

STORMWATER MANAGEMENT REPORT


Prepared For:

**Depietri Group LLC
Ballard and Highland Road
Ashland, MA 01721**

Prepared By:



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February 4, 2026

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1 Introduction

This Stormwater Management Report, prepared in accordance with Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the City of Ashland Stormwater Management Standards, summarizes the Stormwater Management Plan and associated analyses for the proposed subdivision development located at Highland Road and Ballard Road off Upland Road in Ashland, Massachusetts. A United States Geological Survey (USGS) Site Locus Map is provided as Figure 1 in Appendix A.

This stormwater report provides an analysis comparing the pre-development watershed condition to the post-development watershed figures provided as Figure 2 Pre-development and Figure 3 Post-development in Appendix A. This analysis is achieved through the surface runoff rates and volumes calculations described further in the comparison tables. Post-development calculations are accomplished through the implementation of stormwater managements strategies to address all stormwater standards.

The following sections describe the existing and proposed stormwater management strategies. The report will further analyze the stormwater implementation and summarize compliance with applicable stormwater regulations.

1.1 Existing Conditions

The project site is currently vacant on mostly undeveloped land. The subject area is comprised of mostly undeveloped wooded land. Total area is approximately 212,505.57 Square Feet (SF) or 4.88 Acres combined. The total impervious area is 10,294 SF. The subject area is located within the Residential A (RA) zoning district.

The topography generally slopes towards the east where stormwater eventually reaches. Elevations range from 268 located at the west side of the project development area to 185 located to the east of the project development area, elevations referenced to the North American Vertical Datum of 1988 (NAVD88). Stormwater runoff from the project development area flows towards the east and into the abutting properties facing Fountain Street without any stormwater management practice.

1.2 Proposed Conditions

The design of the proposed stormwater management system is to collect, treat and infiltrate runoff from the impervious areas. Impervious areas on the site include two the improvement of a private ways that was created in the previous subdivision plan of 1950, retaining walls, nine houses and their respective driveways on the proposed development area. The project has a combined roof area of 17,424 SF and total impervious area of 59,791 SF.

Impervious area runoff is effectively managed by an infiltration basin, outlet control structures, subsurface infiltration chambers and concrete galleys. Runoff from the new paved roads will be collected by the closed drainage system to eventually reach the infiltration chambers through HDPE pipes. Roof runoff is collected in gutters and downspouts and are all directed to the individual lots Subsurface Cultec Recharger, the runoff from the driveways is directed to the infiltration basin and to the concrete galleys eventually.

2 Stormwater Management

2.1 Method of Calculation

The hydrologic model was created and calculated with HydroCAD®, Version 10.0 software, developed by HydroCAD® Software Solutions LLC, to analyze the hydrology of the Project Site. Hydraulic calculations were performed utilizing the SCS TR-20 Method to determine contributing flows, and the Manning's Equation to determine pipe flows.

2.2 Sources of Data

The following sources of data were used for the hydrologic and hydraulic calculations:

- Soil Conservation Service (SCS) Technical Release No. 20 (TR-20)
- Natural Resources Conservation Service (NRCS) Soil Survey of Middlesex County, Massachusetts
- Subsurface Explorations by MP Design Consultants
- NOAA Precipitation Frequency Estimates

2.3 Rainfall Depths

In accordance with MassDEP Stormwater Management Policy and the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Version 3 the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events were analyzed. Table 1 indicates the rainfall depths used for each storm event, refer to Appendix B – NOAA Rainfall Depths.

Table 1 **Rainfall Depths**

Storm Event	NOAA
2-Year, 24-Hour	3.34"
10-Year, 24-Hour	5.23"
25-Year, 24-Hour	6.40"
50-Year, 24-Hour	7.27"
100-Year, 24-Hour	8.22"

2.4 Soil Conditions

NRCS Soil Survey of Middlesex County, Massachusetts indicates that soils onsite consist of the following:

- 251B-Haven silt loam, 3-8% slope
- 307B-Paxton fine sandy loam, extremely stony, 0-8% slope
- 307D-Paxton fine sandy loam, extremely stony, 15-25% slope
- 416b-Narragansett silt loam, very stony, 3-8% slopes
- 416C-Narragansett silt loam, very stony, 8-15% slope

Subsurface exploration consisting of 18 test pits has been performed by MP Design Consultants. Based on subsurface explorations, soil conditions at these locations consist of fine sandy loam and canton complex. The NRCS Web Soil Survey and FORM 11 – Soil Suitability Assessment prepared by Chris Stanton is provided in Appendix C – Subsurface Exploration Data.

2.5 Existing Stormwater Management

The current project site does not provide any naturally shaped stormwater treatment areas.

2.5.1 Existing Watershed

Under existing conditions, the site has 2 Sub-catchment areas, Drainage Area E-1 (Refer to Appendix A - Figure 2 Pre-Development).

There are 2 points of analysis from the site:

- Design Point DP-1 – All the stormwater runoff from Drainage Area E-1 eventually reaches DP-1 and continues to travel through the existing undeveloped area, reaching the existing pavement on Upland Road. The flow is conveyed through wood/grass combination at the entrance of the site and then through the remaining wooded land before reaching the downslope side of Ballard Road.
- Design Point DP-2 – All the stormwater runoff from Drainage Area E-2 eventually reaches DP-2 and continues to travel through the land. The flow is conveyed through wood/grass combination and then through the remaining wooded land.

Drainage Area E-1: Consists of grass and wooded area and existing houses. Within the drainage area the elevations range from 268 located at the west portion of the drainage area to 195 along the eastern border of the drainage area.

Drainage Area E-2: Consists of grass and wooded area of the proposed development area. Within the drainage area the elevations range from 268 located at the west portion of the drainage area to 184 along the eastern border of the drainage area.

2.6 Proposed Stormwater Management

The proposed project incorporates a stormwater management system that meets the guidelines in the 2008 MassDEP Stormwater Management Policy. Stormwater quality and quantity on the Site will be managed by implementing a series of best management practices (BMPs) that will include deep sump drainage structures, infiltration basin, concrete galleys and subsurface infiltration chambers. The proposed infiltration Basin BMP is anticipated to remove a minimum of 80 percent of total suspended solids (TSS) from stormwater runoff, maintain the peak flow rates of stormwater runoff, and maintain the recharge rates to groundwater, as described in the MassDEP Stormwater Standards section of this report.

2.6.1 Proposed Watershed

Under proposed conditions, the site is divided into 14 Sub-catchment areas, Drainage Areas P1, P2, P3, P4, P5, R-1, R-2, R-3, R-4, R-5, R-6, R-7, R-8, R-9 (Refer to Appendix A - Figure 3 Post-Development).

There are 2 points of analysis for the site:

- Design Point DP-1 – Located at the entrance of the site through Ballard Road. This design point collects runoff through offsite areas that were previously untreated. It also acts as an emergency overflow for stormwater management best management practices for the runoff from private ways and houses.
- Design Point DP-2 – Located behind the proposed developments in Ballard Road. Runoff from houses and lawn area is directed toward this point through the proposed grading.

Drainage Area P1: Consists of the offsite runoff that ultimately will be directed through pipes and grading to DP-1.

Drainage Area P2: Consists of runoff from the proposed developments lawns and private way on Highland Road that will be directed to the proposed infiltration basin and ultimately to the concrete galleys through the proposed drainage system.

Drainage Area P3: Consists of runoff from the proposed developments lawns and private way on Ballard Road that will be directed to the concrete galleys through the proposed drainage system.

Drainage Area P4: Consists of the offsite runoff that ultimately will be directed through swales to the proposed drainage system which directs runoff to the proposed infiltration basin and ultimately to the concrete galleys.

Drainage Area P3: Consists of runoff from the remaining lawn area on the proposed developments.

Drainage Area R-1: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-2: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-3: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-4: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-5: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-6: Consists of the proposed roof runoff for one of the houses with 2496 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-7: Consists of the proposed roof runoff for one of the houses with 2496 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-8: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

Drainage Area R-9: Consists of the proposed roof runoff for one of the houses with 1776 S.F. of area. Stormwater from this drainage area is directed through gutters and downspouts to the subsurface infiltration. See Figure 3 in this report for reference.

3 MassDEP Stormwater Management Standards

The ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. The MassDEP Checklist for Stormwater Report is provided in Appendix D, and the following sections summarize the Project's compliance with the Stormwater Management Standards.

3.1 Standard 1 – No New Untreated Discharges

The Project complies with Standard 1. No new point source discharges of untreated stormwater to or causing erosion in resource areas are proposed as part of the project. Stormwater discharge velocities for the project are mitigated by stone for pipe ends at various locations.

3.2 Standard 2 – Peak Rate Attenuation

The Project complies with Standard 2. The Project's stormwater management systems are designed so that post-development peak discharge rates do not exceed pre-development discharge rates for the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events, and so that there will not be increased flooding impacts nor to the abutters and public closed drainage system. Refer to Appendix E – Hydrocad Reports for further detailed information.

Table 2 **Comparison of Peak Runoff Rates – Design Point 1**

Storm Event (years)	Peak Runoff (cfs)		
	Pre-Development	Post-Development	Δ
2	0.86	0.86	0.00
10	3.52	2.75	-0.77
25	5.55	4.12	-1.43
50	7.18	5.21	-1.97
100	9.05	6.44	-2.61

Table 3 **Comparison of Peak Runoff Volumes – Design Point 1**

Storm Event (years)	Peak Runoff Volume (af)		
	Pre-Development	Post-Development	Δ
2	0.101	0.086	-0.015
10	0.305	0.232	-0.073
25	0.460	0.339	-0.121
50	0.585	0.449	-0.136
100	0.730	0.717	-0.013

Table 4 Comparison of Peak Runoff Rates – Design Point 2

Storm Event (years)	Peak Runoff (cfs)		
	Pre-Development	Post-Development	Δ
2	0.01	0.00	-0.01
10	0.40	0.06	-0.34
25	1.45	0.40	-1.05
50	2.66	0.66	-2.00
100	4.48	1.12	-3.36

Table 5 Comparison of Peak Runoff Volumes – Design Point 2

Storm Event (years)	Peak Runoff Volume (af)		
	Pre-Development	Post-Development	Δ
2	0.003	0.000	-0.003
10	0.124	0.010	-0.114
25	0.271	0.031	-0.240
50	0.408	0.049	-0.359
100	0.582	0.074	-0.508

3.3 Standard 3 – Recharge

The Project complies with Standard 3. The proposed stormwater management system incorporates the use of Subsurface Infiltration Systems to provide the required groundwater recharge. Refer to Appendix H for Recharge Calculations.

3.4 Standard 4 – Water Quality

The Project complies with Standard 4. The incorporation of the described stormwater best management practices (BMPs) will achieve a minimum cumulative Total Suspended Solids (TSS) removal rate of 80%, refer to Appendix I – TSS Removal Calculations. Refer to Appendix J for Water Quality Calculations and Appendix L for a copy of the Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan.

3.5 Standard 5 – Land Uses with Higher Potential Pollutant Loads

Standard 5 is not applicable to the Project. The Project is not considered a Land Use with Higher Potential for Pollutant Loads (LUHPPL) as defined in the Massachusetts Stormwater Handbook.

3.6 Standard 6 – Critical Areas

Standard 6 is not applicable to the Project. The Project does not discharge stormwater to a critical area as defined in the Massachusetts Stormwater Handbook.

3.7 Standard 7 – Redevelopment Projects

Standard 7 is not applicable to the Project. The Project does not qualify as a redevelopment project or other project subject to the Standards only to the maximum extent practicable.

3.8 Standard 8 – Construction Period Pollution Prevention and Erosion and Sedimentation Control

The project complies with Standard 8. The Project will result in the disturbance of greater than one (1) acre of land and requires coverage under the U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Activities (CGP). In support of coverage, a project-specific Storm Water Pollution Prevention Plan (SWPPP) will be prepared, and a Notice of Intent will be submitted to the EPA prior to commencement of construction activities.

The SWPPP will be prepared describing the specific practices, installation methods and inspection requirements for temporary and permanent erosion prevention and sediment control practices. The SWPPP will follow the template developed by the U.S. EPA and will be filed with the Plainville Conservation Commission. At a minimum, the SWPPP will include the following measures:

- Minimize the extent and time of disturbed areas and exposed soils.
- Provide perimeter sedimentation control.
- Minimize sediment track out with stabilized construction exits.
- Dedicated concrete washout areas.
- Control discharges from soil stockpiles.
- Minimize dust and soil compaction.
- Temporary stormwater management practices including basins, traps, and swales.
- Dewatering requirements.
- Temporary and permanent stabilization requirements including seeding, mulching, and matting.
- Good housekeeping pollution prevention measures.
- Maintenance, inspection, recordkeeping, and reporting requirements.

3.9 Standard 9 – Operations and Maintenance Plan

The Project complies with Standard 9. An Operations and Maintenance Plan to be implemented by the owner and its staff to ensure that stormwater management systems function as designed is provided in Appendix L.

3.10 Standard 10 – Prohibition of Illicit Discharges

The Project complies with Standard 10. There are no known or designed illicit discharges on the project site. An Illicit Discharge Compliance Statement is provided in Appendix M.

4 Conclusion

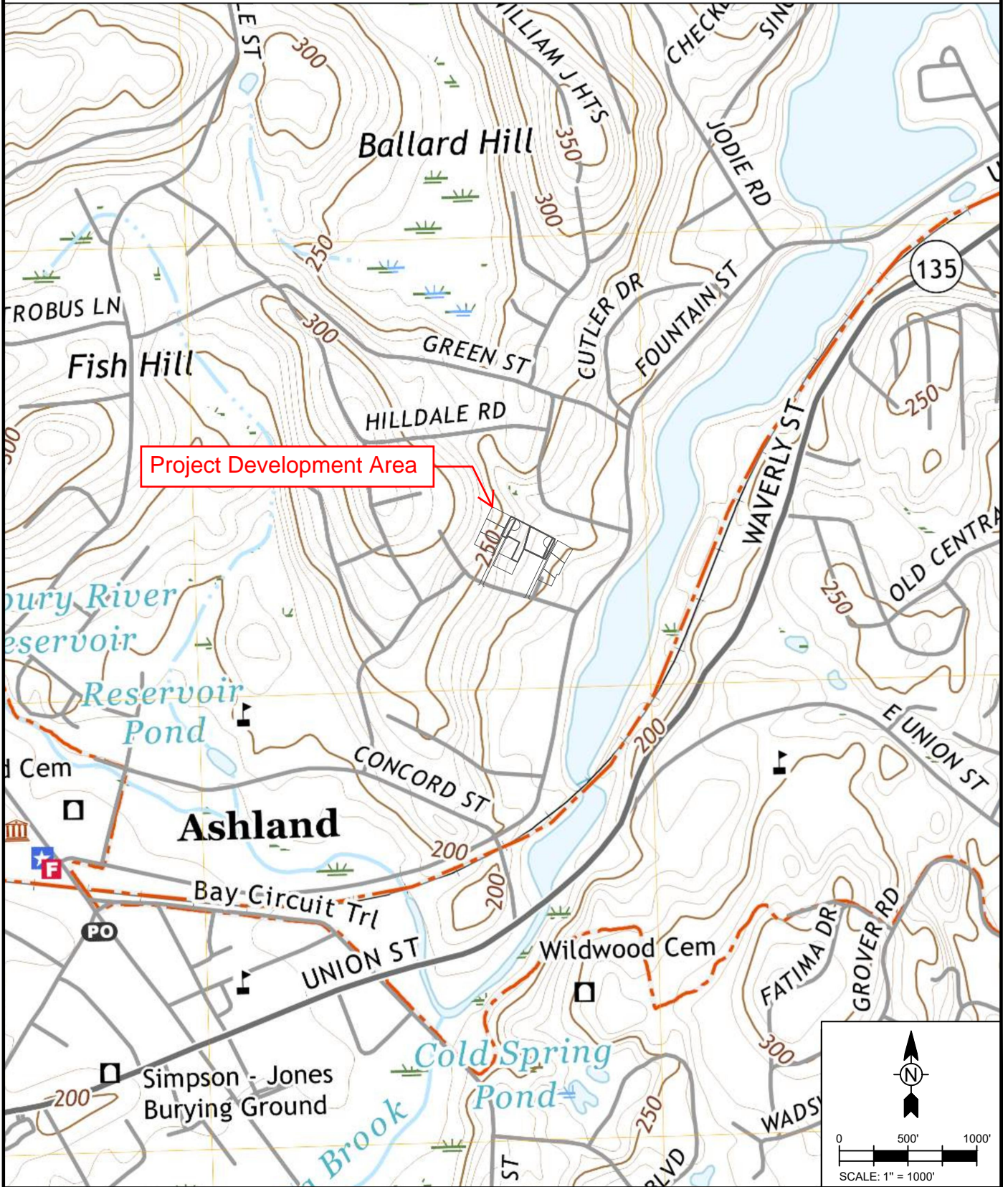
The Stormwater Management Plan addresses both the quantity and quality of stormwater runoff from the Project Site and conforms to the ten (10) MassDEP Stormwater Management Standards and Town of Ashland Stormwater Regulations. The Project will not have a negative impact on the surrounding areas and will install stormwater BMPs to mitigate peak runoff rates while providing adequate recharge and treatment of stormwater runoff.

APPENDIX A

Figures

REFERENCES:

PROPERTY LINE INFORMATION OBTAINED BY EXISTING CONDITIONS PLAN BY REAL MAP INFO LLC , USGS MAP OBTAINED FROM USGS FRAMINGHAM QUADRANGLE TOPOGRAPHIC MAP DATED 2024.



1/16/2026 12:08:57 PM - P:\25025\25025-001_HIGHLAND & BALLARD RD, ASHLAND MA\CAD\CONCEPTUAL\USGS MAP FIG 1.DWG - EDUARDO PINOTTI



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DEPIETRI GROUP
HIGHLAND ROAD AND BALLARD ROAD
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USGS MAP

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Figure 1



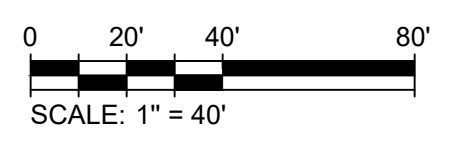
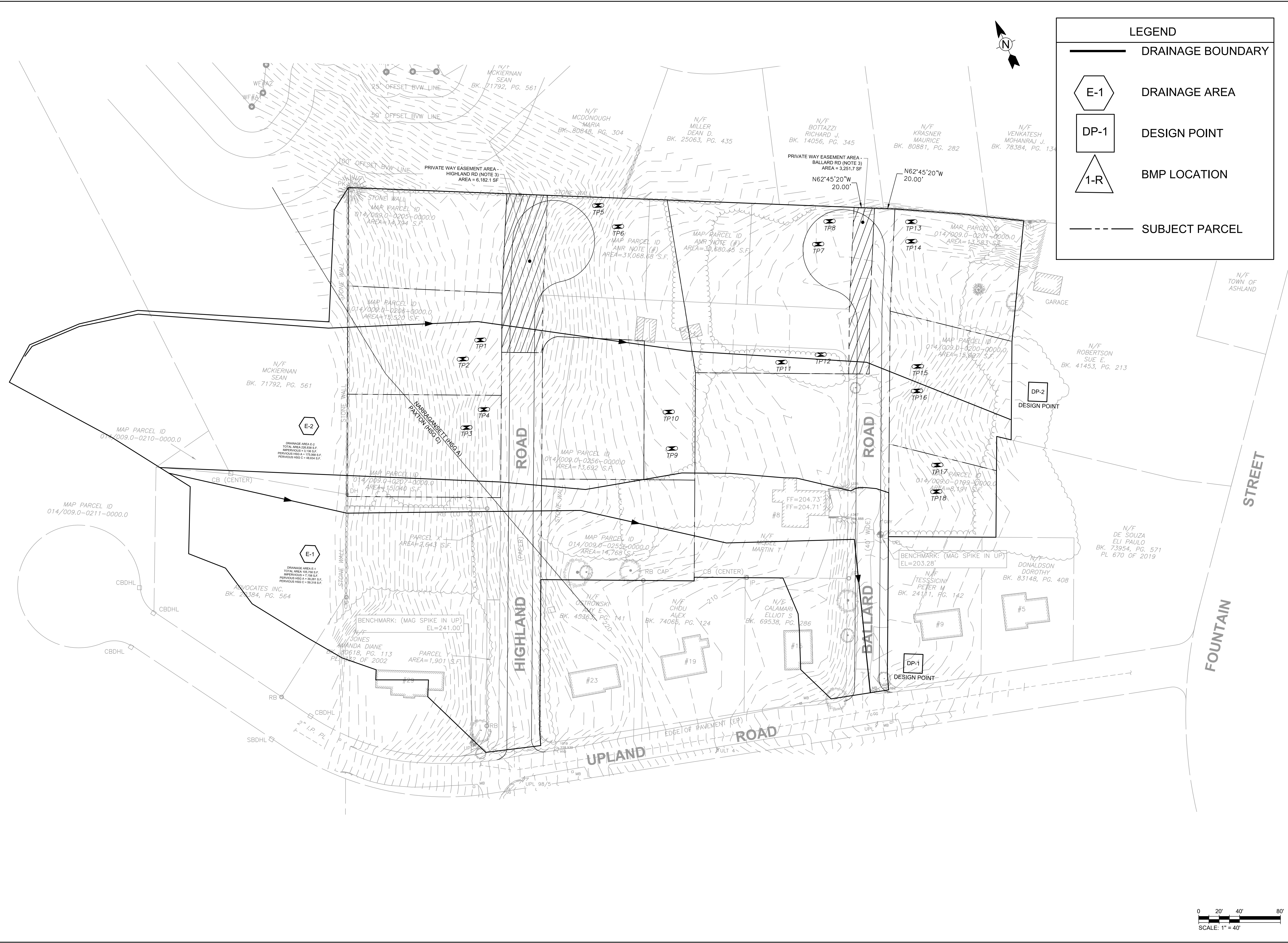
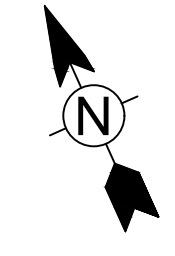
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OWNER:
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PROJECT:
**HIGHLAND RD &
BALLARD RD**
HIGHLAND RD & BALLARD RD,
ASHLAND, MA 01721

LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE AREA
- DESIGN POINT
- BMP LOCATION
- SUBJECT PARCEL



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**PRE-
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Figure 2

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PROJECT:
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ASHLAND, MA 01721

LEGEND

- DRAINAGE BOUNDARY
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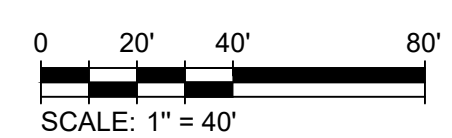
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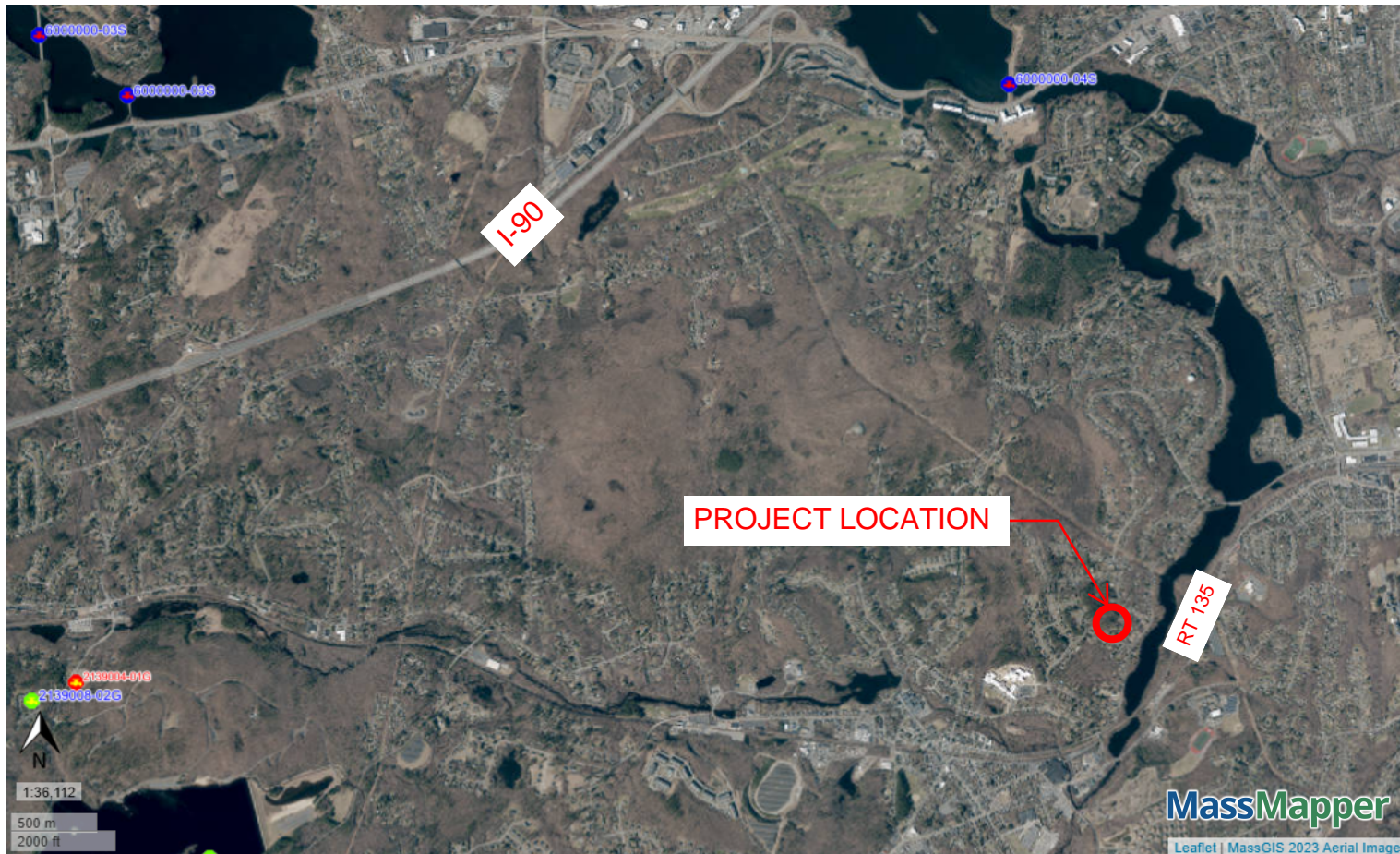
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POST-DEVELOPMENT DRAINAGE PLAN

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Figure 3



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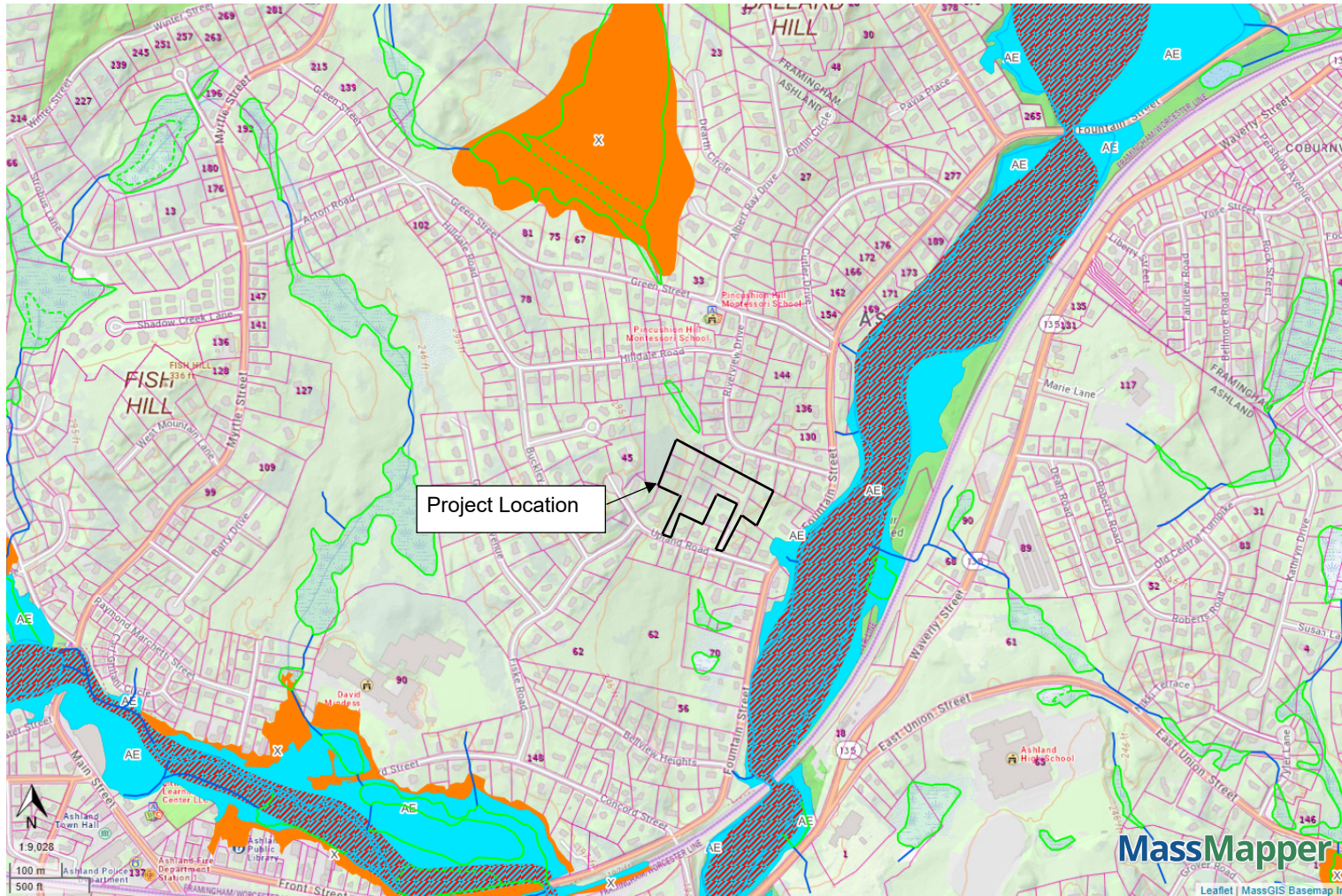
Ballard Road and Highland Road, Ashland MA



- Public Water Supplies**
- Community Groundwater Well
 - Non-Community Groundwater Well
 - Surface Water Intake
 - Emergency Surface Water Intake
 - Community Labels
 - Non-Community Labels

FIGURE 4 - PUBLIC WATER SUPPLIES

Figure 5 - Floodplain District Figure



DEP Wetlands Linear Features

- SHORELINE
- HYDROLOGIC CONNECTION
- - - MEAN WATER LINE
- APPARENT WETLAND LIMIT
- - - CLOSURE LINE
- EDGE OF INTERPRETED AREA

FEMA National Flood Hazard Layer Polygons

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Area Not Included

Property Tax Parcels

APPENDIX B
NOAA Rainfall Depths



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.330 (0.257-0.419)	0.398 (0.309-0.506)	0.509 (0.394-0.649)	0.601 (0.463-0.771)	0.727 (0.543-0.977)	0.822 (0.601-1.13)	0.922 (0.656-1.32)	1.04 (0.697-1.51)	1.20 (0.777-1.82)	1.33 (0.844-2.06)
10-min	0.467 (0.364-0.594)	0.564 (0.438-0.717)	0.721 (0.558-0.919)	0.851 (0.656-1.09)	1.03 (0.769-1.38)	1.16 (0.852-1.60)	1.31 (0.929-1.87)	1.47 (0.988-2.14)	1.70 (1.10-2.57)	1.89 (1.20-2.92)
15-min	0.550 (0.428-0.698)	0.663 (0.515-0.843)	0.848 (0.657-1.08)	1.00 (0.771-1.28)	1.21 (0.905-1.63)	1.37 (1.00-1.88)	1.54 (1.09-2.20)	1.73 (1.16-2.52)	2.00 (1.29-3.02)	2.22 (1.41-3.44)
30-min	0.754 (0.587-0.958)	0.909 (0.707-1.16)	1.16 (0.900-1.48)	1.37 (1.06-1.76)	1.66 (1.24-2.23)	1.88 (1.37-2.58)	2.10 (1.50-3.00)	2.36 (1.59-3.45)	2.73 (1.77-4.14)	3.04 (1.92-4.70)
60-min	0.958 (0.746-1.22)	1.15 (0.898-1.47)	1.48 (1.14-1.88)	1.74 (1.34-2.24)	2.11 (1.57-2.83)	2.38 (1.74-3.27)	2.67 (1.90-3.81)	3.00 (2.02-4.38)	3.47 (2.25-5.25)	3.85 (2.44-5.95)
2-hr	1.22 (0.959-1.54)	1.48 (1.16-1.87)	1.90 (1.48-2.40)	2.24 (1.74-2.86)	2.72 (2.05-3.65)	3.08 (2.27-4.22)	3.46 (2.49-4.95)	3.92 (2.65-5.69)	4.62 (3.00-6.95)	5.21 (3.31-8.00)
3-hr	1.41 (1.11-1.77)	1.71 (1.34-2.15)	2.20 (1.72-2.78)	2.60 (2.03-3.30)	3.16 (2.39-4.22)	3.57 (2.65-4.89)	4.02 (2.92-5.76)	4.58 (3.10-6.62)	5.43 (3.53-8.14)	6.17 (3.92-9.43)
6-hr	1.81 (1.43-2.25)	2.20 (1.74-2.74)	2.83 (2.24-3.55)	3.36 (2.64-4.23)	4.08 (3.11-5.42)	4.62 (3.45-6.29)	5.20 (3.80-7.41)	5.93 (4.03-8.52)	7.07 (4.62-10.5)	8.06 (5.14-12.2)
12-hr	2.29 (1.83-2.83)	2.79 (2.23-3.46)	3.61 (2.87-4.49)	4.28 (3.39-5.36)	5.22 (4.00-6.88)	5.91 (4.44-7.98)	6.66 (4.88-9.41)	7.59 (5.18-10.8)	9.03 (5.92-13.3)	10.3 (6.58-15.5)
24-hr	2.72 (2.19-3.34)	3.34 (2.69-4.12)	4.38 (3.50-5.40)	5.23 (4.16-6.50)	6.40 (4.94-8.39)	7.27 (5.50-9.77)	8.22 (6.07-11.6)	9.40 (6.44-13.3)	11.2 (7.40-16.5)	12.9 (8.25-19.2)
2-day	3.02 (2.45-3.68)	3.78 (3.06-4.61)	5.02 (4.05-6.15)	6.05 (4.85-7.46)	7.46 (5.81-9.73)	8.50 (6.49-11.4)	9.64 (7.19-13.5)	11.1 (7.65-15.6)	13.5 (8.88-19.6)	15.5 (10.0-23.1)
3-day	3.26 (2.66-3.97)	4.08 (3.32-4.96)	5.40 (4.38-6.59)	6.50 (5.24-7.98)	8.01 (6.26-10.4)	9.11 (6.98-12.2)	10.3 (7.73-14.5)	11.9 (8.22-16.7)	14.4 (9.54-21.0)	16.7 (10.8-24.7)
4-day	3.51 (2.87-4.25)	4.34 (3.55-5.27)	5.71 (4.65-6.95)	6.85 (5.53-8.38)	8.41 (6.59-10.9)	9.55 (7.34-12.7)	10.8 (8.10-15.1)	12.4 (8.59-17.4)	15.0 (9.95-21.7)	17.3 (11.2-25.5)
7-day	4.20 (3.46-5.06)	5.08 (4.18-6.13)	6.53 (5.34-7.89)	7.72 (6.28-9.40)	9.37 (7.37-12.0)	10.6 (8.15-13.9)	11.9 (8.92-16.4)	13.6 (9.42-18.8)	16.2 (10.7-23.2)	18.4 (11.9-27.0)
10-day	4.87 (4.02-5.84)	5.78 (4.77-6.94)	7.28 (5.98-8.77)	8.51 (6.95-10.3)	10.2 (8.05-13.0)	11.5 (8.84-15.0)	12.8 (9.60-17.5)	14.5 (10.1-20.0)	17.0 (11.3-24.4)	19.2 (12.4-28.0)
20-day	6.87 (5.72-8.17)	7.85 (6.52-9.35)	9.45 (7.82-11.3)	10.8 (8.87-13.0)	12.6 (9.98-15.8)	14.0 (10.8-18.0)	15.4 (11.5-20.6)	17.0 (11.9-23.3)	19.3 (12.9-27.4)	21.2 (13.8-30.7)
30-day	8.50 (7.11-10.1)	9.53 (7.96-11.3)	11.2 (9.32-13.3)	12.6 (10.4-15.1)	14.5 (11.5-18.1)	16.0 (12.3-20.3)	17.5 (13.0-23.0)	19.0 (13.4-25.9)	21.1 (14.2-29.8)	22.7 (14.8-32.8)
45-day	10.5 (8.83-12.4)	11.6 (9.72-13.7)	13.3 (11.1-15.8)	14.8 (12.3-17.6)	16.8 (13.4-20.7)	18.3 (14.2-23.1)	19.9 (14.7-25.8)	21.3 (15.1-28.9)	23.2 (15.6-32.5)	24.5 (16.0-35.2)
60-day	12.2 (10.3-14.3)	13.3 (11.2-15.6)	15.1 (12.6-17.8)	16.6 (13.8-19.7)	18.6 (14.9-22.9)	20.3 (15.7-25.4)	21.8 (16.1-28.1)	23.2 (16.4-31.2)	24.8 (16.8-34.7)	25.9 (17.0-37.2)

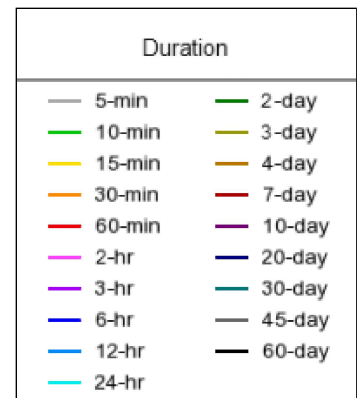
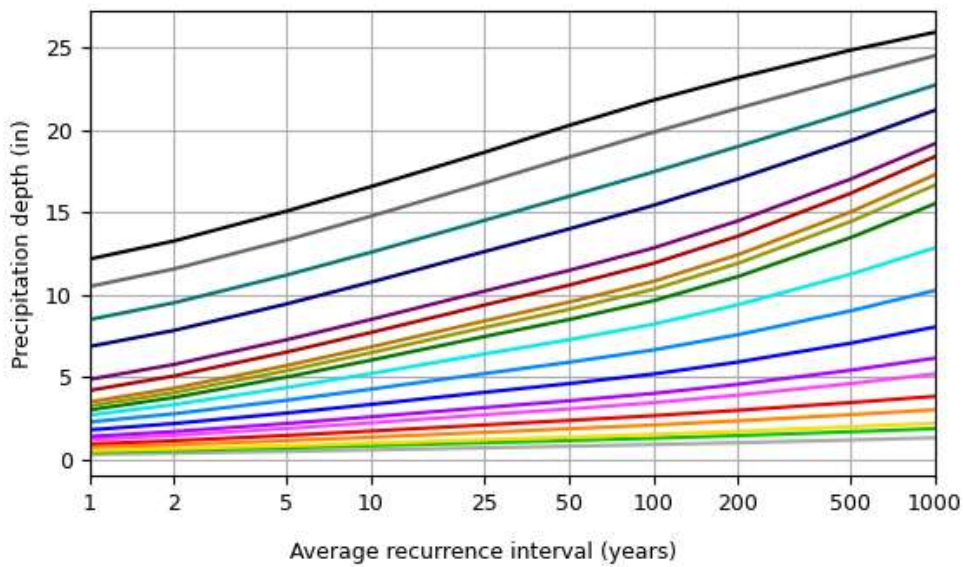
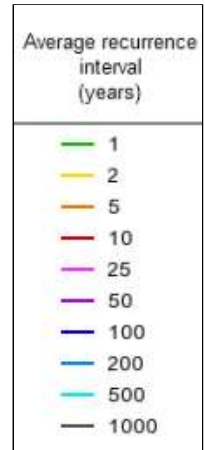
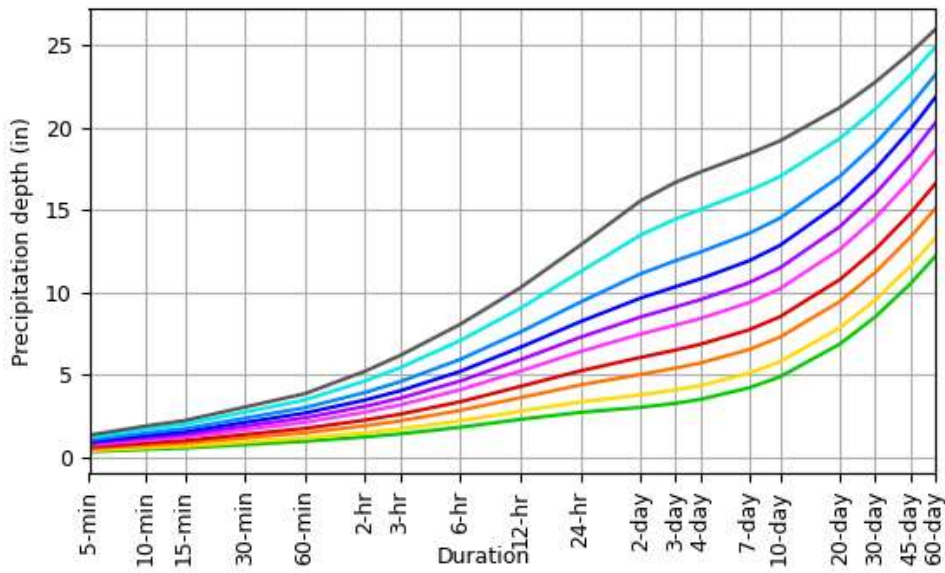
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

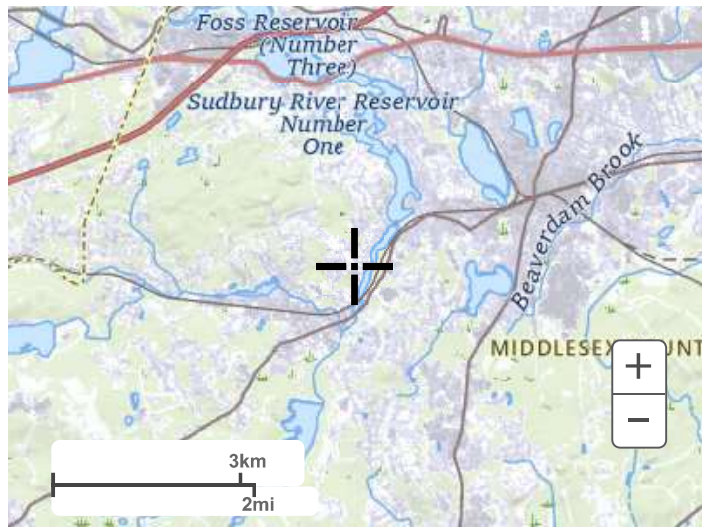
Latitude: 42.2664°, Longitude: -71.4522°



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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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APPENDIX C

Subsurface Exploration Data



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for Middlesex County, Massachusetts



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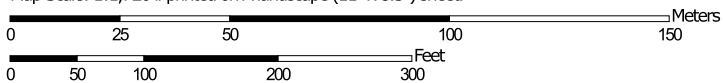
Soil Map

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: 1:1,720 if printed on A landscape (11" x 8.5") sheet.



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 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 25, Sep 5, 2025

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
251B	Haven silt loam, 3 to 8 percent slopes	0.0	0.3%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	0.1	1.0%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	2.5	33.2%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	2.8	37.3%
416C	Narragansett silt loam, 8 to 15 percent slopes, very stony	2.2	28.2%
Totals for Area of Interest		7.6	100.0%

Map Unit Descriptions

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

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

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

Custom Soil Resource Report

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.

