Atlantic
DESIGN ENGINEERS, INC.

STORM WATER
DRAINAGE ANALYSIS
For
Upper Union Solar Project
0 Upper Union Street
Franklin, Massachusetts

Prepared for:

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ADE Project No. 3328.00

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APPENDICES

1.0 INTRODUCTION

The purpose of this drainage study is to analyze the stormwater drainage conditions that will occur as a result of the construction of the proposed Upper Union Solar Project along with associated access drives and infrastructure at 0 Upper Union Street, (Parcel 009 on the Town of Franklin Assessors Map 319). The project site is a 6.2±-acre parcel on the east side of Upper Union Street, just north of Ribero Drive. The property is comprised of partially cleared areas and undeveloped woodland with a 325' wide New England Power Easement running through the center of the site.

The site does not lie within a DEP designated Zone II or a Town of Franklin designated Water Resource District per Town of Franklin Water Resource District maps. The site is not located within FEMA Flood Zone based upon a review of FEMA Flood Mapping. The property is not located within an Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species, as mapped by the Natural Heritage and Endangered Species Program (NHESP). The site is not located within an Area of Critical Environmental Concern (ACEC).

Based upon a review of the Web Soil Survey, soils within the proposed development area have been identified as either Charlton-Hollis-Rock outcrop complex or Woodbridge fine sandy loam, both with a "complex" of hydrological soil groups. The term "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, ranging from soils groups A through D.

HydroCAD Stormwater modeling software was used to analyze the hydrological impacts of the development of the Site, calculate pre- and post-development runoff, design the proposed stormwater management system, and to confirm the adequacy of the system to accommodate the flows from the development. The Stormwater analysis and project design was completed in accordance with the requirements of the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards, and the Town of Franklin Stormwater Management Bylaw.

2.0 PROPOSED STORMWATER MANAGEMENT SYSTEM

The stormwater system for the project has been evaluated and designed based upon DEP Wetland Program Policy 17.1: Photovoltaic System Solar Array Review, the Town's Stormwater Management bylaw, as well as the DEP Stormwater Policy of encouraging environmentally sensitive design with minimal point source discharges. Grading proposed on the site will, for the most part, follow the existing contours to mimic existing runoff patterns, except for areas within the array that presently exceed 20%.

Stormwater runoff from portions of the proposed development area will be directed with ditches/swales, and detention basins, which will prevent direct discharge of untreated stormwater to any wetland resource areas or offsite.

The proposed stormwater management system has also been designed to attenuate any increase in peak flows resulting from development of the site.

Erosion control measures (sediment logs or approved equal) will be in place and maintained at the proposed limit of work throughout construction, until vegetation has stabilized, to protect the wetlands and adjacent properties.

3.0 COMPLIANCE WITH DEP STORMWATER MANAGEMENT STANDARDS

Standard 1: No New Untreated Discharges

Except for a 50 foot long paved apron at the site entrance, there are no new impervious surfaces proposed as part of the solar project that will generate suspended solids or other measurable stormwater contaminants. The only measurable impervious surface on the site is the concrete electrical equipment pads and those will be limited to foot traffic only. All access roads will be gravel which, DEP Program Policy 17.1 does not consider impervious and the area under the arrays will be comprised of tall grasses. Runoff from the small, paved apron at the site entrance is treated by a deep sump catch basin and a subsurface infiltration system. Therefore, there will be no untreated discharge and it is our opinion that Standard 1 has been met.

Standard 2: Peak Rate Attenuation

Pre- and Post-Development stormwater calculations were performed for the 2, 10-, 25-, and 100-year, Type III storm events. A comparison of the Pre- vs. Post-Development peak runoff rates for each storm event at the off-site design points is summarized in the tables below:

Design Point #DP 1 – Offsite West		
Storm Event	***Pre-Development***	***Post-Development***
2-year	1.66 cfs	1.54 cfs
10-year	3.25 cfs	2.95 cfs
25-year	4.55 cfs	4.10 cfs
100-year	7.25 cfs	6.48 cfs

Design Point # DP 2 – Offsite North		
Storm Event	***Pre-Development***	***Post-Development***
2-year	1.82 cfs	1.41 cfs
10-year	3.71 cfs	2.95 cfs
25-year	5.28 cfs	4.03 cfs
100-year	8.58 cfs	6.07 cfs

Design Point # DP 3 – Offsite West Wetland		
Storm Event	***Pre-Development***	***Post-Development***
2-year	1.82 cfs	1.80 cfs
10-year	3.37 cfs	3.28 cfs
25-year	4.61 cfs	4.46 cfs
100-year	7.17 cfs	6.88 cfs

Design Point # DP 4 – Offsite East Wetland		
Storm Event	***Pre-Development***	***Post-Development***
2-year	1.44 cfs	1.25 cfs
10-year	2.81 cfs	2.45 cfs
25-year	3.93 cfs	3.43 cfs
100-year	6.27 cfs	5.48 cfs

Design Point # DP 5 – Offsite Northwest		
Storm Event	***Pre-Development***	***Post-Development***
2-year	1.89 cfs	1.71 cfs
10-year	3.92 cfs	3.27 cfs
25-year	5.62 cfs	4.53 cfs
100-year	9.21 cfs	7.15 cfs

Design Point # DP 6 – Offsite East		
Storm Event	***Pre-Development***	***Post-Development***
2-year	2.04 cfs	1.59 cfs
10-year	4.50 cfs	2.73 cfs
25-year	6.61 cfs	3.58 cfs
100-year	11.13 cfs	7.96 cfs

As shown in the tables, the peak rates for stormwater runoff generated under Post Development condition will be equal to or less than the peak rates generated under Pre-Development conditions for the all storm events.

Complete runoff calculations for the 2, 10, 25, and 100-year Type III storm events including cover, soil types and times of concentration paths for the Pre-Development conditions and Post Development conditions are provided in Appendix A. Also watershed plans are provided in Appendix B.

Standard 3: Groundwater Recharge
Based upon a review of the Web Soil Survey, soils within the proposed development area have been identified as a "complex" of hydrological soil groups ranging from A to D; therefore, we are choosing the least favorable hydrological soil group with the lowest infiltration rate. The groundwater recharge volume required for the proposed impervious surfaces is calculated by the following formula:

Rv = (F)(AIMP)
Rv = Required Recharge Volume
F=Target Depth Factor: 0.10 inch
AIMP = Proposed Impervious Area

The total area of new impervious is equal to 1,749 SF. The calculations in Appendix C show that the BMP recharge volumes exceeds the required recharge volumes. As a result, it is our opinion that Standard 3 has been met.

Standard 4: Water Quality Volume
Except for a 50-foot-long paved apron at the site entrance, there are no new impervious surfaces proposed as part of the solar project that will generate suspended solids or other measurable stormwater contaminants. The only measurable impervious surface on the site is the concrete electrical equipment pads and those will be limited to foot traffic only. All access roads will be gravel which, DEP Program Policy 17.1 does not consider impervious and the area under the arrays will be comprised of tall grasses. Runoff from the small, paved apron at the site entrance is treated by a deep sump catch basin and a subsurface infiltration system.

Therefore, it is our opinion that Standard 4 has been met.

Standard 5: Land Uses with Higher Pollutant Loads (LUHPPLs)
The proposed development is not a LUHPPL and therefore Standard 5 is not applicable.

Standard 6: Critical Areas
The project does not have any discharges within a Zone II, Interim Wellhead Protection Areas or near or to any Critical Areas as defined by the Massachusetts Stormwater Handbook and therefore Standard 6 is not applicable.

Standard 7: Redevelopment Projects
The proposed project is not a redevelopment project and therefore Standard 7 is not applicable.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control
Construction Period Pollution Prevention and Erosion and Sedimentation Control
A Construction Period Erosion and Sedimentation Control Plan is provided on the Site plans along with notes/instructions for the contractor and details/location of all erosion control measures.

Standard 9: Post-Construction Long Term Stormwater Operation and Maintenance Plan
A Post-Construction Long Term Stormwater Operation and Maintenance Plan is provided in Appendix E.

Standard 10: Prohibition of Illicit Discharges
To our knowledge, there are no existing illicit discharges to existing stormwater systems on the Site and measures to prevent illicit discharges from the proposed development to proposed stormwater systems on the Site will be included within the Post-Construction Long Term Pollution Prevention Plan. As required, an Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to the post-construction stormwater Best Management Practices (BMPs).

4.0 COMPLIANCE WITH TOWN OF FRANKLIN STORMWATER MANAGEMENT BYLAW

Per Section 153-16.B.(1)(a) of the Town of Franklin Stormwater Management Bylaw Chapter 153, which states “in addition to meeting the requirements of the Massachusetts Stormwater Standards, as required under the Town of Franklin MS4 stormwater permit, all stormwater management systems shall meet the following criteria:

(1) For new development sites, all stormwater management systems shall be designed to:

  (a) Retain the volume of runoff equivalent to, or greater than, 1.0 inch multiplied by the total post-construction impervious surface area on the site.

Calculations are provided in Appendix C which show that the proposed BMP's consisting of a Cultec Infiltration System and a proposed stone infiltration trench are sized to accommodate 1.0 inches of rainfall over the proposed impervious areas on the site. Therefore, in our opinion, the design meets the standards of bylaw.

APPENDIX A

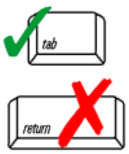
MassDEP Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

COMMONWEALTH OF MASSACHUSETTS
RICHARD
J.
TABACZYNSKI
CIVIL
No. 33746
REGISTERED
PROFESSIONAL ENGINEER

6/19/2023

Signature and Date

Checklist

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

- [x] New development
- [ ] Redevelopment
- [ ] Mix of New Development and Redevelopment

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): Detention Basins and Subsurface Infiltration System

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 (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 (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 (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 (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 (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

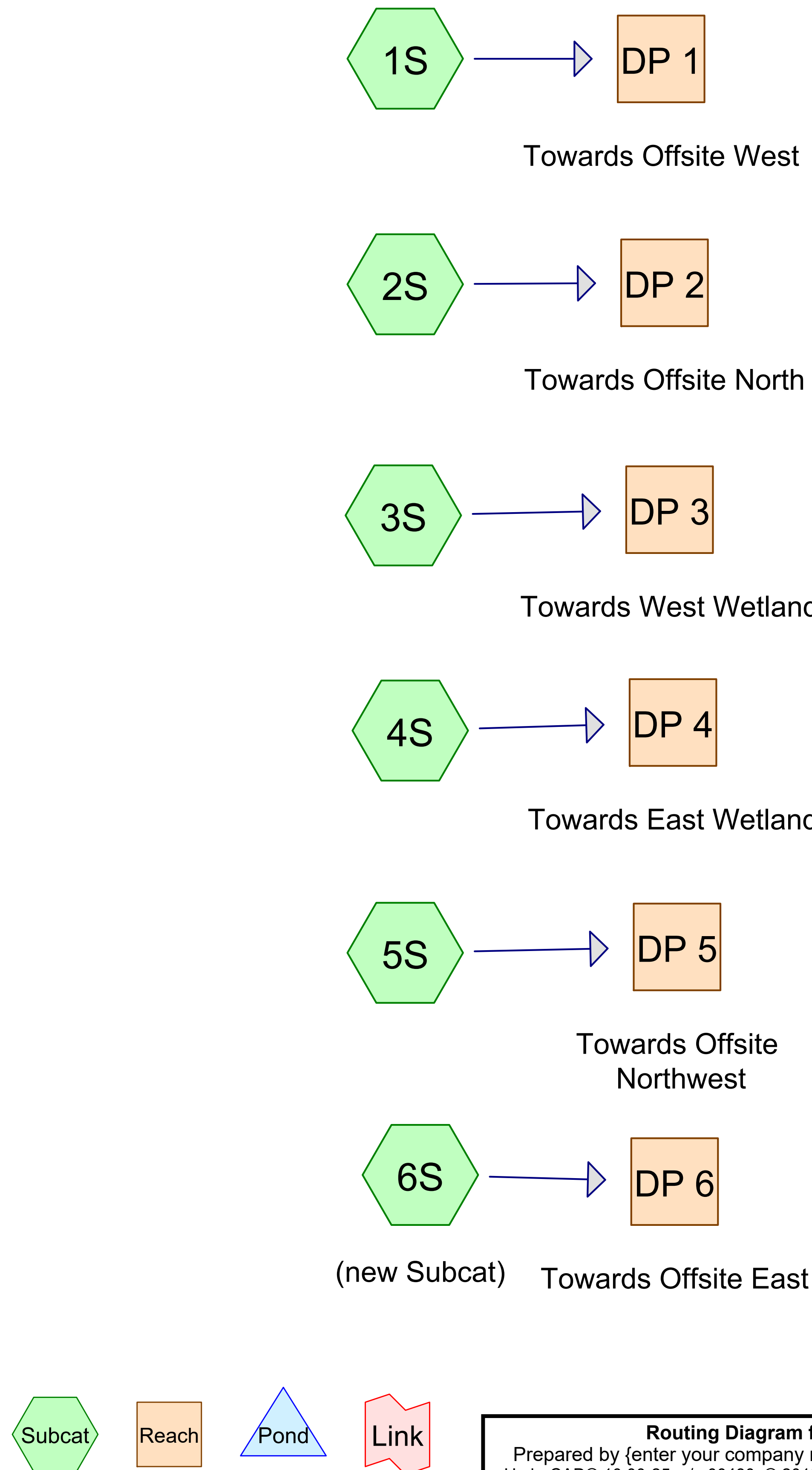
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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.

APPENDIX B

Pre- and Post-Development HydroCAD Calculations



Routing Diagram for 3328.00-PRE
Prepared by {enter your company name here}, Printed 6/15/2023

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
40,762	80	>75% Grass cover, Good, HSG D (1S, 2S)
57,290	83	Brush, Poor, HSG D (3S, 4S)
1,869	96	Gravel surface, HSG D (3S, 4S)
3,240	98	Roofs, HSG D (1S, 2S)
37,709	70	Woods, Good, HSG C (4S, 5S, 6S)
178,720	77	Woods, Good, HSG D (1S, 2S, 3S, 4S, 5S, 6S)
319,590	**78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
37,709	HSG C	4S, 5S, 6S
281,881	HSG D	1S, 2S, 3S, 4S, 5S, 6S
0	Other	
319,590		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	0	40,762	0	40,762	>75% Grass cover, Good	
0	0	0	57,290	0	57,290	Brush, Poor	
0	0	0	1,869	0	1,869	Gravel surface	
0	0	0	3,240	0	3,240	Roofs	
0	0	37,709	178,720	0	216,429	Woods, Good	
0	**0**	**37,709**	**281,881**	**0**	**319,590**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S:	Runoff Area=44,718 sf 5.44% Impervious Runoff Depth=1.42" Flow Length=312' Tc=8.5 min CN=80 Runoff=1.66 cfs 5,282 cf
Subcatchment 2S:	Runoff Area=60,728 sf 1.33% Impervious Runoff Depth=1.29" Flow Length=324' Tc=11.4 min CN=78 Runoff=1.82 cfs 6,518 cf
Subcatchment 3S:	Runoff Area=39,495 sf 0.00% Impervious Runoff Depth=1.63" Flow Length=212' Tc=6.7 min CN=83 Runoff=1.82 cfs 5,350 cf
Subcatchment 4S:	Runoff Area=38,018 sf 0.00% Impervious Runoff Depth=1.42" Flow Length=122' Tc=8.2 min CN=80 Runoff=1.44 cfs 4,490 cf
Subcatchment 5S:	Runoff Area=61,964 sf 0.00% Impervious Runoff Depth=1.23" Flow Length=357' Tc=9.6 min CN=77 Runoff=1.89 cfs 6,331 cf
Subcatchment 6S: (new Subcat)	Runoff Area=74,667 sf 0.00% Impervious Runoff Depth=1.05" Flow Length=427' Tc=8.2 min CN=74 Runoff=2.04 cfs 6,538 cf
Reach DP 1: Towards Offsite West	Inflow=1.66 cfs 5,282 cf Outflow=1.66 cfs 5,282 cf
Reach DP 2: Towards Offsite North	Inflow=1.82 cfs 6,518 cf Outflow=1.82 cfs 6,518 cf
Reach DP 3: Towards West Wetland	Inflow=1.82 cfs 5,350 cf Outflow=1.82 cfs 5,350 cf
Reach DP 4: Towards East Wetland	Inflow=1.44 cfs 4,490 cf Outflow=1.44 cfs 4,490 cf
Reach DP 5: Towards Offsite Northwest	Inflow=1.89 cfs 6,331 cf Outflow=1.89 cfs 6,331 cf
Reach DP 6: Towards Offsite East	Inflow=2.04 cfs 6,538 cf Outflow=2.04 cfs 6,538 cf

Total Runoff Area = 319,590 sf Runoff Volume = 34,510 cf Average Runoff Depth = 1.30"
98.99% Pervious = 316,350 sf 1.01% Impervious = 3,240 sf

Summary for Subcatchment 1S:

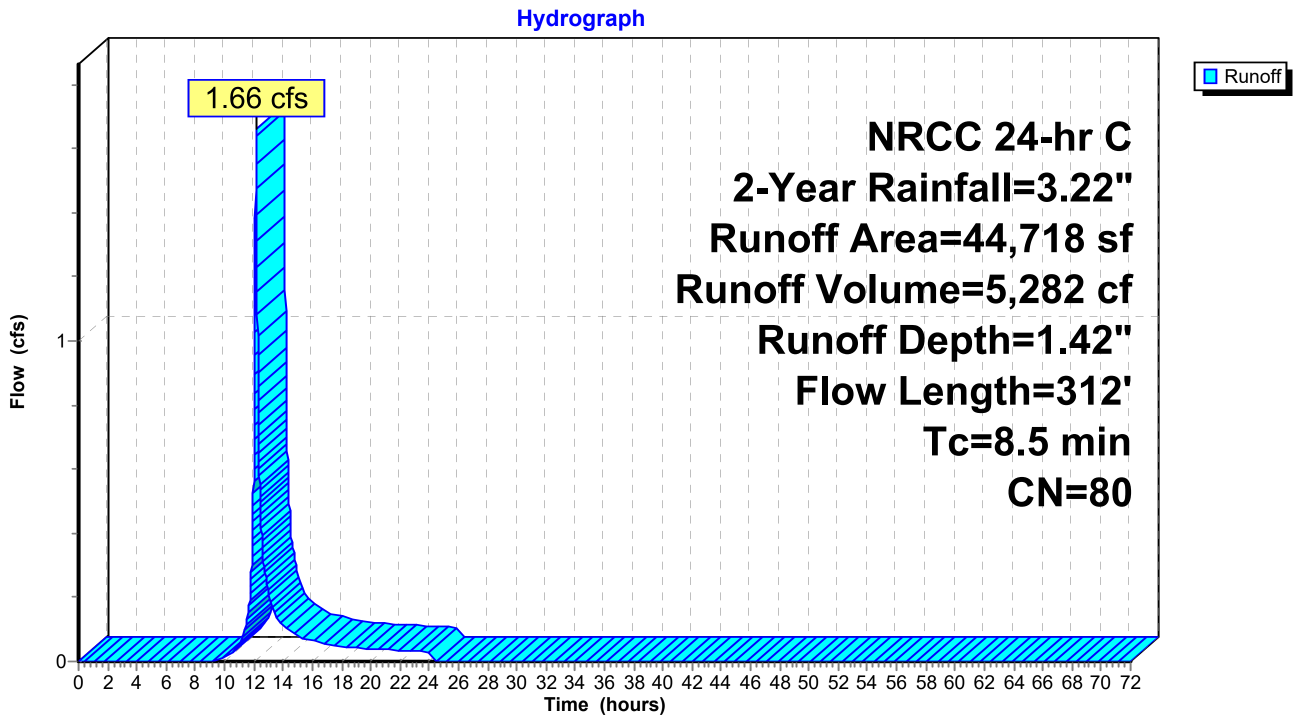
Runoff = 1.66 cfs @ 12.16 hrs, Volume= 5,282 cf, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
16,836	77	Woods, Good, HSG D
2,432	98	Roofs, HSG D
25,450	80	>75% Grass cover, Good, HSG D
44,718	80	Weighted Average
42,286		94.56% Pervious Area
2,432		5.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	248	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	312	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

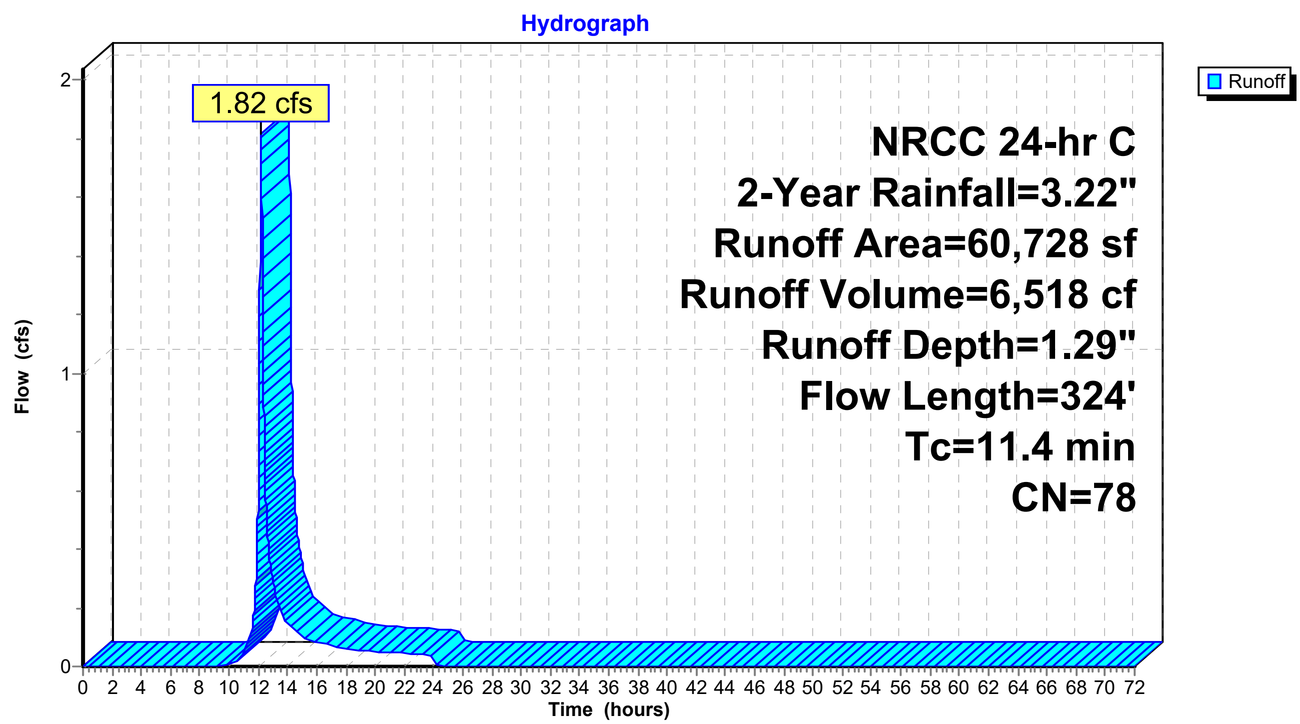
Runoff = 1.82 cfs @ 12.20 hrs, Volume= 6,518 cf, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
15,312	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
44,608	77	Woods, Good, HSG D
60,728	78	Weighted Average
59,920		98.67% Pervious Area
808		1.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.5	262	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	324	Total			

Subcatchment 2S:



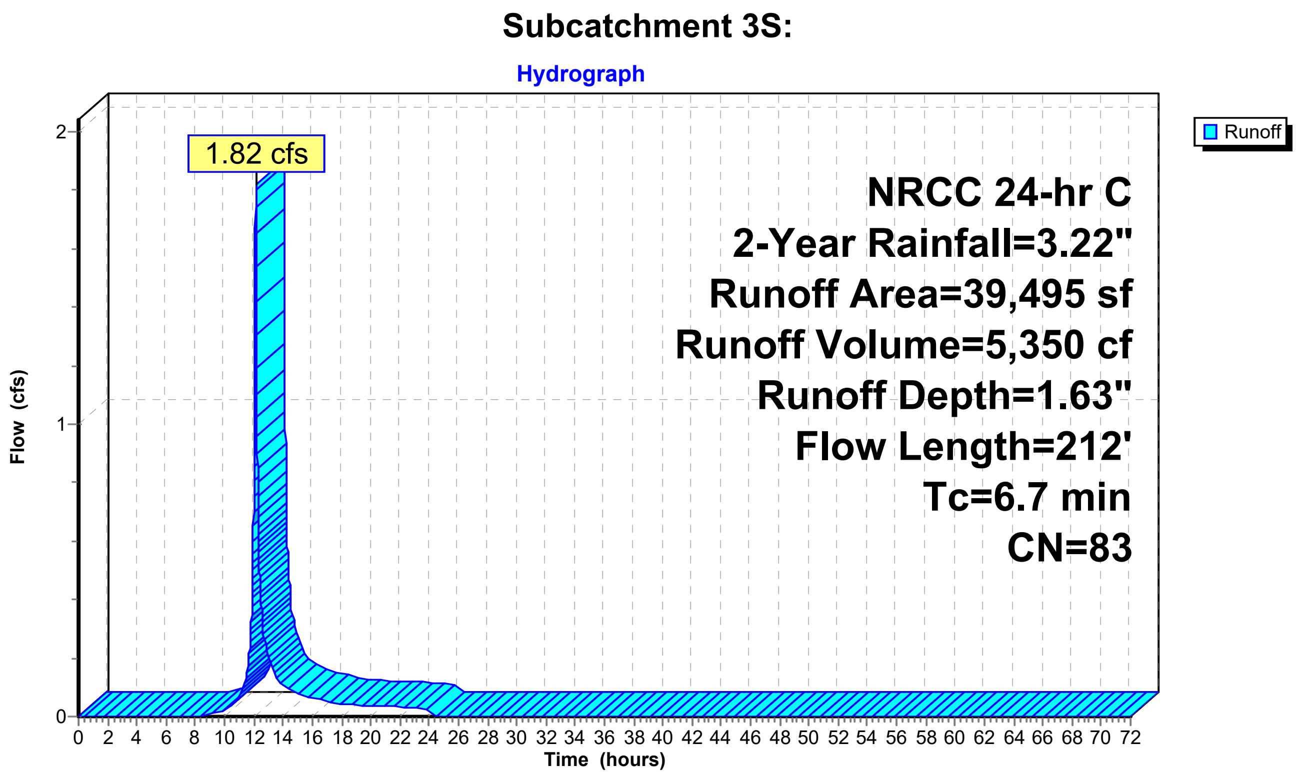
Summary for Subcatchment 3S:

Runoff = 1.82 cfs @ 12.14 hrs, Volume= 5,350 cf, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
5,968	77	Woods, Good, HSG D
1,725	96	Gravel surface, HSG D
31,802	83	Brush, Poor, HSG D
39,495	83	Weighted Average
39,495		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			



Summary for Subcatchment 4S:

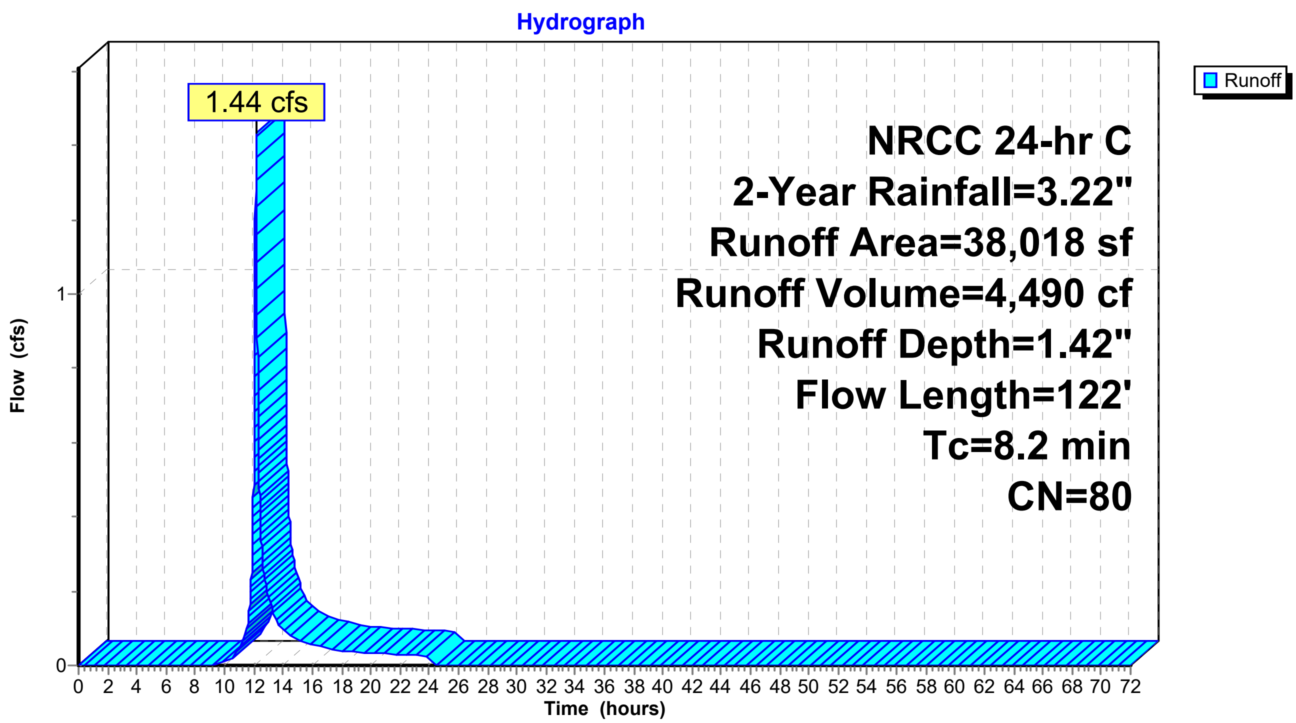
Runoff = 1.44 cfs @ 12.16 hrs, Volume= 4,490 cf, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
25,488	83	Brush, Poor, HSG D
6,988	70	Woods, Good, HSG C
144	96	Gravel surface, HSG D
5,398	77	Woods, Good, HSG D
38,018	80	Weighted Average
38,018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	72	0.1350	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	122	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

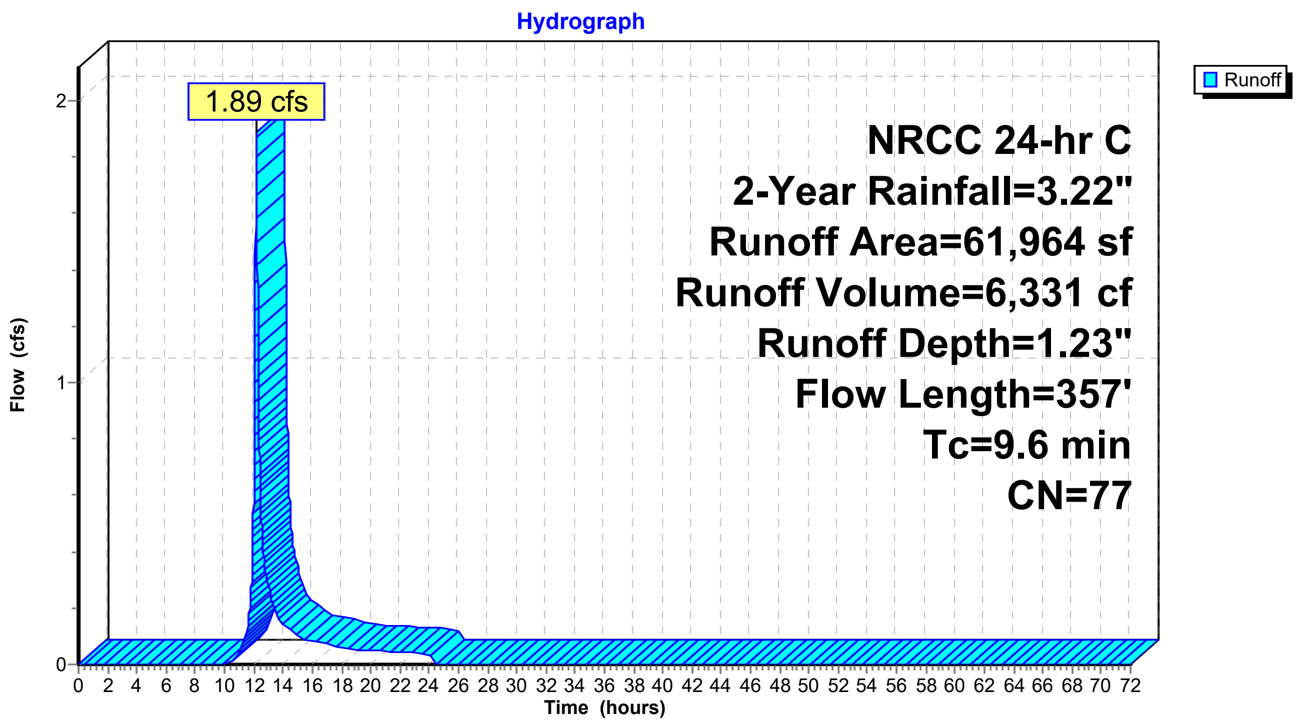
Runoff = 1.89 cfs @ 12.17 hrs, Volume= 6,331 cf, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
3,001	70	Woods, Good, HSG C
58,963	77	Woods, Good, HSG D
61,964	77	Weighted Average
61,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0940	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.2	307	0.1050	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	357	Total			

Subcatchment 5S:



Summary for Subcatchment 6S: (new Subcat)

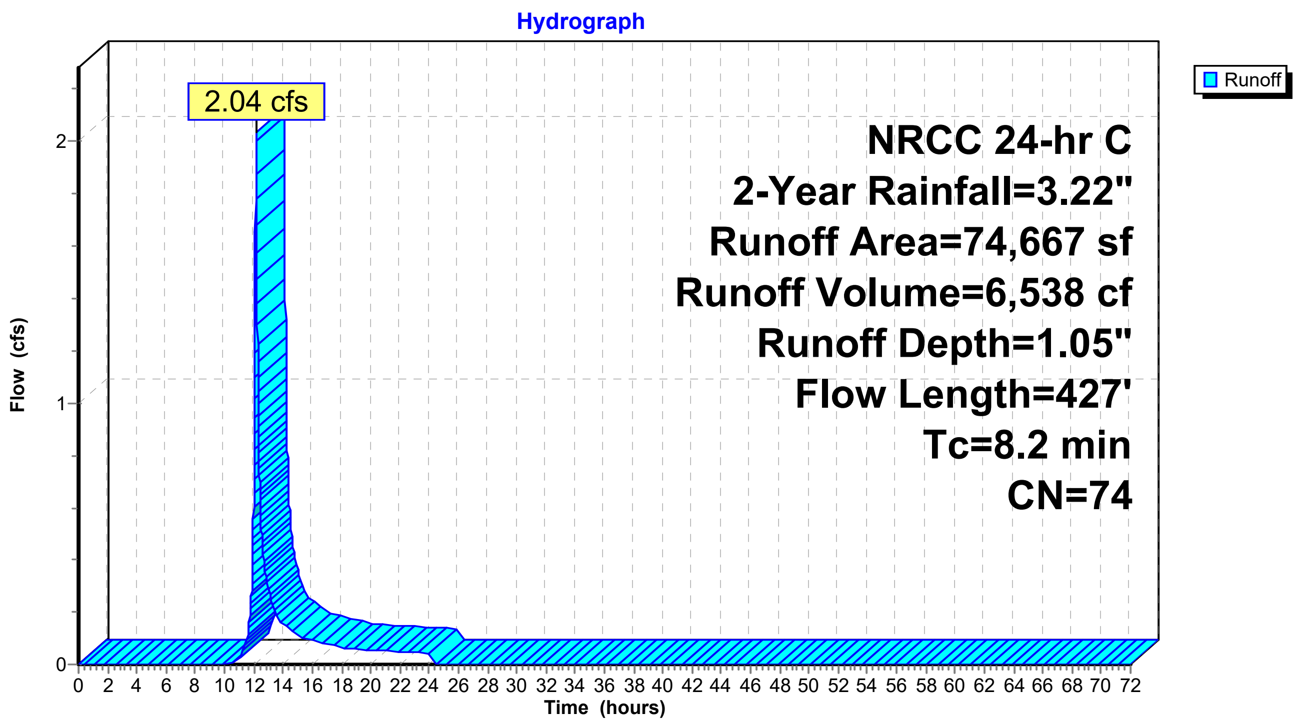
Runoff = 2.04 cfs @ 12.16 hrs, Volume= 6,538 cf, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
46,947	77	Woods, Good, HSG D
27,720	70	Woods, Good, HSG C
74,667	74	Weighted Average
74,667		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.8	377	0.1120	1.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	427	Total			

Subcatchment 6S: (new Subcat)



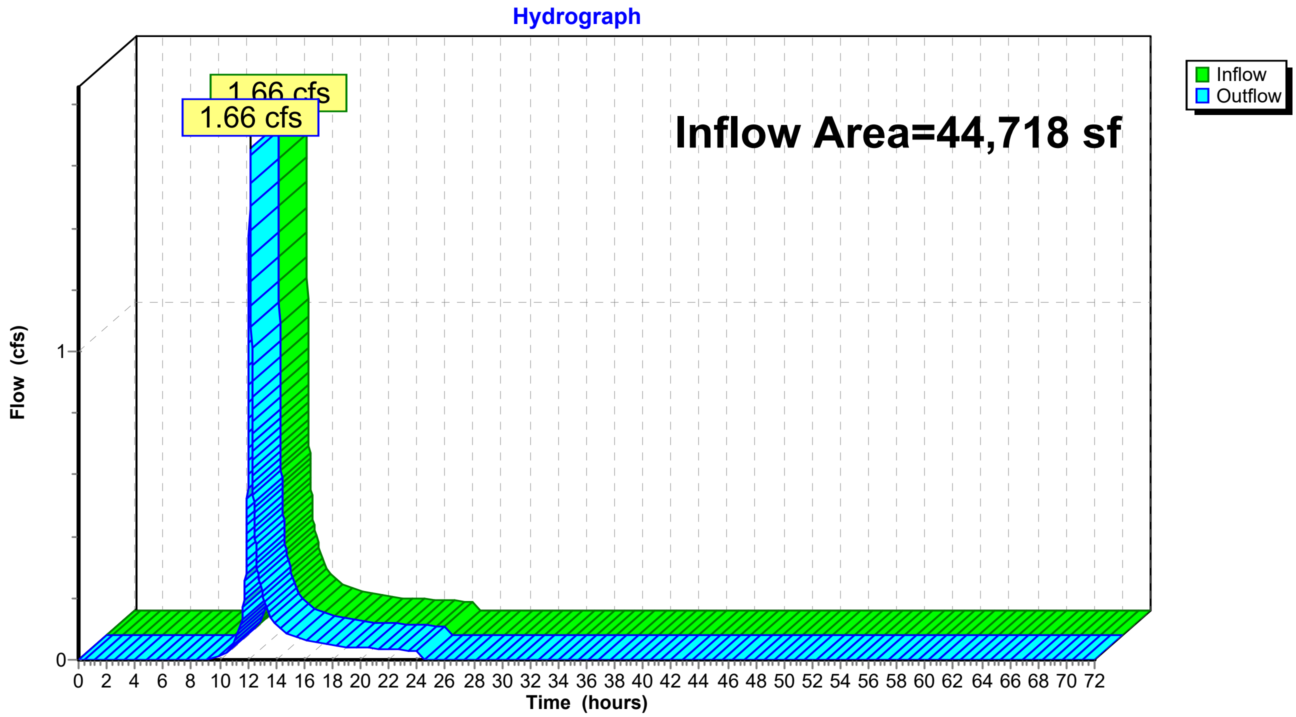
Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	44,718 sf, 5.44% Impervious,	Inflow Depth = 1.42"	for 2-Year event
Inflow =	1.66 cfs @ 12.16 hrs, Volume=	5,282 cf	
Outflow =	1.66 cfs @ 12.16 hrs, Volume=	5,282 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 1: Towards Offsite West



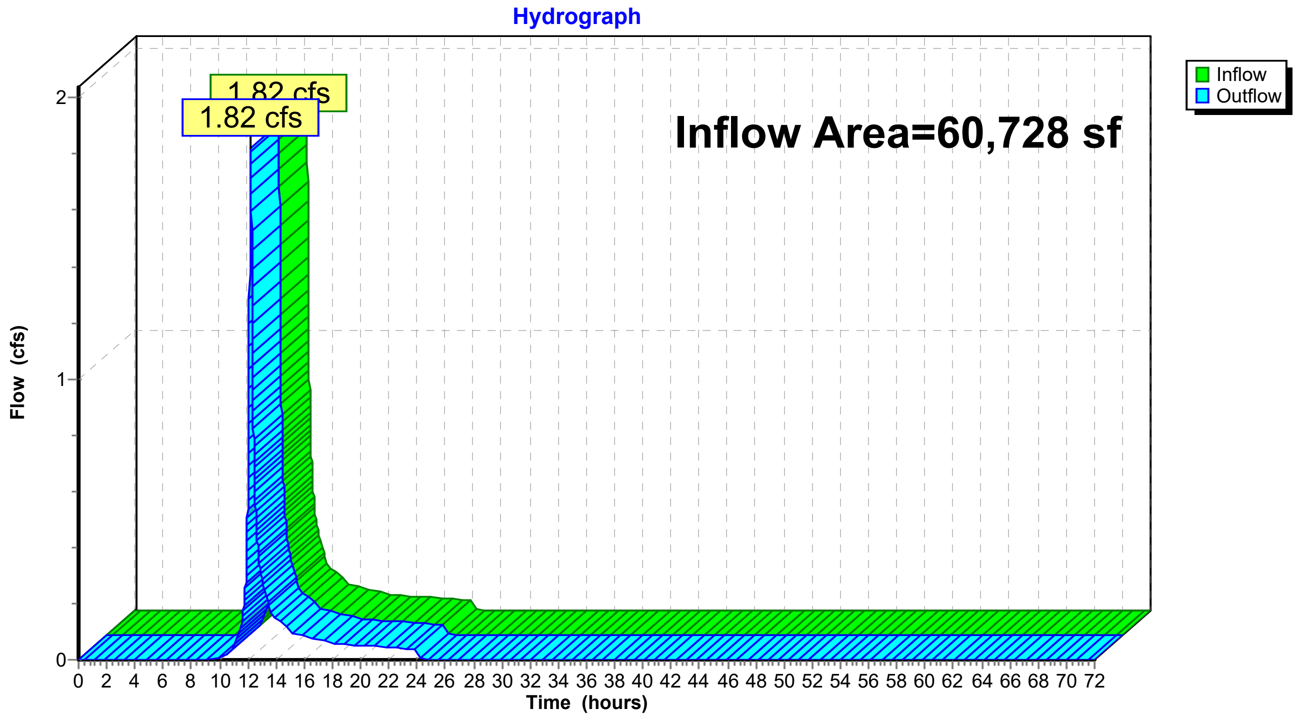
Summary for Reach DP 2: Towards Offsite North

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

Inflow Area = 60,728 sf, 1.33% Impervious, Inflow Depth = 1.29" for 2-Year event
Inflow = 1.82 cfs @ 12.20 hrs, Volume= 6,518 cf
Outflow = 1.82 cfs @ 12.20 hrs, Volume= 6,518 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 2: Towards Offsite North



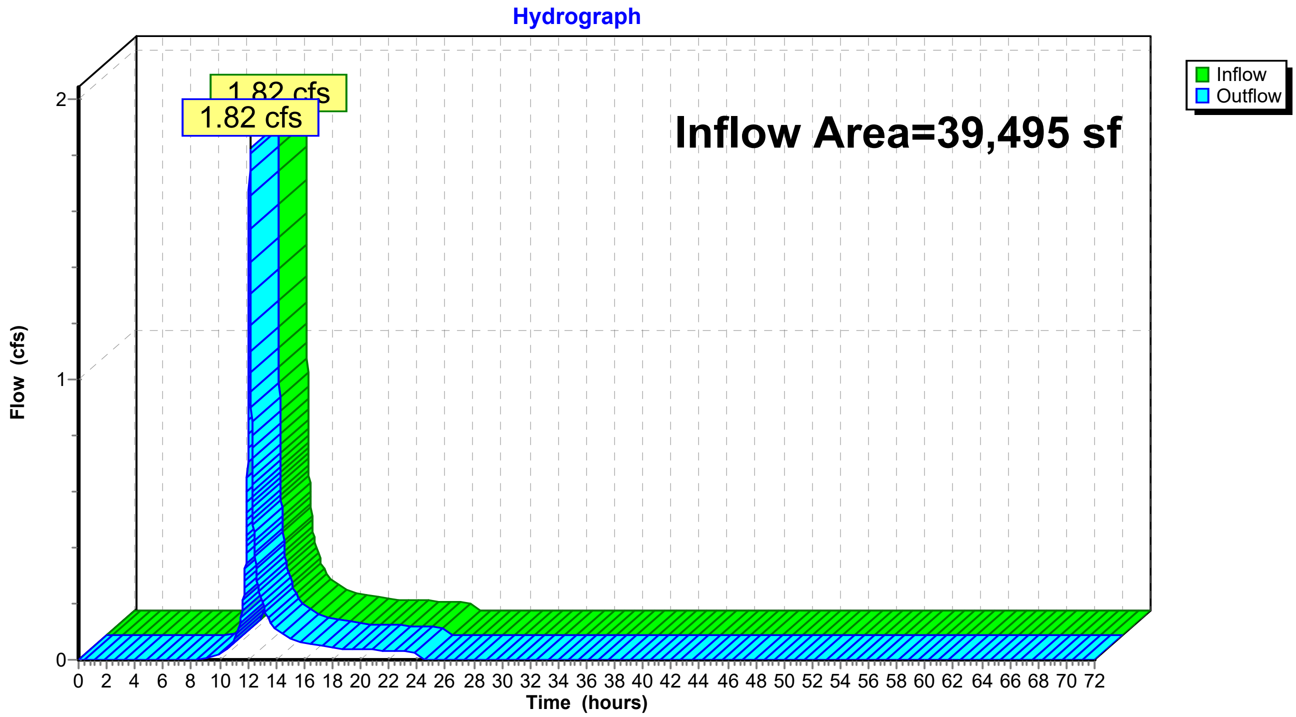
Summary for Reach DP 3: Towards West Wetland

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

Inflow Area = 39,495 sf, 0.00% Impervious, Inflow Depth = 1.63" for 2-Year event
Inflow = 1.82 cfs @ 12.14 hrs, Volume= 5,350 cf
Outflow = 1.82 cfs @ 12.14 hrs, Volume= 5,350 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 3: Towards West Wetland



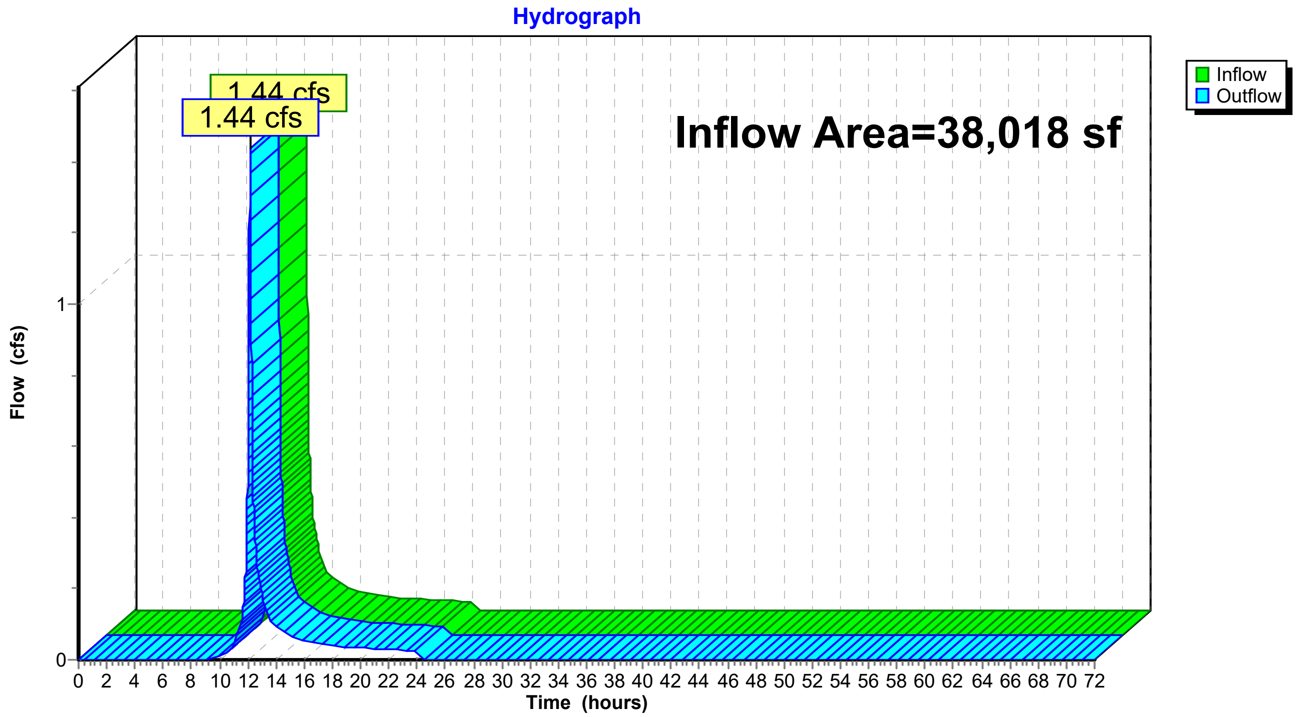
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area = 38,018 sf, 0.00% Impervious, Inflow Depth = 1.42" for 2-Year event
Inflow = 1.44 cfs @ 12.16 hrs, Volume= 4,490 cf
Outflow = 1.44 cfs @ 12.16 hrs, Volume= 4,490 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland



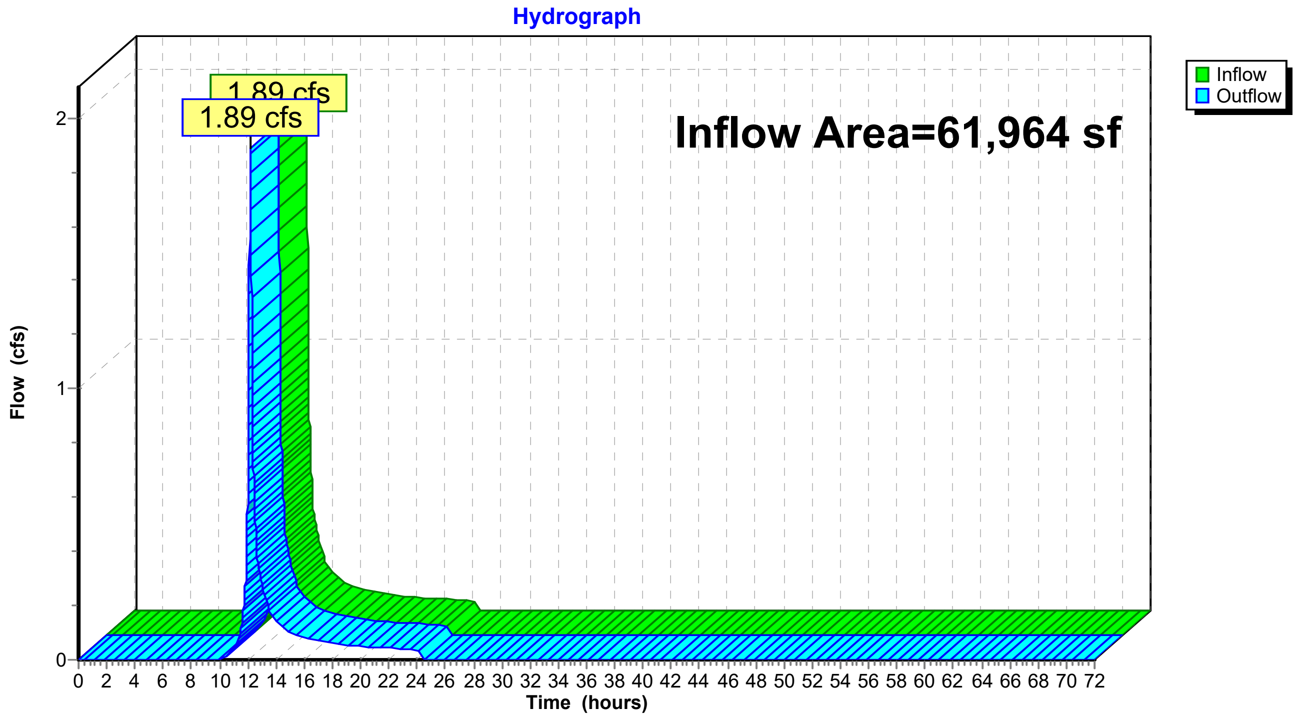
Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area =	61,964 sf,	0.00% Impervious,	Inflow Depth = 1.23"	for 2-Year event	
Inflow =	1.89 cfs @	12.17 hrs,	Volume=	6,331 cf	
Outflow =	1.89 cfs @	12.17 hrs,	Volume=	6,331 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 5: Towards Offsite Northwest



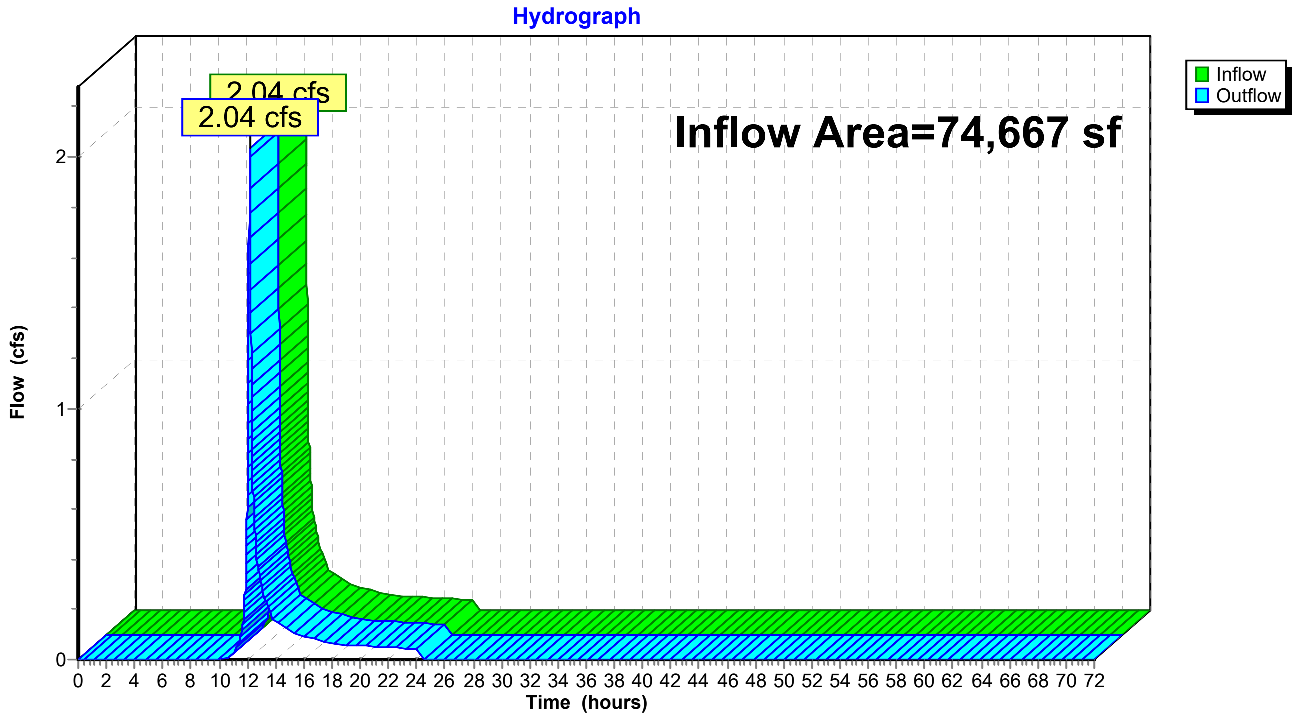
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area =	74,667 sf,	0.00% Impervious, Inflow Depth = 1.05"	for 2-Year event
Inflow =	2.04 cfs @	12.16 hrs, Volume=	6,538 cf
Outflow =	2.04 cfs @	12.16 hrs, Volume=	6,538 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Runoff Area=44,718 sf 5.44% Impervious Runoff Depth=2.77"
Flow Length=312' Tc=8.5 min CN=80 Runoff=3.25 cfs 10,326 cf

