MILLENNIUM ENGINEERING, INC.

Land Surveyors and Civil Engineers

STORMWATER MANAGEMENT REPORT

FOR THE

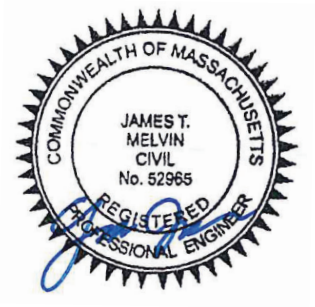
MARINA AT AMESBURY POINT

AT

14 & 13 MERRIMAC STREET
AMESBURY, MA

PREPARED FOR:

14 MERRIMAC STREET LLC.
2 MERRIMAC STREET
AMESBURY, MA



DATE: MARCH 11, 2024

Massachusetts:

62 Elm Street-
Salisbury, MA 01952
Phone: 978-463-8980

New Hampshire:

13 Hampton Road
Exeter, NH 03833
Phone: 603-778-0528

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Stormwater Management Report
13 & 14 Merrimac Street Amesbury, MA

I. Introduction

Introduction

The subject parcel is described as Tax Map 88, Lot 1 on the City of Amesbury, MA Assessor's Map. The project parcel is 1.55 acres in size. Elevations on the site range from 21.00' to the North west end of the parcel to 7.00' at the Southeast end of the site. These elevations are based upon 1988 NAV datum.

The site improvements at 14 Merrimac Street proposes to redevelop the entirety of the existing marina. The project will consist of the demolition of the existing marina facility and large existing maintenance building, and construction of a new marina facility and restaurant with appropriate parking. The proposed stormwater management system for the project includes catch basins, drain manholes, a Contech CDS unit and rain garden. Both the catch basins and CDS unit will remove suspended solids prior to discharging to the PowWow/Merrimac River. In addition, the Rain Garden will provide stormwater treatment and mitigate peak runoff rates so the post-development runoff rates will be less than or equal to the pre-development rates.

In addition to 14 Merrimac Street, 13 Merrimac (Tax map 88, Lot 82) will be utilized for parking restricted to marina patrons and staff. The project parcel is 0.42 acres in size and the elevations range from 21.00' at the northern end and 14 at the southern end. These elevations are based on 1988 NAV datum.

The site improvements at 13 Merrimac Street are minimal. The improvements consist of adding slightly more gravel to the existing gravel parking lot for a more defined parking area. There are no stormwater structures proposed, however a pea stone diaphragm will line the edge of the gravel to provide treatment to the runoff from the parking area.

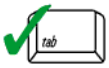
II. Stormwater Management Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

[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.

B. Stormwater Checklist and Certification

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

Checklist for Stormwater Report

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

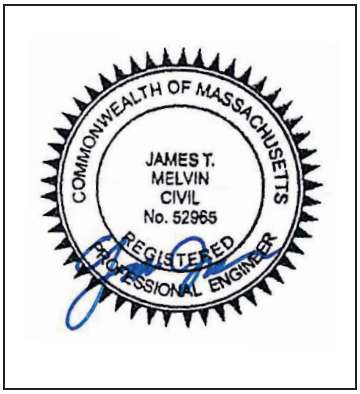
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist (continued)

Checklist for Stormwater Report

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): Contech CDS

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)

Checklist for Stormwater Report

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)

Checklist for Stormwater Report

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)

Checklist for Stormwater Report

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)

Checklist for Stormwater Report

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)

Checklist for Stormwater Report

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.

III. Hydrologic Analysis

Existing Site Characteristics

14 Merrimac Street
In general, the property is irregular in shape and fronts Merrimac Street. The entire property is upland, however, 100' and 200' riverfront buffers exist on-site. There are several existing structures located on-site including a Marina operations building and two large maintenance/storage buildings. Majority of the project site is located within Bordering land subject to flooding. The project has been designed so that post development rates are less than or equal to predevelopment rates. See the accompanying plan for a more detailed description of the existing site conditions and topography.

The lot consists entirely of excavated and filled land. Millenium Engineering performed Nine test pits onsite in June 2023. The test pits indicated fill material throughout the site. See Appendix E for the NRCS soil map.

13 Merrimac Street
In general, the property is irregular in shape and fronts Merrimac Street. Most of the site consists of gravel, some asphalt for the existing dwellings (to remain) driveway, and grass. The entire property is upland, however, 25', 50', and 100' wetland buffers exist on-site due to the asphalt drainage channel at the western most end of the lot.

Proposed Site Features

14 Merrimac Street
The Applicant proposes to redevelop the entirety of the parcel. Access to the property will remain via Merrimac Street. Two of the three existing structures are to be razed. The marina operations building will be replaced with a new marina operations facility and restaurant. The large existing maintenance/storage building will be converted to parking for both marina and restaurant patrons. The smaller maintenance building in the northeast corner of the site will remain. Underground electrical and telecommunications services will also be provided. Sewer and water services are proposed to be connected into the City of Amesbury's sewer and water mains located in the Merrimac Street Right of Way.

To address stormwater management regulations, catch basins, a Contech Water Quality Unit, and rain garden are proposed to treat, store, and infiltrate runoff to the maximum extend practical.

13 Merrimac Street
The improvements to 13 Merrimac Street are minimal. The applicant proposes to keep all existing structures and add gravel to the existing gravel lot to better define the parking area.

WATERSHED ANALYSIS AND METHODOLOGY

The stormwater runoff management system was analyzed using the storm events of the 2-year, 10-year and 100-year frequency. The analysis was performed using HydroCAD, version 10.00. Using USDA NRCS TR-20 and TR-55 methods of estimating runoff, the program uses the measured characteristics of the site and computes runoff produced by simulated rainfall events. The results are then used to design runoff control structures.

Existing drainage area boundaries were developed using an onsite topographic survey performed by Millennium Engineering, Inc. Proposed site development boundaries were developed from proposed grades and ground cover designed to minimize site storm water management structure requirements.

Hydrologic soil groups and curve numbers were estimated for existing and proposed developed conditions using available NRCS Soil Maps, current vegetation, and terrain.

DRAINAGE ANALYSIS

The purpose of the drainage analysis is two-fold. The first is to analyze and quantify the pre-development runoff flows through the site. The second purpose is to evaluate the impact of the proposed development on drainage patterns and flows, both within and outside the site, and to design a stormwater management system to adequately convey post-development runoff.

The design of the stormwater management system has the following goals:

1.) Minimize or eliminate erosion and sedimentation during construction as well as after development.

2.) To ensure that post-development flows do not have an adverse effect on downstream drainage structures and landowners.

3.) To design a stormwater and treatment system which will carry the surface runoff and satisfy goals one and two.

To determine the hydrological effect of the proposed development on the watershed, the existing conditions must first be analyzed.

WATERSHED DESCRIPTION: EXISTING CONDITIONS

Depending on the soil classification, type of ground cover present and the direction of the flow of runoff, the existing site is divided into watershed areas.

14 Merrimac Street

In this case, the entire site at 14 Merrimac street drains to the south east towards the PowWow/Merrimac river creating only one watershed (watershed E1) consisting primarily of pavement and gravel with minimal grassed and wooded areas.

13 Merrimac Street

To the North West, 13 Merrimac Street, is divided into two sub-catchments E2 and E3. Both sub-catchments consist primarily of gravel and some patches of asphalt and grassed areas.

WATERSHED ANALYSIS: EXISTING CONDITIONS

The existing conditions were modeled using the tabular hydrograph method with a Type III synthetic storm distribution for the 2, 10 and 100-year storm recurrence intervals. Runoff hydrographs were produced to estimate existing peak discharge.
Flows for the three storm simulations are as follows:

Existing (Pre-development) Peak Runoff Rates (c.f.s.)

Subcatchment	Size (Acres)	2 Yr Storm	10 Yr Storm	100 Yr Storm
E1	1.62	4.07	6.47	12.24
E2	0.29	0.65	1.11	2.21
E3	0.13	0.29	0.49	0.96

The pre-development drainage calculations can be found in Appendix A

WATERSHED DESCRIPTION: POST-DEVELOPMENT CONDITIONS

To determine the post development runoff, new watersheds, runoff curve numbers and times of concentration were generated reflecting the changes in the topography and surface cover. The post-development watersheds are shown on the attached plans (Watersheds and HydroCad Data, sheet 2 of 2).

14 Merrimac Street

Watershed areas P1A, P1B, P1C, P1D all consist of primarily pavement and some lawn located in the northern area of the site. The runoff flows over land and into CB1-CB4 and are then piped over to the Contech CDS unit which then discharges to the east of the site towards the Pow Wow River. Watershed area P1E and consists of the stretch of pavement located just north of the proposed restaurant and marina facility and south of sub-catchments P1A-P1D. This area flows to the east into the proposed rain garden which then outlets into the Pow Wow River.

The final watershed area, P1F is the remaining area that flows directly to the Pow Wow/Merrimac River. The area consists of Pavement, gravel, roof, and grass.

13 Merrimac Street
Due to the minimal site grading at 13 Merrimac Street, the topography has remained nearly the same as previously. That being said, sub-catchments E2 and E3 remain the same post construction.

WATERSHED ANALYSIS: POST-DEVELOPMENT CONDITIONS

The proposed developed conditions were modeled using the tabular hydrograph method with a Type III synthetic storm distribution for the 2, 10 and 100-year storm recurrence intervals. Runoff hydrographs were produced to estimate the post-development peak discharge.

Flows for the three storm simulations are as follows:

Post-Developed Peak Runoff Rates (c.f.s.)

Subcatchment	Size (Acres)	2 Yr Storm	10 Yr Storm	100 Yr Storm
Total P1	1.62	3.45	5.71	12.03
Total P2	0.29	0.50	0.94	2.06
Total P3	0.13	0.28	0.48	0.96

The post-development drainage calculations can be found in Appendix B.

IV. Stormwater Recharge Calculations

Stormwater Recharge Calculations

Calculations were performed to ensure that the proposed project will comply with the groundwater recharge requirements of the Mass **DEP** Stormwater Management Standards.

Due to the soil properties on-site consisting entirely of fill material and C/D soils (see soil logs), no recharge is provided.

V. TSS Removal Calculations

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

THE MARINA AT AMESBURY POINT
AMESBURY, MA

Area	**0.49 ac**	Unit Site Designation	**CDS**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**6 min**		
CDS Model	**2015-4**	CDS Treatment Capacity	**1.4 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.03	0.03	9.1
0.08	7.7%	37.0%	0.04	0.04	7.4
0.10	8.6%	45.6%	0.04	0.04	8.2
0.12	6.3%	51.9%	0.05	0.05	6.0
0.14	4.7%	56.5%	0.06	0.06	4.4
0.16	4.6%	61.2%	0.07	0.07	4.4
0.18	3.5%	64.7%	0.08	0.08	3.3
0.20	4.3%	69.1%	0.09	0.09	4.0
0.25	8.0%	77.1%	0.11	0.11	7.3
0.30	5.6%	82.7%	0.13	0.13	5.1
0.35	4.4%	87.0%	0.15	0.15	3.9
0.40	2.5%	89.5%	0.18	0.18	2.2
0.45	2.5%	92.1%	0.20	0.20	2.2
0.50	1.4%	93.5%	0.22	0.22	1.2
0.75	5.0%	98.5%	0.33	0.33	4.1
1.00	1.0%	99.5%	0.44	0.44	0.8
1.50	0.0%	99.5%	0.66	0.66	0.0
2.00	0.0%	99.5%	0.88	0.88	0.0
3.00	0.5%	100.0%	1.31	1.31	0.2
					92.8
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**86.4%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

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

Version 1, Automated: Mar. 4, 2008

Location: Rain Garden

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

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

Project: M214054
Prepared By: SRC
Date: 3/11/2024

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

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

1. From MassDEP Stormwater Handbook Vol. 1

VI. Water Quality Calculations

Water Quality Calculations

The Massachusetts DEP requires water quality calculations based on 1/2 inch of runoff for the total impervious area associated with the proposed development. The following calculation identifies the water quality volume required.

Total Impervious Area = 39,063 s.f.
39,063 s.f. * 1/2" / 12 (to convert to ft) = 1,625 c.f. of runoff to be treated for water quality.

Volume of the Rain garden below the lowest outlet = 349 c.f.

The Remaining required WQV is obtained through the CDS unit (see supporting documents)

Project: The Marina at Amesbury Point
Location: Amesbury, MA
Prepared For: Millennium Engineering

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1/2" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (WQV)$$

where:

Q = flow rate associated with first 1/2" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1/2" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
CDS	0.49	0.0007609	6.0	0.100	0.50	752.00	0.29

VII. Soils Analysis

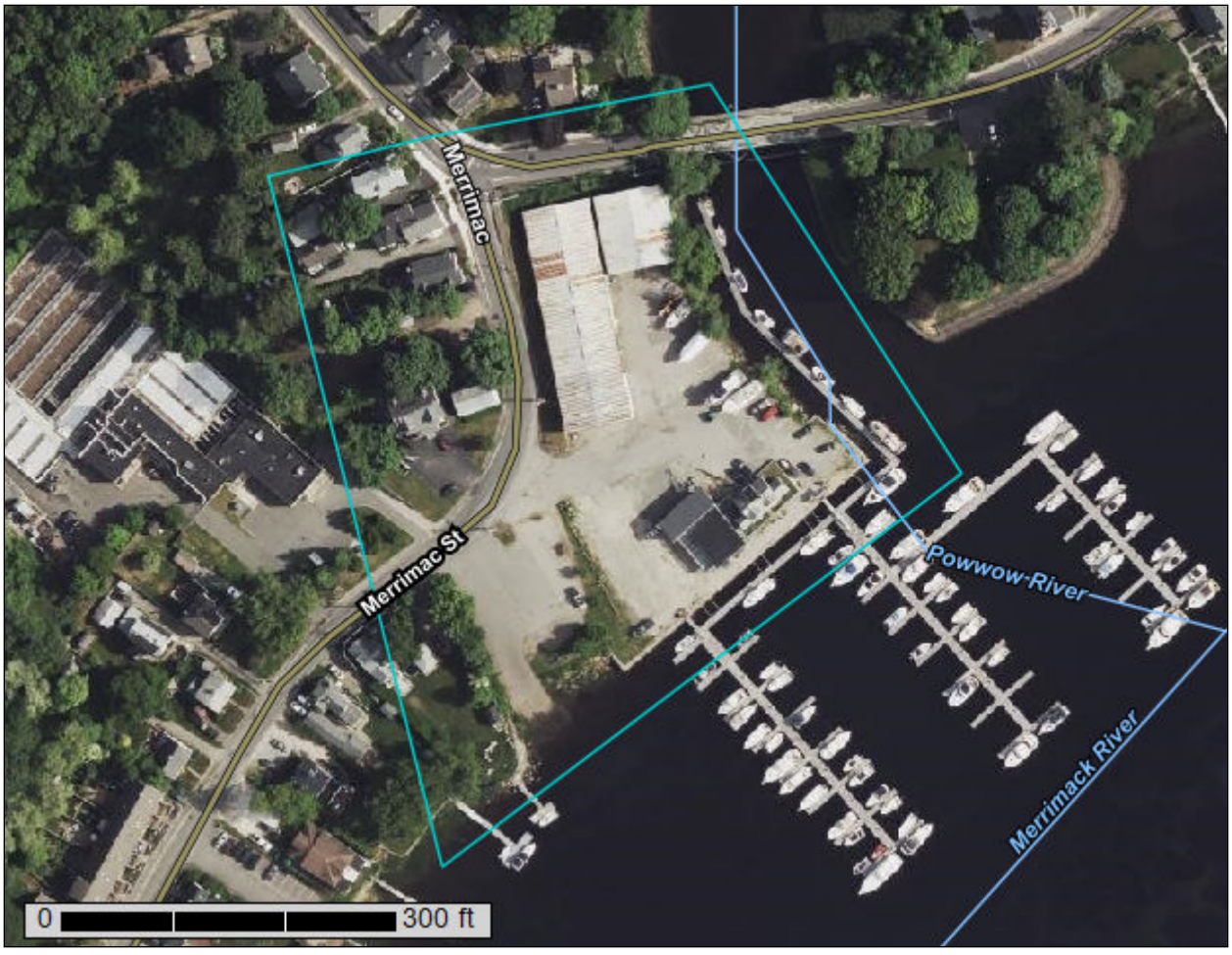
United States Department of Agriculture

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 Essex County, Massachusetts, Northern Part



March 27, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

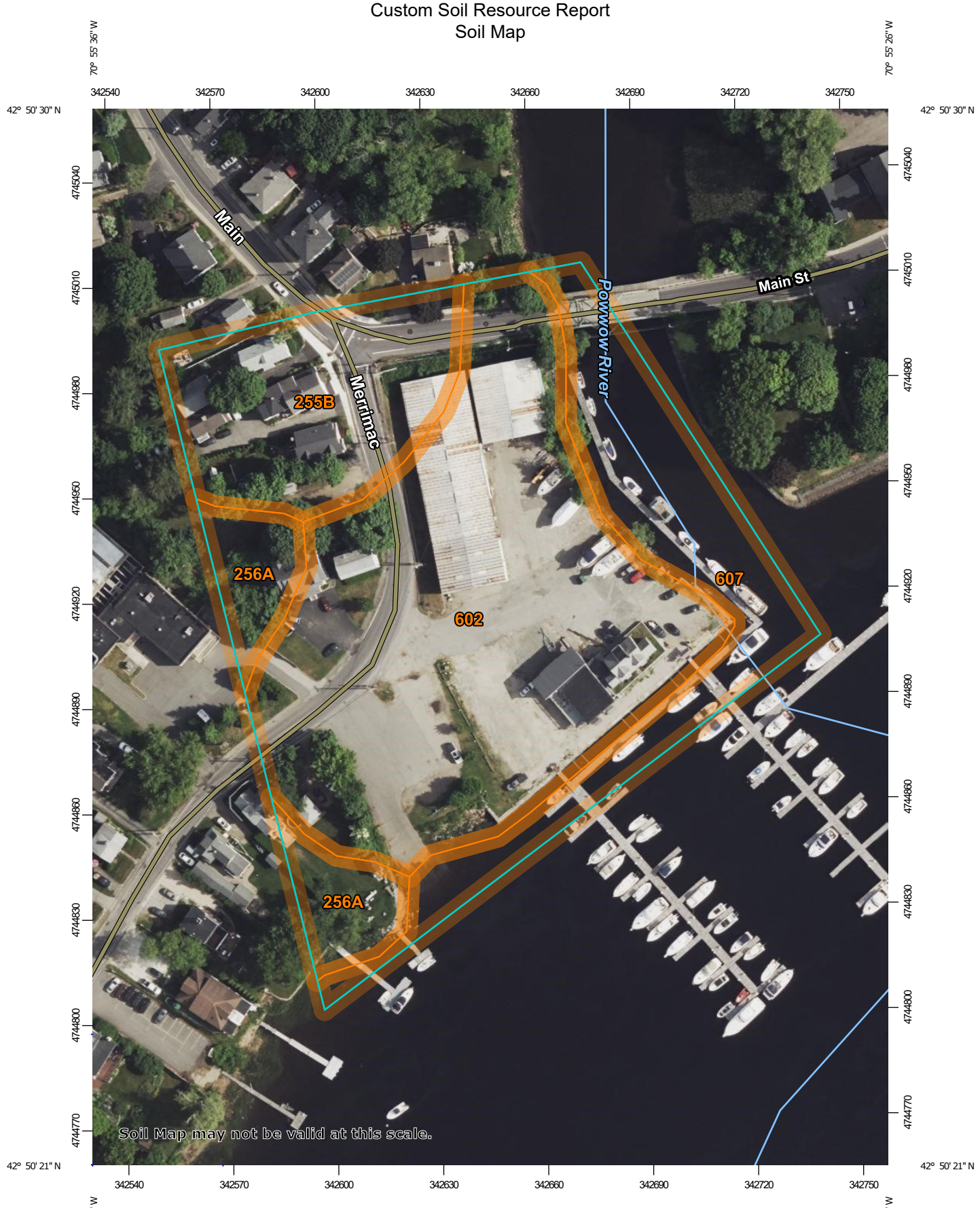
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,470 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 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
255B	Windsor loamy sand, 3 to 8 percent slopes	1.0	17.4%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.5	8.3%
602	Urban land	3.1	53.7%
607	Water, saline	1.2	20.6%
Totals for Area of Interest		**5.8**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Essex County, Massachusetts, Northern Part

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 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: Farmland of statewide importance

Map Unit Composition

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

Description of Windsor, Loamy Sand

Setting

Landform: Dunes, outwash plains, deltas, outwash terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand

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

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

602—Urban land

Map Unit Setting

National map unit symbol: vjx3
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Udorthents

Percent of map unit: 10 percent
Hydric soil rating: No

Hinckley

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

Charlton

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

Windsor

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

Merrimac

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

Paxton

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

607—Water, saline

Map Unit Setting

National map unit symbol: vk29
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water, saline: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Westbrook

Percent of map unit: 5 percent
Landform: Marshes
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

SOIL SUITABILITY ASSESSMENT REPORT
COMMONWEALTH OF MASSACHUSETTS
AMESBURY, MASSACHUSETTS

FOR NEW CONSTRUCTION OF ON-SITE SUBSURFACE DRAINAGE CONTROL

SITE INFORMATION

Mblu: 88/ / 1//

Street Address: 14 Merrimac Street Town: Amesbury State: Massachusetts Zip Code: 01913 County: Essex

Land Use: Commercial; Boat Marina Latitude: ~42° 50' 26.94" N Longitude: ~70° 55' 31.48" W

PUBLISHED SOIL DATA AND MAP UNIT DESCRIPTION NO DATA ON URBAN LAND

Physiographic Division: Appalachian Highlands Physio. Province: New England Physio. Section: Seaboard lowland section

Soil survey area: Essex County, Massachusetts, Northern Part Series name: 602 – Urban land

Order: _____ Suborder: _____ Family: _____

Soil moisture regime: Udic Soil temperature regime: Mesic Runoff class: _____ Hydric soil rating: No

Soil hydric or upland: _____ Average depth to water table: _____ Depth to restrictive feature: _____

Frequency of flooding: _____ Frequency of ponding: _____ Available water capacity: _____

Drainage Class: _____ Hydrologic Soil Group:___ Ksat: _____

Ecological site: _____

WETLAND AREA & USGS WELL MEASUREMENTS

National Wetland Inventory Map: NA Wetlands Conservancy Program: NA Bordering vegetative wetland: > 100'

Current Water Resource Condition (USGS): Well Site # 424841071004101- MA-HLW 23 Haverhill, MA.,

Well depth: 15.10 feet Land surface altitude: 100.00 feet above NGVD29 Latitude: ~42°48'41.8" N Longitude: ~71°00'41.7"

Most recent data value: 10.76' on 06/15/23 (depth to water level in feet below land surface)

SURFICIAL GEOLOGY: NO DATA ON SURFICIAL GEOLOGY

Geologic parent material: Excavated and filled land Geomorphic component: _____

Slope aspect: _____ Landform position (2D): _____ Landform position (3D): _____

Slope gradient: ~01-03% Down slope shape: Linear Across slope shape: Linear Slope complexity: Simple

Bedrock outcropping in vicinity: None observed Glacial erratics in vicinity: None observed

Bedrock Type: Eliot Formation – Silurian (440 – 420 Ma): Gray to gray-green phyllite and calcareous quartzite and quartz-mica schist and well bedded calc-silicates.

TP23-1 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-1

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 82"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	72" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 72"; apparent water observed at 76"; no bedrock encountered.

Depth to bedrock: > 82" Seasonal High Groundwater Table: 72" Apparent water: 76"

TP23-1 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 76" (below land surface) Depth to stabilized apparent water: 76" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 72" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 72" inches below grade

Observed water weeping from side of deep hole: 76" inches below grade

Observed depth to stabilized phreatic water: 76" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ► 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-1 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

#1848 October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-2 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-2

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 72"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	66" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 66"; apparent water observed at 71"; no bedrock encountered. .

Depth to bedrock: > 72" Seasonal High Groundwater Table: 66" Apparent water: 71"

TP23-2 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 71" (below land surface) Depth to stabilized apparent water: 71" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 66" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 66" inches below grade

Observed water weeping from side of deep hole: 71" inches below grade

Observed depth to stabilized phreatic water: 71" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-2 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

#1848 October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-3 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-3

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 92"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	72" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 70"; apparent water observed at 72"; no bedrock encountered.

Depth to bedrock: > 92" Seasonal High Groundwater Table: 70" Apparent water: 72"

TP23-3 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 70" (below land surface) Depth to stabilized apparent water: 70" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 72" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 63" inches below grade

Observed water weeping from side of deep hole: 71" inches below grade

Observed depth to stabilized phreatic water: 71" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ► 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-3 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

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Alexander F. Parker Date of License issuance

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Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-4 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-4

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 67"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	55" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 49"; apparent water observed at 55"; no bedrock encountered.

Depth to bedrock: > 67" Seasonal High Groundwater Table: 49" Apparent water: 55"

TP23-4 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 55" (below land surface) Depth to stabilized apparent water: 55" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 49" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 49" inches below grade

Observed water weeping from side of deep hole: 55" inches below grade

Observed depth to stabilized phreatic water: 55" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-4 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

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Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-5 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-5

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 62"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	48" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 48"; apparent water observed at 55"; no bedrock encountered.

Depth to bedrock: > 62" Seasonal High Groundwater Table: 48" Apparent water: 55"

TP23-5 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 55" (below land surface) Depth to stabilized apparent water: 55" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 49" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 49" inches below grade

Observed water weeping from side of deep hole: 55" inches below grade

Observed depth to stabilized phreatic water: 55" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-5 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-6 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-6

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 69"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	48" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 48"; apparent water observed at 54"; no bedrock encountered.

Depth to bedrock: > 69" Seasonal High Groundwater Table: 48" Apparent water: 54"

TP23-6 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 54" (below land surface) Depth to stabilized apparent water: 54" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 48" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 48" inches below grade

Observed water weeping from side of deep hole: 54" inches below grade

Observed depth to stabilized phreatic water: 54" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-6 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

#1848 October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-7 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10^{+} feet Drainage way: 50^{+} feet Drinking water well: 100^{+} feet Abutting septic system: 50^{+} feet

Wetlands: 50^{+} feet Public water supply reservoir: 400^{+} feet Tributary to reservoir: 200^{+} feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▸ TP23-7

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 65"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	48" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 48"; apparent water observed at 54"; no bedrock encountered.

Depth to bedrock: > 65" Seasonal High Groundwater Table: 48" Apparent water: 54"

TP23-7 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 54" (below land surface) Depth to stabilized apparent water: 54" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 48" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 48" inches below grade

Observed water weeping from side of deep hole: 54" inches below grade

Observed depth to stabilized phreatic water: 54" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-7 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

#1848 October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

TP23-8 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-8

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 67"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	43" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 43"; apparent water observed at 48"; no bedrock encountered.

Depth to bedrock: > 67" Seasonal High Groundwater Table: 43" Apparent water: 48"

TP23-8 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 48" (below land surface) Depth to stabilized apparent water: 48" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 43" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 43" inches below grade

Observed water weeping from side of deep hole: 48" inches below grade

Observed depth to stabilized phreatic water: 48" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-8 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

#1848

Alexander F. Parker

Massachusetts Soil Evaluator & License number

October 1998

Date of License issuance

Unofficial soil evaluation for drainage

Town of Amesbury Witness

06/15/2023

Date of soil testing

M214054

TP23-9 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

Date: 06/15/2023 Weather: Partly cloudy, 60°-70° F, still and dry.

Landscape: Man-made land Landform: _____ Position on landscape: _____

Slope aspect: Southerly Slope (%): 00 – 02 % Slope complexity: Simple Land Cover: Gravel & asphalt surface

Property line: 10+ feet Drainage way: 50+ feet Drinking water well: 100+ feet Abutting septic system: 50+ feet

Wetlands: 50+ feet Public water supply reservoir: 400+ feet Tributary to reservoir: 200+ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

SOIL PROFILE ▶ TP23-9

Depth below land surface (inches)	Soil Horizon/ Layer	Soil Texture (USDA/ NRCS)	Soil Color (Munsell)	Redoxomorphic Features/ ESHGWT	Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc.
00" → 46"	C^	Sandy Loam Loamy Sand Fill mixture HUMAN TRANSPORTED MATERIAL	10YR 2/1 black to 10YR 4/6 dark yellowish brown	35" (f,2,d) 5YR 5/8 Gley 1 7/N	Mechanically mixed anthropic layer; structureless-massive; fine-to-medium grained mineral content; various soil textures mixed within fill matrix; non-sticky; non-plastic; stable walls in the test hole; gravel, cobbles, brick, wire and wood present; seasonal high-water table observed at 35"; apparent water observed at 40"; no bedrock encountered.

Depth to bedrock: > 46" Seasonal High Groundwater Table: 35" Apparent water: 40"

TP23-9 DEEP OBSERVATION HOLE

14 Merrimac Street, Amesbury, Massachusetts

DEPTH TO APPARENT GROUNDWATER TABLE:

Apparent water weeping from pit face: 40" (below land surface) Depth to stabilized apparent water: 40" (below land surface)

Soil moisture state: Damp progressing to saturated

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE:

Depth of Estimated Seasonal High Groundwater Table: 35" (below land surface)

Kind: Iron concentrations; non-cemented iron masses and reduction spots

Shape: Amorphous/ linear Location: In C^ matrix

Hardness: Soft Boundary: Diffuse Abundance: Few Size: Medium Contrast: Distinct

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp matrix

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 35" inches below grade

Observed water weeping from side of deep hole: 40" inches below grade

Observed depth to stabilized phreatic water: 40" inches below grade

DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL: ▶ 00" ALL FILL MATERIAL

Depth of naturally occurring pervious material in TP23-9 Upper boundary: 00"
Lower boundary: 00"

Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

#1848 October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial soil evaluation for drainage 06/15/2023

Town of Amesbury Witness Date of soil testing

VIII. Long Term Pollution Prevention and Operations and Maintenance Plan

This long-term Stormwater Management System Operations and Maintenance (O&M) Plan, filed with the City of Amesbury, shall be implemented for the proposed development at 2 & 13 Merrimac Street to ensure that the stormwater management system functions as designed. The Owner holds the primary responsibility for overseeing and implementing the O&M Plan and assigning a Property Manager who will be responsible for the proper operation and maintenance of the stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M Plan. Included in the manual is a Stormwater Management O&M Plan identifying the key components of the stormwater system and a log for tracking inspections and maintenance.

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the number of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, and prohibitions on the use of pesticides.

The purpose of the Stormwater Operations and Maintenance (O&M) plan is to ensure inspection of the system, removal of accumulated sediments, oils, and debris, and implementation of corrective action and record keeping activities.

The ongoing responsibility is the Owner, its successors, and assigns. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

Responsibility for Operations and Maintenance

14 Merrimac St. LLC
2 Merrimac Street
Amesbury, MA

Illicit Discharge Compliance Statement

I, _____, verify that all illicit discharges to the stormwater management system are prohibited and no illicit discharges exist on the site.

EROSION AND SEDIMENT CONTROL BMPs

Minimize Disturbed Area and Protect Natural Features and Soil

Topsoil

Topsoil stripped from the immediate construction area can be temporarily stockpiled on site providing that the perimeter of the stockpiles is properly staked with silt fence at the toe of slope. The stockpiles shall be in areas that will not interfere with construction and at least 15 feet away from areas of concentrated flows or pavement. The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls.

Stabilize Soils

Temporary Stabilization

- All vegetated areas which do not exhibit a minimum of 85% vegetative growth by Oct. 15th, or which are disturbed after Oct. 15th, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The placement of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85% vegetative growth by Oct. 15th, or which are disturbed after Oct. 15th, shall be stabilized with stone or erosion control blankets appropriate for the design flow conditions.
- After November 15th, incomplete road surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel.

Protect Slopes

Geotextile erosion control blankets shall be used to provide stabilization for slopes exceeding 3:1. Prepare soil before installing erosion control blanket, including any necessary application of lime, fertilizer, and seed. Begin at the top of the slope by anchoring the blanket in a 6" deep x 6" wide trench with approximately 12" extended beyond the upslope portion of the trench. Anchor the blanket with a row of staples/stakes approximately 12" apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12" portion of back over seed and compacted soil. Secure over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the blanket. Roll erosion control blanket either down or horizontally across the slope. Blanket will unroll with appropriate side against the soil surface. All blankets must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide. When using the dot system, staples/stakes should be placed through each of the colored dots corresponding to the appropriate staple pattern. The edges of parallel blankets must be stapled with approximately

2"-5" overlap. Consecutive blankets spliced down the slope must be placed end over end (shingle style) with an approximate 3" overlap. Staple through overlapped area, approximately 12" apart across entire blanket's width. In loose soil conditions, the use of staple or stake lengths greater than 6" may be necessary to properly anchor the blanket.

Establish Perimeter Controls and Sediment Barriers

Silt fence shall be installed along the edge of the limit of work. The silt fence shall be installed before construction begins. Wooden posts shall be doubled and coupled at filter cloth seams. Filter cloth shall be fastened securely to support netting with ties spaced every 24" at top, midsection, and bottom. When two sections of filter cloth adjoin each other, they shall be overlapped by 6 inches, folded and stapled. Silt fence shall be removed upon completion of the project and stabilization of all soil.

Maintenance:
1. Silt fence shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any repairs that are required shall be made immediately.
2. If the fabric on the silt fence shall decompose or become ineffective during the expected life of the fence, the fabric shall be replaced promptly.
3. Sediment deposits shall be inspected after every storm event. The deposits shall be removed when they reach approximately one-half the height of the barrier.
4. Sediment deposits that are removed or left in place after the fabric has been removed shall be graded to conform with the existing topography and vegetated.

Establish Stabilized Construction Entrance

A stabilized construction entrance shall be installed before construction begins on the site. The stone anti-tracking pad shall remain in place until the subgrade of pavement is installed.

1. Stone shall be 1-2" stone, reclaimed stone, or recycled concrete equivalent.
2. The length of the stabilized entrance shall not be less than 50'.
3. The thickness of the stone for the stabilized entrance shall not be less than 6".
4. Geotextile filter cloth shall be placed over the entire area prior to placing the stone.
5. All surface water that is flowing to or diverted toward the construction entrance shall be piped beneath the entrance. If piping is impractical, a berm with 5:1 slope that can be crossed by vehicles may be substituted for the pipe.
6. The entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top-dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, washed, or tracked onto public rights-of-way must be removed promptly.
7. Wheels shall be cleaned to remove mud prior to entrance onto public rights-of way. When washing is required, it shall be done on an area stabilized with stone which drains into an approved sediment trapping device.

Catch Basin Inlet Protection

Inlet protection devices intercept and/or filter sediment before it can be transported from a site into the storm drain system and discharged into a lake, river, stream, wetland, or other waterbody. These devices also keep sediment from filling or clogging storm drainpipes, ditches, and downgradient sediment traps or ponds. A silt sack or approved equal shall be used for catch basin inlet protection. It should be inspected weekly. When the restraint cord is no longer visible, silt sack is full and shall be emptied.

<u>POST-CONSTRUCTION BMPs</u>

Snow and Snow Melt Management

Proper management of snow and snow melt, snow removal and storage, use of deicing compounds, and other practices can minimize major runoff and pollutant loading impacts. Snow will be stored in areas adjacent to the edge of the roadway. Use of alternative deicing compounds, such as calcium chloride and calcium magnesium acetate, will be investigated for use. Professional services will be used for snow management.

Deep Sump/Hooded Catch Basins

Deep sump/hooded catch basins are incorporated in the proposed development's stormwater management plan as pre-treatment for the proposed drainage system. The sump provides for settlement of suspended solids and a hood is provided to remove floatables and trapped hydrocarbons. It is not anticipated that the proposed roadway will become an area of high sediment loading. The sump should be inspected and cleaned at least four times per year; the more frequent the cleaning, the less likely sediment will be resuspended and subsequently discharged. Catch basin sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the catch basin cleaning operations.

Rain Garden

A Rain Garden is incorporated into the site design to provide treatment for stormwater runoff. After rainstorms, inspect the garden and make sure that drainage paths are clear and that ponding water dissipates over 4-6 hours. Inspect and repair erosion monthly. Use small stones to stabilize erosion along drainage paths. Re-mulch any void areas by hand as needed and every year, in the spring, add a fresh mulch layer. Immediately after the completion of garden construction, water plant material for 14 consecutive days unless there is sufficient natural rainfall. Twice a year remove and replace all dead and diseased vegetation. The property owner will be responsible for proper maintenance of the rain gardens.

CDS System

A CDS2015-4 is incorporated into the site design for treatment for the proposed underground infiltration system. At a minimum, the unit shall be inspected twice per year (spring and fall). The CDS unit should be vacuum cleaned when the level of sediment has reached 75% of capacity in the isolated sump. Sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the CDS cleaning operations.

Peastone Diaphragm

A Peastone diaphragm is proposed along the outer edge of the gravel parking lot at 13 Merrimac Street. The stone diaphragm shall be inspected twice per year (spring and fall). Any sediment and debris should be removed manually before the stone is adversely impacted. The owner will be responsible for proper maintenance of the stone trenches.

Rip Rap

Inspect the rip rap outlets regularly, especially after major storm events. Notation of any low spots or erosion should be made.

FINAL STABILIZATION

Permanent Seeding

Loam and hydroseed any disturbed surfaces after the final design grades have been achieved. A minimum of 6" of loam shall be installed. Seed mix shall be a maximum of 10% rye grass and a minimum of 90% permanent bluegrass and/or fescue. Lime shall be applied at a rate of 2 tons/acre.

Construction debris, trash and temporary BMPs (including silt fences, material storage areas, and inlet protection) will also be removed and any areas disturbed during removal will be seeded immediately.