Middlesex County, Massachusetts

251B—Haven silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 990d
Elevation: 30 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Haven

Setting

Landform: Terraces, plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 2 inches: silt loam
H2 - 2 to 20 inches: silt loam
H3 - 20 to 32 inches: very fine sandy loam
H4 - 32 to 65 inches: stratified coarse sand to sand to fine sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY023CT - Well Drained Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 9 percent
Landform: Terraces, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Scio

Percent of map unit: 5 percent
Landform: Terraces, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent

307B—Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w675
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Paxton, Extremely Stony

Setting

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

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Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 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 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Charlton, extremely stony

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

Ridgebury, extremely stony

Percent of map unit: 4 percent
Landform: Ground moraines, drainageways, drumlins, hills, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, extremely stony

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

307D—Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w67l
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Paxton, Extremely Stony

Setting

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

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 9 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 1 percent
Landform: Ground moraines, drainageways, drumlins, hills, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

416B—Narragansett silt loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9940
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Narragansett and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Ground moraines

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Friable loamy eolian deposits and/or friable silty eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

O_i - 0 to 2 inches: slightly decomposed plant material

A - 2 to 7 inches: silt loam

B_w - 7 to 35 inches: silt loam

2C₁ - 35 to 60 inches: very gravelly loamy sand

2C₂ - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent

Surface area covered with cobbles, stones or boulders: 1.6 percent

Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high (0.60 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: A

Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 10 percent

Landform: Terraces, plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, rise

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Canton

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate

Percent of map unit: 5 percent
Landform: Hillslopes, depressions
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

416C—Narragansett silt loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9941
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Narragansett

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable silty eolian deposits and/or friable loamy eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

O_i - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: silt loam
B_w - 7 to 35 inches: silt loam
2C₁ - 35 to 60 inches: very gravelly loamy sand

Custom Soil Resource Report

2C2 - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent

Surface area covered with cobbles, stones or boulders: 1.6 percent

Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: A

Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Minor Components

Charlton

Percent of map unit: 10 percent

Landform: Ground moraines, drumlins

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Canton

Percent of map unit: 7 percent

Landform: Hills

Landform position (two-dimensional): Backslope, toeslope

Landform position (three-dimensional): Side slope, base slope

Down-slope shape: Linear

Across-slope shape: Convex

Hydric soil rating: No

Scituate

Percent of map unit: 3 percent

Landform: Hillslopes, depressions

Landform position (two-dimensional): Summit, toeslope

Landform position (three-dimensional): Head slope, base slope

Down-slope shape: Linear

Across-slope shape: Concave

Hydric soil rating: No

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Custom Soil Resource Report

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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

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TP1				TP2				TP3			
Ap	0-18	10YR 4/3	Loam	Ap	0-9	10YR 4/3	Loam	Ap	0-12	10YR 4/3	Loam
Bw	18-28	10YR 6/6	Loamy Sand	Bw	9-18	10YR 6/6	Loamy Sand	Bw	12-32	10YR 6/6	Loamy Sand
C1	28-64	10 YR 6/3	Sand w/ cobbles	C1	18-48	10 YR 6/3	Sand w/ cobbles	C1	32-40	10 YR 6/1	Fine Sand
C2	64-70	10YR 6/1	Fine Sand	C2	48-63	10YR 6/1	Fine Sand	C2	40-58	10YR 6/1	Coarse Sand w/ stones
C3	70-80	10YR 6/1	Coarse Sand w/ stones	C3	63-75	10YR 6/1	Coarse Sand w/ stones	C3	58-120	10YR 6/1	Sand
C4	80-120	10YR 6/1	Sand	C4	75-120	10YR 6/1	Sand				
NO REDOX INFORMATION				NO REDOX INFORMATION				NO REDOX INFORMATION			
											

TP4				TP5				TP6			
Ap	0-12	10YR 4/3	Loam	Ap	0-9	10YR 4/3	Loam	Ap	0-12	10YR 4/3	Loam
Bw	12-30	10YR 6/6	Loamy Sand	Bw	9-29	10YR 6/6	Loamy Sand	Bw	12-34	10YR 6/6	Loamy Sand
C1	30-66	10 YR 6/1	Gravelly Loamy Sand	C1	29-108	10 YR 6/1	Gravelly Loamy Sand	C1	34-108	10 YR 6/1	Gravelly Loamy Sand
C2	66-120	10YR 6/1	Sand								
NO REDOX INFORMATION				NO REDOX INFORMATION				NO REDOX INFORMATION			
											

TP7				TP8				TP9			
Ap	0-18	10YR 4/3	Loam	Ap	0-15	10YR 4/3	Loam	Ap	0-12	10YR 4/3	Loam
Bw	18-38	10YR 6/6	Loamy Sand	Bw	15-32	10YR 6/6	Loamy Sand	Bw	12-36	10YR 6/6	Loamy Sand
C1	38-108	10 YR 6/1	Gravelly Loamy Sand	C1	32-108	10 YR 6/1	Gravelly Loamy Sand	C1	38-108	10 YR 6/1	Gravelly Loamy Sand

NO REDOX INFORMATION



NO REDOX INFORMATION



NO REDOX INFORMATION



TP10				TP11				TP12			
Ap	0-10	10YR 4/3	Loam	Ap	0-15	10YR 4/3	Loam	Ap	0-18	10YR 4/3	Loam
Bw	10-38	10YR 6/6	Loamy Sand	Bw	18-38	10YR 6/6	Loamy Sand	Bw	18-38	10YR 6/6	Loamy Sand
C1	38-108	10 YR 6/1	Gravelly Loamy Sand	C1	38-108	10 YR 6/1	Gravelly Loamy Sand	C1	38-108	10 YR 6/1	Sand

NO REDOX INFORMATION



35"-38" - 7.5YR 5/8 Redoximorphic concentrations



34" - 38" - 7.5YR 5/8 Redoximorphic concentrations



TP13				TP14				TP15			
Ap	0-12	10YR 4/3	Loam	Ap	0-12	10YR 4/3	Loam	Ap	0-18	10YR 4/3	Loam
Bw	12-30	10YR 6/6	Loamy Sand	Bw	12-30	10YR 6/6	Loamy Sand	Bw	18-38	10YR 6/6	Loamy Sand
C1	30-66	10 YR 6/1	Gravelly Loamy Sand	C1	30-66	10 YR 6/1	Gravelly Loamy Sand	C1	38-108	10 YR 6/1	Gravelly Loamy Sand
C2	66-120	10YR 6/1	Sand	C2	66-120	10YR 6/1	Sand				

27" - 30" - 7.5YR 5/8 Redoximorphic concentrations

26" - 30" - 7.5YR 5/8 Redoximorphic concentrations

NO REDOX INFORMATION



TP16				TP17				TP18			
Ap	0-18	10YR 4/3	Loam	Ap	0-18	10YR 4/3	Loam	Ap	0-12	10YR 4/3	Loam
Bw	18-38	10YR 6/6	Loamy Sand	Bw	18-38	10YR 6/6	Loamy Sand	Bw	12-30	10YR 6/6	Loamy Sand
C1	38-108	10 YR 6/1	Gravelly Loamy Sand	C1	38-108	10 YR 6/1	Gravelly Loamy Sand	C1	30-66	10 YR 6/1	Gravelly Loamy Sand
								C2	66-120	10YR 6/1	Sand

NO REDOX INFORMATION

NO REDOX INFORMATION

NO REDOX INFORMATION



APPENDIX D

**MassDEP Checklist for
Stormwater Report**



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 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

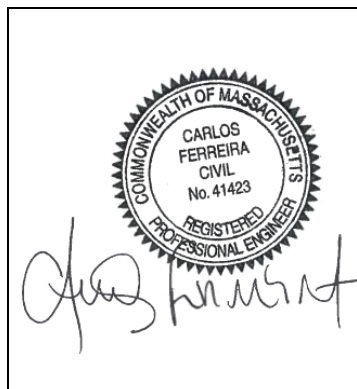
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Carlos Ferreira

Signature and Date

01.19.2026

Checklist

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

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of “country drainage” versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): Subsurface Infiltration Chambers and Infiltration Basin

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

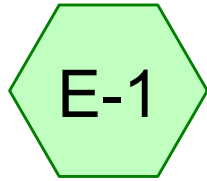
- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

APPENDIX E

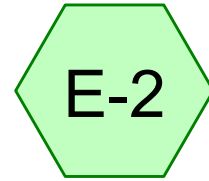
HydroCAD Reports



Drainage Area



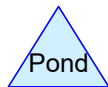
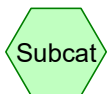
Design Point



Drainage Area



Design Point



Pre-Development_2026.01.21

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.34	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.23	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.40	2
4	50-Year	Type III 24-hr		Default	24.00	1	7.27	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.22	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.339	39	>75% Grass cover, Good, HSG A (E-1, E-2)
0.652	39	>75% Grass cover, Good, HSG A, offsite (E-1, E-2)
0.006	74	>75% Grass cover, Good, HSG C (E-1)
0.525	74	>75% Grass cover, Good, HSG C, offsite (E-1, E-2)
0.040	96	Gravel surface, HSG A (E-1)
0.048	98	Paved driveways (E-1)
0.032	98	Pavement, offsite (E-1, E-2)
0.016	98	Roof (E-2)
0.140	98	Roof, offsite (E-1, E-2)
3.758	30	Woods, Good, HSG A (E-1, E-2)
0.132	30	Woods, Good, HSG A, offsite (E-1, E-2)
0.572	70	Woods, Good, HSG C (E-1, E-2)
1.376	70	Woods, Good, HSG C, offsite (E-1, E-2)
7.635	47	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.921	HSG A	E-1, E-2
0.000	HSG B	
2.478	HSG C	E-1, E-2
0.000	HSG D	
0.236	Other	E-1, E-2
7.635		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.991	0.000	0.531	0.000	0.000	1.522	>75% Grass cover, Good	E-1, E-2
0.040	0.000	0.000	0.000	0.000	0.040	Gravel surface	E-1
0.000	0.000	0.000	0.000	0.048	0.048	Paved driveways	E-1
0.000	0.000	0.000	0.000	0.032	0.032	Pavement, offsite	E-1, E-2
0.000	0.000	0.000	0.000	0.016	0.016	Roof	E-2
0.000	0.000	0.000	0.000	0.140	0.140	Roof, offsite	E-1, E-2
3.890	0.000	1.948	0.000	0.000	5.838	Woods, Good	E-1, E-2
4.921	0.000	2.478	0.000	0.236	7.635	TOTAL AREA	

Pre-Development_2026.01.21

Type III 24-hr 2-Year Rainfall=3.34"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-1: Drainage Area

Runoff Area=105,758 sf 6.77% Impervious Runoff Depth>0.50"
Flow Length=846' Tc=8.8 min CN=61 Runoff=0.86 cfs 0.101 af

SubcatchmentE-2: Drainage Area

Runoff Area=226,838 sf 1.38% Impervious Runoff Depth>0.01"
Flow Length=988' Tc=14.4 min CN=40 Runoff=0.01 cfs 0.003 af

Reach DP-1: Design Point

Inflow=0.86 cfs 0.101 af
Outflow=0.86 cfs 0.101 af

Reach DP-2: Design Point

Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Total Runoff Area = 7.635 ac Runoff Volume = 0.105 af Average Runoff Depth = 0.16"
96.90% Pervious = 7.399 ac 3.10% Impervious = 0.236 ac

Summary for Subcatchment E-1: Drainage Area

Runoff = 0.86 cfs @ 12.17 hrs, Volume= 0.101 af, Depth> 0.50"
 Routed to Reach DP-1 : Design Point

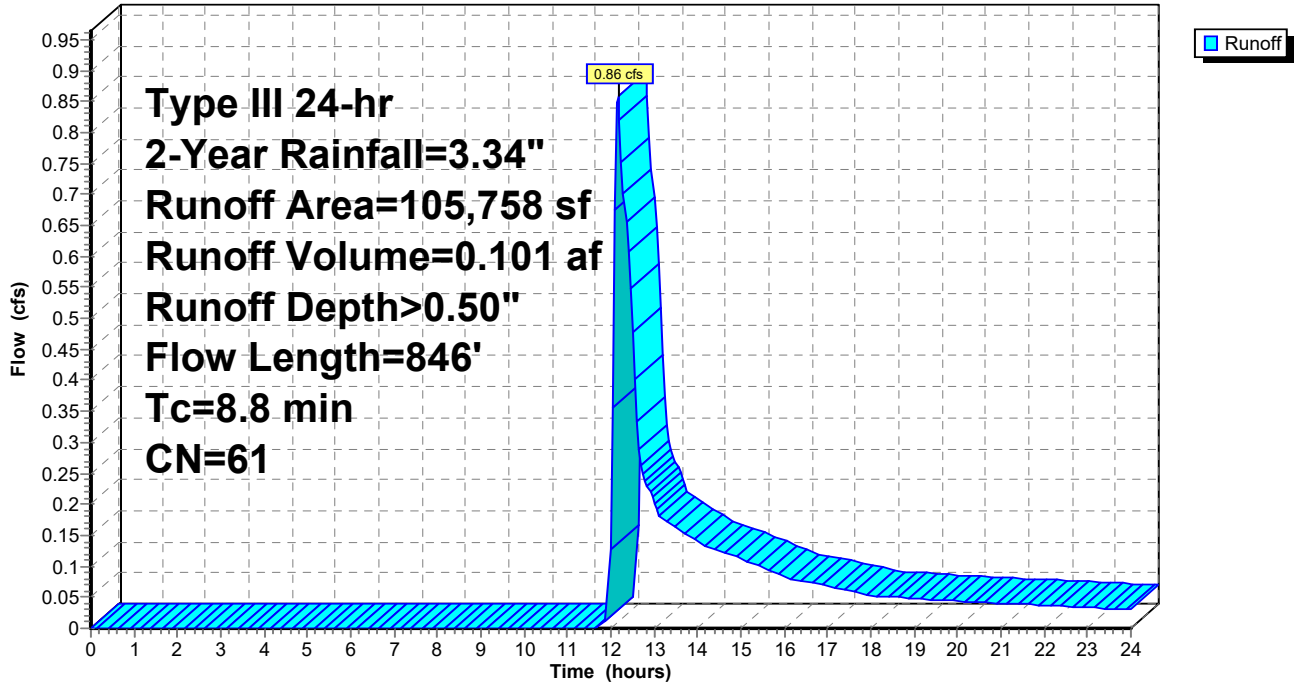
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 4,596	98	Roof, offsite
* 469	98	Pavement, offsite
* 14,347	39	>75% Grass cover, Good, HSG A, offsite
* 18,468	74	>75% Grass cover, Good, HSG C, offsite
* 2,779	30	Woods, Good, HSG A, offsite
* 25,141	70	Woods, Good, HSG C, offsite
* 2,093	98	Paved driveways
1,725	96	Gravel surface, HSG A
8,439	39	>75% Grass cover, Good, HSG A
247	74	>75% Grass cover, Good, HSG C
11,991	30	Woods, Good, HSG A
15,463	70	Woods, Good, HSG C
105,758	61	Weighted Average
98,600		93.23% Pervious Area
7,158		6.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.2	35	0.1200	2.42		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
3.6	419	0.1530	1.96		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.6	192	0.0780	1.95		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.7	150	0.0470	3.49		Shallow Concentrated Flow, Shallow Concentrated Flow Unpaved Kv= 16.1 fps
8.8	846	Total			

Subcatchment E-1: Drainage Area

Hydrograph



Summary for Subcatchment E-2: Drainage Area

Runoff = 0.01 cfs @ 22.75 hrs, Volume= 0.003 af, Depth> 0.01"
 Routed to Reach DP-2 : Design Point

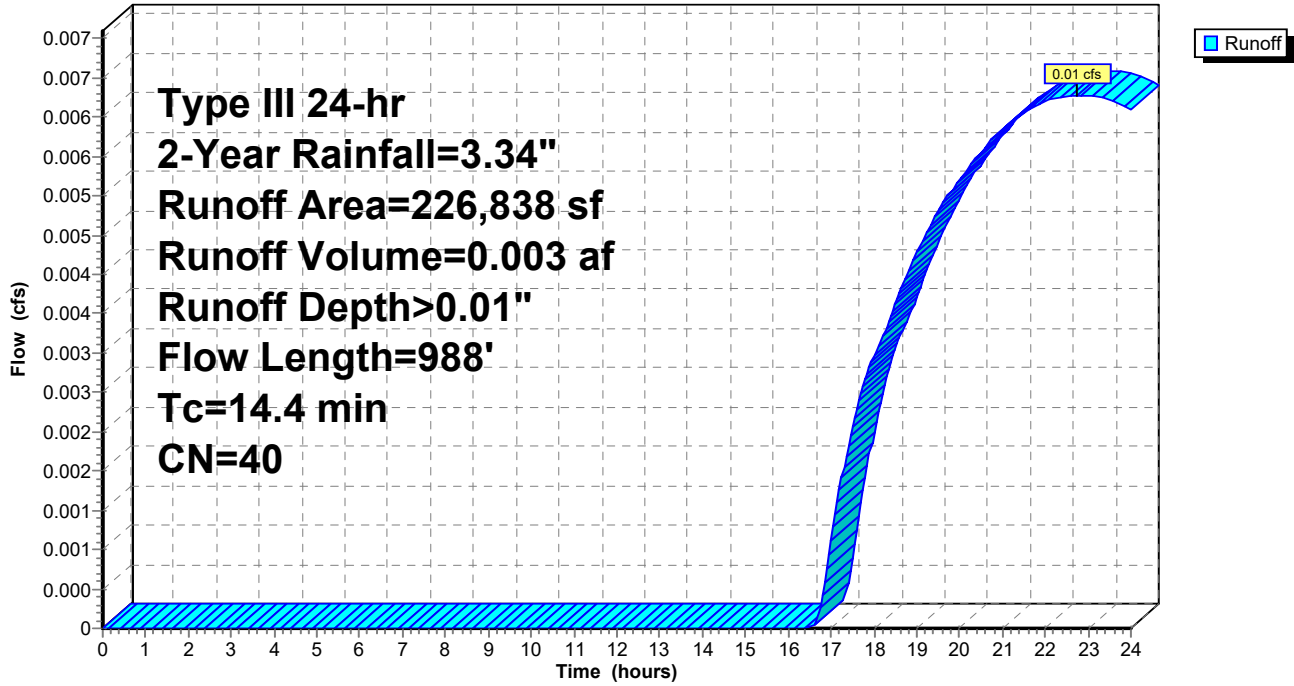
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,514	98	Roof, offsite
* 933	98	Pavement, offsite
* 14,045	39	>75% Grass cover, Good, HSG A, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 2,969	30	Woods, Good, HSG A, offsite
* 34,793	70	Woods, Good, HSG C, offsite
* 689	98	Roof
6,349	39	>75% Grass cover, Good, HSG A
151,705	30	Woods, Good, HSG A
9,441	70	Woods, Good, HSG C
226,838	40	Weighted Average
223,702		98.62% Pervious Area
3,136		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
8.9	938	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
14.4	988	Total			

Subcatchment E-2: Drainage Area

Hydrograph



Summary for Reach DP-1: Design Point

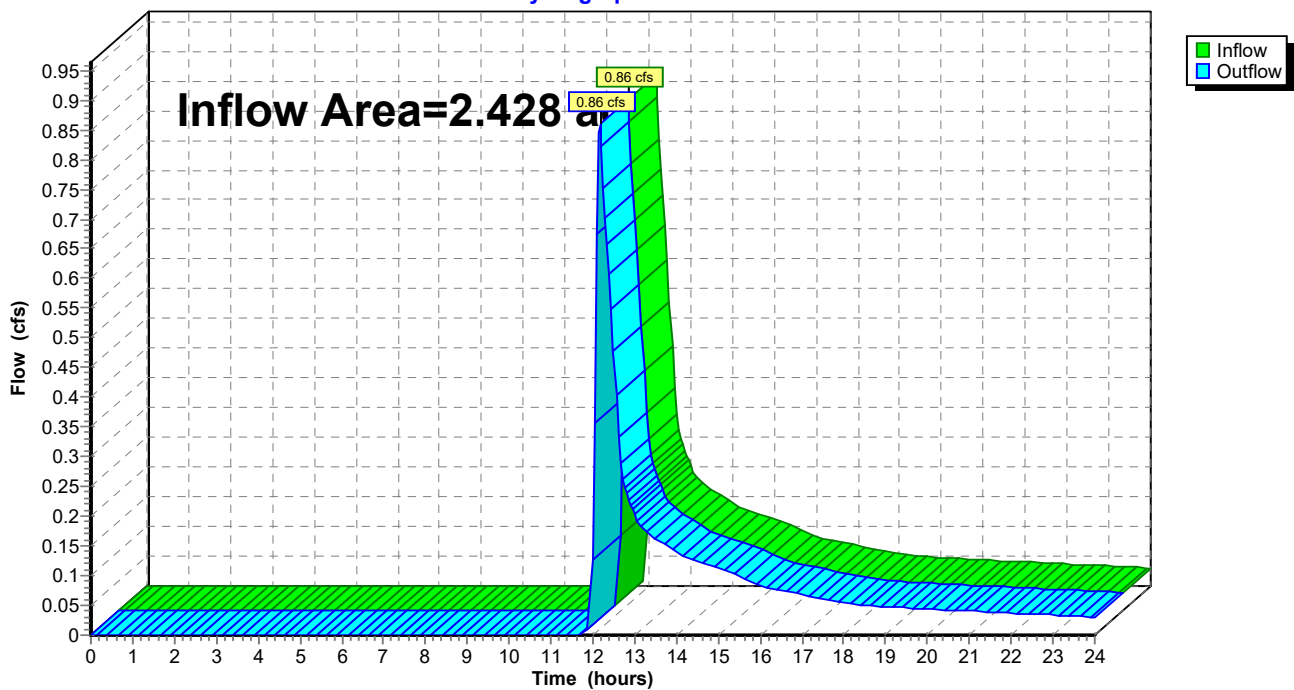
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.428 ac, 6.77% Impervious, Inflow Depth > 0.50" for 2-Year event
Inflow = 0.86 cfs @ 12.17 hrs, Volume= 0.101 af
Outflow = 0.86 cfs @ 12.17 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point

Hydrograph



Summary for Reach DP-2: Design Point

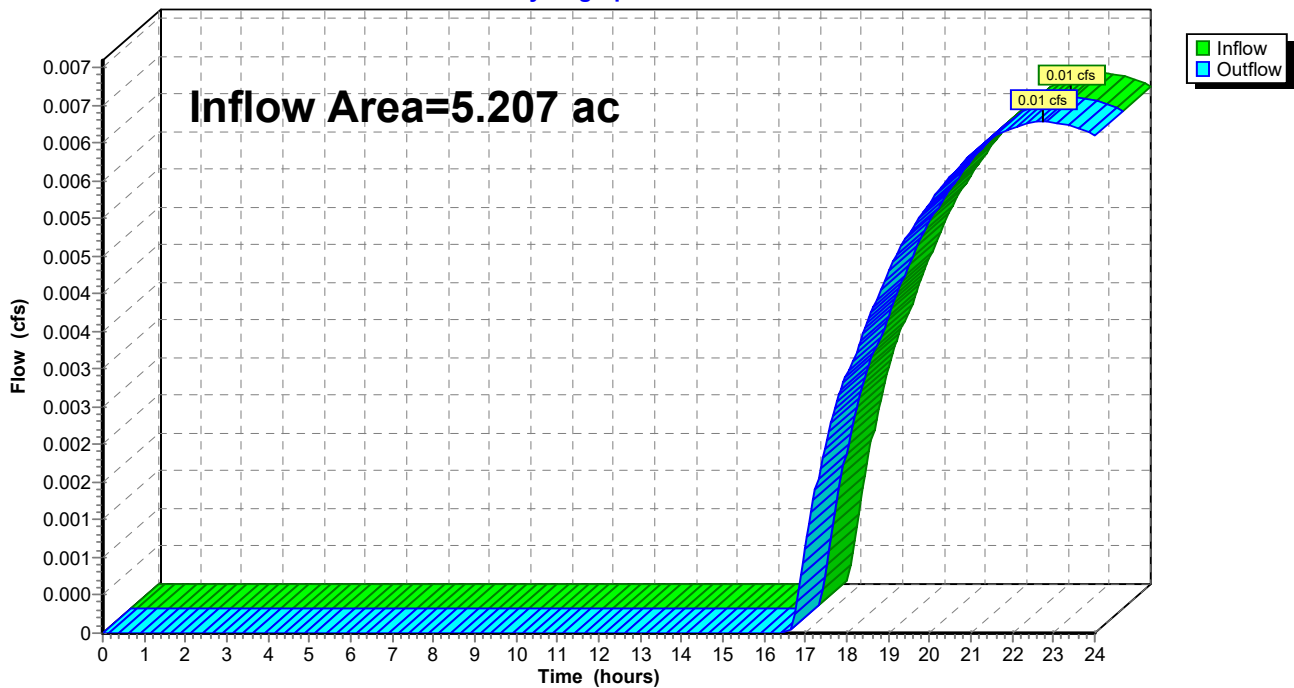
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.207 ac, 1.38% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.01 cfs @ 22.75 hrs, Volume= 0.003 af
Outflow = 0.01 cfs @ 22.75 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.23"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-1: Drainage Area

Runoff Area=105,758 sf 6.77% Impervious Runoff Depth>1.51"
Flow Length=846' Tc=8.8 min CN=61 Runoff=3.52 cfs 0.305 af

SubcatchmentE-2: Drainage Area

Runoff Area=226,838 sf 1.38% Impervious Runoff Depth>0.29"
Flow Length=988' Tc=14.4 min CN=40 Runoff=0.40 cfs 0.124 af

Reach DP-1: Design Point

Inflow=3.52 cfs 0.305 af
Outflow=3.52 cfs 0.305 af

Reach DP-2: Design Point

Inflow=0.40 cfs 0.124 af
Outflow=0.40 cfs 0.124 af

Total Runoff Area = 7.635 ac Runoff Volume = 0.429 af Average Runoff Depth = 0.67"
96.90% Pervious = 7.399 ac 3.10% Impervious = 0.236 ac

Summary for Subcatchment E-1: Drainage Area

Runoff = 3.52 cfs @ 12.14 hrs, Volume= 0.305 af, Depth> 1.51"
 Routed to Reach DP-1 : Design Point

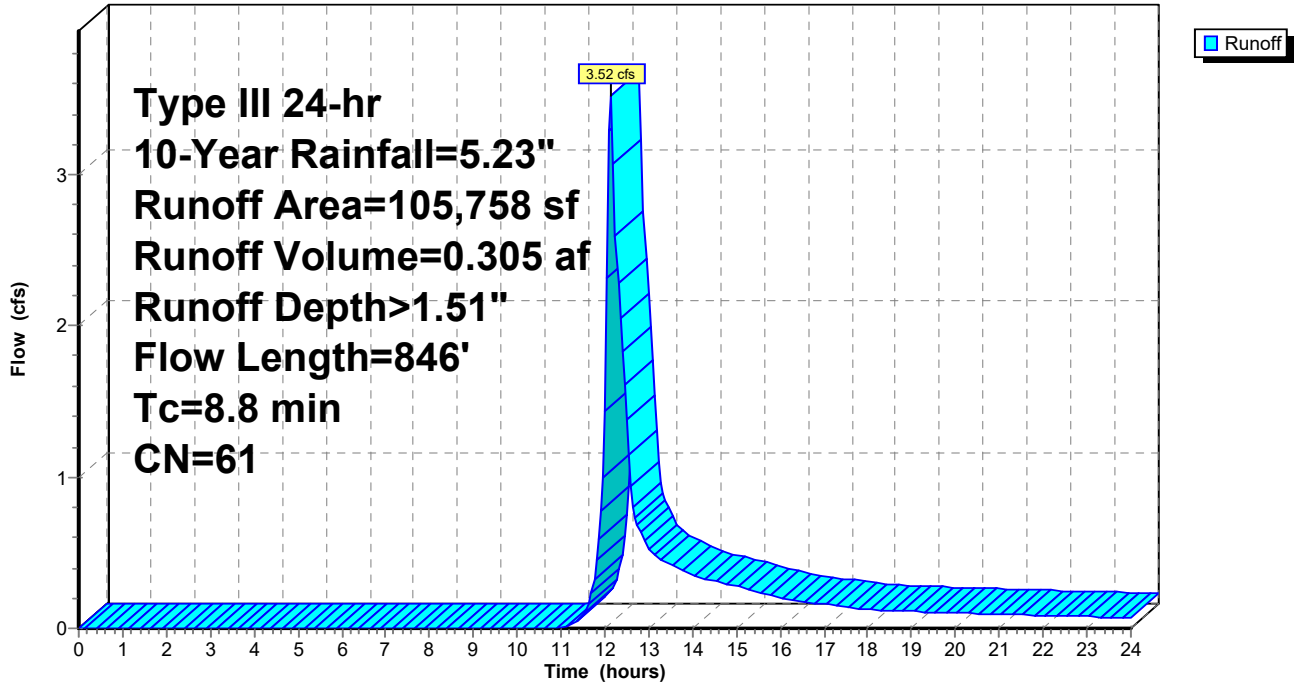
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 4,596	98	Roof, offsite
* 469	98	Pavement, offsite
* 14,347	39	>75% Grass cover, Good, HSG A, offsite
* 18,468	74	>75% Grass cover, Good, HSG C, offsite
* 2,779	30	Woods, Good, HSG A, offsite
* 25,141	70	Woods, Good, HSG C, offsite
* 2,093	98	Paved driveways
1,725	96	Gravel surface, HSG A
8,439	39	>75% Grass cover, Good, HSG A
247	74	>75% Grass cover, Good, HSG C
11,991	30	Woods, Good, HSG A
15,463	70	Woods, Good, HSG C
105,758	61	Weighted Average
98,600		93.23% Pervious Area
7,158		6.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.2	35	0.1200	2.42		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
3.6	419	0.1530	1.96		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.6	192	0.0780	1.95		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.7	150	0.0470	3.49		Shallow Concentrated Flow, Shallow Concentrated Flow Unpaved Kv= 16.1 fps
8.8	846	Total			

Subcatchment E-1: Drainage Area

Hydrograph



Summary for Subcatchment E-2: Drainage Area

Runoff = 0.40 cfs @ 12.53 hrs, Volume= 0.124 af, Depth> 0.29"
 Routed to Reach DP-2 : Design Point

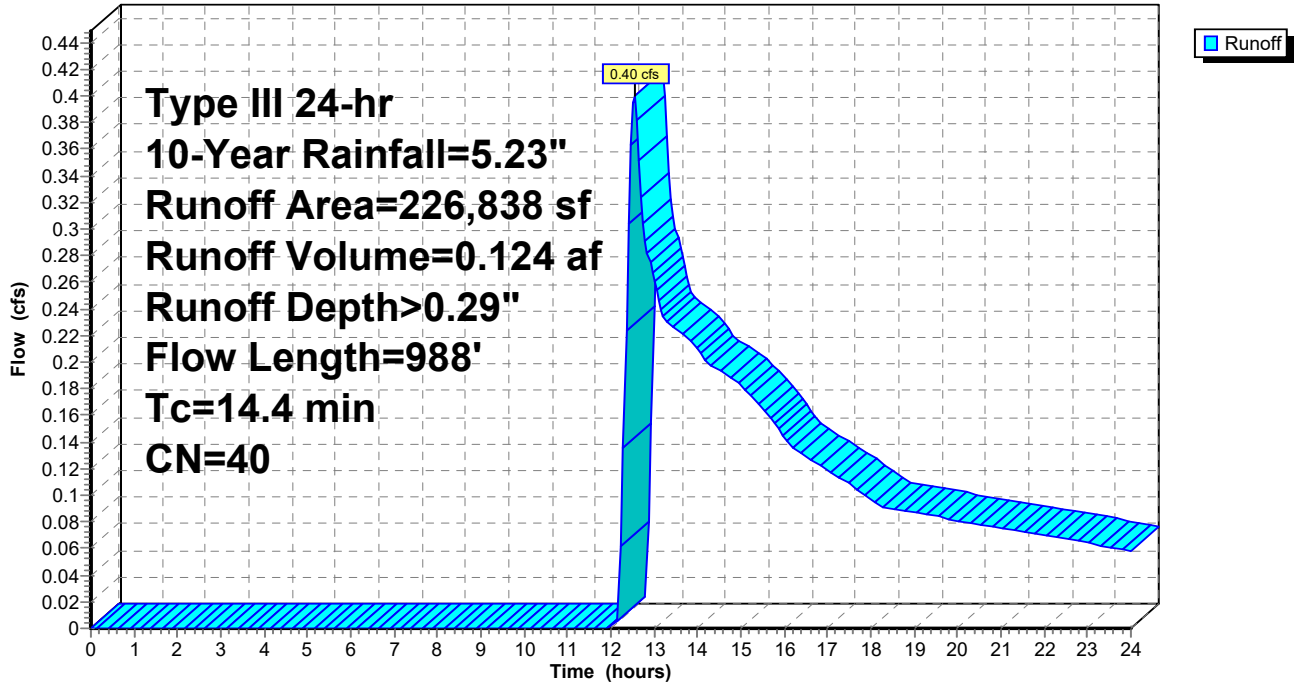
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,514	98	Roof, offsite
* 933	98	Pavement, offsite
* 14,045	39	>75% Grass cover, Good, HSG A, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 2,969	30	Woods, Good, HSG A, offsite
* 34,793	70	Woods, Good, HSG C, offsite
* 689	98	Roof
6,349	39	>75% Grass cover, Good, HSG A
151,705	30	Woods, Good, HSG A
9,441	70	Woods, Good, HSG C
226,838	40	Weighted Average
223,702		98.62% Pervious Area
3,136		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
8.9	938	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
14.4	988	Total			

Subcatchment E-2: Drainage Area

Hydrograph



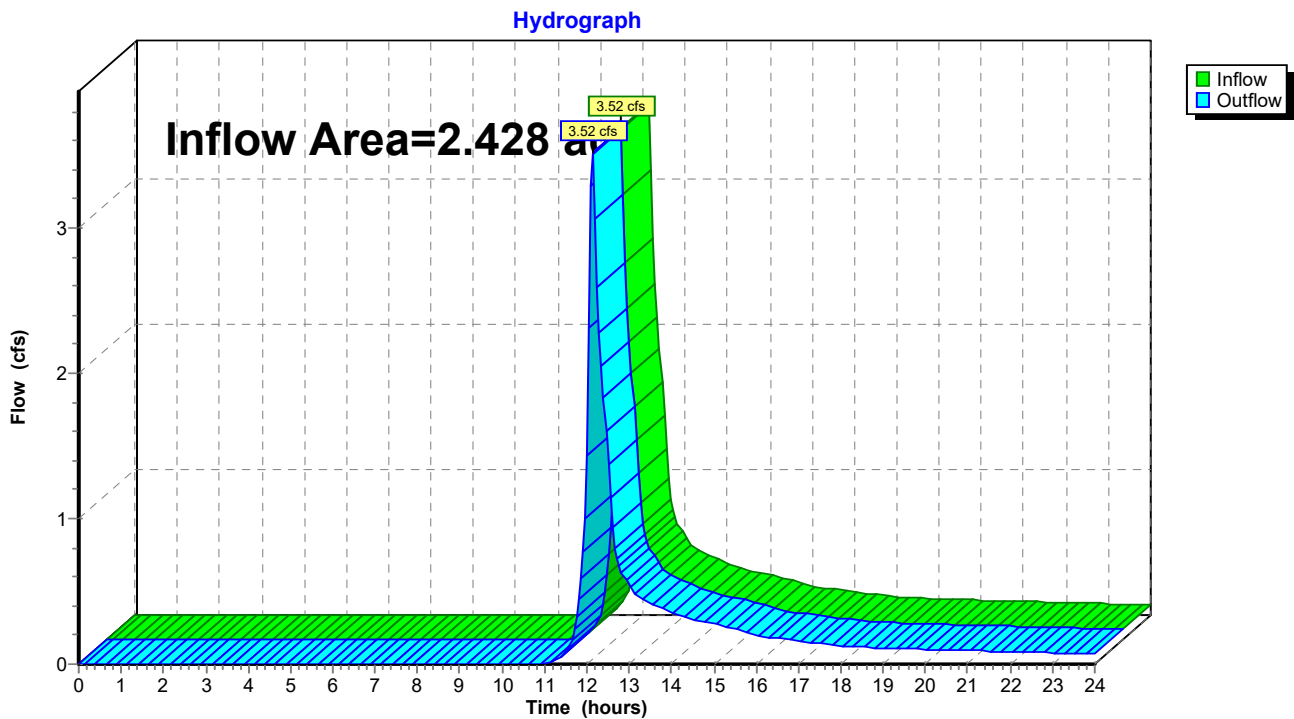
Summary for Reach DP-1: Design Point

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

Inflow Area = 2.428 ac, 6.77% Impervious, Inflow Depth > 1.51" for 10-Year event
Inflow = 3.52 cfs @ 12.14 hrs, Volume= 0.305 af
Outflow = 3.52 cfs @ 12.14 hrs, Volume= 0.305 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



Summary for Reach DP-2: Design Point

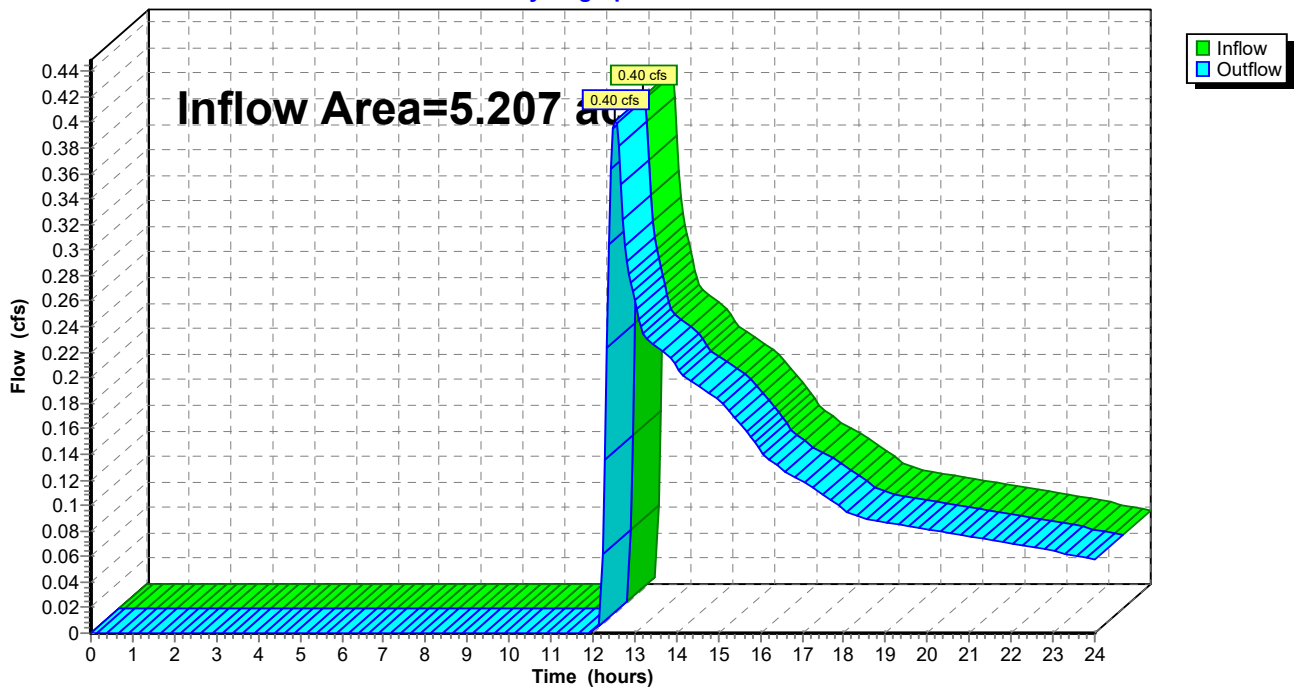
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.207 ac, 1.38% Impervious, Inflow Depth > 0.29" for 10-Year event
Inflow = 0.40 cfs @ 12.53 hrs, Volume= 0.124 af
Outflow = 0.40 cfs @ 12.53 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-1: Drainage Area

Runoff Area=105,758 sf 6.77% Impervious Runoff Depth>2.27"
Flow Length=846' Tc=8.8 min CN=61 Runoff=5.55 cfs 0.460 af

SubcatchmentE-2: Drainage Area

Runoff Area=226,838 sf 1.38% Impervious Runoff Depth>0.62"
Flow Length=988' Tc=14.4 min CN=40 Runoff=1.45 cfs 0.271 af

Reach DP-1: Design Point

Inflow=5.55 cfs 0.460 af
Outflow=5.55 cfs 0.460 af

Reach DP-2: Design Point

Inflow=1.45 cfs 0.271 af
Outflow=1.45 cfs 0.271 af

Total Runoff Area = 7.635 ac Runoff Volume = 0.731 af Average Runoff Depth = 1.15"
96.90% Pervious = 7.399 ac 3.10% Impervious = 0.236 ac

Summary for Subcatchment E-1: Drainage Area

Runoff = 5.55 cfs @ 12.14 hrs, Volume= 0.460 af, Depth> 2.27"
 Routed to Reach DP-1 : Design Point

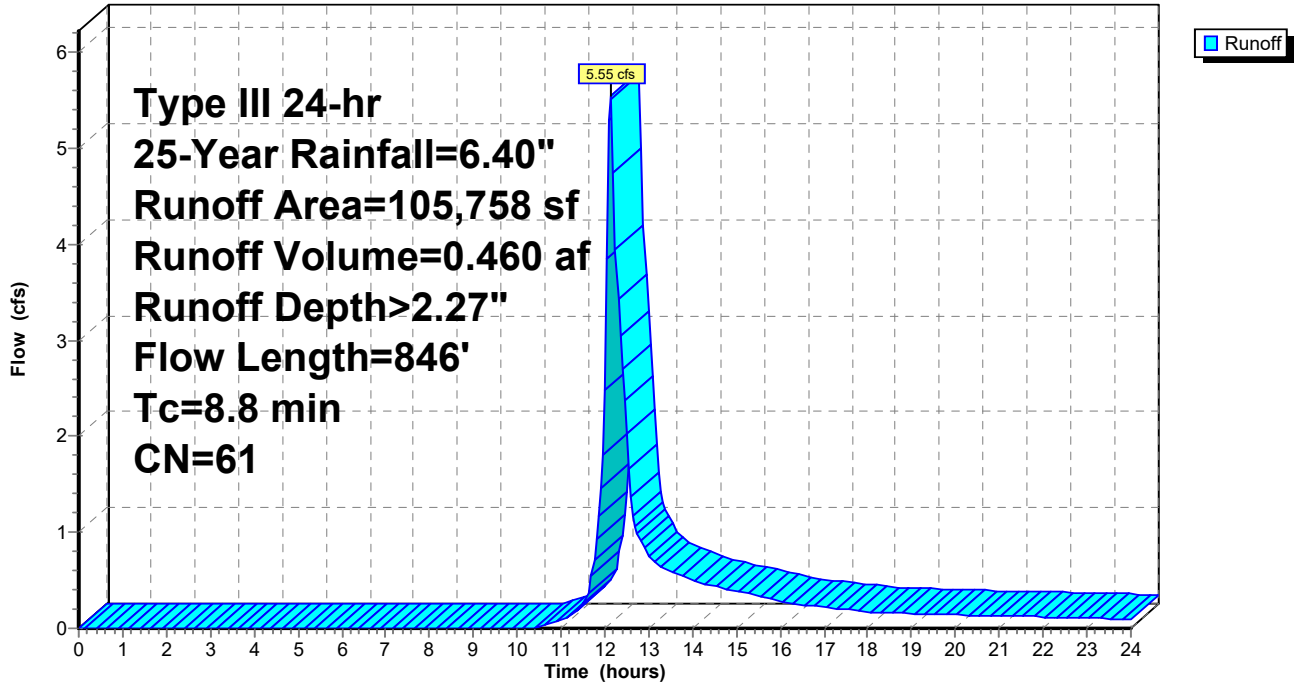
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 4,596	98	Roof, offsite
* 469	98	Pavement, offsite
* 14,347	39	>75% Grass cover, Good, HSG A, offsite
* 18,468	74	>75% Grass cover, Good, HSG C, offsite
* 2,779	30	Woods, Good, HSG A, offsite
* 25,141	70	Woods, Good, HSG C, offsite
* 2,093	98	Paved driveways
1,725	96	Gravel surface, HSG A
8,439	39	>75% Grass cover, Good, HSG A
247	74	>75% Grass cover, Good, HSG C
11,991	30	Woods, Good, HSG A
15,463	70	Woods, Good, HSG C
105,758	61	Weighted Average
98,600		93.23% Pervious Area
7,158		6.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.2	35	0.1200	2.42		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
3.6	419	0.1530	1.96		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.6	192	0.0780	1.95		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.7	150	0.0470	3.49		Shallow Concentrated Flow, Shallow Concentrated Flow Unpaved Kv= 16.1 fps
8.8	846	Total			