Subcatchment 2S: Runoff Area=60,728 sf 1.33% Impervious Runoff Depth=2.59"
Flow Length=324' Tc=11.4 min CN=78 Runoff=3.71 cfs 13,124 cf

Subcatchment 3S: Runoff Area=39,495 sf 0.00% Impervious Runoff Depth=3.05"
Flow Length=212' Tc=6.7 min CN=83 Runoff=3.37 cfs 10,031 cf

Subcatchment 4S: Runoff Area=38,018 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=122' Tc=8.2 min CN=80 Runoff=2.81 cfs 8,779 cf

Subcatchment 5S: Runoff Area=61,964 sf 0.00% Impervious Runoff Depth=2.51"
Flow Length=357' Tc=9.6 min CN=77 Runoff=3.92 cfs 12,942 cf

Subcatchment 6S: (new Subcat) Runoff Area=74,667 sf 0.00% Impervious Runoff Depth=2.25"
Flow Length=427' Tc=8.2 min CN=74 Runoff=4.50 cfs 14,019 cf

Reach DP 1: Towards Offsite West Inflow=3.25 cfs 10,326 cf
Outflow=3.25 cfs 10,326 cf

Reach DP 2: Towards Offsite North Inflow=3.71 cfs 13,124 cf
Outflow=3.71 cfs 13,124 cf

Reach DP 3: Towards West Wetland Inflow=3.37 cfs 10,031 cf
Outflow=3.37 cfs 10,031 cf

Reach DP 4: Towards East Wetland Inflow=2.81 cfs 8,779 cf
Outflow=2.81 cfs 8,779 cf

Reach DP 5: Towards Offsite Northwest Inflow=3.92 cfs 12,942 cf
Outflow=3.92 cfs 12,942 cf

Reach DP 6: Towards Offsite East Inflow=4.50 cfs 14,019 cf
Outflow=4.50 cfs 14,019 cf

Total Runoff Area = 319,590 sf Runoff Volume = 69,221 cf Average Runoff Depth = 2.60"
98.99% Pervious = 316,350 sf 1.01% Impervious = 3,240 sf

Summary for Subcatchment 1S:

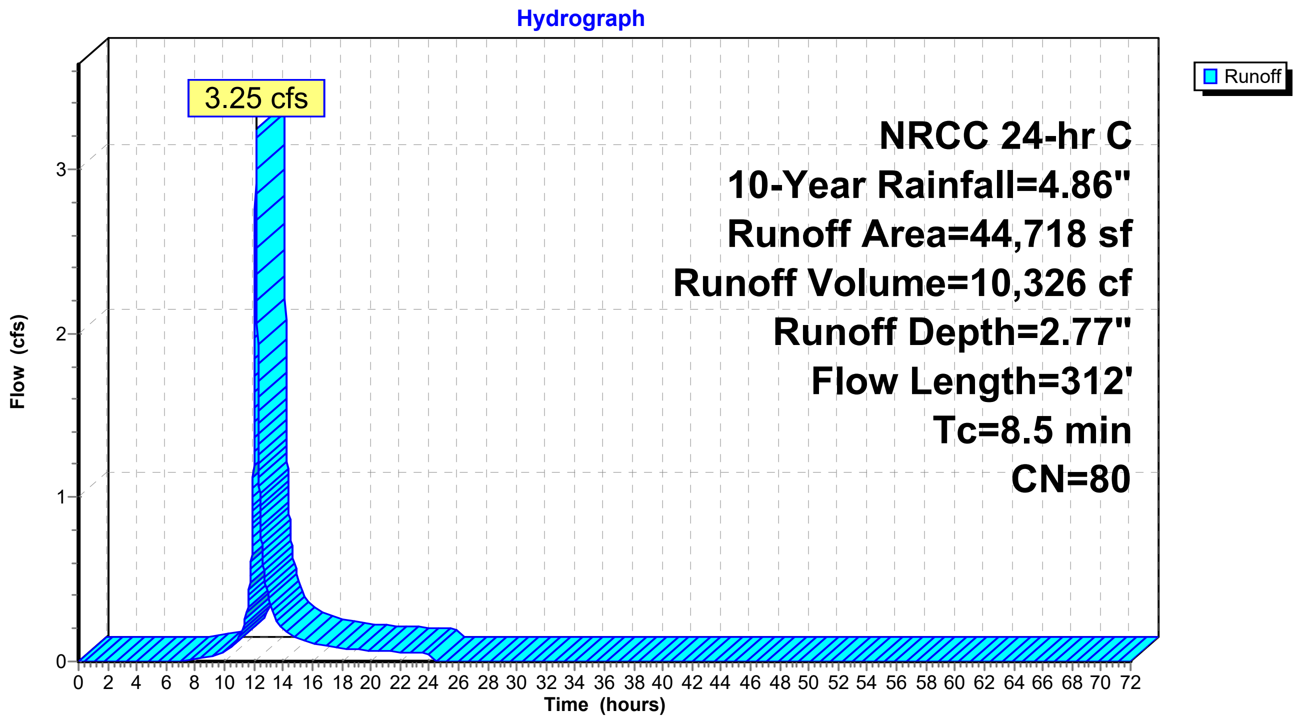
Runoff = 3.25 cfs @ 12.16 hrs, Volume= 10,326 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
16,836	77	Woods, Good, HSG D
2,432	98	Roofs, HSG D
25,450	80	>75% Grass cover, Good, HSG D
44,718	80	Weighted Average
42,286		94.56% Pervious Area
2,432		5.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	248	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	312	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

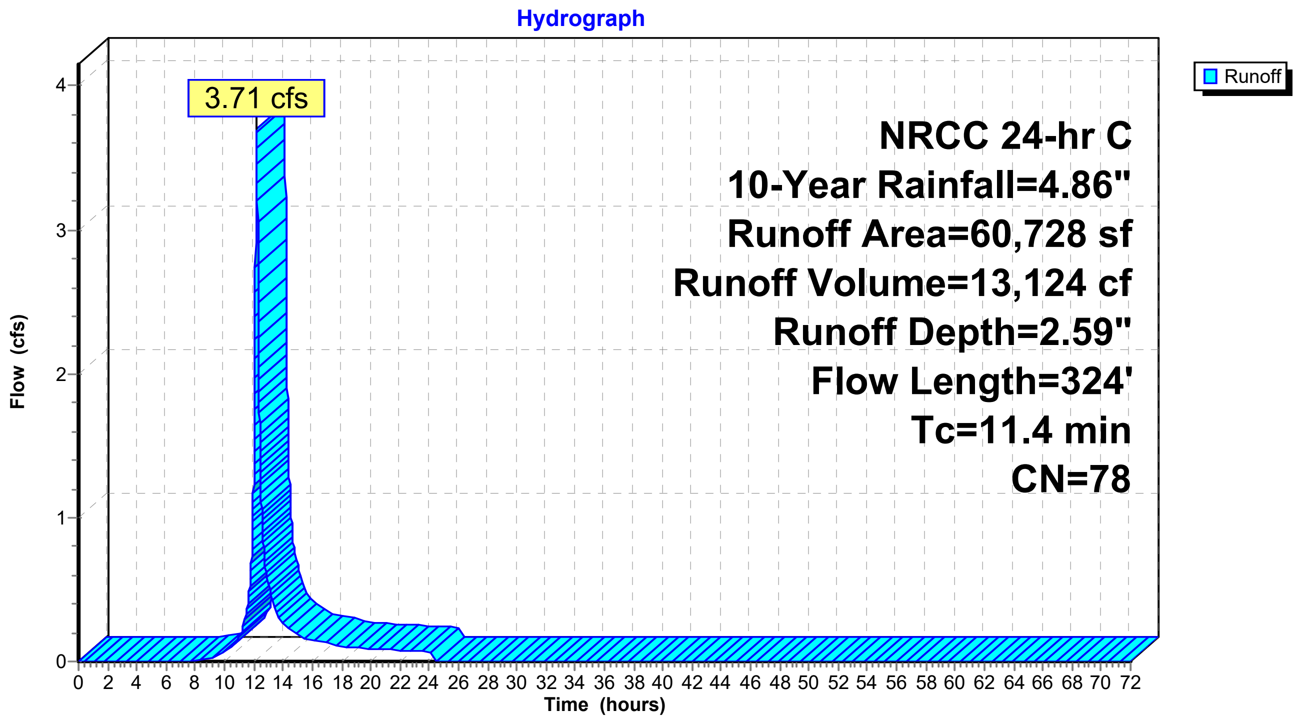
Runoff = 3.71 cfs @ 12.19 hrs, Volume= 13,124 cf, Depth= 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
15,312	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
44,608	77	Woods, Good, HSG D
60,728	78	Weighted Average
59,920		98.67% Pervious Area
808		1.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.5	262	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	324	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

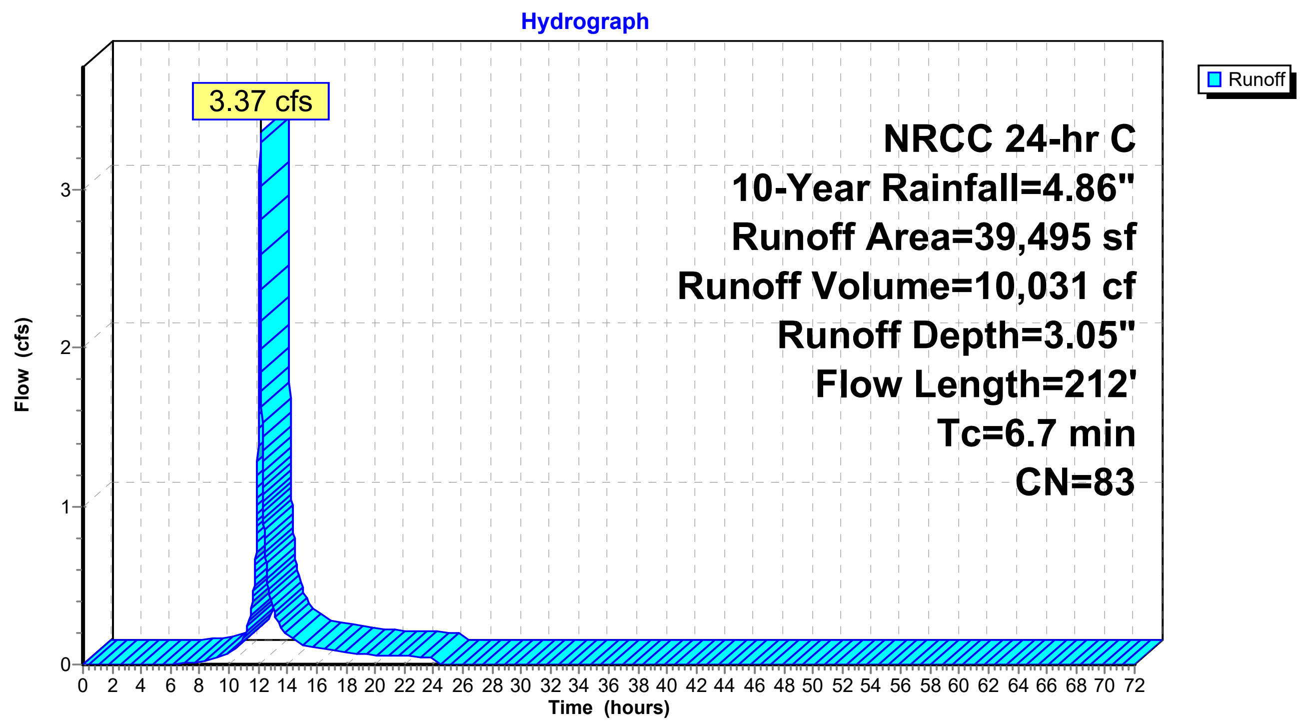
Runoff = 3.37 cfs @ 12.14 hrs, Volume= 10,031 cf, Depth= 3.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
5,968	77	Woods, Good, HSG D
1,725	96	Gravel surface, HSG D
31,802	83	Brush, Poor, HSG D
39,495	83	Weighted Average
39,495		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

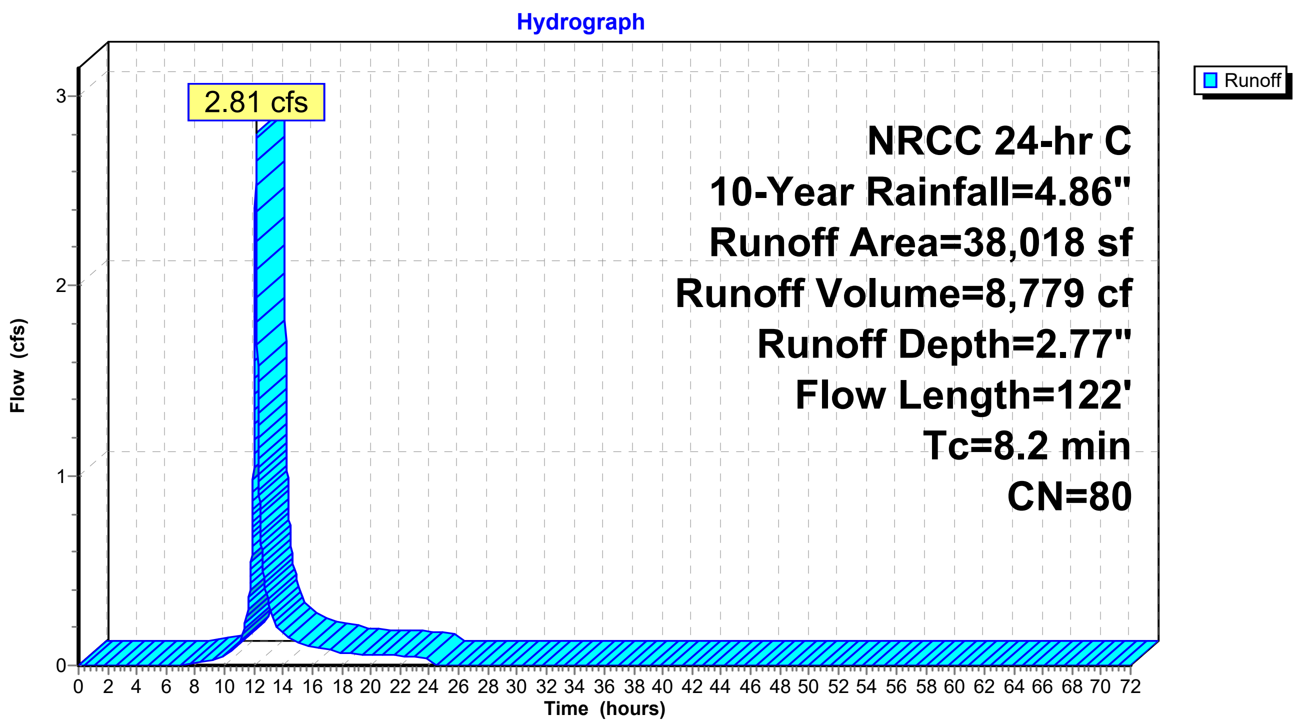
Runoff = 2.81 cfs @ 12.16 hrs, Volume= 8,779 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
25,488	83	Brush, Poor, HSG D
6,988	70	Woods, Good, HSG C
144	96	Gravel surface, HSG D
5,398	77	Woods, Good, HSG D
38,018	80	Weighted Average
38,018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	72	0.1350	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	122	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

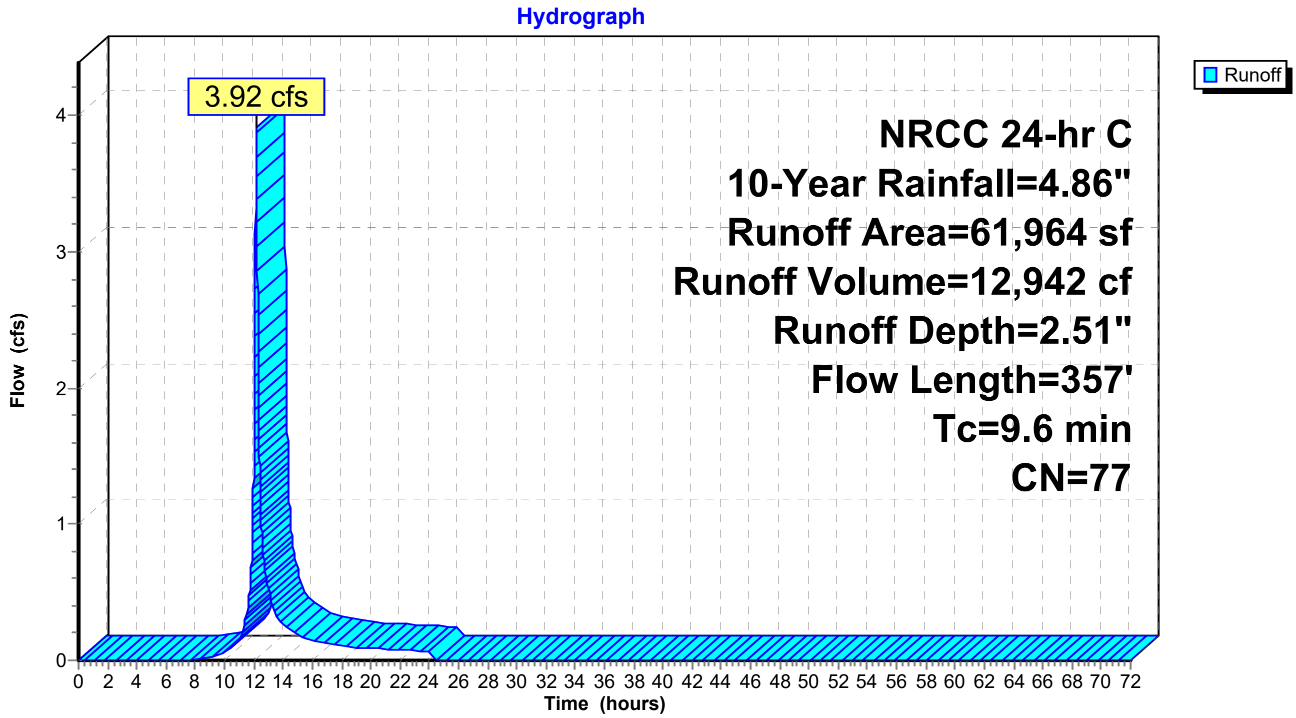
Runoff = 3.92 cfs @ 12.17 hrs, Volume= 12,942 cf, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
3,001	70	Woods, Good, HSG C
58,963	77	Woods, Good, HSG D
61,964	77	Weighted Average
61,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0940	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.2	307	0.1050	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	357	Total			

Subcatchment 5S:



Summary for Subcatchment 6S: (new Subcat)

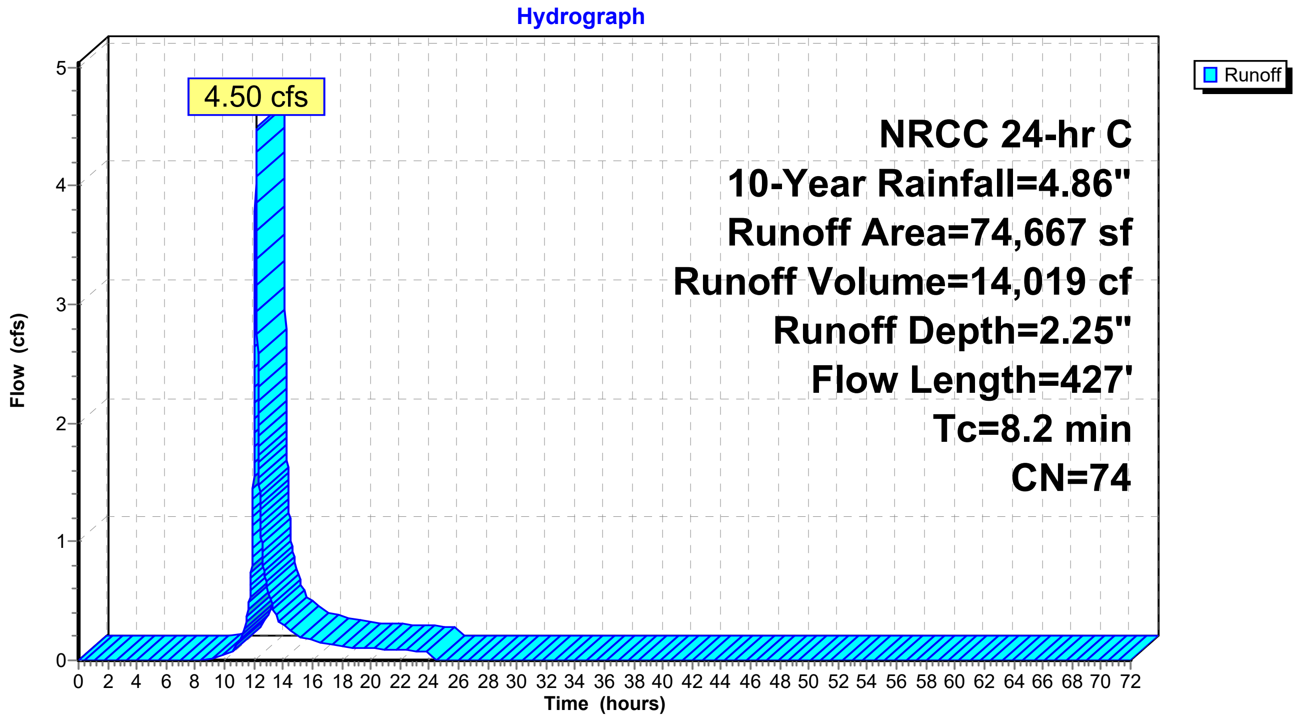
Runoff = 4.50 cfs @ 12.16 hrs, Volume= 14,019 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
46,947	77	Woods, Good, HSG D
27,720	70	Woods, Good, HSG C
74,667	74	Weighted Average
74,667		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.8	377	0.1120	1.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	427	Total			

Subcatchment 6S: (new Subcat)

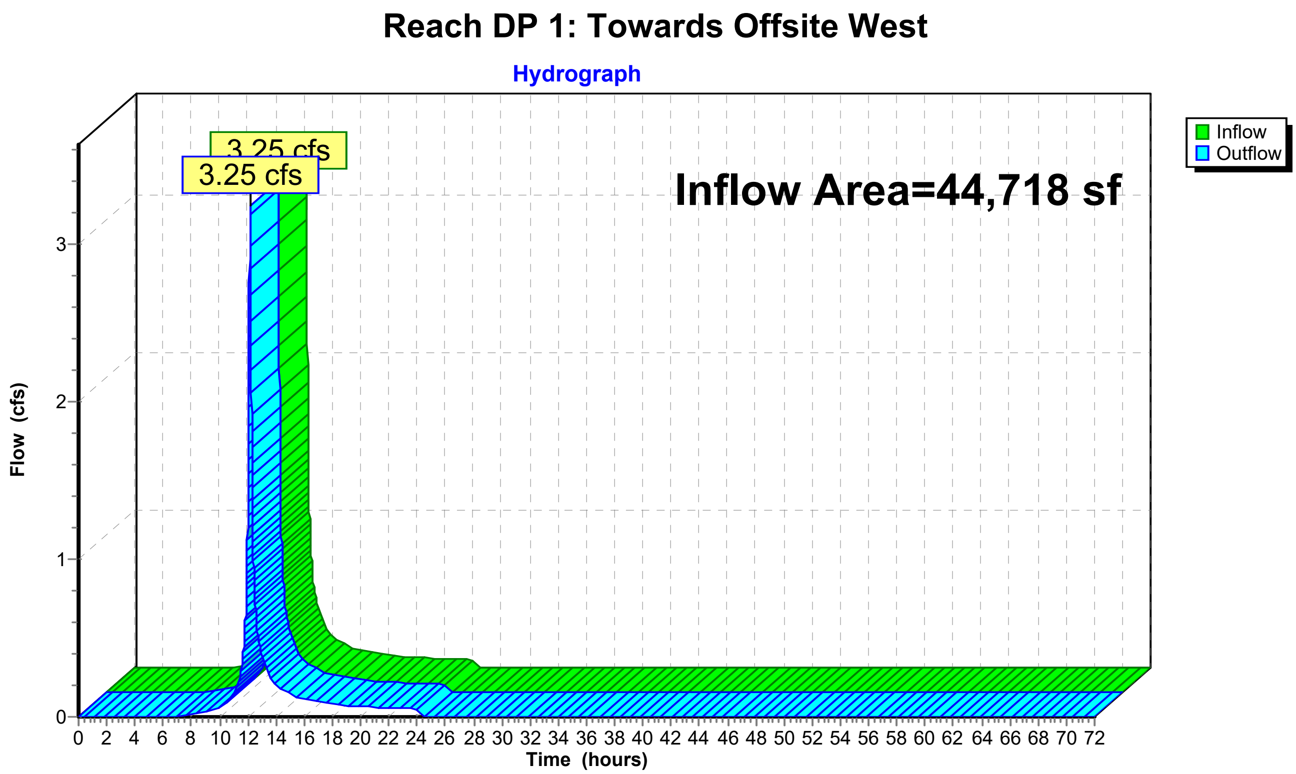


Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	44,718 sf,	5.44% Impervious, Inflow Depth = 2.77"	for 10-Year event
Inflow =	3.25 cfs @	12.16 hrs, Volume=	10,326 cf
Outflow =	3.25 cfs @	12.16 hrs, Volume=	10,326 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



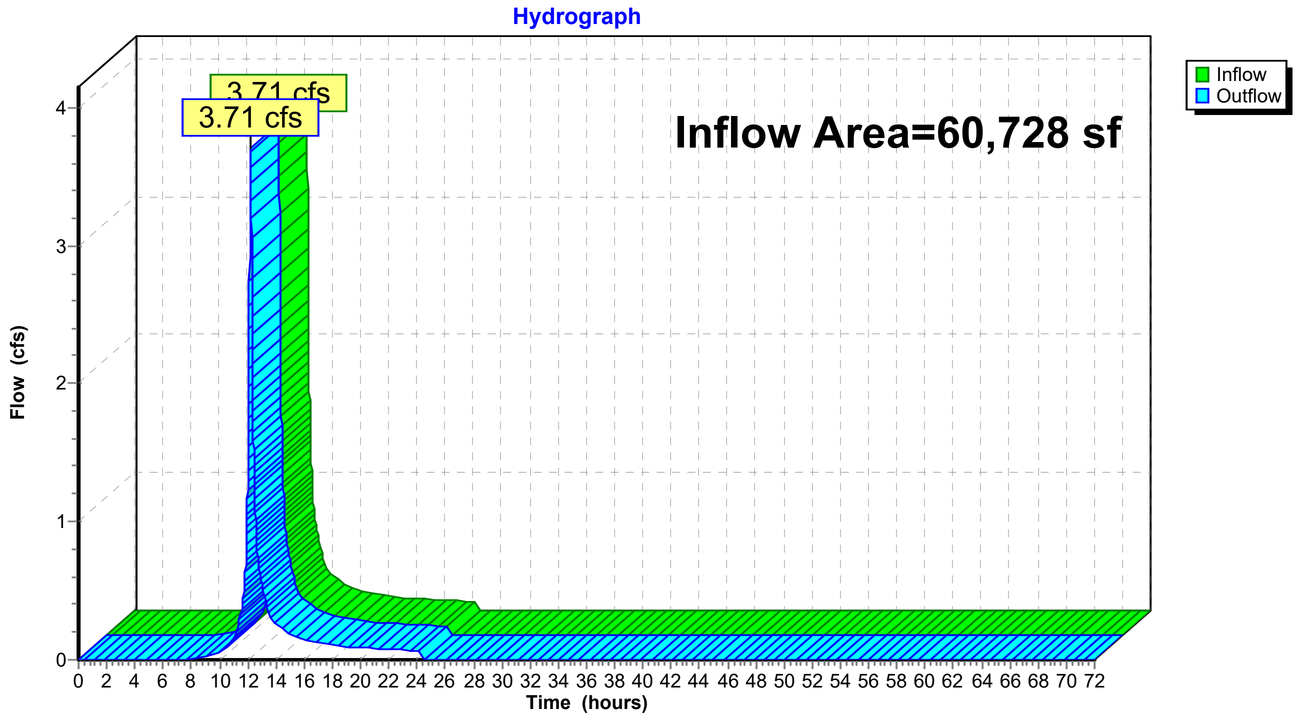
Summary for Reach DP 2: Towards Offsite North

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

Inflow Area =	60,728 sf,	1.33% Impervious, Inflow Depth = 2.59"	for 10-Year event
Inflow =	3.71 cfs @	12.19 hrs, Volume=	13,124 cf
Outflow =	3.71 cfs @	12.19 hrs, Volume=	13,124 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 2: Towards Offsite North



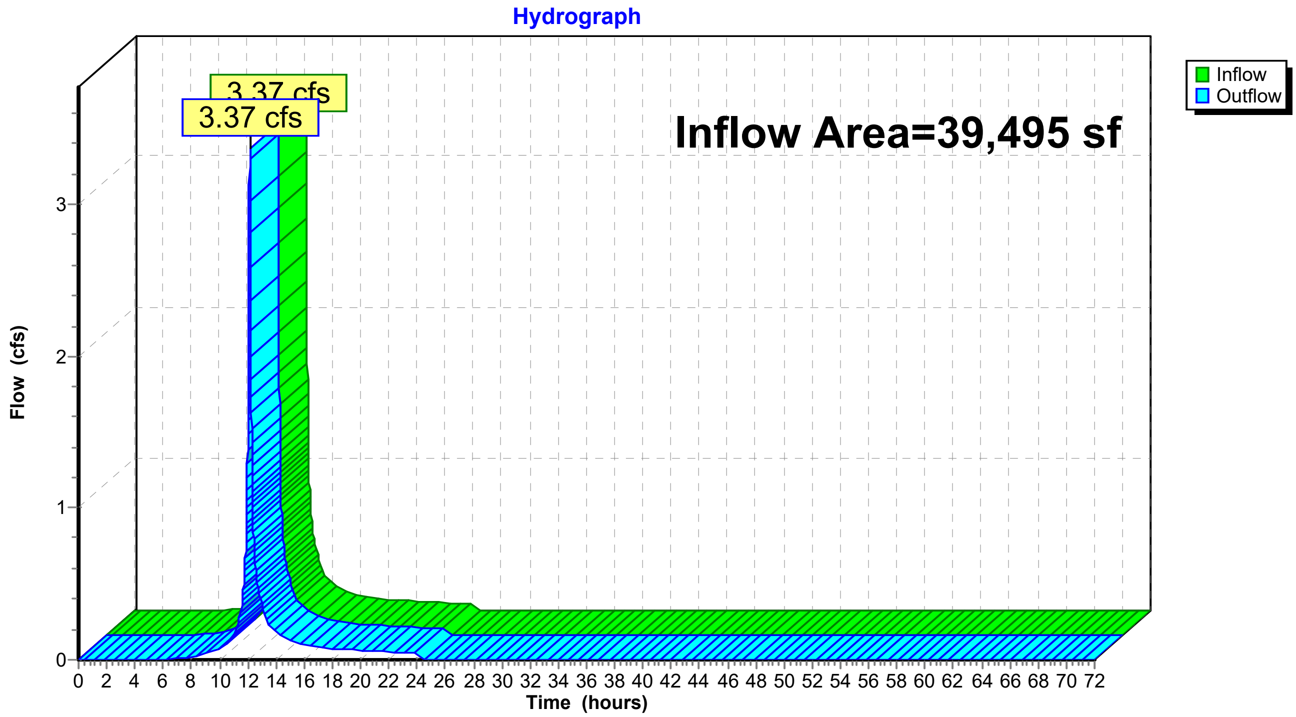
Summary for Reach DP 3: Towards West Wetland

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

Inflow Area =	39,495 sf,	0.00% Impervious,	Inflow Depth = 3.05"	for 10-Year event
Inflow =	3.37 cfs @	12.14 hrs, Volume=	10,031 cf	
Outflow =	3.37 cfs @	12.14 hrs, Volume=	10,031 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 3: Towards West Wetland



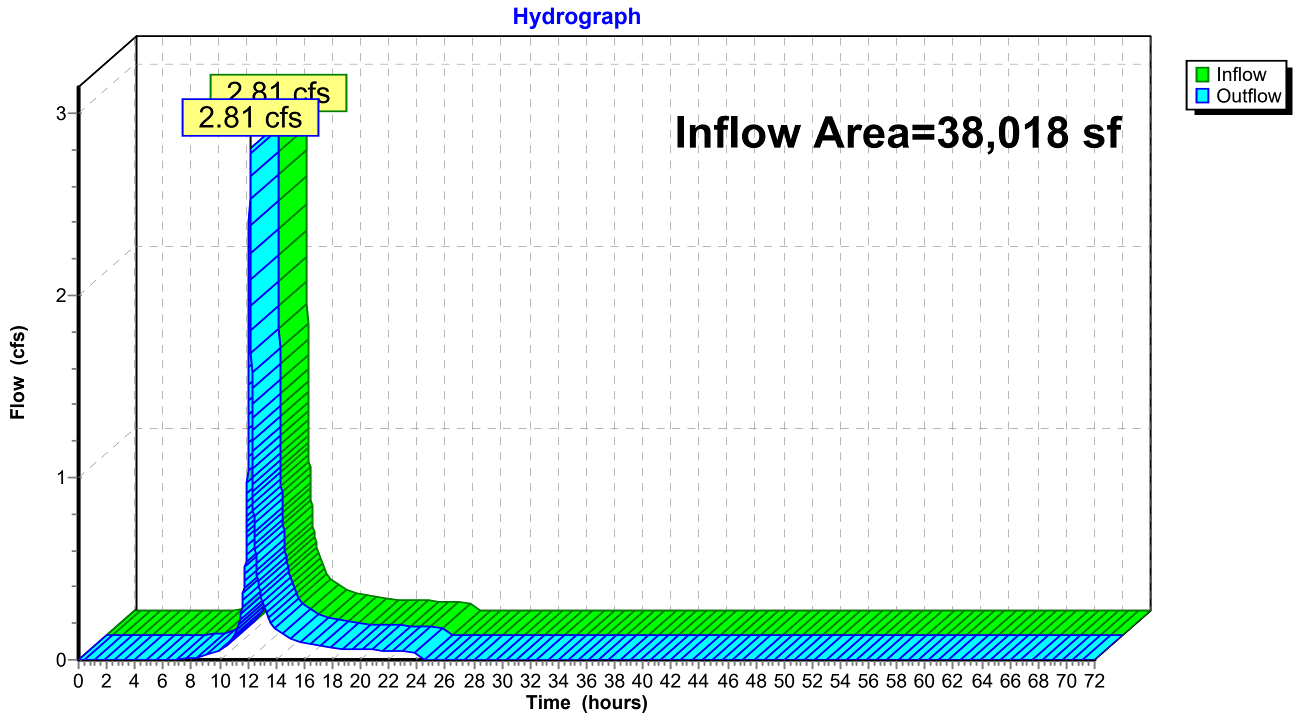
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area =	38,018 sf,	0.00% Impervious, Inflow Depth = 2.77"	for 10-Year event
Inflow =	2.81 cfs @	12.16 hrs, Volume=	8,779 cf
Outflow =	2.81 cfs @	12.16 hrs, Volume=	8,779 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland

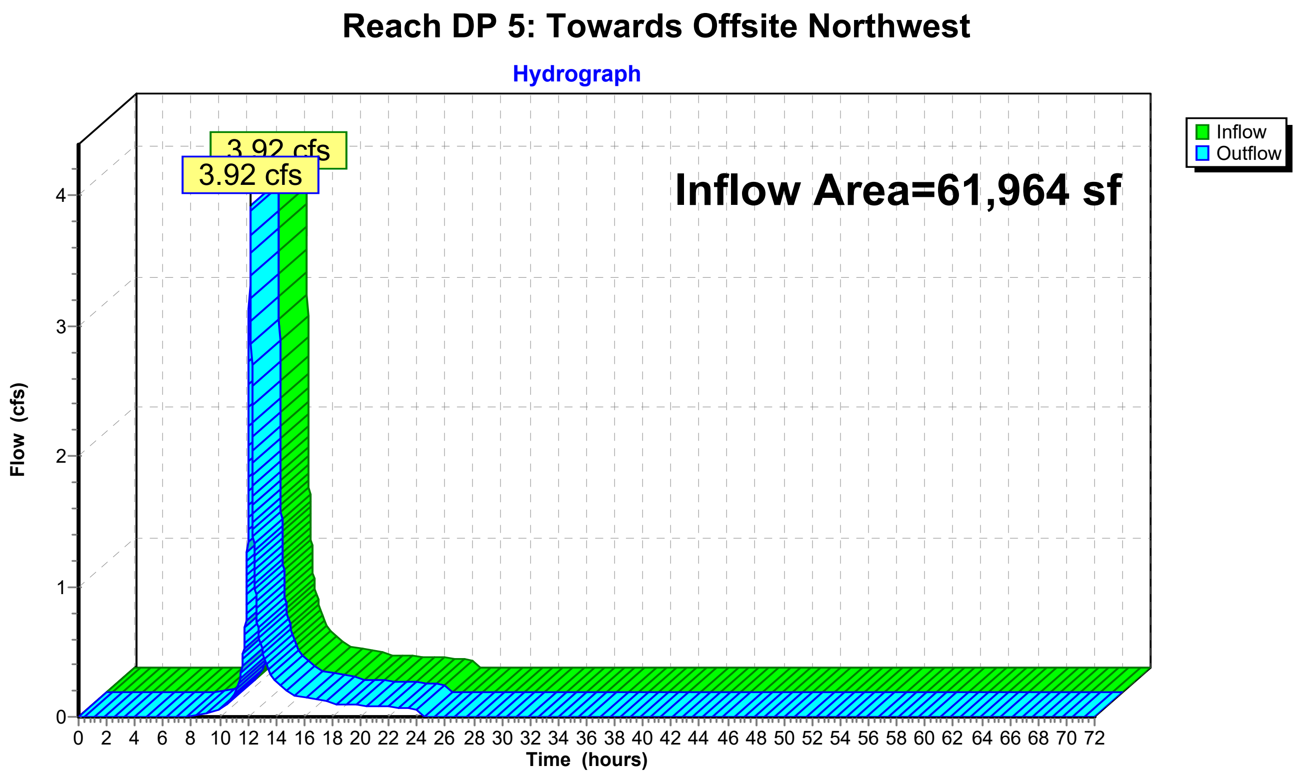


Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area =	61,964 sf,	0.00% Impervious,	Inflow Depth = 2.51"	for 10-Year event	
Inflow =	3.92 cfs @	12.17 hrs, Volume=	12,942 cf		
Outflow =	3.92 cfs @	12.17 hrs, Volume=	12,942 cf,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



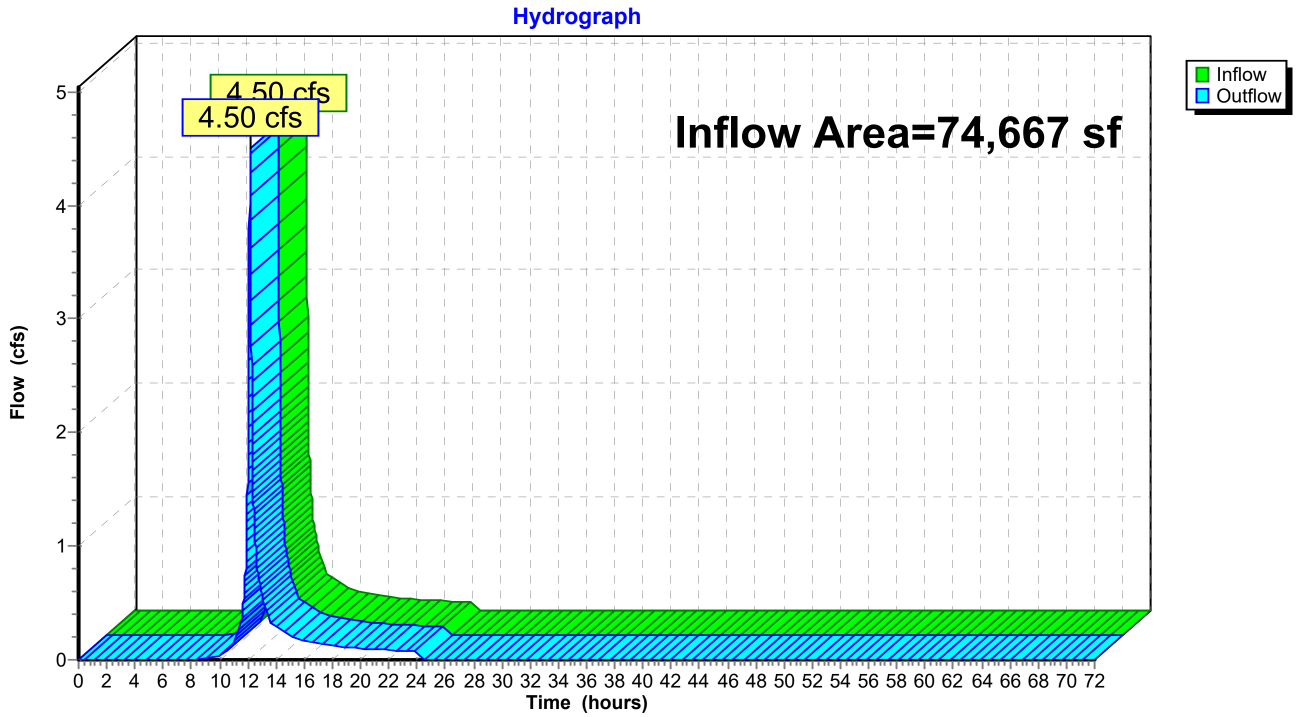
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area =	74,667 sf,	0.00% Impervious,	Inflow Depth = 2.25"	for 10-Year event
Inflow =	4.50 cfs @	12.16 hrs, Volume=	14,019 cf	
Outflow =	4.50 cfs @	12.16 hrs, Volume=	14,019 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Runoff Area=44,718 sf 5.44% Impervious Runoff Depth=3.92"
Flow Length=312' Tc=8.5 min CN=80 Runoff=4.55 cfs 14,596 cf

Subcatchment 2S: Runoff Area=60,728 sf 1.33% Impervious Runoff Depth=3.71"
Flow Length=324' Tc=11.4 min CN=78 Runoff=5.28 cfs 18,784 cf

Subcatchment 3S: Runoff Area=39,495 sf 0.00% Impervious Runoff Depth=4.23"
Flow Length=212' Tc=6.7 min CN=83 Runoff=4.61 cfs 13,925 cf

Subcatchment 4S: Runoff Area=38,018 sf 0.00% Impervious Runoff Depth=3.92"
Flow Length=122' Tc=8.2 min CN=80 Runoff=3.93 cfs 12,409 cf

Subcatchment 5S: Runoff Area=61,964 sf 0.00% Impervious Runoff Depth=3.61"
Flow Length=357' Tc=9.6 min CN=77 Runoff=5.62 cfs 18,643 cf

Subcatchment 6S: (new Subcat) Runoff Area=74,667 sf 0.00% Impervious Runoff Depth=3.31"
Flow Length=427' Tc=8.2 min CN=74 Runoff=6.61 cfs 20,605 cf

Reach DP 1: Towards Offsite West Inflow=4.55 cfs 14,596 cf
Outflow=4.55 cfs 14,596 cf

Reach DP 2: Towards Offsite North Inflow=5.28 cfs 18,784 cf
Outflow=5.28 cfs 18,784 cf

Reach DP 3: Towards West Wetland Inflow=4.61 cfs 13,925 cf
Outflow=4.61 cfs 13,925 cf

Reach DP 4: Towards East Wetland Inflow=3.93 cfs 12,409 cf
Outflow=3.93 cfs 12,409 cf

Reach DP 5: Towards Offsite Northwest Inflow=5.62 cfs 18,643 cf
Outflow=5.62 cfs 18,643 cf

Reach DP 6: Towards Offsite East Inflow=6.61 cfs 20,605 cf
Outflow=6.61 cfs 20,605 cf

Total Runoff Area = 319,590 sf Runoff Volume = 98,961 cf Average Runoff Depth = 3.72"
98.99% Pervious = 316,350 sf 1.01% Impervious = 3,240 sf

Summary for Subcatchment 1S:

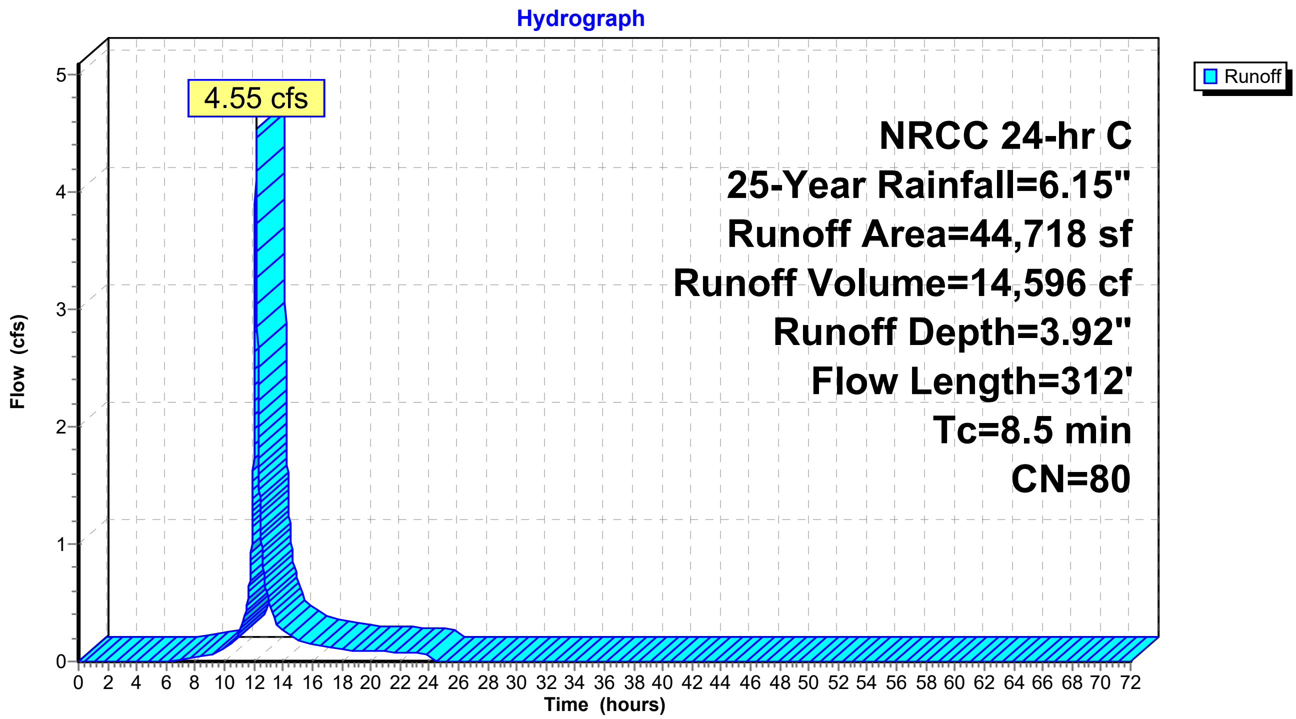
Runoff = 4.55 cfs @ 12.16 hrs, Volume= 14,596 cf, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
16,836	77	Woods, Good, HSG D
2,432	98	Roofs, HSG D
25,450	80	>75% Grass cover, Good, HSG D
44,718	80	Weighted Average
42,286		94.56% Pervious Area
2,432		5.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	248	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	312	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

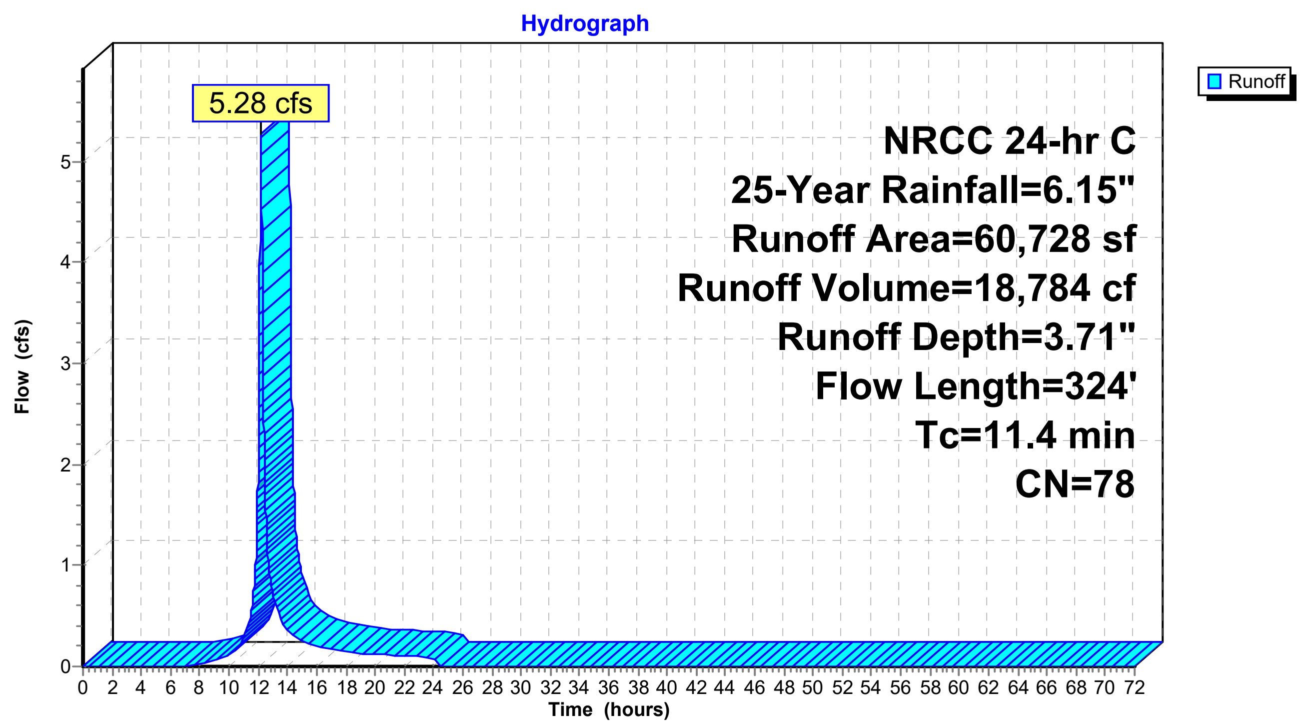
Runoff = 5.28 cfs @ 12.19 hrs, Volume= 18,784 cf, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
15,312	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
44,608	77	Woods, Good, HSG D
60,728	78	Weighted Average
59,920		98.67% Pervious Area
808		1.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.5	262	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	324	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

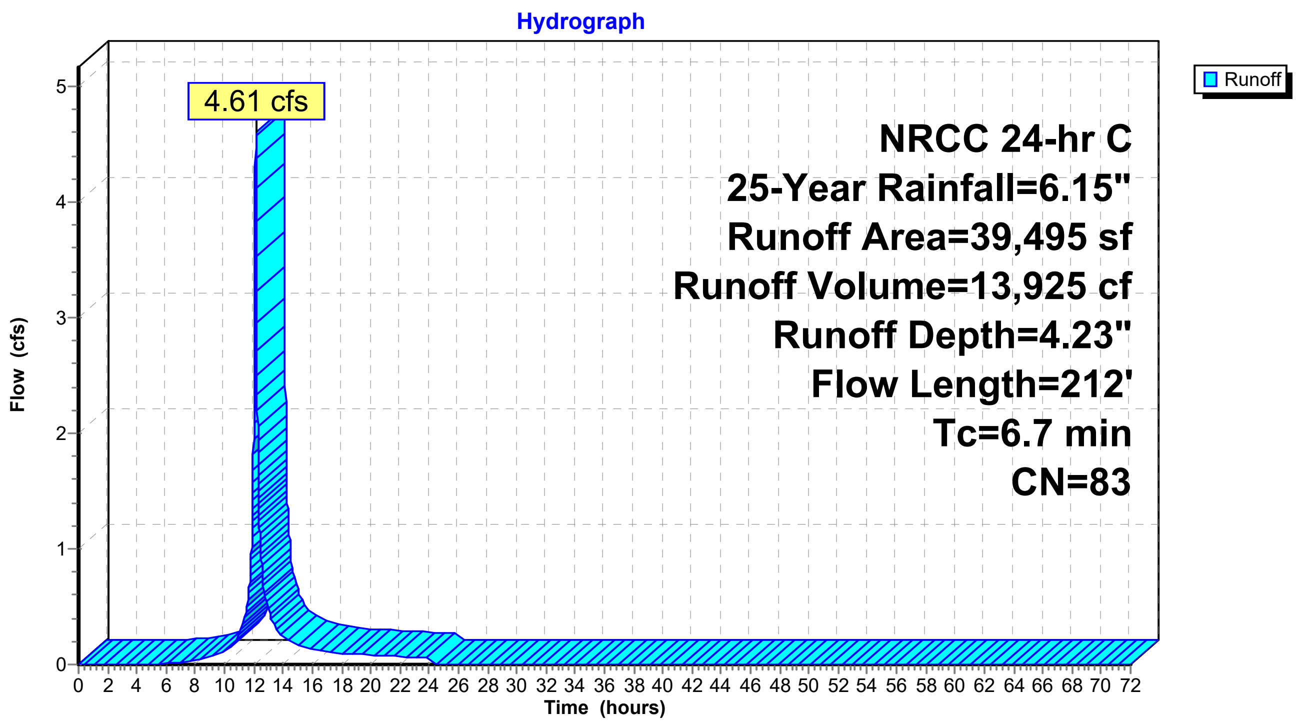
Runoff = 4.61 cfs @ 12.14 hrs, Volume= 13,925 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
5,968	77	Woods, Good, HSG D
1,725	96	Gravel surface, HSG D
31,802	83	Brush, Poor, HSG D
39,495	83	Weighted Average
39,495		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

