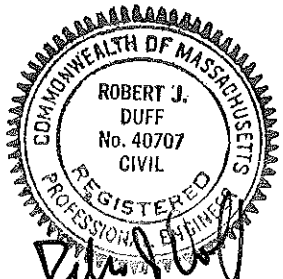
Stormwater Report
North Street & Blackstone Street
Bellingham, MA



Date: December 30, 2022
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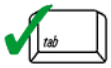
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

Checklist for Stormwater Report

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.

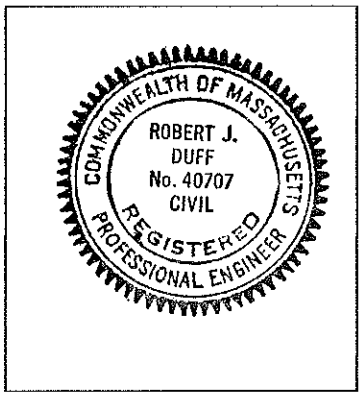
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Robert J Duff 11-15-2023
Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

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

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

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

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

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

Project Description

The project locus is a 20.8± acre site located adjacent to North Street, and Blackstone Street. It is in the Agricultural District Zone. The project area contains approximately 5.4± acres of land which will be fully developed, and the remaining lot area consists of approximately 15.5± acres which will be designated as conservation land which will remain undeveloped. Run-off from this property generally flows from west to east ultimately captured within Bordering Vegetative Wetland (BVW) located in the easterly portion of the property. See Appendix 1/Locus Map.

Soils on site are in three categories – a Canton fine sandy loam 422B, 0 to 8% slopes, extremely stony, Hydrologic Group B, Canton fine sandy loam 420B, 3 to 8% slopes, Hydrologic Group B, and Merrimac fine sandy loam 254B, 3 to 8% slopes, Hydrologic Group A based on the web soil survey and site observations - See Appendix 2 / NRCS Soil Report.

The project proponent intends to construct a 366± foot long roadway with bituminous concrete curbing and asphalt sidewalk. The proposed road will be 22' wide paved surface with access to Blackstone Street and will serve five 3-unit Townhouses. Each unit will have public water service and all units will be connected to a shared septic system for sewer. Storm water run-off will be collected by catch basin to manhole drainage system. A majority of run-off captured within the development will be sent to an infiltration basin, while the remaining runoff, will be conveyed through a series of drainage pipes and swales. Ultimately all the runoff generated from this development will be discharged to the existing wetlands located on the property to the east.

Pre-development drainage runoff from the site was analyzed as two watersheds - See Appendix 10 / Drainage Area Plans.

- EX-1 – This watershed drainage area includes approximately 19.4± acres of both onsite and offsite areas. Runoff from this watershed flows easterly to an existing depression, which discharges overland when full to the bordering vegetative wetlands located on the east side of the property and is identified at the point of analysis (AP-1).

- EX-2 – This watershed drainage area includes approximately 2.0± acres of contributing area. Runoff from this watershed flows overland southeasterly to Blackstone Street, which is identified at the point of analysis (AP-2).

The Post-Development Drainage Analysis regards the area as four watersheds –
See Appendix 10 / Drainage Area Plans.

- PR-1 watershed consists of a proposed paved roadway, sidewalks, driveways, roofs, infiltration basin, and lawn areas of the proposed development which will be collected by the proposed drainage system. The entirety of the proposed drainage system is collected by street catch basins and conveyed by drainage pipes and

manholes to the proposed infiltration basin located in the eastern side of the project area, ultimately discharging to the wetlands located to the east within the proposed conservation area and is identified as point of analysis (AP-1).

- PR-2 watershed includes primarily the undeveloped portion of the property located along the north and west property lines, as well as a portion of the westerly lawn area. Topography and runoff patterns remain generally unchanged from the pre-development conditions. Runoff generated in this sub catchment flows via surface flow to inlet basin #2 and is captured and conveyed via pipe to the proposed infiltration basin for infiltration and detention prior to discharging to the wetlands located to the east within the conservation easement and is identified as point of analysis (AP-1).

- PR-3 watershed includes primarily the undeveloped portion of the property which currently flows to Blackstone Street, as well as a portion of the southwesterly lawn area. Topography and runoff patterns remain generally unchanged from the pre-development conditions. Runoff generated in this sub catchment flows via surface flow southeasterly to Blackstone Street, identified as point of analysis (AP-2).

- PR-4 watershed consists of that portion of the proposed lawn area not captured by the proposed drainage system, which flows easterly overland via swale, discharging to the wetlands identified as point of analysis (AP-1)

Post development stormwater runoff will be treated and attenuated by a standard catch basin to manhole collection system. The site has soils that are considered to have low stormwater runoff potential as identified in the NRCS Web Soil Survey information provided in Appendix 2. The site is designed to be in conformance with the Massachusetts Stormwater Management Guidelines, Massachusetts Wetlands Protection Act and the Town of Bellingham local bylaws and regulations for stormwater management and compliance.

Stormwater Design Parameter:

The stormwater management system was designed to control the post-development rate of peak rainfall runoff from the site by keeping it below the post-development peak rate of rainfall runoff as stated as the objective in the Massachusetts Stormwater Handbook. The calculations were performed using the HydroCAD hydraulic program, developed by applied Microcomputer System. The HydroCAD software is based upon the Soil Conservation Service, "Technical Release 55 – Urban Hydrology for Small Watersheds" and is generally accepted industry methodology.

The analysis was performed for the 2-year, 10-year, and 100-year 24-hour storm events.

The following data was required for input:

- Watershed Area: Areas of each watershed were calculated and expressed in square feet for these calculations.

- SCS Curve Number (Cn): Based on the cover type and hydrologic soil group, a weighted curve number (CN) was determined for each of the existing watersheds utilizing Table 2-2a- *Runoff Curve Numbers For Urban Areas* and *Worksheet 2, Runoff Curve Number and Runoff* from the Soil Conservation Service Technical Release 55 – Urban Hydrology for Small Watersheds.
- Time of Concentration, Tc (Minutes): The time of concentration for each watershed was determined by finding the time necessary for runoff to travel from the hydraulically most distant point in the watershed to the point of analysis. This was calculated by using a minimum time of 6 minutes for runoff to reach the most distant catch basin.
- SCS 24-Hour Storm Type: For the greater New England region, a Type III storm rainfall distribution is recommended for drainage calculations and was used for this project.
- Rainfall Precipitation: Rainfall precipitations used the Cornell Extreme Precipitations rainfall estimates for Norfolk County for the 2, 10, 25, and 100 year storm events and are as follows:

2-year storm event: 3.26 inches
10-year storm event: 4.88 inches
25 year storm event: 6.15 inches
100-year storm event: 8.74 inches

An on-site conventional storm drainage collection system is designed based on the "Rational Method" using Manning's equation to carry a minimum 25-year storm event and underground culverts to carry a minimum 50-year storm event through the site (See Pipe Sizing Attachments). The proposed drainage pipes will be Reinforced Concrete Pipe (RCP), unless otherwise noted on the plans.

Compliance with the 10 Stormwater Standards

Standard 1: No new untreated Discharges

All Paved area runoff from the proposed development will flow across the pavement areas, accumulate into hooded catch basins, connect with drain pipe to a sediment forebay, which discharges to the infiltration basin. No new untreated stormwater discharges are proposed.

Standard 2: Peak Rate Attenuation

To meet Standard 2, the post-development peak discharge rate must be equal to or less than pre-development rates to prevent storm damage and downstream and offsite flooding from the 2-year and the 10-year 24-hour storm events. In addition, the Bellingham Wetlands Bylaws require that runoff volumes not exceed pre-development conditions for up to the 25-year storm. Additionally, surface basins are to be sized assuming frozen conditions within the basin, with no infiltration during a 25-year storm event.

Peak discharge rates were calculated and evaluated at Blackstone Street and the existing wetlands. The point of evaluation is shown on the accompanying watershed plans.

In summary of the attached drainage analysis (HydroCAD), the peak discharge rates (cfs) and Volumes (af) at the point of evaluation are as follows;

Table 1A: Peak Rate Attenuation Summary

	2-yr Storm	**10-yr Storm**	**25-yr Storm**	**25-yr Storm**	**100-yr Storm**
				Frozen Cond.	
Flow to Analysis Point (AP-1)					
Pre-Development	0.0 cfs	0.0 cfs	1.63 cfs	4.37 cfs	19.51 cfs
Post-Development	0.0 cfs	0.0 cfs	1.24 cfs	4.29 cfs	14.69 cfs
Flow to Analysis Point (AP-2)					
Pre-Development	0.19 cfs	1.24 cfs	2.39 cfs	N/A	5.20 cfs
Post-Development	0.19 cfs	1.19 cfs	2.29 cfs	N/A	4.99 cfs

Table 1B: Runoff Volume

	2-yr Storm	**10-yr Storm**	**25-yr Storm**	**25-yr Storm**	**100-yr Storm**
Flow to Analysis Point (AP-1)				**Frozen Cond.**	
Pre-Development	0.000 af	0.00 af	0.15 af	1.39 af	1.932 af
Post-Development	0.000 af	0.01 af	0.14 af	2.12 af	1.388 af
Flow to Analysis Point (AP-2)					
Pre-Development	0.05 af	0.16 af	0.28 af	N/A	0.56 af
Post-Development	0.05 af	0.16 af	0.28 af	N/A	0.58 af

In addition to peak rate attenuation and volume reduction, an on-site storm drain collection system was designed based on the "Rational Method" using Manning's equation to carry a minimum 25-year storm event through the site. The proposed drainage pipes will be Class III reinforced concrete pipe (RCP) and where cover is less than 3.0 ft Class V RCP will be used. On-site storm drainage calculations are included in Appendix 11 / Supplemental Attachments.

Standard 3: Recharge

Soil Evaluation

Soil evaluation is broken down into two stages. Stage 1 identifies the underlying soils just beneath the surface that contribute to how much runoff is generated as stormwater falls and moves across the surface. Stage 2 evaluates the soils in direct contact with the proposed infiltration BMPs. Appendix 2 includes the NRCS Soil Survey used for Stage 1 while Appendix 3 includes the on-site soil textural analysis in the specific locations that infiltration

is proposed. The information from the NRCS Soil Survey is on the Pre and Post Development drainage plans in Appendix 10.

Recharge Volume

The required recharge volume is determined by calculating the proposed impervious area over the corresponding soil identified in the NRCS Soil Survey. As previously stated, the NRCS Soil Survey lists the site as Canton Fine Sandy Loam, 0 to 8 percent slopes, HSG B, Canton Fine Sandy Loam, 3 to 8 percent slopes, HSG B, and Merrimac Fine Sandy Loam, 3 to 8 percent slopes, HSG A. While the site consists of an existing undeveloped residential lot, the project is considered a new development project, as noted in Standard 7, therefore the recharge volume was calculated for the total impervious area.

Table 2: Required Recharge Volume Calculation

	Recharge	**Impervious**	**Volume**
Hydrologic Group	(in/sqft)	(sqft)	(cf)
A - *sand*	0.60	57,369	2,868 cf
B - *loam*	0.35	0	0
C - *silty loam*	0.25	None	0
D - *clay*	0.10	None	0
		Required Recharge Volume Total	**2,868 cf**

Stormwater Basin Sizing

There are three ways of determining the recharge volume provided by a storm water basin (Static, Simple Dynamic and Dynamic Field). The Static Method, used here, includes the volume of water that can be stored beneath the lowest outlet of the basin. This, the most conservative method of determining the recharge volume, does not account for any infiltration that takes place while the basin is filling with water and is less dependent on maintenance of the basin since the only way for the water below the lowest invert can leave the basin is though infiltration. The following table summarizes the recharge volume provided by the infiltration basin. Detailed volume calculations for the basins are included in Appendix 5 / Stage-Area-Storage Calculations.

Table 3: Basin Recharge Volume

	Recharge Volume
Basin 1	17,862 cf
Total	17,862 cf

72-hour Drawdown

When using the conservative Static Method to determine infiltration volume provided, the Rawls Rate is used to represent the infiltration rate in place of a hydraulic conductivity rate. The specific rate chosen is based on the textural analysis of the in-situ soil performed by a competent soil professional.

A Massachusetts Certified Soil Evaluator performed an evaluation of the soil at the proposed infiltration BMP. The soil textural analysis for the infiltration BMP is listed below with the associated Rawls Rate used in the calculations. Where textural analysis varied within any single BMP, the most restrictive textural evaluation and Rawls Rate were used. Soil logs of the in-situ soil evaluation are included in Appendix 3 / Field Soils Evaluation.

Table 4: Rawls Rate

	Most Restrictive Soil Texture	**Rawls Rate (in/hour)**
Basin 1	Sand	8.27 in/hr

Drawdown time for the infiltration basin is determined by applying the Rawls Rate across the bottom area of the infiltration basin. The volume required for drawdown includes the entire volume below in the lowest outlet in the infiltration basin. The following table summarizes the drawdown time for the basin to show it will drawdown within the 72-hour maximum.

Table 5: Basin Drawdown

	Storage Volume	**Bottom Area**	**Time for Drawdown**
Basin 1	17,862 cf	10,452 sf	3 hours

In addition, the HydroCAD model demonstrates that the proposed basin will fully dewater at the 26 hour mark during/after the 100-year design storm.

Standard 4: Water Quality

Water Quality Volume

The required water quality volume is determined through a calculation of the proposed impervious pavement throughout the site and a determination of whether the site is in a critical area, or the proposed use is considered to produce a high pollutant load. As noted in Standards 5 and 6, the land use does not qualify as a use with high pollutant load and no critical area was identified for this site. However, the required water quality volume is based on 1.0" as the soil recharge rate is 8.27 in/hr, meeting the threshold rate of 2.4 in/hr or greater, therefore, the water quality volume is calculated at 1.0" over the area of new proposed impervious pavement.

The area of impervious materials within the proposed site is calculated from the information entered HydroCAD and can be found in Appendix 4. One inch across 38,071 square feet of impervious pavement requires a water quality volume of 3,172.6 cubic feet. Detailed calculations for the infiltration basin are included in Appendix 5 / Stage-Area-Storage Calculations.

Removal of Total Suspended Solids

The water quality volume, as calculated in the previous section, is treated through "Treatment Trains" to provide a minimum of 80 percent TSS removal including 44 percent TSS removal for pretreatment prior to discharging to the infiltration BMP. The TSS Removal Worksheets are included in Appendix 6 for the proposed treatment train. The infiltration basin in conjunction with deep sump hooded catch basins and sediment forebay complete the treatment trains at a minimum of 80 percent and 44 percent TSS removal.

Forebay Sizing

All the stormwater from the impervious pavement is collected and discharged to the proposed sediment forebay which is sized to treat 0.1" of runoff from the 38,071-sf impervious area contributing to the basin. Detailed calculations for the sediment forebay are included in Appendix 5 / Stage-Area-Storage Calculations.

0.1"/12" per foot x 38,071 sf = 317.3 cf of storage required

Table 6: Sediment Forebay Sizing

	Impervious Area being Discharged	**Required Volume**	**Provided Volume**
Forebay 1 @ Inv.=307.0	38,071 cf	317.3 c.f.	1,425c.f.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The proposed project is not a use that would qualify as a LUHPPL.

Standard 6: Critical Areas

The proposed project is not within, nor does it discharge stormwater to an identified Critical Area. However, the site does contain soils with rapid infiltration rates (>2.41 in/hr), and must meet the 1" WQV requirement of Standard 4.

Standard 7: Redevelopment Project

This project is not a redevelopment project.

Locus Map

Appendix 1

U.S.G.S.
Quadrangle

Scale: 1"=2000'

0 2000' 4000' 6000' 8000'

LOCUS MAP

North Street & Blackstone Street
Bellingham, Massachusetts

Date: August 8, 2022 | ***Project No. F4457***

Guerriere & Halnon, Inc.
Engineering & Land Surveying
333 WEST STREET, MILFORD, MA 01757
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NRCS Soils Report

Appendix 2

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

North Street & Blackstone Street

August 10, 2022

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,080 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 17, Sep 3, 2021

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

Date(s) aerial images were photographed: May 24, 2020—Jul 18, 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
53	Freetown muck, ponded, 0 to 1 percent slopes	2.0	9.5%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	12.8	61.3%
420B	Canton fine sandy loam, 3 to 8 percent slopes	1.3	6.1%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	4.8	23.1%
Totals for Area of Interest		**20.8**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Norfolk and Suffolk Counties, Massachusetts

53—Freetown muck, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2qc
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Freetown, Ponded

Setting

Landform: Kettles, marshes, depressions, depressions, bogs, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Whitman, ponded

Percent of map unit: 5 percent
Landform: Depressions on ground moraines

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea, ponded

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

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

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

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w818
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canton, Extremely Stony

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony
Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony
Percent of map unit: 6 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea
Percent of map unit: 4 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Montauk, extremely stony
Percent of map unit: 4 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

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Field Soils Evaluation

Appendix 3

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #1

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
10-30	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
30-108	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 96"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #2

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
10-20	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
20-136	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 126"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH-3

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
8-30	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
30-130	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes NO MOTTLES / WEEPING

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #4

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
8-26	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
26-156	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 156"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #5

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
6-18	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
18-190	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 190"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #6

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
6-24	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
24-154	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes NO MOTTLES OR WEEPING

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #7

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
12-20	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
20-108	C	2.5Y 5/4	-	-	-	L.S.	20	20	-	-	-

Additional Notes NO MOTTLES OR WEEPING

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #8

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
8-24	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
24-103	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WATER @ 92"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #9

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-48	F	-	-	-	-	-	-	-	-	-	-
48-108	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 80"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #10

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
14-28	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
28-42	C1	2.5Y 6/2	-	-	-	S.L.	0	0	-	-	-
42-100	C2	2.5Y 5/4	48"	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 86"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #11

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
12-36	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
36-116	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 96"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #12

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
12-104	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 90"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Deep Observation Hole Number: DTH #13

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
12-24	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
24-103	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes STANDING WATER @ 100"

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

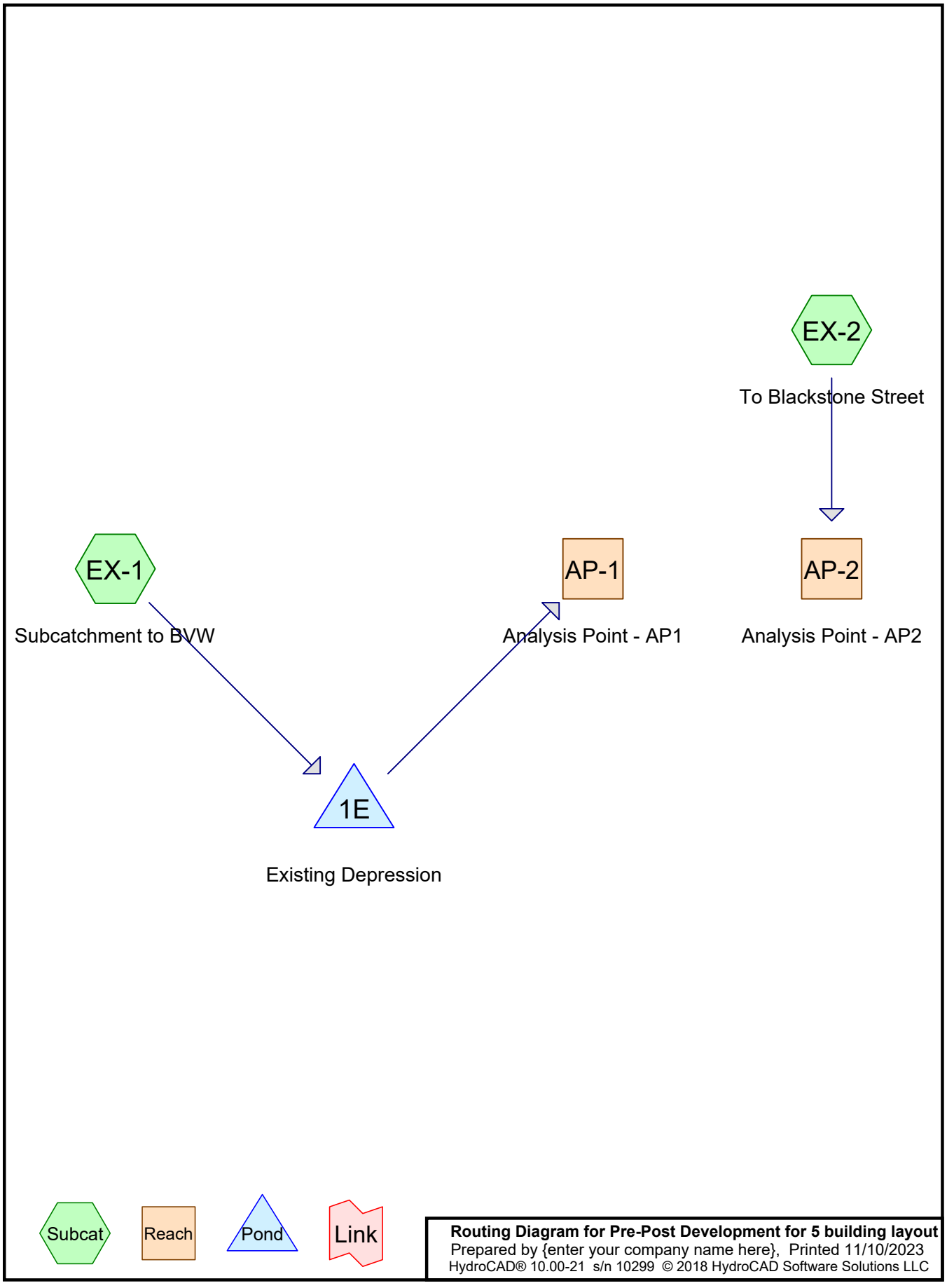
Deep Observation Hole Number: DTH #14

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR 3/3	-	-	-	S.L.	0	0	-	-	-
6-30	B	10YR 5/6	-	-	-	S.L.	0	0	-	-	-
30-114	C	2.5Y 5/4	-	-	-	SAND	20	20	-	-	-

Additional Notes WEEPING @ 100"

HydroCAD Calculations

Appendix 4



Routing Diagram for Pre-Post Development for 5 building layout
Prepared by {enter your company name here}, Printed 11/10/2023

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.753	39	>75% Grass cover, Good, HSG A (EX-1, EX-2)
0.860	61	>75% Grass cover, Good, HSG B (EX-1, EX-2)
0.646	98	Water Surface, HSG A (EX-1)
2.399	30	Woods, Good, HSG A (EX-1, EX-2)
13.720	55	Woods, Good, HSG B (EX-1, EX-2)
21.377	**51**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.798	HSG A	EX-1, EX-2
14.579	HSG B	EX-1, EX-2
0.000	HSG C	
0.000	HSG D	
0.000	Other	
21.377		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.753	0.860	0.000	0.000	0.000	4.612	>75% Grass cover, Good	EX-1, EX-2
0.646	0.000	0.000	0.000	0.000	0.646	Water Surface	EX-1
2.399	13.720	0.000	0.000	0.000	16.119	Woods, Good	EX-1, EX-2
6.798	**14.579**	**0.000**	**0.000**	**0.000**	**21.377**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EX-1: Subcatchment to Runoff Area=844,997 sf 3.33% Impervious Runoff Depth=0.14"
Flow Length=1,712' Tc=42.9 min CN=50 Runoff=0.41 cfs 0.228 af

Subcatchment EX-2: To Blackstone Street Runoff Area=86,206 sf 0.00% Impervious Runoff Depth=0.30"
Flow Length=529' Tc=20.7 min CN=56 Runoff=0.19 cfs 0.049 af

Reach AP-1: Analysis Point - AP1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach AP-2: Analysis Point - AP2 Inflow=0.19 cfs 0.049 af
Outflow=0.19 cfs 0.049 af

Pond 1E: Existing Depression Peak Elev=307.63' Storage=902 cf Inflow=0.41 cfs 0.228 af
Discarded=0.31 cfs 0.228 af Primary=0.00 cfs 0.000 af Outflow=0.31 cfs 0.228 af

Total Runoff Area = 21.377 ac Runoff Volume = 0.277 af Average Runoff Depth = 0.16"
96.98% Pervious = 20.731 ac 3.02% Impervious = 0.646 ac

Summary for Subcatchment EX-1: Subcatchment to BVW

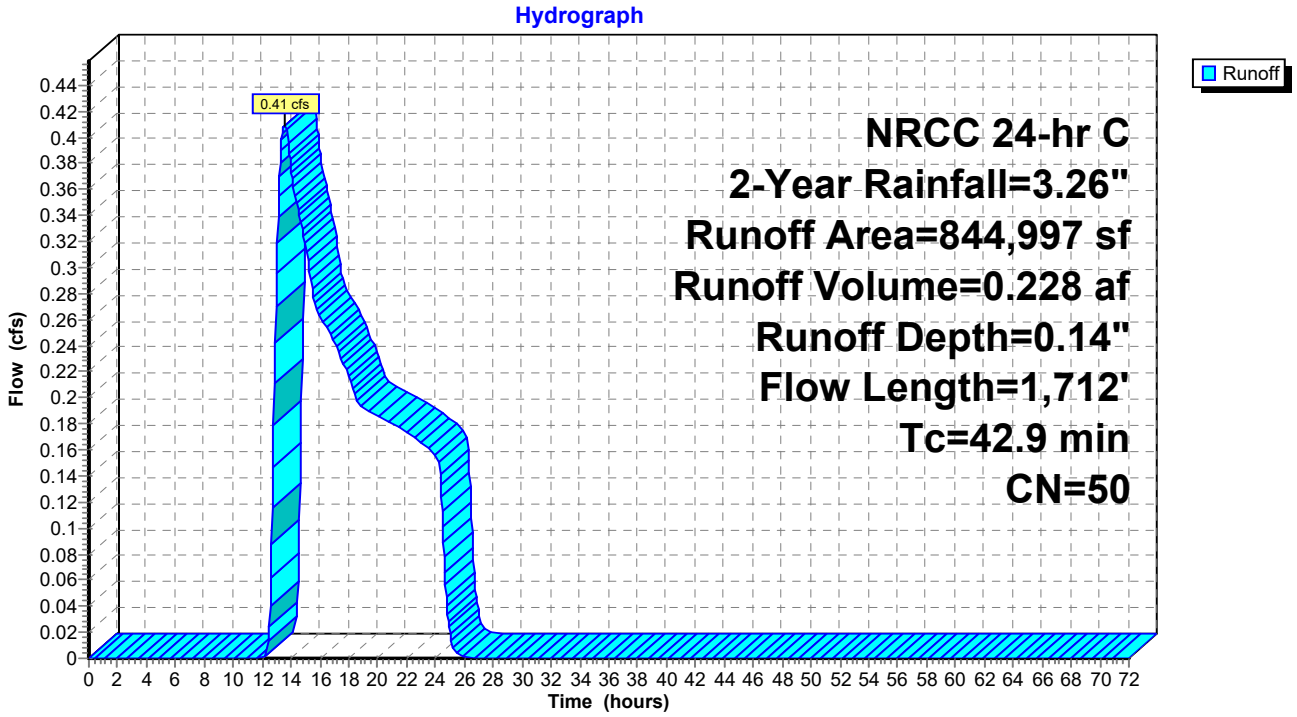
Runoff = 0.41 cfs @ 13.56 hrs, Volume= 0.228 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
528,369	55	Woods, Good, HSG B
20,766	61	>75% Grass cover, Good, HSG B
163,331	39	>75% Grass cover, Good, HSG A
104,370	30	Woods, Good, HSG A
28,161	98	Water Surface, HSG A
844,997	50	Weighted Average
816,836		96.67% Pervious Area
28,161		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
10.0	581	0.0190	0.96		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
7.1	411	0.0190	0.96		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
42.9	1,712	Total			

Subcatchment EX-1: Subcatchment to BVW



Summary for Subcatchment EX-2: To Blackstone Street

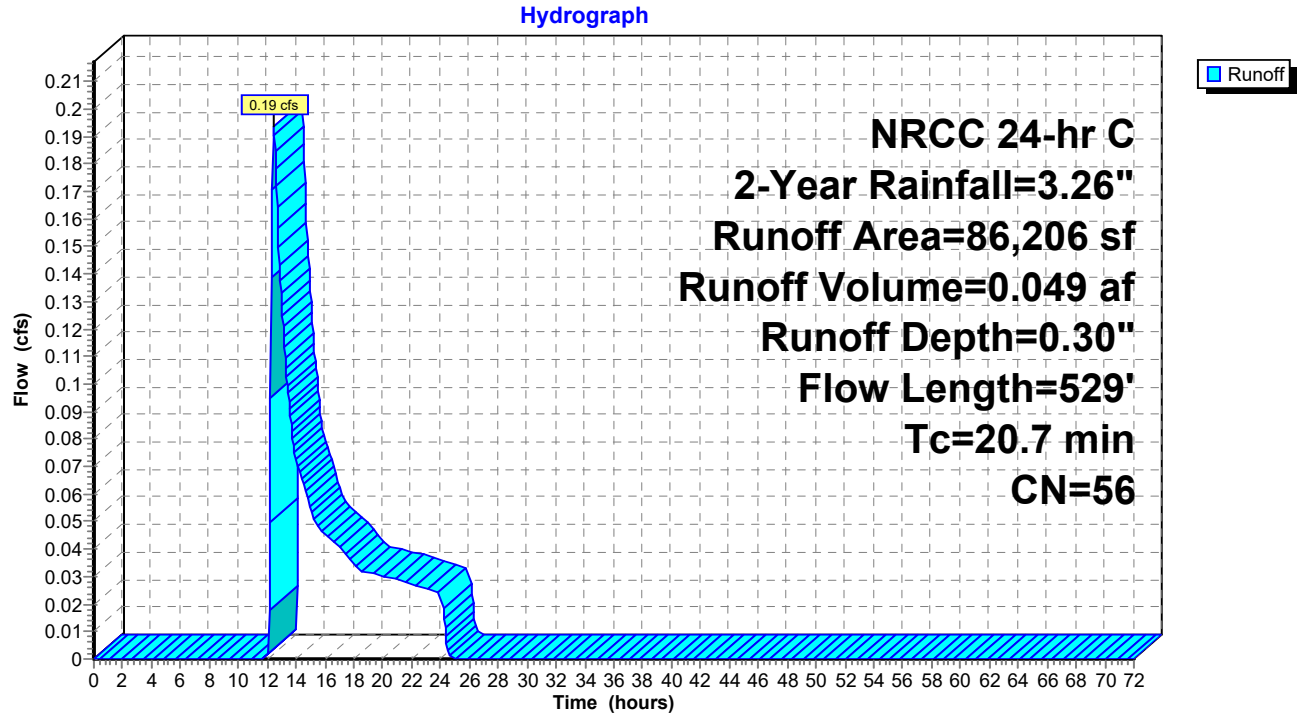
Runoff = 0.19 cfs @ 12.45 hrs, Volume= 0.049 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
69,268	55	Woods, Good, HSG B
16,676	61	>75% Grass cover, Good, HSG B
131	39	>75% Grass cover, Good, HSG A
131	30	Woods, Good, HSG A
86,206	56	Weighted Average
86,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
2.1	161	0.0340	1.29		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
20.7	529	Total			

Subcatchment EX-2: To Blackstone Street



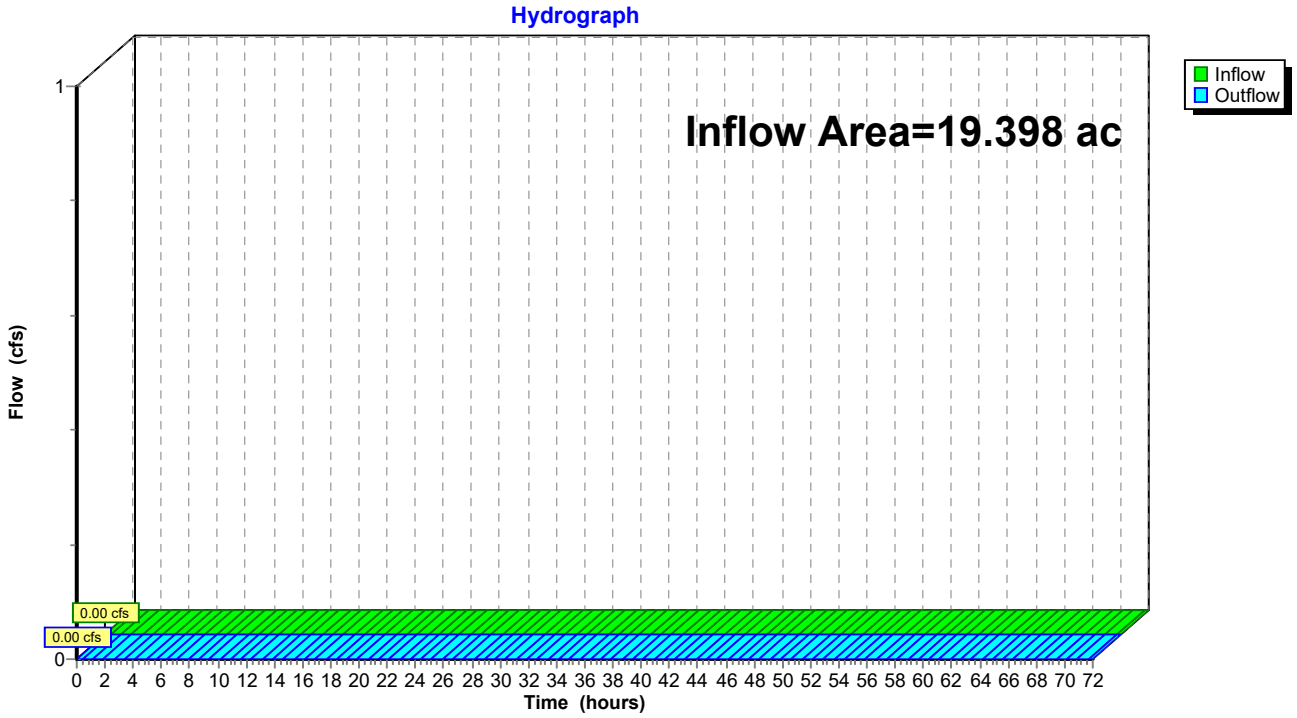
Summary for Reach AP-1: Analysis Point - AP1

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

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 0.00" for 2-Year 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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-1: Analysis Point - AP1



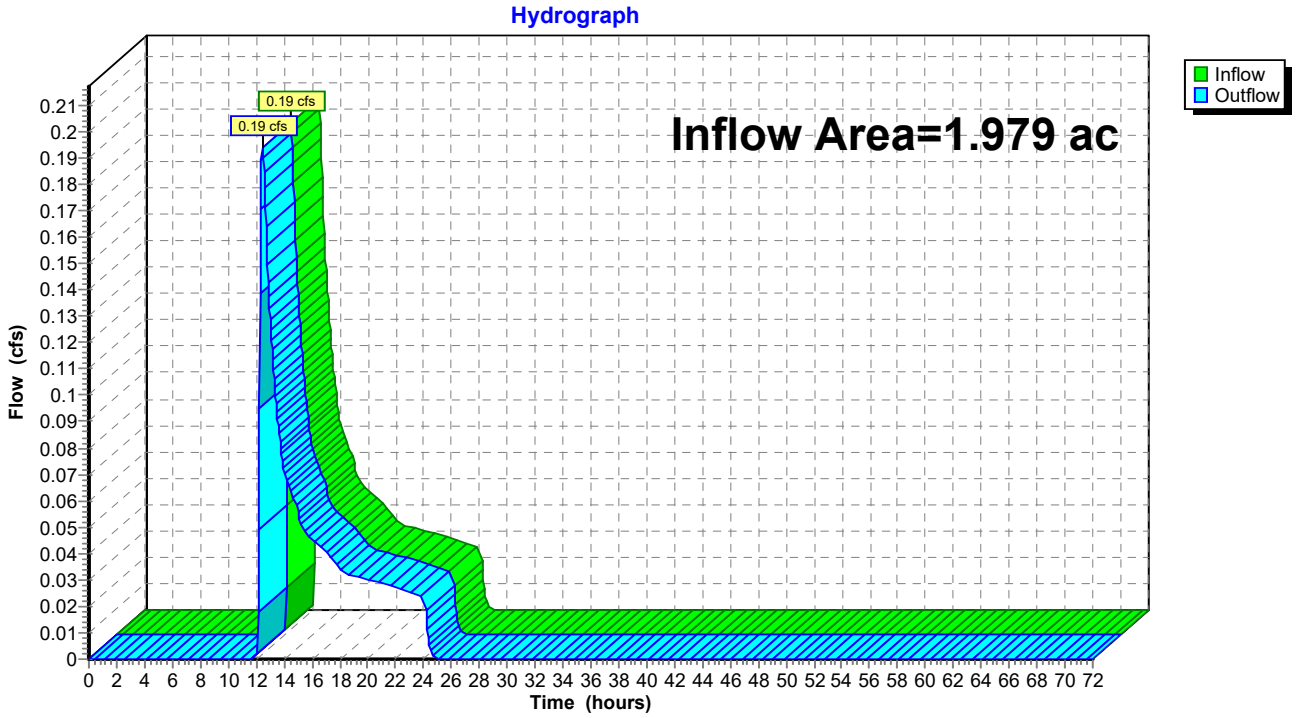
Summary for Reach AP-2: Analysis Point - AP2

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

Inflow Area = 1.979 ac, 0.00% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 0.19 cfs @ 12.45 hrs, Volume= 0.049 af
Outflow = 0.19 cfs @ 12.45 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-2: Analysis Point - AP2



Summary for Pond 1E: Existing Depression

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 0.14" for 2-Year event
Inflow = 0.41 cfs @ 13.56 hrs, Volume= 0.228 af
Outflow = 0.31 cfs @ 15.08 hrs, Volume= 0.228 af, Atten= 24%, Lag= 91.3 min
Discarded = 0.31 cfs @ 15.08 hrs, Volume= 0.228 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 307.63' @ 15.08 hrs Surf.Area= 5,347 sf Storage= 902 cf
Flood Elev= 309.20' Surf.Area= 30,032 sf Storage= 29,481 cf

Plug-Flow detention time= 36.8 min calculated for 0.228 af (100% of inflow)
Center-of-Mass det. time= 36.8 min (1,099.5 - 1,062.7)

Volume	Invert	Avail.Storage	Storage Description
#1	307.30'	53,507 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

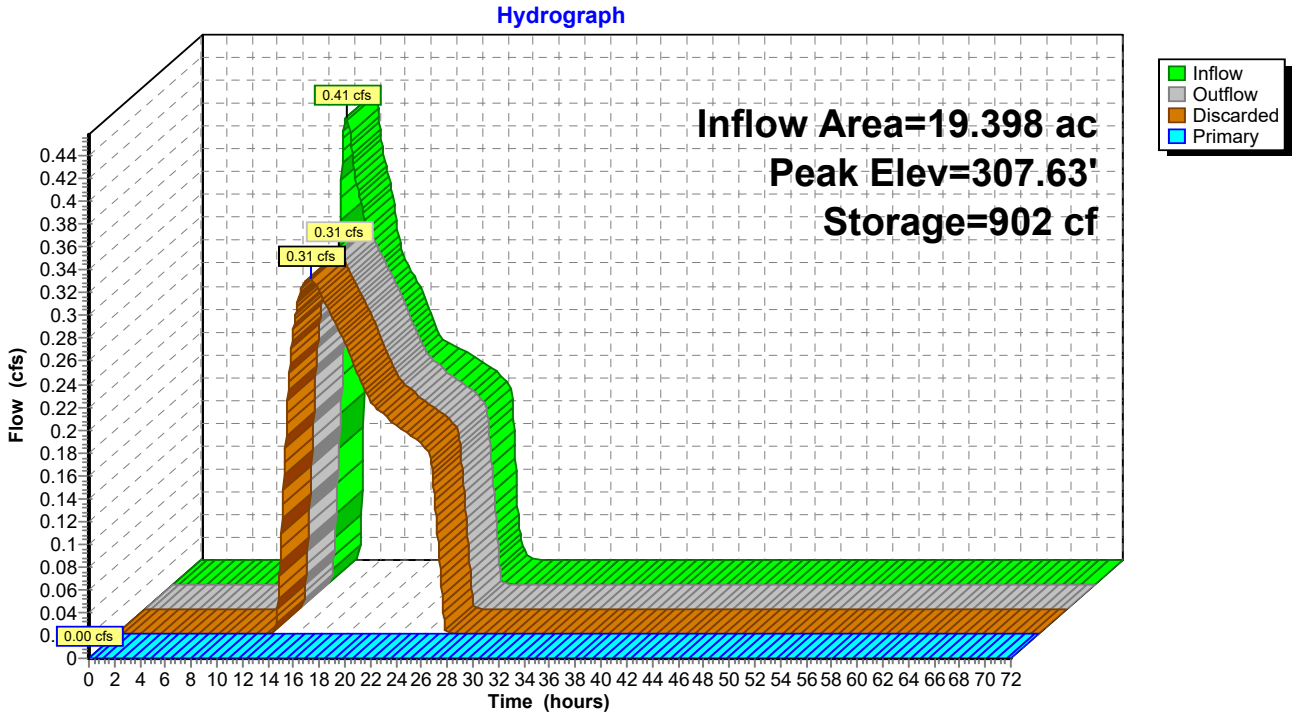
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.30	48	0	0
308.00	11,143	3,917	3,917
309.00	28,160	19,652	23,568
309.10	30,032	2,910	26,478
310.00	30,032	27,029	53,507

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.30'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.00' Phase-In= 0.01'
#2	Primary	309.05'	**30.0' 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=0.31 cfs @ 15.08 hrs HW=307.63' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=307.30' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1E: Existing Depression



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EX-1: Subcatchment to Runoff Area=844,997 sf 3.33% Impervious Runoff Depth=0.64"
Flow Length=1,712' Tc=42.9 min CN=50 Runoff=4.19 cfs 1.041 af

Subcatchment EX-2: To Blackstone Street Runoff Area=86,206 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=529' Tc=20.7 min CN=56 Runoff=1.24 cfs 0.162 af

Reach AP-1: Analysis Point - AP1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach AP-2: Analysis Point - AP2 Inflow=1.24 cfs 0.162 af
Outflow=1.24 cfs 0.162 af

Pond 1E: Existing Depression Peak Elev=308.55' Storage=12,664 cf Inflow=4.19 cfs 1.041 af
Discarded=1.33 cfs 1.041 af Primary=0.00 cfs 0.000 af Outflow=1.33 cfs 1.041 af

Total Runoff Area = 21.377 ac Runoff Volume = 1.203 af Average Runoff Depth = 0.68"
96.98% Pervious = 20.731 ac 3.02% Impervious = 0.646 ac