Subcatchment E-1: Drainage Area

Hydrograph



Summary for Subcatchment E-2: Drainage Area

Runoff = 1.45 cfs @ 12.41 hrs, Volume= 0.271 af, Depth> 0.62"
 Routed to Reach DP-2 : Design Point

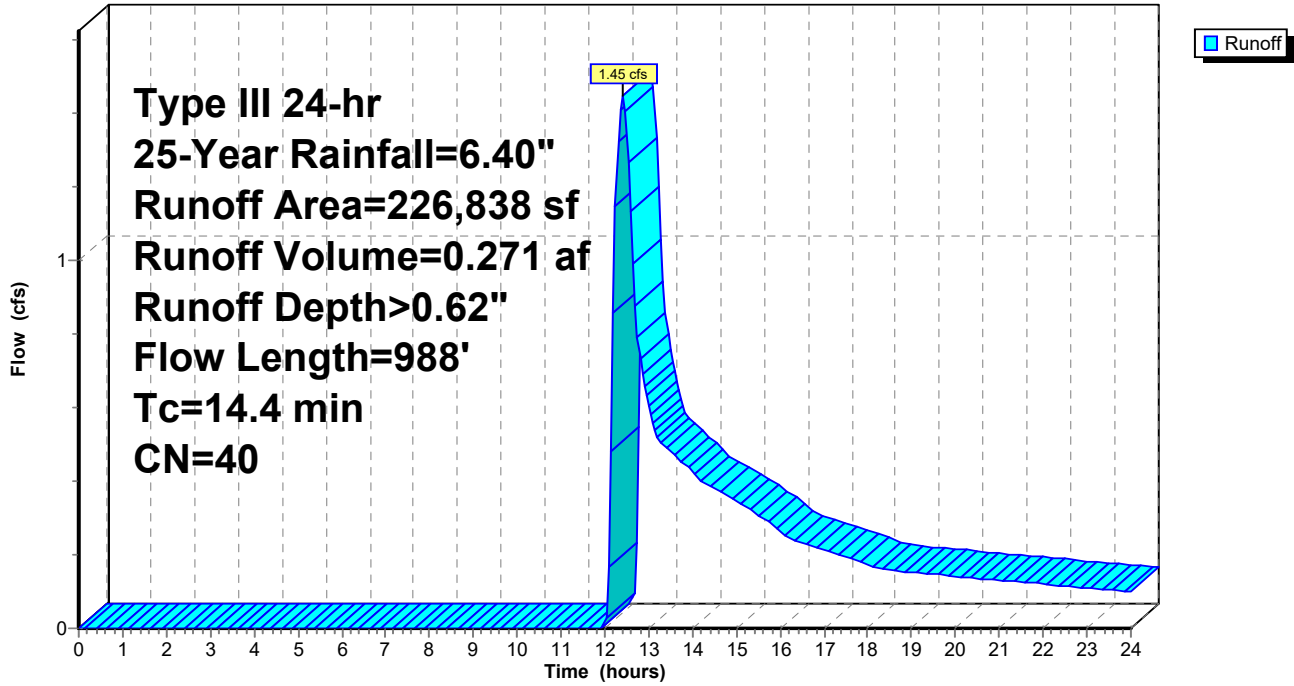
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,514	98	Roof, offsite
* 933	98	Pavement, offsite
* 14,045	39	>75% Grass cover, Good, HSG A, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 2,969	30	Woods, Good, HSG A, offsite
* 34,793	70	Woods, Good, HSG C, offsite
* 689	98	Roof
6,349	39	>75% Grass cover, Good, HSG A
151,705	30	Woods, Good, HSG A
9,441	70	Woods, Good, HSG C
226,838	40	Weighted Average
223,702		98.62% Pervious Area
3,136		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
8.9	938	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
14.4	988	Total			

Subcatchment E-2: Drainage Area

Hydrograph



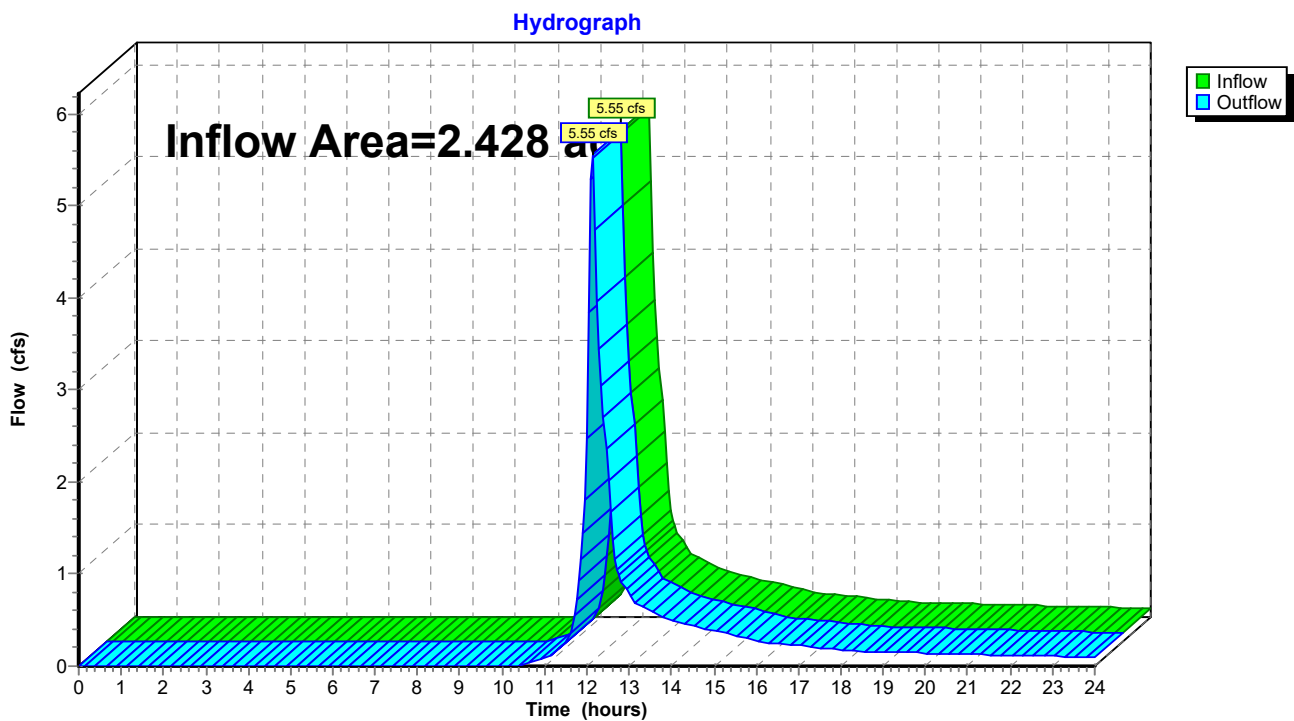
Summary for Reach DP-1: Design Point

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

Inflow Area = 2.428 ac, 6.77% Impervious, Inflow Depth > 2.27" for 25-Year event
Inflow = 5.55 cfs @ 12.14 hrs, Volume= 0.460 af
Outflow = 5.55 cfs @ 12.14 hrs, Volume= 0.460 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



Summary for Reach DP-2: Design Point

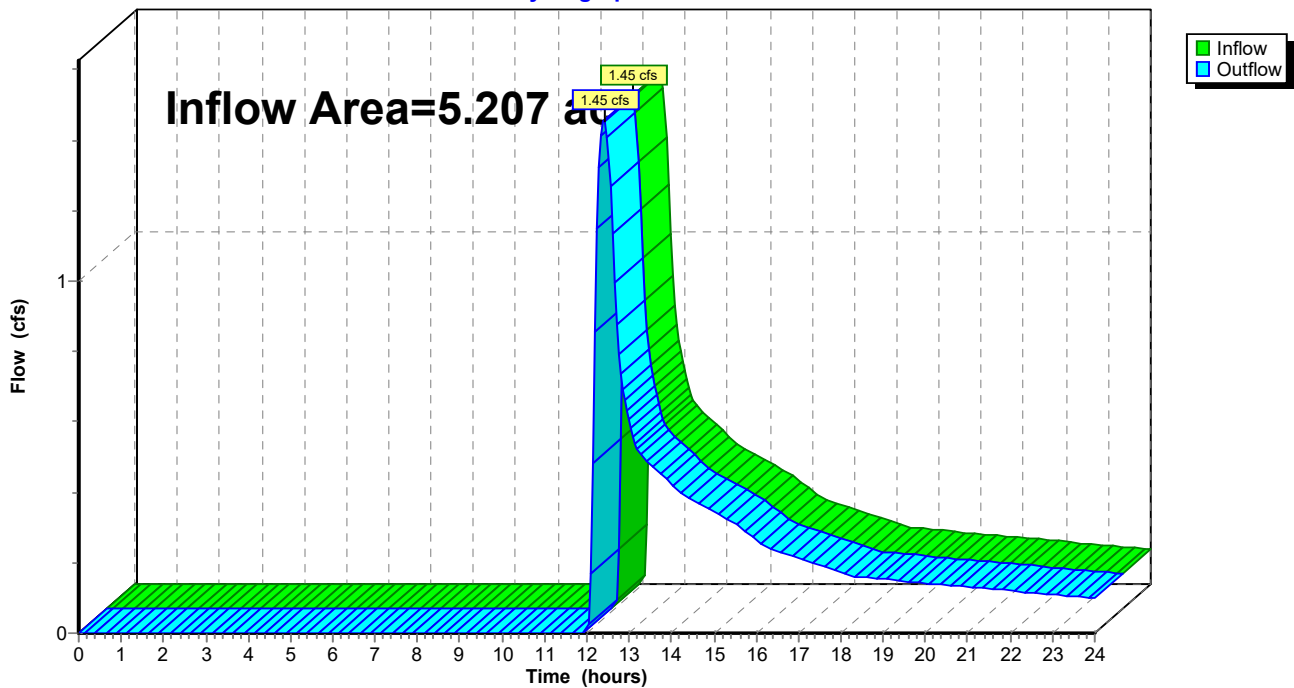
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.207 ac, 1.38% Impervious, Inflow Depth > 0.62" for 25-Year event
Inflow = 1.45 cfs @ 12.41 hrs, Volume= 0.271 af
Outflow = 1.45 cfs @ 12.41 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

Hydrograph



Pre-Development_2026.01.21

Type III 24-hr 50-Year Rainfall=7.27"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-1: Drainage Area

Runoff Area=105,758 sf 6.77% Impervious Runoff Depth>2.89"
Flow Length=846' Tc=8.8 min CN=61 Runoff=7.18 cfs 0.585 af

SubcatchmentE-2: Drainage Area

Runoff Area=226,838 sf 1.38% Impervious Runoff Depth>0.94"
Flow Length=988' Tc=14.4 min CN=40 Runoff=2.66 cfs 0.408 af

Reach DP-1: Design Point

Inflow=7.18 cfs 0.585 af
Outflow=7.18 cfs 0.585 af

Reach DP-2: Design Point

Inflow=2.66 cfs 0.408 af
Outflow=2.66 cfs 0.408 af

Total Runoff Area = 7.635 ac Runoff Volume = 0.994 af Average Runoff Depth = 1.56"
96.90% Pervious = 7.399 ac 3.10% Impervious = 0.236 ac

Summary for Subcatchment E-1: Drainage Area

Runoff = 7.18 cfs @ 12.13 hrs, Volume= 0.585 af, Depth> 2.89"
 Routed to Reach DP-1 : Design Point

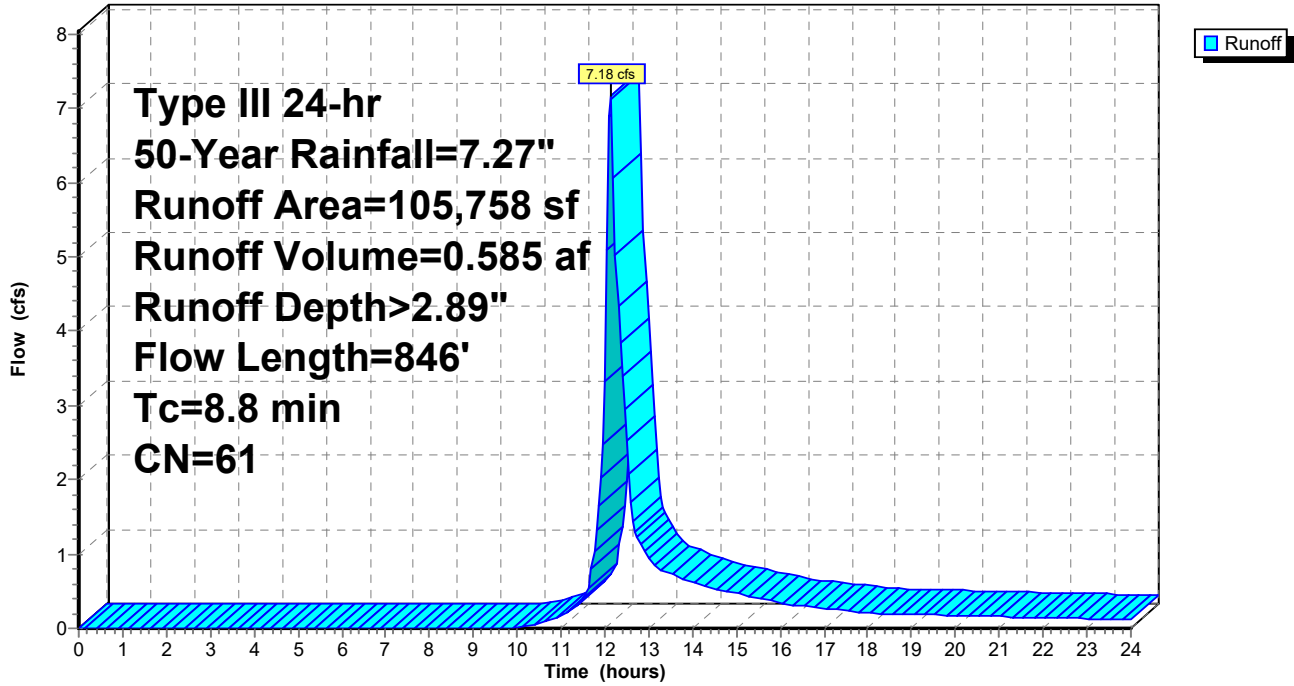
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 4,596	98	Roof, offsite
* 469	98	Pavement, offsite
* 14,347	39	>75% Grass cover, Good, HSG A, offsite
* 18,468	74	>75% Grass cover, Good, HSG C, offsite
* 2,779	30	Woods, Good, HSG A, offsite
* 25,141	70	Woods, Good, HSG C, offsite
* 2,093	98	Paved driveways
1,725	96	Gravel surface, HSG A
8,439	39	>75% Grass cover, Good, HSG A
247	74	>75% Grass cover, Good, HSG C
11,991	30	Woods, Good, HSG A
15,463	70	Woods, Good, HSG C
105,758	61	Weighted Average
98,600		93.23% Pervious Area
7,158		6.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.2	35	0.1200	2.42		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
3.6	419	0.1530	1.96		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.6	192	0.0780	1.95		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.7	150	0.0470	3.49		Shallow Concentrated Flow, Shallow Concentrated Flow Unpaved Kv= 16.1 fps
8.8	846	Total			

Subcatchment E-1: Drainage Area

Hydrograph



Summary for Subcatchment E-2: Drainage Area

Runoff = 2.66 cfs @ 12.31 hrs, Volume= 0.408 af, Depth> 0.94"
 Routed to Reach DP-2 : Design Point

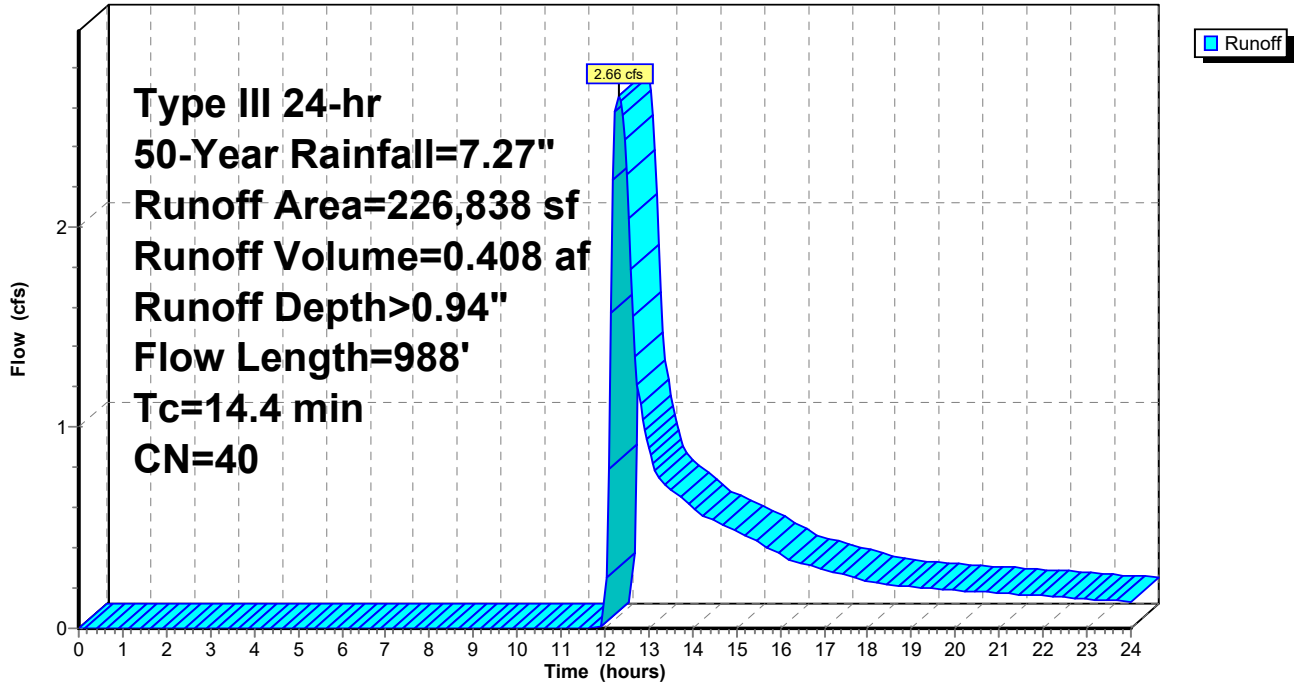
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,514	98	Roof, offsite
* 933	98	Pavement, offsite
* 14,045	39	>75% Grass cover, Good, HSG A, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 2,969	30	Woods, Good, HSG A, offsite
* 34,793	70	Woods, Good, HSG C, offsite
* 689	98	Roof
6,349	39	>75% Grass cover, Good, HSG A
151,705	30	Woods, Good, HSG A
9,441	70	Woods, Good, HSG C
226,838	40	Weighted Average
223,702		98.62% Pervious Area
3,136		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
8.9	938	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
14.4	988	Total			

Subcatchment E-2: Drainage Area

Hydrograph



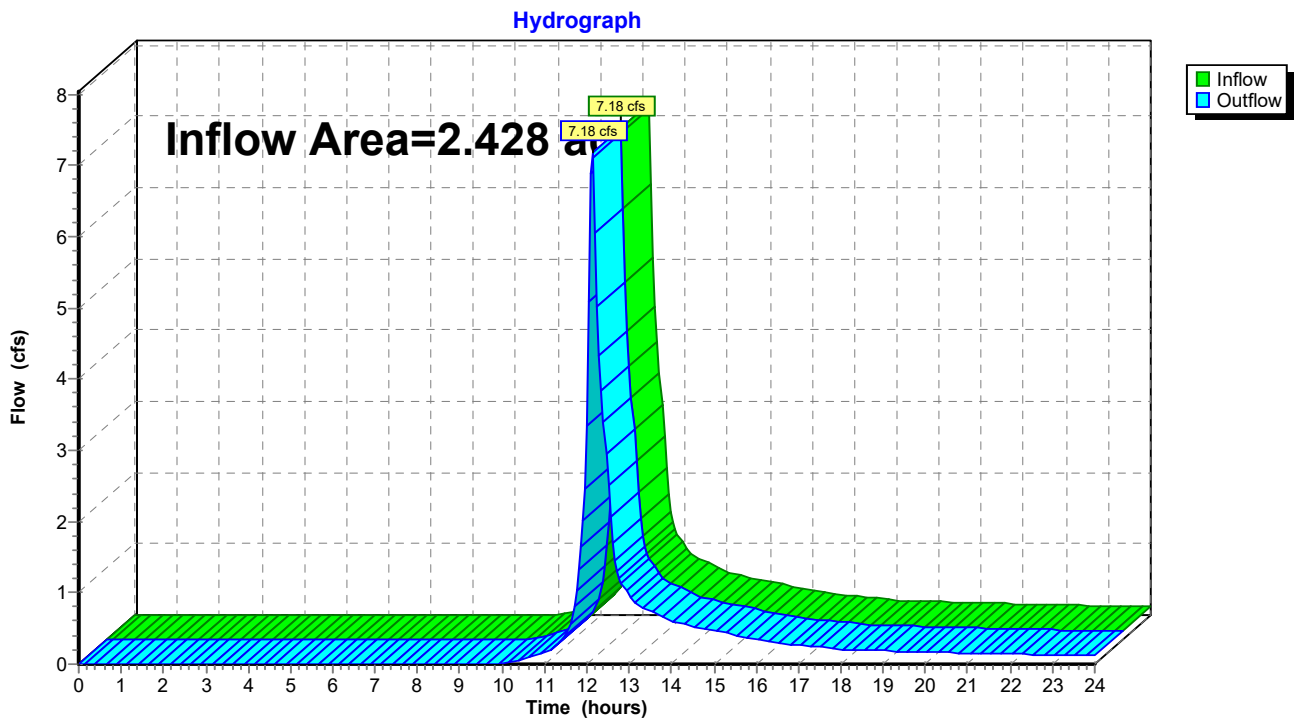
Summary for Reach DP-1: Design Point

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

Inflow Area = 2.428 ac, 6.77% Impervious, Inflow Depth > 2.89" for 50-Year event
Inflow = 7.18 cfs @ 12.13 hrs, Volume= 0.585 af
Outflow = 7.18 cfs @ 12.13 hrs, Volume= 0.585 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



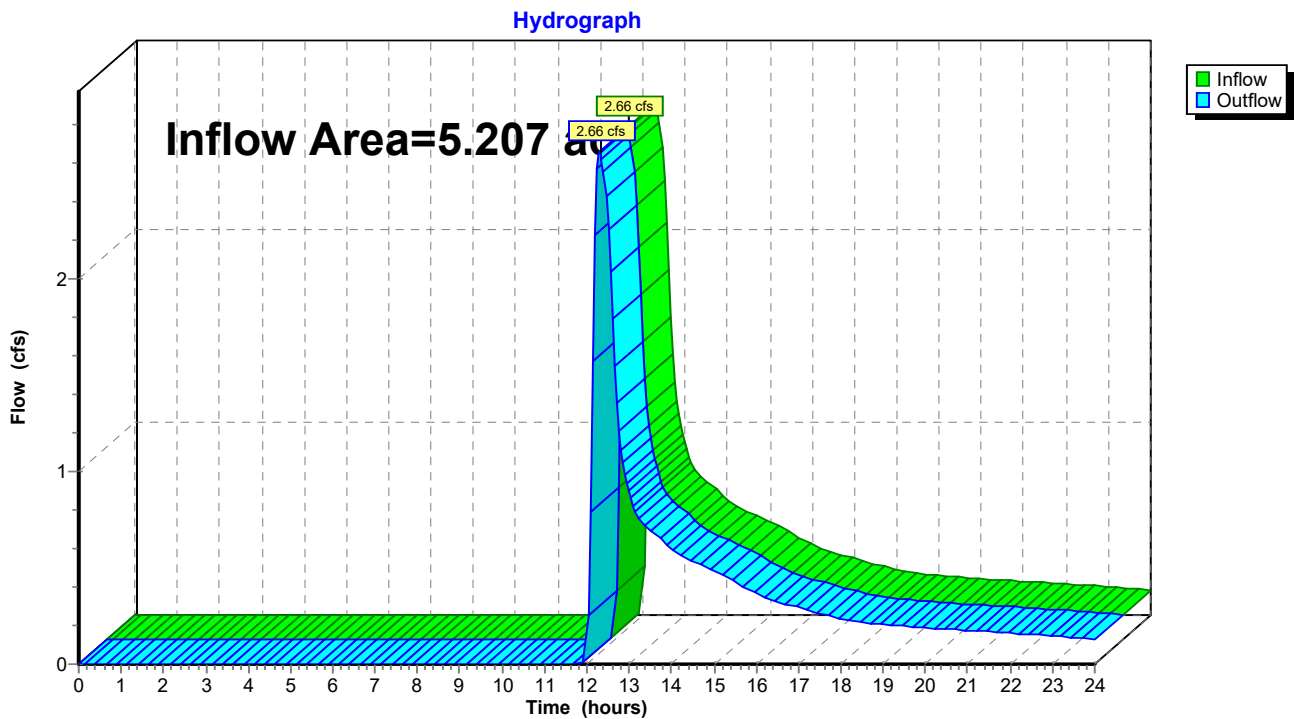
Summary for Reach DP-2: Design Point

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

Inflow Area = 5.207 ac, 1.38% Impervious, Inflow Depth > 0.94" for 50-Year event
Inflow = 2.66 cfs @ 12.31 hrs, Volume= 0.408 af
Outflow = 2.66 cfs @ 12.31 hrs, Volume= 0.408 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point



Pre-Development_2026.01.21

Type III 24-hr 100-Year Rainfall=8.22"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE-1: Drainage Area

Runoff Area=105,758 sf 6.77% Impervious Runoff Depth>3.61"
Flow Length=846' Tc=8.8 min CN=61 Runoff=9.05 cfs 0.730 af

SubcatchmentE-2: Drainage Area

Runoff Area=226,838 sf 1.38% Impervious Runoff Depth>1.34"
Flow Length=988' Tc=14.4 min CN=40 Runoff=4.48 cfs 0.582 af

Reach DP-1: Design Point

Inflow=9.05 cfs 0.730 af
Outflow=9.05 cfs 0.730 af

Reach DP-2: Design Point

Inflow=4.48 cfs 0.582 af
Outflow=4.48 cfs 0.582 af

Total Runoff Area = 7.635 ac Runoff Volume = 1.312 af Average Runoff Depth = 2.06"
96.90% Pervious = 7.399 ac 3.10% Impervious = 0.236 ac

Summary for Subcatchment E-1: Drainage Area

Runoff = 9.05 cfs @ 12.13 hrs, Volume= 0.730 af, Depth> 3.61"
 Routed to Reach DP-1 : Design Point

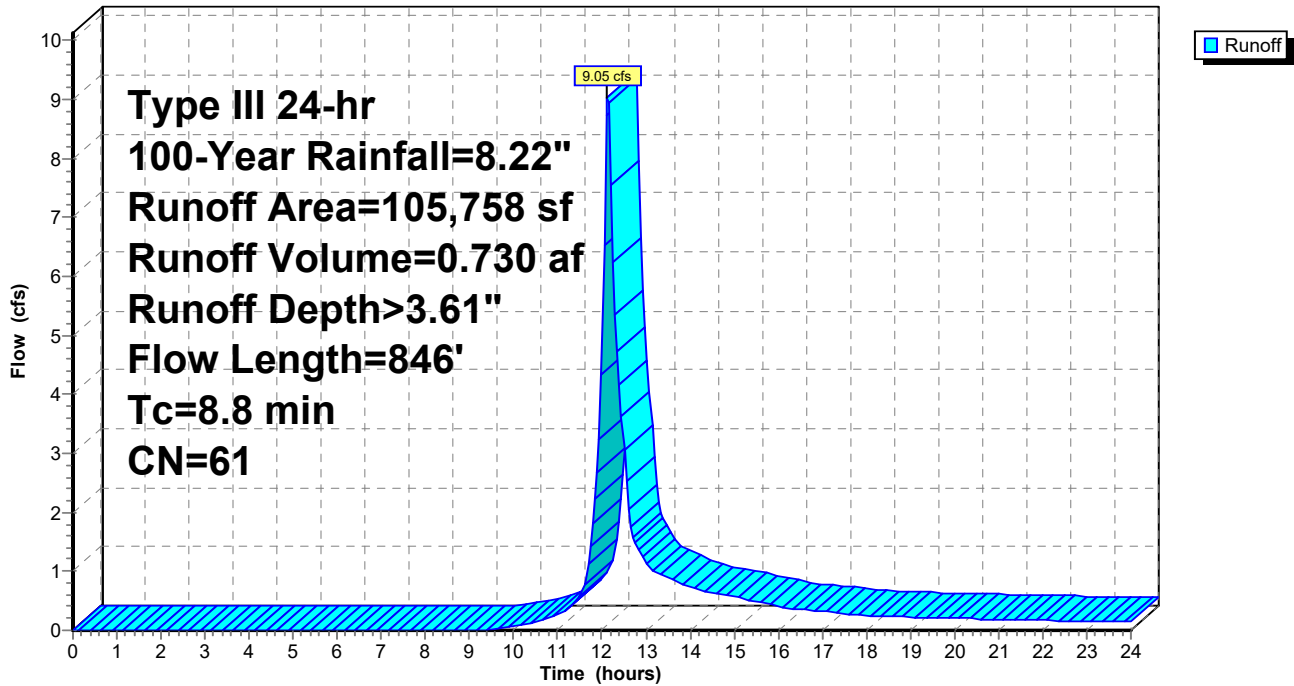
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 4,596	98	Roof, offsite
* 469	98	Pavement, offsite
* 14,347	39	>75% Grass cover, Good, HSG A, offsite
* 18,468	74	>75% Grass cover, Good, HSG C, offsite
* 2,779	30	Woods, Good, HSG A, offsite
* 25,141	70	Woods, Good, HSG C, offsite
* 2,093	98	Paved driveways
1,725	96	Gravel surface, HSG A
8,439	39	>75% Grass cover, Good, HSG A
247	74	>75% Grass cover, Good, HSG C
11,991	30	Woods, Good, HSG A
15,463	70	Woods, Good, HSG C
105,758	61	Weighted Average
98,600		93.23% Pervious Area
7,158		6.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.31		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.2	35	0.1200	2.42		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
3.6	419	0.1530	1.96		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.6	192	0.0780	1.95		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.7	150	0.0470	3.49		Shallow Concentrated Flow, Shallow Concentrated Flow Unpaved Kv= 16.1 fps
8.8	846	Total			

Subcatchment E-1: Drainage Area

Hydrograph



Summary for Subcatchment E-2: Drainage Area

Runoff = 4.48 cfs @ 12.26 hrs, Volume= 0.582 af, Depth> 1.34"
 Routed to Reach DP-2 : Design Point

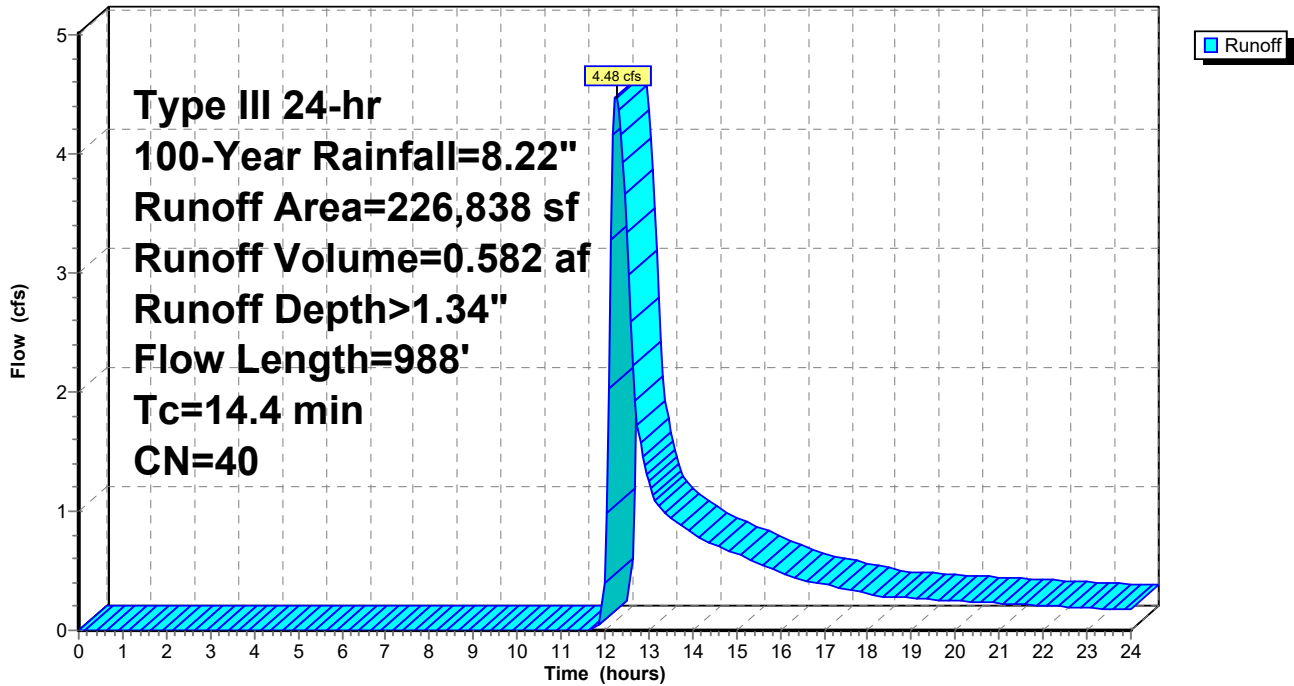
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,514	98	Roof, offsite
* 933	98	Pavement, offsite
* 14,045	39	>75% Grass cover, Good, HSG A, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 2,969	30	Woods, Good, HSG A, offsite
* 34,793	70	Woods, Good, HSG C, offsite
* 689	98	Roof
6,349	39	>75% Grass cover, Good, HSG A
151,705	30	Woods, Good, HSG A
9,441	70	Woods, Good, HSG C
226,838	40	Weighted Average
223,702		98.62% Pervious Area
3,136		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
8.9	938	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
14.4	988	Total			

Subcatchment E-2: Drainage Area

Hydrograph



Summary for Reach DP-1: Design Point

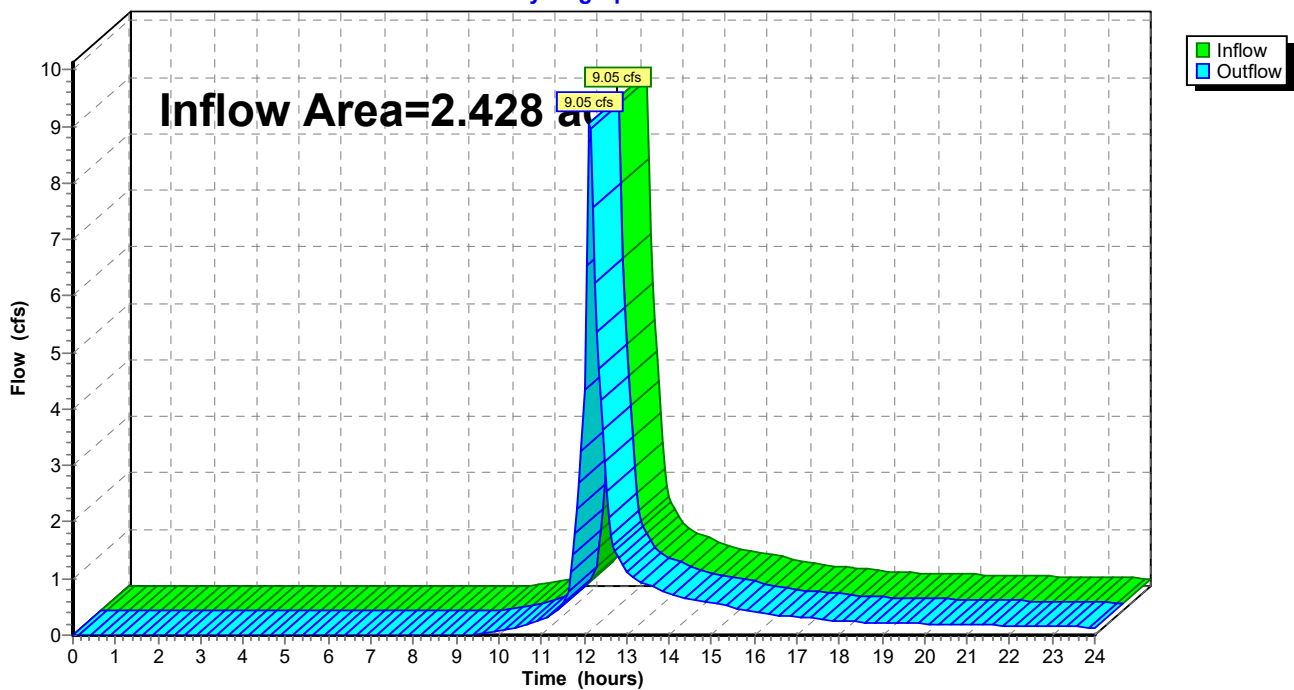
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.428 ac, 6.77% Impervious, Inflow Depth > 3.61" for 100-Year event
Inflow = 9.05 cfs @ 12.13 hrs, Volume= 0.730 af
Outflow = 9.05 cfs @ 12.13 hrs, Volume= 0.730 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point

Hydrograph



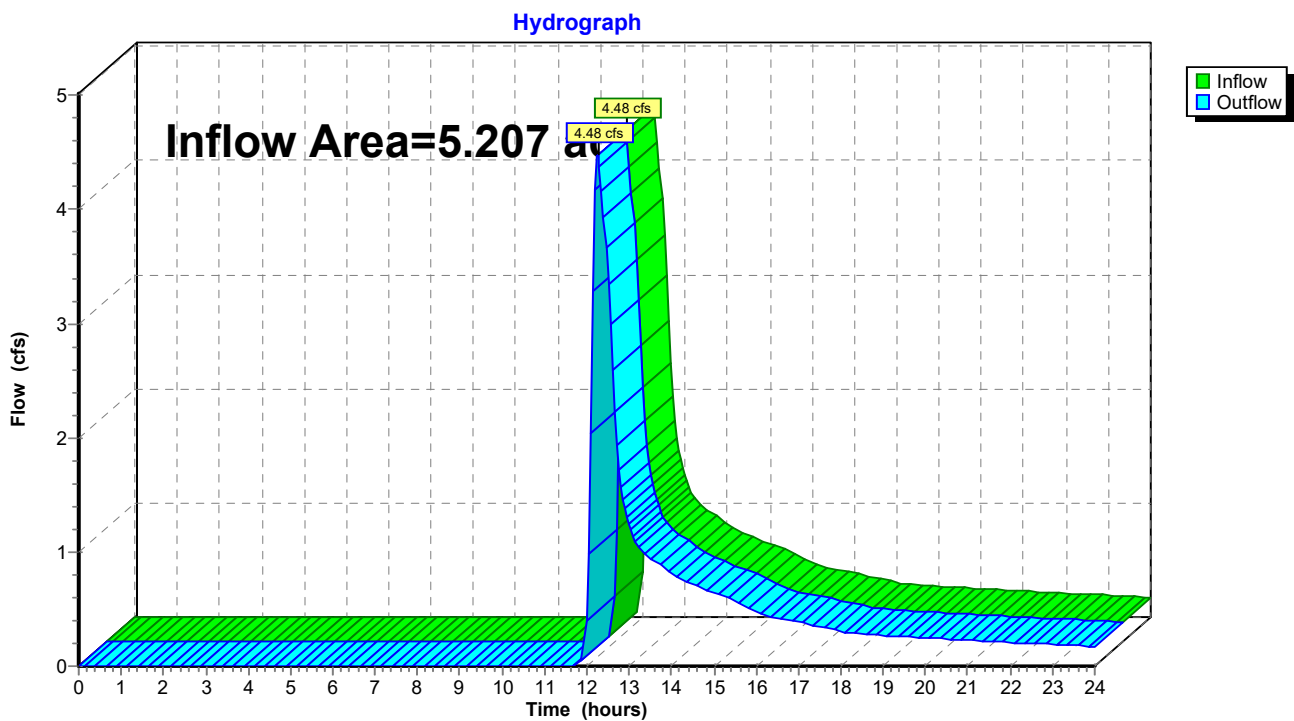
Summary for Reach DP-2: Design Point

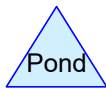
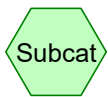
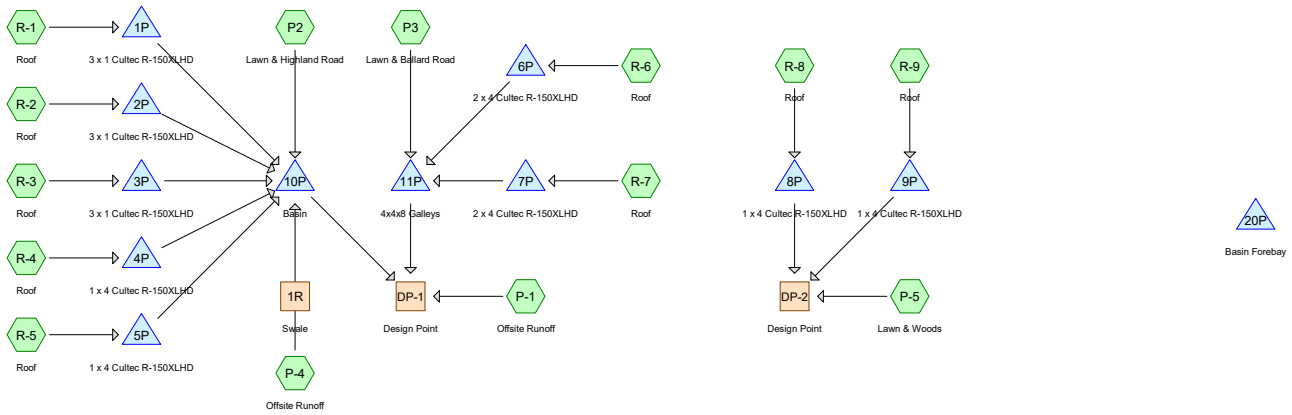
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.207 ac, 1.38% Impervious, Inflow Depth > 1.34" for 100-Year event
Inflow = 4.48 cfs @ 12.26 hrs, Volume= 0.582 af
Outflow = 4.48 cfs @ 12.26 hrs, Volume= 0.582 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point





Routing Diagram for Post Dev Hydrocad Report
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.366	39	>75% Grass cover, Good, HSG A (P-1, P-5, P2, P3)
0.850	39	>75% Grass cover, Good, HSG A, offsite (P-1, P3)
0.436	74	>75% Grass cover, Good, HSG C (P-1, P2)
0.570	74	>75% Grass cover, Good, HSG C, offsite (P-1, P-4)
0.937	98	Paved driveways (P-1, P2, P3)
0.032	98	Pavement, offsite (P-4, P3)
0.400	98	Roof (R-1, R-2, R-3, R-4, R-5, R-6, R-7, R-8, R-9)
0.140	98	Roof, offsite (P-1, P-4, P3)
0.327	30	Woods, Good, HSG A (P-1, P-5, P3)
0.246	30	Woods, Good, HSG A, offsite (P-4, P3)
1.331	70	Woods, Good, HSG C, offsite (P-1, P-4)
7.635	60	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.789	HSG A	P-1, P-4, P-5, P2, P3
0.000	HSG B	
2.337	HSG C	P-1, P-4, P2
0.000	HSG D	
1.509	Other	P-1, P-4, P2, P3, R-1, R-2, R-3, R-4, R-5, R-6, R-7, R-8, R-9
7.635		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.216	0.000	1.006	0.000	0.000	4.222	>75% Grass cover, Good	P-1, P-4, P-5, P2, P3
0.000	0.000	0.000	0.000	0.937	0.937	Paved driveways	P-1, P2, P3
0.000	0.000	0.000	0.000	0.032	0.032	Pavement, offsite	P-4, P3
0.000	0.000	0.000	0.000	0.400	0.400	Roof	R-1, R-2, R-3, R-4, R-5, R-6, R-7, R-8, R-9
0.000	0.000	0.000	0.000	0.140	0.140	Roof, offsite	P-1, P-4, P3
0.573	0.000	1.331	0.000	0.000	1.904	Woods, Good	P-1, P-4, P-5, P3
3.789	0.000	2.337	0.000	1.509	7.635	TOTAL AREA	