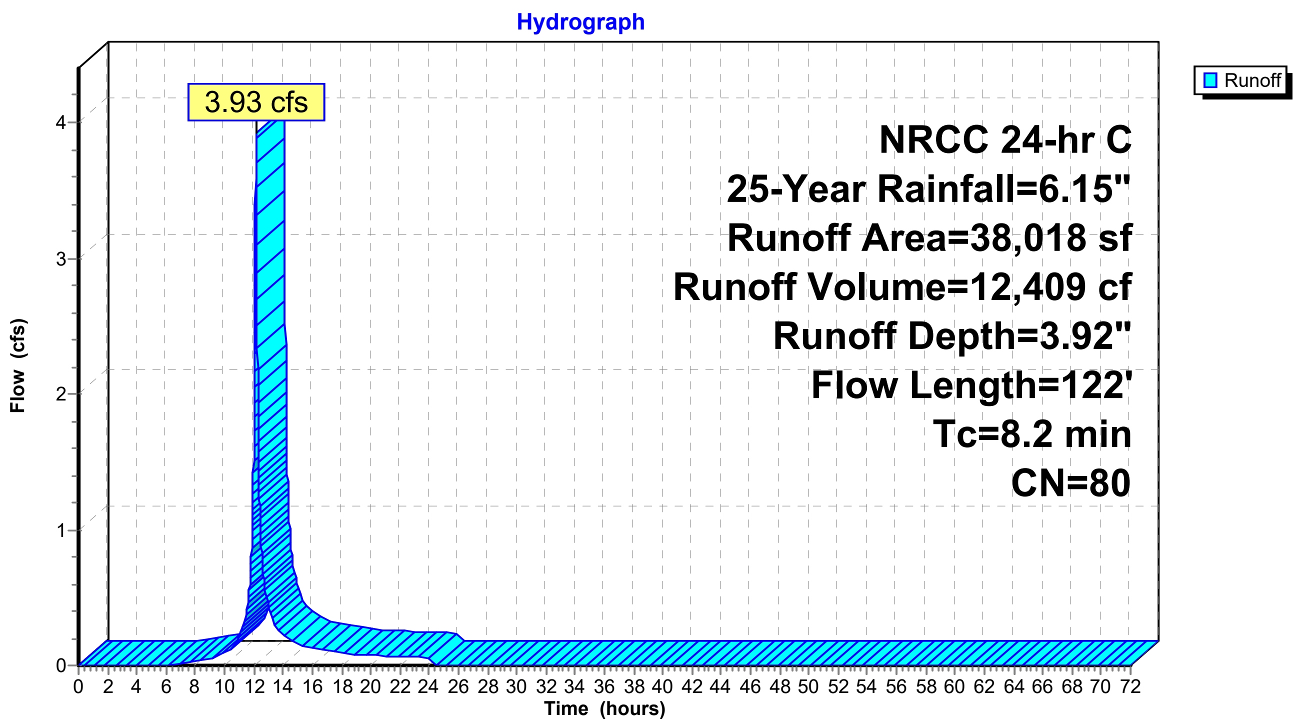
Runoff = 3.93 cfs @ 12.15 hrs, Volume= 12,409 cf, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
25,488	83	Brush, Poor, HSG D
6,988	70	Woods, Good, HSG C
144	96	Gravel surface, HSG D
5,398	77	Woods, Good, HSG D
38,018	80	Weighted Average
38,018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	72	0.1350	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	122	Total			

Subcatchment 4S:



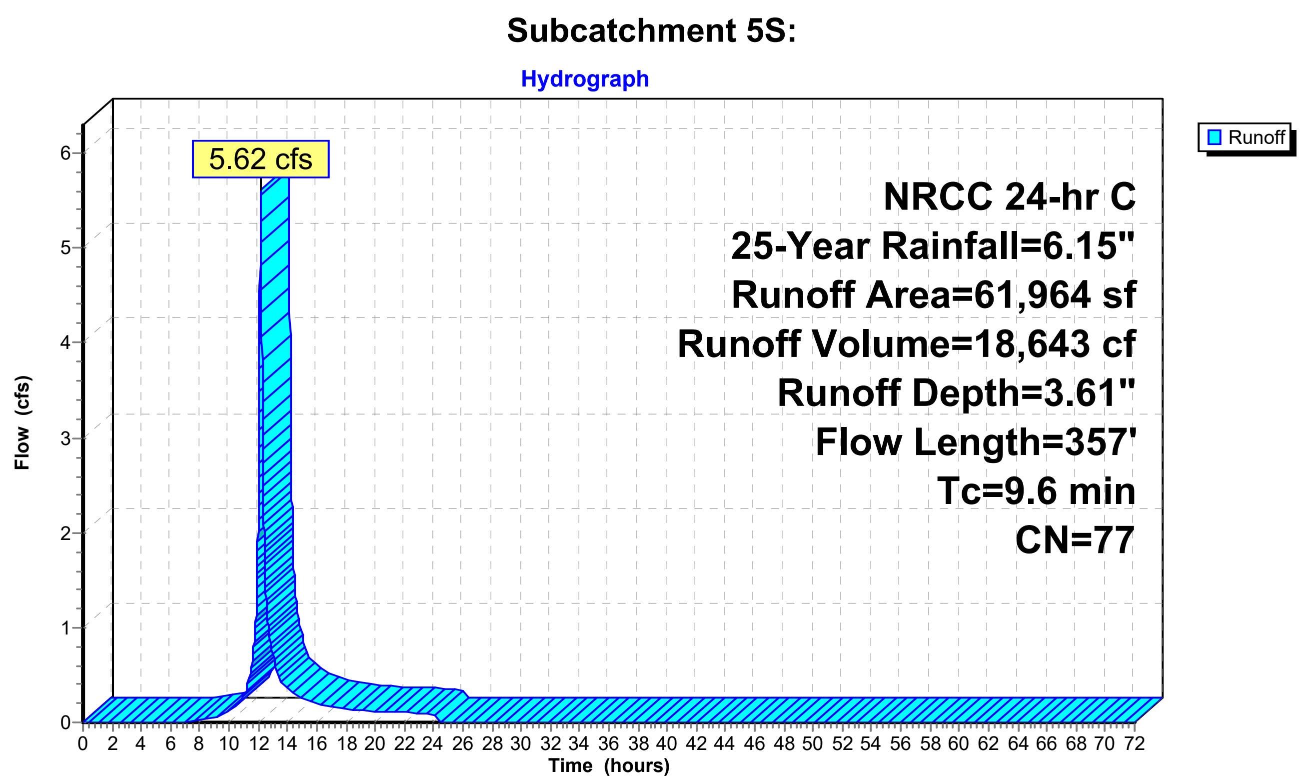
Summary for Subcatchment 5S:

Runoff = 5.62 cfs @ 12.17 hrs, Volume= 18,643 cf, Depth= 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
3,001	70	Woods, Good, HSG C
58,963	77	Woods, Good, HSG D
61,964	77	Weighted Average
61,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0940	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.2	307	0.1050	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	357	Total			



Summary for Subcatchment 6S: (new Subcat)

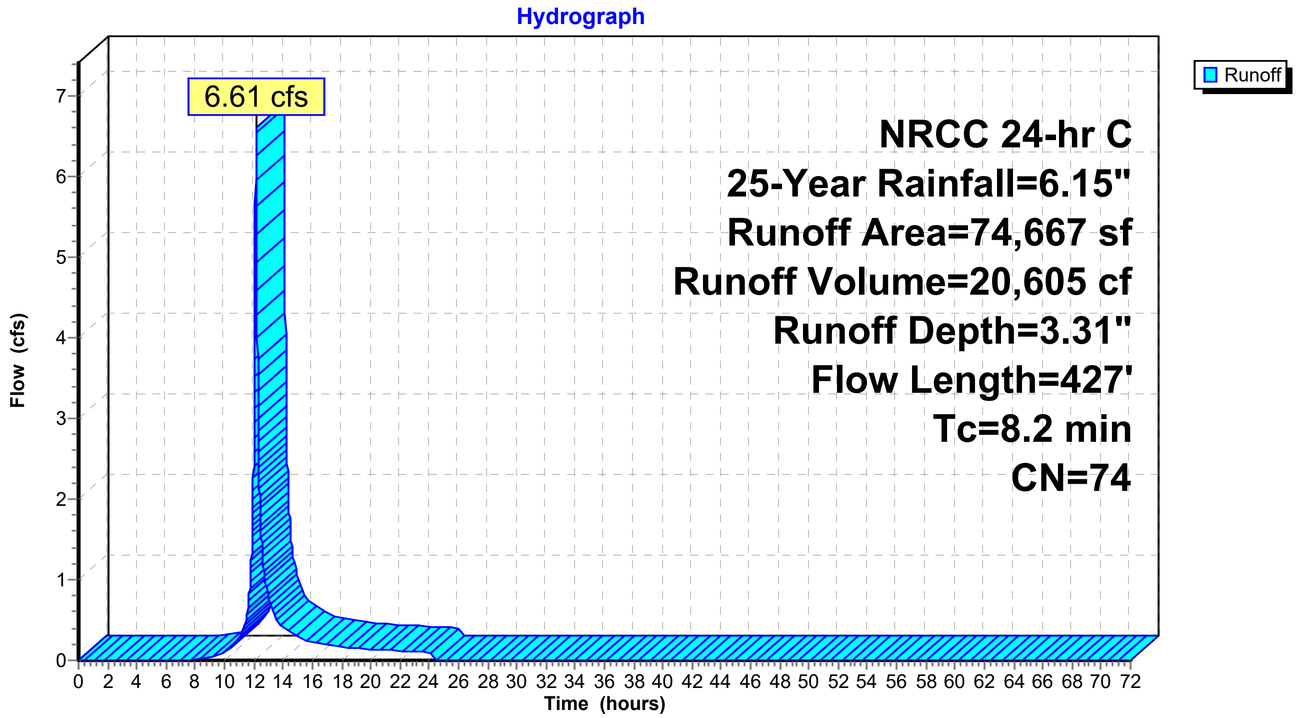
Runoff = 6.61 cfs @ 12.16 hrs, Volume= 20,605 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
46,947	77	Woods, Good, HSG D
27,720	70	Woods, Good, HSG C
74,667	74	Weighted Average
74,667		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.8	377	0.1120	1.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	427	Total			

Subcatchment 6S: (new Subcat)



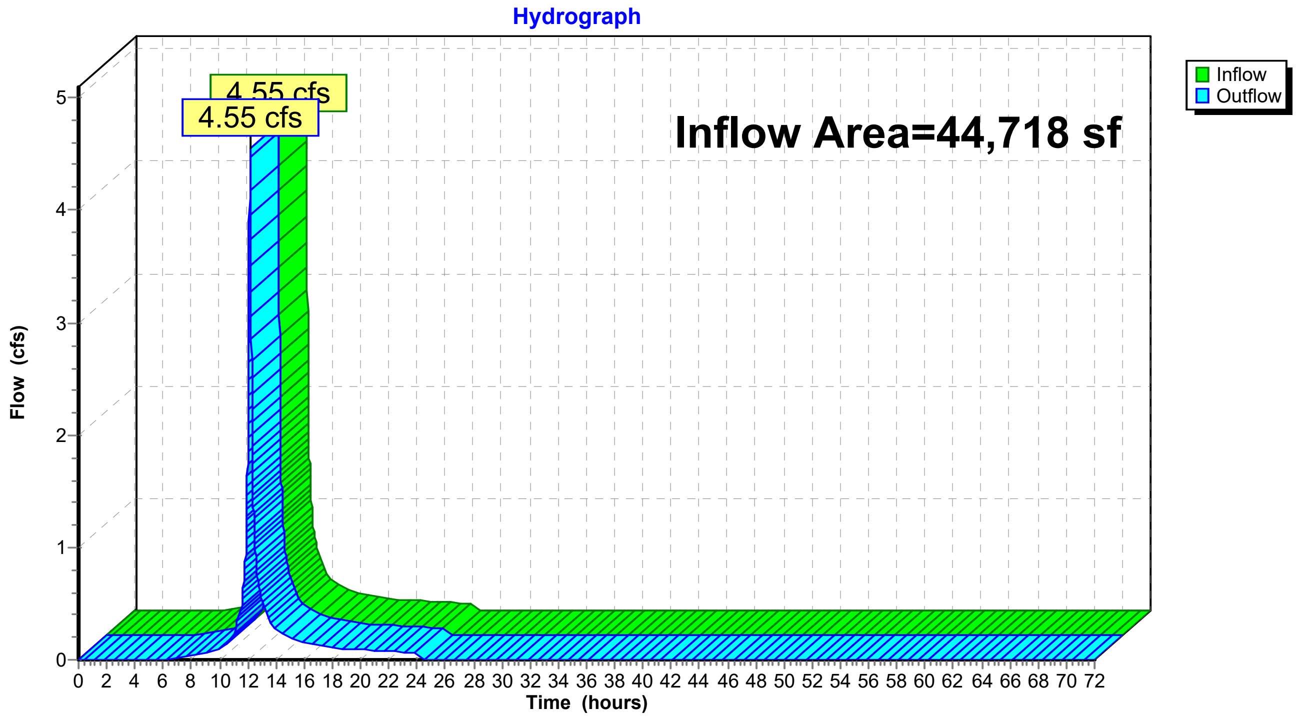
Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	44,718 sf,	5.44% Impervious,	Inflow Depth = 3.92"	for 25-Year event
Inflow =	4.55 cfs @	12.16 hrs, Volume=	14,596 cf	
Outflow =	4.55 cfs @	12.16 hrs, Volume=	14,596 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 1: Towards Offsite West

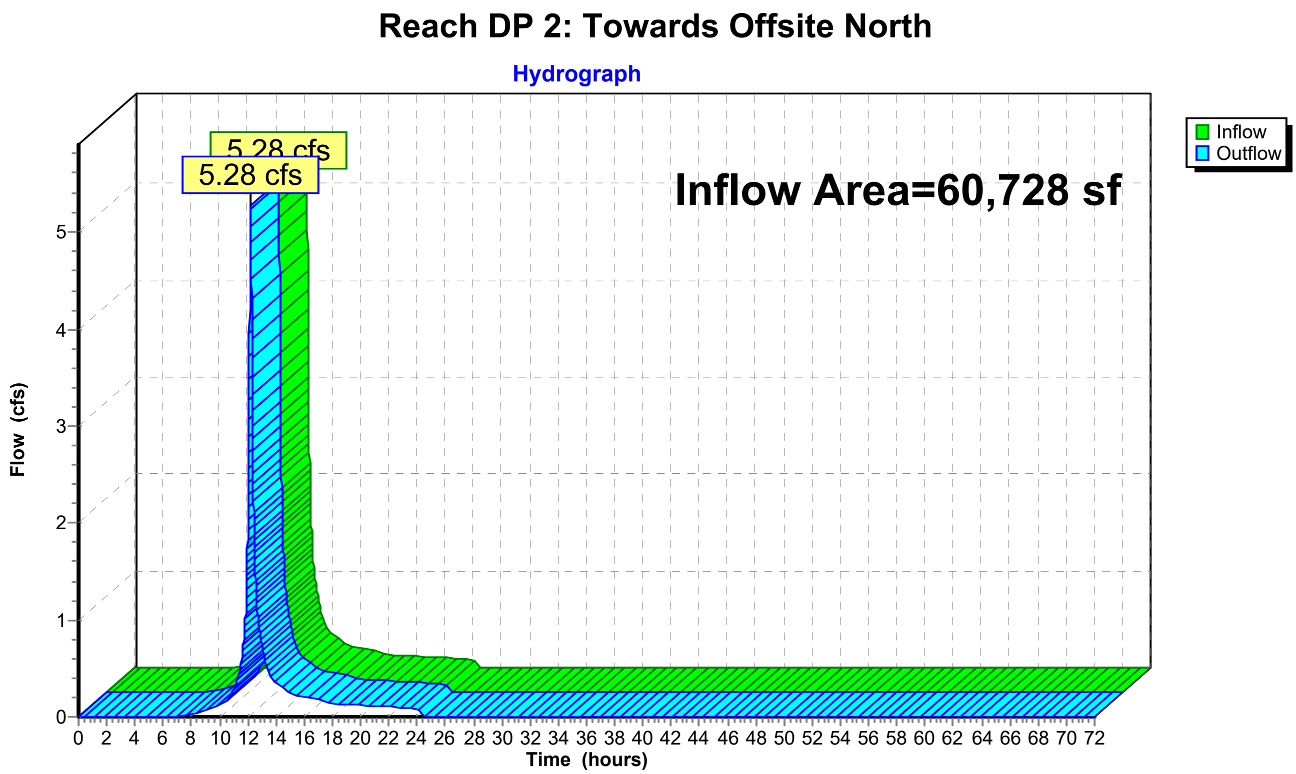


Summary for Reach DP 2: Towards Offsite North

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

Inflow Area =	60,728 sf,	1.33% Impervious,	Inflow Depth = 3.71"	for 25-Year event	
Inflow =	5.28 cfs @	12.19 hrs,	Volume=	18,784 cf	
Outflow =	5.28 cfs @	12.19 hrs,	Volume=	18,784 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



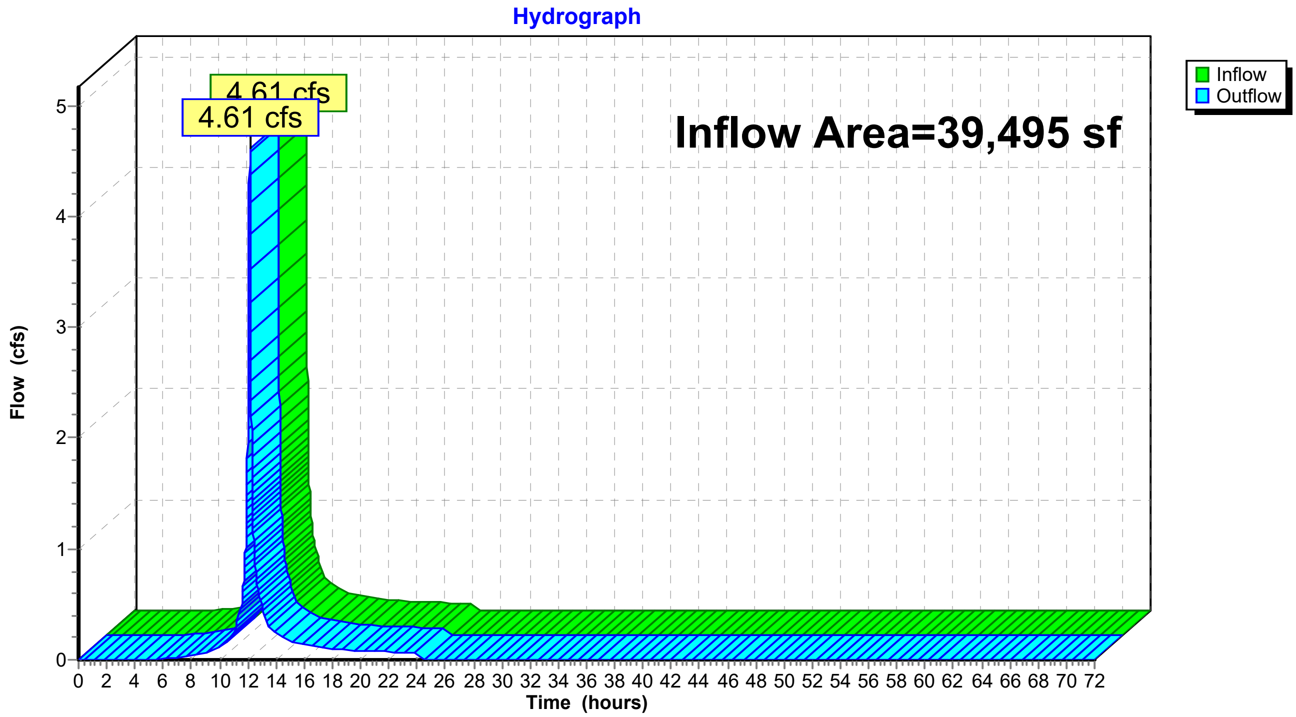
Summary for Reach DP 3: Towards West Wetland

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

Inflow Area =	39,495 sf, 0.00% Impervious,	Inflow Depth = 4.23"	for 25-Year event
Inflow =	4.61 cfs @ 12.14 hrs, Volume=	13,925 cf	
Outflow =	4.61 cfs @ 12.14 hrs, Volume=	13,925 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 3: Towards West Wetland



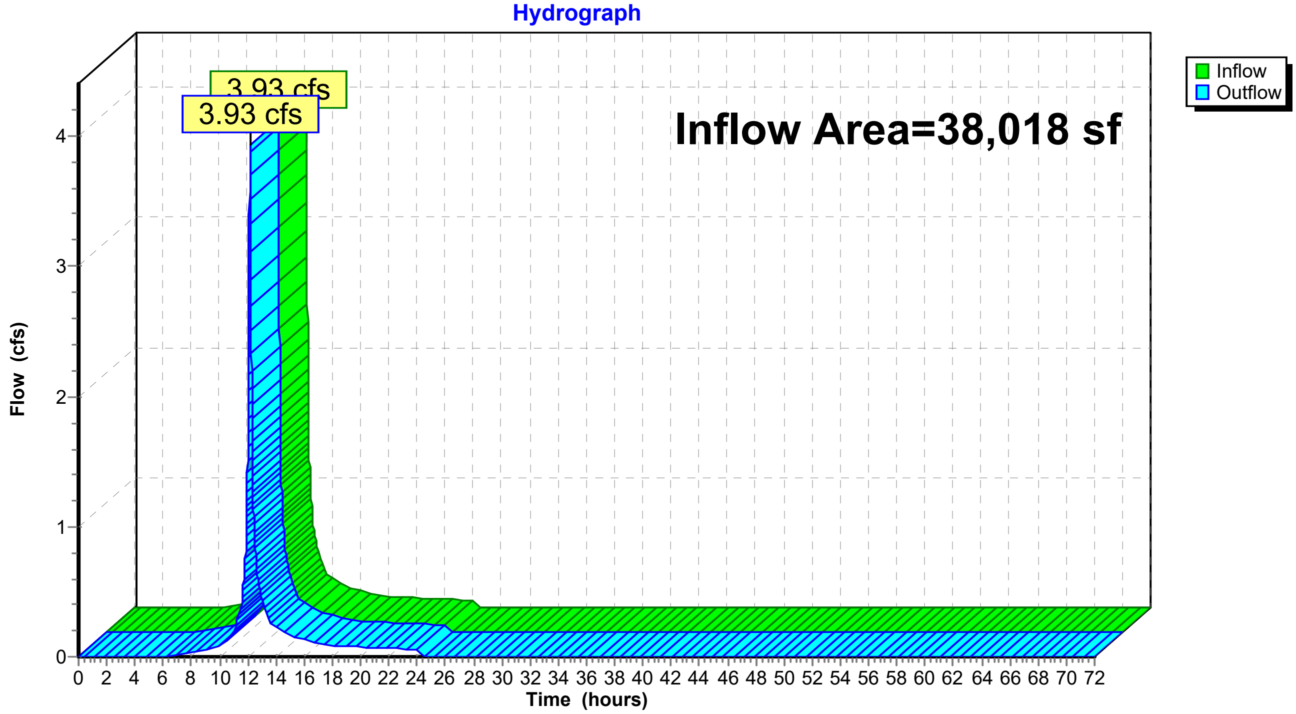
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area =	38,018 sf,	0.00% Impervious,	Inflow Depth = 3.92"	for 25-Year event
Inflow =	3.93 cfs @	12.15 hrs, Volume=	12,409 cf	
Outflow =	3.93 cfs @	12.15 hrs, Volume=	12,409 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland



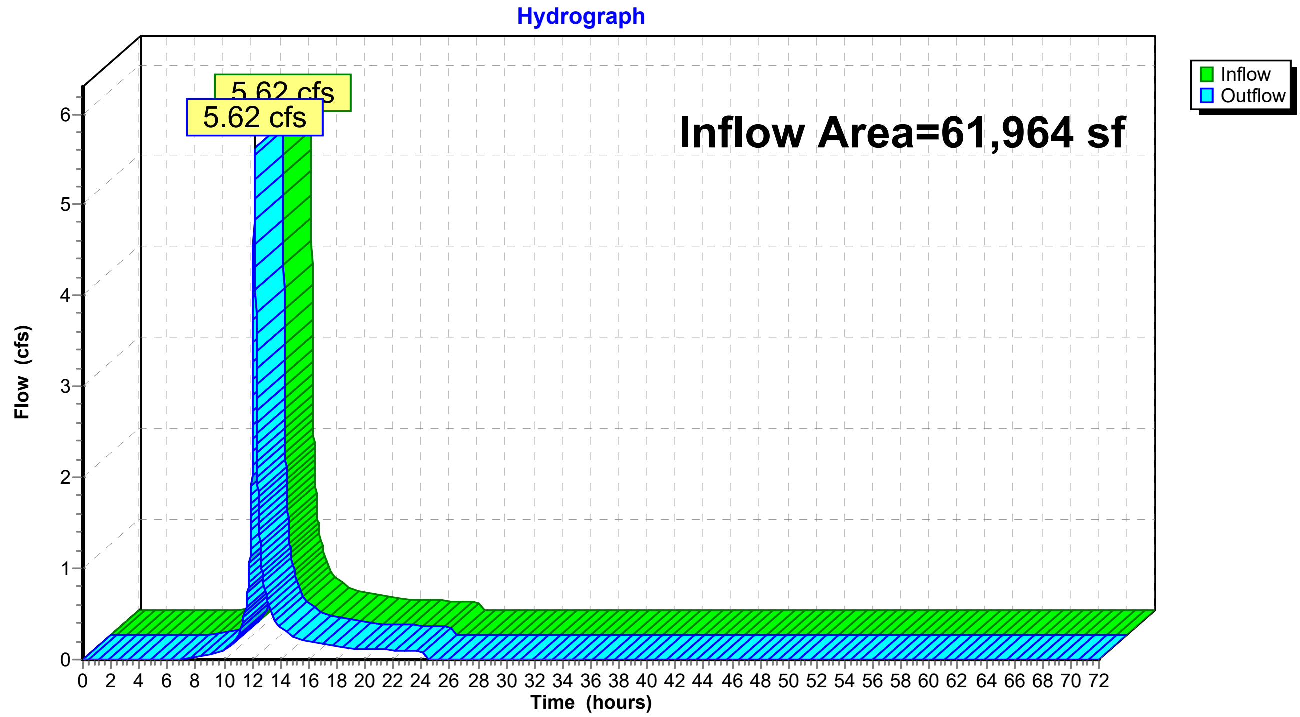
Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area =	61,964 sf,	0.00% Impervious, Inflow Depth = 3.61"	for 25-Year event
Inflow =	5.62 cfs @	12.17 hrs, Volume=	18,643 cf
Outflow =	5.62 cfs @	12.17 hrs, Volume=	18,643 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 5: Towards Offsite Northwest



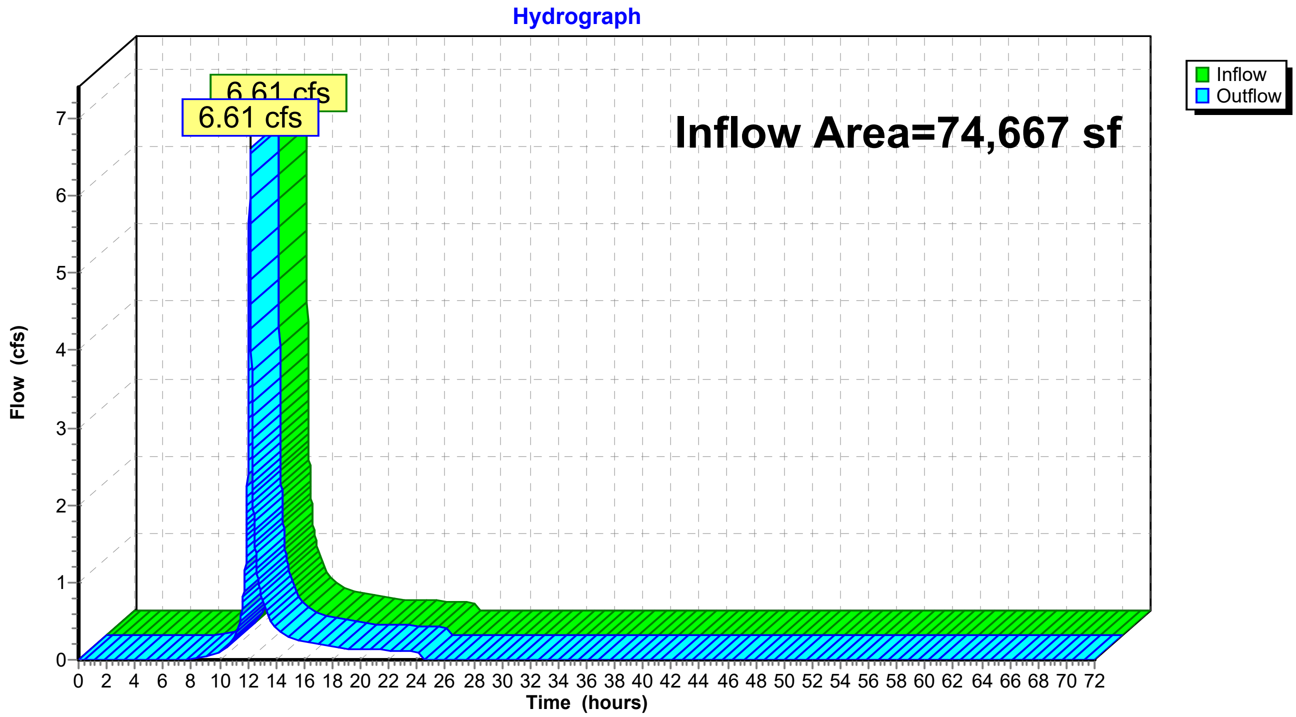
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area =	74,667 sf,	0.00% Impervious,	Inflow Depth = 3.31"	for 25-Year event
Inflow =	6.61 cfs @	12.16 hrs, Volume=	20,605 cf	
Outflow =	6.61 cfs @	12.16 hrs, Volume=	20,605 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Runoff Area=44,718 sf 5.44% Impervious Runoff Depth=6.38"
Flow Length=312' Tc=8.5 min CN=80 Runoff=7.25 cfs 23,770 cf

Subcatchment 2S: Runoff Area=60,728 sf 1.33% Impervious Runoff Depth=6.13"
Flow Length=324' Tc=11.4 min CN=78 Runoff=8.58 cfs 31,047 cf

Subcatchment 3S: Runoff Area=39,495 sf 0.00% Impervious Runoff Depth=6.74"
Flow Length=212' Tc=6.7 min CN=83 Runoff=7.17 cfs 22,196 cf

Subcatchment 4S: Runoff Area=38,018 sf 0.00% Impervious Runoff Depth=6.38"
Flow Length=122' Tc=8.2 min CN=80 Runoff=6.27 cfs 20,209 cf

Subcatchment 5S: Runoff Area=61,964 sf 0.00% Impervious Runoff Depth=6.01"
Flow Length=357' Tc=9.6 min CN=77 Runoff=9.21 cfs 31,049 cf

Subcatchment 6S: (new Subcat) Runoff Area=74,667 sf 0.00% Impervious Runoff Depth=5.65"
Flow Length=427' Tc=8.2 min CN=74 Runoff=11.13 cfs 35,137 cf

Reach DP 1: Towards Offsite West Inflow=7.25 cfs 23,770 cf
Outflow=7.25 cfs 23,770 cf

Reach DP 2: Towards Offsite North Inflow=8.58 cfs 31,047 cf
Outflow=8.58 cfs 31,047 cf

Reach DP 3: Towards West Wetland Inflow=7.17 cfs 22,196 cf
Outflow=7.17 cfs 22,196 cf

Reach DP 4: Towards East Wetland Inflow=6.27 cfs 20,209 cf
Outflow=6.27 cfs 20,209 cf

Reach DP 5: Towards Offsite Northwest Inflow=9.21 cfs 31,049 cf
Outflow=9.21 cfs 31,049 cf

Reach DP 6: Towards Offsite East Inflow=11.13 cfs 35,137 cf
Outflow=11.13 cfs 35,137 cf

Total Runoff Area = 319,590 sf Runoff Volume = 163,408 cf Average Runoff Depth = 6.14"
98.99% Pervious = 316,350 sf 1.01% Impervious = 3,240 sf

Summary for Subcatchment 1S:

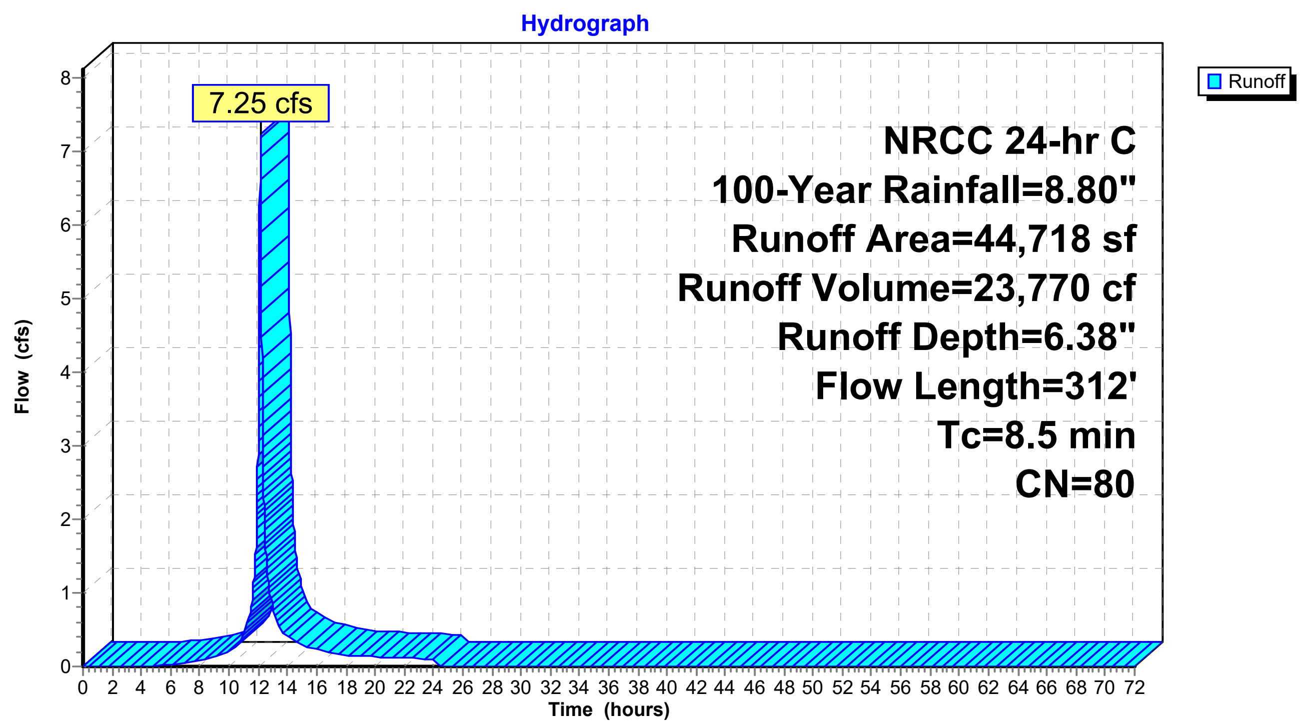
Runoff = 7.25 cfs @ 12.16 hrs, Volume= 23,770 cf, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
16,836	77	Woods, Good, HSG D
2,432	98	Roofs, HSG D
25,450	80	>75% Grass cover, Good, HSG D
44,718	80	Weighted Average
42,286		94.56% Pervious Area
2,432		5.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	248	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	312	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

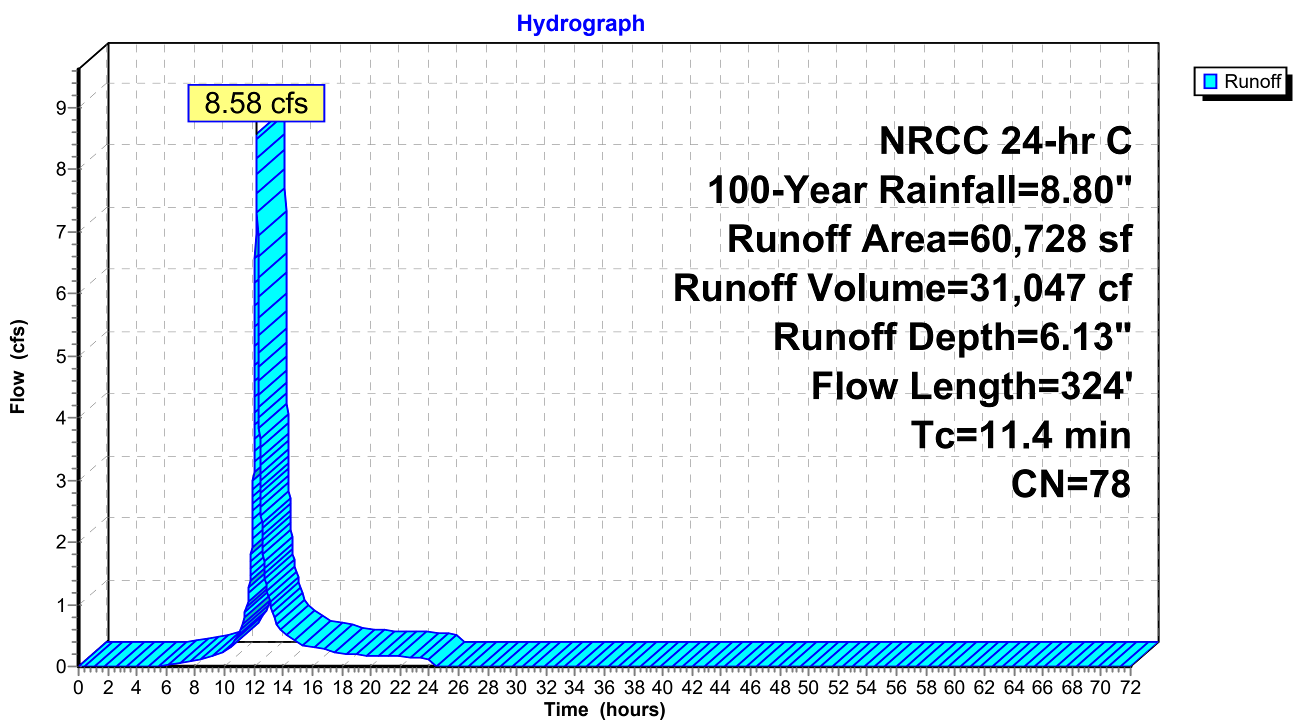
Runoff = 8.58 cfs @ 12.19 hrs, Volume= 31,047 cf, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
15,312	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
44,608	77	Woods, Good, HSG D
60,728	78	Weighted Average
59,920		98.67% Pervious Area
808		1.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.5	262	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	324	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

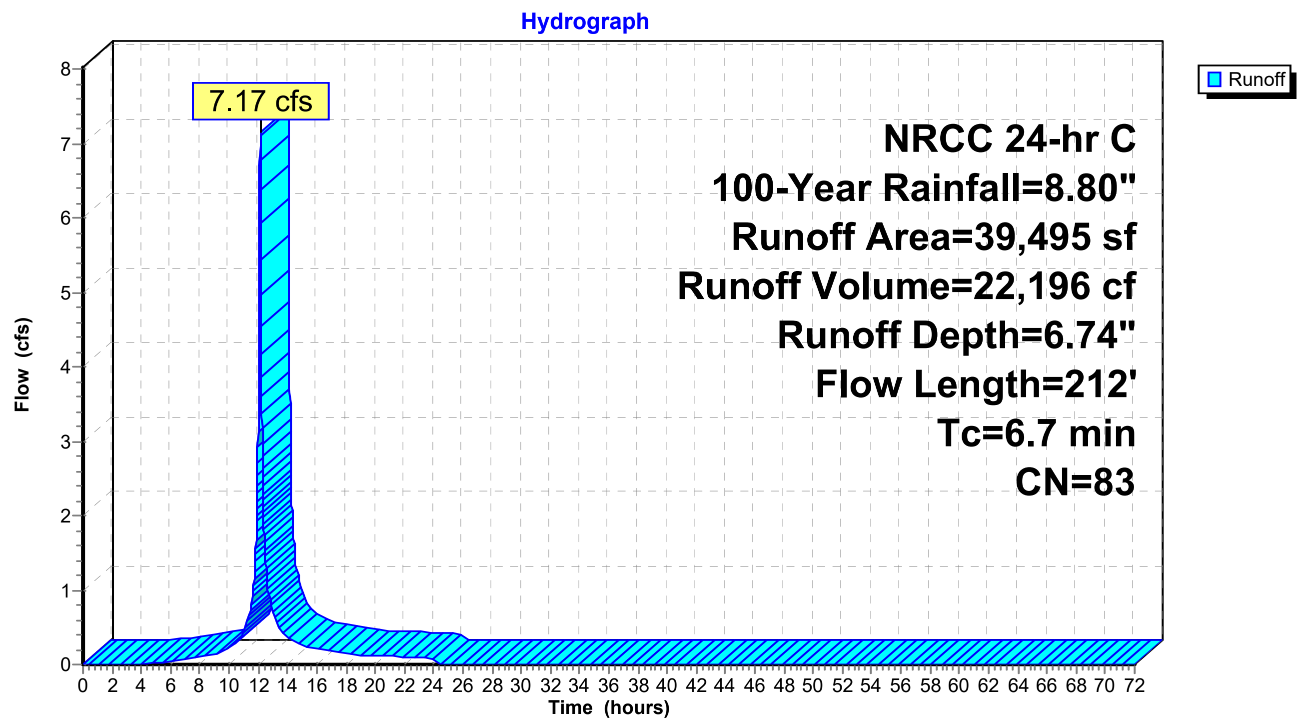
Runoff = 7.17 cfs @ 12.14 hrs, Volume= 22,196 cf, Depth= 6.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
5,968	77	Woods, Good, HSG D
1,725	96	Gravel surface, HSG D
31,802	83	Brush, Poor, HSG D
39,495	83	Weighted Average
39,495		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

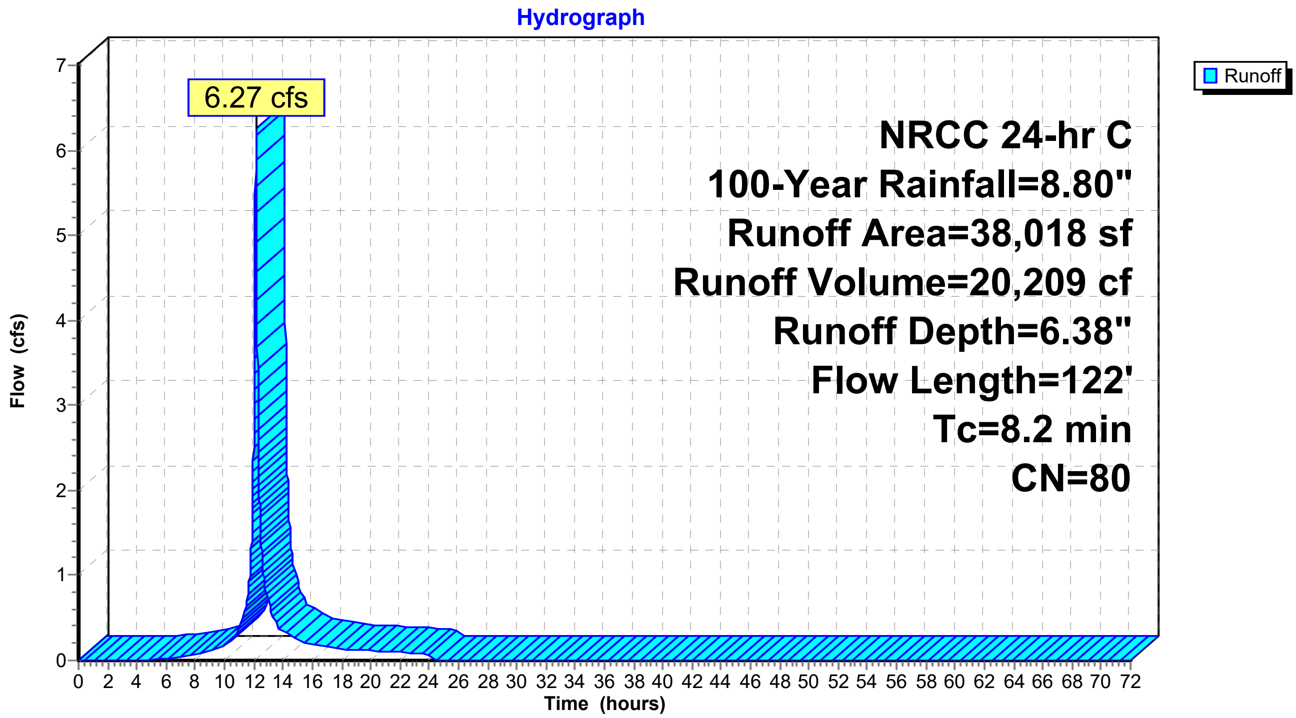
Runoff = 6.27 cfs @ 12.15 hrs, Volume= 20,209 cf, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
25,488	83	Brush, Poor, HSG D
6,988	70	Woods, Good, HSG C
144	96	Gravel surface, HSG D
5,398	77	Woods, Good, HSG D
38,018	80	Weighted Average
38,018		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	72	0.1350	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	122	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

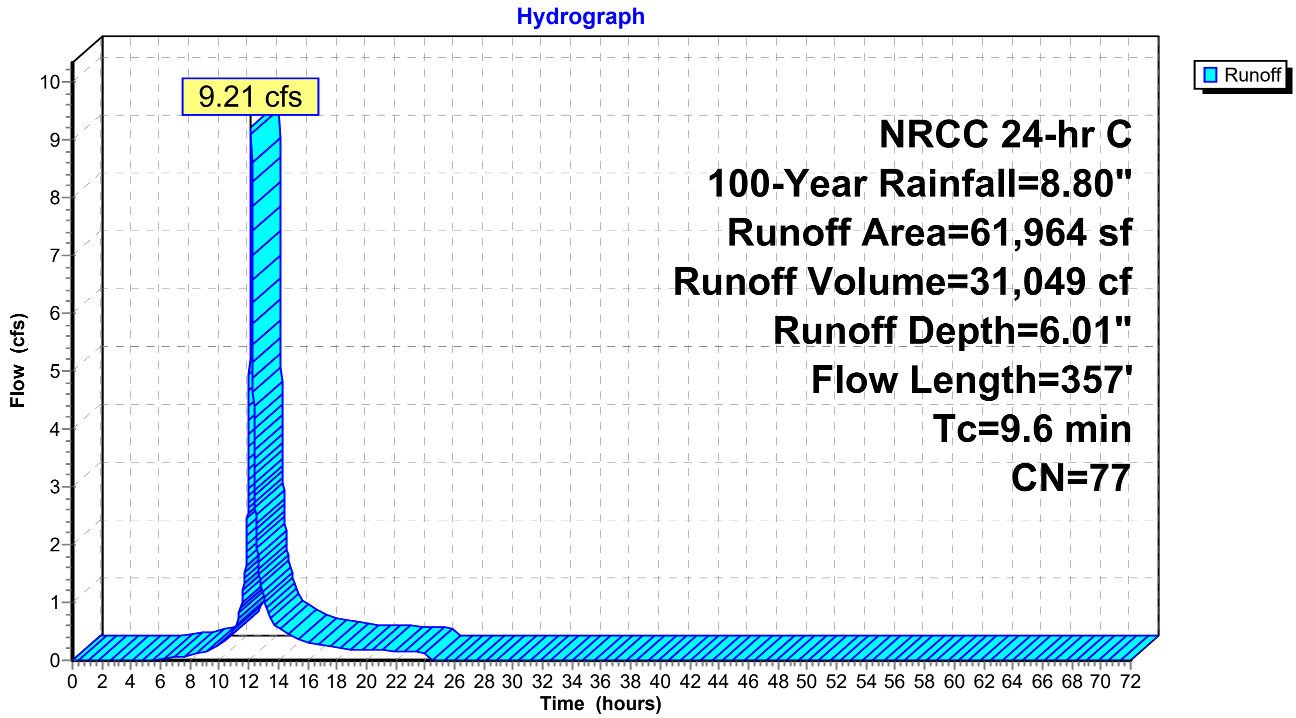
Runoff = 9.21 cfs @ 12.17 hrs, Volume= 31,049 cf, Depth= 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
3,001	70	Woods, Good, HSG C
58,963	77	Woods, Good, HSG D
61,964	77	Weighted Average
61,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0940	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.2	307	0.1050	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	357	Total			

Subcatchment 5S:



Summary for Subcatchment 6S: (new Subcat)

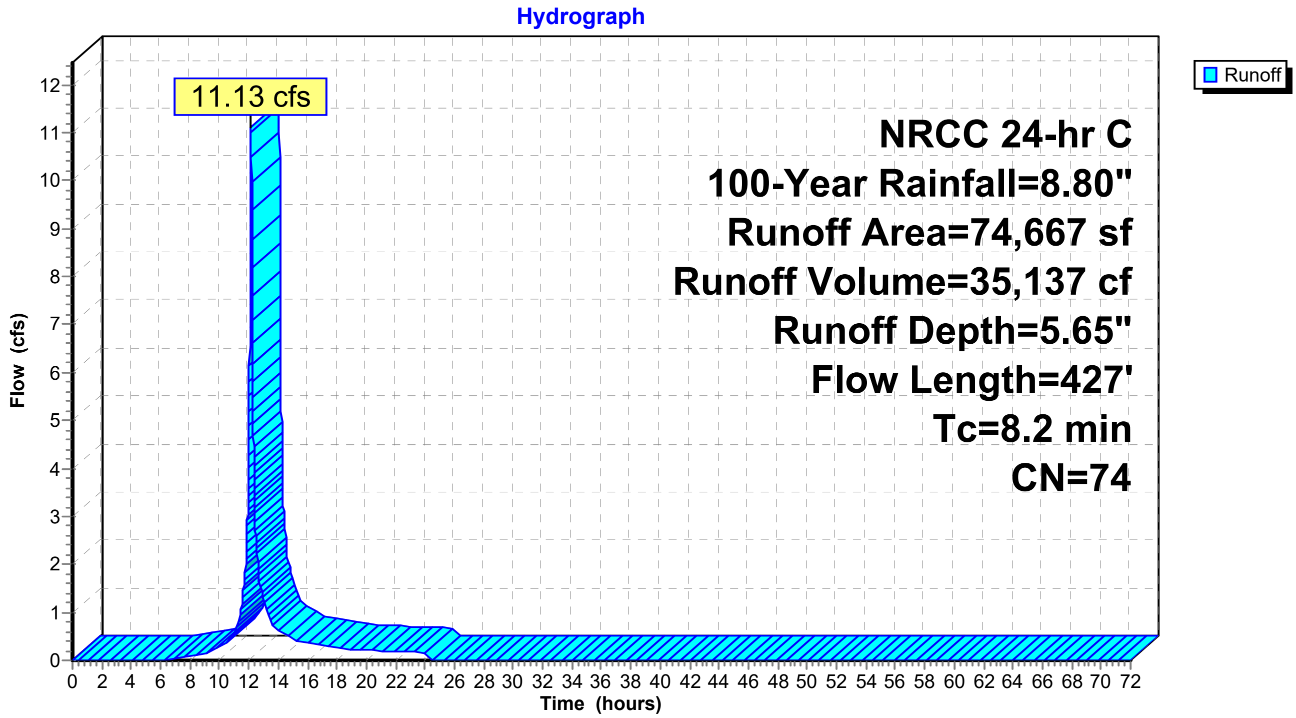
Runoff = 11.13 cfs @ 12.15 hrs, Volume= 35,137 cf, Depth= 5.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
46,947	77	Woods, Good, HSG D
27,720	70	Woods, Good, HSG C
74,667	74	Weighted Average
74,667		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2400	0.19		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
3.8	377	0.1120	1.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	427	Total			

Subcatchment 6S: (new Subcat)

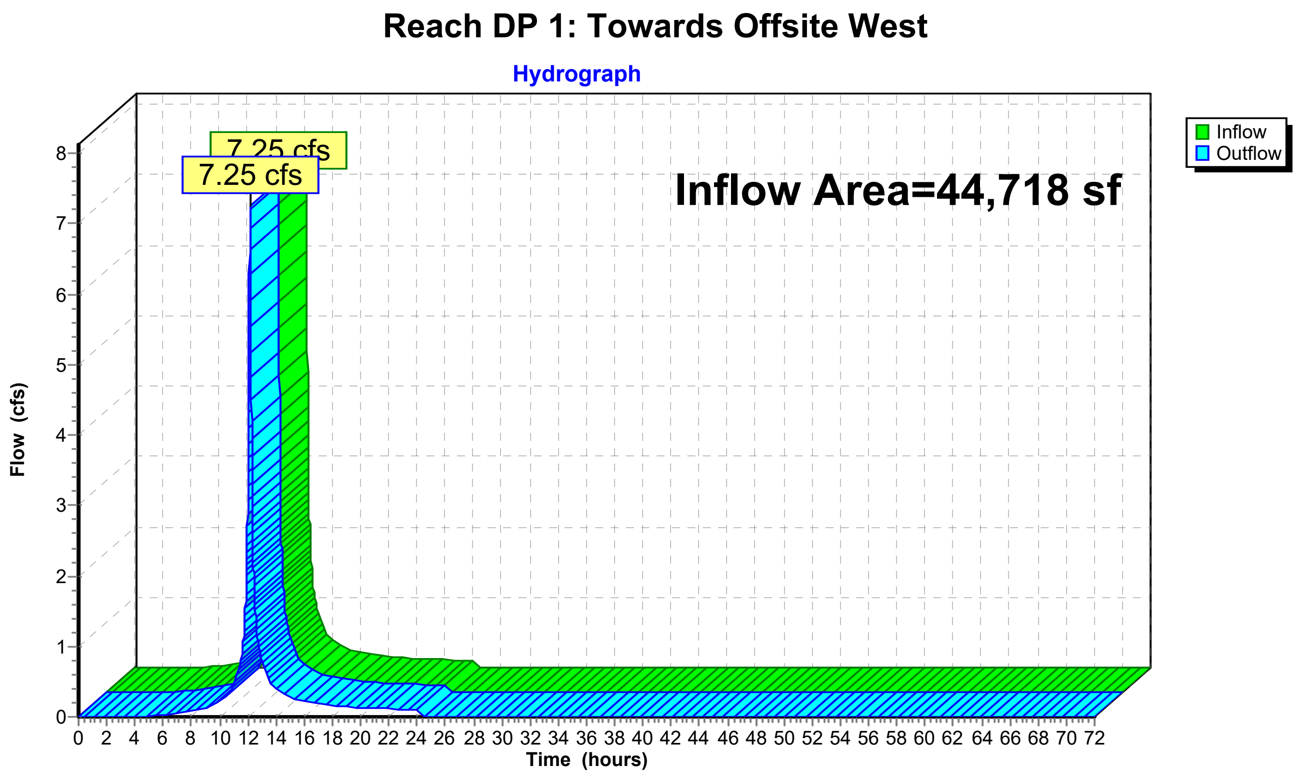


Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	44,718 sf, 5.44% Impervious,	Inflow Depth = 6.38"	for 100-Year event
Inflow =	7.25 cfs @ 12.16 hrs,	Volume= 23,770 cf	
Outflow =	7.25 cfs @ 12.16 hrs,	Volume= 23,770 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