Summary for Subcatchment EX-1: Subcatchment to BVW

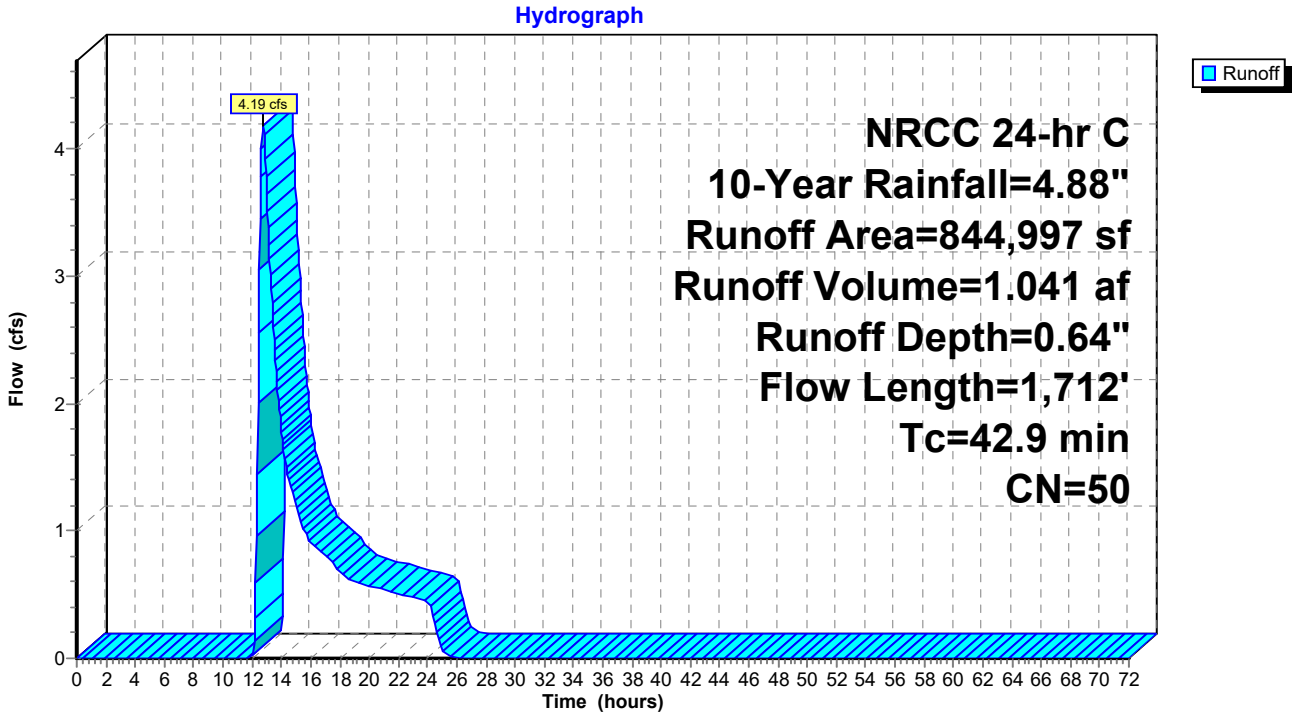
Runoff = 4.19 cfs @ 12.76 hrs, Volume= 1.041 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
528,369	55	Woods, Good, HSG B
20,766	61	>75% Grass cover, Good, HSG B
163,331	39	>75% Grass cover, Good, HSG A
104,370	30	Woods, Good, HSG A
28,161	98	Water Surface, HSG A
844,997	50	Weighted Average
816,836		96.67% Pervious Area
28,161		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
10.0	581	0.0190	0.96		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
7.1	411	0.0190	0.96		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
42.9	1,712	Total			

Subcatchment EX-1: Subcatchment to BVW



Summary for Subcatchment EX-2: To Blackstone Street

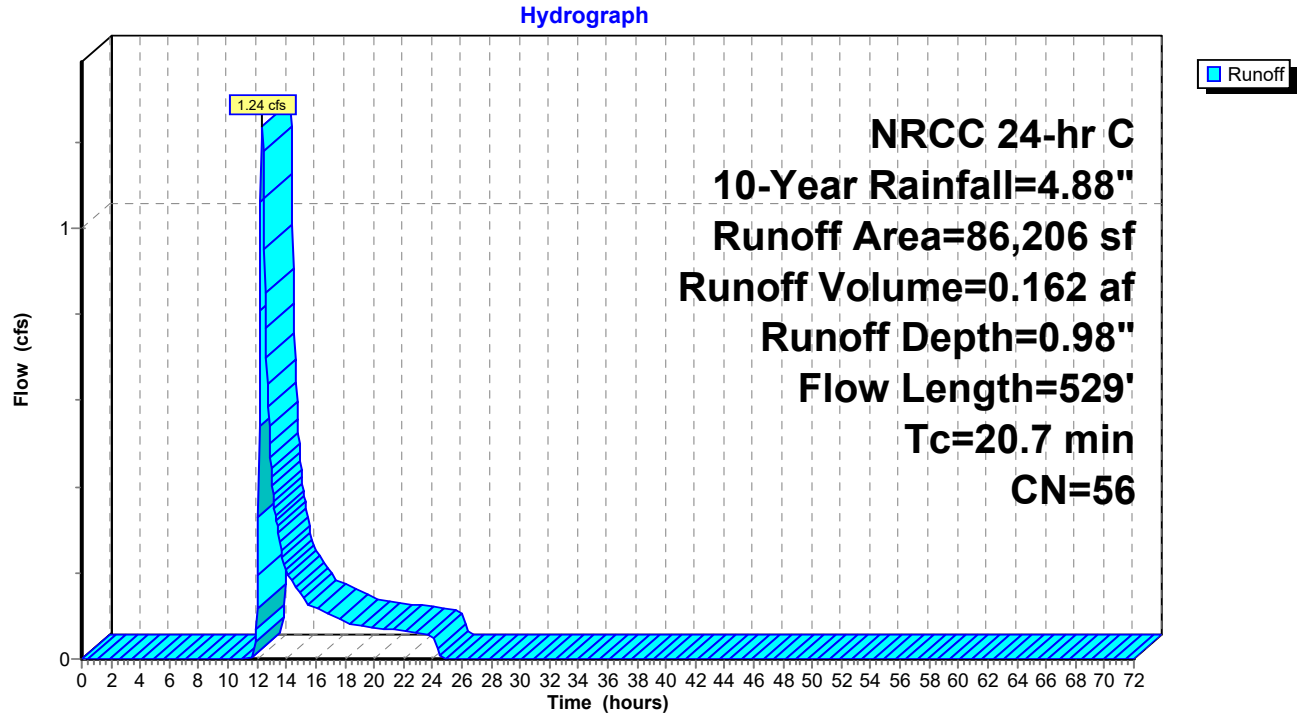
Runoff = 1.24 cfs @ 12.34 hrs, Volume= 0.162 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
69,268	55	Woods, Good, HSG B
16,676	61	>75% Grass cover, Good, HSG B
131	39	>75% Grass cover, Good, HSG A
131	30	Woods, Good, HSG A
86,206	56	Weighted Average
86,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
2.1	161	0.0340	1.29		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
20.7	529	Total			

Subcatchment EX-2: To Blackstone Street



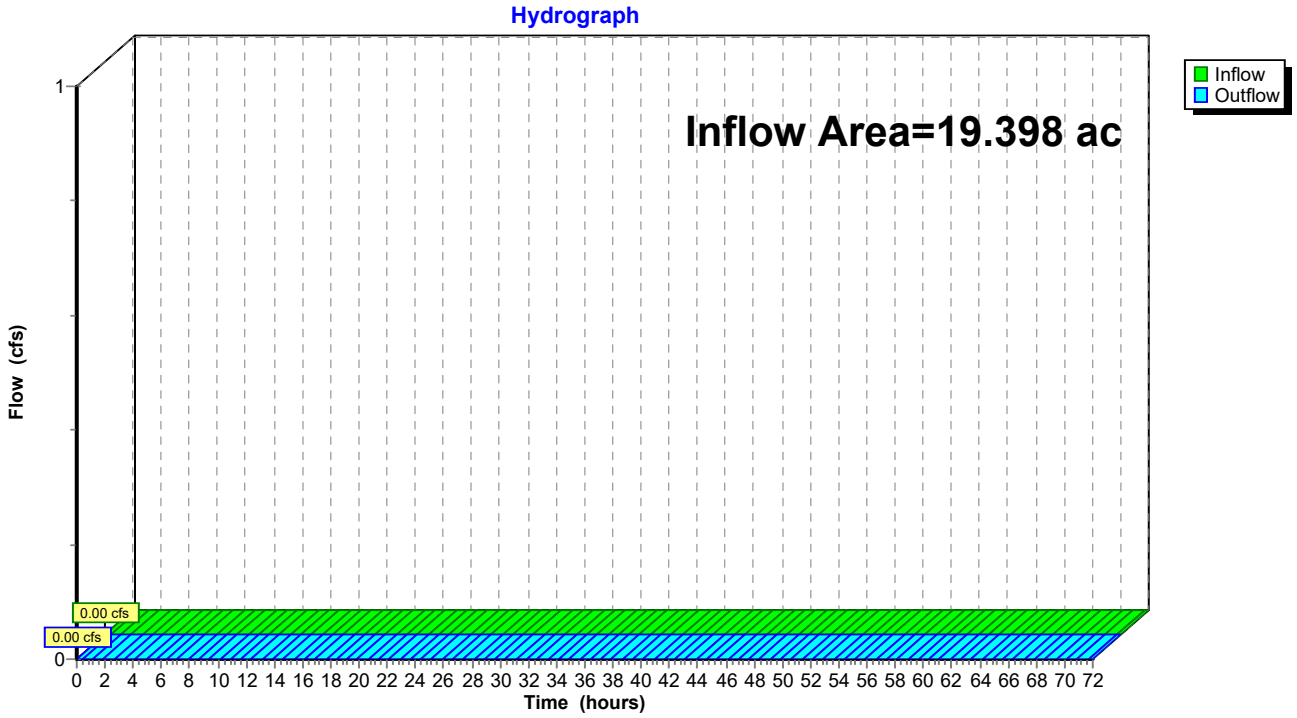
Summary for Reach AP-1: Analysis Point - AP1

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

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 0.00" for 10-Year 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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-1: Analysis Point - AP1



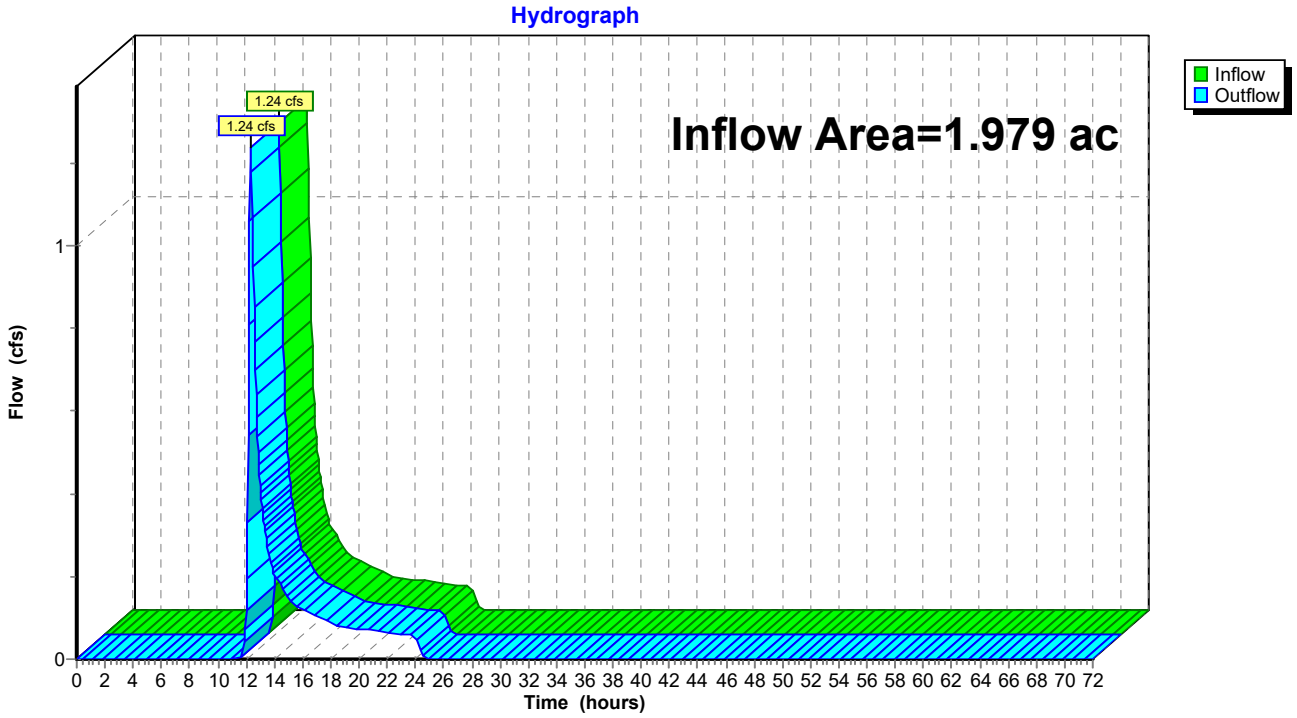
Summary for Reach AP-2: Analysis Point - AP2

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

Inflow Area = 1.979 ac, 0.00% Impervious, Inflow Depth = 0.98" for 10-Year event
Inflow = 1.24 cfs @ 12.34 hrs, Volume= 0.162 af
Outflow = 1.24 cfs @ 12.34 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-2: Analysis Point - AP2



Summary for Pond 1E: Existing Depression

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 0.64" for 10-Year event
Inflow = 4.19 cfs @ 12.76 hrs, Volume= 1.041 af
Outflow = 1.33 cfs @ 14.67 hrs, Volume= 1.041 af, Atten= 68%, Lag= 115.0 min
Discarded = 1.33 cfs @ 14.67 hrs, Volume= 1.041 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 308.55' @ 14.67 hrs Surf.Area= 20,539 sf Storage= 12,664 cf
Flood Elev= 309.20' Surf.Area= 30,032 sf Storage= 29,481 cf

Plug-Flow detention time= 125.5 min calculated for 1.040 af (100% of inflow)
Center-of-Mass det. time= 125.5 min (1,095.7 - 970.2)

Volume	Invert	Avail.Storage	Storage Description
#1	307.30'	53,507 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

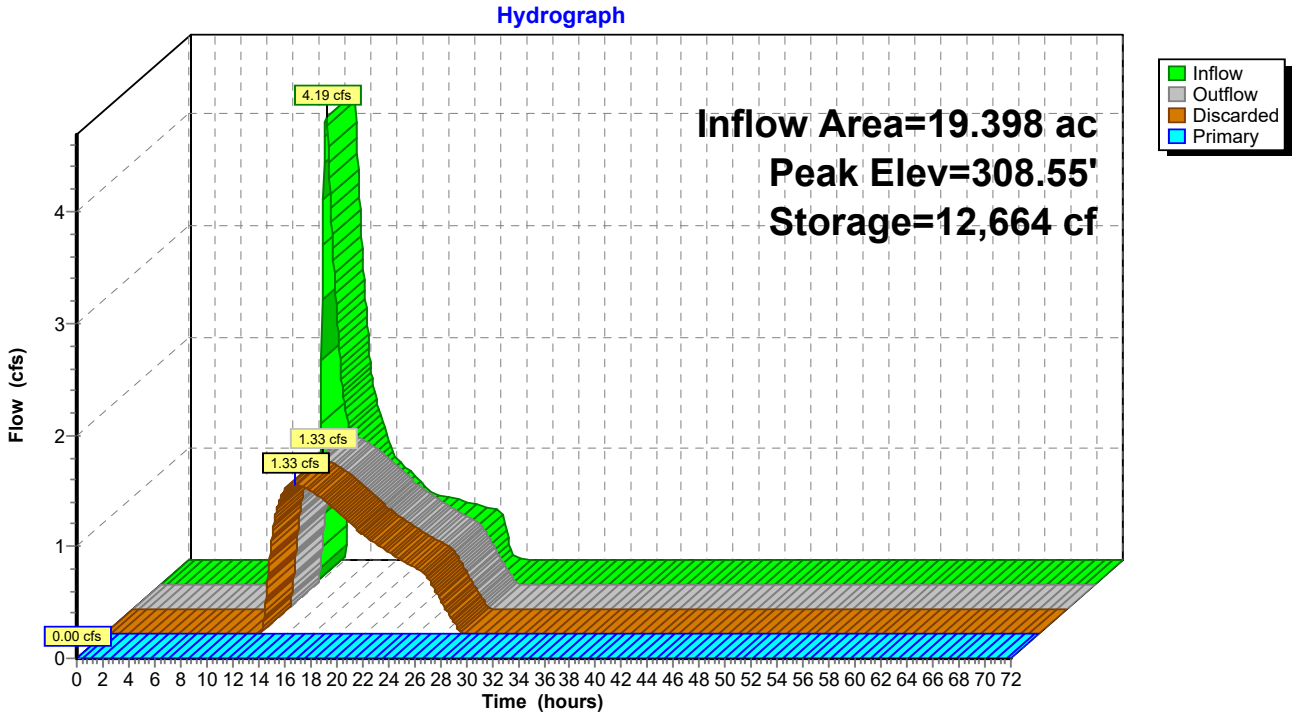
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.30	48	0	0
308.00	11,143	3,917	3,917
309.00	28,160	19,652	23,568
309.10	30,032	2,910	26,478
310.00	30,032	27,029	53,507

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.30'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.00' Phase-In= 0.01'
#2	Primary	309.05'	**30.0' 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=1.33 cfs @ 14.67 hrs HW=308.55' (Free Discharge)
1=Exfiltration (Controls 1.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=307.30' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1E: Existing Depression



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EX-1: Subcatchment to Runoff Area=844,997 sf 3.33% Impervious Runoff Depth=1.22"
Flow Length=1,712' Tc=42.9 min CN=50 Runoff=10.03 cfs 1.968 af

Subcatchment EX-2: To Blackstone Street Runoff Area=86,206 sf 0.00% Impervious Runoff Depth=1.69"
Flow Length=529' Tc=20.7 min CN=56 Runoff=2.39 cfs 0.278 af

Reach AP-1: Analysis Point - AP1 Inflow=1.63 cfs 0.146 af
Outflow=1.63 cfs 0.146 af

Reach AP-2: Analysis Point - AP2 Inflow=2.39 cfs 0.278 af
Outflow=2.39 cfs 0.278 af

Pond 1E: Existing Depression Peak Elev=309.13' Storage=27,421 cf Inflow=10.03 cfs 1.968 af
Discarded=2.06 cfs 1.822 af Primary=1.63 cfs 0.146 af Outflow=3.69 cfs 1.968 af

Total Runoff Area = 21.377 ac Runoff Volume = 2.246 af Average Runoff Depth = 1.26"
96.98% Pervious = 20.731 ac 3.02% Impervious = 0.646 ac

Summary for Subcatchment EX-1: Subcatchment to BVW

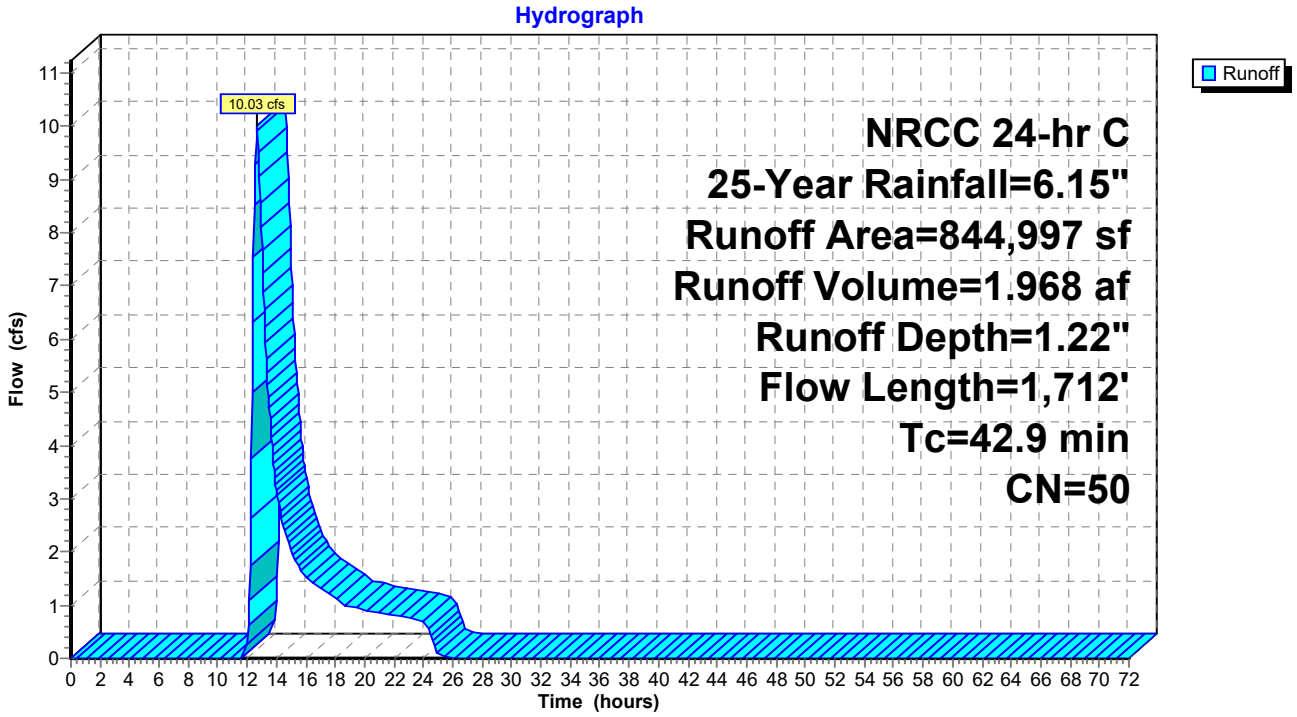
Runoff = 10.03 cfs @ 12.67 hrs, Volume= 1.968 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
528,369	55	Woods, Good, HSG B
20,766	61	>75% Grass cover, Good, HSG B
163,331	39	>75% Grass cover, Good, HSG A
104,370	30	Woods, Good, HSG A
28,161	98	Water Surface, HSG A
844,997	50	Weighted Average
816,836		96.67% Pervious Area
28,161		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
10.0	581	0.0190	0.96		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
7.1	411	0.0190	0.96		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
42.9	1,712	Total			

Subcatchment EX-1: Subcatchment to BVW



Summary for Subcatchment EX-2: To Blackstone Street

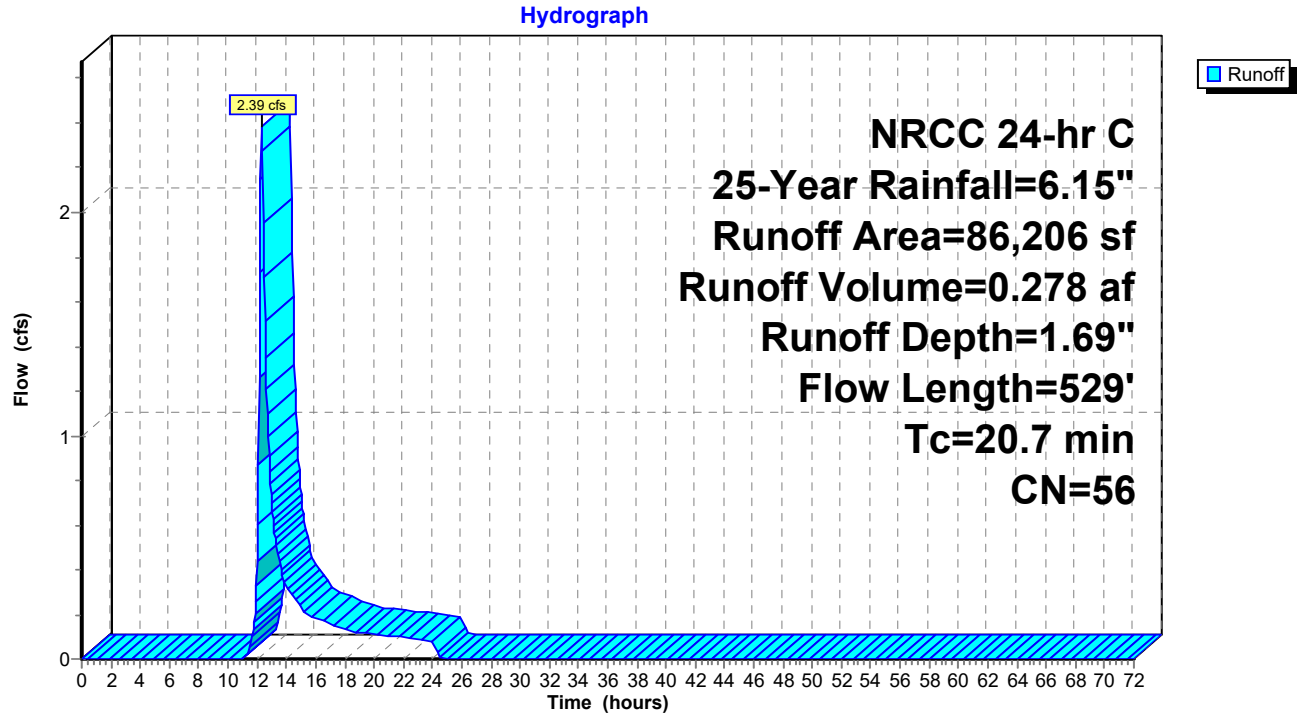
Runoff = 2.39 cfs @ 12.32 hrs, Volume= 0.278 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
69,268	55	Woods, Good, HSG B
16,676	61	>75% Grass cover, Good, HSG B
131	39	>75% Grass cover, Good, HSG A
131	30	Woods, Good, HSG A
86,206	56	Weighted Average
86,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
2.1	161	0.0340	1.29		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
20.7	529	Total			

Subcatchment EX-2: To Blackstone Street



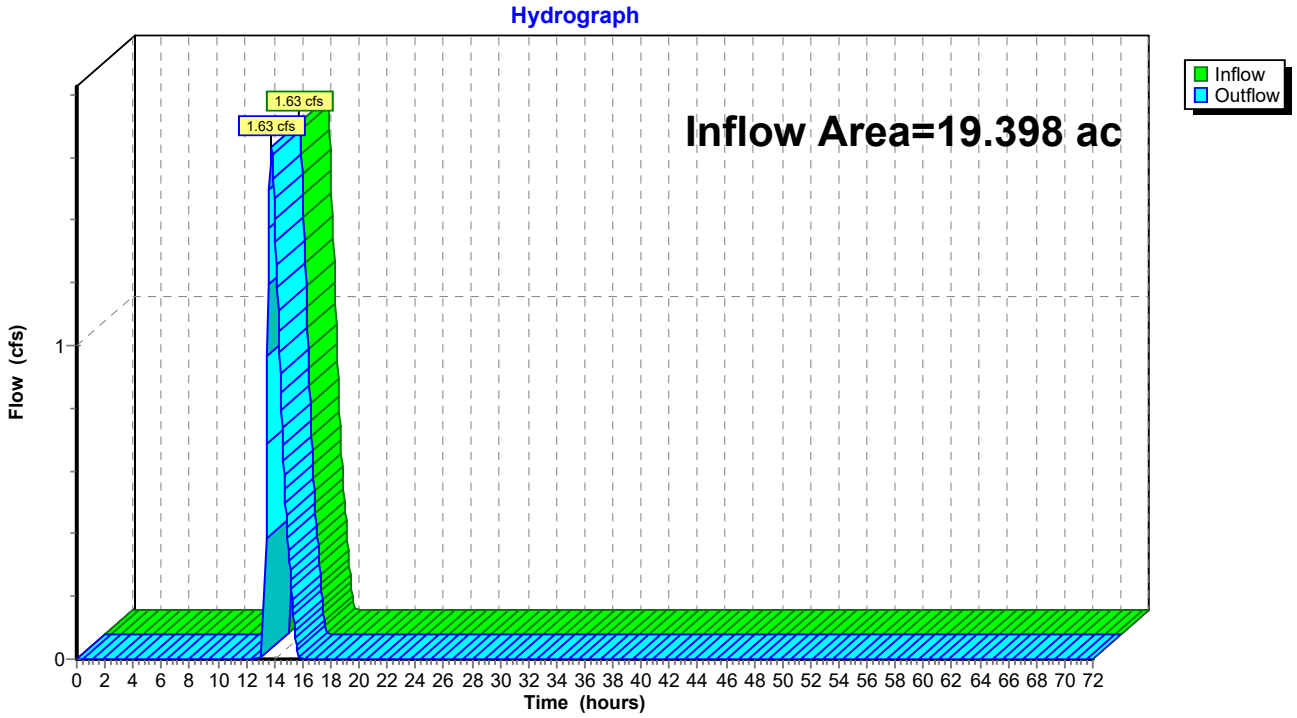
Summary for Reach AP-1: Analysis Point - AP1

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

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 0.09" for 25-Year event
Inflow = 1.63 cfs @ 13.79 hrs, Volume= 0.146 af
Outflow = 1.63 cfs @ 13.79 hrs, Volume= 0.146 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-1: Analysis Point - AP1



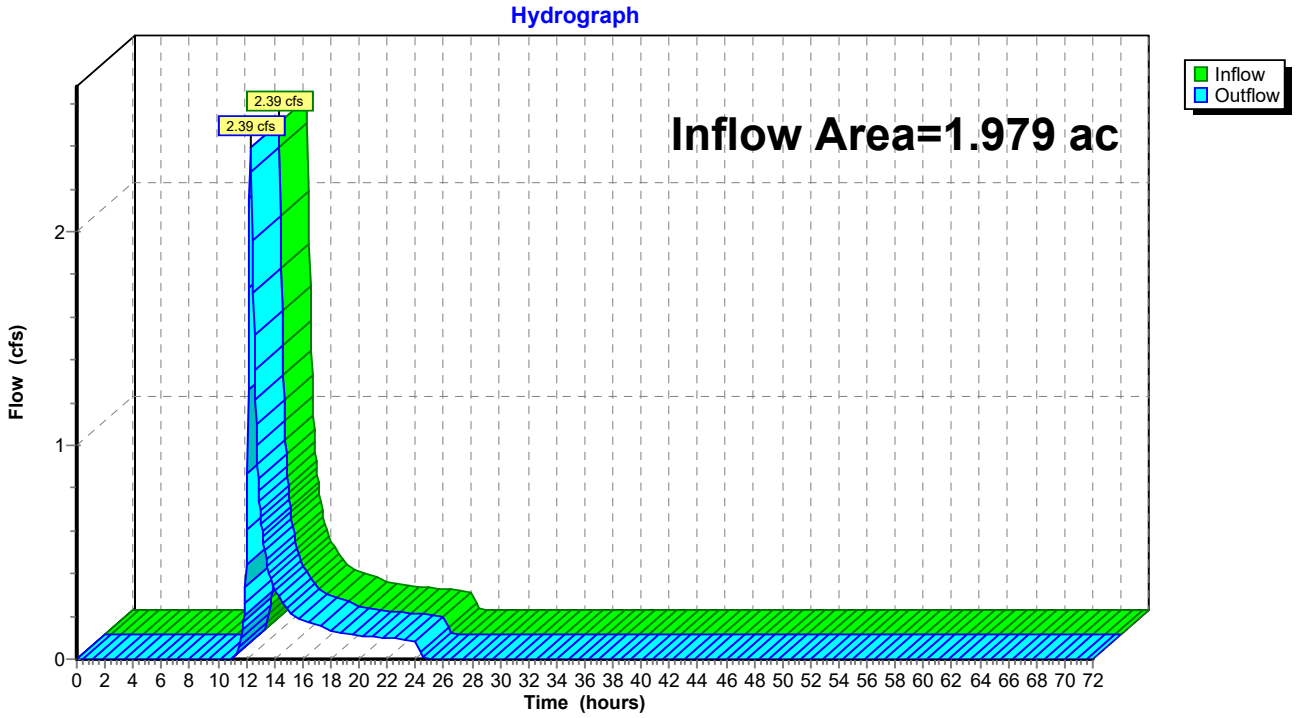
Summary for Reach AP-2: Analysis Point - AP2

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

Inflow Area = 1.979 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-Year event
Inflow = 2.39 cfs @ 12.32 hrs, Volume= 0.278 af
Outflow = 2.39 cfs @ 12.32 hrs, Volume= 0.278 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-2: Analysis Point - AP2



Summary for Pond 1E: Existing Depression

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 1.22" for 25-Year event
Inflow = 10.03 cfs @ 12.67 hrs, Volume= 1.968 af
Outflow = 3.69 cfs @ 13.79 hrs, Volume= 1.968 af, Atten= 63%, Lag= 67.2 min
Discarded = 2.06 cfs @ 13.79 hrs, Volume= 1.822 af
Primary = 1.63 cfs @ 13.79 hrs, Volume= 0.146 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 309.13' @ 13.79 hrs Surf.Area= 30,032 sf Storage= 27,421 cf
Flood Elev= 309.20' Surf.Area= 30,032 sf Storage= 29,481 cf

Plug-Flow detention time= 163.2 min calculated for 1.966 af (100% of inflow)
Center-of-Mass det. time= 163.3 min (1,105.2 - 941.9)

Volume	Invert	Avail.Storage	Storage Description
#1	307.30'	53,507 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

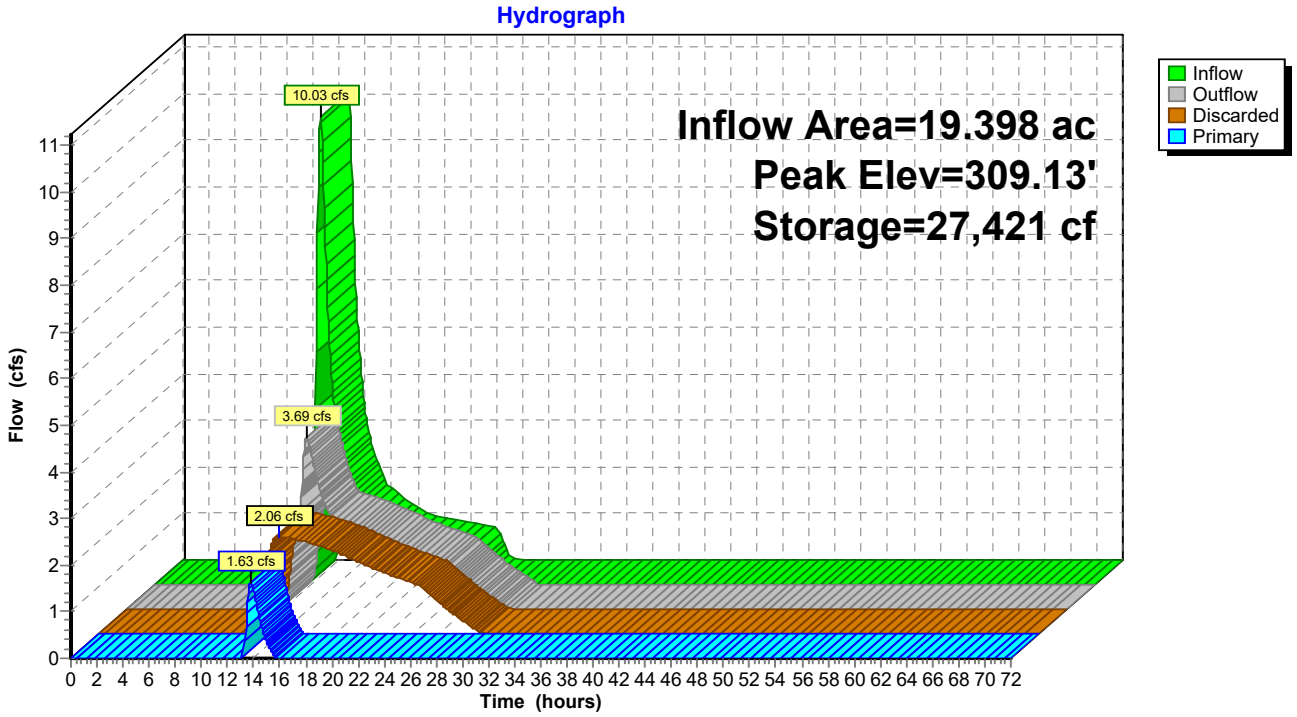
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.30	48	0	0
308.00	11,143	3,917	3,917
309.00	28,160	19,652	23,568
309.10	30,032	2,910	26,478
310.00	30,032	27,029	53,507

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.30'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.00' Phase-In= 0.01'
#2	Primary	309.05'	**30.0' 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=2.06 cfs @ 13.79 hrs HW=309.13' (Free Discharge)
↑—**1=Exfiltration** (Controls 2.06 cfs)

Primary OutFlow Max=1.63 cfs @ 13.79 hrs HW=309.13' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.63 cfs @ 0.67 fps)

Pond 1E: Existing Depression



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EX-1: Subcatchment to Runoff Area=844,997 sf 3.33% Impervious Runoff Depth=2.71"
Flow Length=1,712' Tc=42.9 min CN=50 Runoff=26.11 cfs 4.387 af

Subcatchment EX-2: To Blackstone Street Runoff Area=86,206 sf 0.00% Impervious Runoff Depth=3.42"
Flow Length=529' Tc=20.7 min CN=56 Runoff=5.20 cfs 0.564 af

Reach AP-1: Analysis Point - AP1 Inflow=19.51 cfs 1.932 af
Outflow=19.51 cfs 1.932 af

Reach AP-2: Analysis Point - AP2 Inflow=5.20 cfs 0.564 af
Outflow=5.20 cfs 0.564 af

Pond 1E: Existing Depression Peak Elev=309.46' Storage=37,193 cf Inflow=26.11 cfs 4.387 af
Discarded=2.19 cfs 2.455 af Primary=19.51 cfs 1.932 af Outflow=21.70 cfs 4.387 af

Total Runoff Area = 21.377 ac Runoff Volume = 4.951 af Average Runoff Depth = 2.78"
96.98% Pervious = 20.731 ac 3.02% Impervious = 0.646 ac

Summary for Subcatchment EX-1: Subcatchment to BVW

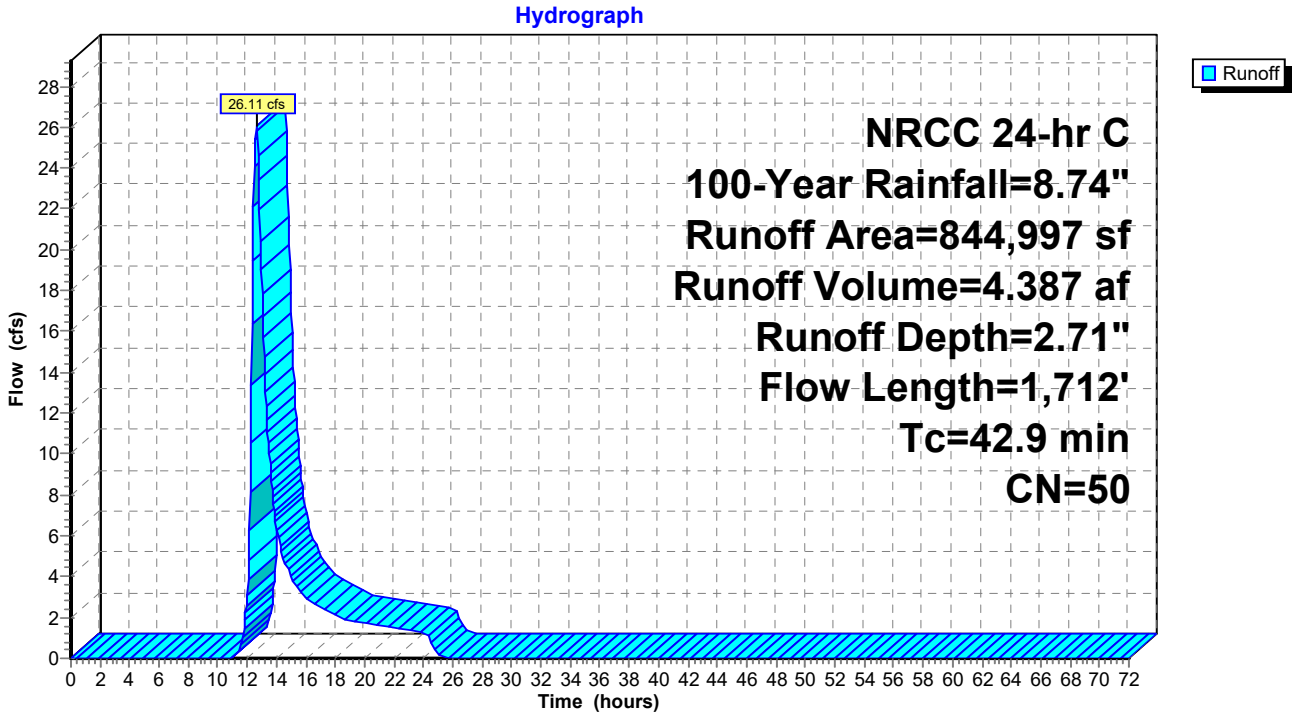
Runoff = 26.11 cfs @ 12.63 hrs, Volume= 4.387 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

Area (sf)	CN	Description
528,369	55	Woods, Good, HSG B
20,766	61	>75% Grass cover, Good, HSG B
163,331	39	>75% Grass cover, Good, HSG A
104,370	30	Woods, Good, HSG A
28,161	98	Water Surface, HSG A
844,997	50	Weighted Average
816,836		96.67% Pervious Area
28,161		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
10.0	581	0.0190	0.96		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
7.1	411	0.0190	0.96		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
42.9	1,712	Total			

Subcatchment EX-1: Subcatchment to BVW



Summary for Subcatchment EX-2: To Blackstone Street

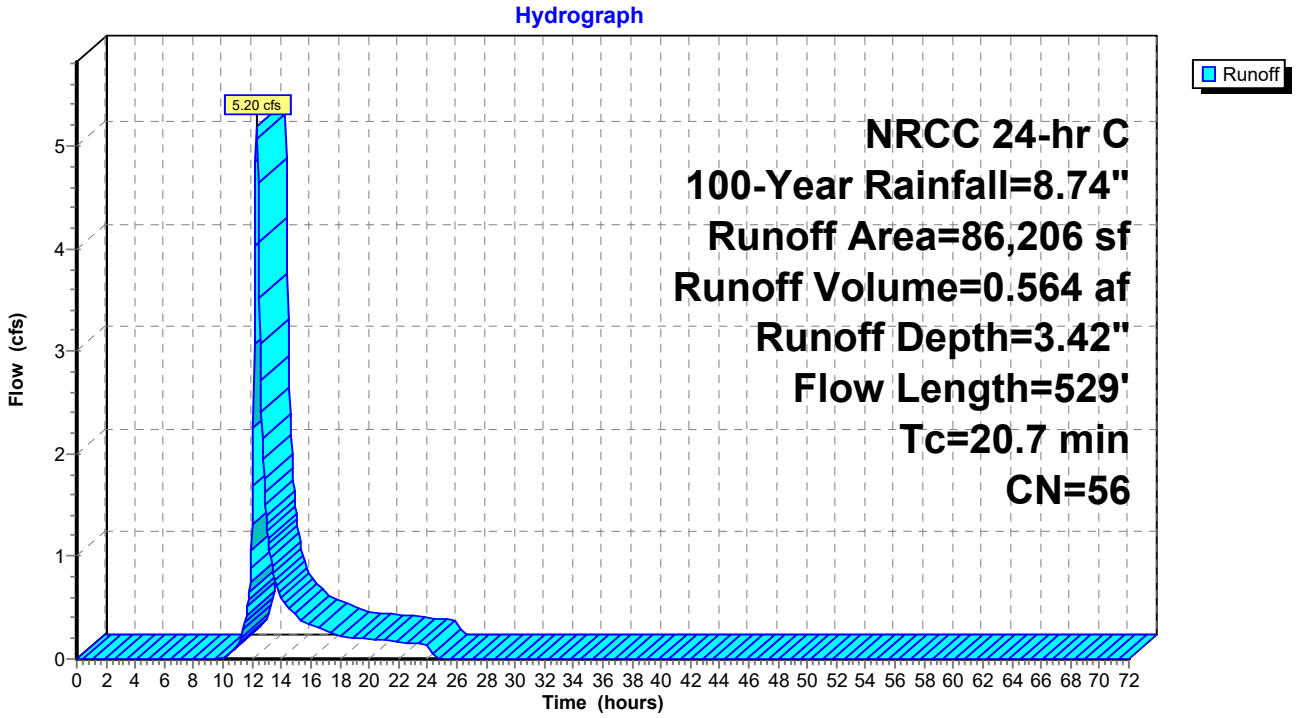
Runoff = 5.20 cfs @ 12.31 hrs, Volume= 0.564 af, Depth= 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