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Type III 24-hr 2-Year Rainfall=3.34"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P-1: Offsite Runoff	Runoff Area=67,182 sf 6.98% Impervious Runoff Depth>0.67" Flow Length=361' Tc=9.4 min CN=65 Runoff=0.86 cfs 0.086 af
Subcatchment P-4: Offsite Runoff	Runoff Area=46,024 sf 5.71% Impervious Runoff Depth>0.96" Flow Length=278' Tc=7.7 min CN=71 Runoff=1.02 cfs 0.085 af
Subcatchment P-5: Lawn & Woods	Runoff Area=31,616 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=36 Runoff=0.00 cfs 0.000 af
Subcatchment P2: Lawn & Highland Road	Runoff Area=94,674 sf 23.94% Impervious Runoff Depth>0.39" Flow Length=338' Tc=6.9 min CN=58 Runoff=0.50 cfs 0.071 af
Subcatchment P3: Lawn & Ballard Road	Runoff Area=75,676 sf 24.23% Impervious Runoff Depth>0.21" Flow Length=356' Tc=11.2 min CN=52 Runoff=0.12 cfs 0.030 af
Subcatchment R-1: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Subcatchment R-2: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Subcatchment R-3: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Subcatchment R-4: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Subcatchment R-5: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Subcatchment R-6: Roof	Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.18 cfs 0.015 af
Subcatchment R-7: Roof	Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.18 cfs 0.015 af
Subcatchment R-8: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Subcatchment R-9: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>3.11" Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af
Reach 1R: Swale	Avg. Flow Depth=0.00' Max Vel=0.00 fps n=0.030 L=114.0' S=0.0702 '/' Capacity=58.68 cfs Outflow=0.00 cfs 0.000 af
Reach DP-1: Design Point	Inflow=0.86 cfs 0.086 af Outflow=0.86 cfs 0.086 af

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Type III 24-hr 2-Year Rainfall=3.34"

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Reach DP-2: Design Point Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: 3 x 1 Cultec R-150XLHD Peak Elev=230.83' Storage=83 cf Inflow=0.13 cfs 0.011 af
Discarded=0.04 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.011 af

Pond 2P: 3 x 1 Cultec R-150XLHD Peak Elev=233.83' Storage=83 cf Inflow=0.13 cfs 0.011 af
Discarded=0.04 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.011 af

Pond 3P: 3 x 1 Cultec R-150XLHD Peak Elev=237.82' Storage=82 cf Inflow=0.13 cfs 0.011 af
Discarded=0.04 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.011 af

Pond 4P: 1 x 4 Cultec R-150XLHD Peak Elev=222.39' Storage=165 cf Inflow=0.13 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Pond 5P: 1 x 4 Cultec R-150XLHD Peak Elev=222.39' Storage=165 cf Inflow=0.13 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Pond 6P: 2 x 4 Cultec R-150XLHD Peak Elev=225.07' Storage=216 cf Inflow=0.18 cfs 0.015 af
Discarded=0.02 cfs 0.015 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.015 af

Pond 7P: 2 x 4 Cultec R-150XLHD Peak Elev=206.07' Storage=217 cf Inflow=0.18 cfs 0.015 af
Discarded=0.02 cfs 0.015 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.015 af

Pond 8P: 1 x 4 Cultec R-150XLHD Peak Elev=194.39' Storage=165 cf Inflow=0.13 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Pond 9P: 1 x 4 Cultec R-150XLHD Peak Elev=198.39' Storage=165 cf Inflow=0.13 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Pond 10P: Basin Peak Elev=210.83' Storage=2,833 cf Inflow=1.48 cfs 0.155 af
Discarded=0.14 cfs 0.131 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.131 af

Pond 11P: 4x4x8 Galleys Peak Elev=187.77' Storage=56 cf Inflow=0.12 cfs 0.030 af
Discarded=0.09 cfs 0.030 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.030 af

Pond 20P: Basin Forebay Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 7.635 ac Runoff Volume = 0.375 af Average Runoff Depth = 0.59"
80.23% Pervious = 6.126 ac 19.77% Impervious = 1.509 ac

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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Subcatchment P-1: Offsite Runoff

Runoff = 0.86 cfs @ 12.16 hrs, Volume= 0.086 af, Depth> 0.67"

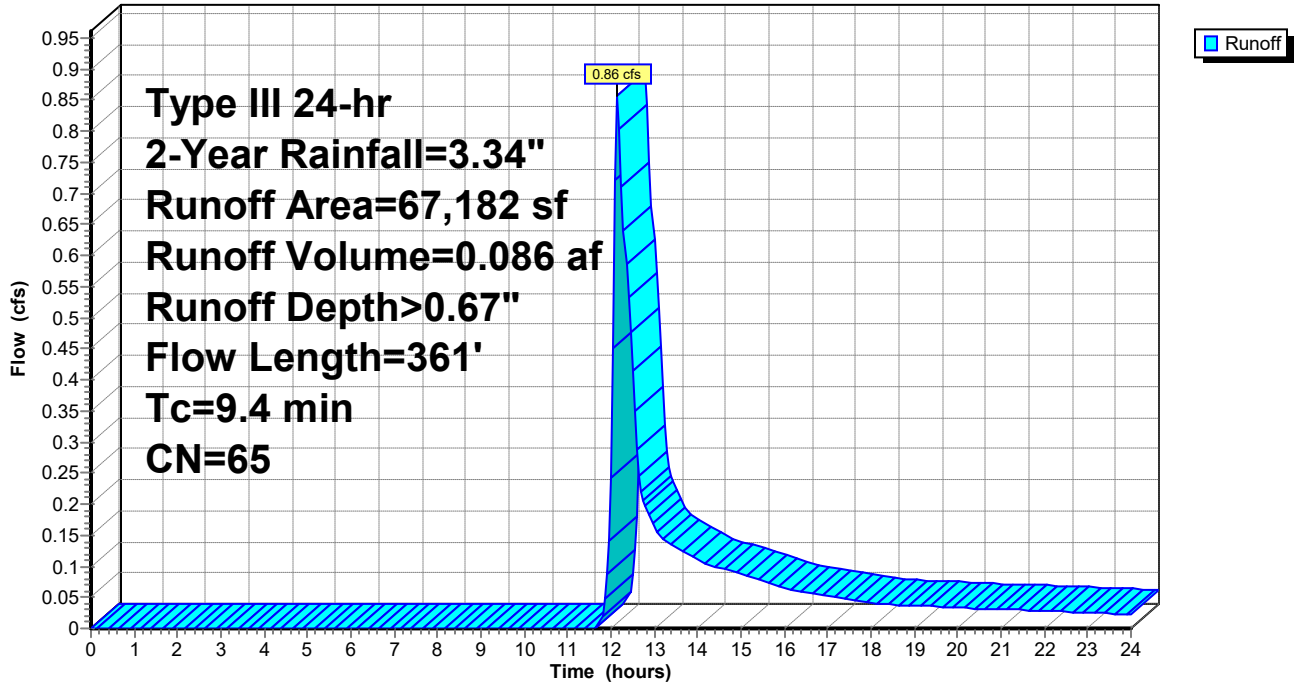
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 2,729	98	Roof, offsite
* 14,859	39	>75% Grass cover, Good, HSG A, offsite
* 20,436	74	>75% Grass cover, Good, HSG C, offsite
* 20,439	70	Woods, Good, HSG C, offsite
* 1,960	98	Paved driveways
777	39	>75% Grass cover, Good, HSG A
4,674	74	>75% Grass cover, Good, HSG C
1,308	30	Woods, Good, HSG A
67,182	65	Weighted Average
62,493		93.02% Pervious Area
4,689		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	17	0.0100	0.09		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
0.5	10	0.3300	0.34		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
4.0	23	0.0650	0.09		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.34"
0.2	14	0.0710	1.33		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.3	217	0.1500	2.71		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0375	3.93		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
9.4	361	Total			

Subcatchment P-1: Offsite Runoff

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Subcatchment P-4: Offsite Runoff

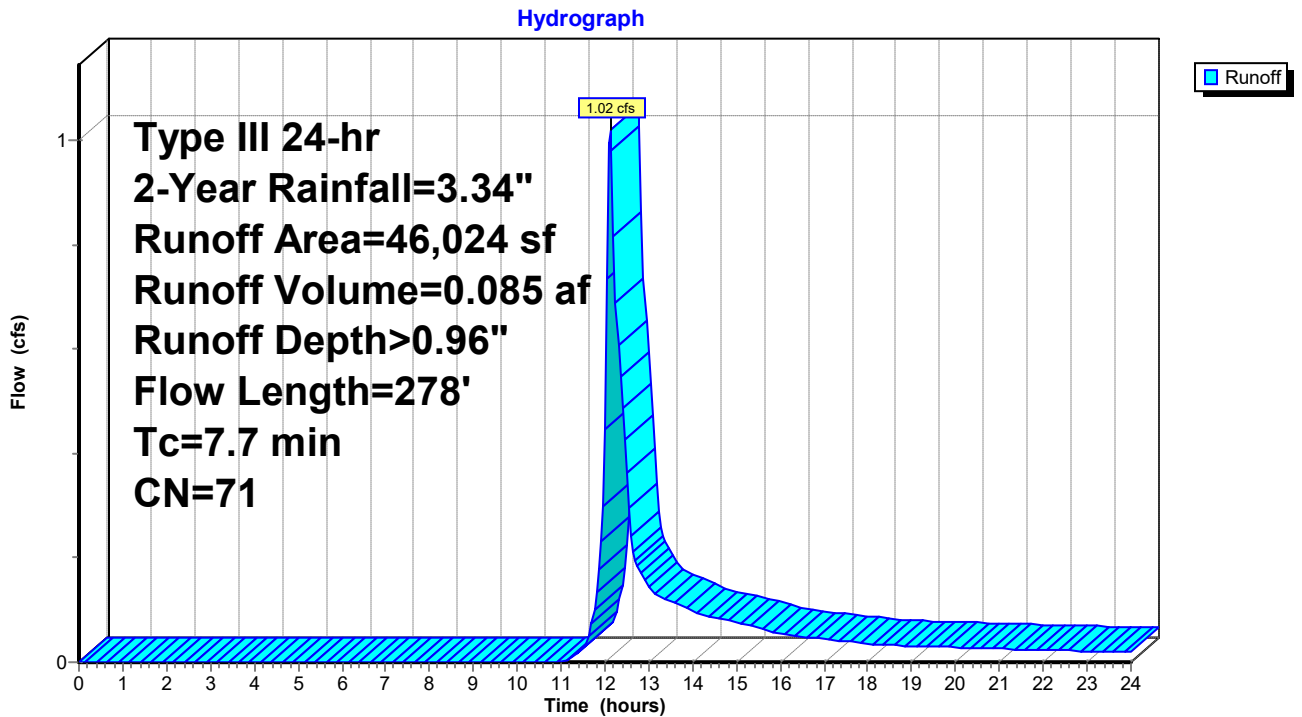
Runoff = 1.02 cfs @ 12.12 hrs, Volume= 0.085 af, Depth> 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,694	98	Roof, offsite
* 933	98	Pavement, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 1,470	30	Woods, Good, HSG A, offsite
* 37,527	70	Woods, Good, HSG C, offsite
46,024	71	Weighted Average
43,397		94.29% Pervious Area
2,627		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
2.2	228	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
7.7	278	Total			

Subcatchment P-4: Offsite Runoff



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Subcatchment P-5: Lawn & Woods

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

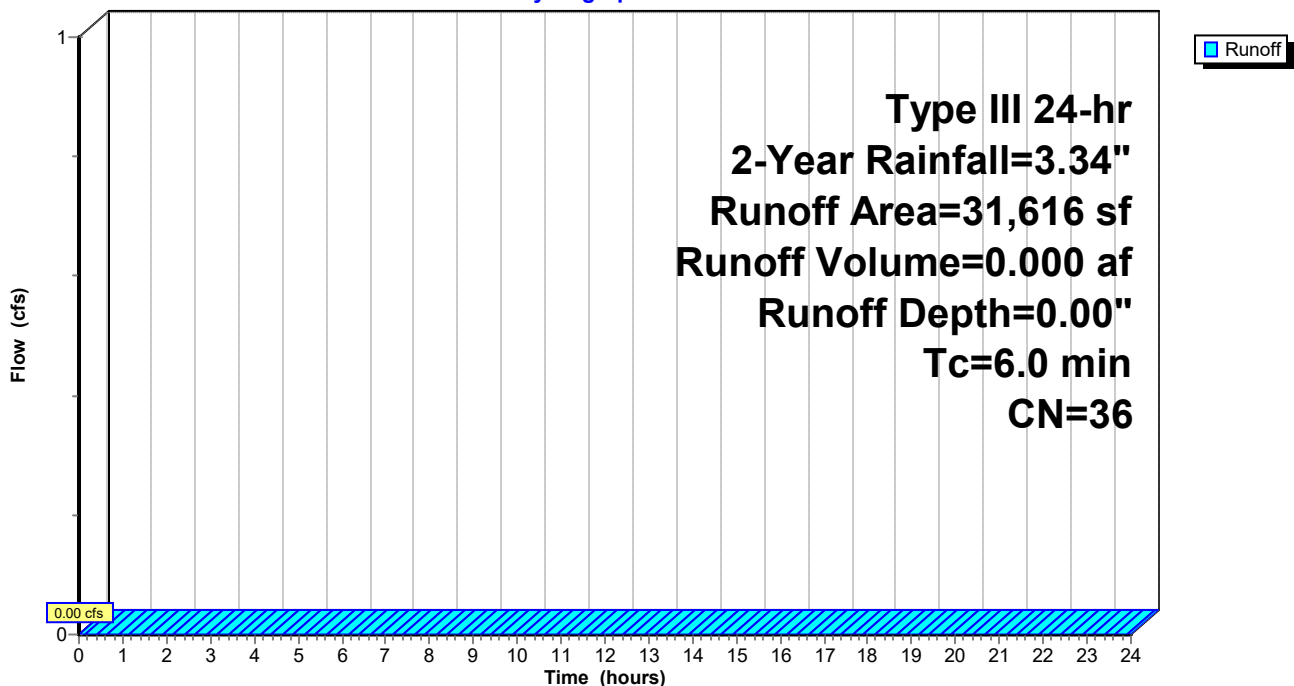
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
*	0	98 Roof, offsite
*	0	98 Pavement, offsite
*	0	39 >75% Grass cover, Good, HSG A, offsite
*	0	74 >75% Grass cover, Good, HSG C, offsite
*	0	30 Woods, Good, HSG A, offsite
*	0	70 Woods, Good, HSG C, offsite
*	0	98 Roof
*	0	98 Paved driveways
22,623	39	>75% Grass cover, Good, HSG A
8,993	30	Woods, Good, HSG A
0	70	Woods, Good, HSG C
31,616	36	Weighted Average
31,616		100.00% Pervious Area

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

Subcatchment P-5: Lawn & Woods

Hydrograph



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Summary for Subcatchment P2: Lawn & Highland Road

Runoff = 0.50 cfs @ 12.17 hrs, Volume= 0.071 af, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 22,666	98	Paved driveways
57,693	39	>75% Grass cover, Good, HSG A
14,315	74	>75% Grass cover, Good, HSG C
94,674	58	Weighted Average
72,008		76.06% Pervious Area
22,666		23.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.4	23	0.0200	0.99		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.8	153	0.0260	3.27		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.2	112	0.0400	10.72	8.42	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
6.9	338	Total			

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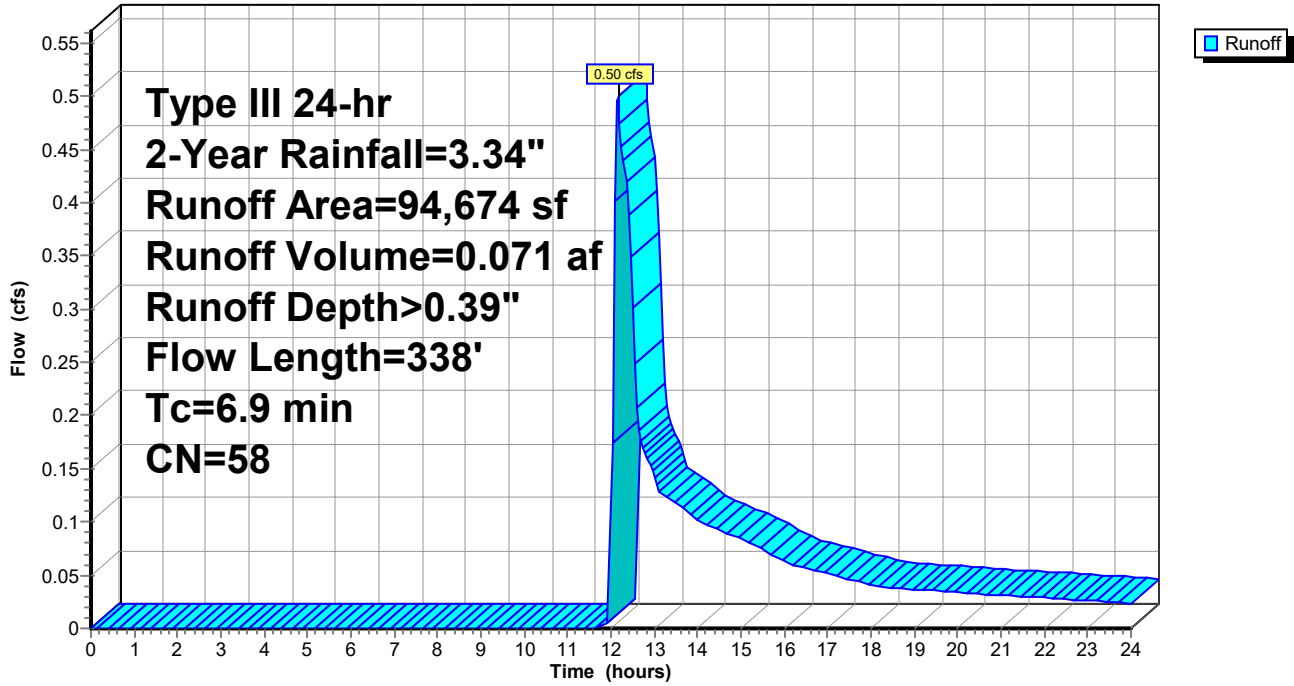
Type III 24-hr 2-Year Rainfall=3.34"

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Subcatchment P2: Lawn & Highland Road

Hydrograph



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Summary for Subcatchment P3: Lawn & Ballard Road

Runoff = 0.12 cfs @ 12.46 hrs, Volume= 0.030 af, Depth> 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,687	98	Roof, offsite
* 469	98	Pavement, offsite
* 22,183	39	>75% Grass cover, Good, HSG A, offsite
* 9,255	30	Woods, Good, HSG A, offsite
* 16,183	98	Paved driveways
21,959	39	>75% Grass cover, Good, HSG A
3,940	30	Woods, Good, HSG A
75,676	52	Weighted Average
57,337		75.77% Pervious Area
18,339		24.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		Sheet Flow, TC up until 50' length Woods: Light underbrush n= 0.400 P2= 3.34"
2.4	101	0.0200	0.71		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
0.7	120	0.0200	2.87		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.3	85	0.0100	5.36	4.21	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
11.2	356	Total			

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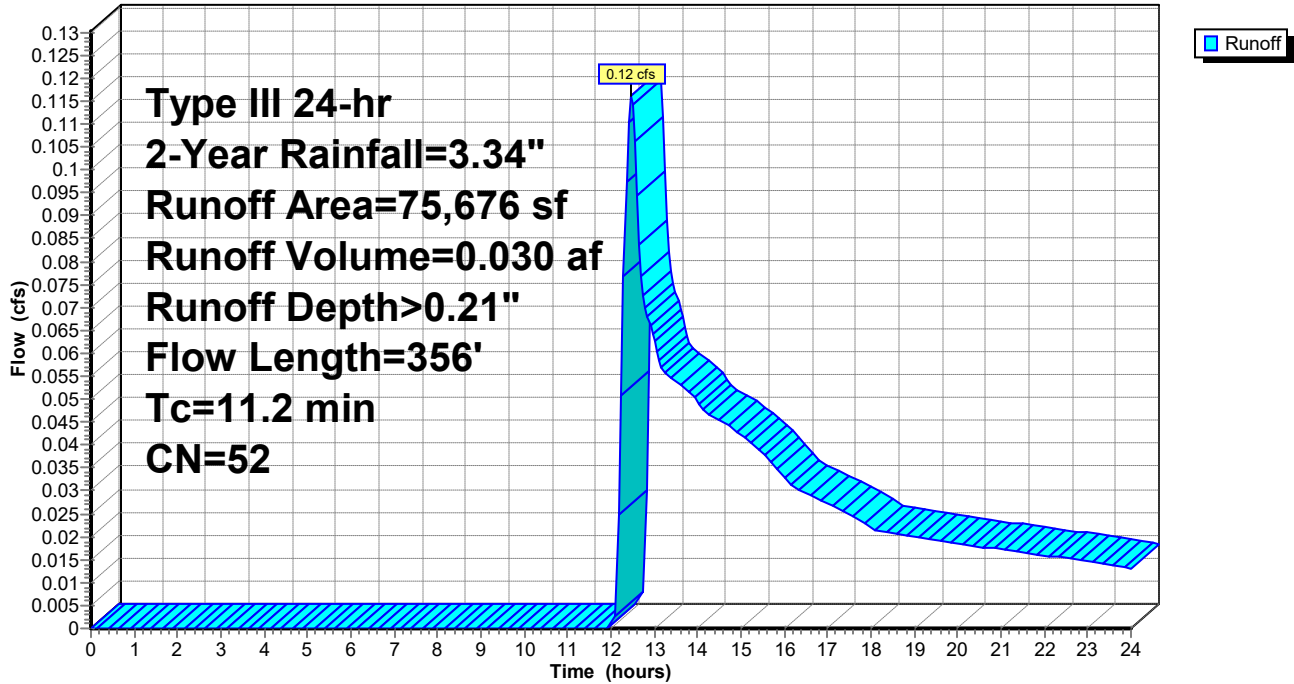
Type III 24-hr 2-Year Rainfall=3.34"

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Subcatchment P3: Lawn & Ballard Road

Hydrograph



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Summary for Subcatchment R-1: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

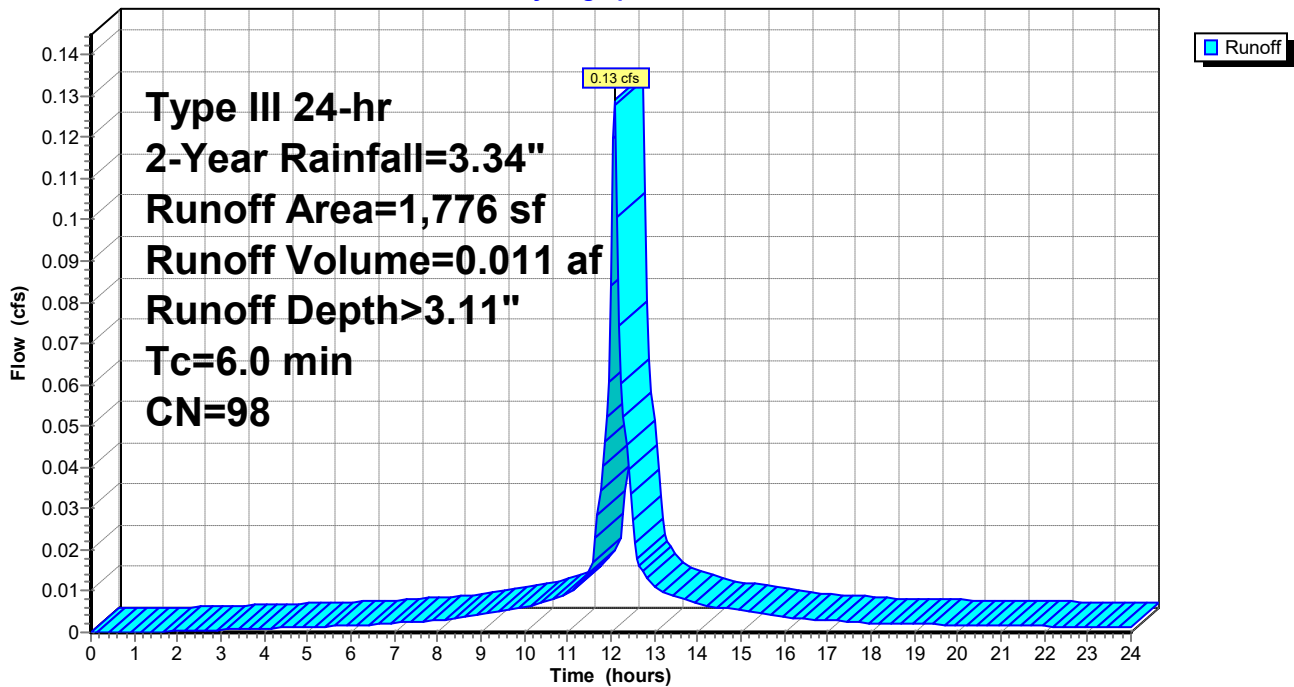
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-1: Roof

Hydrograph



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Summary for Subcatchment R-2: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

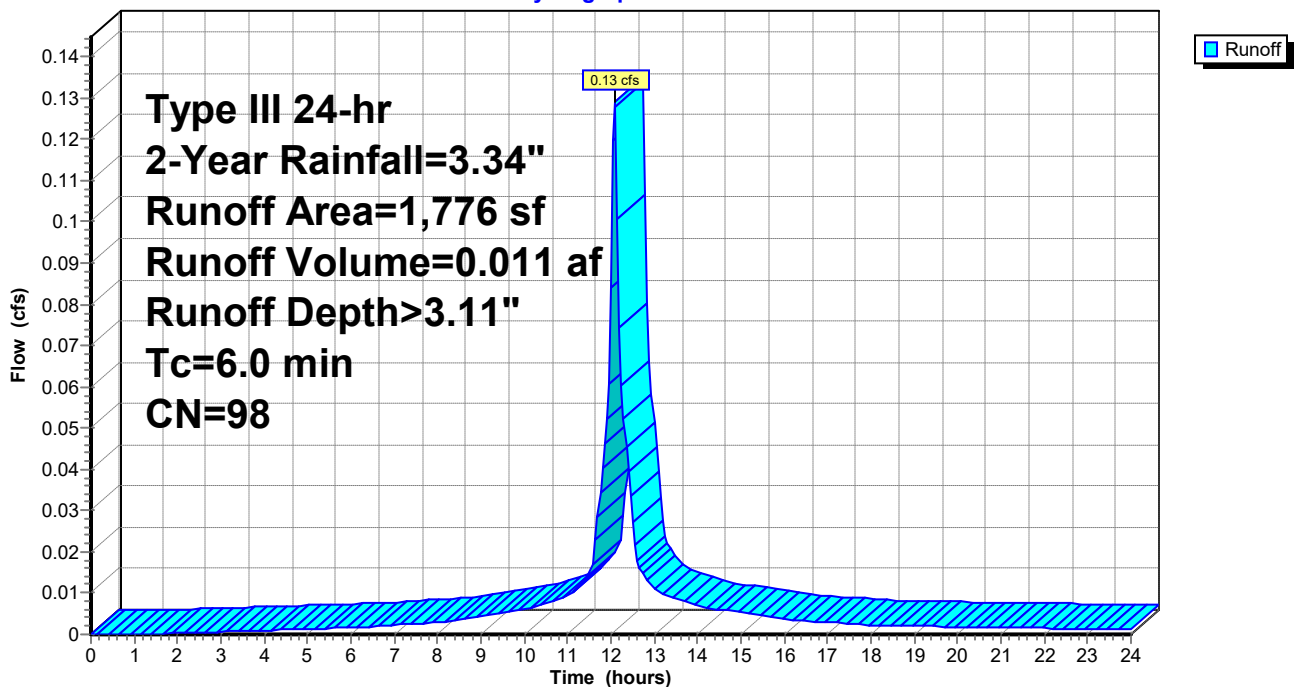
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-2: Roof

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Subcatchment R-3: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

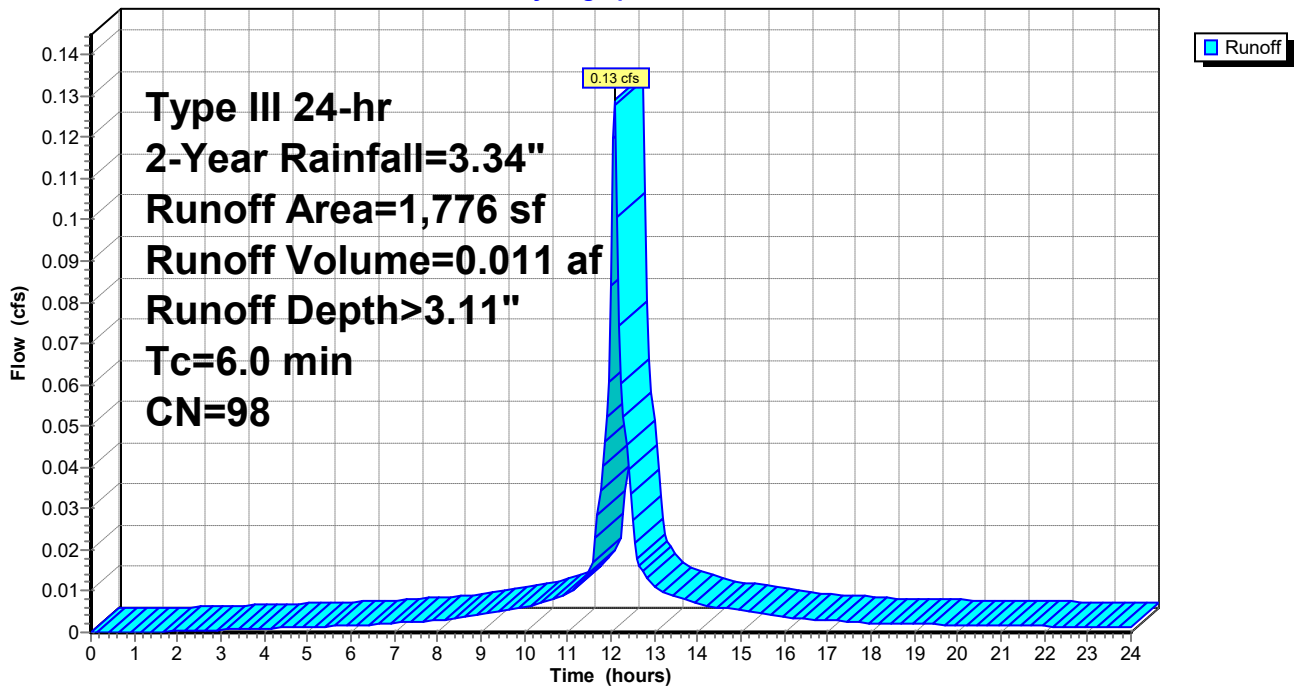
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-3: Roof

Hydrograph



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Summary for Subcatchment R-4: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

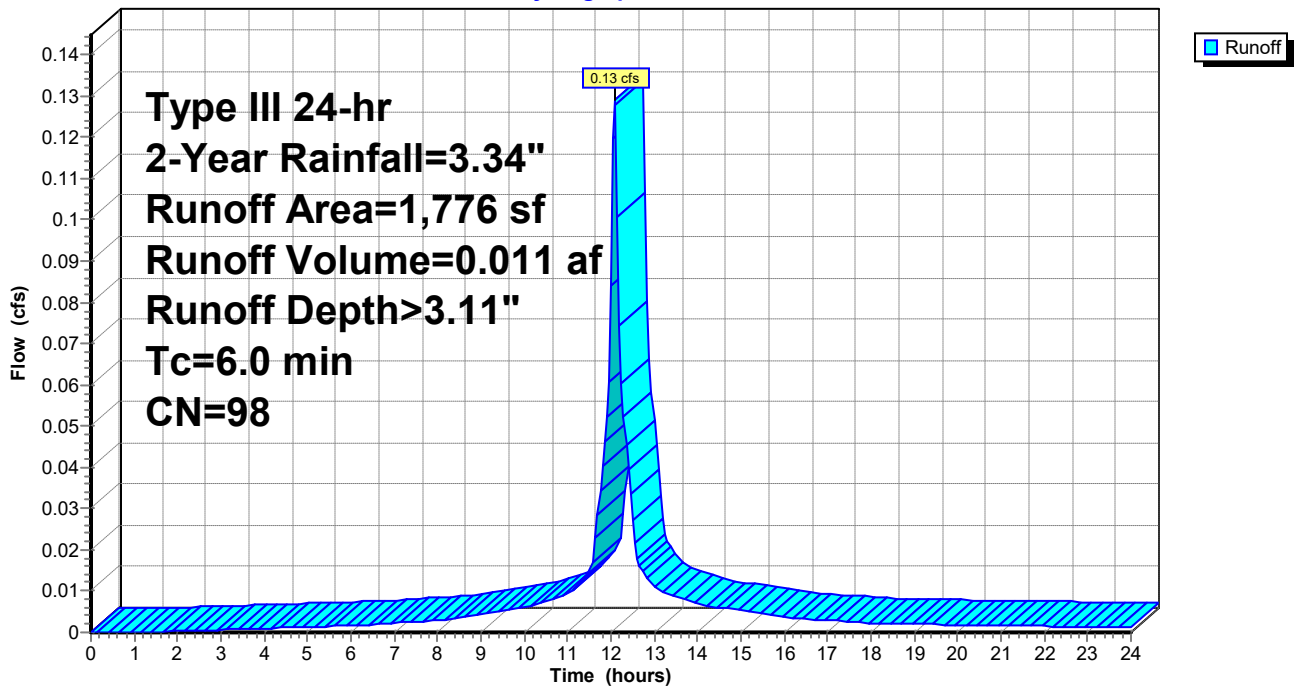
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-4: Roof

Hydrograph



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Summary for Subcatchment R-5: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

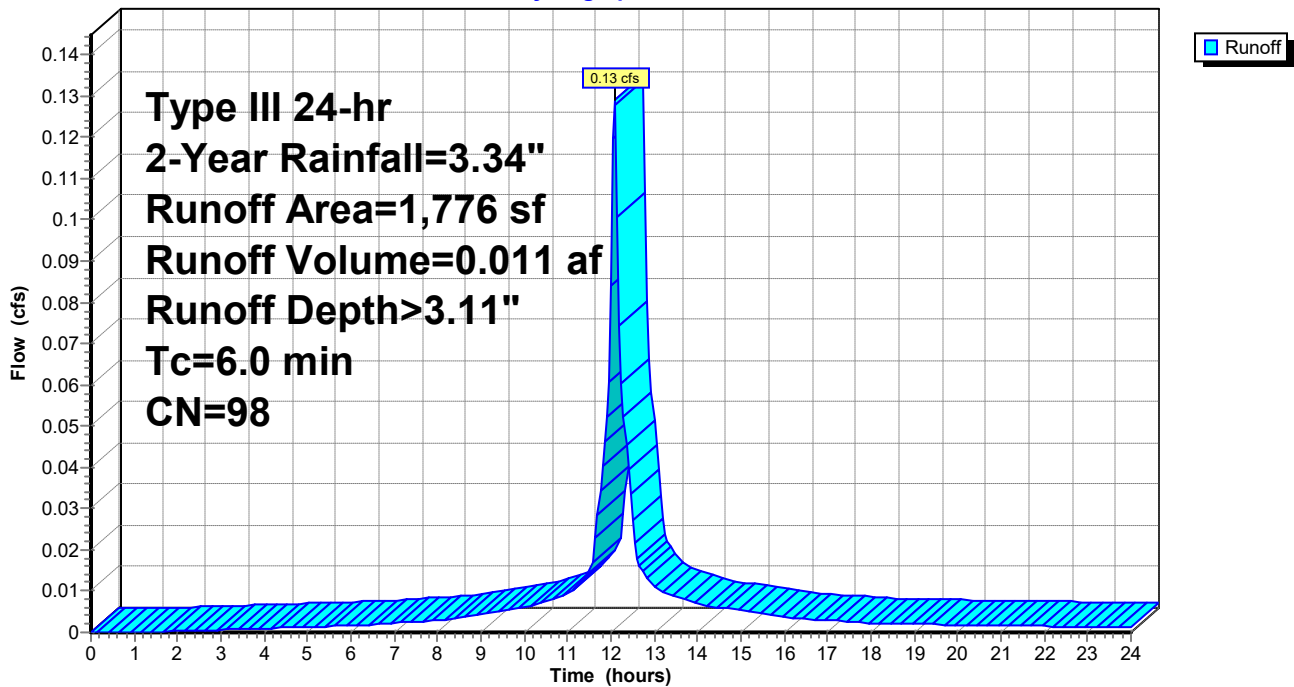
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-5: Roof

Hydrograph



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Summary for Subcatchment R-6: Roof

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af, Depth> 3.11"

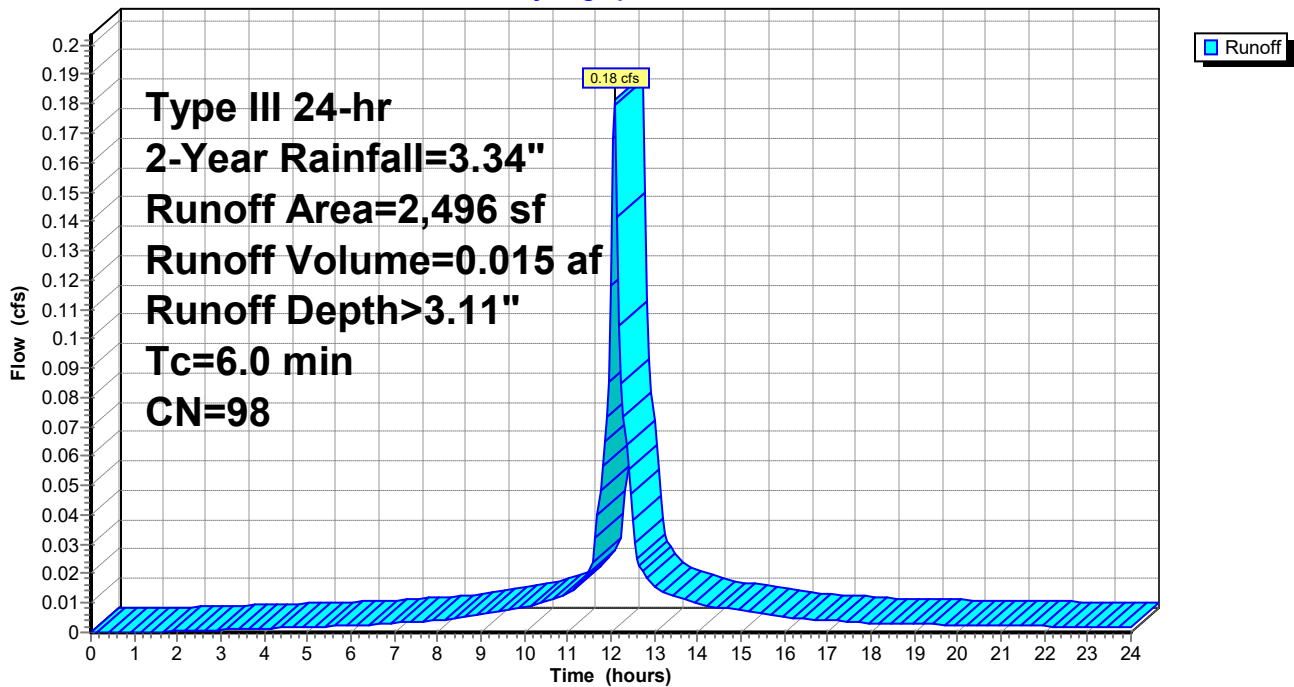
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-6: Roof

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Subcatchment R-7: Roof

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af, Depth> 3.11"

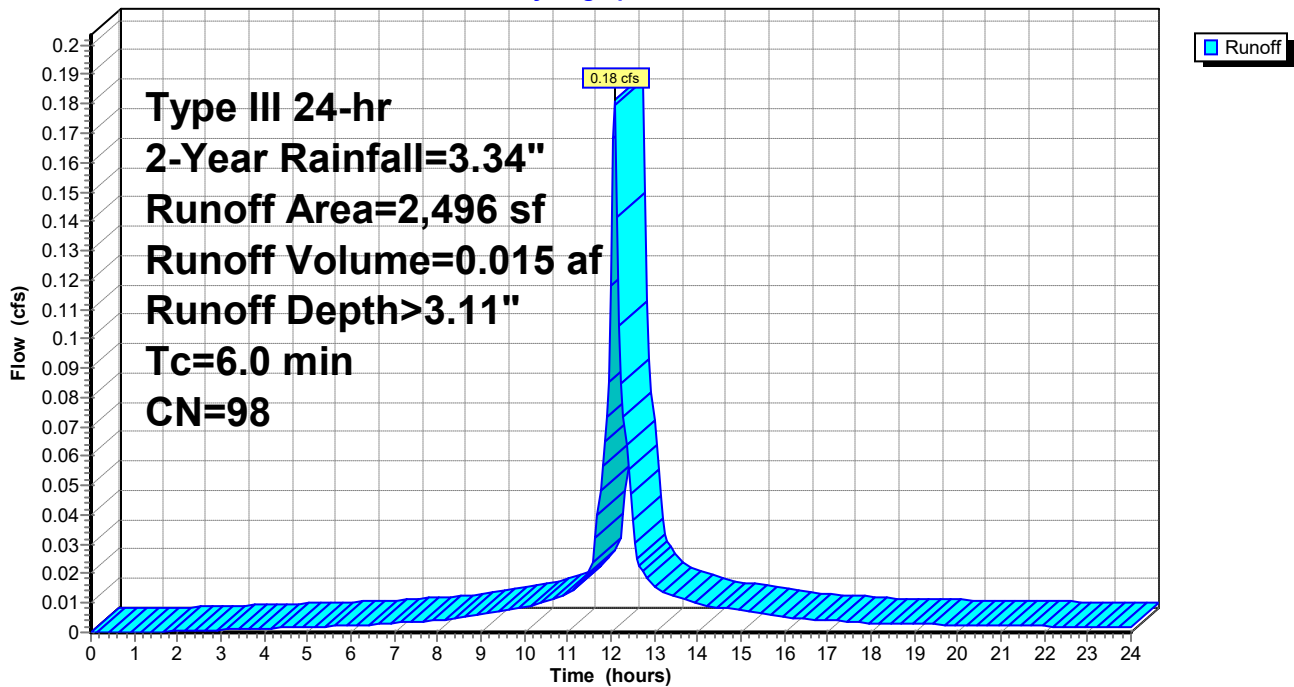
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-7: Roof

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Subcatchment R-8: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