IIX. **Appendix**

a. Rip Rap Sizing Calculations

Rockingham County Conservation District

PIPE OUTLET PROTECTION APRON DESIGN
And
d_{50} RIPRAP SIZING

PROJECT NAME :	2 Merrimac Street				
PROJECT # :	Primary drainage outlet				
BY :	SRC		CHECKED BY :		
DATE :	3/11/2024	STORM:	10-Yr	DATE :	

DOWNSTREAM PIPE HYDRAULICS

Peak Discharge Required =	6.37	cfs
Depth of Flow* =	1.00	Feet

La AND W CALCULATIONS:

Culvert Diameter (Do) =	18.0	Inches
Tail Water Depth (TW)* =	1.00	Feet
Width of Apron @ U.S End (W) =	4.5	Feet
Length of Apron (La) =	21	Feet
Width of Apron @ D.S End (W) =	13	Feet

***If outletting to Flat Area use TW depth = 0.2 x Do**

ROCK RIPRAP SIZE

d_{50} = 0.16 Feet or 1.89 Inches

$d_{50} = (0.02 \times Q^{4/3})/(Tw \times Do)$

ROCK RIPRAP GRADATION (TABLE 7-24 OF NHDES HANDBOOK)

% of Weight Smaller Than The Given Size	Size of Stone in Inches		
100	2.8	to	3.8
85	2.5	to	3.4
50	1.9	to	2.8
15	0.6	to	0.9

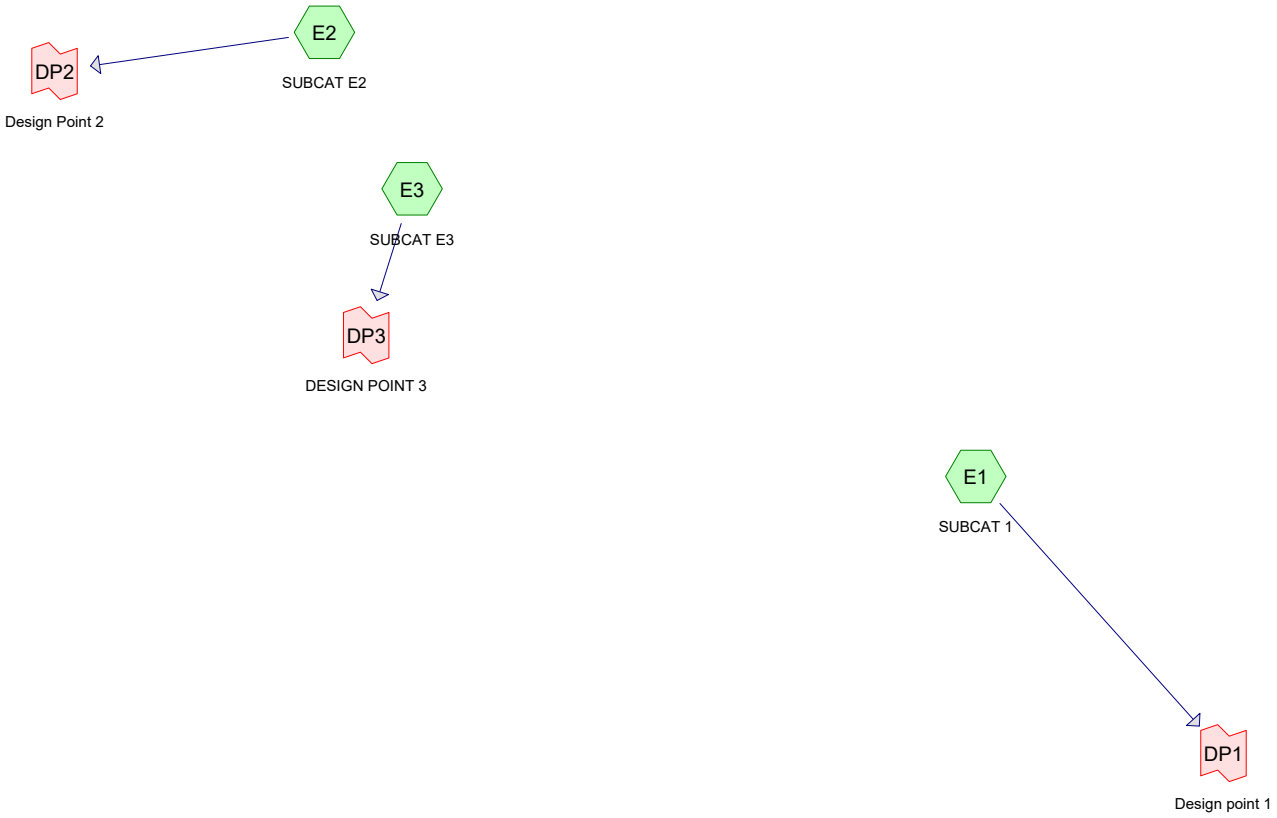
Minimum Rock Riprap Blanket Thickness = 6.0 Inches

Minimum Six inch Sand/Gravel Bedding or Geotextile Fabric Required Under All Rock Riprap

FORMULAS USED (Reference NHDES HANDBOOK, Pages 7-114, 7-115)

Manning's Uniform Channel Flow -	Q = (A x 1.486 x R^(2/3) x S^(1/2))/"n"
Length of Apron (La) TW< Do/2 -	La = (1.8 x Q/Do^1.5) + 7 x Do
Length of Apron (La) TW>= Do/2 -	La = 3.0 x Q/Do^1.5 + 7 x Do
Width of Apron @ D.S End TW < Do/2 -	W = 3 x Do + La
Width of Apron @ D.S End TW >= Do/2 -	W = 3 x Do + 0.4 x La
Width of D.S. Apron if in Channel -	Ch. BW +Sum of Side Slopes x Flow Depth
Width of Apron @ Culvert -	Wc = 3 x Do

b. Existing Conditions HydroCAD Report



Subcat Reach Pond Link

Routing Diagram for Existing Dev
Prepared by {enter your company name here}, Printed 3/9/2024

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.183	79	50-75% Grass cover, Fair, HSG C (E1, E3)
0.187	86	<50% Grass cover, Poor, HSG C (E2)
0.518	96	Gravel surface, HSG C (E1, E2, E3)
0.546	98	Paved parking, HSG C (E1, E3)
0.515	98	Roofs, HSG C (E1, E2, E3)
0.097	76	Woods/grass comb., Fair, HSG C (E1)
2.047	**94**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.047	HSG C	E1, E2, E3
0.000	HSG D	
0.000	Other	
2.047		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.183	0.000	0.000	0.183	50-75% Grass cover, Fair	E1, E3
0.000	0.000	0.187	0.000	0.000	0.187	<50% Grass cover, Poor	E2
0.000	0.000	0.518	0.000	0.000	0.518	Gravel surface	E1, E2, E3
0.000	0.000	0.546	0.000	0.000	0.546	Paved parking	E1, E3
0.000	0.000	0.515	0.000	0.000	0.515	Roofs	E1, E2, E3
0.000	0.000	0.097	0.000	0.000	0.097	Woods/grass comb., Fair	E1
0.000	**0.000**	**2.047**	**0.000**	**0.000**	**2.047**	**TOTAL AREA**	

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

Subcatchment E1: SUBCAT 1 Runoff Area=70,903 sf 61.51% Impervious Runoff Depth>2.36"
Flow Length=491' Tc=7.5 min CN=95 Runoff=4.07 cfs 0.320 af

Subcatchment E2: SUBCAT E2 Runoff Area=12,765 sf 2.74% Impervious Runoff Depth>1.93"
Tc=6.0 min CN=90 Runoff=0.65 cfs 0.047 af

Subcatchment E3: SUBCAT E3 Runoff Area=5,514 sf 41.15% Impervious Runoff Depth>2.02"
Tc=6.0 min CN=91 Runoff=0.29 cfs 0.021 af

Link DP1: Design point 1 Inflow=4.07 cfs 0.320 af
Primary=4.07 cfs 0.320 af

Link DP2: Design Point 2 Inflow=0.65 cfs 0.047 af
Primary=0.65 cfs 0.047 af

Link DP3: DESIGN POINT 3 Inflow=0.29 cfs 0.021 af
Primary=0.29 cfs 0.021 af

Total Runoff Area = 2.047 ac Runoff Volume = 0.389 af Average Runoff Depth = 2.28"
48.16% Pervious = 0.986 ac 51.84% Impervious = 1.061 ac

Summary for Subcatchment E1: SUBCAT 1

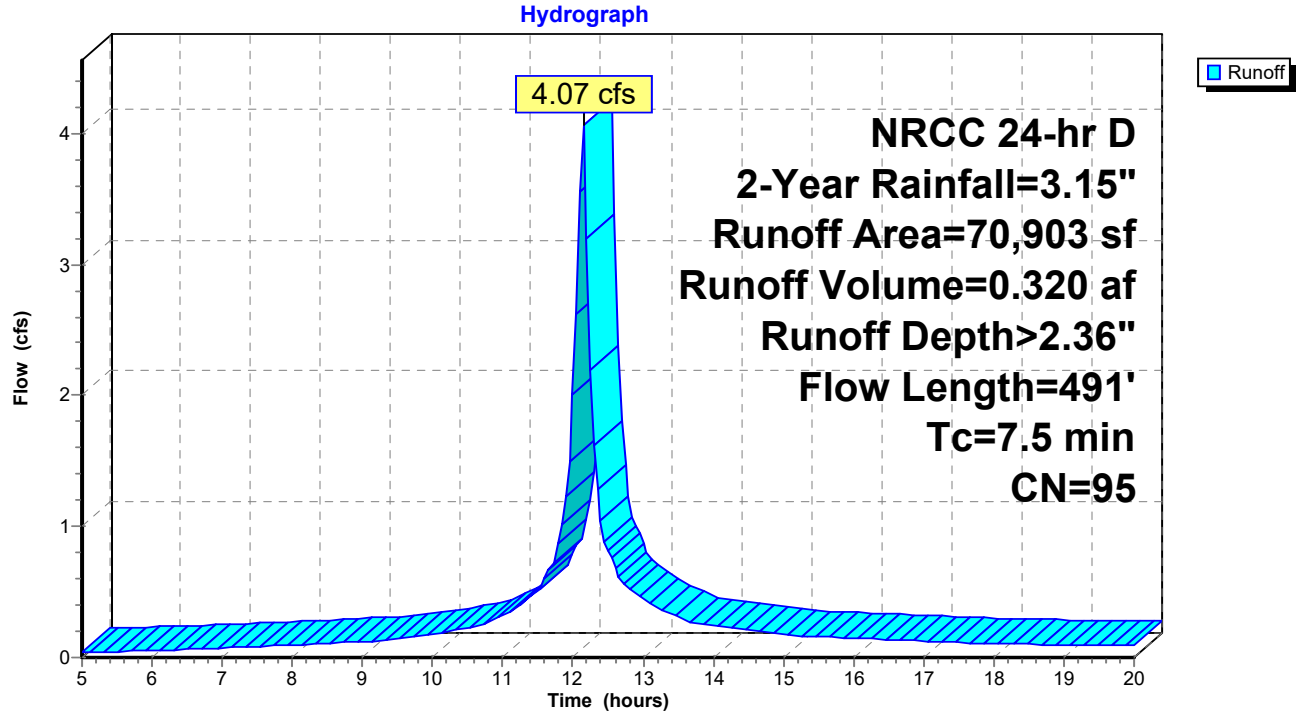
Runoff = 4.07 cfs @ 12.14 hrs, Volume= 0.320 af, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
21,129	98	Roofs, HSG C
22,485	98	Paved parking, HSG C
16,808	96	Gravel surface, HSG C
4,232	76	Woods/grass comb., Fair, HSG C
6,249	79	50-75% Grass cover, Fair, HSG C
70,903	95	Weighted Average
27,289		38.49% Pervious Area
43,614		61.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	25	0.2800	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	200	0.0050	1.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.1	266	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.5	491	Total			

Subcatchment E1: SUBCAT 1



Summary for Subcatchment E2: SUBCAT E2

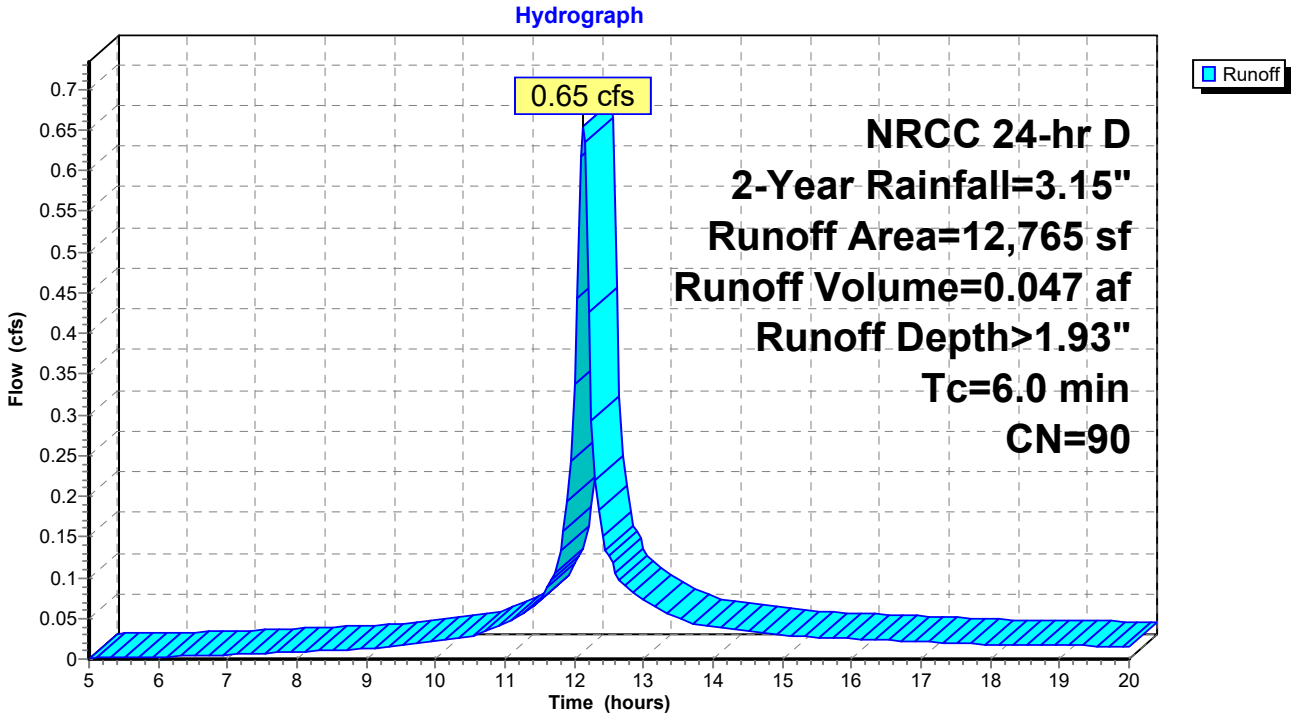
Runoff = 0.65 cfs @ 12.13 hrs, Volume= 0.047 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,266	96	Gravel surface, HSG C
350	98	Roofs, HSG C
8,149	86	<50% Grass cover, Poor, HSG C
12,765	90	Weighted Average
12,415		97.26% Pervious Area
350		2.74% Impervious Area

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

Subcatchment E2: SUBCAT E2



Summary for Subcatchment E3: SUBCAT E3

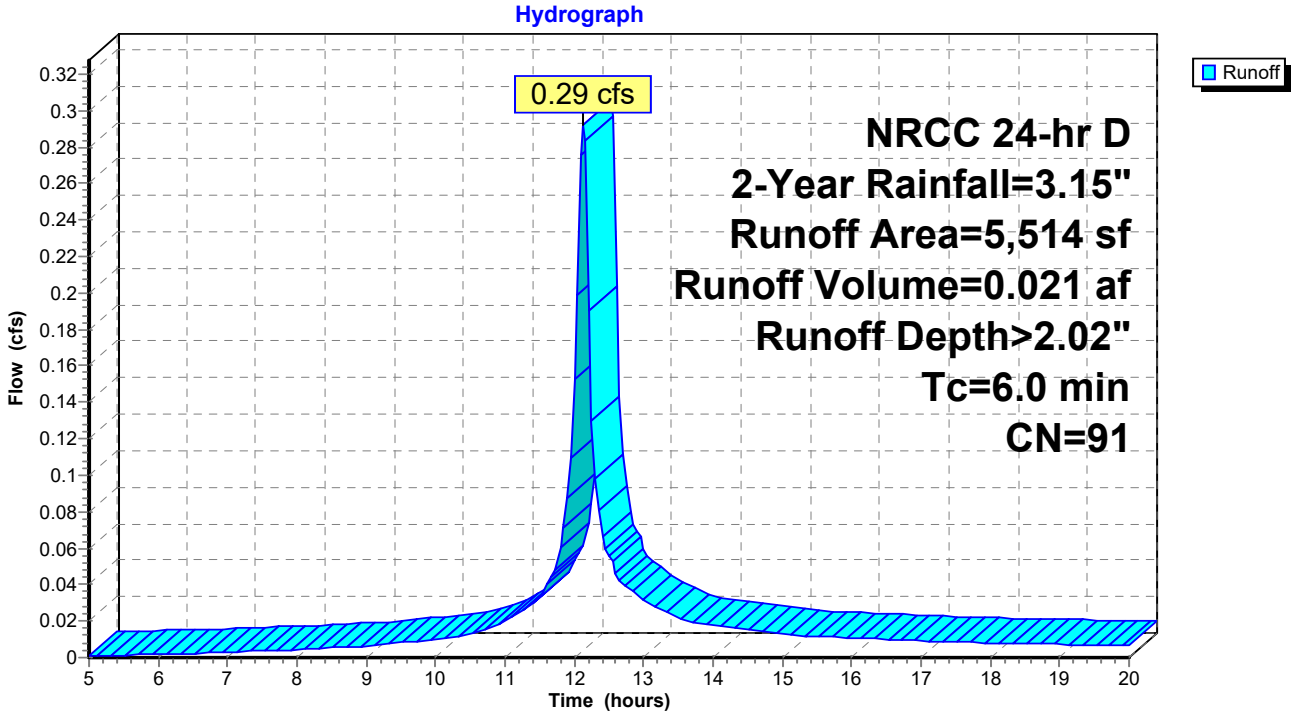
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 0.021 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,506	96	Gravel surface, HSG C
1,300	98	Paved parking, HSG C
969	98	Roofs, HSG C
1,739	79	50-75% Grass cover, Fair, HSG C
5,514	91	Weighted Average
3,245		58.85% Pervious Area
2,269		41.15% Impervious Area

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

Subcatchment E3: SUBCAT E3

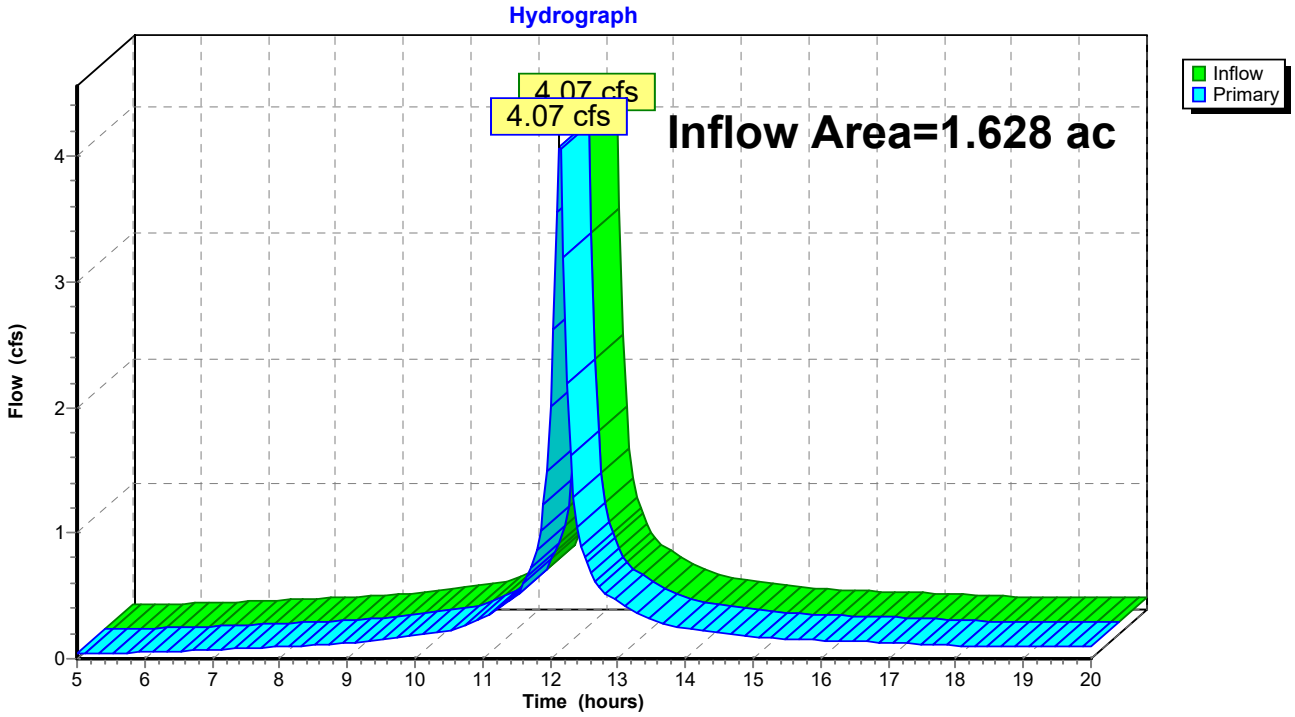


Summary for Link DP1: Design point 1

Inflow Area = 1.628 ac, 61.51% Impervious, Inflow Depth > 2.36" for 2-Year event
Inflow = 4.07 cfs @ 12.14 hrs, Volume= 0.320 af
Primary = 4.07 cfs @ 12.14 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP1: Design point 1

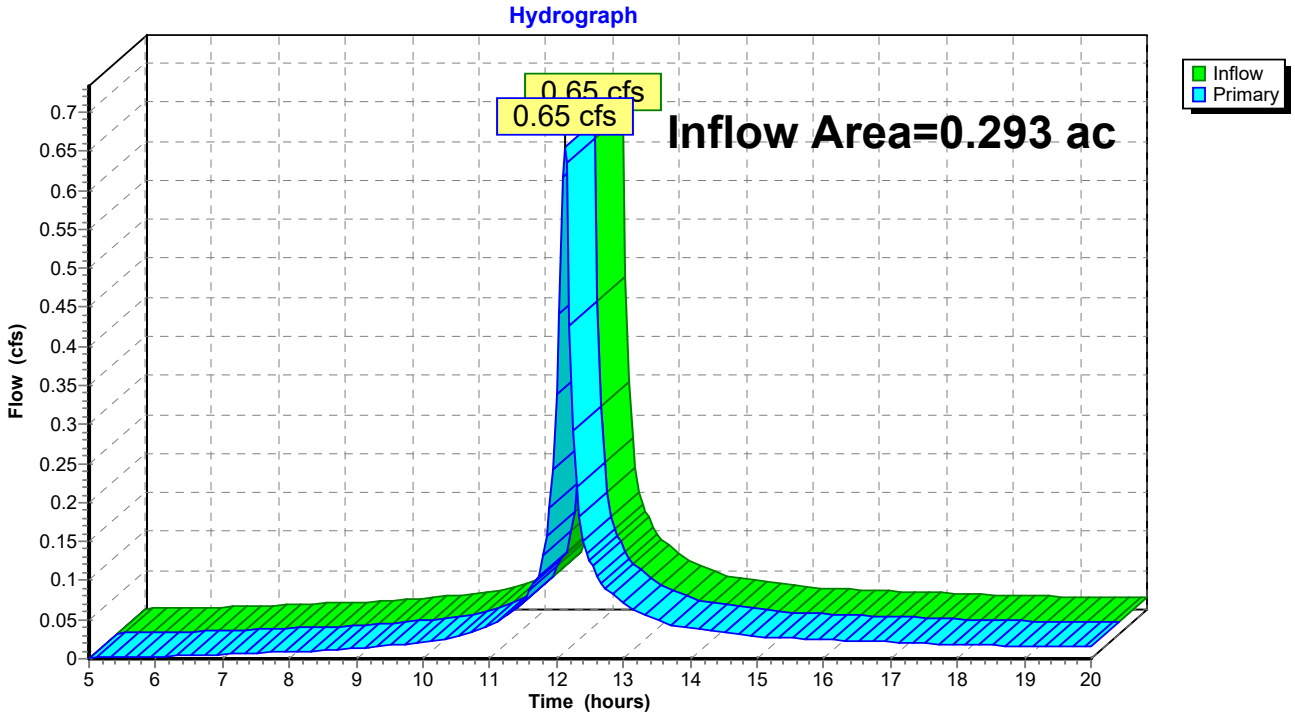


Summary for Link DP2: Design Point 2

Inflow Area = 0.293 ac, 2.74% Impervious, Inflow Depth > 1.93" for 2-Year event
Inflow = 0.65 cfs @ 12.13 hrs, Volume= 0.047 af
Primary = 0.65 cfs @ 12.13 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP2: Design Point 2

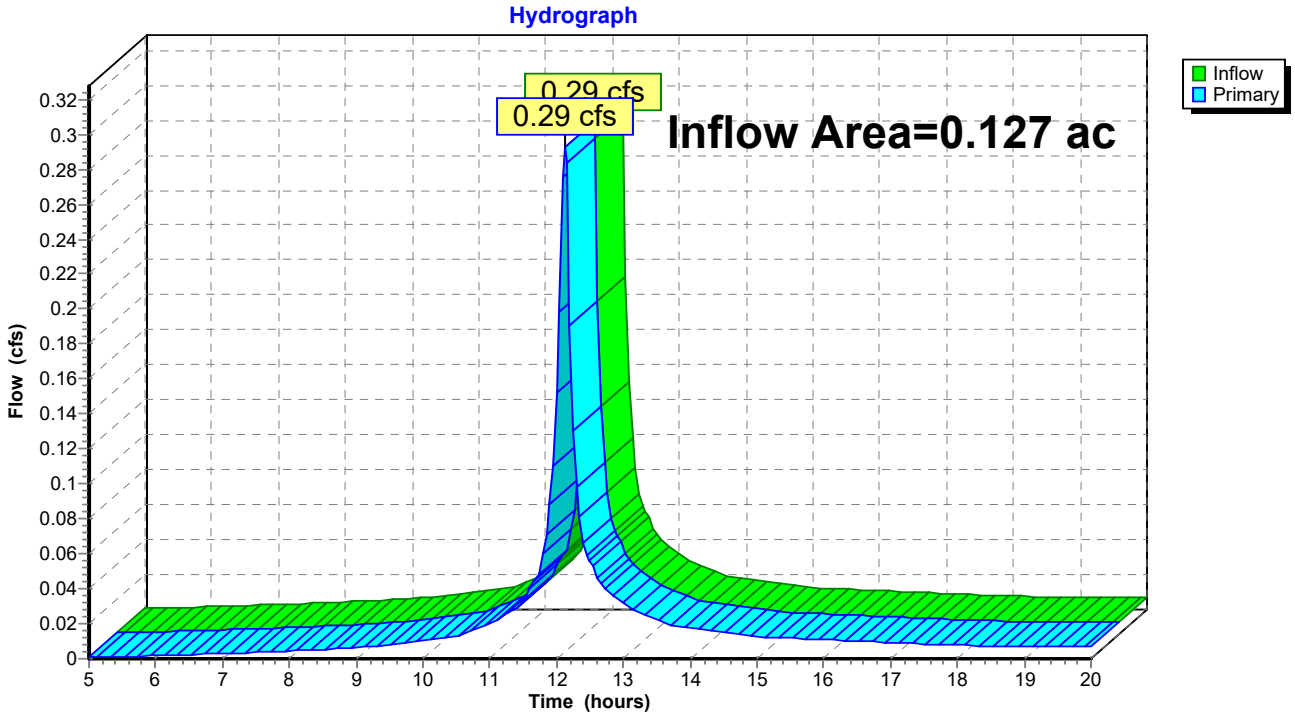


Summary for Link DP3: DESIGN POINT 3

Inflow Area = 0.127 ac, 41.15% Impervious, Inflow Depth > 2.02" for 2-Year event
Inflow = 0.29 cfs @ 12.13 hrs, Volume= 0.021 af
Primary = 0.29 cfs @ 12.13 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP3: DESIGN POINT 3



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

Subcatchment E1: SUBCAT 1 Runoff Area=70,903 sf 61.51% Impervious Runoff Depth>3.84"
Flow Length=491' Tc=7.5 min CN=95 Runoff=6.47 cfs 0.520 af

Subcatchment E2: SUBCAT E2 Runoff Area=12,765 sf 2.74% Impervious Runoff Depth>3.39"
Tc=6.0 min CN=90 Runoff=1.11 cfs 0.083 af

Subcatchment E3: SUBCAT E3 Runoff Area=5,514 sf 41.15% Impervious Runoff Depth>3.48"
Tc=6.0 min CN=91 Runoff=0.49 cfs 0.037 af

Link DP1: Design point 1 Inflow=6.47 cfs 0.520 af
Primary=6.47 cfs 0.520 af

Link DP2: Design Point 2 Inflow=1.11 cfs 0.083 af
Primary=1.11 cfs 0.083 af

Link DP3: DESIGN POINT 3 Inflow=0.49 cfs 0.037 af
Primary=0.49 cfs 0.037 af

Total Runoff Area = 2.047 ac Runoff Volume = 0.640 af Average Runoff Depth = 3.75"
48.16% Pervious = 0.986 ac 51.84% Impervious = 1.061 ac

Summary for Subcatchment E1: SUBCAT 1

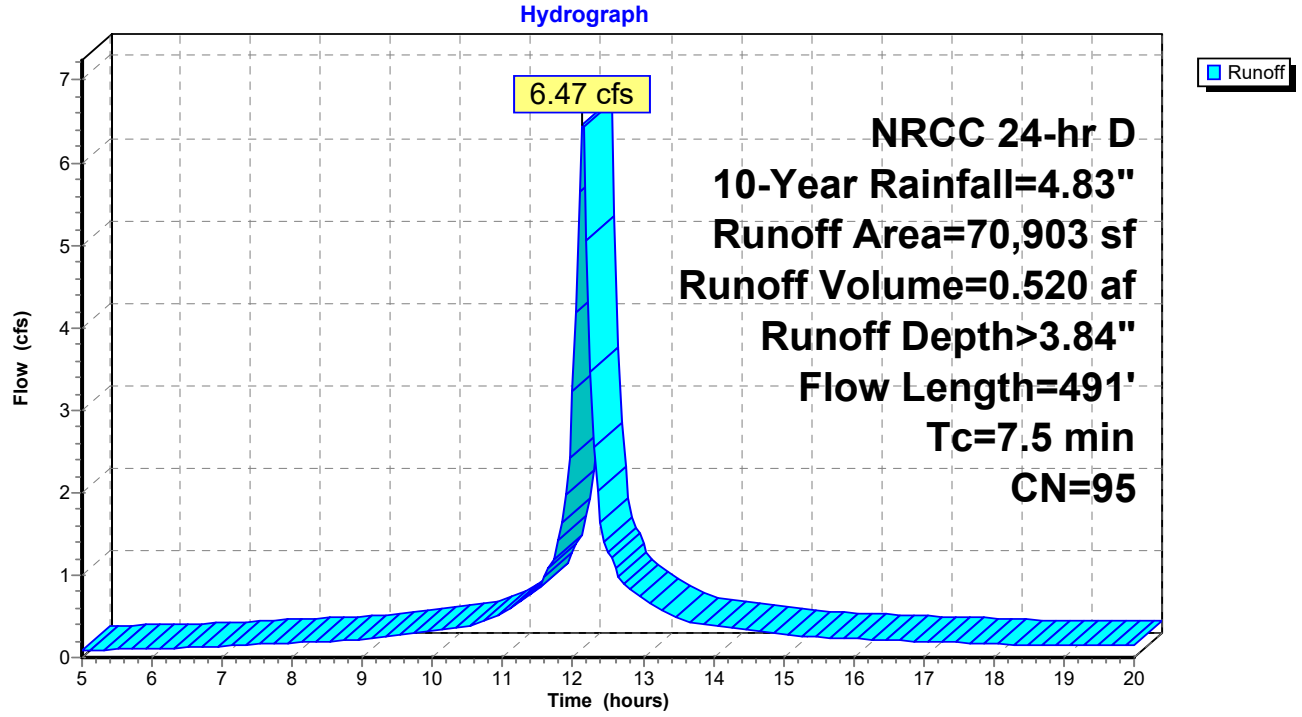
Runoff = 6.47 cfs @ 12.14 hrs, Volume= 0.520 af, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
21,129	98	Roofs, HSG C
22,485	98	Paved parking, HSG C
16,808	96	Gravel surface, HSG C
4,232	76	Woods/grass comb., Fair, HSG C
6,249	79	50-75% Grass cover, Fair, HSG C
70,903	95	Weighted Average
27,289		38.49% Pervious Area
43,614		61.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	25	0.2800	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	200	0.0050	1.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.1	266	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.5	491	Total			

Subcatchment E1: SUBCAT 1



Summary for Subcatchment E2: SUBCAT E2

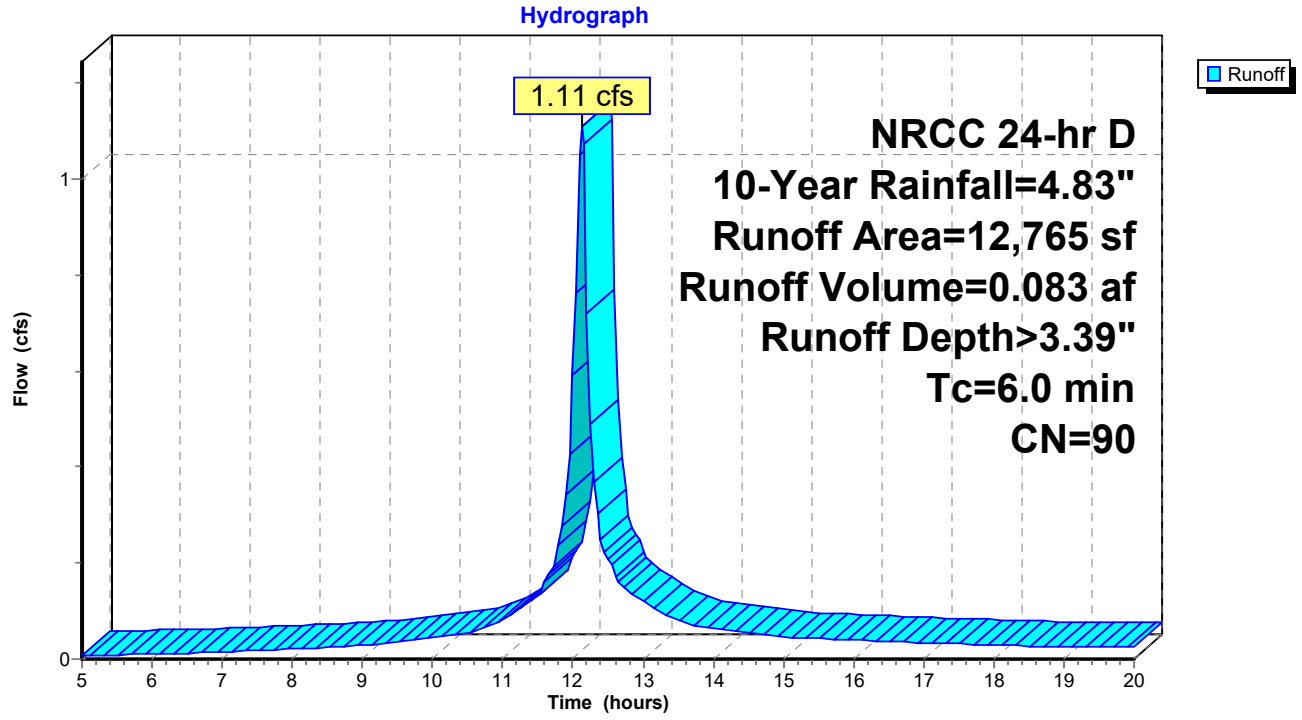
Runoff = 1.11 cfs @ 12.13 hrs, Volume= 0.083 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
4,266	96	Gravel surface, HSG C
350	98	Roofs, HSG C
8,149	86	<50% Grass cover, Poor, HSG C
12,765	90	Weighted Average
12,415		97.26% Pervious Area
350		2.74% Impervious Area

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

Subcatchment E2: SUBCAT E2



Summary for Subcatchment E3: SUBCAT E3

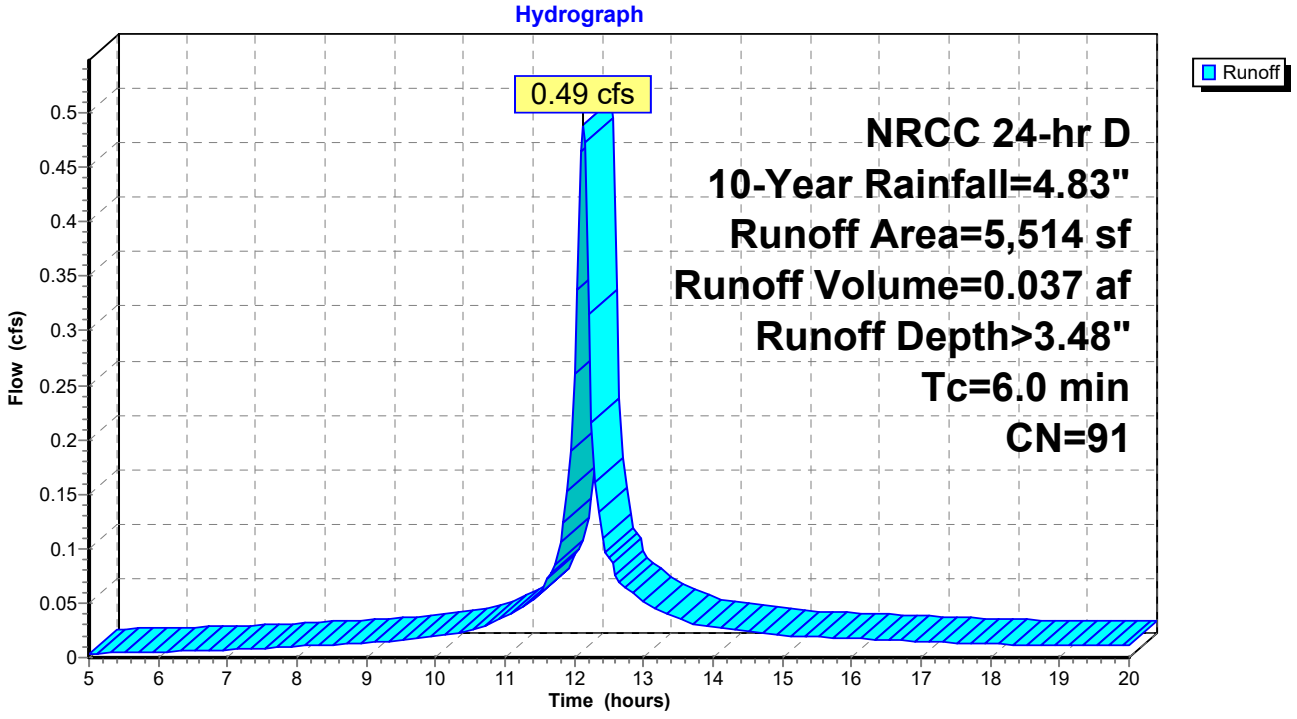
Runoff = 0.49 cfs @ 12.13 hrs, Volume= 0.037 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,506	96	Gravel surface, HSG C
1,300	98	Paved parking, HSG C
969	98	Roofs, HSG C
1,739	79	50-75% Grass cover, Fair, HSG C
5,514	91	Weighted Average
3,245		58.85% Pervious Area
2,269		41.15% Impervious Area

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

Subcatchment E3: SUBCAT E3

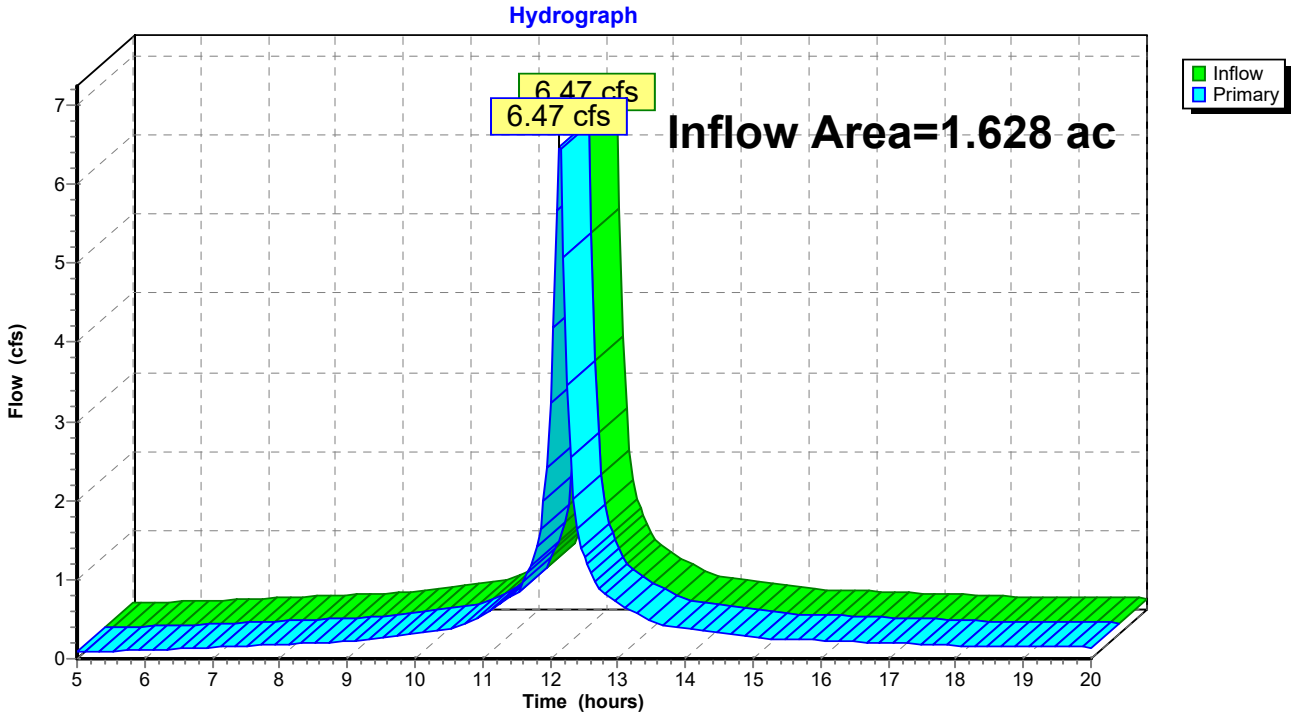


Summary for Link DP1: Design point 1

Inflow Area = 1.628 ac, 61.51% Impervious, Inflow Depth > 3.84" for 10-Year event
Inflow = 6.47 cfs @ 12.14 hrs, Volume= 0.520 af
Primary = 6.47 cfs @ 12.14 hrs, Volume= 0.520 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP1: Design point 1

