Stormwater Management System Report

SHELL POINT PLACE

PROPOSED DEFINITIVE SUBDIVISION PLAN

69 GREAT NECK ROAD
WAREHAM, MASSACHUSETTS

Prepared for:

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Project No. 2443

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CONSULTING ENGINEERS

Preface

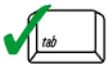
Stormwater Management Standards Compliance Checklist

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

Signature and Date 10/7/2021

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

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

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

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

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

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Infiltration Basin, Water Quality Inlets

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) NOT APPLICABLE

☐ 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 NOT APPLICABLE

☐ 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 NOT APPLICABLE

☐ 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.

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Section 1

Hydrologic Overview

1.0 INTRODUCTION

1.1 Project Description

The proposed project consists of a six-lot residential subdivision to be serviced by an approximate 550' long paved roadway as shown on the Definitive Subdivision Plans. The roadway will be serviced by an on-site stormwater management system to attenuate the increase in rates of runoff and treat the increased TSS load associated with the development. The stormwater management system will consist of a closed conduit drainage system along both sides of the proposed roadway which will discharge to either a series of leaching pits or an above ground infiltration basin. A 12" culvert serves as an overflow outlet from in the leaching pits in large storm events, discharging to the proposed infiltration basin. The stormwater management system has been designed to accept and treat the projected stormwater flows from the development in accordance with the current DEP Stormwater Management Standards. As part of the new DEP Stormwater Management Standards and Regulations, the DEP is requiring Low Impact Development (LID) measures to be considered in the design of the project. The project, as proposed, does make use of certain LID measures including infiltration capacity below the outlet of the infiltration basin.

1.2 Hydrologic Overview

A hydrologic analysis for the pre and post developed conditions for the project site has been prepared and is submitted in the following sections of this report. The primary goal of this analysis is to evaluate and mitigate the potential impacts of the proposed development to the adjacent properties. Particular consideration has been given to stormwater quantity and quality flowing towards the existing intermittent stream that flows through the site.

The analysis of the present condition and the proposed condition hydrology includes a calculated estimation of the runoff volume and peak storm flow rates from the site for each individual drainage area. The HydroCAD hydrologic program, developed by Applied Microcomputer Systems, was utilized in the preparation of the stormwater runoff models. The HydroCAD software is based upon the Soil Conservation Service, "Technical Release 20 – Urban Hydrology for Small Watersheds" and is a generally accepted industry standard methodology.

An analysis was performed for the 2, 10, 25, and 100-year frequency rainfall events. These events were based on a 24-hour duration storm with a SCS Type III storm distribution curve. Time of Concentration (Tc) values and runoff curve numbers (CN) were developed for each of the calculated existing and proposed drainage areas based upon prevalent topographic patterns, ground cover conditions, and SCS Hydrologic Soil Group classifications.

The hydrologic study area in the pre-developed condition consists of two (2) watershed areas with one analysis point at an existing catch basin within Great Neck Road. The hydrologic study area in the post-developed condition consists of four (4) watershed areas and the same corresponding analysis point. The analysis assumes that the individual buildings on each house lot will be serviced by appropriately sized on-site roof drain recharge systems and therefore those areas have been excluded from the post development calculations of runoff to the subject analysis point. The pre and post development watershed areas and corresponding analysis point are described in the following sections and shown on the Watershed Plans submitted in Appendix A.

The Plymouth County Soil Conservation Service (SCS) mapping for this area indicates a number of predominant soil classifications on the project site. The predominant soil classifications are as follows:

- Carver loamy coarse sand (259B), 3 to 8 percent slopes – Hydrologic Soil Group A.
- Plymouth loamy coarse sand (437C), 3 to 8 percent slopes – Hydrologic Soil Group A.
- Montauk find sandy loam (301B), 3 to 8 percent slopes – Hydrologic Soil Group C.

1.3 Pre-Development Hydrologic Summary

In the present condition, the site is comprised of two (2) watershed areas with one corresponding Analysis Point as shown on the attached Pre-Development Watershed Plan and described below. The watershed designation and corresponding analysis point are as follows:

- Subcatchment PRE-1 is an 0.22-acre watershed area consisting of a small portion of the property that will be used to develop the subdivision that currently contributes runoff to a small depression (POND D-1) on the subject parcel. This depression overtops towards an existing catch basin located within Great Neck Road which is being taken as the Analysis Point for the hydrologic calculations. The Time of Concentration for Subcatchment PRE-1 was estimated at 10.9 minutes and the CN was estimated to be 34.

- Subcatchment PRE-2 is an 8.9-acre watershed area consisting of the remaining portions of the project site that will be used to develop the subdivision. Subcatchment PRE-2 currently contributes runoff unattenuated towards the existing catch basin being taken as the Analysis Point for the calculations. The Time of Concentration for Subcatchment PRE-2 was estimated at 31.1 minutes and the CN was estimated to be 38.

A summary of the pre-development hydrologic conditions for the 2, 10, 25 and 100-year storm events is submitted in Table 1.3 below.

Table 1.3 – Pre-Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	0.01
10-year storm	0.22
25-year storm	0.91
100-year storm	3.24

1.4 Post Development Hydrologic Summary

In the developed condition, the site is comprised of three (3) watershed areas as shown on the attached Post Development Watershed Plan. The designated post development analysis point corresponds to the previously described pre-development analysis point. The watershed designations and corresponding analysis point for each of the post development watersheds are as follows:

- Subcatchment POST-1 is a 3.4-acre portion of the overall watershed area consisting of a portion of the proposed development of the subdivision which will flow through a closed conduit piping system to a series of proposed leaching pits (PITS) prior to overtopping towards a proposed infiltration basin (BASIN) located at the front of the development. This infiltration basin has been sized to retain and infiltrate up through the 25-year storm event with minimal overflow occurring in the 100-year storm event towards an existing catch basin in Great Neck Road (Analysis Point 1). The Time of Concentration for Subcatchment POST-1 was estimated at 28.3 minutes and the CN was estimated to be 47.

- Subcatchment POST-2 is a 4.4-acre portion of the overall watershed area consisting of a portion of the proposed development of the subdivision which will flow through a closed conduit piping system towards a proposed infiltration basin (BASIN) located at the front of the development. This infiltration basin has been sized to retain and infiltrate up through the 25-year storm event with minimal overflow occurring in the 100-year storm event towards an existing catch basin in Great Neck Road (Analysis Point 1). The Time of Concentration for Subcatchment POST-2 was estimated at 25.3 minutes and the CN was estimated to be 44.

- Subcatchment POST-3 is a 1.1-acre watershed area consisting of a portion of the site which will continue to contribute runoff unattenuated towards the subject catch basin in Great Neck Road (Analysis Point 1). The Time of Concentration for Subcatchment POST-3 was estimated at 24.7 minutes and the CN was estimated to be 41.

A summary of the post-development hydrologic conditions for the 2, 10, and 100-year storm events is submitted in Table 1.4 below.

Table 1.4 – Post Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	0.00
10-year storm	0.07
25-year storm	0.22
100-year storm	1.79

A summary of the pre and post-development hydrologic conditions for the 2, 10, and 100-year storm events is submitted in Table 1.5 below. Results shown as a “negative” represent a decrease in post development condition rates of runoff.

Table 1.5 – Pre-Post Development Hydrologic Results

Storm Event	Analysis Point AP-1 Rate of Flow
2-year storm	-100.0%
10-year storm	-68.2%
25-year storm	-75.8%
100-year storm	-44.8%

The hydrologic analysis indicates that the stormwater management system design for the site meets or reduces peak runoff rates for the 2, 10, 25 and 100-year, 24-hour, Type III storm events from the pre-developed levels at the subject analysis points. The analysis shows the proposed development of this project area will not result in an increase in the rates of runoff from the project site.

1.5 Stormwater Management System Summary

The proposed stormwater management system incorporates a number of Best Management Practices (BMPs), as prescribed in the Department of Environmental Protection Stormwater Management Policy Handbook. These practices include structural and non-structural measures providing stormwater quantity and quality management. These BMPs will function to minimize potential adverse water quality impacts to the existing stormwater management system in Great Neck Road and the surrounding wetland ecosystem. The following sections describe the temporary and permanent stormwater BMPs proposed for the site development.

The proposed stormwater management plan has been developed based on the projected site conditions and the present condition of the water resource areas that receive stormwater runoff from the site. The proposed BMPs have been designed to comply with the Stormwater Management Policy Handbook.

The proposed roadway is the primary target area for water quantity and quality control measures for the project. Runoff from the roadway will flow through a closed conduit drainage system with deep sump catch basins and additional oil-water separator manholes or a proprietary water quality inlet, where natural screening and physical settling of pollutants will facilitate the removal of total suspended solids (TSS). The closed conduit drainage system will discharge to either a set of proposed leaching basins or a proposed infiltration basin for additional attenuation and treatment. The proposed infiltration basin has been sized to retain and infiltrate up through the 25-year storm event. In the 100-year storm event, a small amount of runoff will leave the basin through a 10' long vegetated spillway designed to minimize erosion and induce sheet flow conditions when in use. The predicted Total Suspended Solids (TSS) Removal for these areas are submitted in the following section of this report. As the calculations show, the provided closed conduit drainage system and structures will provide the required 44% TSS Removal prior to discharge to the infiltration BMP's and the overall stormwater management system will provide more than the required 80% TSS Removal prior to discharge from the site. Calculations are also provided to show that the provided stormwater management system will also provide the required recharge volume for the proposed impervious surfaces. As previously mentioned, the dwellings on each lot will be required through the covenants of the subdivision to provide adequately sized roof drain recharge systems to provide the necessary recharge volumes on each lot.

1.6 Select Structural Best Management Practices (BMP's)

Hooded Catch Basins with Deep Sumps

Stormwater from portions of the paved parking and driveway areas will be collected in a closed conduit piping system fitted with 4-foot deep sump catch basins with hooded outlets. Catch basin sump systems are effective devices for removal of large matter and pollutants that adsorb to sediments and other particulates. Catch basins with sumps and hooded outlets are designed to trap sediment particles and floating contaminants (e.g., oil and greases), that are typically the most significant constituents of the urban runoff pollutant load. Regular maintenance and cleaning of catch basins is required to assure adequate performance of these structures. A specific maintenance schedule is submitted in this document and on the plans.

Oil Water Separator Manholes

Oil Water Separator Manholes will be implemented at the stormwater management system for additional pretreatment prior to discharge to the leaching pits. This system consists of two manholes connected in series with a large diameter pipe at the bottom of each structure. They have been designed with a permanent pool depth of approximately 6 feet. The first manhole will allow additional solids to settle out and will also trap floatable debris. Oil and grease will float on the permanent pool of water and will also be trapped in the first manhole. The second

manhole will also have a sump which will provide a final stage of pollutant removal by providing an additional permanent pool settling zone prior to the outlet.

Proprietary Treatment Unit (CDS Water Quality Unit)

A water quality unit will be installed to remove additional Total Suspended Solids (TSS) and floatables which pass through the catch basins.

The water quality unit shall be a CDS as manufactured by Contech Construction Products, Inc. The CDS unit provides hydrodynamic separation of water borne sediment and floatables entering the unit that are not retained in the deep sump catch basins. The predicted Total Suspended Solids (TSS) removal rate for the specified model is 85%. The calculations and additional unit information is attached in Section 2 of this report.

Infiltration Basins

Following pretreatment within the catch basins and oil/grit separator manholes, runoff from a portion of the proposed subdivision will flow to a proposed infiltration basin. The infiltration basin will provide sufficient storage to retain and infiltrate up through the 25 year storm event and has been equipped with a vegetated overflow spillway which will convey a small amount of runoff towards the towards drainage system in the 100 year storm event.

Leaching Pits

The leaching pit system will consist of a series of 8-foot diameter leaching pits, 4 feet- 6 feet deep set within a bed of crushed stone. The system was designed to provide retain and infiltrate up through the 10-year storm event and will overtop in larger storm events via a closed conduit piping system towards the proposed infiltration basin. Stormwater runoff will exfiltrate through the bottom and sides of the leaching bed taking advantage of the in-situ pervious soil.

1.7 Select Non-Structural Best Management Practices (BMP's)

Stormwater Management System Maintenance Program

All structural components of the stormwater management system will be inspected and maintained of a regular basis in accordance with the requirements of the Stormwater Management Policy. A detailed Stormwater Management System Operation and Maintenance Plan has been prepared in accordance with the newly promulgated Stormwater Management Standards and Stormwater Management Handbook prepared by the Massachusetts Department of Environmental Protection.

1.8 Regulatory Compliance

The Massachusetts Stormwater Handbook, Volume 3 (February, 2008), has been used as the primary guidance for the selection and design of permanent non-structural and structural BMPs for the long-term protection of existing wetland and water resources. The Stormwater Management Plan developed for this project incorporates water quantity and quality controls that will protect surface and groundwater resources, wetlands and adjacent properties from potential impacts due to increased impervious areas on the site. The Stormwater Management Plan also incorporates select LID measures in accordance with the new Stormwater Management Policies.

The stormwater performance standards developed by the DEP and a brief discussion on how the proposed project will achieve the standards are provided below. The Stormwater Management System Compliance Certification and Checklist has been included as the Preface to this Report.

Standard 1. No new stormwater conveyances may discharge untreated stormwater directly to, or cause erosion in wetlands or waters of the Commonwealth.

- No proposed site stormwater conveyance system will discharge untreated stormwater runoff directly to wetlands. Stormwater runoff from paved areas will be collected and treated by a closed conduit pipe system consisting of one or a series of structural BMPs including deep sump/hooded catch basins, oil water separator manholes or a proprietary water quality inlet, subsurface leaching pits and an above ground infiltration basin. Riprap pads will be installed at the point of discharge of the detention basin outfall to eliminate potential erosive flow velocities and dissipate the energy of the discharged stormwater, thereby avoiding sedimentation to the downgradient areas.

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

- The storage volume above the outlet devices within the leaching pits and infiltration basin will serve to limit the peak rates of stormwater runoff at or below pre-development levels for the 2-, 10-, 25- and 100-year storm events. Refer to the Calculations in Sections 2 & 3 for additional information.

Standard 3. Loss of annual recharge to groundwater shall be eliminated or minimized through the use of 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.

- Provisions for groundwater recharge have been provided via the proposed leaching pits and infiltration basin. The provided stormwater management system provides enough recharge volume to account for this project's proposed impervious area. Detailed recharge volume calculations for the project are submitted in the following sections. Provisions for groundwater recharge will also be provided on the individual lots via underground roof drain recharge systems, which will be required within the covenants of the subdivision.

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 as determined in accordance with the Massachusetts Stormwater Handbook; and
c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

- The 80 percent TSS removal rate will be achieved will the implementation of a deep sump catch basins, oil water separator manholes or a proprietary water quality inlet, and either leaching pits or a proposed infiltration basin.

The aggregate total of both structural and non-structural BMPs will meet or exceed the target 80% removal rate. Detailed TSS removal calculations for are submitted in Section 5.

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. If, through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L.c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.**

- The proposed project is not considered a high intensity use with higher potential pollutant loads.

Standard 6. **Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or 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 by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.**

- The project does not discharge stormwater to any designated critical areas as defined in the Massachusetts Stormwater Handbook.

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.**

- This standard is not applicable as this is not a redevelopment of a previously developed site.

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.**

- The proposed development will incorporate erosion and sedimentation controls to minimize the potential for sedimentation in down gradient resources. These controls will include straw wattles/silt fence barriers, and slope stabilization measures such as hay/straw blankets and jute matting. The proponent along with their chosen site contractor will complete a Stormwater Pollution Prevention Plan in accordance with the NPDES General Permit for Stormwater Discharges associated with Construction Projects and this SWPPP will also be used as the plan to meet this standard.

Standard 9. A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

- The Stormwater Management Plan for this project has been developed in full compliance with the DEP Stormwater Management Policy. The Plan is based on a multi-dimensional approach to stormwater management that recognizes the need for proper site planning, source control of potential contaminants, and implementation of structural and non-structural treatment methods to ensure the protection of water resources in the vicinity of the site and adjacent properties. The Stormwater Operation and Maintenance Plan is provided on the construction drawings.

Standard 10. Illicit Discharges to the Stormwater Management System are prohibited.

- An Illicit Discharge Compliance Statement has been completed and is included as an Appendix to this Report.

1.9 Post Construction Operation and Maintenance Plan

Name and current address of the Applicant

David Andrade
P.O. Box 255
19 Old Onset Road
Onset, Ma 02558

Name and address of the Contractor of Record

To be determined and provided to the Planning Board and Conservation Commission upon selection.

Plans of Record

Refer to Definitive Subdivision Plans prepared by Field Engineering for David Andrade dated 10/7/2021.

1. The contractor shall be responsible for the proper inspection and maintenance of all stormwater management facilities until such time as the Stormwater Management System is accepted by the Owner. Thereafter the Owner shall be responsible for the proper inspection and maintenance of the stormwater facilities in accordance with this Operation and Maintenance Plan as well as the continuing conditions of the Certificate of Compliance on the property.

2. All Structural Best Management Practices (BMP's) including the catch basins, and subsurface infiltration systems should be inspected after every major rainfall event exceeding 1.0-inch for the first 6 months after construction to ensure proper stabilization and construction.

3. Thereafter, regular BMP inspections should be conducted according to the following schedule:

BMP Structure	Inspections per Year
Deep Sump Catch Basins	4
Oil Water Separator Manholes	2
Leaching Pits	2
Infiltration Basin	2
Proprietary Water Quality Inlet	Per Manufacturer's Specifications

4. The owner shall maintain and submit to the Conservation Commission upon request a BMP Inspection Report following each site inspection as recommended above. The BMP Inspection report shall identify the Date of Inspection, the name and contact number of the responsible party, specific structures inspected, specific maintenance required and observations at a minimum, inspection reports should address the following conditions where applicable:
    1. Embankment Subsidence
    2. Erosion
    3. Cracking of Containment Berm
    4. Inlet/Outlet Conditions
    5. Sediment Accumulations
    6. Slope Stability

5. Accumulated silt and sediment should be removed at least once a year for deep sump catch basins or more frequently if accumulated depth of sediment exceeds six inches.

6. All removed sediments are to be properly disposed of at a location to be approved by the Board of Health. Transportation and disposal of sediments shall comply with all applicable local, state, and federal regulations.

7. The driveway and parking areas shall be swept at least twice per year.

8. The infiltration basin and all landscaped areas should be inspected for trash on a monthly basis. Any accumulated trash, litter and discarded materials shall be removed.

9. Snow will be stockpiled within and around areas which drain into the stormwater management system wherever practicable. Catch basin grates will be cleaned of snow and ice after all snowfall events. The discharge of snow directly into the wetland resource areas will be prohibited.

10. No disposal of materials will be permitted within the any of the stormwater management system BMP's. This prohibition applies to trash, fill material, construction debris, grass clippings, collected leaves, and cut branches.

11. The embankment, side slopes, and bottom areas of the infiltration basin shall be mowed at least twice annually to facilitate maintenance of the basin.

12. An Operation and Maintenance Inspection Form shall be developed and copies of the completed forms shall be compiled by the Owner. These forms shall be available for review by the Conservation Commission upon request.

13. The Owner shall contract with a maintenance company on an annual basis that will be responsible for the operation and maintenance of the stormwater management system. The contact information for this company shall be provided to the Conservation Commission for their files.

14. The storm water BMP's will be inspected annually during regularly scheduled mid-summer landscaping and weeding operations for invasive or unwanted plants. If invasive species are found, they will be physically uprooted and removed from the area.

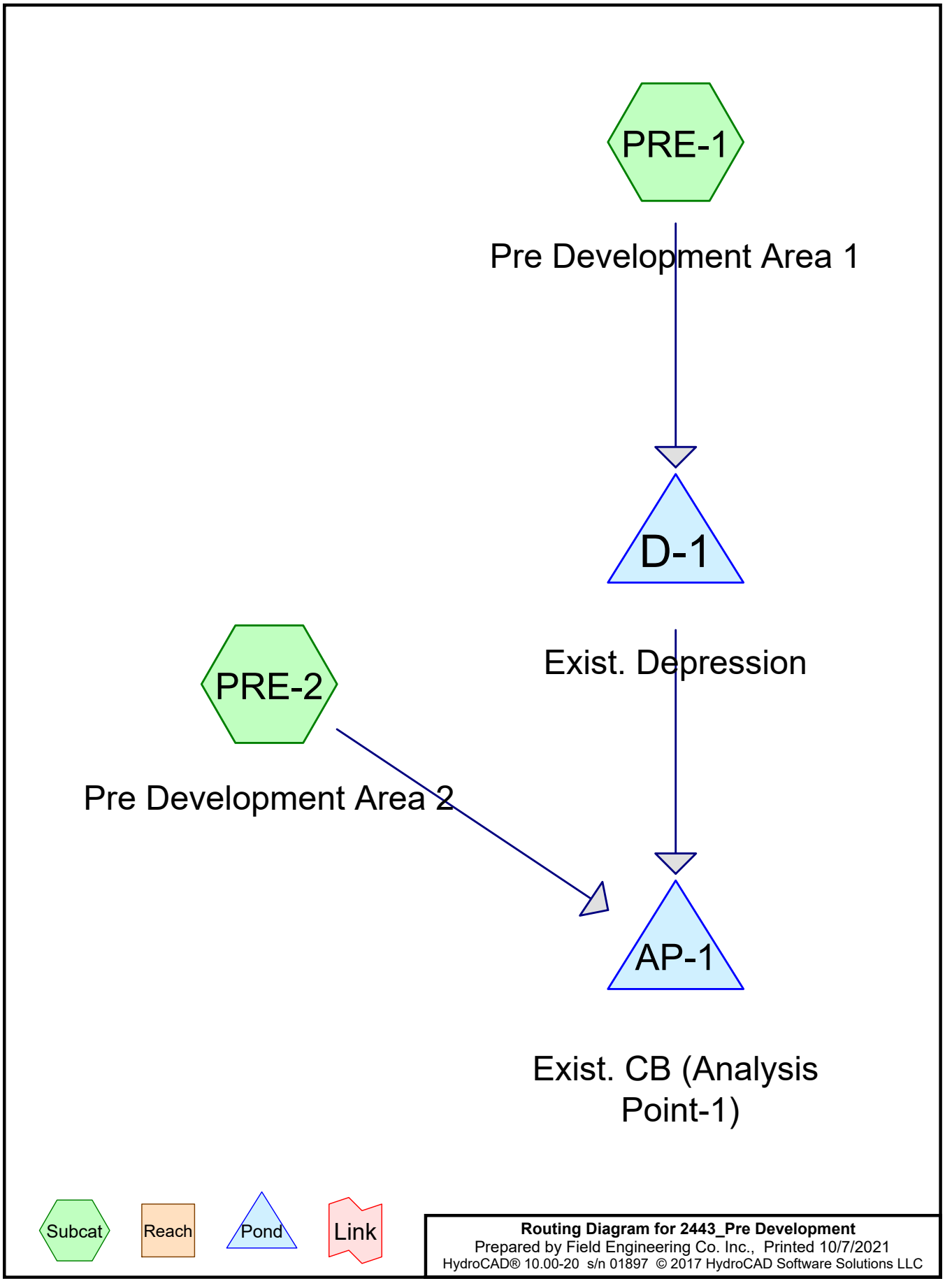
Invasive Species Control Plan (ISCP)

The owner will monitor the extended detention/infiltration basins and sediment forebays pursuant to the recommendations outlined in the USACE document titled "New England District Compensatory Mitigation Guidance" document, pages 24-26 section 4.f. Invasive Species.. Due to the proximity of the extended detention/infiltration system to the existing bordering vegetated wetland, the applicant has chosen a mechanical control method of removal. Invasive species will be removed by hand (pulling, mowing or excavating on-site). No chemical control will be utilized.

Special attention will be given to assure that none of the following invasive species populate the storm water BMP's: common reed (*Phragmites australis*), Purple loosestrife (*Lythrum salicaria*), Smooth and Common buckthorn (*Frangula alnus, Rhamnus carthartica*), Russian and Autumn olives (*Elaeagnus angustifolia and E. umbellata*), Multiflora rose (*Rosa multiflora*), Reed canary-grass (*Phalaris arundinacea*), and Japanese knotweed (*Fallopia japonica*).

Section 2

Pre Development Hydrologic Analysis



Routing Diagram for 2443_Pre Development
Prepared by Field Engineering Co. Inc., Printed 10/7/2021

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

Subcatchment PRE-1: Pre Development Area Runoff Area=9,414 sf 4.32% Impervious Runoff Depth=0.00"
Flow Length=164' Tc=10.9 min CN=34 Runoff=0.00 cfs 0.000 af

Subcatchment PRE-2: Pre Development Runoff Area=386,225 sf 4.22% Impervious Runoff Depth=0.00"
Flow Length=1,215' Tc=31.1 min CN=38 Runoff=0.01 cfs 0.002 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=0.01 cfs 0.002 af
Primary=0.01 cfs 0.002 af

Pond D-1: Exist. Depression Peak Elev=6.61' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.00"
95.78% Pervious = 8.699 ac 4.22% Impervious = 0.384 ac

Summary for Subcatchment PRE-1: Pre Development Area 1

[45] Hint: Runoff=Zero

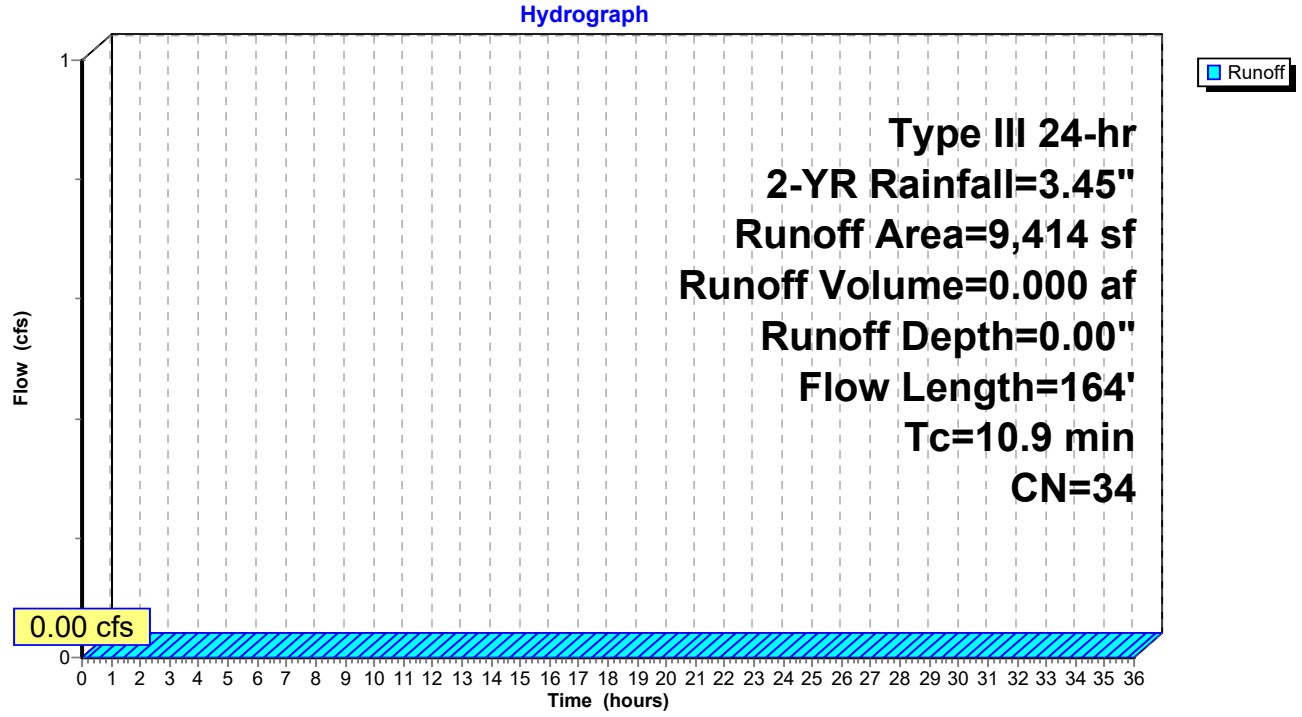
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.45"

Area (sf)	CN	Description
594	39	>75% Grass cover, Good, HSG A
8,413	30	Woods, Good, HSG A
407	98	Paved parking, HSG A
9,414	34	Weighted Average
9,007		95.68% Pervious Area
407		4.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	55	0.0500	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.45"
6.0	45	0.0900	0.13		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.45"
0.8	64	0.0800	1.41		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
10.9	164	Total			

Subcatchment PRE-1: Pre Development Area 1



Summary for Subcatchment PRE-2: Pre Development Area 2

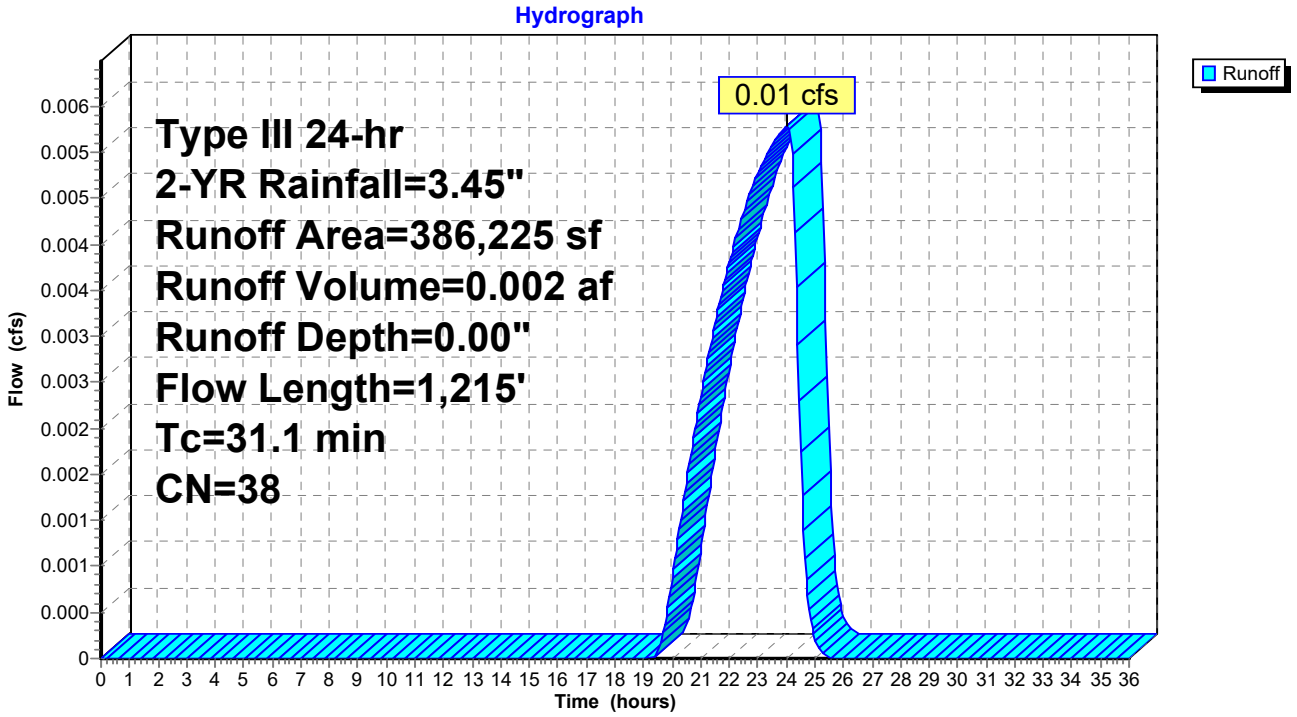
Runoff = 0.01 cfs @ 24.04 hrs, Volume= 0.002 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.45"

Area (sf)	CN	Description
16,304	98	Paved parking, HSG A
21,151	39	>75% Grass cover, Good, HSG A
301,069	30	Woods, Good, HSG A
47,701	70	Woods, Good, HSG C
386,225	38	Weighted Average
369,921		95.78% Pervious Area
16,304		4.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.9	612	0.0250	0.79		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.1	26	0.0800	5.74		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
2.6	125	0.0250	0.79		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
31.1	1,215	Total			

Subcatchment PRE-2: Pre Development Area 2



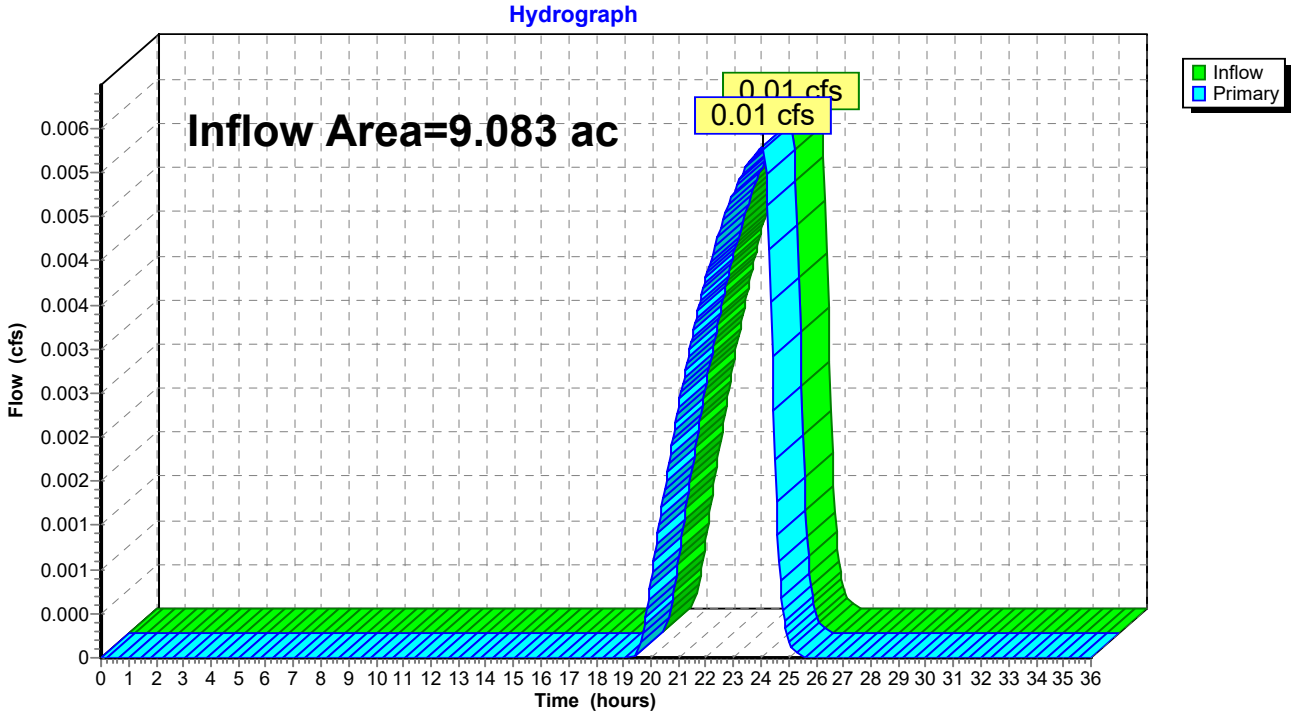
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.083 ac, 4.22% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.01 cfs @ 24.04 hrs, Volume= 0.002 af
Primary = 0.01 cfs @ 24.04 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond D-1: Exist. Depression