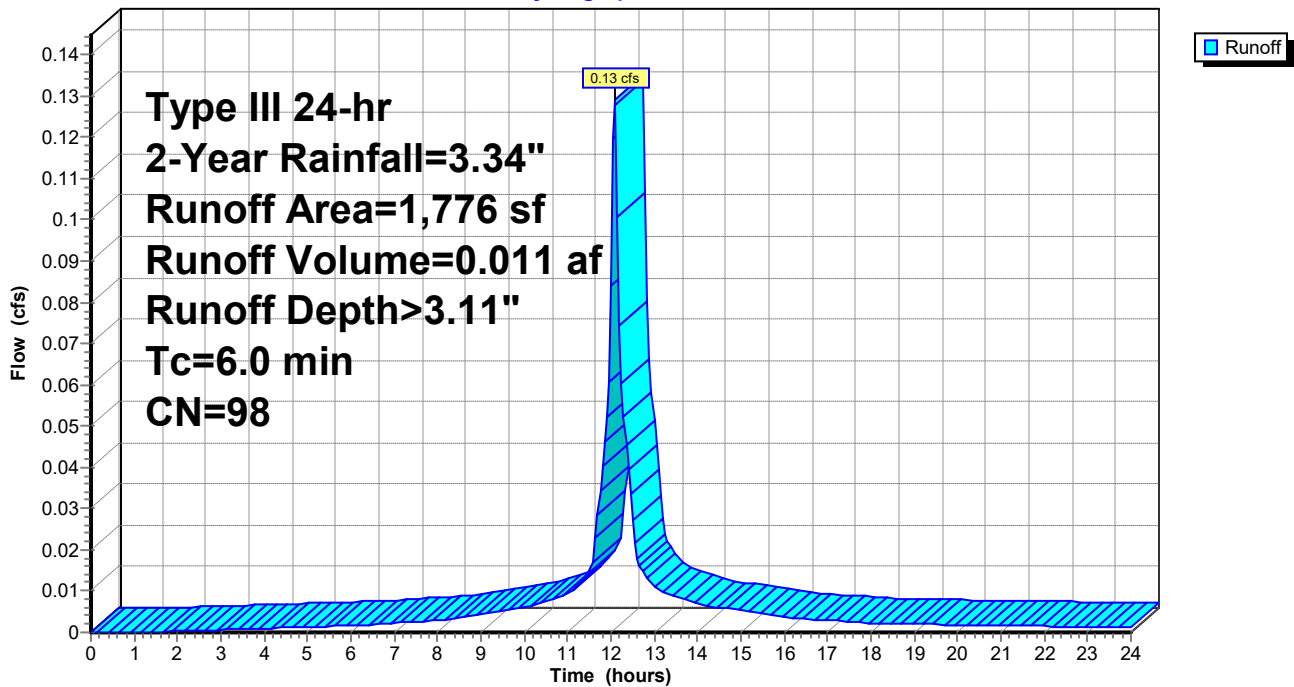
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-8: Roof

Hydrograph



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Summary for Subcatchment R-9: Roof

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 3.11"

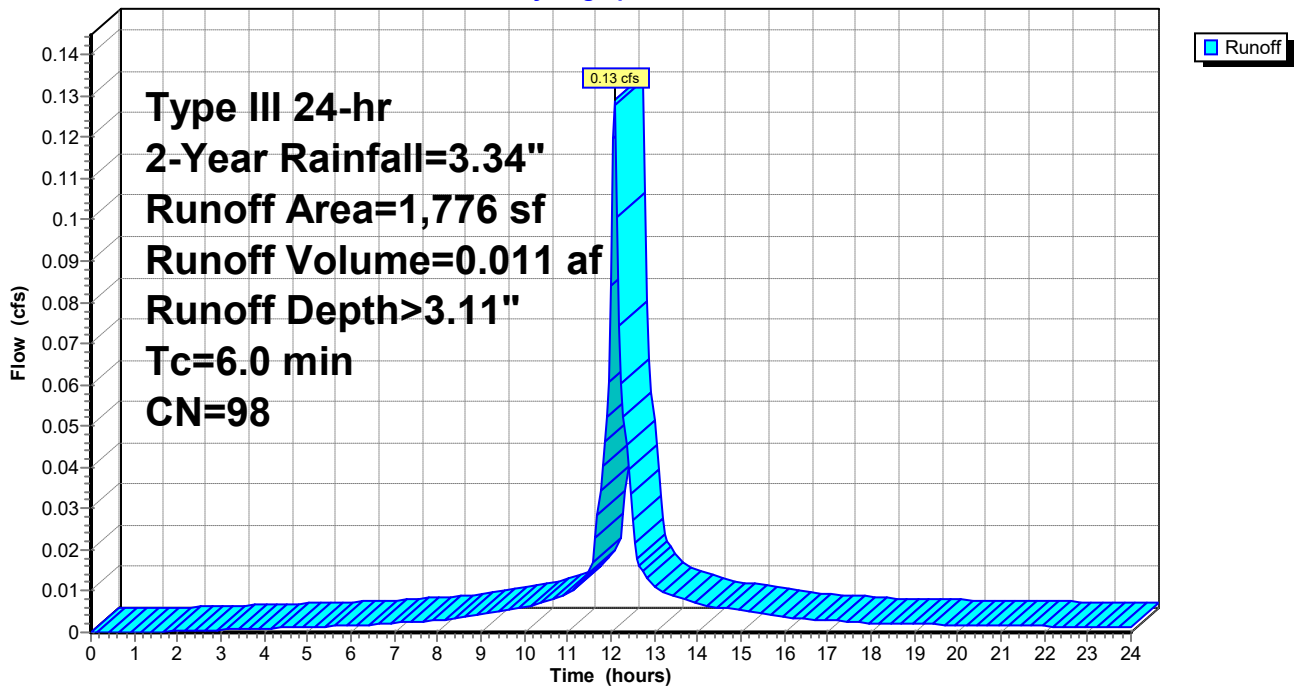
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.34"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-9: Roof

Hydrograph



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Summary for Reach 1R: Swale

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 58.68 cfs

3.00' x 1.00' deep channel, n= 0.030

Side Slope Z-value= 3.0 '/' Top Width= 9.00'

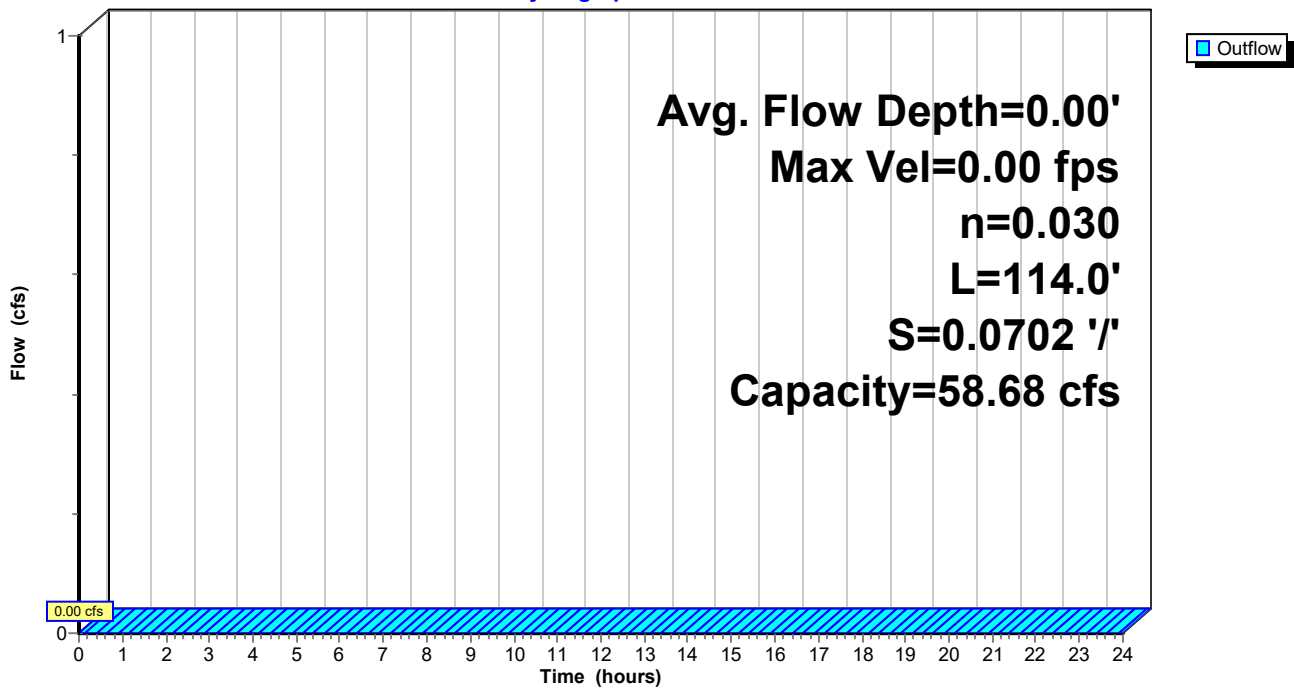
Length= 114.0' Slope= 0.0702 '/'

Inlet Invert= 261.00', Outlet Invert= 253.00'



Reach 1R: Swale

Hydrograph



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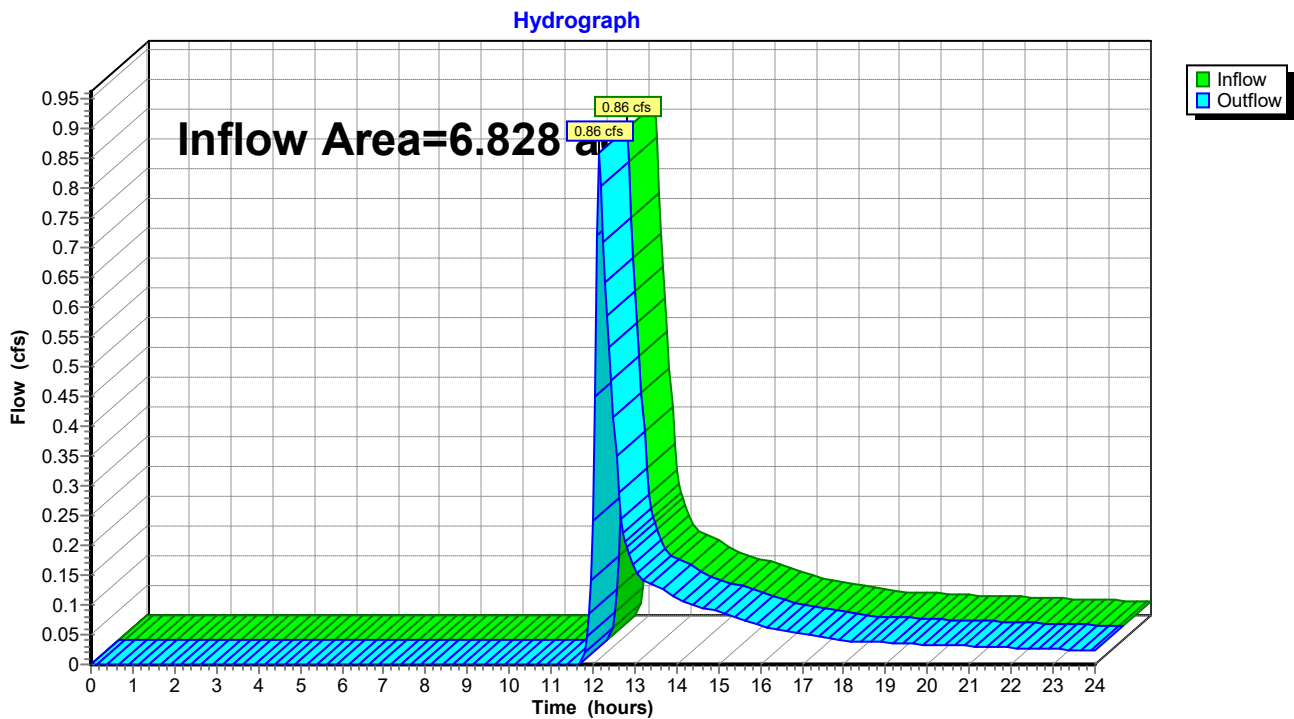
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Summary for Reach DP-1: Design Point

Inflow Area = 6.828 ac, 20.91% Impervious, Inflow Depth > 0.15" for 2-Year event
Inflow = 0.86 cfs @ 12.16 hrs, Volume= 0.086 af
Outflow = 0.86 cfs @ 12.16 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



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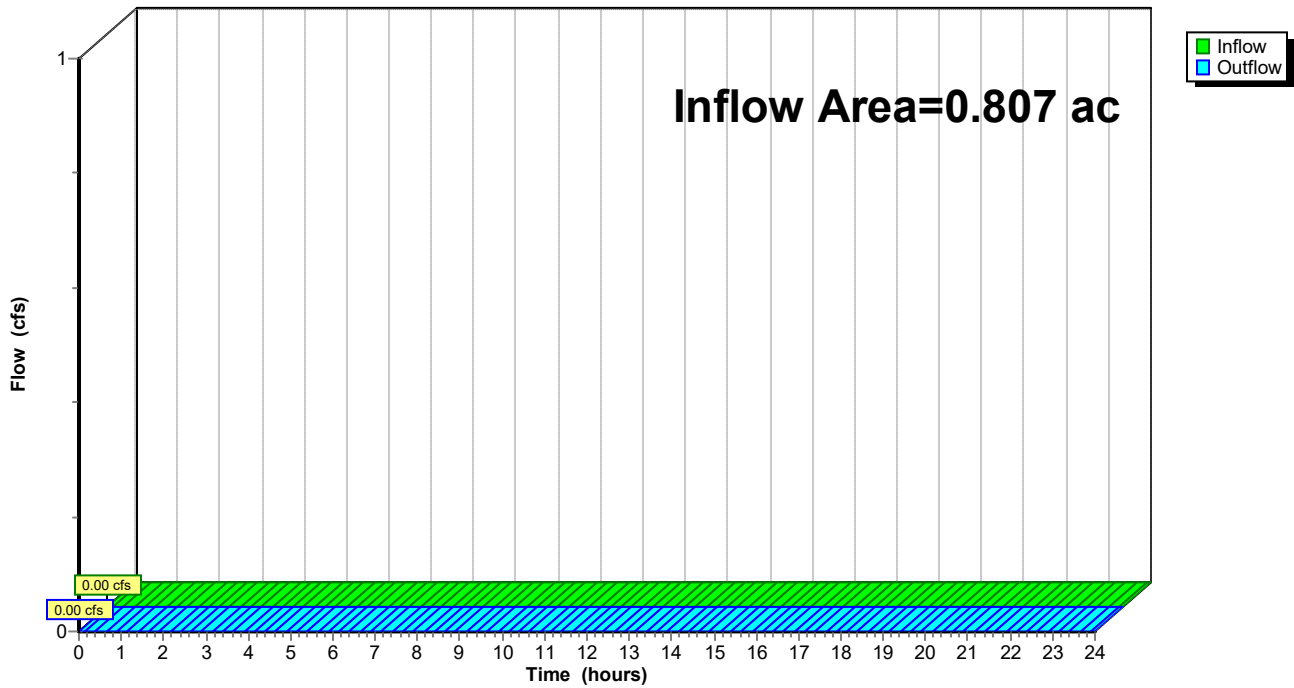
Summary for Reach DP-2: Design Point

Inflow Area = 0.807 ac, 10.10% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

Hydrograph



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Summary for Pond 1P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.04 cfs @ 11.85 hrs, Volume= 0.011 af, Atten= 72%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.85 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 230.83' @ 12.43 hrs Surf.Area= 189 sf Storage= 83 cf

Plug-Flow detention time= 11.6 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 11.3 min (766.3 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	230.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	230.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	232.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.04	1	0	0
237.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	236.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.85 hrs HW=230.09' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=230.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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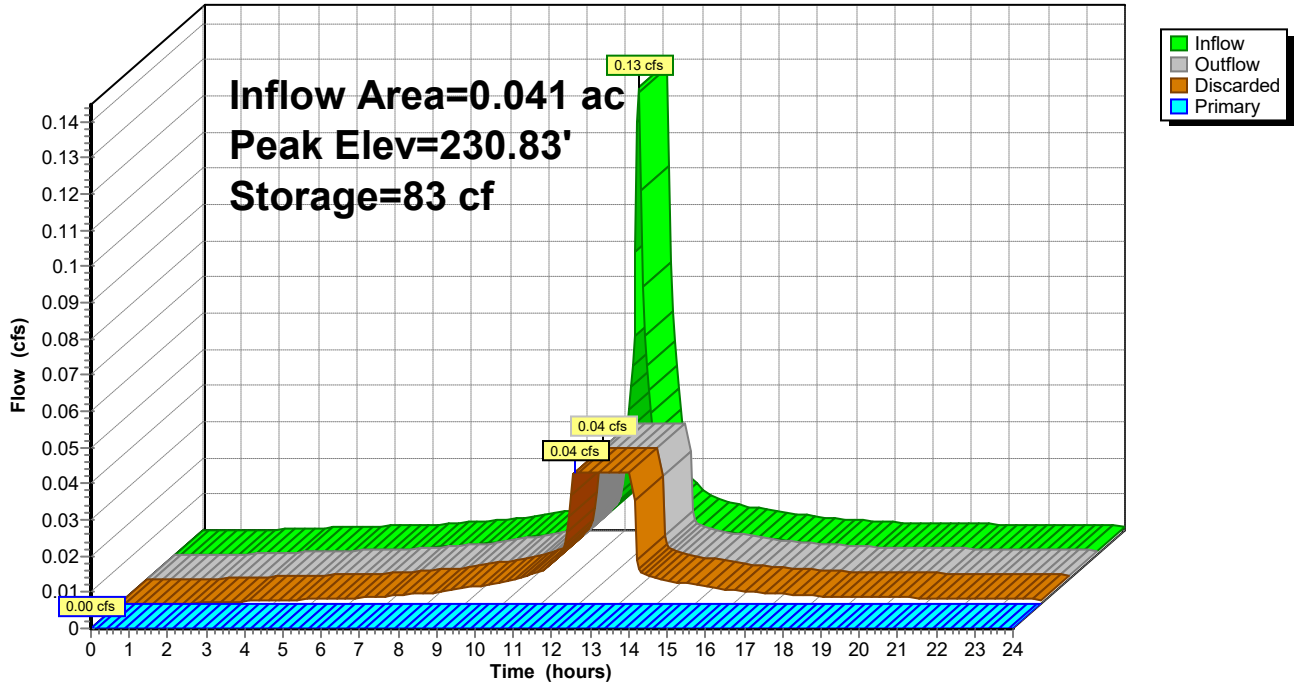
Type III 24-hr 2-Year Rainfall=3.34"

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Pond 1P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Pond 2P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.04 cfs @ 11.85 hrs, Volume= 0.011 af, Atten= 72%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.85 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 233.83' @ 12.43 hrs Surf.Area= 189 sf Storage= 83 cf

Plug-Flow detention time= 11.6 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 11.3 min (766.3 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	233.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	233.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	235.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.04	1	0	0
240.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	233.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	239.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.85 hrs HW=233.09' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=233.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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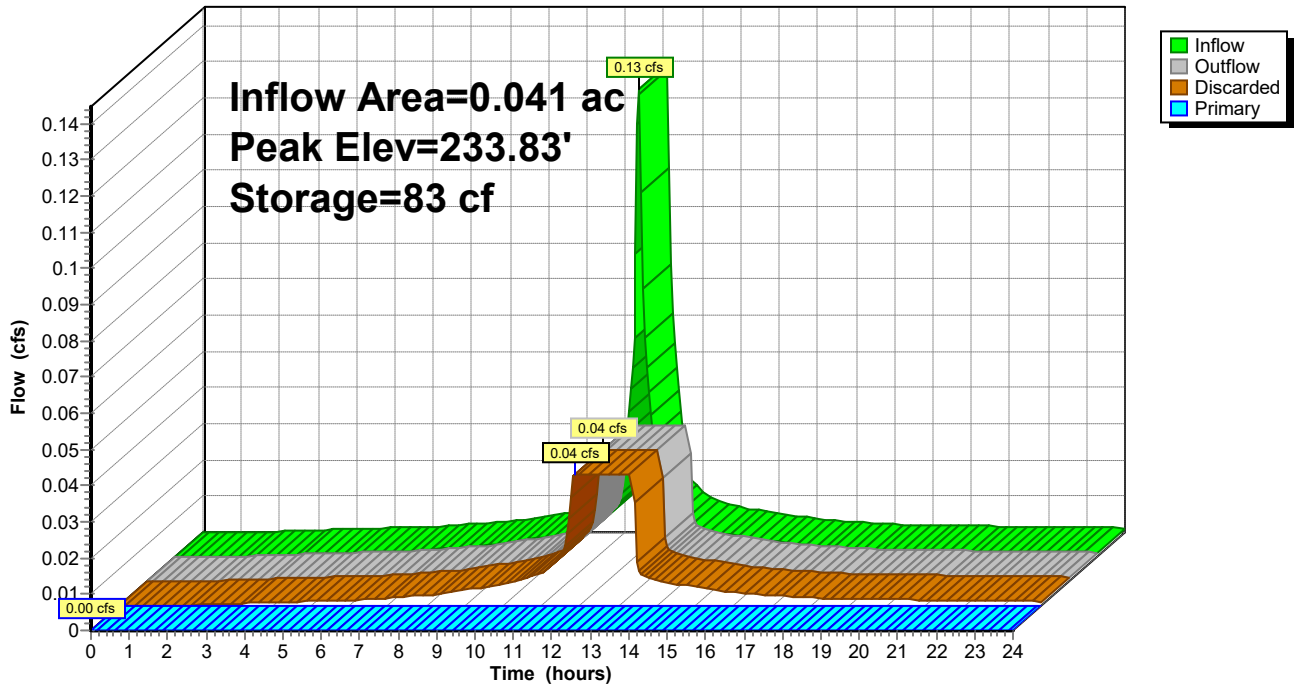
Type III 24-hr 2-Year Rainfall=3.34"

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Pond 2P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.34"

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Summary for Pond 3P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.04 cfs @ 11.80 hrs, Volume= 0.011 af, Atten= 72%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.80 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 237.82' @ 12.43 hrs Surf.Area= 189 sf Storage= 82 cf

Plug-Flow detention time= 11.3 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 11.0 min (766.0 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	237.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	237.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	239.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
239.04	1	0	0
243.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	242.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.80 hrs HW=237.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=237.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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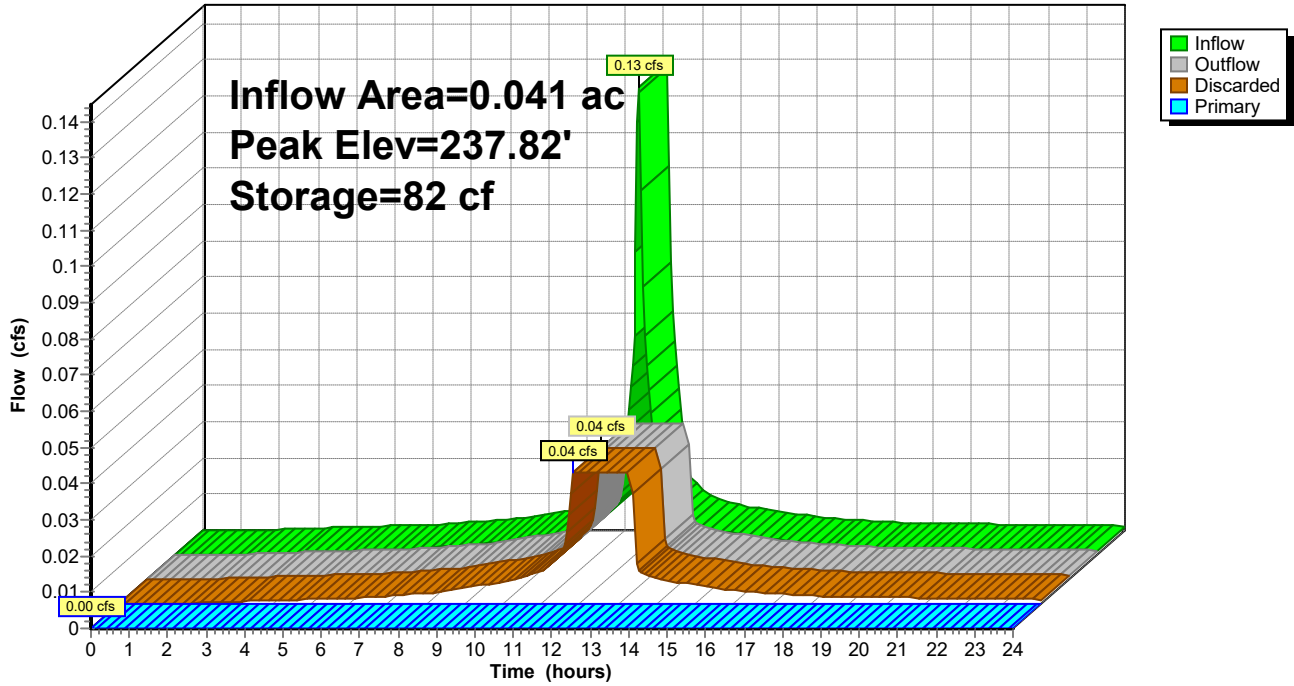
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Pond 3P: 3 x 1 Cultec R-150XLHD

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Summary for Pond 4P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af, Atten= 91%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 222.39' @ 12.96 hrs Surf.Area= 208 sf Storage= 165 cf

Plug-Flow detention time= 103.0 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 102.2 min (857.3 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.40 hrs HW=221.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=221.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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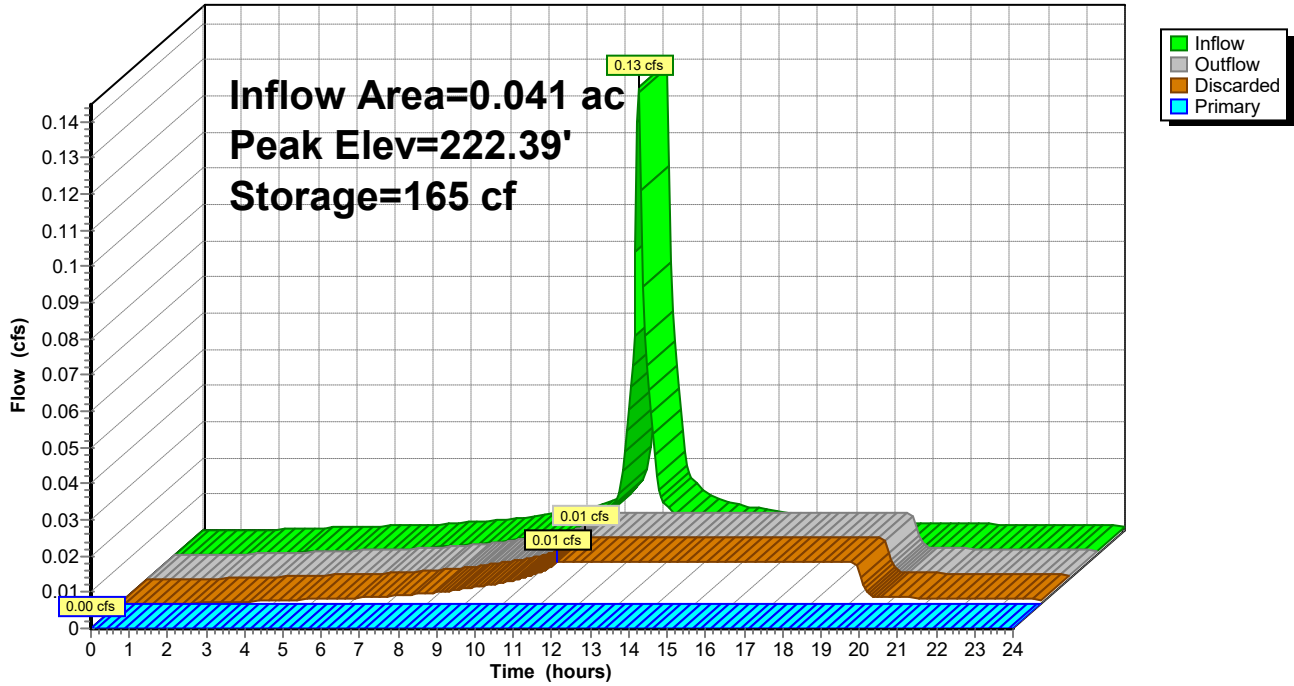
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Pond 4P: 1 x 4 Cultec R-150XLHD

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Summary for Pond 5P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af, Atten= 91%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 222.39' @ 12.96 hrs Surf.Area= 208 sf Storage= 165 cf

Plug-Flow detention time= 103.0 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 102.2 min (857.3 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.40 hrs HW=221.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=221.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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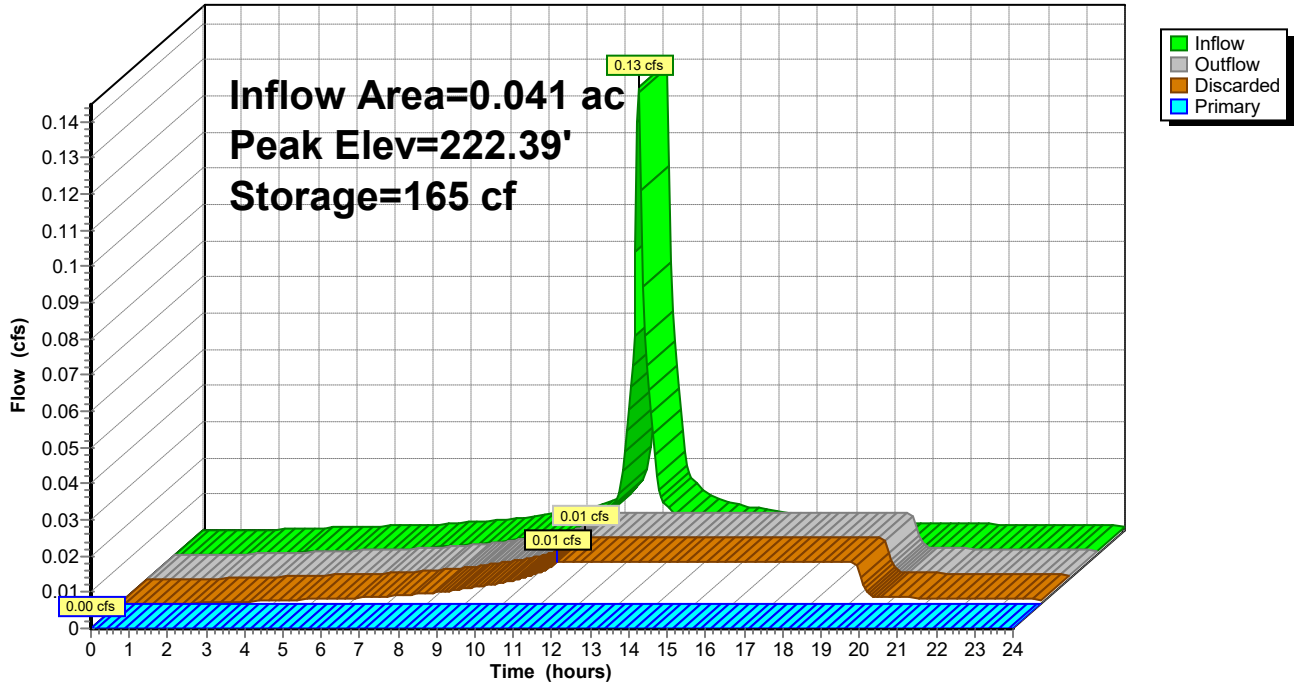
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Pond 5P: 1 x 4 Cultec R-150XLHD

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Summary for Pond 6P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af
 Outflow = 0.02 cfs @ 11.60 hrs, Volume= 0.015 af, Atten= 89%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.60 hrs, Volume= 0.015 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 225.07' @ 12.78 hrs Surf.Area= 350 sf Storage= 216 cf

Plug-Flow detention time= 75.9 min calculated for 0.015 af (100% of inflow)
 Center-of-Mass det. time= 75.1 min (830.2 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	224.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	224.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	226.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
226.04	1	0	0
230.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	229.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 11.60 hrs HW=224.07' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=224.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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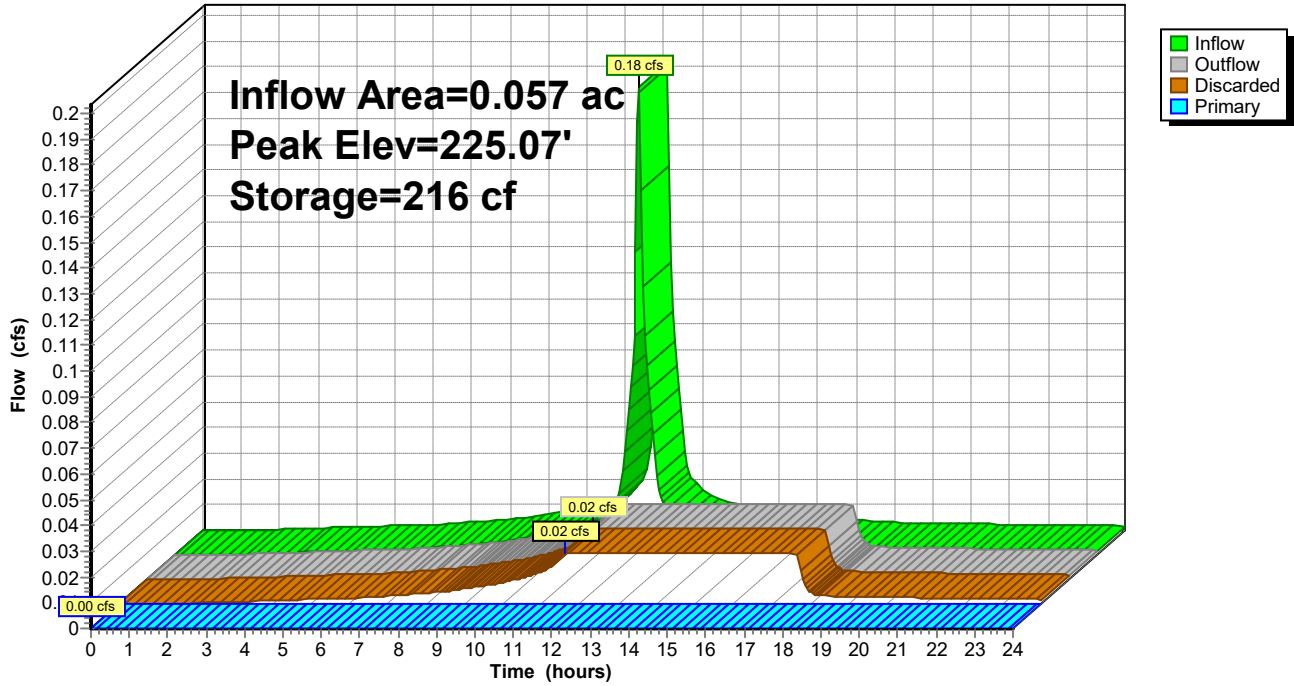
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Pond 6P: 2 x 4 Cultec R-150XLHD

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Summary for Pond 7P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af
 Outflow = 0.02 cfs @ 11.60 hrs, Volume= 0.015 af, Atten= 89%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.60 hrs, Volume= 0.015 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 206.07' @ 12.78 hrs Surf.Area= 350 sf Storage= 217 cf

Plug-Flow detention time= 77.2 min calculated for 0.015 af (100% of inflow)
 Center-of-Mass det. time= 76.1 min (831.2 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	205.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	208.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.04	1	0	0
212.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	211.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 11.60 hrs HW=205.07' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=205.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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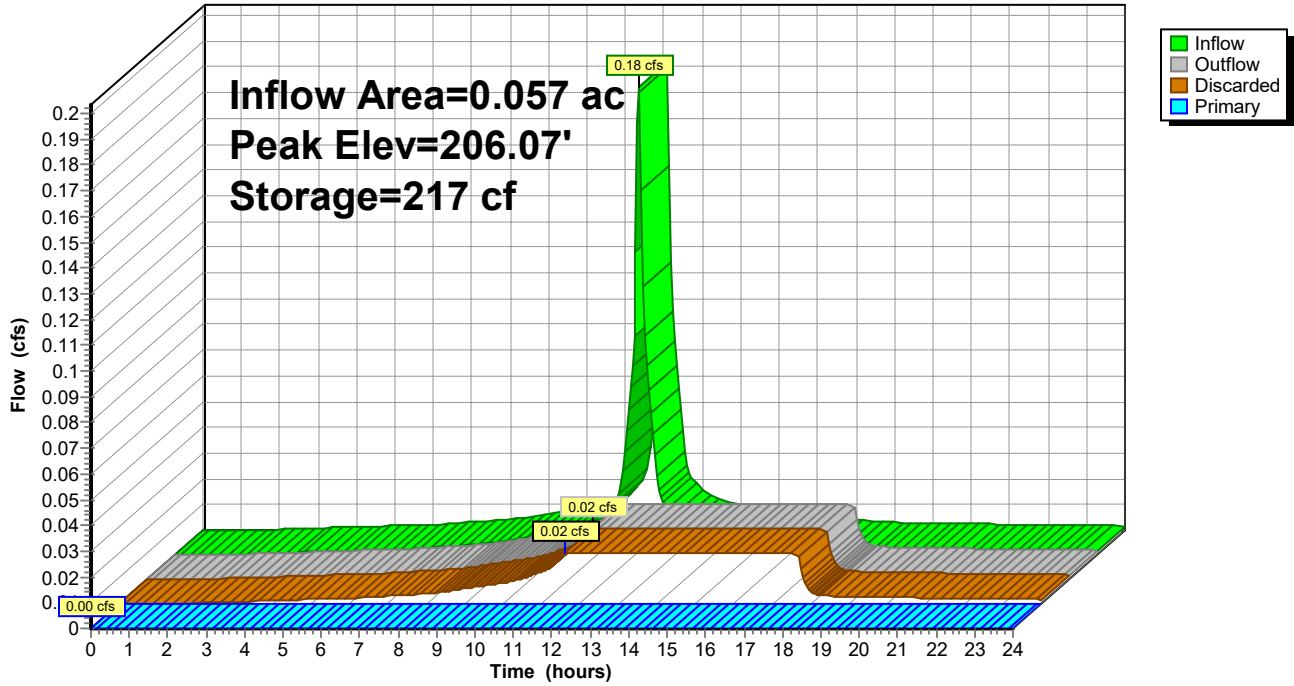
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Pond 7P: 2 x 4 Cultec R-150XLHD

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Summary for Pond 8P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af, Atten= 91%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 194.39' @ 12.96 hrs Surf.Area= 208 sf Storage= 165 cf

Plug-Flow detention time= 103.0 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 102.2 min (857.3 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	193.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	195.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.04	1	0	0
199.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	193.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	198.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.40 hrs HW=193.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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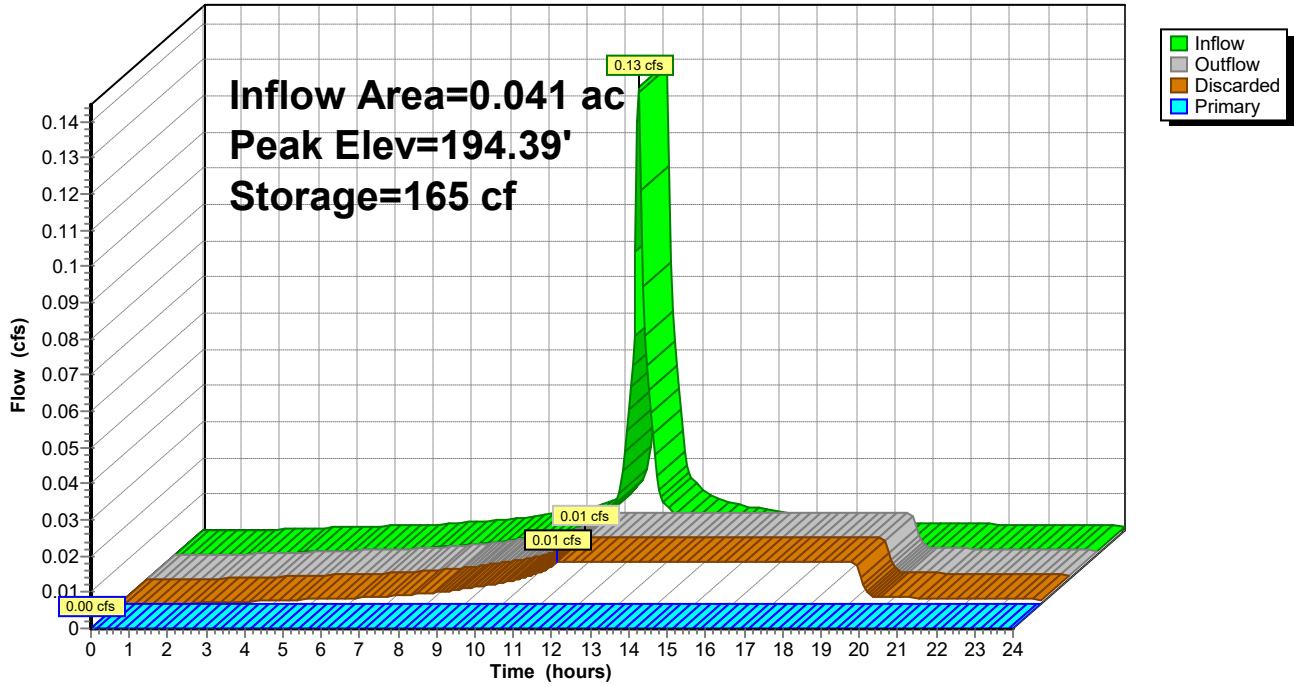
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Pond 8P: 1 x 4 Cultec R-150XLHD

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Summary for Pond 9P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 3.11" for 2-Year event
 Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
 Outflow = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af, Atten= 91%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.40 hrs, Volume= 0.011 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 198.39' @ 12.96 hrs Surf.Area= 208 sf Storage= 165 cf

Plug-Flow detention time= 103.0 min calculated for 0.011 af (100% of inflow)
 Center-of-Mass det. time= 102.2 min (857.3 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	197.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	197.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	199.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
199.04	1	0	0
203.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	197.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	202.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.40 hrs HW=197.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=197.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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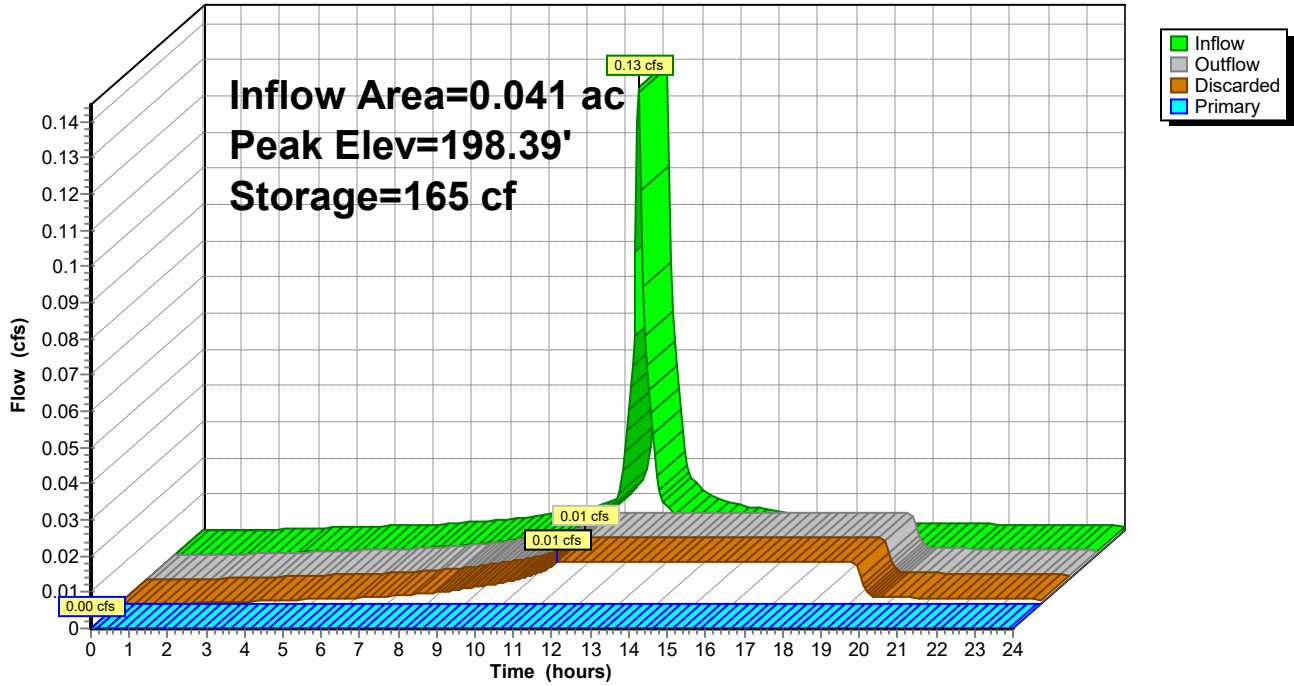
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Pond 9P: 1 x 4 Cultec R-150XLHD

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Summary for Pond 10P: Basin

Inflow Area = 3.434 ac, 22.85% Impervious, Inflow Depth > 0.54" for 2-Year event
 Inflow = 1.48 cfs @ 12.14 hrs, Volume= 0.155 af
 Outflow = 0.14 cfs @ 15.43 hrs, Volume= 0.131 af, Atten= 90%, Lag= 197.2 min
 Discarded = 0.14 cfs @ 15.43 hrs, Volume= 0.131 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 210.83' @ 15.43 hrs Surf.Area= 2,565 sf Storage= 2,833 cf