Area (sf)	CN	Description
69,268	55	Woods, Good, HSG B
16,676	61	>75% Grass cover, Good, HSG B
131	39	>75% Grass cover, Good, HSG A
131	30	Woods, Good, HSG A
86,206	56	Weighted Average
86,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
2.1	161	0.0340	1.29		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
20.7	529	Total			

Subcatchment EX-2: To Blackstone Street



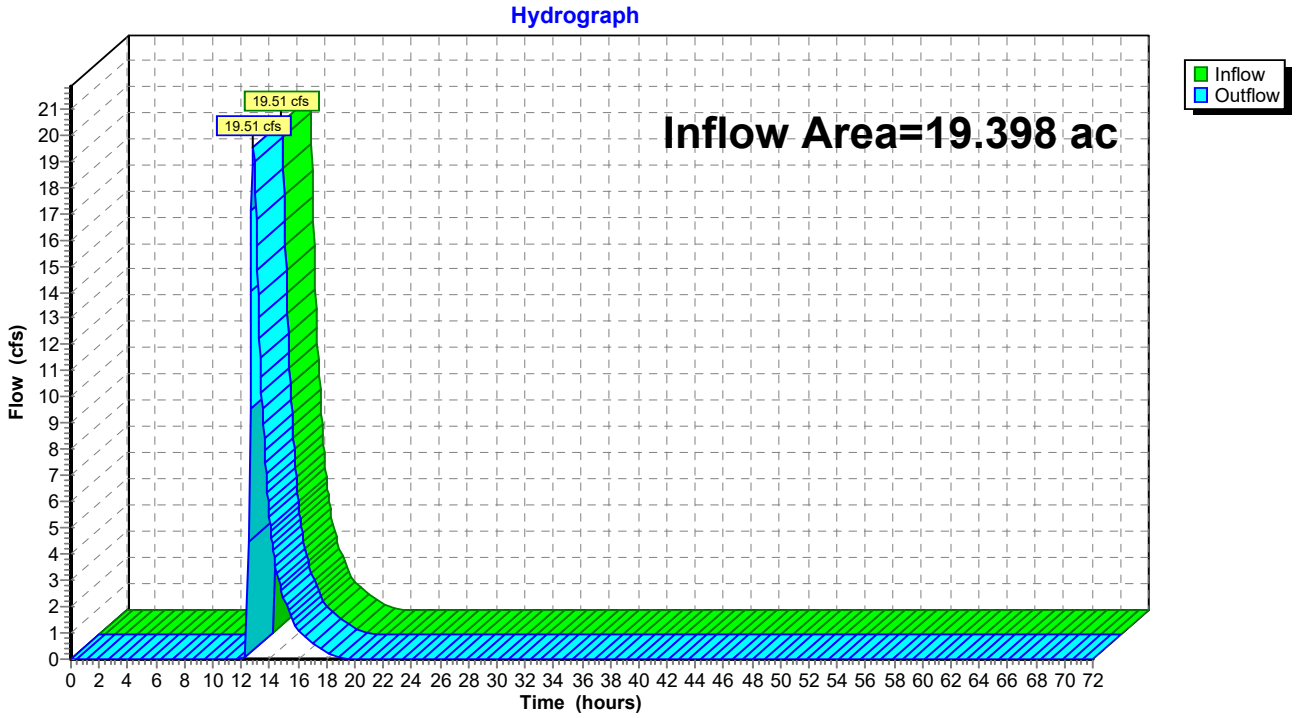
Summary for Reach AP-1: Analysis Point - AP1

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

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 1.20" for 100-Year event
Inflow = 19.51 cfs @ 12.86 hrs, Volume= 1.932 af
Outflow = 19.51 cfs @ 12.86 hrs, Volume= 1.932 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-1: Analysis Point - AP1



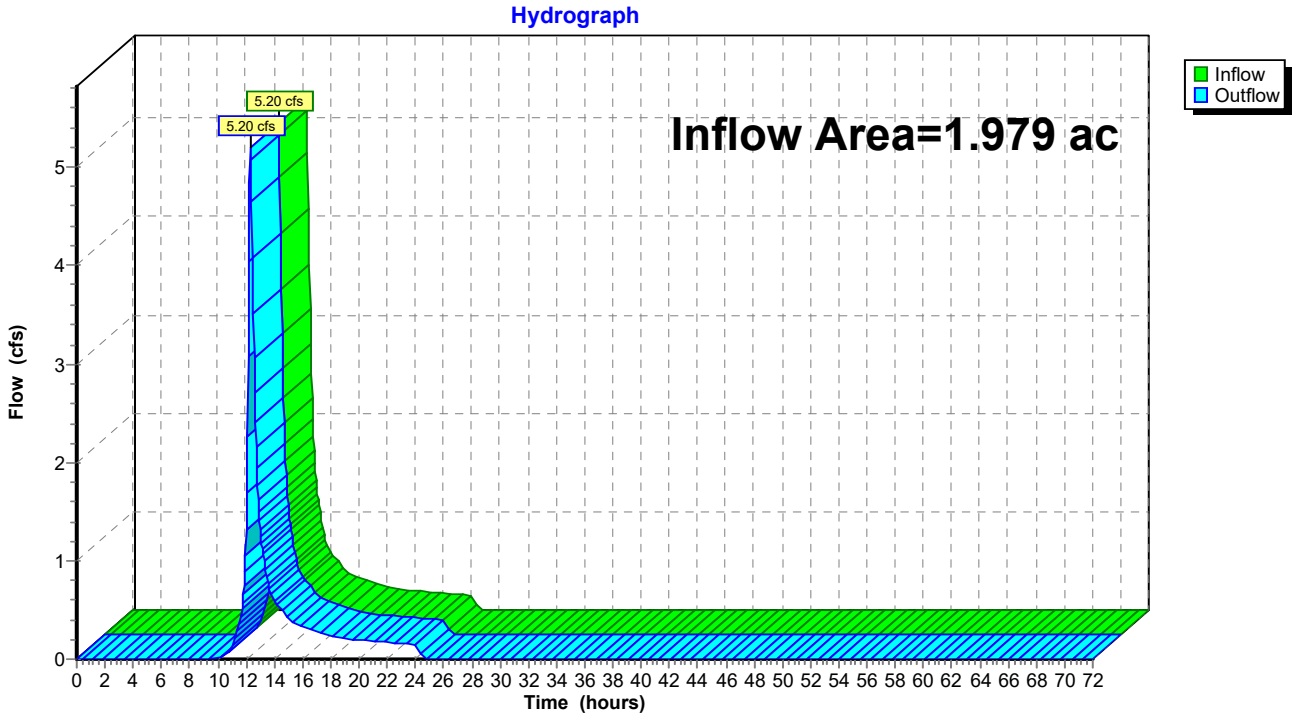
Summary for Reach AP-2: Analysis Point - AP2

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

Inflow Area = 1.979 ac, 0.00% Impervious, Inflow Depth = 3.42" for 100-Year event
Inflow = 5.20 cfs @ 12.31 hrs, Volume= 0.564 af
Outflow = 5.20 cfs @ 12.31 hrs, Volume= 0.564 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-2: Analysis Point - AP2



Summary for Pond 1E: Existing Depression

[58] Hint: Peaked 0.26' above defined flood level

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 2.71" for 100-Year event
Inflow = 26.11 cfs @ 12.63 hrs, Volume= 4.387 af
Outflow = 21.70 cfs @ 12.86 hrs, Volume= 4.387 af, Atten= 17%, Lag= 14.1 min
Discarded = 2.19 cfs @ 12.86 hrs, Volume= 2.455 af
Primary = 19.51 cfs @ 12.86 hrs, Volume= 1.932 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 309.46' @ 12.86 hrs Surf.Area= 30,032 sf Storage= 37,193 cf
Flood Elev= 309.20' Surf.Area= 30,032 sf Storage= 29,481 cf

Plug-Flow detention time= 111.3 min calculated for 4.384 af (100% of inflow)
Center-of-Mass det. time= 111.4 min (1,023.5 - 912.1)

Volume	Invert	Avail.Storage	Storage Description
#1	307.30'	53,507 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

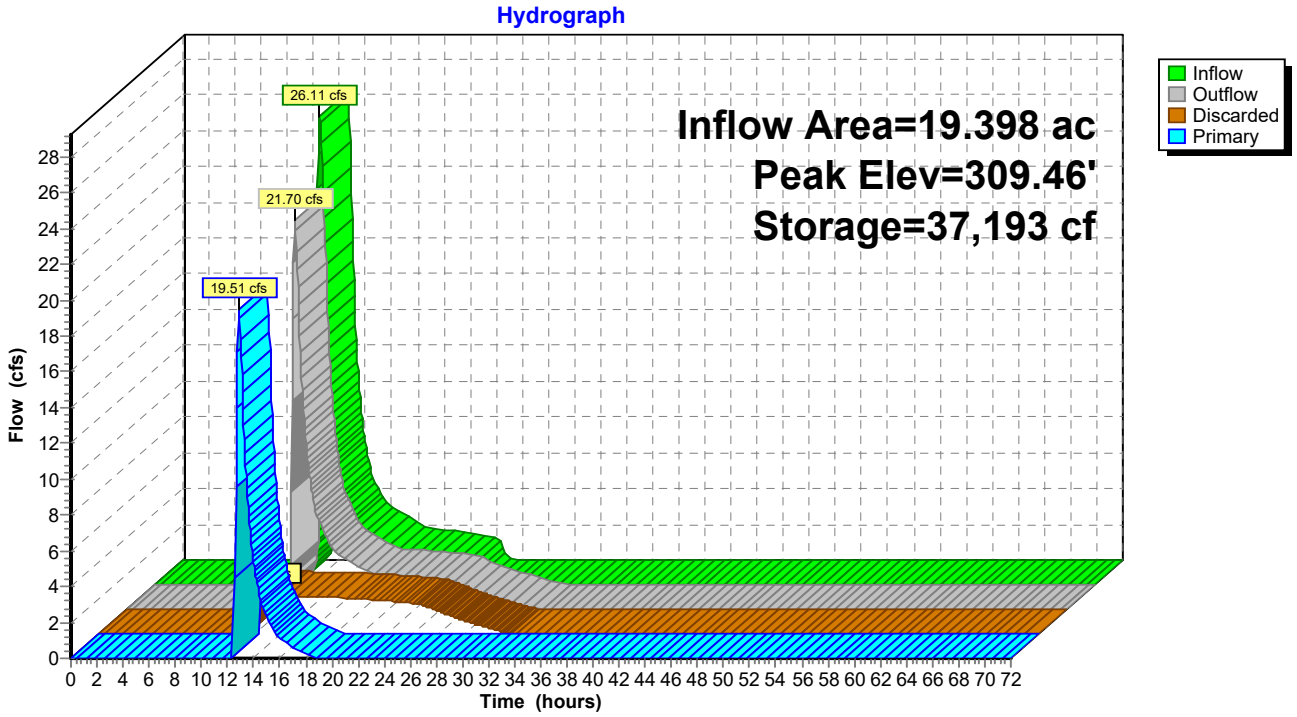
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.30	48	0	0
308.00	11,143	3,917	3,917
309.00	28,160	19,652	23,568
309.10	30,032	2,910	26,478
310.00	30,032	27,029	53,507

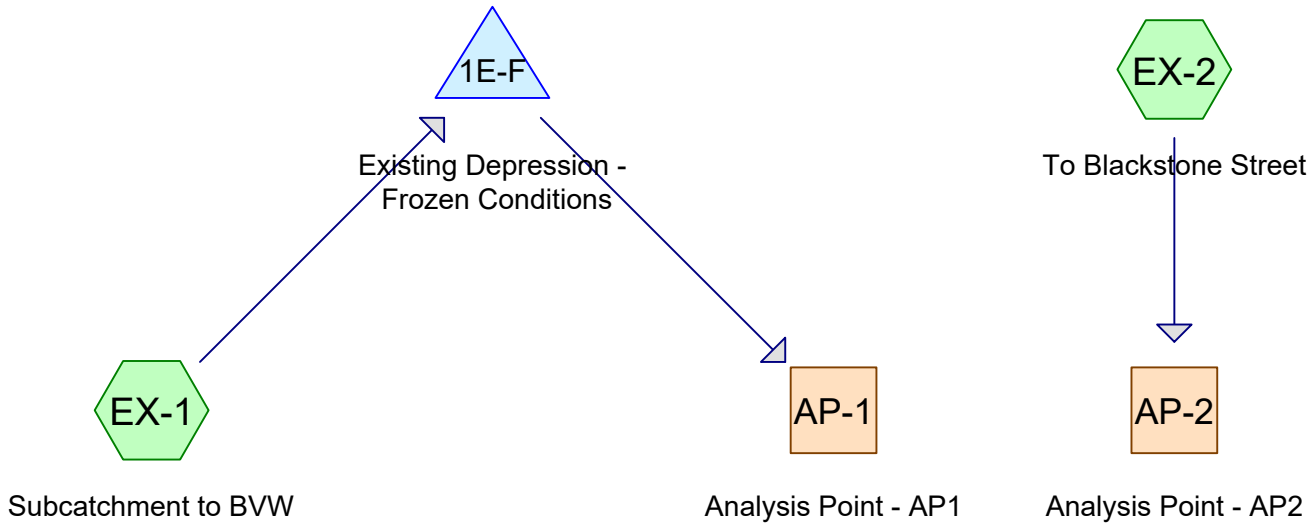
Device	Routing	Invert	Outlet Devices
#1	Discarded	307.30'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.00' Phase-In= 0.01'
#2	Primary	309.05'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 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

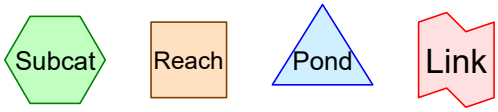
Discarded OutFlow Max=2.19 cfs @ 12.86 hrs HW=309.46' (Free Discharge)
↑—**1=Exfiltration** (Controls 2.19 cfs)

Primary OutFlow Max=19.43 cfs @ 12.86 hrs HW=309.46' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 19.43 cfs @ 1.60 fps)

Pond 1E: Existing Depression







Routing Diagram for Pre-Post Development for 5 building layout
Prepared by {enter your company name here}, Printed 11/10/2023

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.753	39	>75% Grass cover, Good, HSG A (EX-1, EX-2)
0.860	61	>75% Grass cover, Good, HSG B (EX-1, EX-2)
0.646	98	Water Surface, HSG A (EX-1)
2.399	30	Woods, Good, HSG A (EX-1, EX-2)
13.720	55	Woods, Good, HSG B (EX-1, EX-2)
21.377	**51**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.798	HSG A	EX-1, EX-2
14.579	HSG B	EX-1, EX-2
0.000	HSG C	
0.000	HSG D	
0.000	Other	
21.377		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.753	0.860	0.000	0.000	0.000	4.612	>75% Grass cover, Good	EX-1, EX-2
0.646	0.000	0.000	0.000	0.000	0.646	Water Surface	EX-1
2.399	13.720	0.000	0.000	0.000	16.119	Woods, Good	EX-1, EX-2
6.798	**14.579**	**0.000**	**0.000**	**0.000**	**21.377**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EX-1: Subcatchment to Runoff Area=844,997 sf 3.33% Impervious Runoff Depth=1.22"
Flow Length=1,712' Tc=42.9 min CN=50 Runoff=10.03 cfs 1.968 af

Subcatchment EX-2: To Blackstone Street Runoff Area=86,206 sf 0.00% Impervious Runoff Depth=1.69"
Flow Length=529' Tc=20.7 min CN=56 Runoff=2.39 cfs 0.278 af

Reach AP-1: Analysis Point - AP1 Inflow=4.37 cfs 1.394 af
Outflow=4.37 cfs 1.394 af

Reach AP-2: Analysis Point - AP2 Inflow=2.39 cfs 0.278 af
Outflow=2.39 cfs 0.278 af

Pond 1E-F: Existing Depression - Frozen Peak Elev=309.21' Storage=29,692 cf Inflow=10.03 cfs 1.968 af
Outflow=4.37 cfs 1.394 af

Total Runoff Area = 21.377 ac Runoff Volume = 2.246 af Average Runoff Depth = 1.26"
96.98% Pervious = 20.731 ac 3.02% Impervious = 0.646 ac

Summary for Subcatchment EX-1: Subcatchment to BVW

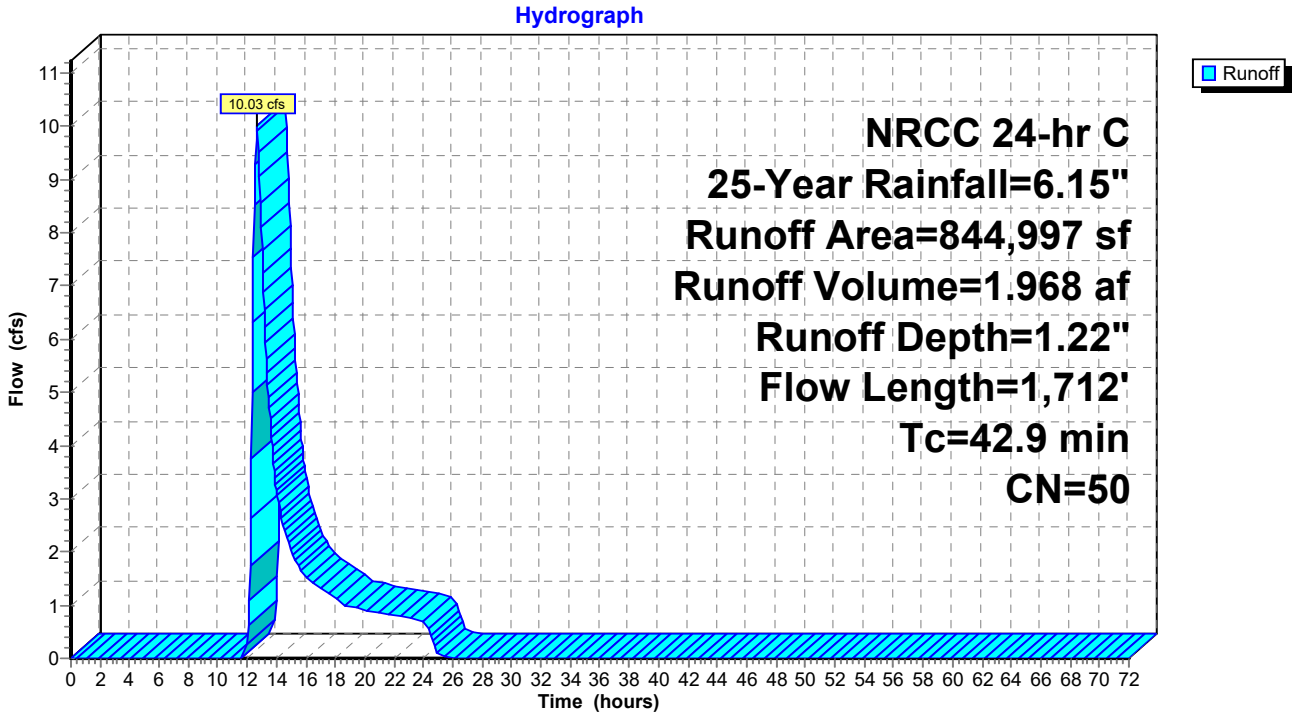
Runoff = 10.03 cfs @ 12.67 hrs, Volume= 1.968 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
528,369	55	Woods, Good, HSG B
20,766	61	>75% Grass cover, Good, HSG B
163,331	39	>75% Grass cover, Good, HSG A
104,370	30	Woods, Good, HSG A
28,161	98	Water Surface, HSG A
844,997	50	Weighted Average
816,836		96.67% Pervious Area
28,161		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
10.0	581	0.0190	0.96		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
7.1	411	0.0190	0.96		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
42.9	1,712	Total			

Subcatchment EX-1: Subcatchment to BVW



Summary for Subcatchment EX-2: To Blackstone Street

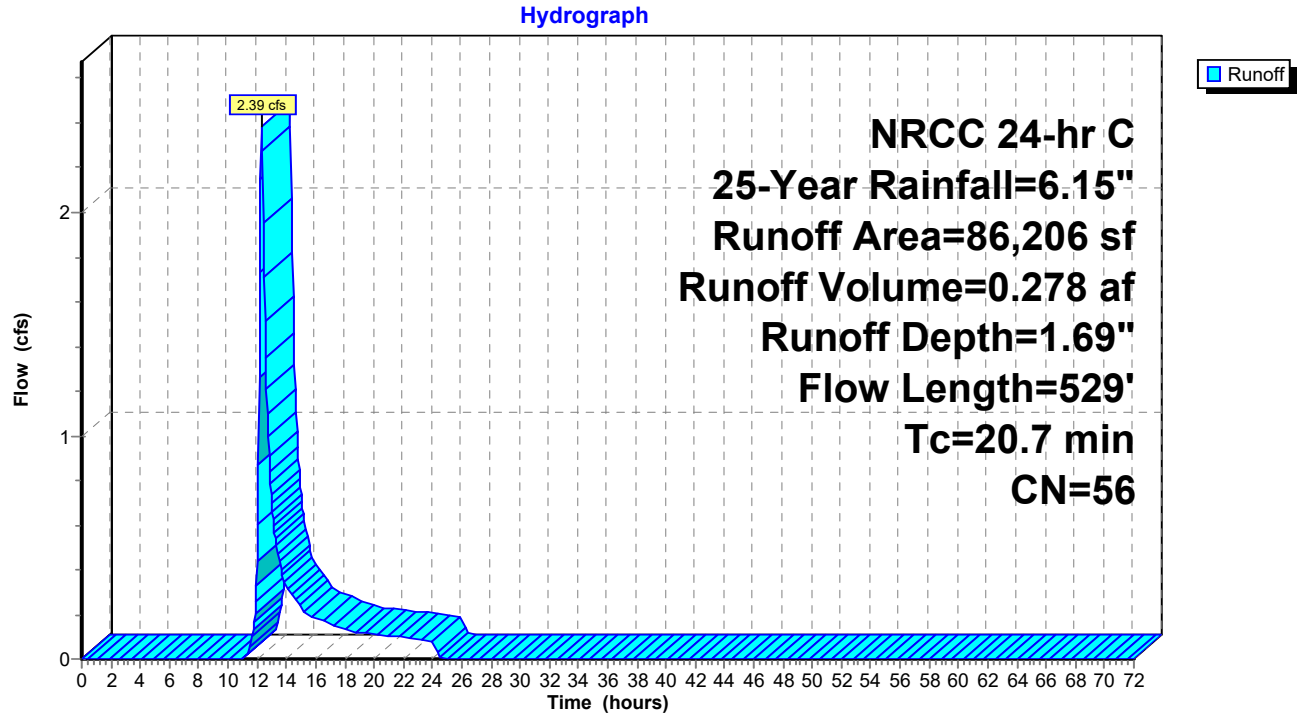
Runoff = 2.39 cfs @ 12.32 hrs, Volume= 0.278 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
69,268	55	Woods, Good, HSG B
16,676	61	>75% Grass cover, Good, HSG B
131	39	>75% Grass cover, Good, HSG A
131	30	Woods, Good, HSG A
86,206	56	Weighted Average
86,206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
2.1	161	0.0340	1.29		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
20.7	529	Total			

Subcatchment EX-2: To Blackstone Street



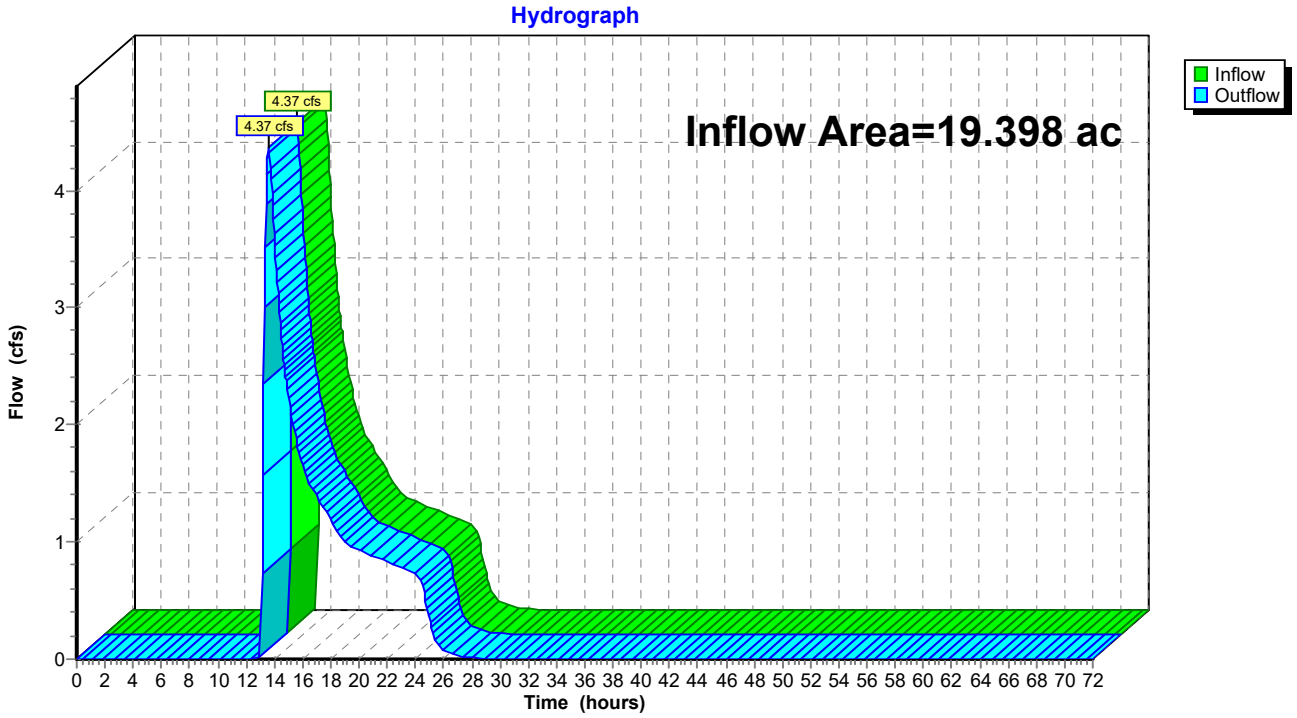
Summary for Reach AP-1: Analysis Point - AP1

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

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 0.86" for 25-Year event
Inflow = 4.37 cfs @ 13.59 hrs, Volume= 1.394 af
Outflow = 4.37 cfs @ 13.59 hrs, Volume= 1.394 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-1: Analysis Point - AP1



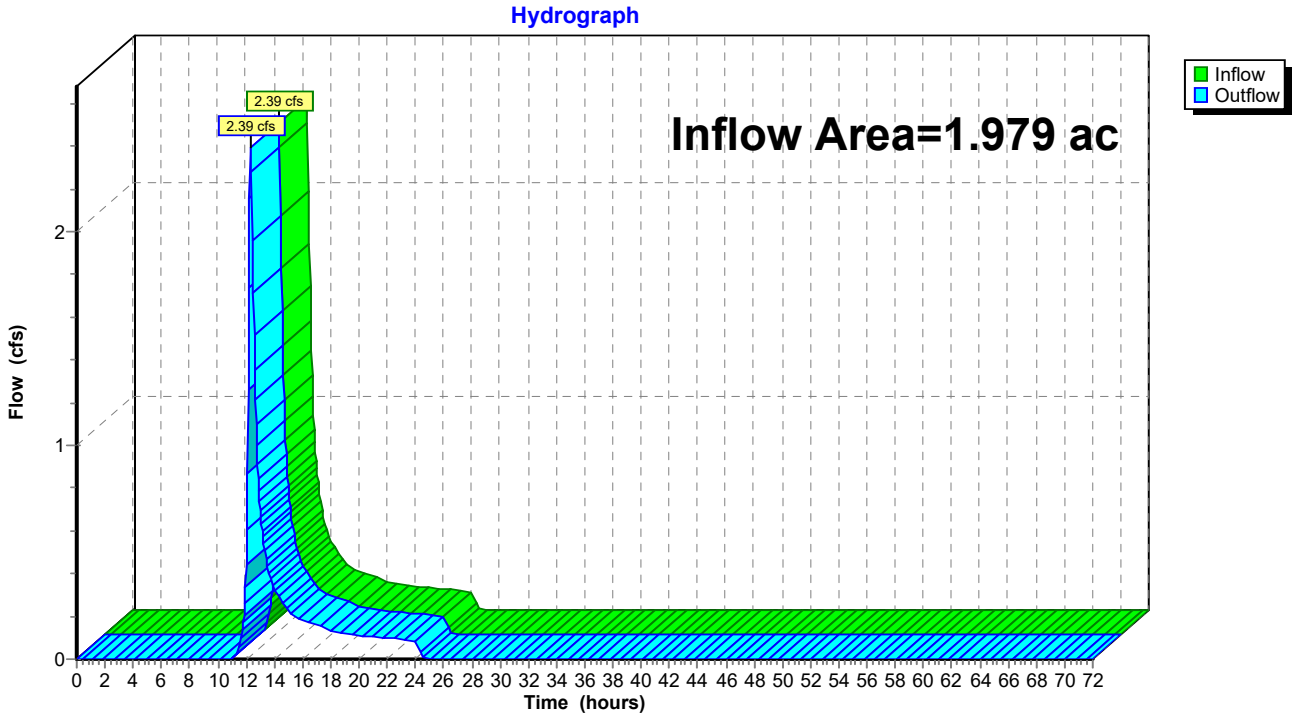
Summary for Reach AP-2: Analysis Point - AP2

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

Inflow Area = 1.979 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-Year event
Inflow = 2.39 cfs @ 12.32 hrs, Volume= 0.278 af
Outflow = 2.39 cfs @ 12.32 hrs, Volume= 0.278 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP-2: Analysis Point - AP2



Summary for Pond 1E-F: Existing Depression - Frozen Conditions

[58] Hint: Peaked 0.01' above defined flood level

Inflow Area = 19.398 ac, 3.33% Impervious, Inflow Depth = 1.22" for 25-Year event
Inflow = 10.03 cfs @ 12.67 hrs, Volume= 1.968 af
Outflow = 4.37 cfs @ 13.59 hrs, Volume= 1.394 af, Atten= 56%, Lag= 54.9 min
Primary = 4.37 cfs @ 13.59 hrs, Volume= 1.394 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 309.21' @ 13.59 hrs Surf.Area= 30,032 sf Storage= 29,692 cf
Flood Elev= 309.20' Surf.Area= 30,032 sf Storage= 29,481 cf

Plug-Flow detention time= 218.1 min calculated for 1.394 af (71% of inflow)
Center-of-Mass det. time= 100.5 min (1,042.4 - 941.9)

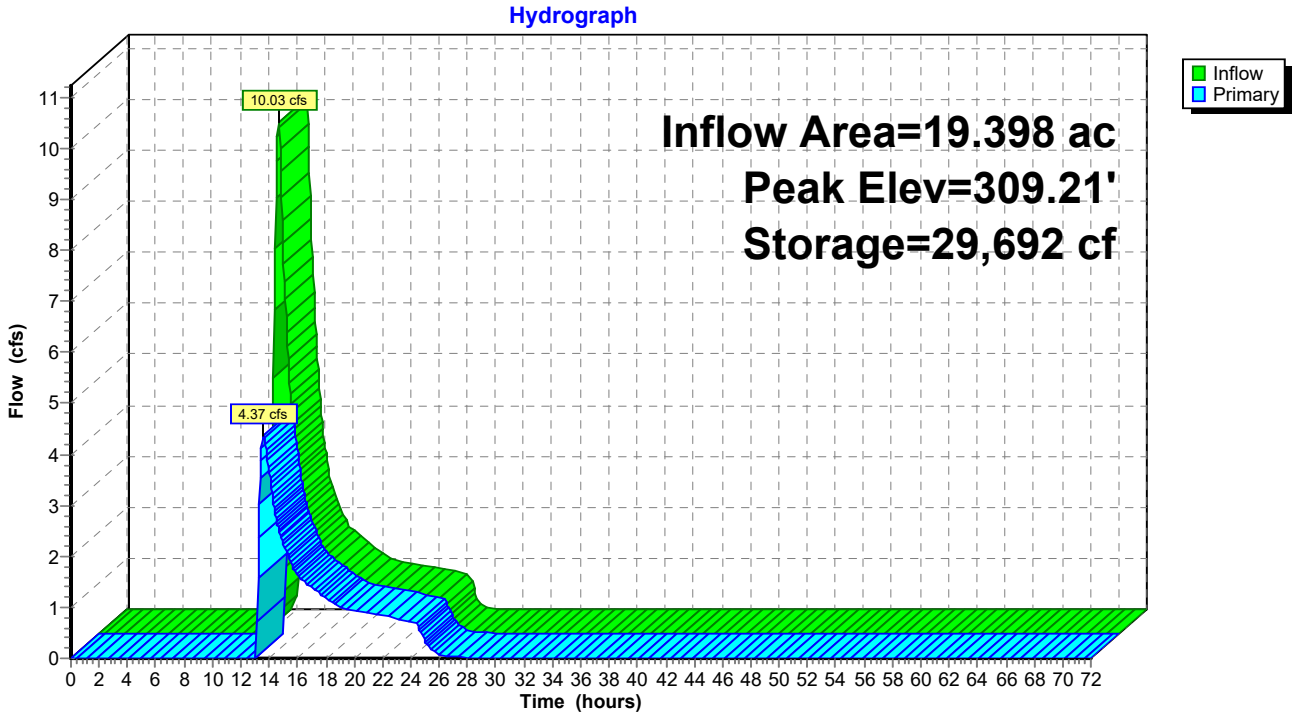
Volume	Invert	Avail.Storage	Storage Description
#1	307.30'	53,507 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

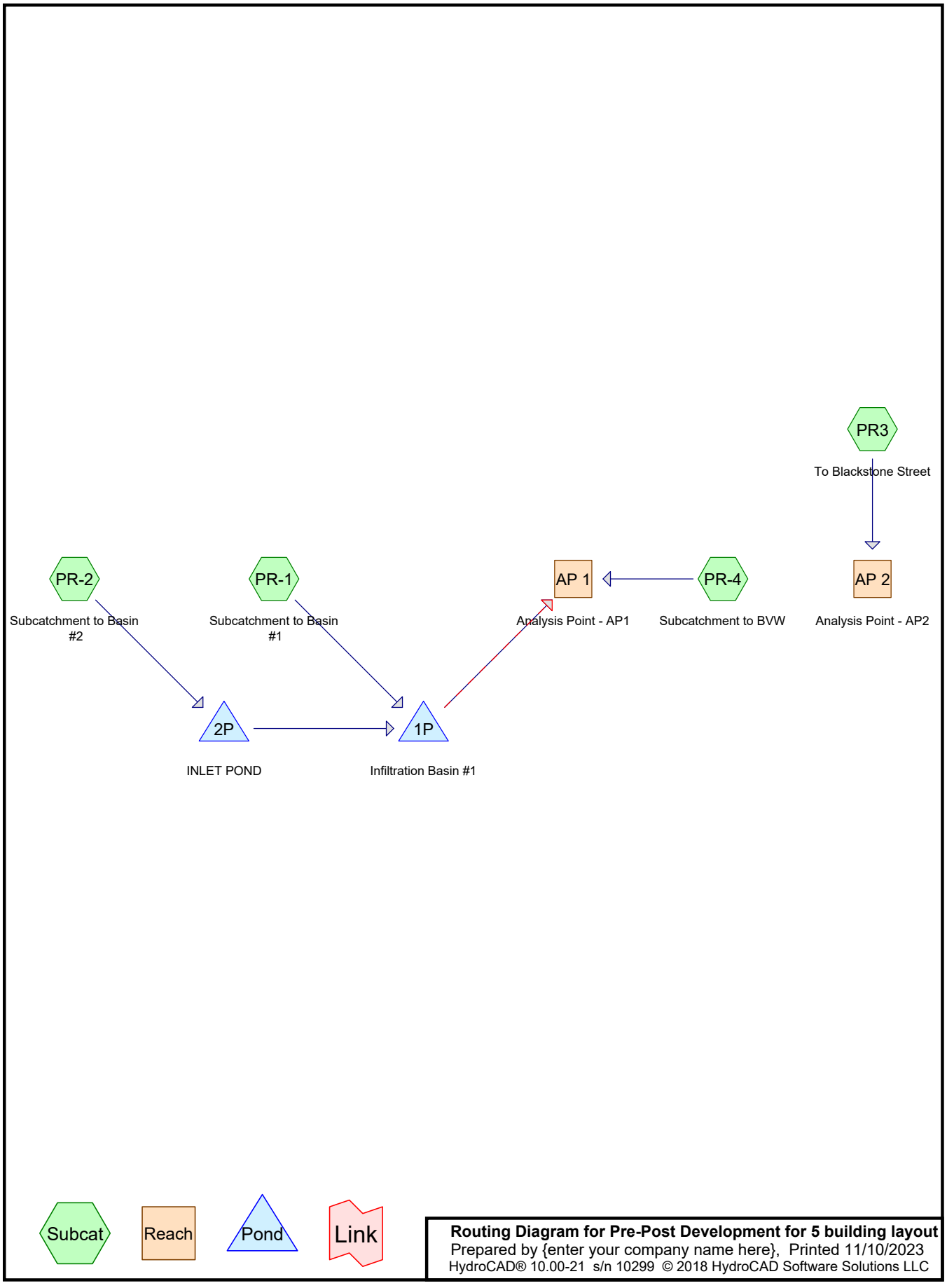
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.30	48	0	0
308.00	11,143	3,917	3,917
309.00	28,160	19,652	23,568
309.10	30,032	2,910	26,478
310.00	30,032	27,029	53,507

Device	Routing	Invert	Outlet Devices
#1	Primary	309.05'	**30.0' 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

Primary OutFlow Max=4.36 cfs @ 13.59 hrs HW=309.21' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.36 cfs @ 0.93 fps)

Pond 1E-F: Existing Depression - Frozen Conditions





Routing Diagram for Pre-Post Development for 5 building layout
Prepared by {enter your company name here}, Printed 11/10/2023

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.863	39	>75% Grass cover, Good, HSG A (PR-1, PR-2, PR-4)
0.840	61	>75% Grass cover, Good, HSG B (PR-2, PR3)
0.874	98	Paved roads w/curbs & sewers (PR-1)
0.443	98	Roofs (PR-1)
0.474	98	Water Surface, HSG A (PR-1)
2.222	30	Woods, Good, HSG A (PR-2)
13.663	55	Woods, Good, HSG B (PR-2, PR3)
21.378	**54**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.559	HSG A	PR-1, PR-2, PR-4
14.503	HSG B	PR-2, PR3
0.000	HSG C	
0.000	HSG D	
1.317	Other	PR-1
21.378		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
2.863	0.840	0.000	0.000	0.000	3.703	>75% Grass cover, Good	PR-1, PR-2, PR-4, PR3
0.000	0.000	0.000	0.000	0.874	0.874	Paved roads w/curbs & sewers	PR-1
0.000	0.000	0.000	0.000	0.443	0.443	Roofs	PR-1
0.474	0.000	0.000	0.000	0.000	0.474	Water Surface	PR-1
2.222	13.663	0.000	0.000	0.000	15.884	Woods, Good	PR-2, PR3
5.559	**14.503**	**0.000**	**0.000**	**1.317**	**21.378**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	PR-2	0.00	0.00	312.0	0.0230	0.013	24.0	0.0	0.0
2	PR-4	0.00	0.00	47.0	0.0050	0.011	12.0	0.0	0.0
3	1P	306.00	305.53	94.2	0.0050	0.011	24.0	0.0	0.0
4	2P	310.60	307.00	363.4	0.0099	0.013	24.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PR-1: Subcatchment to Runoff Area=141,517 sf 55.11% Impervious Runoff Depth=0.97"
Tc=6.0 min CN=72 Runoff=3.71 cfs 0.262 af

Subcatchment PR-2: Subcatchment to Runoff Area=671,716 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=1,673' Tc=42.4 min CN=51 Runoff=0.42 cfs 0.210 af

Subcatchment PR-4: Subcatchment to BVW Runoff Area=30,761 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=494' Tc=10.7 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment PR3: To Blackstone Street Runoff Area=87,231 sf 0.00% Impervious Runoff Depth=0.30"
Flow Length=581' Tc=22.9 min CN=56 Runoff=0.19 cfs 0.050 af

Reach AP 1: Analysis Point - AP1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach AP 2: Analysis Point - AP2 Inflow=0.19 cfs 0.050 af
Outflow=0.19 cfs 0.050 af

Pond 1P: Infiltration Basin #1 Peak Elev=305.57' Storage=715 cf Inflow=3.71 cfs 0.472 af
Discarded=2.07 cfs 0.472 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=2.07 cfs 0.472 af

Pond 2P: INLET POND Peak Elev=312.00' Storage=0 cf Inflow=0.42 cfs 0.210 af
Discarded=0.00 cfs 0.000 af Primary=0.42 cfs 0.210 af Outflow=0.42 cfs 0.210 af

Total Runoff Area = 21.378 ac Runoff Volume = 0.522 af Average Runoff Depth = 0.29"
91.62% Pervious = 19.588 ac 8.38% Impervious = 1.790 ac

Summary for Subcatchment PR-1: Subcatchment to Basin #1

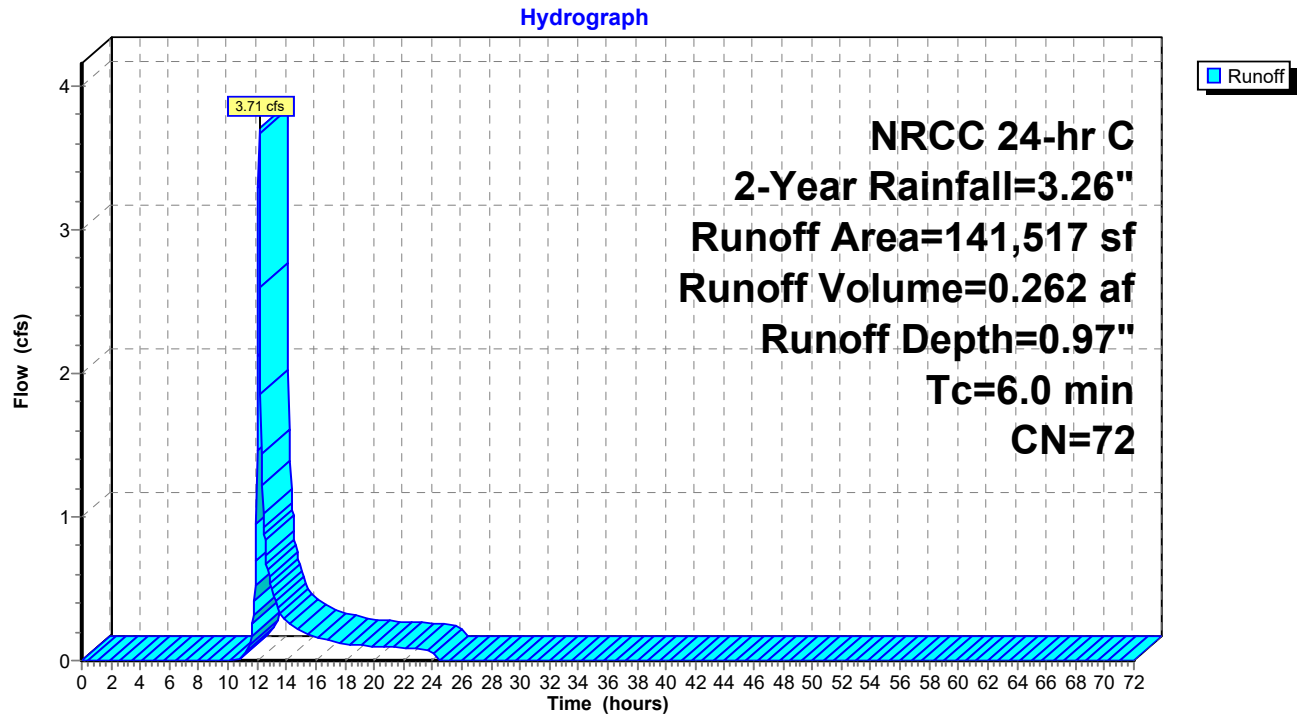
Runoff = 3.71 cfs @ 12.14 hrs, Volume= 0.262 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