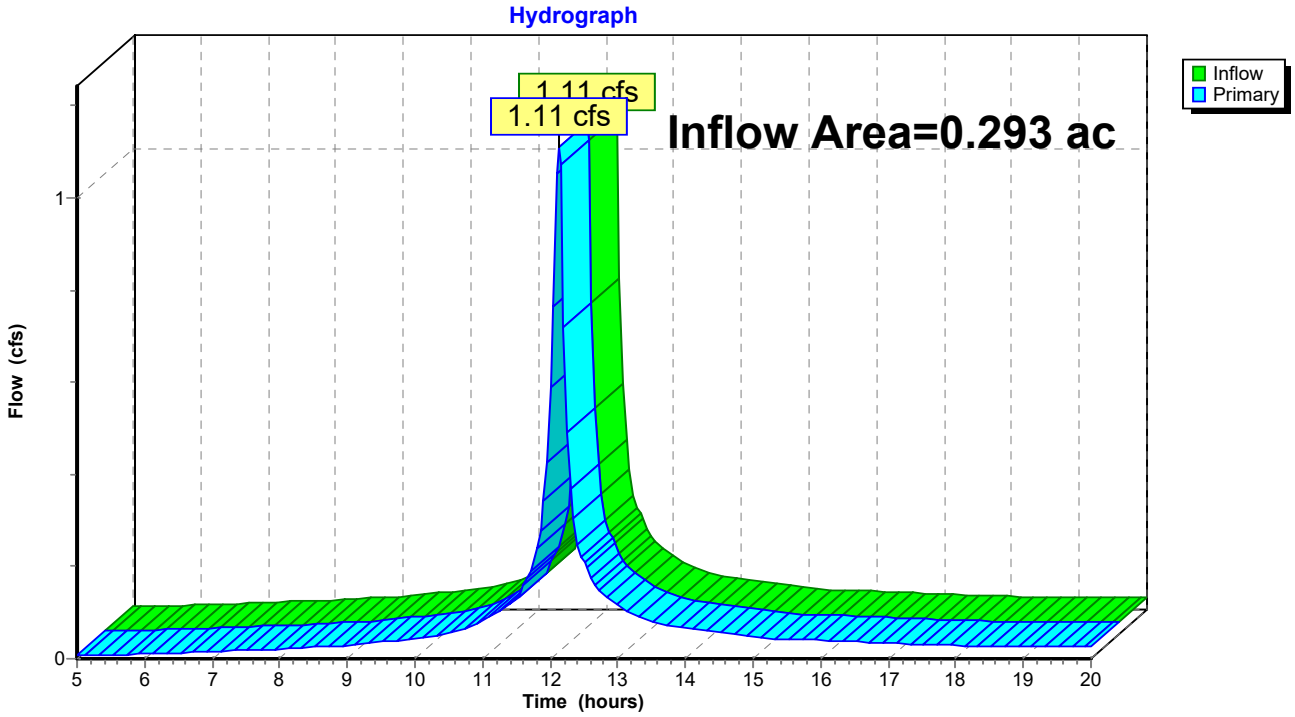


Summary for Link DP2: Design Point 2

Inflow Area = 0.293 ac, 2.74% Impervious, Inflow Depth > 3.39" for 10-Year event
Inflow = 1.11 cfs @ 12.13 hrs, Volume= 0.083 af
Primary = 1.11 cfs @ 12.13 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP2: Design Point 2

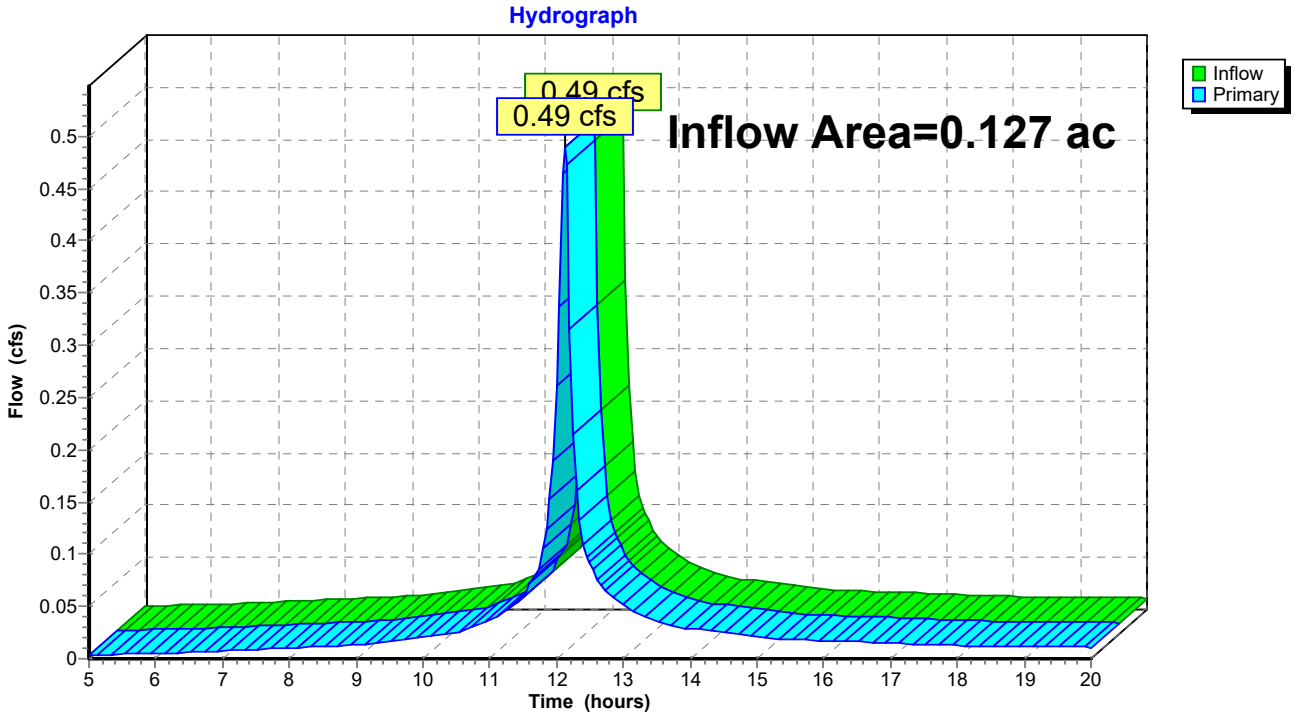


Summary for Link DP3: DESIGN POINT 3

Inflow Area = 0.127 ac, 41.15% Impervious, Inflow Depth > 3.48" for 10-Year event
Inflow = 0.49 cfs @ 12.13 hrs, Volume= 0.037 af
Primary = 0.49 cfs @ 12.13 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP3: DESIGN POINT 3



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

Subcatchment E1: SUBCAT 1 Runoff Area=70,903 sf 61.51% Impervious Runoff Depth>7.42"
Flow Length=491' Tc=7.5 min CN=95 Runoff=12.24 cfs 1.006 af

Subcatchment E2: SUBCAT E2 Runoff Area=12,765 sf 2.74% Impervious Runoff Depth>7.00"
Tc=6.0 min CN=90 Runoff=2.21 cfs 0.171 af

Subcatchment E3: SUBCAT E3 Runoff Area=5,514 sf 41.15% Impervious Runoff Depth>7.09"
Tc=6.0 min CN=91 Runoff=0.96 cfs 0.075 af

Link DP1: Design point 1 Inflow=12.24 cfs 1.006 af
Primary=12.24 cfs 1.006 af

Link DP2: Design Point 2 Inflow=2.21 cfs 0.171 af
Primary=2.21 cfs 0.171 af

Link DP3: DESIGN POINT 3 Inflow=0.96 cfs 0.075 af
Primary=0.96 cfs 0.075 af

Total Runoff Area = 2.047 ac Runoff Volume = 1.252 af Average Runoff Depth = 7.34"
48.16% Pervious = 0.986 ac 51.84% Impervious = 1.061 ac

Summary for Subcatchment E1: SUBCAT 1

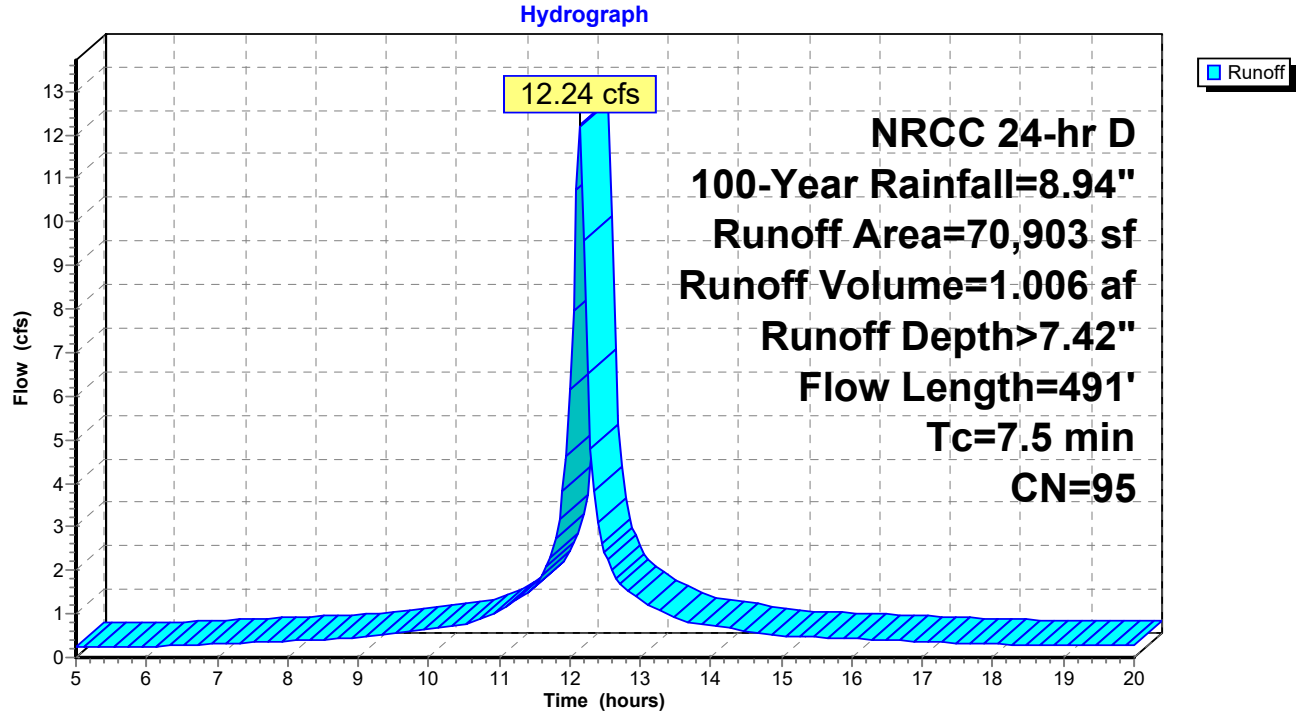
Runoff = 12.24 cfs @ 12.14 hrs, Volume= 1.006 af, Depth> 7.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
21,129	98	Roofs, HSG C
22,485	98	Paved parking, HSG C
16,808	96	Gravel surface, HSG C
4,232	76	Woods/grass comb., Fair, HSG C
6,249	79	50-75% Grass cover, Fair, HSG C
70,903	95	Weighted Average
27,289		38.49% Pervious Area
43,614		61.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	25	0.2800	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	200	0.0050	1.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.1	266	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.5	491	Total			

Subcatchment E1: SUBCAT 1



Summary for Subcatchment E2: SUBCAT E2

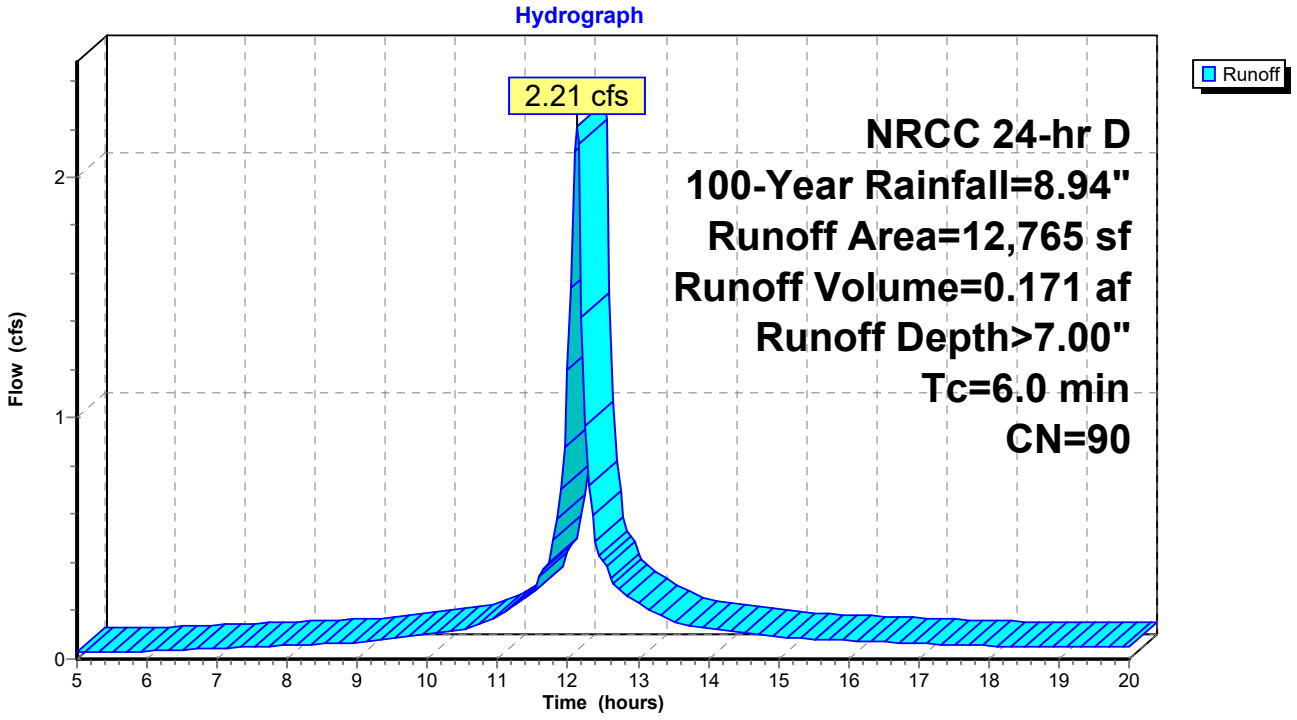
Runoff = 2.21 cfs @ 12.13 hrs, Volume= 0.171 af, Depth> 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
4,266	96	Gravel surface, HSG C
350	98	Roofs, HSG C
8,149	86	<50% Grass cover, Poor, HSG C
12,765	90	Weighted Average
12,415		97.26% Pervious Area
350		2.74% Impervious Area

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

Subcatchment E2: SUBCAT E2



Summary for Subcatchment E3: SUBCAT E3

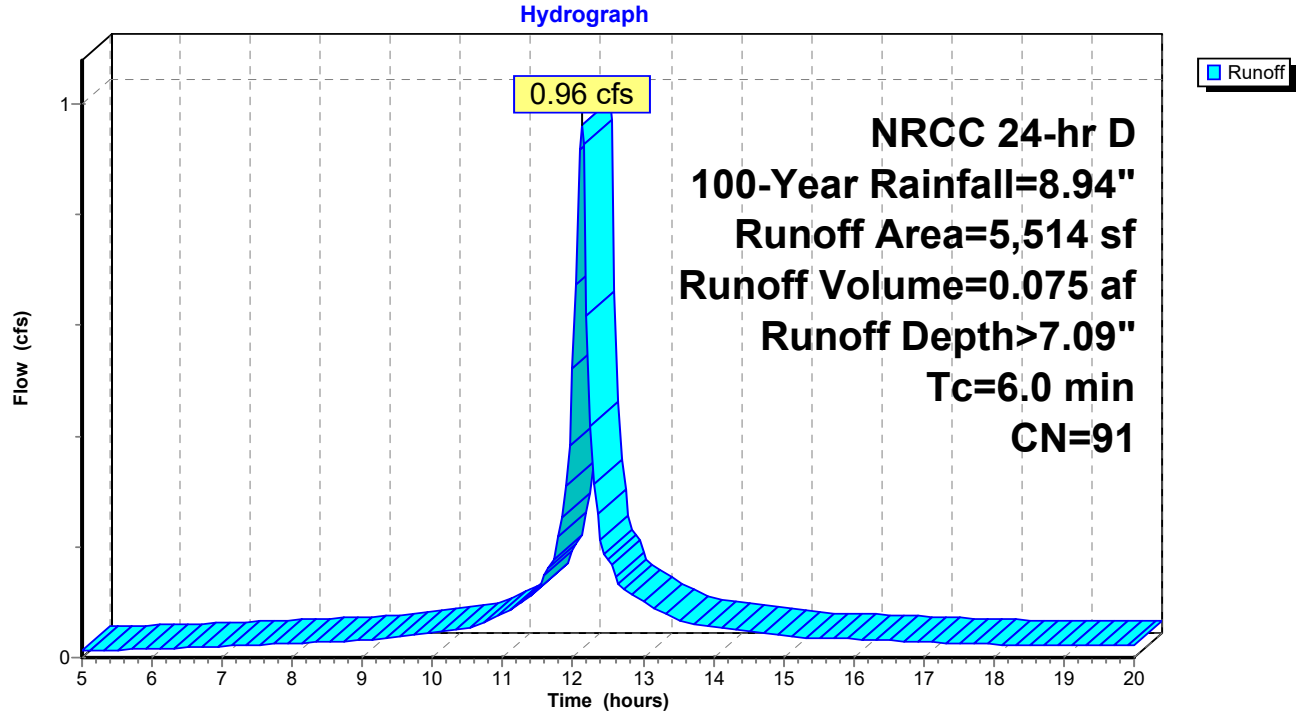
Runoff = 0.96 cfs @ 12.13 hrs, Volume= 0.075 af, Depth> 7.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,506	96	Gravel surface, HSG C
1,300	98	Paved parking, HSG C
969	98	Roofs, HSG C
1,739	79	50-75% Grass cover, Fair, HSG C
5,514	91	Weighted Average
3,245		58.85% Pervious Area
2,269		41.15% Impervious Area

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

Subcatchment E3: SUBCAT E3

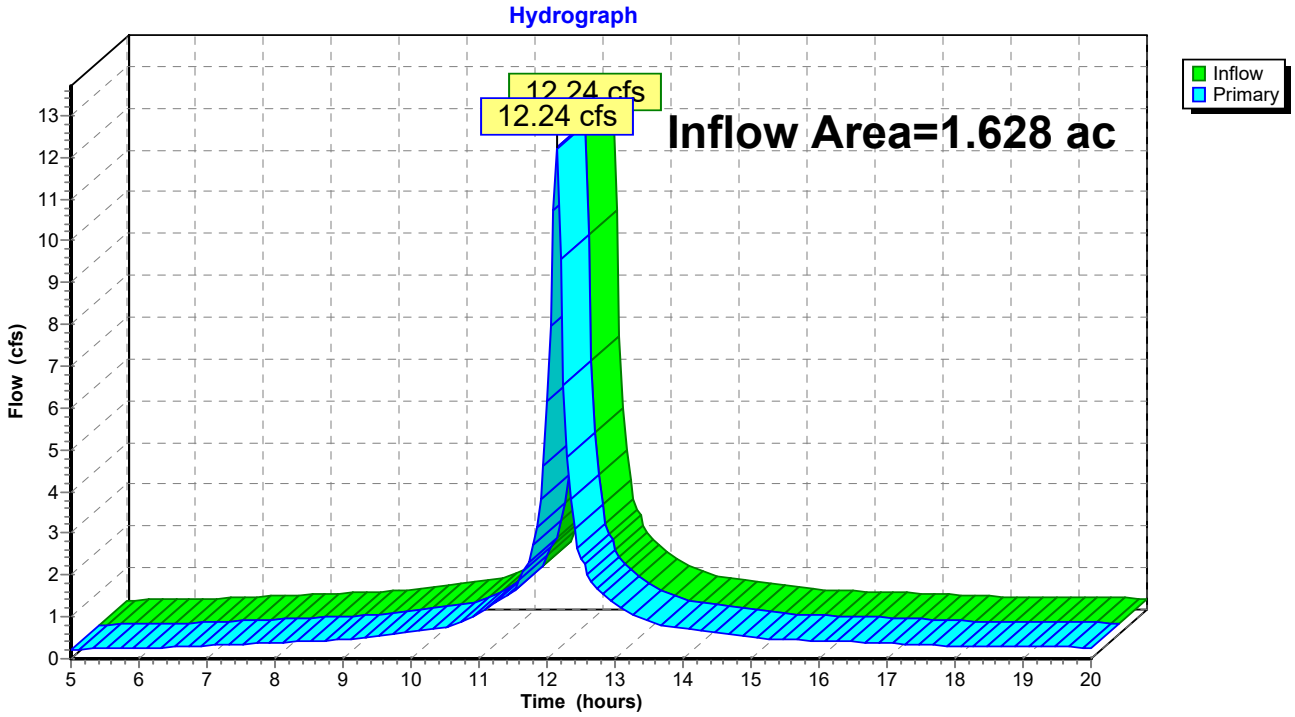


Summary for Link DP1: Design point 1

Inflow Area = 1.628 ac, 61.51% Impervious, Inflow Depth > 7.42" for 100-Year event
Inflow = 12.24 cfs @ 12.14 hrs, Volume= 1.006 af
Primary = 12.24 cfs @ 12.14 hrs, Volume= 1.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP1: Design point 1

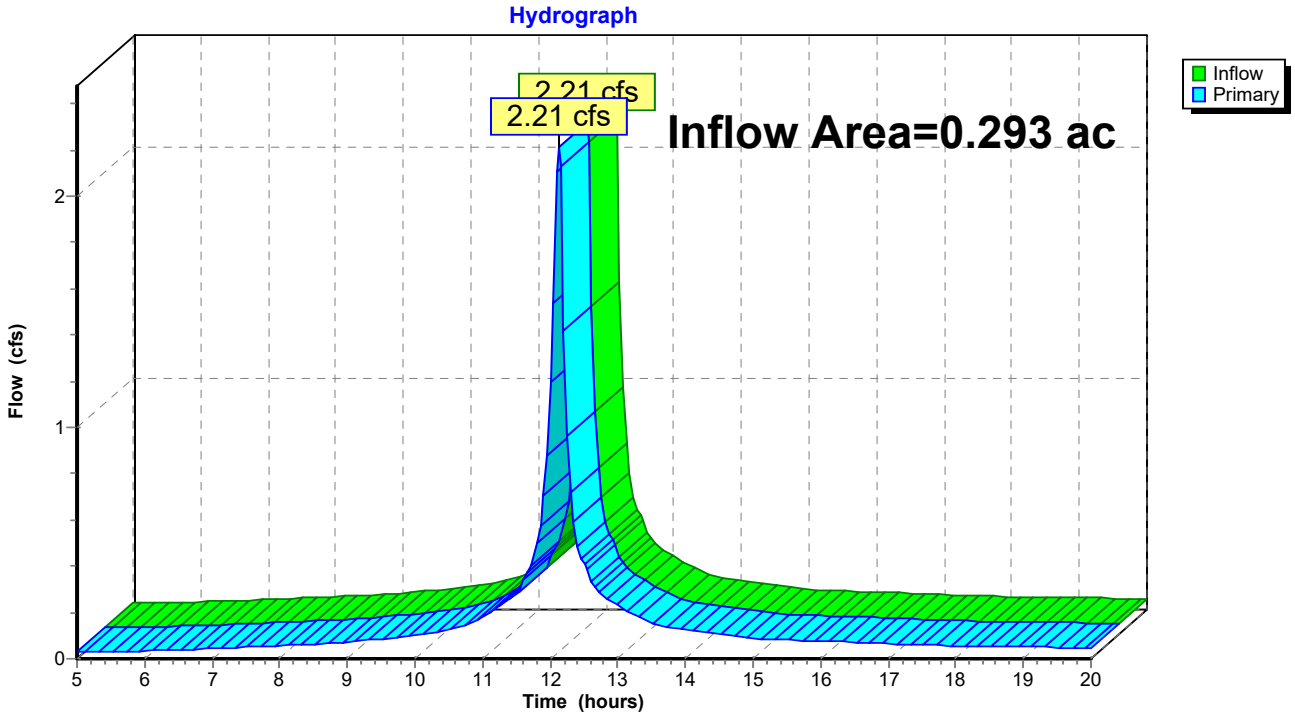


Summary for Link DP2: Design Point 2

Inflow Area = 0.293 ac, 2.74% Impervious, Inflow Depth > 7.00" for 100-Year event
Inflow = 2.21 cfs @ 12.13 hrs, Volume= 0.171 af
Primary = 2.21 cfs @ 12.13 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP2: Design Point 2

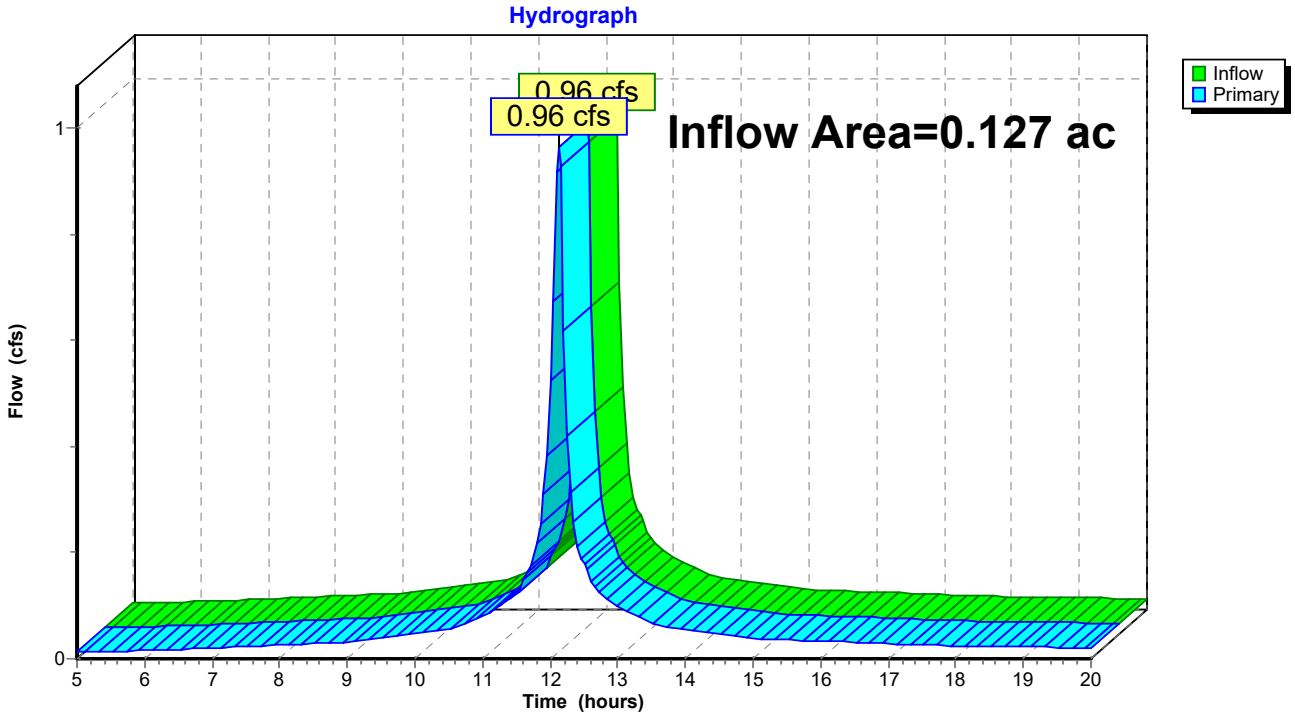


Summary for Link DP3: DESIGN POINT 3

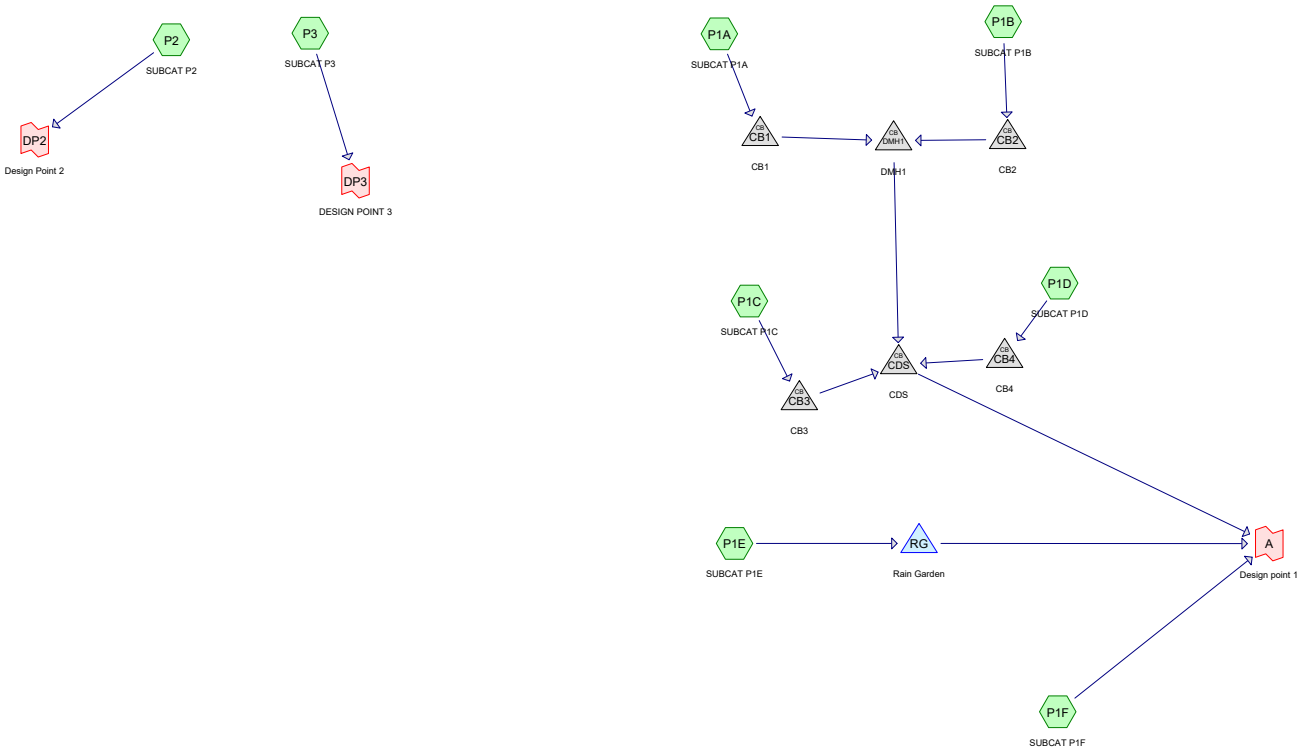
Inflow Area = 0.127 ac, 41.15% Impervious, Inflow Depth > 7.09" for 100-Year event
Inflow = 0.96 cfs @ 12.13 hrs, Volume= 0.075 af
Primary = 0.96 cfs @ 12.13 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP3: DESIGN POINT 3



c. Proposed Conditions HydroCAD Report



Subcat Reach Pond Link

Routing Diagram for POST Dev 1-16-24

Prepared by {enter your company name here}, Printed 3/9/2024

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.574	74	>75% Grass cover, Good, HSG C (P1A, P1B, P1C, P1E, P1F, P2, P3)
0.231	96	Gravel surface, HSG C (P1F, P2, P3)
0.927	98	Paved parking, HSG C (P1A, P1B, P1C, P1D, P1E, P1F, P3)
0.006	98	Retaining Wall (P1A, P1C)
0.310	98	Roofs, HSG C (P1B, P1F, P2, P3)
2.047	**91**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.042	HSG C	P1A, P1B, P1C, P1D, P1E, P1F, P2, P3
0.000	HSG D	
0.006	Other	P1A, P1C
2.047		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.574	0.000	0.000	0.574	>75% Grass cover, Good	P1A, P1B, P1C, P1E, P1F, P2, P3
0.000	0.000	0.231	0.000	0.000	0.231	Gravel surface	P1F, P2, P3
0.000	0.000	0.927	0.000	0.000	0.927	Paved parking	P1A, P1B, P1C, P1D, P1E, P1F, P3
0.000	0.000	0.000	0.000	0.006	0.006	Retaining Wall	P1A, P1C
0.000	0.000	0.310	0.000	0.000	0.310	Roofs	P1B, P1F, P2, P3
0.000	**0.000**	**2.042**	**0.000**	**0.006**	**2.047**	**TOTAL AREA**	

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

Subcatchment P1A: SUBCAT P1A Runoff Area=6,884 sf 77.83% Impervious Runoff Depth>2.19"
Tc=6.0 min CN=93 Runoff=0.39 cfs 0.029 af

Subcatchment P1B: SUBCAT P1B Runoff Area=9,254 sf 82.40% Impervious Runoff Depth>2.27"
Tc=6.0 min CN=94 Runoff=0.54 cfs 0.040 af

Subcatchment P1C: SUBCAT P1C Runoff Area=6,257 sf 93.00% Impervious Runoff Depth>2.45"
Tc=6.0 min CN=96 Runoff=0.38 cfs 0.029 af

Subcatchment P1D: SUBCAT P1D Runoff Area=4,870 sf 100.00% Impervious Runoff Depth>2.60"
Tc=6.0 min CN=98 Runoff=0.31 cfs 0.024 af

Subcatchment P1E: SUBCAT P1E Runoff Area=12,295 sf 76.32% Impervious Runoff Depth>2.10"
Tc=6.0 min CN=92 Runoff=0.67 cfs 0.049 af

Subcatchment P1F: SUBCAT P1F Runoff Area=31,332 sf 59.22% Impervious Runoff Depth>2.02"
Tc=6.0 min CN=91 Runoff=1.66 cfs 0.121 af

Subcatchment P2: SUBCAT P2 Runoff Area=12,765 sf 2.74% Impervious Runoff Depth>1.40"
Tc=6.0 min CN=83 Runoff=0.50 cfs 0.034 af

Subcatchment P3: SUBCAT P3 Runoff Area=5,514 sf 38.85% Impervious Runoff Depth>1.93"
Tc=6.0 min CN=90 Runoff=0.28 cfs 0.020 af

Pond CB1: CB1 Peak Elev=7.86' Inflow=0.39 cfs 0.029 af
12.0" Round Culvert n=0.010 L=56.6' S=0.0223 '/' Outflow=0.39 cfs 0.029 af

Pond CB2: CB2 Peak Elev=6.91' Inflow=0.54 cfs 0.040 af
12.0" Round Culvert n=0.010 L=47.0' S=0.0051 '/' Outflow=0.54 cfs 0.040 af

Pond CB3: CB3 Peak Elev=7.05' Inflow=0.38 cfs 0.029 af
12.0" Round Culvert n=0.010 L=53.5' S=0.0161 '/' Outflow=0.38 cfs 0.029 af

Pond CB4: CB4 Peak Elev=6.30' Inflow=0.31 cfs 0.024 af
12.0" Round Culvert n=0.010 L=28.0' S=0.0050 '/' Outflow=0.31 cfs 0.024 af

Pond CDS: CDS Peak Elev=5.47' Inflow=1.61 cfs 0.123 af
18.0" Round Culvert n=0.013 L=55.0' S=0.0051 '/' Outflow=1.61 cfs 0.123 af

Pond DMH1: DMH1 Peak Elev=6.72' Inflow=0.93 cfs 0.069 af
12.0" Round Culvert n=0.010 L=60.0' S=0.0052 '/' Outflow=0.93 cfs 0.069 af

Pond RG: Rain Garden Peak Elev=5.34' Storage=621 cf Inflow=0.67 cfs 0.049 af
Primary=0.27 cfs 0.048 af Secondary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.048 af

Link A: Design point 1 Inflow=3.45 cfs 0.291 af
Primary=3.45 cfs 0.291 af

Link DP2: Design Point 2 Inflow=0.50 cfs 0.034 af
Primary=0.50 cfs 0.034 af

Link DP3: DESIGN POINT 3 Inflow=0.28 cfs 0.020 af
Primary=0.28 cfs 0.020 af

Total Runoff Area = 2.047 ac Runoff Volume = 0.347 af Average Runoff Depth = 2.04"
39.33% Pervious = 0.805 ac 60.67% Impervious = 1.242 ac

Summary for Subcatchment P1A: SUBCAT P1A

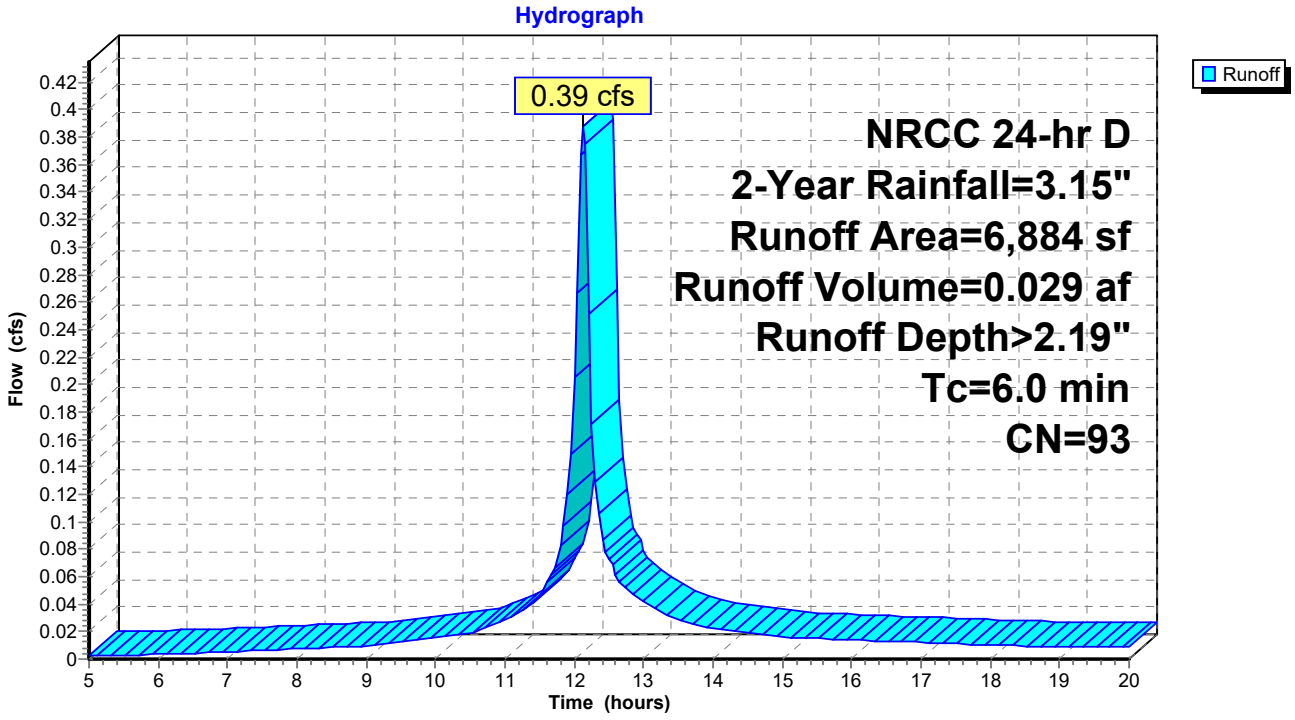
Runoff = 0.39 cfs @ 12.13 hrs, Volume= 0.029 af, Depth> 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