Plug-Flow detention time= 239.5 min calculated for 0.130 af (84% of inflow)
 Center-of-Mass det. time= 169.0 min (1,064.3 - 895.3)

Volume	Invert	Avail.Storage	Storage Description			
#1	209.40'	24,363 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
209.40	1,431	238.0	0	0	1,431	
210.00	1,887	254.0	992	992	2,075	
211.00	2,716	282.0	2,289	3,281	3,299	
212.00	3,629	309.0	3,161	6,443	4,602	
213.00	5,010	426.0	4,301	10,744	11,455	
214.00	6,399	472.0	5,690	16,434	14,773	
215.00	7,894	422.0	7,133	23,567	18,358	
215.10	8,022	423.0	796	24,363	18,438	

Device	Routing	Invert	Outlet Devices
#1	Primary	215.30'	10.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	209.40'	2.410 in/hr Exfiltration over Horizontal area
#3	Device 4	214.60'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	211.00'	12.0" Round Culvert L= 113.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.00' / 209.00' S= 0.0177 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.14 cfs @ 15.43 hrs HW=210.83' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=209.40' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Culvert** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)

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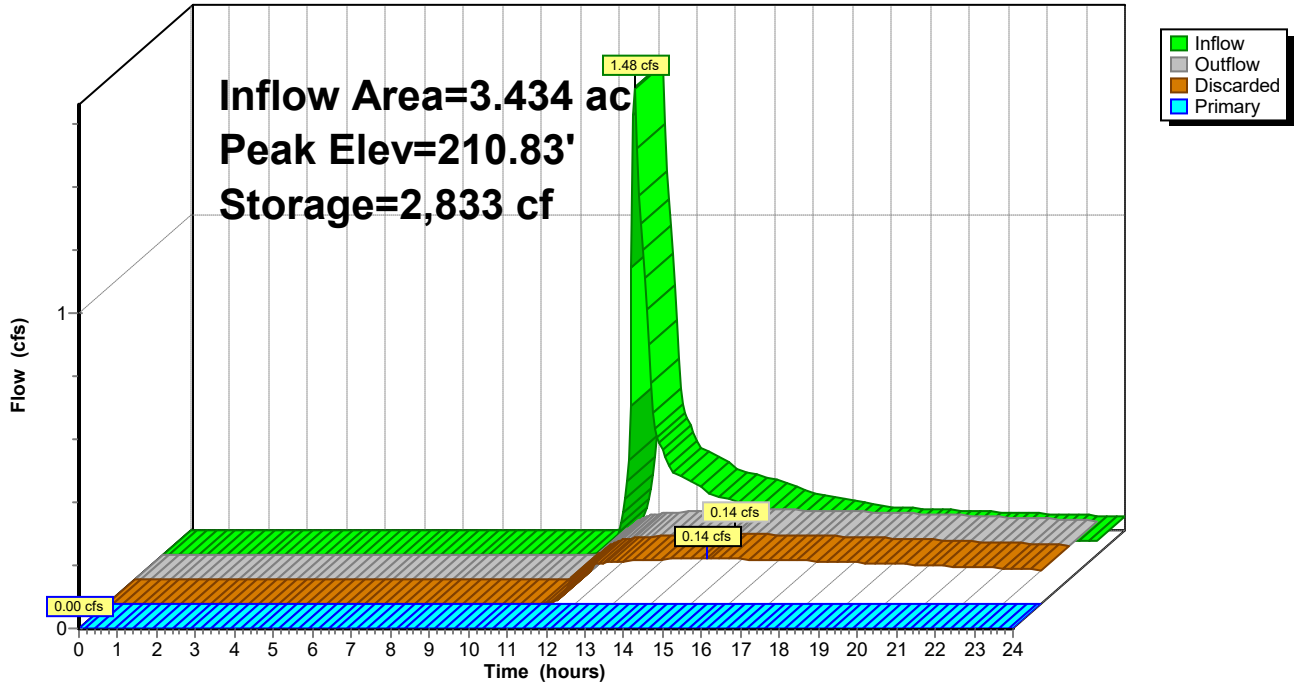
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Pond 10P: Basin

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Summary for Pond 11P: 4x4x8 Galleys

Inflow Area = 1.852 ac, 28.92% Impervious, Inflow Depth > 0.19" for 2-Year event
 Inflow = 0.12 cfs @ 12.46 hrs, Volume= 0.030 af
 Outflow = 0.09 cfs @ 12.61 hrs, Volume= 0.030 af, Atten= 20%, Lag= 8.9 min
 Discarded = 0.09 cfs @ 12.61 hrs, Volume= 0.030 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 187.77' @ 12.61 hrs Surf.Area= 2,129 sf Storage= 56 cf

Plug-Flow detention time= 10.1 min calculated for 0.030 af (99% of inflow)
 Center-of-Mass det. time= 7.2 min (982.9 - 975.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.70'	2,307 cf	33.80'W x 63.00'L x 8.50'H Field A 18,100 cf Overall - 12,333 cf Embedded = 5,767 cf x 40.0% Voids
#2A	188.20'	9,846 cf	Concrete Galley 4x4x8 x 105 Inside #1 Inside= 42.0"W x 91.0"H => 26.79 sf x 3.50'L = 93.8 cf Outside= 52.8"W x 96.0"H => 29.36 sf x 4.00'L = 117.5 cf 105 Chambers in 7 Rows
		12,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	187.70'	2.410 in/hr Exfiltration over Horizontal area
#2	Primary	195.20'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 195.20' / 195.10' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.12 cfs @ 12.61 hrs HW=187.77' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=187.70' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

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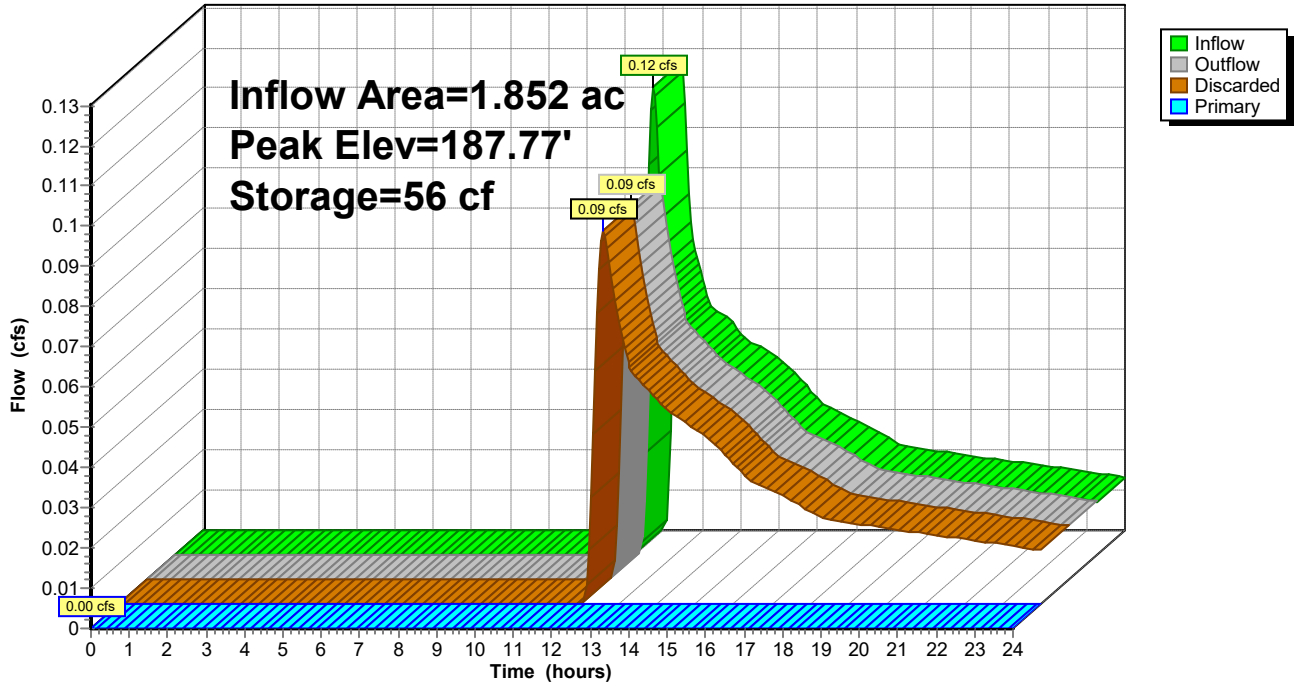
Type III 24-hr 2-Year Rainfall=3.34"

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Pond 11P: 4x4x8 Galleys

Hydrograph



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Summary for Pond 20P: Basin Forebay

Volume	Invert	Avail.Storage	Storage Description			
#1	213.00'	488 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
213.00	385	89.0	0	0	385	
214.00	598	113.0	488	488	784	

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P-1: Offsite Runoff	Runoff Area=67,182 sf 6.98% Impervious Runoff Depth>1.80" Flow Length=361' Tc=9.4 min CN=65 Runoff=2.75 cfs 0.232 af
Subcatchment P-4: Offsite Runoff	Runoff Area=46,024 sf 5.71% Impervious Runoff Depth>2.29" Flow Length=278' Tc=7.7 min CN=71 Runoff=2.61 cfs 0.202 af
Subcatchment P-5: Lawn & Woods	Runoff Area=31,616 sf 0.00% Impervious Runoff Depth>0.14" Tc=6.0 min CN=36 Runoff=0.01 cfs 0.009 af
Subcatchment P2: Lawn & Highland Road	Runoff Area=94,674 sf 23.94% Impervious Runoff Depth>1.30" Flow Length=338' Tc=6.9 min CN=58 Runoff=2.79 cfs 0.235 af
Subcatchment P3: Lawn & Ballard Road	Runoff Area=75,676 sf 24.23% Impervious Runoff Depth>0.90" Flow Length=356' Tc=11.2 min CN=52 Runoff=1.13 cfs 0.131 af
Subcatchment R-1: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Subcatchment R-2: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Subcatchment R-3: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Subcatchment R-4: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Subcatchment R-5: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Subcatchment R-6: Roof	Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.29 cfs 0.024 af
Subcatchment R-7: Roof	Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.29 cfs 0.024 af
Subcatchment R-8: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Subcatchment R-9: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>4.99" Tc=6.0 min CN=98 Runoff=0.20 cfs 0.017 af
Reach 1R: Swale	Avg. Flow Depth=0.00' Max Vel=0.00 fps n=0.030 L=114.0' S=0.0702 '/' Capacity=58.68 cfs Outflow=0.00 cfs 0.000 af
Reach DP-1: Design Point	Inflow=2.75 cfs 0.232 af Outflow=2.75 cfs 0.232 af

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Reach DP-2: Design Point

Inflow=0.06 cfs 0.010 af
Outflow=0.06 cfs 0.010 af

Pond 1P: 3 x 1 Cultec R-150XLHD

Peak Elev=231.64' Storage=186 cf Inflow=0.20 cfs 0.017 af
Discarded=0.04 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.017 af

Pond 2P: 3 x 1 Cultec R-150XLHD

Peak Elev=234.64' Storage=186 cf Inflow=0.20 cfs 0.017 af
Discarded=0.04 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.017 af

Pond 3P: 3 x 1 Cultec R-150XLHD

Peak Elev=238.63' Storage=186 cf Inflow=0.20 cfs 0.017 af
Discarded=0.04 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.017 af

Pond 4P: 1 x 4 Cultec R-150XLHD

Peak Elev=226.07' Storage=281 cf Inflow=0.20 cfs 0.017 af
Discarded=0.01 cfs 0.016 af Primary=0.03 cfs 0.001 af Outflow=0.04 cfs 0.017 af

Pond 5P: 1 x 4 Cultec R-150XLHD

Peak Elev=226.07' Storage=281 cf Inflow=0.20 cfs 0.017 af
Discarded=0.01 cfs 0.016 af Primary=0.03 cfs 0.001 af Outflow=0.04 cfs 0.017 af

Pond 6P: 2 x 4 Cultec R-150XLHD

Peak Elev=225.98' Storage=410 cf Inflow=0.29 cfs 0.024 af
Discarded=0.02 cfs 0.024 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.024 af

Pond 7P: 2 x 4 Cultec R-150XLHD

Peak Elev=206.99' Storage=412 cf Inflow=0.29 cfs 0.024 af
Discarded=0.02 cfs 0.024 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.024 af

Pond 8P: 1 x 4 Cultec R-150XLHD

Peak Elev=198.07' Storage=281 cf Inflow=0.20 cfs 0.017 af
Discarded=0.01 cfs 0.016 af Primary=0.03 cfs 0.001 af Outflow=0.04 cfs 0.017 af

Pond 9P: 1 x 4 Cultec R-150XLHD

Peak Elev=202.07' Storage=281 cf Inflow=0.20 cfs 0.017 af
Discarded=0.01 cfs 0.016 af Primary=0.03 cfs 0.001 af Outflow=0.04 cfs 0.017 af

Pond 10P: Basin

Peak Elev=212.98' Storage=10,660 cf Inflow=5.40 cfs 0.438 af
Discarded=0.28 cfs 0.263 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.263 af

Pond 11P: 4x4x8 Galleys

Peak Elev=189.42' Storage=2,310 cf Inflow=1.13 cfs 0.131 af
Discarded=0.12 cfs 0.118 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.118 af

Pond 20P: Basin Forebay

Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 7.635 ac Runoff Volume = 0.974 af Average Runoff Depth = 1.53"
80.23% Pervious = 6.126 ac 19.77% Impervious = 1.509 ac

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Summary for Subcatchment P-1: Offsite Runoff

Runoff = 2.75 cfs @ 12.15 hrs, Volume= 0.232 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 2,729	98	Roof, offsite
* 14,859	39	>75% Grass cover, Good, HSG A, offsite
* 20,436	74	>75% Grass cover, Good, HSG C, offsite
* 20,439	70	Woods, Good, HSG C, offsite
* 1,960	98	Paved driveways
777	39	>75% Grass cover, Good, HSG A
4,674	74	>75% Grass cover, Good, HSG C
1,308	30	Woods, Good, HSG A
67,182	65	Weighted Average
62,493		93.02% Pervious Area
4,689		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	17	0.0100	0.09		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
0.5	10	0.3300	0.34		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
4.0	23	0.0650	0.09		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.34"
0.2	14	0.0710	1.33		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.3	217	0.1500	2.71		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0375	3.93		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
9.4	361	Total			

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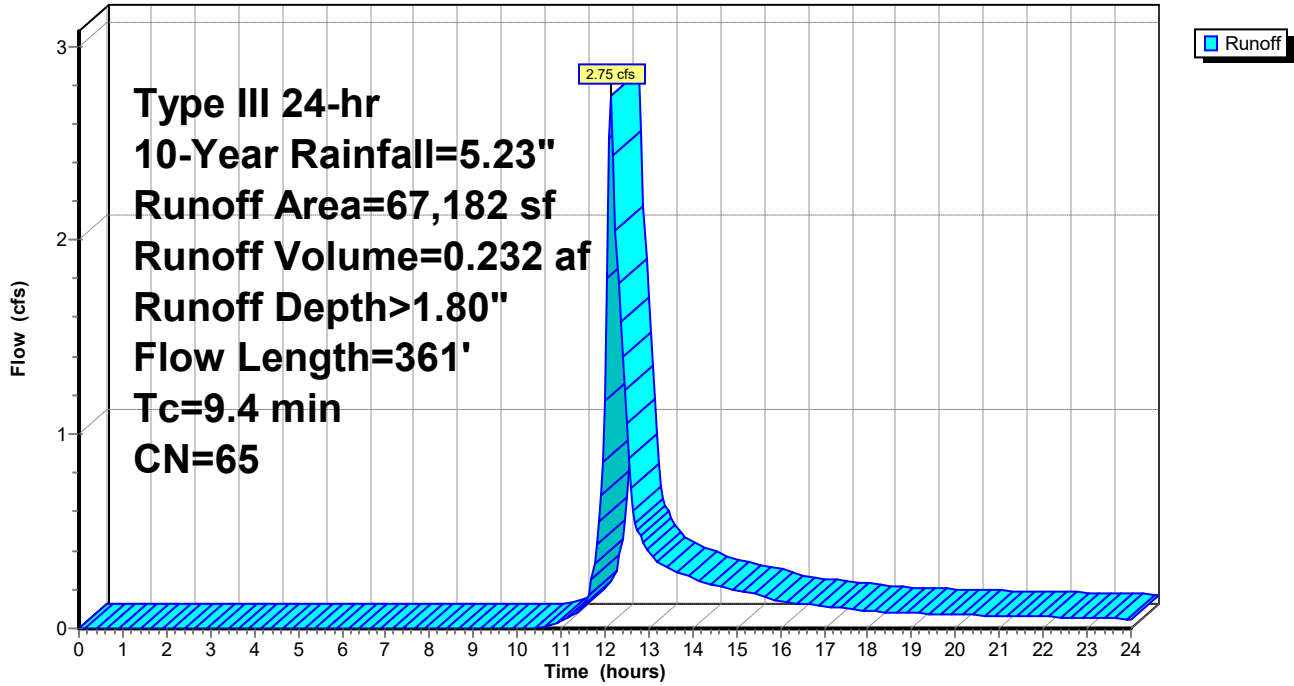
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Subcatchment P-1: Offsite Runoff

Hydrograph



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Summary for Subcatchment P-4: Offsite Runoff

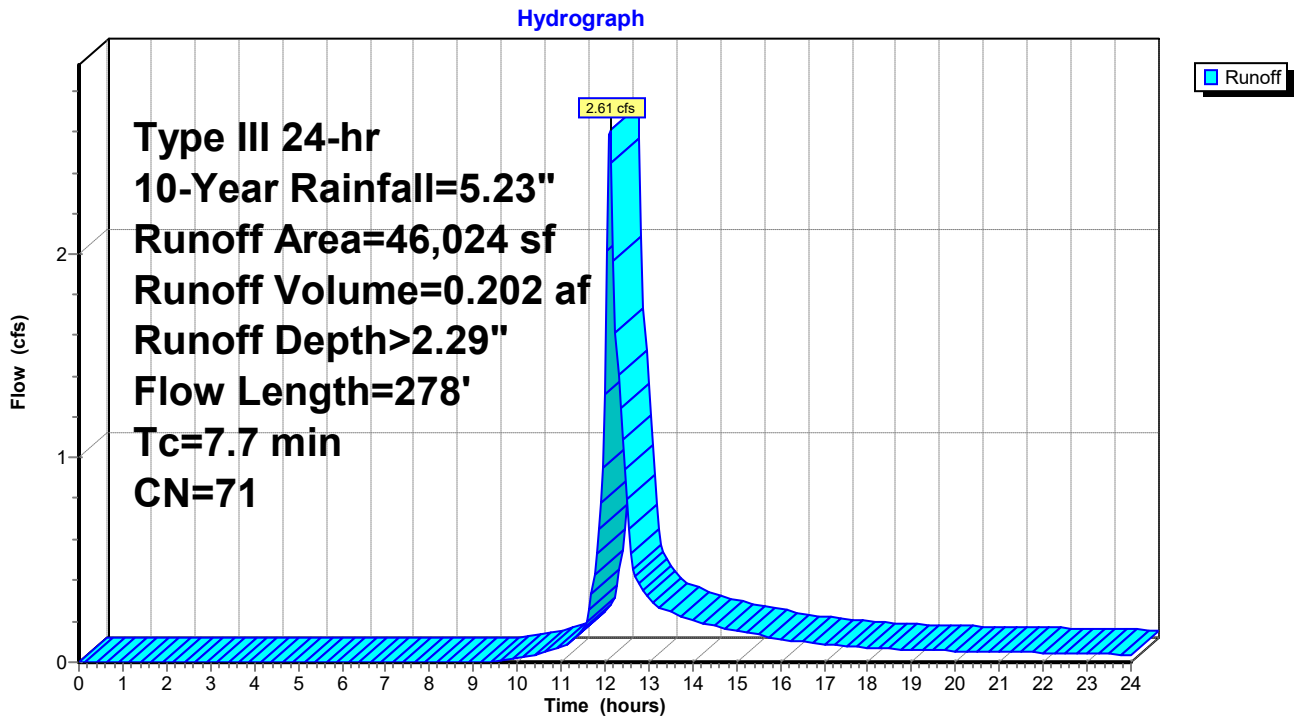
Runoff = 2.61 cfs @ 12.12 hrs, Volume= 0.202 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,694	98	Roof, offsite
* 933	98	Pavement, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 1,470	30	Woods, Good, HSG A, offsite
* 37,527	70	Woods, Good, HSG C, offsite
46,024	71	Weighted Average
43,397		94.29% Pervious Area
2,627		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
2.2	228	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
7.7	278	Total			

Subcatchment P-4: Offsite Runoff



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Summary for Subcatchment P-5: Lawn & Woods

Runoff = 0.01 cfs @ 14.58 hrs, Volume= 0.009 af, Depth> 0.14"

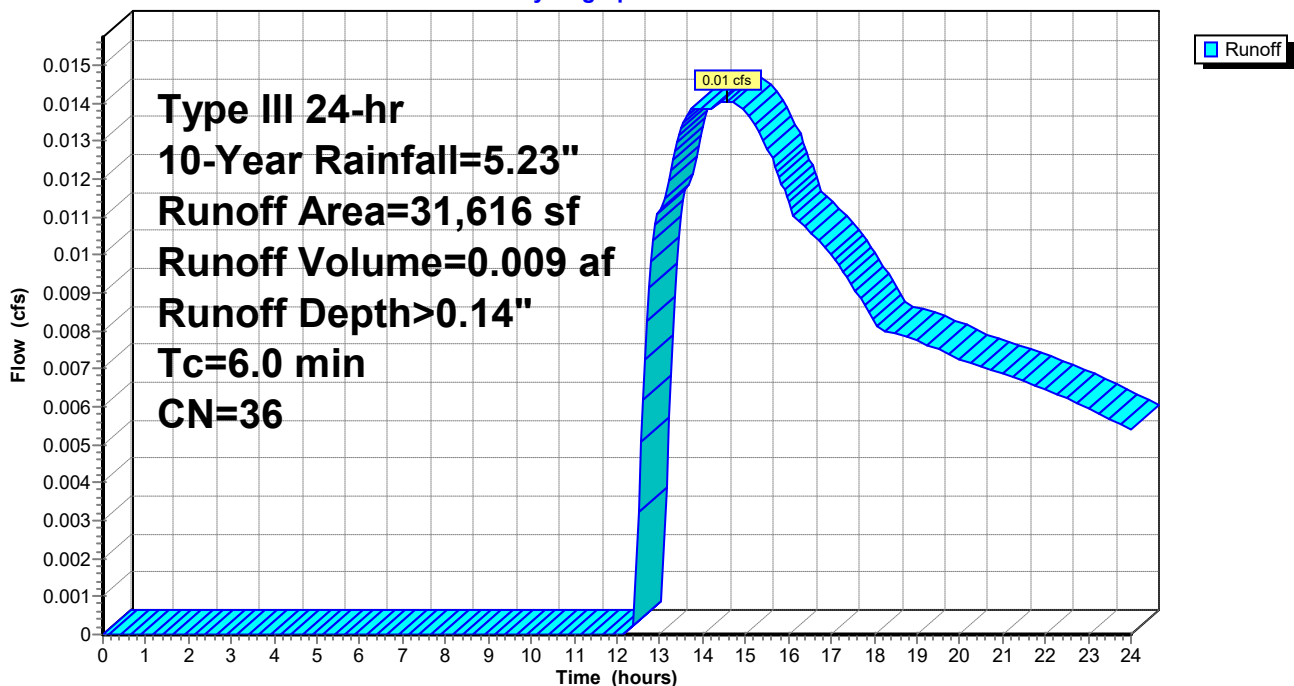
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
*	0	98 Roof, offsite
*	0	98 Pavement, offsite
*	0	39 >75% Grass cover, Good, HSG A, offsite
*	0	74 >75% Grass cover, Good, HSG C, offsite
*	0	30 Woods, Good, HSG A, offsite
*	0	70 Woods, Good, HSG C, offsite
*	0	98 Roof
*	0	98 Paved driveways
22,623	39	>75% Grass cover, Good, HSG A
8,993	30	Woods, Good, HSG A
0	70	Woods, Good, HSG C
31,616	36	Weighted Average
31,616		100.00% Pervious Area

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

Subcatchment P-5: Lawn & Woods

Hydrograph



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Summary for Subcatchment P2: Lawn & Highland Road

Runoff = 2.79 cfs @ 12.12 hrs, Volume= 0.235 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 22,666	98	Paved driveways
57,693	39	>75% Grass cover, Good, HSG A
14,315	74	>75% Grass cover, Good, HSG C
94,674	58	Weighted Average
72,008		76.06% Pervious Area
22,666		23.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.4	23	0.0200	0.99		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.8	153	0.0260	3.27		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.2	112	0.0400	10.72	8.42	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
6.9	338	Total			

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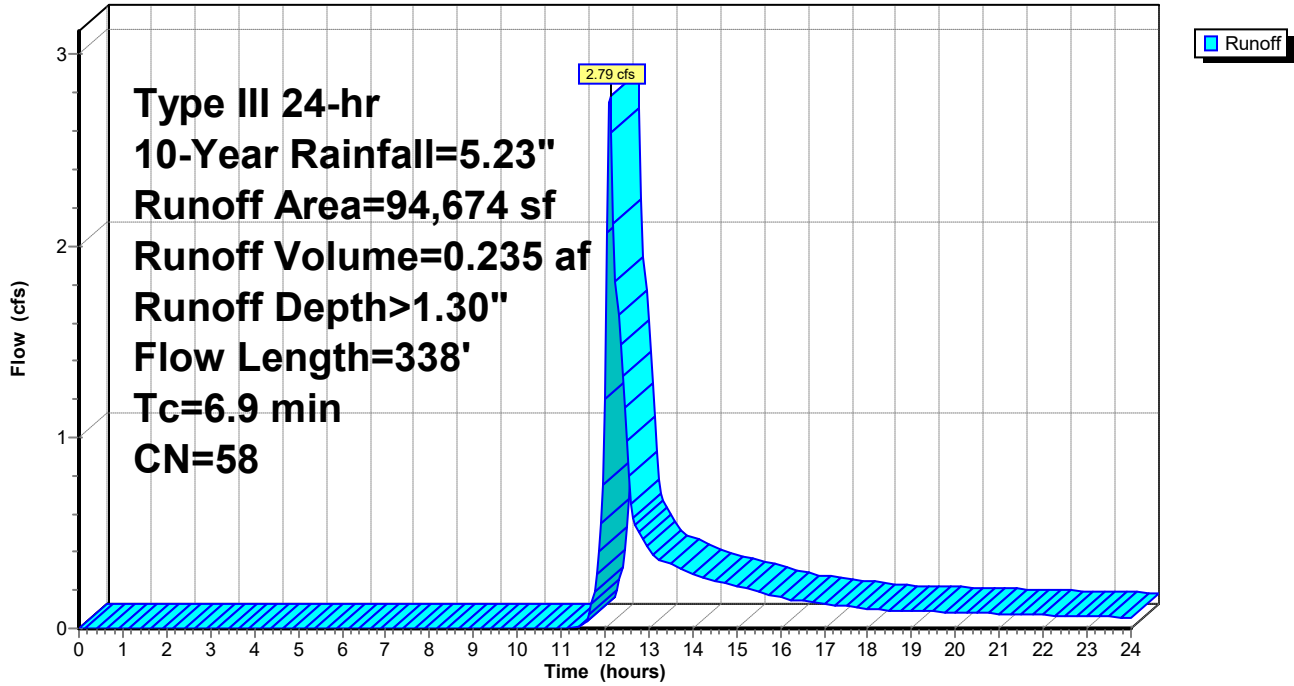
Type III 24-hr 10-Year Rainfall=5.23"

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Subcatchment P2: Lawn & Highland Road

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Summary for Subcatchment P3: Lawn & Ballard Road

Runoff = 1.13 cfs @ 12.20 hrs, Volume= 0.131 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,687	98	Roof, offsite
* 469	98	Pavement, offsite
* 22,183	39	>75% Grass cover, Good, HSG A, offsite
* 9,255	30	Woods, Good, HSG A, offsite
* 16,183	98	Paved driveways
21,959	39	>75% Grass cover, Good, HSG A
3,940	30	Woods, Good, HSG A
75,676	52	Weighted Average
57,337		75.77% Pervious Area
18,339		24.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		Sheet Flow, TC up until 50' length Woods: Light underbrush n= 0.400 P2= 3.34"
2.4	101	0.0200	0.71		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
0.7	120	0.0200	2.87		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.3	85	0.0100	5.36	4.21	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
11.2	356	Total			

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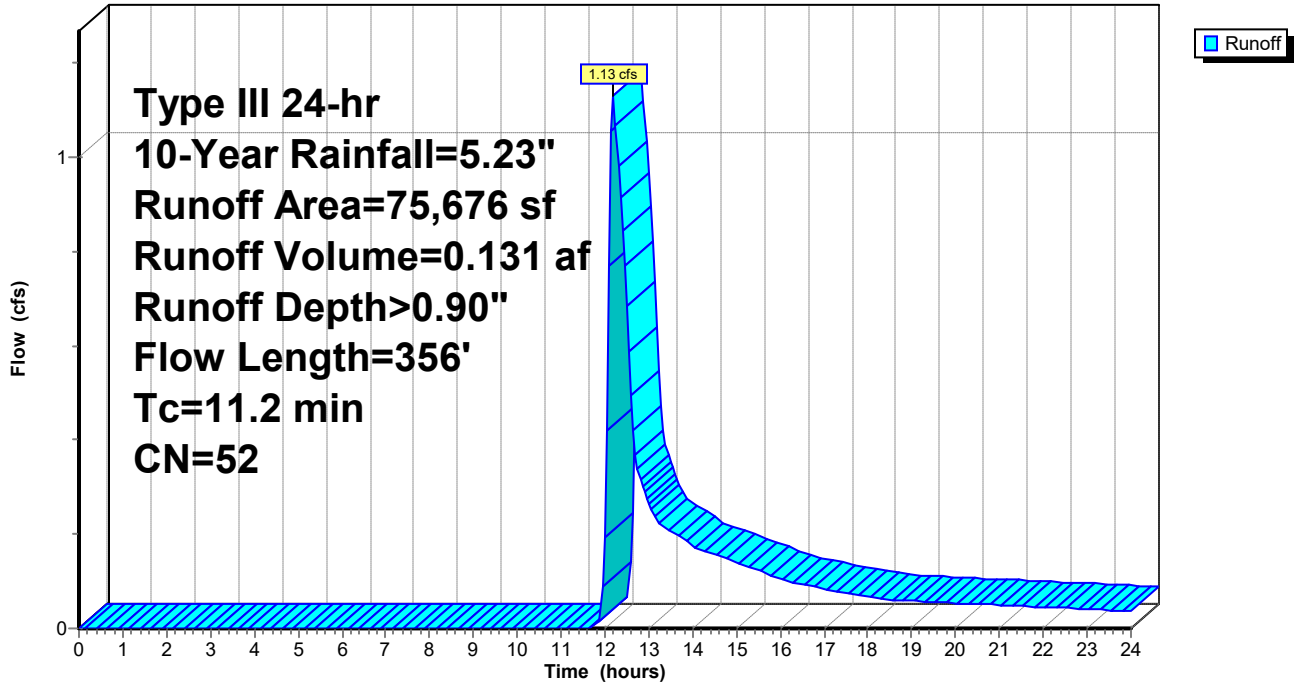
Type III 24-hr 10-Year Rainfall=5.23"

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Subcatchment P3: Lawn & Ballard Road

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Summary for Subcatchment R-1: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

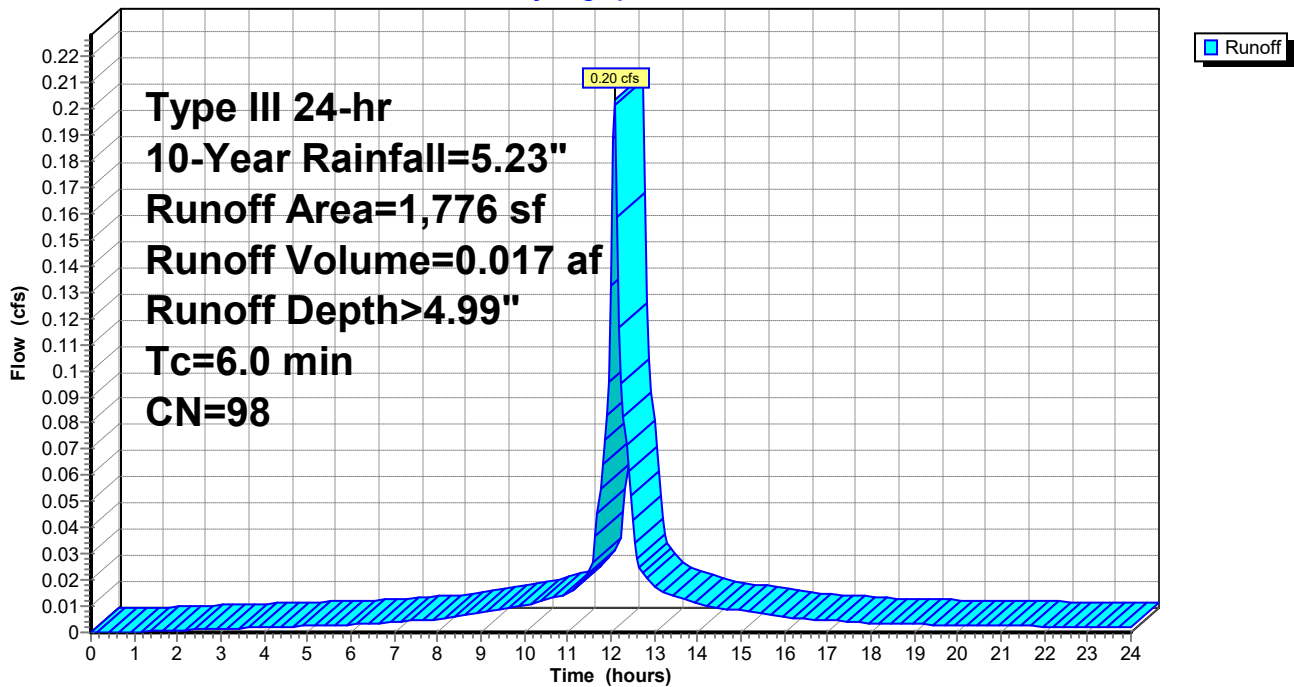
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-1: Roof

Hydrograph



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Summary for Subcatchment R-2: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

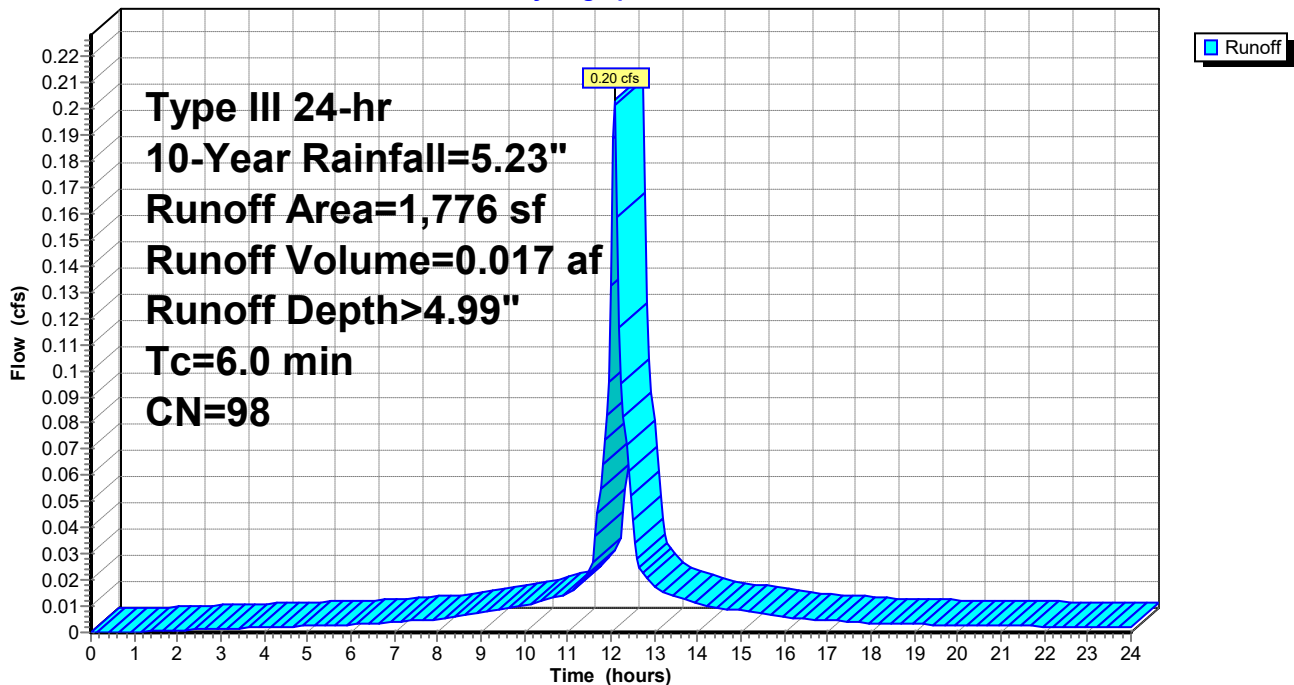
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-2: Roof

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.23"

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Summary for Subcatchment R-3: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

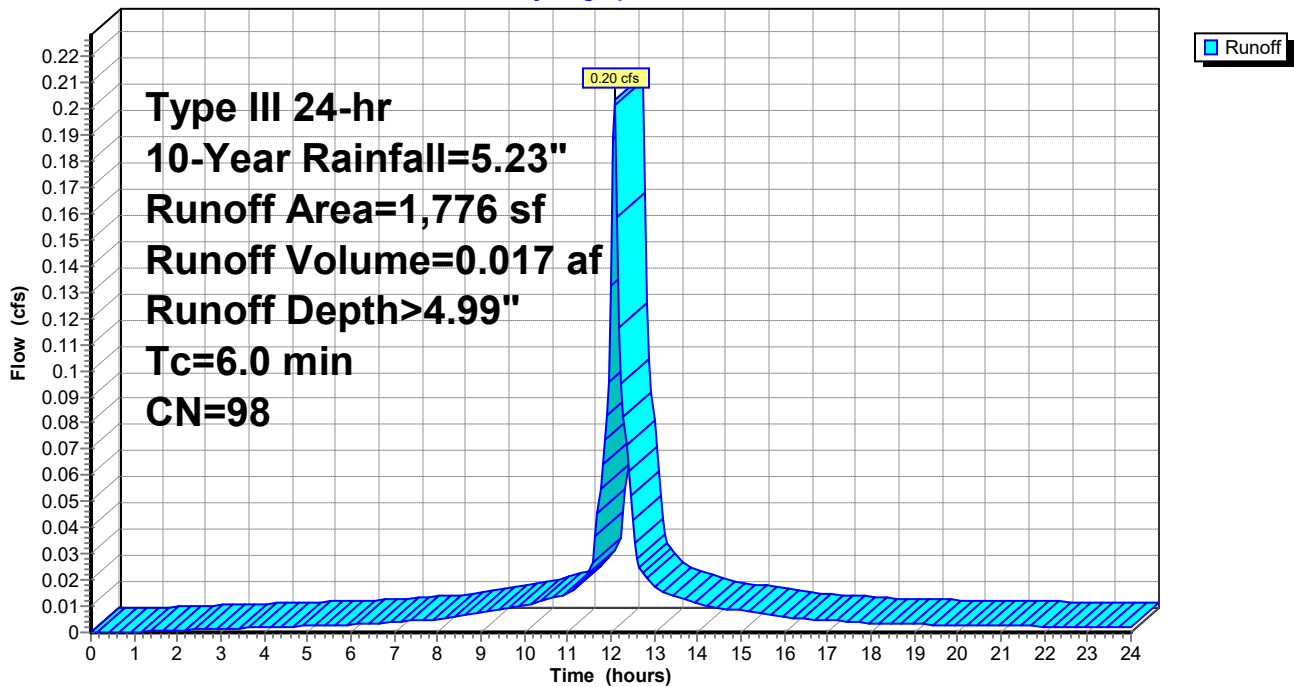
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-3: Roof

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.23"

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Summary for Subcatchment R-4: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

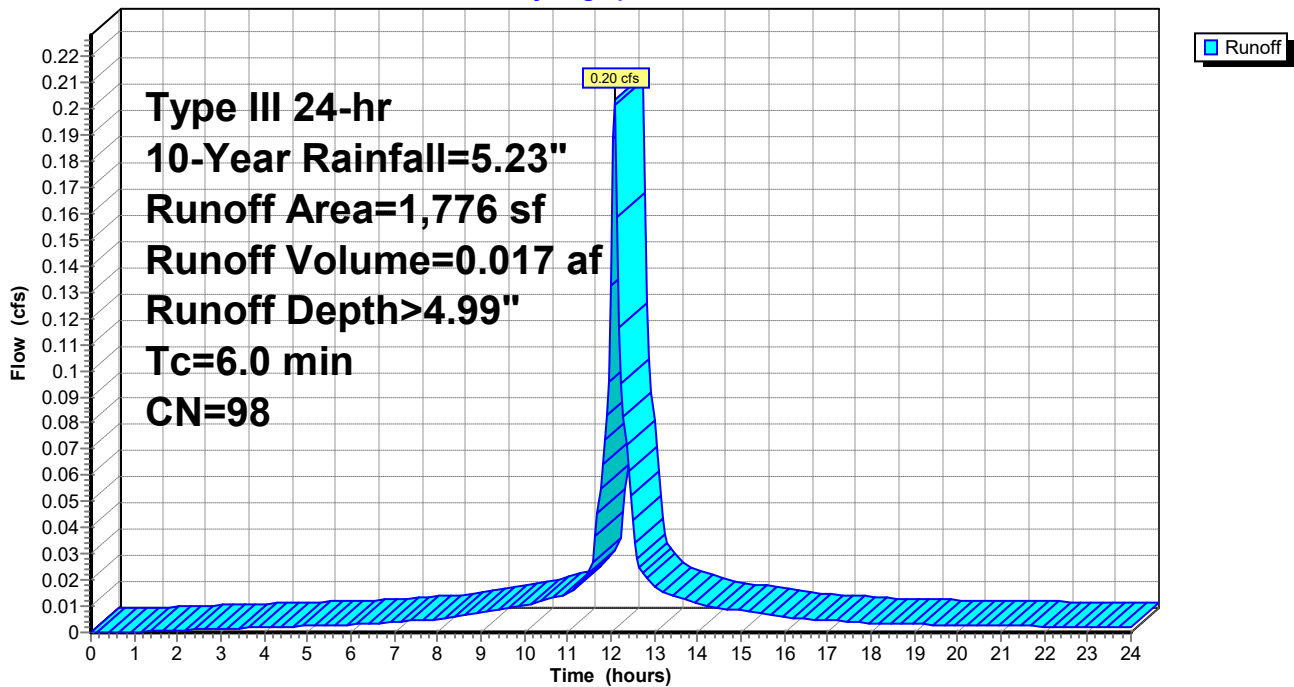
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-4: Roof

Hydrograph



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Summary for Subcatchment R-5: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