Inflow Area = 0.216 ac, 4.32% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 6.61' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	6.61'	4,668 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

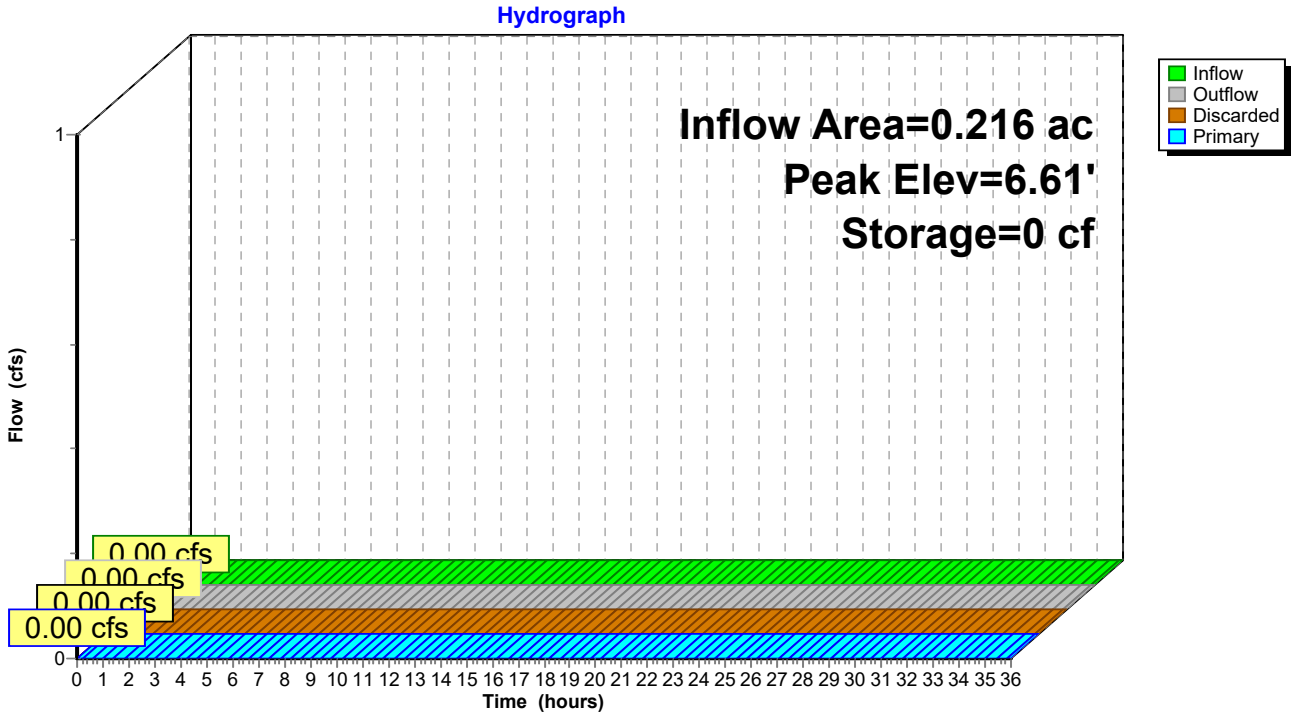
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6.61	0	0	0
7.00	52	10	10
8.00	671	362	372
9.00	1,993	1,332	1,704
10.00	3,935	2,964	4,668

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.61'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	9.70'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.61' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.61' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist. Depression



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

Subcatchment PRE-1: Pre Development Area Runoff Area=9,414 sf 4.32% Impervious Runoff Depth=0.07"
Flow Length=164' Tc=10.9 min CN=34 Runoff=0.00 cfs 0.001 af

Subcatchment PRE-2: Pre Development Runoff Area=386,225 sf 4.22% Impervious Runoff Depth=0.18"
Flow Length=1,215' Tc=31.1 min CN=38 Runoff=0.22 cfs 0.130 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=0.22 cfs 0.130 af
Primary=0.22 cfs 0.130 af

Pond D-1: Exist. Depression Peak Elev=6.83' Storage=3 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.132 af Average Runoff Depth = 0.17"
95.78% Pervious = 8.699 ac 4.22% Impervious = 0.384 ac

Summary for Subcatchment PRE-1: Pre Development Area 1

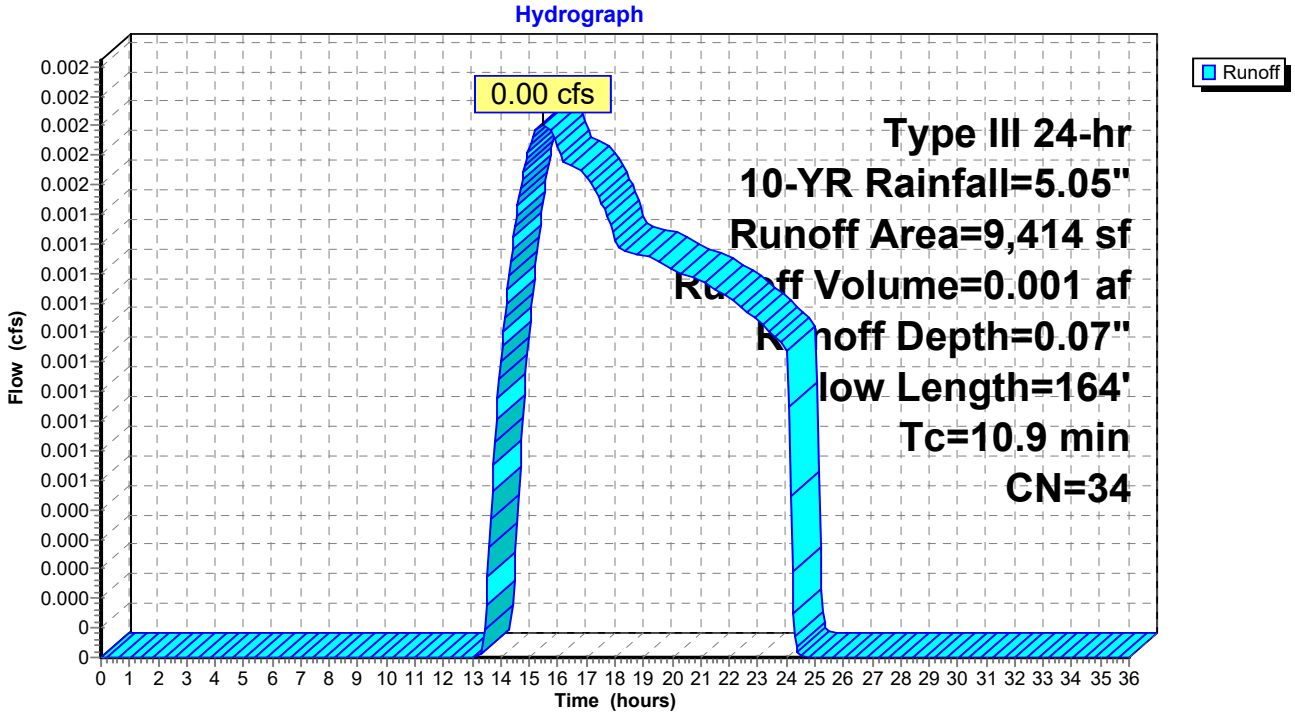
Runoff = 0.00 cfs @ 15.48 hrs, Volume= 0.001 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
594	39	>75% Grass cover, Good, HSG A
8,413	30	Woods, Good, HSG A
407	98	Paved parking, HSG A
9,414	34	Weighted Average
9,007		95.68% Pervious Area
407		4.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	55	0.0500	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.45"
6.0	45	0.0900	0.13		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.45"
0.8	64	0.0800	1.41		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
10.9	164	Total			

Subcatchment PRE-1: Pre Development Area 1



Summary for Subcatchment PRE-2: Pre Development Area 2

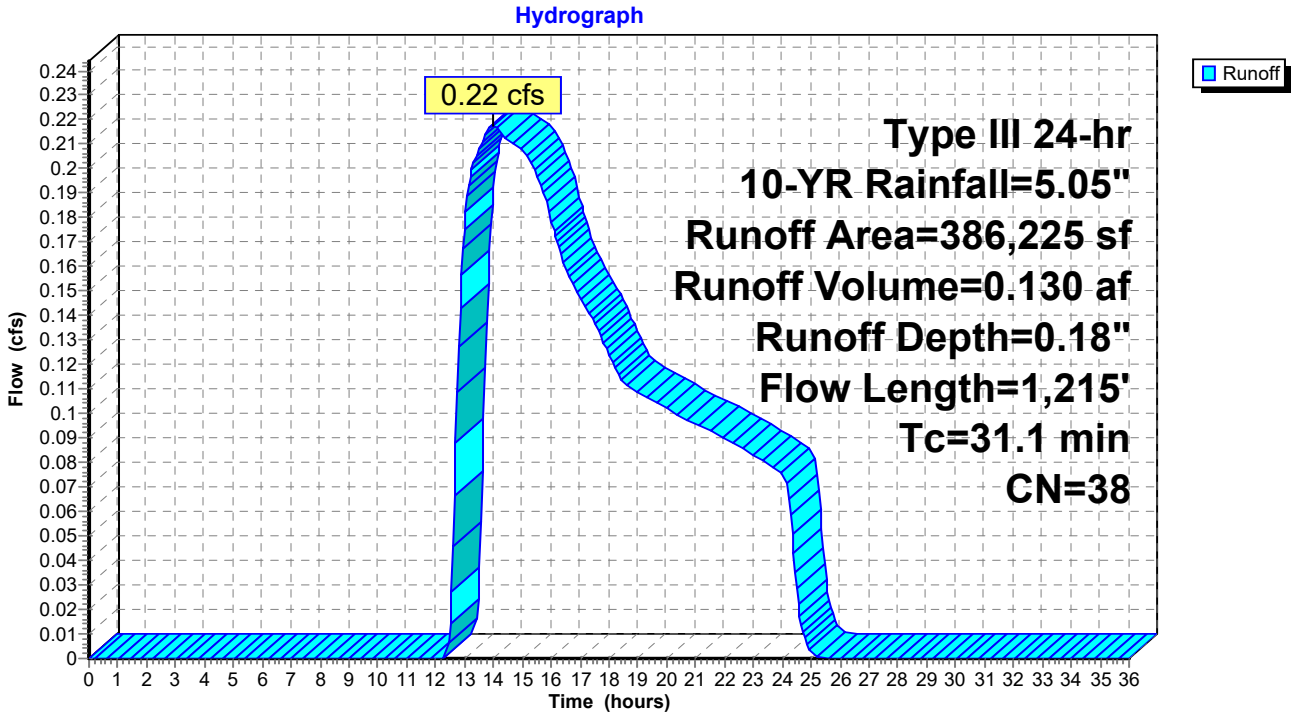
Runoff = 0.22 cfs @ 14.01 hrs, Volume= 0.130 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
16,304	98	Paved parking, HSG A
21,151	39	>75% Grass cover, Good, HSG A
301,069	30	Woods, Good, HSG A
47,701	70	Woods, Good, HSG C
386,225	38	Weighted Average
369,921		95.78% Pervious Area
16,304		4.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.9	612	0.0250	0.79		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.1	26	0.0800	5.74		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
2.6	125	0.0250	0.79		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
31.1	1,215	Total			

Subcatchment PRE-2: Pre Development Area 2



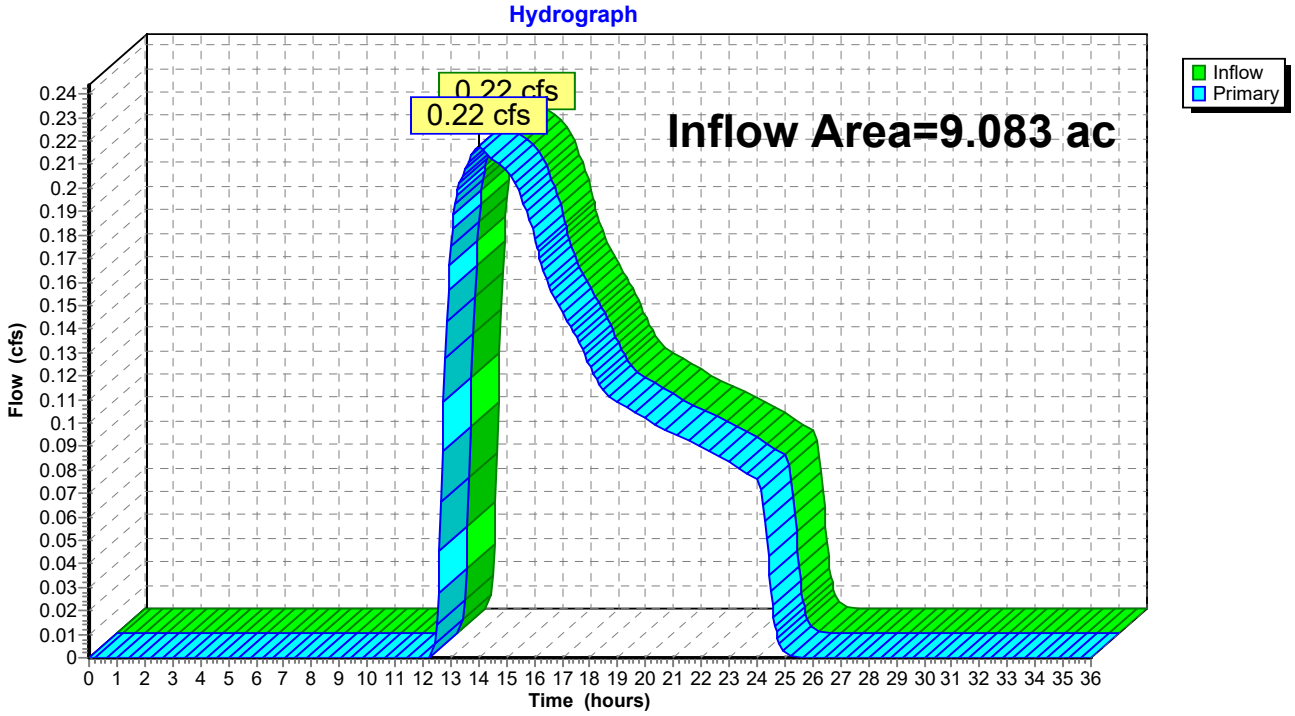
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.083 ac, 4.22% Impervious, Inflow Depth = 0.17" for 10-YR event
Inflow = 0.22 cfs @ 14.01 hrs, Volume= 0.130 af
Primary = 0.22 cfs @ 14.01 hrs, Volume= 0.130 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond D-1: Exist. Depression

Inflow Area = 0.216 ac, 4.32% Impervious, Inflow Depth = 0.07" for 10-YR event
Inflow = 0.00 cfs @ 15.48 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 16.90 hrs, Volume= 0.001 af, Atten= 9%, Lag= 85.1 min
Discarded = 0.00 cfs @ 16.90 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 6.83' @ 16.90 hrs Surf.Area= 29 sf Storage= 3 cf

Plug-Flow detention time= 27.3 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 27.3 min (1,143.2 - 1,115.9)

Volume	Invert	Avail.Storage	Storage Description
#1	6.61'	4,668 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

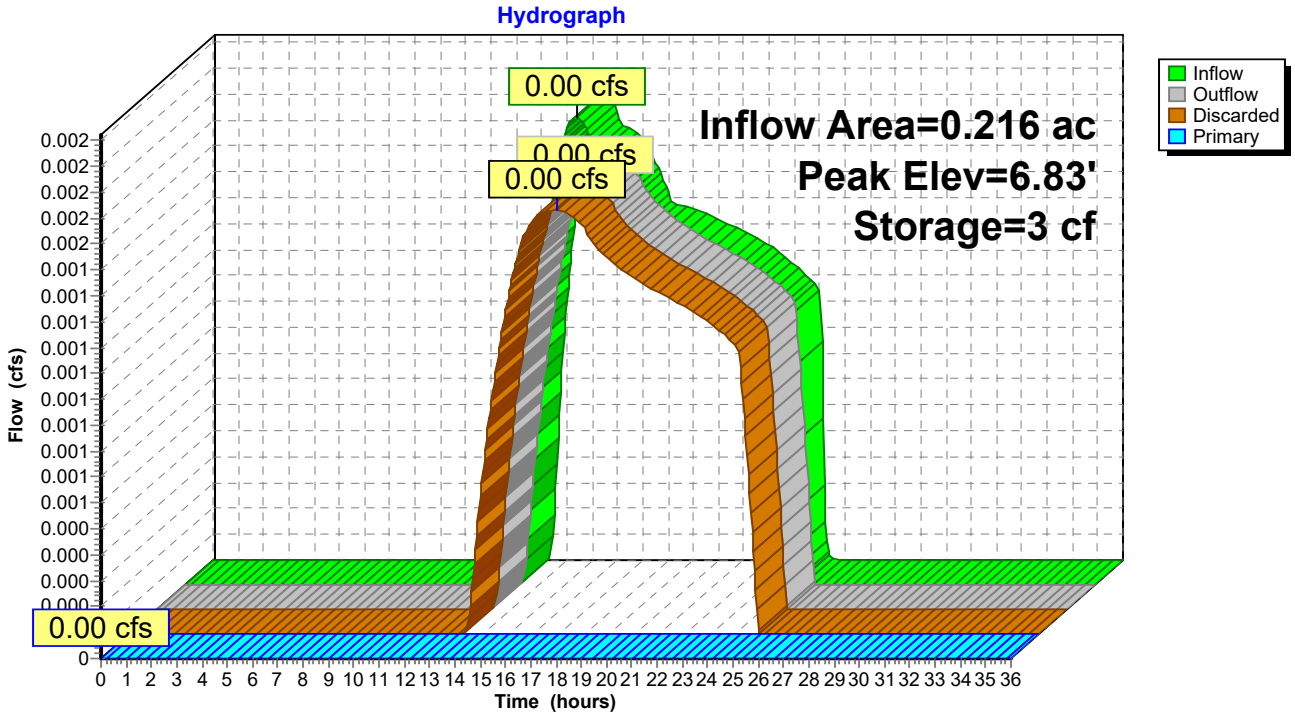
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6.61	0	0	0
7.00	52	10	10
8.00	671	362	372
9.00	1,993	1,332	1,704
10.00	3,935	2,964	4,668

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.61'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	9.70'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.00 cfs @ 16.90 hrs HW=6.83' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.61' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist. Depression



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

Subcatchment PRE-1: Pre Development Area Runoff Area=9,414 sf 4.32% Impervious Runoff Depth=0.22"
Flow Length=164' Tc=10.9 min CN=34 Runoff=0.01 cfs 0.004 af

Subcatchment PRE-2: Pre Development Runoff Area=386,225 sf 4.22% Impervious Runoff Depth=0.40"
Flow Length=1,215' Tc=31.1 min CN=38 Runoff=0.91 cfs 0.298 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=0.91 cfs 0.298 af
Primary=0.91 cfs 0.298 af

Pond D-1: Exist. Depression Peak Elev=7.09' Storage=17 cf Inflow=0.01 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.302 af Average Runoff Depth = 0.40"
95.78% Pervious = 8.699 ac 4.22% Impervious = 0.384 ac

Summary for Subcatchment PRE-1: Pre Development Area 1

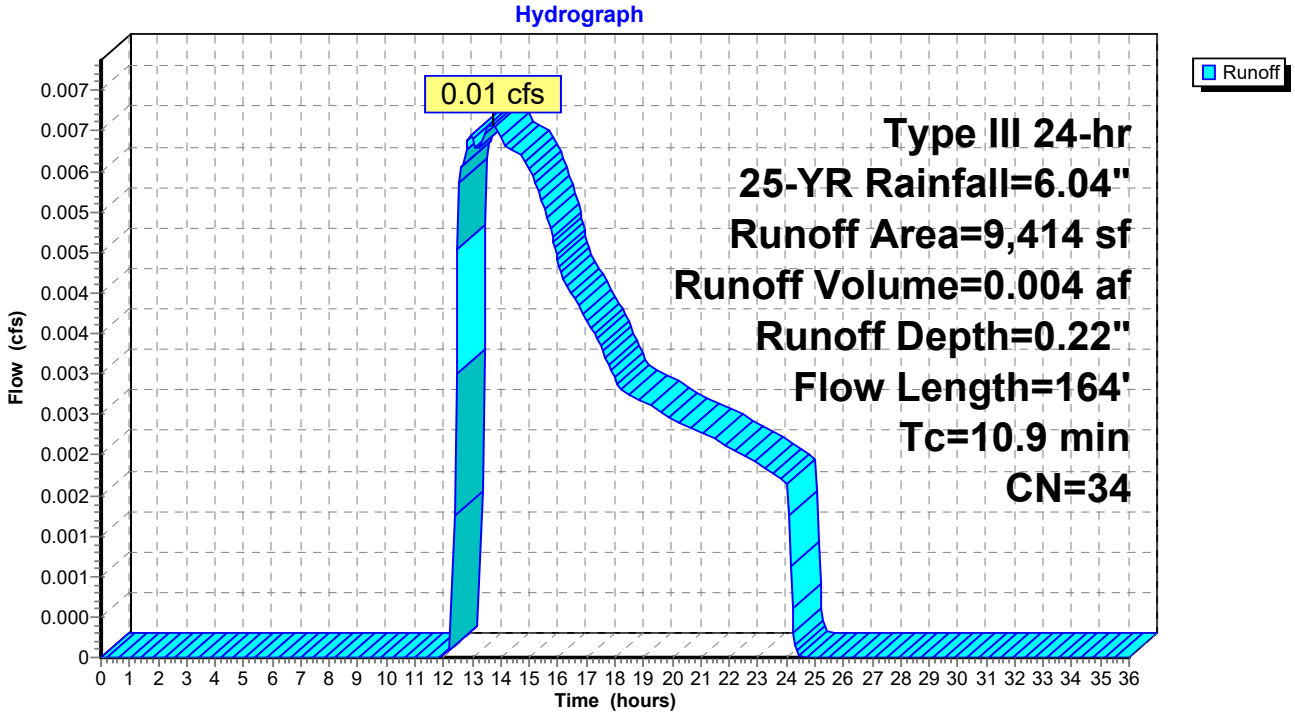
Runoff = 0.01 cfs @ 13.70 hrs, Volume= 0.004 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.04"

Area (sf)	CN	Description
594	39	>75% Grass cover, Good, HSG A
8,413	30	Woods, Good, HSG A
407	98	Paved parking, HSG A
9,414	34	Weighted Average
9,007		95.68% Pervious Area
407		4.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	55	0.0500	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.45"
6.0	45	0.0900	0.13		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.45"
0.8	64	0.0800	1.41		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
10.9	164	Total			

Subcatchment PRE-1: Pre Development Area 1



Summary for Subcatchment PRE-2: Pre Development Area 2

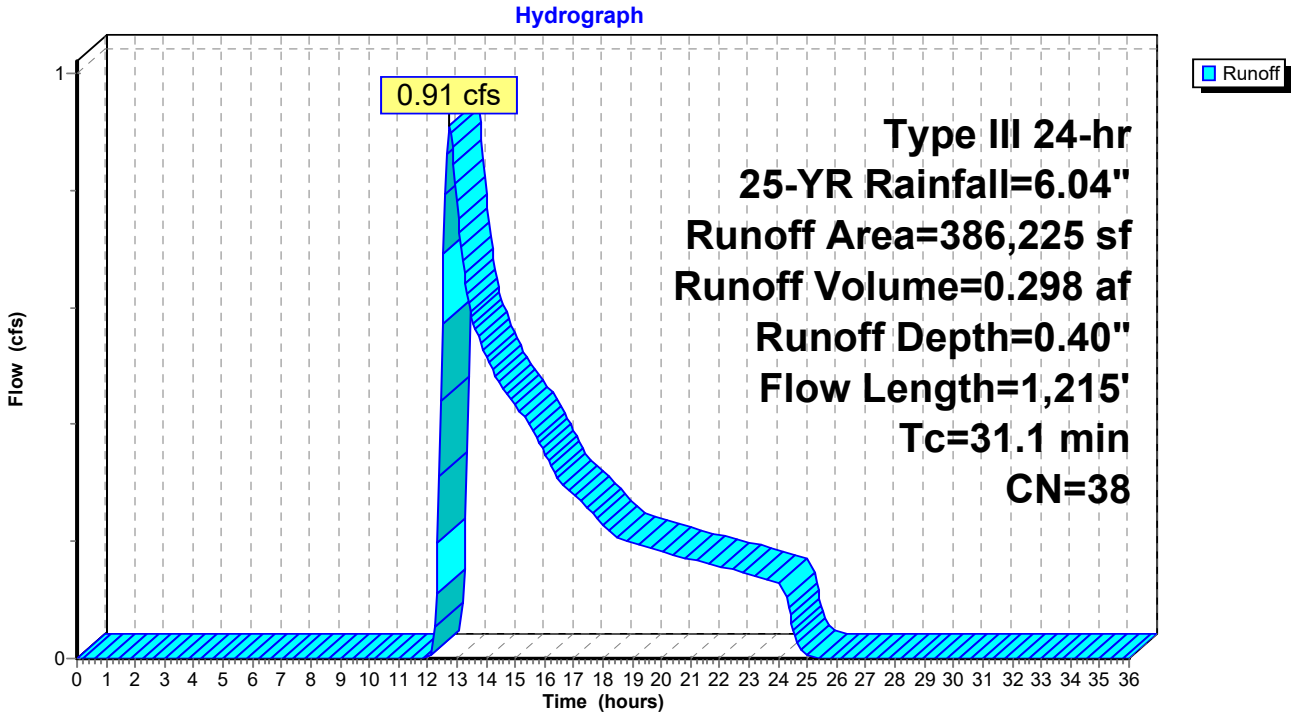
Runoff = 0.91 cfs @ 12.75 hrs, Volume= 0.298 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.04"

Area (sf)	CN	Description
16,304	98	Paved parking, HSG A
21,151	39	>75% Grass cover, Good, HSG A
301,069	30	Woods, Good, HSG A
47,701	70	Woods, Good, HSG C
386,225	38	Weighted Average
369,921		95.78% Pervious Area
16,304		4.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.9	612	0.0250	0.79		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.1	26	0.0800	5.74		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
2.6	125	0.0250	0.79		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
31.1	1,215	Total			

Subcatchment PRE-2: Pre Development Area 2



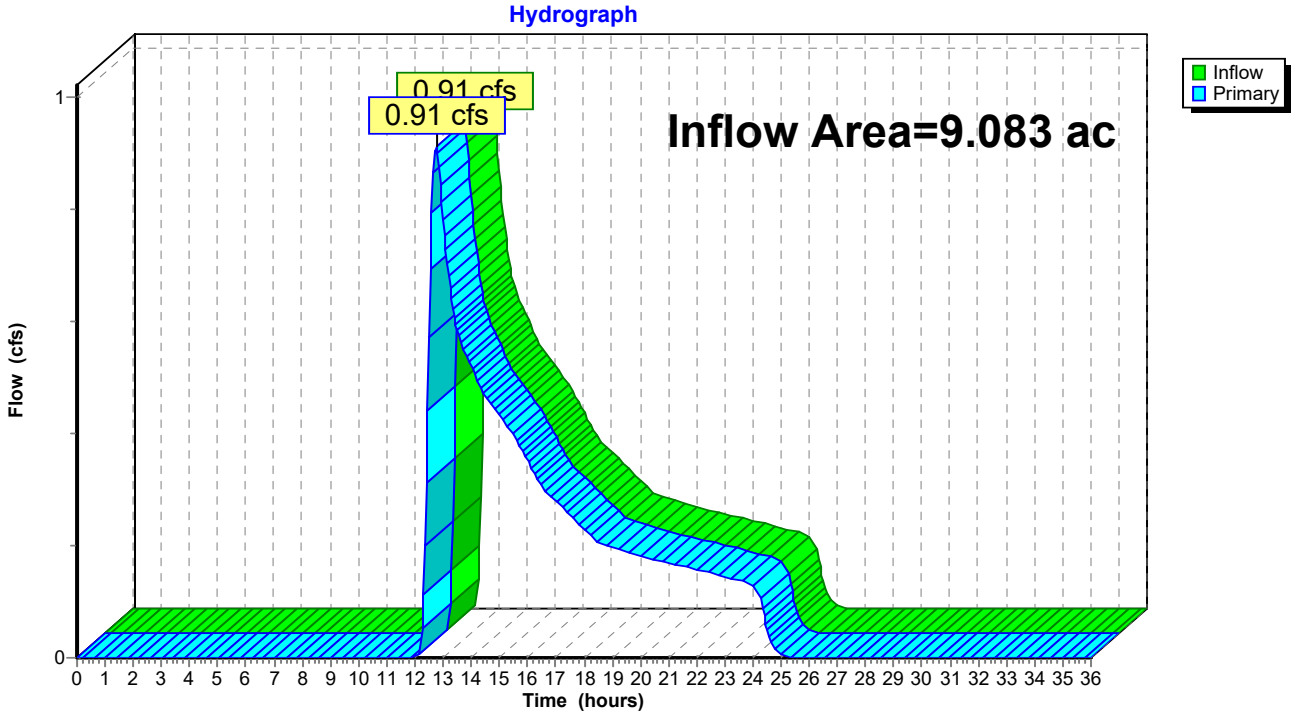
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.083 ac, 4.22% Impervious, Inflow Depth = 0.39" for 25-YR event
Inflow = 0.91 cfs @ 12.75 hrs, Volume= 0.298 af
Primary = 0.91 cfs @ 12.75 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond D-1: Exist. Depression

Inflow Area = 0.216 ac, 4.32% Impervious, Inflow Depth = 0.22" for 25-YR event
Inflow = 0.01 cfs @ 13.70 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 15.03 hrs, Volume= 0.004 af, Atten= 9%, Lag= 80.1 min
Discarded = 0.01 cfs @ 15.03 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 7.09' @ 15.03 hrs Surf.Area= 108 sf Storage= 17 cf

Plug-Flow detention time= 50.1 min calculated for 0.004 af (100% of inflow)
Center-of-Mass det. time= 50.1 min (1,074.9 - 1,024.8)

Volume	Invert	Avail.Storage	Storage Description
#1	6.61'	4,668 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

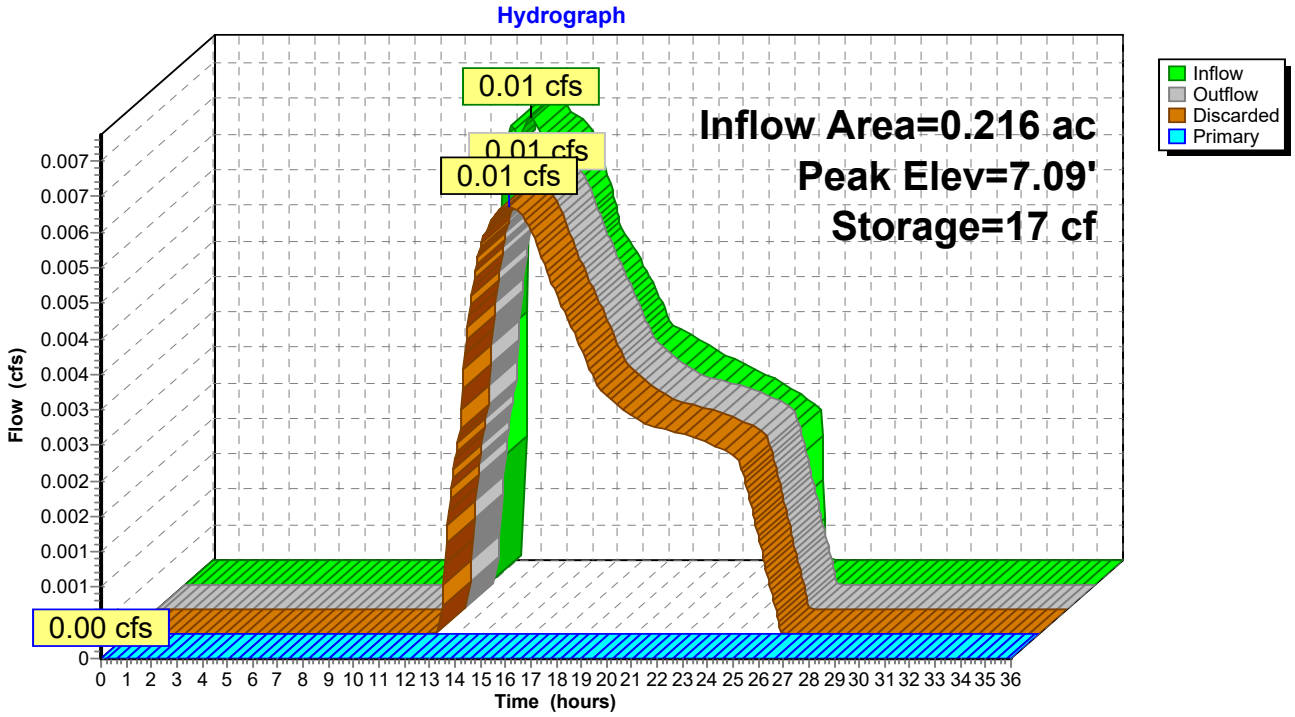
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6.61	0	0	0
7.00	52	10	10
8.00	671	362	372
9.00	1,993	1,332	1,704
10.00	3,935	2,964	4,668