	Area (sf)	CN	Description
*	38,062	98	Paved roads w/curbs & sewers
*	19,293	98	Roofs
	63,524	39	>75% Grass cover, Good, HSG A
*	20,638	98	Water Surface, HSG A
	141,517	72	Weighted Average
	63,524		44.89% Pervious Area
	77,993		55.11% Impervious Area

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

Subcatchment PR-1: Subcatchment to Basin #1



Summary for Subcatchment PR-2: Subcatchment to Basin #2

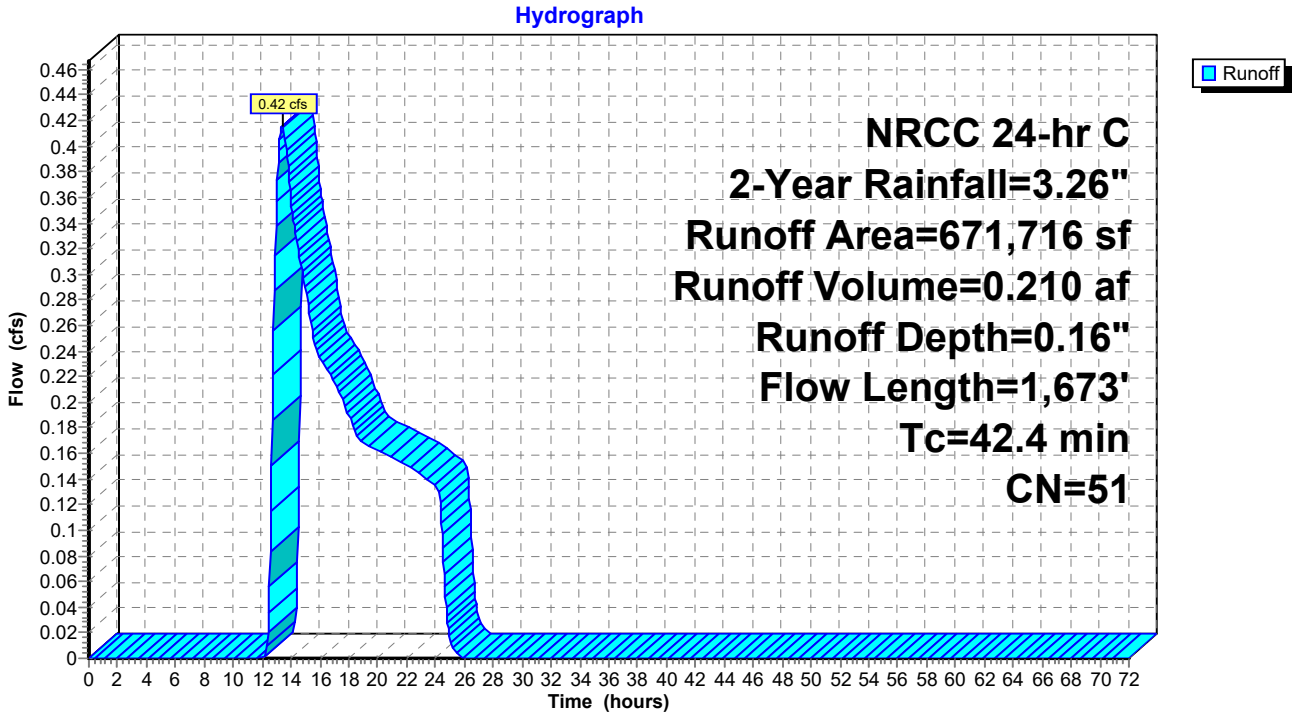
Runoff = 0.42 cfs @ 13.39 hrs, Volume= 0.210 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
527,673	55	Woods, Good, HSG B
96,783	30	Woods, Good, HSG A
16,825	61	>75% Grass cover, Good, HSG B
30,435	39	>75% Grass cover, Good, HSG A
671,716	51	Weighted Average
671,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
14.1	581	0.0190	0.69		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
2.0	60	0.0100	0.50		**Shallow Concentrated Flow, Segment E-F** Woodland Kv= 5.0 fps
0.5	312	0.0230	10.92	34.31	**Pipe Channel, Segment F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, straight & clean
42.4	1,673	Total			

Subcatchment PR-2: Subcatchment to Basin #2



Summary for Subcatchment PR-4: Subcatchment to BVW

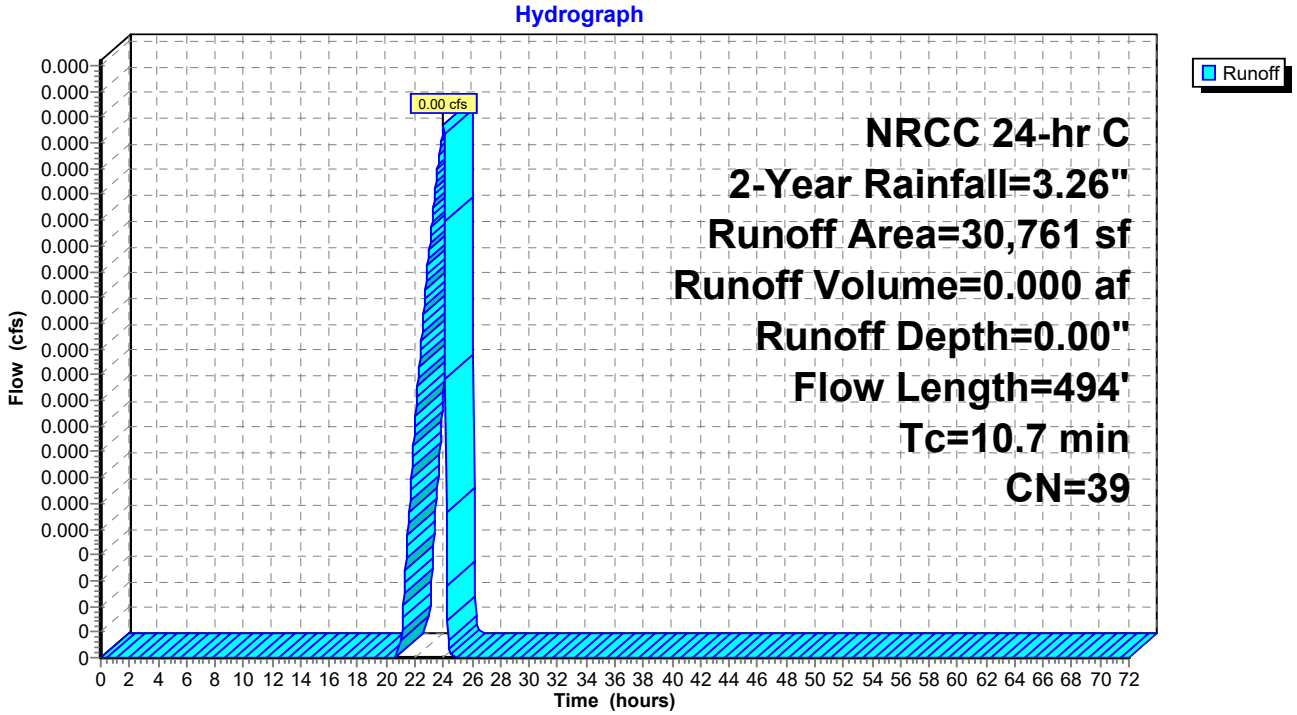
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
30,761	39	>75% Grass cover, Good, HSG A
30,761		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Segment A-B** Grass: Short n= 0.150 P2= 3.26"
1.5	144	0.0550	1.64		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0050	3.79	2.98	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
3.4	253	0.0070	1.25		**Shallow Concentrated Flow, Segment D-E** Grassed Waterway Kv= 15.0 fps
10.7	494	Total			

Subcatchment PR-4: Subcatchment to BVW



Summary for Subcatchment PR3: To Blackstone Street

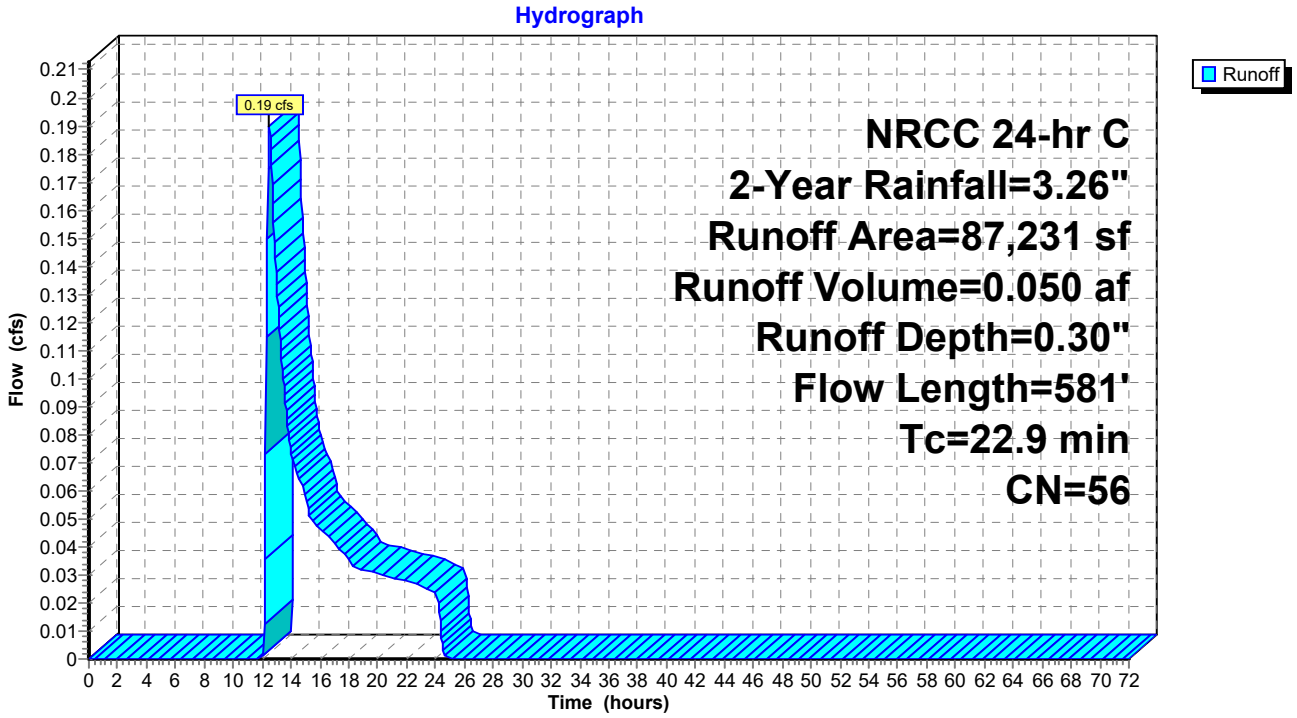
Runoff = 0.19 cfs @ 12.49 hrs, Volume= 0.050 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
67,471	55	Woods, Good, HSG B
19,760	61	>75% Grass cover, Good, HSG B
87,231	56	Weighted Average
87,231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
0.8	68	0.0890	1.49		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
3.5	145	0.0100	0.70		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
22.9	581	Total			

Subcatchment PR3: To Blackstone Street



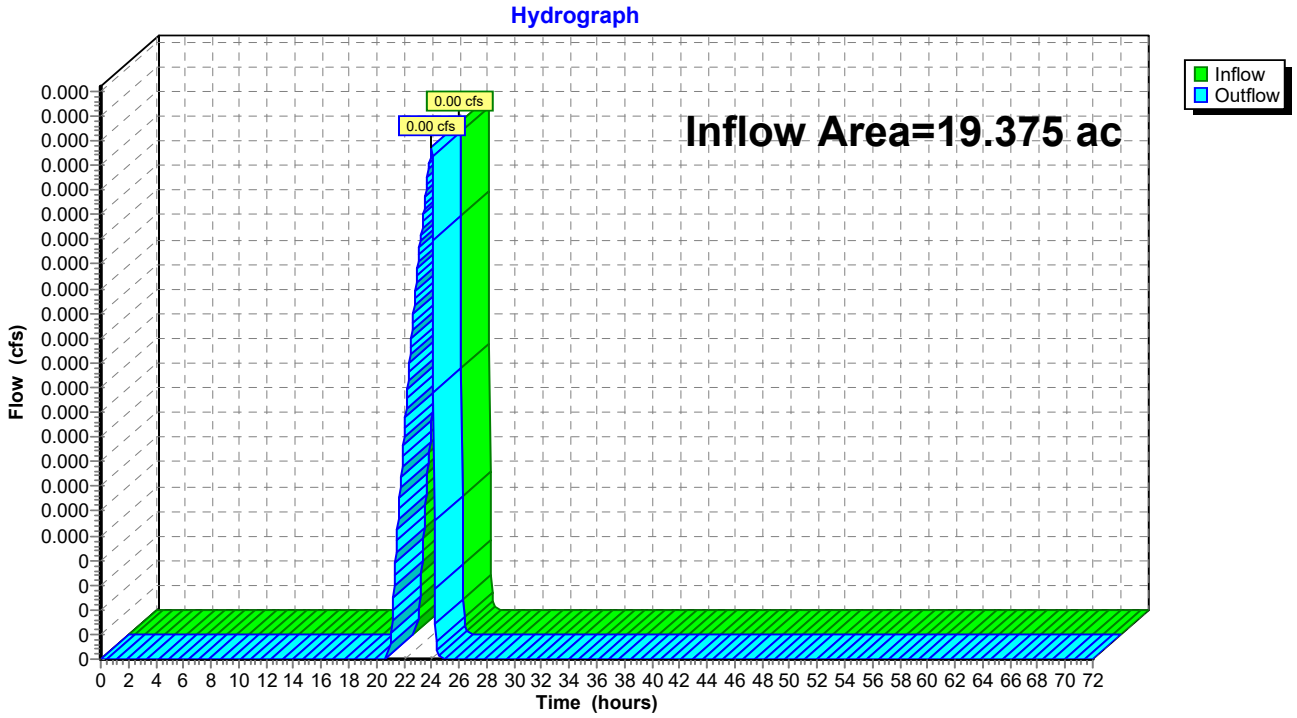
Summary for Reach AP 1: Analysis Point - AP1

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

Inflow Area = 19.375 ac, 9.24% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 1: Analysis Point - AP1



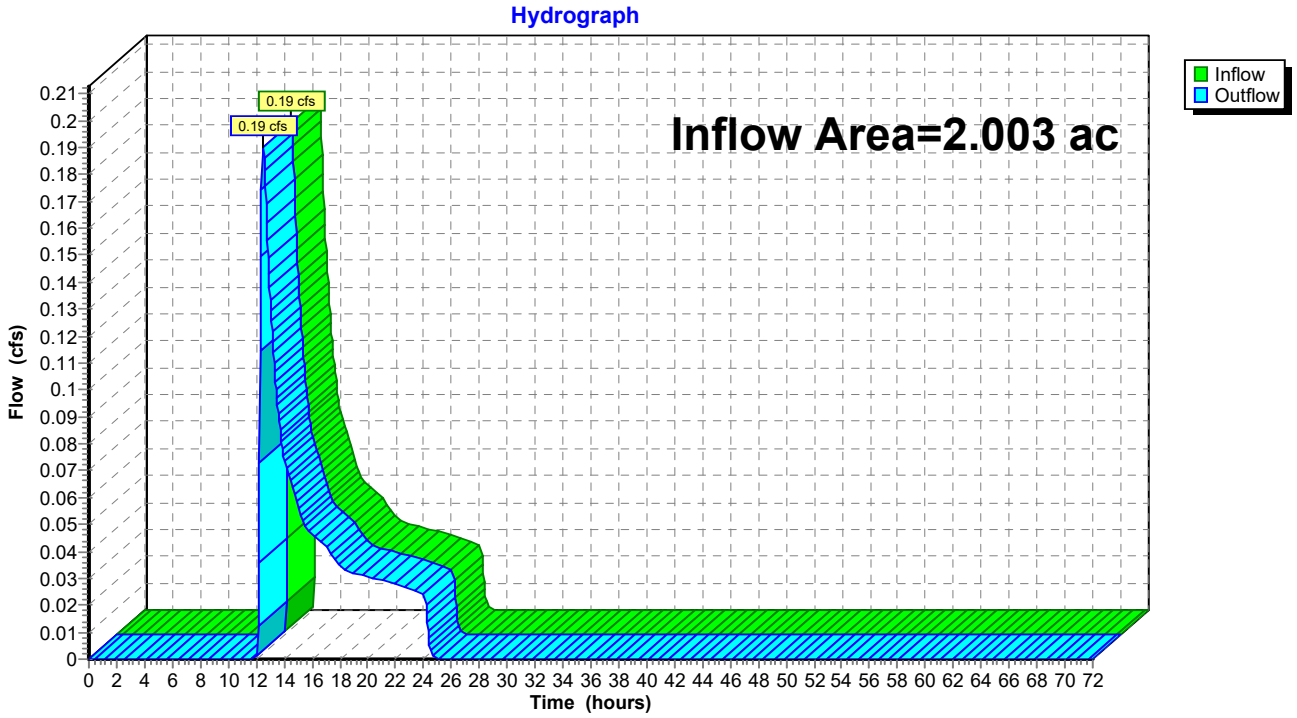
Summary for Reach AP 2: Analysis Point - AP2

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

Inflow Area = 2.003 ac, 0.00% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 0.19 cfs @ 12.49 hrs, Volume= 0.050 af
Outflow = 0.19 cfs @ 12.49 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 2: Analysis Point - AP2



Summary for Pond 1P: Infiltration Basin #1

Inflow Area = 18.669 ac, 9.59% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 3.71 cfs @ 12.14 hrs, Volume= 0.472 af
Outflow = 2.07 cfs @ 12.24 hrs, Volume= 0.472 af, Atten= 44%, Lag= 6.0 min
Discarded = 2.07 cfs @ 12.24 hrs, Volume= 0.472 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 305.57' @ 12.24 hrs Surf.Area= 10,581 sf Storage= 715 cf
Flood Elev= 310.50' Surf.Area= 20,637 sf Storage= 77,211 cf

Plug-Flow detention time= 1.3 min calculated for 0.472 af (100% of inflow)
Center-of-Mass det. time= 1.3 min (957.0 - 955.7)

Volume	Invert	Avail.Storage	Storage Description
#1	305.50'	87,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
305.50	10,451	0	0
306.00	11,407	5,465	5,465
308.00	15,368	26,775	32,240
310.00	19,555	34,923	67,163
310.50	20,637	10,048	77,211
311.00	20,637	10,319	87,529

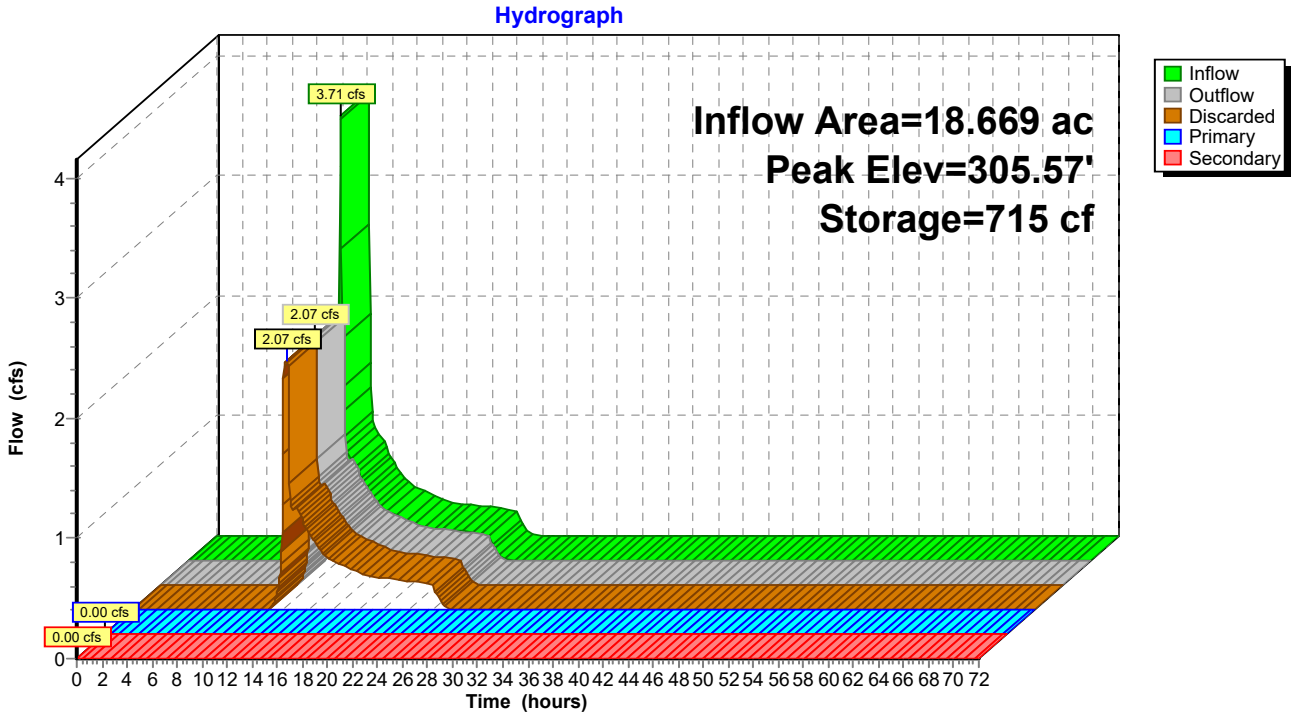
Device	Routing	Invert	Outlet Devices
#1	Primary	306.00'	**24.0" Round Culvert** L= 94.2' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 306.00' / 305.53' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	308.55'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	307.00'	**12.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600
#4	Discarded	305.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 302.70' Phase-In= 0.01'
#5	Secondary	309.90'	**30.0' 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=2.07 cfs @ 12.24 hrs HW=305.57' (Free Discharge)
└**4=Exfiltration** (Controls 2.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Infiltration Basin #1



Summary for Pond 2P: INLET POND

Inflow Area = 15.420 ac, 0.00% Impervious, Inflow Depth = 0.16" for 2-Year event
Inflow = 0.42 cfs @ 13.39 hrs, Volume= 0.210 af
Outflow = 0.42 cfs @ 13.39 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 14.57 hrs, Volume= 0.000 af
Primary = 0.42 cfs @ 13.39 hrs, Volume= 0.210 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 312.00' @ 0.00 hrs Surf.Area= 1,182 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,048.6 - 1,048.6)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	3,480 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

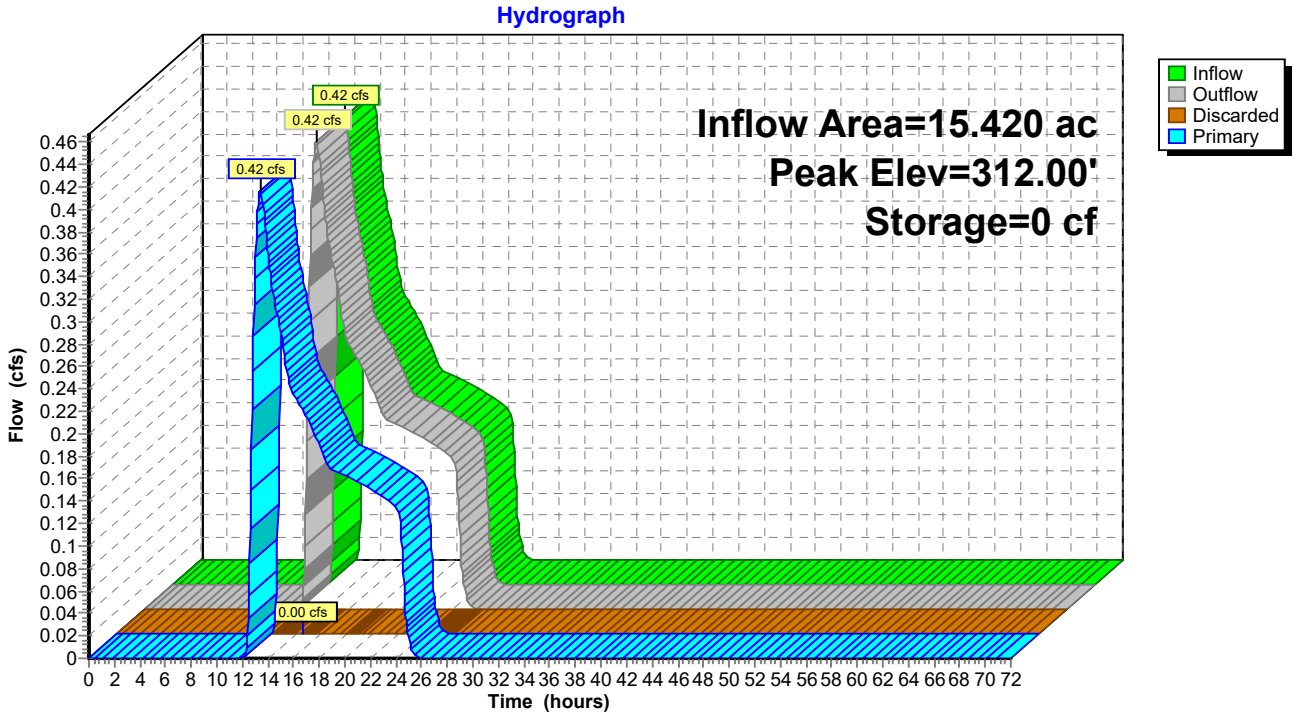
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	1,182	0	0
313.00	1,690	1,436	1,436
314.00	2,398	2,044	3,480

Device	Routing	Invert	Outlet Devices
#1	Primary	310.60'	**24.0" Round Culvert** L= 363.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 310.60' / 307.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	312.00'	**8.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.67' Phase-In= 0.01'

Discarded OutFlow Max=0.00 cfs @ 14.57 hrs HW=312.00' (Free Discharge)
↑└**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 13.39 hrs HW=312.00' TW=305.50' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.00 cfs of 9.46 cfs potential flow)

Pond 2P: INLET POND



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PR-1: Subcatchment to Runoff Area=141,517 sf 55.11% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=72 Runoff=8.38 cfs 0.570 af

Subcatchment PR-2: Subcatchment to Runoff Area=671,716 sf 0.00% Impervious Runoff Depth=0.70"
Flow Length=1,673' Tc=42.4 min CN=51 Runoff=3.82 cfs 0.895 af

Subcatchment PR-4: Subcatchment to BVW Runoff Area=30,761 sf 0.00% Impervious Runoff Depth=0.18"
Flow Length=494' Tc=10.7 min CN=39 Runoff=0.02 cfs 0.010 af

Subcatchment PR3: To Blackstone Street Runoff Area=87,231 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=581' Tc=22.9 min CN=56 Runoff=1.19 cfs 0.164 af

Reach AP 1: Analysis Point - AP1 Inflow=0.02 cfs 0.010 af
Outflow=0.02 cfs 0.010 af

Reach AP 2: Analysis Point - AP2 Inflow=1.19 cfs 0.164 af
Outflow=1.19 cfs 0.164 af

Pond 1P: Infiltration Basin #1 Peak Elev=306.40' Storage=10,214 cf Inflow=8.52 cfs 1.465 af
Discarded=3.03 cfs 1.465 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=3.03 cfs 1.465 af

Pond 2P: INLET POND Peak Elev=312.00' Storage=0 cf Inflow=3.82 cfs 0.895 af
Discarded=0.00 cfs 0.000 af Primary=3.82 cfs 0.895 af Outflow=3.82 cfs 0.895 af

Total Runoff Area = 21.378 ac Runoff Volume = 1.639 af Average Runoff Depth = 0.92"
91.62% Pervious = 19.588 ac 8.38% Impervious = 1.790 ac

Summary for Subcatchment PR-1: Subcatchment to Basin #1

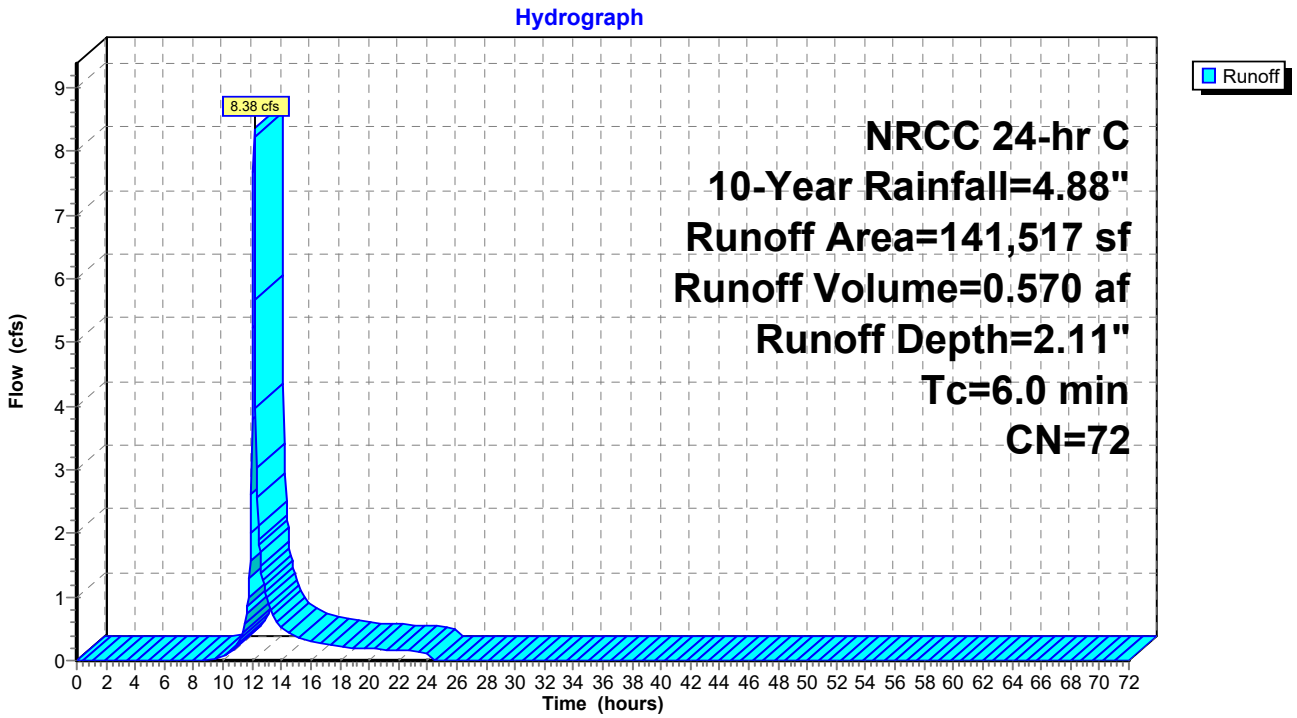
Runoff = 8.38 cfs @ 12.13 hrs, Volume= 0.570 af, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.88"

	Area (sf)	CN	Description
*	38,062	98	Paved roads w/curbs & sewers
*	19,293	98	Roofs
	63,524	39	>75% Grass cover, Good, HSG A
*	20,638	98	Water Surface, HSG A
	141,517	72	Weighted Average
	63,524		44.89% Pervious Area
	77,993		55.11% Impervious Area

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

Subcatchment PR-1: Subcatchment to Basin #1



Summary for Subcatchment PR-2: Subcatchment to Basin #2

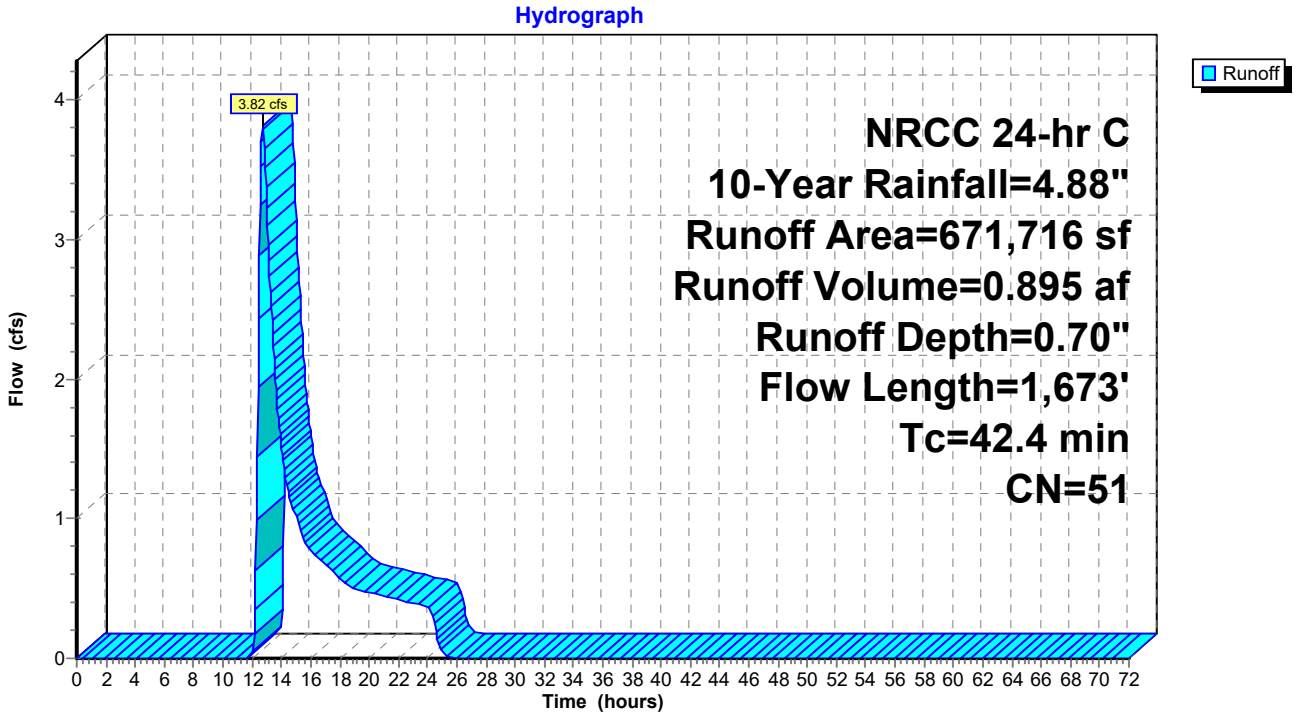
Runoff = 3.82 cfs @ 12.74 hrs, Volume= 0.895 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
527,673	55	Woods, Good, HSG B
96,783	30	Woods, Good, HSG A
16,825	61	>75% Grass cover, Good, HSG B
30,435	39	>75% Grass cover, Good, HSG A
671,716	51	Weighted Average
671,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
14.1	581	0.0190	0.69		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
2.0	60	0.0100	0.50		**Shallow Concentrated Flow, Segment E-F** Woodland Kv= 5.0 fps
0.5	312	0.0230	10.92	34.31	**Pipe Channel, Segment F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, straight & clean
42.4	1,673	Total			

Subcatchment PR-2: Subcatchment to Basin #2



Summary for Subcatchment PR-4: Subcatchment to BVW

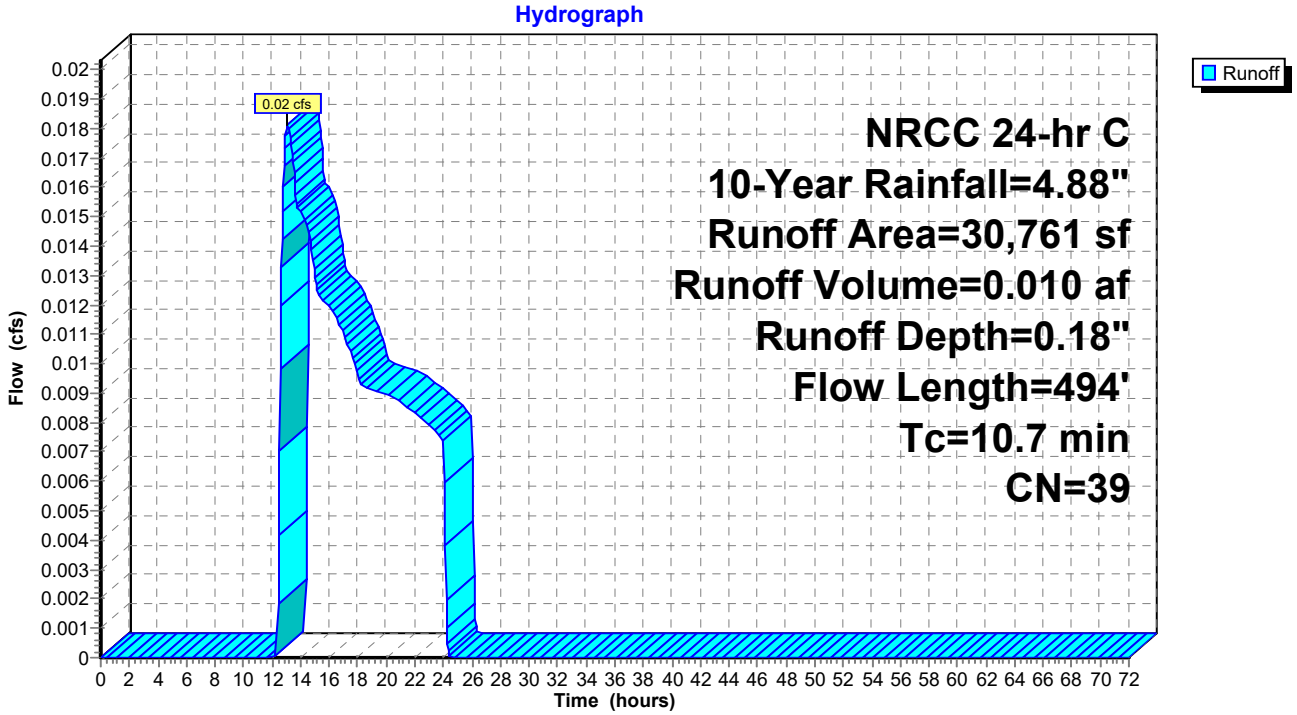
Runoff = 0.02 cfs @ 13.06 hrs, Volume= 0.010 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
30,761	39	>75% Grass cover, Good, HSG A
30,761		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Segment A-B** Grass: Short n= 0.150 P2= 3.26"
1.5	144	0.0550	1.64		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0050	3.79	2.98	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
3.4	253	0.0070	1.25		**Shallow Concentrated Flow, Segment D-E** Grassed Waterway Kv= 15.0 fps
10.7	494	Total			

Subcatchment PR-4: Subcatchment to BVW



Summary for Subcatchment PR3: To Blackstone Street

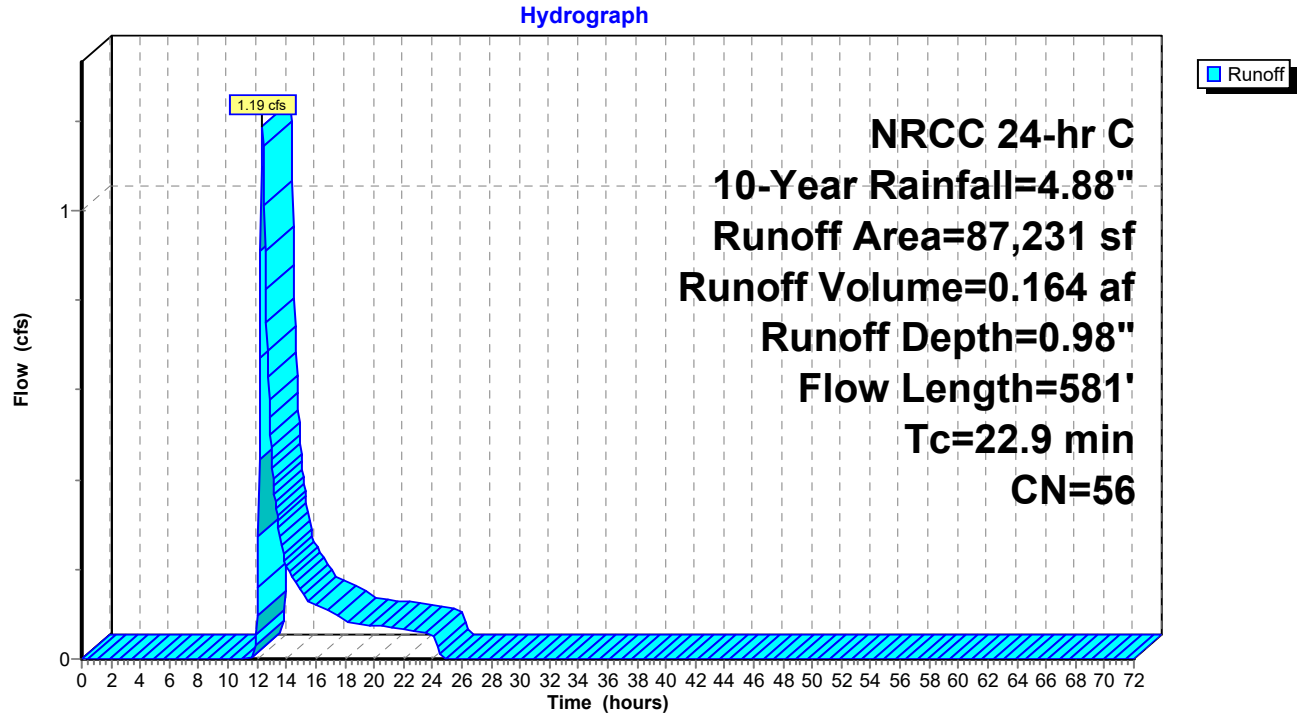
Runoff = 1.19 cfs @ 12.37 hrs, Volume= 0.164 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
67,471	55	Woods, Good, HSG B
19,760	61	>75% Grass cover, Good, HSG B
87,231	56	Weighted Average
87,231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
0.8	68	0.0890	1.49		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
3.5	145	0.0100	0.70		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
22.9	581	Total			