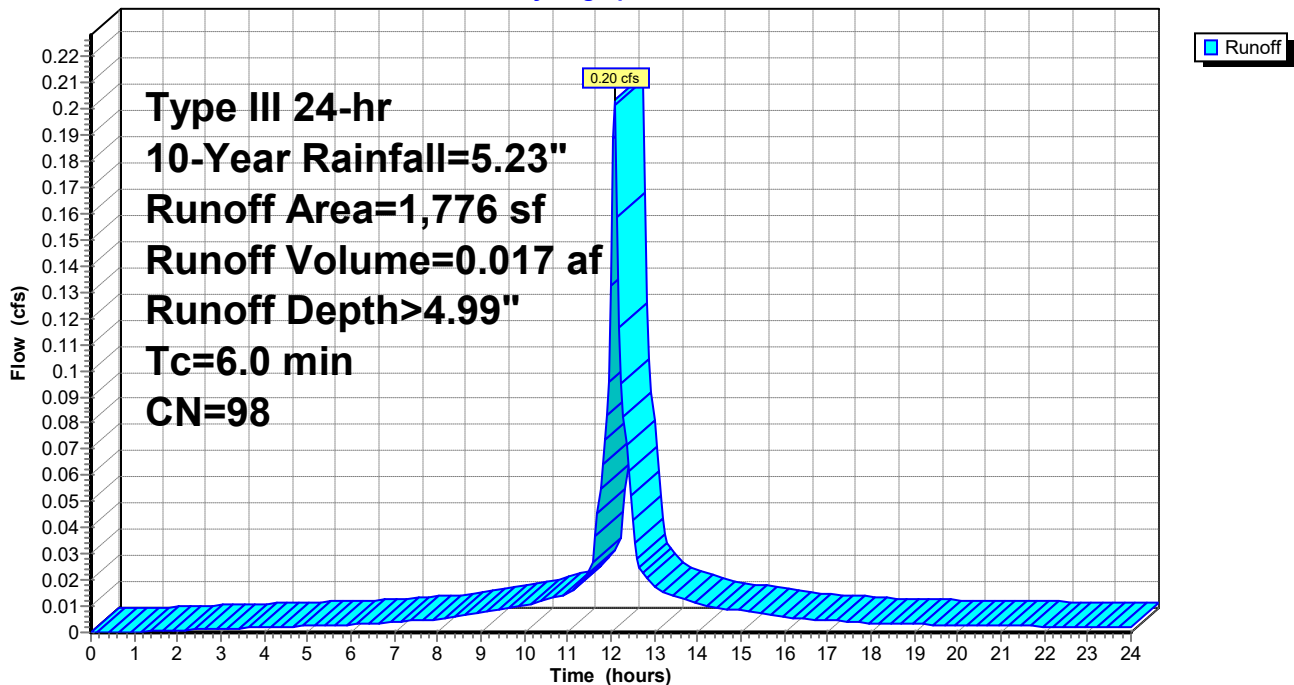
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-5: Roof

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Summary for Subcatchment R-6: Roof

Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 4.99"

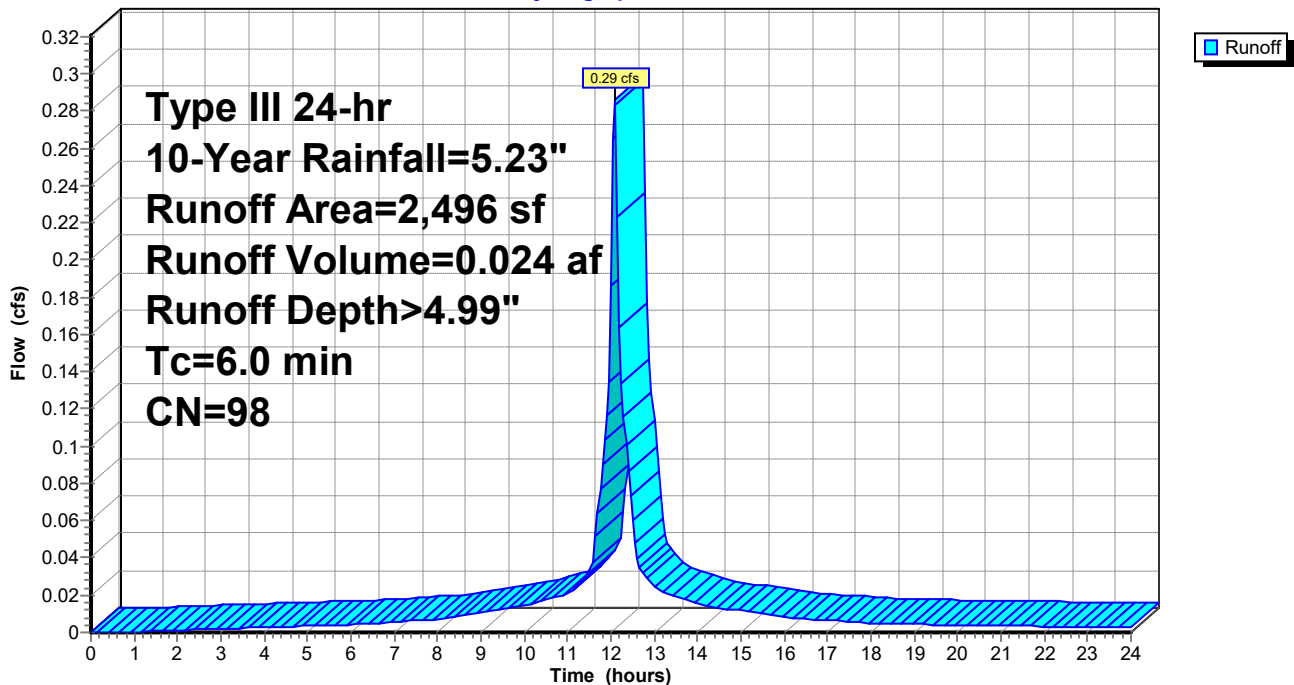
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-6: Roof

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.23"

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Summary for Subcatchment R-7: Roof

Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 4.99"

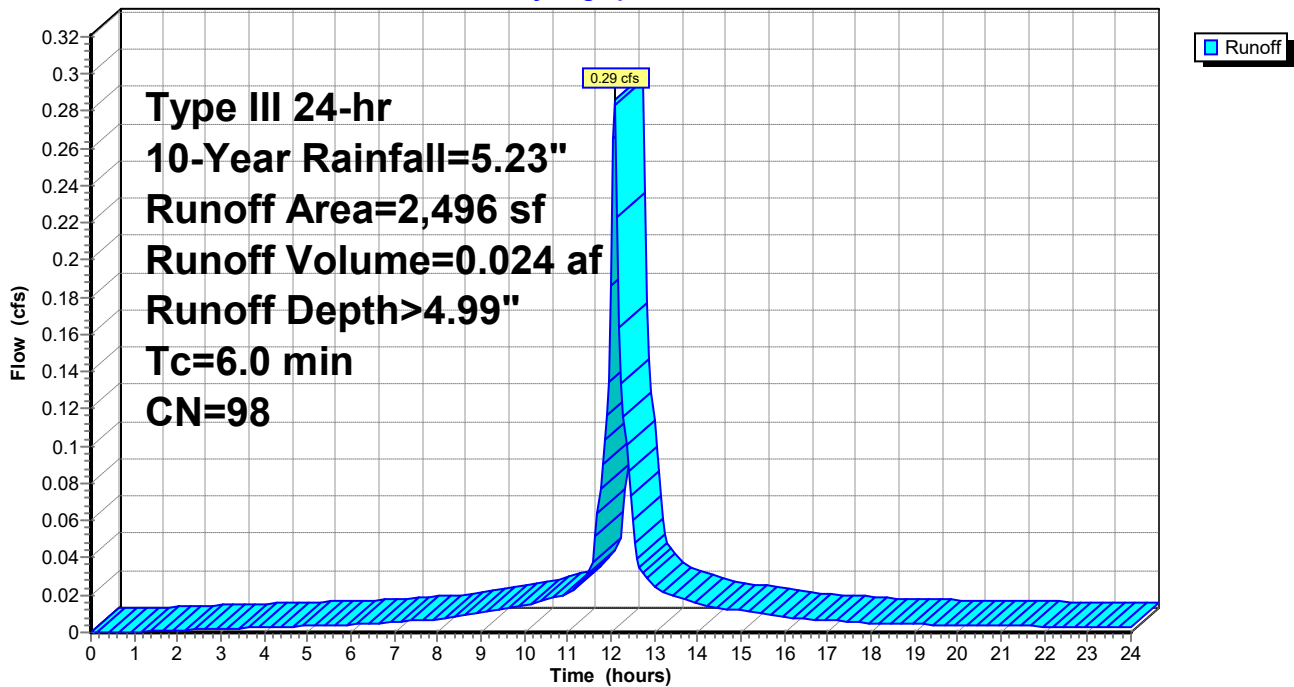
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-7: Roof

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Summary for Subcatchment R-8: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

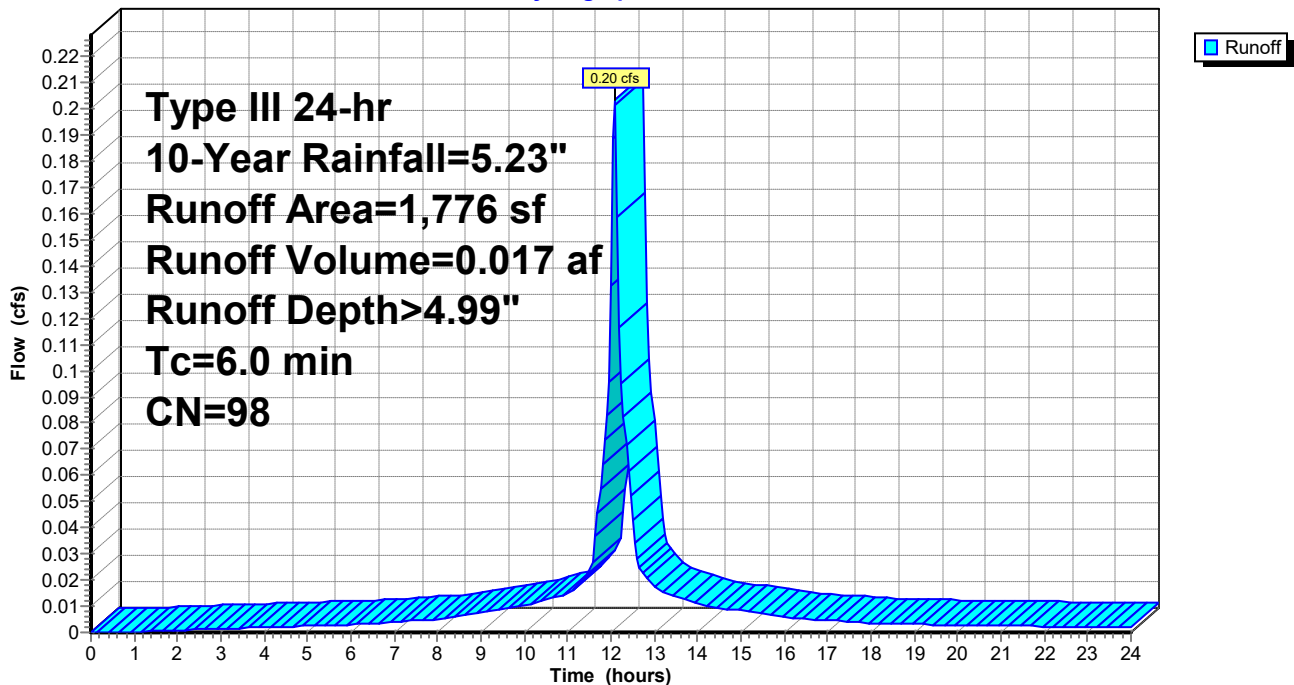
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-8: Roof

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.23"

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Summary for Subcatchment R-9: Roof

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af, Depth> 4.99"

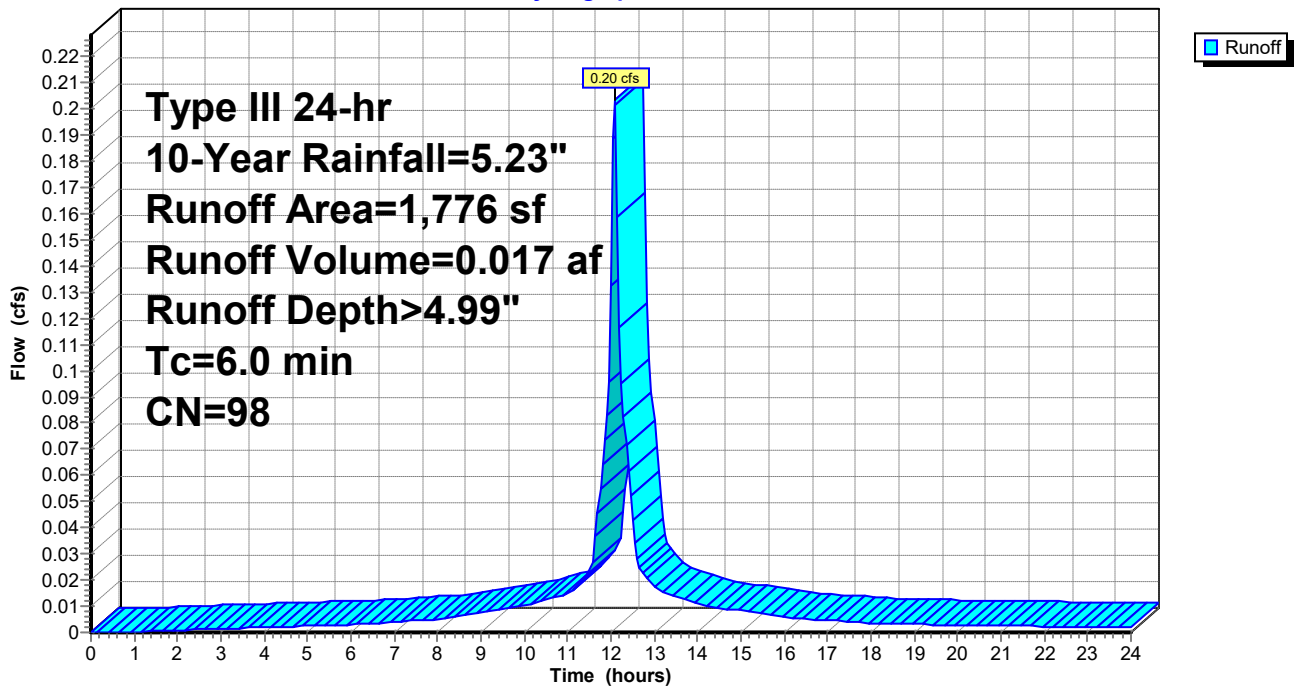
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.23"

	Area (sf)	CN	Description
*	1,776	98	Roof
	1,776		100.00% Impervious Area

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

Subcatchment R-9: Roof

Hydrograph



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Summary for Reach 1R: Swale

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 58.68 cfs

3.00' x 1.00' deep channel, n= 0.030

Side Slope Z-value= 3.0 '/' Top Width= 9.00'

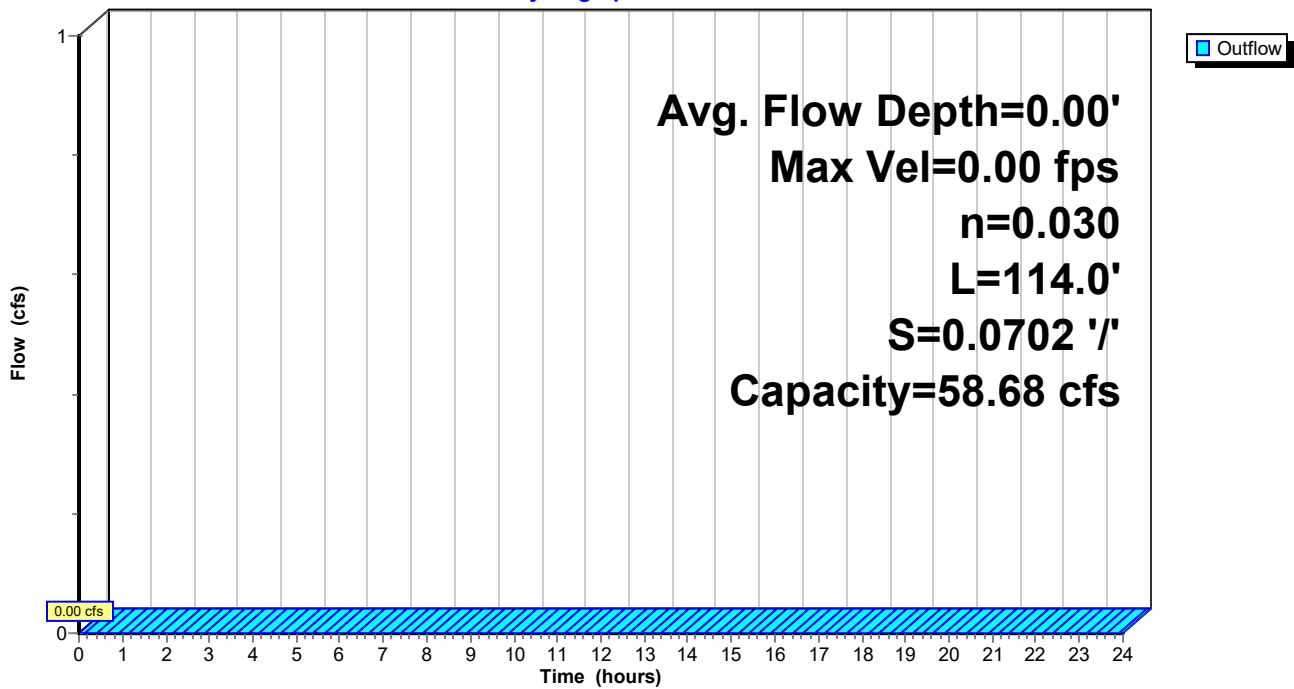
Length= 114.0' Slope= 0.0702 '/'

Inlet Invert= 261.00', Outlet Invert= 253.00'



Reach 1R: Swale

Hydrograph



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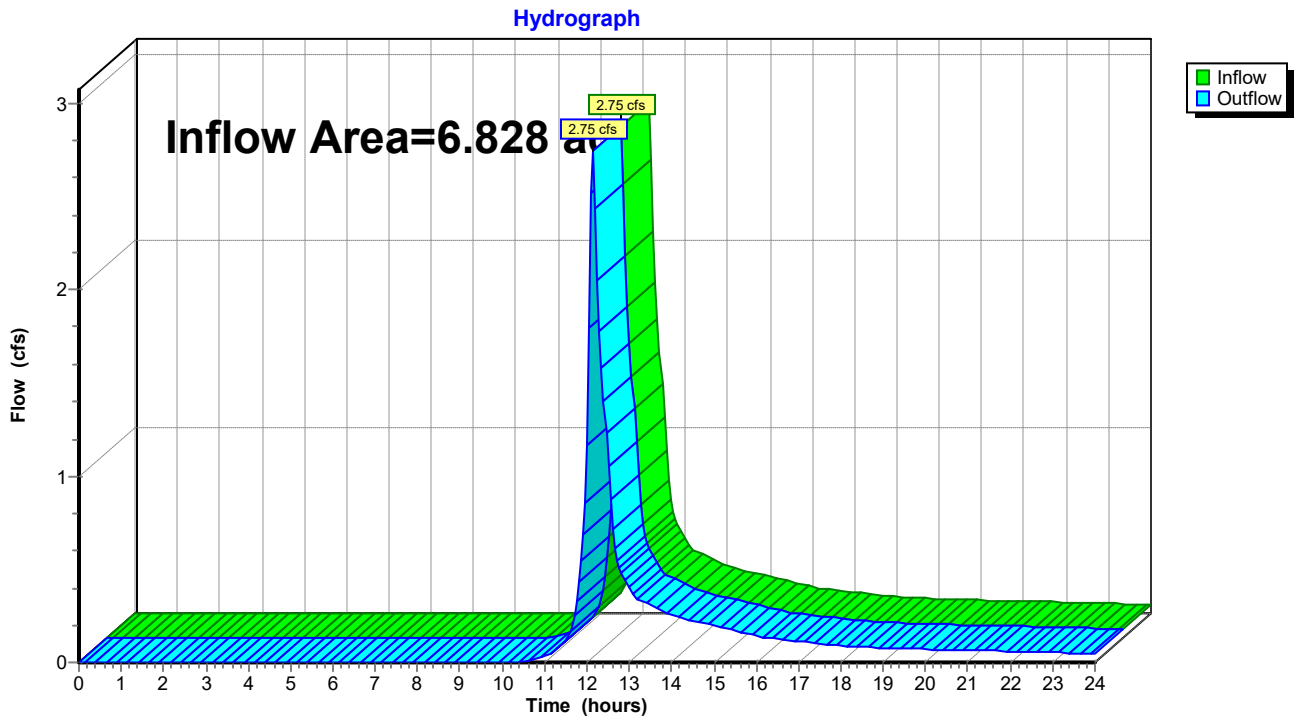
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Summary for Reach DP-1: Design Point

Inflow Area = 6.828 ac, 20.91% Impervious, Inflow Depth > 0.41" for 10-Year event
Inflow = 2.75 cfs @ 12.15 hrs, Volume= 0.232 af
Outflow = 2.75 cfs @ 12.15 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



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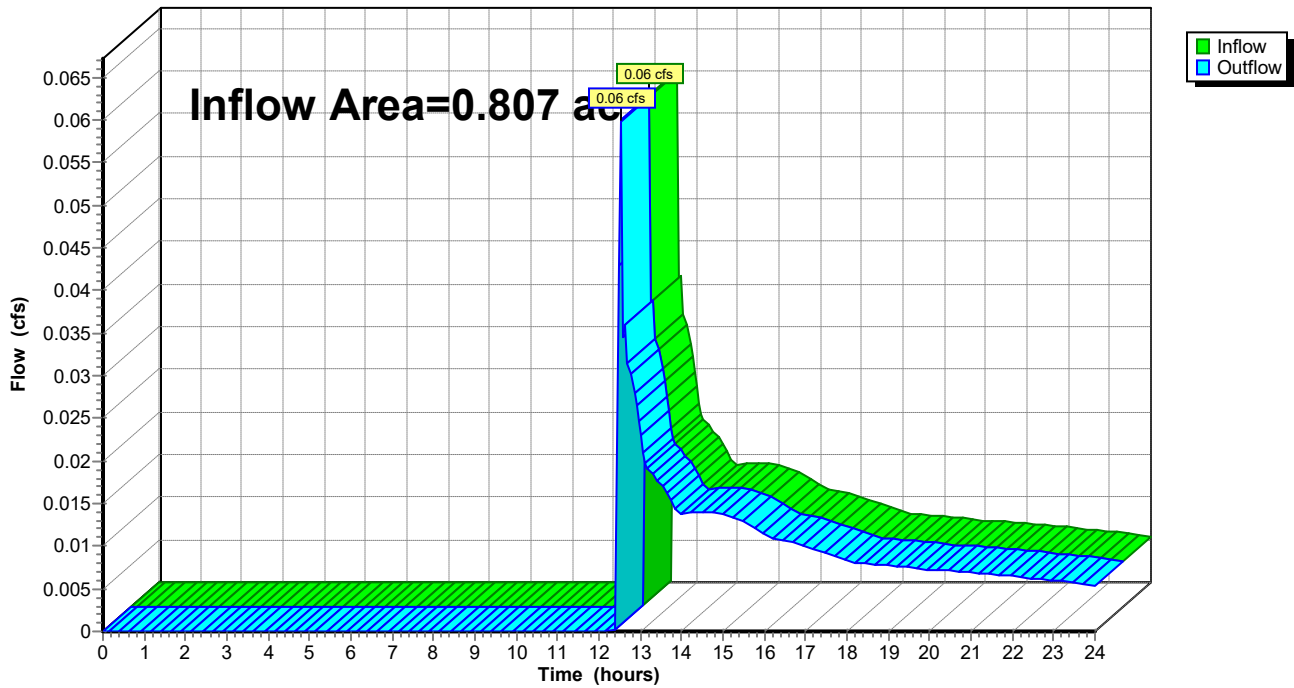
Summary for Reach DP-2: Design Point

Inflow Area = 0.807 ac, 10.10% Impervious, Inflow Depth > 0.15" for 10-Year event
Inflow = 0.06 cfs @ 12.54 hrs, Volume= 0.010 af
Outflow = 0.06 cfs @ 12.54 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.23"

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Summary for Pond 1P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 11.70 hrs, Volume= 0.017 af, Atten= 82%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.70 hrs, Volume= 0.017 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 231.64' @ 12.54 hrs Surf.Area= 189 sf Storage= 186 cf

Plug-Flow detention time= 28.2 min calculated for 0.017 af (100% of inflow)
 Center-of-Mass det. time= 27.6 min (774.5 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	230.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	230.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	232.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.04	1	0	0
237.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	236.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.70 hrs HW=230.08' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=230.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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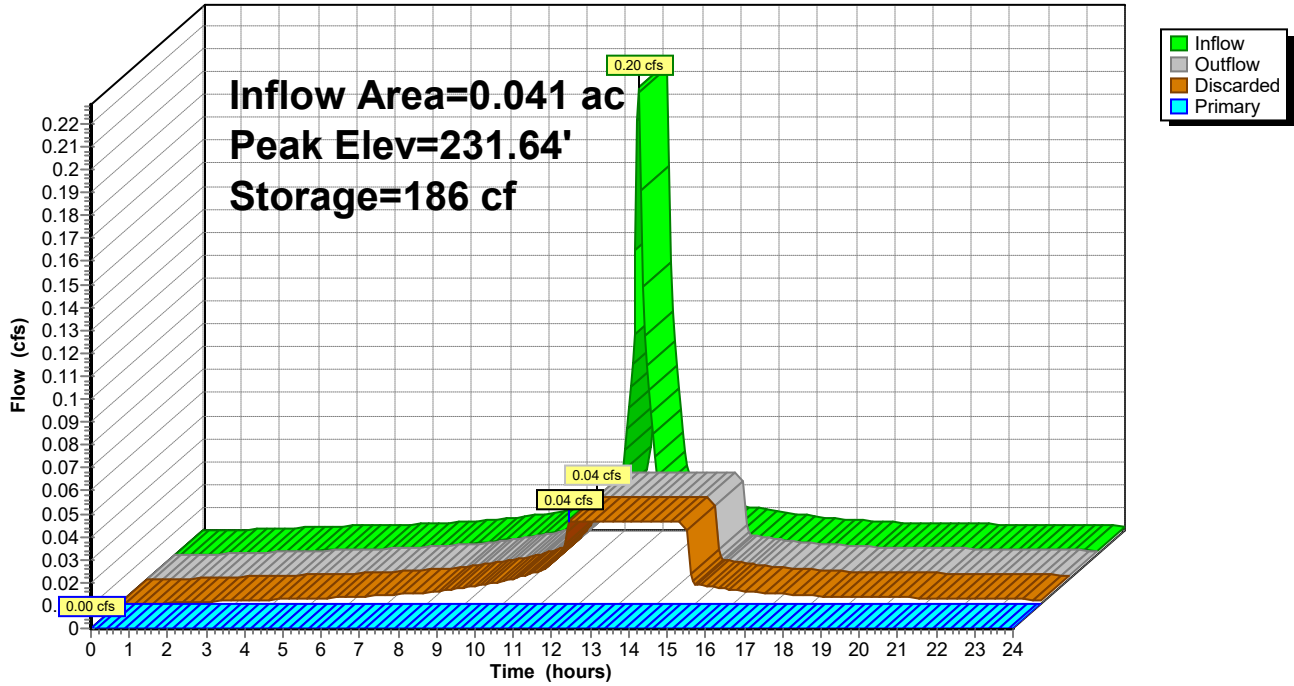
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 1P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 2P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 11.70 hrs, Volume= 0.017 af, Atten= 82%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.70 hrs, Volume= 0.017 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 234.64' @ 12.54 hrs Surf.Area= 189 sf Storage= 186 cf

Plug-Flow detention time= 28.2 min calculated for 0.017 af (100% of inflow)
 Center-of-Mass det. time= 27.6 min (774.5 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	233.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	233.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	235.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.04	1	0	0
240.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	233.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	239.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.70 hrs HW=233.08' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=233.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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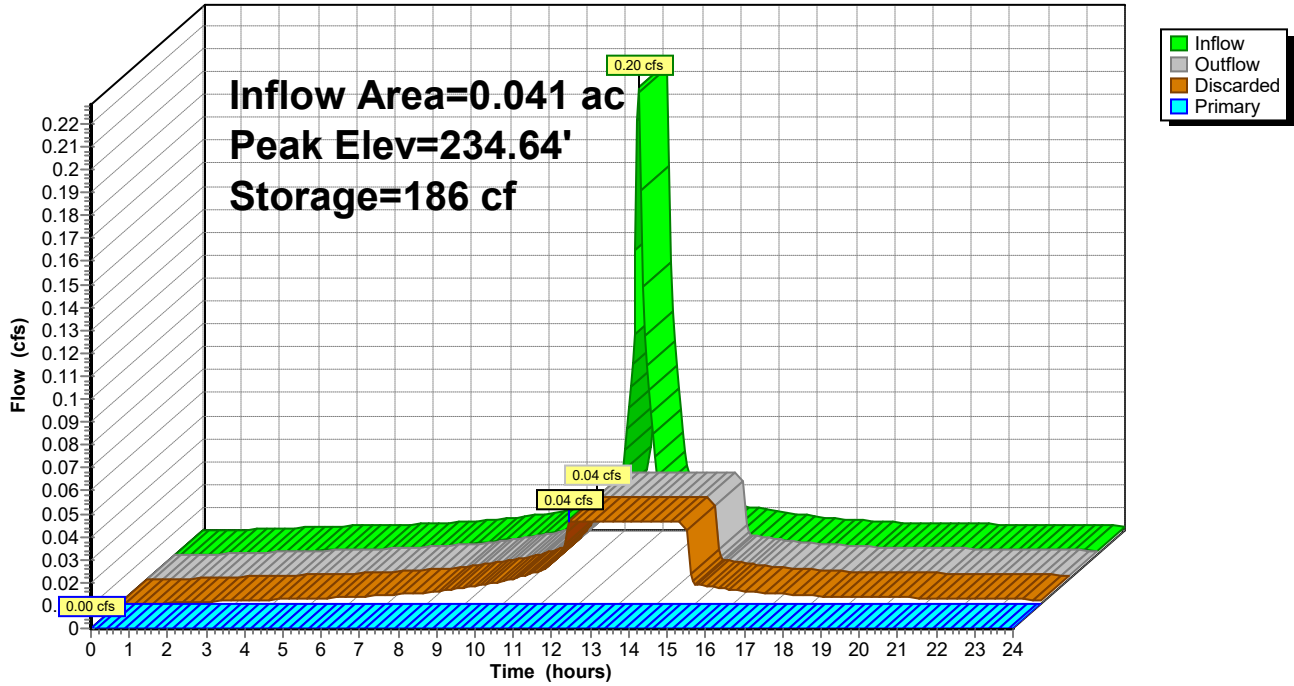
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 2P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 3P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 11.70 hrs, Volume= 0.017 af, Atten= 82%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.70 hrs, Volume= 0.017 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 238.63' @ 12.54 hrs Surf.Area= 189 sf Storage= 186 cf

Plug-Flow detention time= 27.9 min calculated for 0.017 af (100% of inflow)
 Center-of-Mass det. time= 27.3 min (774.2 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	237.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	237.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	239.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
239.04	1	0	0
243.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	242.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.70 hrs HW=237.07' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=237.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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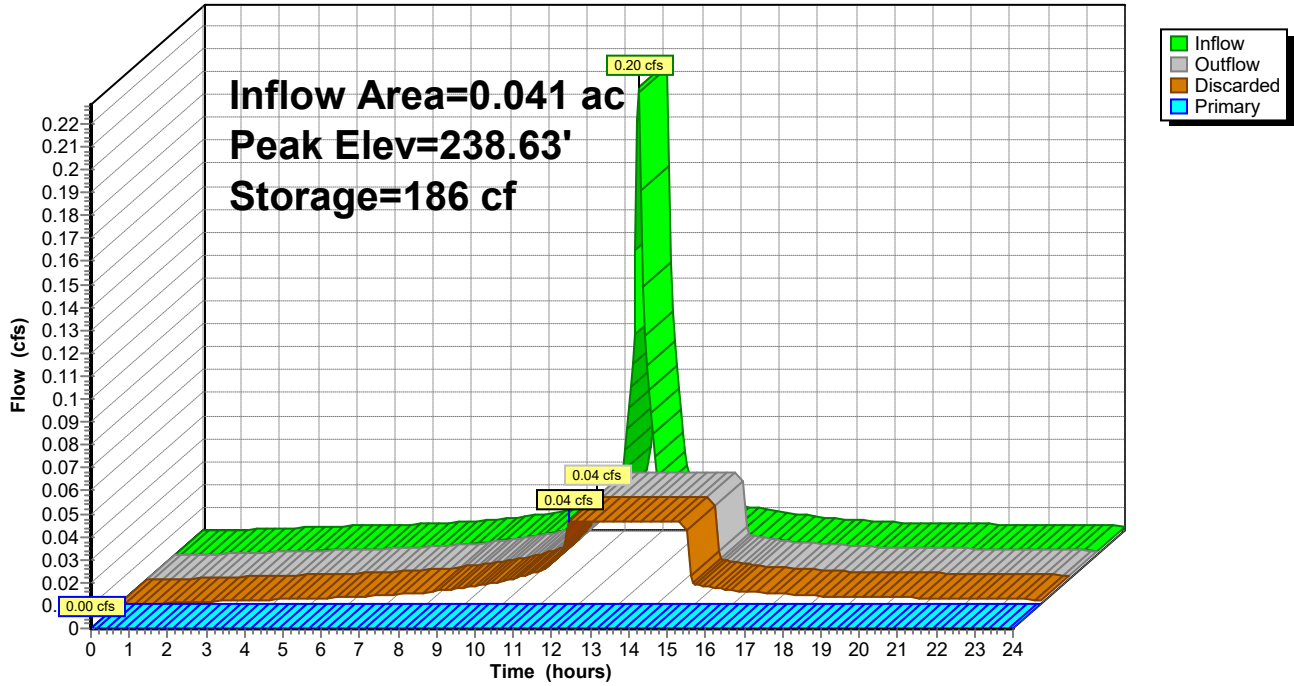
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 3P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 4P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 12.54 hrs, Volume= 0.017 af, Atten= 81%, Lag= 27.4 min
 Discarded = 0.01 cfs @ 12.30 hrs, Volume= 0.016 af
 Primary = 0.03 cfs @ 12.54 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.07' @ 12.55 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 189.8 min calculated for 0.017 af (98% of inflow)
 Center-of-Mass det. time= 176.9 min (923.7 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.30 hrs HW=223.20' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.54 hrs HW=226.07' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.89 fps)

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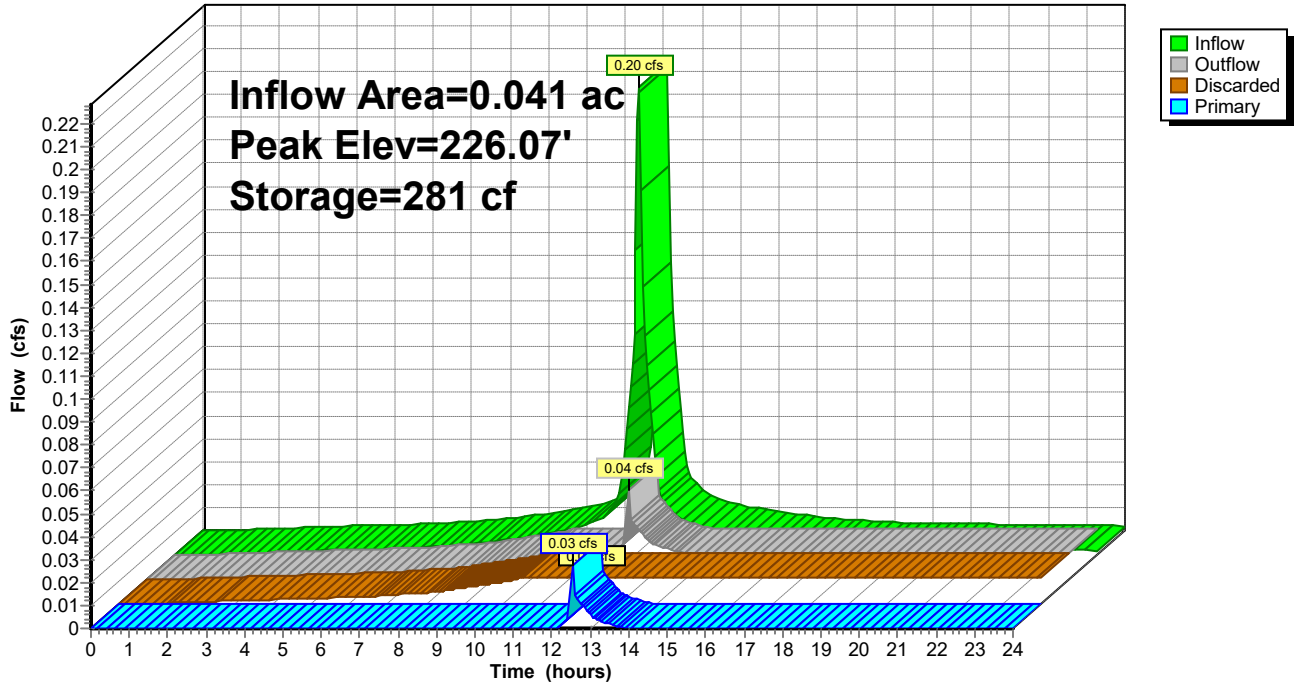
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 4P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 5P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 12.54 hrs, Volume= 0.017 af, Atten= 81%, Lag= 27.4 min
 Discarded = 0.01 cfs @ 12.30 hrs, Volume= 0.016 af
 Primary = 0.03 cfs @ 12.54 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.07' @ 12.55 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 189.8 min calculated for 0.017 af (98% of inflow)
 Center-of-Mass det. time= 176.9 min (923.7 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.30 hrs HW=223.20' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.54 hrs HW=226.07' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.89 fps)

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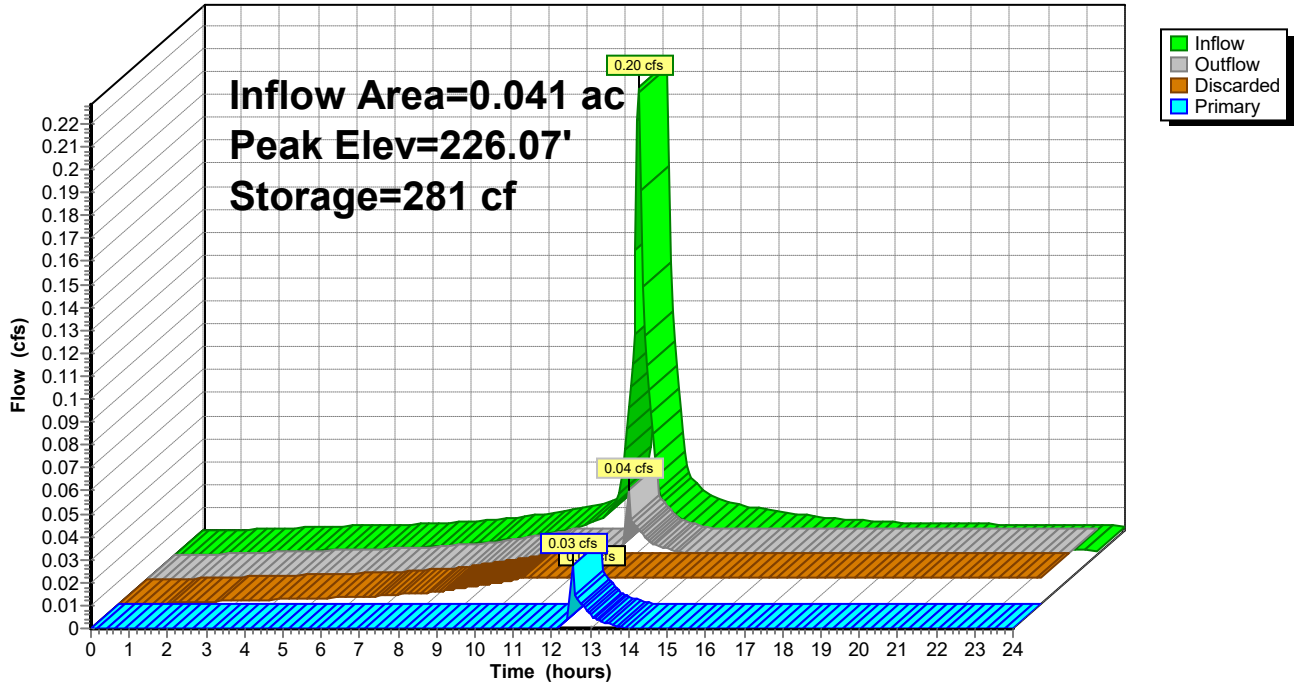
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 5P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 6P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.29 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.02 cfs @ 10.95 hrs, Volume= 0.024 af, Atten= 93%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 10.95 hrs, Volume= 0.024 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 225.98' @ 13.44 hrs Surf.Area= 350 sf Storage= 410 cf

Plug-Flow detention time= 161.0 min calculated for 0.024 af (100% of inflow)
 Center-of-Mass det. time= 160.2 min (907.1 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	224.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	224.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	226.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
226.04	1	0	0
230.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	229.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 10.95 hrs HW=224.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=224.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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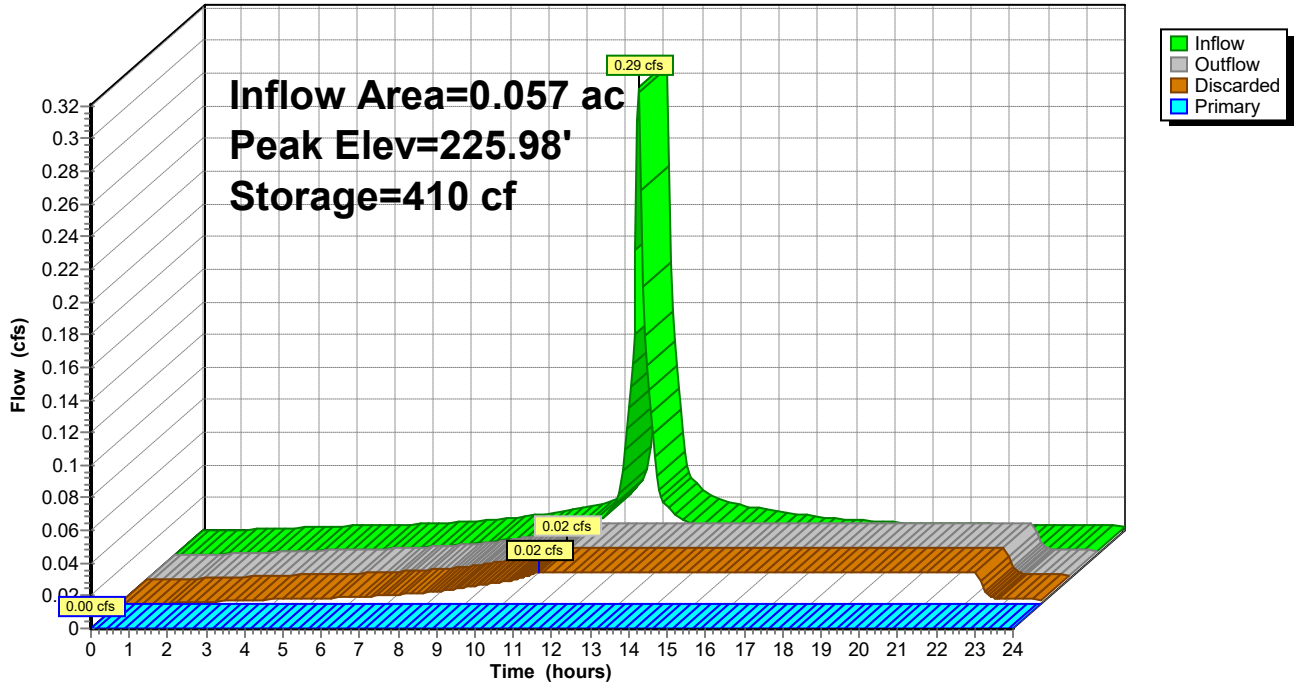
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 6P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 7P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.29 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.02 cfs @ 10.95 hrs, Volume= 0.024 af, Atten= 93%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 10.95 hrs, Volume= 0.024 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 206.99' @ 13.44 hrs Surf.Area= 350 sf Storage= 412 cf