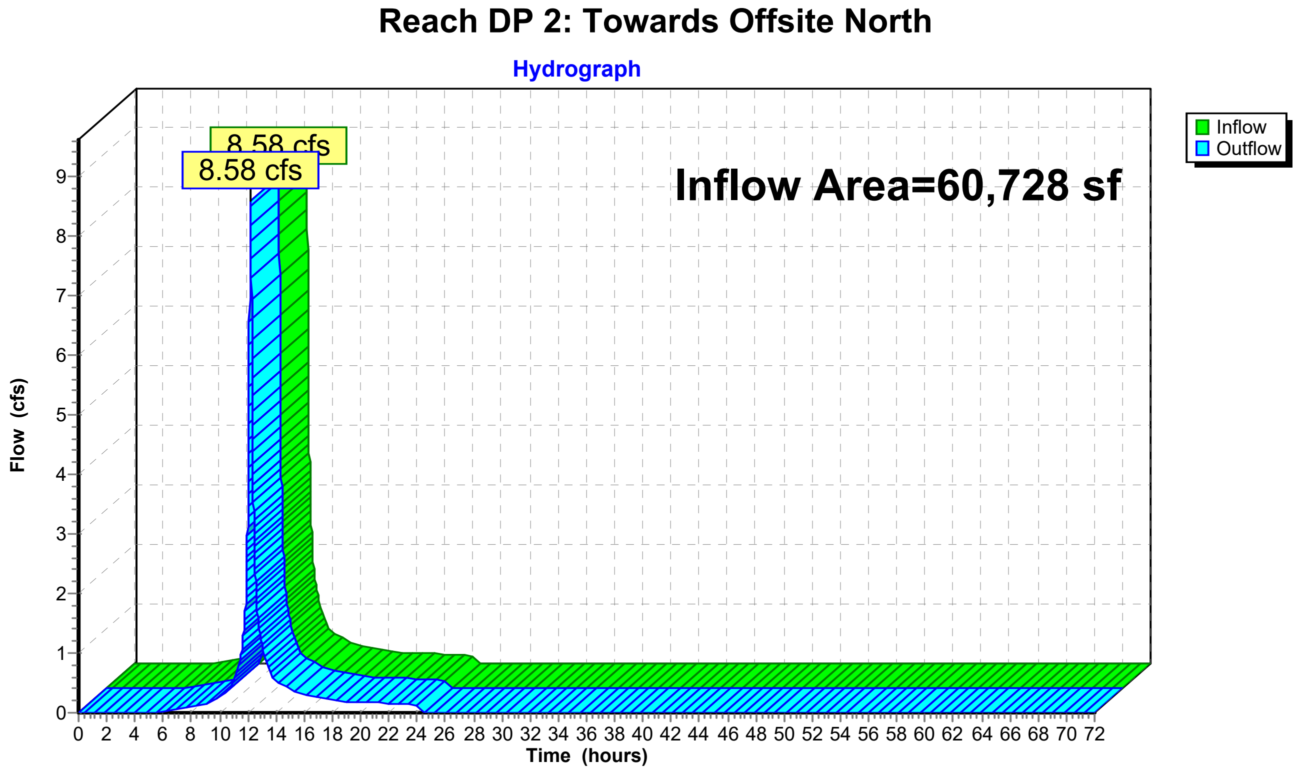


Summary for Reach DP 2: Towards Offsite North

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

Inflow Area =	60,728 sf,	1.33% Impervious,	Inflow Depth = 6.13"	for 100-Year event
Inflow =	8.58 cfs @	12.19 hrs, Volume=	31,047 cf	
Outflow =	8.58 cfs @	12.19 hrs, Volume=	31,047 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



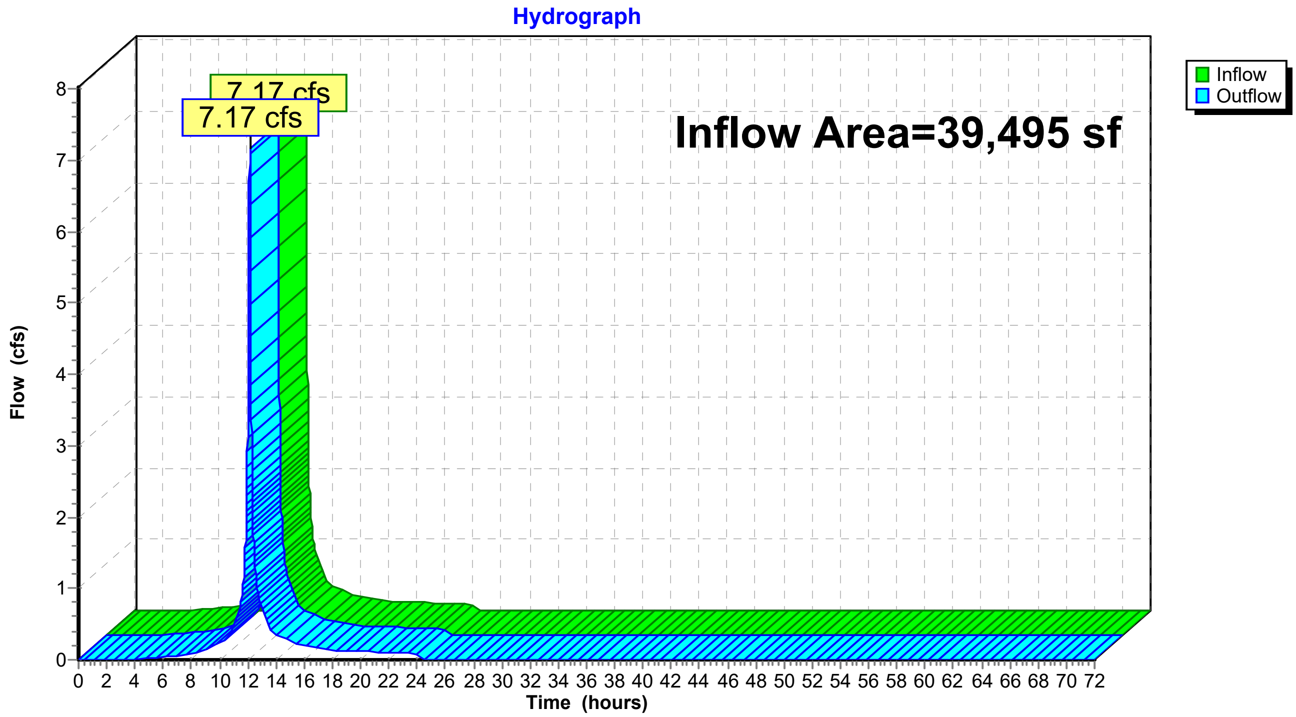
Summary for Reach DP 3: Towards West Wetland

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

Inflow Area = 39,495 sf, 0.00% Impervious, Inflow Depth = 6.74" for 100-Year event
Inflow = 7.17 cfs @ 12.14 hrs, Volume= 22,196 cf
Outflow = 7.17 cfs @ 12.14 hrs, Volume= 22,196 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 3: Towards West Wetland



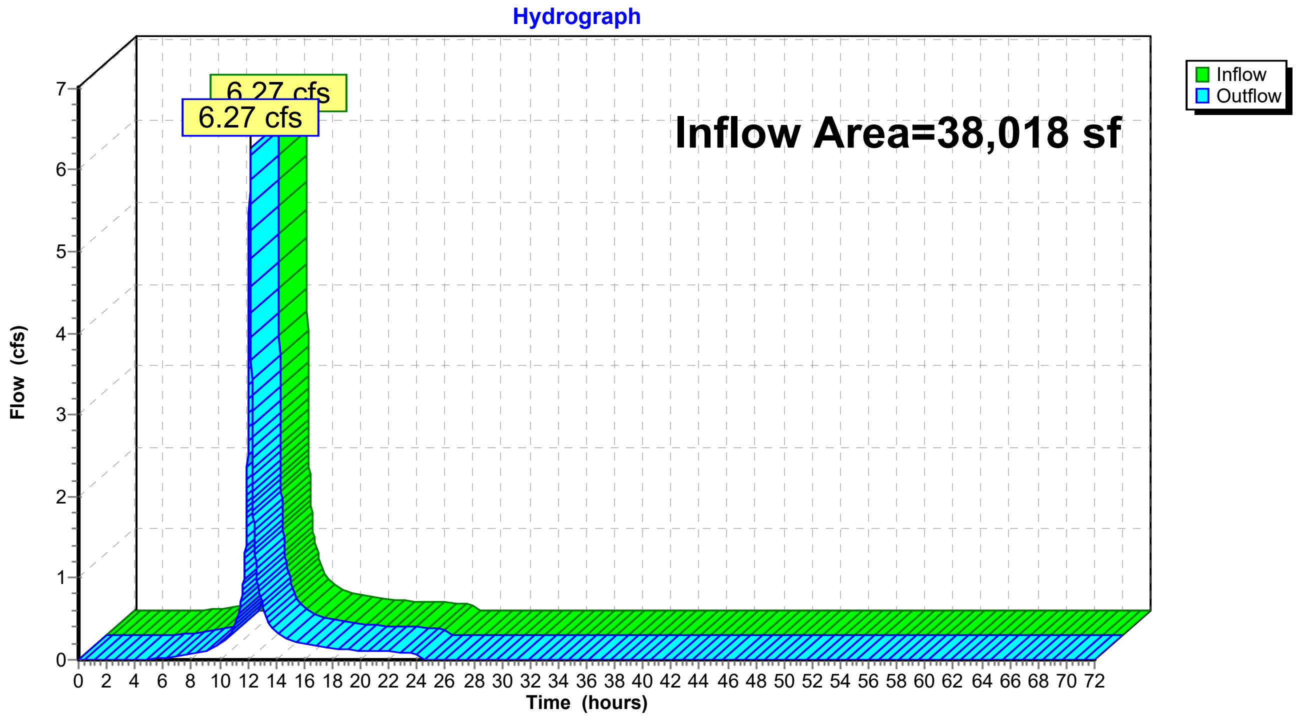
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area =	38,018 sf,	0.00% Impervious,	Inflow Depth = 6.38"	for 100-Year event
Inflow =	6.27 cfs @	12.15 hrs, Volume=	20,209 cf	
Outflow =	6.27 cfs @	12.15 hrs, Volume=	20,209 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland



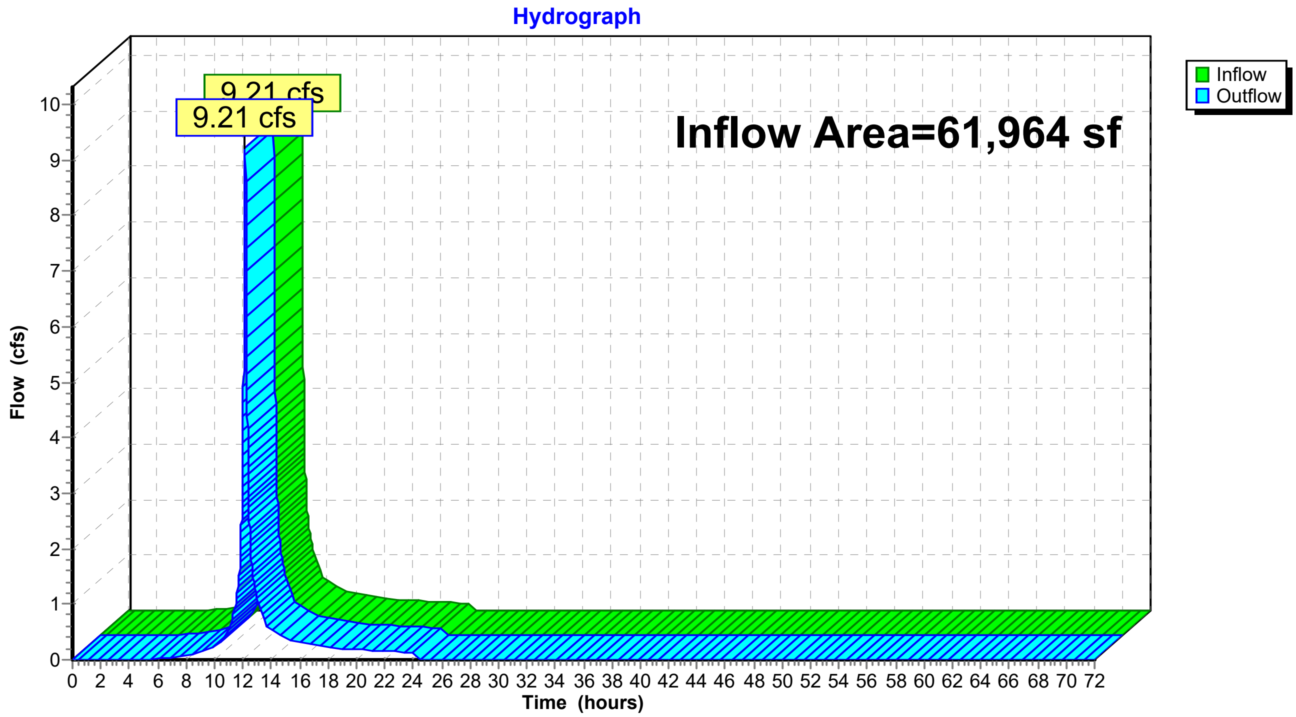
Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area =	61,964 sf,	0.00% Impervious,	Inflow Depth = 6.01"	for 100-Year event	
Inflow =	9.21 cfs @	12.17 hrs, Volume=	31,049 cf		
Outflow =	9.21 cfs @	12.17 hrs, Volume=	31,049 cf,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 5: Towards Offsite Northwest



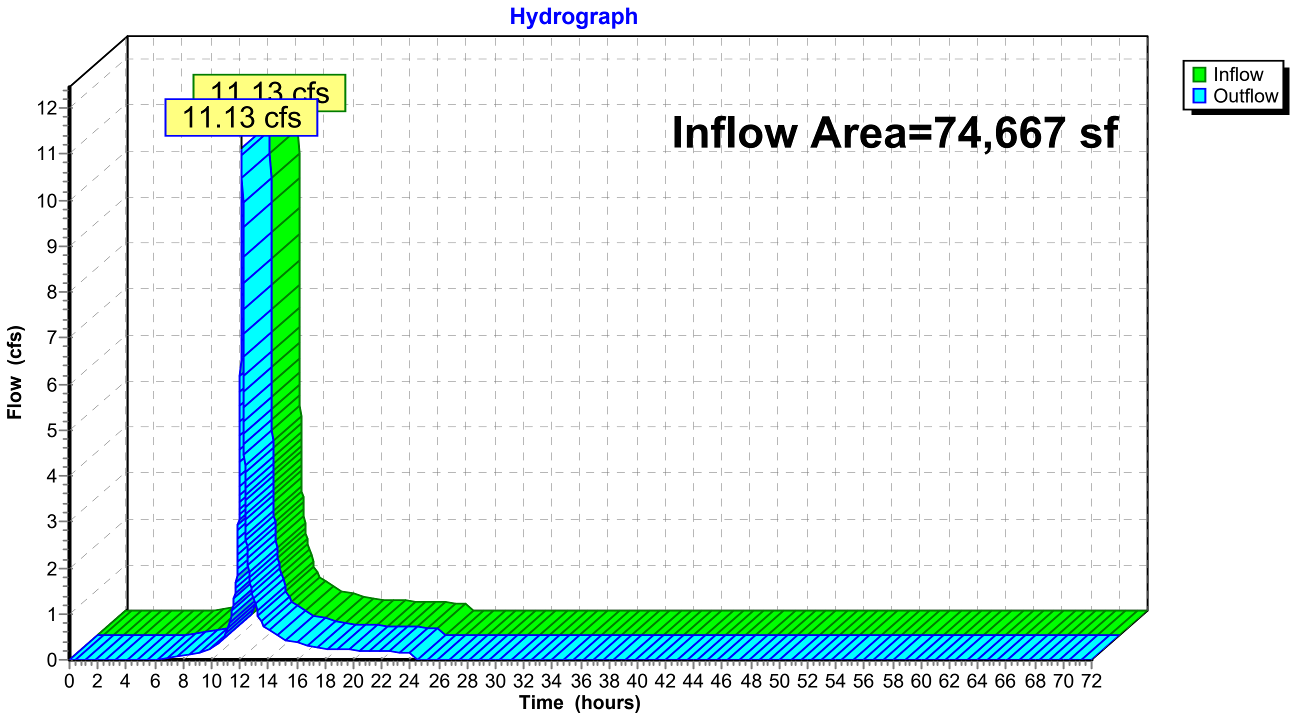
Summary for Reach DP 6: Towards Offsite East

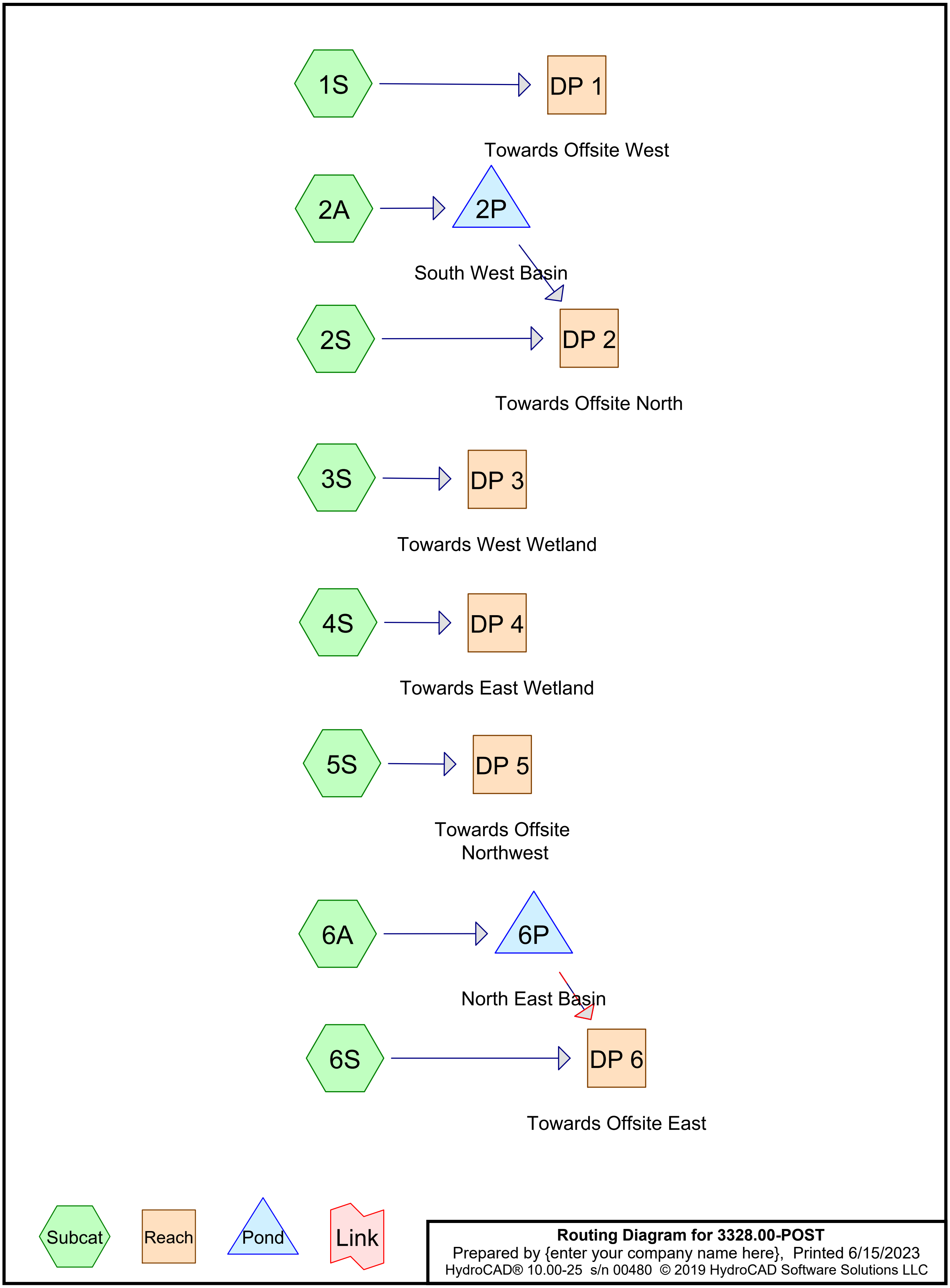
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 74,667 sf, 0.00% Impervious, Inflow Depth = 5.65" for 100-Year event
Inflow = 11.13 cfs @ 12.15 hrs, Volume= 35,137 cf
Outflow = 11.13 cfs @ 12.15 hrs, Volume= 35,137 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East




1S
DP 1
Towards Offsite West
2A
2P
South West Basin
2S
DP 2
Towards Offsite North
3S
DP 3
Towards West Wetland
4S
DP 4
Towards East Wetland
5S
DP 5
Towards Offsite
Northwest
6A
6P
North East Basin
6S
DP 6
Towards Offsite East
Subcat
Reach
Pond
Link
Routing Diagram for 3328.00-POST
Prepared by {enter your company name here}, Printed 6/15/2023
HydroCAD® 10.00-25 s/n 00480 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,864	74	>75% Grass cover, Good, HSG C (6A)
115,033	80	>75% Grass cover, Good, HSG D (1S, 2A, 5S, 6A)
51,483	83	Brush, Poor, HSG D (2S, 3S, 4S)
1,726	91	Gravel roads, HSG D (6A)
24,722	96	Gravel surface, HSG D (1S, 2A, 2S, 3S, 4S, 5S)
1,109	98	Paved parking, HSG D (1S)
2,717	98	Roofs, HSG D (1S, 2A)
620	98	Unconnected pavement, HSG D (6A)
32,548	70	Woods, Good, HSG C (4S, 5S, 6A, 6S)
70,768	77	Woods, Good, HSG D (1S, 2A, 2S, 3S, 4S, 5S, 6A, 6S)
319,590	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
51,412	HSG C	4S, 5S, 6A, 6S
268,178	HSG D	1S, 2A, 2S, 3S, 4S, 5S, 6A, 6S
0	Other	
319,590		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	18,864	115,033	0	133,897	>75% Grass cover, Good	
0	0	0	51,483	0	51,483	Brush, Poor	
0	0	0	1,726	0	1,726	Gravel roads	
0	0	0	24,722	0	24,722	Gravel surface	
0	0	0	1,109	0	1,109	Paved parking	
0	0	0	2,717	0	2,717	Roofs	
0	0	0	620	0	620	Unconnected pavement	
0	0	32,548	70,768	0	103,316	Woods, Good	
0	**0**	**51,412**	**268,178**	**0**	**319,590**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Runoff Area=39,843 sf 7.57% Impervious Runoff Depth=1.48"
Flow Length=298' Tc=9.0 min CN=81 Runoff=1.54 cfs 4,930 cf

Subcatchment 2A: Runoff Area=43,949 sf 1.84% Impervious Runoff Depth=1.48"
Flow Length=261' Tc=8.2 min CN=81 Runoff=1.75 cfs 5,438 cf

Subcatchment 2S: Runoff Area=21,866 sf 0.00% Impervious Runoff Depth=1.48"
Flow Length=225' Tc=10.8 min CN=81 Runoff=0.78 cfs 2,706 cf

Subcatchment 3S: Runoff Area=37,420 sf 0.00% Impervious Runoff Depth=1.70"
Flow Length=212' Tc=6.7 min CN=84 Runoff=1.80 cfs 5,298 cf

Subcatchment 4S: Runoff Area=37,744 sf 0.00% Impervious Runoff Depth=1.42"
Flow Length=90' Tc=11.5 min CN=80 Runoff=1.25 cfs 4,458 cf

Subcatchment 5S: Runoff Area=39,402 sf 0.00% Impervious Runoff Depth=1.48"
Flow Length=109' Tc=6.0 min CN=81 Runoff=1.71 cfs 4,875 cf

Subcatchment 6A: Runoff Area=81,711 sf 0.76% Impervious Runoff Depth=1.29"
Flow Length=592' Tc=8.1 min CN=78 Runoff=2.80 cfs 8,771 cf

Subcatchment 6S: Runoff Area=17,655 sf 0.00% Impervious Runoff Depth=0.84"
Flow Length=213' Tc=6.2 min CN=70 Runoff=0.40 cfs 1,235 cf

Reach DP 1: Towards Offsite West Inflow=1.54 cfs 4,930 cf
Outflow=1.54 cfs 4,930 cf

Reach DP 2: Towards Offsite North Inflow=1.41 cfs 8,142 cf
Outflow=1.41 cfs 8,142 cf

Reach DP 3: Towards West Wetland Inflow=1.80 cfs 5,298 cf
Outflow=1.80 cfs 5,298 cf

Reach DP 4: Towards East Wetland Inflow=1.25 cfs 4,458 cf
Outflow=1.25 cfs 4,458 cf

Reach DP 5: Towards Offsite Northwest Inflow=1.71 cfs 4,875 cf
Outflow=1.71 cfs 4,875 cf

Reach DP 6: Towards Offsite East Inflow=1.59 cfs 10,006 cf
Outflow=1.59 cfs 10,006 cf

Pond 2P: South West Basin Peak Elev=457.23' Storage=1,431 cf Inflow=1.75 cfs 5,438 cf
10.0" Round Culvert n=0.013 L=14.0' S=0.0100 '/' Outflow=0.75 cfs 5,436 cf

Pond 6P: North East Basin Peak Elev=402.11' Storage=1,298 cf Inflow=2.80 cfs 8,771 cf
Outflow=1.39 cfs 8,771 cf

Total Runoff Area = 319,590 sf Runoff Volume = 37,711 cf Average Runoff Depth = 1.42"
98.61% Pervious = 315,144 sf 1.39% Impervious = 4,446 sf

Summary for Subcatchment 1S:

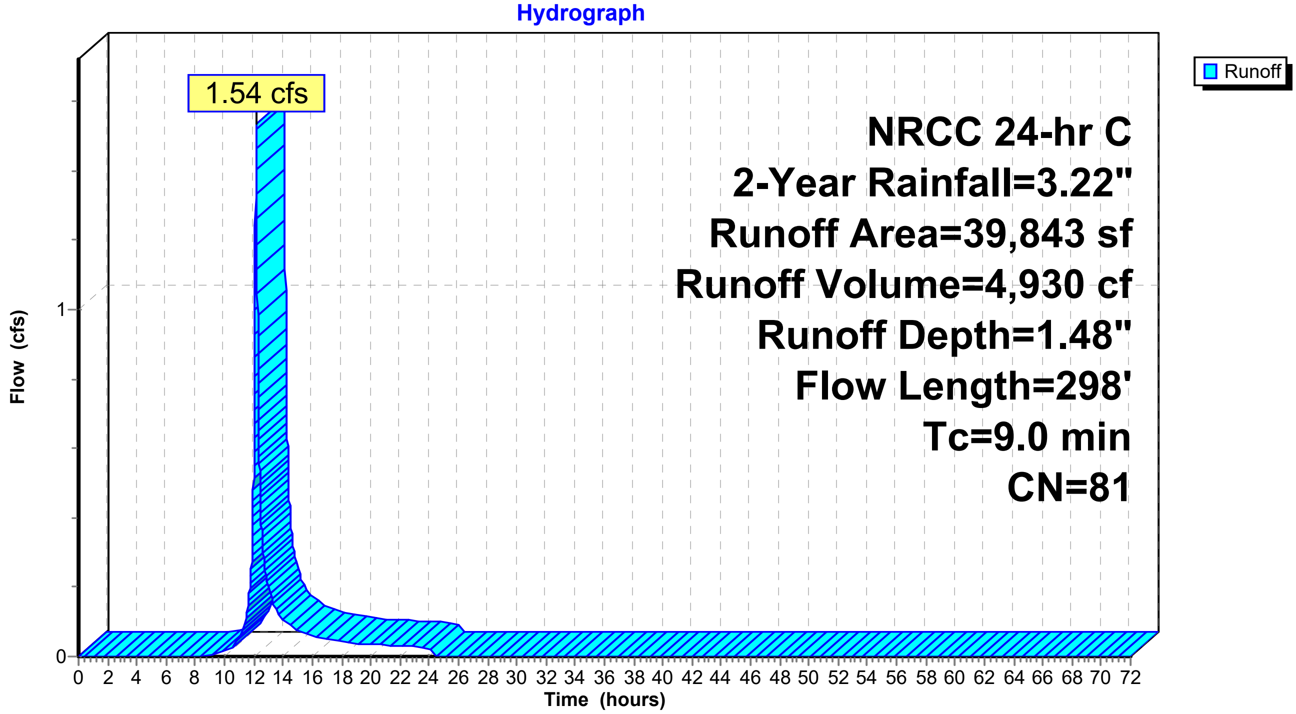
Runoff = 1.54 cfs @ 12.17 hrs, Volume= 4,930 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
13,399	77	Woods, Good, HSG D
1,909	98	Roofs, HSG D
20,826	80	>75% Grass cover, Good, HSG D
2,600	96	Gravel surface, HSG D
1,109	98	Paved parking, HSG D
39,843	81	Weighted Average
36,825		92.43% Pervious Area
3,018		7.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	65	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	59	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	110	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.0	298	Total			

Subcatchment 1S:



Summary for Subcatchment 2A:

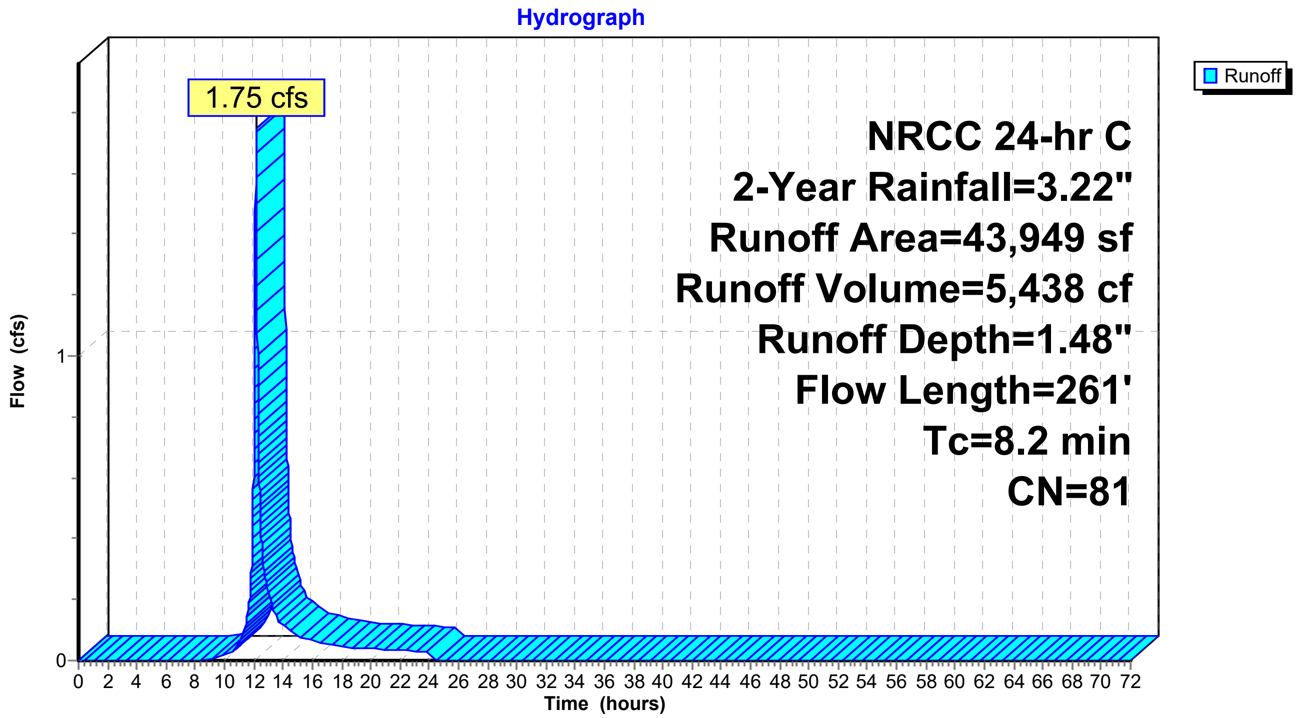
Runoff = 1.75 cfs @ 12.16 hrs, Volume= 5,438 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
17,342	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
20,539	77	Woods, Good, HSG D
5,260	96	Gravel surface, HSG D
43,949	81	Weighted Average
43,141		98.16% Pervious Area
808		1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	76	0.0210	0.72		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	22	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	101	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	261	Total			

Subcatchment 2A:



Summary for Subcatchment 2S:

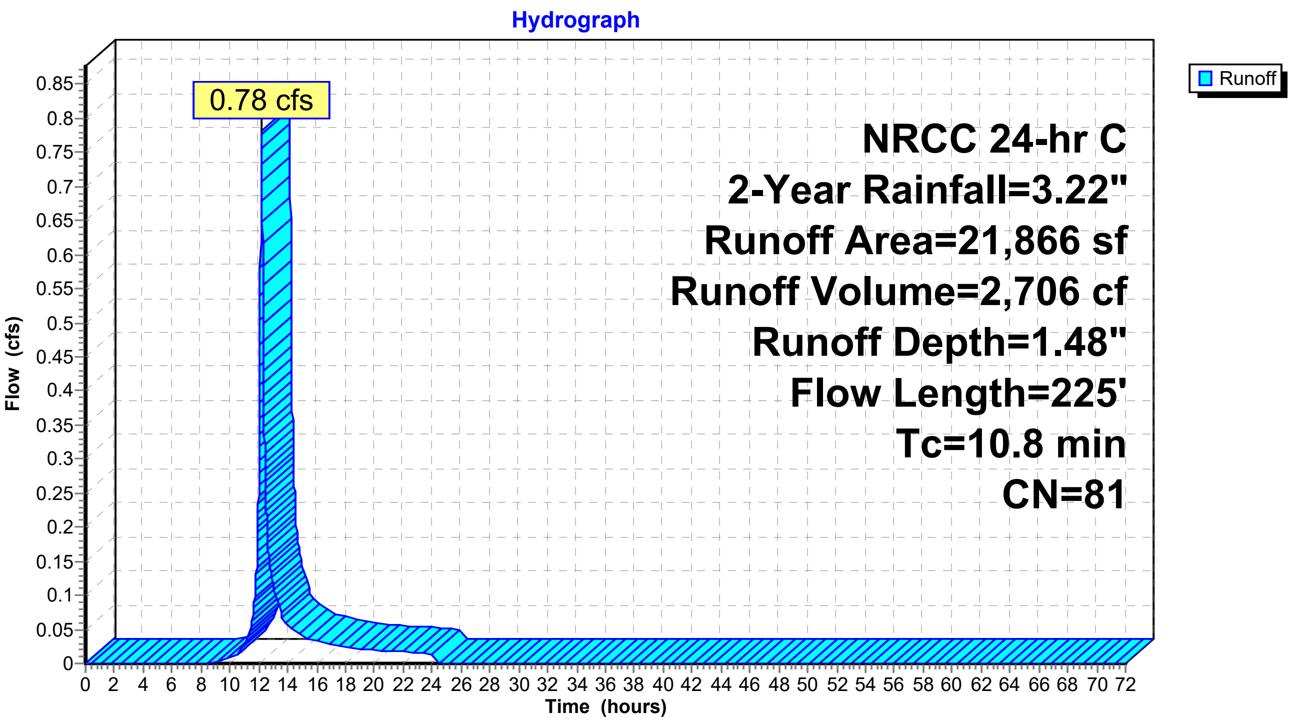
Runoff = 0.78 cfs @ 12.18 hrs, Volume= 2,706 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
12,429	77	Woods, Good, HSG D
2,697	96	Gravel surface, HSG D
6,740	83	Brush, Poor, HSG D
21,866	81	Weighted Average
21,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.2	21	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	154	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.8	225	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

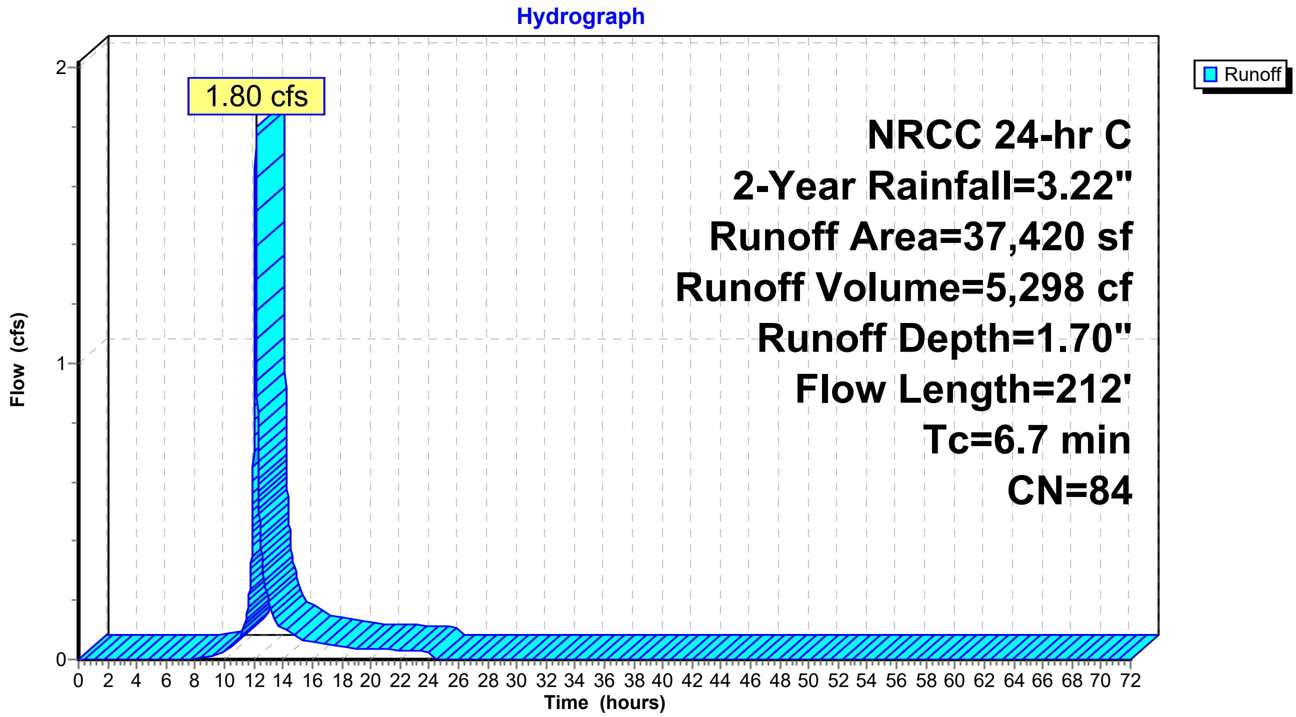
Runoff = 1.80 cfs @ 12.14 hrs, Volume= 5,298 cf, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
3,709	77	Woods, Good, HSG D
29,820	83	Brush, Poor, HSG D
3,891	96	Gravel surface, HSG D
37,420	84	Weighted Average
37,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

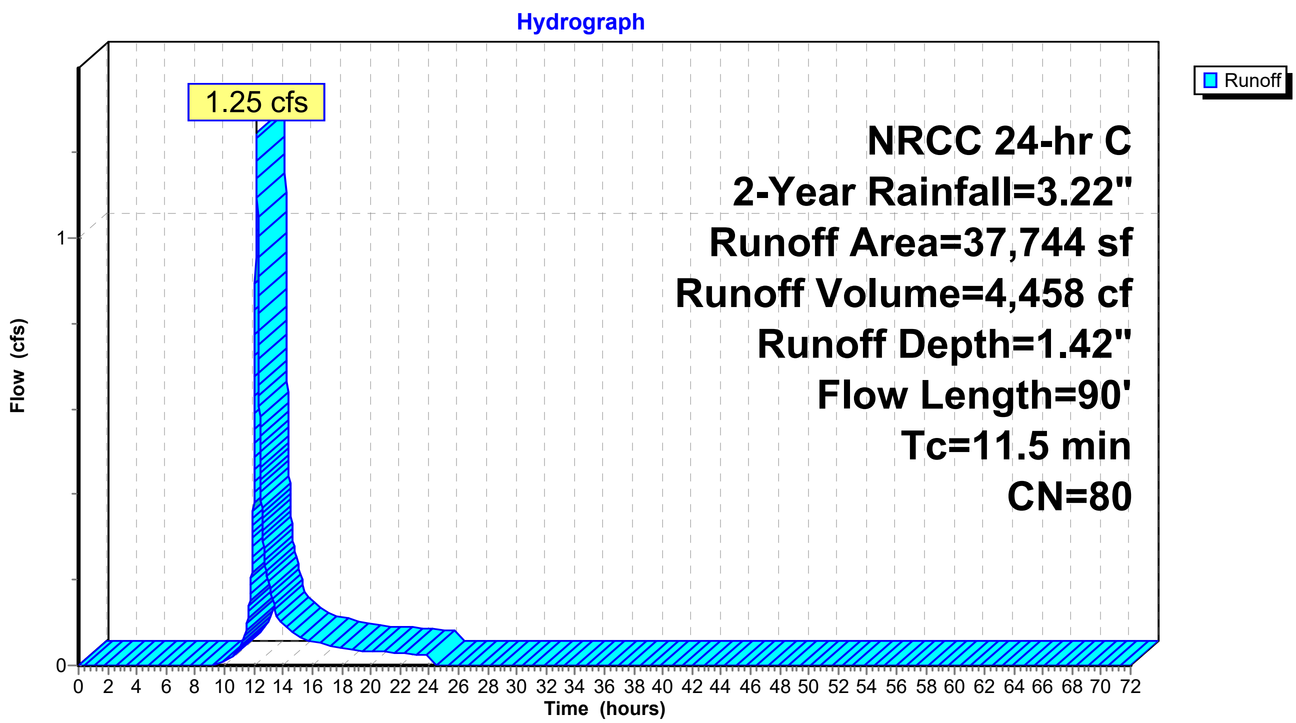
Runoff = 1.25 cfs @ 12.20 hrs, Volume= 4,458 cf, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
14,923	83	Brush, Poor, HSG D
4,794	96	Gravel surface, HSG D
10,680	77	Woods, Good, HSG D
7,347	70	Woods, Good, HSG C
37,744	80	Weighted Average
37,744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	50	0.0240	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	90	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

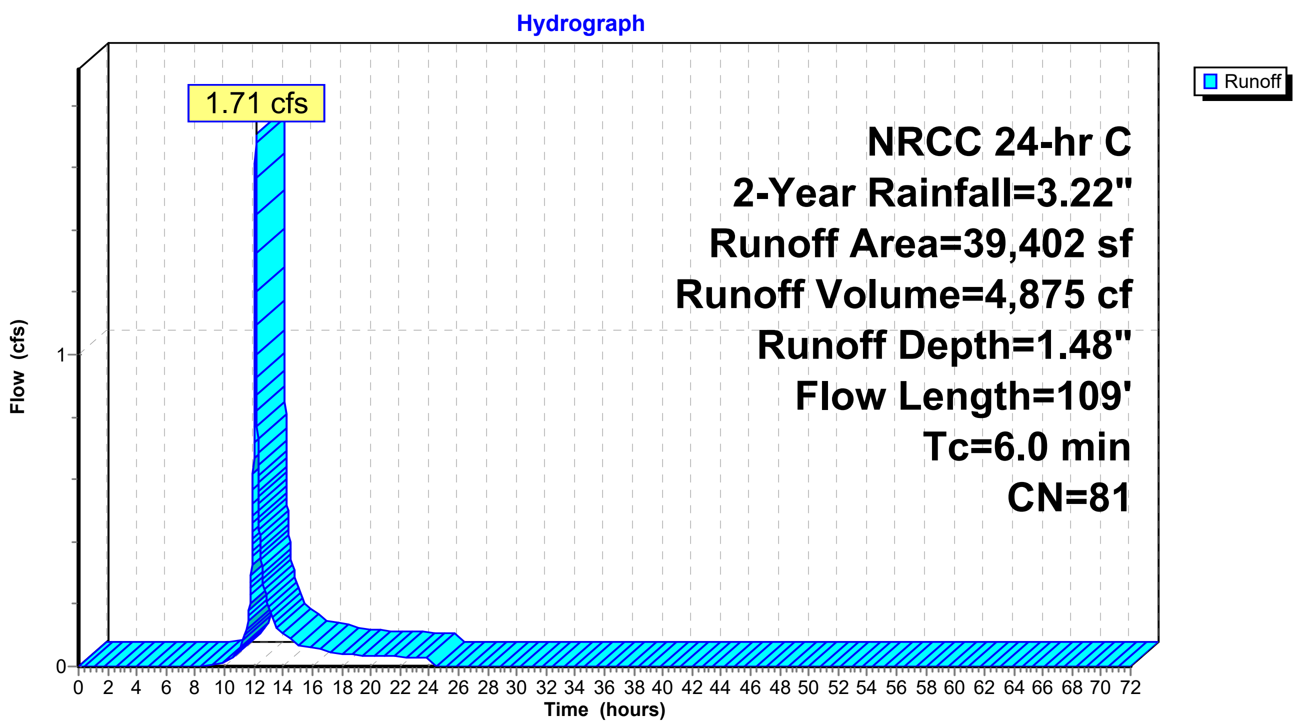
Runoff = 1.71 cfs @ 12.13 hrs, Volume= 4,875 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
23,878	80	>75% Grass cover, Good, HSG D
7,772	77	Woods, Good, HSG D
2,272	70	Woods, Good, HSG C
5,480	96	Gravel surface, HSG D
39,402	81	Weighted Average
39,402		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	44	0.0520	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0530	1.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	109	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S:



Summary for Subcatchment 6A:

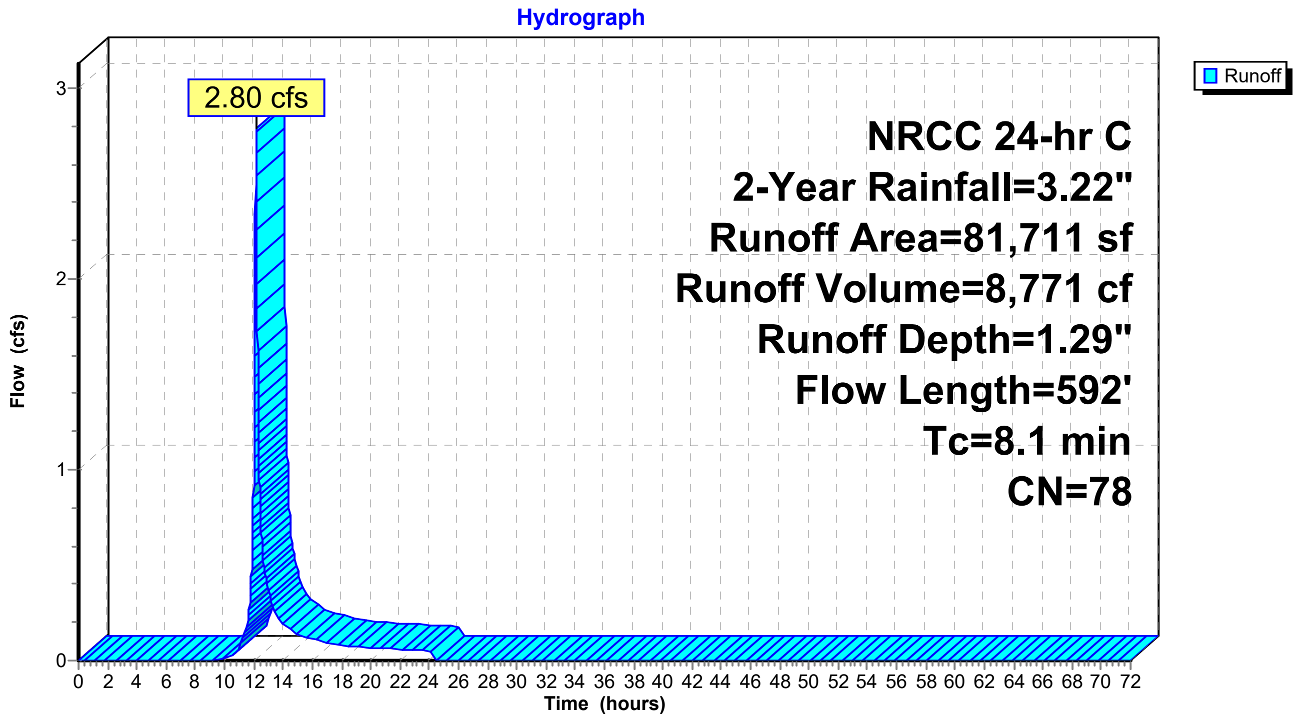
Runoff = 2.80 cfs @ 12.16 hrs, Volume= 8,771 cf, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
52,987	80	>75% Grass cover, Good, HSG D
18,864	74	>75% Grass cover, Good, HSG C
1,726	91	Gravel roads, HSG D
620	98	Unconnected pavement, HSG D
1,876	77	Woods, Good, HSG D
5,638	70	Woods, Good, HSG C
81,711	78	Weighted Average
81,091		99.24% Pervious Area
620		0.76% Impervious Area
620		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0623	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
4.7	542	0.0720	1.92	19.79	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 5.6 & 7.0 '/' Top.W=16.60' n= 0.150 Sheet flow over Short Grass
8.1	592	Total			

Subcatchment 6A:



Summary for Subcatchment 6S:

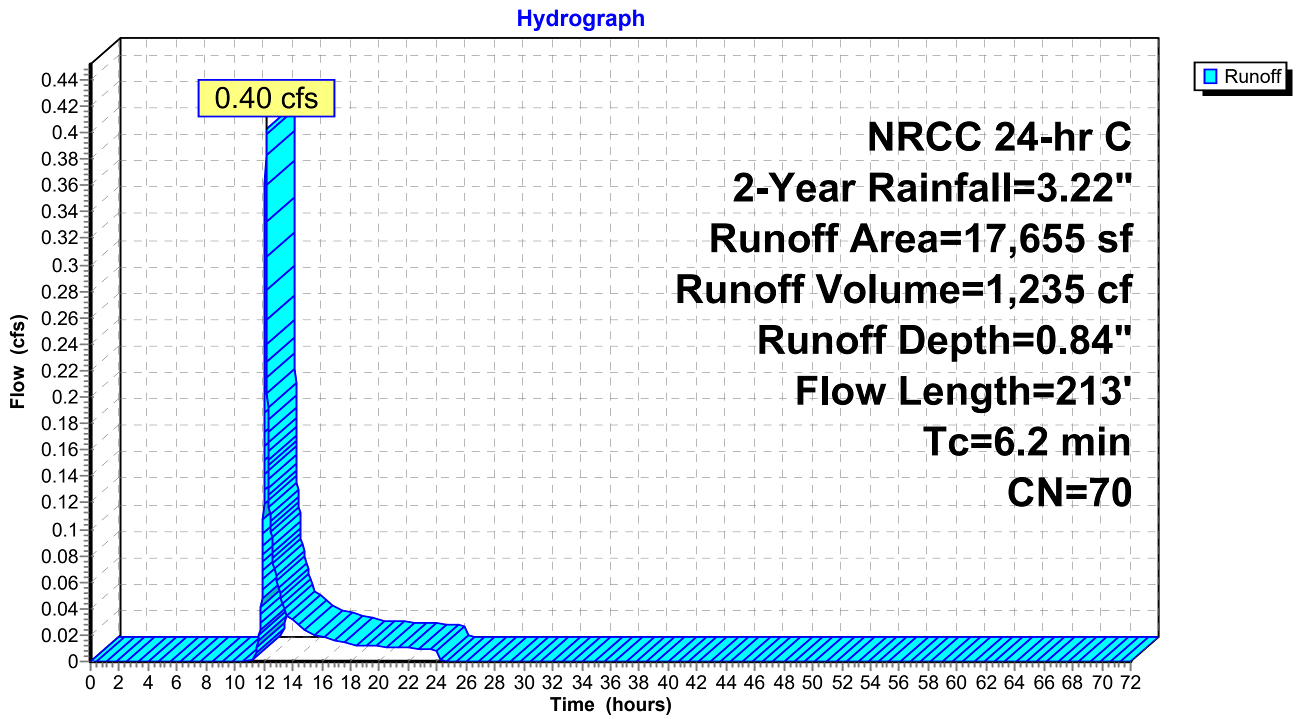
Runoff = 0.40 cfs @ 12.14 hrs, Volume= 1,235 cf, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.22"

Area (sf)	CN	Description
17,291	70	Woods, Good, HSG C
364	77	Woods, Good, HSG D
17,655	70	Weighted Average
17,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1670	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.5	88	0.1670	2.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	21	0.2130	2.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	54	0.0935	2.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	213	Total			

Subcatchment 6S:



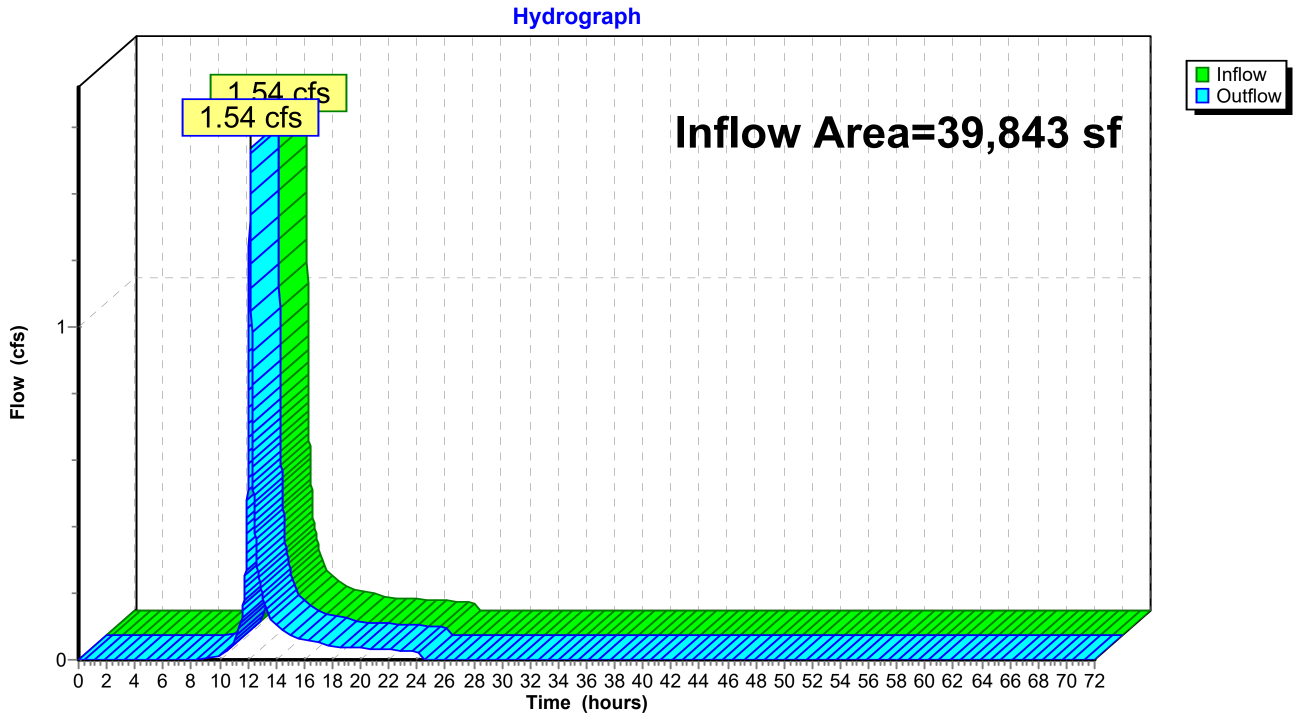
Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	39,843 sf, 7.57% Impervious,	Inflow Depth = 1.48"	for 2-Year event
Inflow =	1.54 cfs @ 12.17 hrs, Volume=	4,930 cf	
Outflow =	1.54 cfs @ 12.17 hrs, Volume=	4,930 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 1: Towards Offsite West