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.61'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	9.70'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.01 cfs @ 15.03 hrs HW=7.09' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.61' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist. Depression



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

Subcatchment PRE-1: Pre Development Area Runoff Area=9,414 sf 4.32% Impervious Runoff Depth=0.59"
Flow Length=164' Tc=10.9 min CN=34 Runoff=0.05 cfs 0.011 af

Subcatchment PRE-2: Pre Development Runoff Area=386,225 sf 4.22% Impervious Runoff Depth=0.90"
Flow Length=1,215' Tc=31.1 min CN=38 Runoff=3.24 cfs 0.667 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=3.24 cfs 0.667 af
Primary=3.24 cfs 0.667 af

Pond D-1: Exist. Depression Peak Elev=7.40' Storage=82 cf Inflow=0.05 cfs 0.011 af
Discarded=0.02 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.011 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.678 af Average Runoff Depth = 0.90"
95.78% Pervious = 8.699 ac 4.22% Impervious = 0.384 ac

Summary for Subcatchment PRE-1: Pre Development Area 1

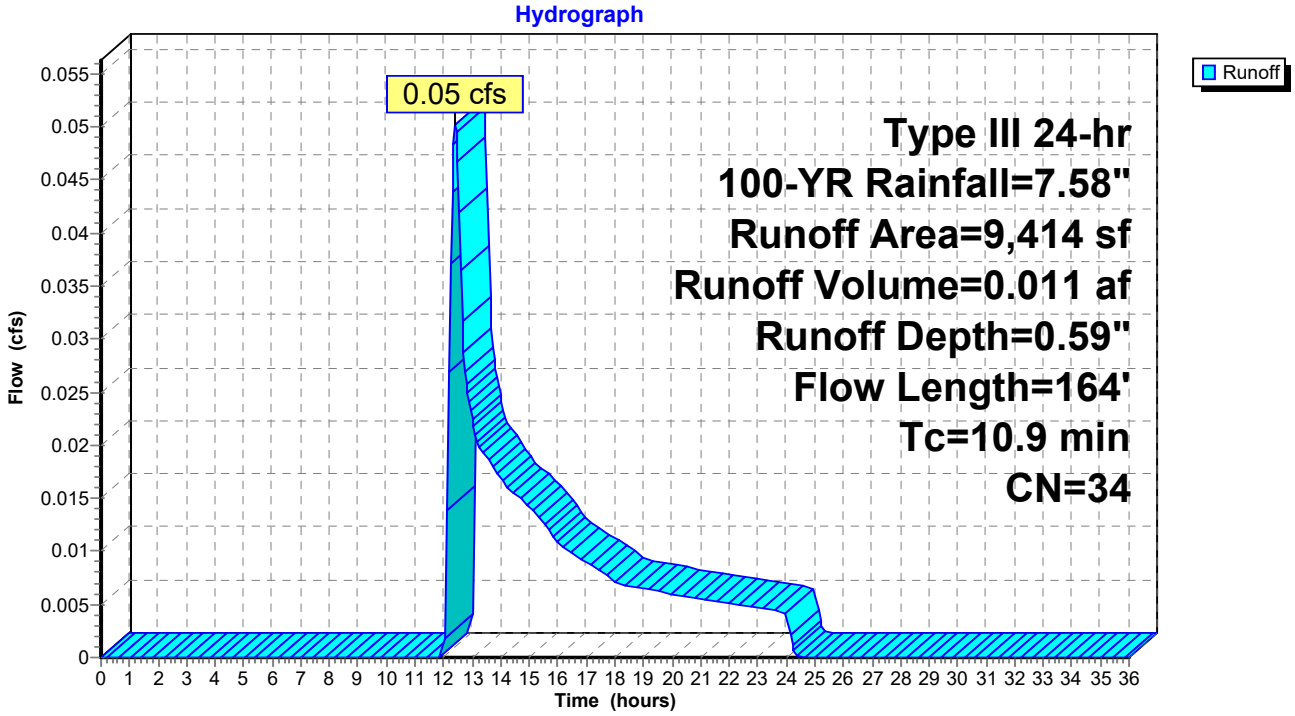
Runoff = 0.05 cfs @ 12.41 hrs, Volume= 0.011 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.58"

Area (sf)	CN	Description
594	39	>75% Grass cover, Good, HSG A
8,413	30	Woods, Good, HSG A
407	98	Paved parking, HSG A
9,414	34	Weighted Average
9,007		95.68% Pervious Area
407		4.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	55	0.0500	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.45"
6.0	45	0.0900	0.13		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.45"
0.8	64	0.0800	1.41		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
10.9	164	Total			

Subcatchment PRE-1: Pre Development Area 1



Summary for Subcatchment PRE-2: Pre Development Area 2

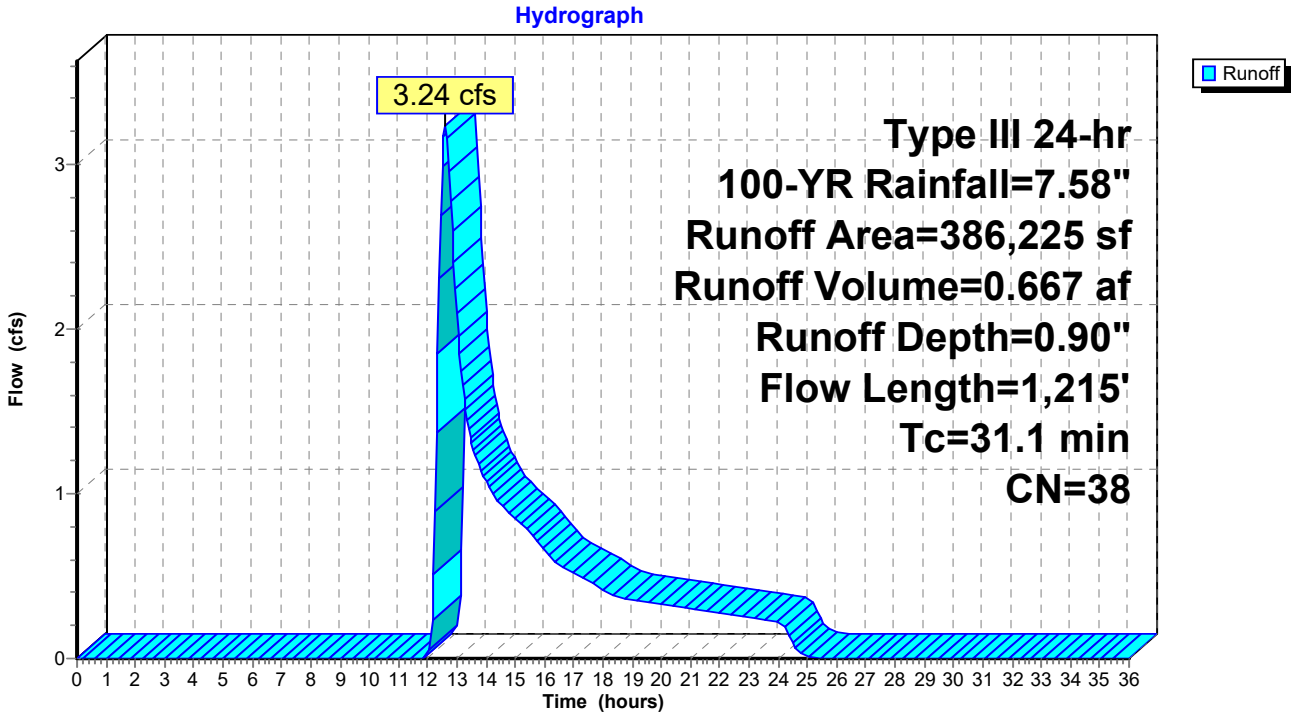
Runoff = 3.24 cfs @ 12.61 hrs, Volume= 0.667 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.58"

Area (sf)	CN	Description
16,304	98	Paved parking, HSG A
21,151	39	>75% Grass cover, Good, HSG A
301,069	30	Woods, Good, HSG A
47,701	70	Woods, Good, HSG C
386,225	38	Weighted Average
369,921		95.78% Pervious Area
16,304		4.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.9	612	0.0250	0.79		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.1	26	0.0800	5.74		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
2.6	125	0.0250	0.79		**Shallow Concentrated Flow, F-G** Woodland Kv= 5.0 fps
31.1	1,215	Total			

Subcatchment PRE-2: Pre Development Area 2



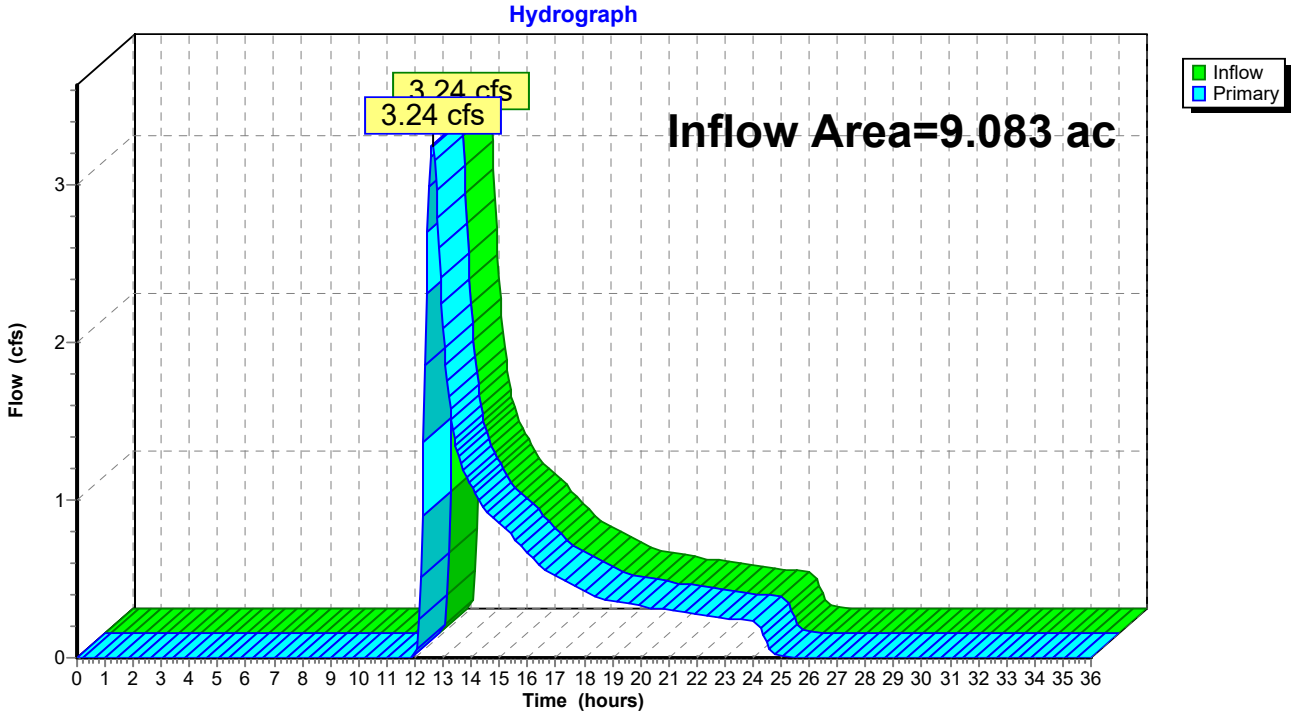
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9.083 ac, 4.22% Impervious, Inflow Depth = 0.88" for 100-YR event
Inflow = 3.24 cfs @ 12.61 hrs, Volume= 0.667 af
Primary = 3.24 cfs @ 12.61 hrs, Volume= 0.667 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond D-1: Exist. Depression

Inflow Area = 0.216 ac, 4.32% Impervious, Inflow Depth = 0.59" for 100-YR event
Inflow = 0.05 cfs @ 12.41 hrs, Volume= 0.011 af
Outflow = 0.02 cfs @ 14.01 hrs, Volume= 0.011 af, Atten= 66%, Lag= 96.0 min
Discarded = 0.02 cfs @ 14.01 hrs, Volume= 0.011 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 7.40' @ 14.01 hrs Surf.Area= 302 sf Storage= 82 cf

Plug-Flow detention time= 65.4 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 65.5 min (1,025.7 - 960.3)

Volume	Invert	Avail.Storage	Storage Description
#1	6.61'	4,668 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

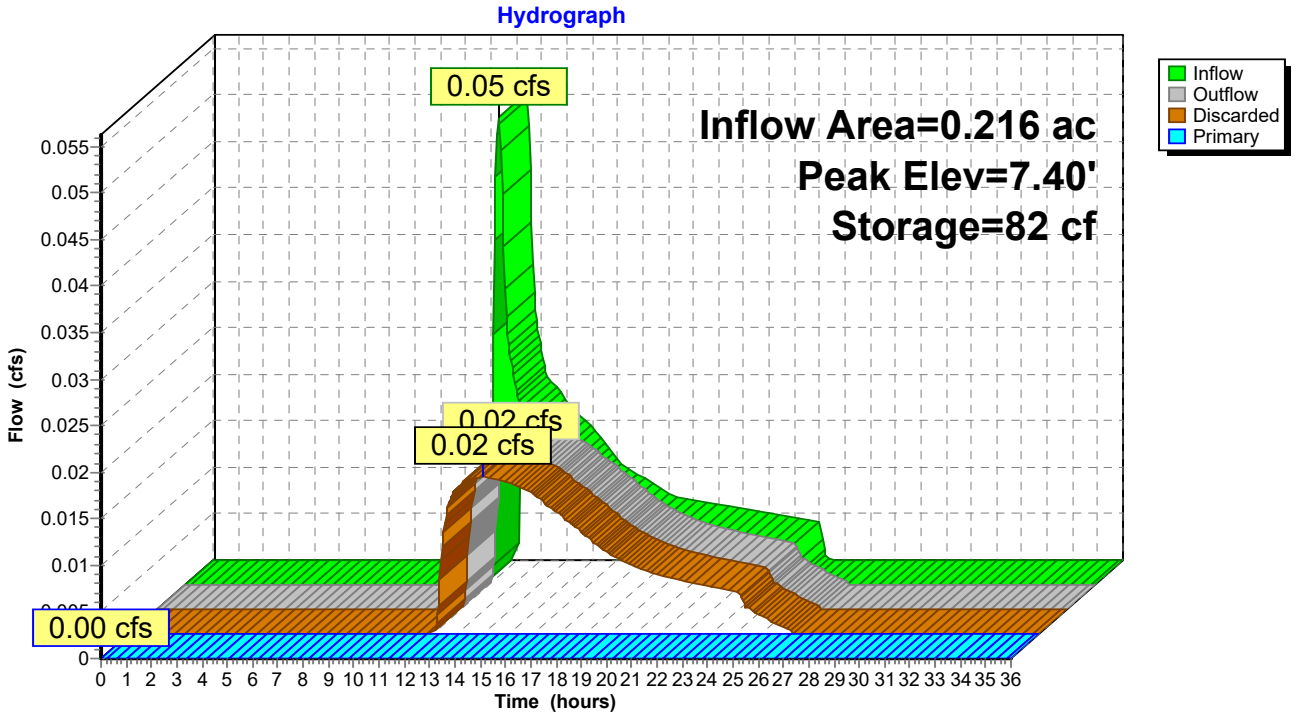
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6.61	0	0	0
7.00	52	10	10
8.00	671	362	372
9.00	1,993	1,332	1,704
10.00	3,935	2,964	4,668

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.61'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	9.70'	**12.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.02 cfs @ 14.01 hrs HW=7.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

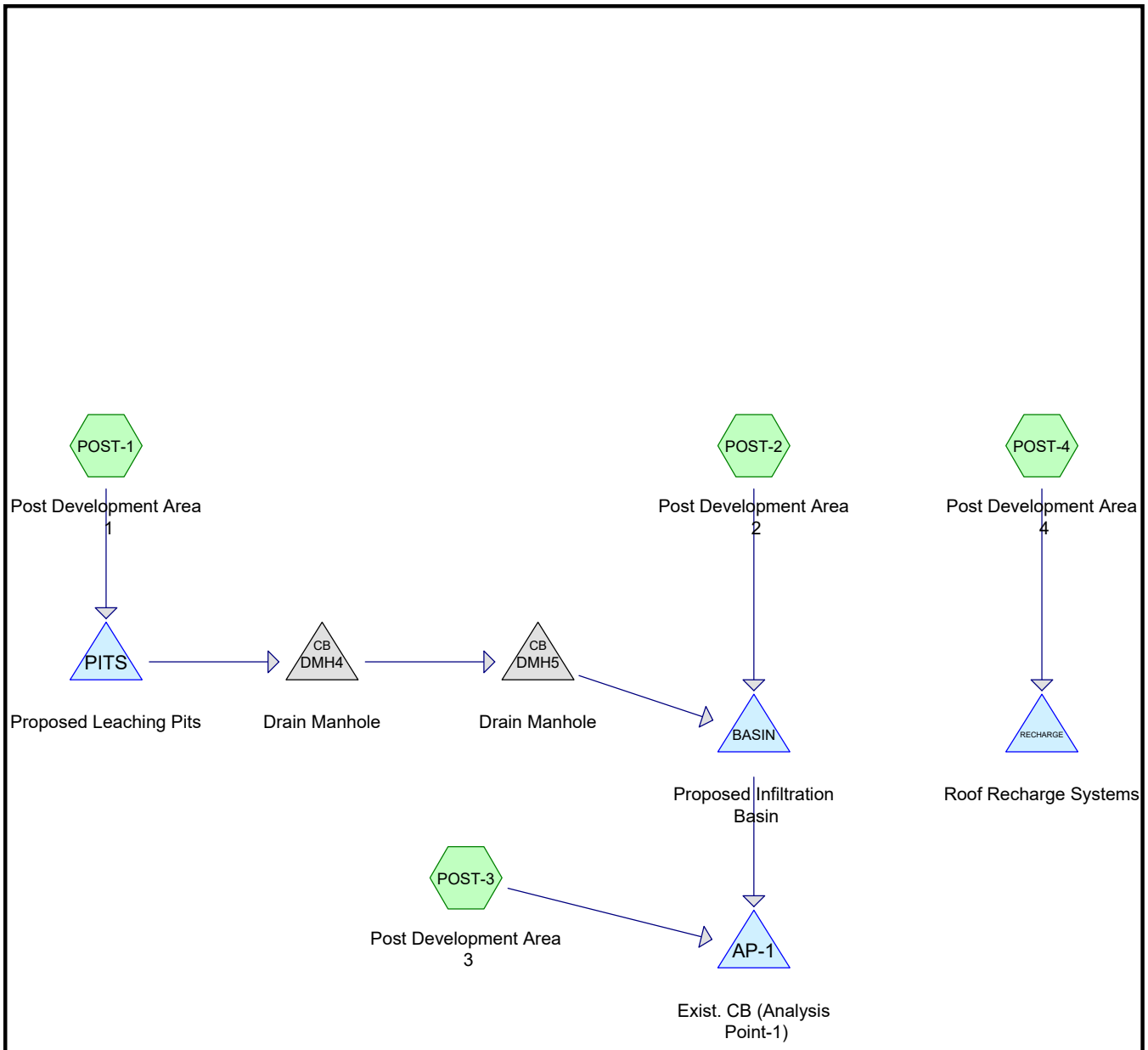
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.61' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist. Depression



Section 3

Post Development Hydrologic Analysis



Subcat Reach Pond Link

Routing Diagram for 2443_Post Development
Prepared by Field Engineering Co. Inc., Printed 10/7/2021

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

Subcatchment POST-1: Post Runoff Area=146,803 sf 12.28% Impervious Runoff Depth=0.11"
Flow Length=1,203' Tc=28.3 min CN=47 Runoff=0.05 cfs 0.032 af

Subcatchment POST-2: Post Development Runoff Area=190,380 sf 7.86% Impervious Runoff Depth=0.06"
Flow Length=1,039' Tc=25.3 min CN=44 Runoff=0.03 cfs 0.022 af

Subcatchment POST-3: Post Development Runoff Area=45,857 sf 12.19% Impervious Runoff Depth=0.02"
Flow Length=625' Tc=24.7 min CN=41 Runoff=0.00 cfs 0.002 af

Subcatchment POST-4: Post Runoff Area=12,600 sf 100.00% Impervious Runoff Depth=3.22"
Tc=6.0 min CN=98 Runoff=0.95 cfs 0.078 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=0.00 cfs 0.002 af
Primary=0.00 cfs 0.002 af

Pond BASIN: Proposed Infiltration Basin Peak Elev=8.02' Storage=59 cf Inflow=0.03 cfs 0.022 af
Discarded=0.03 cfs 0.022 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.022 af

Pond DMH4: Drain Manhole Peak Elev=14.98' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=118.0' S=0.0380 '/' Outflow=0.00 cfs 0.000 af

Pond DMH5: Drain Manhole Peak Elev=10.50' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0500 '/' Outflow=0.00 cfs 0.000 af

Pond PITS: Proposed Leaching Pits Peak Elev=11.70' Storage=0.004 af Inflow=0.05 cfs 0.032 af
Discarded=0.04 cfs 0.032 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.032 af

Pond RECHARGE: Roof Recharge Systems Inflow=0.95 cfs 0.078 af
Primary=0.95 cfs 0.078 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.133 af Average Runoff Depth = 0.18"
87.06% Pervious = 7.908 ac 12.94% Impervious = 1.175 ac

Summary for Subcatchment POST-1: Post Development Area 1

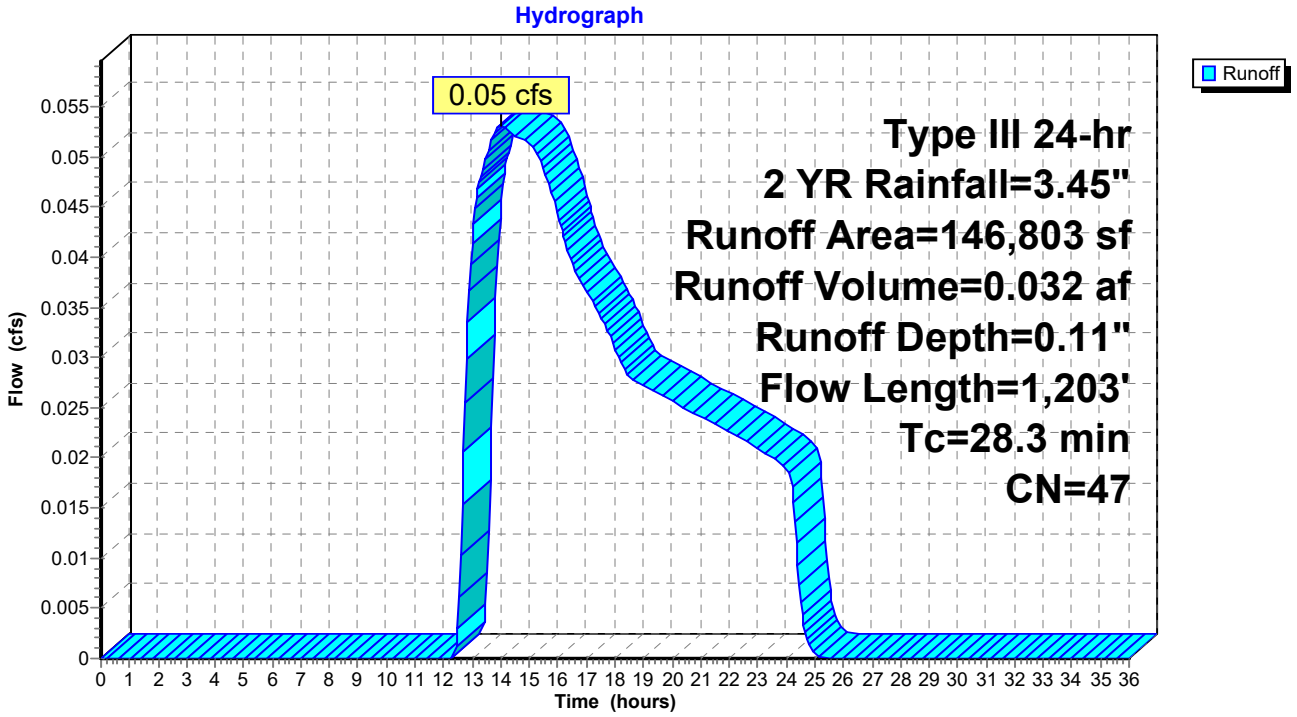
Runoff = 0.05 cfs @ 14.02 hrs, Volume= 0.032 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.45"

Area (sf)	CN	Description
18,030	98	Paved parking, HSG C
34,368	39	>75% Grass cover, Good, HSG A
71,874	30	Woods, Good, HSG A
22,531	70	Woods, Good, HSG C
146,803	47	Weighted Average
128,773		87.72% Pervious Area
18,030		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.1	352	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	33	0.0350	3.80		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
11.1	576	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	17	0.0130	5.60	4.40	**Pipe Channel, F-G** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
28.3	1,203	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-2: Post Development Area 2

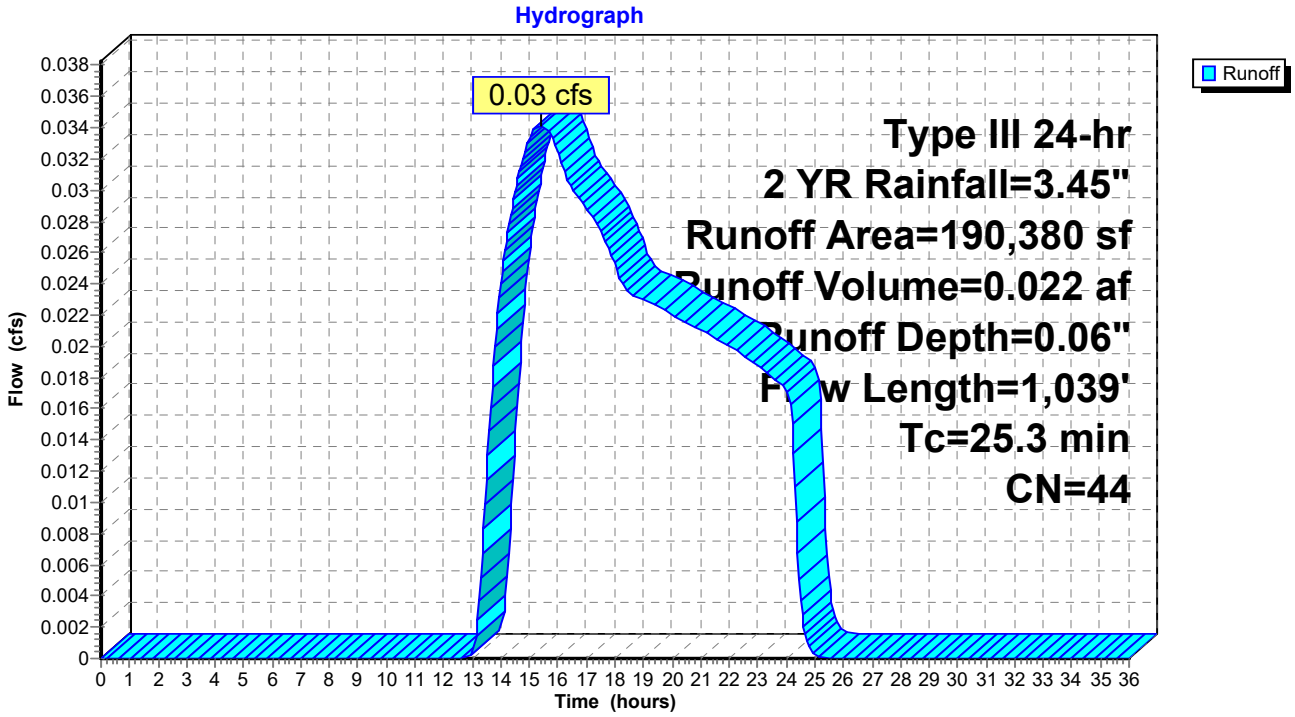
Runoff = 0.03 cfs @ 15.40 hrs, Volume= 0.022 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.45"

Area (sf)	CN	Description
14,970	98	Paved parking, HSG C
66,640	39	>75% Grass cover, Good, HSG A
83,600	30	Woods, Good, HSG A
25,170	70	Woods, Good, HSG C
190,380	44	Weighted Average
175,410		92.14% Pervious Area
14,970		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.8	587	0.0400	1.00		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
25.3	1,039	Total			

Subcatchment POST-2: Post Development Area 2



Summary for Subcatchment POST-3: Post Development Area 3

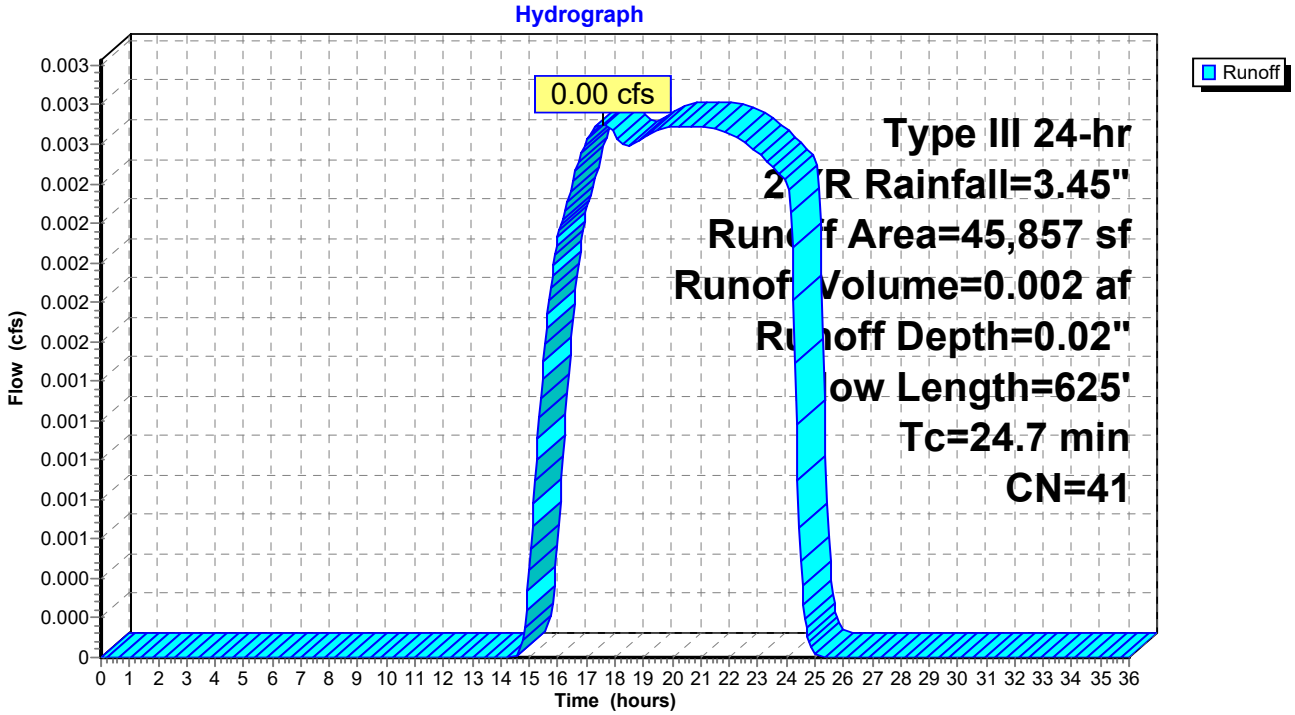
Runoff = 0.00 cfs @ 17.56 hrs, Volume= 0.002 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.45"

Area (sf)	CN	Description
14,260	39	>75% Grass cover, Good, HSG A
5,588	98	Paved parking, HSG A
26,009	30	Woods, Good, HSG A
45,857	41	Weighted Average
40,269		87.81% Pervious Area
5,588		12.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
5.3	318	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	27	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
3.5	180	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
24.7	625	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Subcatchment POST-4: Post Development Area 4