Subcatchment PR3: To Blackstone Street



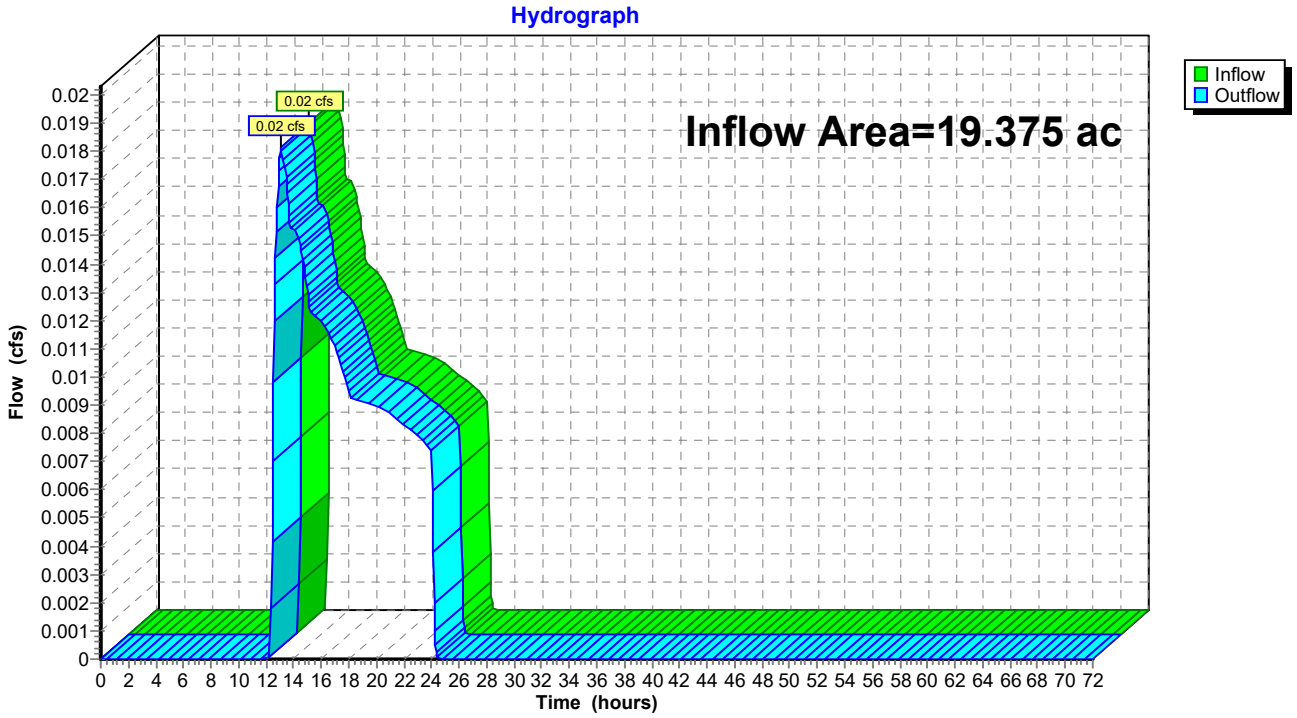
Summary for Reach AP 1: Analysis Point - AP1

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

Inflow Area = 19.375 ac, 9.24% Impervious, Inflow Depth = 0.01" for 10-Year event
Inflow = 0.02 cfs @ 13.06 hrs, Volume= 0.010 af
Outflow = 0.02 cfs @ 13.06 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 1: Analysis Point - AP1



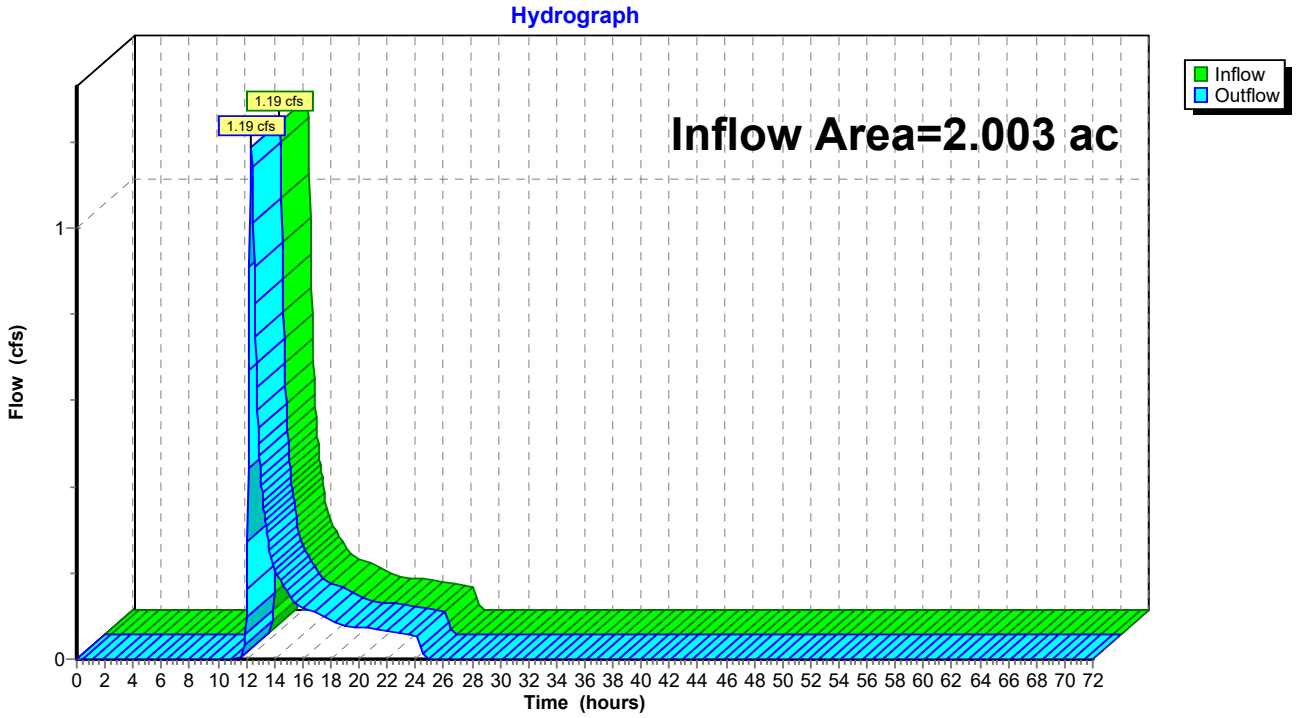
Summary for Reach AP 2: Analysis Point - AP2

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

Inflow Area = 2.003 ac, 0.00% Impervious, Inflow Depth = 0.98" for 10-Year event
Inflow = 1.19 cfs @ 12.37 hrs, Volume= 0.164 af
Outflow = 1.19 cfs @ 12.37 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 2: Analysis Point - AP2



Summary for Pond 1P: Infiltration Basin #1

Inflow Area = 18.669 ac, 9.59% Impervious, Inflow Depth = 0.94" for 10-Year event
Inflow = 8.52 cfs @ 12.14 hrs, Volume= 1.465 af
Outflow = 3.03 cfs @ 13.41 hrs, Volume= 1.465 af, Atten= 64%, Lag= 76.5 min
Discarded = 3.03 cfs @ 13.41 hrs, Volume= 1.465 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 306.40' @ 13.41 hrs Surf.Area= 12,204 sf Storage= 10,214 cf
Flood Elev= 310.50' Surf.Area= 20,637 sf Storage= 77,211 cf

Plug-Flow detention time= 24.8 min calculated for 1.464 af (100% of inflow)
Center-of-Mass det. time= 24.8 min (946.5 - 921.7)

Volume	Invert	Avail.Storage	Storage Description
#1	305.50'	87,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
305.50	10,451	0	0
306.00	11,407	5,465	5,465
308.00	15,368	26,775	32,240
310.00	19,555	34,923	67,163
310.50	20,637	10,048	77,211
311.00	20,637	10,319	87,529

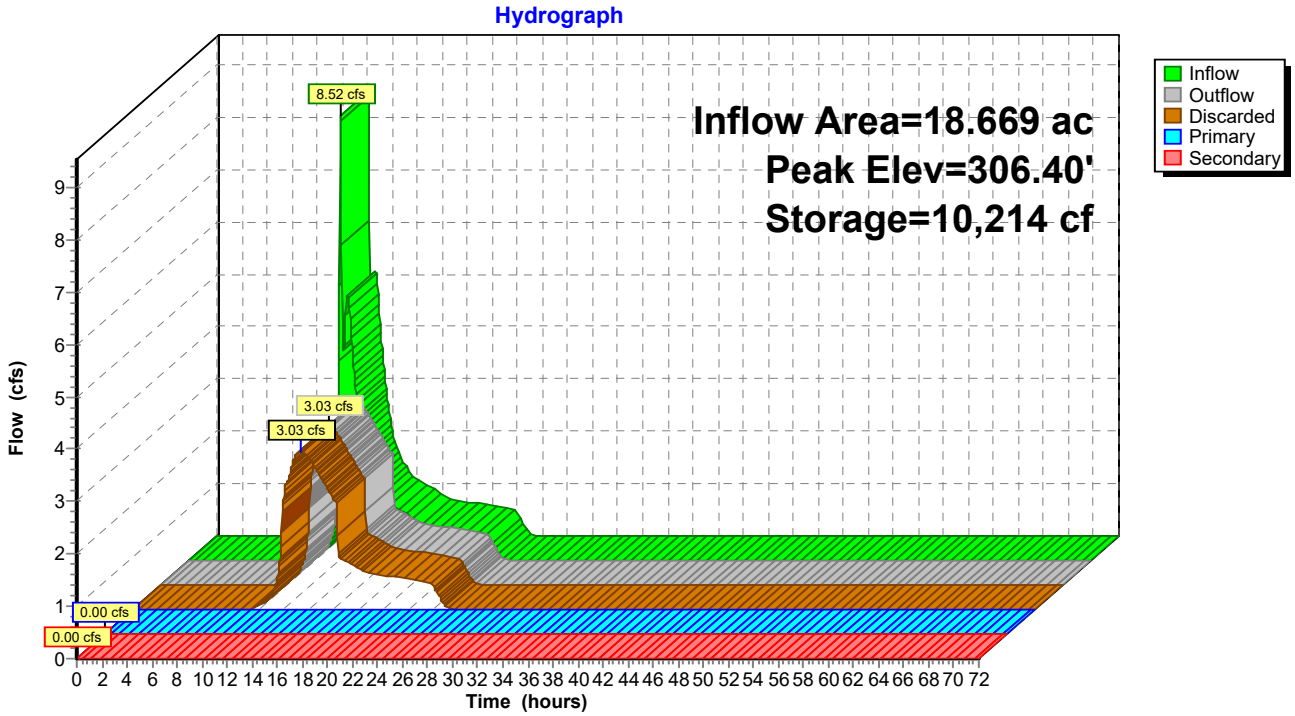
Device	Routing	Invert	Outlet Devices
#1	Primary	306.00'	**24.0" Round Culvert** L= 94.2' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 306.00' / 305.53' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	308.55'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	307.00'	**12.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600
#4	Discarded	305.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 302.70' Phase-In= 0.01'
#5	Secondary	309.90'	**30.0' 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=3.03 cfs @ 13.41 hrs HW=306.40' (Free Discharge)
└**4=Exfiltration** (Controls 3.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
  └**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Infiltration Basin #1



Summary for Pond 2P: INLET POND

Inflow Area = 15.420 ac, 0.00% Impervious, Inflow Depth = 0.70" for 10-Year event
Inflow = 3.82 cfs @ 12.74 hrs, Volume= 0.895 af
Outflow = 3.82 cfs @ 12.74 hrs, Volume= 0.895 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af
Primary = 3.82 cfs @ 12.74 hrs, Volume= 0.895 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 312.00' @ 0.00 hrs Surf.Area= 1,182 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (964.1 - 964.1)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	3,480 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

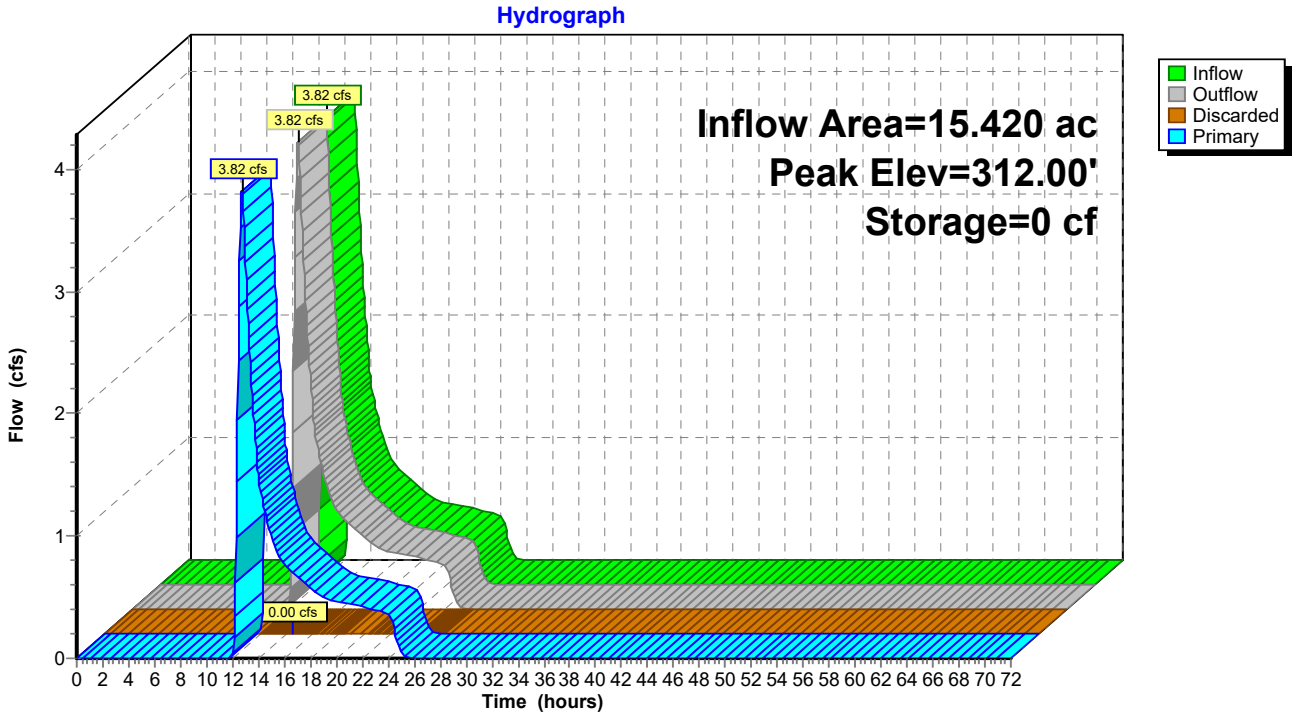
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	1,182	0	0
313.00	1,690	1,436	1,436
314.00	2,398	2,044	3,480

Device	Routing	Invert	Outlet Devices
#1	Primary	310.60'	**24.0" Round Culvert** L= 363.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 310.60' / 307.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	312.00'	**8.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.67' Phase-In= 0.01'

Discarded OutFlow Max=0.00 cfs @ 14.56 hrs HW=312.00' (Free Discharge)
↑└**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 12.74 hrs HW=312.00' TW=306.18' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.00 cfs of 9.46 cfs potential flow)

Pond 2P: INLET POND



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PR-1: Subcatchment to Runoff Area=141,517 sf 55.11% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=72 Runoff=12.42 cfs 0.844 af

Subcatchment PR-2: Subcatchment to Runoff Area=671,716 sf 0.00% Impervious Runoff Depth=1.29"
Flow Length=1,673' Tc=42.4 min CN=51 Runoff=8.73 cfs 1.661 af

Subcatchment PR-4: Subcatchment to BVW Runoff Area=30,761 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=494' Tc=10.7 min CN=39 Runoff=0.11 cfs 0.029 af

Subcatchment PR3: To Blackstone Street Runoff Area=87,231 sf 0.00% Impervious Runoff Depth=1.69"
Flow Length=581' Tc=22.9 min CN=56 Runoff=2.29 cfs 0.281 af

Reach AP 1: Analysis Point - AP1 Inflow=1.25 cfs 0.143 af
Outflow=1.25 cfs 0.143 af

Reach AP 2: Analysis Point - AP2 Inflow=2.29 cfs 0.281 af
Outflow=2.29 cfs 0.281 af

Pond 1P: Infiltration Basin #1 Peak Elev=307.52' Storage=25,048 cf Inflow=13.41 cfs 2.504 af
Discarded=4.42 cfs 2.390 af Primary=1.19 cfs 0.114 af Secondary=0.00 cfs 0.000 af Outflow=5.61 cfs 2.504 af

Pond 2P: INLET POND Peak Elev=312.00' Storage=1 cf Inflow=8.73 cfs 1.661 af
Discarded=0.02 cfs 0.000 af Primary=8.71 cfs 1.660 af Outflow=8.73 cfs 1.661 af

Total Runoff Area = 21.378 ac Runoff Volume = 2.814 af Average Runoff Depth = 1.58"
91.62% Pervious = 19.588 ac 8.38% Impervious = 1.790 ac

Summary for Subcatchment PR-1: Subcatchment to Basin #1

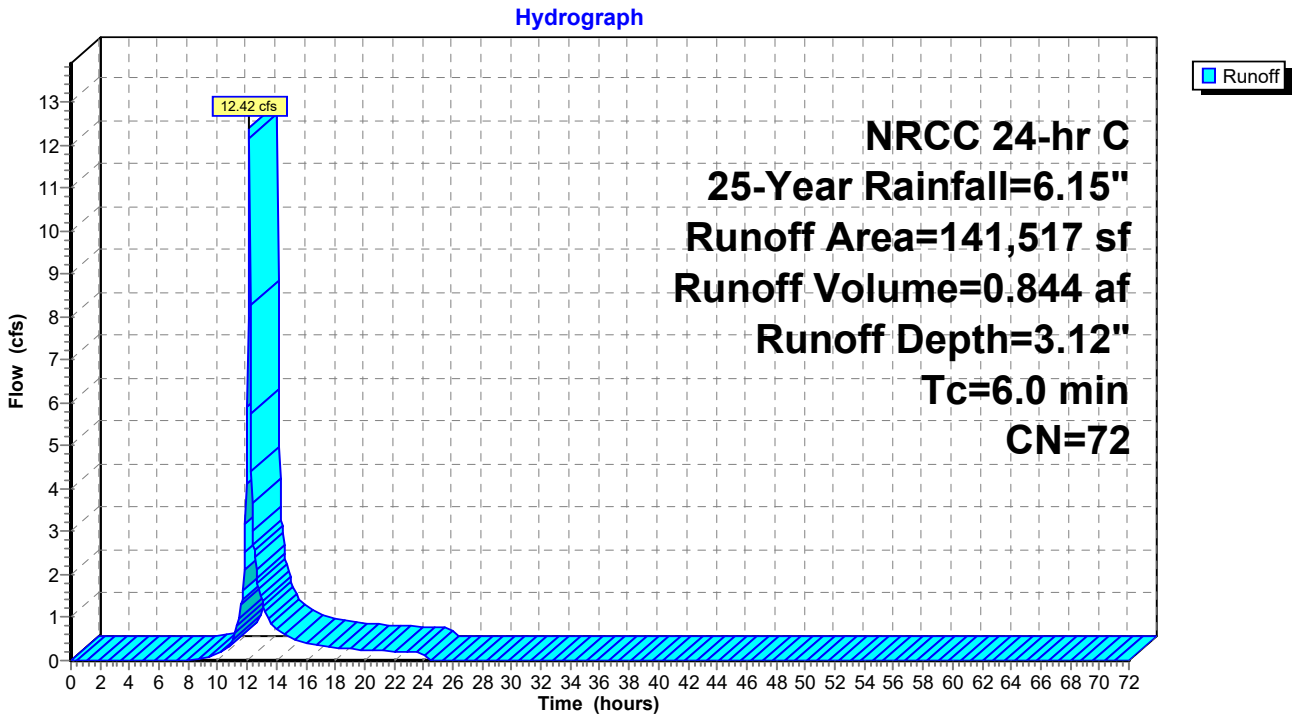
Runoff = 12.42 cfs @ 12.13 hrs, Volume= 0.844 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	38,062	98	Paved roads w/curbs & sewers
*	19,293	98	Roofs
	63,524	39	>75% Grass cover, Good, HSG A
*	20,638	98	Water Surface, HSG A
	141,517	72	Weighted Average
	63,524		44.89% Pervious Area
	77,993		55.11% Impervious Area

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

Subcatchment PR-1: Subcatchment to Basin #1



Summary for Subcatchment PR-2: Subcatchment to Basin #2

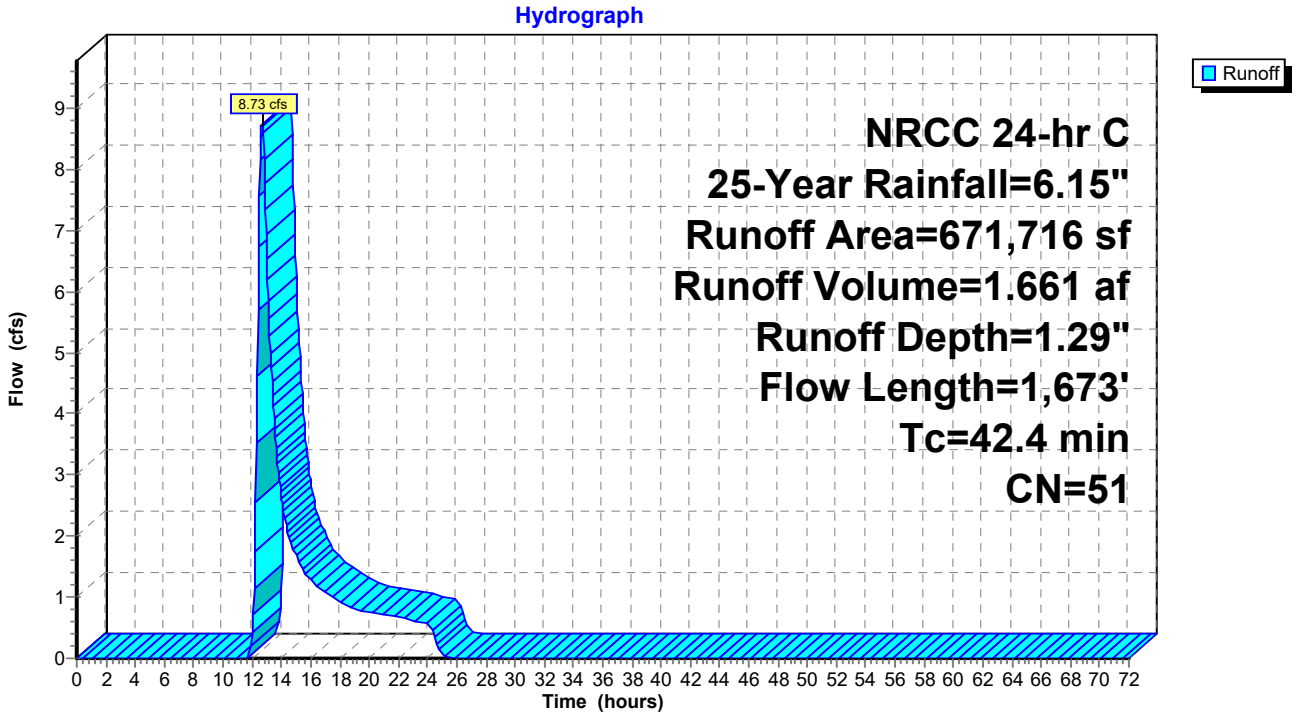
Runoff = 8.73 cfs @ 12.67 hrs, Volume= 1.661 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
527,673	55	Woods, Good, HSG B
96,783	30	Woods, Good, HSG A
16,825	61	>75% Grass cover, Good, HSG B
30,435	39	>75% Grass cover, Good, HSG A
671,716	51	Weighted Average
671,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
14.1	581	0.0190	0.69		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
2.0	60	0.0100	0.50		**Shallow Concentrated Flow, Segment E-F** Woodland Kv= 5.0 fps
0.5	312	0.0230	10.92	34.31	**Pipe Channel, Segment F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, straight & clean
42.4	1,673	Total			

Subcatchment PR-2: Subcatchment to Basin #2



Summary for Subcatchment PR-4: Subcatchment to BVW

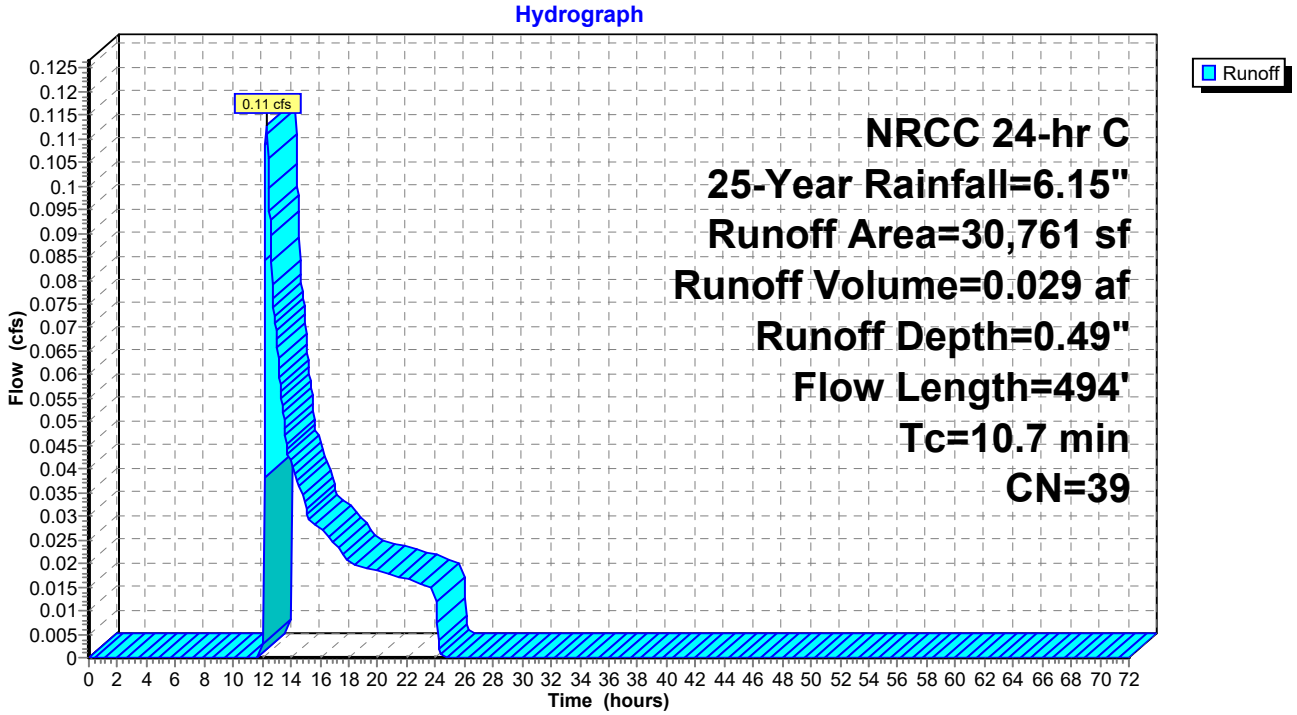
Runoff = 0.11 cfs @ 12.31 hrs, Volume= 0.029 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
30,761	39	>75% Grass cover, Good, HSG A
30,761		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Segment A-B** Grass: Short n= 0.150 P2= 3.26"
1.5	144	0.0550	1.64		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0050	3.79	2.98	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
3.4	253	0.0070	1.25		**Shallow Concentrated Flow, Segment D-E** Grassed Waterway Kv= 15.0 fps
10.7	494	Total			

Subcatchment PR-4: Subcatchment to BVW



Summary for Subcatchment PR3: To Blackstone Street

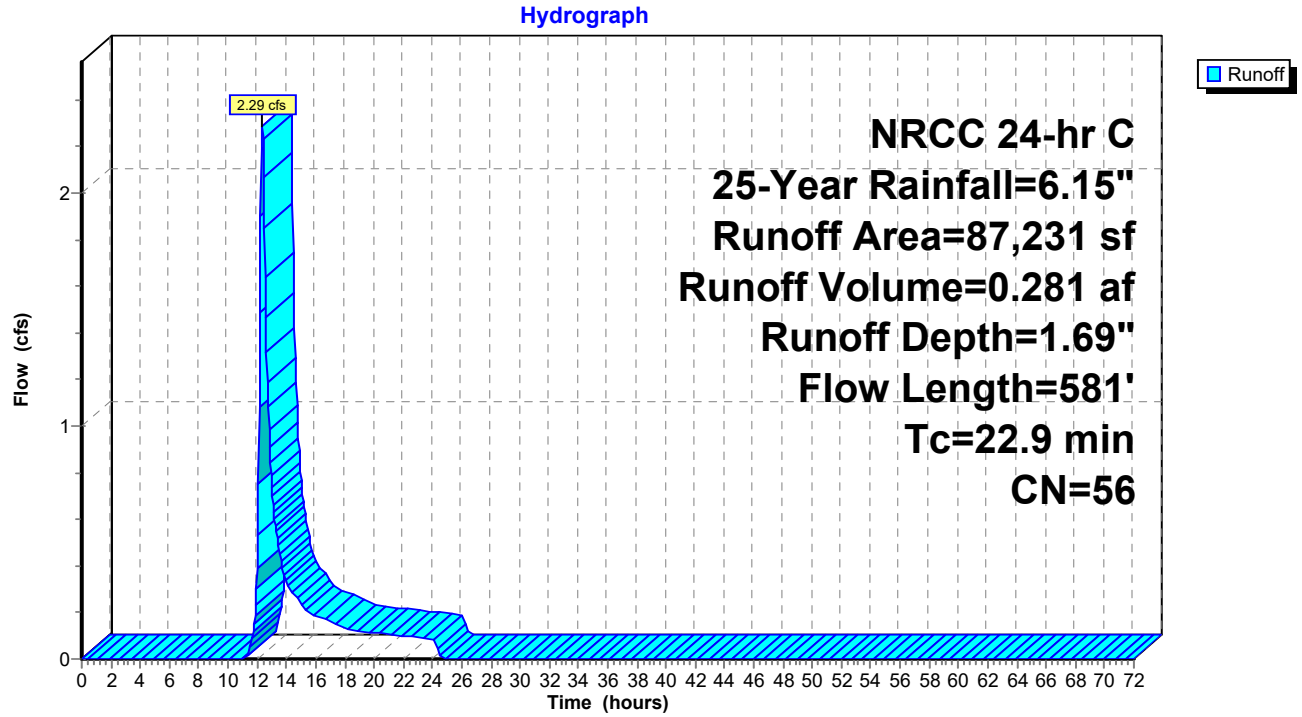
Runoff = 2.29 cfs @ 12.36 hrs, Volume= 0.281 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
67,471	55	Woods, Good, HSG B
19,760	61	>75% Grass cover, Good, HSG B
87,231	56	Weighted Average
87,231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
0.8	68	0.0890	1.49		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
3.5	145	0.0100	0.70		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
22.9	581	Total			

Subcatchment PR3: To Blackstone Street



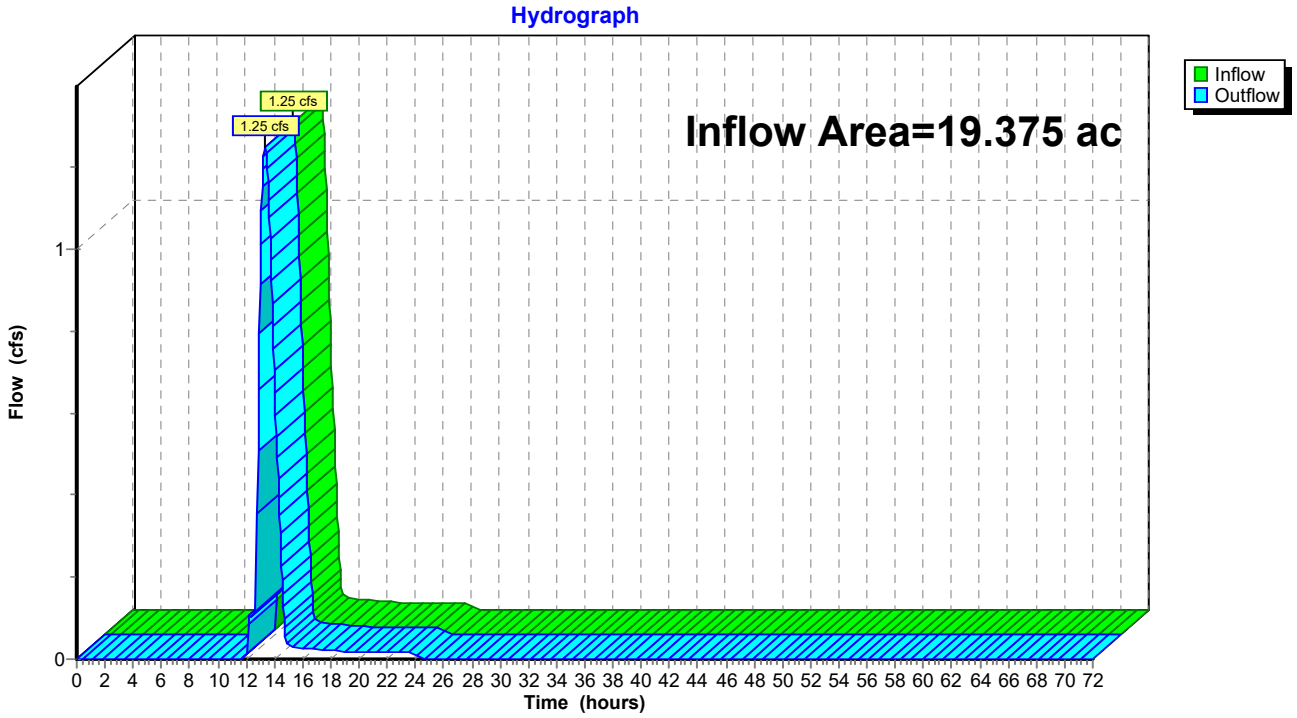
Summary for Reach AP 1: Analysis Point - AP1

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

Inflow Area = 19.375 ac, 9.24% Impervious, Inflow Depth = 0.09" for 25-Year event
Inflow = 1.25 cfs @ 13.34 hrs, Volume= 0.143 af
Outflow = 1.25 cfs @ 13.34 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 1: Analysis Point - AP1



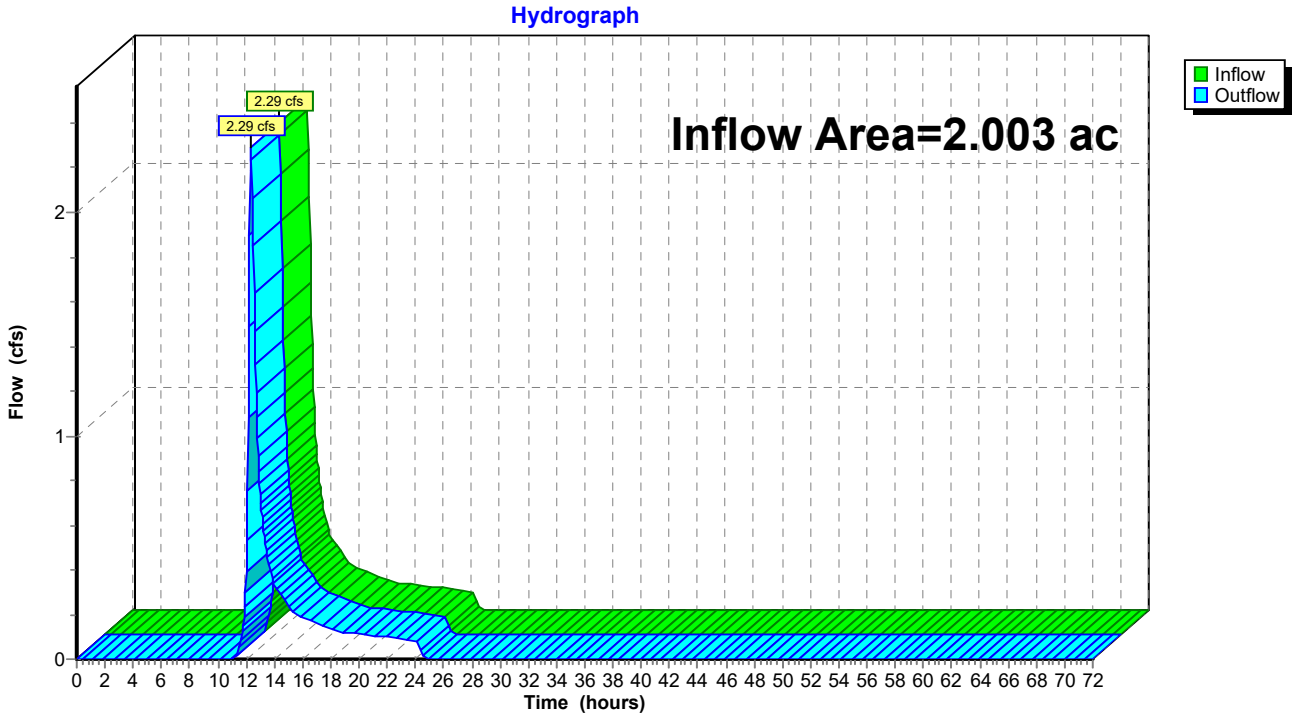
Summary for Reach AP 2: Analysis Point - AP2

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

Inflow Area = 2.003 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-Year event
Inflow = 2.29 cfs @ 12.36 hrs, Volume= 0.281 af
Outflow = 2.29 cfs @ 12.36 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 2: Analysis Point - AP2



Summary for Pond 1P: Infiltration Basin #1

Inflow Area = 18.669 ac, 9.59% Impervious, Inflow Depth = 1.61" for 25-Year event
Inflow = 13.41 cfs @ 12.14 hrs, Volume= 2.504 af
Outflow = 5.61 cfs @ 13.35 hrs, Volume= 2.504 af, Atten= 58%, Lag= 72.5 min
Discarded = 4.42 cfs @ 13.35 hrs, Volume= 2.390 af
Primary = 1.19 cfs @ 13.35 hrs, Volume= 0.114 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 307.52' @ 13.35 hrs Surf.Area= 14,412 sf Storage= 25,048 cf
Flood Elev= 310.50' Surf.Area= 20,637 sf Storage= 77,211 cf

Plug-Flow detention time= 48.2 min calculated for 2.502 af (100% of inflow)
Center-of-Mass det. time= 48.2 min (953.7 - 905.5)

Volume	Invert	Avail.Storage	Storage Description
#1	305.50'	87,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
305.50	10,451	0	0
306.00	11,407	5,465	5,465
308.00	15,368	26,775	32,240
310.00	19,555	34,923	67,163
310.50	20,637	10,048	77,211
311.00	20,637	10,319	87,529

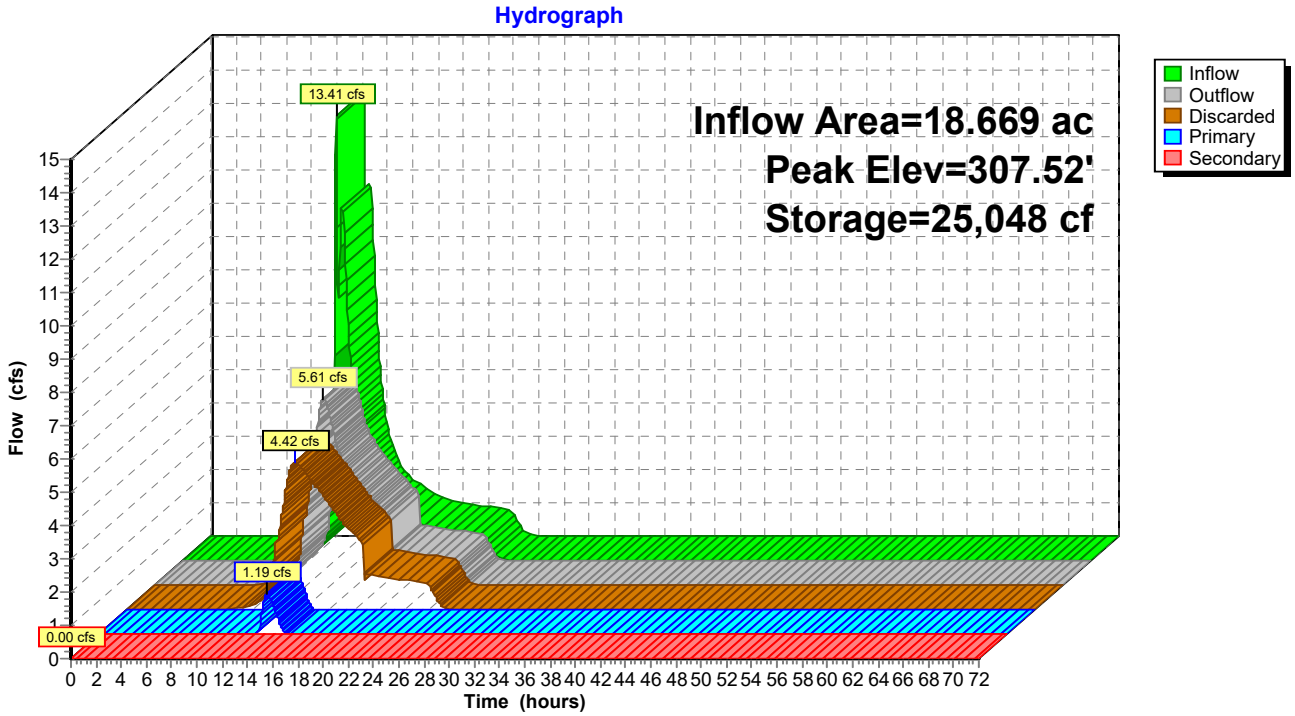
Device	Routing	Invert	Outlet Devices
#1	Primary	306.00'	**24.0" Round Culvert** L= 94.2' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 306.00' / 305.53' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	308.55'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	307.00'	**12.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600
#4	Discarded	305.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 302.70' Phase-In= 0.01'
#5	Secondary	309.90'	**30.0' 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=4.41 cfs @ 13.35 hrs HW=307.52' (Free Discharge)
└**4=Exfiltration** (Controls 4.41 cfs)

Primary OutFlow Max=1.19 cfs @ 13.35 hrs HW=307.52' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.19 cfs of 9.75 cfs potential flow)
└**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 1.19 cfs @ 2.31 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Infiltration Basin #1



Summary for Pond 2P: INLET POND

Inflow Area = 15.420 ac, 0.00% Impervious, Inflow Depth = 1.29" for 25-Year event
Inflow = 8.73 cfs @ 12.67 hrs, Volume= 1.661 af
Outflow = 8.73 cfs @ 12.67 hrs, Volume= 1.661 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 12.67 hrs, Volume= 0.000 af
Primary = 8.71 cfs @ 12.67 hrs, Volume= 1.660 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 312.00' @ 12.67 hrs Surf.Area= 1,182 sf Storage= 1 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (937.5 - 937.5)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	3,480 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