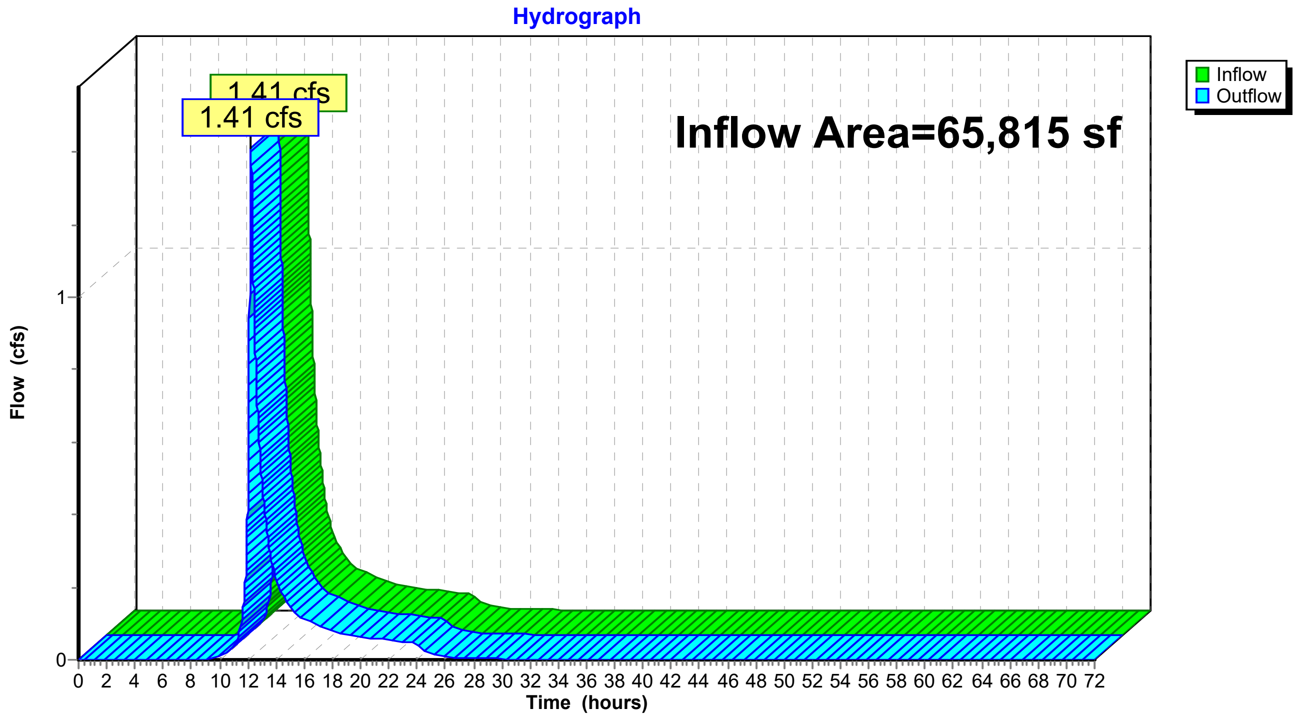
Summary for Reach DP 2: Towards Offsite North

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

Inflow Area = 65,815 sf, 1.23% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 1.41 cfs @ 12.21 hrs, Volume= 8,142 cf
Outflow = 1.41 cfs @ 12.21 hrs, Volume= 8,142 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 2: Towards Offsite North



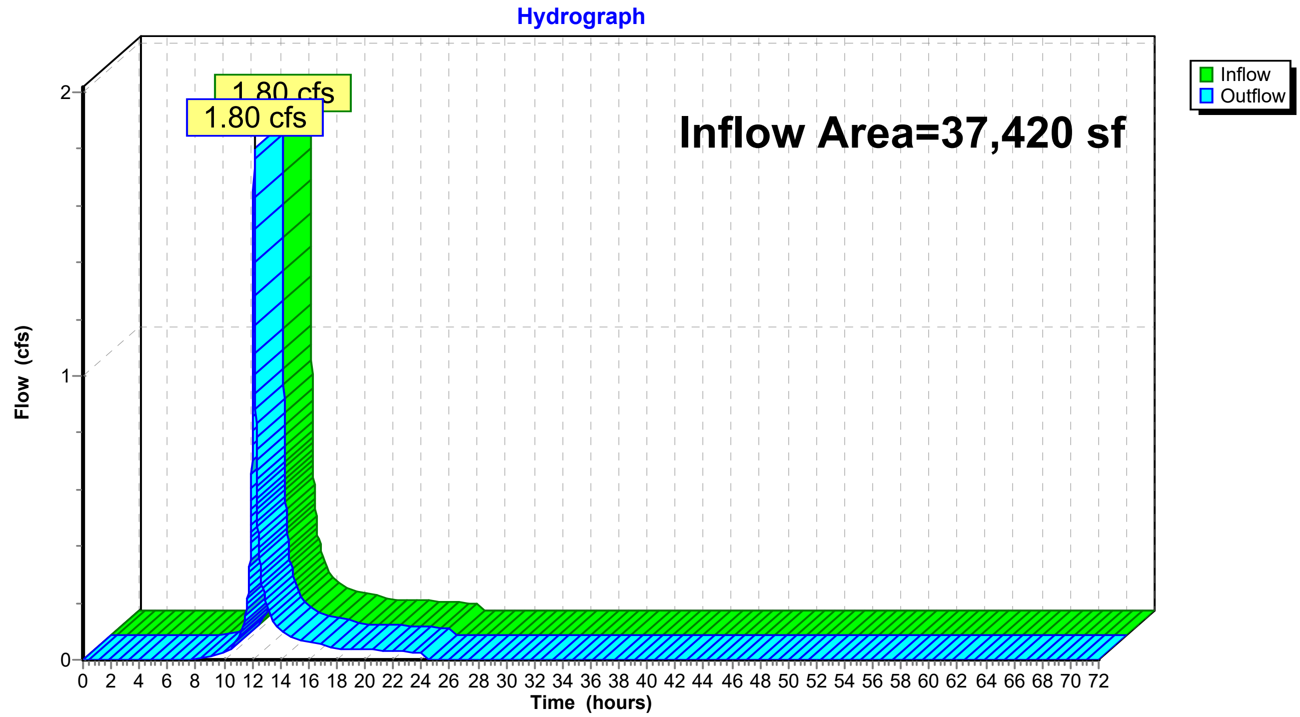
Summary for Reach DP 3: Towards West Wetland

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

Inflow Area = 37,420 sf, 0.00% Impervious, Inflow Depth = 1.70" for 2-Year event
Inflow = 1.80 cfs @ 12.14 hrs, Volume= 5,298 cf
Outflow = 1.80 cfs @ 12.14 hrs, Volume= 5,298 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 3: Towards West Wetland



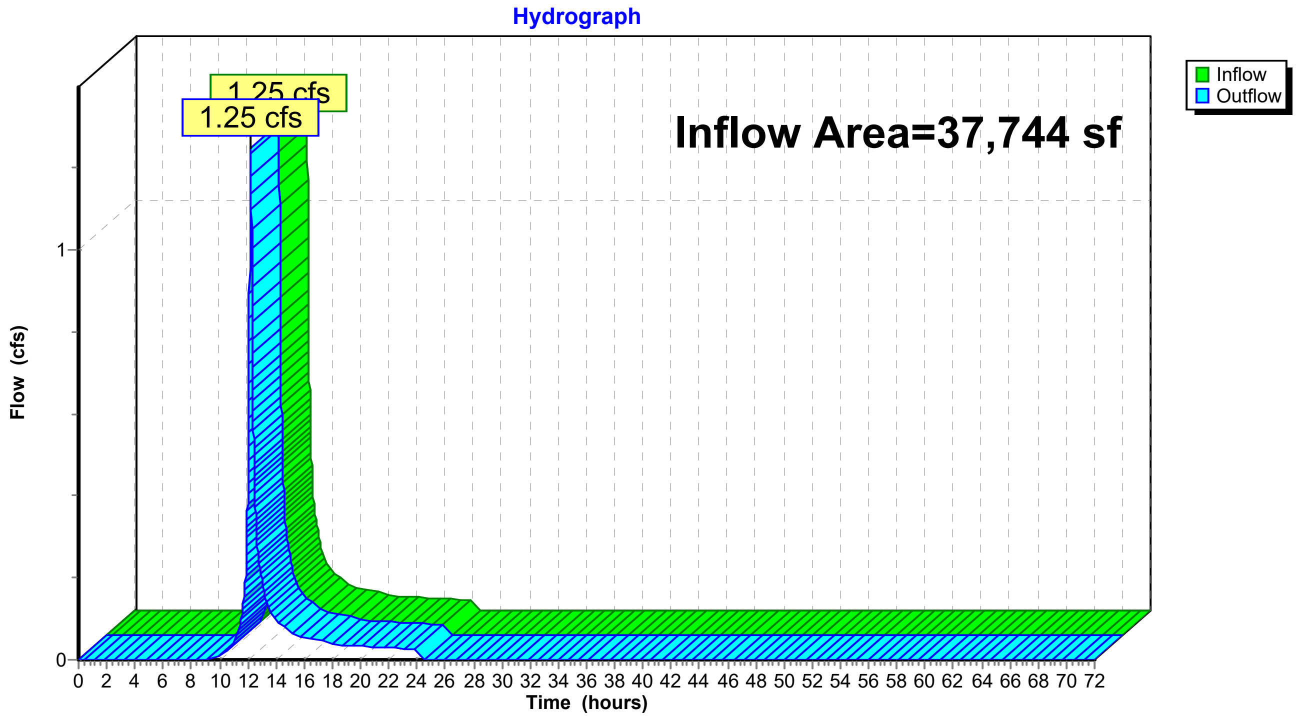
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area =	37,744 sf,	0.00% Impervious,	Inflow Depth = 1.42"	for 2-Year event
Inflow =	1.25 cfs @	12.20 hrs, Volume=	4,458 cf	
Outflow =	1.25 cfs @	12.20 hrs, Volume=	4,458 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland



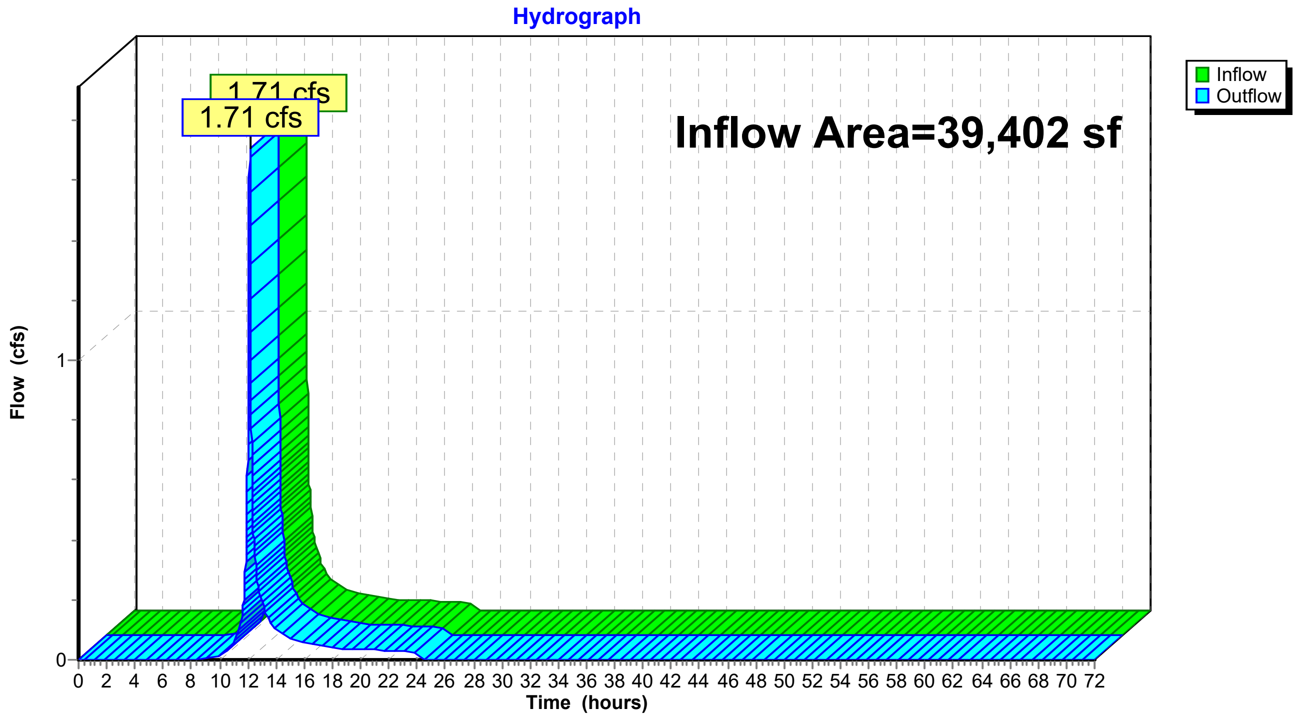
Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area = 39,402 sf, 0.00% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 4,875 cf
Outflow = 1.71 cfs @ 12.13 hrs, Volume= 4,875 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 5: Towards Offsite Northwest



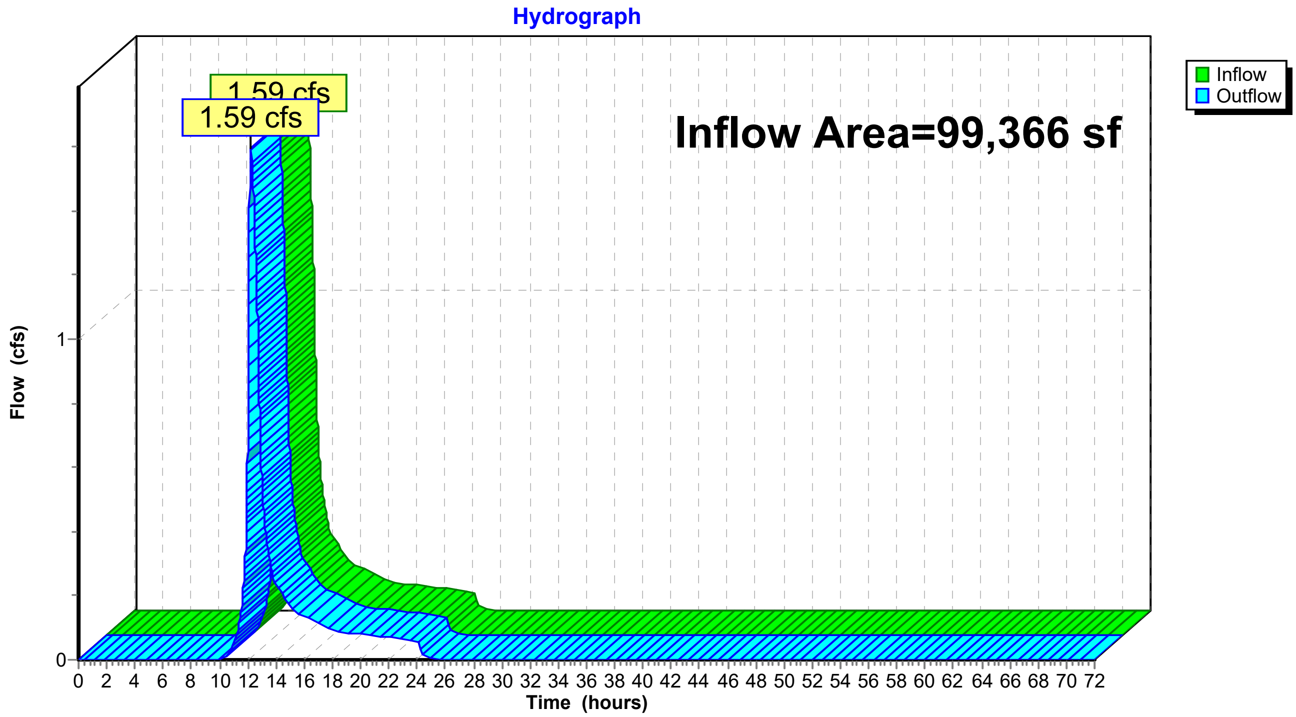
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area =	99,366 sf,	0.62% Impervious,	Inflow Depth = 1.21"	for 2-Year event
Inflow =	1.59 cfs @	12.19 hrs, Volume=	10,006 cf	
Outflow =	1.59 cfs @	12.19 hrs, Volume=	10,006 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Summary for Pond 2P: South West Basin

Inflow Area = 43,949 sf, 1.84% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 1.75 cfs @ 12.16 hrs, Volume= 5,438 cf
Outflow = 0.75 cfs @ 12.32 hrs, Volume= 5,436 cf, Atten= 57%, Lag= 9.6 min
Primary = 0.75 cfs @ 12.32 hrs, Volume= 5,436 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 457.23' @ 12.32 hrs Surf.Area= 2,919 sf Storage= 1,431 cf

Plug-Flow detention time= 76.1 min calculated for 5,436 cf (100% of inflow)
Center-of-Mass det. time= 75.9 min (928.0 - 852.1)

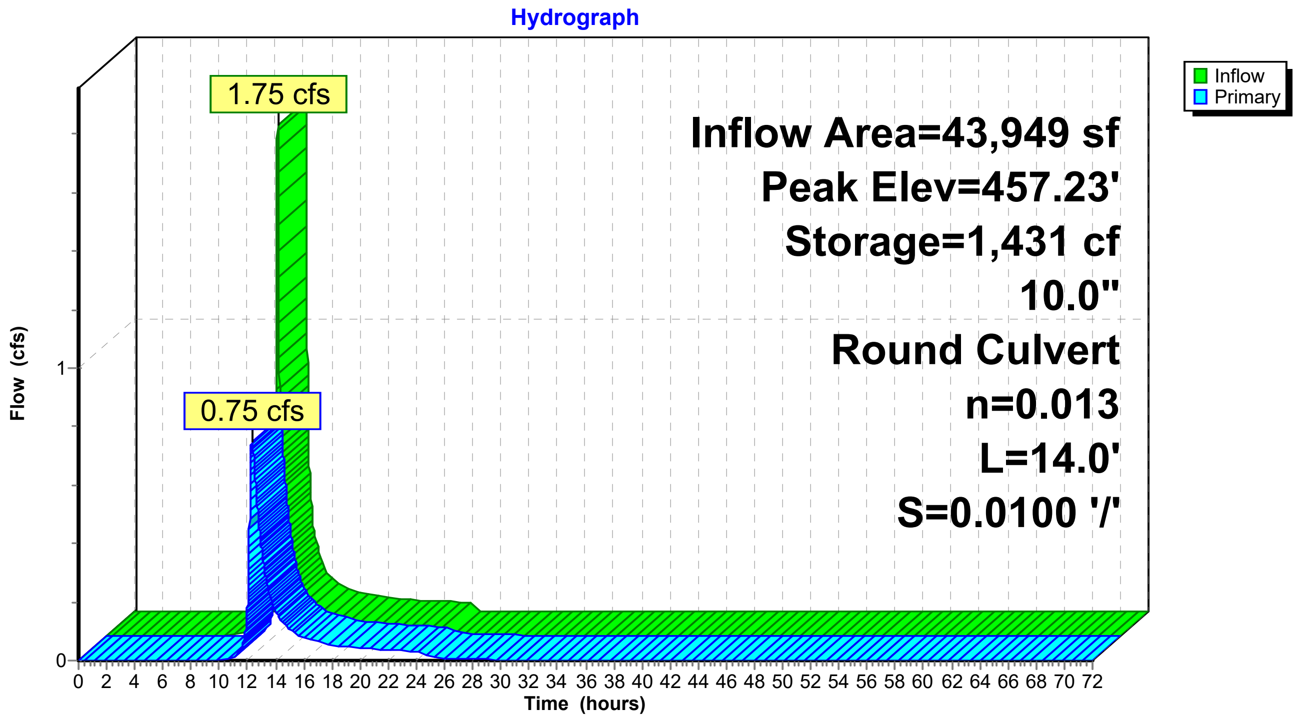
Volume	Invert	Avail.Storage	Storage Description
#1	456.70'	6,701 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.70	2,487	270.0	0	0	2,487
458.70	4,296	320.0	6,701	6,701	4,908

Device	Routing	Invert	Outlet Devices
#1	Primary	456.70'	**10.0" Round ADS Round 10"** L= 14.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 456.70' / 456.56' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=0.75 cfs @ 12.32 hrs HW=457.23' (Free Discharge)
└─**1=ADS Round 10"** (Barrel Controls 0.75 cfs @ 2.90 fps)

Pond 2P: South West Basin



Summary for Pond 6P: North East Basin

Inflow Area = 81,711 sf, 0.76% Impervious, Inflow Depth = 1.29" for 2-Year event
Inflow = 2.80 cfs @ 12.16 hrs, Volume= 8,771 cf
Outflow = 1.39 cfs @ 12.29 hrs, Volume= 8,771 cf, Atten= 50%, Lag= 7.9 min
Primary = 1.39 cfs @ 12.29 hrs, Volume= 8,771 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 402.11' @ 12.29 hrs Surf.Area= 1,994 sf Storage= 1,298 cf

Plug-Flow detention time= 14.6 min calculated for 8,769 cf (100% of inflow)
Center-of-Mass det. time= 14.6 min (877.1 - 862.5)

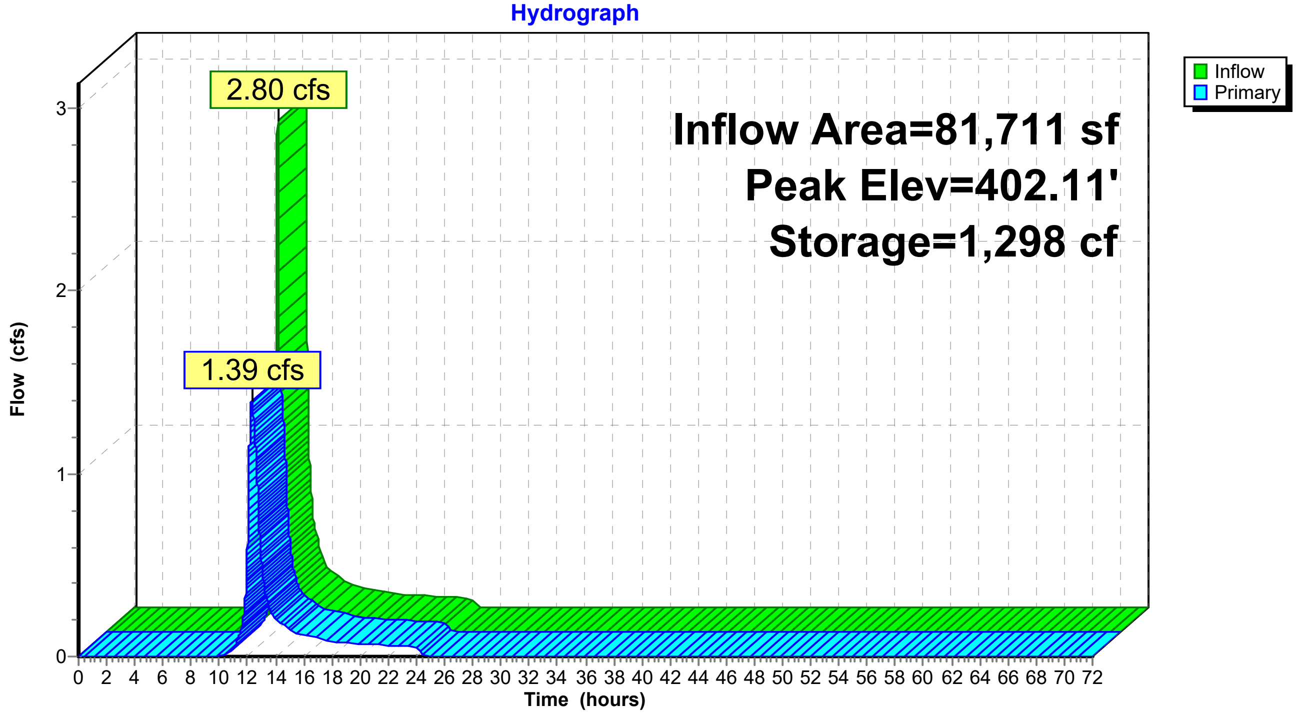
Volume	Invert	Avail.Storage	Storage Description
#1	401.00'	12,521 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
401.00	454	159.0	0	0	454
402.00	1,868	254.0	1,081	1,081	3,583
403.00	3,130	251.0	2,472	3,553	3,863
404.00	4,462	289.0	3,776	7,329	5,518
405.00	5,957	326.0	5,192	12,521	7,355

Device	Routing	Invert	Outlet Devices
#1	Primary	401.00'	**8.0" Round ADS_Round 8"** L= 22.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 401.00' / 400.78' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Primary	404.00'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.39 cfs @ 12.29 hrs HW=402.11' (Free Discharge)
↑—**1=ADS_Round 8"** (Barrel Controls 1.39 cfs @ 4.00 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: North East Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Runoff Area=39,843 sf 7.57% Impervious Runoff Depth=2.86"
Flow Length=298' Tc=9.0 min CN=81 Runoff=2.95 cfs 9,502 cf

Subcatchment 2A: Runoff Area=43,949 sf 1.84% Impervious Runoff Depth=2.86"
Flow Length=261' Tc=8.2 min CN=81 Runoff=3.35 cfs 10,482 cf

Subcatchment 2S: Runoff Area=21,866 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=225' Tc=10.8 min CN=81 Runoff=1.51 cfs 5,215 cf

Subcatchment 3S: Runoff Area=37,420 sf 0.00% Impervious Runoff Depth=3.14"
Flow Length=212' Tc=6.7 min CN=84 Runoff=3.28 cfs 9,800 cf

Subcatchment 4S: Runoff Area=37,744 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=90' Tc=11.5 min CN=80 Runoff=2.45 cfs 8,716 cf

Subcatchment 5S: Runoff Area=39,402 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=109' Tc=6.0 min CN=81 Runoff=3.27 cfs 9,397 cf

Subcatchment 6A: Runoff Area=81,711 sf 0.76% Impervious Runoff Depth=2.59"
Flow Length=592' Tc=8.1 min CN=78 Runoff=5.67 cfs 17,658 cf

Subcatchment 6S: Runoff Area=17,655 sf 0.00% Impervious Runoff Depth=1.93"
Flow Length=213' Tc=6.2 min CN=70 Runoff=0.98 cfs 2,844 cf

Reach DP 1: Towards Offsite West Inflow=2.95 cfs 9,502 cf
Outflow=2.95 cfs 9,502 cf

Reach DP 2: Towards Offsite North Inflow=2.95 cfs 15,695 cf
Outflow=2.95 cfs 15,695 cf

Reach DP 3: Towards West Wetland Inflow=3.28 cfs 9,800 cf
Outflow=3.28 cfs 9,800 cf

Reach DP 4: Towards East Wetland Inflow=2.45 cfs 8,716 cf
Outflow=2.45 cfs 8,716 cf

Reach DP 5: Towards Offsite Northwest Inflow=3.27 cfs 9,397 cf
Outflow=3.27 cfs 9,397 cf

Reach DP 6: Towards Offsite East Inflow=2.73 cfs 20,502 cf
Outflow=2.73 cfs 20,502 cf

Pond 2P: South West Basin Peak Elev=457.58' Storage=2,504 cf Inflow=3.35 cfs 10,482 cf
10.0" Round Culvert n=0.013 L=14.0' S=0.0100 '/' Outflow=1.60 cfs 10,480 cf

Pond 6P: North East Basin Peak Elev=402.95' Storage=3,385 cf Inflow=5.67 cfs 17,658 cf
Outflow=2.09 cfs 17,658 cf

Total Runoff Area = 319,590 sf Runoff Volume = 73,614 cf Average Runoff Depth = 2.76"
98.61% Pervious = 315,144 sf 1.39% Impervious = 4,446 sf

Summary for Subcatchment 1S:

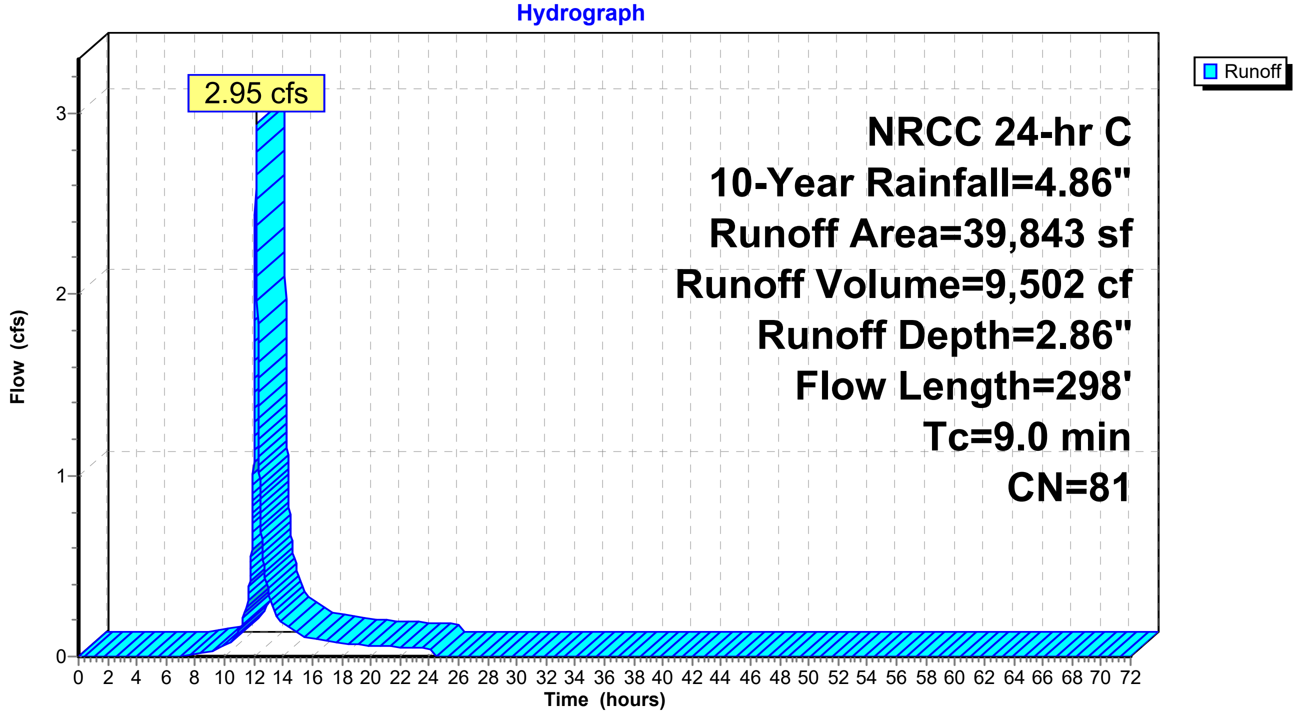
Runoff = 2.95 cfs @ 12.16 hrs, Volume= 9,502 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
13,399	77	Woods, Good, HSG D
1,909	98	Roofs, HSG D
20,826	80	>75% Grass cover, Good, HSG D
2,600	96	Gravel surface, HSG D
1,109	98	Paved parking, HSG D
39,843	81	Weighted Average
36,825		92.43% Pervious Area
3,018		7.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	65	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	59	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	110	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.0	298	Total			

Subcatchment 1S:



Summary for Subcatchment 2A:

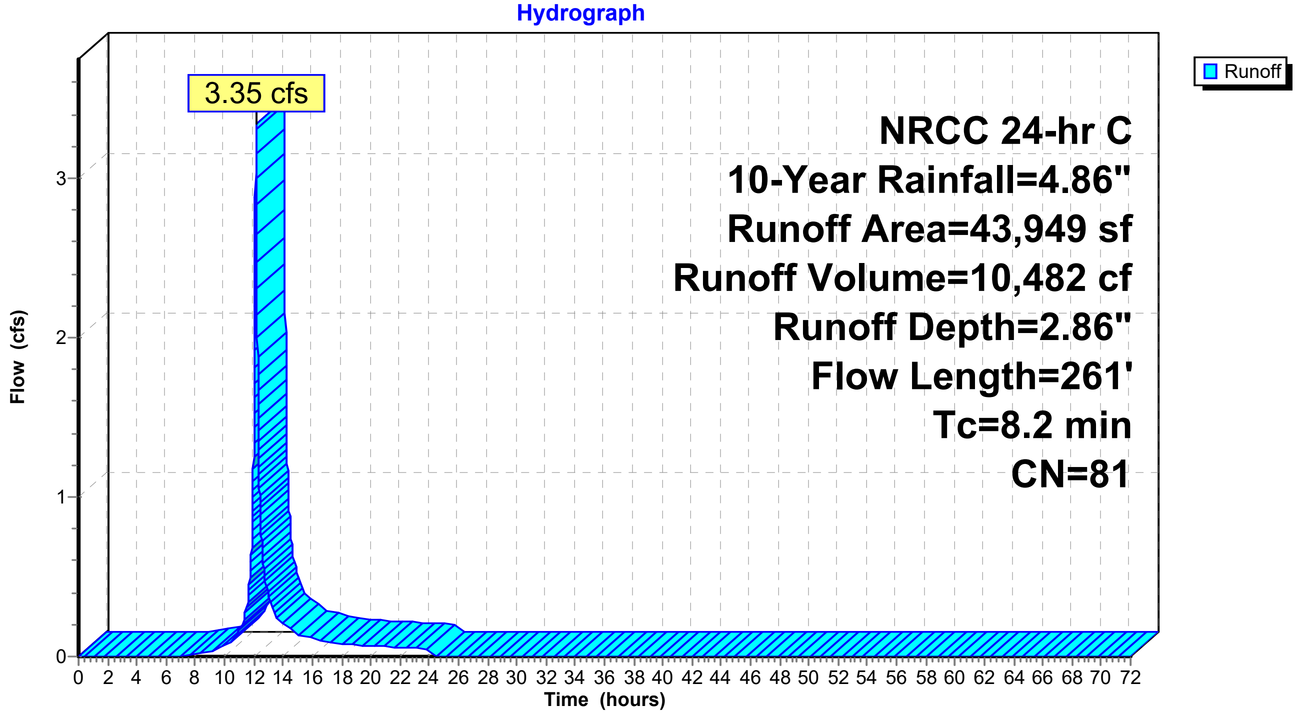
Runoff = 3.35 cfs @ 12.16 hrs, Volume= 10,482 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
17,342	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
20,539	77	Woods, Good, HSG D
5,260	96	Gravel surface, HSG D
43,949	81	Weighted Average
43,141		98.16% Pervious Area
808		1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	76	0.0210	0.72		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	22	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	101	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	261	Total			

Subcatchment 2A:



Summary for Subcatchment 2S:

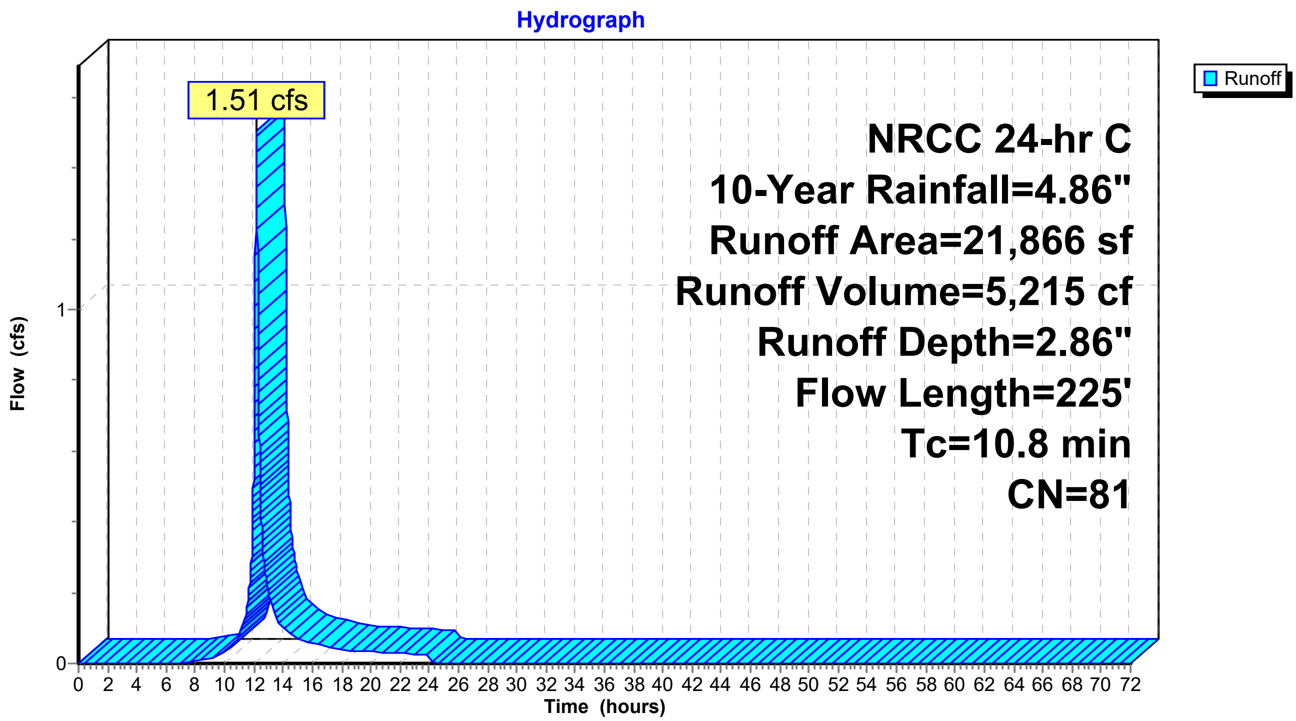
Runoff = 1.51 cfs @ 12.18 hrs, Volume= 5,215 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
12,429	77	Woods, Good, HSG D
2,697	96	Gravel surface, HSG D
6,740	83	Brush, Poor, HSG D
21,866	81	Weighted Average
21,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.2	21	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	154	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.8	225	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

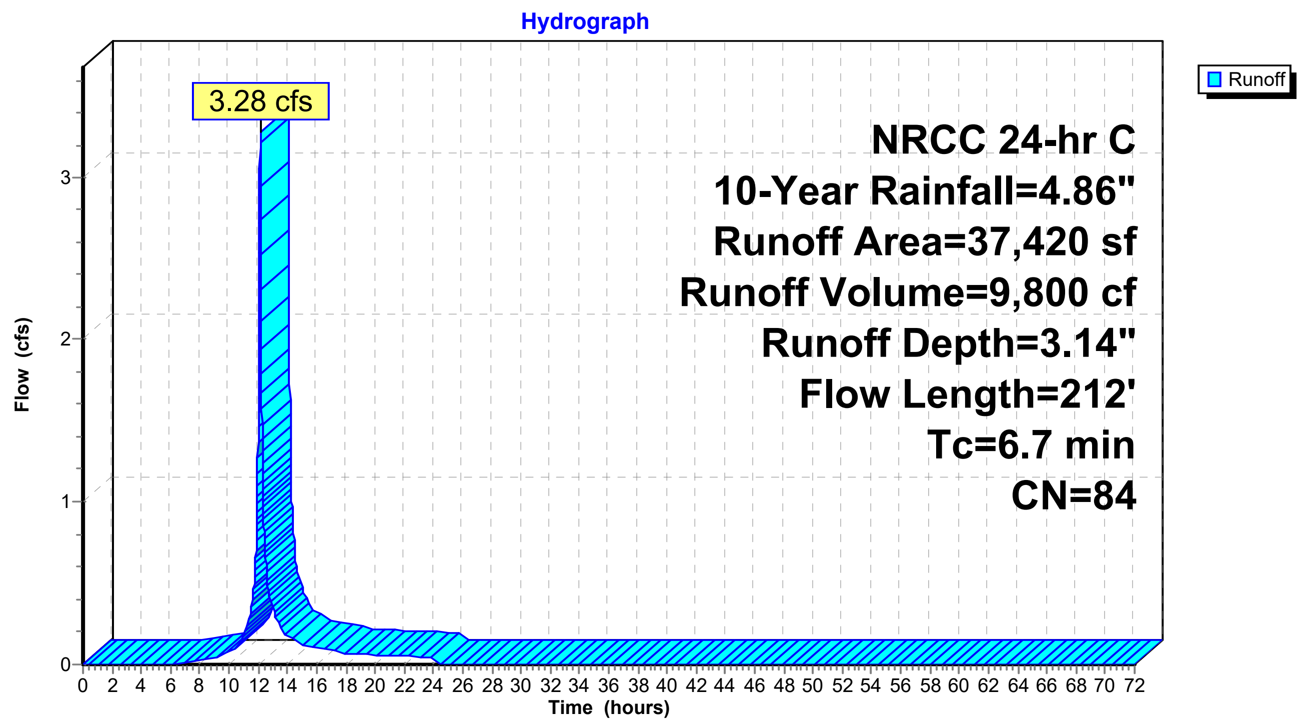
Runoff = 3.28 cfs @ 12.14 hrs, Volume= 9,800 cf, Depth= 3.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
3,709	77	Woods, Good, HSG D
29,820	83	Brush, Poor, HSG D
3,891	96	Gravel surface, HSG D
37,420	84	Weighted Average
37,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

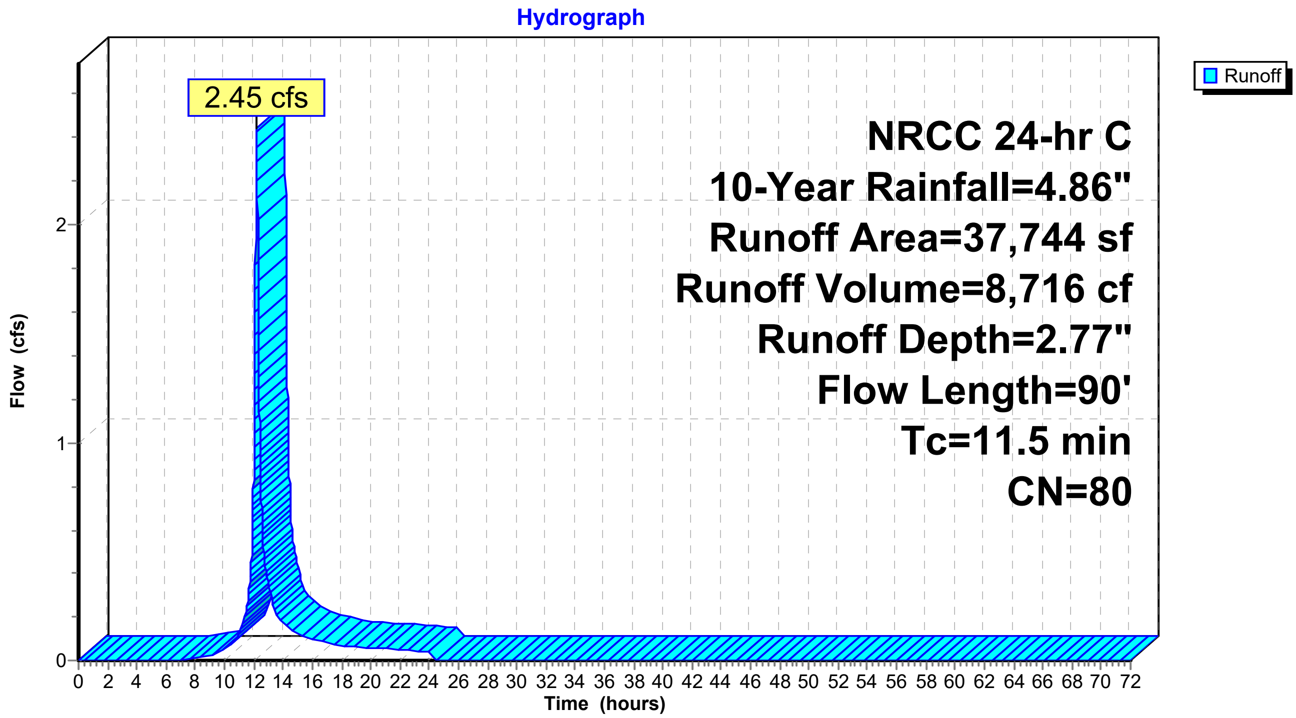
Runoff = 2.45 cfs @ 12.19 hrs, Volume= 8,716 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
14,923	83	Brush, Poor, HSG D
4,794	96	Gravel surface, HSG D
10,680	77	Woods, Good, HSG D
7,347	70	Woods, Good, HSG C
37,744	80	Weighted Average
37,744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	50	0.0240	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	90	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

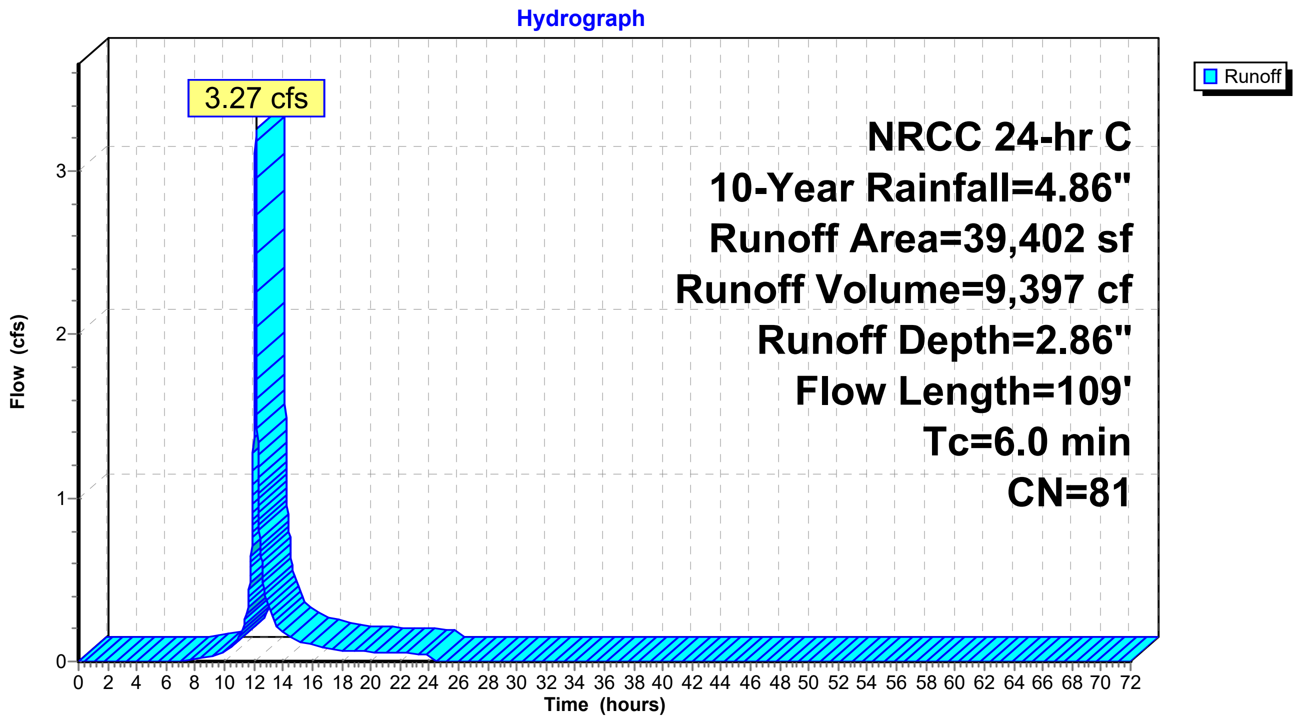
Runoff = 3.27 cfs @ 12.13 hrs, Volume= 9,397 cf, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
23,878	80	>75% Grass cover, Good, HSG D
7,772	77	Woods, Good, HSG D
2,272	70	Woods, Good, HSG C
5,480	96	Gravel surface, HSG D
39,402	81	Weighted Average
39,402		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	44	0.0520	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0530	1.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	109	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S:



Summary for Subcatchment 6A:

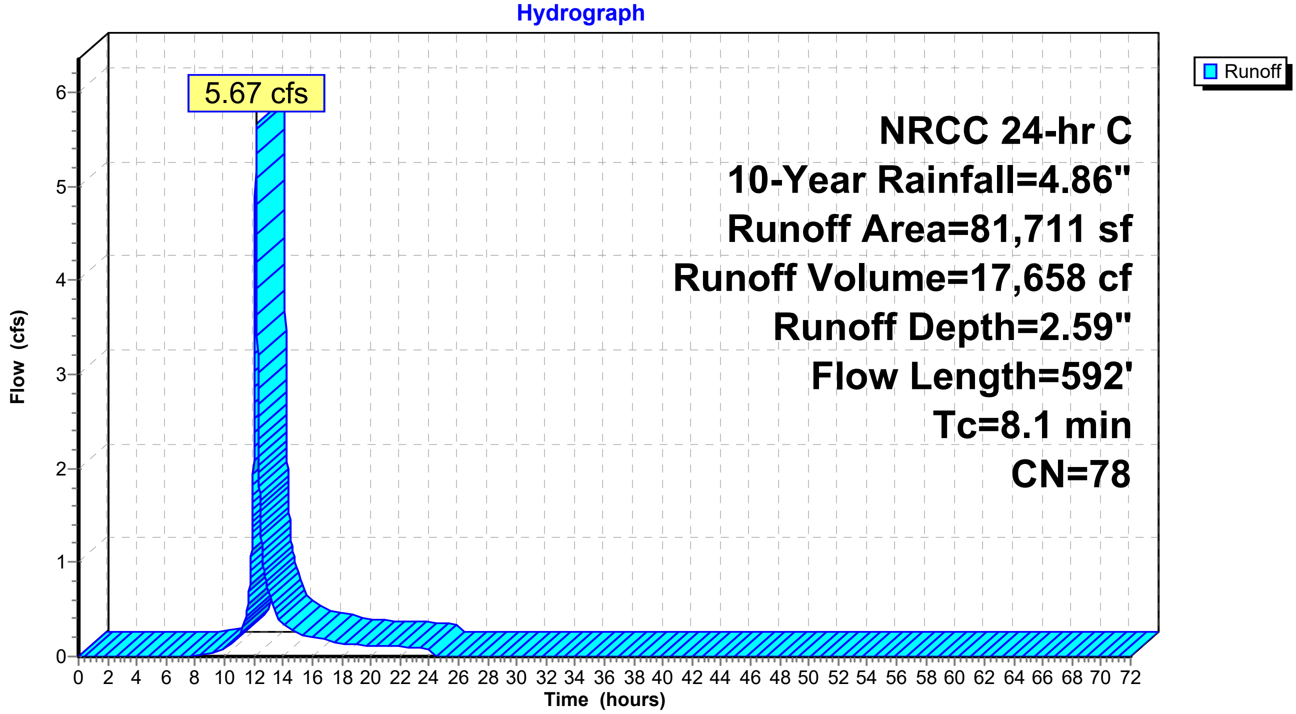
Runoff = 5.67 cfs @ 12.15 hrs, Volume= 17,658 cf, Depth= 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
52,987	80	>75% Grass cover, Good, HSG D
18,864	74	>75% Grass cover, Good, HSG C
1,726	91	Gravel roads, HSG D
620	98	Unconnected pavement, HSG D
1,876	77	Woods, Good, HSG D
5,638	70	Woods, Good, HSG C
81,711	78	Weighted Average
81,091		99.24% Pervious Area
620		0.76% Impervious Area
620		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0623	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
4.7	542	0.0720	1.92	19.79	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 5.6 & 7.0 '/' Top.W=16.60' n= 0.150 Sheet flow over Short Grass
8.1	592	Total			

Subcatchment 6A:



Summary for Subcatchment 6S:

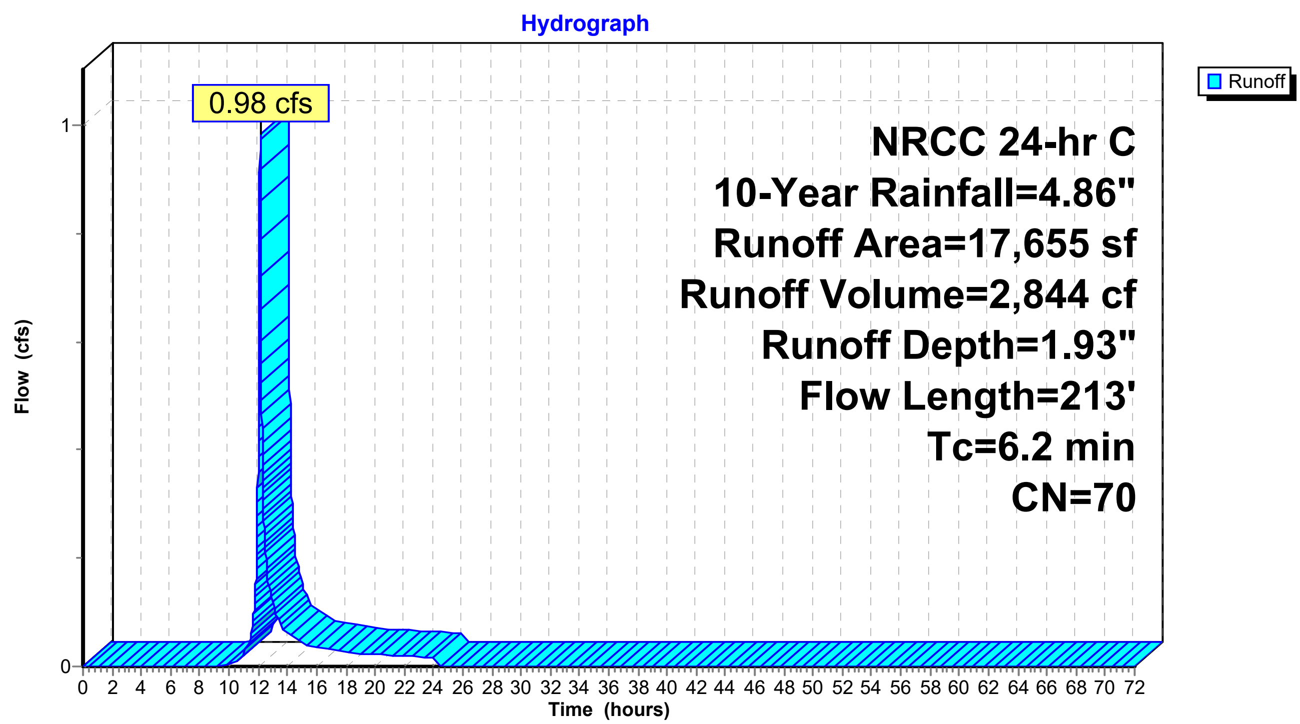
Runoff = 0.98 cfs @ 12.14 hrs, Volume= 2,844 cf, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.86"