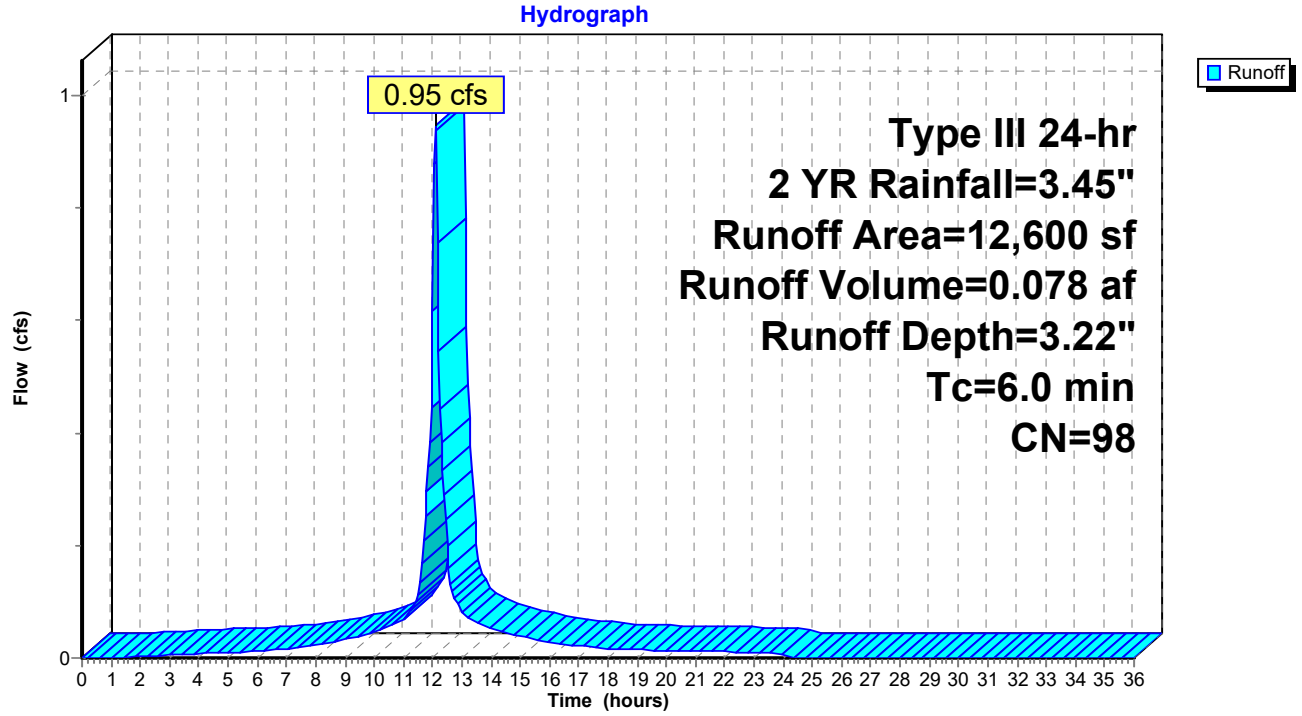
Runoff = 0.95 cfs @ 12.09 hrs, Volume= 0.078 af, Depth= 3.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.45"

Area (sf)	CN	Description
12,600	98	Roofs, HSG A
12,600		100.00% Impervious Area

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

Subcatchment POST-4: Post Development Area 4



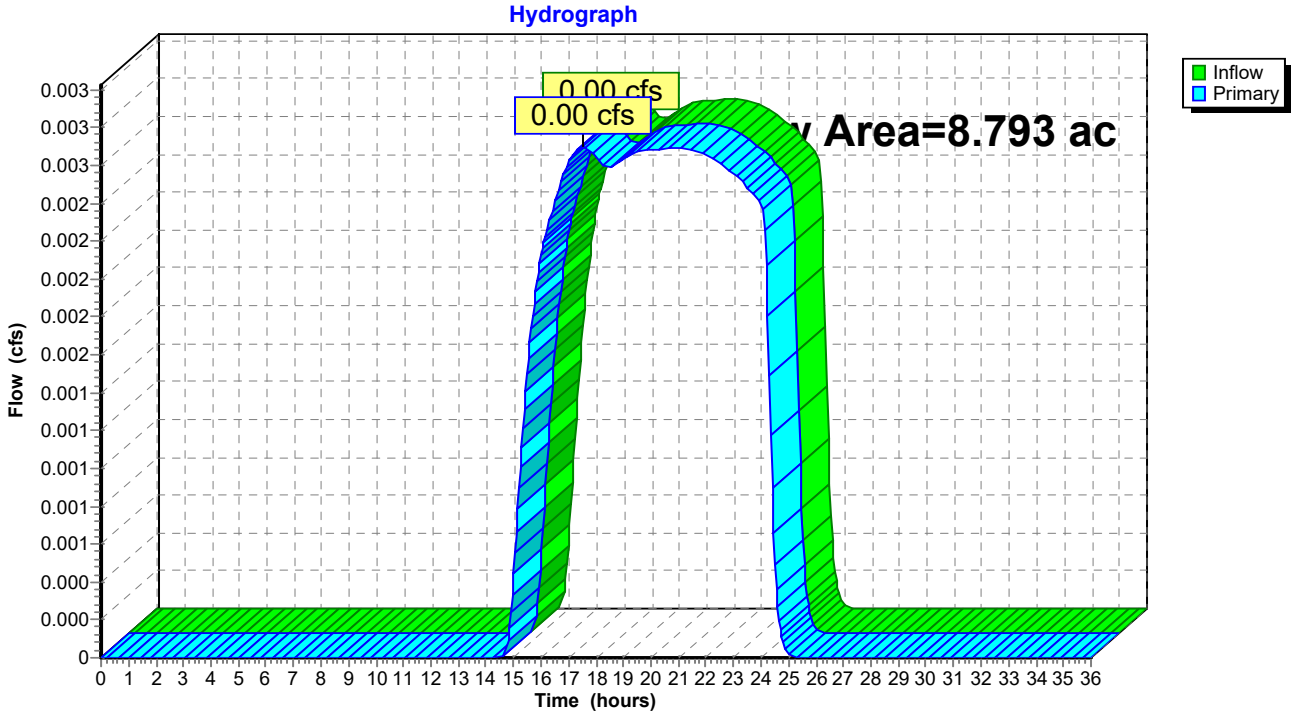
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8.793 ac, 10.07% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 17.56 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 17.56 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond BASIN: Proposed Infiltration Basin

Inflow Area = 7.741 ac, 9.79% Impervious, Inflow Depth = 0.03" for 2 YR event
Inflow = 0.03 cfs @ 15.40 hrs, Volume= 0.022 af
Outflow = 0.03 cfs @ 15.92 hrs, Volume= 0.022 af, Atten= 4%, Lag= 31.0 min
Discarded = 0.03 cfs @ 15.92 hrs, Volume= 0.022 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 8.02' @ 15.92 hrs Surf.Area= 3,382 sf Storage= 59 cf

Plug-Flow detention time= 30.2 min calculated for 0.022 af (100% of inflow)
Center-of-Mass det. time= 29.8 min (1,133.2 - 1,103.4)

Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	19,592 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

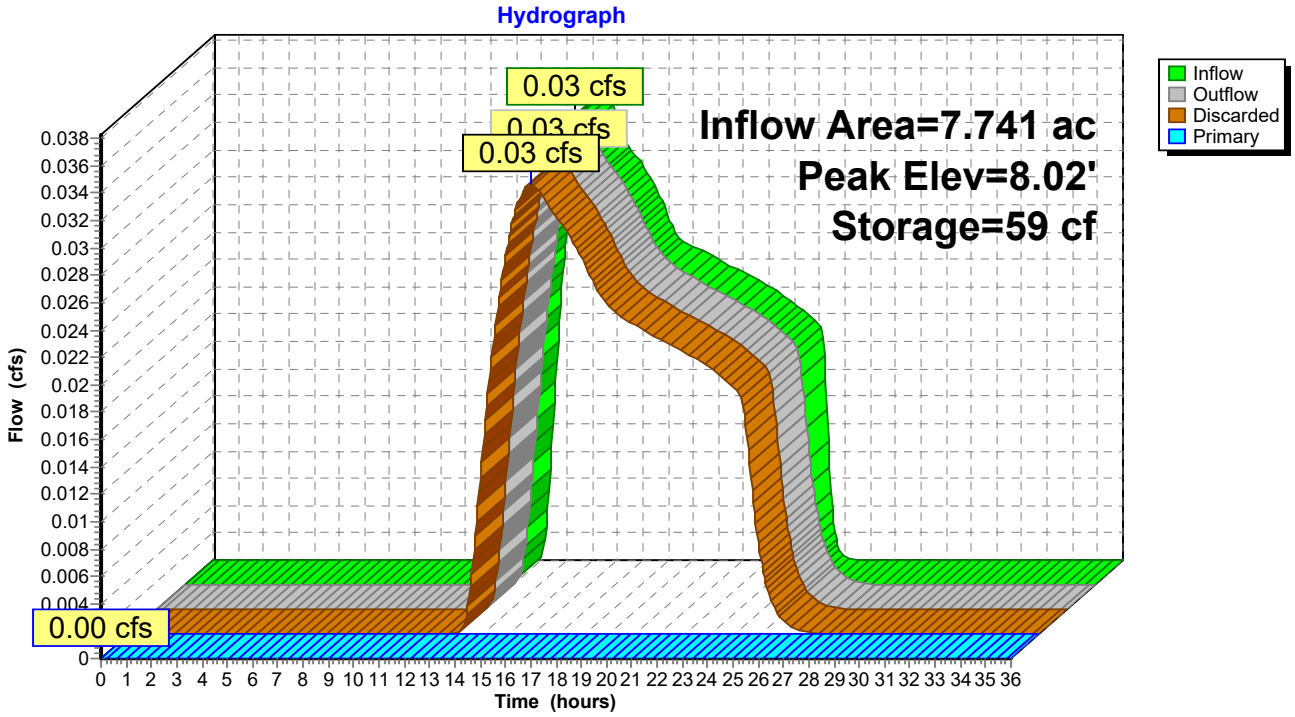
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	3,370	0	0
9.00	4,085	3,728	3,728
10.00	4,855	4,470	8,198
11.00	5,683	5,269	13,467
12.00	6,567	6,125	19,592

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	10.75'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.03 cfs @ 15.92 hrs HW=8.02' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Proposed Infiltration Basin



Summary for Pond DMH4: Drain Manhole

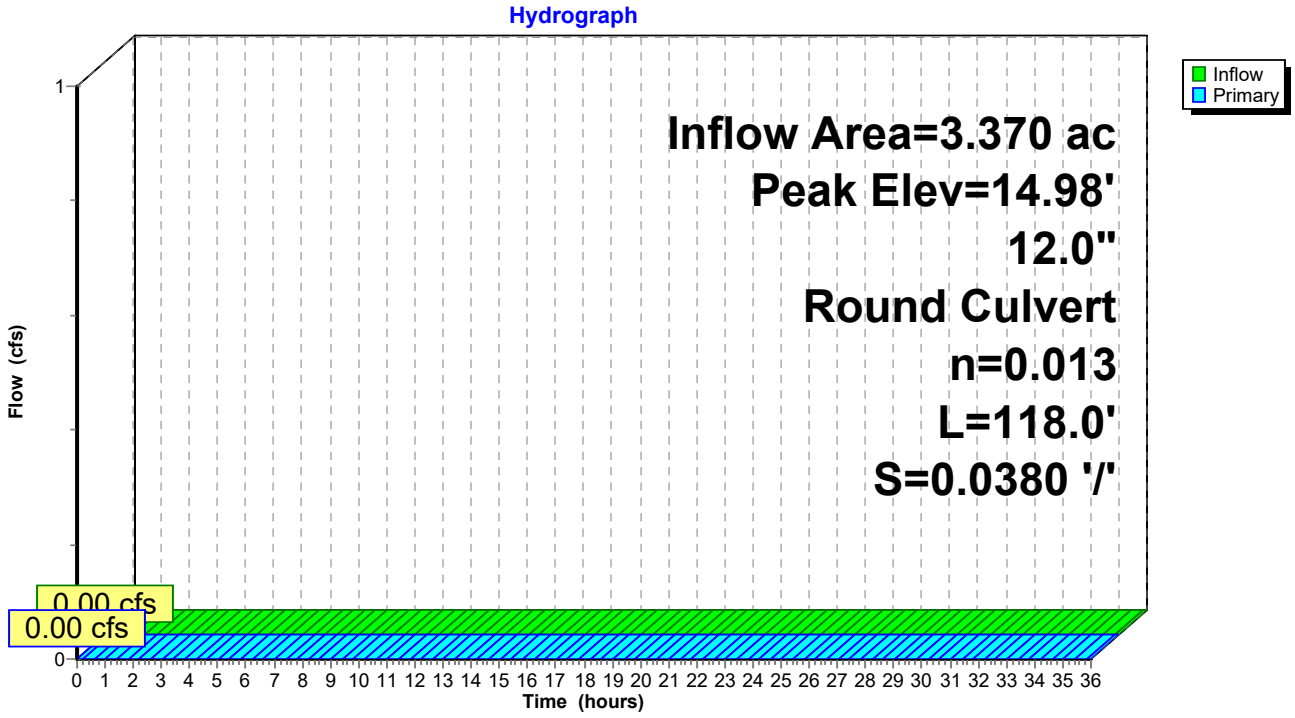
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 14.98' @ 0.00 hrs
Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.98'	**12.0" Round Culvert** L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 14.98' / 10.50' S= 0.0380 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.98' TW=10.50' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond DMH4: Drain Manhole



Summary for Pond DMH5: Drain Manhole

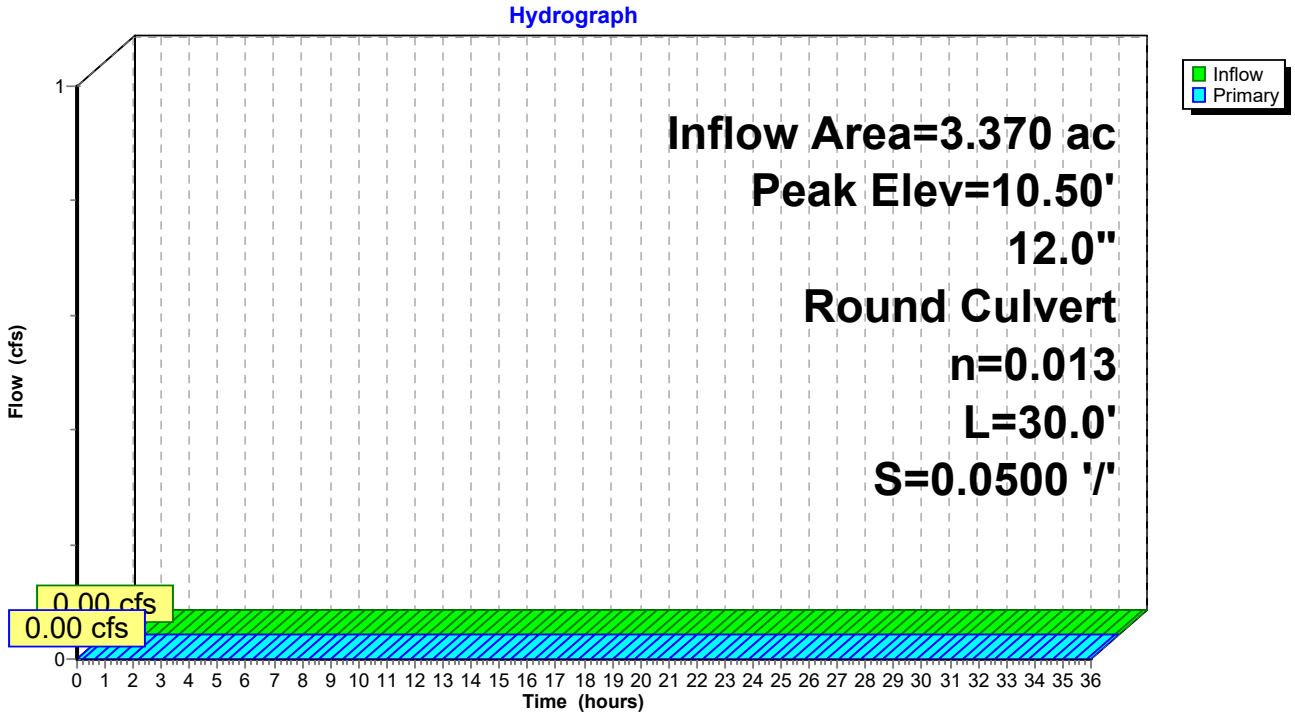
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.50' @ 0.00 hrs
Flood Elev= 14.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	10.50'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 10.50' / 9.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' TW=8.00' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond DMH5: Drain Manhole



Summary for Pond PITS: Proposed Leaching Pits

Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.11" for 2 YR event
Inflow = 0.05 cfs @ 14.02 hrs, Volume= 0.032 af
Outflow = 0.04 cfs @ 14.20 hrs, Volume= 0.032 af, Atten= 27%, Lag= 10.6 min
Discarded = 0.04 cfs @ 14.20 hrs, Volume= 0.032 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 11.70' @ 16.55 hrs Surf.Area= 0.016 ac Storage= 0.004 af
Flood Elev= 18.00' Surf.Area= 0.016 ac Storage= 0.105 af

Plug-Flow detention time= 47.9 min calculated for 0.032 af (100% of inflow)
Center-of-Mass det. time= 48.0 min (1,095.5 - 1,047.5)

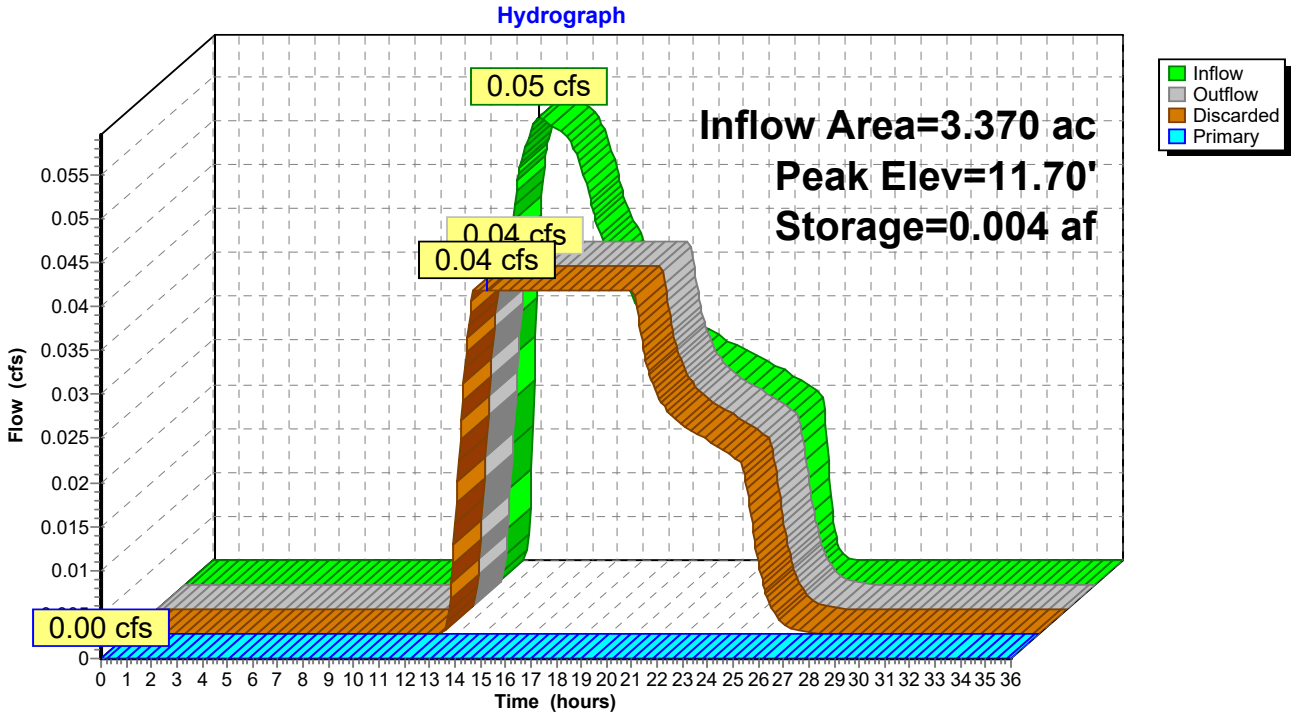
Volume	Invert	Avail.Storage	Storage Description
#1	11.45'	0.078 af	**10.00'W x 70.00'L x 7.00'H Prismatoid** 0.112 af Overall - 0.035 af Embedded = 0.078 af
#2	11.45'	0.028 af	**8.00'D x 4.00'H Vertical Cone/Cylinder** x 6 Inside #1
#3	11.45'	0.007 af	**8.00'D x 6.00'H Vertical Cone/Cylinder** Inside #1
		0.112 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.45'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	16.20'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.20' / 14.98' S= 0.0407 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 14.20 hrs HW=11.59' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=11.45' TW=14.98' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond PITS: Proposed Leaching Pits



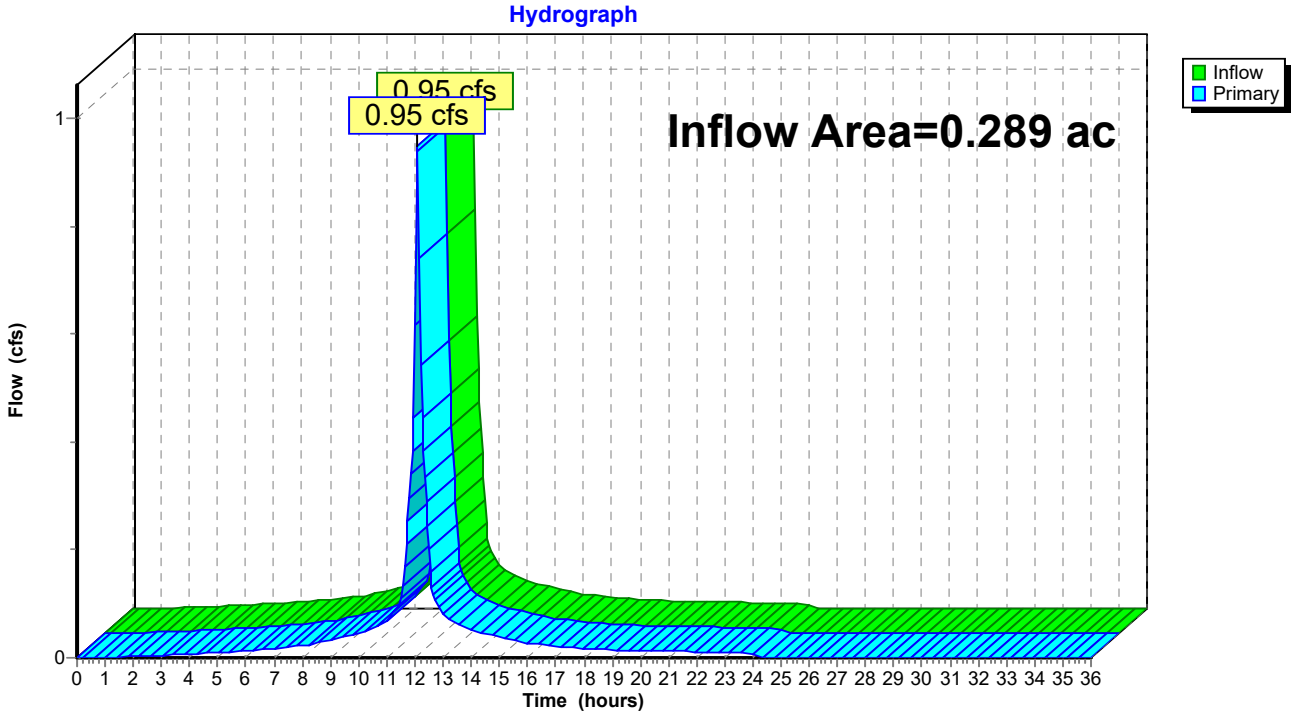
Summary for Pond RECHARGE: Roof Recharge Systems

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.289 ac,100.00% Impervious, Inflow Depth = 3.22" for 2 YR event
Inflow = 0.95 cfs @ 12.09 hrs, Volume= 0.078 af
Primary = 0.95 cfs @ 12.09 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond RECHARGE: Roof Recharge Systems



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

Subcatchment POST-1: Post Runoff Area=146,803 sf 12.28% Impervious Runoff Depth=0.56"
Flow Length=1,203' Tc=28.3 min CN=47 Runoff=0.74 cfs 0.156 af

Subcatchment POST-2: Post Development Runoff Area=190,380 sf 7.86% Impervious Runoff Depth=0.41"
Flow Length=1,039' Tc=25.3 min CN=44 Runoff=0.60 cfs 0.150 af

Subcatchment POST-3: Post Development Runoff Area=45,857 sf 12.19% Impervious Runoff Depth=0.28"
Flow Length=625' Tc=24.7 min CN=41 Runoff=0.07 cfs 0.025 af

Subcatchment POST-4: Post Runoff Area=12,600 sf 100.00% Impervious Runoff Depth=4.81"
Tc=6.0 min CN=98 Runoff=1.40 cfs 0.116 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=0.07 cfs 0.025 af
Primary=0.07 cfs 0.025 af

Pond BASIN: Proposed Infiltration Basin Peak Elev=8.46' Storage=1,621 cf Inflow=0.60 cfs 0.189 af
Discarded=0.21 cfs 0.189 af Primary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.189 af

Pond DMH4: Drain Manhole Peak Elev=15.15' Inflow=0.13 cfs 0.039 af
12.0" Round Culvert n=0.013 L=118.0' S=0.0380 '/' Outflow=0.13 cfs 0.039 af

Pond DMH5: Drain Manhole Peak Elev=10.67' Inflow=0.13 cfs 0.039 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0500 '/' Outflow=0.13 cfs 0.039 af

Pond PITS: Proposed Leaching Pits Peak Elev=16.37' Storage=0.079 af Inflow=0.74 cfs 0.156 af
Discarded=0.04 cfs 0.077 af Primary=0.13 cfs 0.039 af Outflow=0.17 cfs 0.116 af

Pond RECHARGE: Roof Recharge Systems Inflow=1.40 cfs 0.116 af
Primary=1.40 cfs 0.116 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.447 af Average Runoff Depth = 0.59"
87.06% Pervious = 7.908 ac 12.94% Impervious = 1.175 ac

Summary for Subcatchment POST-1: Post Development Area 1

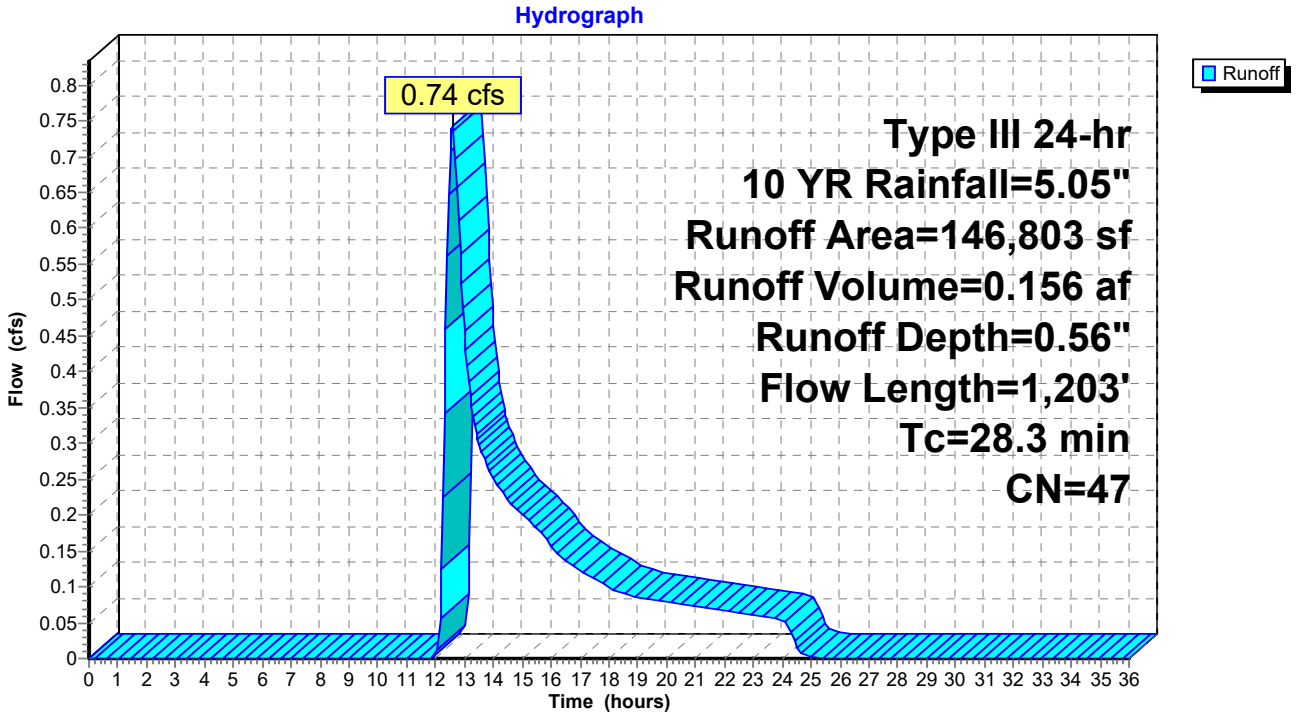
Runoff = 0.74 cfs @ 12.59 hrs, Volume= 0.156 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.05"

Area (sf)	CN	Description
18,030	98	Paved parking, HSG C
34,368	39	>75% Grass cover, Good, HSG A
71,874	30	Woods, Good, HSG A
22,531	70	Woods, Good, HSG C
146,803	47	Weighted Average
128,773		87.72% Pervious Area
18,030		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.1	352	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	33	0.0350	3.80		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
11.1	576	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	17	0.0130	5.60	4.40	**Pipe Channel, F-G** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
28.3	1,203	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-2: Post Development Area 2

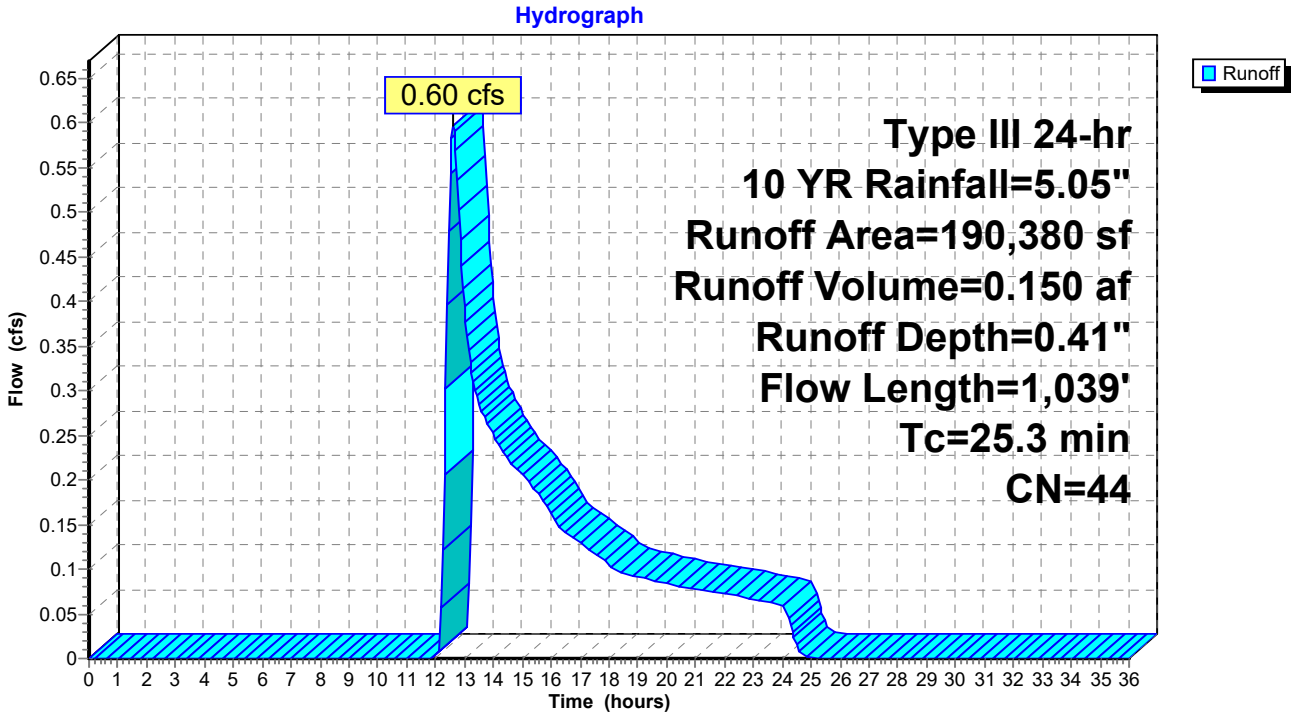
Runoff = 0.60 cfs @ 12.61 hrs, Volume= 0.150 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.05"

Area (sf)	CN	Description
14,970	98	Paved parking, HSG C
66,640	39	>75% Grass cover, Good, HSG A
83,600	30	Woods, Good, HSG A
25,170	70	Woods, Good, HSG C
190,380	44	Weighted Average
175,410		92.14% Pervious Area
14,970		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.8	587	0.0400	1.00		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
25.3	1,039	Total			

Subcatchment POST-2: Post Development Area 2



Summary for Subcatchment POST-3: Post Development Area 3

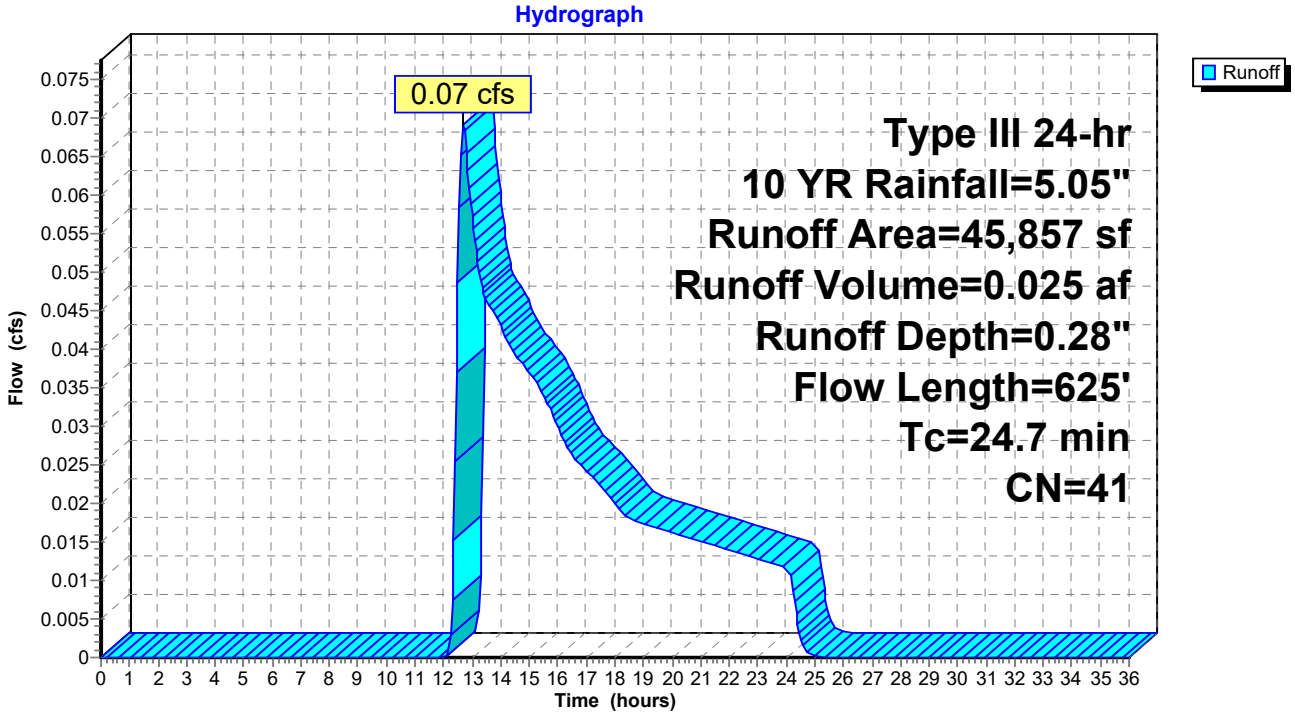
Runoff = 0.07 cfs @ 12.69 hrs, Volume= 0.025 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.05"