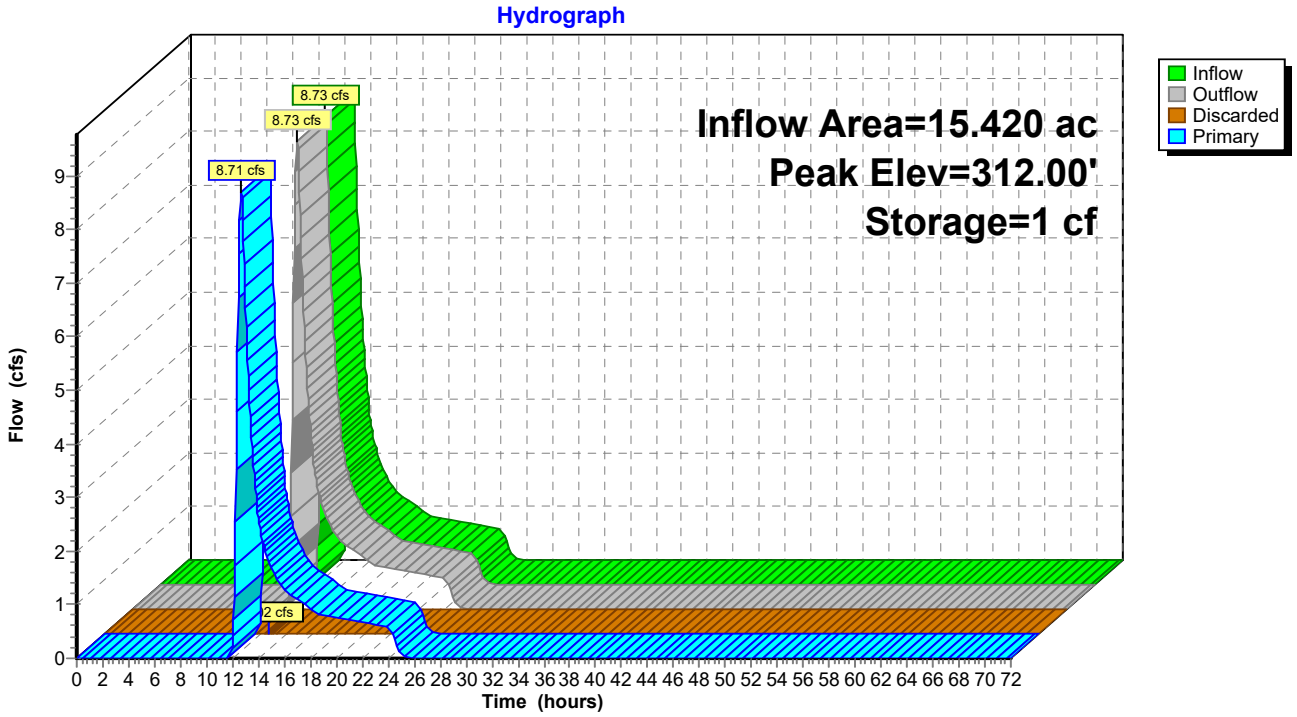
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	1,182	0	0
313.00	1,690	1,436	1,436
314.00	2,398	2,044	3,480

Device	Routing	Invert	Outlet Devices
#1	Primary	310.60'	**24.0" Round Culvert** L= 363.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 310.60' / 307.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	312.00'	**8.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.67' Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.67 hrs HW=312.00' (Free Discharge)
↑—**2=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=9.47 cfs @ 12.67 hrs HW=312.00' TW=306.98' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 9.47 cfs @ 4.03 fps)

Pond 2P: INLET POND



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PR-1: Subcatchment to Runoff Area=141,517 sf 55.11% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=72 Runoff=21.07 cfs 1.448 af

Subcatchment PR-2: Subcatchment to Runoff Area=671,716 sf 0.00% Impervious Runoff Depth=2.83"
Flow Length=1,673' Tc=42.4 min CN=51 Runoff=21.90 cfs 3.637 af

Subcatchment PR-4: Subcatchment to BVW Runoff Area=30,761 sf 0.00% Impervious Runoff Depth=1.48"
Flow Length=494' Tc=10.7 min CN=39 Runoff=0.84 cfs 0.087 af

Subcatchment PR3: To Blackstone Street Runoff Area=87,231 sf 0.00% Impervious Runoff Depth=3.42"
Flow Length=581' Tc=22.9 min CN=56 Runoff=4.99 cfs 0.571 af

Reach AP 1: Analysis Point - AP1 Inflow=14.77 cfs 1.395 af
Outflow=14.77 cfs 1.395 af

Reach AP 2: Analysis Point - AP2 Inflow=4.99 cfs 0.571 af
Outflow=4.99 cfs 0.571 af

Pond 1P: Infiltration Basin #1 Peak Elev=308.88' Storage=46,656 cf Inflow=26.27 cfs 5.054 af
Discarded=6.27 cfs 3.747 af Primary=14.56 cfs 1.307 af Secondary=0.00 cfs 0.000 af Outflow=20.83 cfs 5.054 af

Pond 2P: INLET POND Peak Elev=313.49' Storage=2,350 cf Inflow=21.90 cfs 3.637 af
Discarded=0.46 cfs 0.031 af Primary=20.80 cfs 3.606 af Outflow=21.26 cfs 3.637 af

Total Runoff Area = 21.378 ac Runoff Volume = 5.743 af Average Runoff Depth = 3.22"
91.62% Pervious = 19.588 ac 8.38% Impervious = 1.790 ac

Summary for Subcatchment PR-1: Subcatchment to Basin #1

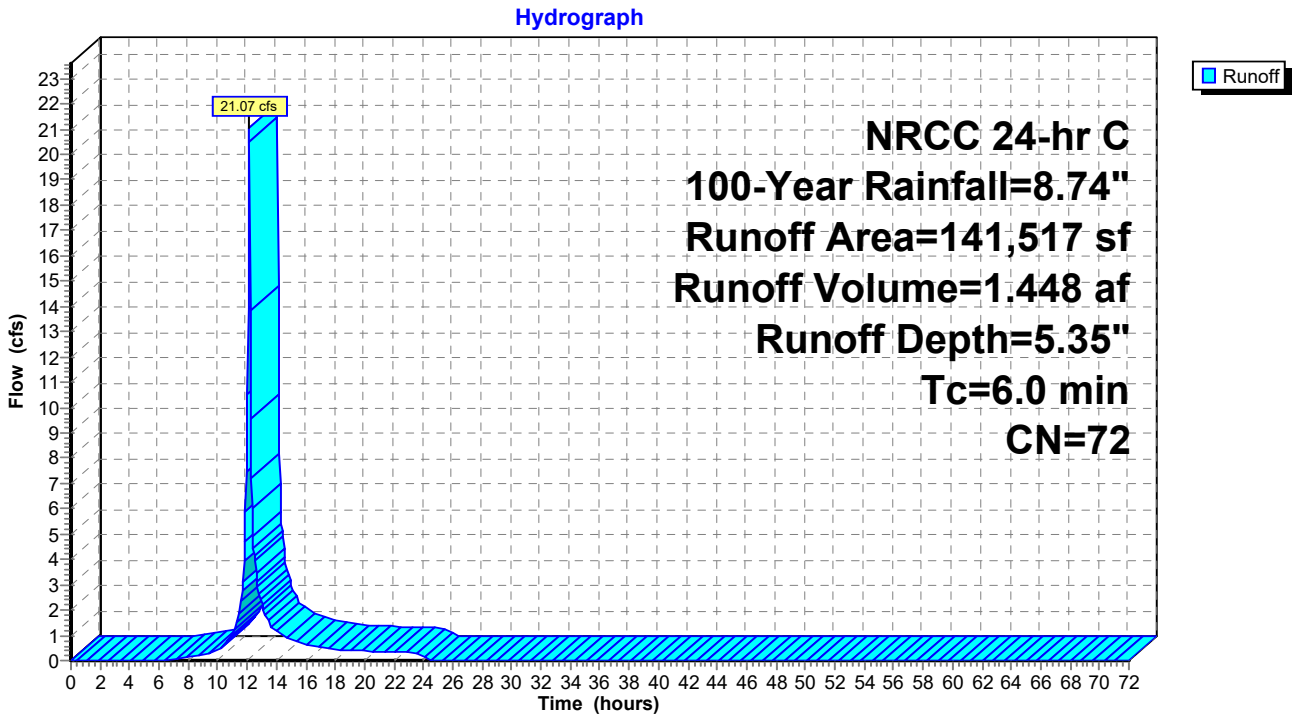
Runoff = 21.07 cfs @ 12.13 hrs, Volume= 1.448 af, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

	Area (sf)	CN	Description
*	38,062	98	Paved roads w/curbs & sewers
*	19,293	98	Roofs
	63,524	39	>75% Grass cover, Good, HSG A
*	20,638	98	Water Surface, HSG A
	141,517	72	Weighted Average
	63,524		44.89% Pervious Area
	77,993		55.11% Impervious Area

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

Subcatchment PR-1: Subcatchment to Basin #1



Summary for Subcatchment PR-2: Subcatchment to Basin #2

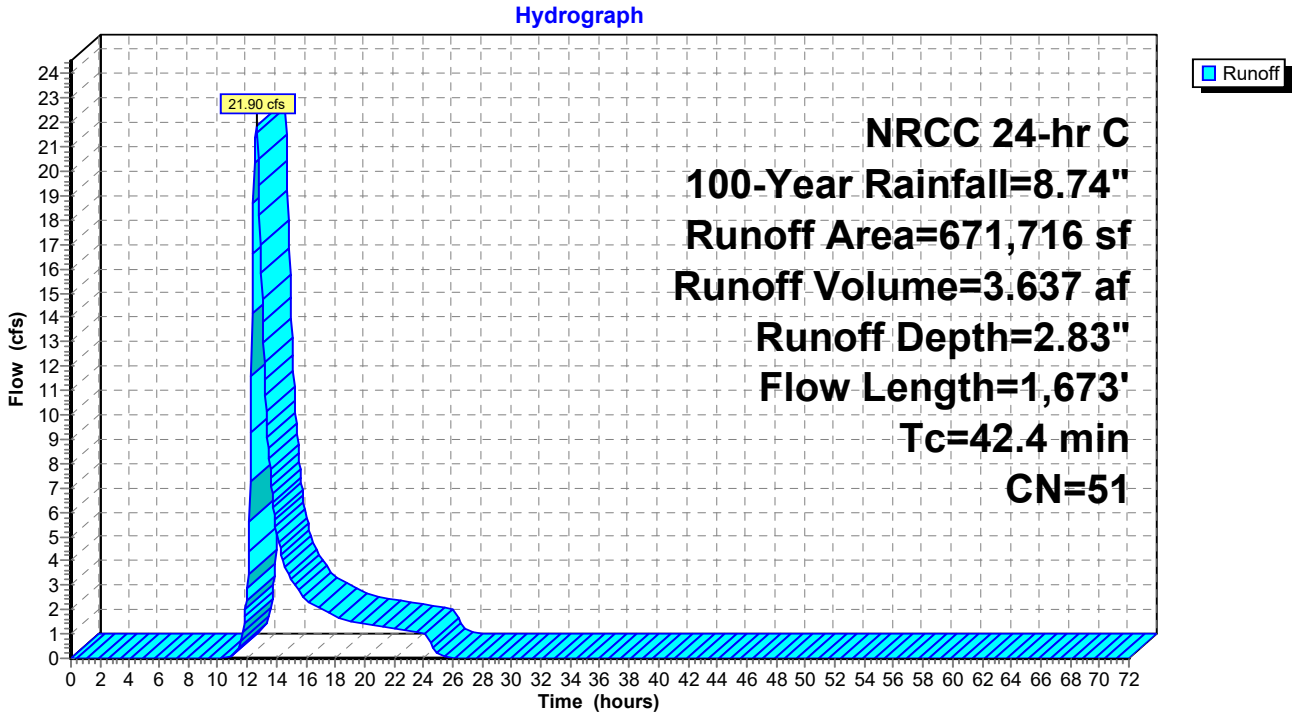
Runoff = 21.90 cfs @ 12.62 hrs, Volume= 3.637 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

Area (sf)	CN	Description
527,673	55	Woods, Good, HSG B
96,783	30	Woods, Good, HSG A
16,825	61	>75% Grass cover, Good, HSG B
30,435	39	>75% Grass cover, Good, HSG A
671,716	51	Weighted Average
671,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
14.1	581	0.0190	0.69		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
2.0	60	0.0100	0.50		**Shallow Concentrated Flow, Segment E-F** Woodland Kv= 5.0 fps
0.5	312	0.0230	10.92	34.31	**Pipe Channel, Segment F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, straight & clean
42.4	1,673	Total			

Subcatchment PR-2: Subcatchment to Basin #2



Summary for Subcatchment PR-4: Subcatchment to BVW

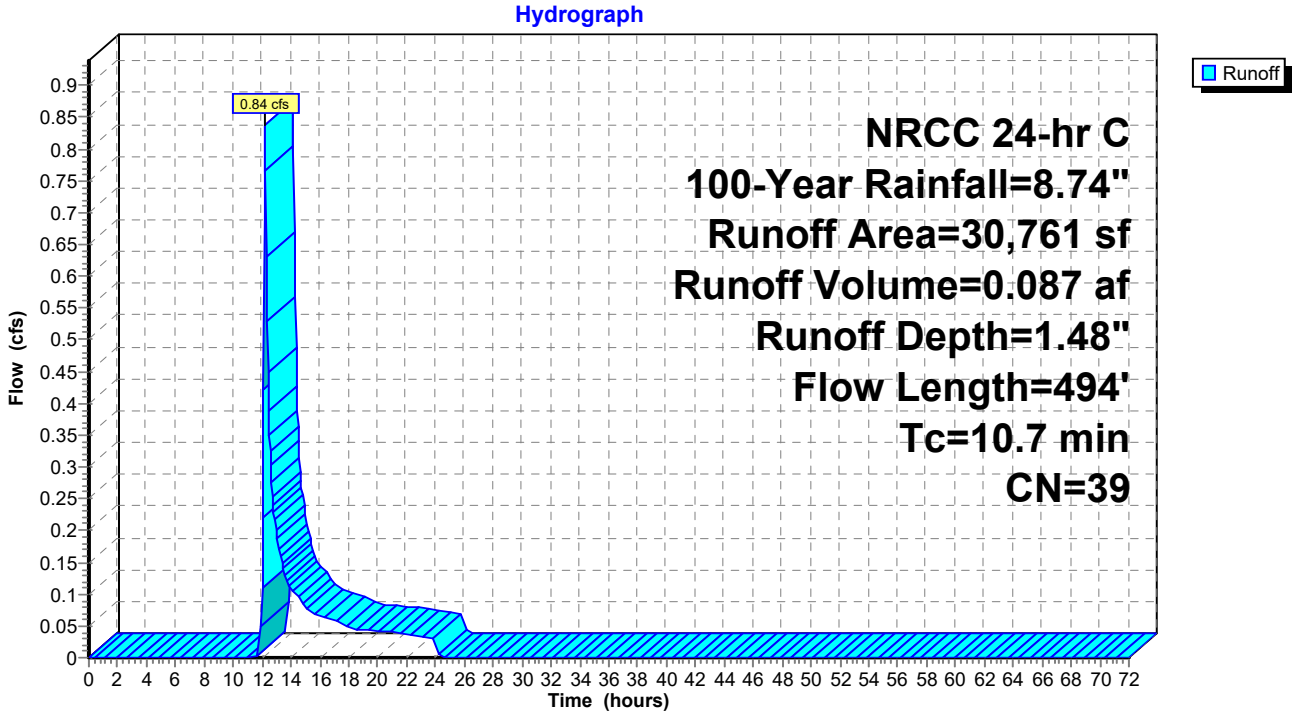
Runoff = 0.84 cfs @ 12.21 hrs, Volume= 0.087 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

Area (sf)	CN	Description
30,761	39	>75% Grass cover, Good, HSG A
30,761		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Segment A-B** Grass: Short n= 0.150 P2= 3.26"
1.5	144	0.0550	1.64		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0050	3.79	2.98	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
3.4	253	0.0070	1.25		**Shallow Concentrated Flow, Segment D-E** Grassed Waterway Kv= 15.0 fps
10.7	494	Total			

Subcatchment PR-4: Subcatchment to BVW



Summary for Subcatchment PR3: To Blackstone Street

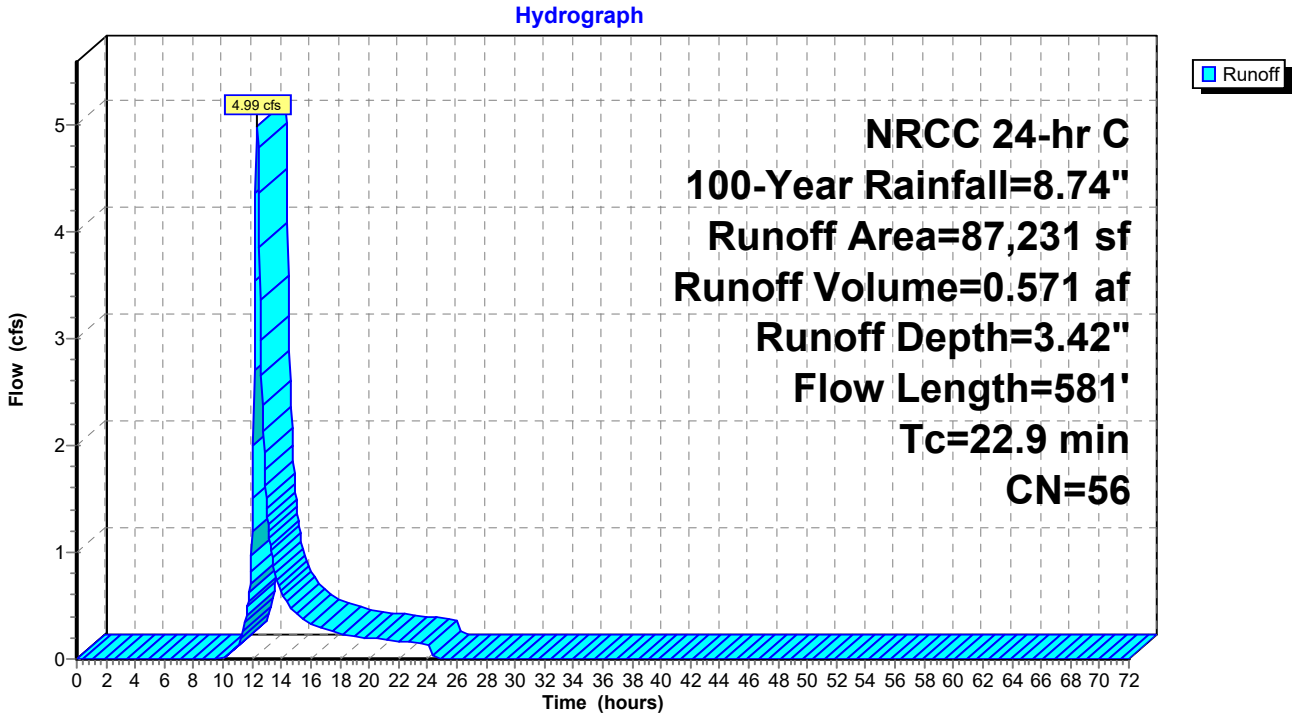
Runoff = 4.99 cfs @ 12.34 hrs, Volume= 0.571 af, Depth= 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

Area (sf)	CN	Description
67,471	55	Woods, Good, HSG B
19,760	61	>75% Grass cover, Good, HSG B
87,231	56	Weighted Average
87,231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
0.8	68	0.0890	1.49		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
3.5	145	0.0100	0.70		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
22.9	581	Total			

Subcatchment PR3: To Blackstone Street



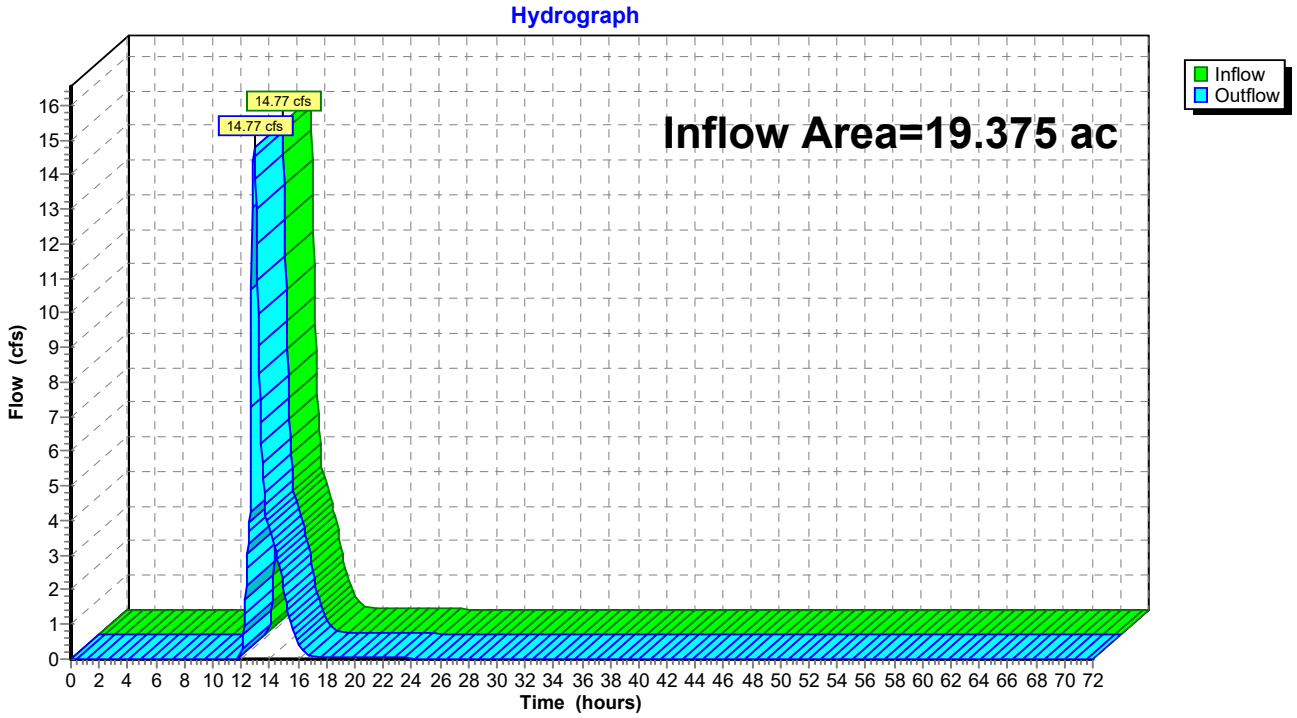
Summary for Reach AP 1: Analysis Point - AP1

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

Inflow Area = 19.375 ac, 9.24% Impervious, Inflow Depth = 0.86" for 100-Year event
Inflow = 14.77 cfs @ 12.91 hrs, Volume= 1.395 af
Outflow = 14.77 cfs @ 12.91 hrs, Volume= 1.395 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 1: Analysis Point - AP1



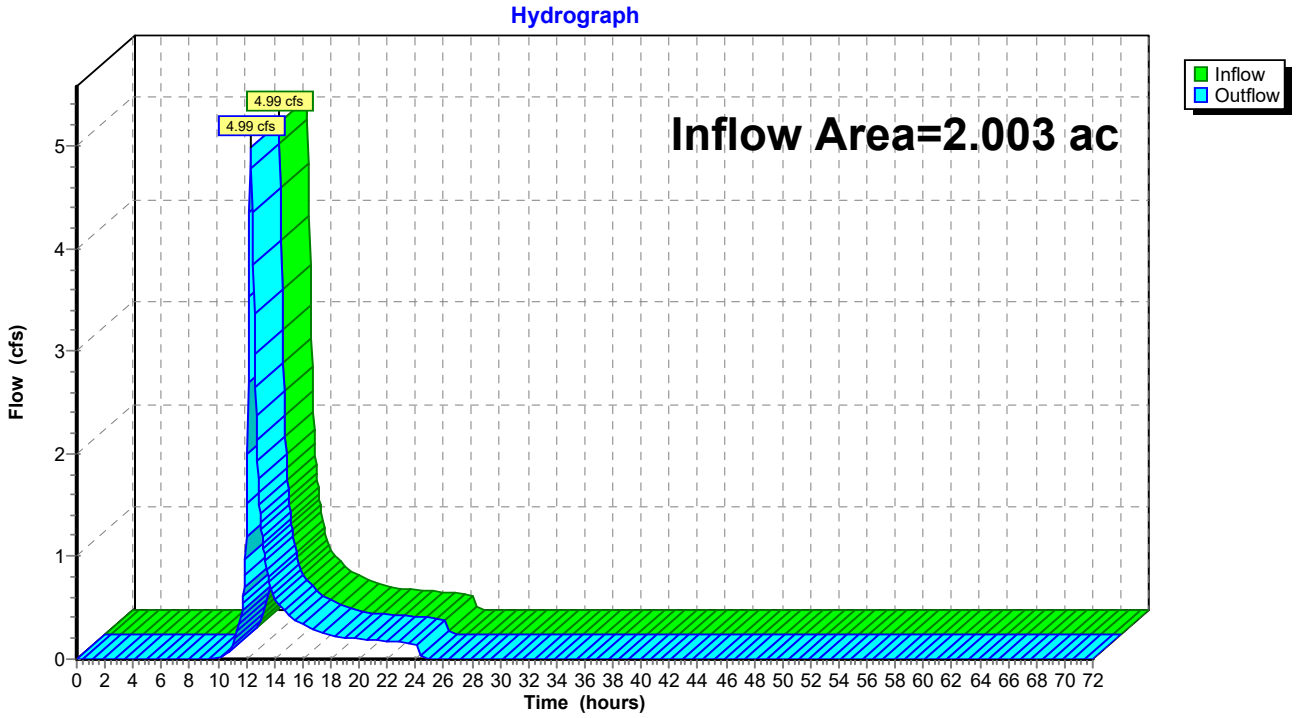
Summary for Reach AP 2: Analysis Point - AP2

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

Inflow Area = 2.003 ac, 0.00% Impervious, Inflow Depth = 3.42" for 100-Year event
Inflow = 4.99 cfs @ 12.34 hrs, Volume= 0.571 af
Outflow = 4.99 cfs @ 12.34 hrs, Volume= 0.571 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 2: Analysis Point - AP2



Summary for Pond 1P: Infiltration Basin #1

Inflow Area = 18.669 ac, 9.59% Impervious, Inflow Depth = 3.25" for 100-Year event
Inflow = 26.27 cfs @ 12.14 hrs, Volume= 5.054 af
Outflow = 20.83 cfs @ 12.91 hrs, Volume= 5.054 af, Atten= 21%, Lag= 46.1 min
Discarded = 6.27 cfs @ 12.91 hrs, Volume= 3.747 af
Primary = 14.56 cfs @ 12.91 hrs, Volume= 1.307 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 308.88' @ 12.91 hrs Surf.Area= 17,220 sf Storage= 46,656 cf
Flood Elev= 310.50' Surf.Area= 20,637 sf Storage= 77,211 cf

Plug-Flow detention time= 52.6 min calculated for 5.051 af (100% of inflow)
Center-of-Mass det. time= 52.6 min (938.8 - 886.2)

Volume	Invert	Avail.Storage	Storage Description
#1	305.50'	87,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
305.50	10,451	0	0
306.00	11,407	5,465	5,465
308.00	15,368	26,775	32,240
310.00	19,555	34,923	67,163
310.50	20,637	10,048	77,211
311.00	20,637	10,319	87,529

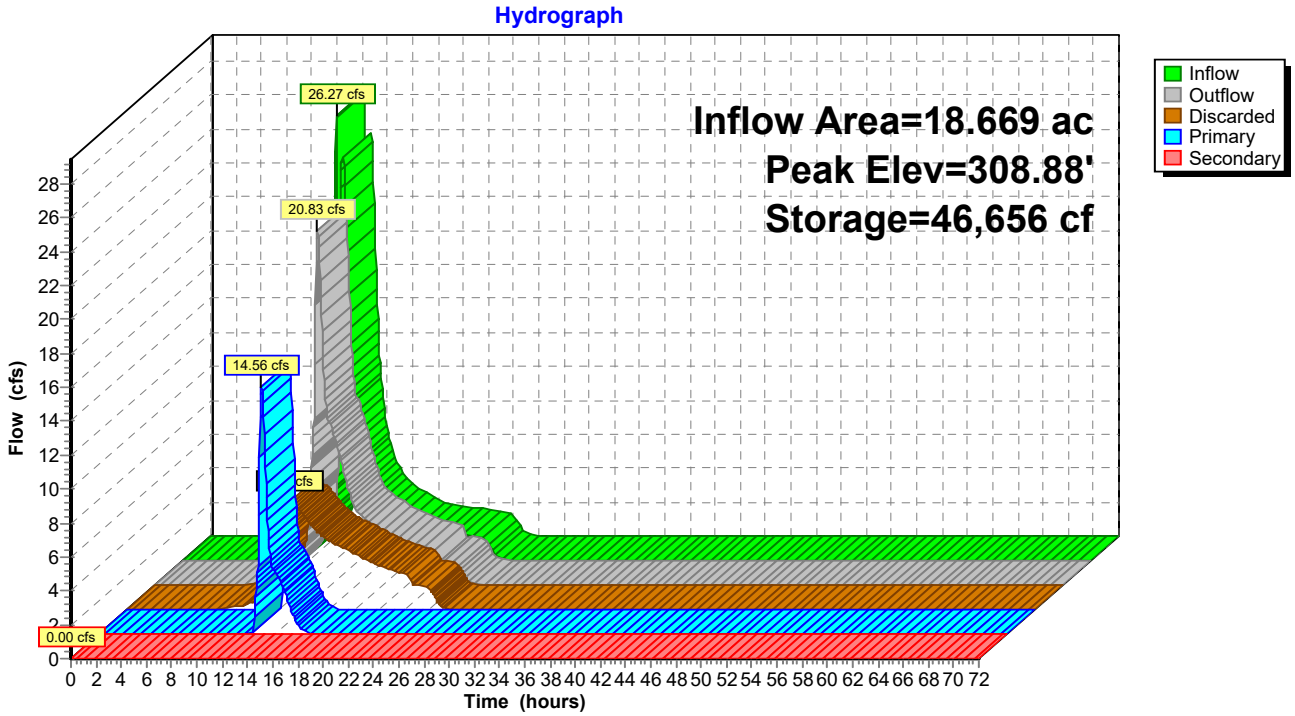
Device	Routing	Invert	Outlet Devices
#1	Primary	306.00'	**24.0" Round Culvert** L= 94.2' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 306.00' / 305.53' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	308.55'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	307.00'	**12.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600
#4	Discarded	305.50'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 302.70' Phase-In= 0.01'
#5	Secondary	309.90'	**30.0' 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=6.27 cfs @ 12.91 hrs HW=308.88' (Free Discharge)
└**4=Exfiltration** (Controls 6.27 cfs)

Primary OutFlow Max=14.52 cfs @ 12.91 hrs HW=308.88' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 14.52 cfs of 20.54 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 10.10 cfs @ 1.89 fps)
└**3=Orifice/Grate** (Orifice Controls 4.42 cfs @ 5.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Infiltration Basin #1



Summary for Pond 2P: INLET POND

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=87)

Inflow Area = 15.420 ac, 0.00% Impervious, Inflow Depth = 2.83" for 100-Year event
Inflow = 21.90 cfs @ 12.62 hrs, Volume= 3.637 af
Outflow = 21.26 cfs @ 12.71 hrs, Volume= 3.637 af, Atten= 3%, Lag= 5.2 min
Discarded = 0.46 cfs @ 12.71 hrs, Volume= 0.031 af
Primary = 20.80 cfs @ 12.71 hrs, Volume= 3.606 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 313.49' @ 12.71 hrs Surf.Area= 2,037 sf Storage= 2,350 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.5 min (909.4 - 908.9)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	3,480 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

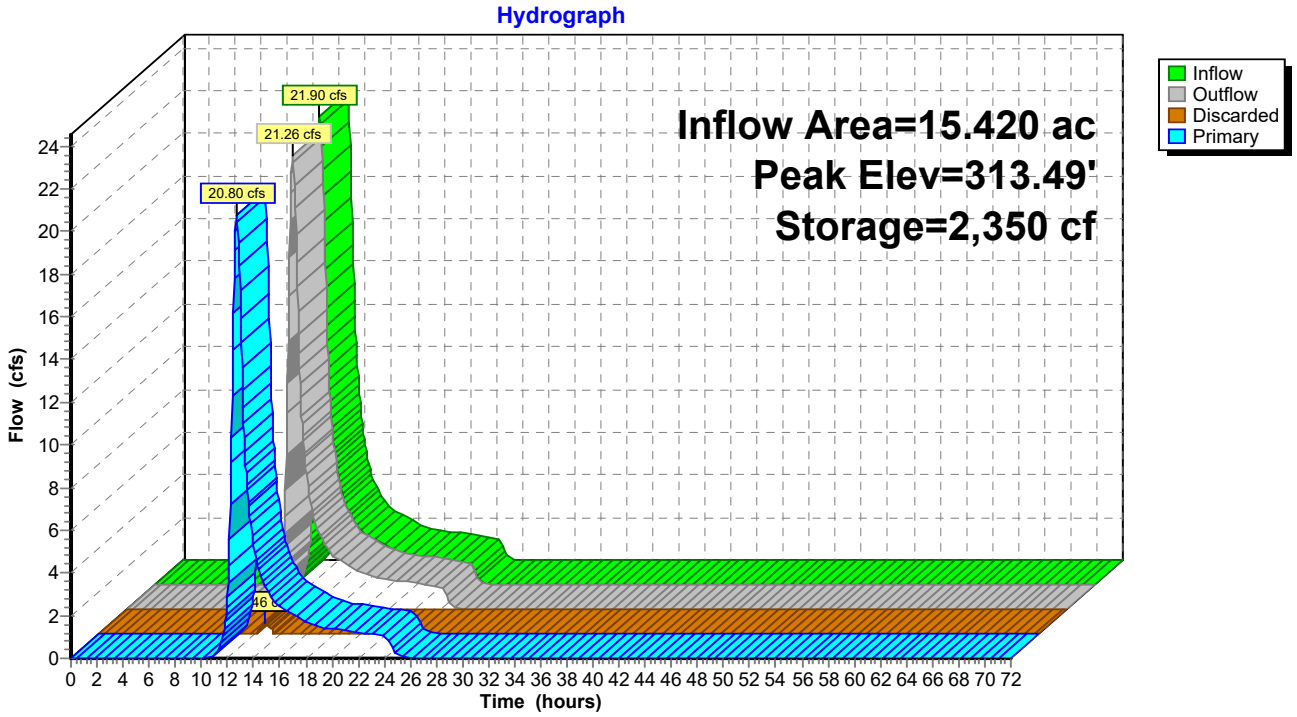
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	1,182	0	0
313.00	1,690	1,436	1,436
314.00	2,398	2,044	3,480

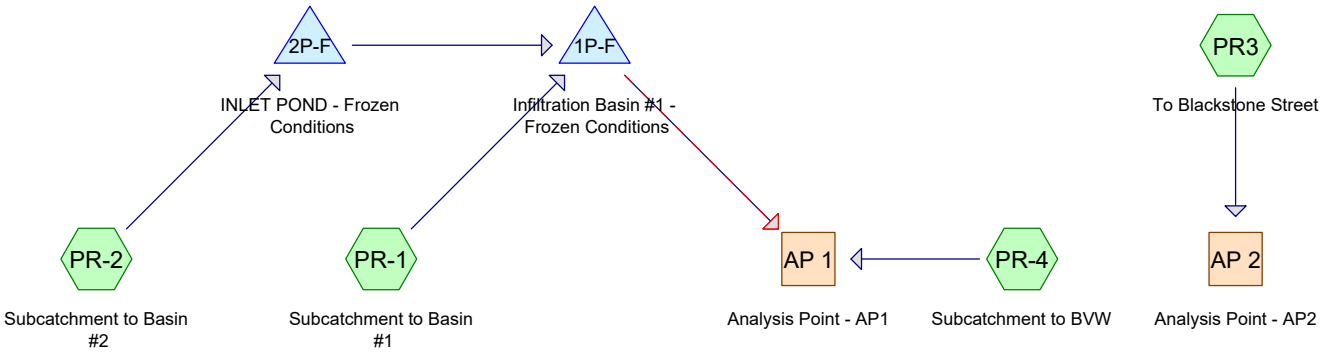
Device	Routing	Invert	Outlet Devices
#1	Primary	310.60'	**24.0" Round Culvert** L= 363.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 310.60' / 307.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	312.00'	**8.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.67' Phase-In= 0.01'

Discarded OutFlow Max=0.46 cfs @ 12.71 hrs HW=313.49' (Free Discharge)
2=Exfiltration (Controls 0.46 cfs)

Primary OutFlow Max=20.78 cfs @ 12.71 hrs HW=313.49' TW=308.71' (Dynamic Tailwater)
1=Culvert (Inlet Controls 20.78 cfs @ 6.61 fps)

Pond 2P: INLET POND





Subcat Reach Pond Link

Routing Diagram for Pre-Post Development for 5 building layout

Prepared by {enter your company name here}, Printed 11/10/2023

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.863	39	>75% Grass cover, Good, HSG A (PR-1, PR-2, PR-4)
0.840	61	>75% Grass cover, Good, HSG B (PR-2, PR3)
0.874	98	Paved roads w/curbs & sewers (PR-1)
0.443	98	Roofs (PR-1)
0.474	98	Water Surface, HSG A (PR-1)
2.222	30	Woods, Good, HSG A (PR-2)
13.663	55	Woods, Good, HSG B (PR-2, PR3)
21.378	**54**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.559	HSG A	PR-1, PR-2, PR-4
14.503	HSG B	PR-2, PR3
0.000	HSG C	
0.000	HSG D	
1.317	Other	PR-1
21.378		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
2.863	0.840	0.000	0.000	0.000	3.703	>75% Grass cover, Good	PR-1, PR-2, PR-4, PR3
0.000	0.000	0.000	0.000	0.874	0.874	Paved roads w/curbs & sewers	PR-1
0.000	0.000	0.000	0.000	0.443	0.443	Roofs	PR-1
0.474	0.000	0.000	0.000	0.000	0.474	Water Surface	PR-1
2.222	13.663	0.000	0.000	0.000	15.884	Woods, Good	PR-2, PR3
5.559	**14.503**	**0.000**	**0.000**	**1.317**	**21.378**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	PR-2	0.00	0.00	312.0	0.0230	0.013	24.0	0.0	0.0
2	PR-4	0.00	0.00	47.0	0.0050	0.011	12.0	0.0	0.0
3	1P-F	306.00	305.52	96.0	0.0050	0.011	24.0	0.0	0.0
4	2P-F	310.60	307.00	363.4	0.0099	0.013	24.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PR-1: Subcatchment to Runoff Area=141,517 sf 55.11% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=72 Runoff=12.42 cfs 0.844 af

Subcatchment PR-2: Subcatchment to Runoff Area=671,716 sf 0.00% Impervious Runoff Depth=1.29"
Flow Length=1,673' Tc=42.4 min CN=51 Runoff=8.73 cfs 1.661 af

Subcatchment PR-4: Subcatchment to BVW Runoff Area=30,761 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=494' Tc=10.7 min CN=39 Runoff=0.11 cfs 0.029 af

Subcatchment PR3: To Blackstone Street Runoff Area=87,231 sf 0.00% Impervious Runoff Depth=1.69"
Flow Length=581' Tc=22.9 min CN=56 Runoff=2.29 cfs 0.281 af

Reach AP 1: Analysis Point - AP1 Inflow=4.29 cfs 2.122 af
Outflow=4.29 cfs 2.122 af

Reach AP 2: Analysis Point - AP2 Inflow=2.29 cfs 0.281 af
Outflow=2.29 cfs 0.281 af

Pond 1P-F: Infiltration Basin #1 - Frozen Peak Elev=308.58' Storage=41,535 cf Inflow=13.41 cfs 2.504 af
Primary=4.25 cfs 2.093 af Secondary=0.00 cfs 0.000 af Outflow=4.25 cfs 2.093 af

Pond 2P-F: INLET POND - Frozen Conditions Peak Elev=312.00' Storage=1 cf Inflow=8.73 cfs 1.661 af
Discarded=0.02 cfs 0.000 af Primary=8.71 cfs 1.660 af Outflow=8.73 cfs 1.661 af

Total Runoff Area = 21.378 ac Runoff Volume = 2.814 af Average Runoff Depth = 1.58"
91.62% Pervious = 19.588 ac 8.38% Impervious = 1.790 ac

Summary for Subcatchment PR-1: Subcatchment to Basin #1

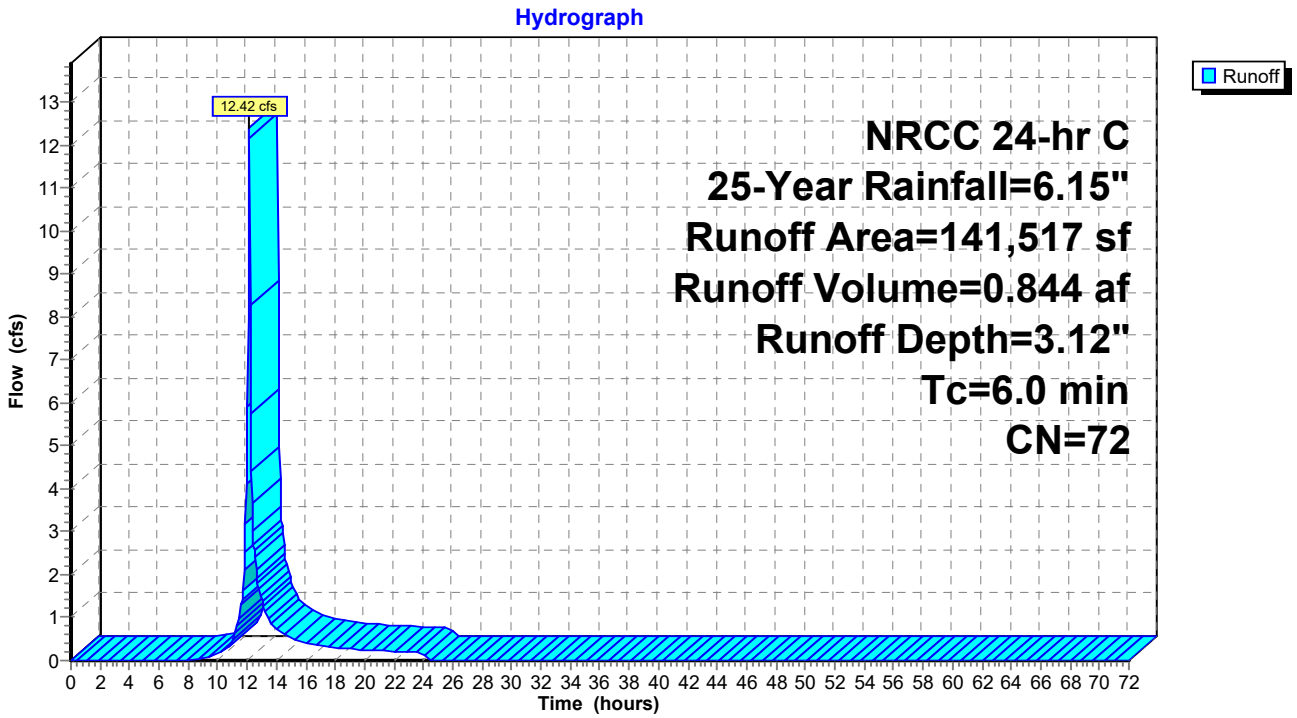
Runoff = 12.42 cfs @ 12.13 hrs, Volume= 0.844 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	38,062	98	Paved roads w/curbs & sewers
*	19,293	98	Roofs
	63,524	39	>75% Grass cover, Good, HSG A
*	20,638	98	Water Surface, HSG A
	141,517	72	Weighted Average
	63,524		44.89% Pervious Area
	77,993		55.11% Impervious Area