Area (sf)	CN	Description
17,291	70	Woods, Good, HSG C
364	77	Woods, Good, HSG D
17,655	70	Weighted Average
17,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1670	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.5	88	0.1670	2.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	21	0.2130	2.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	54	0.0935	2.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	213	Total			

Subcatchment 6S:



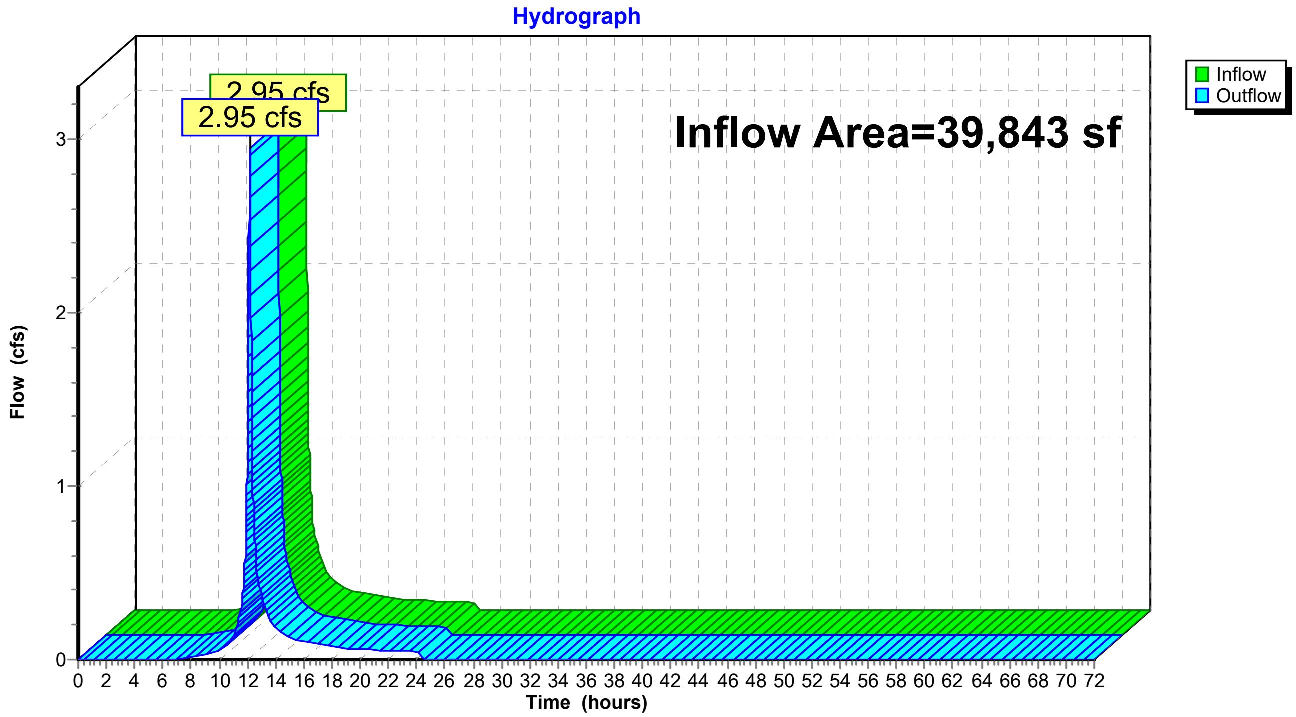
Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	39,843 sf,	7.57% Impervious,	Inflow Depth = 2.86"	for 10-Year event
Inflow =	2.95 cfs @	12.16 hrs, Volume=	9,502 cf	
Outflow =	2.95 cfs @	12.16 hrs, Volume=	9,502 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 1: Towards Offsite West



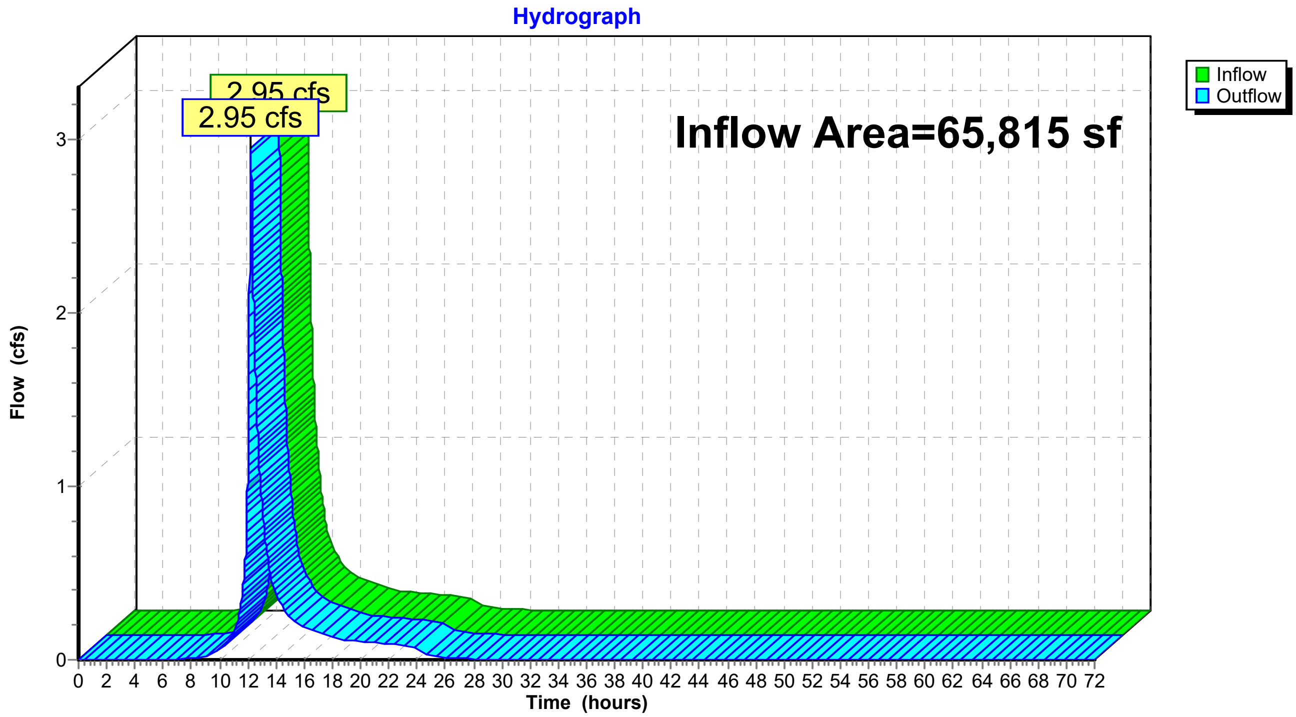
Summary for Reach DP 2: Towards Offsite North

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

Inflow Area = 65,815 sf, 1.23% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 2.95 cfs @ 12.20 hrs, Volume= 15,695 cf
Outflow = 2.95 cfs @ 12.20 hrs, Volume= 15,695 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 2: Towards Offsite North

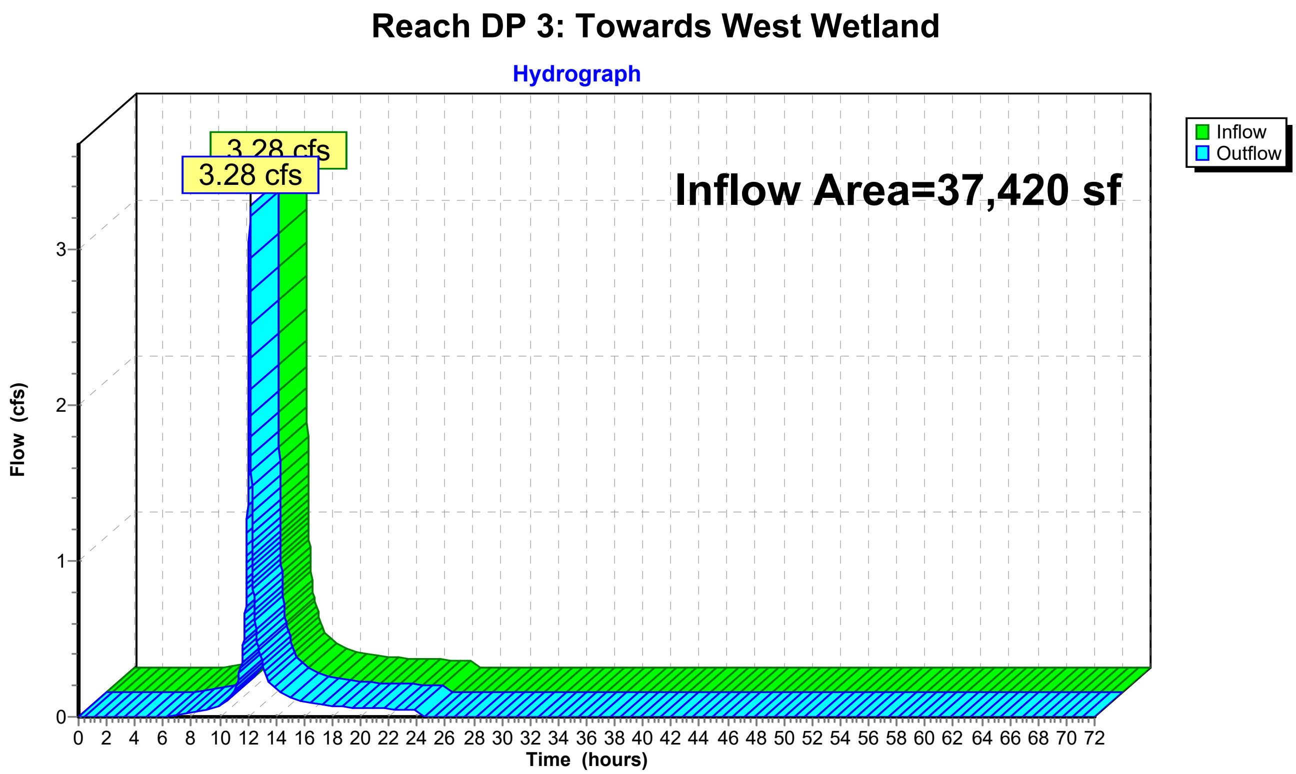


Summary for Reach DP 3: Towards West Wetland

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

Inflow Area =	37,420 sf,	0.00% Impervious,	Inflow Depth = 3.14"	for 10-Year event
Inflow =	3.28 cfs @	12.14 hrs, Volume=	9,800 cf	
Outflow =	3.28 cfs @	12.14 hrs, Volume=	9,800 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



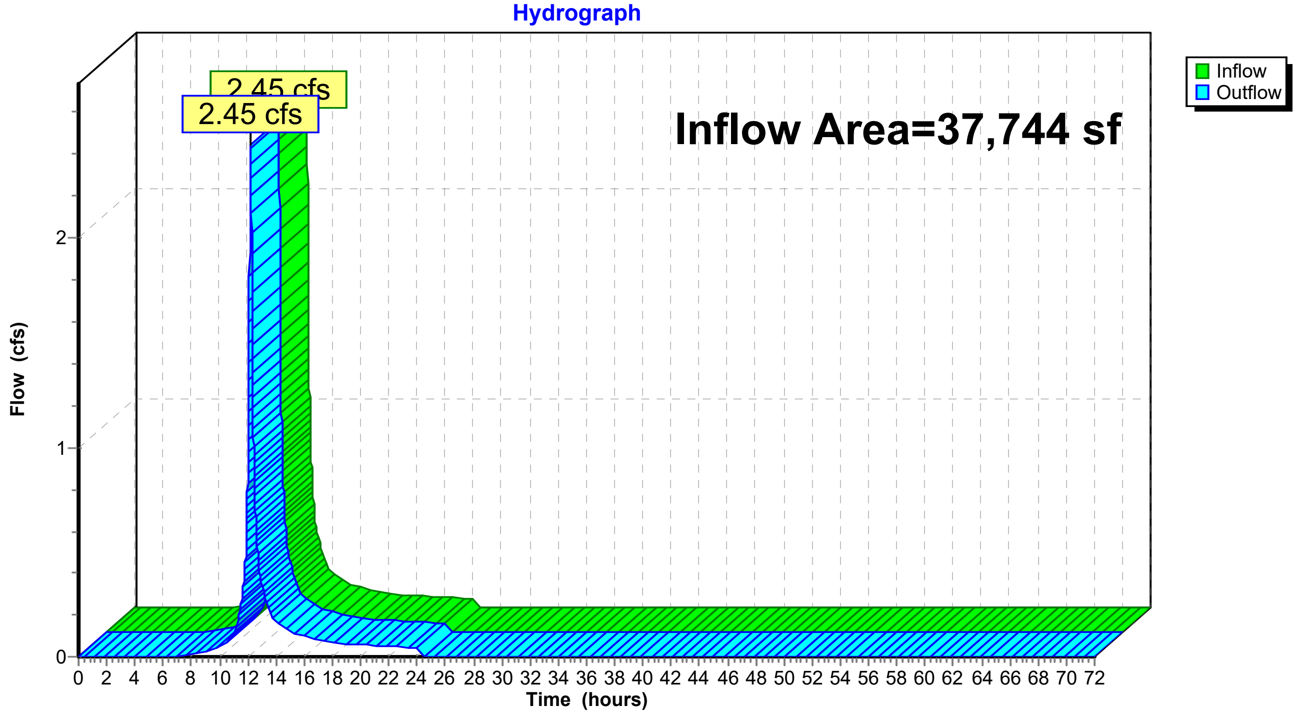
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area = 37,744 sf, 0.00% Impervious, Inflow Depth = 2.77" for 10-Year event
Inflow = 2.45 cfs @ 12.19 hrs, Volume= 8,716 cf
Outflow = 2.45 cfs @ 12.19 hrs, Volume= 8,716 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland



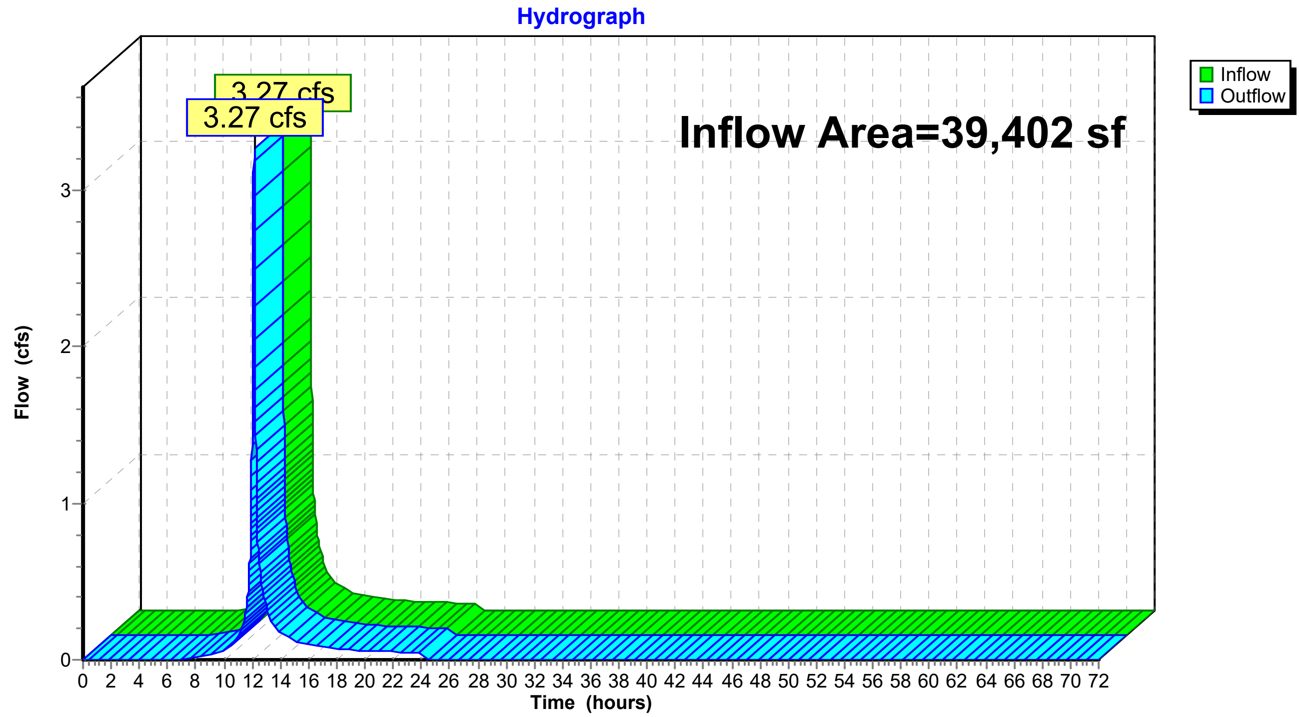
Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area = 39,402 sf, 0.00% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 3.27 cfs @ 12.13 hrs, Volume= 9,397 cf
Outflow = 3.27 cfs @ 12.13 hrs, Volume= 9,397 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 5: Towards Offsite Northwest



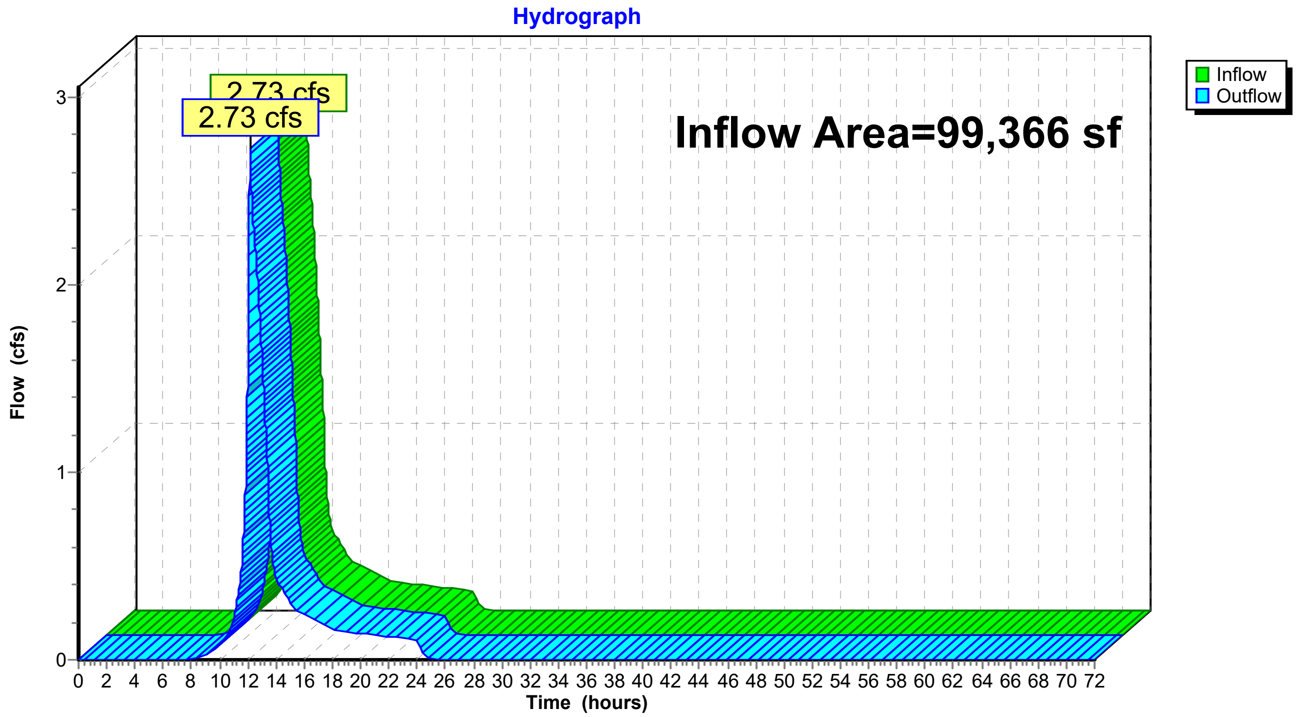
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area = 99,366 sf, 0.62% Impervious, Inflow Depth = 2.48" for 10-Year event
Inflow = 2.73 cfs @ 12.16 hrs, Volume= 20,502 cf
Outflow = 2.73 cfs @ 12.16 hrs, Volume= 20,502 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Summary for Pond 2P: South West Basin

Inflow Area = 43,949 sf, 1.84% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 3.35 cfs @ 12.16 hrs, Volume= 10,482 cf
Outflow = 1.60 cfs @ 12.29 hrs, Volume= 10,480 cf, Atten= 52%, Lag= 7.9 min
Primary = 1.60 cfs @ 12.29 hrs, Volume= 10,480 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 457.58' @ 12.29 hrs Surf.Area= 3,222 sf Storage= 2,504 cf

Plug-Flow detention time= 56.5 min calculated for 10,480 cf (100% of inflow)
Center-of-Mass det. time= 56.4 min (887.6 - 831.2)

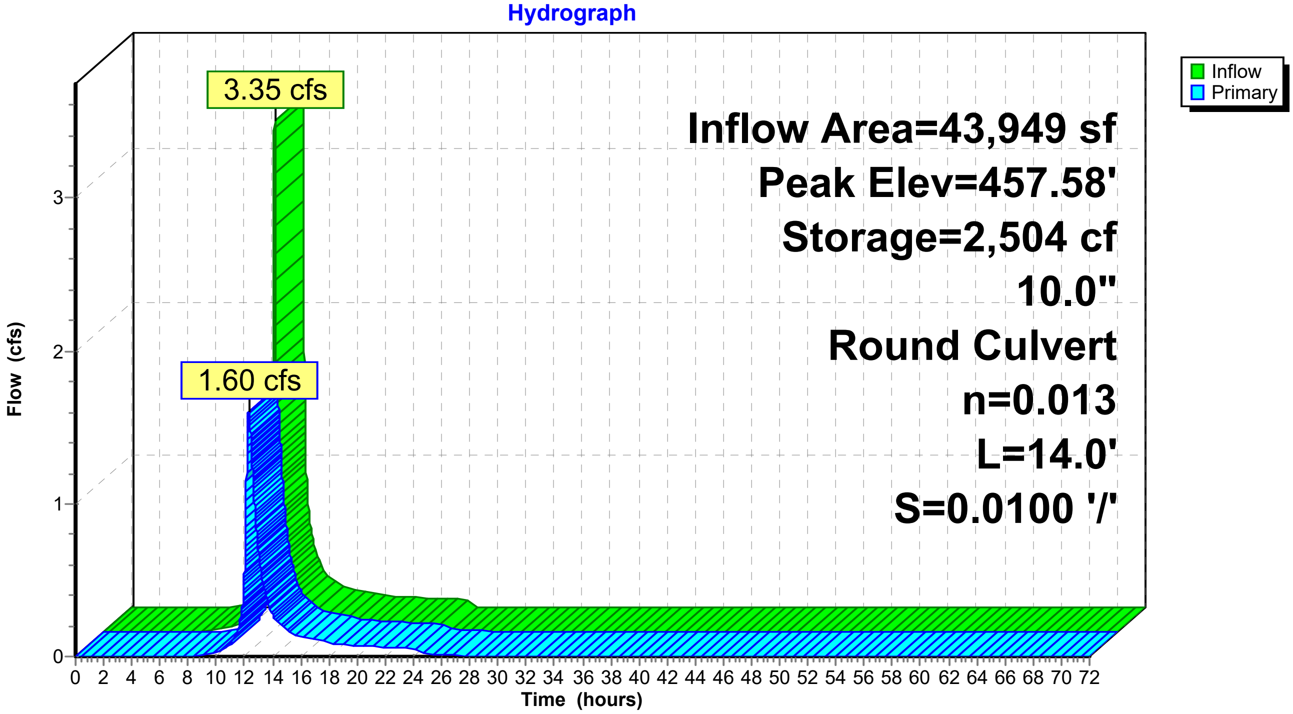
Volume	Invert	Avail.Storage	Storage Description
#1	456.70'	6,701 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.70	2,487	270.0	0	0	2,487
458.70	4,296	320.0	6,701	6,701	4,908

Device	Routing	Invert	Outlet Devices
#1	Primary	456.70'	**10.0" Round ADS Round 10"** L= 14.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 456.70' / 456.56' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=1.60 cfs @ 12.29 hrs HW=457.58' (Free Discharge)
└**1=ADS Round 10"** (Barrel Controls 1.60 cfs @ 3.46 fps)

Pond 2P: South West Basin



Summary for Pond 6P: North East Basin

Inflow Area = 81,711 sf, 0.76% Impervious, Inflow Depth = 2.59" for 10-Year event
Inflow = 5.67 cfs @ 12.15 hrs, Volume= 17,658 cf
Outflow = 2.09 cfs @ 12.34 hrs, Volume= 17,658 cf, Atten= 63%, Lag= 11.3 min
Primary = 2.09 cfs @ 12.34 hrs, Volume= 17,658 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 402.95' @ 12.34 hrs Surf.Area= 3,053 sf Storage= 3,385 cf

Plug-Flow detention time= 16.9 min calculated for 17,656 cf (100% of inflow)
Center-of-Mass det. time= 16.9 min (857.0 - 840.1)

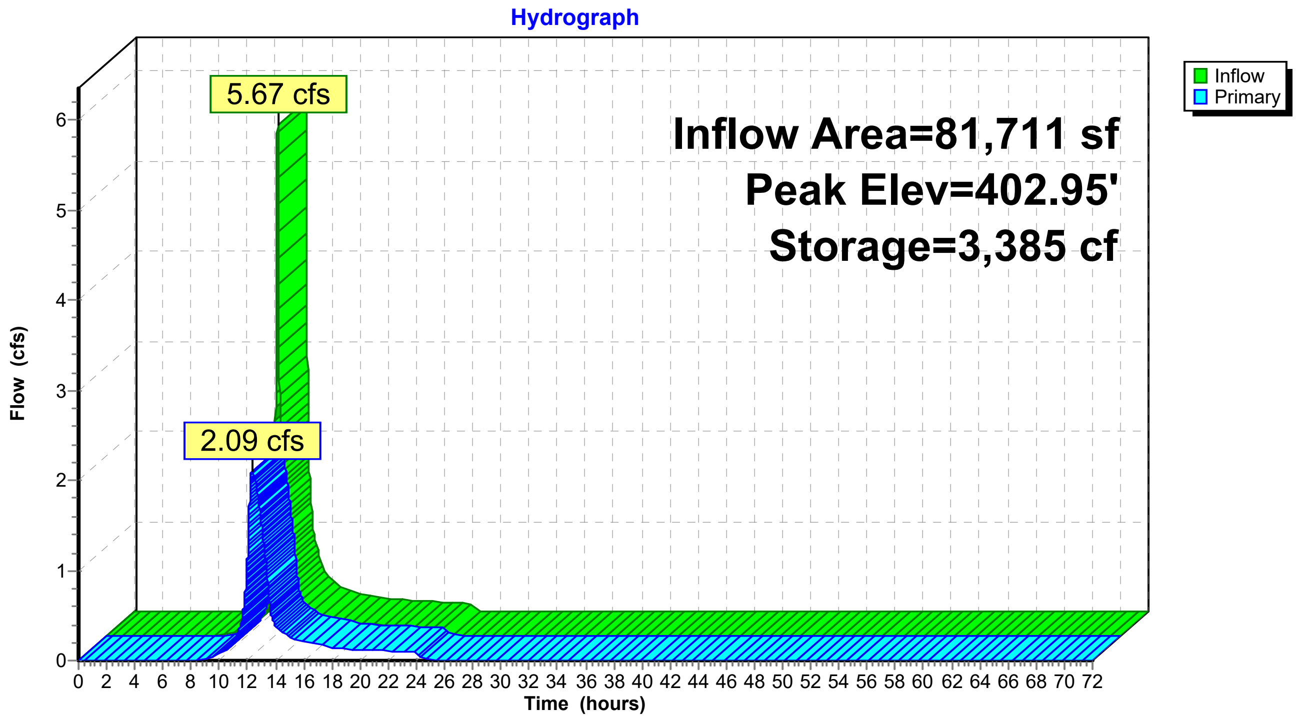
Volume	Invert	Avail.Storage	Storage Description
#1	401.00'	12,521 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
401.00	454	159.0	0	0	454
402.00	1,868	254.0	1,081	1,081	3,583
403.00	3,130	251.0	2,472	3,553	3,863
404.00	4,462	289.0	3,776	7,329	5,518
405.00	5,957	326.0	5,192	12,521	7,355

Device	Routing	Invert	Outlet Devices
#1	Primary	401.00'	**8.0" Round ADS_Round 8"** L= 22.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 401.00' / 400.78' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Primary	404.00'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=2.09 cfs @ 12.34 hrs HW=402.95' (Free Discharge)
├─**1=ADS_Round 8"** (Barrel Controls 2.09 cfs @ 5.99 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: North East Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S:	Runoff Area=39,843 sf 7.57% Impervious Runoff Depth=4.02" Flow Length=298' Tc=9.0 min CN=81 Runoff=4.10 cfs 13,350 cf
Subcatchment 2A:	Runoff Area=43,949 sf 1.84% Impervious Runoff Depth=4.02" Flow Length=261' Tc=8.2 min CN=81 Runoff=4.65 cfs 14,725 cf
Subcatchment 2S:	Runoff Area=21,866 sf 0.00% Impervious Runoff Depth=4.02" Flow Length=225' Tc=10.8 min CN=81 Runoff=2.10 cfs 7,326 cf
Subcatchment 3S:	Runoff Area=37,420 sf 0.00% Impervious Runoff Depth=4.34" Flow Length=212' Tc=6.7 min CN=84 Runoff=4.46 cfs 13,524 cf
Subcatchment 4S:	Runoff Area=37,744 sf 0.00% Impervious Runoff Depth=3.92" Flow Length=90' Tc=11.5 min CN=80 Runoff=3.43 cfs 12,320 cf
Subcatchment 5S:	Runoff Area=39,402 sf 0.00% Impervious Runoff Depth=4.02" Flow Length=109' Tc=6.0 min CN=81 Runoff=4.53 cfs 13,202 cf
Subcatchment 6A:	Runoff Area=81,711 sf 0.76% Impervious Runoff Depth=3.71" Flow Length=592' Tc=8.1 min CN=78 Runoff=8.06 cfs 25,274 cf
Subcatchment 6S:	Runoff Area=17,655 sf 0.00% Impervious Runoff Depth=2.92" Flow Length=213' Tc=6.2 min CN=70 Runoff=1.50 cfs 4,303 cf
Reach DP 1: Towards Offsite West	Inflow=4.10 cfs 13,350 cf Outflow=4.10 cfs 13,350 cf
Reach DP 2: Towards Offsite North	Inflow=4.03 cfs 22,050 cf Outflow=4.03 cfs 22,050 cf
Reach DP 3: Towards West Wetland	Inflow=4.46 cfs 13,524 cf Outflow=4.46 cfs 13,524 cf
Reach DP 4: Towards East Wetland	Inflow=3.43 cfs 12,320 cf Outflow=3.43 cfs 12,320 cf
Reach DP 5: Towards Offsite Northwest	Inflow=4.53 cfs 13,202 cf Outflow=4.53 cfs 13,202 cf
Reach DP 6: Towards Offsite East	Inflow=3.58 cfs 29,577 cf Outflow=3.58 cfs 29,577 cf
Pond 2P: South West Basin	Peak Elev=457.86' Storage=3,430 cf Inflow=4.65 cfs 14,725 cf 10.0" Round Culvert n=0.013 L=14.0' S=0.0100 '/' Outflow=2.07 cfs 14,724 cf
Pond 6P: North East Basin	Peak Elev=403.56' Storage=5,517 cf Inflow=8.06 cfs 25,274 cf Outflow=2.49 cfs 25,274 cf

Total Runoff Area = 319,590 sf Runoff Volume = 104,025 cf Average Runoff Depth = 3.91"
98.61% Pervious = 315,144 sf 1.39% Impervious = 4,446 sf

Summary for Subcatchment 1S:

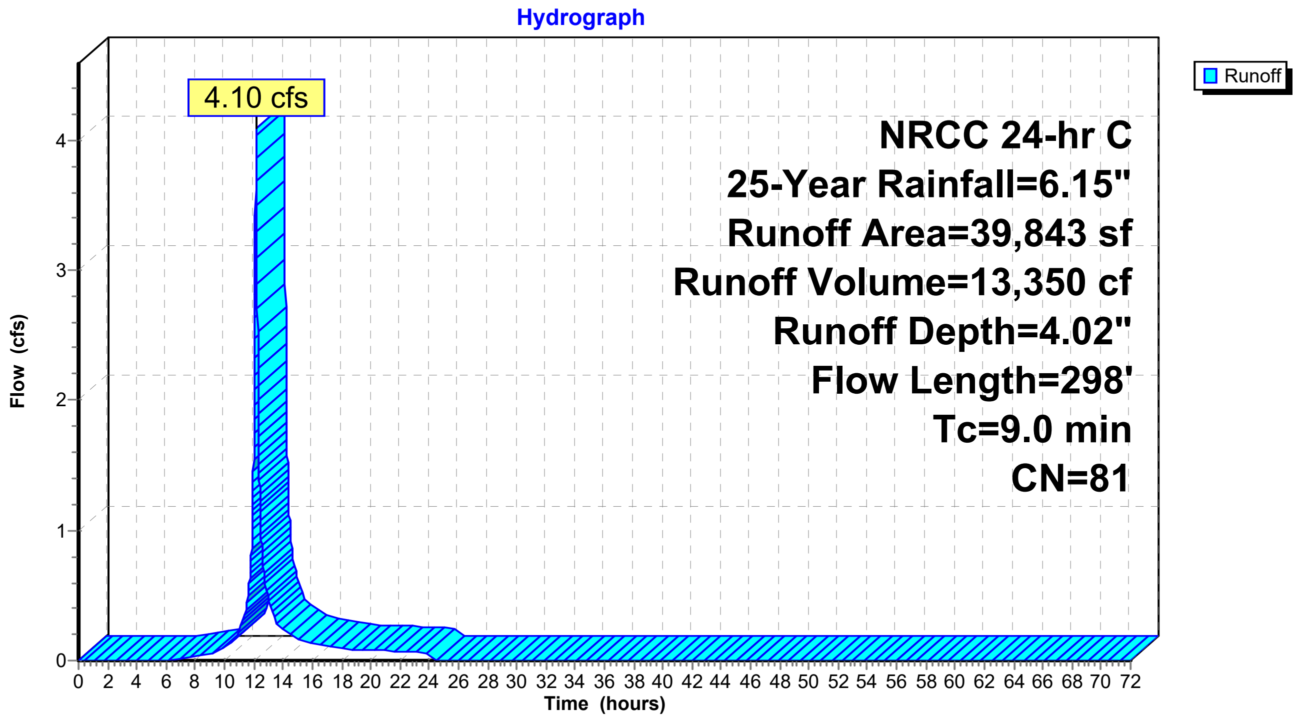
Runoff = 4.10 cfs @ 12.16 hrs, Volume= 13,350 cf, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
13,399	77	Woods, Good, HSG D
1,909	98	Roofs, HSG D
20,826	80	>75% Grass cover, Good, HSG D
2,600	96	Gravel surface, HSG D
1,109	98	Paved parking, HSG D
39,843	81	Weighted Average
36,825		92.43% Pervious Area
3,018		7.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	65	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	59	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	110	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.0	298	Total			

Subcatchment 1S:



Summary for Subcatchment 2A:

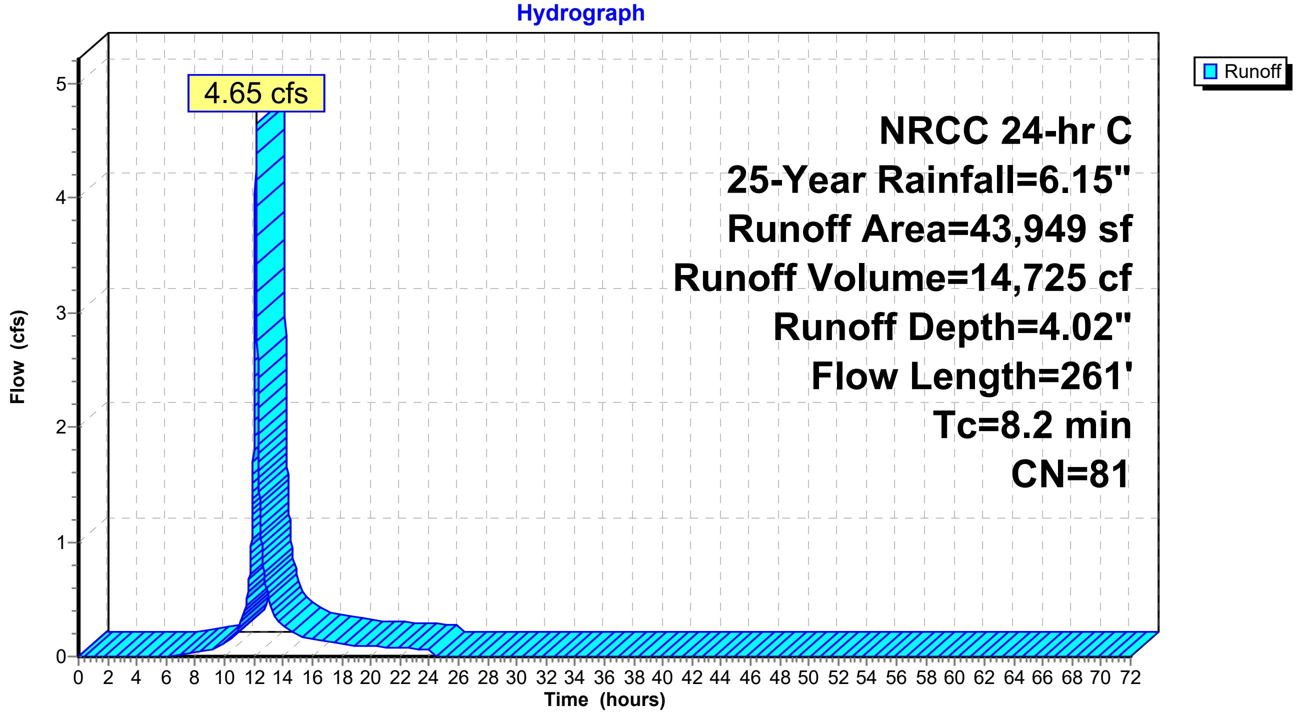
Runoff = 4.65 cfs @ 12.15 hrs, Volume= 14,725 cf, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
17,342	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
20,539	77	Woods, Good, HSG D
5,260	96	Gravel surface, HSG D
43,949	81	Weighted Average
43,141		98.16% Pervious Area
808		1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	76	0.0210	0.72		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	22	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	101	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	261	Total			

Subcatchment 2A:



Summary for Subcatchment 2S:

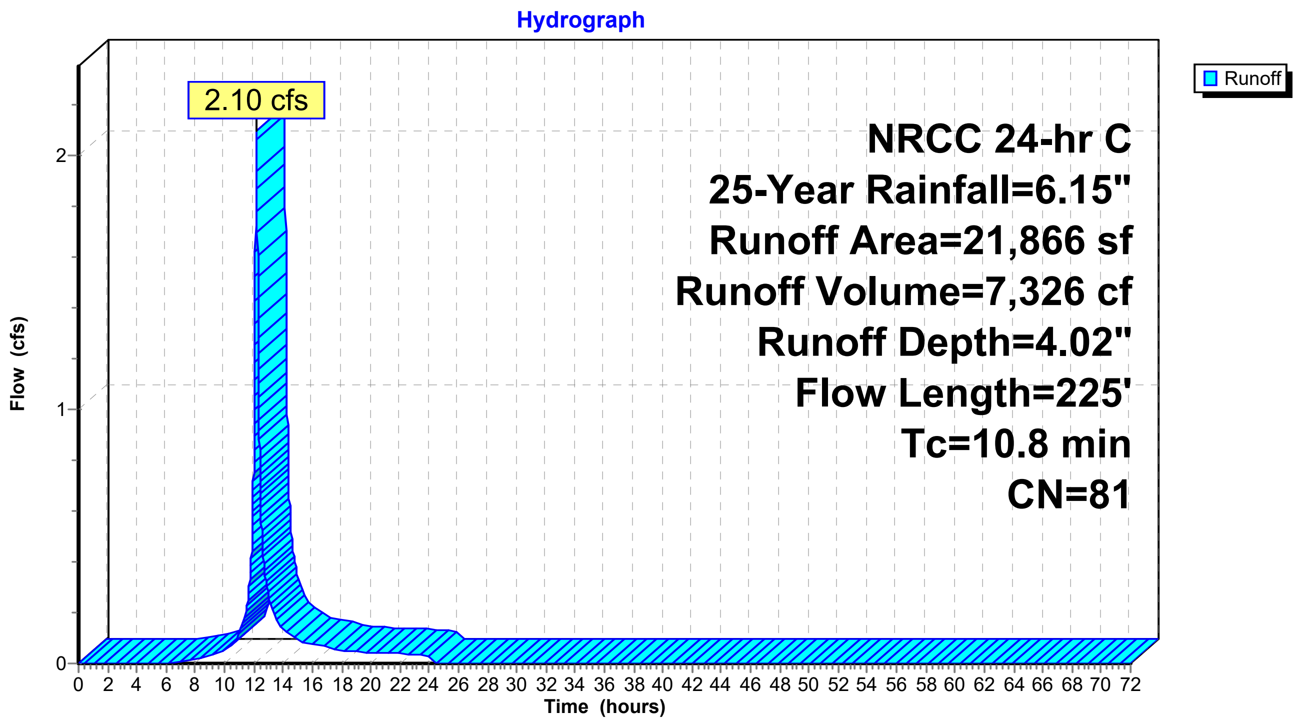
Runoff = 2.10 cfs @ 12.18 hrs, Volume= 7,326 cf, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
12,429	77	Woods, Good, HSG D
2,697	96	Gravel surface, HSG D
6,740	83	Brush, Poor, HSG D
21,866	81	Weighted Average
21,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.2	21	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	154	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.8	225	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

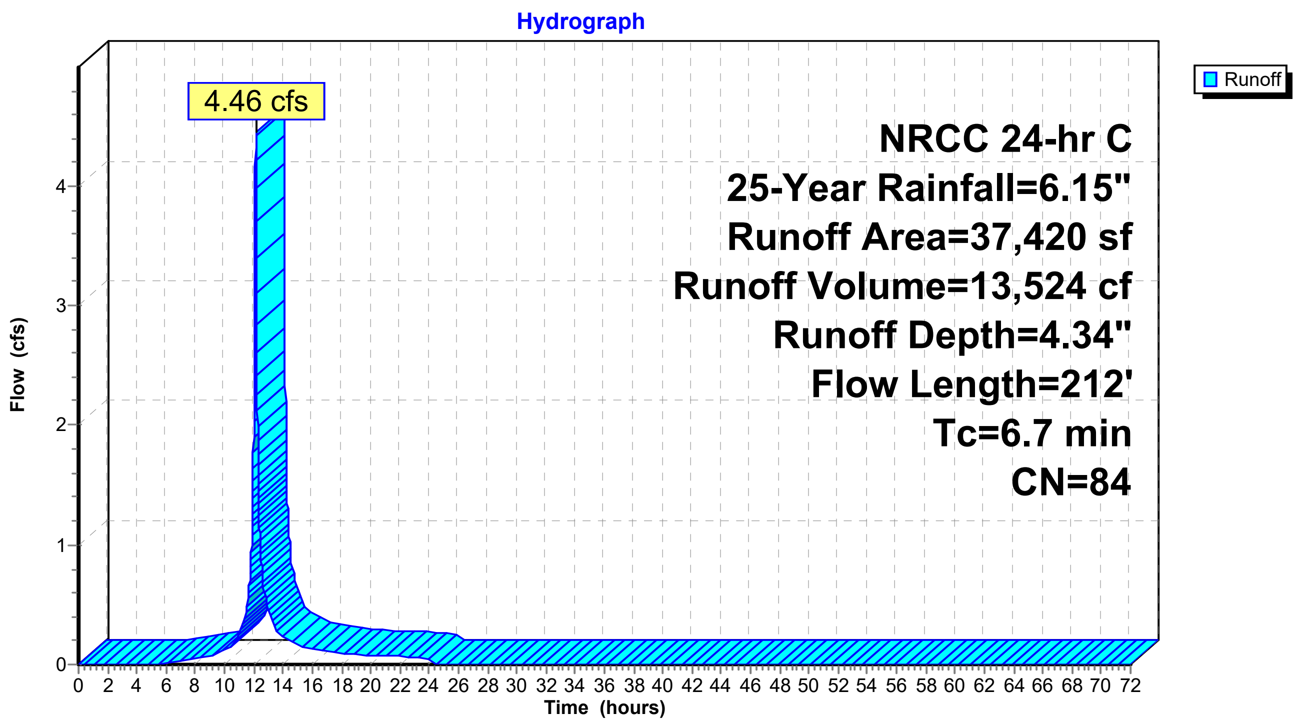
Runoff = 4.46 cfs @ 12.14 hrs, Volume= 13,524 cf, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
3,709	77	Woods, Good, HSG D
29,820	83	Brush, Poor, HSG D
3,891	96	Gravel surface, HSG D
37,420	84	Weighted Average
37,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

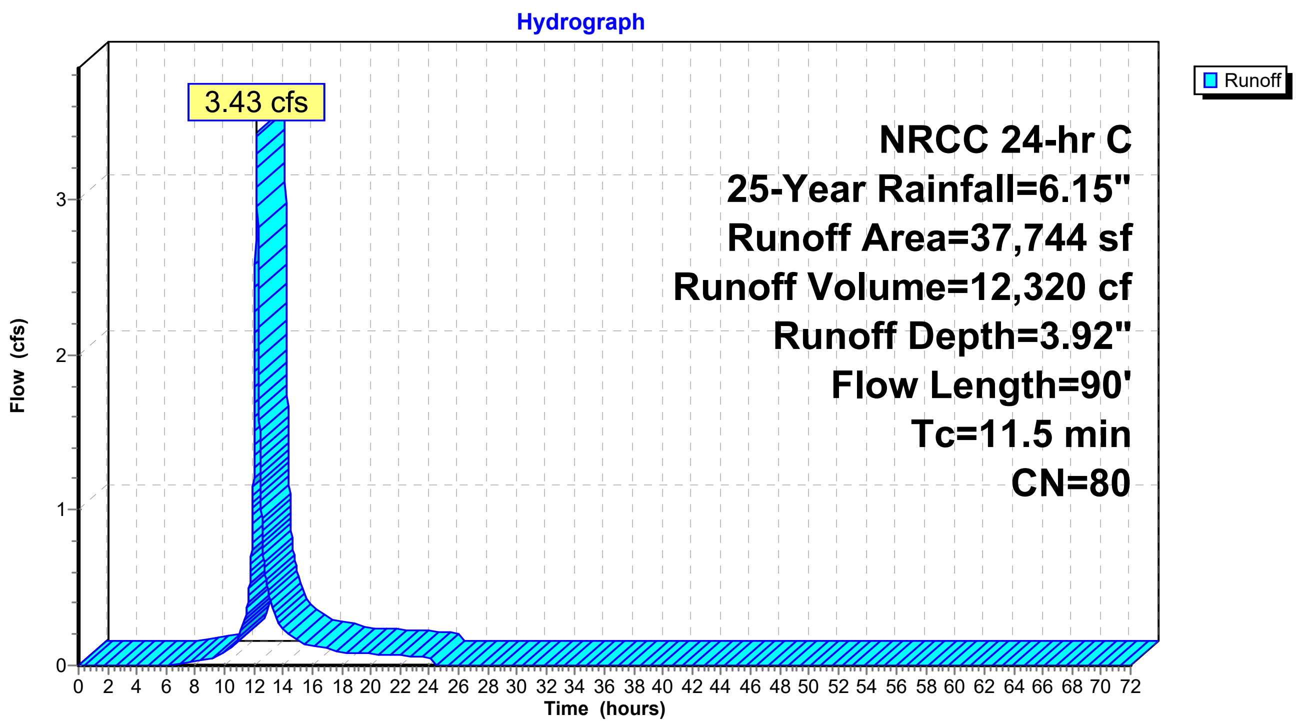
Runoff = 3.43 cfs @ 12.19 hrs, Volume= 12,320 cf, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
14,923	83	Brush, Poor, HSG D
4,794	96	Gravel surface, HSG D
10,680	77	Woods, Good, HSG D
7,347	70	Woods, Good, HSG C
37,744	80	Weighted Average
37,744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	50	0.0240	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	90	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

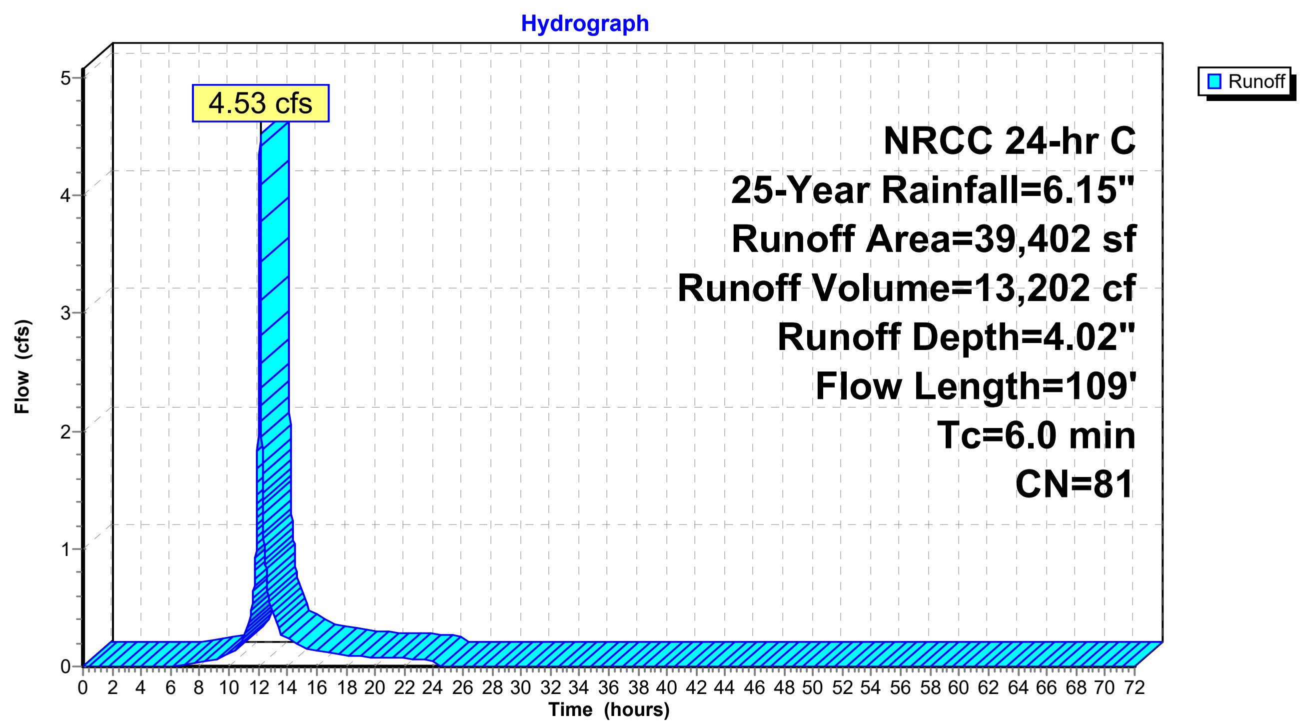
Runoff = 4.53 cfs @ 12.13 hrs, Volume= 13,202 cf, Depth= 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
23,878	80	>75% Grass cover, Good, HSG D
7,772	77	Woods, Good, HSG D
2,272	70	Woods, Good, HSG C
5,480	96	Gravel surface, HSG D
39,402	81	Weighted Average
39,402		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	44	0.0520	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0530	1.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	109	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S:



Summary for Subcatchment 6A:

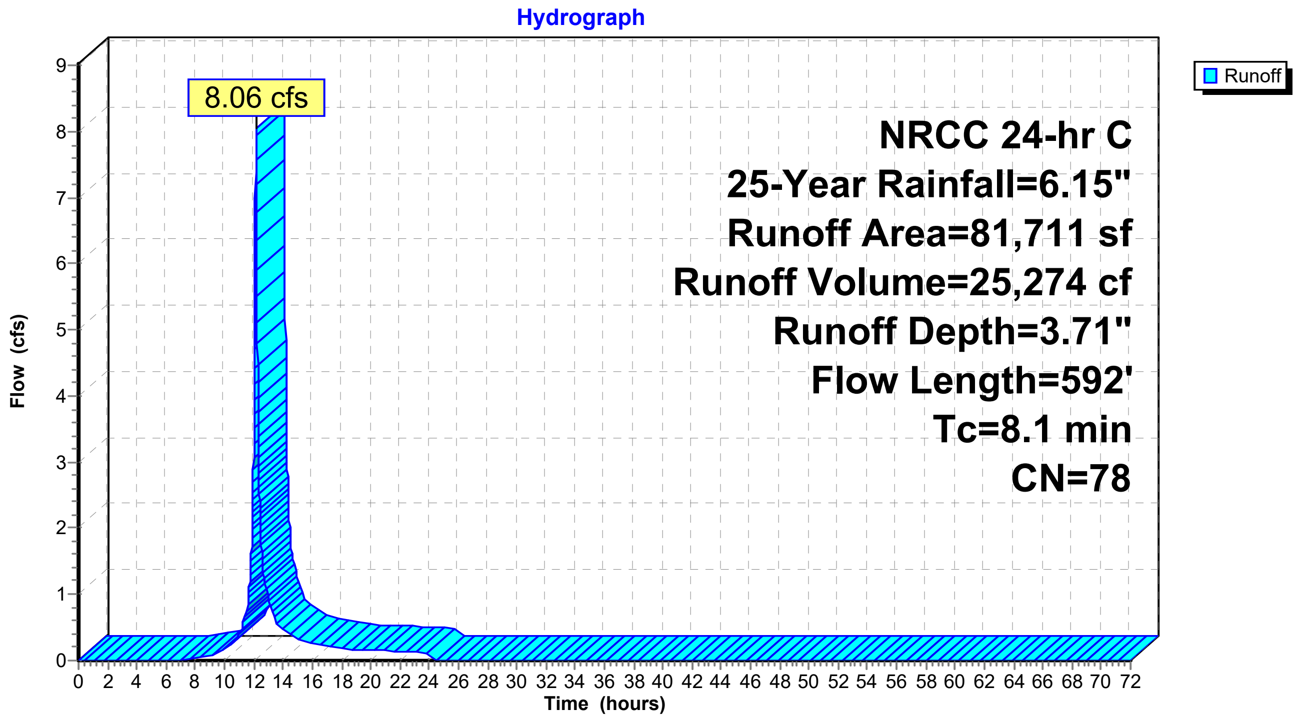
Runoff = 8.06 cfs @ 12.15 hrs, Volume= 25,274 cf, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
52,987	80	>75% Grass cover, Good, HSG D
18,864	74	>75% Grass cover, Good, HSG C
1,726	91	Gravel roads, HSG D
620	98	Unconnected pavement, HSG D
1,876	77	Woods, Good, HSG D
5,638	70	Woods, Good, HSG C
81,711	78	Weighted Average
81,091		99.24% Pervious Area
620		0.76% Impervious Area
620		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0623	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
4.7	542	0.0720	1.92	19.79	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 5.6 & 7.0 '/' Top.W=16.60' n= 0.150 Sheet flow over Short Grass
8.1	592	Total			