Area (sf)	CN	Description
14,260	39	>75% Grass cover, Good, HSG A
5,588	98	Paved parking, HSG A
26,009	30	Woods, Good, HSG A
45,857	41	Weighted Average
40,269		87.81% Pervious Area
5,588		12.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
5.3	318	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	27	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
3.5	180	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
24.7	625	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Subcatchment POST-4: Post Development Area 4

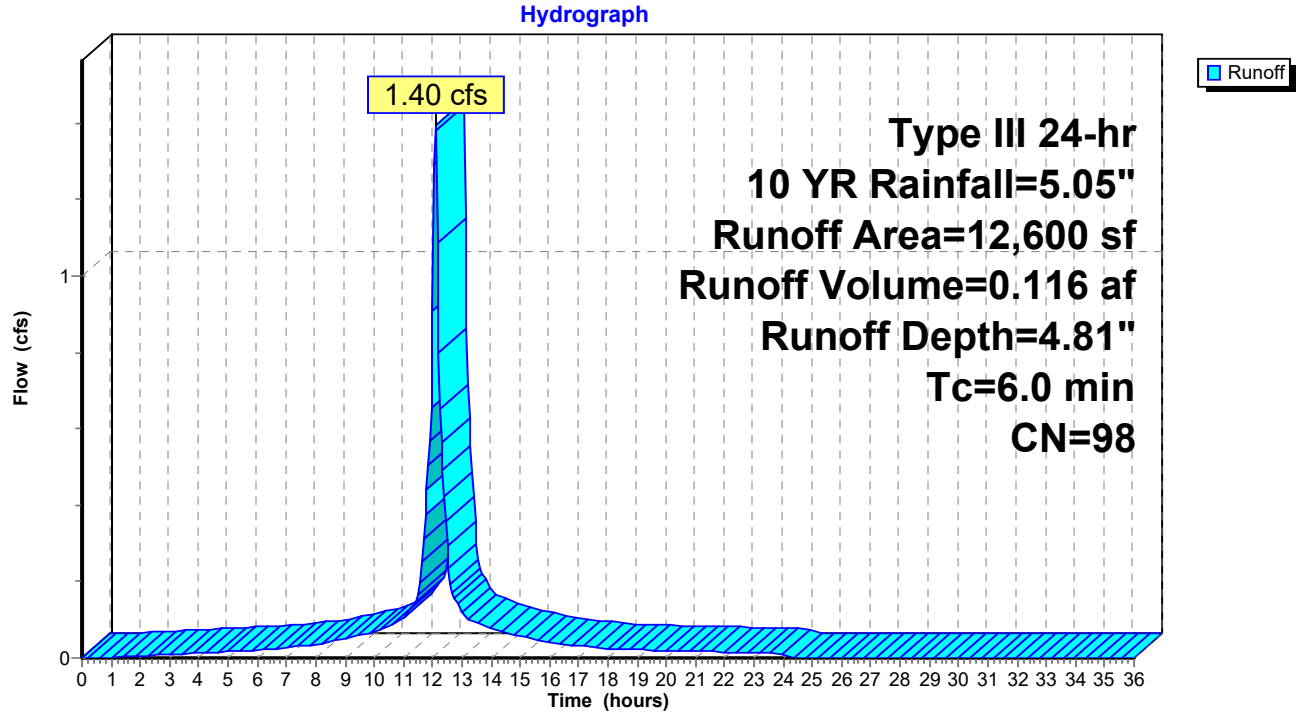
Runoff = 1.40 cfs @ 12.09 hrs, Volume= 0.116 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.05"

Area (sf)	CN	Description
12,600	98	Roofs, HSG A
12,600		100.00% Impervious Area

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

Subcatchment POST-4: Post Development Area 4



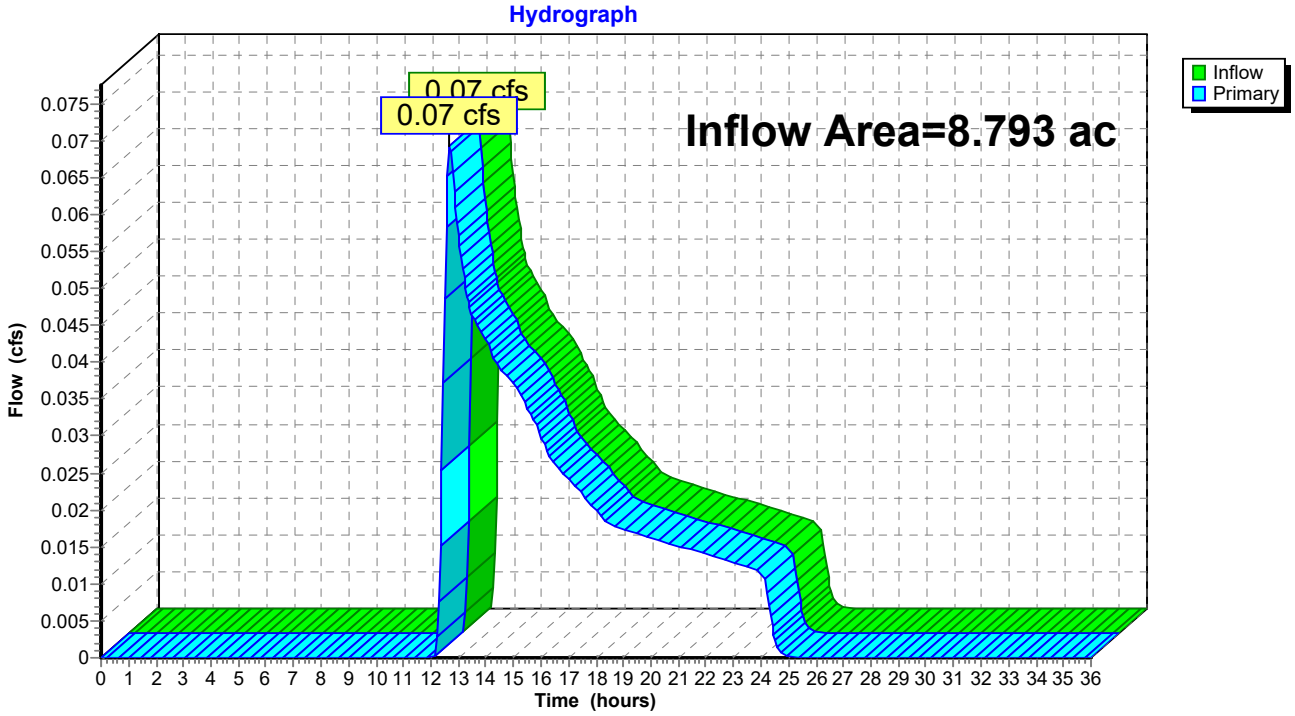
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8.793 ac, 10.07% Impervious, Inflow Depth = 0.03" for 10 YR event
Inflow = 0.07 cfs @ 12.69 hrs, Volume= 0.025 af
Primary = 0.07 cfs @ 12.69 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond BASIN: Proposed Infiltration Basin

Inflow Area = 7.741 ac, 9.79% Impervious, Inflow Depth = 0.29" for 10 YR event
Inflow = 0.60 cfs @ 12.61 hrs, Volume= 0.189 af
Outflow = 0.21 cfs @ 17.24 hrs, Volume= 0.189 af, Atten= 65%, Lag= 277.8 min
Discarded = 0.21 cfs @ 17.24 hrs, Volume= 0.189 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 8.46' @ 17.24 hrs Surf.Area= 3,698 sf Storage= 1,621 cf

Plug-Flow detention time= 89.5 min calculated for 0.189 af (100% of inflow)
Center-of-Mass det. time= 89.1 min (1,087.8 - 998.6)

Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	19,592 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

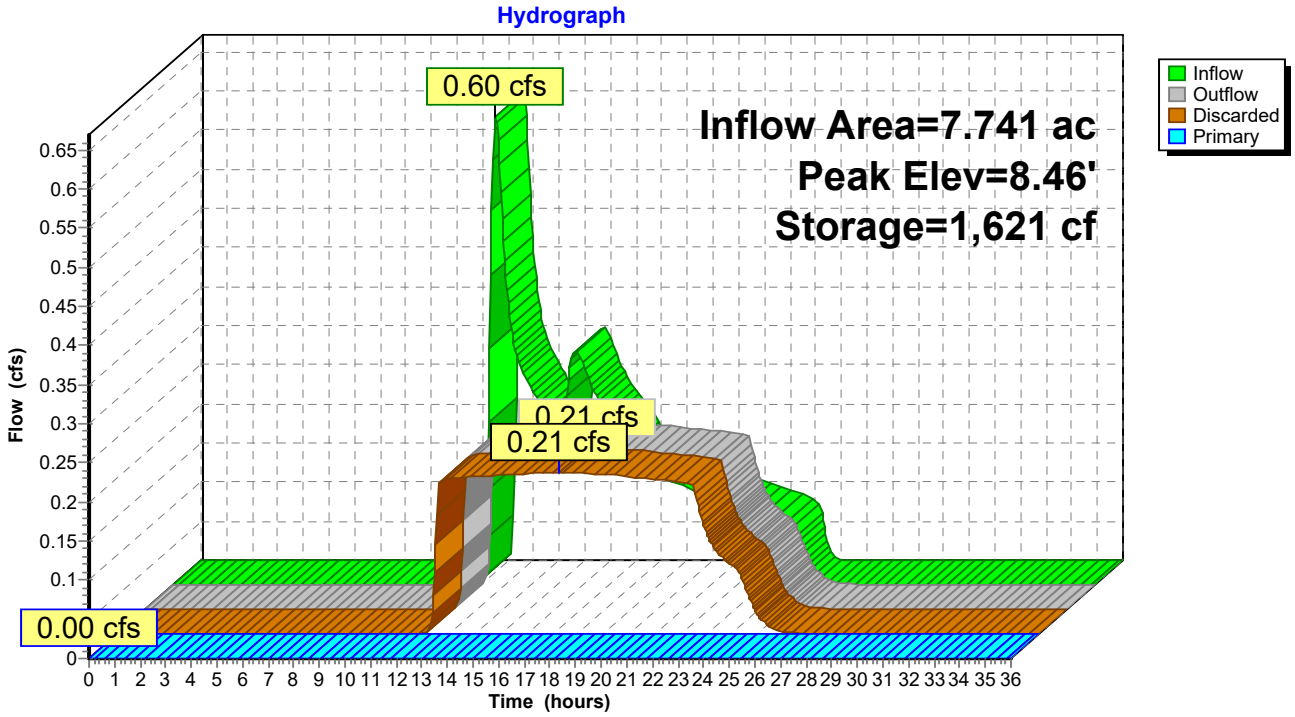
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	3,370	0	0
9.00	4,085	3,728	3,728
10.00	4,855	4,470	8,198
11.00	5,683	5,269	13,467
12.00	6,567	6,125	19,592

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	10.75'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.21 cfs @ 17.24 hrs HW=8.46' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Proposed Infiltration Basin



Summary for Pond DMH4: Drain Manhole

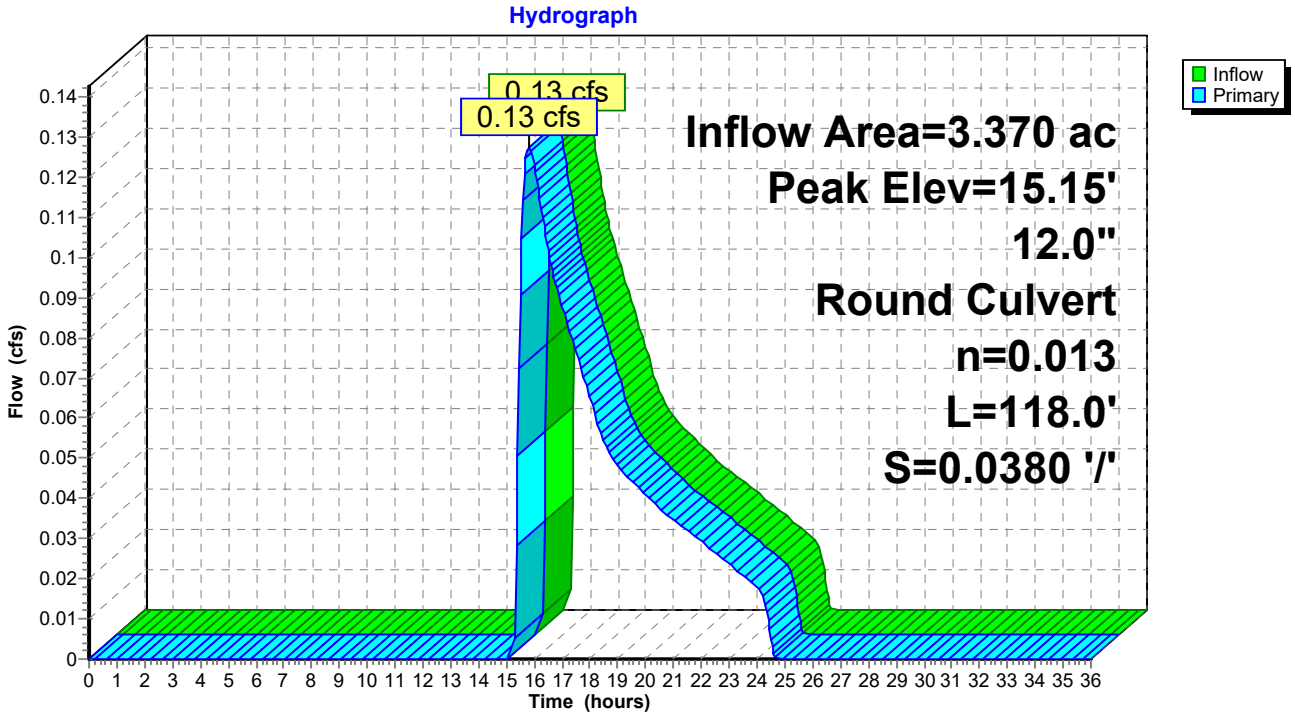
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.14" for 10 YR event
Inflow = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af
Outflow = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 15.15' @ 15.81 hrs
Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.98'	**12.0" Round Culvert** L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 14.98' / 10.50' S= 0.0380 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 15.81 hrs HW=15.15' TW=10.67' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.13 cfs @ 1.41 fps)

Pond DMH4: Drain Manhole



Summary for Pond DMH5: Drain Manhole

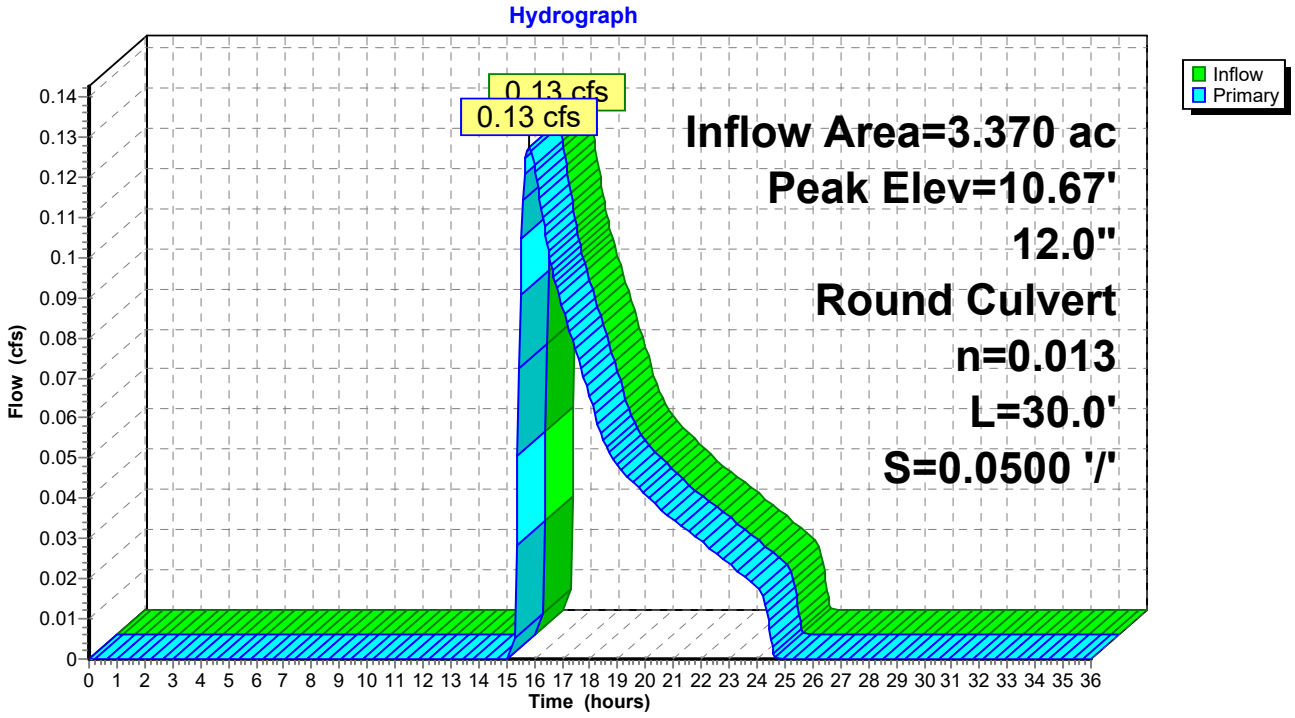
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.14" for 10 YR event
Inflow = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af
Outflow = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.67' @ 15.81 hrs
Flood Elev= 14.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	10.50'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 10.50' / 9.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 15.81 hrs HW=10.67' TW=8.40' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.13 cfs @ 1.41 fps)

Pond DMH5: Drain Manhole



Summary for Pond PITS: Proposed Leaching Pits

Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.56" for 10 YR event
Inflow = 0.74 cfs @ 12.59 hrs, Volume= 0.156 af
Outflow = 0.17 cfs @ 15.81 hrs, Volume= 0.116 af, Atten= 78%, Lag= 193.4 min
Discarded = 0.04 cfs @ 12.35 hrs, Volume= 0.077 af
Primary = 0.13 cfs @ 15.81 hrs, Volume= 0.039 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 16.37' @ 15.81 hrs Surf.Area= 0.016 ac Storage= 0.079 af
Flood Elev= 18.00' Surf.Area= 0.016 ac Storage= 0.105 af

Plug-Flow detention time= 482.2 min calculated for 0.116 af (74% of inflow)
Center-of-Mass det. time= 381.1 min (1,332.5 - 951.3)

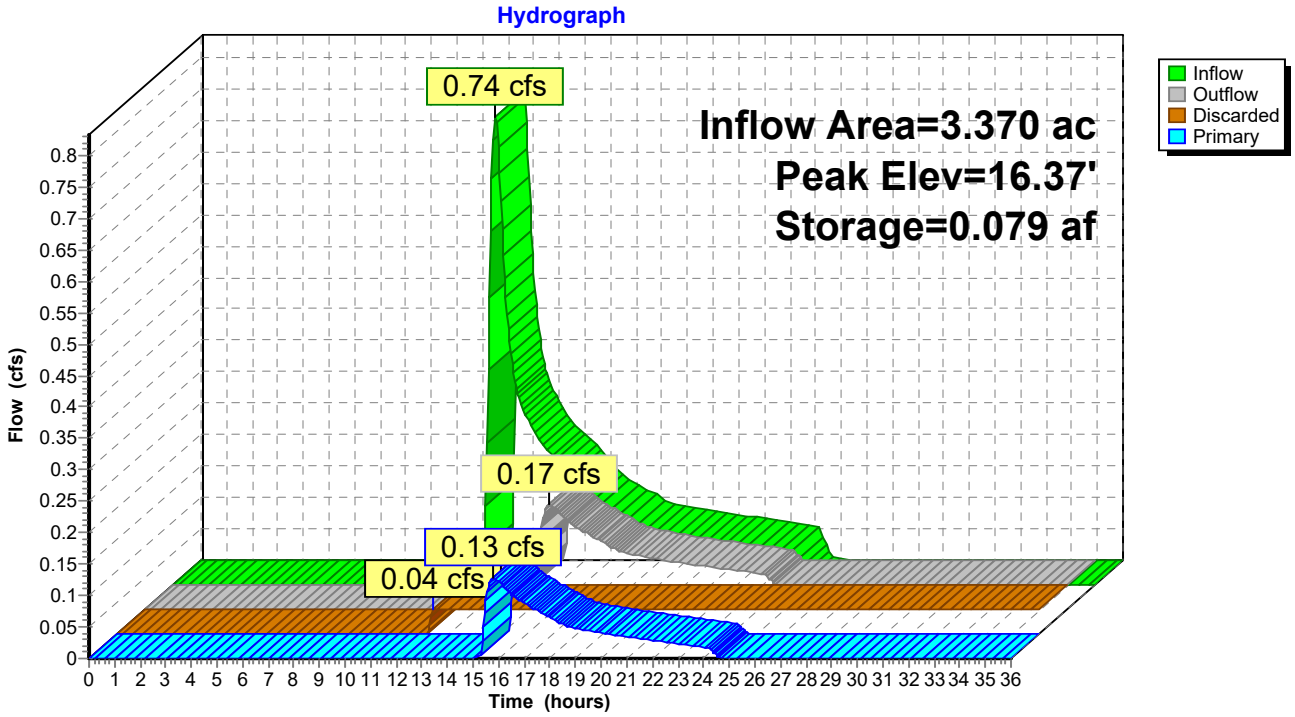
Volume	Invert	Avail.Storage	Storage Description
#1	11.45'	0.078 af	**10.00'W x 70.00'L x 7.00'H Prismatoid** 0.112 af Overall - 0.035 af Embedded = 0.078 af
#2	11.45'	0.028 af	**8.00'D x 4.00'H Vertical Cone/Cylinder** x 6 Inside #1
#3	11.45'	0.007 af	**8.00'D x 6.00'H Vertical Cone/Cylinder** Inside #1
		0.112 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.45'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	16.20'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.20' / 14.98' S= 0.0407 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 12.35 hrs HW=11.68' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.13 cfs @ 15.81 hrs HW=16.37' TW=15.15' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.13 cfs @ 1.41 fps)

Pond PITS: Proposed Leaching Pits



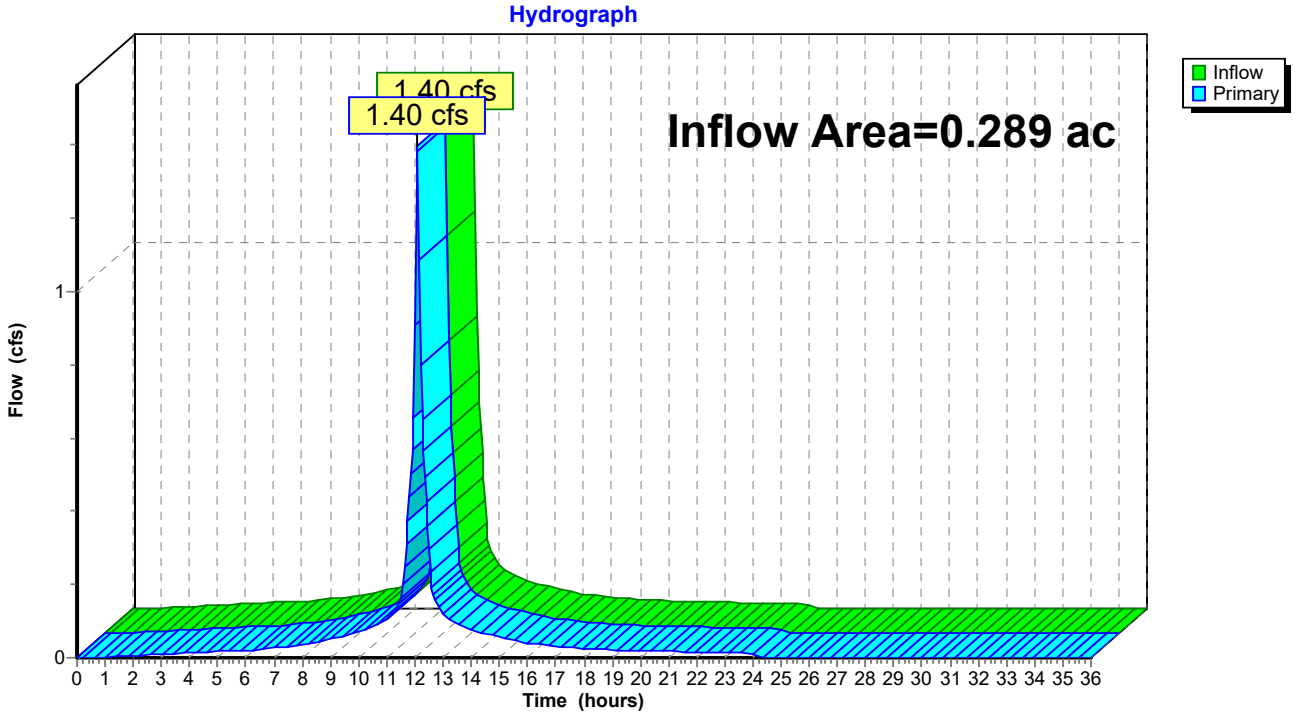
Summary for Pond RECHARGE: Roof Recharge Systems

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.289 ac,100.00% Impervious, Inflow Depth = 4.81" for 10 YR event
Inflow = 1.40 cfs @ 12.09 hrs, Volume= 0.116 af
Primary = 1.40 cfs @ 12.09 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond RECHARGE: Roof Recharge Systems



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

Subcatchment POST-1: Post Runoff Area=146,803 sf 12.28% Impervious Runoff Depth=0.95"
Flow Length=1,203' Tc=28.3 min CN=47 Runoff=1.59 cfs 0.267 af

Subcatchment POST-2: Post Development Runoff Area=190,380 sf 7.86% Impervious Runoff Depth=0.75"
Flow Length=1,039' Tc=25.3 min CN=44 Runoff=1.48 cfs 0.274 af

Subcatchment POST-3: Post Development Runoff Area=45,857 sf 12.19% Impervious Runoff Depth=0.57"
Flow Length=625' Tc=24.7 min CN=41 Runoff=0.22 cfs 0.050 af

Subcatchment POST-4: Post Runoff Area=12,600 sf 100.00% Impervious Runoff Depth=5.80"
Tc=6.0 min CN=98 Runoff=1.67 cfs 0.140 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=0.22 cfs 0.050 af
Primary=0.22 cfs 0.050 af

Pond BASIN: Proposed Infiltration Basin Peak Elev=10.13' Storage=8,812 cf Inflow=1.48 cfs 0.424 af
Discarded=0.28 cfs 0.424 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.424 af

Pond DMH4: Drain Manhole Peak Elev=15.38' Inflow=0.62 cfs 0.150 af
12.0" Round Culvert n=0.013 L=118.0' S=0.0380 '/' Outflow=0.62 cfs 0.150 af

Pond DMH5: Drain Manhole Peak Elev=10.90' Inflow=0.62 cfs 0.150 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0500 '/' Outflow=0.62 cfs 0.150 af

Pond PITS: Proposed Leaching Pits Peak Elev=16.60' Storage=0.083 af Inflow=1.59 cfs 0.267 af
Discarded=0.04 cfs 0.077 af Primary=0.62 cfs 0.150 af Outflow=0.66 cfs 0.227 af

Pond RECHARGE: Roof Recharge Systems Inflow=1.67 cfs 0.140 af
Primary=1.67 cfs 0.140 af

Total Runoff Area = 9.083 ac Runoff Volume = 0.731 af Average Runoff Depth = 0.97"
87.06% Pervious = 7.908 ac 12.94% Impervious = 1.175 ac

Summary for Subcatchment POST-1: Post Development Area 1

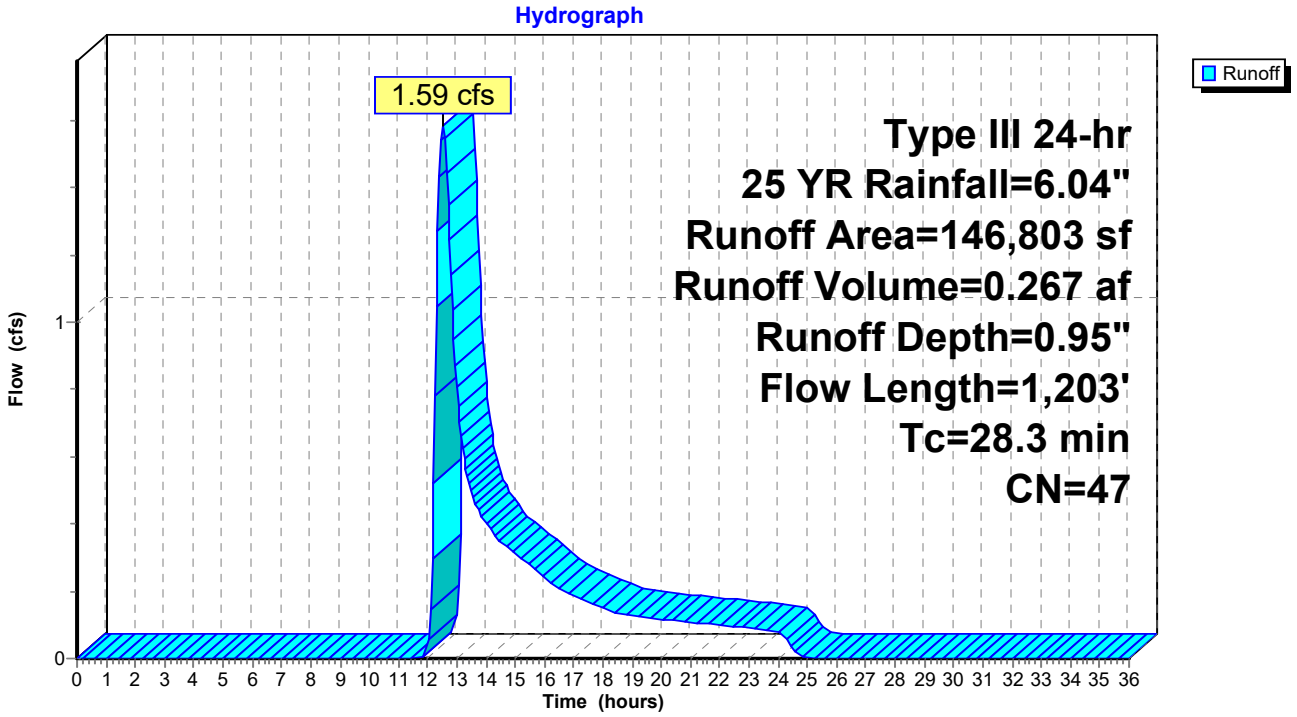
Runoff = 1.59 cfs @ 12.51 hrs, Volume= 0.267 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.04"

Area (sf)	CN	Description
18,030	98	Paved parking, HSG C
34,368	39	>75% Grass cover, Good, HSG A
71,874	30	Woods, Good, HSG A
22,531	70	Woods, Good, HSG C
146,803	47	Weighted Average
128,773		87.72% Pervious Area
18,030		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.1	352	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	33	0.0350	3.80		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
11.1	576	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	17	0.0130	5.60	4.40	**Pipe Channel, F-G** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
28.3	1,203	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-2: Post Development Area 2

