet

The Required Recharge Volume calculation is based on the 2008 Massachusetts Stormwater Handbook equation. The *Required Recharge Volume* equals a depth of runoff corresponding to the soil type multiplied by the new impervious areas covering that soil type at the post-development site. The *Required Recharge Volume* is based on the *Static* method.

An underground system consisting of Stormtech chambers is proposed under the proposed parking area. The delineated soil boundaries from the attached Natural Resources Conservation Service (NRCS) soil survey show that the site consists of Urban land with no Hydulic Group assigned. For the purpose of this report, it is assumed B soils for the Recharge calculations.

The project has been designed to integrate a recharge BMP consisting of a subsurface chamber system with a stone bed connected to the proposed roof drainage.

Rv = F x impervious Area (Equation 1) Volume 3, Ch 1, page 15

where;

Rv = Required Recharge Volume, expressed in cubic feet, cubic yards, or acre-feet
F= Target Depth Factor associated with each Hydrologic Soil Group (HSG)
Impervious Area = new pavement and new rooftop area

F for A soils = 0.60 inches (Table 2.3.2) Volume 3, Ch 1, page 16
F for B soils = 0.35 inches
F for C soils = 0.25 inches
F for D soils = 0.10 inches

Using the formula above, the following table shows the site's proposed impervious surface area overlying particular Hydrologic Soil Groups and the calculated *Required Recharge Volume*.

No Net Increase of Proposed Impervious = (-) 450 sq. ft.

Required Recharge Volume

Rv = F x Imp.
Rv = 0.35 in x (/12) x (0 s.f.)
Rv = 0 cu. ft.

Storage volume in the underground system below the outlet invert (stone at 35%): UG-1 (storage volume) = 565 cu. ft. (refer to the attached hydroCAD report for additional information)

The storage available in the underground system prior to discharge exceeds the Required Recharge Volume required for the impervious Area proposed on the site.

565 cu. ft. > 0 cu. ft.

Conclusion:

The proposed subsurface infiltration systems' recharge volume exceeds the required recharge volume. The project's stormwater management system satisfies Standard 3 of the Mass DEP Stormwater Regulations.

Stormwater O &M Plan

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A division of ADS®

Save Valuable Land and Protect Water Resources

Isolator® Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator® Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patented technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

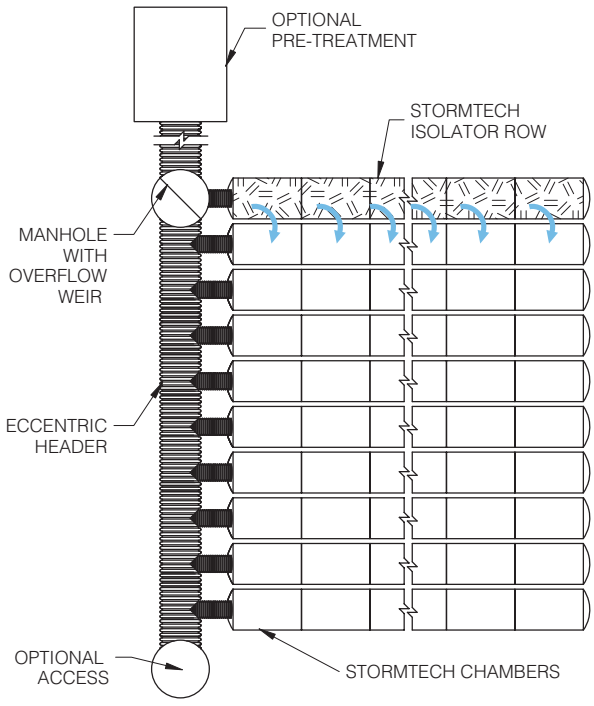
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.0 Isolator Row Inspection/Maintenance

2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

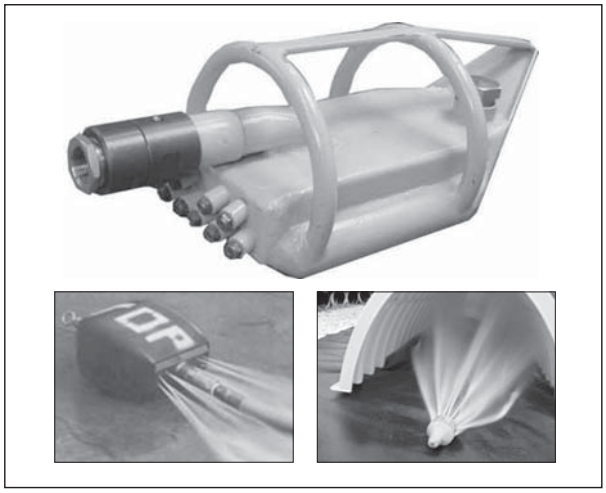
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