	Area (sf)	CN	Description
	5,204	98	Paved parking, HSG C
	1,526	74	>75% Grass cover, Good, HSG C
*	154	98	Retaining Wall
	6,884	93	Weighted Average
	1,526		22.17% Pervious Area
	5,358		77.83% Impervious Area

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

Subcatchment P1A: SUBCAT P1A



Summary for Subcatchment P1B: SUBCAT P1B

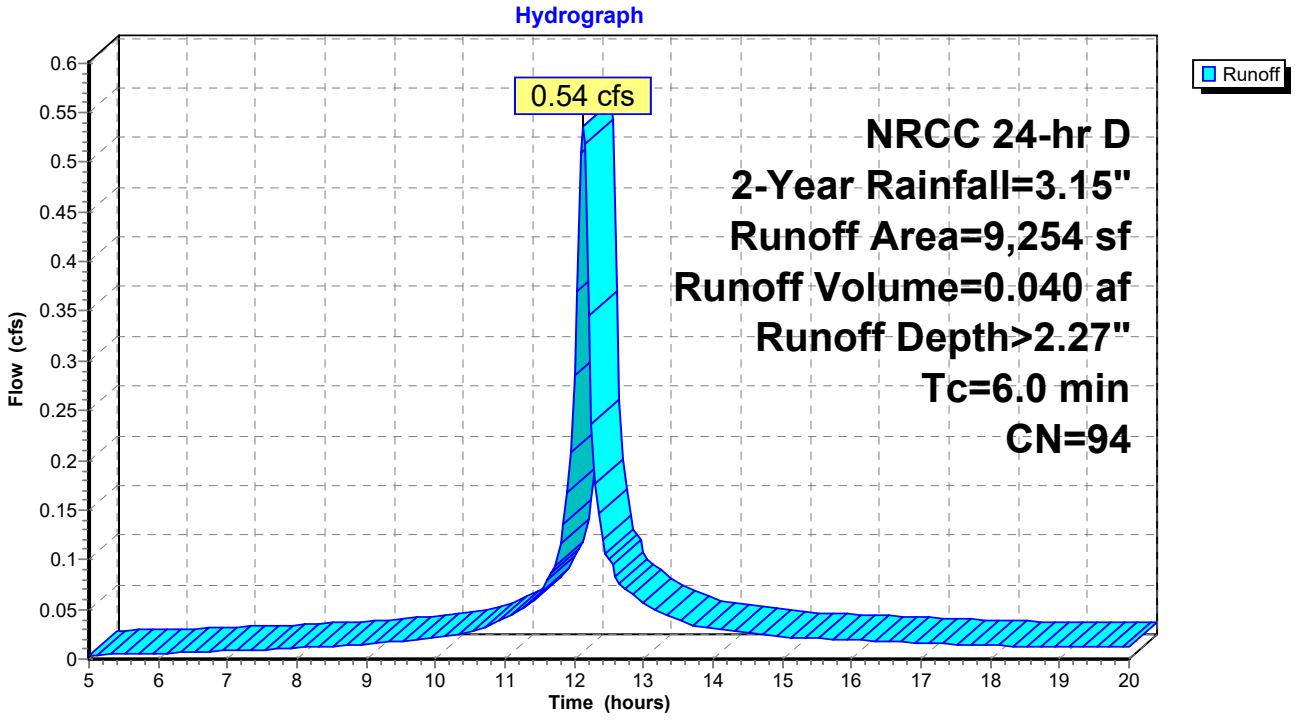
Runoff = 0.54 cfs @ 12.13 hrs, Volume= 0.040 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
5,436	98	Paved parking, HSG C
1,629	74	>75% Grass cover, Good, HSG C
2,189	98	Roofs, HSG C
9,254	94	Weighted Average
1,629		17.60% Pervious Area
7,625		82.40% Impervious Area

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

Subcatchment P1B: SUBCAT P1B



Summary for Subcatchment P1C: SUBCAT P1C

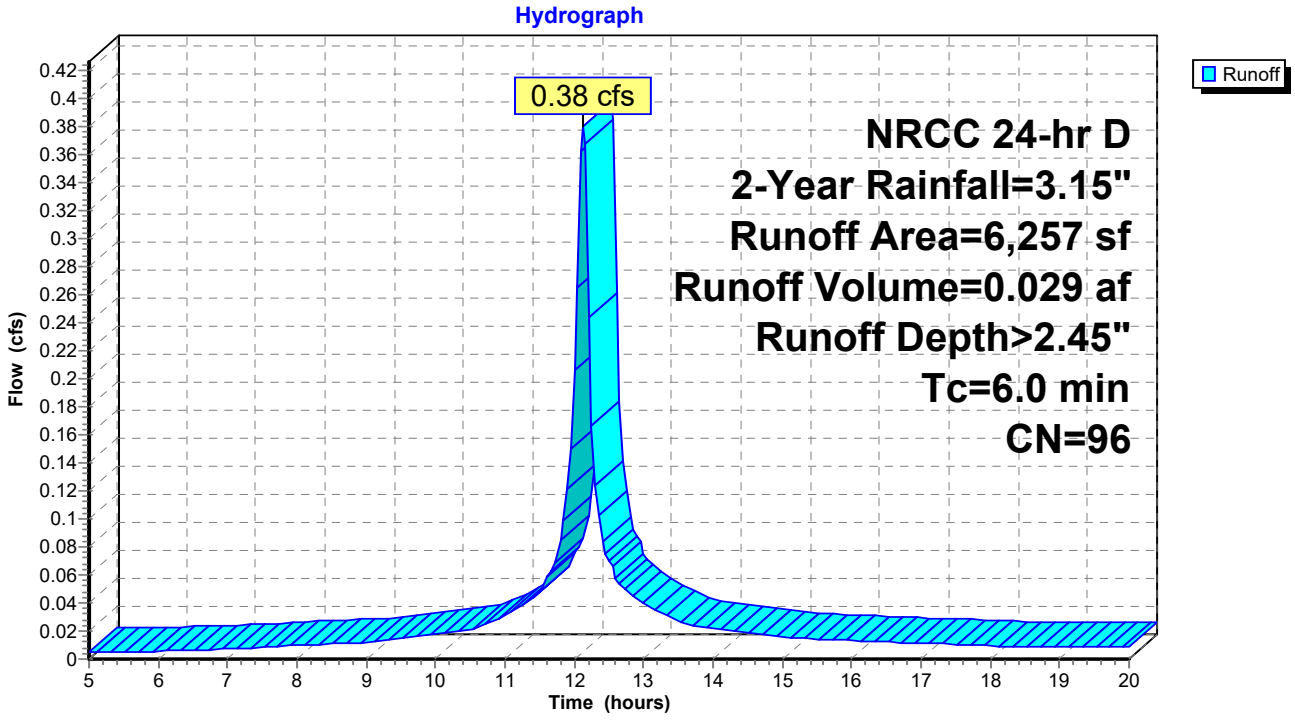
Runoff = 0.38 cfs @ 12.13 hrs, Volume= 0.029 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

	Area (sf)	CN	Description
	5,731	98	Paved parking, HSG C
	438	74	>75% Grass cover, Good, HSG C
*	88	98	Retaining Wall
	6,257	96	Weighted Average
	438		7.00% Pervious Area
	5,819		93.00% Impervious Area

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

Subcatchment P1C: SUBCAT P1C



Summary for Subcatchment P1D: SUBCAT P1D

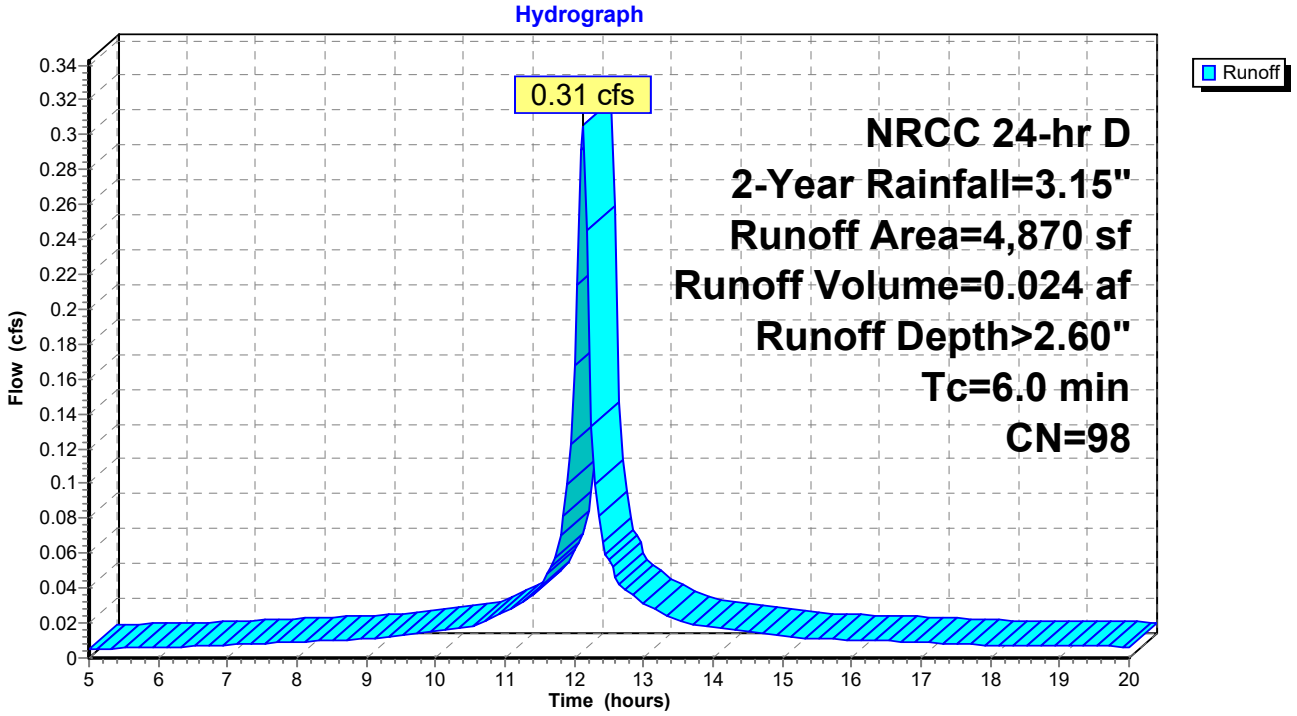
Runoff = 0.31 cfs @ 12.13 hrs, Volume= 0.024 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,870	98	Paved parking, HSG C
4,870		100.00% Impervious Area

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

Subcatchment P1D: SUBCAT P1D



Summary for Subcatchment P1E: SUBCAT P1E

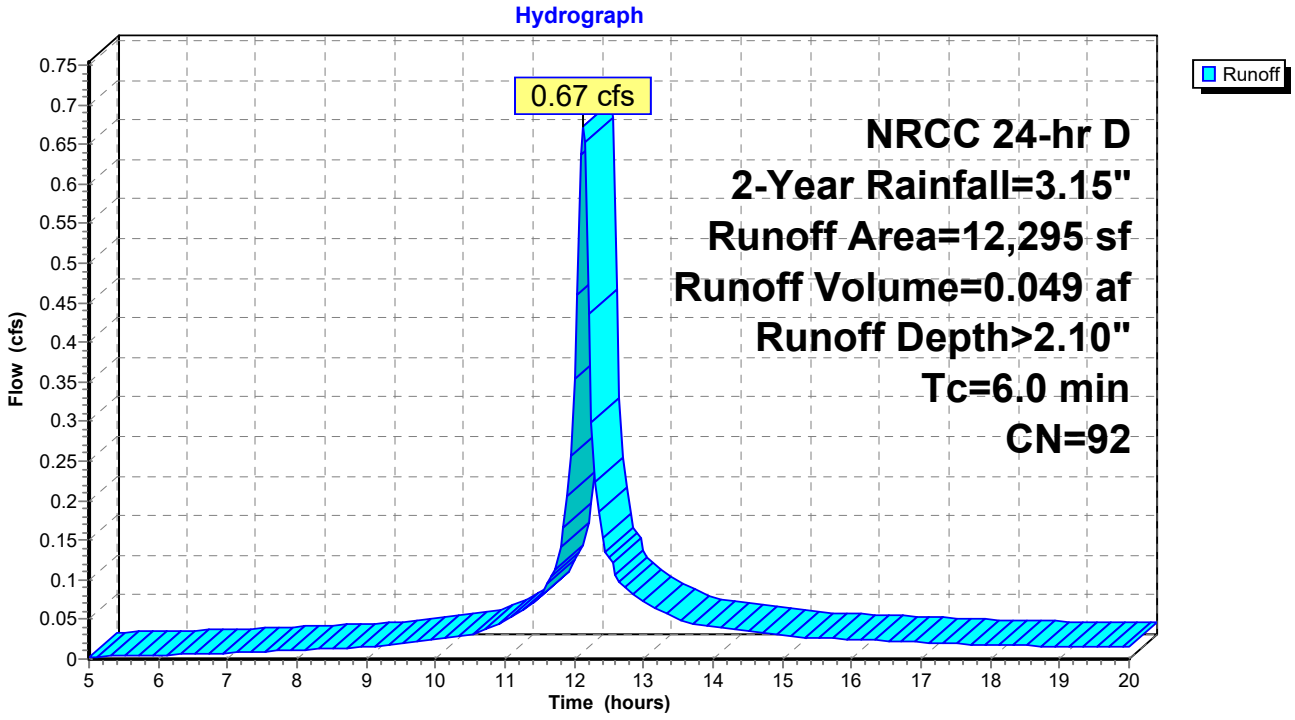
Runoff = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
9,384	98	Paved parking, HSG C
2,040	74	>75% Grass cover, Good, HSG C
871	74	>75% Grass cover, Good, HSG C
12,295	92	Weighted Average
2,911		23.68% Pervious Area
9,384		76.32% Impervious Area

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

Subcatchment P1E: SUBCAT P1E



Summary for Subcatchment P1F: SUBCAT P1F

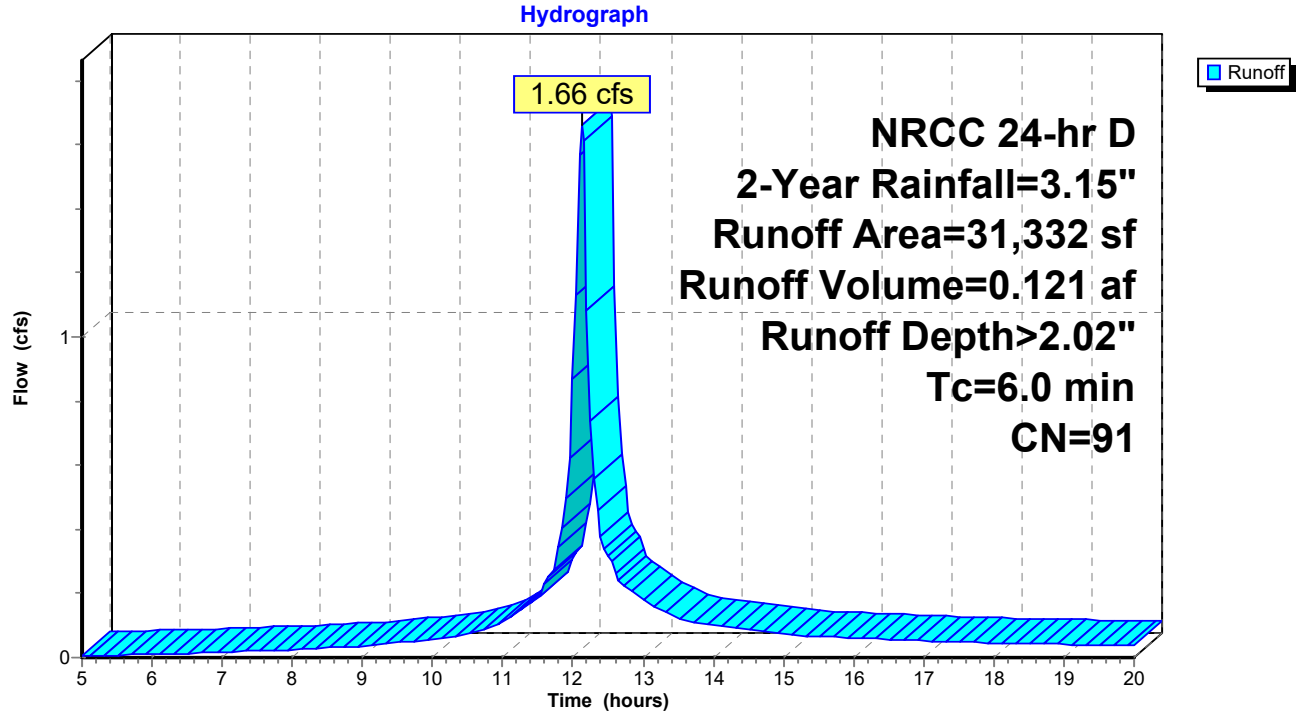
Runoff = 1.66 cfs @ 12.13 hrs, Volume= 0.121 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
8,438	98	Paved parking, HSG C
9,131	74	>75% Grass cover, Good, HSG C
3,646	96	Gravel surface, HSG C
10,117	98	Roofs, HSG C
31,332	91	Weighted Average
12,777		40.78% Pervious Area
18,555		59.22% Impervious Area

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

Subcatchment P1F: SUBCAT P1F



Summary for Subcatchment P2: SUBCAT P2

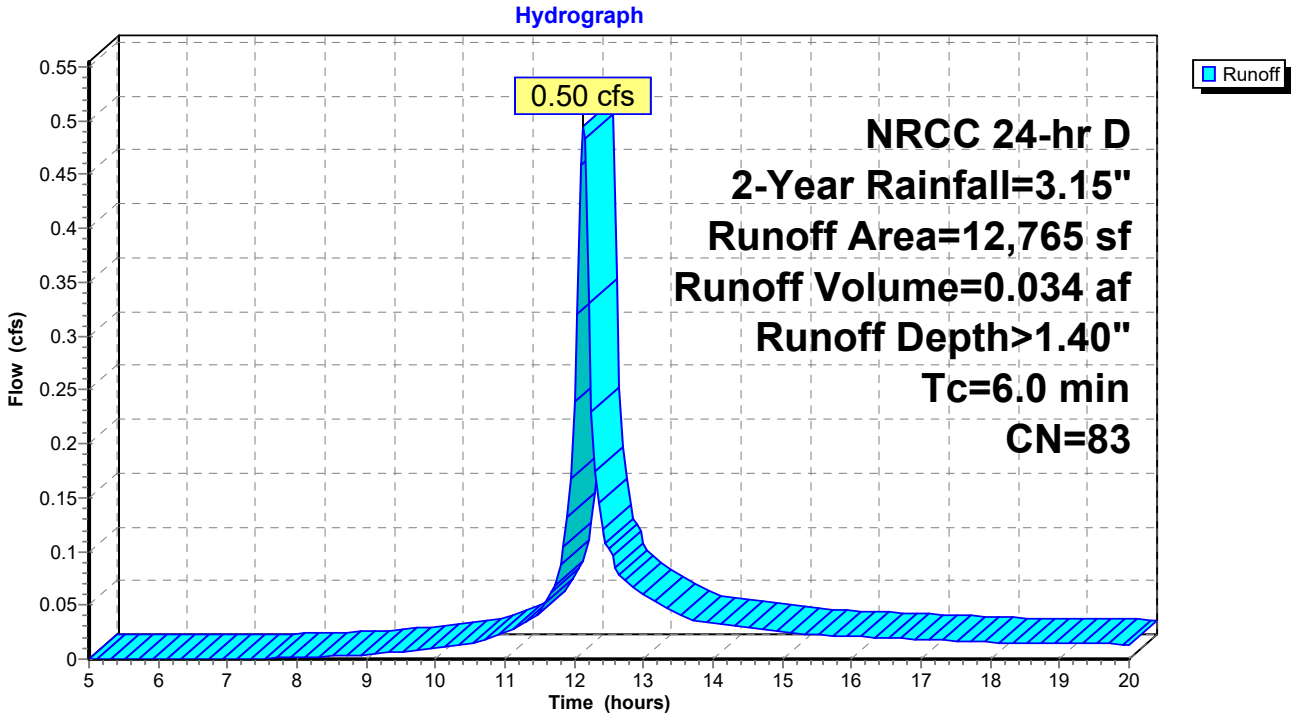
Runoff = 0.50 cfs @ 12.13 hrs, Volume= 0.034 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,782	96	Gravel surface, HSG C
350	98	Roofs, HSG C
7,633	74	>75% Grass cover, Good, HSG C
12,765	83	Weighted Average
12,415		97.26% Pervious Area
350		2.74% Impervious Area

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

Subcatchment P2: SUBCAT P2



Summary for Subcatchment P3: SUBCAT P3

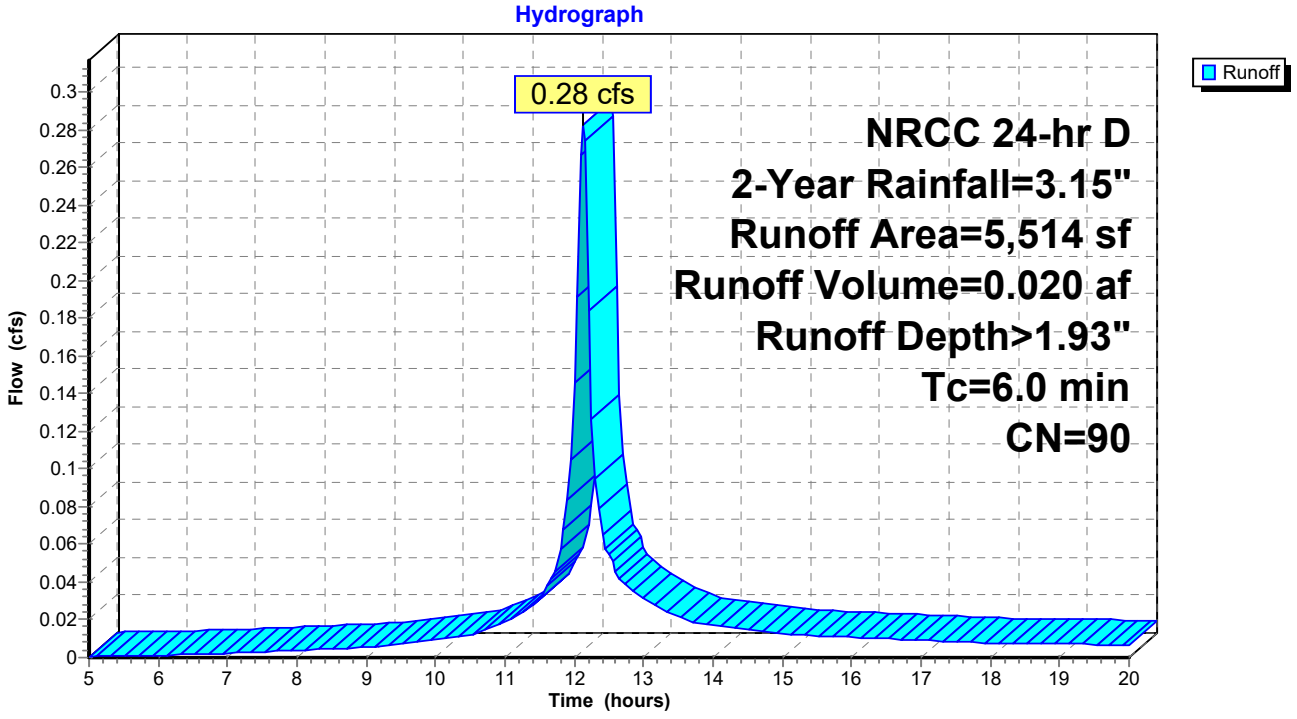
Runoff = 0.28 cfs @ 12.13 hrs, Volume= 0.020 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,639	96	Gravel surface, HSG C
1,300	98	Paved parking, HSG C
842	98	Roofs, HSG C
1,733	74	>75% Grass cover, Good, HSG C
5,514	90	Weighted Average
3,372		61.15% Pervious Area
2,142		38.85% Impervious Area

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

Subcatchment P3: SUBCAT P3



Summary for Pond CB1: CB1

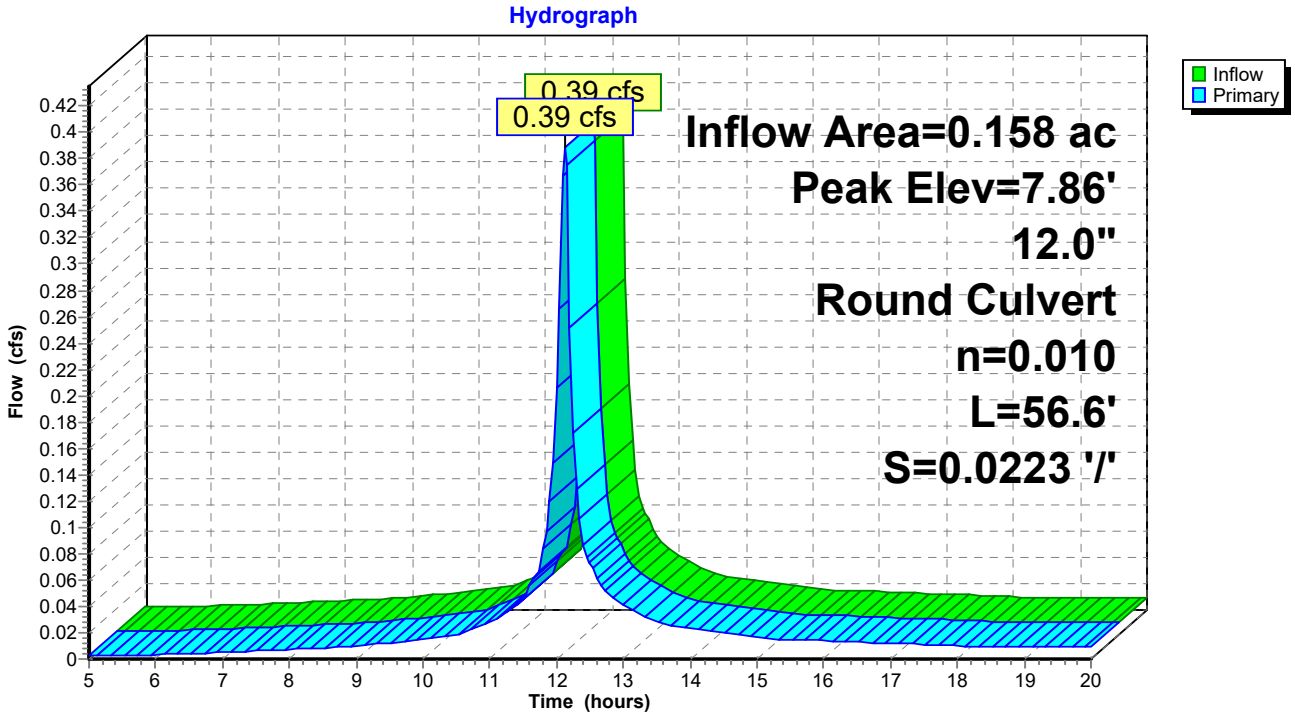
Inflow Area = 0.158 ac, 77.83% Impervious, Inflow Depth > 2.19" for 2-Year event
Inflow = 0.39 cfs @ 12.13 hrs, Volume= 0.029 af
Outflow = 0.39 cfs @ 12.13 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.13 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.86' @ 12.13 hrs
Flood Elev= 10.91'

Device	Routing	Invert	Outlet Devices
#1	Primary	7.51'	**12.0" Round Culvert** L= 56.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 7.51' / 6.25' S= 0.0223 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.37 cfs @ 12.13 hrs HW=7.85' (Free Discharge)
1=Culvert (Inlet Controls 0.37 cfs @ 1.57 fps)

Pond CB1: CB1



Summary for Pond CB2: CB2

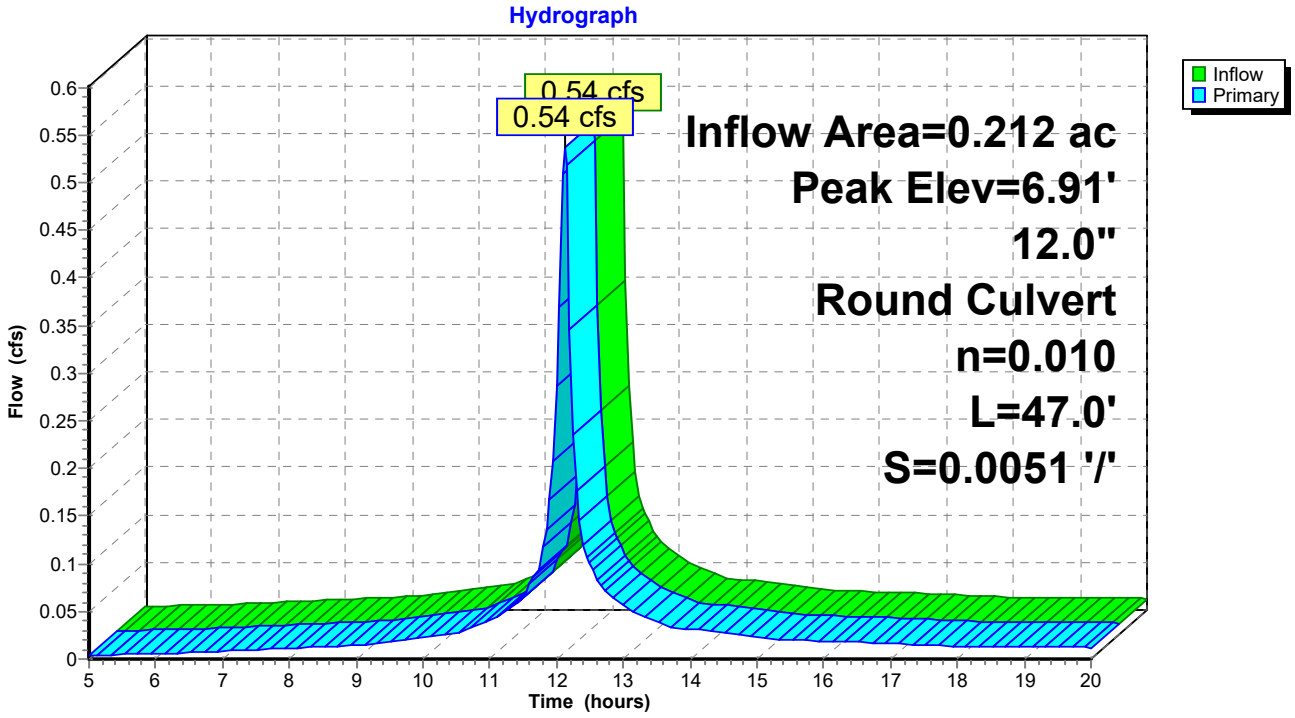
Inflow Area = 0.212 ac, 82.40% Impervious, Inflow Depth > 2.27" for 2-Year event
Inflow = 0.54 cfs @ 12.13 hrs, Volume= 0.040 af
Outflow = 0.54 cfs @ 12.13 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.13 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.91' @ 12.13 hrs
Flood Elev= 9.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.49'	**12.0" Round Culvert** L= 47.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.49' / 6.25' S= 0.0051 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.51 cfs @ 12.13 hrs HW=6.90' (Free Discharge)
1=Culvert (Inlet Controls 0.51 cfs @ 1.71 fps)

Pond CB2: CB2



Summary for Pond CB3: CB3

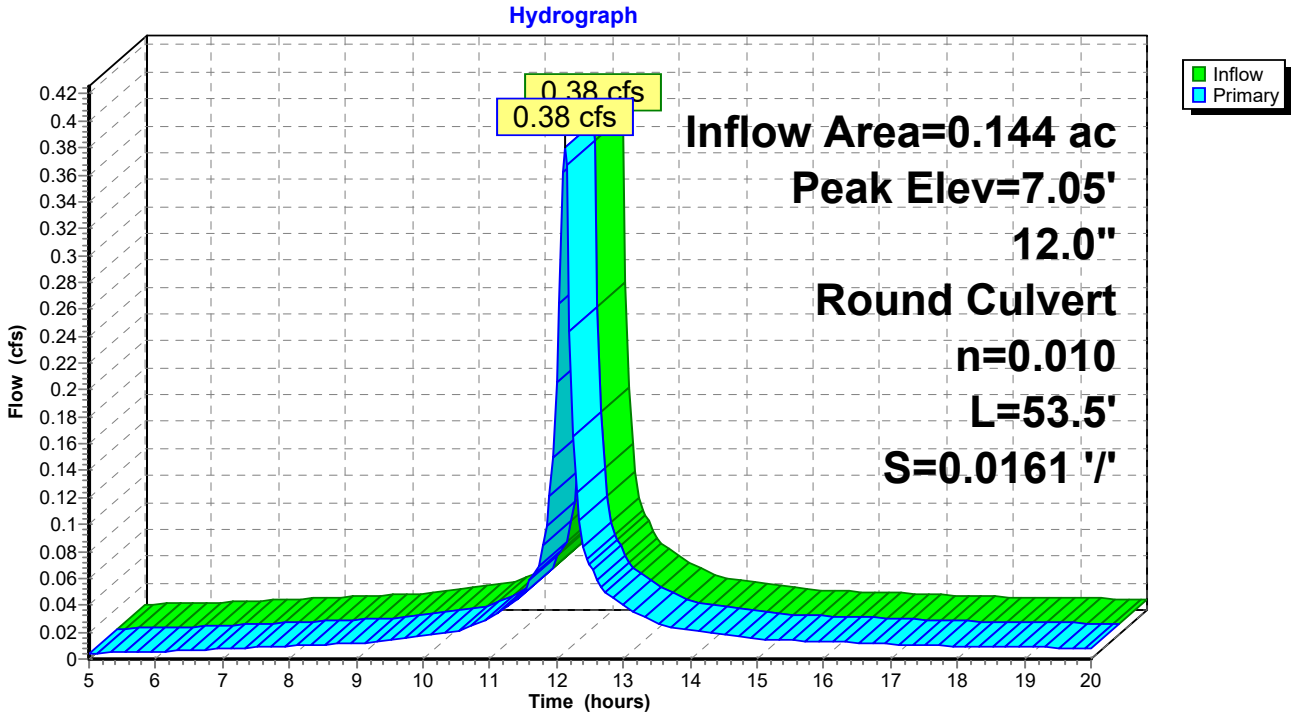
Inflow Area = 0.144 ac, 93.00% Impervious, Inflow Depth > 2.45" for 2-Year event
Inflow = 0.38 cfs @ 12.13 hrs, Volume= 0.029 af
Outflow = 0.38 cfs @ 12.13 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.38 cfs @ 12.13 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.05' @ 12.13 hrs
Flood Elev= 10.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.70'	**12.0" Round Culvert** L= 53.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.70' / 5.84' S= 0.0161 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.36 cfs @ 12.13 hrs HW=7.04' (Free Discharge)
1=Culvert (Inlet Controls 0.36 cfs @ 1.56 fps)

Pond CB3: CB3



Summary for Pond CB4: CB4

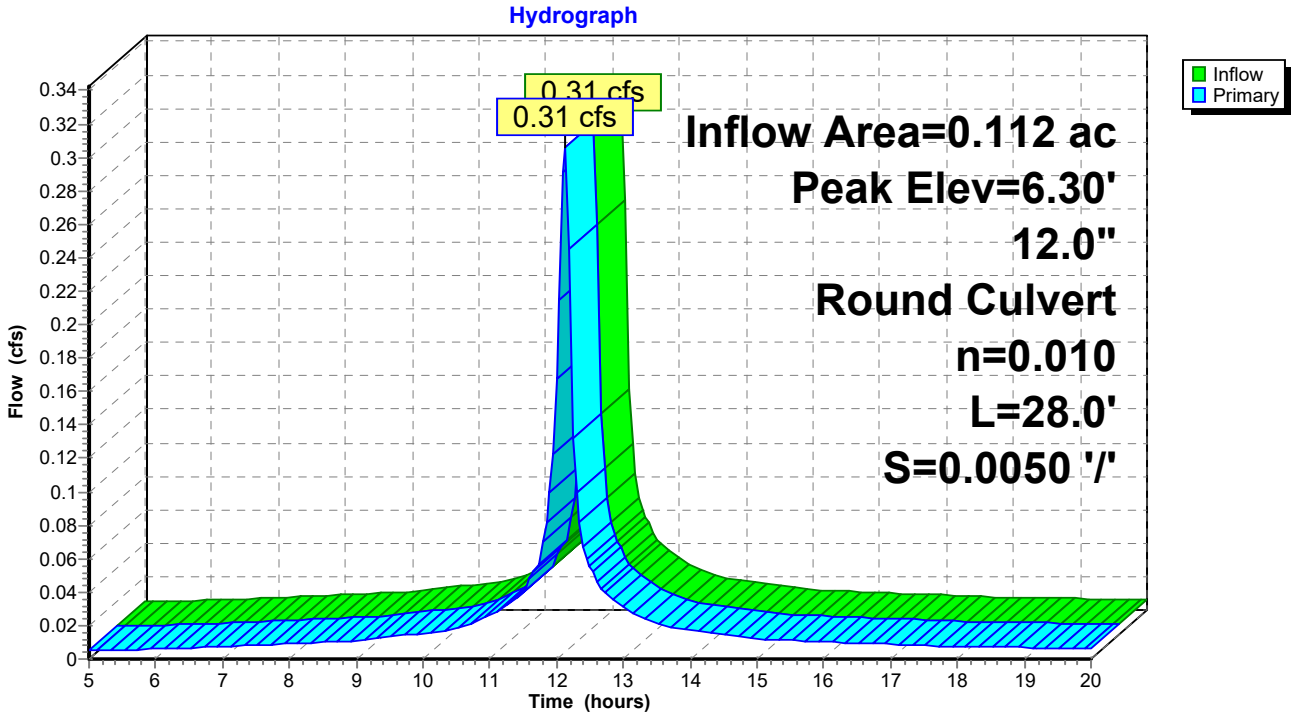
Inflow Area = 0.112 ac,100.00% Impervious, Inflow Depth > 2.60" for 2-Year event
Inflow = 0.31 cfs @ 12.13 hrs, Volume= 0.024 af
Outflow = 0.31 cfs @ 12.13 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.13 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.30' @ 12.13 hrs
Flood Elev= 8.48'

Device	Routing	Invert	Outlet Devices
#1	Primary	5.98'	**12.0" Round Culvert** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 5.98' / 5.84' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 12.13 hrs HW=6.29' (Free Discharge)
1=Culvert (Barrel Controls 0.29 cfs @ 2.14 fps)