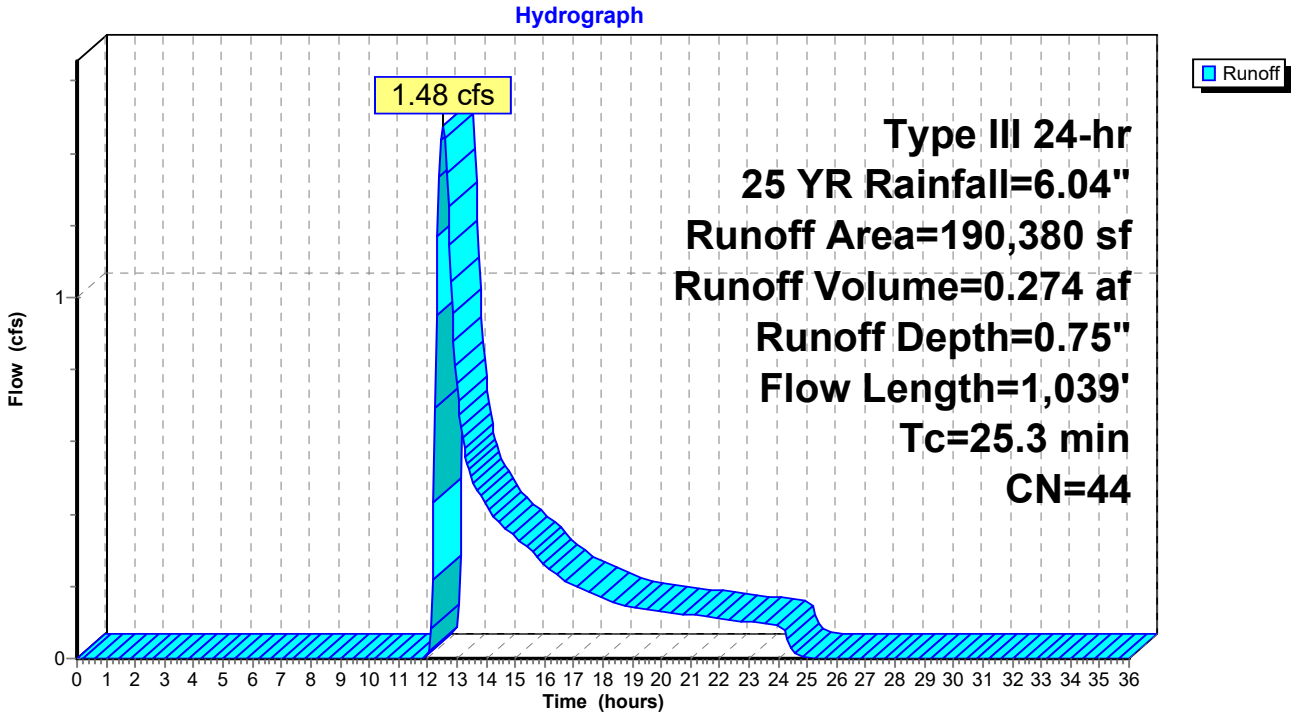
Runoff = 1.48 cfs @ 12.51 hrs, Volume= 0.274 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.04"

Area (sf)	CN	Description
14,970	98	Paved parking, HSG C
66,640	39	>75% Grass cover, Good, HSG A
83,600	30	Woods, Good, HSG A
25,170	70	Woods, Good, HSG C
190,380	44	Weighted Average
175,410		92.14% Pervious Area
14,970		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.8	587	0.0400	1.00		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
25.3	1,039	Total			

Subcatchment POST-2: Post Development Area 2



Summary for Subcatchment POST-3: Post Development Area 3

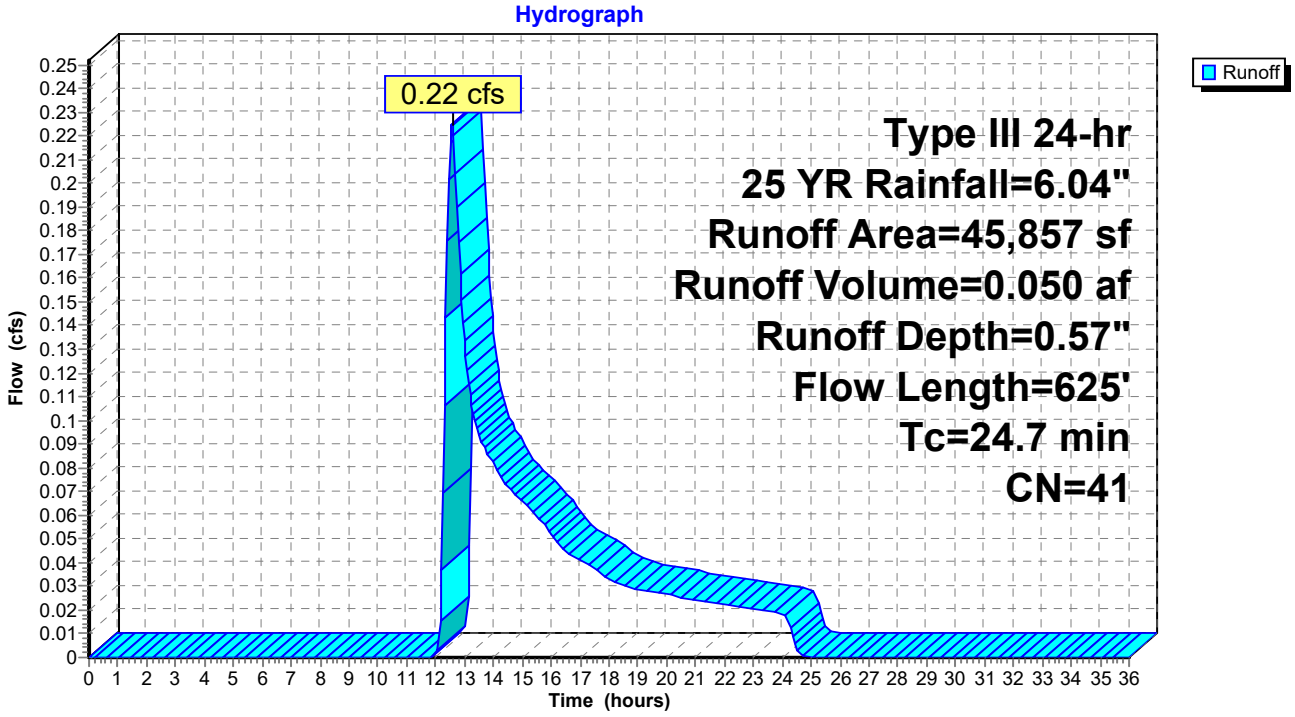
Runoff = 0.22 cfs @ 12.57 hrs, Volume= 0.050 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.04"

Area (sf)	CN	Description
14,260	39	>75% Grass cover, Good, HSG A
5,588	98	Paved parking, HSG A
26,009	30	Woods, Good, HSG A
45,857	41	Weighted Average
40,269		87.81% Pervious Area
5,588		12.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
5.3	318	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	27	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
3.5	180	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
24.7	625	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Subcatchment POST-4: Post Development Area 4

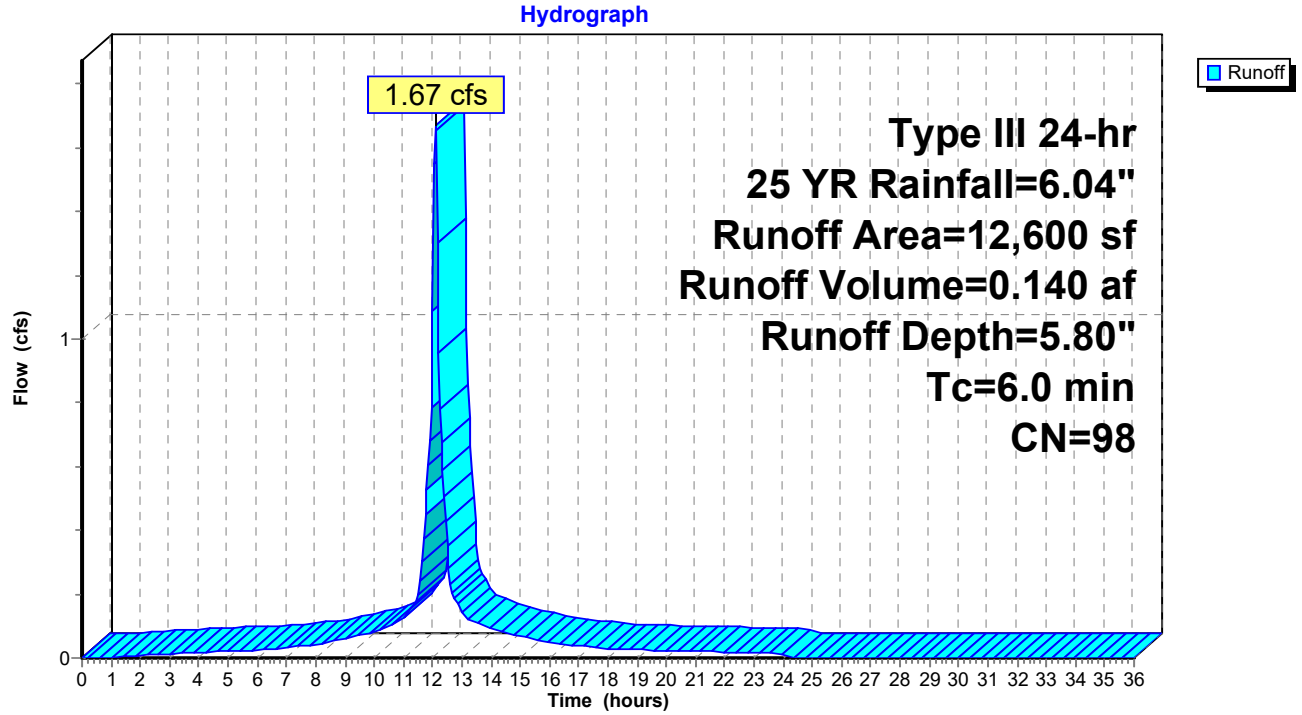
Runoff = 1.67 cfs @ 12.09 hrs, Volume= 0.140 af, Depth= 5.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.04"

Area (sf)	CN	Description
12,600	98	Roofs, HSG A
12,600		100.00% Impervious Area

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

Subcatchment POST-4: Post Development Area 4



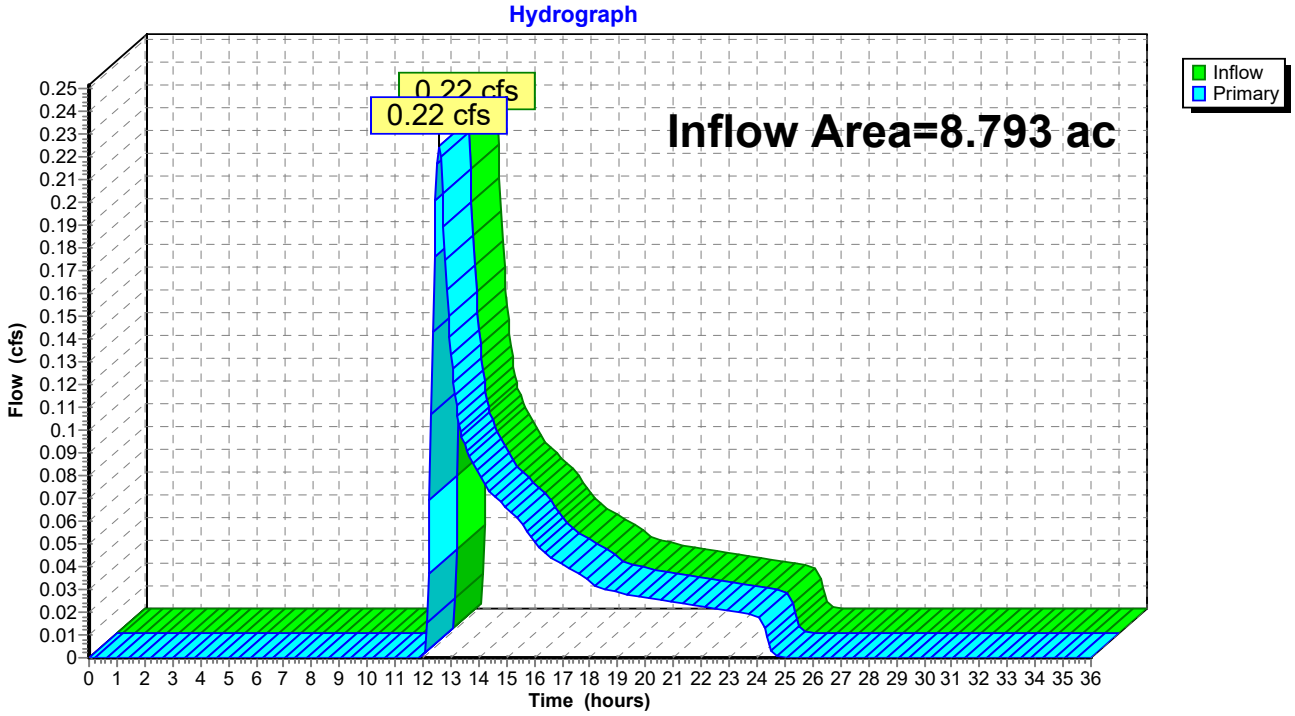
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8.793 ac, 10.07% Impervious, Inflow Depth = 0.07" for 25 YR event
Inflow = 0.22 cfs @ 12.57 hrs, Volume= 0.050 af
Primary = 0.22 cfs @ 12.57 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond BASIN: Proposed Infiltration Basin

Inflow Area = 7.741 ac, 9.79% Impervious, Inflow Depth = 0.66" for 25 YR event
Inflow = 1.48 cfs @ 12.51 hrs, Volume= 0.424 af
Outflow = 0.28 cfs @ 18.06 hrs, Volume= 0.424 af, Atten= 81%, Lag= 333.0 min
Discarded = 0.28 cfs @ 18.06 hrs, Volume= 0.424 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.13' @ 18.06 hrs Surf.Area= 4,959 sf Storage= 8,812 cf

Plug-Flow detention time= 381.6 min calculated for 0.423 af (100% of inflow)
Center-of-Mass det. time= 381.8 min (1,335.6 - 953.7)

Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	19,592 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

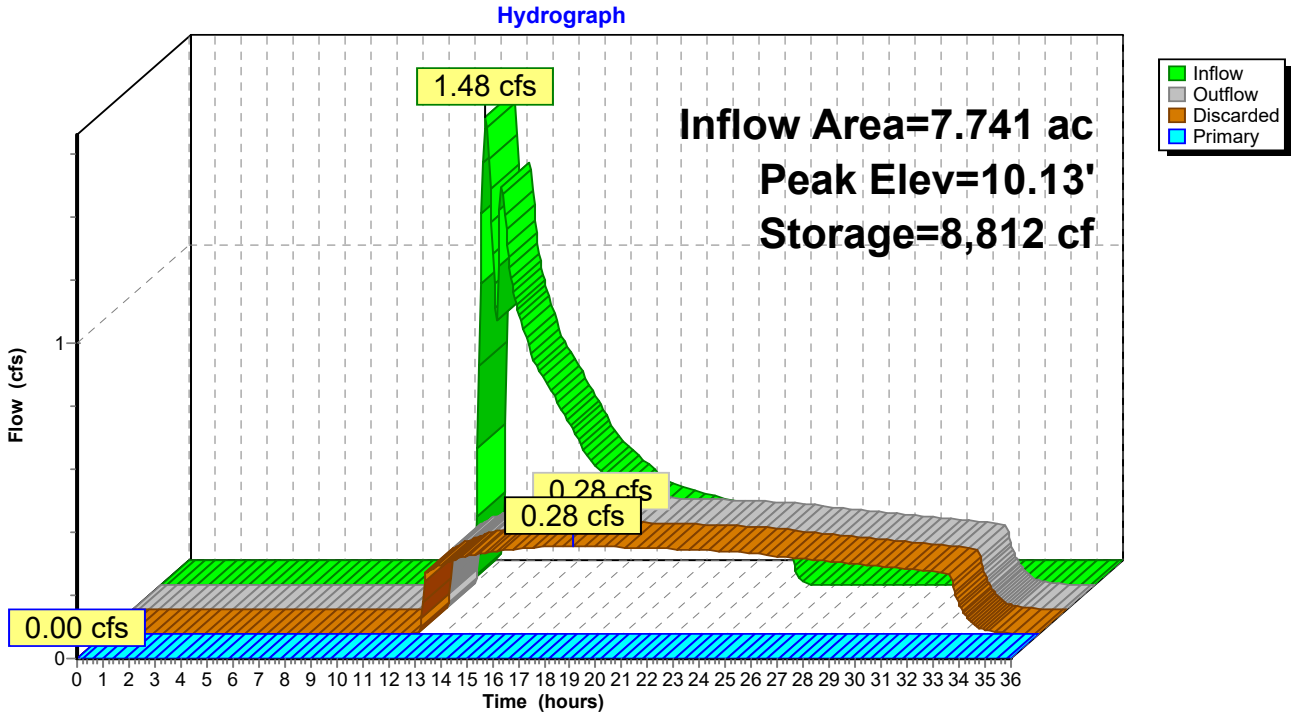
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	3,370	0	0
9.00	4,085	3,728	3,728
10.00	4,855	4,470	8,198
11.00	5,683	5,269	13,467
12.00	6,567	6,125	19,592

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	10.75'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.28 cfs @ 18.06 hrs HW=10.13' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: Proposed Infiltration Basin



Summary for Pond DMH4: Drain Manhole

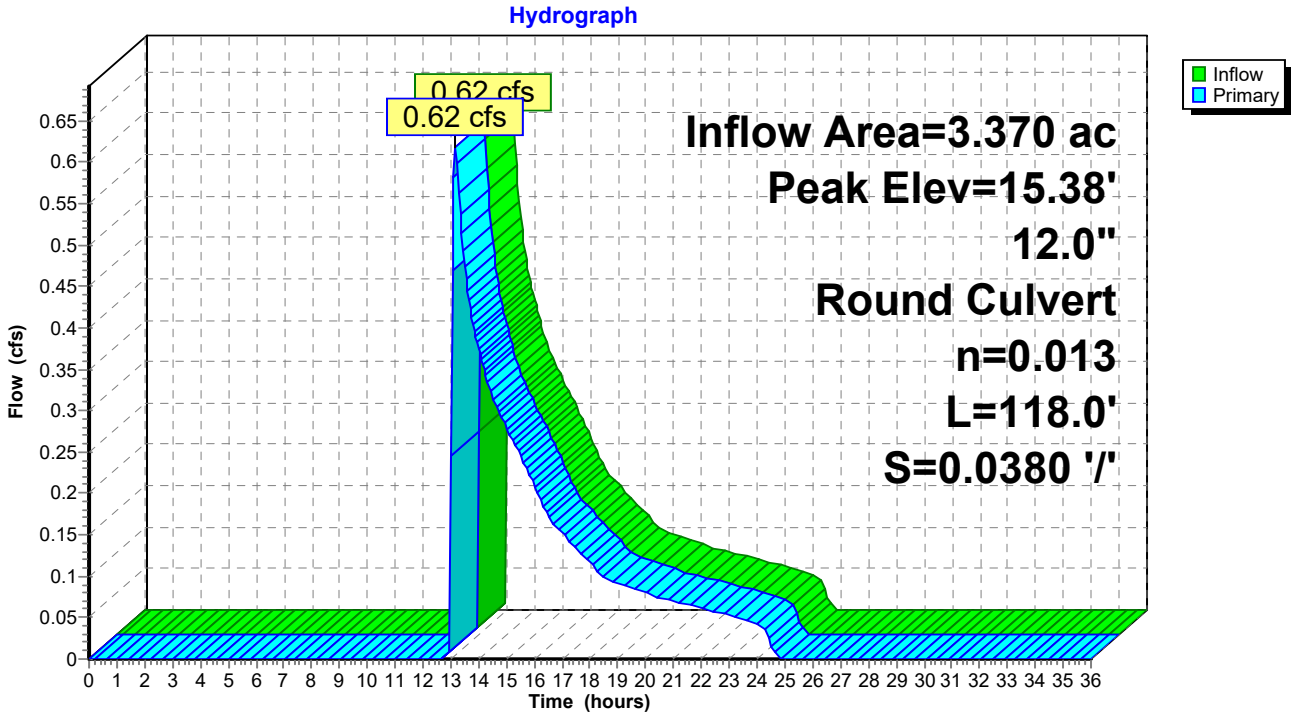
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.53" for 25 YR event
Inflow = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af
Outflow = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 15.38' @ 13.17 hrs
Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.98'	**12.0" Round Culvert** L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 14.98' / 10.50' S= 0.0380 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 13.17 hrs HW=15.37' TW=10.89' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.61 cfs @ 2.14 fps)

Pond DMH4: Drain Manhole



Summary for Pond DMH5: Drain Manhole

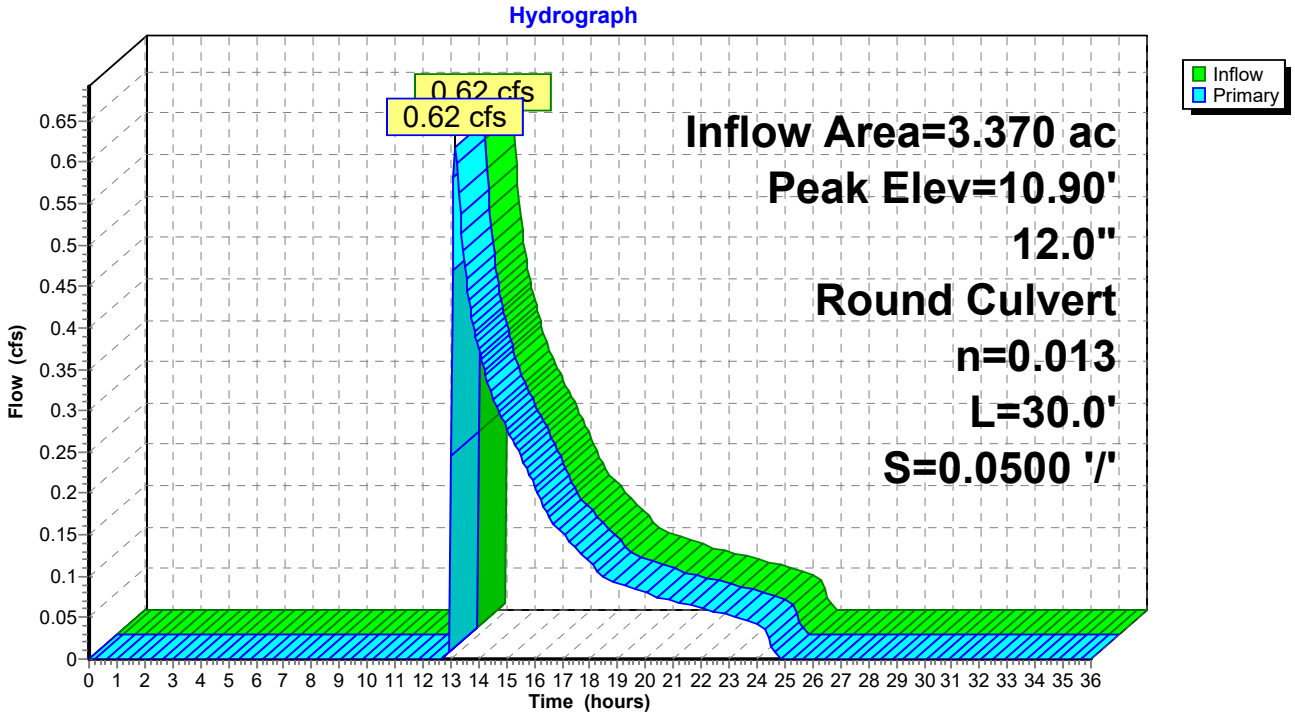
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.53" for 25 YR event
Inflow = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af
Outflow = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.90' @ 13.17 hrs
Flood Elev= 14.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	10.50'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 10.50' / 9.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 13.17 hrs HW=10.89' TW=8.92' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.61 cfs @ 2.14 fps)

Pond DMH5: Drain Manhole



Summary for Pond PITS: Proposed Leaching Pits

Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 0.95" for 25 YR event
Inflow = 1.59 cfs @ 12.51 hrs, Volume= 0.267 af
Outflow = 0.66 cfs @ 13.17 hrs, Volume= 0.227 af, Atten= 59%, Lag= 39.2 min
Discarded = 0.04 cfs @ 12.20 hrs, Volume= 0.077 af
Primary = 0.62 cfs @ 13.17 hrs, Volume= 0.150 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 16.60' @ 13.17 hrs Surf.Area= 0.016 ac Storage= 0.083 af
Flood Elev= 18.00' Surf.Area= 0.016 ac Storage= 0.105 af

Plug-Flow detention time= 276.9 min calculated for 0.226 af (85% of inflow)
Center-of-Mass det. time= 210.2 min (1,137.3 - 927.2)

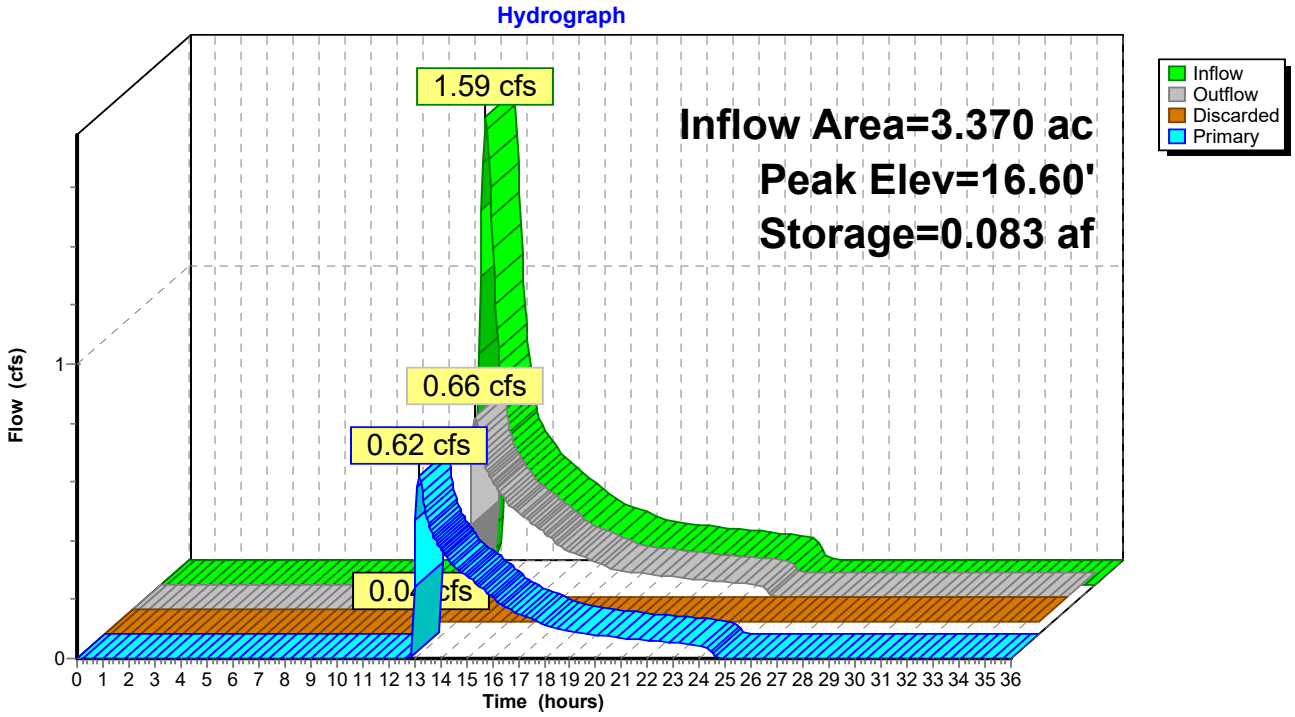
Volume	Invert	Avail.Storage	Storage Description
#1	11.45'	0.078 af	**10.00'W x 70.00'L x 7.00'H Prismatoid** 0.112 af Overall - 0.035 af Embedded = 0.078 af
#2	11.45'	0.028 af	**8.00'D x 4.00'H Vertical Cone/Cylinder** x 6 Inside #1
#3	11.45'	0.007 af	**8.00'D x 6.00'H Vertical Cone/Cylinder** Inside #1
		0.112 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.45'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	16.20'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.20' / 14.98' S= 0.0407 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 12.20 hrs HW=11.63' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.61 cfs @ 13.17 hrs HW=16.59' TW=15.37' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.61 cfs @ 2.14 fps)

Pond PITS: Proposed Leaching Pits



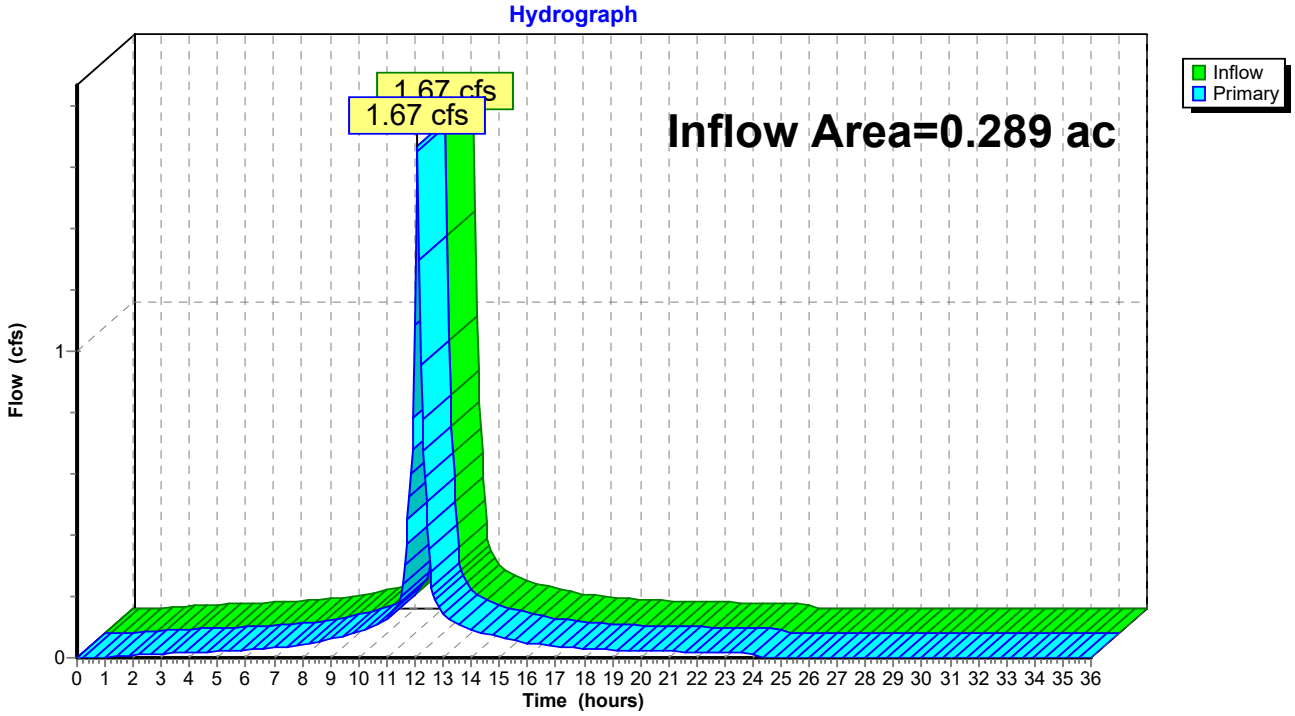
Summary for Pond RECHARGE: Roof Recharge Systems

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.289 ac,100.00% Impervious, Inflow Depth = 5.80" for 25 YR event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 0.140 af
Primary = 1.67 cfs @ 12.09 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond RECHARGE: Roof Recharge Systems



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

Subcatchment POST-1: Post Runoff Area=146,803 sf 12.28% Impervious Runoff Depth=1.71"
Flow Length=1,203' Tc=28.3 min CN=47 Runoff=3.34 cfs 0.480 af

Subcatchment POST-2: Post Development Runoff Area=190,380 sf 7.86% Impervious Runoff Depth=1.43"
Flow Length=1,039' Tc=25.3 min CN=44 Runoff=3.52 cfs 0.520 af

Subcatchment POST-3: Post Development Runoff Area=45,857 sf 12.19% Impervious Runoff Depth=1.16"
Flow Length=625' Tc=24.7 min CN=41 Runoff=0.63 cfs 0.102 af

Subcatchment POST-4: Post Runoff Area=12,600 sf 100.00% Impervious Runoff Depth=7.34"
Tc=6.0 min CN=98 Runoff=2.10 cfs 0.177 af

Pond AP-1: Exist. CB (Analysis Point-1) Inflow=1.79 cfs 0.406 af
Primary=1.79 cfs 0.406 af

Pond BASIN: Proposed Infiltration Basin Peak Elev=10.91' Storage=12,960 cf Inflow=5.77 cfs 0.881 af
Discarded=0.31 cfs 0.548 af Primary=1.60 cfs 0.305 af Outflow=1.91 cfs 0.853 af

Pond DMH4: Drain Manhole Peak Elev=16.02' Inflow=2.78 cfs 0.361 af
12.0" Round Culvert n=0.013 L=118.0' S=0.0380 '/' Outflow=2.78 cfs 0.361 af

Pond DMH5: Drain Manhole Peak Elev=11.54' Inflow=2.78 cfs 0.361 af
12.0" Round Culvert n=0.013 L=30.0' S=0.0500 '/' Outflow=2.78 cfs 0.361 af

Pond PITS: Proposed Leaching Pits Peak Elev=17.24' Storage=0.093 af Inflow=3.34 cfs 0.480 af
Discarded=0.04 cfs 0.078 af Primary=2.78 cfs 0.361 af Outflow=2.82 cfs 0.439 af

Pond RECHARGE: Roof Recharge Systems Inflow=2.10 cfs 0.177 af
Primary=2.10 cfs 0.177 af

Total Runoff Area = 9.083 ac Runoff Volume = 1.278 af Average Runoff Depth = 1.69"
87.06% Pervious = 7.908 ac 12.94% Impervious = 1.175 ac