Subcatchment 6A:



Summary for Subcatchment 6S:

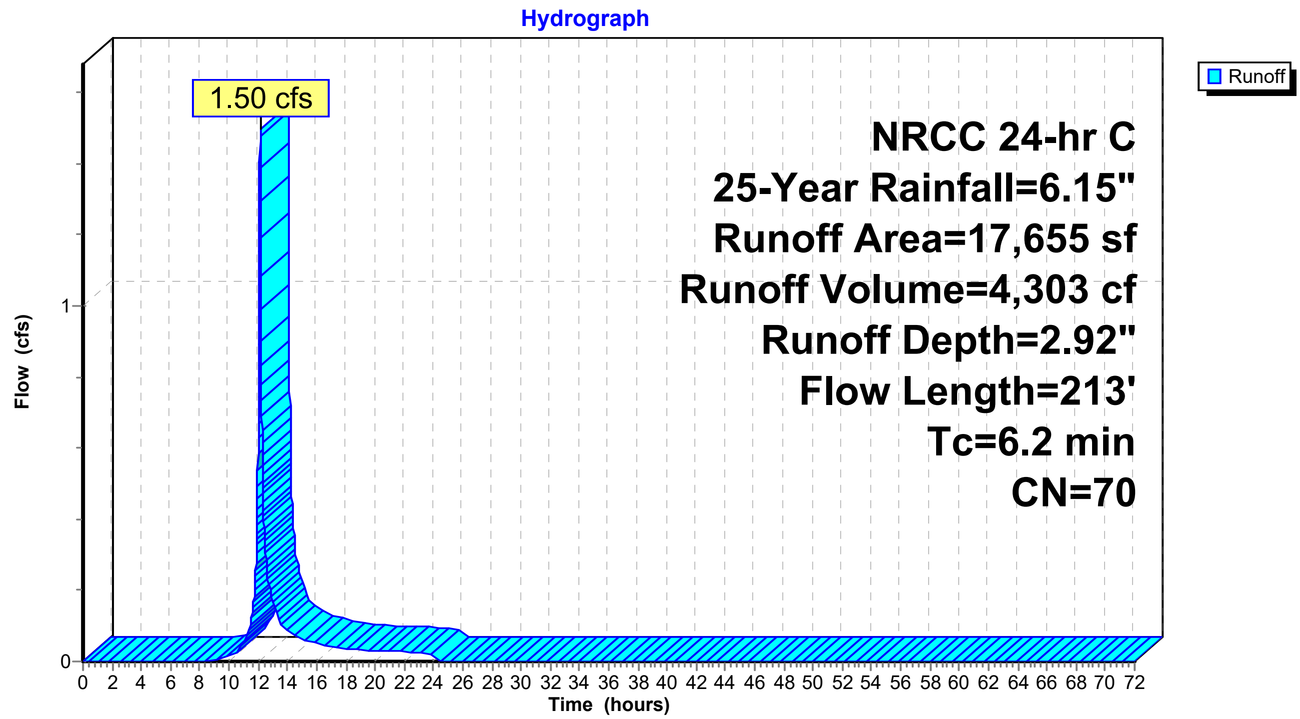
Runoff = 1.50 cfs @ 12.14 hrs, Volume= 4,303 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=6.15"

Area (sf)	CN	Description
17,291	70	Woods, Good, HSG C
364	77	Woods, Good, HSG D
17,655	70	Weighted Average
17,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1670	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.5	88	0.1670	2.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	21	0.2130	2.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	54	0.0935	2.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	213	Total			

Subcatchment 6S:



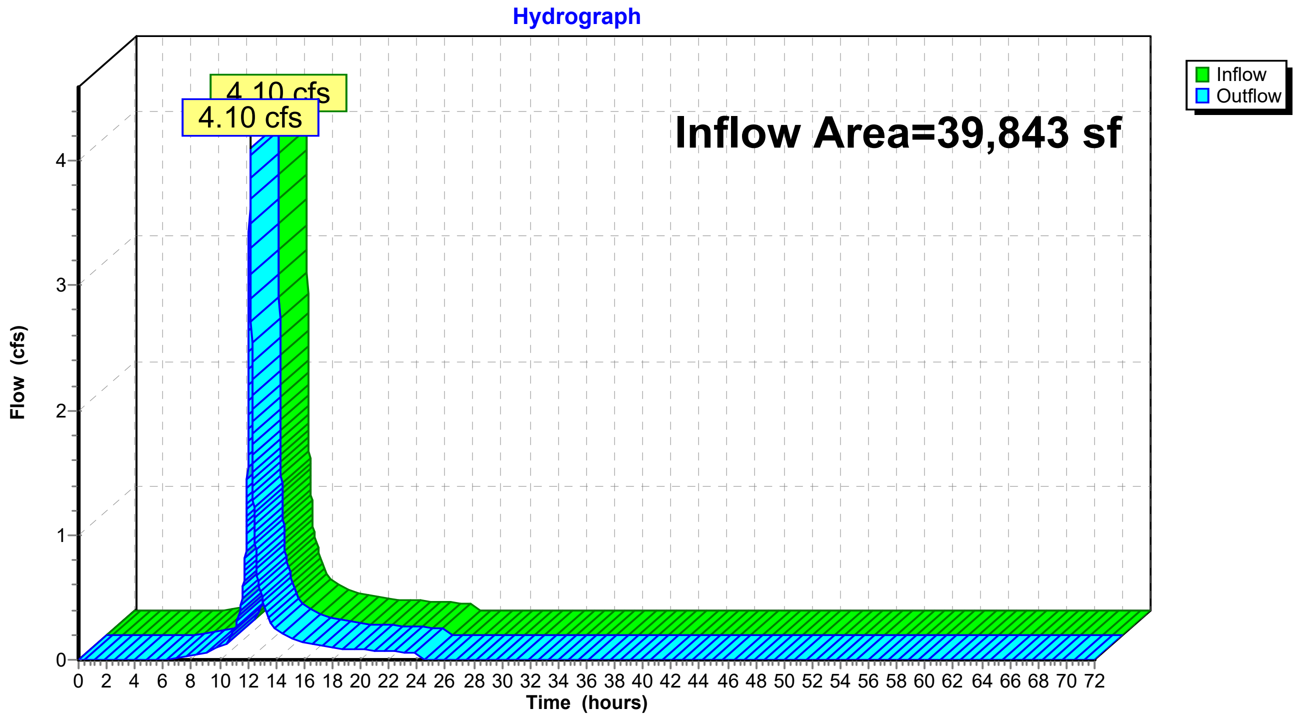
Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	39,843 sf, 7.57% Impervious,	Inflow Depth = 4.02"	for 25-Year event
Inflow =	4.10 cfs @ 12.16 hrs, Volume=	13,350 cf	
Outflow =	4.10 cfs @ 12.16 hrs, Volume=	13,350 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 1: Towards Offsite West

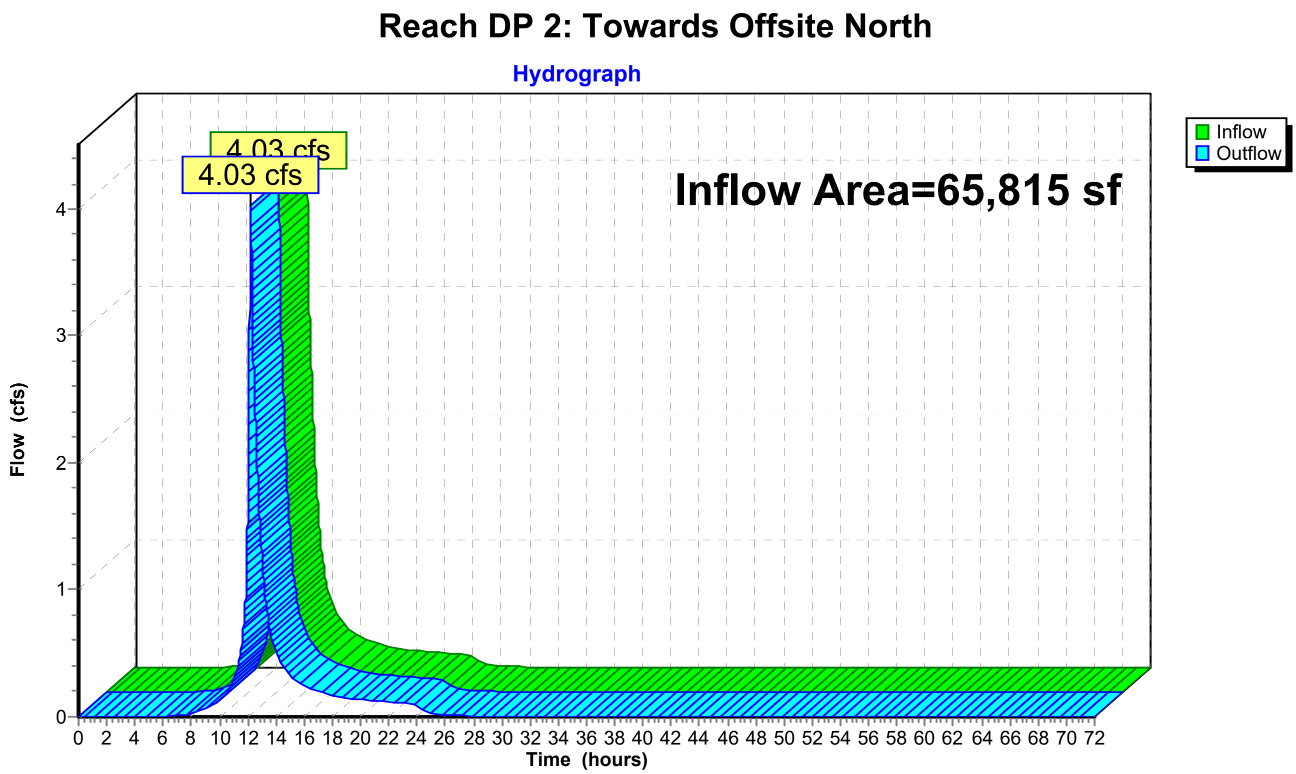


Summary for Reach DP 2: Towards Offsite North

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

Inflow Area =	65,815 sf, 1.23% Impervious,	Inflow Depth = 4.02"	for 25-Year event
Inflow =	4.03 cfs @ 12.19 hrs, Volume=	22,050 cf	
Outflow =	4.03 cfs @ 12.19 hrs, Volume=	22,050 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

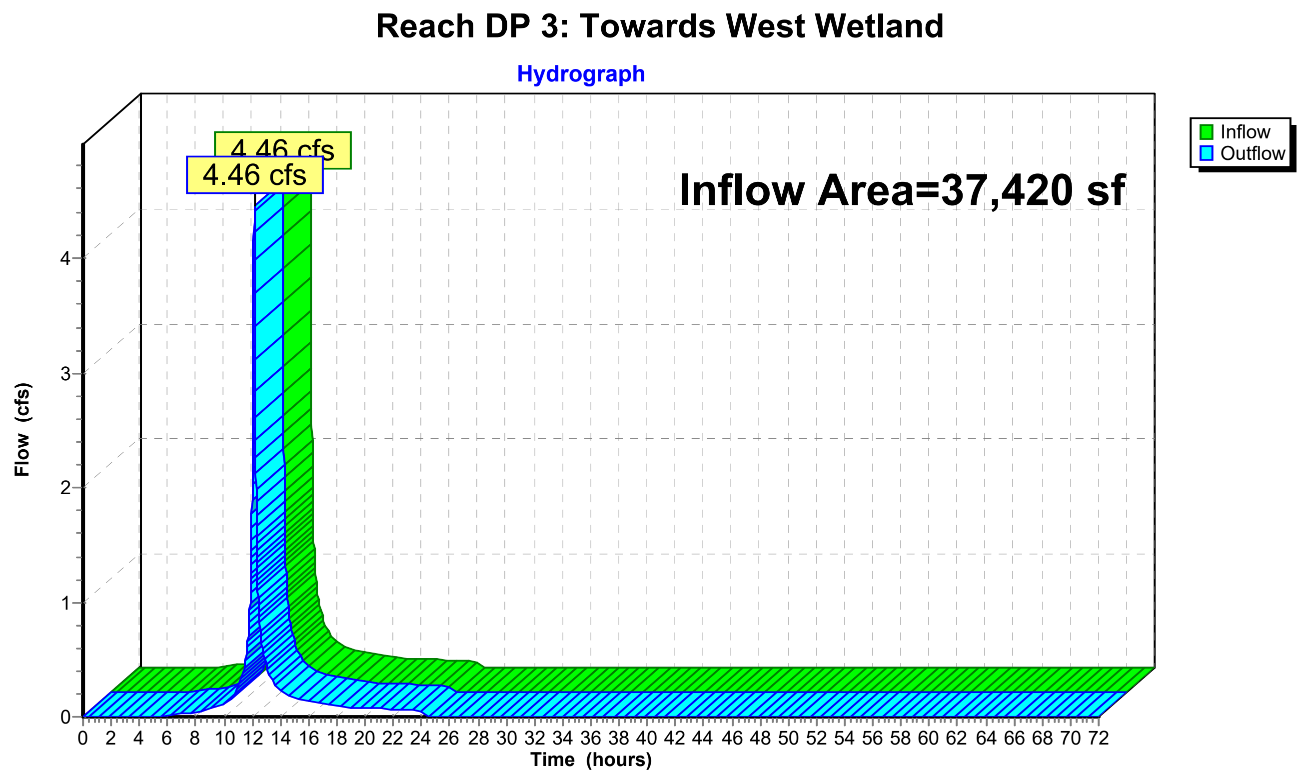


Summary for Reach DP 3: Towards West Wetland

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

Inflow Area =	37,420 sf,	0.00% Impervious, Inflow Depth = 4.34"	for 25-Year event
Inflow =	4.46 cfs @	12.14 hrs, Volume=	13,524 cf
Outflow =	4.46 cfs @	12.14 hrs, Volume=	13,524 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



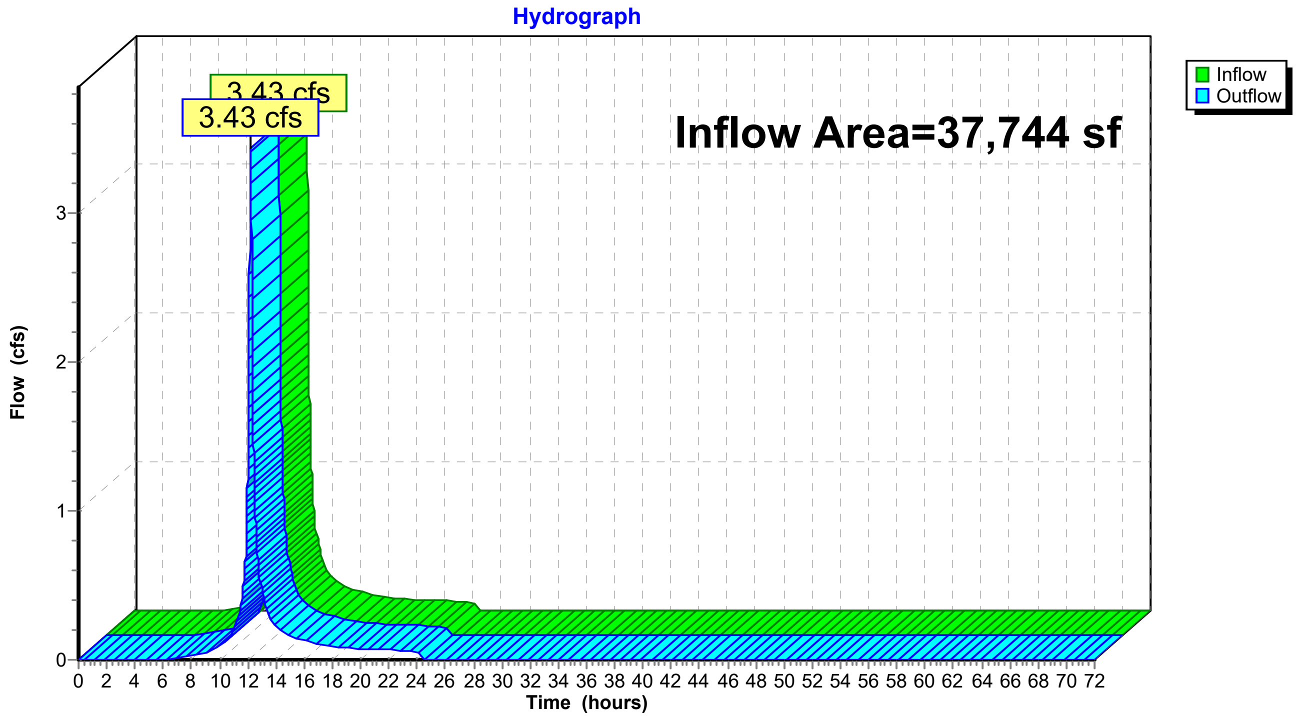
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area = 37,744 sf, 0.00% Impervious, Inflow Depth = 3.92" for 25-Year event
Inflow = 3.43 cfs @ 12.19 hrs, Volume= 12,320 cf
Outflow = 3.43 cfs @ 12.19 hrs, Volume= 12,320 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland

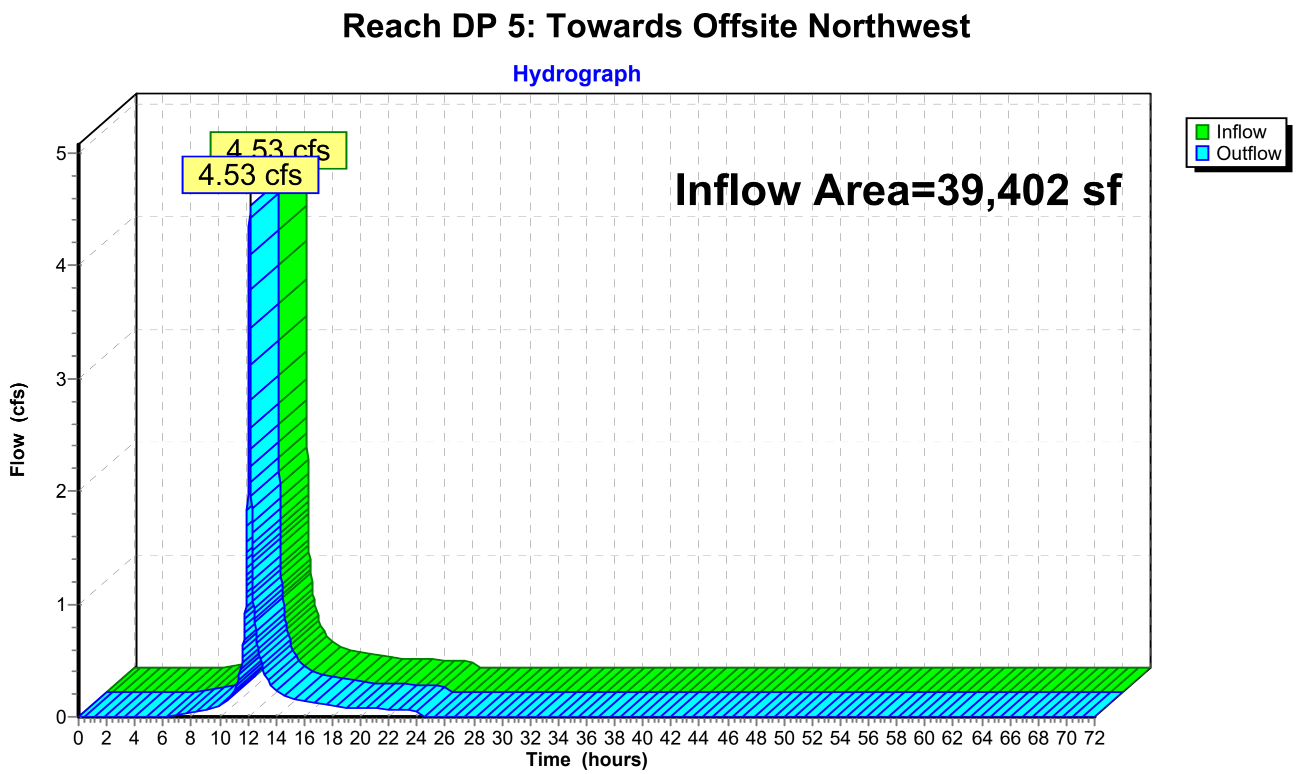


Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area =	39,402 sf,	0.00% Impervious,	Inflow Depth = 4.02"	for 25-Year event
Inflow =	4.53 cfs @	12.13 hrs, Volume=	13,202 cf	
Outflow =	4.53 cfs @	12.13 hrs, Volume=	13,202 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



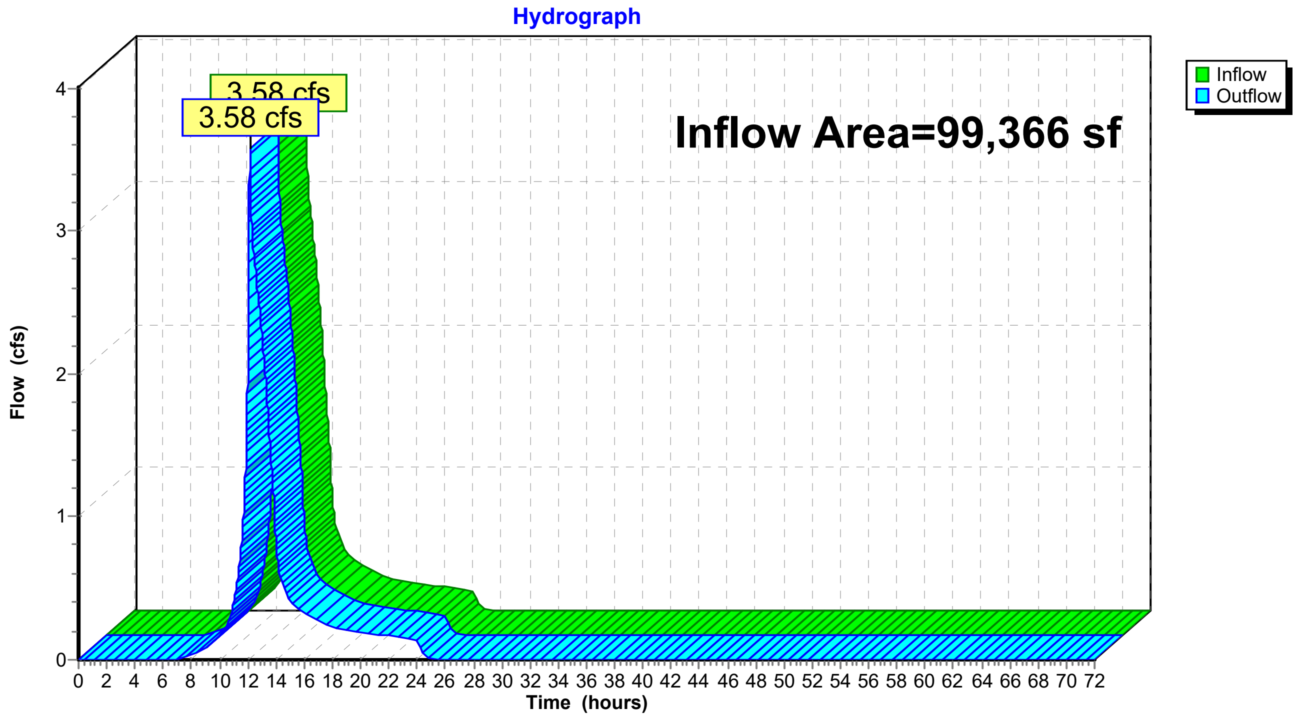
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area = 99,366 sf, 0.62% Impervious, Inflow Depth = 3.57" for 25-Year event
Inflow = 3.58 cfs @ 12.15 hrs, Volume= 29,577 cf
Outflow = 3.58 cfs @ 12.15 hrs, Volume= 29,577 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Summary for Pond 2P: South West Basin

Inflow Area = 43,949 sf, 1.84% Impervious, Inflow Depth = 4.02" for 25-Year event
Inflow = 4.65 cfs @ 12.15 hrs, Volume= 14,725 cf
Outflow = 2.07 cfs @ 12.30 hrs, Volume= 14,724 cf, Atten= 55%, Lag= 8.6 min
Primary = 2.07 cfs @ 12.30 hrs, Volume= 14,724 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 457.86' @ 12.30 hrs Surf.Area= 3,473 sf Storage= 3,430 cf

Plug-Flow detention time= 49.8 min calculated for 14,724 cf (100% of inflow)
Center-of-Mass det. time= 49.7 min (870.2 - 820.5)

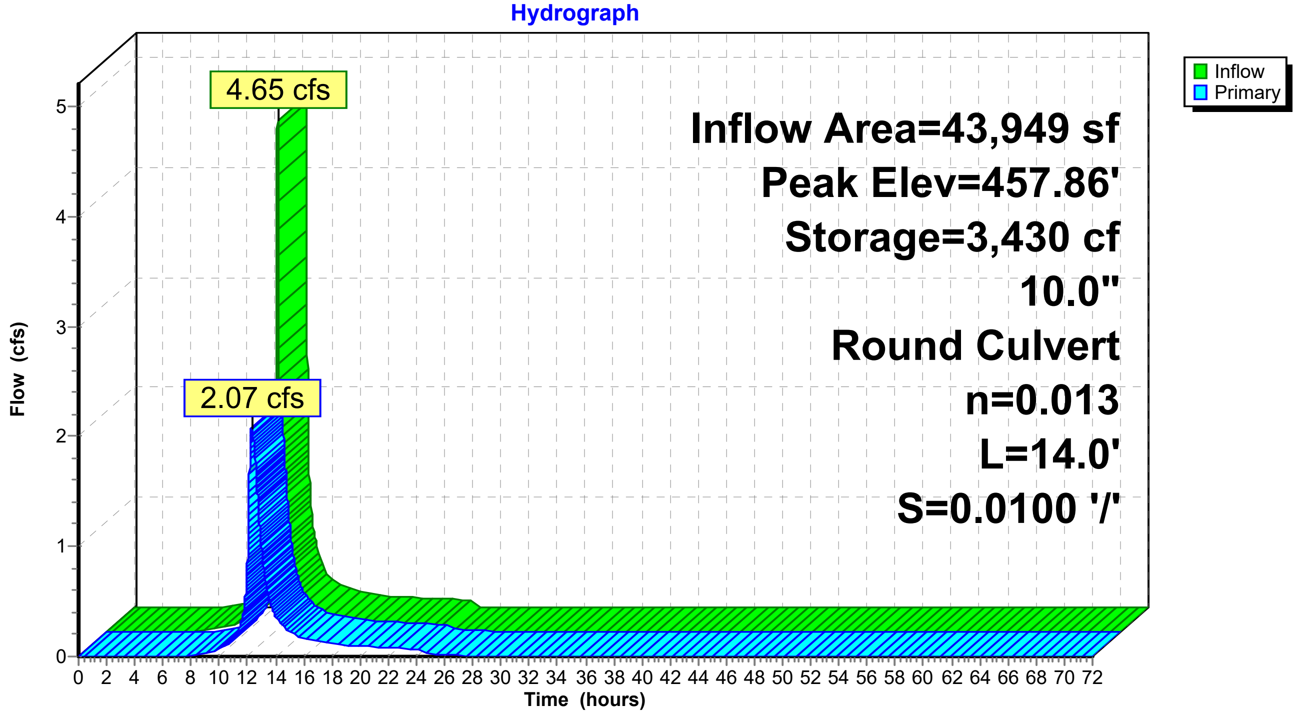
Volume	Invert	Avail.Storage	Storage Description
#1	456.70'	6,701 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.70	2,487	270.0	0	0	2,487
458.70	4,296	320.0	6,701	6,701	4,908

Device	Routing	Invert	Outlet Devices
#1	Primary	456.70'	**10.0" Round ADS Round 10"** L= 14.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 456.70' / 456.56' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=2.07 cfs @ 12.30 hrs HW=457.86' (Free Discharge)
↑—**1=ADS Round 10"** (Barrel Controls 2.07 cfs @ 3.80 fps)

Pond 2P: South West Basin



Summary for Pond 6P: North East Basin

Inflow Area = 81,711 sf, 0.76% Impervious, Inflow Depth = 3.71" for 25-Year event
Inflow = 8.06 cfs @ 12.15 hrs, Volume= 25,274 cf
Outflow = 2.49 cfs @ 12.38 hrs, Volume= 25,274 cf, Atten= 69%, Lag= 13.7 min
Primary = 2.49 cfs @ 12.38 hrs, Volume= 25,274 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 403.56' @ 12.38 hrs Surf.Area= 3,852 sf Storage= 5,517 cf

Plug-Flow detention time= 20.3 min calculated for 25,271 cf (100% of inflow)
Center-of-Mass det. time= 20.3 min (849.1 - 828.8)

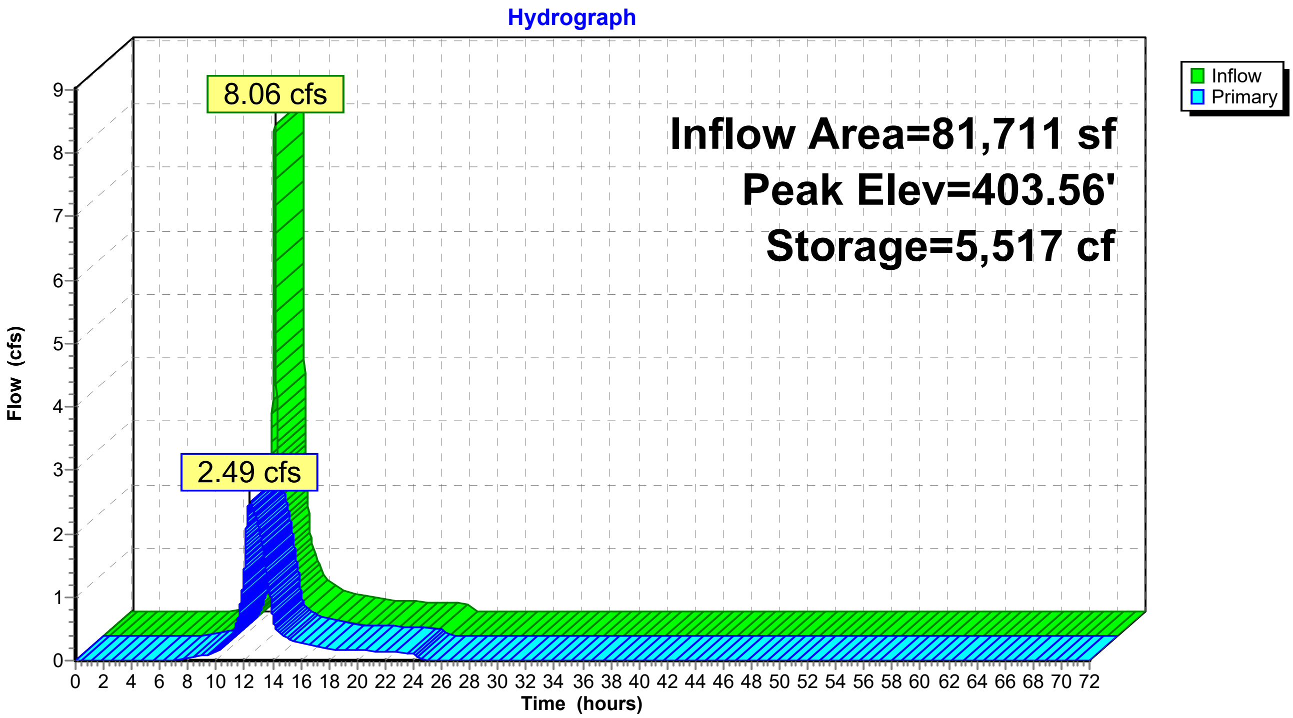
Volume	Invert	Avail.Storage	Storage Description
#1	401.00'	12,521 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
401.00	454	159.0	0	0	454
402.00	1,868	254.0	1,081	1,081	3,583
403.00	3,130	251.0	2,472	3,553	3,863
404.00	4,462	289.0	3,776	7,329	5,518
405.00	5,957	326.0	5,192	12,521	7,355

Device	Routing	Invert	Outlet Devices
#1	Primary	401.00'	**8.0" Round ADS_Round 8"** L= 22.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 401.00' / 400.78' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Primary	404.00'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=2.49 cfs @ 12.38 hrs HW=403.56' (Free Discharge)
├─**1=ADS_Round 8"** (Barrel Controls 2.49 cfs @ 7.12 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: North East Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Runoff Area=39,843 sf 7.57% Impervious Runoff Depth=6.50"
Flow Length=298' Tc=9.0 min CN=81 Runoff=6.48 cfs 21,583 cf

Subcatchment 2A: Runoff Area=43,949 sf 1.84% Impervious Runoff Depth=6.50"
Flow Length=261' Tc=8.2 min CN=81 Runoff=7.35 cfs 23,808 cf

Subcatchment 2S: Runoff Area=21,866 sf 0.00% Impervious Runoff Depth=6.50"
Flow Length=225' Tc=10.8 min CN=81 Runoff=3.32 cfs 11,845 cf

Subcatchment 3S: Runoff Area=37,420 sf 0.00% Impervious Runoff Depth=6.87"
Flow Length=212' Tc=6.7 min CN=84 Runoff=6.88 cfs 21,410 cf

Subcatchment 4S: Runoff Area=37,744 sf 0.00% Impervious Runoff Depth=6.38"
Flow Length=90' Tc=11.5 min CN=80 Runoff=5.48 cfs 20,063 cf

Subcatchment 5S: Runoff Area=39,402 sf 0.00% Impervious Runoff Depth=6.50"
Flow Length=109' Tc=6.0 min CN=81 Runoff=7.15 cfs 21,345 cf

Subcatchment 6A: Runoff Area=81,711 sf 0.76% Impervious Runoff Depth=6.13"
Flow Length=592' Tc=8.1 min CN=78 Runoff=13.07 cfs 41,774 cf

Subcatchment 6S: Runoff Area=17,655 sf 0.00% Impervious Runoff Depth=5.16"
Flow Length=213' Tc=6.2 min CN=70 Runoff=2.62 cfs 7,590 cf

Reach DP 1: Towards Offsite West Inflow=6.48 cfs 21,583 cf
Outflow=6.48 cfs 21,583 cf

Reach DP 2: Towards Offsite North Inflow=6.07 cfs 35,651 cf
Outflow=6.07 cfs 35,651 cf

Reach DP 3: Towards West Wetland Inflow=6.88 cfs 21,410 cf
Outflow=6.88 cfs 21,410 cf

Reach DP 4: Towards East Wetland Inflow=5.48 cfs 20,063 cf
Outflow=5.48 cfs 20,063 cf

Reach DP 5: Towards Offsite Northwest Inflow=7.15 cfs 21,345 cf
Outflow=7.15 cfs 21,345 cf

Reach DP 6: Towards Offsite East Inflow=7.96 cfs 49,364 cf
Outflow=7.96 cfs 49,364 cf

Pond 2P: South West Basin Peak Elev=458.40' Storage=5,473 cf Inflow=7.35 cfs 23,808 cf
10.0" Round Culvert n=0.013 L=14.0' S=0.0100 '/' Outflow=2.98 cfs 23,806 cf

Pond 6P: North East Basin Peak Elev=404.34' Storage=8,927 cf Inflow=13.07 cfs 41,774 cf
Outflow=6.86 cfs 41,774 cf

Total Runoff Area = 319,590 sf Runoff Volume = 169,418 cf Average Runoff Depth = 6.36"
98.61% Pervious = 315,144 sf 1.39% Impervious = 4,446 sf

Summary for Subcatchment 1S:

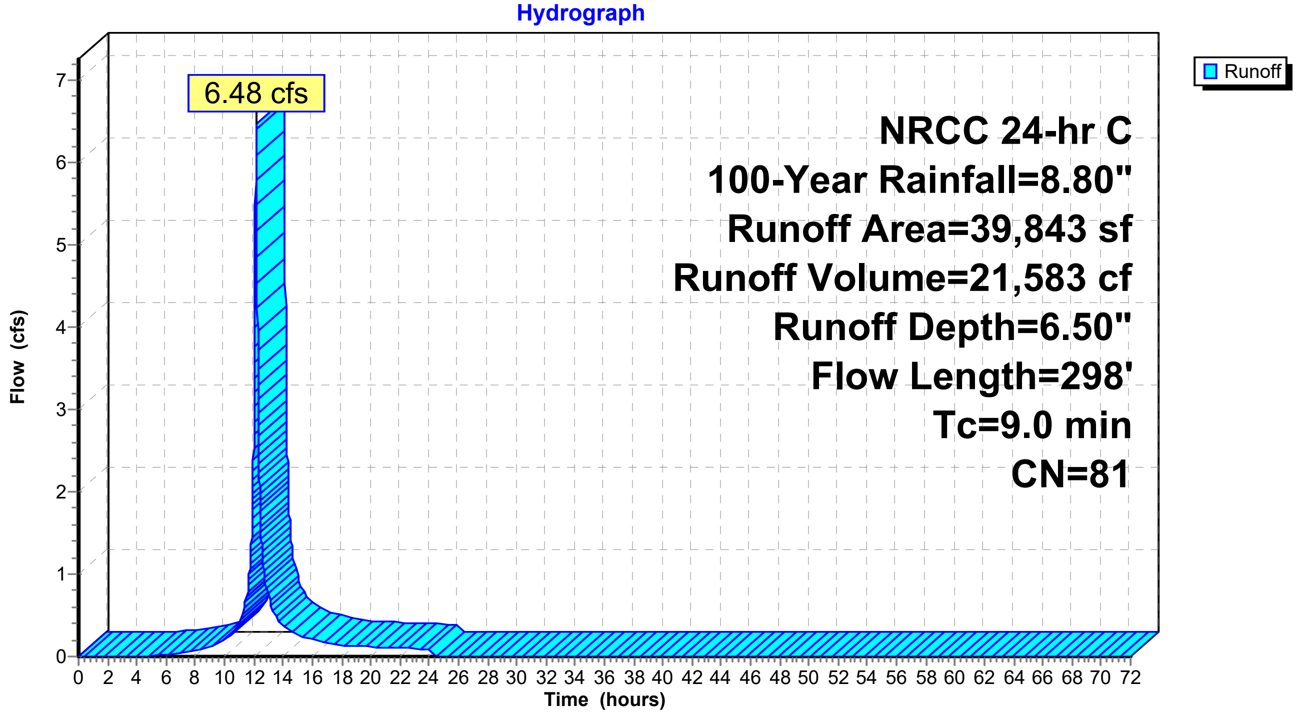
Runoff = 6.48 cfs @ 12.16 hrs, Volume= 21,583 cf, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
13,399	77	Woods, Good, HSG D
1,909	98	Roofs, HSG D
20,826	80	>75% Grass cover, Good, HSG D
2,600	96	Gravel surface, HSG D
1,109	98	Paved parking, HSG D
39,843	81	Weighted Average
36,825		92.43% Pervious Area
3,018		7.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	14	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	65	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	59	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.8	110	0.0170	0.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.0	298	Total			

Subcatchment 1S:



Summary for Subcatchment 2A:

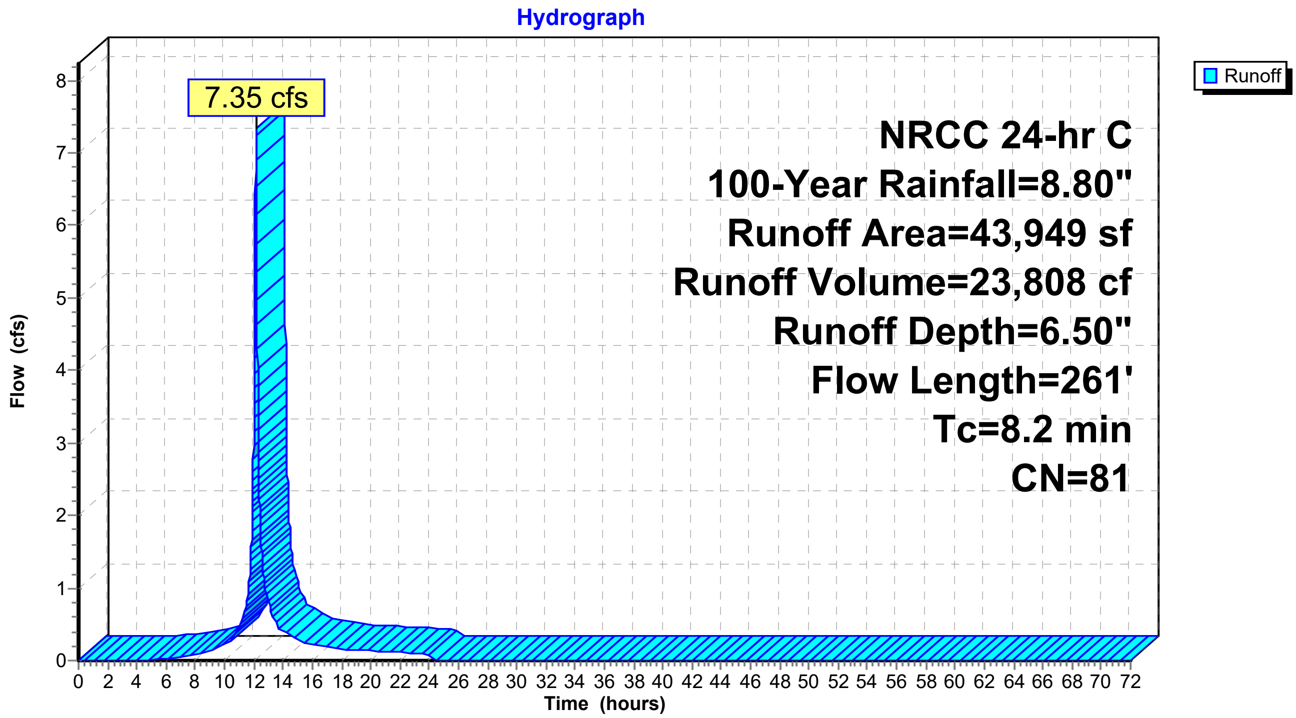
Runoff = 7.35 cfs @ 12.15 hrs, Volume= 23,808 cf, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
17,342	80	>75% Grass cover, Good, HSG D
808	98	Roofs, HSG D
20,539	77	Woods, Good, HSG D
5,260	96	Gravel surface, HSG D
43,949	81	Weighted Average
43,141		98.16% Pervious Area
808		1.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0280	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	12	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	76	0.0210	0.72		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	22	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	101	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	261	Total			

Subcatchment 2A:



Summary for Subcatchment 2S:

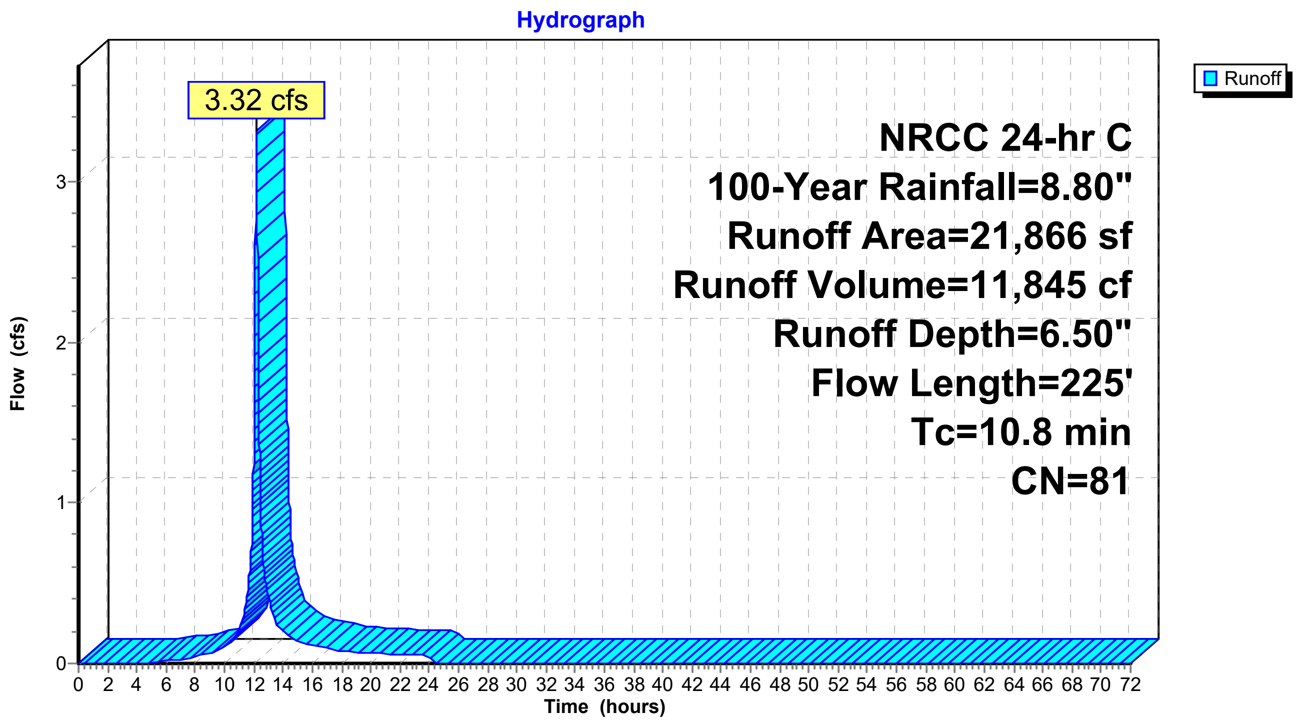
Runoff = 3.32 cfs @ 12.18 hrs, Volume= 11,845 cf, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
12,429	77	Woods, Good, HSG D
2,697	96	Gravel surface, HSG D
6,740	83	Brush, Poor, HSG D
21,866	81	Weighted Average
21,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.2	21	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	154	0.0180	0.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.8	225	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

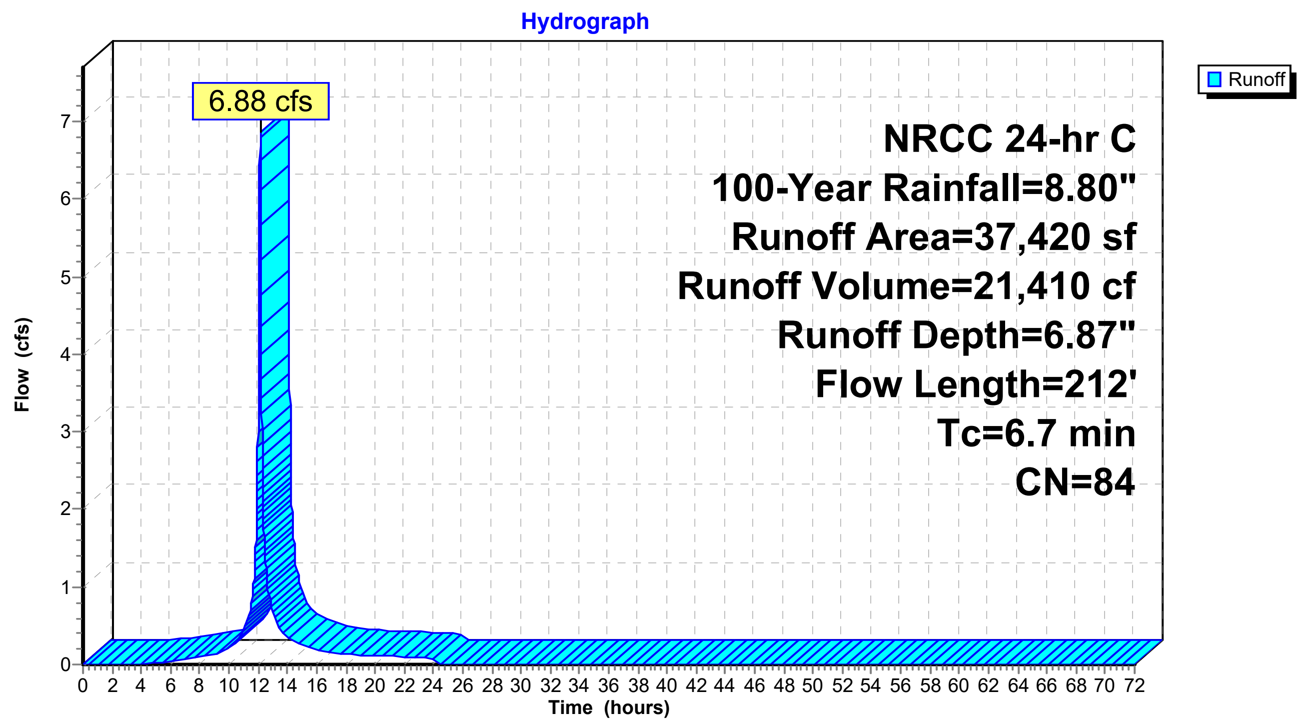
Runoff = 6.88 cfs @ 12.14 hrs, Volume= 21,410 cf, Depth= 6.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
3,709	77	Woods, Good, HSG D
29,820	83	Brush, Poor, HSG D
3,891	96	Gravel surface, HSG D
37,420	84	Weighted Average
37,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0840	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.44"
1.4	98	0.0286	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0588	3.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	52	0.0323	1.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	212	Total			

Subcatchment 3S:



Summary for Subcatchment 4S:

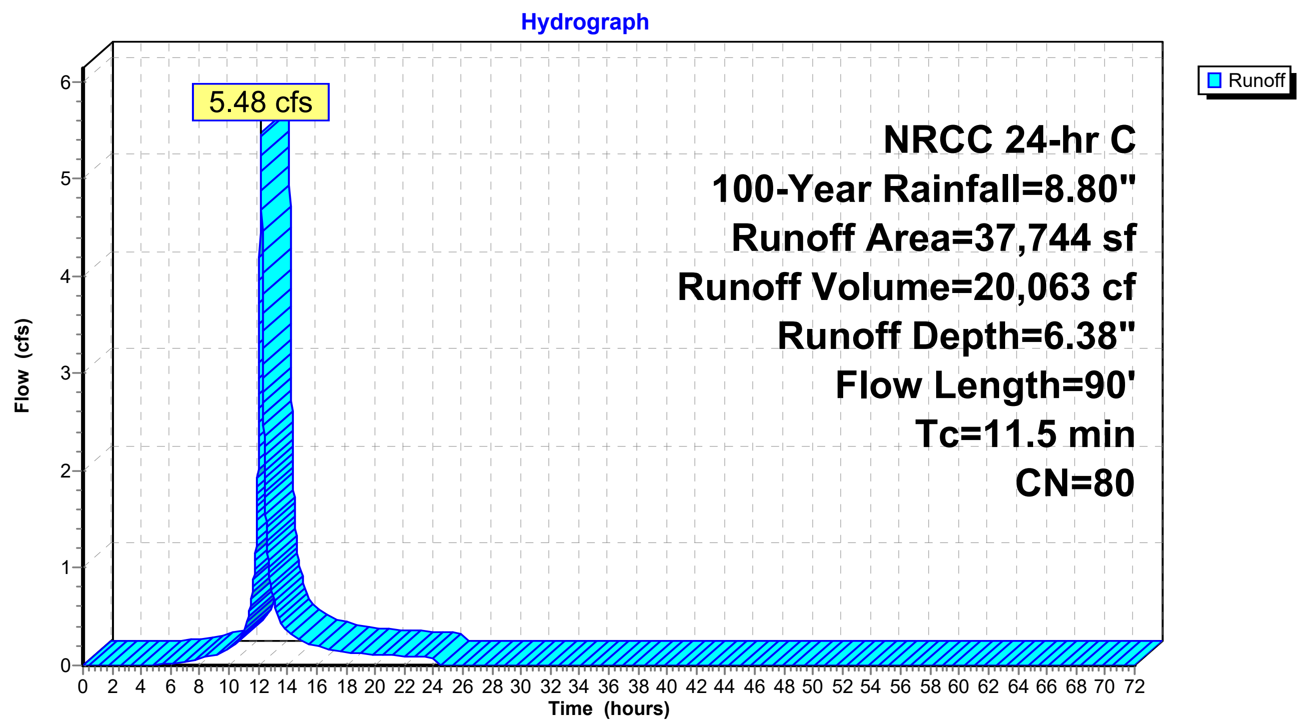
Runoff = 5.48 cfs @ 12.19 hrs, Volume= 20,063 cf, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
14,923	83	Brush, Poor, HSG D
4,794	96	Gravel surface, HSG D
10,680	77	Woods, Good, HSG D
7,347	70	Woods, Good, HSG C
37,744	80	Weighted Average
37,744		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	50	0.0240	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.4	40	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	90	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