2.2 MAINTENANCE

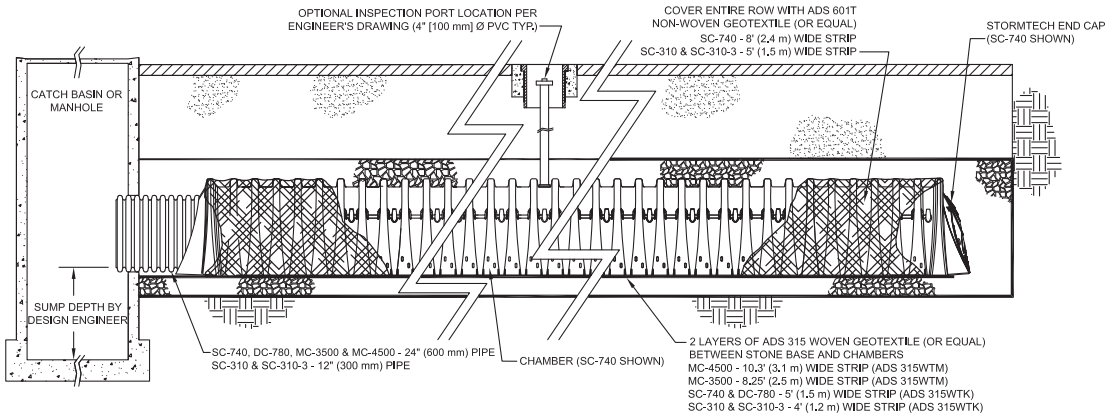
The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)



NOTE: NON-WOVEN FABRIC IS ONLY REQUIRED OVER THE INLET PIPE CONNECTION INTO THE END CAP FOR DC-780, MC-3500 AND MC-4500 CHAMBER MODELS AND IS NOT REQUIRED OVER THE ENTIRE ISOLATOR ROW.

3.0 Isolator Row Step By Step Maintenance Procedures

Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.

iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows

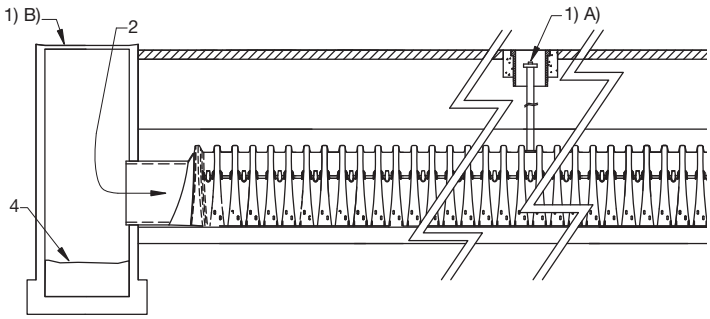
i. Remove cover from manhole at upstream end of Isolator Row

ii. Using a flashlight, inspect down Isolator Row through outlet pipe

1. Mirrors on poles or cameras may be used to avoid a confined space entry
2. Follow OSHA regulations for confined space entry if entering manhole

iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



Step 2) Clean out Isolator Row using the JetVac process

A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary.

- BMP ID# — Always use ID# from the Operation and Maintenance Manual or Approved Plans.
- Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.
- Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.
- Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.
- Comments and actions taken — Describe any maintenance done and need for follow-up.

Soil Data

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

July 15, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map (30-32 Wall Street)

Map Scale: 1:227 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 3 6 12 18

Feet: 0 10 20 40 60

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 18, Sep 9, 2022

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

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

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

Map Unit Legend (30-32 Wall Street)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land, 0 to 15 percent slopes	0.2	100.0%
Totals for Area of Interest		**0.2**	**100.0%**

Map Unit Descriptions (30-32 Wall Street)

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

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

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

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

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

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

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

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

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

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

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

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

Norfolk and Suffolk Counties, Massachusetts

602—Urban land, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: vkyj
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Rock outcrops

Percent of map unit: 1 percent
Hydric soil rating: Unranked

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