Summary for Subcatchment POST-1: Post Development Area 1

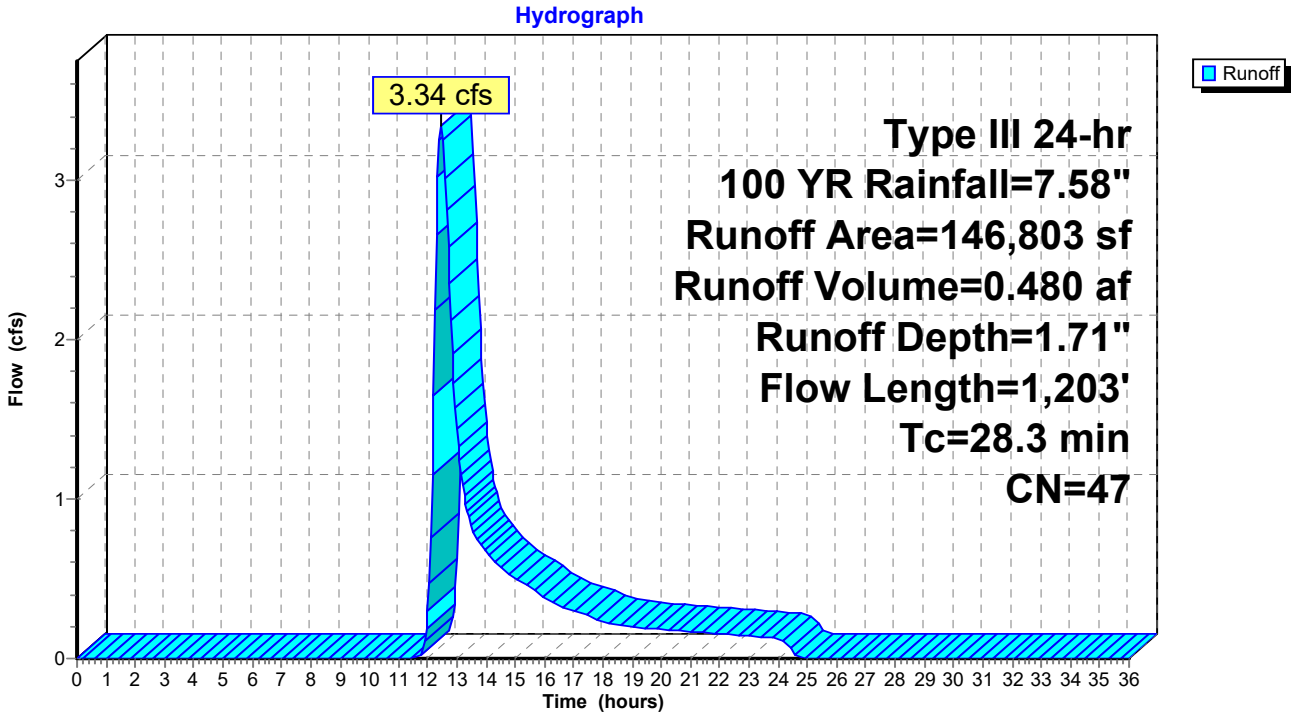
Runoff = 3.34 cfs @ 12.46 hrs, Volume= 0.480 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.58"

Area (sf)	CN	Description
18,030	98	Paved parking, HSG C
34,368	39	>75% Grass cover, Good, HSG A
71,874	30	Woods, Good, HSG A
22,531	70	Woods, Good, HSG C
146,803	47	Weighted Average
128,773		87.72% Pervious Area
18,030		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.1	352	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	33	0.0350	3.80		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
11.1	576	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
1.0	175	0.0200	2.87		**Shallow Concentrated Flow, E-F** Paved Kv= 20.3 fps
0.1	17	0.0130	5.60	4.40	**Pipe Channel, F-G** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
28.3	1,203	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-2: Post Development Area 2

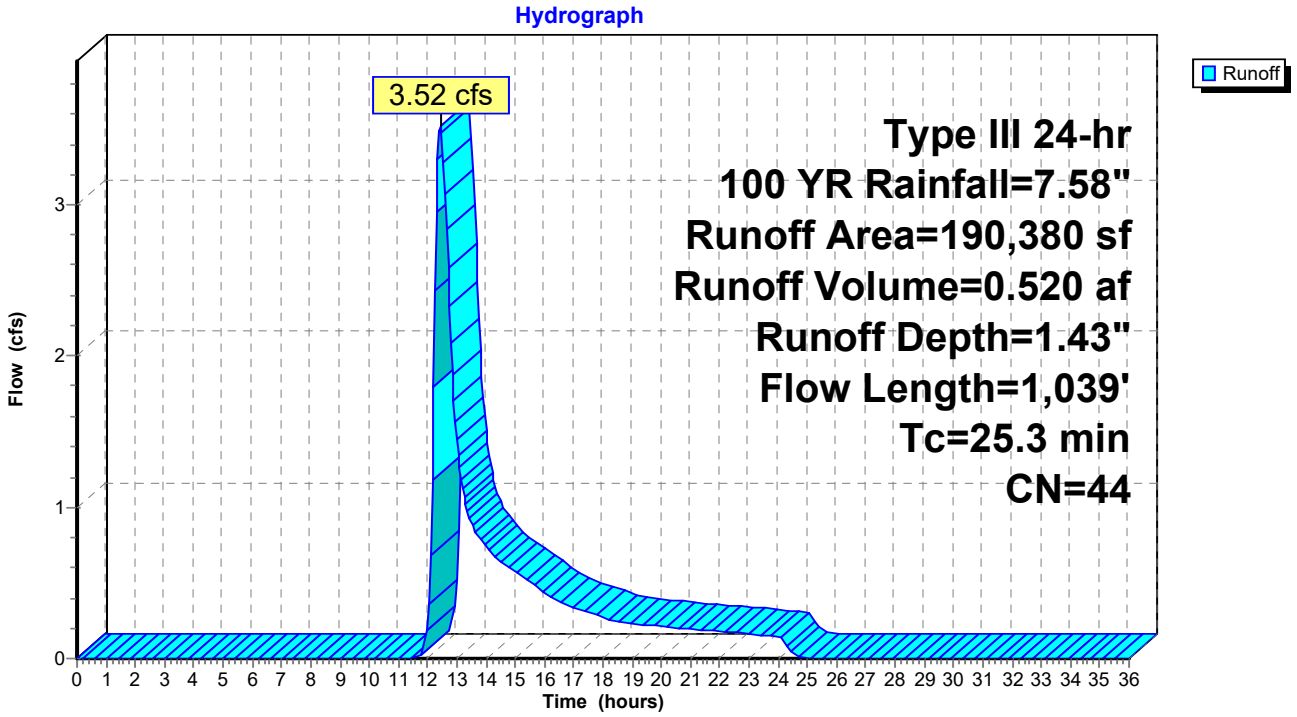
Runoff = 3.52 cfs @ 12.44 hrs, Volume= 0.520 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.58"

Area (sf)	CN	Description
14,970	98	Paved parking, HSG C
66,640	39	>75% Grass cover, Good, HSG A
83,600	30	Woods, Good, HSG A
25,170	70	Woods, Good, HSG C
190,380	44	Weighted Average
175,410		92.14% Pervious Area
14,970		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0250	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
4.4	370	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	32	0.0300	3.52		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.8	587	0.0400	1.00		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
25.3	1,039	Total			

Subcatchment POST-2: Post Development Area 2



Summary for Subcatchment POST-3: Post Development Area 3

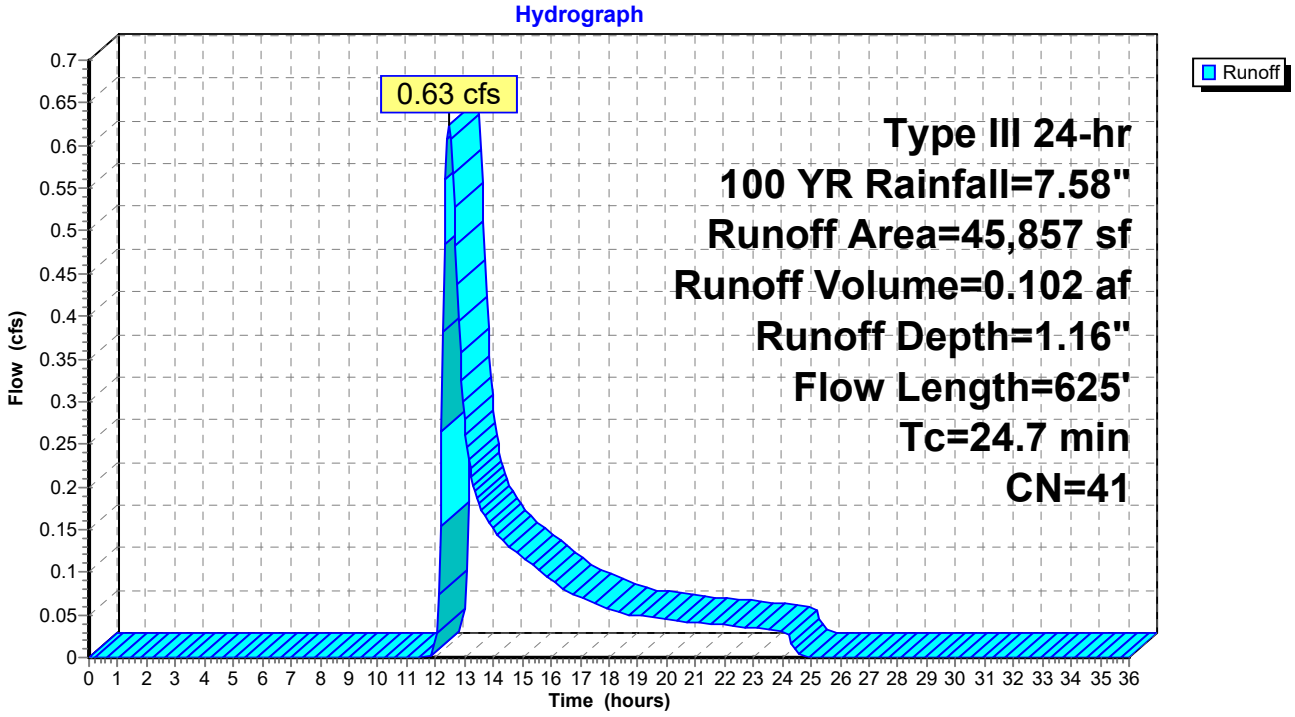
Runoff = 0.63 cfs @ 12.46 hrs, Volume= 0.102 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.58"

Area (sf)	CN	Description
14,260	39	>75% Grass cover, Good, HSG A
5,588	98	Paved parking, HSG A
26,009	30	Woods, Good, HSG A
45,857	41	Weighted Average
40,269		87.81% Pervious Area
5,588		12.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.45"
5.3	318	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.2	27	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
3.5	180	0.0300	0.87		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
24.7	625	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Subcatchment POST-4: Post Development Area 4

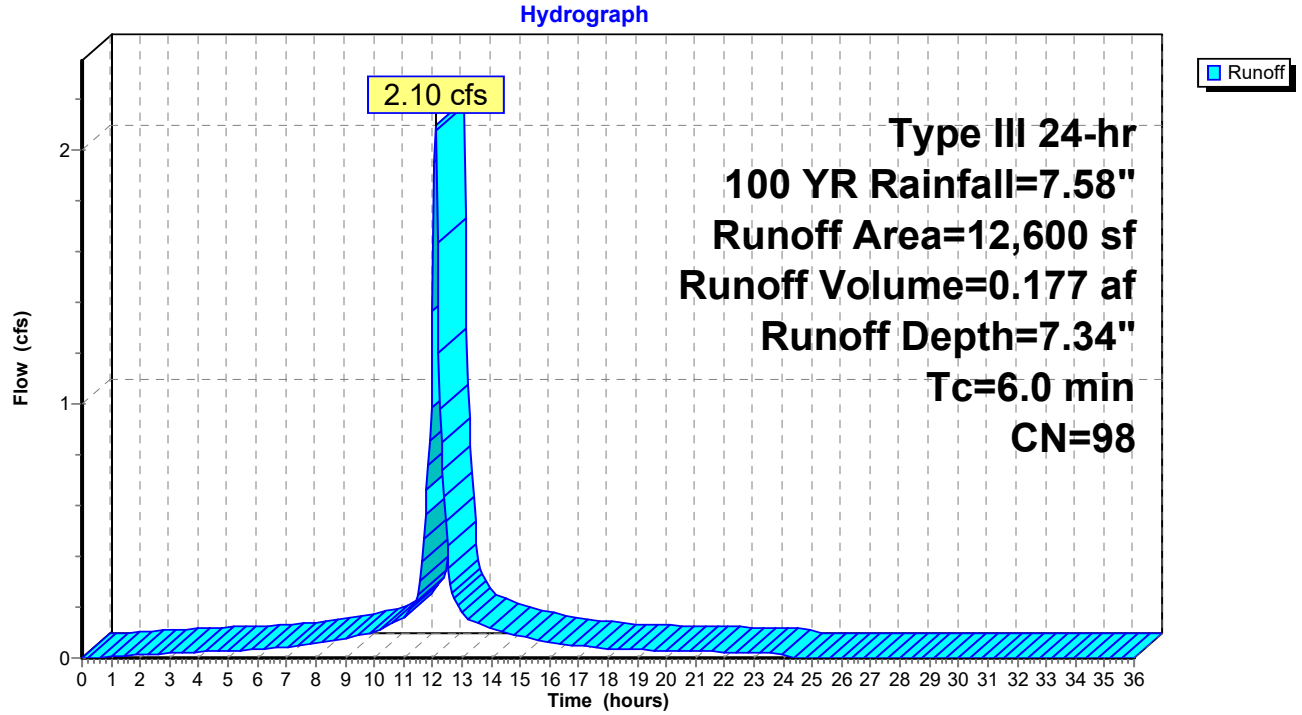
Runoff = 2.10 cfs @ 12.09 hrs, Volume= 0.177 af, Depth= 7.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.58"

Area (sf)	CN	Description
12,600	98	Roofs, HSG A
12,600		100.00% Impervious Area

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

Subcatchment POST-4: Post Development Area 4



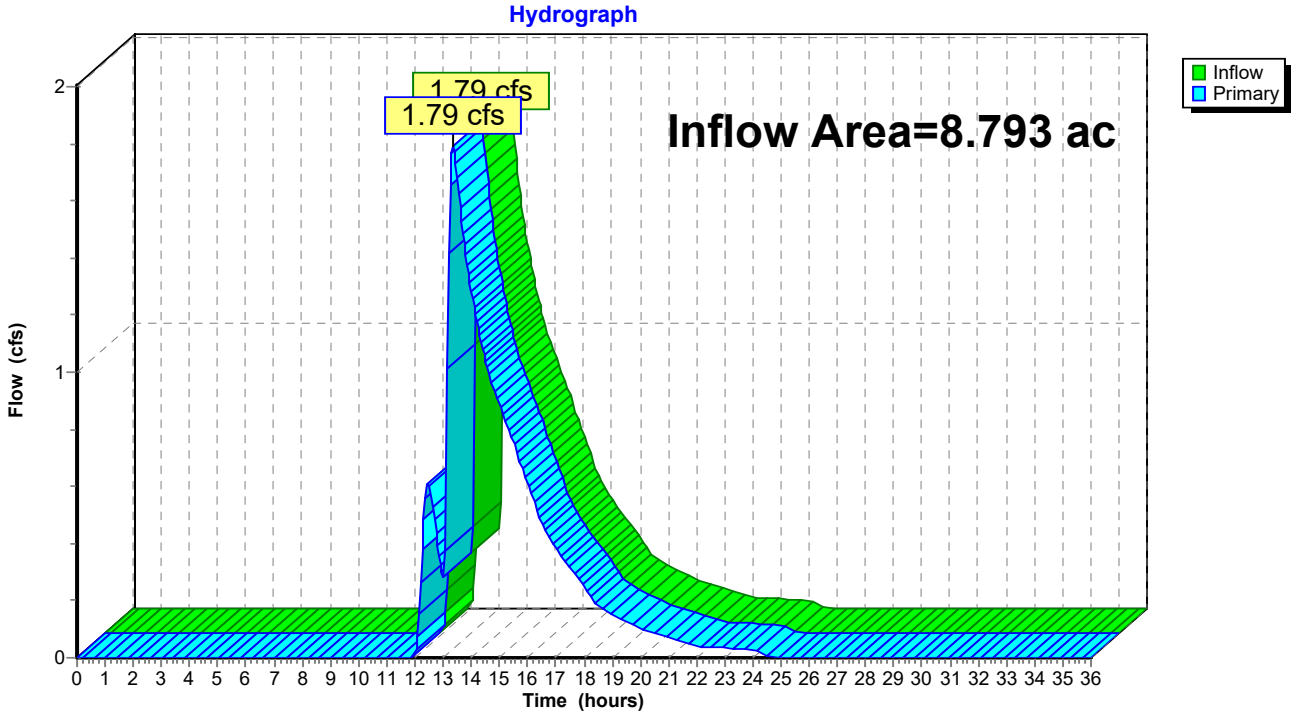
Summary for Pond AP-1: Exist. CB (Analysis Point-1)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 8.793 ac, 10.07% Impervious, Inflow Depth = 0.55" for 100 YR event
Inflow = 1.79 cfs @ 13.35 hrs, Volume= 0.406 af
Primary = 1.79 cfs @ 13.35 hrs, Volume= 0.406 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond AP-1: Exist. CB (Analysis Point-1)



Summary for Pond BASIN: Proposed Infiltration Basin

[80] Warning: Exceeded Pond DMH5 by 0.06' @ 25.00 hrs (0.01 cfs 0.000 af)

Inflow Area = 7.741 ac, 9.79% Impervious, Inflow Depth = 1.37" for 100 YR event
Inflow = 5.77 cfs @ 12.61 hrs, Volume= 0.881 af
Outflow = 1.91 cfs @ 13.36 hrs, Volume= 0.853 af, Atten= 67%, Lag= 45.3 min
Discarded = 0.31 cfs @ 13.36 hrs, Volume= 0.548 af
Primary = 1.60 cfs @ 13.36 hrs, Volume= 0.305 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.91' @ 13.36 hrs Surf.Area= 5,609 sf Storage= 12,960 cf

Plug-Flow detention time= 324.2 min calculated for 0.853 af (97% of inflow)
Center-of-Mass det. time= 307.6 min (1,225.6 - 918.0)

Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	19,592 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

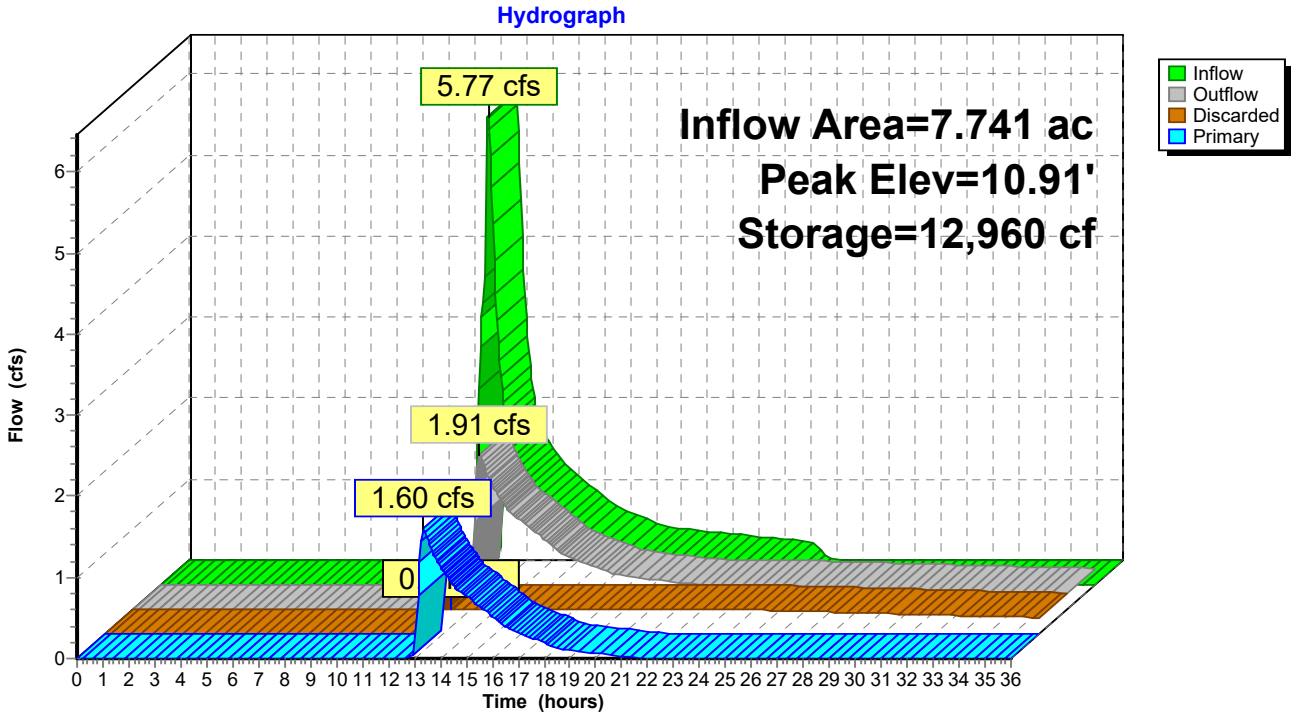
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	3,370	0	0
9.00	4,085	3,728	3,728
10.00	4,855	4,470	8,198
11.00	5,683	5,269	13,467
12.00	6,567	6,125	19,592

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	10.75'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.31 cfs @ 13.36 hrs HW=10.91' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=1.59 cfs @ 13.36 hrs HW=10.91' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.59 cfs @ 1.00 fps)

Pond BASIN: Proposed Infiltration Basin



Summary for Pond DMH4: Drain Manhole

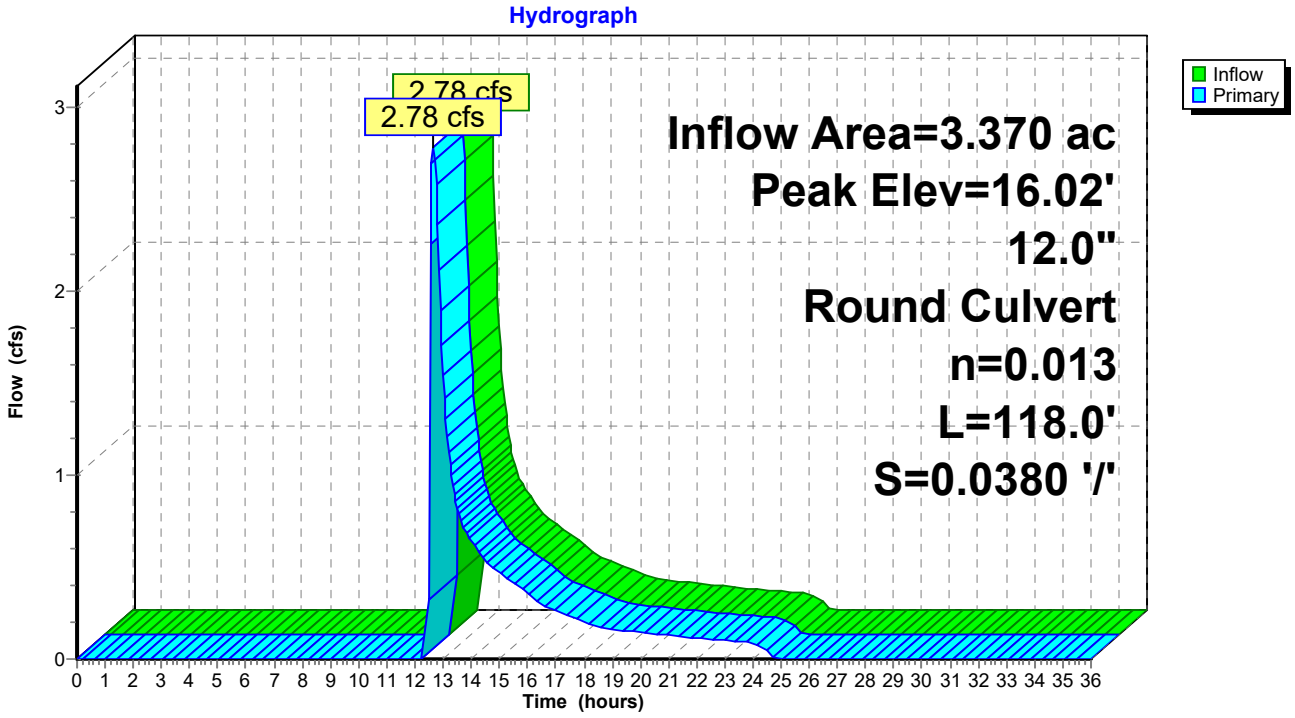
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 1.29" for 100 YR event
Inflow = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af
Outflow = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af, Atten= 0%, Lag= 0.0 min
Primary = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 16.02' @ 12.65 hrs
Flood Elev= 19.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	14.98'	**12.0" Round Culvert** L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 14.98' / 10.50' S= 0.0380 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.78 cfs @ 12.65 hrs HW=16.02' TW=11.54' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.78 cfs @ 3.54 fps)

Pond DMH4: Drain Manhole



Summary for Pond DMH5: Drain Manhole

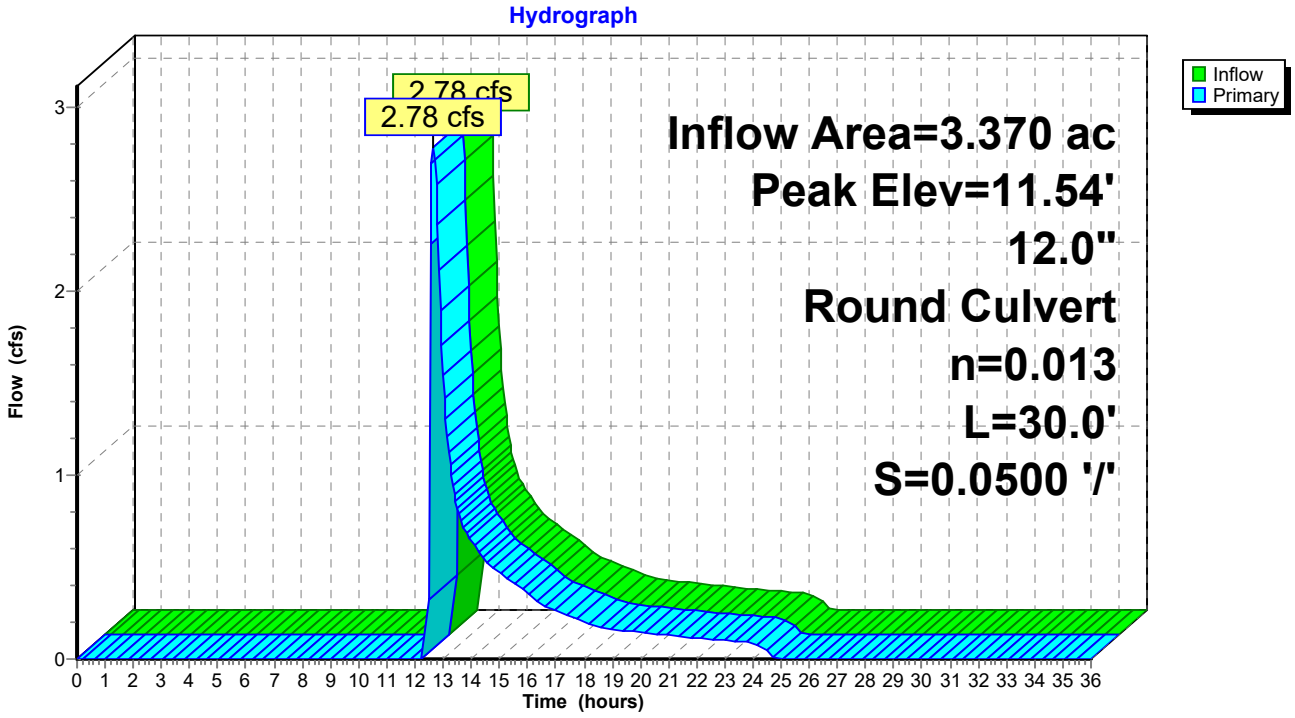
Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 1.29" for 100 YR event
Inflow = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af
Outflow = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af, Atten= 0%, Lag= 0.0 min
Primary = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 11.54' @ 12.65 hrs
Flood Elev= 14.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	10.50'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 10.50' / 9.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.78 cfs @ 12.65 hrs HW=11.54' TW=9.64' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.78 cfs @ 3.54 fps)

Pond DMH5: Drain Manhole



Summary for Pond PITS: Proposed Leaching Pits

Inflow Area = 3.370 ac, 12.28% Impervious, Inflow Depth = 1.71" for 100 YR event
Inflow = 3.34 cfs @ 12.46 hrs, Volume= 0.480 af
Outflow = 2.82 cfs @ 12.65 hrs, Volume= 0.439 af, Atten= 16%, Lag= 11.4 min
Discarded = 0.04 cfs @ 12.05 hrs, Volume= 0.078 af
Primary = 2.78 cfs @ 12.65 hrs, Volume= 0.361 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 17.24' @ 12.65 hrs Surf.Area= 0.016 ac Storage= 0.093 af
Flood Elev= 18.00' Surf.Area= 0.016 ac Storage= 0.105 af

Plug-Flow detention time= 153.2 min calculated for 0.439 af (92% of inflow)
Center-of-Mass det. time= 111.2 min (1,016.0 - 904.8)

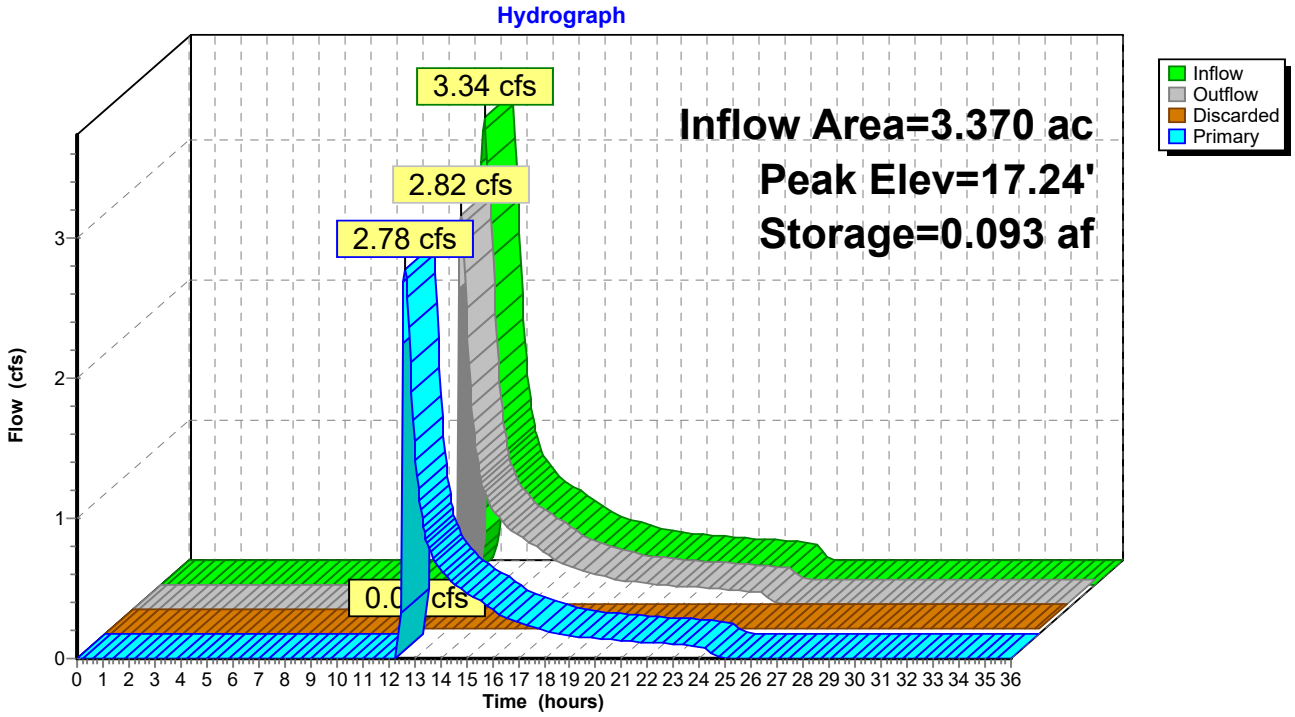
Volume	Invert	Avail.Storage	Storage Description
#1	11.45'	0.078 af	**10.00'W x 70.00'L x 7.00'H Prismatoid** 0.112 af Overall - 0.035 af Embedded = 0.078 af
#2	11.45'	0.028 af	**8.00'D x 4.00'H Vertical Cone/Cylinder** x 6 Inside #1
#3	11.45'	0.007 af	**8.00'D x 6.00'H Vertical Cone/Cylinder** Inside #1
		0.112 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.45'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#2	Primary	16.20'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.20' / 14.98' S= 0.0407 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.04 cfs @ 12.05 hrs HW=11.66' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.78 cfs @ 12.65 hrs HW=17.24' TW=16.02' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 2.78 cfs @ 3.54 fps)

Pond PITS: Proposed Leaching Pits



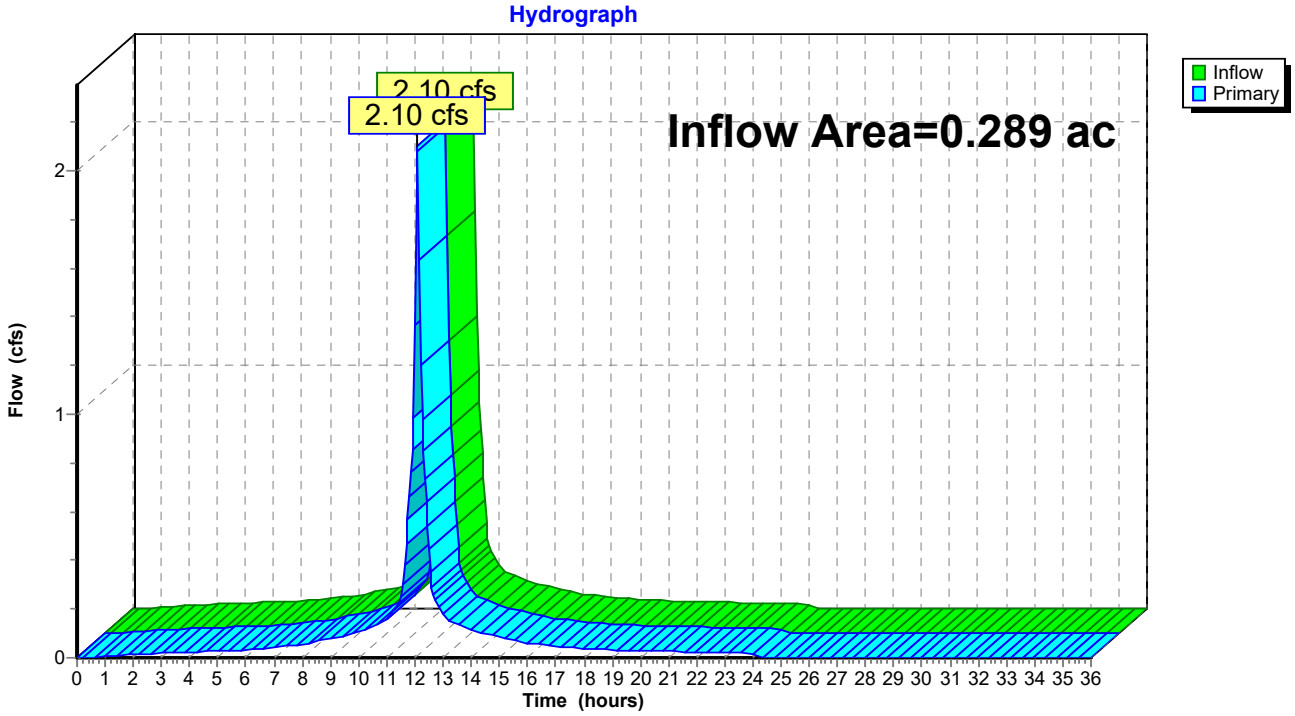
Summary for Pond RECHARGE: Roof Recharge Systems