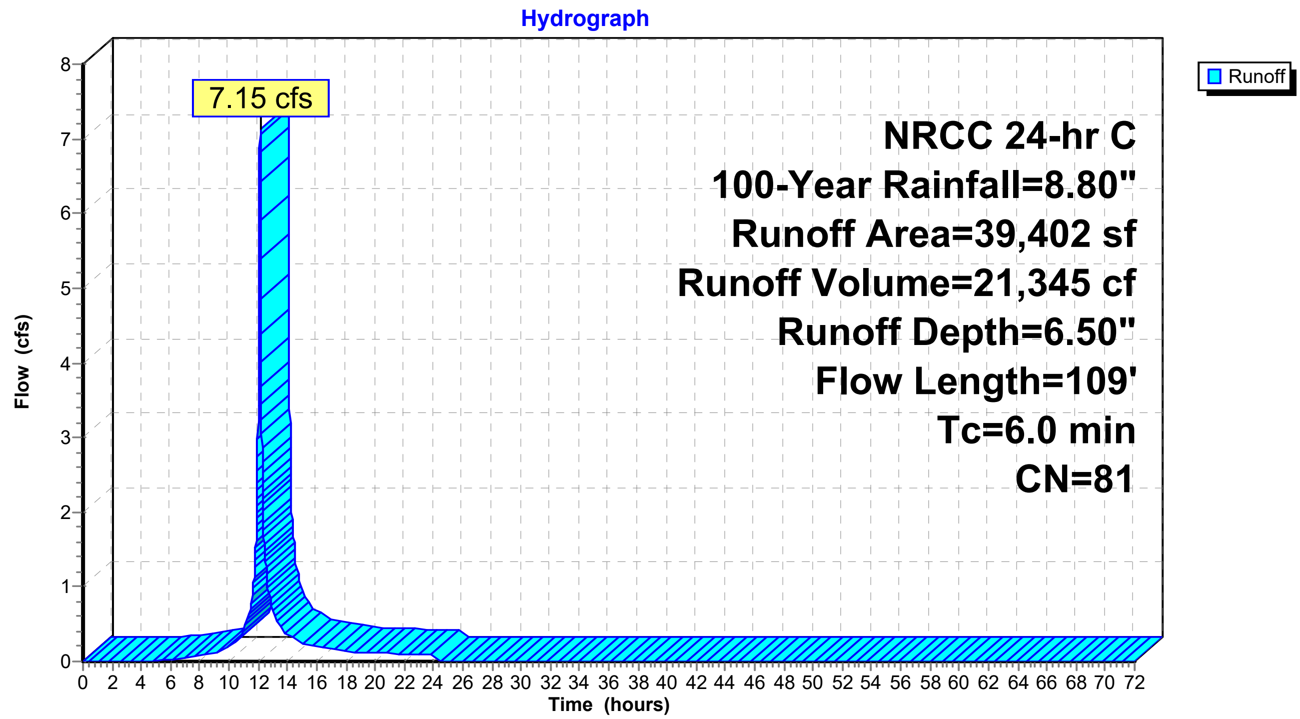
Runoff = 7.15 cfs @ 12.13 hrs, Volume= 21,345 cf, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
23,878	80	>75% Grass cover, Good, HSG D
7,772	77	Woods, Good, HSG D
2,272	70	Woods, Good, HSG C
5,480	96	Gravel surface, HSG D
39,402	81	Weighted Average
39,402		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	44	0.0520	1.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0530	1.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.4	109	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S:



Summary for Subcatchment 6A:

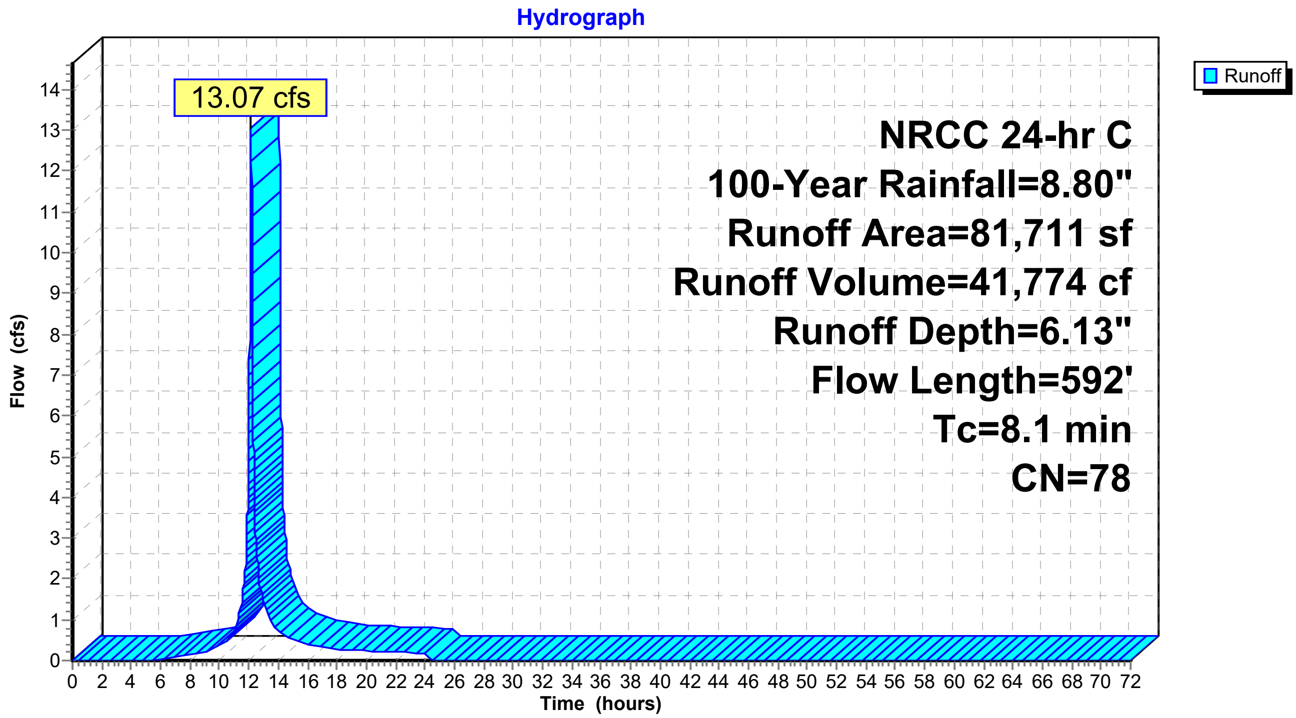
Runoff = 13.07 cfs @ 12.15 hrs, Volume= 41,774 cf, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
52,987	80	>75% Grass cover, Good, HSG D
18,864	74	>75% Grass cover, Good, HSG C
1,726	91	Gravel roads, HSG D
620	98	Unconnected pavement, HSG D
1,876	77	Woods, Good, HSG D
5,638	70	Woods, Good, HSG C
81,711	78	Weighted Average
81,091		99.24% Pervious Area
620		0.76% Impervious Area
620		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0623	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
4.7	542	0.0720	1.92	19.79	**Trap/Vee/Rect Channel Flow,** Bot.W=4.00' D=1.00' Z= 5.6 & 7.0 '/' Top.W=16.60' n= 0.150 Sheet flow over Short Grass
8.1	592	Total			

Subcatchment 6A:



Summary for Subcatchment 6S:

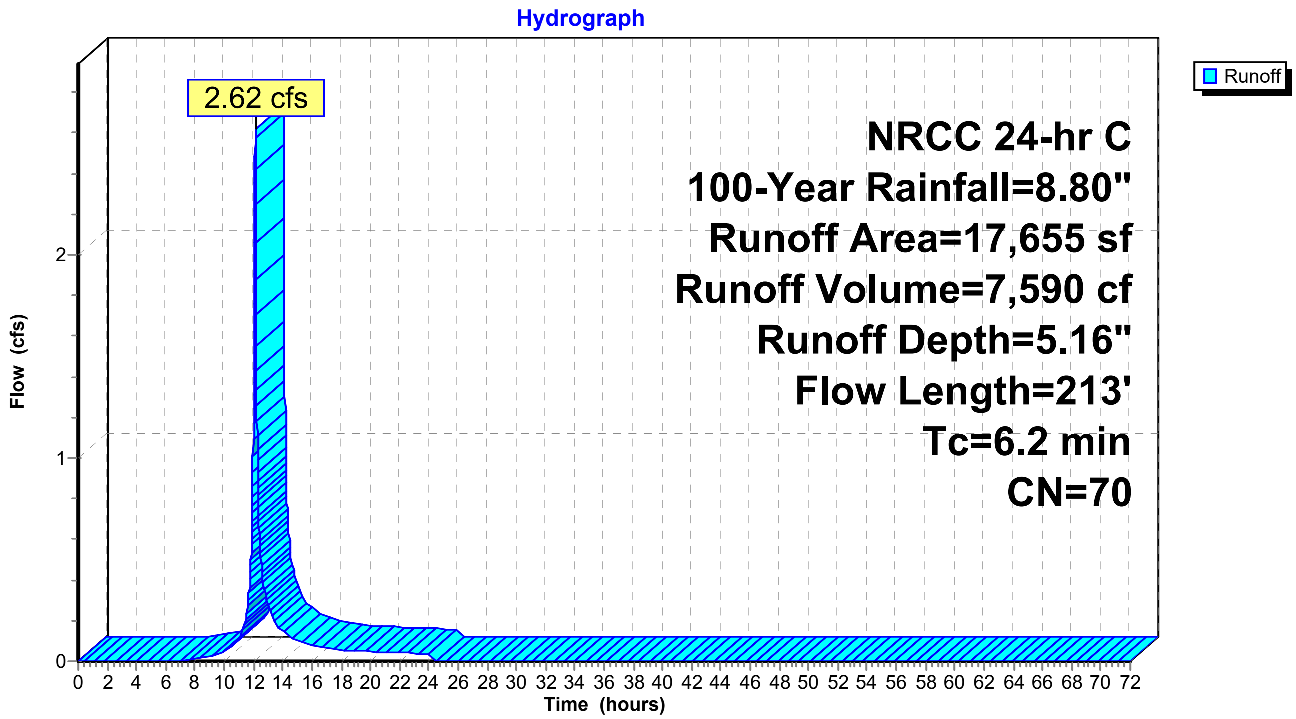
Runoff = 2.62 cfs @ 12.13 hrs, Volume= 7,590 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.80"

Area (sf)	CN	Description
17,291	70	Woods, Good, HSG C
364	77	Woods, Good, HSG D
17,655	70	Weighted Average
17,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1670	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.44"
0.5	88	0.1670	2.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	21	0.2130	2.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	54	0.0935	2.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	213	Total			

Subcatchment 6S:

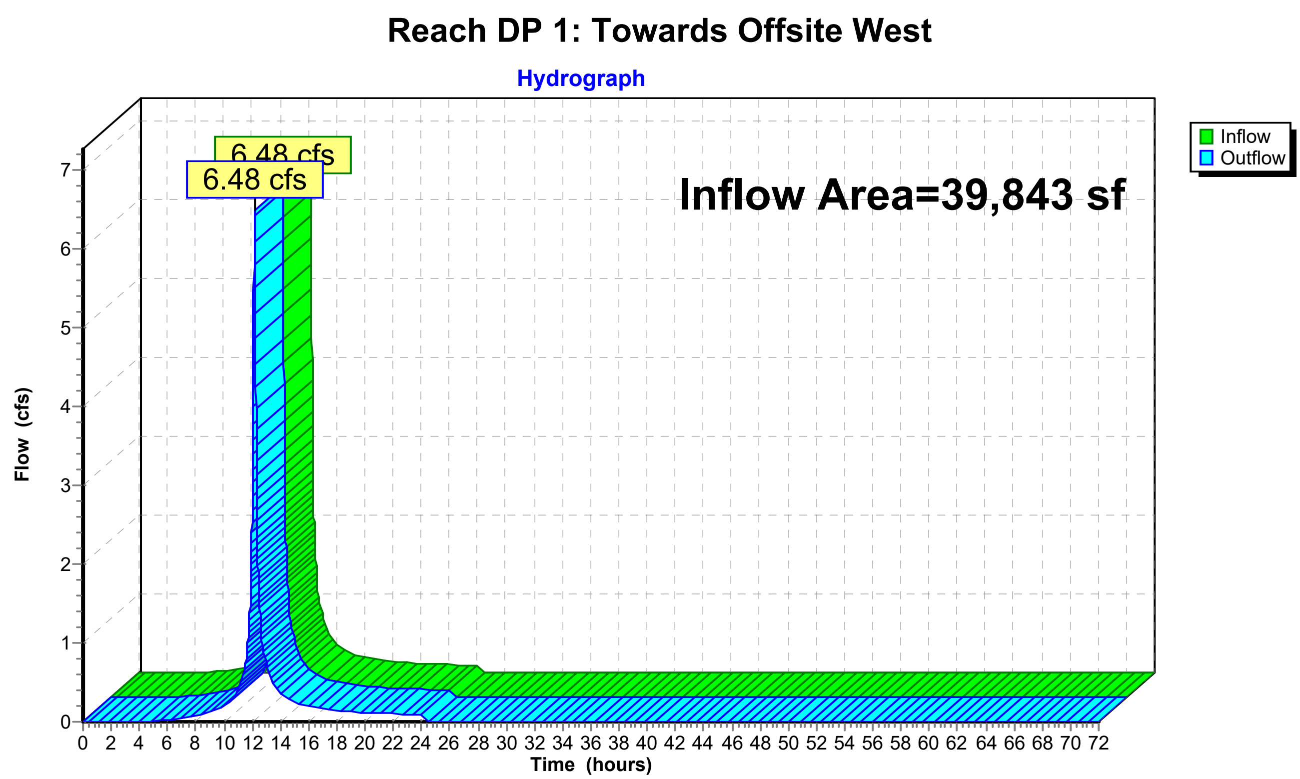


Summary for Reach DP 1: Towards Offsite West

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

Inflow Area =	39,843 sf,	7.57% Impervious,	Inflow Depth = 6.50"	for 100-Year event
Inflow =	6.48 cfs @	12.16 hrs, Volume=	21,583 cf	
Outflow =	6.48 cfs @	12.16 hrs, Volume=	21,583 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



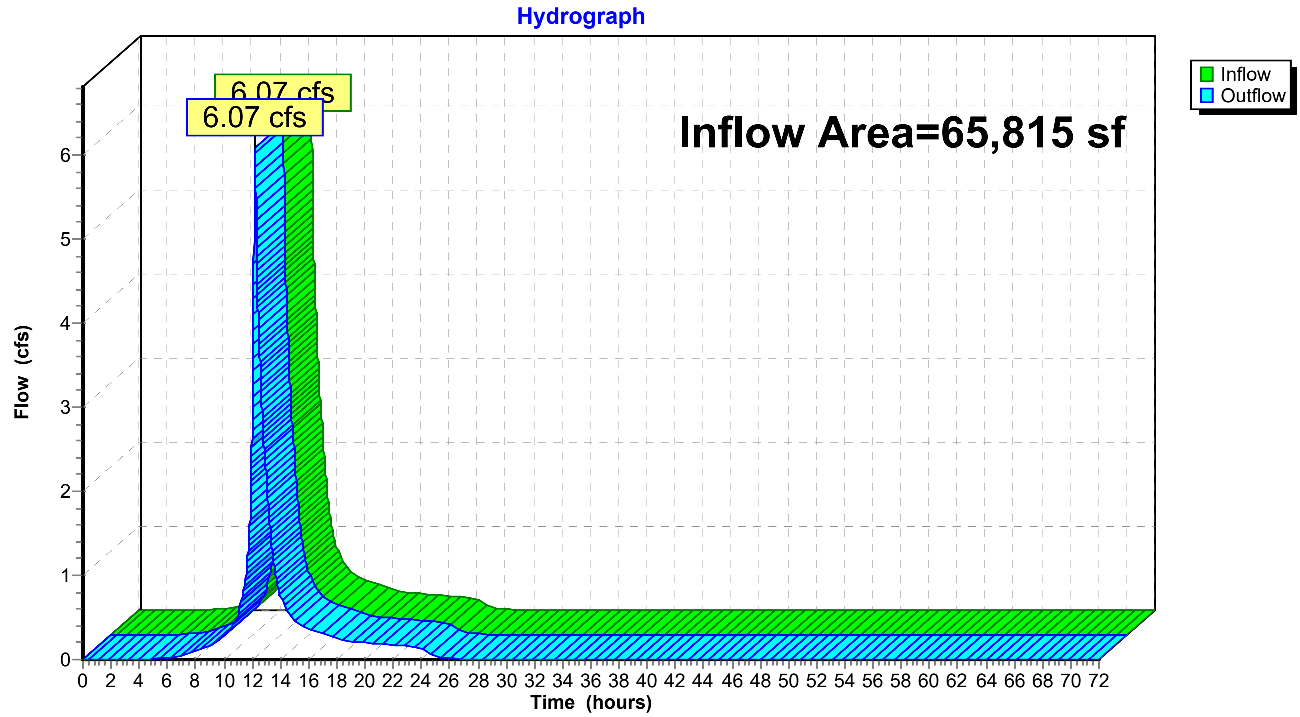
Summary for Reach DP 2: Towards Offsite North

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

Inflow Area =	65,815 sf, 1.23% Impervious,	Inflow Depth = 6.50"	for 100-Year event
Inflow =	6.07 cfs @ 12.19 hrs, Volume=	35,651 cf	
Outflow =	6.07 cfs @ 12.19 hrs, Volume=	35,651 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 2: Towards Offsite North



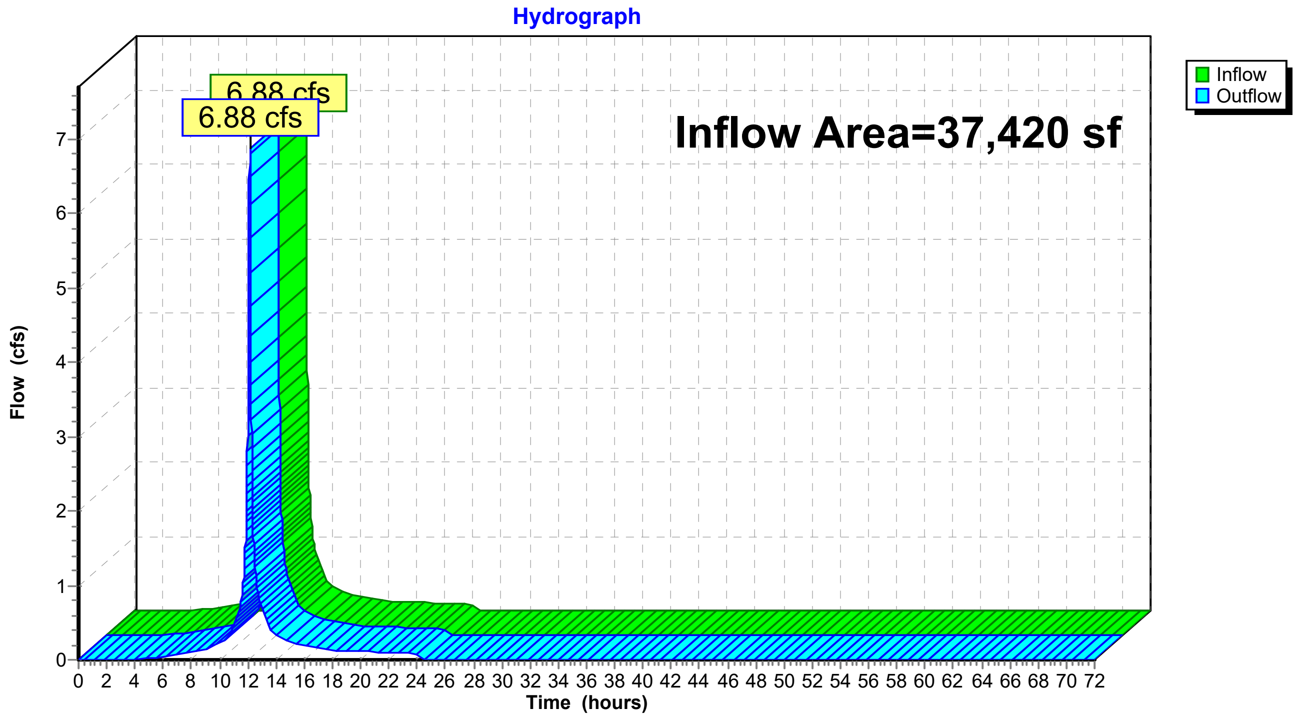
Summary for Reach DP 3: Towards West Wetland

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

Inflow Area =	37,420 sf, 0.00% Impervious,	Inflow Depth = 6.87"	for 100-Year event
Inflow =	6.88 cfs @ 12.14 hrs, Volume=	21,410 cf	
Outflow =	6.88 cfs @ 12.14 hrs, Volume=	21,410 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 3: Towards West Wetland



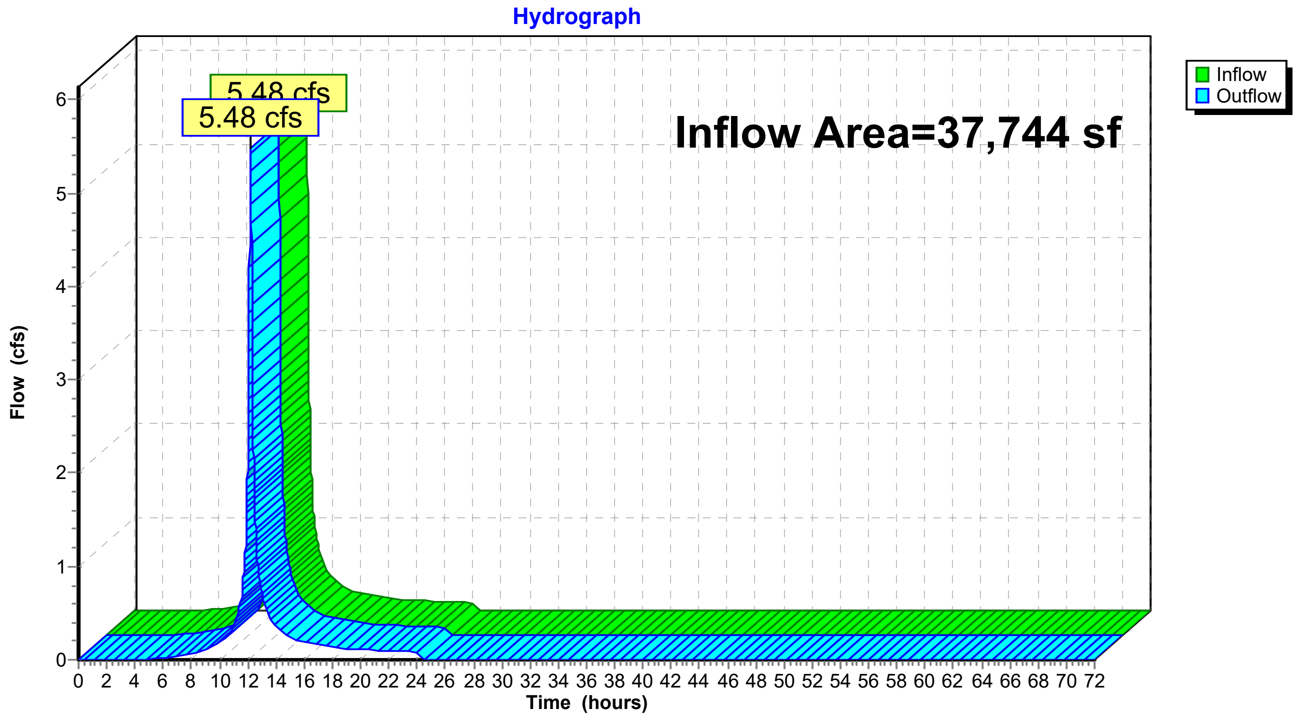
Summary for Reach DP 4: Towards East Wetland

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

Inflow Area =	37,744 sf,	0.00% Impervious, Inflow Depth = 6.38"	for 100-Year event
Inflow =	5.48 cfs @	12.19 hrs, Volume=	20,063 cf
Outflow =	5.48 cfs @	12.19 hrs, Volume=	20,063 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 4: Towards East Wetland



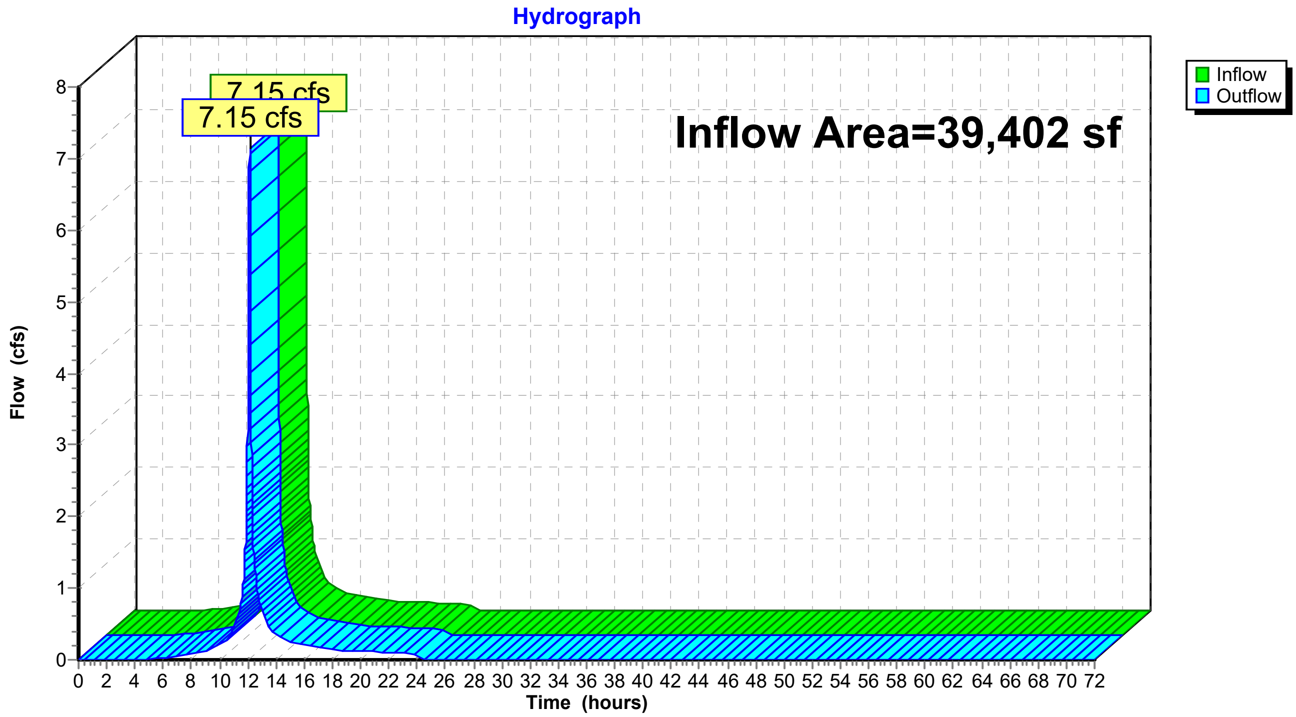
Summary for Reach DP 5: Towards Offsite Northwest

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

Inflow Area =	39,402 sf,	0.00% Impervious,	Inflow Depth = 6.50"	for 100-Year event
Inflow =	7.15 cfs @	12.13 hrs, Volume=	21,345 cf	
Outflow =	7.15 cfs @	12.13 hrs, Volume=	21,345 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 5: Towards Offsite Northwest



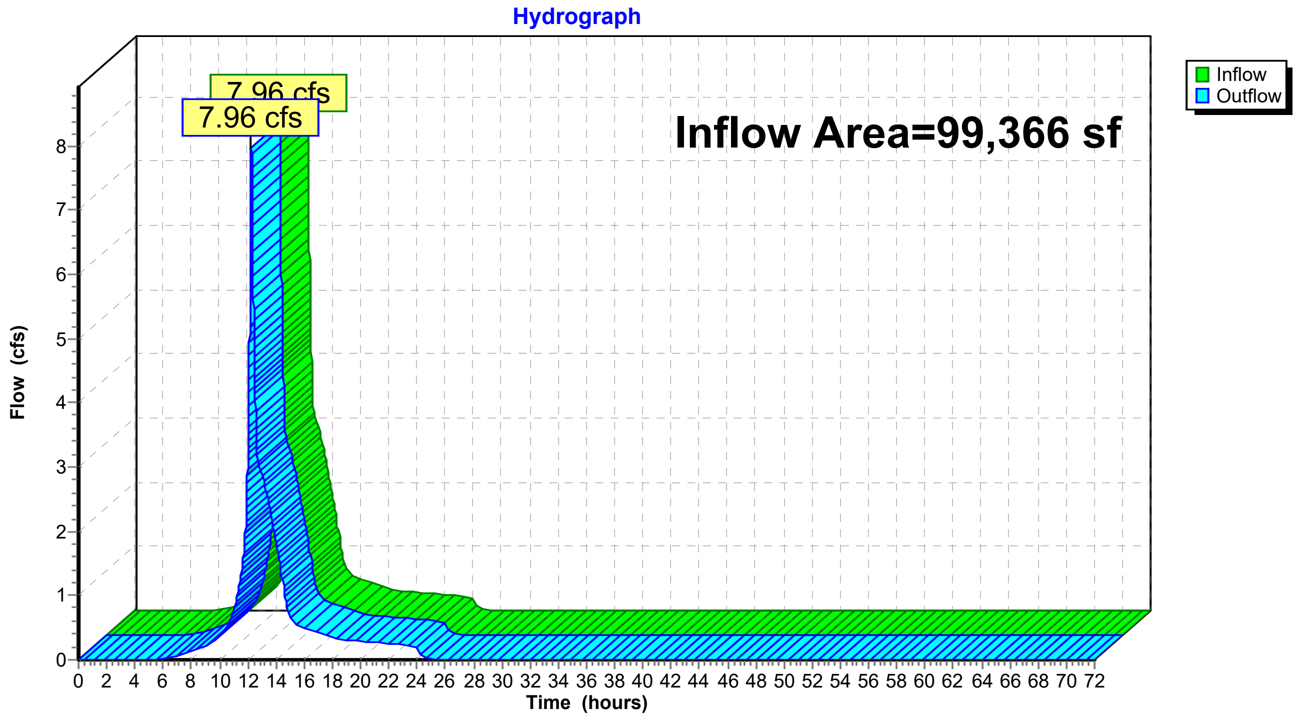
Summary for Reach DP 6: Towards Offsite East

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

Inflow Area =	99,366 sf,	0.62% Impervious, Inflow Depth = 5.96"	for 100-Year event
Inflow =	7.96 cfs @	12.26 hrs, Volume=	49,364 cf
Outflow =	7.96 cfs @	12.26 hrs, Volume=	49,364 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP 6: Towards Offsite East



Summary for Pond 2P: South West Basin

Inflow Area = 43,949 sf, 1.84% Impervious, Inflow Depth = 6.50" for 100-Year event
Inflow = 7.35 cfs @ 12.15 hrs, Volume= 23,808 cf
Outflow = 2.98 cfs @ 12.31 hrs, Volume= 23,806 cf, Atten= 59%, Lag= 9.6 min
Primary = 2.98 cfs @ 12.31 hrs, Volume= 23,806 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 458.40' @ 12.31 hrs Surf.Area= 3,997 sf Storage= 5,473 cf

Plug-Flow detention time= 43.2 min calculated for 23,806 cf (100% of inflow)
Center-of-Mass det. time= 43.1 min (848.5 - 805.5)

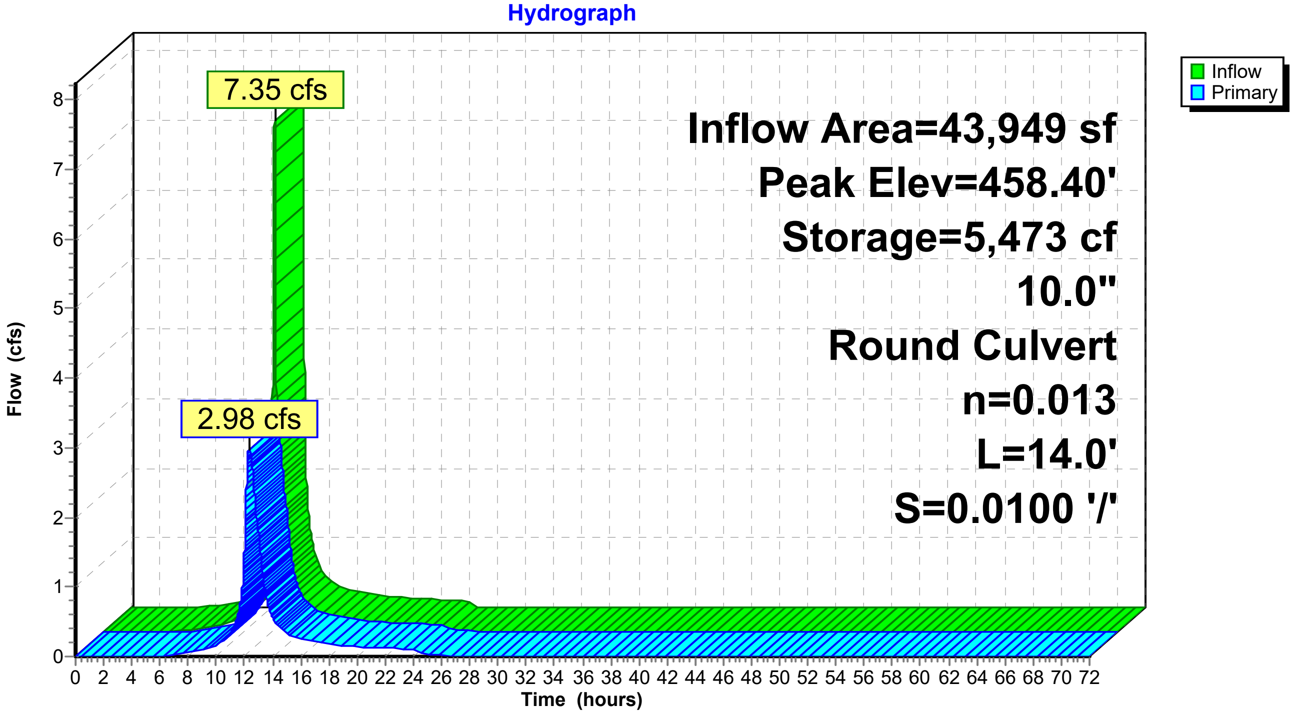
Volume	Invert	Avail.Storage	Storage Description
#1	456.70'	6,701 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.70	2,487	270.0	0	0	2,487
458.70	4,296	320.0	6,701	6,701	4,908

Device	Routing	Invert	Outlet Devices
#1	Primary	456.70'	**10.0" Round ADS Round 10"** L= 14.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 456.70' / 456.56' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.55 sf

Primary OutFlow Max=2.98 cfs @ 12.31 hrs HW=458.40' (Free Discharge)
└─**1=ADS Round 10"** (Inlet Controls 2.98 cfs @ 5.46 fps)

Pond 2P: South West Basin



Summary for Pond 6P: North East Basin

Inflow Area = 81,711 sf, 0.76% Impervious, Inflow Depth = 6.13" for 100-Year event
Inflow = 13.07 cfs @ 12.15 hrs, Volume= 41,774 cf
Outflow = 6.86 cfs @ 12.27 hrs, Volume= 41,774 cf, Atten= 47%, Lag= 6.9 min
Primary = 6.86 cfs @ 12.27 hrs, Volume= 41,774 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 404.34' @ 12.27 hrs Surf.Area= 4,946 sf Storage= 8,927 cf

Plug-Flow detention time= 22.6 min calculated for 41,768 cf (100% of inflow)
Center-of-Mass det. time= 22.6 min (835.5 - 812.9)

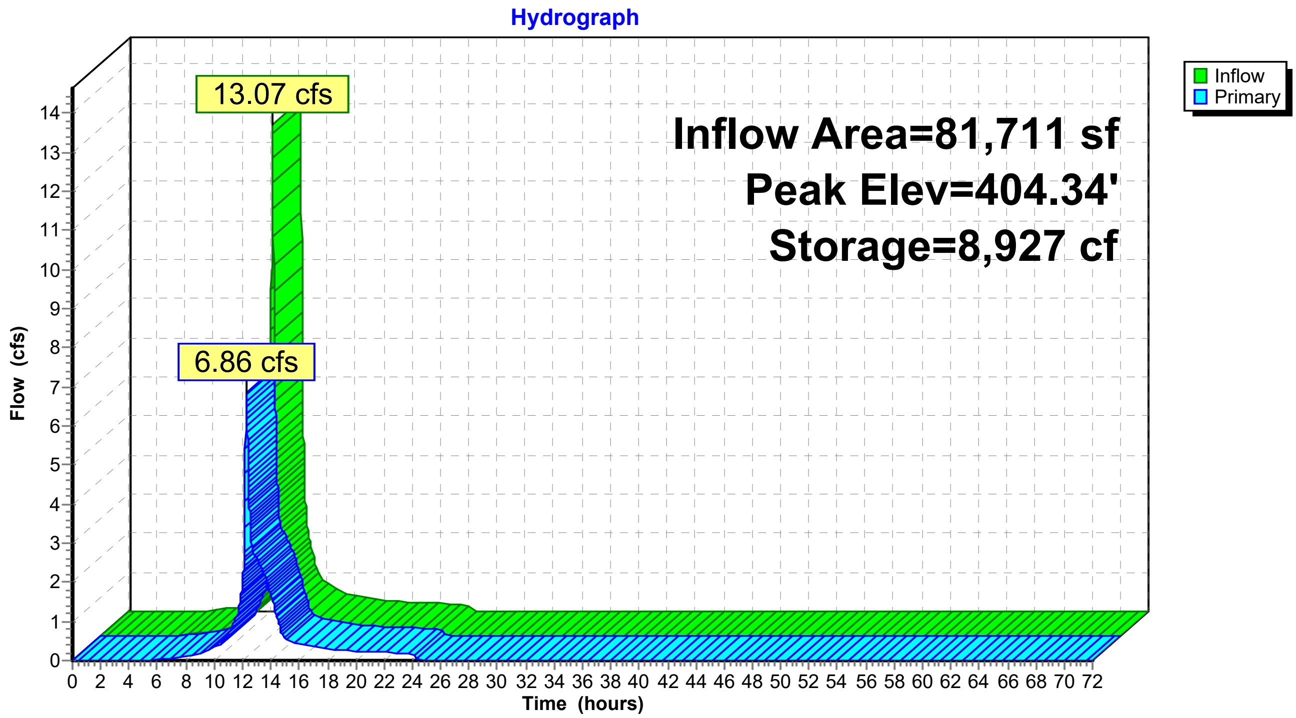
Volume	Invert	Avail.Storage	Storage Description
#1	401.00'	12,521 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
401.00	454	159.0	0	0	454
402.00	1,868	254.0	1,081	1,081	3,583
403.00	3,130	251.0	2,472	3,553	3,863
404.00	4,462	289.0	3,776	7,329	5,518
405.00	5,957	326.0	5,192	12,521	7,355

Device	Routing	Invert	Outlet Devices
#1	Primary	401.00'	**8.0" Round ADS_Round 8"** L= 22.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 401.00' / 400.78' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Primary	404.00'	**8.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=6.85 cfs @ 12.27 hrs HW=404.34' (Free Discharge)
├─**1=ADS_Round 8"** (Barrel Controls 2.91 cfs @ 8.33 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.94 cfs @ 1.45 fps)

Pond 6P: North East Basin



APPENDIX C

Pre- and Post-Development Watershed Plans

FILE: 3328 WSHD

Atlantic® DESIGN ENGINEERS, INC.
P.O. Box 1051, Sandwich, MA 02563 (508) 888 – 9282

Designed by :
Drawn by :
Checked by :
Survey chk. by :
Approved by :

SCALE
SCALE 1" = 40'
0 20 40 60

DATE

NO.	BY	DATE	REVISION

APPLICANT:
VS UNION SOLAR SMART, LLC
24941 DANA POINT HARBOR
DANA POINT, CA 92629

PRE DEVELOPMENT WATERSHED PLAN
FOR
UPPER UNION SOLAR PROJECT
FRANKLIN, MA
MAY 31, 2023

Sheet 1 of 2
JOB NUMBER 3328.00

FILE: 3328 WSHD

Atlantic® DESIGN ENGINEERS, INC.
P.O. Box 1051, Sandwich, MA 02563 (508) 888 – 9282

Designed by :
Drawn by :
Checked by :
Survey chk. by :
Approved by :

SCALE
SCALE 1" = 40'
0 20 40 60

DATE

NO.	BY	DATE	REVISION

APPLICANT:
VS UNION SOLAR SMART, LLC
24941 DANA POINT HARBOR
DANA POINT, CA 92629

POST DEVELOPMENT WATERSHED PLAN
FOR
UPPER UNION SOLAR PROJECT
FRANKLIN, MA
MAY 31, 2023

Sheet 2 of 2
JOB NUMBER 3328.00

APPENDIX D
Miscellaneous Calculations

Required Recharge Volume

Design Engineer:	Atlantic Design Engineers, Inc	Job No.:	3328.00
Project Name:	Upper Union Solar Project	Calc'd By:	NCM
Location:	0 Upper Union Street	Revised Date:	6/19/2023

The groundwater recharge volume is required for the proposed asphalt **impervious area.**

Rv = (F) (Aimp)
Rv = Required Recharge Volume
Aimp= Impervious Area on site
F = Target Depth Factor: 0.1 inch for D soils

Required Recharge

Total New Impervious Area =	1,109 sf	
Required Recharge Volume (Rv)=	1,109 *0.1"* (1/12)=	**9 cf**
Recharge Volume Provided		
Cultec 100HD Subsurface System	(See HydroCAD Calcs)	**126** cf
Proposed Volume Provided in Sub-Surface Systems=		**126 cf**

Total Required Recharge Volume on Site= **9 cf**

Proposed Recharge Volume Provided in Subsurface System= **126 cf**

126 cf > 9 cf

Standard is Met

Required Recharge Volume

Design Engineer:	Atlantic Design Engineers, Inc	Job No.:	3328.00
Project Name:	Upper Union Solar Project	Calc'd By:	NCM
Location:	0 Upper Union Street	Revised Date:	6/19/2023

The groundwater recharge volume is required for the proposed equipment pad **impervious area.**

Rv = (F) (Aimp)
Rv = Required Recharge Volume
Aimp= Impervious Area on site
F = Target Depth Factor: 0.1 inch for D soils

Infiltration Trench (50'Lx2'Wx1'D @ 40% Voids)

Total New Impervious Area =	640 sf	
Required Recharge Volume (Rv)=	640 *0.1"* (1/12)=	**5 cf**
Recharge Volume Provided		
Infiltration Trench	50*2*1*(1-60%)=	**60 cf**
Proposed Volume Provided in Infiltration Trench=		**60 cf**

Total Required Recharge Volume on Site= 5 cf

Proposed Recharge Volume Provided in Infiltration Trench= 60 cf

60 cf > 5 cf

Standard is Met

Water Quality Calulation Sheet*

Design Engineer:	Atlantic Design Engineers, Inc	Job No.:	3328.00
Project Name:	Upper Union Solar Project	Calc'd By:	NCM
Location:	0 Upper Union Street	Revised Date:	6/19/2023

The required water quality treatment volume is calculated as follows:

Vwq = (Dwq)*(Aimp)
Vwq =Required Water Quality Volume
Dwq =Water Quality Depth * **1”**
Aimp=Area of Impervious

Subcatchment Area: 1A

Total Impervious Area for the Subcatchment=	1,109	sf			
Water Quality Volume Required (Vwq)=	1,109	* 1" * (1/12)=	92	cf	
Volume Provided via Cultec 100HD=		See Hydrocad	126	cf	
Volume Required=	92.4	<	126		**Water Quality Volume is met**

Subcatchment Area: 6A

Total Impervious Area for the Subcatchment=	640	sf			
Water Quality Volume Required (Vwq)=	640	* 1" * (1/12)=	53	cf	
Volume Provided via Infiltration Trench=		50*2*1*(1-60%)	60	cf	
Volume Required=	53.3	<	60		**Water Quality Volume is met**

Total Impervious Area on the Site=	1,749	sf
Total Volume Quality Required=	146	cf
Total Volume Provided=	186	cf

* The purpose of these calculations is to show compliance with the Town of Franklin Stormwater Management Bylaw Chapter 153, specifically Section153-16.B.(1).(a)

APPENDIX E

NRCS Soil Survey Maps and Soil Group Descriptions

United States Department of Agriculture

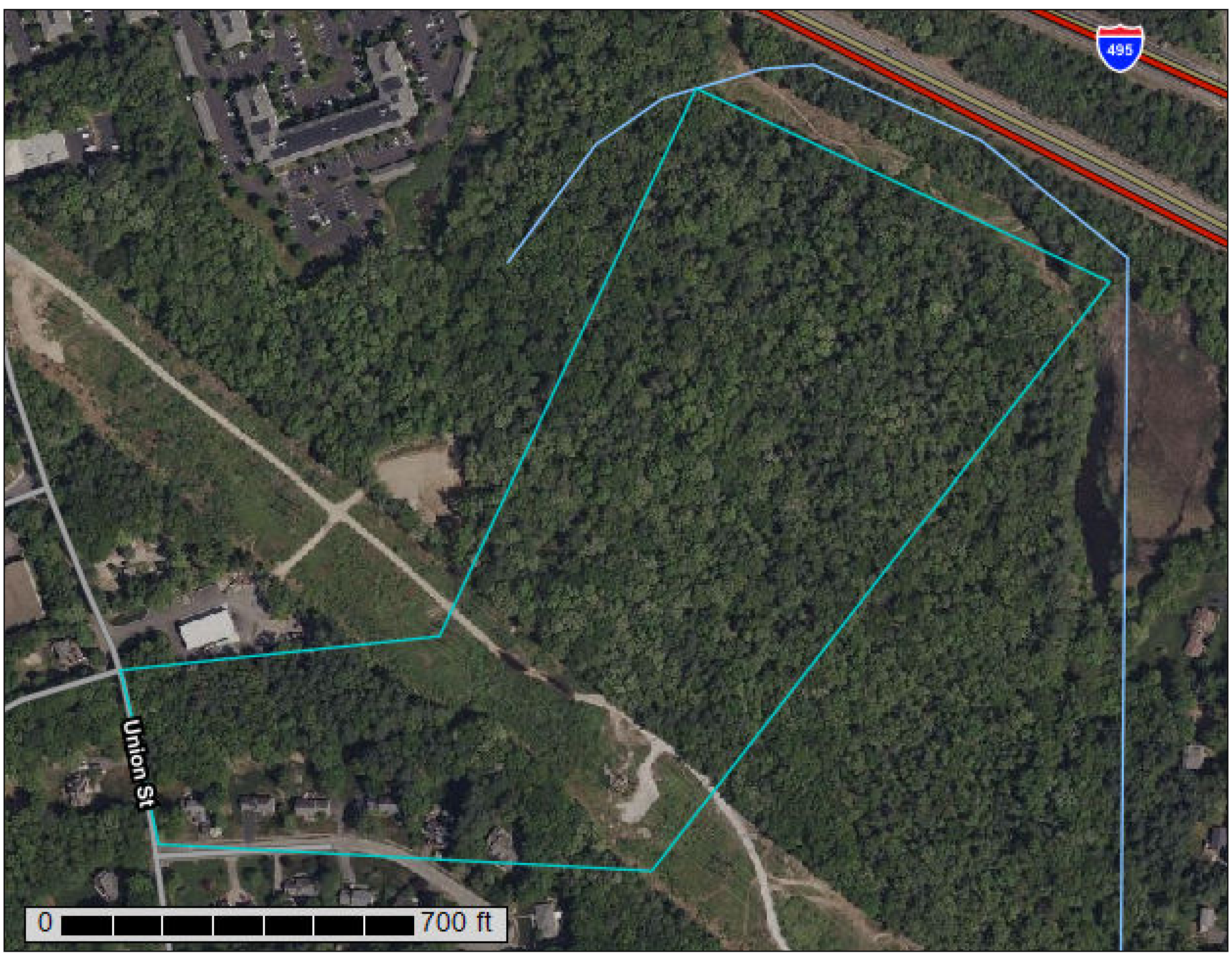
NRCS

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



June 15, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map

Map Scale: 1:4,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
51	Swansea muck, 0 to 1 percent slopes	0.6	2.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	1.8	5.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	9.9	32.4%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	8.6	28.0%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	6.8	22.3%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	2.9	9.5%
Totals for Area of Interest		**30.6**	**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

51—Swansea muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2trl2
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

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

Description of Swansea

Setting

Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 24 inches: muck
Oa2 - 24 to 34 inches: muck
Cg - 34 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 1 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 16.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 10 percent
Landform: Bogs, swamps

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

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions
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

103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: vktd
Elevation: 0 to 480 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Charlton

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable coarse-loamy ablation till derived from granite

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 36 inches: fine sandy loam
H3 - 36 to 60 inches: fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 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: Moderate (about 7.8 inches)

Interpretive groups

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

Description of Hollis

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Shallow, friable loamy ablation till derived from igneous rock

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 14 inches: gravelly fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Igneous and metamorphic rock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Canton

Percent of map unit: 7 percent
Hydric soil rating: No

Chatfield

Percent of map unit: 5 percent
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Hydric soil rating: No

Whitman

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 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

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent

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

Description of Charlton, Extremely Stony

Setting

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

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
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: Moderate (about 8.7 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

Description of Hollis, Extremely Stony

Setting

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

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
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): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

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

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent

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

Canton, extremely stony
Percent of map unit: 5 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony
Percent of map unit: 2 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

103D—Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes

Map Unit Setting
National map unit symbol: vktk
Elevation: 0 to 490 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Charlton and similar soils: 35 percent
Hollis and similar soils: 25 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy ablation till derived from granite

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 36 inches: fine sandy loam
H3 - 36 to 60 inches: fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 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: Moderate (about 7.8 inches)

Interpretive groups

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

Description of Hollis

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Shallow, friable loamy ablation till derived from igneous rock

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 14 inches: gravelly fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 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 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Igneous and metamorphic rock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Chatfield

Percent of map unit: 8 percent
Hydric soil rating: No

Canton

Percent of map unit: 8 percent
Hydric soil rating: No

Montauk

Percent of map unit: 4 percent
Hydric soil rating: No

310B—Woodbridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2ql
Elevation: 0 to 1,470 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

Woodbridge, fine sandy loam, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Fine Sandy Loam

Setting

Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 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 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
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
Hydric soil rating: No

Ridgebury

Percent of map unit: 8 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Toeslope, backslope, footslope
Landform position (three-dimensional): Base slope, head slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qs
Elevation: 0 to 1,580 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

Woodbridge, extremely stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 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 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton, extremely stony

Percent of map unit: 10 percent
Landform: 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: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 8 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

APPENDIX F

Post-Construction Long Term Stormwater Operation and Maintenance Plan

Upper Union Solar Project
At
0 Upper Union Street – Franklin, MA
Post-Construction Long Term Stormwater Operation & Maintenance Plan
June 19, 2023
ADE Job #3328.00

A. GENERAL NOTES

1. Upon completion of construction, the operation and maintenance of all components of the stormwater management system will be the responsibility (financially and otherwise) of the system owner (responsible party):

VS Union Solar Smart, LLC
24941 Dana Point Harbor
Dana Point, California 92629

______________________________ ____________________
Signature **Date**

2. The responsible party shall file an inspection report with the Town of Franklin DPW following each site inspection as recommended in the Operation & Maintenance (O&M) Schedule. The inspection report shall identify the date of inspection, name, and contact number of responsible party, specific structures inspected, specific maintenance and/or repairs required and general observations. Any deficiencies noted in the inspection report shall be corrected to the Town of Franklin's DPW's satisfaction.

3. Disposal of accumulated sediment and hydrocarbons to be in accordance with the applicable local, state, and federal guidelines and regulations.

4. There shall be no illicit discharge of any waste or waste water into the stormwater management system. The maintenance of the facility shall be undertaken in such a manner as to prevent any discharge of waste or waste water into the stormwater management system. Any waste oil or other waste products generated during the maintenance shall be properly disposed of offsite.

5. The Town will be notified of changes in project ownership or assignment of operation and maintenance financial responsibility.

6. The maintenance schedule in this operation and maintenance (O&M) Plan will only be amended by mutual agreement of the Town and the responsible party. Amendments will be made in writing and signed by the responsible party.

B. STORMWATER SYSTEM/BMPS

Erosion control barriers:
Until the site is fully stabilized, erosion control barriers (sediment log, straw wattles, silt fence, etc.) should be inspected immediately after major storm events (2” or greater). Sediment deposits must be removed when the level of deposition reaches approximately one-half the height of the barrier. Repair/replace any sections of erosion control barriers that are damaged and install additional rows of barriers if needed.

Deep Sump Hooded Catch Basins:
Inspect after every major storm event (2” or greater) for the first few months after construction and at least twice per year thereafter. Inspect for clogged grates or pipes and excessive accumulation of sediment and trash. Remove accumulation of leaves or debris over grate inlets as needed throughout the year. Clean sumps when sediment reaches 24”.

Sub-surface Infiltration System:
Inspect after every major storm event (2” or greater) for the first few months after construction to ensure proper stabilization and function. Thereafter, inspect at least twice per year during wet weather to ensure the system is draining properly. Check for accumulation of sediment and ponding water. If ponding water is visible inside the system for several days after a storm event, notify the engineer for possible remedial measures. Remove sediment as necessary during construction, while the system is dry, and at least every five years after construction.

Grassed swales:
Inspect after every major storm event (2” or greater) for the first few months after construction and at least twice per year thereafter. Repair eroded spots immediately after inspection. Additional inspections should be scheduled during the first few months to ensure that the vegetation in the channels is established adequately. Accumulated sediment shall be removed at least once a year or before it exceeds 0.5' in depth, whichever occurs first. Swales shall be mowed as needed. Clippings to be removed from swales, areas immediately up-gradient and properlyp disposed of.

Street Sweeping:
All paved areas should be swept two times per year, once during the late spring and once during the late fall seasons after construction.

Stone Infiltration Trench:
Inspect after every major storm event (2” or greater) for the first few months after construction and at least twice per year thereafter during wet weather to ensure the system is working properly. Check for accumulation of sediment, debris, weed growth and leaf litter and clean out as required, including replacement of top layer of stone.

Detention Basins:
Inspect after every major storm event (2" or greater) for the first few months after construction to ensure proper stabilization and function. Thereafter inspect at least twice per year during wet

weather to ensure the system is draining properly. Examine the outlet structure or outlet pipes for evidence of clogging or excessive outlet velocities. Check for accumulation of sediment and ponding of water. If ponding water above the outlet pipes is visible inside the basin for several days after a storm event, notify the engineer for possible remedial measures. Mow the berm at least twice per year. Remove sediment while the system is dry, and at least every 5 years after construction.

Outlet Pipes and Flared End Sections:
Inspect after every major storm event (2" or greater) for the first few months after construction to ensure proper stabilization and function. Thereater inspect twice a year for erosion, clogging, settling, and excessive accumulation of leaves, trash, debris or sediment and channelization of stormwater discharge.

Rip-rap Aprons/Spillways/Level Spreaders:
Inspect after every major storm event (2" or greater) for the first few months after construction to ensure proper stabilization and function. Thereafter inspect twice per year at a minimum, for erosion, excessive accumulation of sediment, signs of failure, excessive weed/vegetation growth, and trash. Repair eroded spots immediately after inspection. Accumulated sediment shall be removed at least once a year or before it exceeds 0.5 ft. in depth, whichever occurs first.

C. ESTIMATED ANNUAL BUDGET

The estimated annual budget for the activities required in this Post-Construction Long Term Stormwater Operation and Maintenance Plan is $2,000.00.

D. SAMPLE OPERATION AND MAINTENANCE LOG (Next Page)

SAMPLE OPERATION AND MAINTENANCE LOG

UPPER UNION SOLAR PROJECT - FRANKLIN, MASSACHUSETTS

POST-CONSTRUCTION

LONG TERM STORMWATER OPERATION & MAINTENANCE PLAN

Date: ________________________ **Personnel Present:** ______________________________
____
Inspectors Name: ____
Inspectors Contact Information: ____
____
____
Signature: ____

O&M ITEM:	**COMMENTS, CORRECTIVE ACTION NEEDED, AND NOTES:**
Erosion Control Barriers	
Deep Sump Hooded Catch Basins	
Sub-Surface Infiltration System	
Grassed Swales	
Street Sweeping	
Stone Infiltration Trench	
Detention Basins	
Outlet Pipes and Flared End Sections	
Rip-rap Aprons/Spillways/Level Spreaders	