Pond CB4: CB4



Summary for Pond CDS: CDS

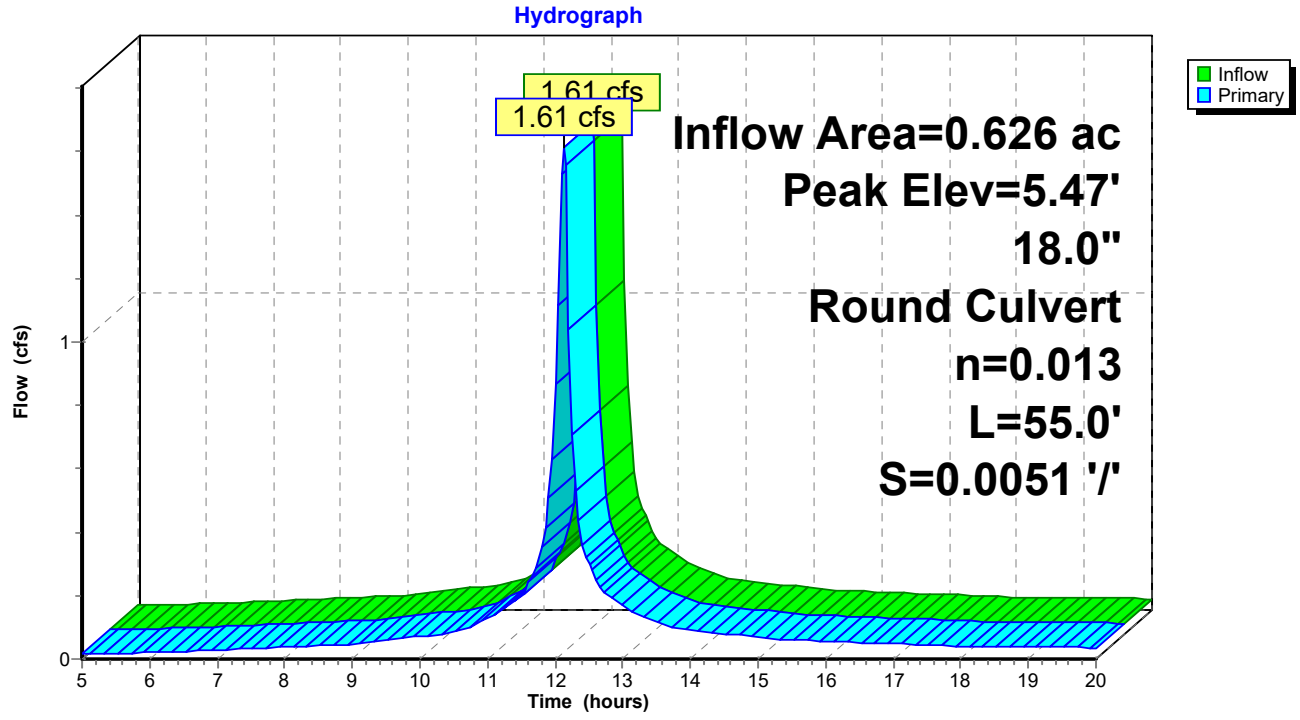
Inflow Area = 0.626 ac, 86.82% Impervious, Inflow Depth > 2.35" for 2-Year event
Inflow = 1.61 cfs @ 12.13 hrs, Volume= 0.123 af
Outflow = 1.61 cfs @ 12.13 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min
Primary = 1.61 cfs @ 12.13 hrs, Volume= 0.123 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 5.47' @ 12.13 hrs
Flood Elev= 8.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	4.78'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.78' / 4.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.54 cfs @ 12.13 hrs HW=5.46' (Free Discharge)
1=Culvert (Barrel Controls 1.54 cfs @ 2.93 fps)

Pond CDS: CDS



Summary for Pond DMH1: DMH1

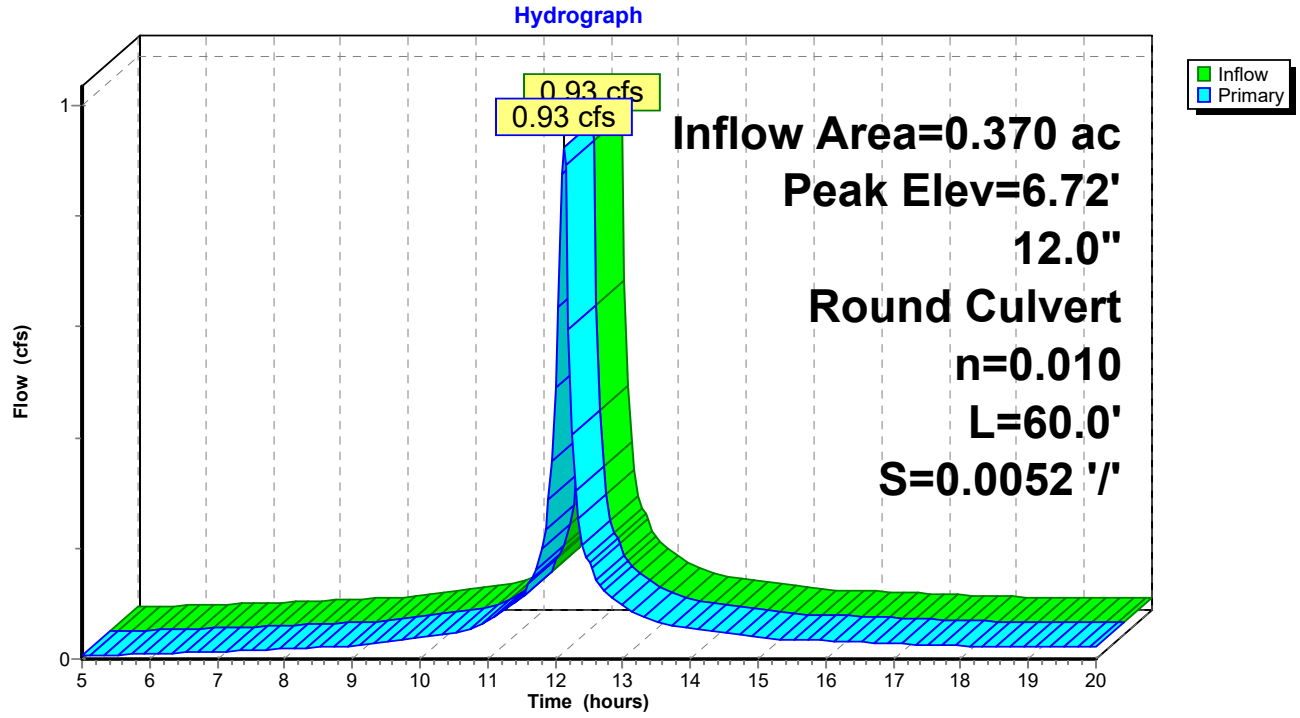
Inflow Area = 0.370 ac, 80.45% Impervious, Inflow Depth > 2.24" for 2-Year event
Inflow = 0.93 cfs @ 12.13 hrs, Volume= 0.069 af
Outflow = 0.93 cfs @ 12.13 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min
Primary = 0.93 cfs @ 12.13 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.72' @ 12.13 hrs
Flood Elev= 9.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.15'	**12.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.15' / 5.84' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.89 cfs @ 12.13 hrs HW=6.70' (Free Discharge)
1=Culvert (Inlet Controls 0.89 cfs @ 2.00 fps)

Pond DMH1: DMH1



Summary for Pond RG: Rain Garden

Inflow Area = 0.282 ac, 76.32% Impervious, Inflow Depth > 2.10" for 2-Year event
Inflow = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af
Outflow = 0.27 cfs @ 12.27 hrs, Volume= 0.048 af, Atten= 60%, Lag= 8.7 min
Primary = 0.27 cfs @ 12.27 hrs, Volume= 0.048 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 5.34' @ 12.27 hrs Surf.Area= 881 sf Storage= 621 cf

Plug-Flow detention time= 58.8 min calculated for 0.048 af (97% of inflow)
Center-of-Mass det. time= 47.4 min (815.3 - 767.8)

Volume	Invert	Avail.Storage	Storage Description
#1	4.45'	1,948 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

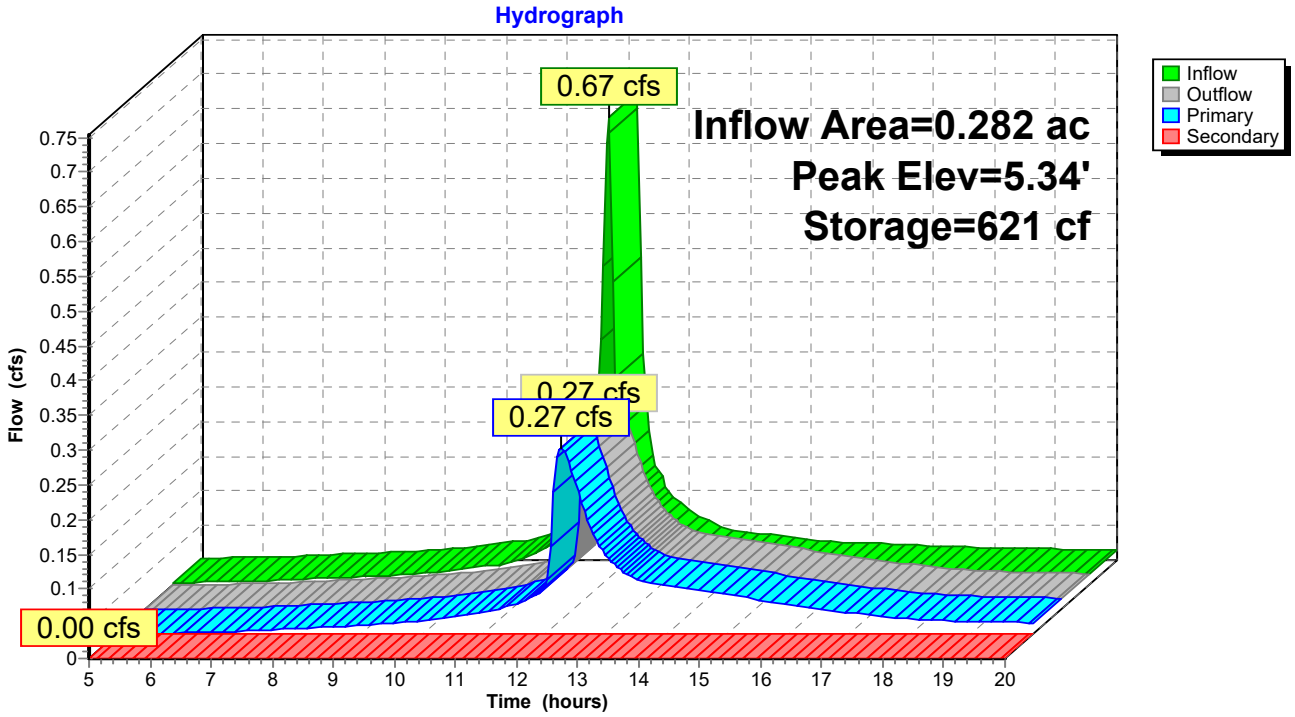
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.45	536	0	0
5.00	734	349	349
6.00	1,172	953	1,302
6.50	1,412	646	1,948

Device	Routing	Invert	Outlet Devices
#1	Primary	4.35'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.35' / 4.25' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	6.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	4.45'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	5.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	6.17'	**6.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.27 cfs @ 12.27 hrs HW=5.33' (Free Discharge)
└**1=Culvert** (Passes 0.27 cfs of 1.99 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 4.31 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.17 cfs @ 1.97 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=4.45' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RG: Rain Garden

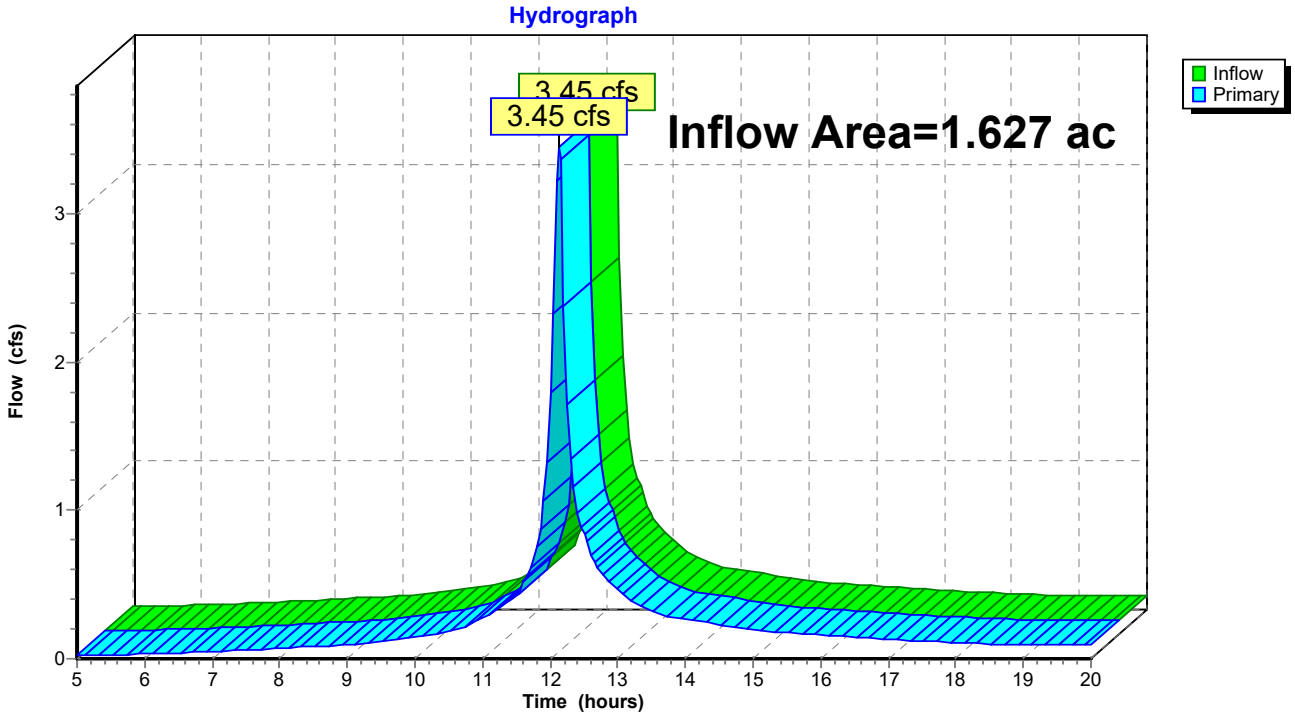


Summary for Link A: Design point 1

Inflow Area = 1.627 ac, 72.80% Impervious, Inflow Depth > 2.15" for 2-Year event
Inflow = 3.45 cfs @ 12.13 hrs, Volume= 0.291 af
Primary = 3.45 cfs @ 12.13 hrs, Volume= 0.291 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: Design point 1

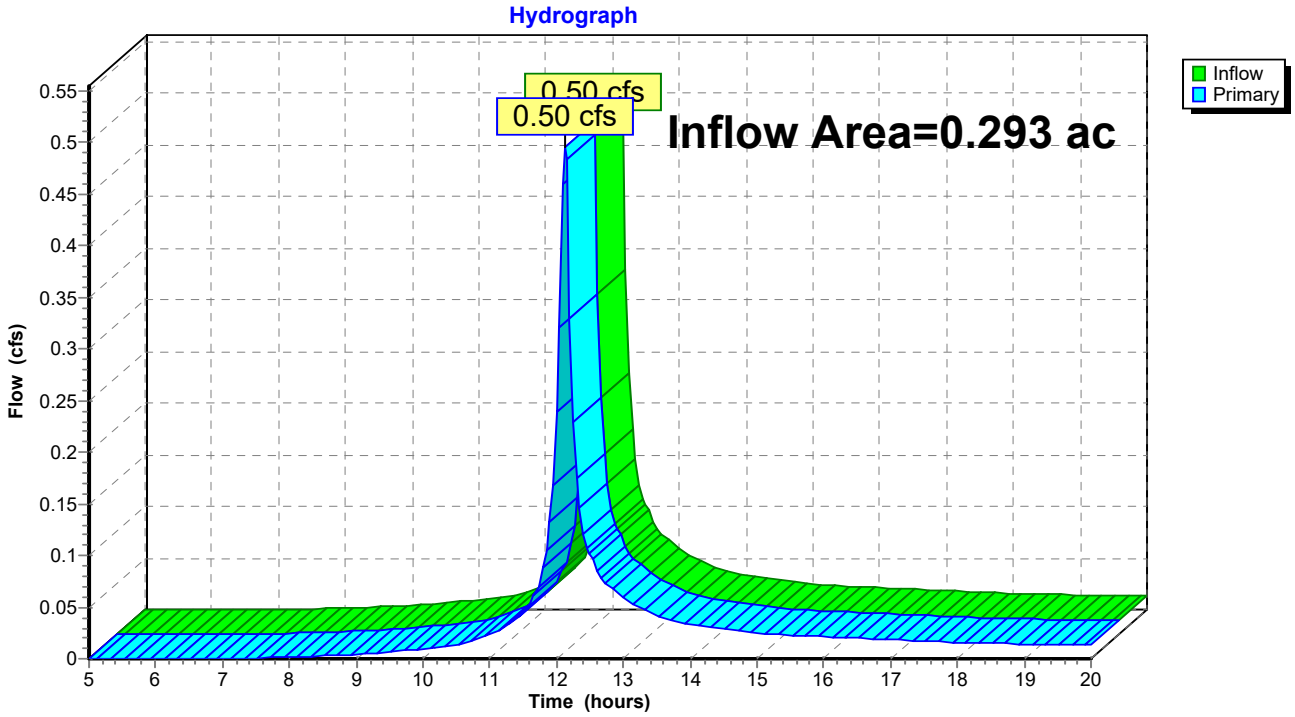


Summary for Link DP2: Design Point 2

Inflow Area = 0.293 ac, 2.74% Impervious, Inflow Depth > 1.40" for 2-Year event
Inflow = 0.50 cfs @ 12.13 hrs, Volume= 0.034 af
Primary = 0.50 cfs @ 12.13 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP2: Design Point 2

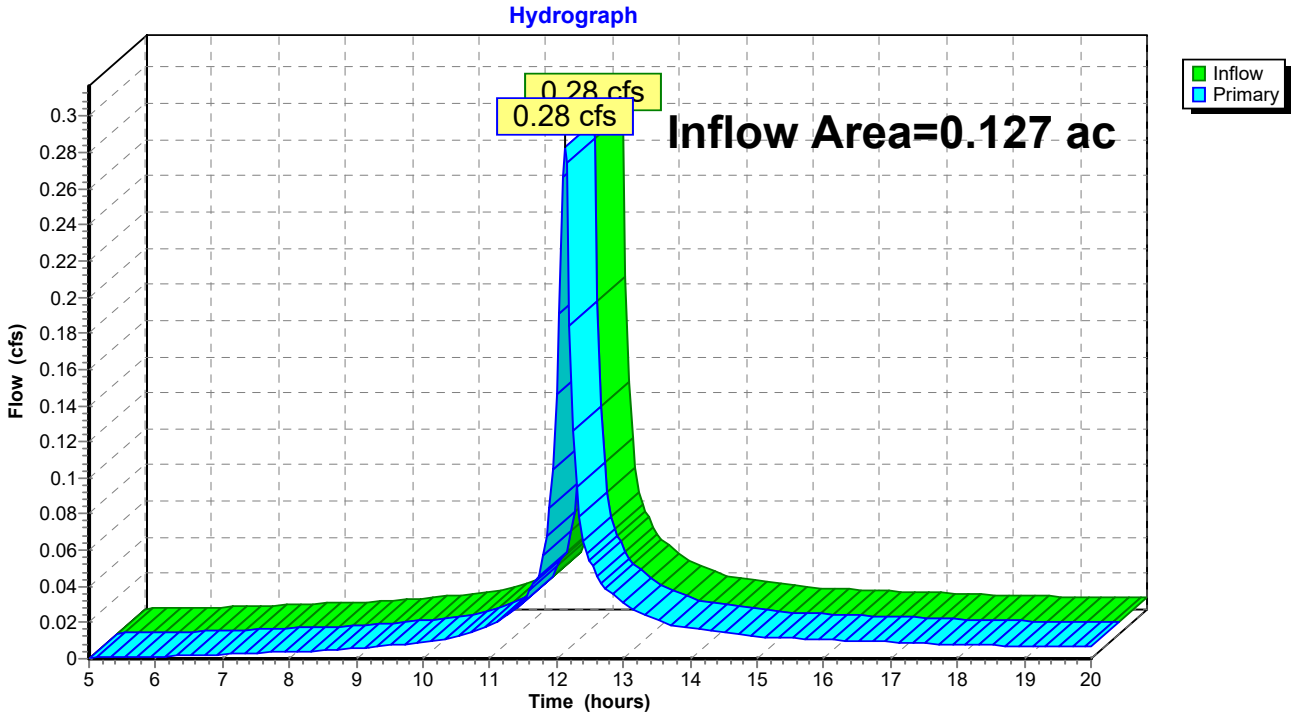


Summary for Link DP3: DESIGN POINT 3

Inflow Area = 0.127 ac, 38.85% Impervious, Inflow Depth > 1.93" for 2-Year event
Inflow = 0.28 cfs @ 12.13 hrs, Volume= 0.020 af
Primary = 0.28 cfs @ 12.13 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP3: DESIGN POINT 3



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

Subcatchment P1A: SUBCAT P1A Runoff Area=6,884 sf 77.83% Impervious Runoff Depth>3.66"
Tc=6.0 min CN=93 Runoff=0.63 cfs 0.048 af

Subcatchment P1B: SUBCAT P1B Runoff Area=9,254 sf 82.40% Impervious Runoff Depth>3.75"
Tc=6.0 min CN=94 Runoff=0.86 cfs 0.066 af

Subcatchment P1C: SUBCAT P1C Runoff Area=6,257 sf 93.00% Impervious Runoff Depth>3.92"
Tc=6.0 min CN=96 Runoff=0.60 cfs 0.047 af

Subcatchment P1D: SUBCAT P1D Runoff Area=4,870 sf 100.00% Impervious Runoff Depth>4.06"
Tc=6.0 min CN=98 Runoff=0.47 cfs 0.038 af

Subcatchment P1E: SUBCAT P1E Runoff Area=12,295 sf 76.32% Impervious Runoff Depth>3.57"
Tc=6.0 min CN=92 Runoff=1.11 cfs 0.084 af

Subcatchment P1F: SUBCAT P1F Runoff Area=31,332 sf 59.22% Impervious Runoff Depth>3.48"
Tc=6.0 min CN=91 Runoff=2.78 cfs 0.209 af

Subcatchment P2: SUBCAT P2 Runoff Area=12,765 sf 2.74% Impervious Runoff Depth>2.74"
Tc=6.0 min CN=83 Runoff=0.94 cfs 0.067 af

Subcatchment P3: SUBCAT P3 Runoff Area=5,514 sf 38.85% Impervious Runoff Depth>3.39"
Tc=6.0 min CN=90 Runoff=0.48 cfs 0.036 af

Pond CB1: CB1 Peak Elev=7.97' Inflow=0.63 cfs 0.048 af
12.0" Round Culvert n=0.010 L=56.6' S=0.0223 '/' Outflow=0.63 cfs 0.048 af

Pond CB2: CB2 Peak Elev=7.03' Inflow=0.86 cfs 0.066 af
12.0" Round Culvert n=0.010 L=47.0' S=0.0051 '/' Outflow=0.86 cfs 0.066 af

Pond CB3: CB3 Peak Elev=7.14' Inflow=0.60 cfs 0.047 af
12.0" Round Culvert n=0.010 L=53.5' S=0.0161 '/' Outflow=0.60 cfs 0.047 af

Pond CB4: CB4 Peak Elev=6.38' Inflow=0.47 cfs 0.038 af
12.0" Round Culvert n=0.010 L=28.0' S=0.0050 '/' Outflow=0.47 cfs 0.038 af

Pond CDS: CDS Peak Elev=5.69' Inflow=2.56 cfs 0.199 af
18.0" Round Culvert n=0.013 L=55.0' S=0.0051 '/' Outflow=2.56 cfs 0.199 af

Pond DMH1: DMH1 Peak Elev=6.91' Inflow=1.49 cfs 0.115 af
12.0" Round Culvert n=0.010 L=60.0' S=0.0052 '/' Outflow=1.49 cfs 0.115 af

Pond RG: Rain Garden Peak Elev=5.73' Storage=999 cf Inflow=1.11 cfs 0.084 af
Primary=0.43 cfs 0.082 af Secondary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.082 af

Link A: Design point 1 Inflow=5.71 cfs 0.490 af
Primary=5.71 cfs 0.490 af

Link DP2: Design Point 2
Inflow=0.94 cfs 0.067 af
Primary=0.94 cfs 0.067 af

Link DP3: DESIGN POINT 3
Inflow=0.48 cfs 0.036 af
Primary=0.48 cfs 0.036 af

Total Runoff Area = 2.047 ac Runoff Volume = 0.594 af Average Runoff Depth = 3.48"
39.33% Pervious = 0.805 ac 60.67% Impervious = 1.242 ac

Summary for Subcatchment P1A: SUBCAT P1A

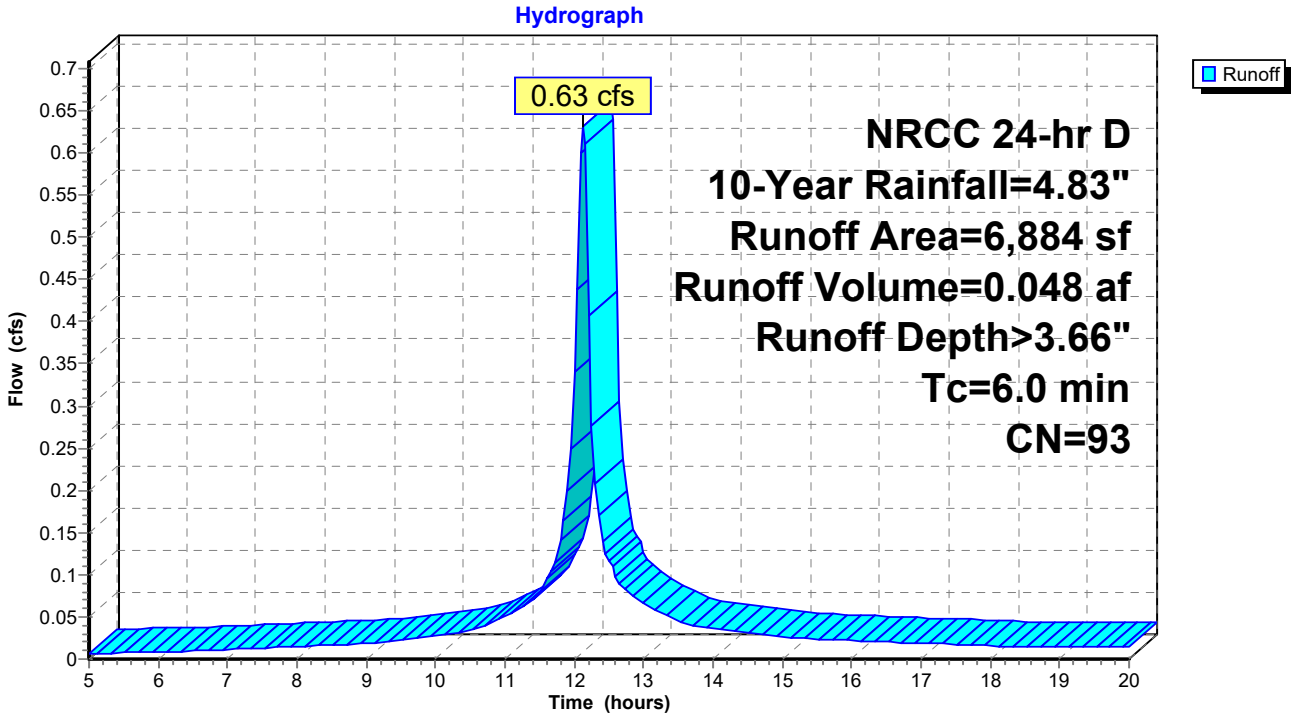
Runoff = 0.63 cfs @ 12.13 hrs, Volume= 0.048 af, Depth> 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

	Area (sf)	CN	Description
	5,204	98	Paved parking, HSG C
	1,526	74	>75% Grass cover, Good, HSG C
*	154	98	Retaining Wall
	6,884	93	Weighted Average
	1,526		22.17% Pervious Area
	5,358		77.83% Impervious Area

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

Subcatchment P1A: SUBCAT P1A



Summary for Subcatchment P1B: SUBCAT P1B

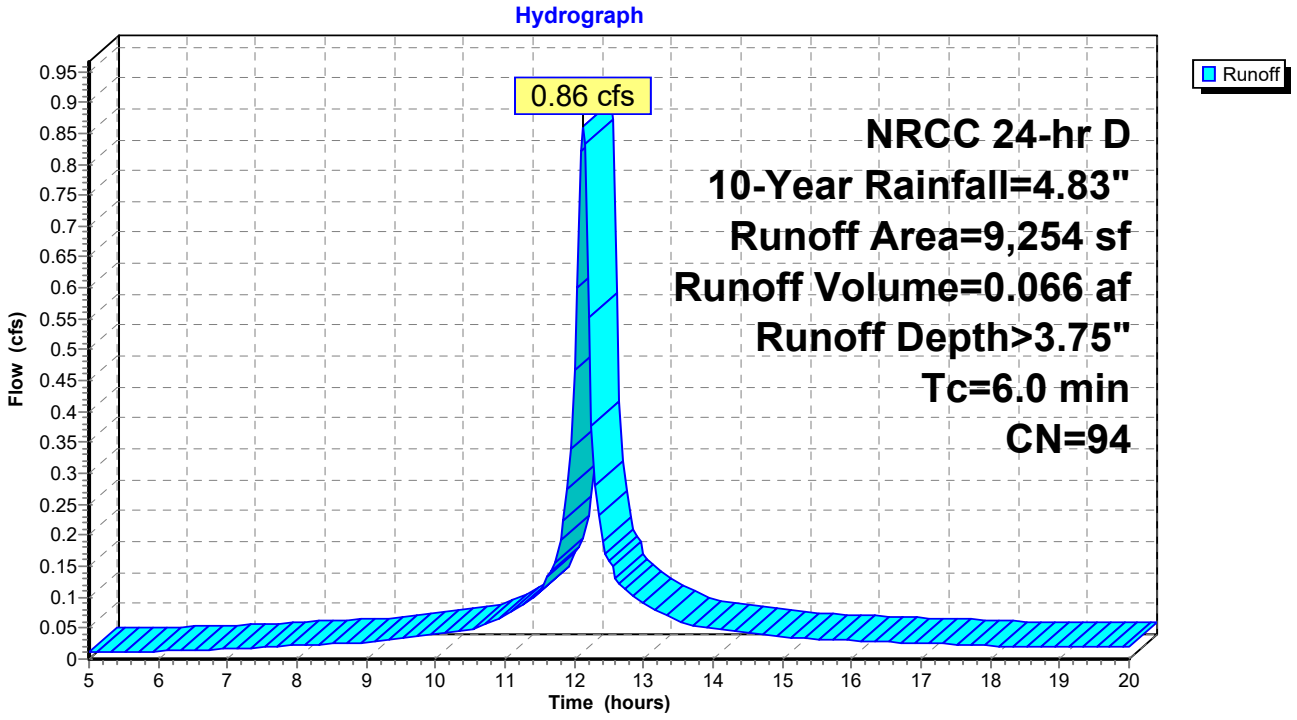
Runoff = 0.86 cfs @ 12.13 hrs, Volume= 0.066 af, Depth> 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
5,436	98	Paved parking, HSG C
1,629	74	>75% Grass cover, Good, HSG C
2,189	98	Roofs, HSG C
9,254	94	Weighted Average
1,629		17.60% Pervious Area
7,625		82.40% Impervious Area

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

Subcatchment P1B: SUBCAT P1B



Summary for Subcatchment P1C: SUBCAT P1C

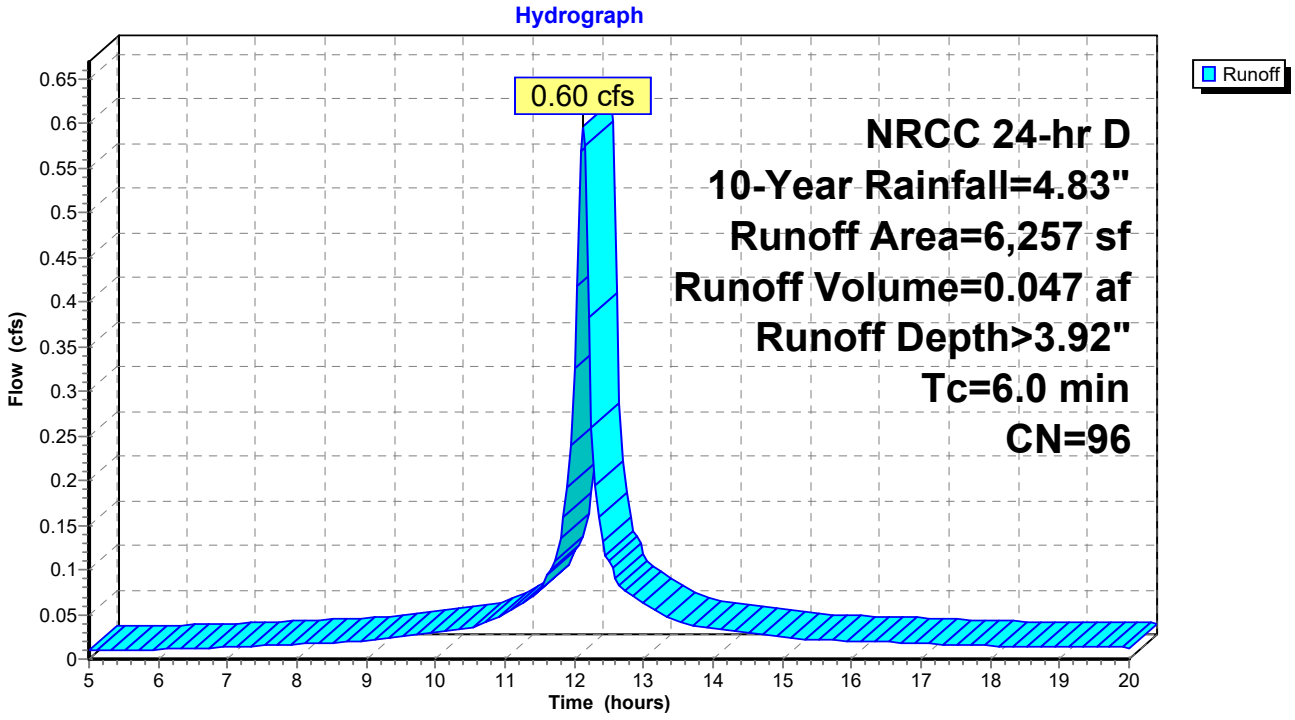
Runoff = 0.60 cfs @ 12.13 hrs, Volume= 0.047 af, Depth> 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

	Area (sf)	CN	Description
	5,731	98	Paved parking, HSG C
	438	74	>75% Grass cover, Good, HSG C
*	88	98	Retaining Wall
	6,257	96	Weighted Average
	438		7.00% Pervious Area
	5,819		93.00% Impervious Area

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

Subcatchment P1C: SUBCAT P1C



Summary for Subcatchment P1D: SUBCAT P1D

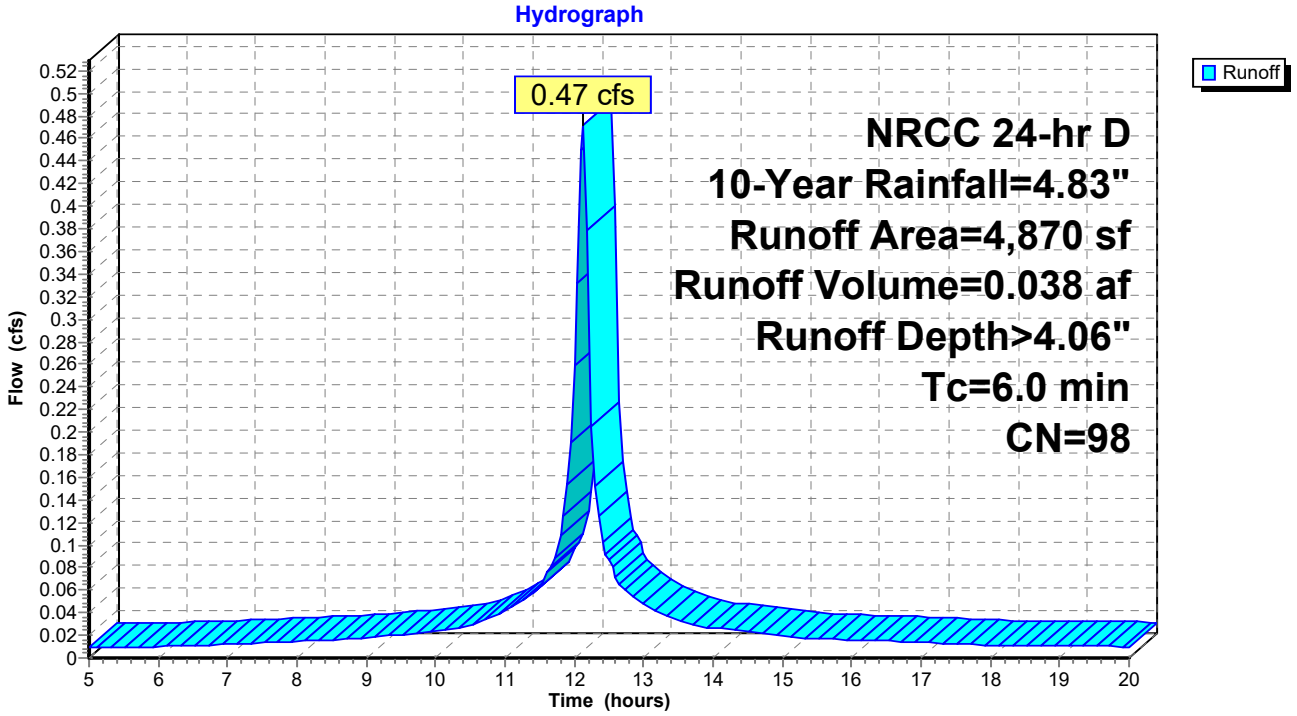
Runoff = 0.47 cfs @ 12.13 hrs, Volume= 0.038 af, Depth> 4.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
4,870	98	Paved parking, HSG C
4,870		100.00% Impervious Area