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.289 ac,100.00% Impervious, Inflow Depth = 7.34" for 100 YR event
Inflow = 2.10 cfs @ 12.09 hrs, Volume= 0.177 af
Primary = 2.10 cfs @ 12.09 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Pond RECHARGE: Roof Recharge Systems



Section 4

Supplemental Data

Map Scale: 1:2,750 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

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

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

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 13, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 9, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	1.3	3.4%
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	2.4	6.2%
66A	Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded	0.8	2.2%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	0.3	0.7%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	17.5	46.0%
301B	Montauk fine sandy loam, 0 to 8 percent slopes, very stony	6.4	16.8%
323B	Poquonock sand, 3 to 8 percent slopes, very stony	0.7	1.7%
437C	Plymouth loamy coarse sand, 8 to 15 percent slopes, bouldery	7.2	18.9%
600	Pits, gravel	1.6	4.1%
Totals for Area of Interest		**38.2**	**100.0%**

NOAA Atlas 14, Volume 10, Version 3
Location name: Wareham, Massachusetts, USA*
Latitude: 41.7501°, Longitude: -70.6841°
Elevation: 18.53 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.294** (0.238-0.359)	**0.364** (0.295-0.445)	**0.479** (0.386-0.586)	**0.574** (0.461-0.705)	**0.705** (0.550-0.895)	**0.803** (0.616-1.03)	**0.907** (0.680-1.20)	**1.03** (0.729-1.37)	**1.21** (0.827-1.65)	**1.36** (0.911-1.88)
10-min	**0.417** (0.338-0.508)	**0.516** (0.418-0.630)	**0.678** (0.547-0.830)	**0.813** (0.653-0.999)	**0.999** (0.780-1.27)	**1.14** (0.872-1.47)	**1.29** (0.963-1.71)	**1.46** (1.03-1.94)	**1.71** (1.17-2.34)	**1.93** (1.29-2.66)
15-min	**0.490** (0.397-0.598)	**0.607** (0.491-0.741)	**0.798** (0.644-0.977)	**0.957** (0.768-1.18)	**1.18** (0.917-1.49)	**1.34** (1.03-1.73)	**1.51** (1.13-2.01)	**1.71** (1.21-2.28)	**2.02** (1.38-2.75)	**2.27** (1.52-3.13)
30-min	**0.707** (0.573-0.863)	**0.874** (0.707-1.07)	**1.15** (0.926-1.40)	**1.37** (1.10-1.69)	**1.69** (1.32-2.14)	**1.92** (1.47-2.48)	**2.17** (1.63-2.88)	**2.46** (1.74-3.28)	**2.89** (1.98-3.94)	**3.25** (2.18-4.49)
60-min	**0.924** (0.748-1.13)	**1.14** (0.924-1.39)	**1.50** (1.21-1.83)	**1.79** (1.44-2.20)	**2.20** (1.72-2.79)	**2.50** (1.92-3.23)	**2.83** (2.12-3.75)	**3.21** (2.27-4.27)	**3.77** (2.58-5.14)	**4.24** (2.84-5.86)
2-hr	**1.25** (1.01-1.51)	**1.55** (1.26-1.88)	**2.04** (1.65-2.48)	**2.44** (1.97-2.98)	**3.00** (2.37-3.80)	**3.42** (2.65-4.39)	**3.87** (2.93-5.12)	**4.41** (3.14-5.83)	**5.22** (3.60-7.06)	**5.92** (3.99-8.11)
3-hr	**1.47** (1.20-1.77)	**1.82** (1.49-2.19)	**2.39** (1.95-2.89)	**2.86** (2.32-3.48)	**3.51** (2.77-4.42)	**3.99** (3.11-5.10)	**4.51** (3.44-5.95)	**5.14** (3.68-6.77)	**6.10** (4.22-8.20)	**6.91** (4.68-9.42)
6-hr	**1.91** (1.57-2.29)	**2.33** (1.92-2.80)	**3.02** (2.47-3.63)	**3.59** (2.93-4.33)	**4.37** (3.47-5.45)	**4.95** (3.87-6.27)	**5.58** (4.26-7.27)	**6.32** (4.56-8.24)	**7.43** (5.18-9.91)	**8.37** (5.72-11.3)
12-hr	**2.42** (2.01-2.89)	**2.89** (2.39-3.45)	**3.66** (3.02-4.37)	**4.30** (3.53-5.15)	**5.18** (4.14-6.39)	**5.83** (4.58-7.30)	**6.53** (5.00-8.38)	**7.32** (5.33-9.47)	**8.46** (5.95-11.2)	**9.40** (6.48-12.6)
24-hr	**2.91** (2.43-3.45)	**3.45** (2.87-4.08)	**4.32** (3.59-5.13)	**5.05** (4.17-6.01)	**6.04** (4.86-7.40)	**6.80** (5.37-8.43)	**7.58** (5.83-9.62)	**8.45** (6.20-10.8)	**9.68** (6.86-12.7)	**10.7** (7.40-14.2)
2-day	**3.35** (2.81-3.94)	**3.98** (3.34-4.68)	**5.01** (4.19-5.90)	**5.86** (4.88-6.93)	**7.03** (5.69-8.54)	**7.92** (6.29-9.74)	**8.84** (6.85-11.1)	**9.86** (7.29-12.6)	**11.3** (8.08-14.7)	**12.5** (8.73-16.4)
3-day	**3.68** (3.10-4.31)	**4.34** (3.66-5.09)	**5.43** (4.56-6.37)	**6.33** (5.29-7.45)	**7.56** (6.15-9.15)	**8.50** (6.78-10.4)	**9.47** (7.36-11.9)	**10.5** (7.83-13.4)	**12.0** (8.65-15.6)	**13.3** (9.32-17.4)
4-day	**3.97** (3.36-4.64)	**4.65** (3.93-5.43)	**5.76** (4.85-6.74)	**6.68** (5.60-7.85)	**7.95** (6.47-9.57)	**8.91** (7.12-10.9)	**9.90** (7.71-12.3)	**11.0** (8.18-13.9)	**12.5** (8.99-16.1)	**13.7** (9.65-17.8)
7-day	**4.74** (4.03-5.50)	**5.44** (4.62-6.33)	**6.60** (5.59-7.68)	**7.56** (6.37-8.83)	**8.87** (7.26-10.6)	**9.88** (7.93-11.9)	**10.9** (8.51-13.4)	**12.0** (8.99-15.0)	**13.4** (9.74-17.2)	**14.5** (10.3-18.8)
10-day	**5.45** (4.64-6.30)	**6.18** (5.26-7.16)	**7.37** (6.26-8.55)	**8.36** (7.07-9.74)	**9.73** (7.98-11.6)	**10.8** (8.68-12.9)	**11.8** (9.25-14.5)	**12.9** (9.72-16.1)	**14.3** (10.4-18.2)	**15.4** (11.0-19.8)
20-day	**7.55** (6.48-8.68)	**8.37** (7.18-9.62)	**9.70** (8.30-11.2)	**10.8** (9.20-12.5)	**12.3** (10.2-14.5)	**13.5** (10.9-16.1)	**14.7** (11.5-17.7)	**15.8** (12.0-19.5)	**17.2** (12.6-21.7)	**18.1** (13.0-23.2)
30-day	**9.31** (8.03-10.7)	**10.2** (8.79-11.7)	**11.7** (10.0-13.4)	**12.9** (11.0-14.8)	**14.5** (12.1-17.0)	**15.9** (12.9-18.7)	**17.1** (13.5-20.5)	**18.3** (14.0-22.5)	**19.6** (14.5-24.7)	**20.6** (14.9-26.2)
45-day	**11.5** (9.98-13.2)	**12.5** (10.8-14.3)	**14.1** (12.2-16.2)	**15.5** (13.3-17.8)	**17.3** (14.4-20.2)	**18.8** (15.3-22.1)	**20.2** (15.9-24.0)	**21.4** (16.4-26.2)	**22.8** (17.0-28.5)	**23.7** (17.2-30.0)
60-day	**13.4** (11.6-15.3)	**14.5** (12.6-16.5)	**16.2** (14.0-18.5)	**17.7** (15.2-20.2)	**19.7** (16.4-22.8)	**21.3** (17.4-24.9)	**22.8** (18.0-27.0)	**24.0** (18.5-29.3)	**25.5** (19.0-31.7)	**26.4** (19.2-33.3)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

FIELD ENGINEERING CO. INC. MATTAPOISETT, MA

RUN-OFF COEFFICIENT CALCULATIONS

Client:	David Andrade	Job No.	2443
Project:	Proposed Definitive Subdivision	Date:	10/7/2021
Location:	Great Neck Road, Wareham, MA	Calcs by:	P. Therrien

:oefficient (C) factor:

Impervious areas (Roofs and paved areas)	0.90
Pervious areas (landscaped;lawn areas)	0.40
Pervious areas (undisturbed;wooded)	0.30

AREA NO.	LAWN AREA (ac.)	WOODED AREA (ac.)	IMPERV. AREA (ac.)	TOTAL AREA (ac.)	COMPOSITE FACTOR "C"
CB4	0.47	1.34	0.23	2.04	0.39
CB3	0.32	0.78	0.23	1.33	0.43
CB2	0.34	0.28	0.11	0.73	0.44
CB1	0.21	0.00	0.13	0.34	0.59

FIELD ENGINEERING CO., INC. MATTAPOISETT, MA

STORM DRAINAGE DESIGN DATA
Rational Method Q=CIA
Design Storm 25 YEAR

Client: DAVID ANDRADE Job No: 2443
Project: DEFINITIVE SUBDIVISION Date: 10/7/2021
Location: GREAT NECK ROAD, WAREHAM Cal By: RRR

NOTE: Data entry columns headed by double asterisk. **

Street Name	From MH	Inv. Elev.	To MH	Inv. Elev.	Length (ft)	Slope (%)	Area Inc. (ac.)	Area Total (ac.)	Runoff Inc. "C"	Coef. Ave. "C"	Int. (in/hr) "I"	Inlet Time (min)	Pipe Time (min)	Total Time (min)	Flow Inc. (cfs)	Flow Total (cfs)	Pipe Dia. (in)	"n"	Slope (ft/ft)	Flow Full (cfs)	Vel. Full (ft/s)
**	**	**	**	**	**		**		**		**	**					**	**			
SYS 1	CB3	15.49	DMH2/3	15.37	4	3.00%	1.33	1.33	0.43	0.43	4.1	16.00	0.01	16.00	2.34	2.34	12	0.013	0.0300	6.13	7.81
**	**	**	**	**	**		**		**		**	**					**				
SYS 1	CB4	15.49	DMH2/3	15.37	12	1.00%	2.04	2.04	0.39	0.39	3.2	28.30	0.04	28.30	2.55	2.55	12	0.013	0.0100	3.54	4.51
**	**	**	**	**	**		**		**		**	**					**	**			
SYS 1	DMH2/3	15.32	LPITS	15.20	7	1.71%	0.00	3.37	0.00	0.41	3.2	0.00	0.02	28.31	0.00	4.38	12	0.013	0.0171	4.64	5.90
**	**	**	**	**	**		**		**		**	**					**	**			
**	**	**	**	**	**		**		**		**	**					**	**			
SYS 2	CB1	8.39	DMH1	8.29	4	2.50%	0.34	0.34	0.59	0.59	4.8	10.00	0.01	10.00	0.96	0.96	12	0.013	0.0250	5.60	7.13
**	**	**	**	**	**		**		**		**	**					**	**			
SYS 2	CB2	8.39	DMH1	8.29	12	0.83%	0.73	0.73	0.44	0.44	3.6	20.00	0.05	20.00	1.16	1.16	12	0.013	0.0083	3.23	4.12
**	**	**	**	**	**		**		**		**	**					**	**			
SYS 2	DMH1	8.29	WQI1	8.16	13	1.00%	0.00	1.07	0.00	0.49	3.6	0.00	0.05	20.05	0.00	1.88	12	0.013	0.0100	3.54	4.51
SYS 2	WQI1	8.16	FE	8.00	15	1.07%	0.00	1.07	0.00	0.49	3.6	0.00	0.05	20.10	0.00	1.88	12	0.013	0.0107	3.66	4.66
**	**	**	**	**	**		**		**		**	**					**	**			

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Pre-Treatment Train

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Oil Grit Separator	**0.25**	**0.75**	**0.19**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**

Total TSS Removal = **44%**

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

Project: ANDRADE SUBDIVISION
Prepared By: KJM
Date: 10/7/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Discharge to Leaching Pits

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Oil Grit Separator	**0.25**	**0.75**	**0.19**	**0.56**
Dry Well	**0.80**	**0.56**	**0.45**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**

Total TSS Removal = **89%**

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

Project: ANDRADE SUBDIVISION

Prepared By: KJM

Date: 10/7/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Discharge to Infiltration Basin

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
DEEP SUMP CATCH BASINS	0.25	1.00	0.25	0.75
WATER QUALITY INLET (CDS-UNIT)	0.80	0.75	0.60	0.15
INFILTRATION BASIN	0.80	0.15	0.12	0.03

Total TSS Removal = 0.97

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

Project: ANDRADE

Prepared By: KJM | RKR

Date: 10/7/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

FIELD ENGINEERING, INC. MATTAPOISETT, MA

RECHARGE VOLUME CALCULATIONS

Client:	DAVID ANDRADE	Job No.	2443
Project:	PROPOSED ROADWAY	Date:	10/7/2021
Location:	GREAT NECK ROAD	Design by:	R. RICCIO

RECHARGE VOLUME CALCULATIONS

HYDROLOGIC SOIL GROUP	A
UNIT VOLUME (in.) =	0.60
IMPERVIOUS AREA (s.f.) =	20,558
RECHARGE VOLUME (cu.ft.) =	1,028

AVAILABLE VOLUME CALCULATION (BASIN

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)	
**	**				
8.0	3,370.0	0.0	0.0	0.000	
10.8	5,476.0	12,163.3	12,163.3	0.279	
RECHARGE VOLUME PROVIDED			12,163.3	0.279	
RECHARGE VOLUME REQUIRED			1,027.9	0.024	OK

DRAWDOWN TIME CALCULATION

DRAWDOWN TIME=(REQ.RECH. VOL.)/(DES. INFILTRATION RATE "K"*BOTTOM AREA

RECHARGE VOLUME PROVIDED (CF)=	12,163.3	
DESIGN INFILTRATION RATE (IN/HR)=	2.4	
BOTTOM AREA(SF)=	3,370.0	
DRAWDOWN TIME (HRS)=	18.0	OK

FIELD ENGINEERING, INC. MATTAPOISETT, MA

RECHARGE VOLUME CALCULATIONS

Client:	DAVID ANDRADE	Job No.	2443
Project:	PROPOSED ROADWAY	Date:	10/7/2021
Location:	GREAT NECK ROAD	Design by:	R. RICCIO

RECHARGE VOLUME CALCULATIONS-LEACHING PITS

HYDROLOGIC SOIL GROUP	A
UNIT VOLUME (in.) =	0.60
IMPERVIOUS AREA (s.f.) =	18,030
RECHARGE VOLUME (cu.ft.) =	902

AVAILABLE VOLUME CALCULATION (LEACHING PITS

ELEV (ft.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**			
11.45	0.0	0.0	0.000
17.00	3,877.0	3,877.0	0.089

RECHARGE VOLUME PROVIDED	3,877.0	0.089	
RECHARGE VOLUME REQUIRED	901.5	0.021	OK

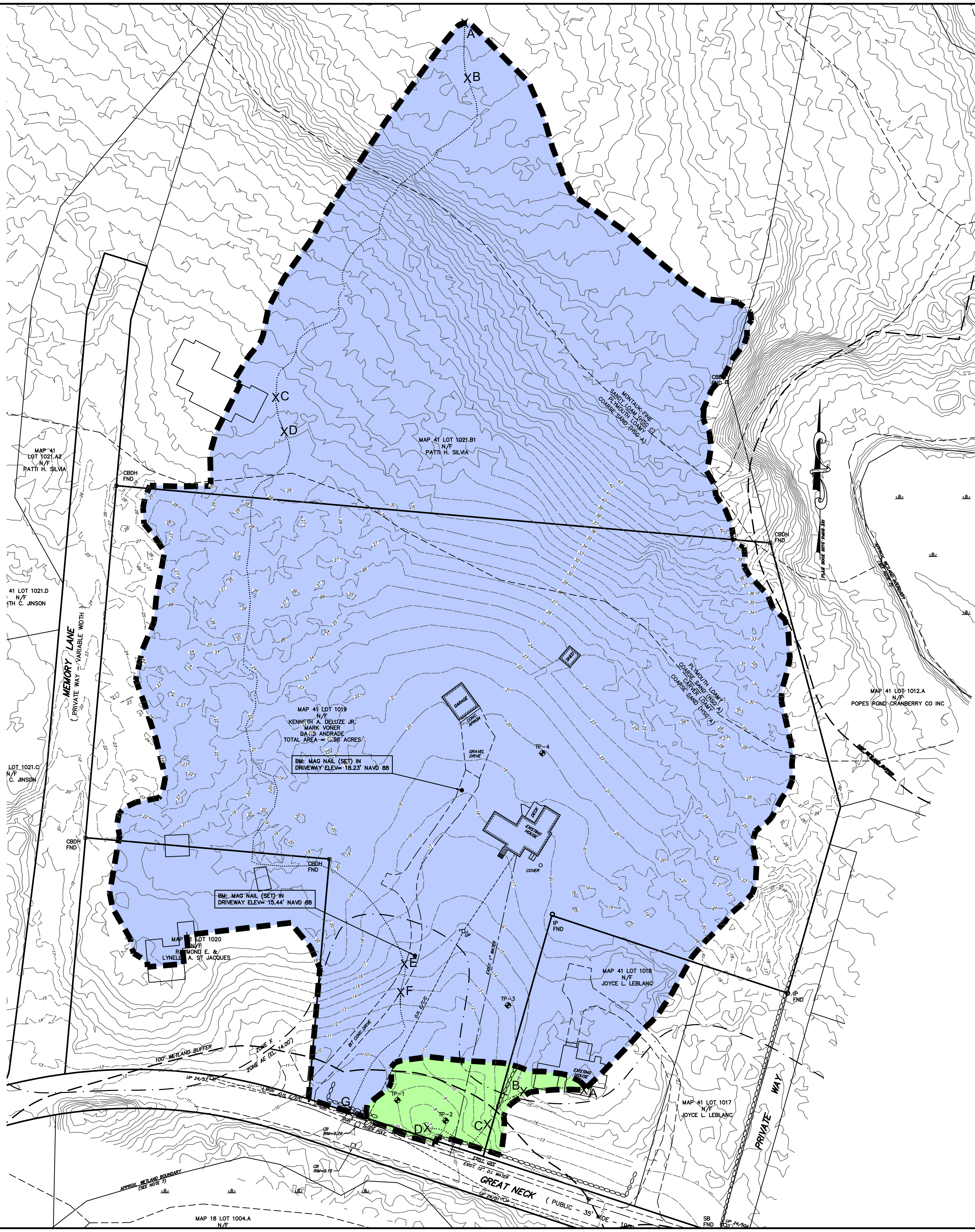
DRAWDOWN TIME CALCULATION

DRAWDOWN TIME=(REQ.RECH. VOL.)/(DES. INFILTRATION RATE "K"*BOTTOM AREA

RECHARGE VOLUME PROVIDED (CF)=	3,877.0	
DESIGN INFILTRATION RATE (IN/HR)=	2.4	
BOTTOM AREA(SF)=	800.0	
DRAWDOWN TIME (HRS)=	24.1	OK

Appendix A

Pre and Post Development Watershed and Subcatchment Area Plans



WATERSHED AREA PRE 1 0.22 AC.

WATERSHED AREA PRE 2 8.87 AC.

50 0 25 50 100

SCALE: 1 INCH = 50 FEET

2443_SITE.dwg

FIELD ENGINEERING CO., INC.
CONSULTING ENGINEERS

11D INDUSTRIAL DRIVE
P.O. BOX 1178
MATTAPOISETT, MA 02739
TEL: (508) 758-2749
FAX: (508) 758-2849

No.	Description	Date	Appvd.

Date: 10/7/2021

Scale: 1"=50'

Drawn By	Designed By	Checked By
PGT	PGT	RRR

Issued For: PERMITTING

DEFINITIVE SUBDIVISION PLAN OF LAND
SHELL POINT PLACE
DAVID ANDRADE

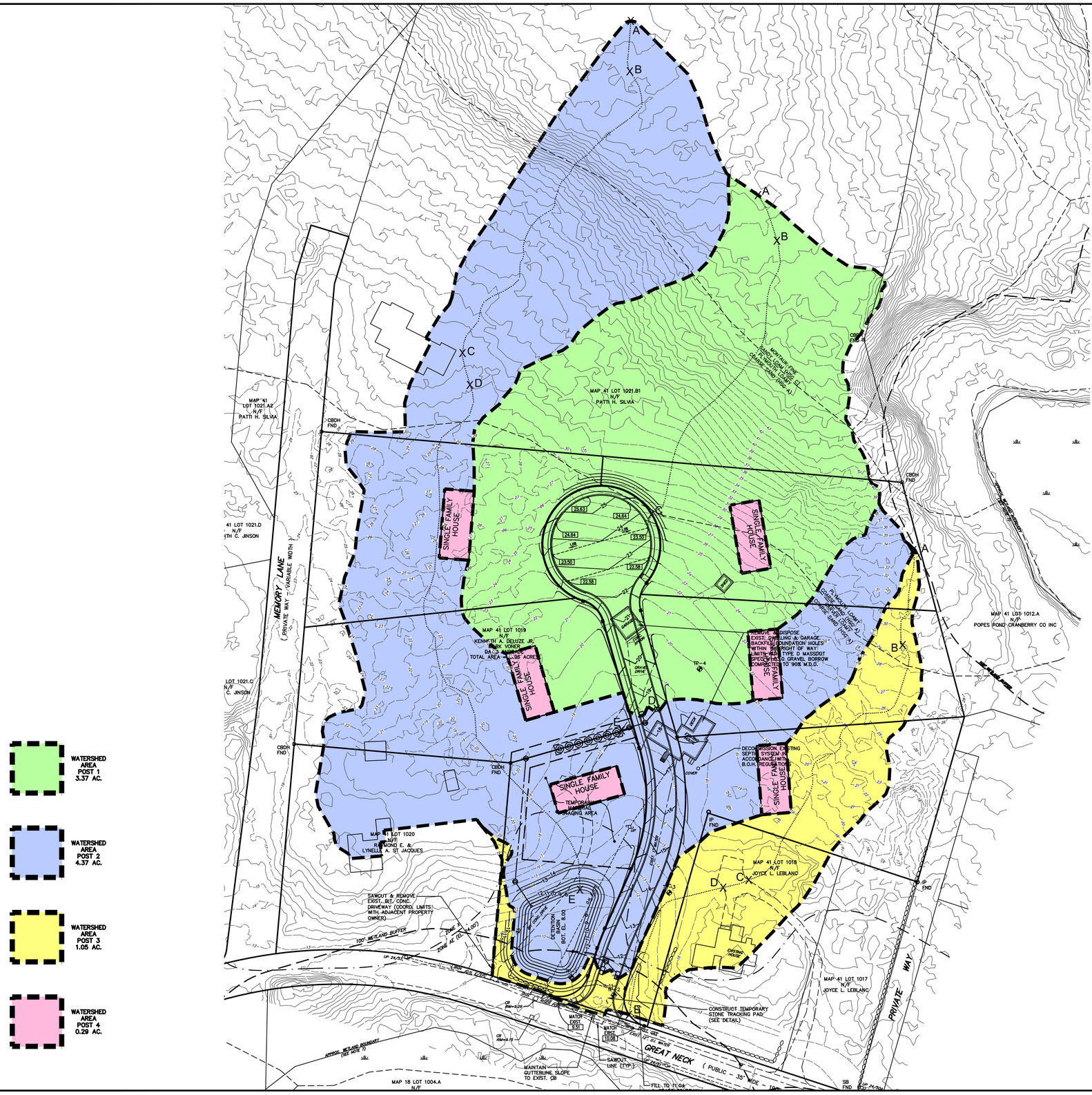
69 GREAT NECK ROAD
WAREHAM, MASSACHUSETTS

Drawing Title: PRE DEVELOPMENT WATERSHED PLAN

Project No.: 2443

Sheet: 1 OF 1

Sheet No.: PRE-1



2443_SITE.dwg

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Revisions

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PGT	PGT	RRR

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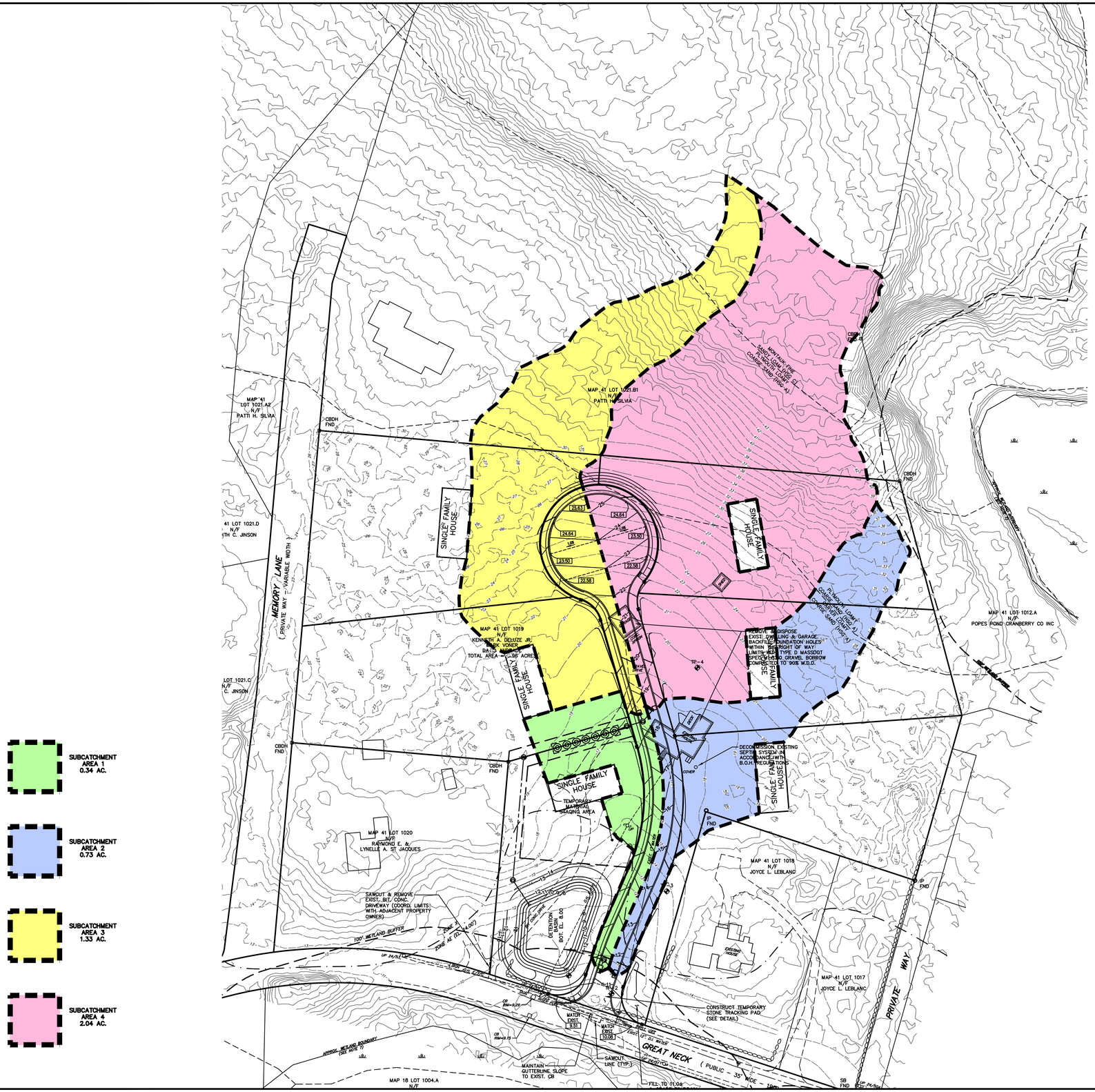
DEFINITIVE SUBDIVISION PLAN OF LAND
SHELL POINT PLACE
DAVID ANDRADE

69 GREAT NECK ROAD
WAREHAM, MASSACHUSETTS

Drawing Title: POST DEVELOPMENT WATERSHED PLAN

Project No.	Sheet
2443	1 OF 1

Sheet No.: POST-1



2443_SITE.dwg

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Revisions

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Date: 10/7/2021

Scale: 1"=50'

Drawn By	Designed By	Checked By
PGT	PGT	RRR

Issued For: PERMITTING

DEFINITIVE SUBDIVISION PLAN OF LAND
SHELL POINT PLACE
DAVID ANDRADE

69 GREAT NECK ROAD
WAREHAM, MASSACHUSETTS

Drawing Title: SUBCATCHMENT AREA PLAN

Project No.	Sheet
2443	1 OF 1

Sheet No.: SUB-1

Appendix B

Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan
Proposed Definitive Subdivision Plan
David Andrade
Great Neck Road
Wareham, Massachusetts

1.0 Introduction

This Long Term Pollution Prevention Plan has been prepared in accordance with the Massachusetts Stormwater Handbook for Compliance with Stormwater Standards 4-6.

2.0 Good Housekeeping Practices/Storage Provisions

Good housekeeping practices including periodic inspections of stormwater management system components will be performed in accordance with the Stormwater Management System Operation and Maintenance Plan. It is not anticipated that any high pollutant materials would be stored on site in areas that would discharge directly to the wetland systems. It would be anticipated that maintenance personnel would make routine visits to the property to perform periodic inspections to the facility and stormwater management system components.

3.0 Routine Maintenance of Stormwater BMP's

The Stormwater BMP's including the leaching pits and infiltration basin will all be operated and maintained in accordance with the Stormwater Management System Operation and Maintenance Plan which is discussed on the Definitive Subdivision Plans.

4.0 Landscaping Provisions

Landscaping on-site will consist strictly of loam and seeded areas. It is anticipated that the grassed areas within the roadway shoulders will be mowed once or twice annually. Disposal of lawn and garden waste will be prohibited from any areas being used for stormwater management as well as in any wetland resource areas. Additionally, provisions shall be made to minimize the amount of fertilizers and other materials that will be allowed to be discharged within the landscaped areas on the site.

5.0 Pet Waste Management Provisions

Residents will be asked to pick up and dispose of pet waste in proper locations as required.

6.0 Provisions for Solid Waste Management

It would be anticipated that solid waste will be picked up from the residences on a regular basis as is done throughout the Town.

7.0 Illicit Discharge Prevention

Illicit connections to the stormwater management system will be strictly prohibited. Any contractors performing work at the site will be notified of the prohibition of any illicit connections to the stormwater management system. All work done on site shall be per the approved design plans.

Appendix C

Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement
Proposed Definitive Subdivision Plan
David Andrade
Great Neck Road
Wareham, Massachusetts

1.0 Description of Illicit Discharges

Illicit discharges are discharges to the stormwater management system that are not entirely composed of stormwater. Illicit discharges include (but are not limited to) wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

2.0 Illicit Discharge Prevention

The project, as designed, does not provide for any illicit connections to the proposed stormwater management system. As part of the long-term pollution prevention plan that will be on file at the Town and with the Owners, illicit connections to the stormwater management system will be strictly prohibited. Any contractors performing work at the site will be notified of the prohibition of any illicit connections to the stormwater management system.

3.0 Training for Staff

The property owner/managers responsible for the maintenance of the stormwater management system will be properly trained as required to detect any unauthorized illicit discharges to the stormwater management system and eliminate them as soon as possible. It is anticipated that staff will be performing routine maintenance on the stormwater management system and at this time would be able to detect any unauthorized illicit discharges.

4.0 Site Map

Refer to Proposed Definitive Subdivision Plans by Field Engineering for locations and information on the proposed stormwater management system associated with this project.

5.0 Certification

As the design plans show, there are no provisions for illicit discharges to the stormwater management system being proposed. Additionally, there are no proposed connections between any stormwater and wastewater management systems. Illicit discharges will be prohibited to the new stormwater management system associated with the proposed project and the property owners have been notified to not allow any unauthorized illicit discharges.

COMMONWEALTH OF MASSACHUSETTS
RICHARD R. RICCIO III
CIVIL
No. 45993
REGISTERED PROFESSIONAL ENGINEER

Richard R. Riccio III, P.E.

10/7/2021