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

Subcatchment PR-1: Subcatchment to Basin #1



Summary for Subcatchment PR-2: Subcatchment to Basin #2

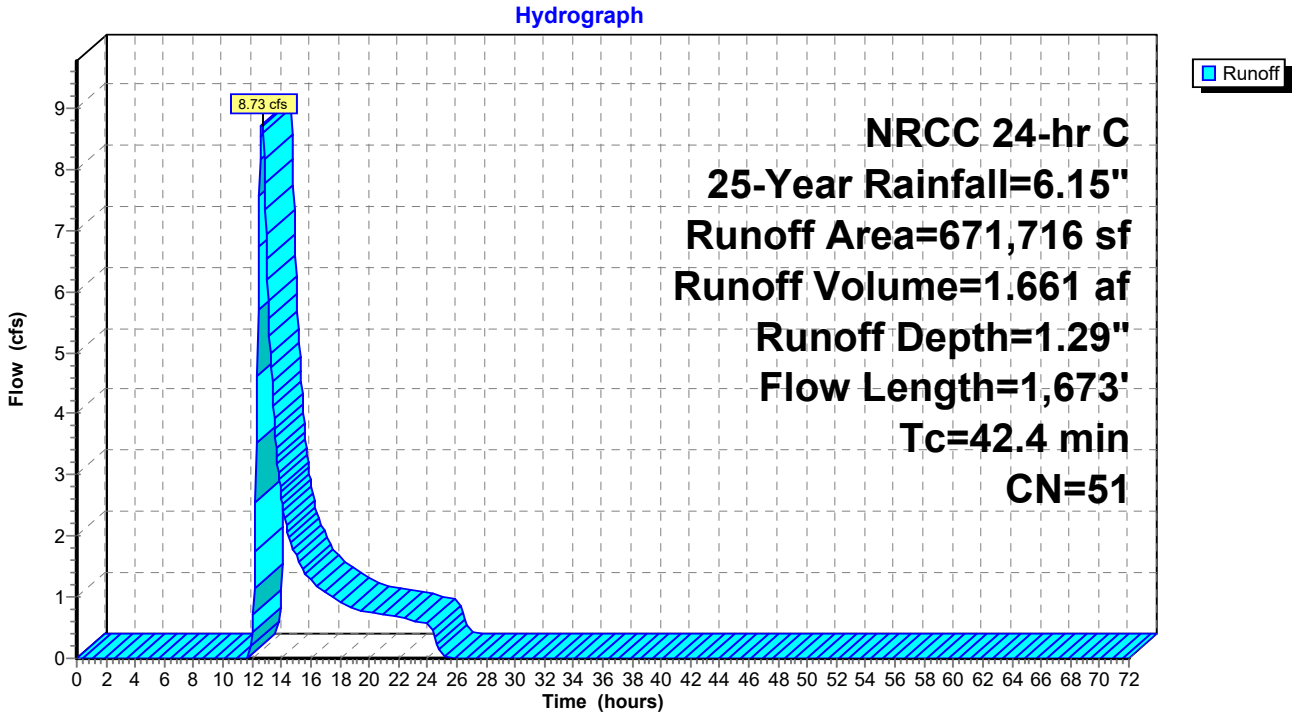
Runoff = 8.73 cfs @ 12.67 hrs, Volume= 1.661 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
527,673	55	Woods, Good, HSG B
96,783	30	Woods, Good, HSG A
16,825	61	>75% Grass cover, Good, HSG B
30,435	39	>75% Grass cover, Good, HSG A
671,716	51	Weighted Average
671,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
14.1	581	0.0190	0.69		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
2.0	60	0.0100	0.50		**Shallow Concentrated Flow, Segment E-F** Woodland Kv= 5.0 fps
0.5	312	0.0230	10.92	34.31	**Pipe Channel, Segment F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, straight & clean
42.4	1,673	Total			

Subcatchment PR-2: Subcatchment to Basin #2



Summary for Subcatchment PR-4: Subcatchment to BVW

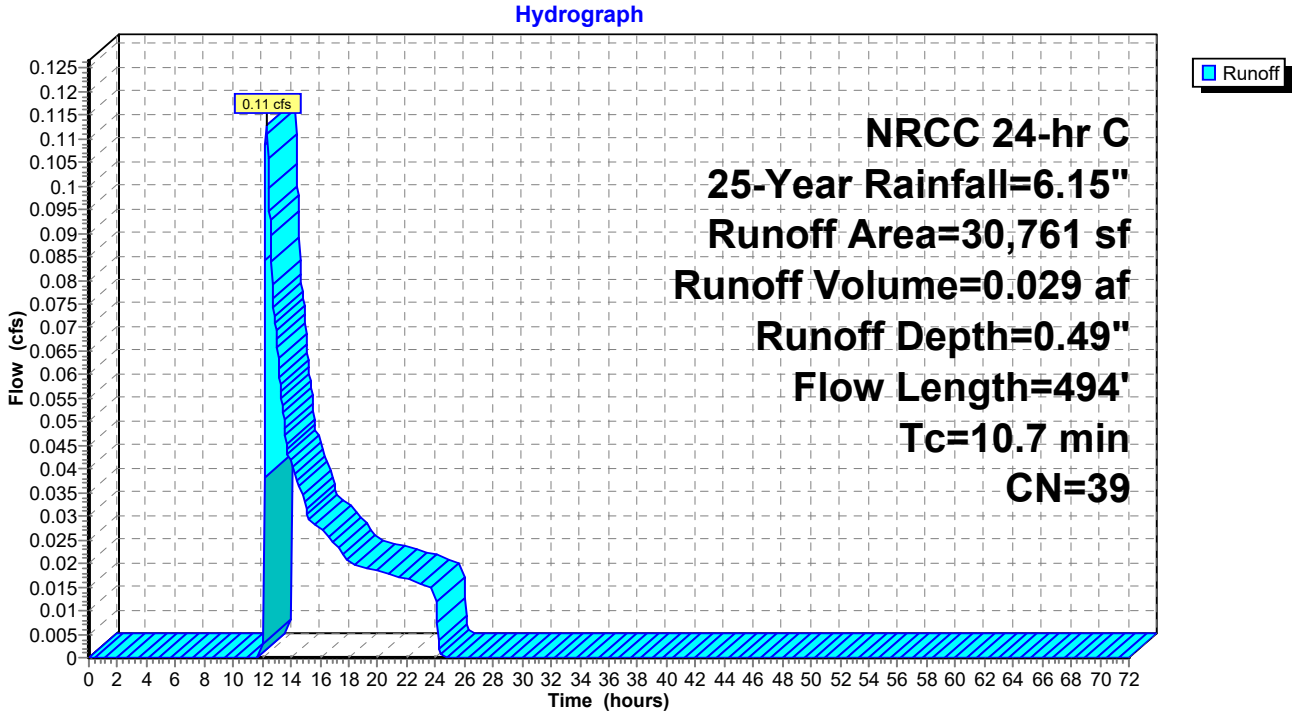
Runoff = 0.11 cfs @ 12.31 hrs, Volume= 0.029 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
30,761	39	>75% Grass cover, Good, HSG A
30,761		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Segment A-B** Grass: Short n= 0.150 P2= 3.26"
1.5	144	0.0550	1.64		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0050	3.79	2.98	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
3.4	253	0.0070	1.25		**Shallow Concentrated Flow, Segment D-E** Grassed Waterway Kv= 15.0 fps
10.7	494	Total			

Subcatchment PR-4: Subcatchment to BVW



Summary for Subcatchment PR3: To Blackstone Street

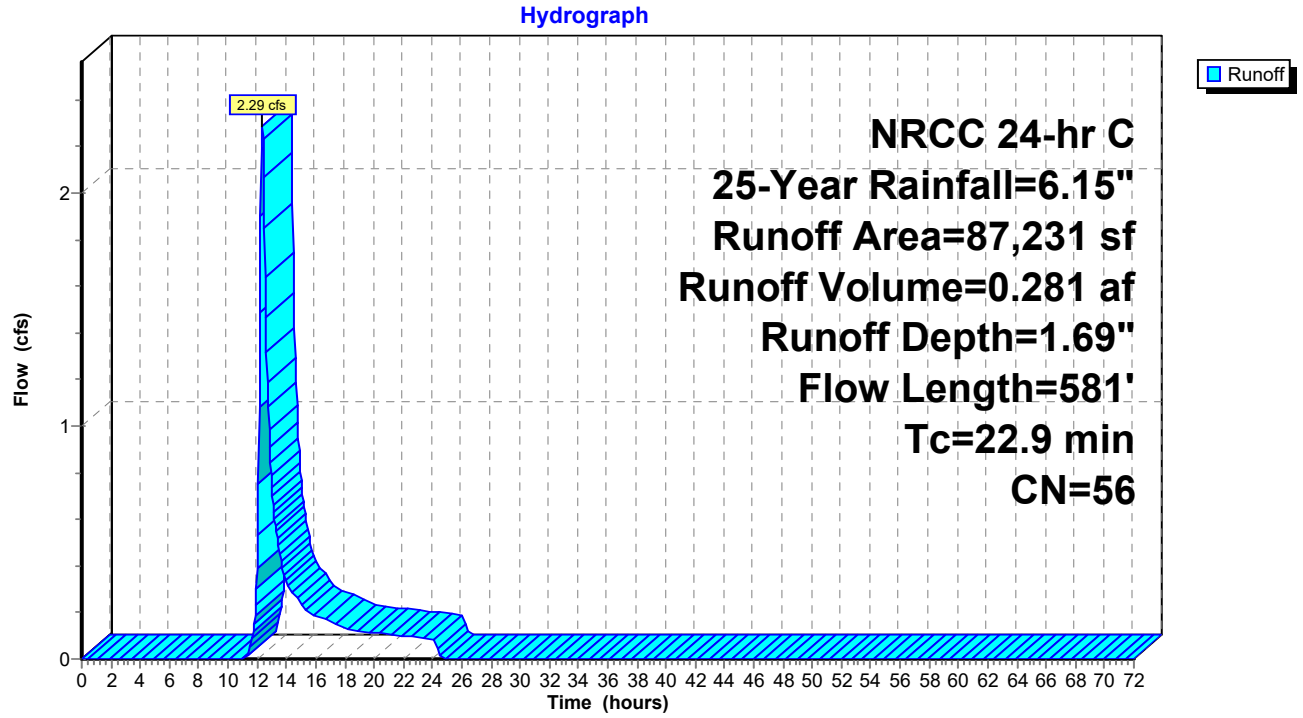
Runoff = 2.29 cfs @ 12.36 hrs, Volume= 0.281 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
67,471	55	Woods, Good, HSG B
19,760	61	>75% Grass cover, Good, HSG B
87,231	56	Weighted Average
87,231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0610	0.06		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
2.8	215	0.0640	1.26		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
2.2	103	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
0.8	68	0.0890	1.49		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
3.5	145	0.0100	0.70		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
22.9	581	Total			

Subcatchment PR3: To Blackstone Street



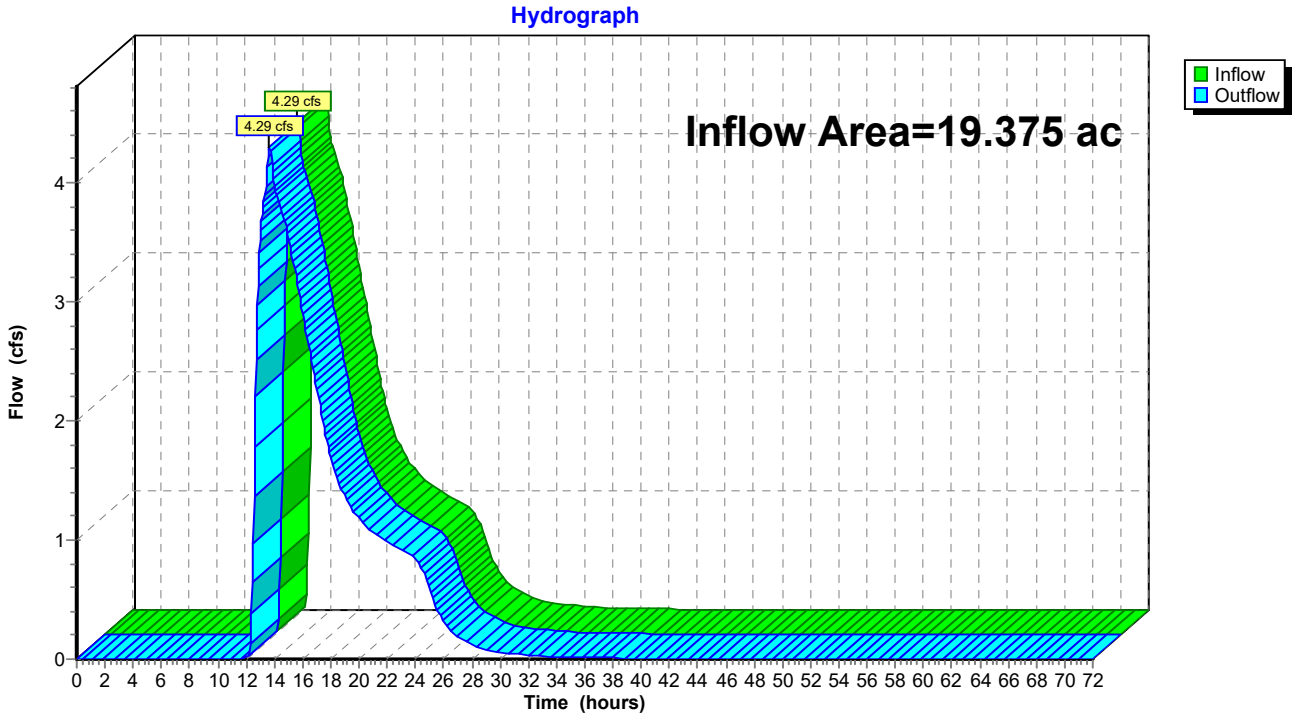
Summary for Reach AP 1: Analysis Point - AP1

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

Inflow Area = 19.375 ac, 9.24% Impervious, Inflow Depth = 1.31" for 25-Year event
Inflow = 4.29 cfs @ 13.66 hrs, Volume= 2.122 af
Outflow = 4.29 cfs @ 13.66 hrs, Volume= 2.122 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 1: Analysis Point - AP1



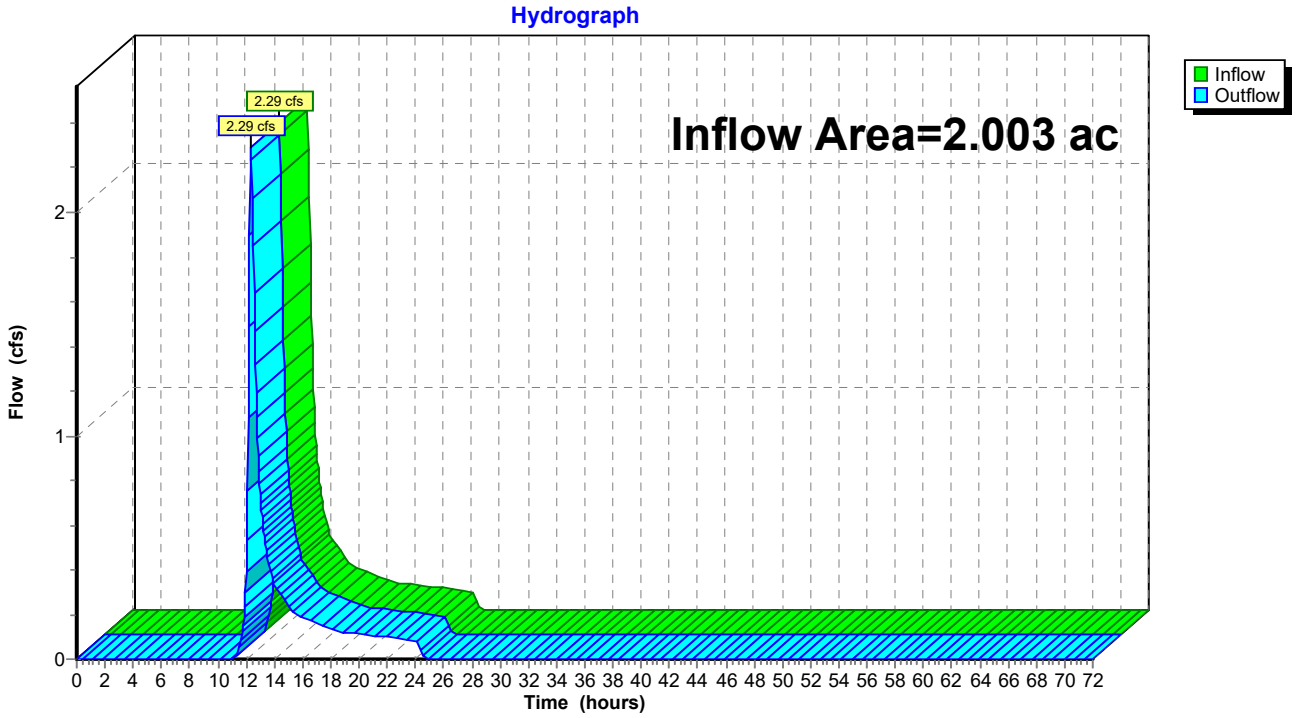
Summary for Reach AP 2: Analysis Point - AP2

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

Inflow Area = 2.003 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-Year event
Inflow = 2.29 cfs @ 12.36 hrs, Volume= 0.281 af
Outflow = 2.29 cfs @ 12.36 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 2: Analysis Point - AP2



Summary for Pond 1P-F: Infiltration Basin #1 - Frozen Conditions

Inflow Area = 18.669 ac, 9.59% Impervious, Inflow Depth = 1.61" for 25-Year event
Inflow = 13.41 cfs @ 12.14 hrs, Volume= 2.504 af
Outflow = 4.25 cfs @ 13.66 hrs, Volume= 2.093 af, Atten= 68%, Lag= 91.4 min
Primary = 4.25 cfs @ 13.66 hrs, Volume= 2.093 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 308.58' @ 13.66 hrs Surf.Area= 16,586 sf Storage= 41,535 cf
Flood Elev= 310.50' Surf.Area= 20,637 sf Storage= 77,211 cf

Plug-Flow detention time= 213.7 min calculated for 2.092 af (84% of inflow)
Center-of-Mass det. time= 138.5 min (1,044.1 - 905.5)

Volume	Invert	Avail.Storage	Storage Description
#1	305.50'	87,529 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

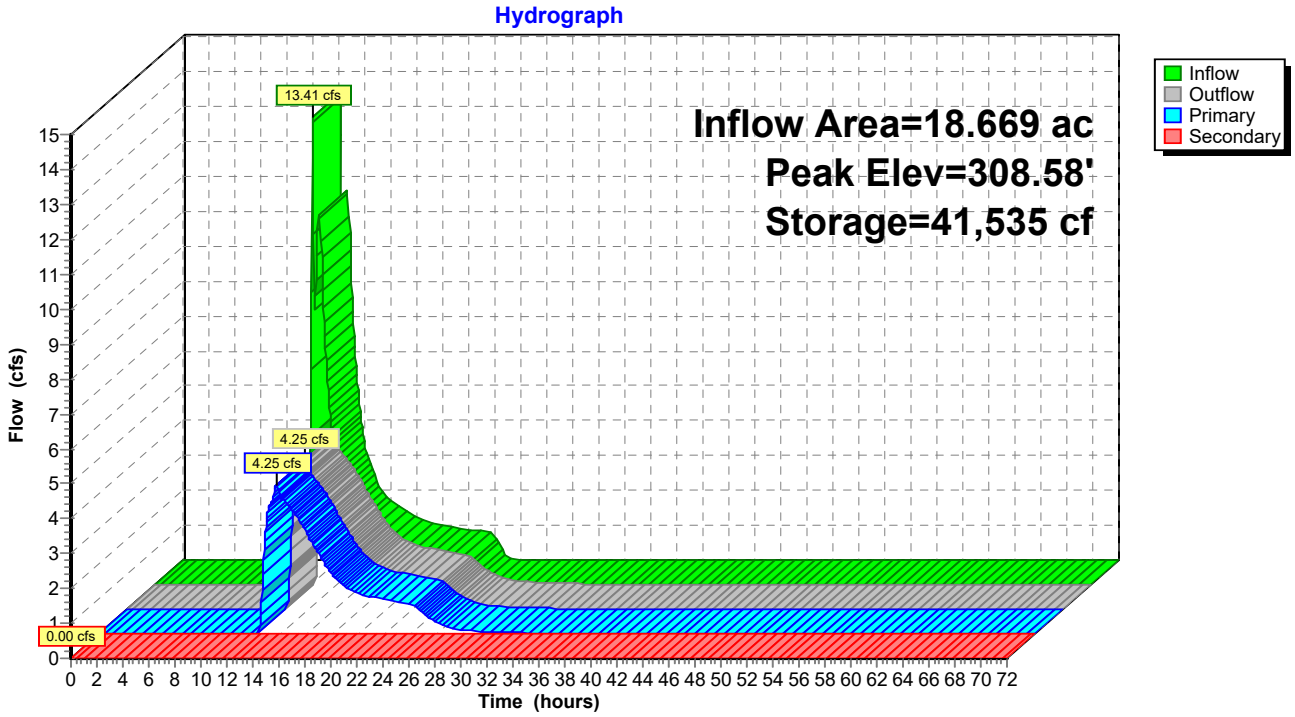
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
305.50	10,451	0	0
306.00	11,407	5,465	5,465
308.00	15,368	26,775	32,240
310.00	19,555	34,923	67,163
310.50	20,637	10,048	77,211
311.00	20,637	10,319	87,529

Device	Routing	Invert	Outlet Devices
#1	Primary	306.00'	**24.0" Round Culvert** L= 96.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 306.00' / 305.52' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Device 1	308.55'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	307.00'	**12.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600
#4	Secondary	310.50'	**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

Primary OutFlow Max=4.25 cfs @ 13.66 hrs HW=308.58' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.25 cfs of 19.03 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 0.29 cfs @ 0.58 fps)
  └─**3=Orifice/Grate** (Orifice Controls 3.95 cfs @ 5.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=305.50' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P-F: Infiltration Basin #1 - Frozen Conditions



Summary for Pond 2P-F: INLET POND - Frozen Conditions

Inflow Area = 15.420 ac, 0.00% Impervious, Inflow Depth = 1.29" for 25-Year event
Inflow = 8.73 cfs @ 12.67 hrs, Volume= 1.661 af
Outflow = 8.73 cfs @ 12.67 hrs, Volume= 1.661 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 12.67 hrs, Volume= 0.000 af
Primary = 8.71 cfs @ 12.67 hrs, Volume= 1.660 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 312.00' @ 12.67 hrs Surf.Area= 1,182 sf Storage= 1 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (937.5 - 937.5)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	3,480 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

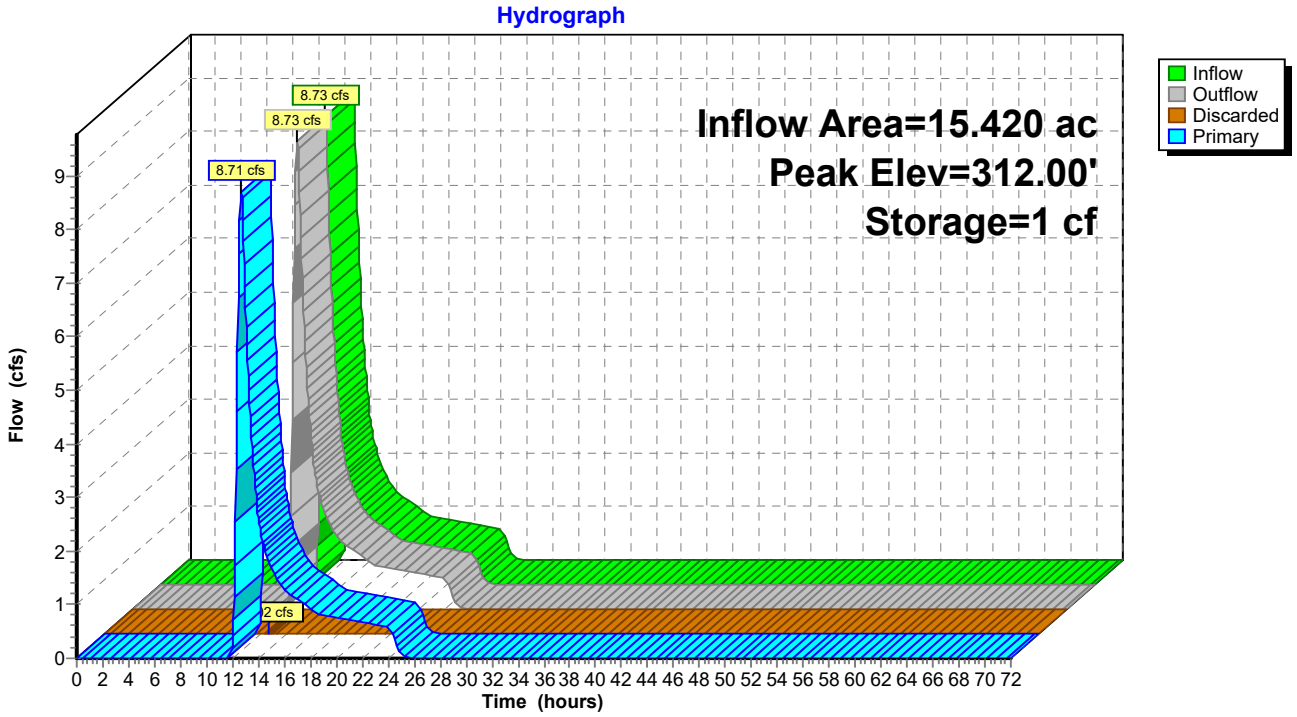
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	1,182	0	0
313.00	1,690	1,436	1,436
314.00	2,398	2,044	3,480

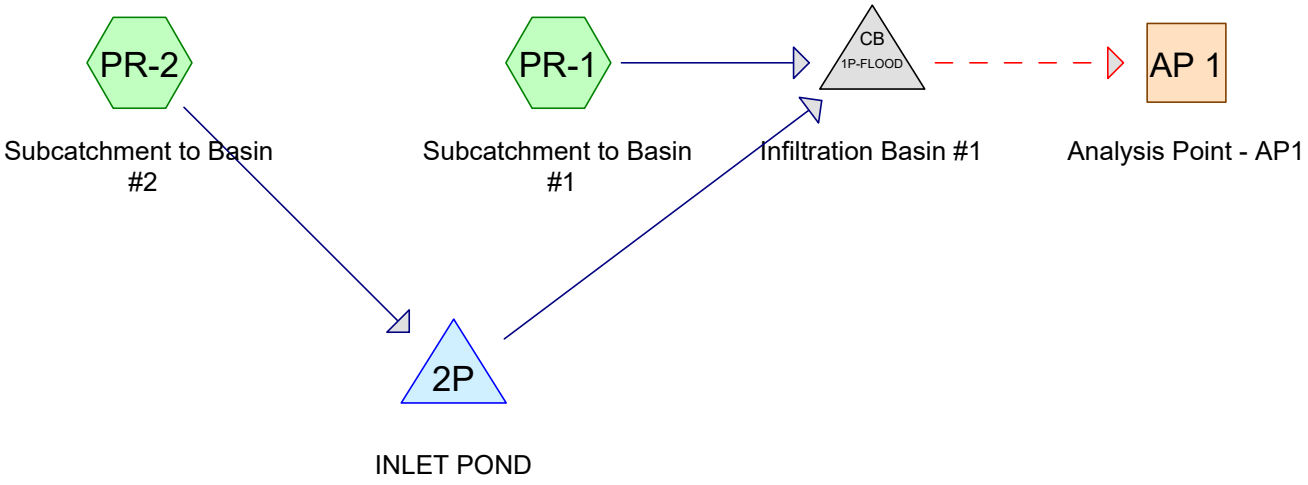
Device	Routing	Invert	Outlet Devices
#1	Primary	310.60'	**24.0" Round Culvert** L= 363.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 310.60' / 307.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	312.00'	**8.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.67' Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.67 hrs HW=312.00' (Free Discharge)
↑—**2=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=9.47 cfs @ 12.67 hrs HW=312.00' TW=307.80' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 9.47 cfs @ 4.03 fps)

Pond 2P-F: INLET POND - Frozen Conditions





Subcat Reach Pond Link

Routing Diagram for Pre-Post Development for 5 building layout
Prepared by {enter your company name here}, Printed 11/10/2023

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.157	39	>75% Grass cover, Good, HSG A (PR-1, PR-2)
0.386	61	>75% Grass cover, Good, HSG B (PR-2)
0.874	98	Paved roads w/curbs & sewers (PR-1)
0.443	98	Roofs (PR-1)
0.474	98	Water Surface, HSG A (PR-1)
2.222	30	Woods, Good, HSG A (PR-2)
12.114	55	Woods, Good, HSG B (PR-2)
18.669	**54**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.853	HSG A	PR-1, PR-2
12.500	HSG B	PR-2
0.000	HSG C	
0.000	HSG D	
1.317	Other	PR-1
18.669		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
2.157	0.386	0.000	0.000	0.000	2.543	>75% Grass cover, Good	PR-1, PR-2
0.000	0.000	0.000	0.000	0.874	0.874	Paved roads w/curbs & sewers	PR-1
0.000	0.000	0.000	0.000	0.443	0.443	Roofs	PR-1
0.474	0.000	0.000	0.000	0.000	0.474	Water Surface	PR-1
2.222	12.114	0.000	0.000	0.000	14.336	Woods, Good	PR-2
4.853	**12.500**	**0.000**	**0.000**	**1.317**	**18.669**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	PR-2	0.00	0.00	312.0	0.0230	0.013	24.0	0.0	0.0
2	2P	310.60	307.00	363.4	0.0099	0.013	24.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

SubcatchmentPR-1: Subcatchmentto Runoff Area=141,517 sf 55.11% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=72 Runoff=21.07 cfs 1.448 af

SubcatchmentPR-2: Subcatchmentto Runoff Area=671,716 sf 0.00% Impervious Runoff Depth=2.83"
Flow Length=1,673' Tc=42.4 min CN=51 Runoff=21.90 cfs 3.637 af

Reach AP 1: Analysis Point - AP1 Inflow=26.94 cfs 5.131 af
Outflow=26.94 cfs 5.131 af

Pond 1P-FLOOD: Infiltration Basin #1 Peak Elev=310.38' Inflow=26.29 cfs 5.044 af
Outflow=26.29 cfs 5.044 af

Pond 2P: INLET POND Peak Elev=314.05' Storage=3,480 cf Inflow=21.90 cfs 3.637 af
Discarded=0.56 cfs 0.042 af Primary=19.79 cfs 3.595 af Outflow=20.35 cfs 3.637 af

Total Runoff Area = 18.669 ac Runoff Volume = 5.085 af Average Runoff Depth = 3.27"
90.41% Pervious = 16.879 ac 9.59% Impervious = 1.790 ac

Summary for Subcatchment PR-1: Subcatchment to Basin #1

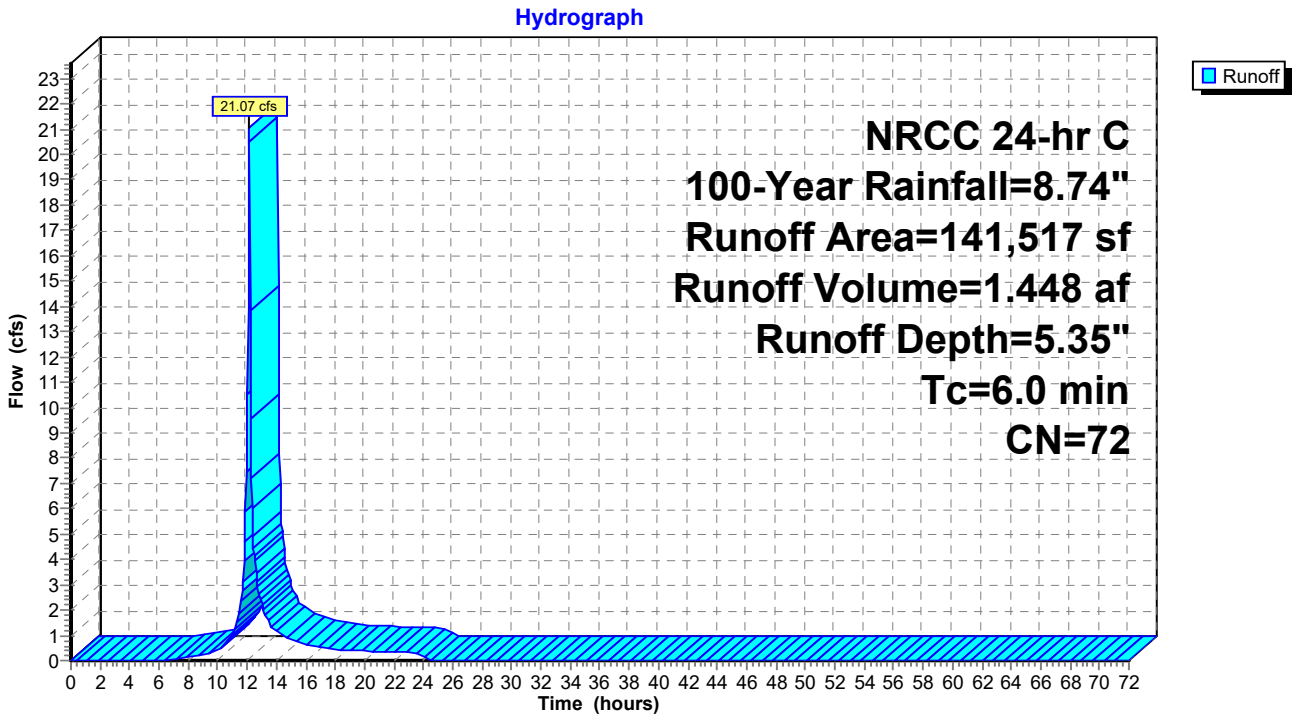
Runoff = 21.07 cfs @ 12.13 hrs, Volume= 1.448 af, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

	Area (sf)	CN	Description
*	38,062	98	Paved roads w/curbs & sewers
*	19,293	98	Roofs
	63,524	39	>75% Grass cover, Good, HSG A
*	20,638	98	Water Surface, HSG A
	141,517	72	Weighted Average
	63,524		44.89% Pervious Area
	77,993		55.11% Impervious Area

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

Subcatchment PR-1: Subcatchment to Basin #1



Summary for Subcatchment PR-2: Subcatchment to Basin #2

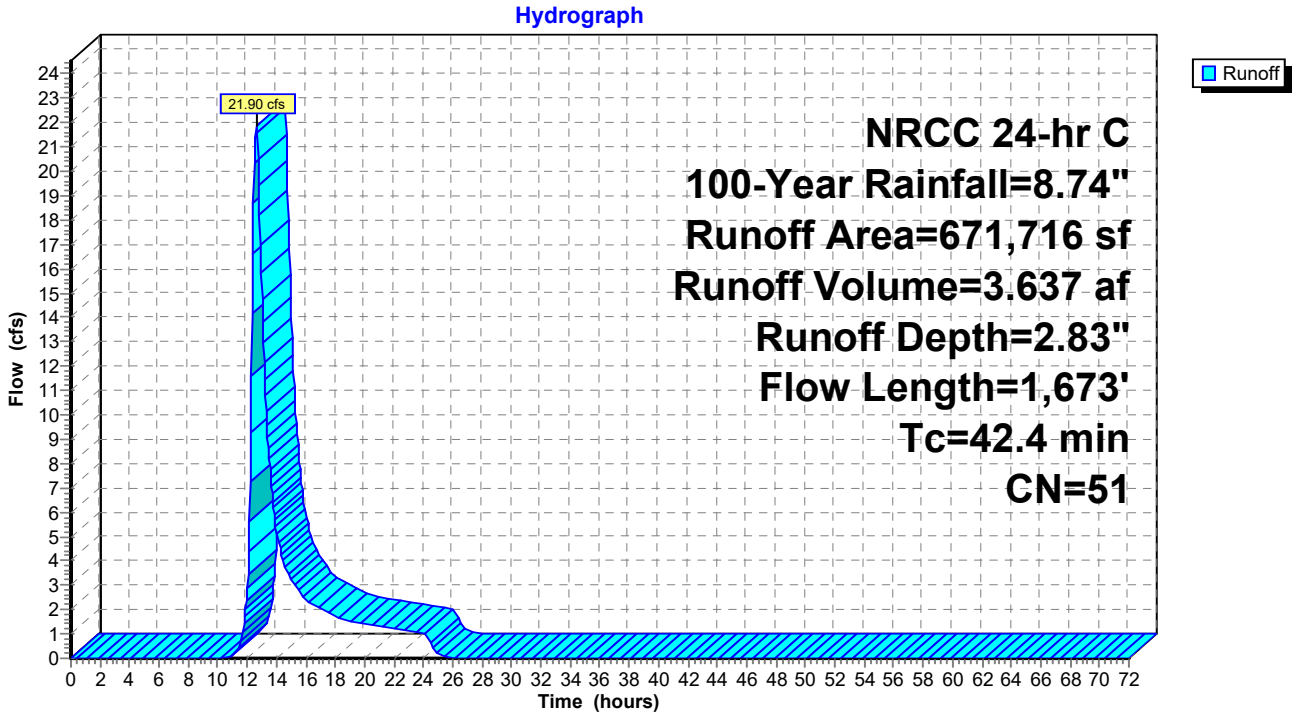
Runoff = 21.90 cfs @ 12.62 hrs, Volume= 3.637 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.74"

Area (sf)	CN	Description
527,673	55	Woods, Good, HSG B
96,783	30	Woods, Good, HSG A
16,825	61	>75% Grass cover, Good, HSG B
30,435	39	>75% Grass cover, Good, HSG A
671,716	51	Weighted Average
671,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0800	0.07		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 3.26"
0.9	78	0.0800	1.41		**Shallow Concentrated Flow, Segment B-C** Woodland Kv= 5.0 fps
12.7	592	0.0240	0.77		**Shallow Concentrated Flow, Segment C-D** Woodland Kv= 5.0 fps
14.1	581	0.0190	0.69		**Shallow Concentrated Flow, Segment D-E** Woodland Kv= 5.0 fps
2.0	60	0.0100	0.50		**Shallow Concentrated Flow, Segment E-F** Woodland Kv= 5.0 fps
0.5	312	0.0230	10.92	34.31	**Pipe Channel, Segment F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, straight & clean
42.4	1,673	Total			

Subcatchment PR-2: Subcatchment to Basin #2



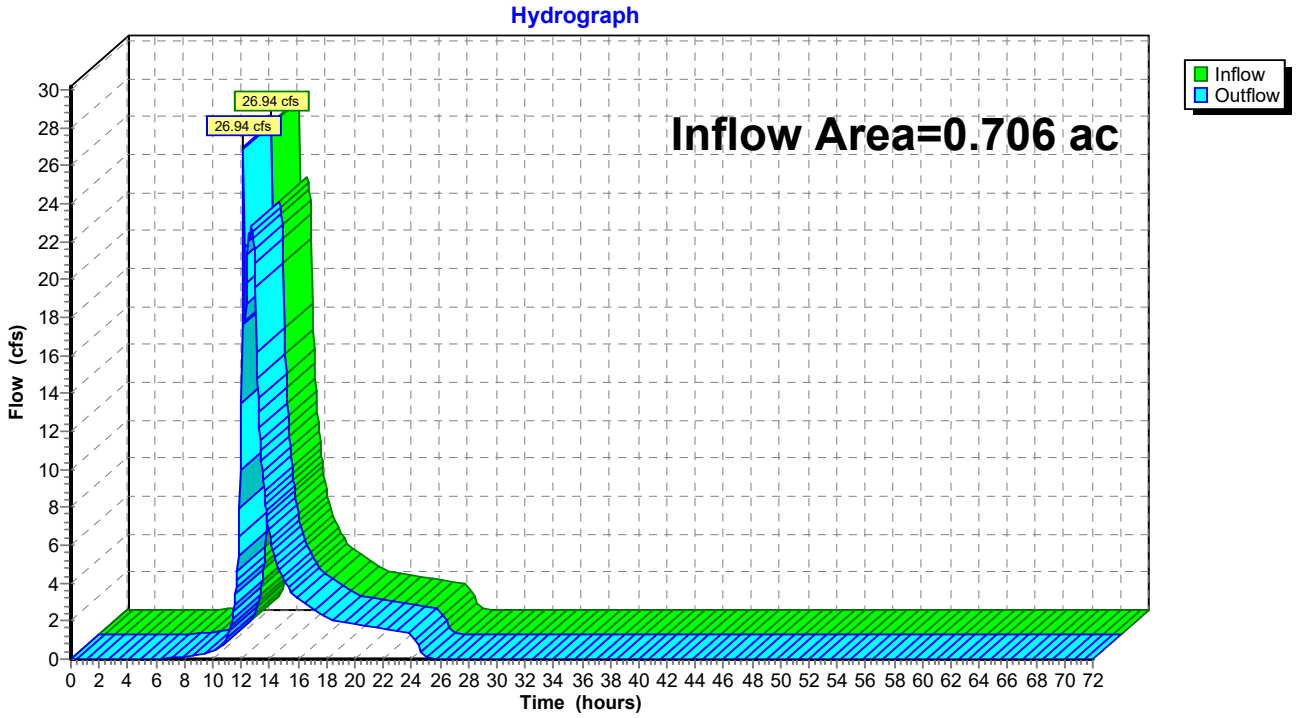
Summary for Reach AP 1: Analysis Point - AP1

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

Inflow Area = 0.706 ac, 0.00% Impervious, Inflow Depth = 87.19" for 100-Year event
Inflow = 26.94 cfs @ 12.14 hrs, Volume= 5.131 af
Outflow = 26.94 cfs @ 12.14 hrs, Volume= 5.131 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach AP 1: Analysis Point - AP1



Summary for Pond 1P-FLOOD: Infiltration Basin #1

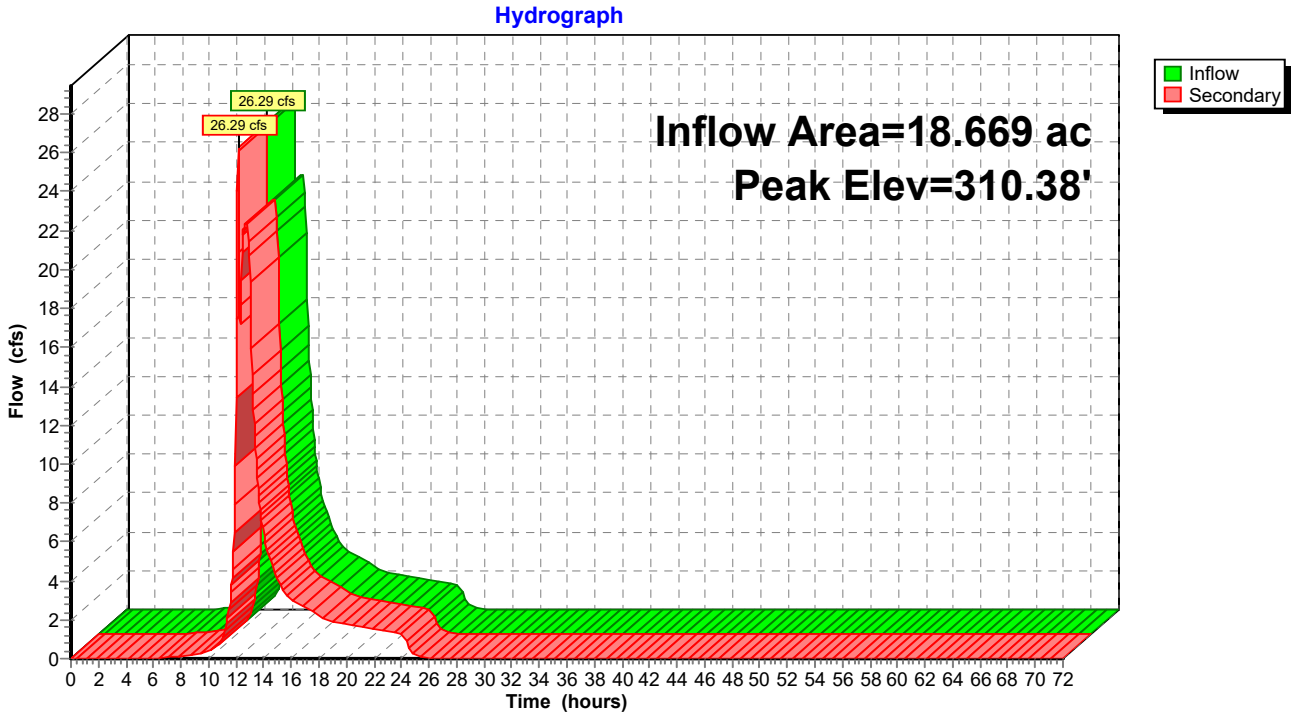
Inflow Area = 18.669 ac, 9.59% Impervious, Inflow Depth = 3.24" for 100-Year event
Inflow = 26.29 cfs @ 12.14 hrs, Volume= 5.044 af
Outflow = 26.29 cfs @ 12.14 hrs, Volume= 5.044 af, Atten= 0%, Lag= 0.0 min
Secondary = 26.29 cfs @ 12.14 hrs, Volume= 5.044 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 310.38' @ 12.14 hrs
Flood Elev= 310.50'