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

Subcatchment P1D: SUBCAT P1D



Summary for Subcatchment P1E: SUBCAT P1E

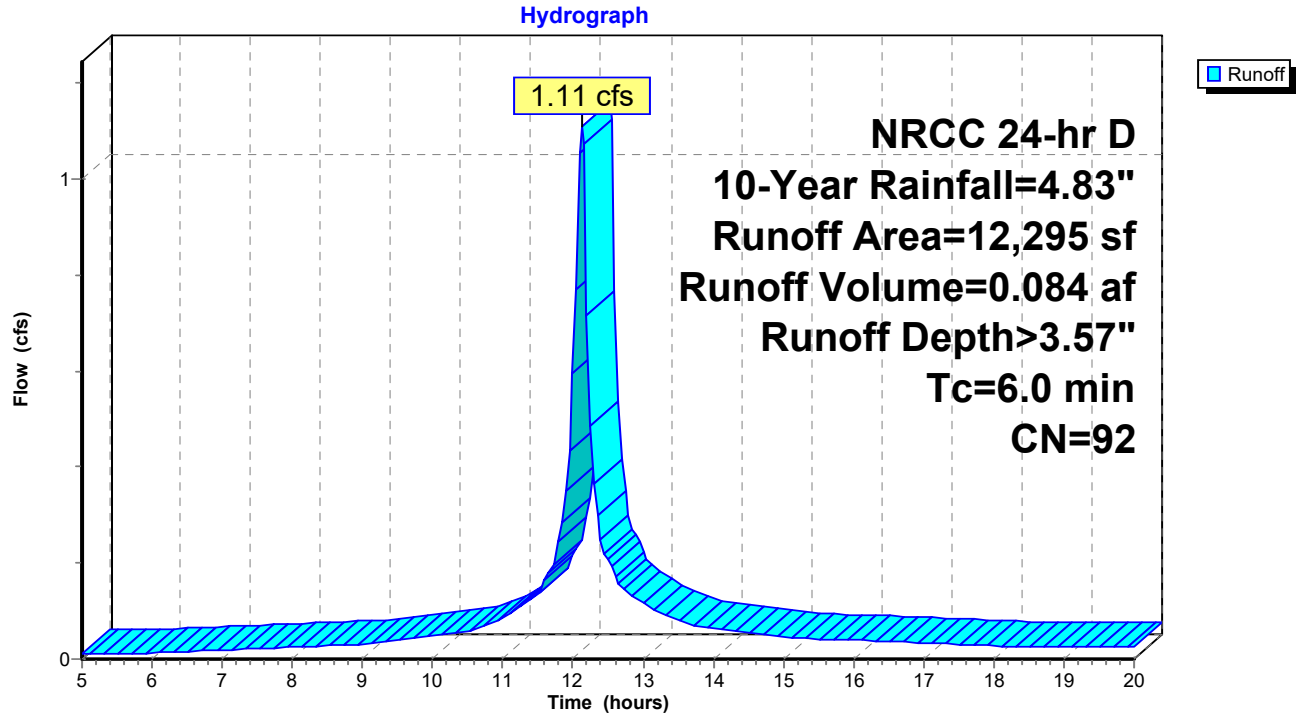
Runoff = 1.11 cfs @ 12.13 hrs, Volume= 0.084 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
9,384	98	Paved parking, HSG C
2,040	74	>75% Grass cover, Good, HSG C
871	74	>75% Grass cover, Good, HSG C
12,295	92	Weighted Average
2,911		23.68% Pervious Area
9,384		76.32% Impervious Area

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

Subcatchment P1E: SUBCAT P1E



Summary for Subcatchment P1F: SUBCAT P1F

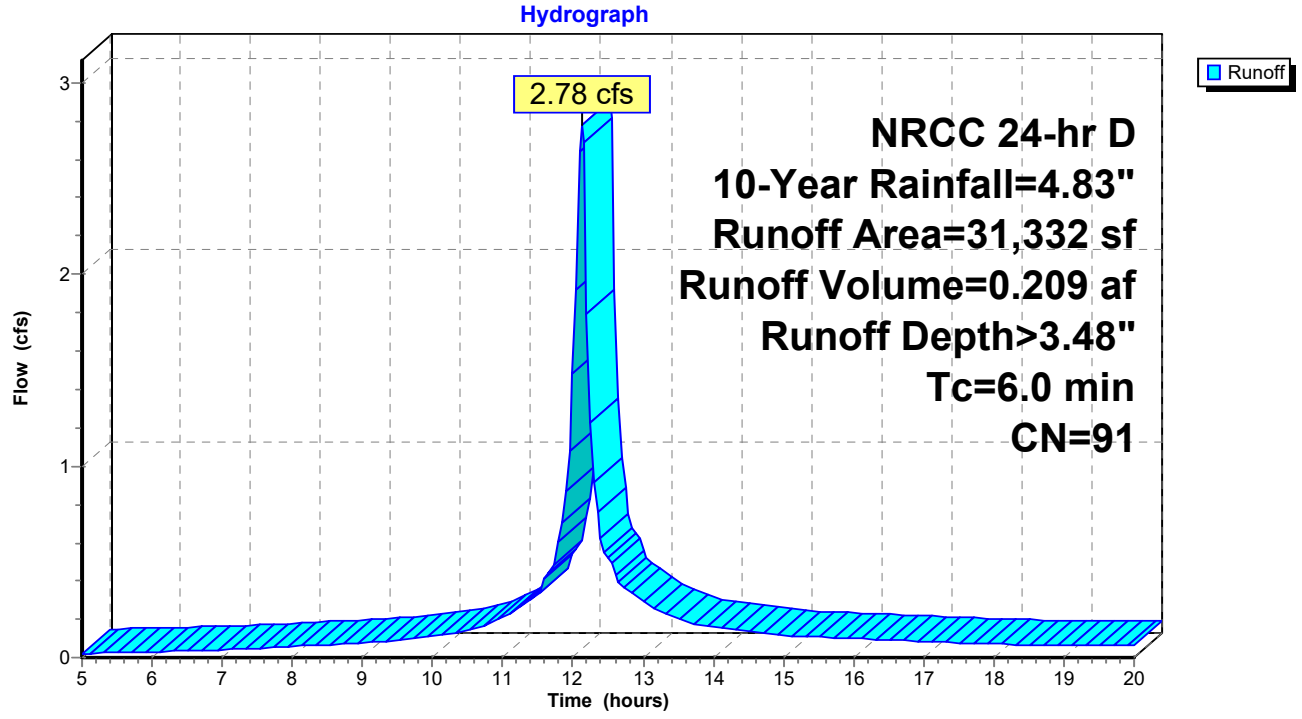
Runoff = 2.78 cfs @ 12.13 hrs, Volume= 0.209 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
8,438	98	Paved parking, HSG C
9,131	74	>75% Grass cover, Good, HSG C
3,646	96	Gravel surface, HSG C
10,117	98	Roofs, HSG C
31,332	91	Weighted Average
12,777		40.78% Pervious Area
18,555		59.22% Impervious Area

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

Subcatchment P1F: SUBCAT P1F



Summary for Subcatchment P2: SUBCAT P2

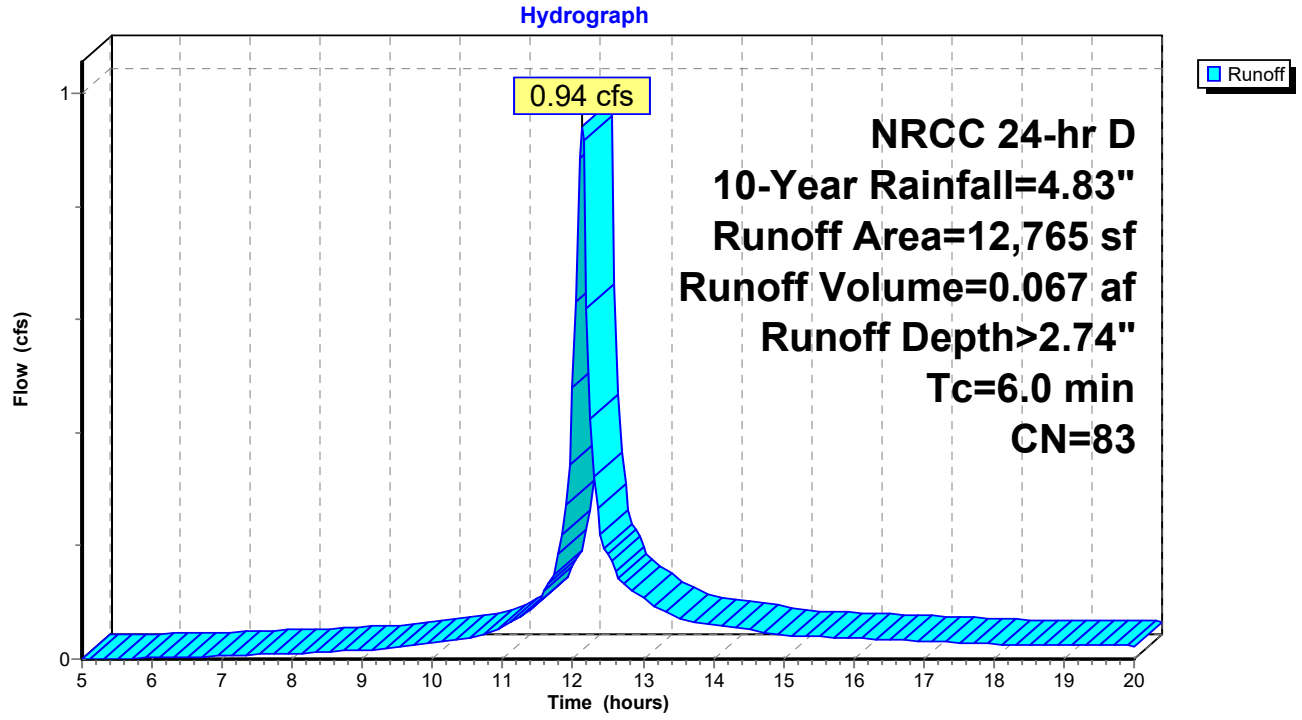
Runoff = 0.94 cfs @ 12.13 hrs, Volume= 0.067 af, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
4,782	96	Gravel surface, HSG C
350	98	Roofs, HSG C
7,633	74	>75% Grass cover, Good, HSG C
12,765	83	Weighted Average
12,415		97.26% Pervious Area
350		2.74% Impervious Area

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

Subcatchment P2: SUBCAT P2



Summary for Subcatchment P3: SUBCAT P3

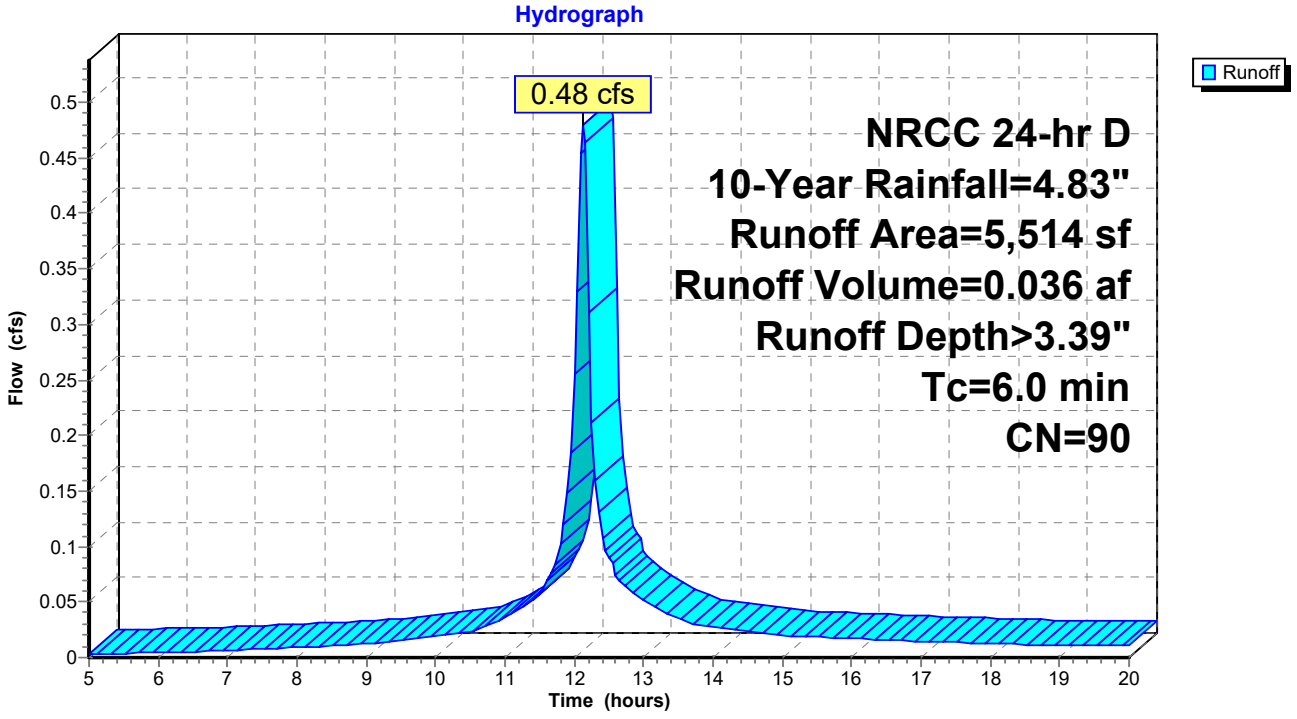
Runoff = 0.48 cfs @ 12.13 hrs, Volume= 0.036 af, Depth> 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,639	96	Gravel surface, HSG C
1,300	98	Paved parking, HSG C
842	98	Roofs, HSG C
1,733	74	>75% Grass cover, Good, HSG C
5,514	90	Weighted Average
3,372		61.15% Pervious Area
2,142		38.85% Impervious Area

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

Subcatchment P3: SUBCAT P3



Summary for Pond CB1: CB1

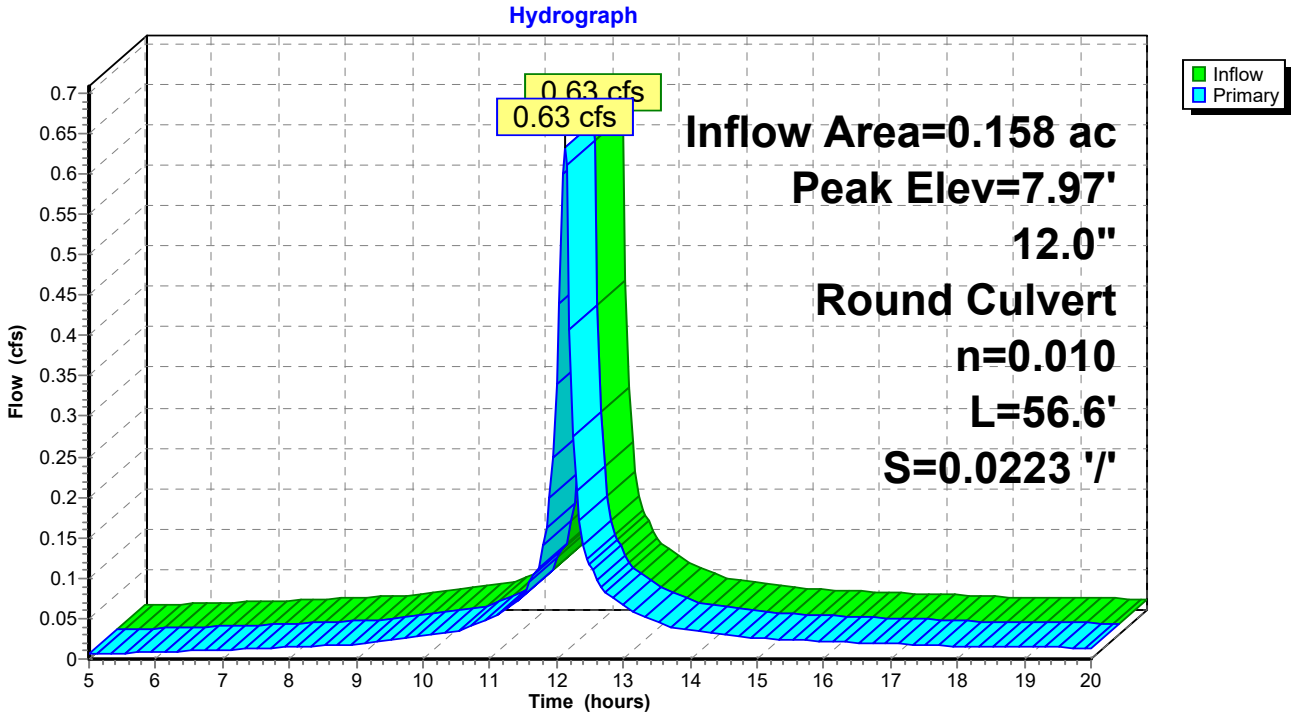
Inflow Area = 0.158 ac, 77.83% Impervious, Inflow Depth > 3.66" for 10-Year event
Inflow = 0.63 cfs @ 12.13 hrs, Volume= 0.048 af
Outflow = 0.63 cfs @ 12.13 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.13 hrs, Volume= 0.048 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.97' @ 12.13 hrs
Flood Elev= 10.91'

Device	Routing	Invert	Outlet Devices
#1	Primary	7.51'	**12.0" Round Culvert** L= 56.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 7.51' / 6.25' S= 0.0223 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 12.13 hrs HW=7.95' (Free Discharge)
1=Culvert (Inlet Controls 0.61 cfs @ 1.79 fps)

Pond CB1: CB1



Summary for Pond CB2: CB2

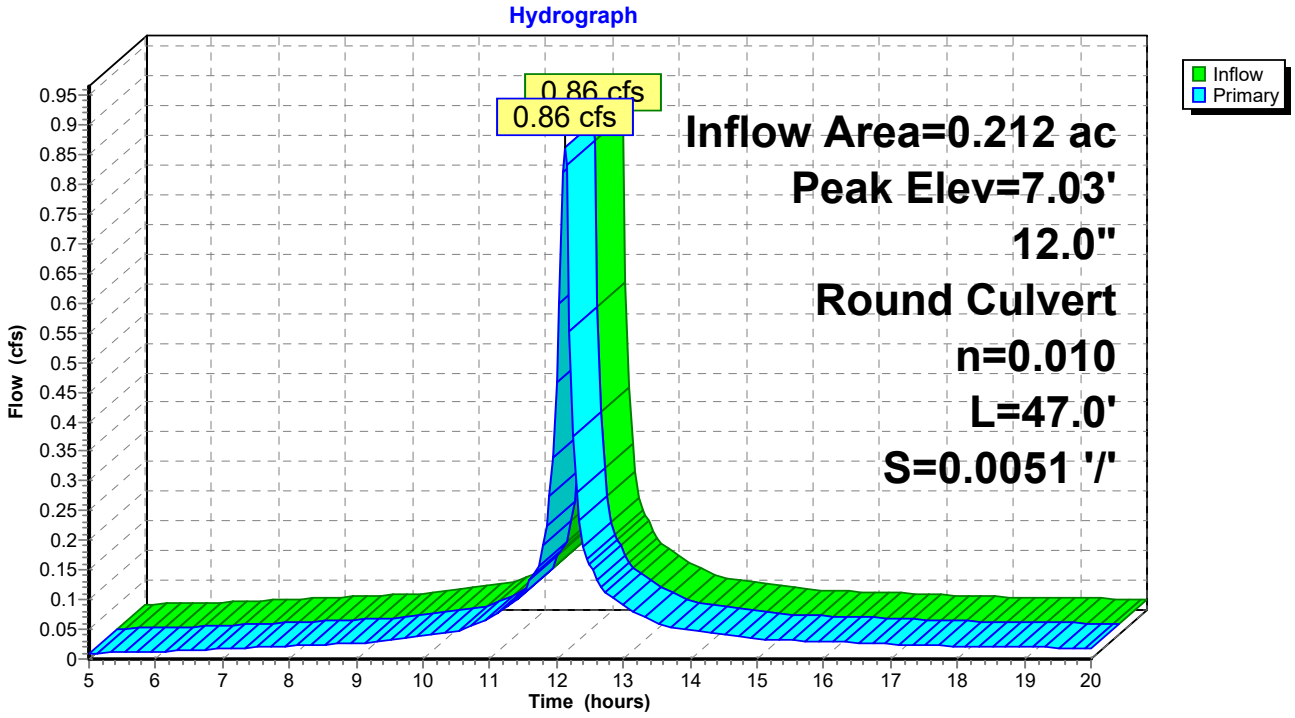
Inflow Area = 0.212 ac, 82.40% Impervious, Inflow Depth > 3.75" for 10-Year event
Inflow = 0.86 cfs @ 12.13 hrs, Volume= 0.066 af
Outflow = 0.86 cfs @ 12.13 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.13 hrs, Volume= 0.066 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.03' @ 12.13 hrs
Flood Elev= 9.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.49'	**12.0" Round Culvert** L= 47.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.49' / 6.25' S= 0.0051 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.83 cfs @ 12.13 hrs HW=7.02' (Free Discharge)
1=Culvert (Barrel Controls 0.83 cfs @ 2.84 fps)

Pond CB2: CB2



Summary for Pond CB3: CB3

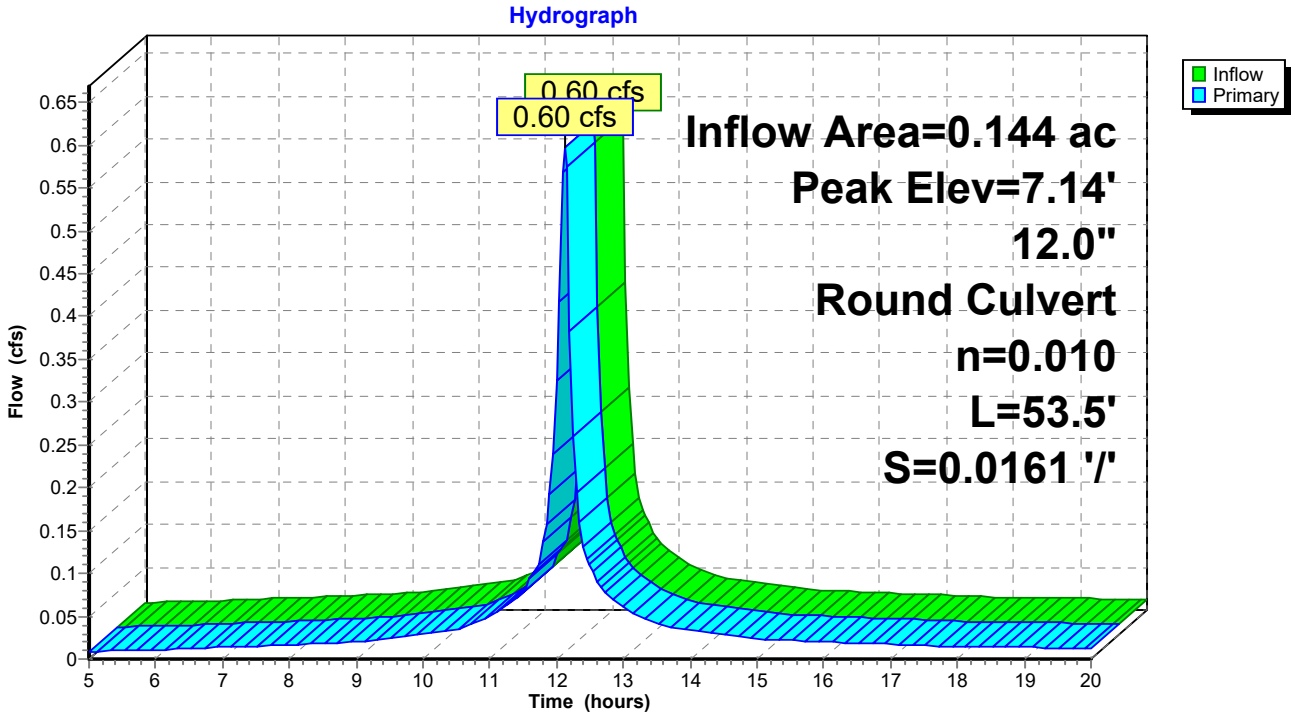
Inflow Area = 0.144 ac, 93.00% Impervious, Inflow Depth > 3.92" for 10-Year event
Inflow = 0.60 cfs @ 12.13 hrs, Volume= 0.047 af
Outflow = 0.60 cfs @ 12.13 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.13 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.14' @ 12.13 hrs
Flood Elev= 10.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.70'	**12.0" Round Culvert** L= 53.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.70' / 5.84' S= 0.0161 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.57 cfs @ 12.13 hrs HW=7.13' (Free Discharge)
1=Culvert (Inlet Controls 0.57 cfs @ 1.76 fps)

Pond CB3: CB3



Summary for Pond CB4: CB4

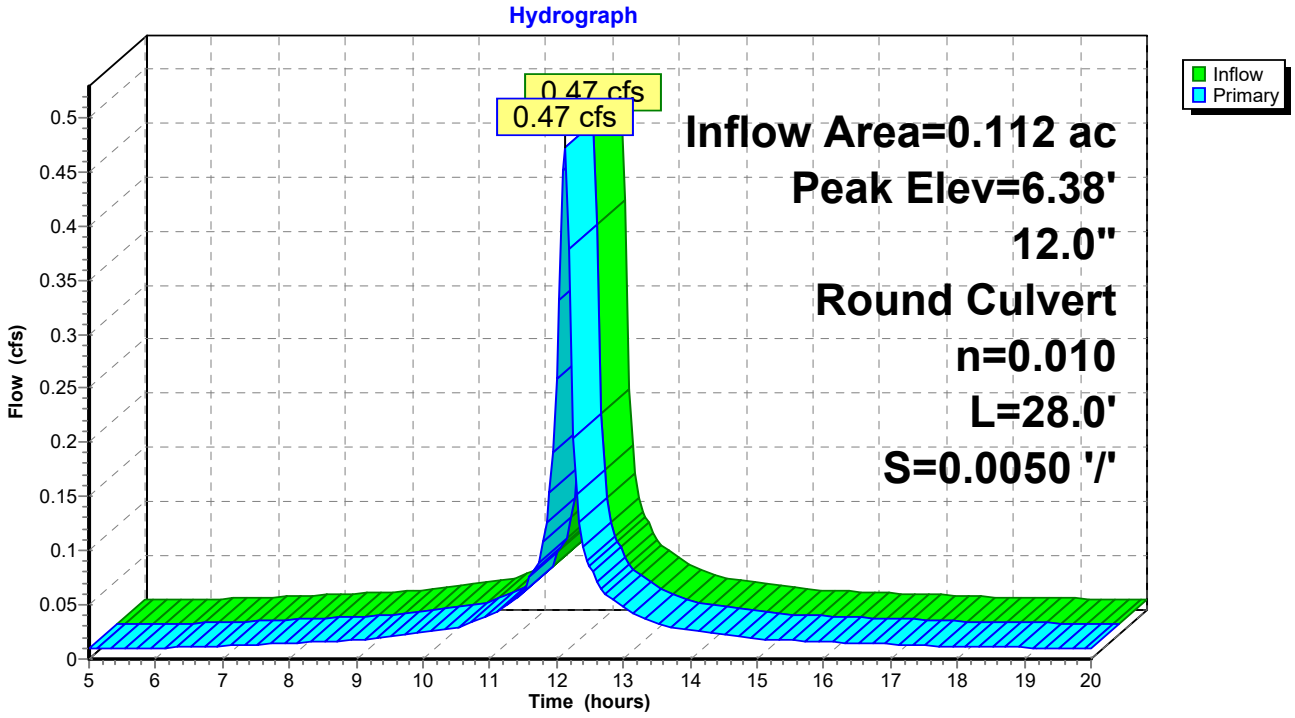
Inflow Area = 0.112 ac,100.00% Impervious, Inflow Depth > 4.06" for 10-Year event
Inflow = 0.47 cfs @ 12.13 hrs, Volume= 0.038 af
Outflow = 0.47 cfs @ 12.13 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.13 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.38' @ 12.13 hrs
Flood Elev= 8.48'

Device	Routing	Invert	Outlet Devices
#1	Primary	5.98'	**12.0" Round Culvert** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 5.98' / 5.84' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.45 cfs @ 12.13 hrs HW=6.37' (Free Discharge)
1=Culvert (Barrel Controls 0.45 cfs @ 2.35 fps)

Pond CB4: CB4



Summary for Pond CDS: CDS

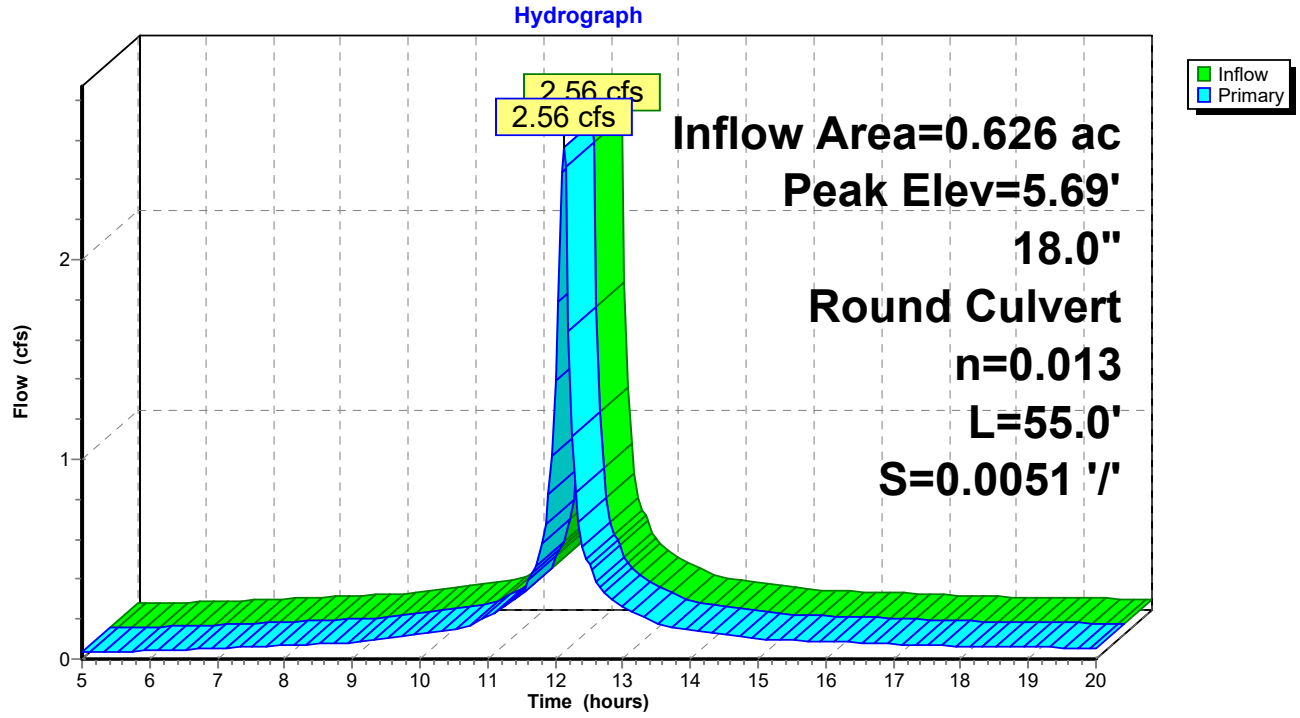
Inflow Area = 0.626 ac, 86.82% Impervious, Inflow Depth > 3.82" for 10-Year event
Inflow = 2.56 cfs @ 12.13 hrs, Volume= 0.199 af
Outflow = 2.56 cfs @ 12.13 hrs, Volume= 0.199 af, Atten= 0%, Lag= 0.0 min
Primary = 2.56 cfs @ 12.13 hrs, Volume= 0.199 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 5.69' @ 12.13 hrs
Flood Elev= 8.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	4.78'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.78' / 4.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.46 cfs @ 12.13 hrs HW=5.66' (Free Discharge)
1=Culvert (Barrel Controls 2.46 cfs @ 3.27 fps)

Pond CDS: CDS



Summary for Pond DMH1: DMH1

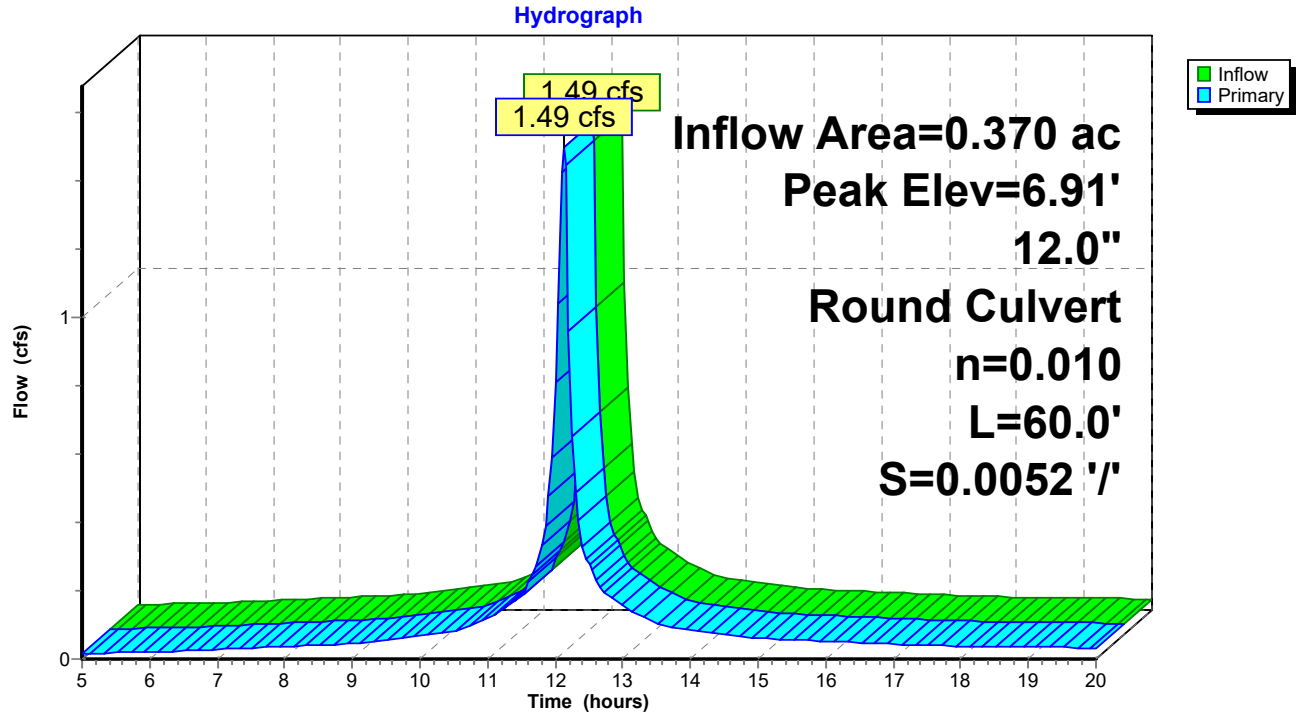
Inflow Area = 0.370 ac, 80.45% Impervious, Inflow Depth > 3.71" for 10-Year event
Inflow = 1.49 cfs @ 12.13 hrs, Volume= 0.115 af
Outflow = 1.49 cfs @ 12.13 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
Primary = 1.49 cfs @ 12.13 hrs, Volume= 0.115 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.91' @ 12.13 hrs
Flood Elev= 9.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.15'	**12.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.15' / 5.84' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.43 cfs @ 12.13 hrs HW=6.89' (Free Discharge)
1=Culvert (Inlet Controls 1.43 cfs @ 2.31 fps)

Pond DMH1: DMH1



Summary for Pond RG: Rain Garden

Inflow Area = 0.282 ac, 76.32% Impervious, Inflow Depth > 3.57" for 10-Year event
Inflow = 1.11 cfs @ 12.13 hrs, Volume= 0.084 af
Outflow = 0.43 cfs @ 12.27 hrs, Volume= 0.082 af, Atten= 61%, Lag= 8.8 min
Primary = 0.43 cfs @ 12.27 hrs, Volume= 0.082 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 5.73' @ 12.27 hrs Surf.Area= 1,053 sf Storage= 999 cf

Plug-Flow detention time= 53.6 min calculated for 0.082 af (97% of inflow)
Center-of-Mass det. time= 43.6 min (799.4 - 755.8)

Volume	Invert	Avail.Storage	Storage Description
#1	4.45'	1,948 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

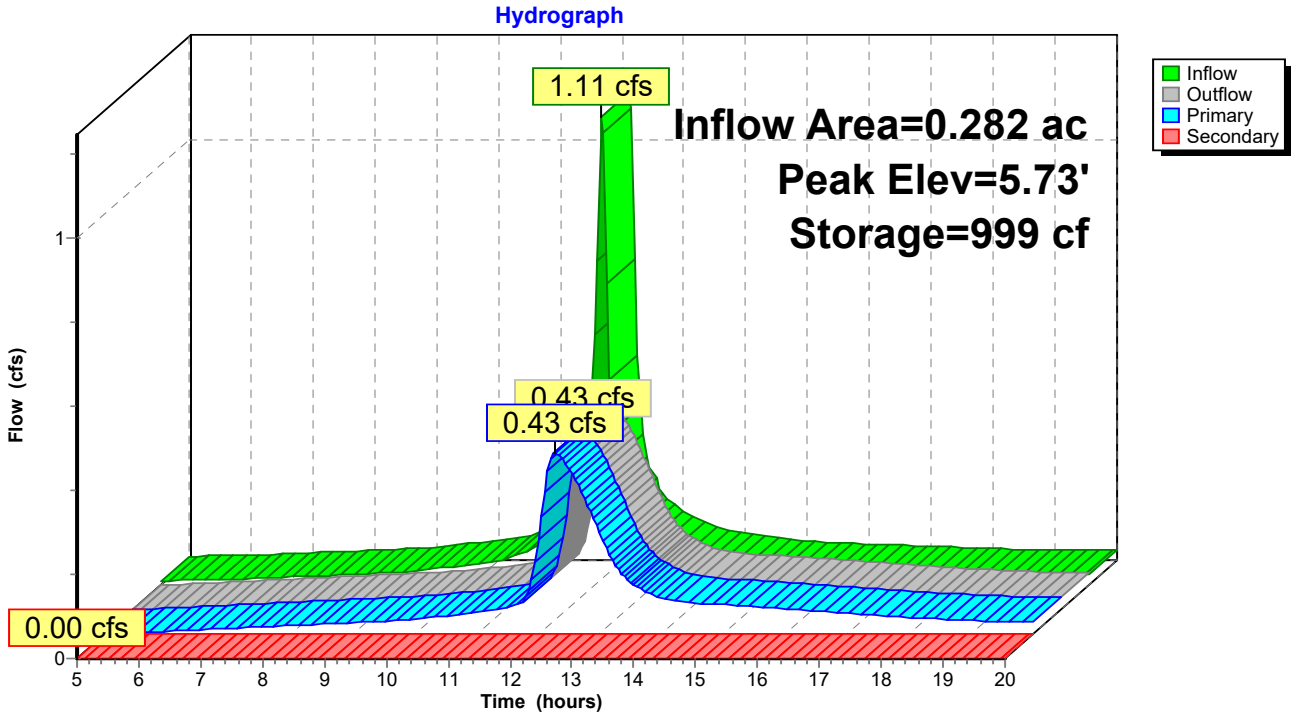
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.45	536	0	0
5.00	734	349	349
6.00	1,172	953	1,302
6.50	1,412	646	1,948

Device	Routing	Invert	Outlet Devices
#1	Primary	4.35'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.35' / 4.25' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	6.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	4.45'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	5.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	6.17'	**6.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.43 cfs @ 12.27 hrs HW=5.72' (Free Discharge)
└**1=Culvert** (Passes 0.43 cfs of 2.79 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.11 cfs @ 5.25 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.31 cfs @ 3.59 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=4.45' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RG: Rain Garden