Device	Routing	Invert	Outlet Devices
#1	Secondary	309.90'	**30.0' 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

Secondary OutFlow Max=25.66 cfs @ 12.14 hrs HW=310.38' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 25.66 cfs @ 1.80 fps)

Pond 1P-FLOOD: Infiltration Basin #1



Summary for Pond 2P: INLET POND

[93] Warning: Storage range exceeded by 0.05'

Inflow Area = 15.420 ac, 0.00% Impervious, Inflow Depth = 2.83" for 100-Year event
Inflow = 21.90 cfs @ 12.62 hrs, Volume= 3.637 af
Outflow = 20.35 cfs @ 12.75 hrs, Volume= 3.637 af, Atten= 7%, Lag= 8.1 min
Discarded = 0.56 cfs @ 12.76 hrs, Volume= 0.042 af
Primary = 19.79 cfs @ 12.75 hrs, Volume= 3.595 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 314.05' @ 12.75 hrs Surf.Area= 2,398 sf Storage= 3,480 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.7 min (909.6 - 908.9)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	3,480 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

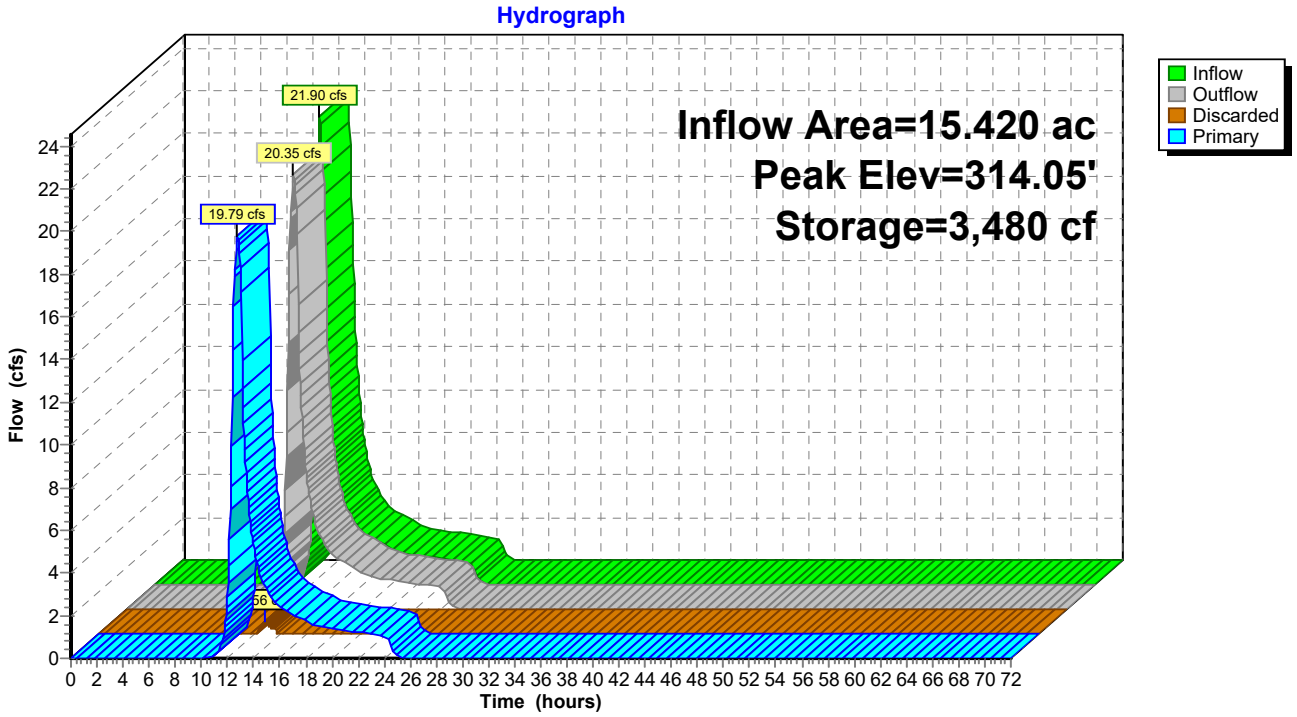
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	1,182	0	0
313.00	1,690	1,436	1,436
314.00	2,398	2,044	3,480

Device	Routing	Invert	Outlet Devices
#1	Primary	310.60'	**24.0" Round Culvert** L= 363.4' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 310.60' / 307.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Discarded	312.00'	**8.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 304.67' Phase-In= 0.01'

Discarded OutFlow Max=0.56 cfs @ 12.76 hrs HW=314.04' (Free Discharge)
↑**2=Exfiltration** (Controls 0.56 cfs)

Primary OutFlow Max=19.77 cfs @ 12.75 hrs HW=314.05' TW=310.34' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 19.77 cfs @ 6.29 fps)

Pond 2P: INLET POND



Stage-Area-Storage Calculations

Appendix 5

Stage-Area-Storage for Pond 12P: INLET POND

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
312.00	1,182	0
312.05	1,207	60
312.10	1,233	121
312.15	1,258	183
312.20	1,284	247
312.25	1,309	311
312.30	1,334	377
312.35	1,360	445
312.40	1,385	513
312.45	1,411	583
312.50	1,436	655
312.55	1,461	727
312.60	1,487	801
312.65	1,512	876
312.70	1,538	952
312.75	1,563	1,029
312.80	1,588	1,108
312.85	1,614	1,188
312.90	1,639	1,270
312.95	1,665	1,352
313.00	1,690	1,436
313.05	1,725	1,521
313.10	1,761	1,609
313.15	1,796	1,697
313.20	1,832	1,788
313.25	1,867	1,881
313.30	1,902	1,975
313.35	1,938	2,071
313.40	1,973	2,169
313.45	2,009	2,268
313.50	2,044	2,370
313.55	2,079	2,473
313.60	2,115	2,577
313.65	2,150	2,684
313.70	2,186	2,792
313.75	2,221	2,903
313.80	2,256	3,015
313.85	2,292	3,128
313.90	2,327	3,244
313.95	2,363	3,361
314.00	**2,398**	**3,480**

Stage-Area-Storage for Pond 11P: Infiltration Basin #1

Elevation (feet)	Surface (sq-ft)	Horizontal (sq-ft)	Storage (cubic-feet)
305.50	10,451	10,451	0
305.56	10,566	10,566	631
305.62	10,680	10,680	1,268
305.68	10,795	10,795	1,912
305.74	10,910	10,910	2,563
305.80	11,025	11,025	3,221
305.86	11,139	11,139	3,886
305.92	11,254	11,254	4,558
305.98	11,369	11,369	5,237
306.04	11,486	11,486	5,922
306.10	11,605	11,605	6,615
306.16	11,724	11,724	7,315
306.22	11,843	11,843	8,022
306.28	11,962	11,962	8,736
306.34	12,080	12,080	9,457
306.40	12,199	12,199	10,186
306.46	12,318	12,318	10,921
306.52	12,437	12,437	11,664
306.58	12,556	12,556	12,414
306.64	12,675	12,675	13,171
306.70	12,793	12,793	13,935
306.76	12,912	12,912	14,706
306.82	13,031	13,031	15,484
306.88	13,150	13,150	16,270
306.94	13,269	13,269	17,062
307.00	13,388	13,388	17,862
307.06	13,506	13,506	18,669
307.12	13,625	13,625	19,483
307.18	13,744	13,744	20,304
307.24	13,863	13,863	21,132
307.30	13,982	13,982	21,967
307.36	14,100	14,100	22,810
307.42	14,219	14,219	23,659
307.48	14,338	14,338	24,516
307.54	14,457	14,457	25,380
307.60	14,576	14,576	26,251
307.66	14,695	14,695	27,129
307.72	14,813	14,813	28,014
307.78	14,932	14,932	28,906
307.84	15,051	15,051	29,806
307.90	15,170	15,170	30,713
307.96	15,289	15,289	31,626
308.02	15,410	15,410	32,547
308.08	15,535	15,535	33,476
308.14	15,661	15,661	34,412
308.20	15,787	15,787	35,355
308.26	15,912	15,912	36,306
308.32	16,038	16,038	37,264
308.38	16,164	16,164	38,230
308.44	16,289	16,289	39,204
308.50	16,415	16,415	40,185
308.56	16,540	16,540	41,174

Stage-Area-Storage for Pond 11P: Infiltration Basin #1 (continued)

Elevation (feet)	Surface (sq-ft)	Horizontal (sq-ft)	Storage (cubic-feet)
308.62	16,666	16,666	42,170
308.68	16,792	16,792	43,174
308.74	16,917	16,917	44,185
308.80	17,043	17,043	45,204
308.86	17,168	17,168	46,230
308.92	17,294	17,294	47,264
308.98	17,420	17,420	48,305
309.04	17,545	17,545	49,354
309.10	17,671	17,671	50,411
309.16	17,796	17,796	51,475
309.22	17,922	17,922	52,546
309.28	18,048	18,048	53,626
309.34	18,173	18,173	54,712
309.40	18,299	18,299	55,806
309.46	18,425	18,425	56,908
309.52	18,550	18,550	58,017
309.58	18,676	18,676	59,134
309.64	18,801	18,801	60,258
309.70	18,927	18,927	61,390
309.76	19,053	19,053	62,530
309.82	19,178	19,178	63,677
309.88	19,304	19,304	64,831
309.94	19,429	19,429	65,993
310.00	19,555	19,555	67,163
310.06	19,685	19,685	68,340
310.12	19,815	19,815	69,525
310.18	19,945	19,945	70,717
310.24	20,074	20,074	71,918
310.30	20,204	20,204	73,126
310.36	20,334	20,334	74,343
310.42	20,464	20,464	75,566
310.48	**20,594**	**20,594**	76,798
310.54	**20,637**	**20,637**	78,036
310.60	20,637	20,637	79,274
310.66	20,637	20,637	80,512
310.72	20,637	20,637	81,751
310.78	20,637	20,637	82,989
310.84	20,637	20,637	84,227
310.90	20,637	20,637	85,465
310.96	20,637	20,637	**86,704**

TSS Removal Worksheet

Appendix 6

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: North Street / Blackstone Street, Bellingham MA

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 Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15

Total TSS Removal = 85%

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

Project: F-4410

Prepared By: Kyle Pitz

Date: 17-August-22

*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: North Street / Blackstone Street, Bellingham MA

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 Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56

Pretreatment

Total TSS Removal = 44%

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

Project: F-4410

Prepared By: Kyle Pitz

Date: 17-August-22

*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

Long Term Operation and Maintenance Plan

Appendix 7

The following shall serve as the (O&M) Plan required by Standard 9, as well as the Long-Term Pollution Prevention Plan required by Standard 4.

A. Names of Persons or Entity Responsible for Plan Compliance

Applicant: Raven Homes, Inc.
22 Buckhill Road
Northborough, MA 01532
PH: 508-393-4511

B. Stormwater Management System Owner

Owner:
Raven Homes, Inc.
22 Buckhill Road
Northborough, MA 01532
PH: 508-393-4511

C. Good housekeeping practices

1. Maintain site, landscaping and vegetation.
2. Sweep and pick up litter on pavements and grounds.
3. Deliveries shall be monitored by owners or representative to ensure that if any spillage occurs, it shall be contained and cleaned up immediately.
4. Maintain pavement and curbing in good repair.

D. Requirements for routine inspections and maintenance of stormwater BMPs

1. Plans: The stormwater Operation and Maintenance Plan shall consist of all Plans, documents and all local state and federal approvals as required for the subject property.
2. Record Keeping:
   a. Maintain a log of all operation and maintenance activities for at least three years following construction, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location).
   b. Make this log available to MassDEP and the Conservation Commission upon request; and
   c. Allow MassDEP and the Conservation Commission to inspect each BMP to determine whether the responsible party is implementing the Operation and Maintenance Plan.
3. Descriptions and Designs: The Best Management Practices (BMP) incorporated into the design include the following.
   a. Street Sweeping – Stipulated within the Construction Period Pollution Prevention Plan, the Long-Term Pollution Prevention Plan, and the Operation and Maintenance Plan. As the amount of TSS removal is discretionary, no credit was taken within the calculations for this BMP.
   b. Deep sump catch basins with hoods installed to promote TSS Removal of solids and control floatable pollutants. This BMP has a design rate of 25% TSS Removal.
   c. Infiltration basin and sediment forebay provided to promote the required 80% TSS Removal. Refer to TSS Removal Worksheet in Standard 4 for treatment train.
   d. Safety Fencing: Provide 6-FT high chain link fence with lockable gates around detention basin for public safety.
   e. Spill Containment Kit to contain and clean-up spills that could occur on site.

4. BMP Maintenance: After construction it is the responsibility of the owner to perform maintenance. The cleaning of the components of the stormwater management system shall generally be as follows:
    a. Roadway: The owner shall keep the roadway swept with a mechanical sweeper or hand swept semi-annually at a minimum.
    b. Catch Basins: Shall be cleaned by excavating, pumping or vacuuming four times per year and at the end of foliage and snow removal seasons. The sediment shall be disposed of off-site by the Owner. Inspect quarterly, remove silt when ¼ full.
    c. Infiltration Basin: Preventative maintenance shall be performed at least twice per year. Inspection shall be performed after every major storm for the first three months and twice a year thereafter and when there are discharges through the high outlet orifice. Mowing of the buffer area, and bottom of basin; removal of trash and debris; removal of grass clippings and organic matter to be performed at least twice per year. Pretreatment devices shall be inspected every other month and a least twice a year and after every major storm event.

5. Access Provisions: All of the components of the storm water system shall be accessible by the Owner

E. <u>Spill prevention and response plans</u>
1. Inventory materials to be present on-site during construction.
2. Train employees and subcontractors in prevention and clean up procedures.
3. All materials stored on site will be stored in their appropriate containers under a roof.
4. Follow manufacturers recommendation for disposal of used containers.
5. Store only enough product on site to do the job.
6. On site equipment, fueling and maintenance measures:
    a. Inspect on-site vehicles and equipment daily for leaks.
    b. Conduct all vehicle and equipment maintenance and refueling in one location, away from storm drains.
    c. Perform major repairs and maintenance off site.
    d. Use drip pans, drip cloths or absorbent pads when replacing spent fuels.
    e. Collect spent fuels and remove from site.
7. Clean up spills.
    a. Never hose down “dirty” pavement or impermeable surfaces where fluids have spilled. Use dry clean up methods (sawdust, cat litter and/or rags and absorbent pads).
    b. Sweep up dry materials immediately. Never wash them away or bury them.
    c. Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
    d. Report significant spills to the Fire Department, Conservation Commission and Board of Health.

F. <u>Provisions for maintenance of lawns, gardens, and other landscaped areas</u>
Use only organic fertilizer. Dispose of clippings outside of the 100-foot buffer zone to the adjacent wetland.

G. <u>Requirements for storage and use of herbicides, and pesticides</u>
The application of herbicides or pesticides will be done by professional certified contractor.

H. <u>Provisions for operation and management of septic system</u>
Site to be serviced by private on-site sewer.

I. Requirements for handling of pet waste

Pet waste should never be dumped or washed into the local storm drain system. Waste shall be picked up immediately and placed in bags and properly disposed of in the garbage to be collected and taken to a landfill.

J. Provisions for washing of vehicles

Washing of vehicles shall be done in an area as to eliminate wash water from being directly discharged to the local storm drain system. Vehicles should be washed in areas where wash water can be held prior to discharging to the sanitary sewer system or in areas where infiltration precludes runoff to storm drains. Avoid using detergents whenever possible.

K. Provisions for solid waste management

1. Waste Management Plan
    a. Recycle materials whenever possible (paper, plaster cardboard, metal cans). Separate containers for material are recommended.
    b. Do not bury waste and debris on site.
    c. Certified haulers will be hired to remove the dumpster container waste as needed. Recycling products will also be removed off site weekly.

L. Snow disposal and plowing plans relative to Wetland Resource Areas

Snow storage is adequate around the site for large storm events. Storage of snow shall not be placed directly near areas adjacent to the proposed infiltration basin.

M. Winter Road Salt and/or Sand Use and Storage restrictions

No sand, salt, or chemicals for de-icing will be stored outside.

N. Street sweeping schedules

Sweeping, the act of cleaning pavement can be done by mechanical sweepers, vacuum sweeper or hand sweeper. The quantity of sand is a direct correlation with the treatment of ice and snow and the types of chemicals and spreaders that are being used on site to manage snow. If a liquid de-icer such as calcium chloride is used as a pretreatment to new events the amount of sand is minimized. Sweeping for this site should be done semi-annually at a minimum. Collecting the particulate before it enters the catch basins is cheaper and more environmentally friendly than in a catch basin mixing with oils and greases in the surface water runoff in catch basins.

O. Provisions for prevention of illicit discharges to the stormwater management system

The discharge into the stormwater system is not being violated, see attachment for illicit discharges compliance.

P. Training the staff or personnel involved with implementing Long-Term Pollution Prevention Plan

The owner shall develop policies and procedures for containing the illicit spilling of oils, soda, beer, paper and litter. These wastes provide a degrading of the water quality. The placement of signs and trash barrels with lids around the site would contribute to a clean water quality site condition.

Q. List of Emergency contacts for implementing Long-Term Pollution Prevention Plan:

Raven Homes, Inc.
22 Buckhill Road
Northborough, MA 01532
PH: 508-393-4511

This shall be the contact until such time as the project is sold.

R. Estimated BMP Maintenance Costs

The following prices are estimates of the costs associated with maintenance of the proposed site BMPs. Costs provided are only estimates and may not reflect actual costs to perform the work. Actual costs may vary depending on company/personnel performing the work. Actual costs may increase over time.

BMP	Estimated Maintenance Cost
Pavement sweeping	$ 400 per year
Catch basin cleaning	$ 200 per catch basin per cleaning
Infiltration Basin	$ 200 per cleaning
Spill Containment Kit	$ 750 purchase price

Construction Period Pollution Prevention Plan

Appendix 8

Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control.
EPA NPDES – Storm Water Pollution Prevention Plan (SWPPP)

A. Names of Persons or Entity Responsible for Plan Compliance

Applicant: Raven Homes, Inc.
22 Buckhill Road
Northborough, MA 01532
PH: 508-393-4511

B. Construction Period Pollution Prevention Measures

1. Inventory materials to be present on-site during construction.
2. Train employees and subcontractors in prevention and clean up procedures.
3. All materials stored on site will be stored in their appropriate containers and if possible, under a roof or covered.
4. Follow manufacturer's recommendation for disposal of used containers.
5. Store only enough product on site to do the job.
6. On site equipment, fueling and maintenance measures:
    a. Inspect on-site vehicles and equipment daily for leaks.
    b. Conduct all vehicle and equipment maintenance and refueling in front of building, away from storm drains.
    c. Perform major repairs and maintenance off site.
    d. Use drip pans, drip cloths or absorbent pads when replacing spent fuels.
    e. Collect spent fuels and remove from site, per Local and State regulations.
    f. Maintain a clean construction entrance where truck traffic is frequent to reduce soil compaction constant sweeping is required and limit tracking of sediment into streets, sweeping street when silt is observed on street.
7. Stockpile materials and maintain Erosion Control around the materials where it can easily be accessed. Maintain easy access to clean up materials to include brooms, mops, rags gloves, goggles, sand, sawdust, plastic and metal trash containers.
8. Clean up spills.
    a. Never hose down "dirty" pavement or impermeable surfaces where fluids have spilled. Use dry clean up methods (sawdust, cat litter and/or rags/absorbent pads).
    b. Sweep up dry materials immediately. Never wash them away or bury them.
    c. Clean up spills on dirt areas by digging up and properly disposing of contaminated soil in a certified container and notify a certified hauler for removal.
    d. Report significant spills to the Fire Department.
9. It is the responsibility of the site superintendent or employees designated by the Applicant to inspect erosion control and repair as needed, also to inspect all on site vehicles for leaks and check all containers on site that may contain hazardous materials daily.

C. Erosion and Sedimentation Control Plan.
Erosion Control Plan prepared by Guerriere & Halnon, Inc. Dated 12/30/22 revised 11/7/2023

D. Site Development Plans.
See Site Plan prepared by Guerriere & Halnon, Inc. Dated 12/30/22 and revised through 11/7/2023

E. Construction Plans
See Site Plan prepared by Guerriere & Halnon, Inc. Dated 12/30/22 and revised through 11/7/2023

1. Construction
    a. Record Order of Conditions - The site superintendent shall be aware of all the Conditions contained within the Order including inspection schedules.
    b. Install DEP File # Sign.
    c. Prior to any work on the site including tree/brush clearing, the approved limit of clearing as well as the location of the proposed erosion control devices (such as silt fence/mulch sock, etc.) must be staked on the ground under the direction of a Massachusetts registered Professional Land Surveyor.
    d. Install silt fence/mulch sock at locations shown on Erosion Control Plan
    e. Strip off top and subsoil. Stockpile material to be reused away from the wetland, remove excess material from the site. Install and maintain erosion control barrier around stockpile.
    f. Rough grade site, maintaining a temporary low area/sediment trap away from the wetland.
    g. Construct drainage outfalls and stilling basin. Stabilize side slopes with loam, seed and mulch.
    h. Install underground utilities; protect all open drainage structures with erosion/siltation control devices.
    i. Install binder course of bituminous asphalt.
    j. Install wearing course of asphalt, and striping (where required).
    k. Maintain all erosion control devices until site is stabilized and a Certificate of Compliance is issued by the Conservation Commission.
    l. The Contractor shall be responsible to schedule any required inspections of his/her work.

F. Construction Waste Management Plan
    a. Dumpster for trash and bulk waste collection shall be provided separately for construction.
    b. Recycle materials whenever possible (paper, plaster cardboard, metal cans). Separate containers for material are recommended.
    c. Segregate and provide containers for disposal options for waste.
    d. Do not bury waste and debris on site.
    e. Certified haulers will be hired to remove the dumpster container waste as needed. Recycling products will also be removed off site weekly.
    f. The sewer system is only for disposal of human waste, and substances permitted for disposal in the site sewer permit with the Town B.O.H.

G. <u>Operation and Maintenance of Erosion and Sedimentation Controls</u>

The operation and maintenance of sedimentation control shall be the responsibility of the contractor. The inspection and maintenance of the stormwater component shall be performed as noted below. The contractor shall have erosion control in place at all times. The contractor, based on future weather reports, shall prepare and inspect all erosion control devices; cleaning, repairing and upgrading is a priority so that the devices perform as per design. Inspect the site during rain events. Do not stay away from the site. At a minimum there should be inspection to assure the devices are not clogged or plugged, or that devices have not been destroyed or damaged during the rain event. After a storm event inspection is required to clean and repair any damage components. Immediate repair is required.

H. <u>Inspection and Maintenance Schedules</u>
    1. Inspection must be conducted at least once every 7 days and within 24 hours of the end of a storm event 0.5 inches or greater.

2. Inspection frequency can be reduced to once a month if:
    a. The site is temporarily stabilized.
    b. Runoff is unlikely due to winter conditions when site is covered with snow or ice.
3. Inspections must be conducted by qualified personnel, "qualified personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls and who possess the skills to assess the conditions and take measures to maintain and ensure proper operation, also to conclude if the erosion control methods selected are effective.
4. For each inspection, the inspection report must include: (See attached inspection and maintenance log)
    a. The inspection date.
    b. Names, titles of personnel making the inspection.
    c. Weather information for the period since the last inspection.
    d. Weather information at the time of the inspection.
    e. Locations of discharges of sediment from the site, if any.
    f. Locations of BMP's that need to be maintained.
    g. Locations where additional BMP's may be required.
    h. Corrective action required or any changes to the SWPPP that may be necessary.

5. The owner, or their representative, such as the contractor, shall inspect the following in-place work.

<u>Inspection Schedule:</u>

Erosion Control	Weekly
Catch Basins	Weekly
Temporary Sedimentation Traps/Basins	Weekly
Street Sweeping	Weekly

Please Note: Special inspections shall also be made after a significant rainfall event.

<u>Maintenance Schedule</u>

Erosion Control Devices Failure	Immediately
Catch Basins	Sump 1/4 full of sediment
Street Sweeping	14 days minimum and prior to any significant rain event.

Please Note: Special maintenance shall also be made after a significant rainfall event.

I. <u>Inspection and Maintenance Log Form</u>. (Log Form Follows)

Illicit Discharge Statement

Appendix 9

Illicit Discharge Compliance Statement

It is the intent of the Applicant, Raven Homes, Inc, 22 Buckhill Road, Northborough, MA 01532, (508)393-4511, to control illicit disposal into the storm drainage system. There will be no connection to the storm water system to inadvertently direct other types of liquids, chemicals or solids into the storm drainage system. The Applicant will also promote a clean Green Environment by mitigating spills onto pavements, oils, chemicals, pet waste, debris and litter.

Respectfully Acknowledged,

Raven Homes, Inc.

Drainage Area Plans

Appendix 10

F4457

APPROVED DATE:

BELLINGHAM PLANNING BOARD

BEING A MAJORITY

LEGAL NOTES

UTILITIES ARE PLOTTED AS A COMPILATION OF RECORD DOCUMENTS, MARKINGS AND OTHER OBSERVED EVIDENCE TO DEVELOP A VIEW OF THE UNDERGROUND UTILITIES AND SHOULD BE CONSIDERED APPROXIMATE. LACKING EXCAVATION, THE EXACT LOCATION OF UNDERGROUND FEATURES CANNOT BE ACCURATELY, COMPLETELY AND RELIABLY DEPICTED. ADDITIONAL UTILITIES, NOT EVIDENCED BY RECORD DOCUMENTS OR OBSERVED PHYSICAL EVIDENCE, MAY EXIST. CONTRACTORS (IN ACCORDANCE WITH MASS.G.L. CHAPTER 82 SECTION 40 AS AMENDED) MUST CONTACT ALL UTILITY COMPANIES BEFORE EXCAVATING AND DRILLING AND CALL DIGSAFE AT 1(888)DIG-SAFE(7233).

CONSTRUCTION ON THIS LAND IS SUBJECT TO ANY EASEMENTS, RIGHTS-OF-WAY, RESTRICTIONS, RESERVATIONS, OR OTHER LIMITATIONS WHICH MAY BE REVEALED BY AN EXAMINATION OF THE TITLE.

OWNER

RAVEN HOMES, INC.
22 BUCKHILL ROAD
NORTHBOROUGH, MA 01532

DEED BOOK 38607 PAGE 308
PLAN BOOK 697, PLAN 40

A.M. 58 LOTS 1C, 1D & 1E
A.M. 59 LOT 60A

APPLICANT

RAVEN HOMES, INC.
22 BUCKHILL ROAD
NORTHBOROUGH, MA 01532

SITE PLAN
NORTH STREET & BLACKSTONE STREET
BELLINGHAM
MASSACHUSETTS

EXISTING WATERSHED

OCTOBER 7, 2022

DATE	REVISION DESCRIPTION
11/7/2023	REVISED LAYOUT AND GRADING

GRAPHIC SCALE: 1"=40'

0 10 20 30 40 50 75 100 FEET
0 5 10 15 20 30 METERS

Guerriere & Halnon, Inc.
ENGINEERING & LAND SURVEYING
55 WEST CENTRAL ST. PH. (508) 528-3221
FRANKLIN, MA 02038 FX. (508) 528-7921
www.gandhengineering.com

SHEET 1 OF 2

JOB NO. F4457

422B
CANTON FINE SANDY LOAM,
0 TO 8 PERCENT SLOPES,
EXTREMELY STONY
HSG B

254B
MERRIMAC FINE SANDY LOAM,
3 TO 8 PERCENT SLOPES
HSG A

420B
CANTON FINE SANDY LOAM,
3 TO 8 PERCENT SLOPES
HSG B

GRASS

WOODS

WETLANDS

EXISTING DEPRESSION L

EXISTING DEPRESSION OUTLET EL.= 309.05

EX-1

EX-2

AP-1

AP-2

1E

100'B

50'B

NORTH STREET
(PUBLIC ~ VARIABLE WIDTH)

BLACKSTONE STREET
(PUBLIC ~ VARIABLE WIDTH)

OLD TOWN ROAD
(UNIMPROVED)

LEGEND

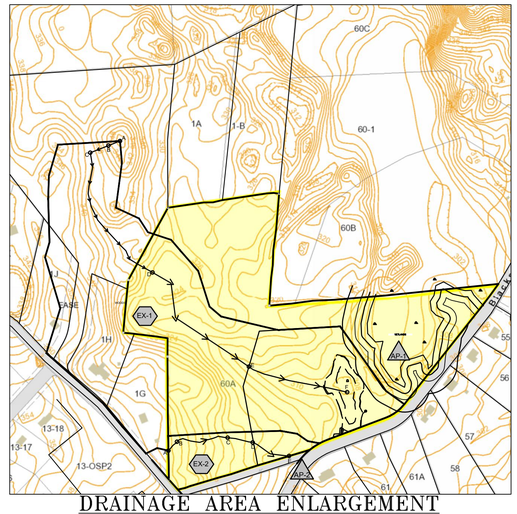
EX EXISTING SUBCATCHMENT

AP ANALYSIS POINT

SUBCATCHMENT BOUNDARY

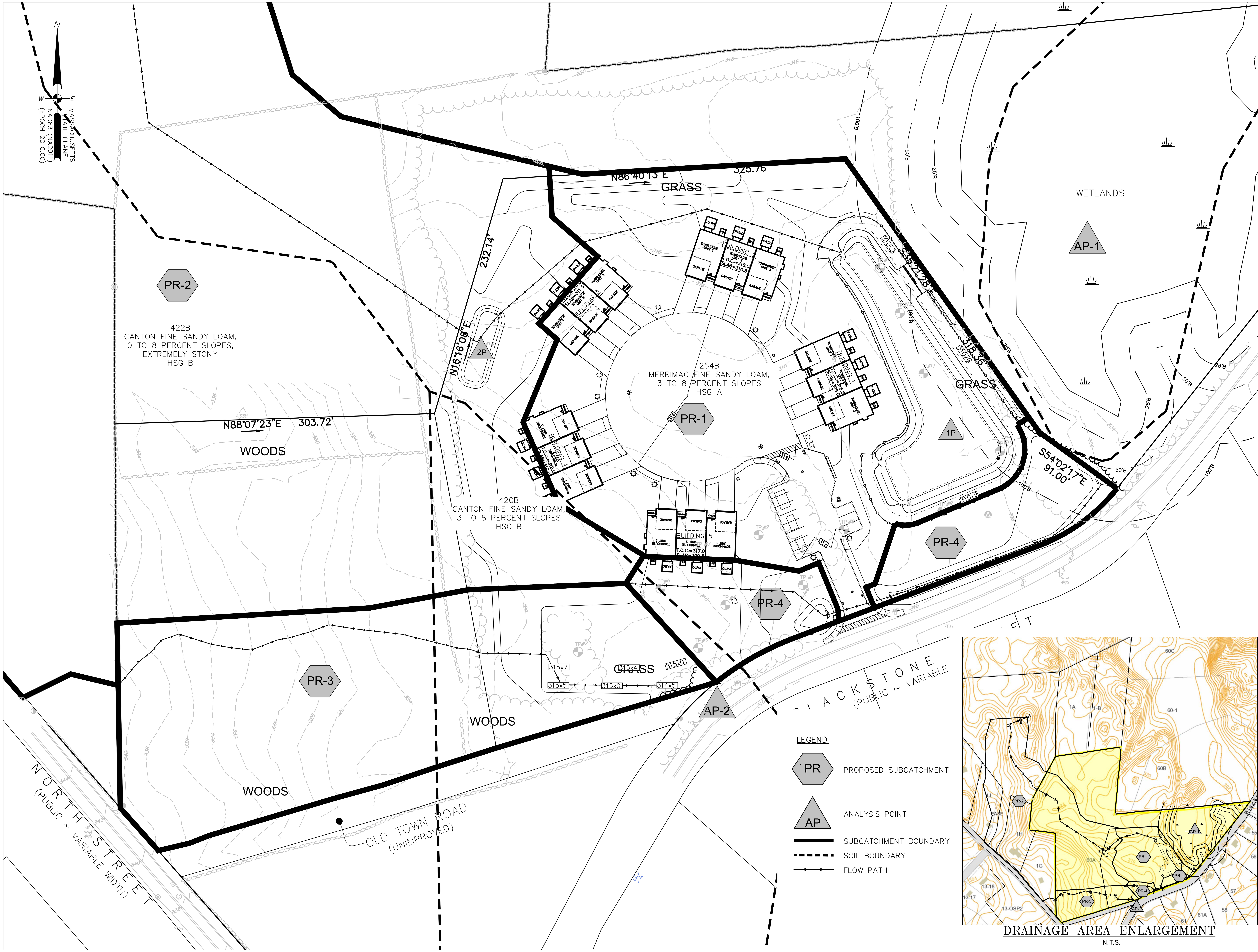
SOIL BOUNDARY

FLOW PATH



DRAINAGE AREA ENLARGEMENT
N.T.S.

J:\CSD\Franklin\F4457\DWG\F4457-CIVIL rev4.dwg, 11/10/2023 11:44:22 AM, [MAH]



DRAINAGE AREA ENLARGEMENT

N.T.S.

F4457

APPROVED DATE:

BELLINGHAM PLANNING BOARD

BEING A MAJORITY

LEGAL NOTES

UTILITIES ARE PLOTTED AS A COMPILATION OF RECORD DOCUMENTS, MARKINGS AND OTHER OBSERVED EVIDENCE TO DEVELOP A VIEW OF THE UNDERGROUND UTILITIES AND SHOULD BE CONSIDERED APPROXIMATE. LACKING EXCAVATION, THE EXACT LOCATION OF UNDERGROUND FEATURES CANNOT BE ACCURATELY, COMPLETELY AND RELIABLY DEPICTED. ADDITIONAL UTILITIES, NOT EVIDENCED BY RECORD DOCUMENTS OR OBSERVED PHYSICAL EVIDENCE, MAY EXIST. CONTRACTORS (IN ACCORDANCE WITH MASS.G.L. CHAPTER 82 SECTION 40 AS AMENDED) MUST CONTACT ALL UTILITY COMPANIES BEFORE EXCAVATING AND DRILLING AND CALL DIGSAFE AT 1(888)DIG-SAFE{7233}.

CONSTRUCTION ON THIS LAND IS SUBJECT TO ANY EASEMENTS, RIGHTS-OF-WAY, RESTRICTIONS, RESERVATIONS, OR OTHER LIMITATIONS WHICH MAY BE REVEALED BY AN EXAMINATION OF THE TITLE.

OWNER

RAVEN HOMES, INC.
22 BUCKHILL ROAD
NORTHBOROUGH, MA 01532

DEED BOOK 38607 PAGE 308
PLAN BOOK 697, PLAN 40

A.M. 58 LOTS 1C, 1D & 1E
A.M. 59 LOT 60A

APPLICANT

RAVEN HOMES, INC.
22 BUCKHILL ROAD
NORTHBOROUGH, MA 01532

SITE PLAN NORTH STREET & BLACKSTONE STREET BELLINGHAM MASSACHUSETTS

PROPOSED WATERSHED

OCTOBER 7, 2022

DATE	REVISION DESCRIPTION
11/7/20223	REVISED LAYOUT AND GRADING

GRAPHIC SCALE: 1"=40'

0 10 20 30 40 50 75 100 FEET
0 5 10 15 20 30 METERS

Guerriere & Halnon, Inc.
ENGINEERING & LAND SURVEYING
55 WEST CENTRAL ST. FRANKLIN, MA 02038
PH. (508) 528-3221
FX. (508) 528-7921
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SHEET 2 OF 2

JOB NO. F4457

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SUPPLEMENTAL ATTACHMENTS

Appendix 11

Hydrograph for Pond 1P: Infiltration Basin #1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	305.50	0.00	0.00	0.00	**0.00**
2.50	0.00	0	305.50	0.00	0.00	0.00	0.00
5.00	0.00	0	305.50	0.00	0.00	0.00	0.00
7.50	0.07	4	305.50	0.07	0.07	0.00	0.00
10.00	**0.44**	23	305.50	0.44	0.44	0.00	0.00
12.50	**21.99**	**33,606**	**308.09**	**8.18**	**5.17**	**3.01**	0.00
15.00	4.01	**27,902**	**307.71**	**6.60**	**4.67**	**1.93**	0.00
17.50	2.34	15,133	306.79	3.50	3.50	0.00	0.00
20.00	1.71	5,853	306.03	2.59	2.59	0.00	0.00
22.50	1.43	104	305.51	1.99	1.99	0.00	0.00
25.00	0.06	7	305.50	0.13	0.13	0.00	0.00
27.50	0.00	0	305.50	0.00	0.00	0.00	0.00
30.00	0.00	0	305.50	0.00	0.00	0.00	0.00
32.50	0.00	0	305.50	0.00	0.00	0.00	0.00
35.00	0.00	0	305.50	0.00	0.00	0.00	0.00
37.50	0.00	0	305.50	0.00	0.00	0.00	0.00
40.00	0.00	0	305.50	0.00	0.00	0.00	0.00
42.50	0.00	0	305.50	0.00	0.00	0.00	0.00
45.00	0.00	0	305.50	0.00	0.00	0.00	0.00
47.50	0.00	0	305.50	0.00	0.00	0.00	0.00
50.00	0.00	0	305.50	0.00	0.00	0.00	0.00
52.50	0.00	0	305.50	0.00	0.00	0.00	0.00
55.00	0.00	0	305.50	0.00	0.00	0.00	0.00
57.50	0.00	0	305.50	0.00	0.00	0.00	0.00
60.00	0.00	0	305.50	0.00	0.00	0.00	0.00
62.50	0.00	0	305.50	0.00	0.00	0.00	0.00
65.00	0.00	0	305.50	0.00	0.00	0.00	0.00
67.50	0.00	0	305.50	0.00	0.00	0.00	0.00
70.00	0.00	0	305.50	0.00	0.00	0.00	0.00

Land Use Coefficients "C"

Pave	0.90
Gravel	0.80
Wetland	0.72
Grass	0.30
Woods	0.25
Roof	0.90

Drainage Area	Land Use Area Impervious (acres)	Gravel (acres)	Wetland (acres)	Pervious (acres)	Woods (acres)	Roof (acres)	Total (acres)	Weighted "C"
DA-1A	0.346			0.198		0.186	0.731	0.74
DA-1B	0.357			0.108		0.130	0.595	0.79
DA-3A	0.094			0.093		0.000	0.187	0.60
DA-3B	0.076			0.041		0.000	0.118	0.69
DA-5					14.336		15.372	0.23
DA-6				0.351	0.000		0.351	0.30
SUBTOTAL	0.874	0.000	0.000	0.791	14.336	0.316	17.353	
OVERALL TOTALS	0.874			0.791	14.336	0.316	16.317	

Guerriere & Halnon, Inc.
55 West Central Steet
Franklin, MA 01757-0235

Project: North Street & Blackstone Street, Bellingham MA
Job No.: 4457

DESIGN COMPUTATIONS FOR STORM DRAINS

Prepared By: KKP Date: 10/12/2022 Revised: 11-7-23 MAH
Checked By: Date: Revised:

Drainage Area	Upper Structure	Lower Structure	Sum of CA's (sf)	Time of Concentration (Tc) (min)	Rainfall Intensity (I) (in/hr)	Actual Peak Flow Rate (Q) (cfs)	Pipe Diameter (in)	Slope (ft/ft)	Roughness Coefficient (n)	Design Flow Full (Q) (cfs)	Velocity Flow Full (V) (fps)	Actual Velocity (V) (fps)	Length of Pipe (L)* (ft)	Time in pipe (min)	Total Fall (ft)	Invert Elevation Elev. Upper End	Invert Elevation Elev. Lower End	Rim Elev Elev. Upper End	Rim Elev Elev. Lower End	Destination
DA-1	CB-1A	DMH-1	0.54	6.00	5.80	3.12	12	0.013	0.011	4.89	6.22	3.98	24.5	0.07	0.33	309.60	309.27	313.84	313.68	
	CB-1B	DMH-1	0.47	6.00	5.80	2.73	12	0.018	0.011	5.61	7.14	3.47	18.6	0.04	0.33	309.60	309.27	313.73	313.68	
	DMH-1	HW #1	1.01	6.07	5.80	5.85	12	0.024	0.011	6.51	8.29	7.45	73.9	0.15	1.77	308.77	307.00	313.68		
DA-3	CB-2A	DMH-2	0.11	6.00	5.80	0.65	12	0.005	0.011	2.97	3.78	0.83	14.1	0.06	0.07	307.67	307.60	310.47	310.86	
	CB-2B	DMH-2	0.08	6.00	5.80	0.47	12	0.007	0.011	3.48	4.43	0.60	10.3	0.04	0.07	307.67	307.60	310.47	310.86	
	DMH-2	HW #2	0.19	6.06	5.80	1.12	18	0.005	0.011	9.01	5.10	0.64	94.8	0.31	0.50	307.50	307.00	310.86		
																				INFILTRATION BASIN
	OCS	HW #2				1.12	24	0.005	0.013	15.96	5.08	0.36	96.5	0.32	0.48	306.00	305.52			

CONSTRUCTION PHASE INSPECTION FORMS

North Street and Blackstone Street

Bellingham MA

Date _____ Prev. Insp. Date: _____

Inspector: _____ Title: _____

Weather: _____

Weather Since Last Inspection _____

Erosion Control - Inspect Weekly

Comments:
Corrective measures taken and date

On Site Pavement Sweeping - Inspect Weekly

Comments:
Corrective measures taken and date

Catch Basins - Inspect Weekly

Comments:
Corrective measures taken and date

Stormceptor - Inspect Weekly

Comments:
Corrective measures taken and date

Temporary Sediment Traps/Basins - Inspect Weekly

Comments:
Corrective measures taken and date

CONSTRUCTION PHASE INSPECTION FORMS

North Street and Blackstone Street

Bellingham MA

Notify Conservation Commission RE Issues Effecting Resource Areas

Comments:
Corrective measures taken and date

Silt on Public Streets - Inspect Weekly

Comments:
Corrective measures taken and date

Stock Pile Materials - Ring with Haybales - Inspect Weekly

Comments:
Corrective measures taken and date

Any Fuel or Chemical Spill - Inspect Daily

Comments:
Corrective measures taken and date

Post Construction Inspection Report
North Street/Blackstone Street
Bellingham, Massachusetts

INSPECTION DATE:						
Person Inspecting		Weather				Other Personnel Present
		Clear				
Item	**N/A***	**sat.****	**NMR*****	**CAM****	**MCA***	**Comments:**
Pavement Swept						
Catch Basins						
CB #1A						
CB #1B						
CB #2A						
CB #2B						
Infiltration Basin #1						
Sediment Forebay						
Infiltration Basin						
Inlet Basin #2						
Infiltration Basin						
NMR* normal maintenance requested						
N/A* not applicable at the time of inspection						
CAM* corrective action - minor						
SAT* satisfactory conditions as compliant						
MCA* Major corrective action						