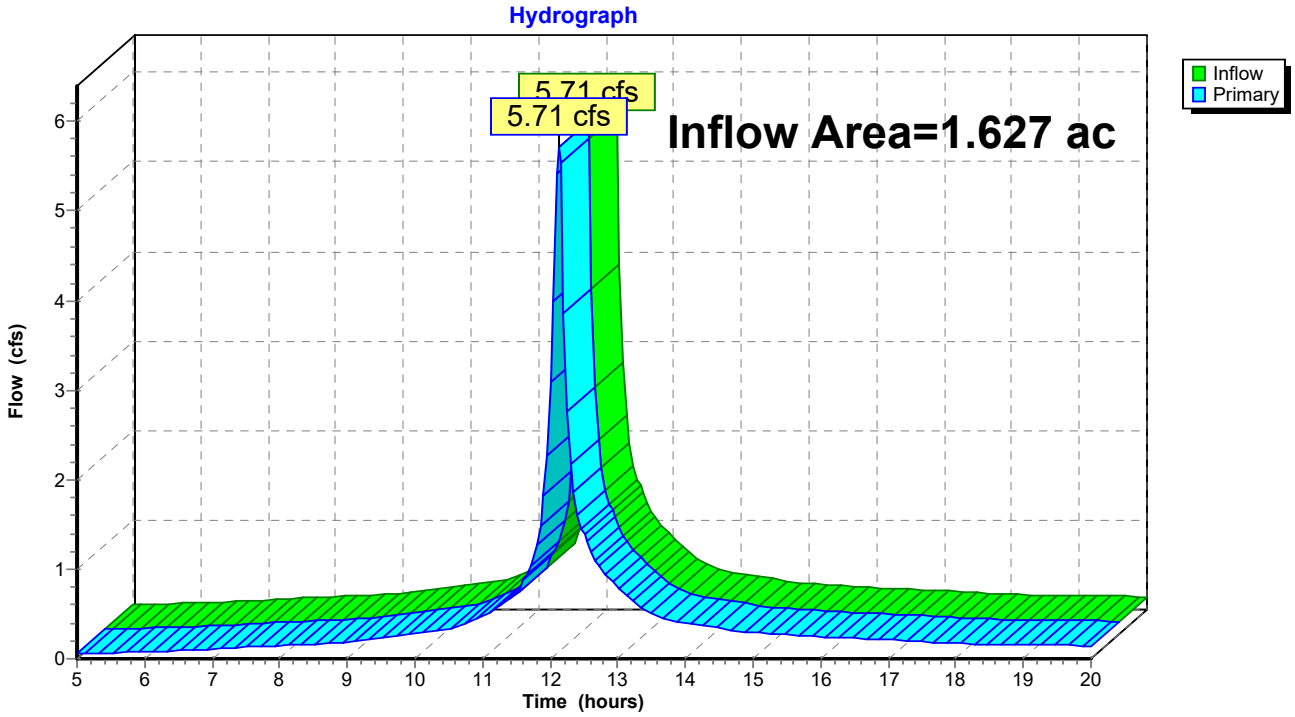


Summary for Link A: Design point 1

Inflow Area = 1.627 ac, 72.80% Impervious, Inflow Depth > 3.61" for 10-Year event
Inflow = 5.71 cfs @ 12.13 hrs, Volume= 0.490 af
Primary = 5.71 cfs @ 12.13 hrs, Volume= 0.490 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: Design point 1

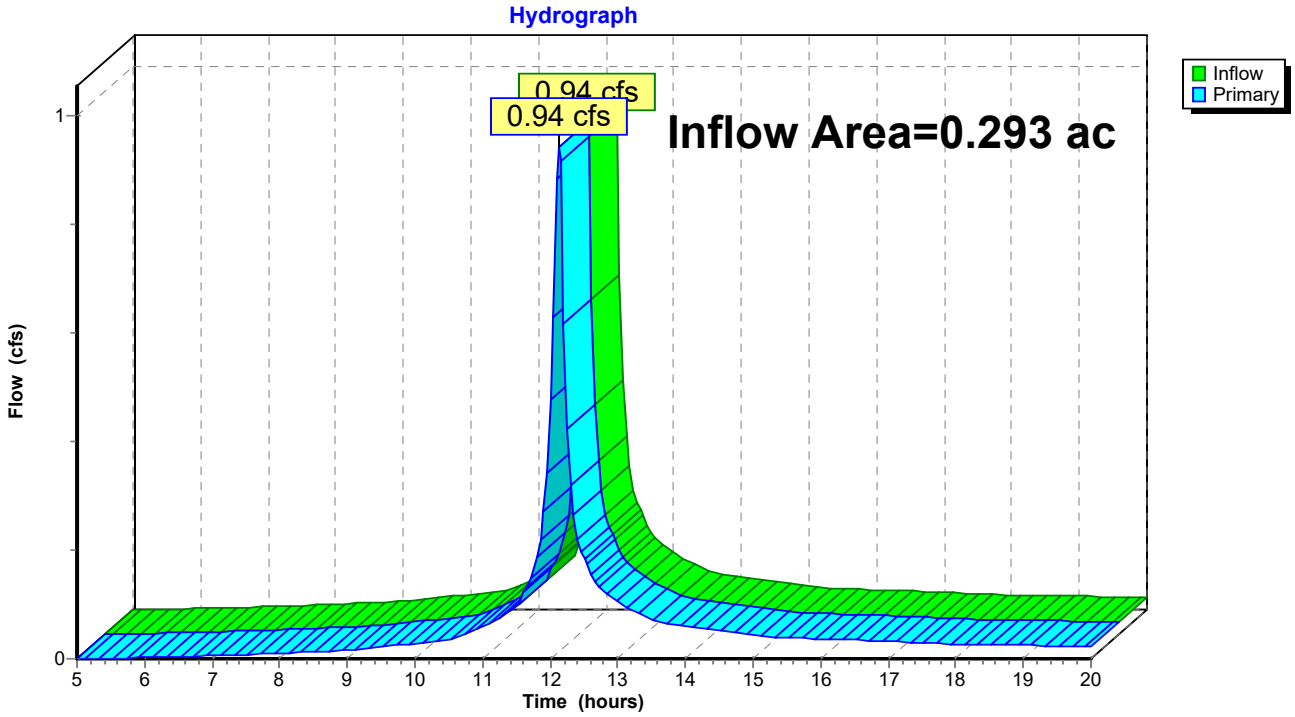


Summary for Link DP2: Design Point 2

Inflow Area = 0.293 ac, 2.74% Impervious, Inflow Depth > 2.74" for 10-Year event
Inflow = 0.94 cfs @ 12.13 hrs, Volume= 0.067 af
Primary = 0.94 cfs @ 12.13 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP2: Design Point 2

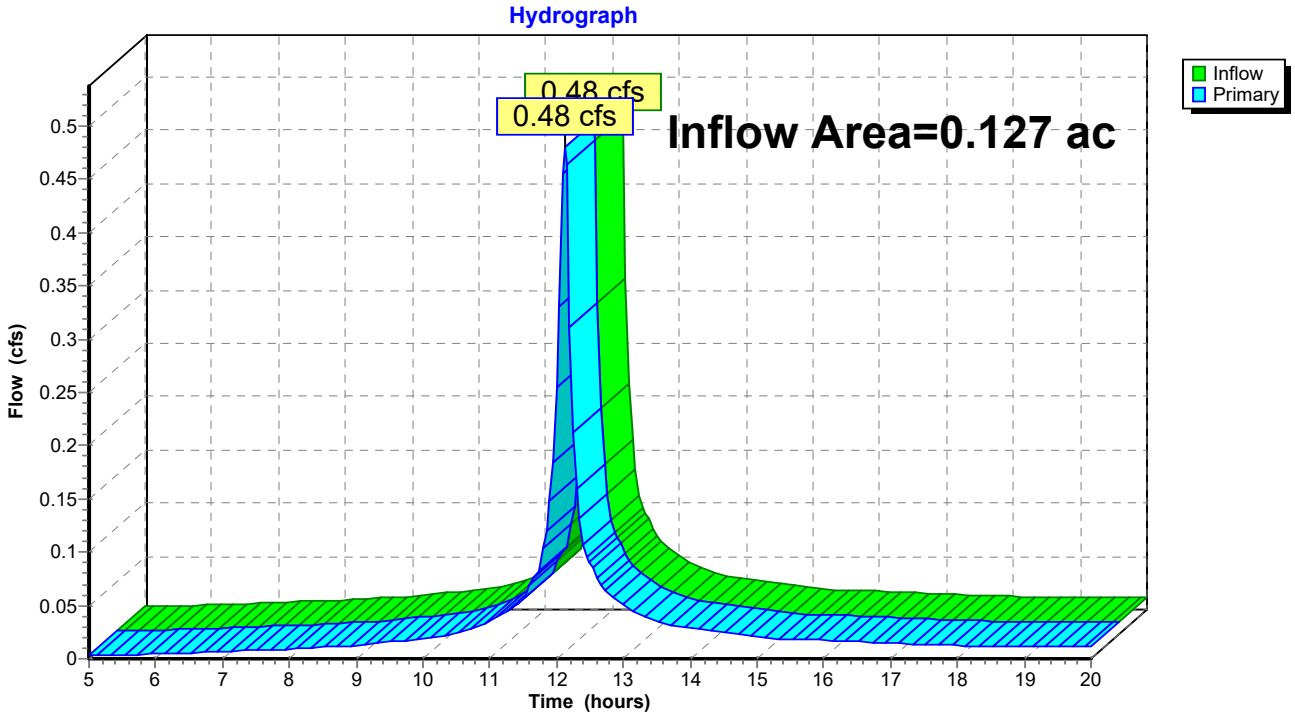


Summary for Link DP3: DESIGN POINT 3

Inflow Area = 0.127 ac, 38.85% Impervious, Inflow Depth > 3.39" for 10-Year event
Inflow = 0.48 cfs @ 12.13 hrs, Volume= 0.036 af
Primary = 0.48 cfs @ 12.13 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP3: DESIGN POINT 3



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

Subcatchment P1A: SUBCAT P1A Runoff Area=6,884 sf 77.83% Impervious Runoff Depth>7.27"
Tc=6.0 min CN=93 Runoff=1.22 cfs 0.096 af

Subcatchment P1B: SUBCAT P1B Runoff Area=9,254 sf 82.40% Impervious Runoff Depth>7.35"
Tc=6.0 min CN=94 Runoff=1.65 cfs 0.130 af

Subcatchment P1C: SUBCAT P1C Runoff Area=6,257 sf 93.00% Impervious Runoff Depth>7.48"
Tc=6.0 min CN=96 Runoff=1.12 cfs 0.090 af

Subcatchment P1D: SUBCAT P1D Runoff Area=4,870 sf 100.00% Impervious Runoff Depth>7.59"
Tc=6.0 min CN=98 Runoff=0.88 cfs 0.071 af

Subcatchment P1E: SUBCAT P1E Runoff Area=12,295 sf 76.32% Impervious Runoff Depth>7.18"
Tc=6.0 min CN=92 Runoff=2.16 cfs 0.169 af

Subcatchment P1F: SUBCAT P1F Runoff Area=31,332 sf 59.22% Impervious Runoff Depth>7.09"
Tc=6.0 min CN=91 Runoff=5.47 cfs 0.425 af

Subcatchment P2: SUBCAT P2 Runoff Area=12,765 sf 2.74% Impervious Runoff Depth>6.27"
Tc=6.0 min CN=83 Runoff=2.06 cfs 0.153 af

Subcatchment P3: SUBCAT P3 Runoff Area=5,514 sf 38.85% Impervious Runoff Depth>7.00"
Tc=6.0 min CN=90 Runoff=0.96 cfs 0.074 af

Pond CB1: CB1 Peak Elev=8.18' Inflow=1.22 cfs 0.096 af
12.0" Round Culvert n=0.010 L=56.6' S=0.0223 '/' Outflow=1.22 cfs 0.096 af

Pond CB2: CB2 Peak Elev=7.30' Inflow=1.65 cfs 0.130 af
12.0" Round Culvert n=0.010 L=47.0' S=0.0051 '/' Outflow=1.65 cfs 0.130 af

Pond CB3: CB3 Peak Elev=7.33' Inflow=1.12 cfs 0.090 af
12.0" Round Culvert n=0.010 L=53.5' S=0.0161 '/' Outflow=1.12 cfs 0.090 af

Pond CB4: CB4 Peak Elev=6.56' Inflow=0.88 cfs 0.071 af
12.0" Round Culvert n=0.010 L=28.0' S=0.0050 '/' Outflow=0.88 cfs 0.071 af

Pond CDS: CDS Peak Elev=6.13' Inflow=4.86 cfs 0.386 af
18.0" Round Culvert n=0.013 L=55.0' S=0.0051 '/' Outflow=4.86 cfs 0.386 af

Pond DMH1: DMH1 Peak Elev=7.56' Inflow=2.86 cfs 0.226 af
12.0" Round Culvert n=0.010 L=60.0' S=0.0052 '/' Outflow=2.86 cfs 0.226 af

Pond RG: Rain Garden Peak Elev=6.15' Storage=1,486 cf Inflow=2.16 cfs 0.169 af
Primary=2.06 cfs 0.164 af Secondary=0.00 cfs 0.000 af Outflow=2.06 cfs 0.164 af

Link A: Design point 1 Inflow=12.03 cfs 0.975 af
Primary=12.03 cfs 0.975 af

Link DP2: Design Point 2 Inflow=2.06 cfs 0.153 af
Primary=2.06 cfs 0.153 af

Link DP3: DESIGN POINT 3 Inflow=0.96 cfs 0.074 af
Primary=0.96 cfs 0.074 af

Total Runoff Area = 2.047 ac Runoff Volume = 1.207 af Average Runoff Depth = 7.07"
39.33% Pervious = 0.805 ac 60.67% Impervious = 1.242 ac

Summary for Subcatchment P1A: SUBCAT P1A

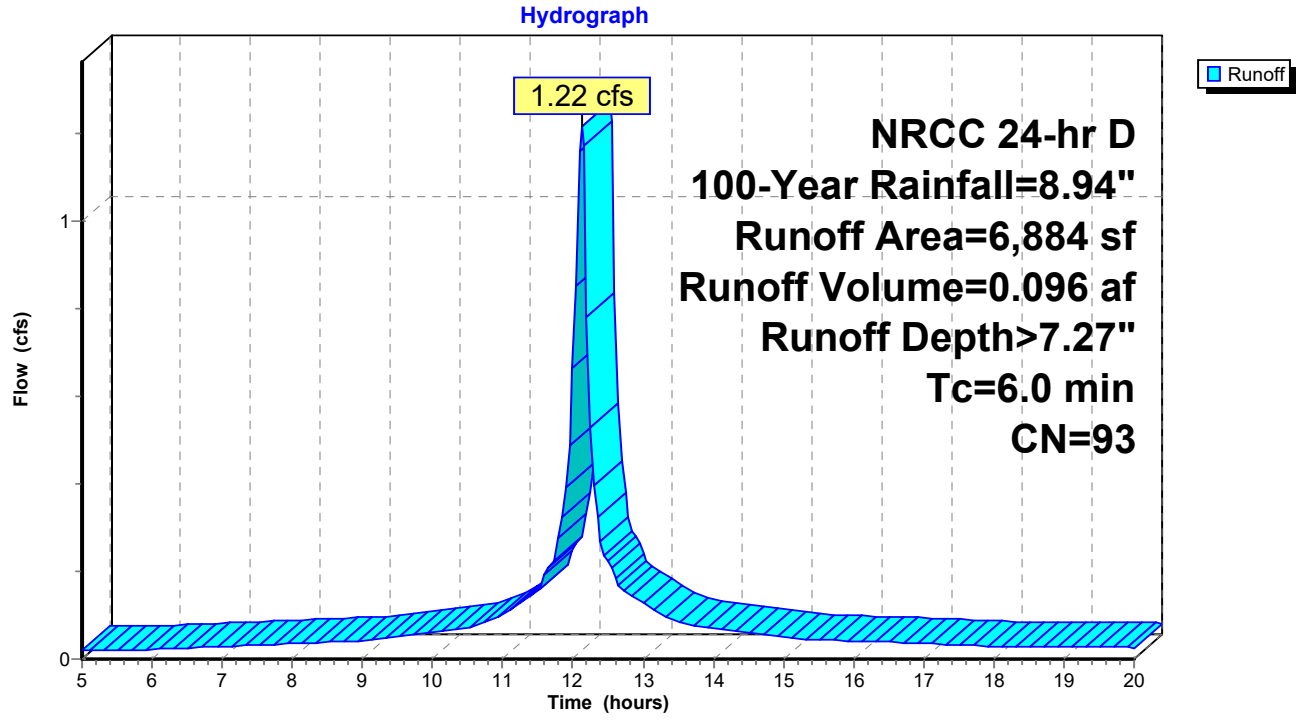
Runoff = 1.22 cfs @ 12.13 hrs, Volume= 0.096 af, Depth> 7.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

	Area (sf)	CN	Description
	5,204	98	Paved parking, HSG C
	1,526	74	>75% Grass cover, Good, HSG C
*	154	98	Retaining Wall
	6,884	93	Weighted Average
	1,526		22.17% Pervious Area
	5,358		77.83% Impervious Area

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

Subcatchment P1A: SUBCAT P1A



Summary for Subcatchment P1B: SUBCAT P1B

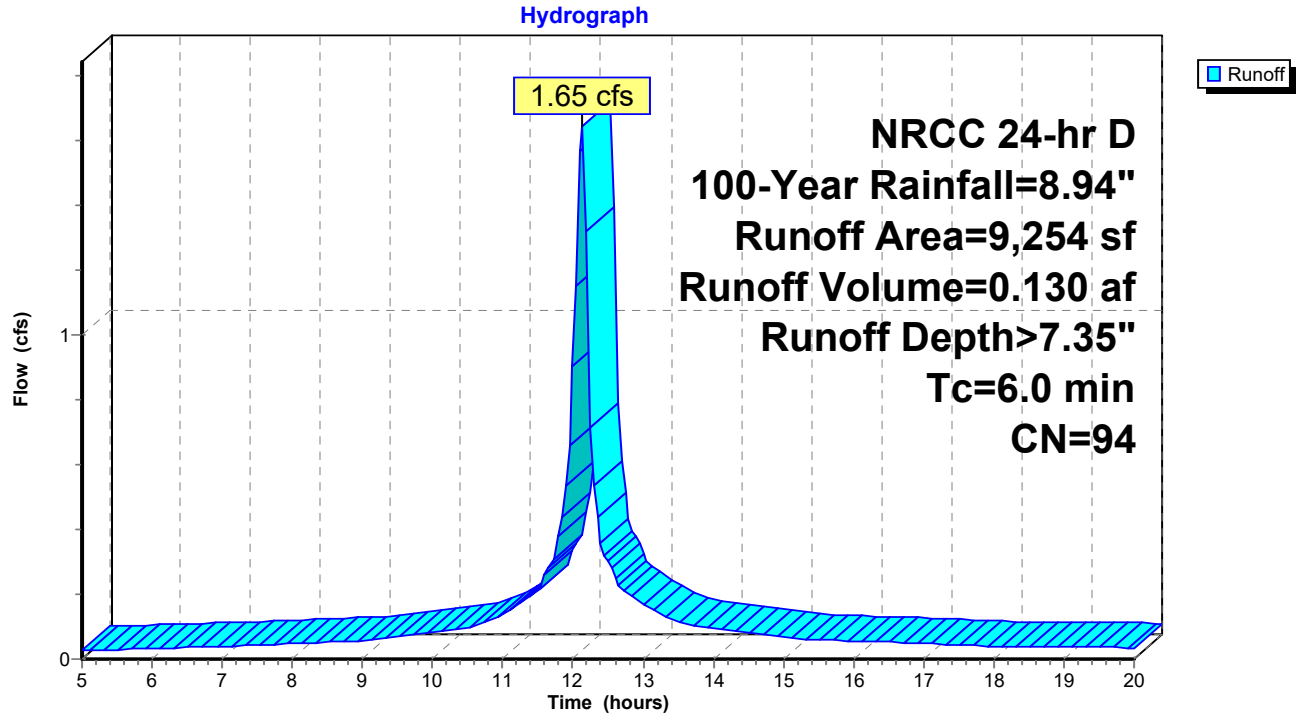
Runoff = 1.65 cfs @ 12.13 hrs, Volume= 0.130 af, Depth> 7.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
5,436	98	Paved parking, HSG C
1,629	74	>75% Grass cover, Good, HSG C
2,189	98	Roofs, HSG C
9,254	94	Weighted Average
1,629		17.60% Pervious Area
7,625		82.40% Impervious Area

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

Subcatchment P1B: SUBCAT P1B



Summary for Subcatchment P1C: SUBCAT P1C

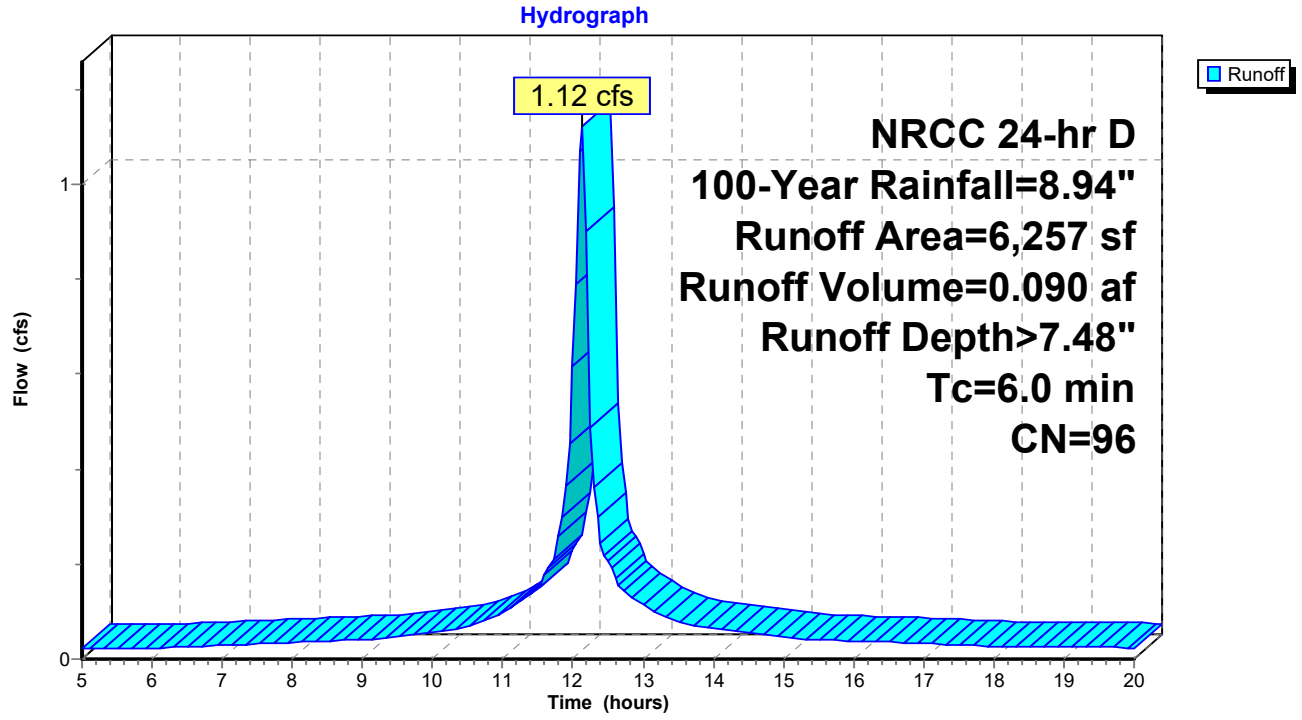
Runoff = 1.12 cfs @ 12.13 hrs, Volume= 0.090 af, Depth> 7.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

	Area (sf)	CN	Description
	5,731	98	Paved parking, HSG C
	438	74	>75% Grass cover, Good, HSG C
*	88	98	Retaining Wall
	6,257	96	Weighted Average
	438		7.00% Pervious Area
	5,819		93.00% Impervious Area

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

Subcatchment P1C: SUBCAT P1C



Summary for Subcatchment P1D: SUBCAT P1D

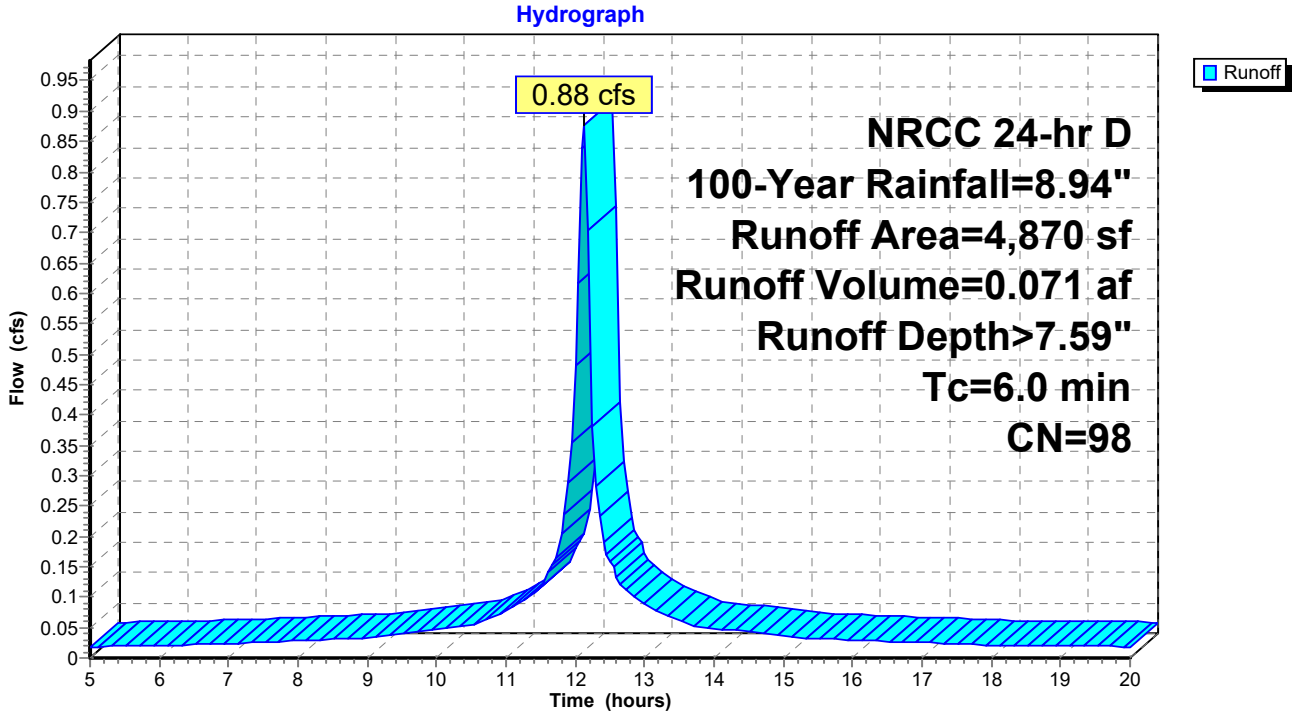
Runoff = 0.88 cfs @ 12.13 hrs, Volume= 0.071 af, Depth> 7.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
4,870	98	Paved parking, HSG C
4,870		100.00% Impervious Area

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

Subcatchment P1D: SUBCAT P1D



Summary for Subcatchment P1E: SUBCAT P1E

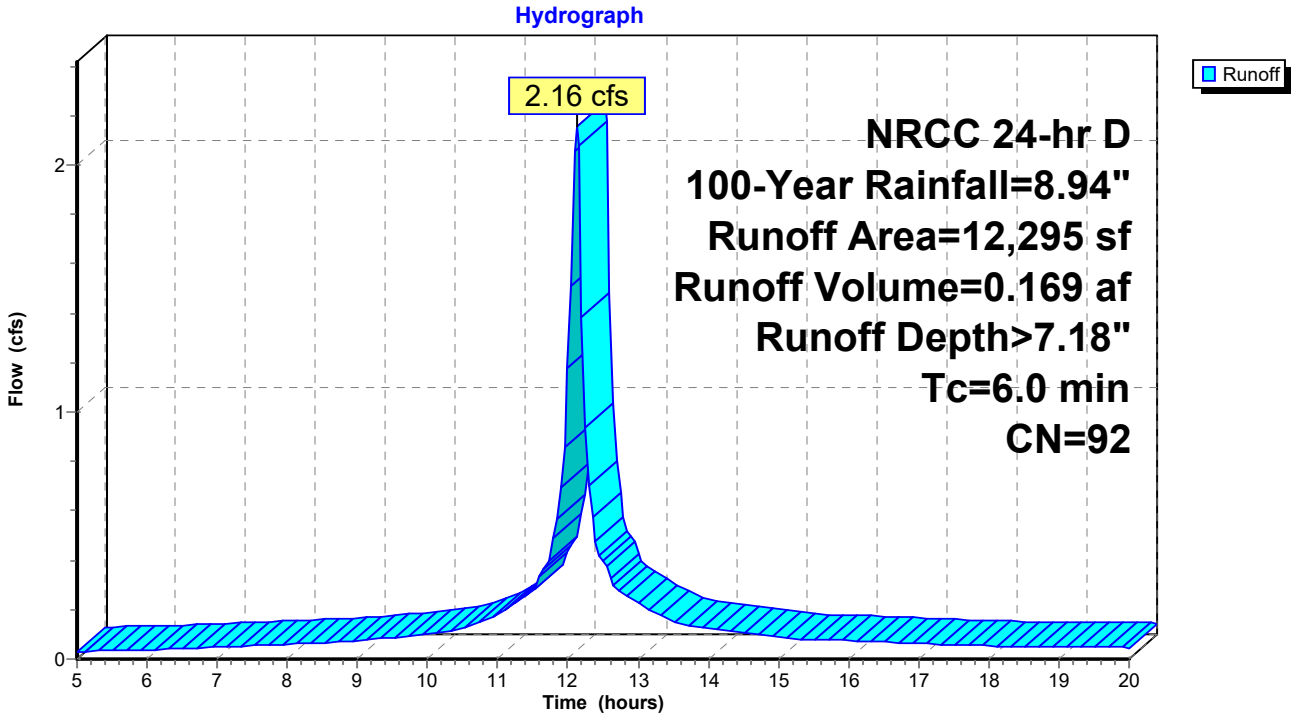
Runoff = 2.16 cfs @ 12.13 hrs, Volume= 0.169 af, Depth> 7.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
9,384	98	Paved parking, HSG C
2,040	74	>75% Grass cover, Good, HSG C
871	74	>75% Grass cover, Good, HSG C
12,295	92	Weighted Average
2,911		23.68% Pervious Area
9,384		76.32% Impervious Area

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

Subcatchment P1E: SUBCAT P1E



Summary for Subcatchment P1F: SUBCAT P1F

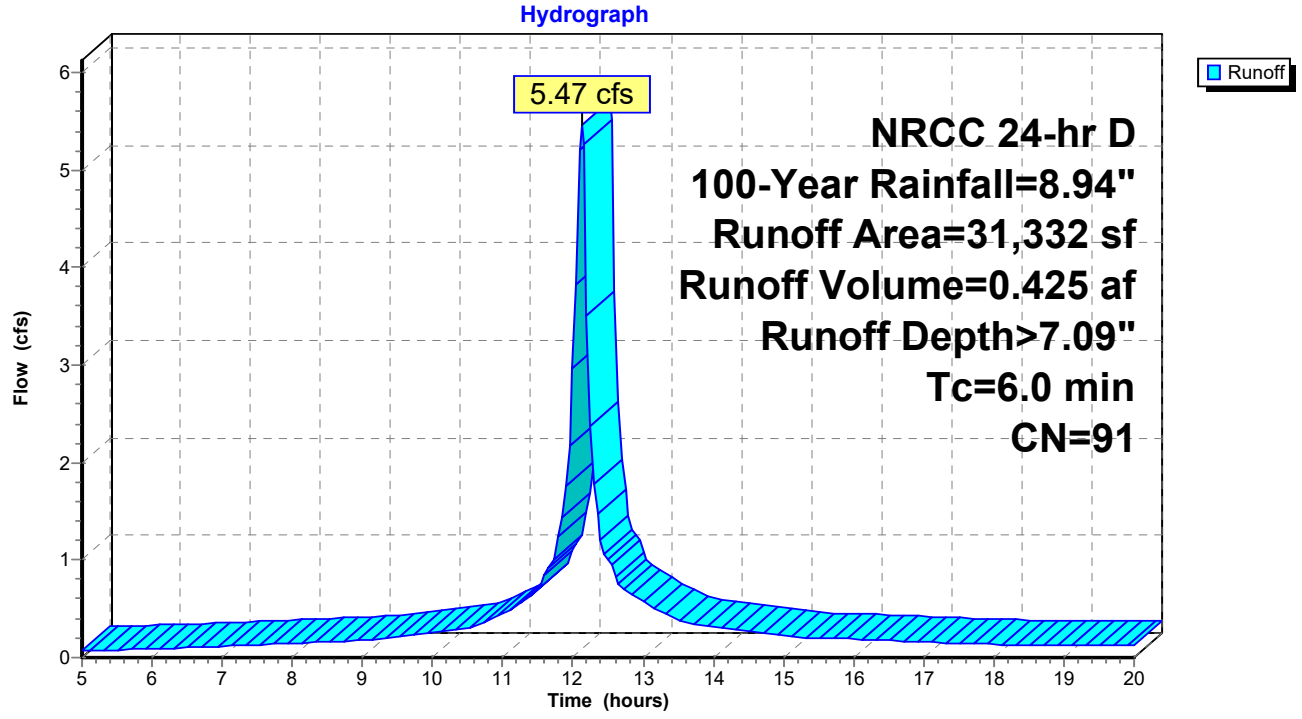
Runoff = 5.47 cfs @ 12.13 hrs, Volume= 0.425 af, Depth> 7.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
8,438	98	Paved parking, HSG C
9,131	74	>75% Grass cover, Good, HSG C
3,646	96	Gravel surface, HSG C
10,117	98	Roofs, HSG C
31,332	91	Weighted Average
12,777		40.78% Pervious Area
18,555		59.22% Impervious Area

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

Subcatchment P1F: SUBCAT P1F



Summary for Subcatchment P2: SUBCAT P2

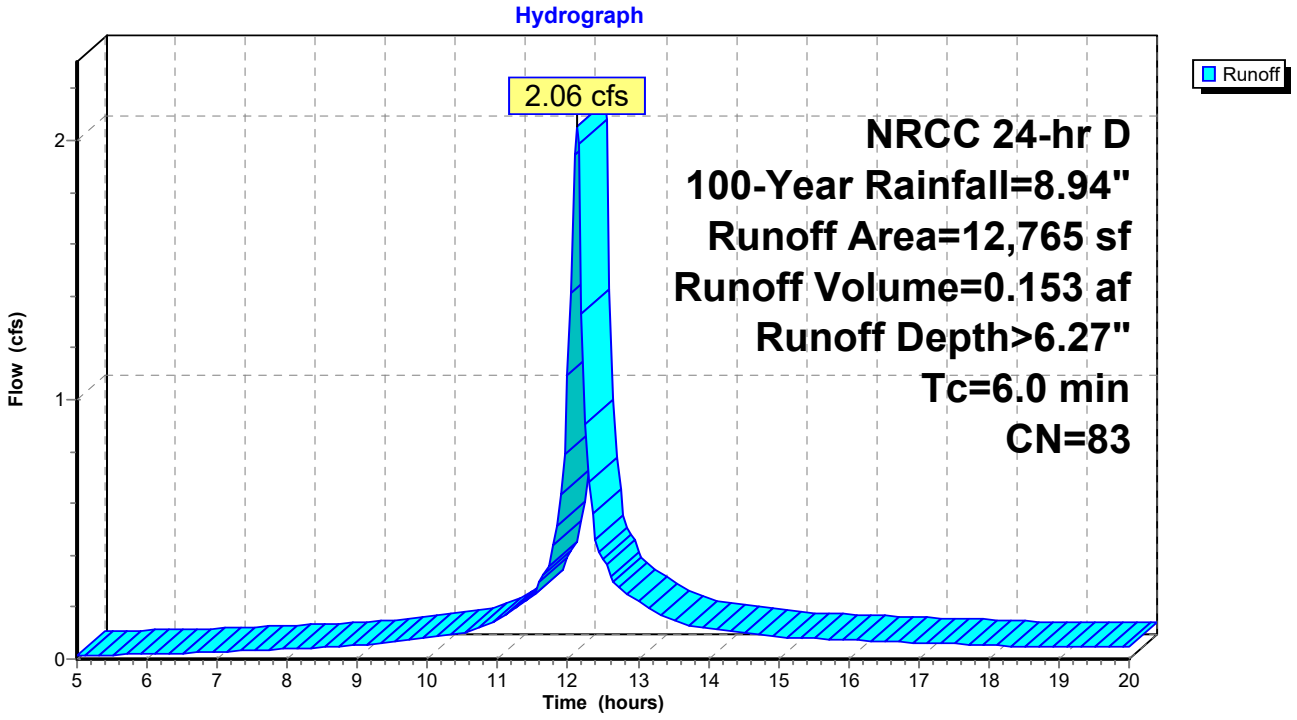
Runoff = 2.06 cfs @ 12.13 hrs, Volume= 0.153 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
4,782	96	Gravel surface, HSG C
350	98	Roofs, HSG C
7,633	74	>75% Grass cover, Good, HSG C
12,765	83	Weighted Average
12,415		97.26% Pervious Area
350		2.74% Impervious Area

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

Subcatchment P2: SUBCAT P2



Summary for Subcatchment P3: SUBCAT P3

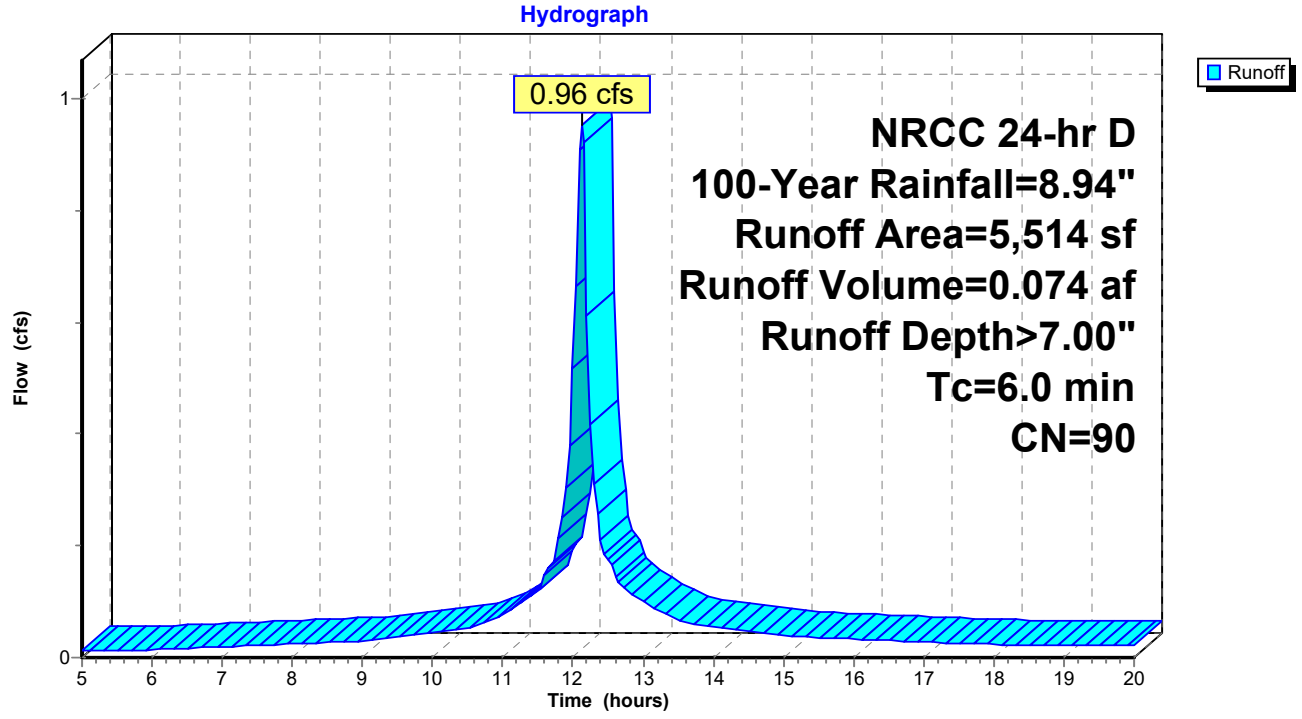
Runoff = 0.96 cfs @ 12.13 hrs, Volume= 0.074 af, Depth> 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,639	96	Gravel surface, HSG C
1,300	98	Paved parking, HSG C
842	98	Roofs, HSG C
1,733	74	>75% Grass cover, Good, HSG C
5,514	90	Weighted Average
3,372		61.15% Pervious Area
2,142		38.85% Impervious Area

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

Subcatchment P3: SUBCAT P3



Summary for Pond CB1: CB1

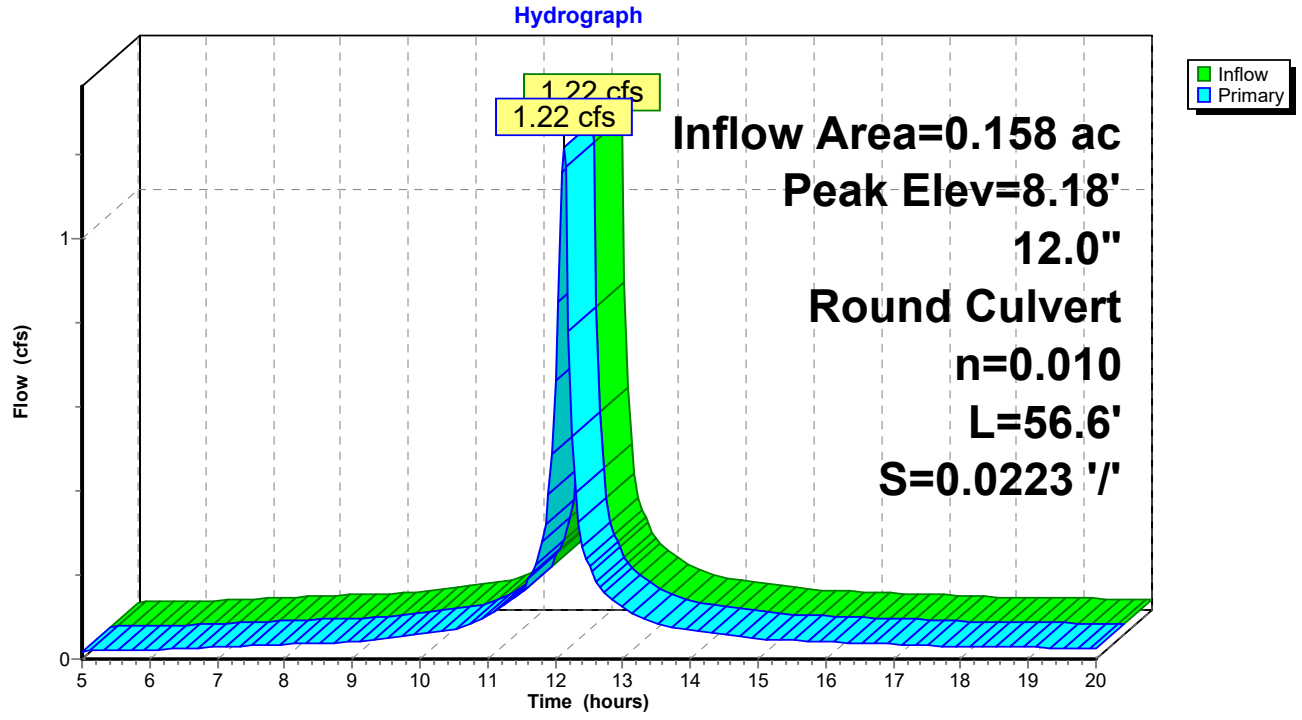
Inflow Area = 0.158 ac, 77.83% Impervious, Inflow Depth > 7.27" for 100-Year event
Inflow = 1.22 cfs @ 12.13 hrs, Volume= 0.096 af
Outflow = 1.22 cfs @ 12.13 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min
Primary = 1.22 cfs @ 12.13 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 8.18' @ 12.13 hrs
Flood Elev= 10.91'

Device	Routing	Invert	Outlet Devices
#1	Primary	7.51'	**12.0" Round Culvert** L= 56.6' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 7.51' / 6.25' S= 0.0223 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.17 cfs @ 12.13 hrs HW=8.16' (Free Discharge)
1=Culvert (Inlet Controls 1.17 cfs @ 2.16 fps)

Pond CB1: CB1



Summary for Pond CB2: CB2

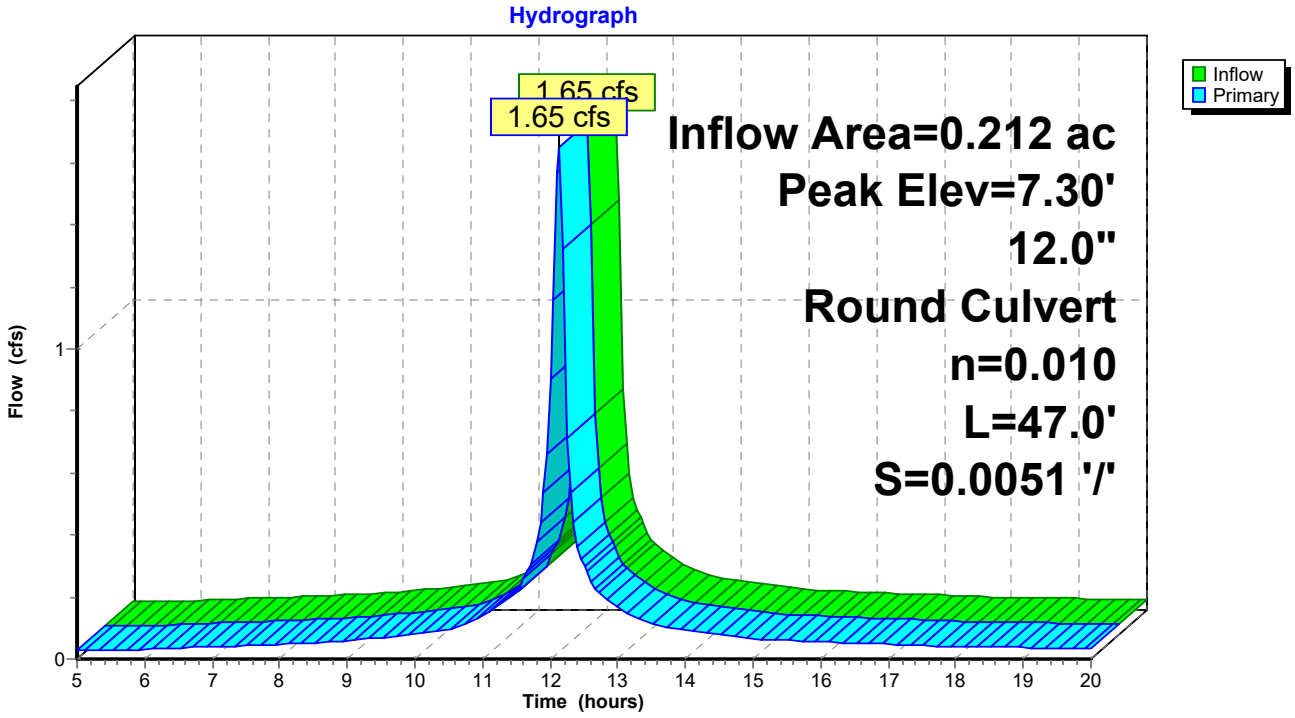
Inflow Area = 0.212 ac, 82.40% Impervious, Inflow Depth > 7.35" for 100-Year event
Inflow = 1.65 cfs @ 12.13 hrs, Volume= 0.130 af
Outflow = 1.65 cfs @ 12.13 hrs, Volume= 0.130 af, Atten= 0%, Lag= 0.0 min
Primary = 1.65 cfs @ 12.13 hrs, Volume= 0.130 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.30' @ 12.13 hrs
Flood Elev= 9.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.49'	**12.0" Round Culvert** L= 47.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.49' / 6.25' S= 0.0051 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.58 cfs @ 12.13 hrs HW=7.28' (Free Discharge)
1=Culvert (Barrel Controls 1.58 cfs @ 3.25 fps)

Pond CB2: CB2



Summary for Pond CB3: CB3

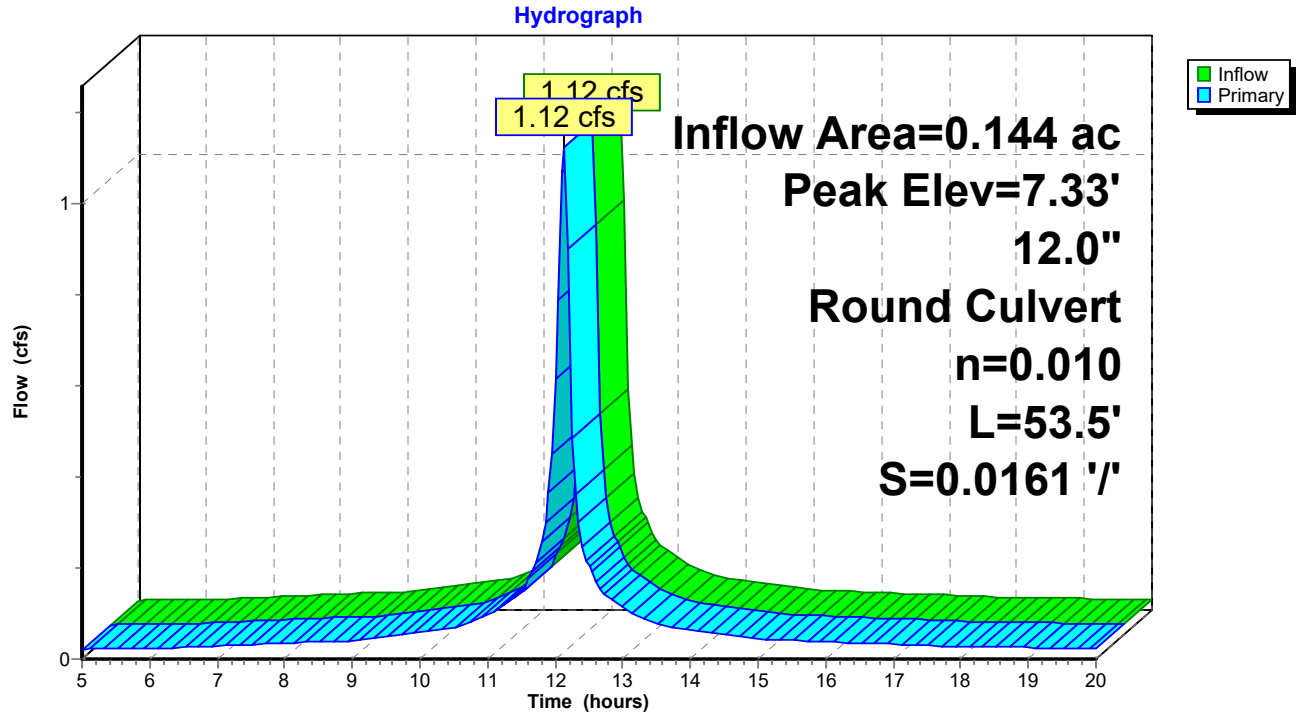
Inflow Area = 0.144 ac, 93.00% Impervious, Inflow Depth > 7.48" for 100-Year event
Inflow = 1.12 cfs @ 12.13 hrs, Volume= 0.090 af
Outflow = 1.12 cfs @ 12.13 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.13 hrs, Volume= 0.090 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.33' @ 12.13 hrs
Flood Elev= 10.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.70'	**12.0" Round Culvert** L= 53.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.70' / 5.84' S= 0.0161 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.08 cfs @ 12.13 hrs HW=7.32' (Free Discharge)
1=Culvert (Inlet Controls 1.08 cfs @ 2.11 fps)

Pond CB3: CB3



Summary for Pond CB4: CB4

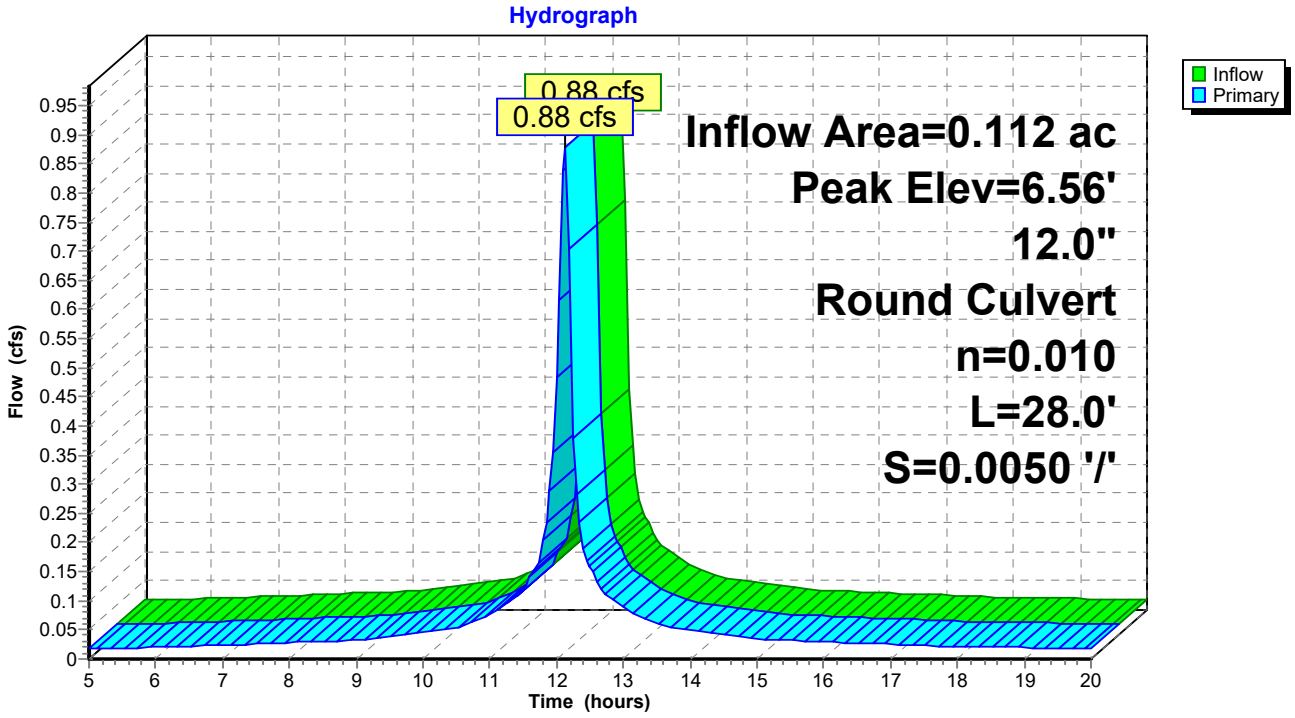
Inflow Area = 0.112 ac,100.00% Impervious, Inflow Depth > 7.59" for 100-Year event
Inflow = 0.88 cfs @ 12.13 hrs, Volume= 0.071 af
Outflow = 0.88 cfs @ 12.13 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.13 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.56' @ 12.13 hrs
Flood Elev= 8.48'

Device	Routing	Invert	Outlet Devices
#1	Primary	5.98'	**12.0" Round Culvert** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 5.98' / 5.84' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.84 cfs @ 12.13 hrs HW=6.54' (Free Discharge)
1=Culvert (Barrel Controls 0.84 cfs @ 2.68 fps)

Pond CB4: CB4



Summary for Pond CDS: CDS

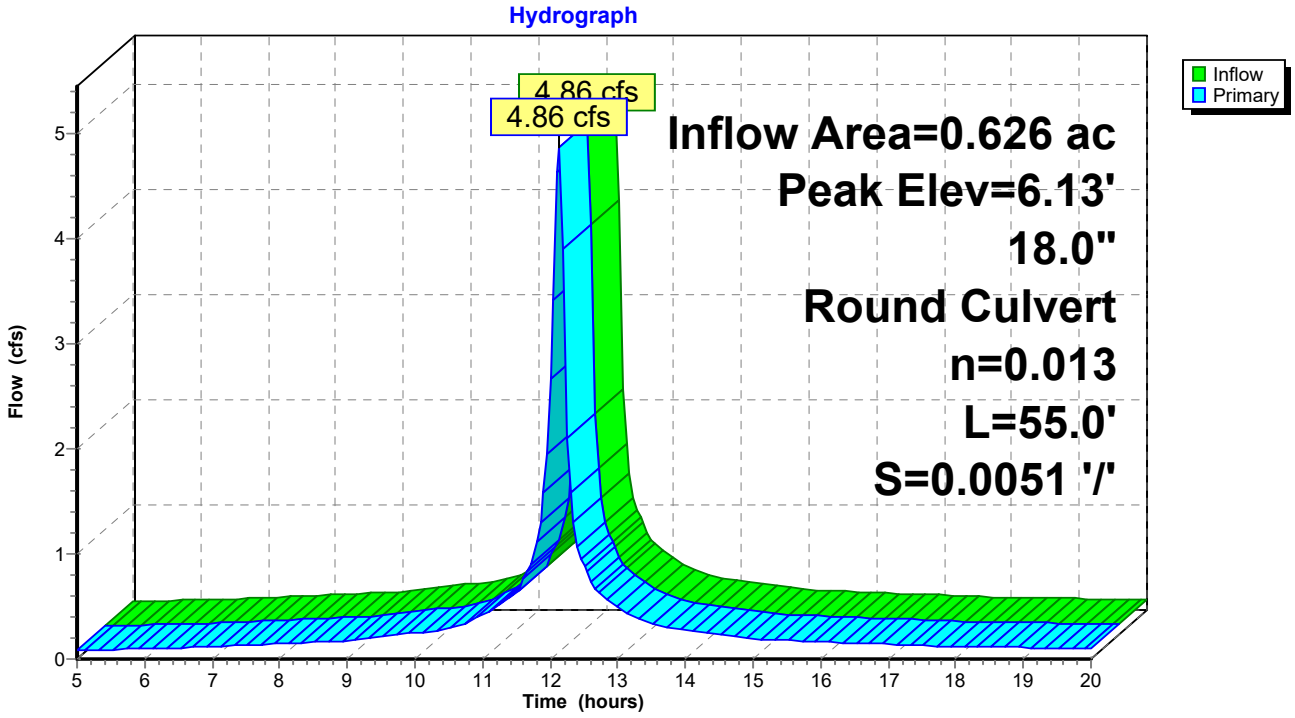
Inflow Area = 0.626 ac, 86.82% Impervious, Inflow Depth > 7.40" for 100-Year event
Inflow = 4.86 cfs @ 12.13 hrs, Volume= 0.386 af
Outflow = 4.86 cfs @ 12.13 hrs, Volume= 0.386 af, Atten= 0%, Lag= 0.0 min
Primary = 4.86 cfs @ 12.13 hrs, Volume= 0.386 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.13' @ 12.13 hrs
Flood Elev= 8.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	4.78'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.78' / 4.50' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.66 cfs @ 12.13 hrs HW=6.09' (Free Discharge)
1=Culvert (Barrel Controls 4.66 cfs @ 3.79 fps)

Pond CDS: CDS



Summary for Pond DMH1: DMH1

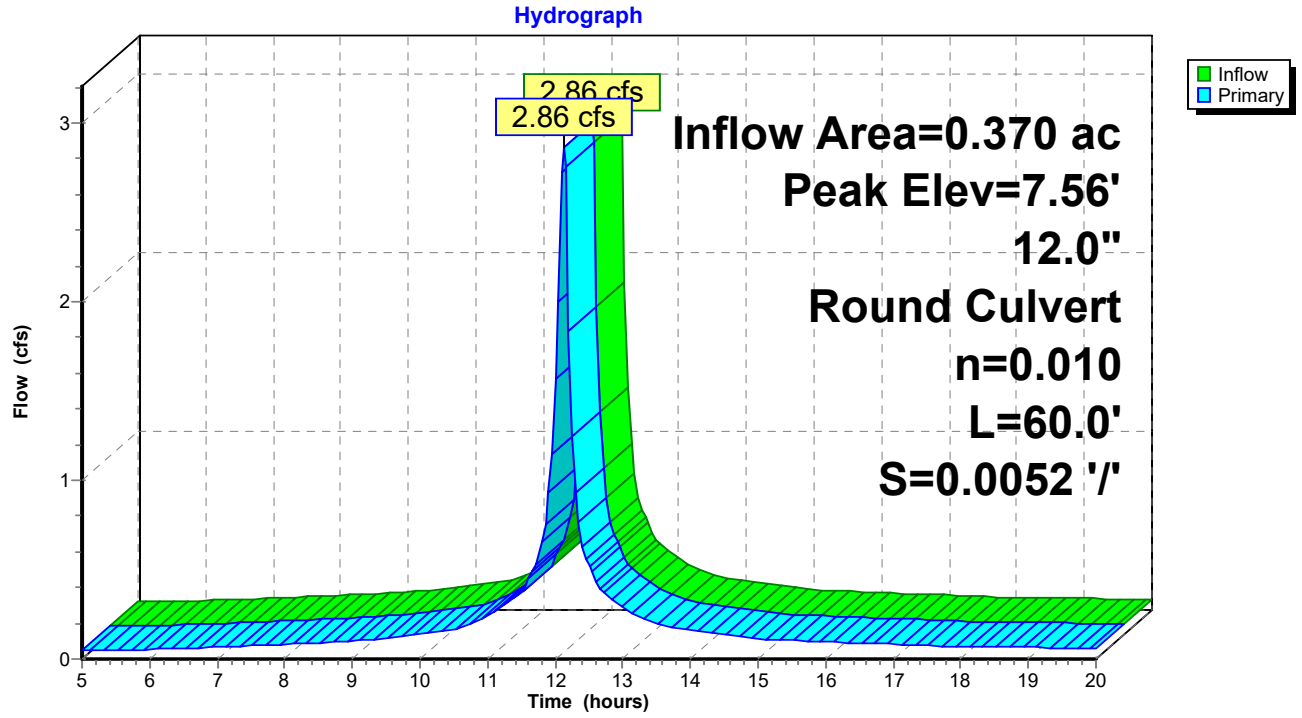
Inflow Area = 0.370 ac, 80.45% Impervious, Inflow Depth > 7.31" for 100-Year event
Inflow = 2.86 cfs @ 12.13 hrs, Volume= 0.226 af
Outflow = 2.86 cfs @ 12.13 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min
Primary = 2.86 cfs @ 12.13 hrs, Volume= 0.226 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 7.56' @ 12.13 hrs
Flood Elev= 9.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	6.15'	**12.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.15' / 5.84' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.74 cfs @ 12.13 hrs HW=7.49' (Free Discharge)
1=Culvert (Inlet Controls 2.74 cfs @ 3.49 fps)

Pond DMH1: DMH1



Summary for Pond RG: Rain Garden

Inflow Area = 0.282 ac, 76.32% Impervious, Inflow Depth > 7.18" for 100-Year event
Inflow = 2.16 cfs @ 12.13 hrs, Volume= 0.169 af
Outflow = 2.06 cfs @ 12.17 hrs, Volume= 0.164 af, Atten= 5%, Lag= 2.4 min
Primary = 2.06 cfs @ 12.17 hrs, Volume= 0.164 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 6.15' @ 12.17 hrs Surf.Area= 1,245 sf Storage= 1,486 cf

Plug-Flow detention time= 47.2 min calculated for 0.164 af (97% of inflow)
Center-of-Mass det. time= 34.0 min (778.3 - 744.4)

Volume	Invert	Avail.Storage	Storage Description
#1	4.45'	1,948 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

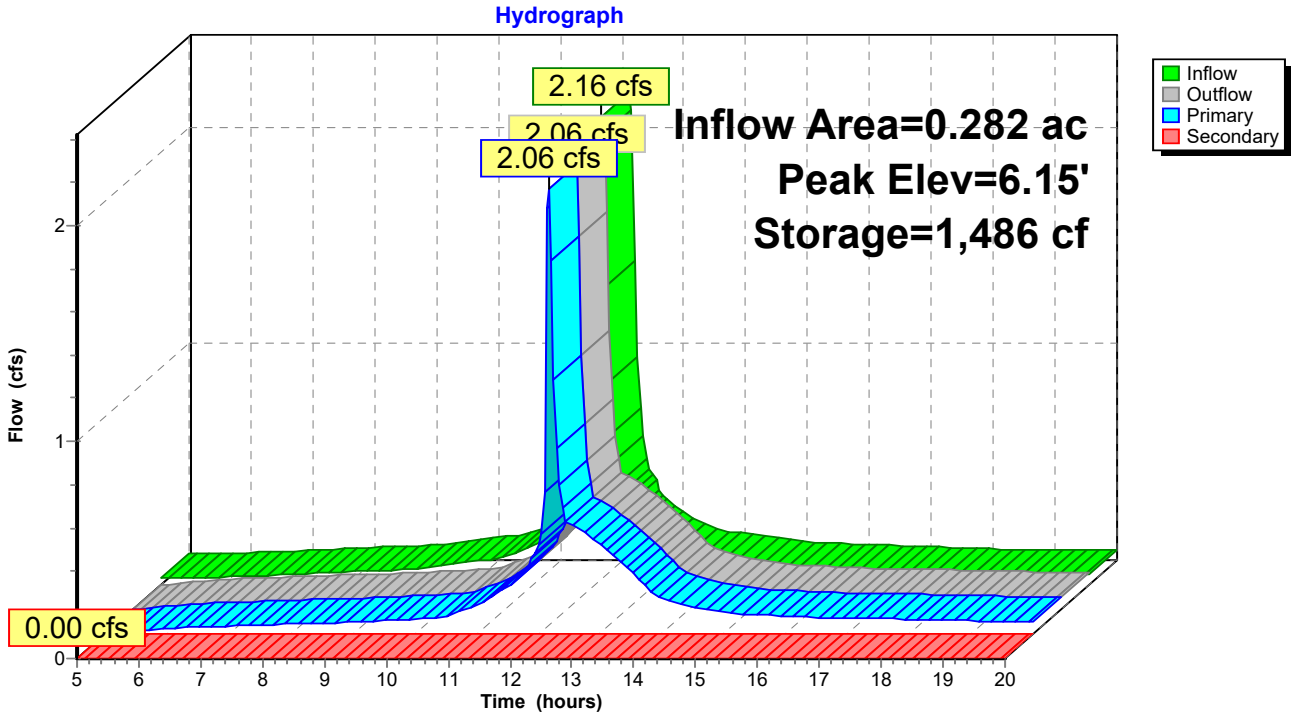
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
4.45	536	0	0
5.00	734	349	349
6.00	1,172	953	1,302
6.50	1,412	646	1,948

Device	Routing	Invert	Outlet Devices
#1	Primary	4.35'	**12.0" Round Culvert** L= 11.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.35' / 4.25' S= 0.0091 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	6.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	4.45'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	5.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	6.17'	**6.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.88 cfs @ 12.17 hrs HW=6.14' (Free Discharge)
└**1=Culvert** (Passes 1.88 cfs of 3.39 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 1.33 cfs @ 1.21 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.13 cfs @ 6.10 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.41 cfs @ 4.74 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=4.46' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RG: Rain Garden

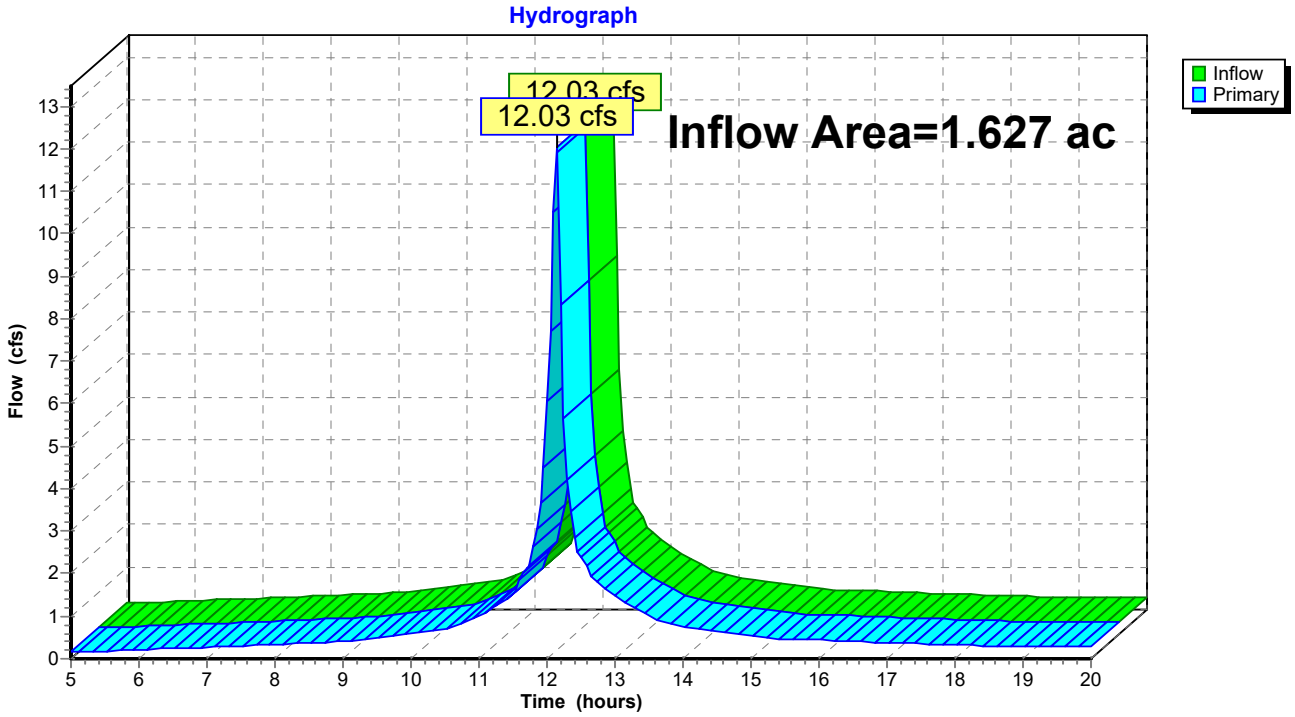


Summary for Link A: Design point 1

Inflow Area = 1.627 ac, 72.80% Impervious, Inflow Depth > 7.19" for 100-Year event
Inflow = 12.03 cfs @ 12.14 hrs, Volume= 0.975 af
Primary = 12.03 cfs @ 12.14 hrs, Volume= 0.975 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link A: Design point 1

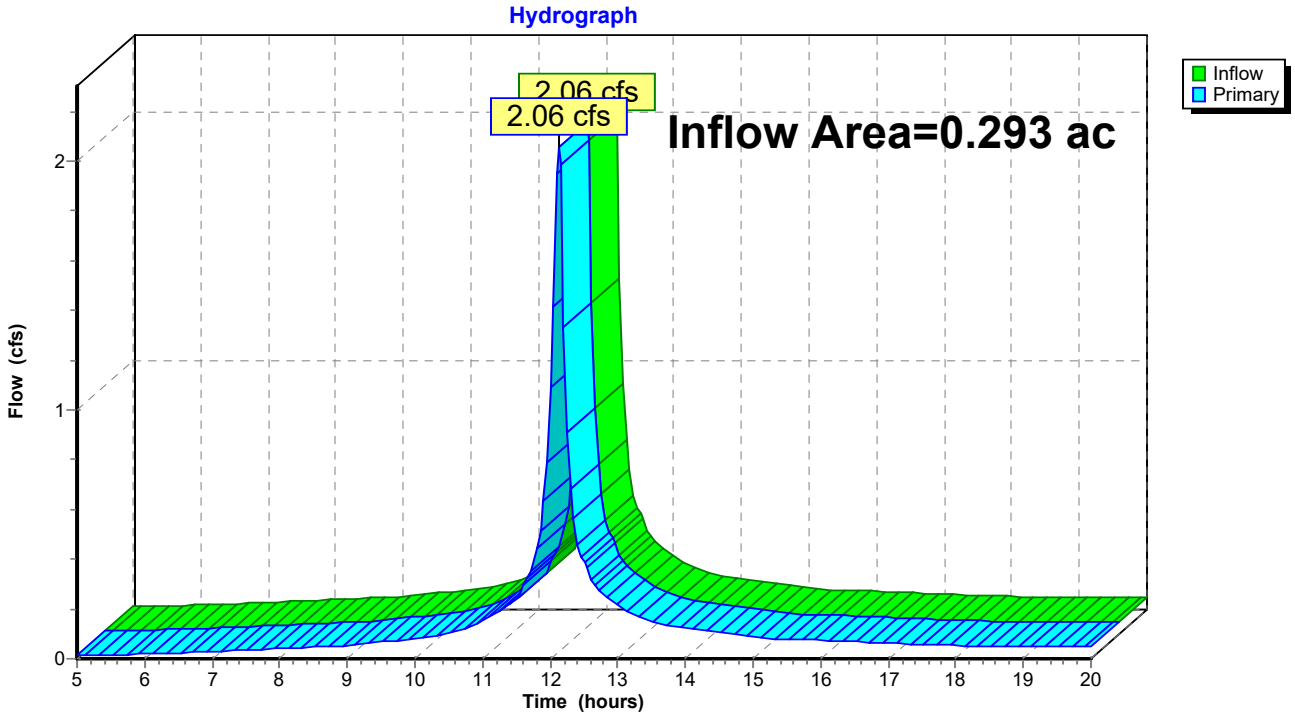


Summary for Link DP2: Design Point 2

Inflow Area = 0.293 ac, 2.74% Impervious, Inflow Depth > 6.27" for 100-Year event
Inflow = 2.06 cfs @ 12.13 hrs, Volume= 0.153 af
Primary = 2.06 cfs @ 12.13 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP2: Design Point 2

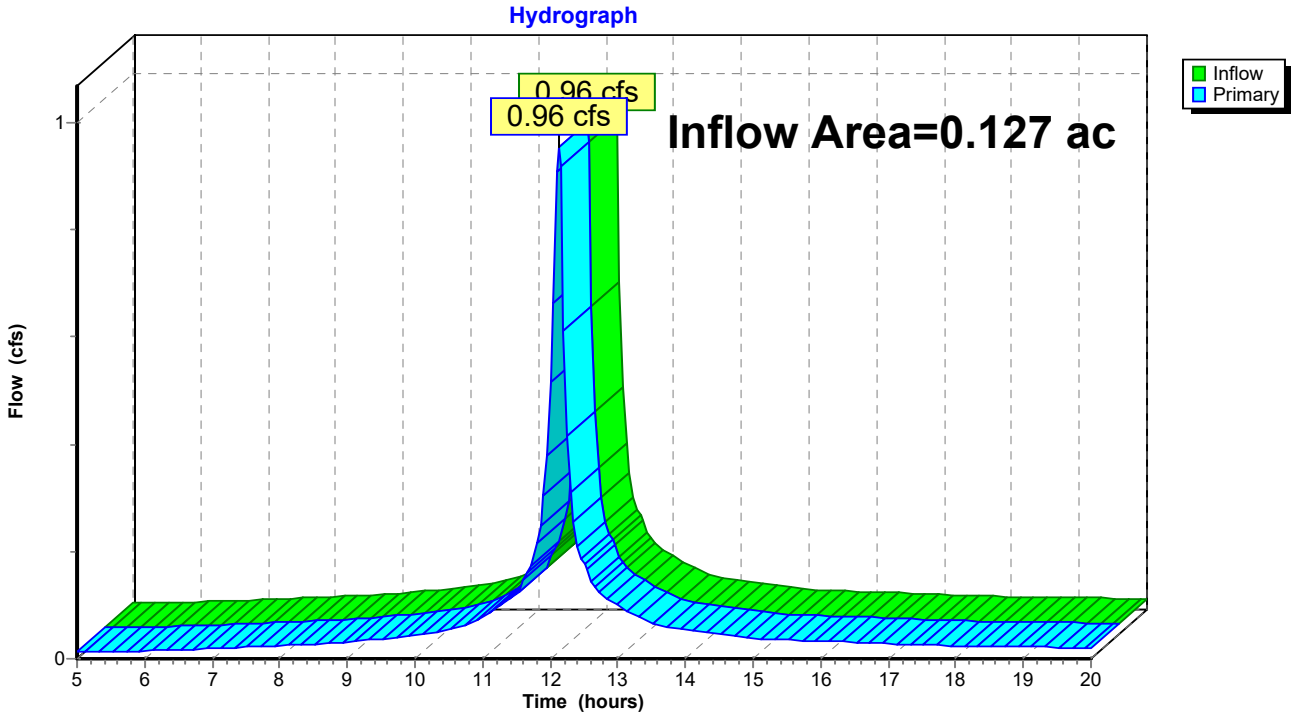


Summary for Link DP3: DESIGN POINT 3

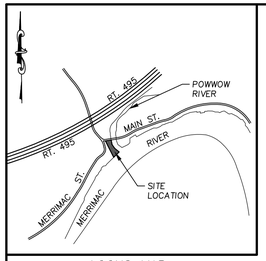
Inflow Area = 0.127 ac, 38.85% Impervious, Inflow Depth > 7.00" for 100-Year event
Inflow = 0.96 cfs @ 12.13 hrs, Volume= 0.074 af
Primary = 0.96 cfs @ 12.13 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link DP3: DESIGN POINT 3



d. Watershed Maps



LOCUS MAP
N.T.S.

MAIN STREET
MERRIMAC STREET
POW WOW RIVER
FLOW
MERRIMACK RIVER
FLOW
100' BUFFER TO BANK
100' RIVERFRONT BUFFER
200' RIVERFRONT BUFFER
50' BUFFER
25' BUFFER
E1
E2
E3
DP1
DP2
DP3
#13 MERRIMAC STREET
#14 MERRIMAC STREET
#15
#13 EXISTING DWELLING (TO REMAIN)
EXISTING BUILDING
EXISTING BUILDING (TO REMAIN)
100-YEAR FLOOD ELEV. =11.00 ZONE AE
MEAN HIGH WATER ELEV. =4.00
I ROD FND.
I.P. FND.
S.B. FND.
RRS FND.
DISK
MNF
DH FND
CB RIM=16.85
CB RIM=16.83
CB RIM=16.75
CB RIM=11.17
CB INV.=10.81
OUTLET 24" PVC INV.=10.74
VINYL STOCKADE FENCE
CHAIN LINK FENCE
SHED
DECK
GMTR
EMTR
TRANSFOMER
UP 3
UP 64
CONC. SIDEWALK
BIT. SIDEWALK
EDGE OF PAVEMENT (TYPICAL)
10' R.O.W. EASEMENT
WF A3
WF A4
WF A5
WF A6
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15
L16
L17
L18
L19
L20
L21
L22
L23

GRAPHIC SCALE
0 0 0 0 0 0
(IN FEET)
1 inch = 30'

PREPARED FOR

14 MERRIMAC STREET, LLC
14 MERRIMAC STREET
AMESBURY, MA 01913

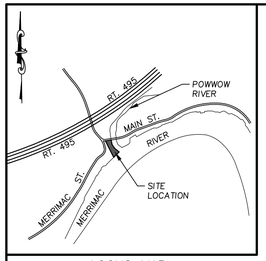
NO.	DATE	DESCRIPTION	BY

MEI
MILLENNIUM ENGINEERING, INC.
ENGINEERING AND LAND SURVEYING
62 ELM ST. SALISBURY, MA 01952 (978) 463-8980
13 HAMPTON RD. EXETER, NH 03833 (603) 778-0528

SCALE: 1"=30' | CALC. BY: S.R.C.
DATE: MAR. 11, 2024 | CHKD. BY: J.T.M.
PROJECT: M214054

SITE PLAN
IN
AMESBURY, MA
AT
14 MERRIMAC STREET

PRE-WATERSHED PLAN



LOCUS MAP
N.T.S.

MAIN STREET
MERRIMAC STREET
CONC. SIDEWALK
100' RIVERFRONT BUFFER
200' RIVERFRONT BUFFER
VINYL STOCKADE FENCE
50' BUFFER
25' BUFFER
EDGE OF GRAVEL (TYP.)
DECK
#13 EXISTING DWELLING (TO REMAIN)
10' R.O.W. EASEMENT
EXISTING BUILDING (TO REMAIN)
TRANSFORMER
PEASTONE
SETBACK LINE (TYP.)
21.0'
10.6'
POW WOW RIVER
FLOW
MERRIMACK RIVER
FLOW
DP1
DP2
DP3
P1A
P1B
P1C
P1D
P1E
P1F
P2
P3
#1
#13
#13 ½
#15

GRAPHIC SCALE
0 0 0 0 0 0
(IN FEET)
1 inch = 30'

PREPARED FOR

14 MERRIMAC STREET, LLC
14 MERRIMAC STREET
AMESBURY, MA 01913

NO.	DATE	DESCRIPTION	BY

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SITE PLAN
IN
AMESBURY, MA
AT
14 MERRIMAC STREET

POST-WATERSHED PLAN

SHEET: 2 OF 2