Plug-Flow detention time= 162.1 min calculated for 0.024 af (100% of inflow)
 Center-of-Mass det. time= 161.3 min (908.1 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	205.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	208.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.04	1	0	0
212.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	211.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 10.95 hrs HW=205.07' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=205.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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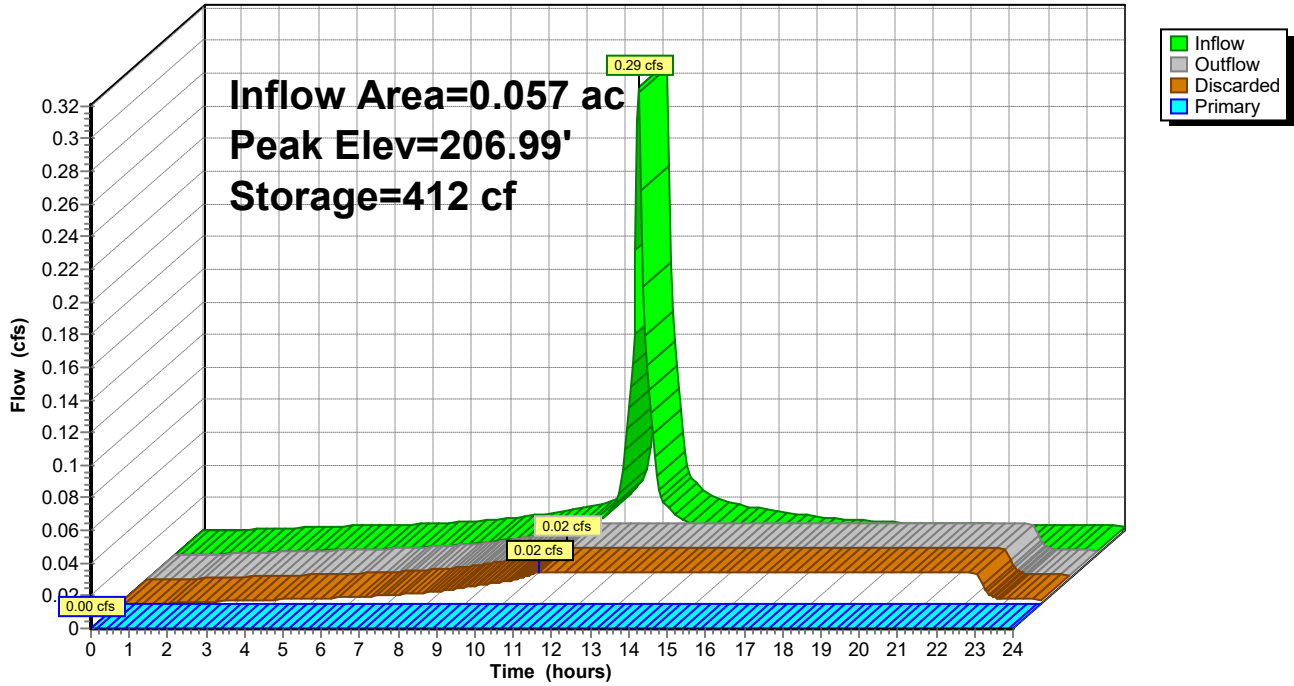
Type III 24-hr 10-Year Rainfall=5.23"

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Pond 7P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 8P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 12.54 hrs, Volume= 0.017 af, Atten= 81%, Lag= 27.4 min
 Discarded = 0.01 cfs @ 12.30 hrs, Volume= 0.016 af
 Primary = 0.03 cfs @ 12.54 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 198.07' @ 12.55 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 189.8 min calculated for 0.017 af (98% of inflow)
 Center-of-Mass det. time= 176.9 min (923.7 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	193.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	195.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.04	1	0	0
199.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	193.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	198.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.30 hrs HW=195.20' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.54 hrs HW=198.07' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.89 fps)

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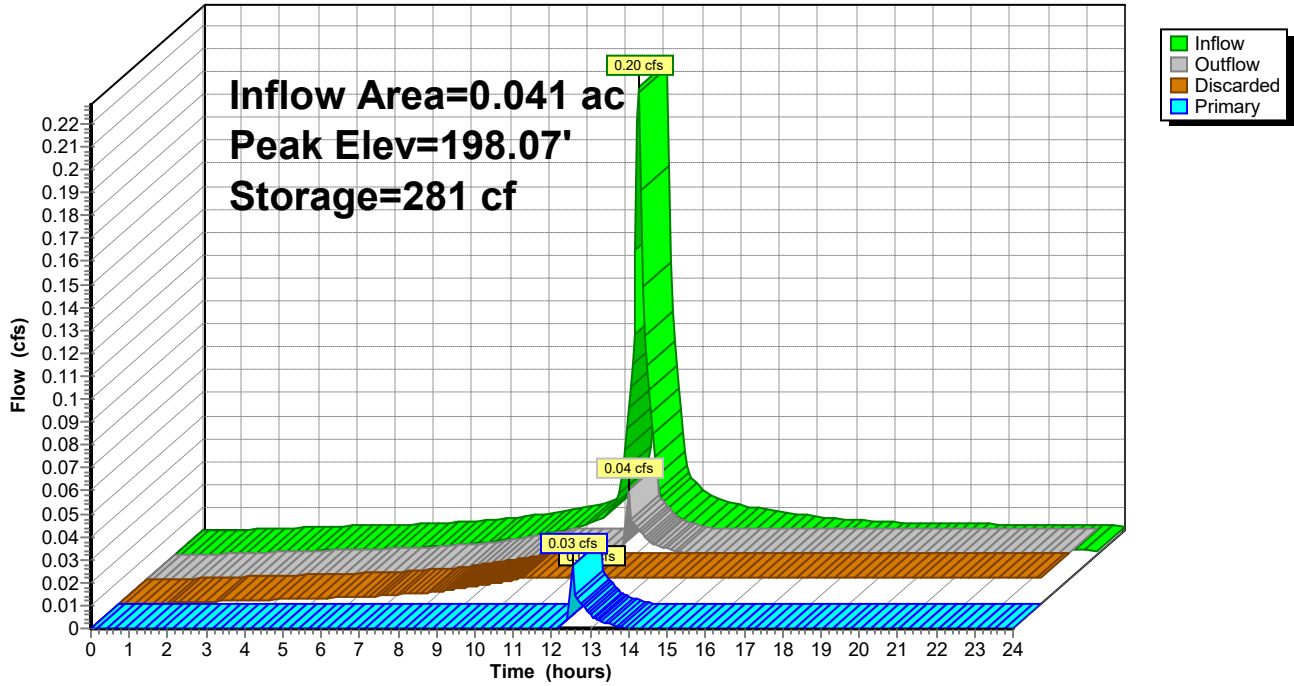
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Pond 8P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 9P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 4.99" for 10-Year event
 Inflow = 0.20 cfs @ 12.09 hrs, Volume= 0.017 af
 Outflow = 0.04 cfs @ 12.54 hrs, Volume= 0.017 af, Atten= 81%, Lag= 27.4 min
 Discarded = 0.01 cfs @ 12.30 hrs, Volume= 0.016 af
 Primary = 0.03 cfs @ 12.54 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 202.07' @ 12.55 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 189.8 min calculated for 0.017 af (98% of inflow)
 Center-of-Mass det. time= 176.9 min (923.7 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	197.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	197.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	199.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
199.04	1	0	0
203.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	197.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	202.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.30 hrs HW=199.20' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 12.54 hrs HW=202.07' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.89 fps)

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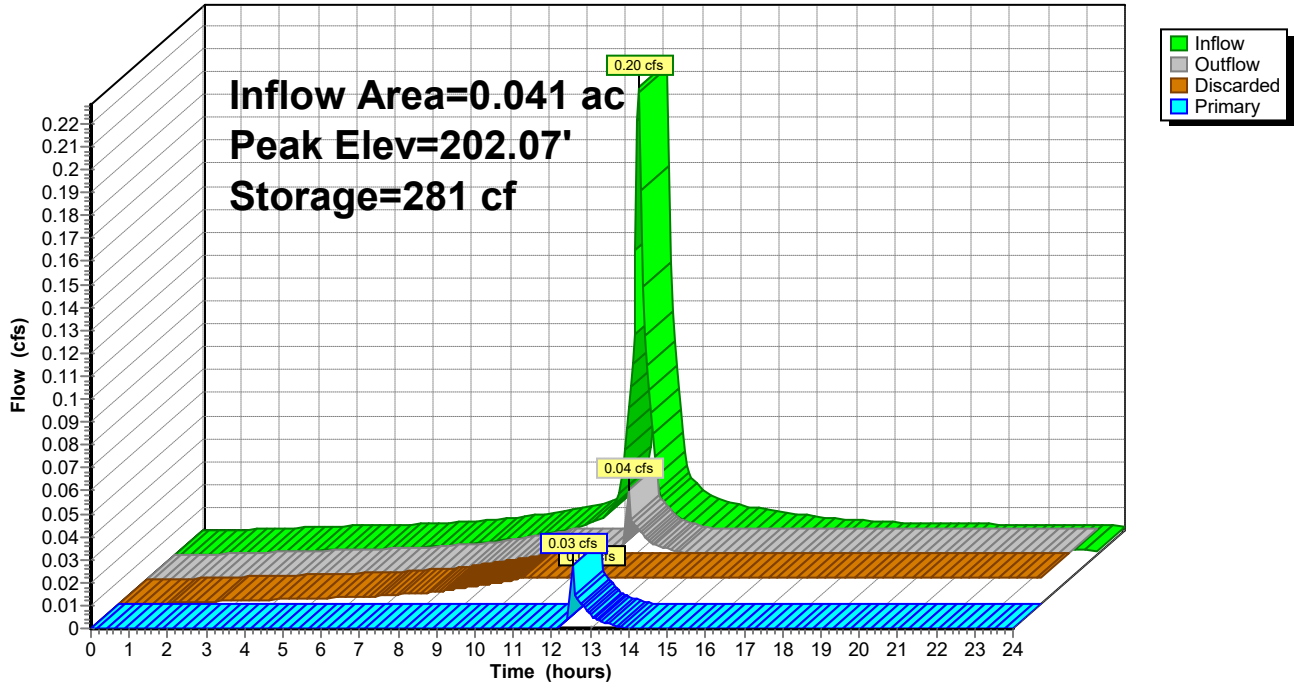
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Pond 9P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 10P: Basin

Inflow Area = 3.434 ac, 22.85% Impervious, Inflow Depth > 1.53" for 10-Year event
 Inflow = 5.40 cfs @ 12.12 hrs, Volume= 0.438 af
 Outflow = 0.28 cfs @ 15.95 hrs, Volume= 0.263 af, Atten= 95%, Lag= 230.1 min
 Discarded = 0.28 cfs @ 15.95 hrs, Volume= 0.263 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 212.98' @ 15.95 hrs Surf.Area= 4,985 sf Storage= 10,660 cf

Plug-Flow detention time= 321.7 min calculated for 0.262 af (60% of inflow)
 Center-of-Mass det. time= 202.2 min (1,064.0 - 861.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	209.40'	24,363 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
209.40	1,431	238.0	0	0	1,431	
210.00	1,887	254.0	992	992	2,075	
211.00	2,716	282.0	2,289	3,281	3,299	
212.00	3,629	309.0	3,161	6,443	4,602	
213.00	5,010	426.0	4,301	10,744	11,455	
214.00	6,399	472.0	5,690	16,434	14,773	
215.00	7,894	422.0	7,133	23,567	18,358	
215.10	8,022	423.0	796	24,363	18,438	

Device	Routing	Invert	Outlet Devices
#1	Primary	215.30'	10.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	209.40'	2.410 in/hr Exfiltration over Horizontal area
#3	Device 4	214.60'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	211.00'	12.0" Round Culvert L= 113.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.00' / 209.00' S= 0.0177 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.28 cfs @ 15.95 hrs HW=212.98' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=209.40' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Culvert** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)

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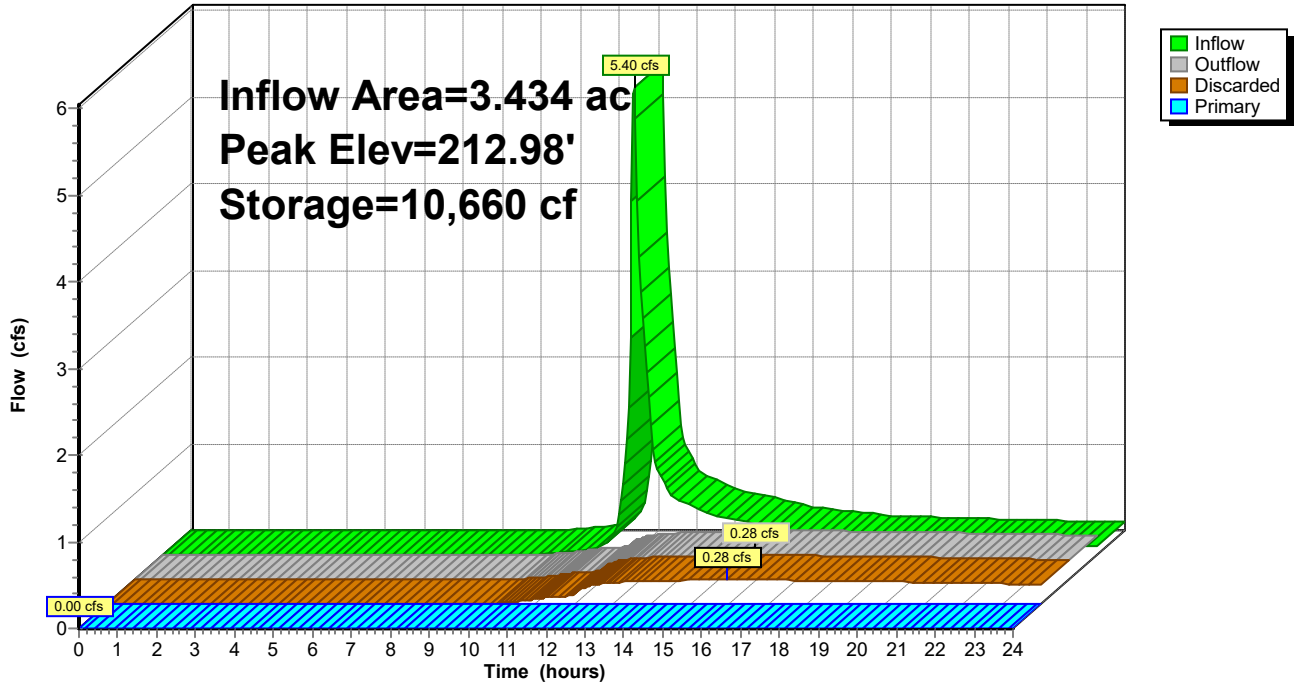
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Pond 10P: Basin

Hydrograph



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Summary for Pond 11P: 4x4x8 Galleys

Inflow Area = 1.852 ac, 28.92% Impervious, Inflow Depth > 0.85" for 10-Year event
 Inflow = 1.13 cfs @ 12.20 hrs, Volume= 0.131 af
 Outflow = 0.12 cfs @ 12.10 hrs, Volume= 0.118 af, Atten= 90%, Lag= 0.0 min
 Discarded = 0.12 cfs @ 12.10 hrs, Volume= 0.118 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 189.42' @ 15.63 hrs Surf.Area= 2,129 sf Storage= 2,310 cf

Plug-Flow detention time= 223.7 min calculated for 0.118 af (90% of inflow)
 Center-of-Mass det. time= 177.3 min (1,080.5 - 903.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.70'	2,307 cf	33.80'W x 63.00'L x 8.50'H Field A 18,100 cf Overall - 12,333 cf Embedded = 5,767 cf x 40.0% Voids
#2A	188.20'	9,846 cf	Concrete Galley 4x4x8 x 105 Inside #1 Inside= 42.0"W x 91.0"H => 26.79 sf x 3.50'L = 93.8 cf Outside= 52.8"W x 96.0"H => 29.36 sf x 4.00'L = 117.5 cf 105 Chambers in 7 Rows
		12,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	187.70'	2.410 in/hr Exfiltration over Horizontal area
#2	Primary	195.20'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 195.20' / 195.10' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.12 cfs @ 12.10 hrs HW=187.89' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=187.70' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

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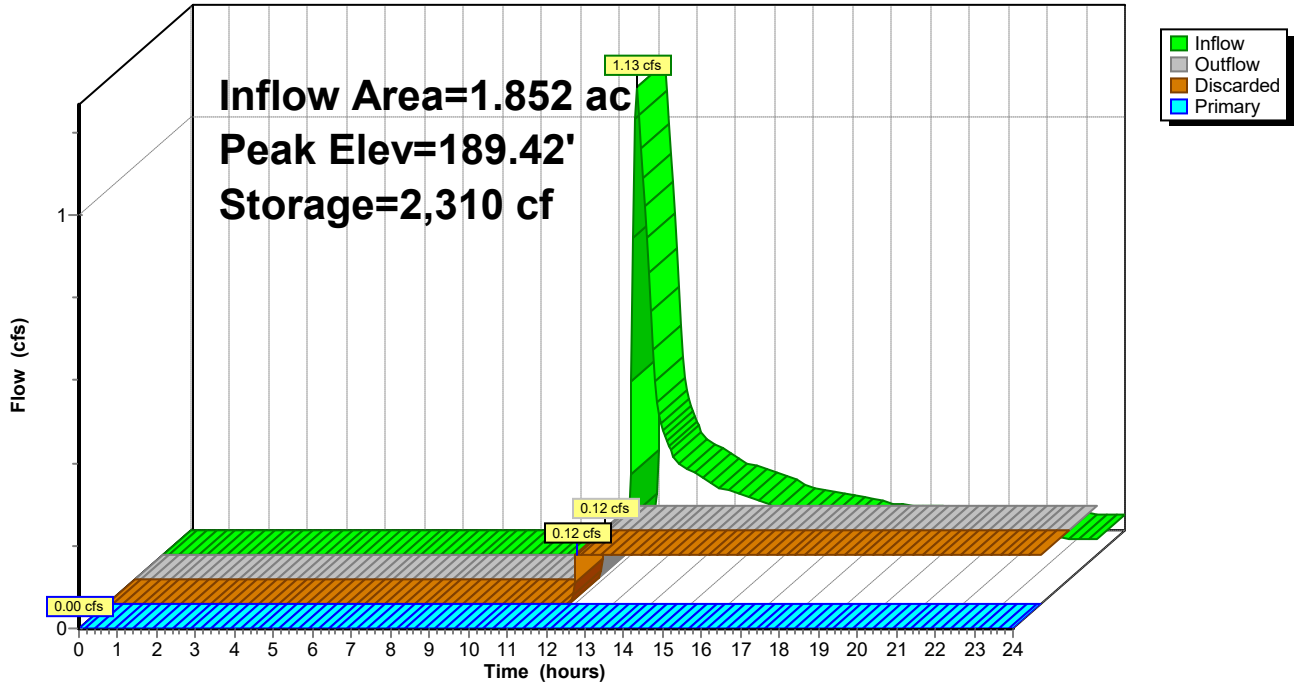
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Pond 11P: 4x4x8 Galleys

Hydrograph



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Summary for Pond 20P: Basin Forebay

Volume	Invert	Avail.Storage	Storage Description			
#1	213.00'	488 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
213.00	385	89.0	0	0	385	
214.00	598	113.0	488	488	784	

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Type III 24-hr 25-Year Rainfall=6.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P-1: Offsite Runoff Runoff Area=67,182 sf 6.98% Impervious Runoff Depth>2.64"
Flow Length=361' Tc=9.4 min CN=65 Runoff=4.12 cfs 0.339 af

Subcatchment P-4: Offsite Runoff Runoff Area=46,024 sf 5.71% Impervious Runoff Depth>3.22"
Flow Length=278' Tc=7.7 min CN=71 Runoff=3.71 cfs 0.284 af

Subcatchment P-5: Lawn & Woods Runoff Area=31,616 sf 0.00% Impervious Runoff Depth>0.39"
Tc=6.0 min CN=36 Runoff=0.10 cfs 0.024 af

Subcatchment P2: Lawn & Highland Road Runoff Area=94,674 sf 23.94% Impervious Runoff Depth>2.01"
Flow Length=338' Tc=6.9 min CN=58 Runoff=4.61 cfs 0.364 af

Subcatchment P3: Lawn & Ballard Road Runoff Area=75,676 sf 24.23% Impervious Runoff Depth>1.50"
Flow Length=356' Tc=11.2 min CN=52 Runoff=2.17 cfs 0.217 af

Subcatchment R-1: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Subcatchment R-2: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Subcatchment R-3: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Subcatchment R-4: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Subcatchment R-5: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Subcatchment R-6: Roof Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.029 af

Subcatchment R-7: Roof Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.029 af

Subcatchment R-8: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Subcatchment R-9: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>6.16"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.021 af

Reach 1R: Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.030 L=114.0' S=0.0702 '/' Capacity=58.68 cfs Outflow=0.00 cfs 0.000 af

Reach DP-1: Design Point Inflow=4.12 cfs 0.339 af
Outflow=4.12 cfs 0.339 af

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Reach DP-2: Design Point Inflow=0.40 cfs 0.031 af
Outflow=0.40 cfs 0.031 af

Pond 1P: 3 x 1 Cultec R-150XLHD Peak Elev=232.45' Storage=255 cf Inflow=0.25 cfs 0.021 af
Discarded=0.04 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.021 af

Pond 2P: 3 x 1 Cultec R-150XLHD Peak Elev=235.45' Storage=255 cf Inflow=0.25 cfs 0.021 af
Discarded=0.04 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.021 af

Pond 3P: 3 x 1 Cultec R-150XLHD Peak Elev=239.44' Storage=254 cf Inflow=0.25 cfs 0.021 af
Discarded=0.04 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.021 af

Pond 4P: 1 x 4 Cultec R-150XLHD Peak Elev=226.20' Storage=281 cf Inflow=0.25 cfs 0.021 af
Discarded=0.01 cfs 0.017 af Primary=0.17 cfs 0.004 af Outflow=0.18 cfs 0.020 af

Pond 5P: 1 x 4 Cultec R-150XLHD Peak Elev=226.20' Storage=281 cf Inflow=0.25 cfs 0.021 af
Discarded=0.01 cfs 0.017 af Primary=0.17 cfs 0.004 af Outflow=0.18 cfs 0.020 af

Pond 6P: 2 x 4 Cultec R-150XLHD Peak Elev=229.11' Storage=492 cf Inflow=0.35 cfs 0.029 af
Discarded=0.02 cfs 0.027 af Primary=0.06 cfs 0.001 af Outflow=0.08 cfs 0.028 af

Pond 7P: 2 x 4 Cultec R-150XLHD Peak Elev=211.12' Storage=492 cf Inflow=0.35 cfs 0.029 af
Discarded=0.02 cfs 0.027 af Primary=0.07 cfs 0.001 af Outflow=0.09 cfs 0.028 af

Pond 8P: 1 x 4 Cultec R-150XLHD Peak Elev=198.20' Storage=281 cf Inflow=0.25 cfs 0.021 af
Discarded=0.01 cfs 0.017 af Primary=0.17 cfs 0.004 af Outflow=0.18 cfs 0.020 af

Pond 9P: 1 x 4 Cultec R-150XLHD Peak Elev=202.20' Storage=281 cf Inflow=0.25 cfs 0.021 af
Discarded=0.01 cfs 0.017 af Primary=0.17 cfs 0.004 af Outflow=0.18 cfs 0.020 af

Pond 10P: Basin Peak Elev=214.10' Storage=17,076 cf Inflow=8.32 cfs 0.654 af
Discarded=0.36 cfs 0.354 af Primary=0.00 cfs 0.000 af Outflow=0.36 cfs 0.354 af

Pond 11P: 4x4x8 Galleys Peak Elev=191.40' Storage=5,362 cf Inflow=2.17 cfs 0.220 af
Discarded=0.12 cfs 0.120 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.120 af

Pond 20P: Basin Forebay Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 7.635 ac Runoff Volume = 1.433 af Average Runoff Depth = 2.25"
80.23% Pervious = 6.126 ac 19.77% Impervious = 1.509 ac

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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment P-1: Offsite Runoff

Runoff = 4.12 cfs @ 12.14 hrs, Volume= 0.339 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 2,729	98	Roof, offsite
* 14,859	39	>75% Grass cover, Good, HSG A, offsite
* 20,436	74	>75% Grass cover, Good, HSG C, offsite
* 20,439	70	Woods, Good, HSG C, offsite
* 1,960	98	Paved driveways
777	39	>75% Grass cover, Good, HSG A
4,674	74	>75% Grass cover, Good, HSG C
1,308	30	Woods, Good, HSG A
67,182	65	Weighted Average
62,493		93.02% Pervious Area
4,689		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	17	0.0100	0.09		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
0.5	10	0.3300	0.34		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
4.0	23	0.0650	0.09		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.34"
0.2	14	0.0710	1.33		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.3	217	0.1500	2.71		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0375	3.93		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
9.4	361	Total			

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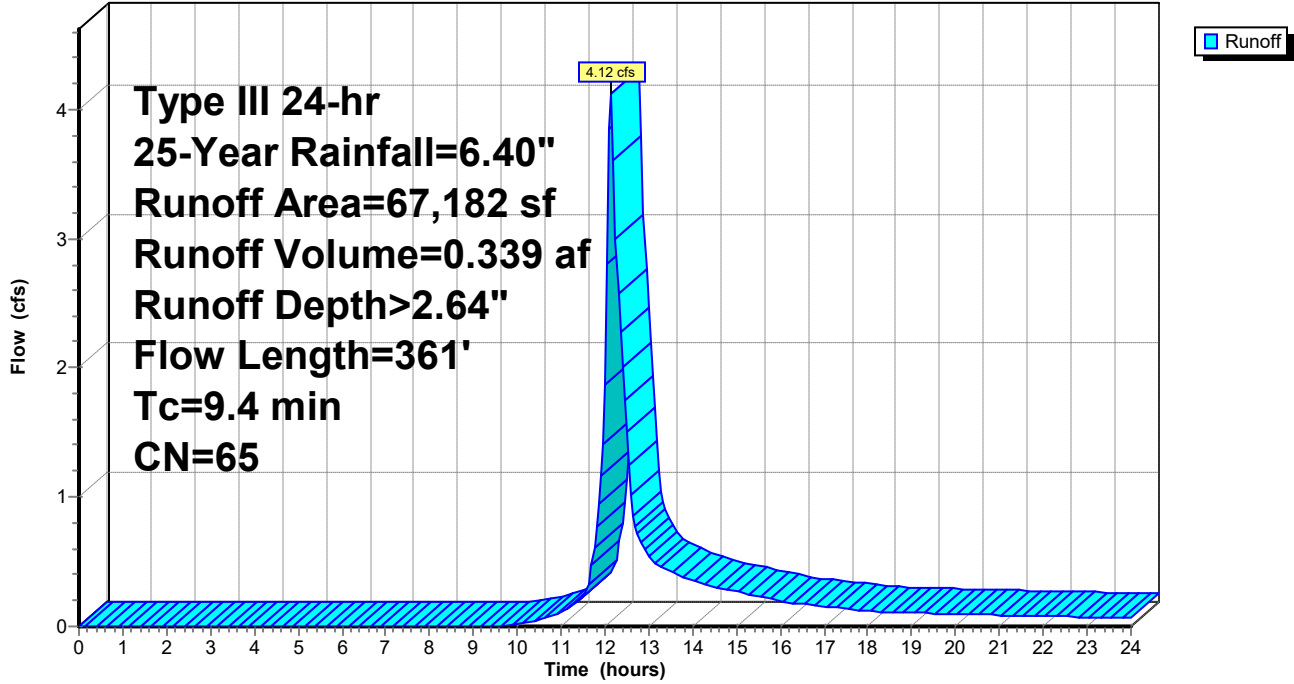
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Subcatchment P-1: Offsite Runoff

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Summary for Subcatchment P-4: Offsite Runoff

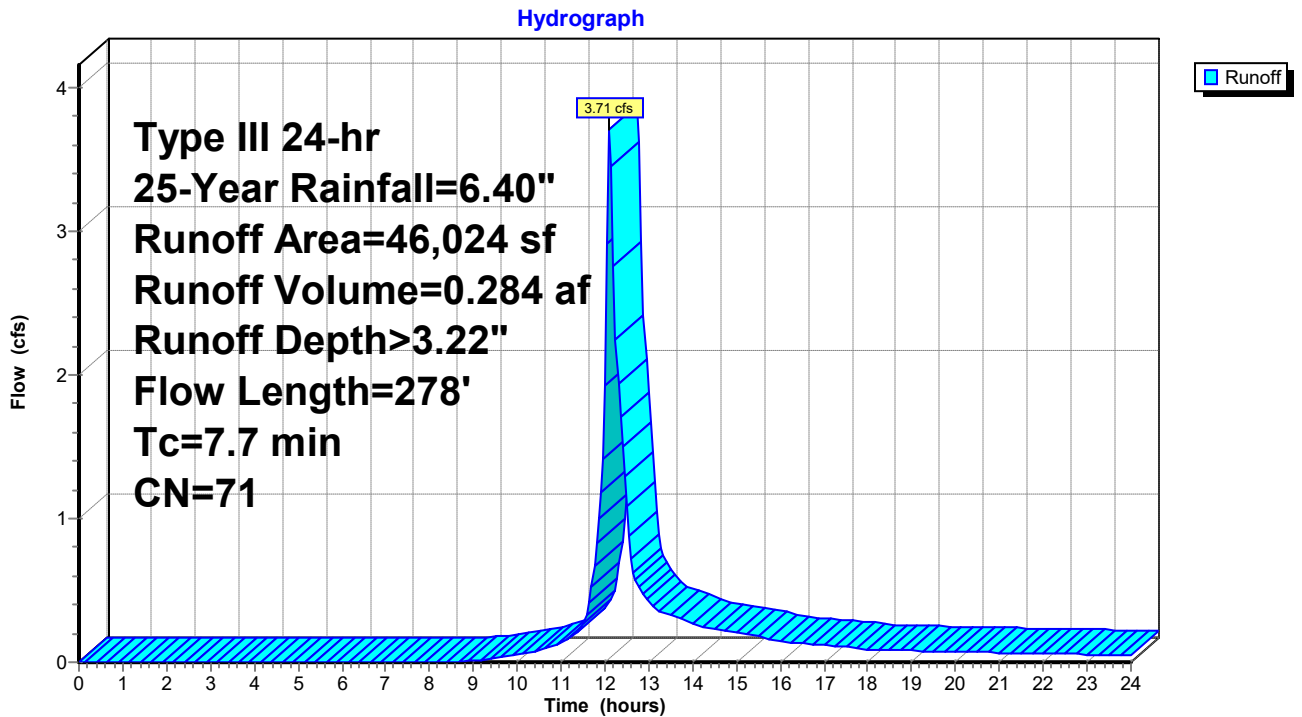
Runoff = 3.71 cfs @ 12.11 hrs, Volume= 0.284 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,694	98	Roof, offsite
* 933	98	Pavement, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 1,470	30	Woods, Good, HSG A, offsite
* 37,527	70	Woods, Good, HSG C, offsite
46,024	71	Weighted Average
43,397		94.29% Pervious Area
2,627		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
2.2	228	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
7.7	278	Total			

Subcatchment P-4: Offsite Runoff



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment P-5: Lawn & Woods

Runoff = 0.10 cfs @ 12.38 hrs, Volume= 0.024 af, Depth> 0.39"

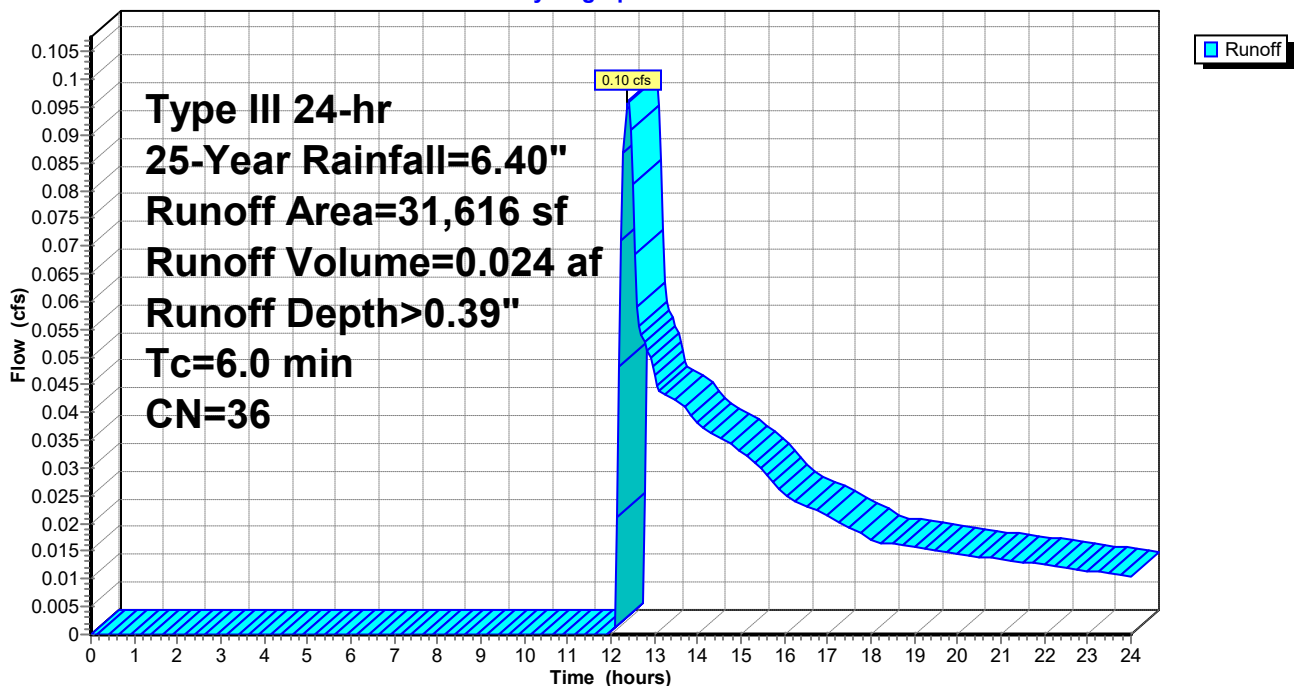
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
*	0	98 Roof, offsite
*	0	98 Pavement, offsite
*	0	39 >75% Grass cover, Good, HSG A, offsite
*	0	74 >75% Grass cover, Good, HSG C, offsite
*	0	30 Woods, Good, HSG A, offsite
*	0	70 Woods, Good, HSG C, offsite
*	0	98 Roof
*	0	98 Paved driveways
22,623	39	>75% Grass cover, Good, HSG A
8,993	30	Woods, Good, HSG A
0	70	Woods, Good, HSG C
31,616	36	Weighted Average
31,616		100.00% Pervious Area

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

Subcatchment P-5: Lawn & Woods

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment P2: Lawn & Highland Road

Runoff = 4.61 cfs @ 12.11 hrs, Volume= 0.364 af, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 22,666	98	Paved driveways
57,693	39	>75% Grass cover, Good, HSG A
14,315	74	>75% Grass cover, Good, HSG C
94,674	58	Weighted Average
72,008		76.06% Pervious Area
22,666		23.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.4	23	0.0200	0.99		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.8	153	0.0260	3.27		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.2	112	0.0400	10.72	8.42	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
6.9	338	Total			

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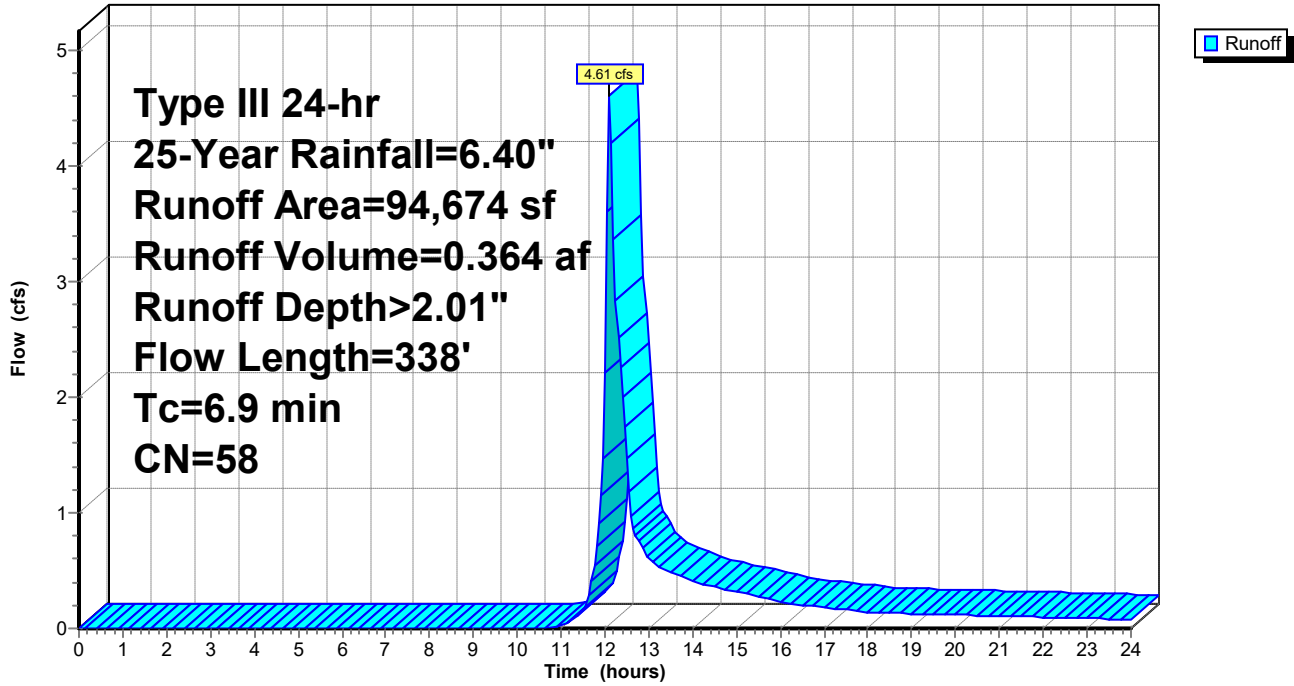
Type III 24-hr 25-Year Rainfall=6.40"

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Subcatchment P2: Lawn & Highland Road

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment P3: Lawn & Ballard Road

Runoff = 2.17 cfs @ 12.18 hrs, Volume= 0.217 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,687	98	Roof, offsite
* 469	98	Pavement, offsite
* 22,183	39	>75% Grass cover, Good, HSG A, offsite
* 9,255	30	Woods, Good, HSG A, offsite
* 16,183	98	Paved driveways
21,959	39	>75% Grass cover, Good, HSG A
3,940	30	Woods, Good, HSG A
75,676	52	Weighted Average
57,337		75.77% Pervious Area
18,339		24.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		Sheet Flow, TC up until 50' length Woods: Light underbrush n= 0.400 P2= 3.34"
2.4	101	0.0200	0.71		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
0.7	120	0.0200	2.87		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.3	85	0.0100	5.36	4.21	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
11.2	356	Total			

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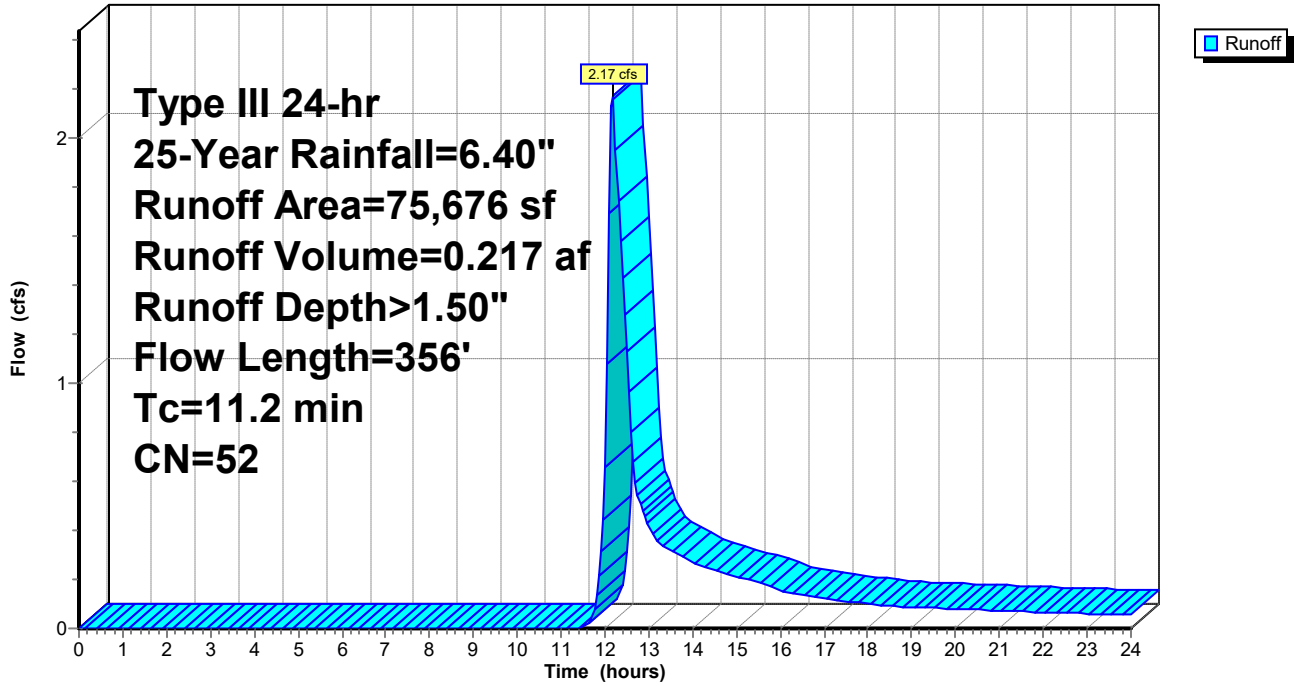
Type III 24-hr 25-Year Rainfall=6.40"

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Subcatchment P3: Lawn & Ballard Road

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-1: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

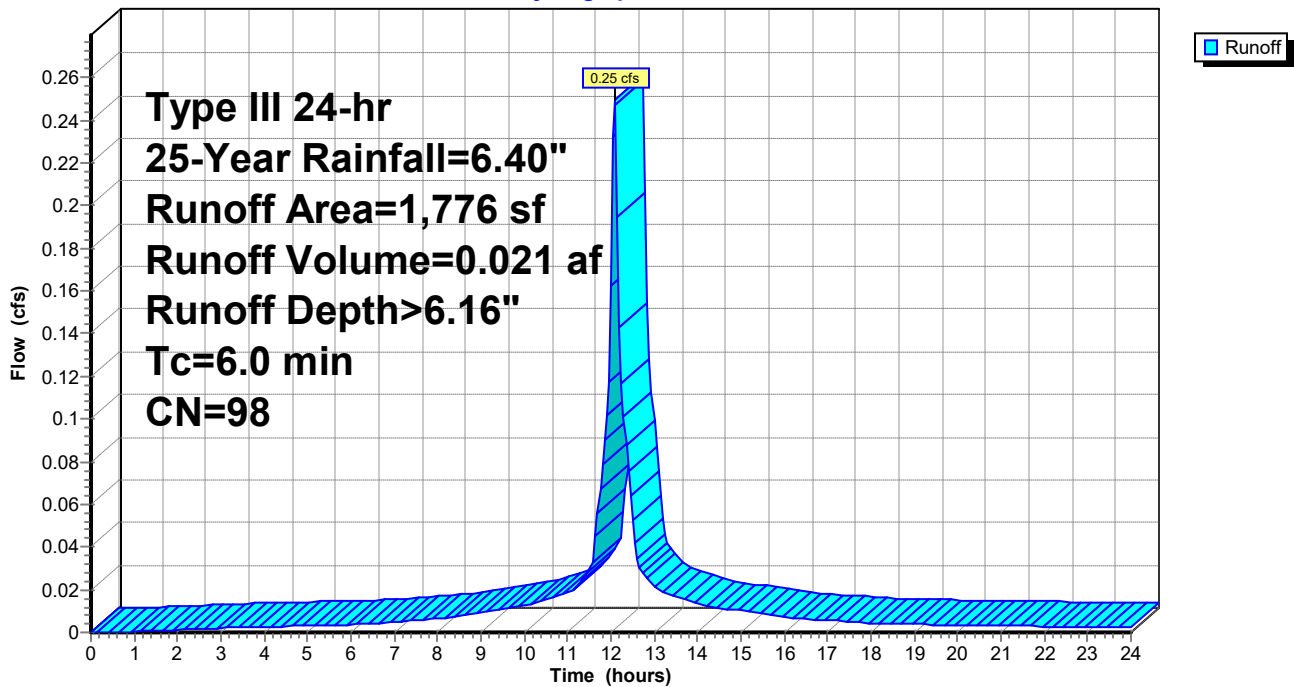
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-1: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-2: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

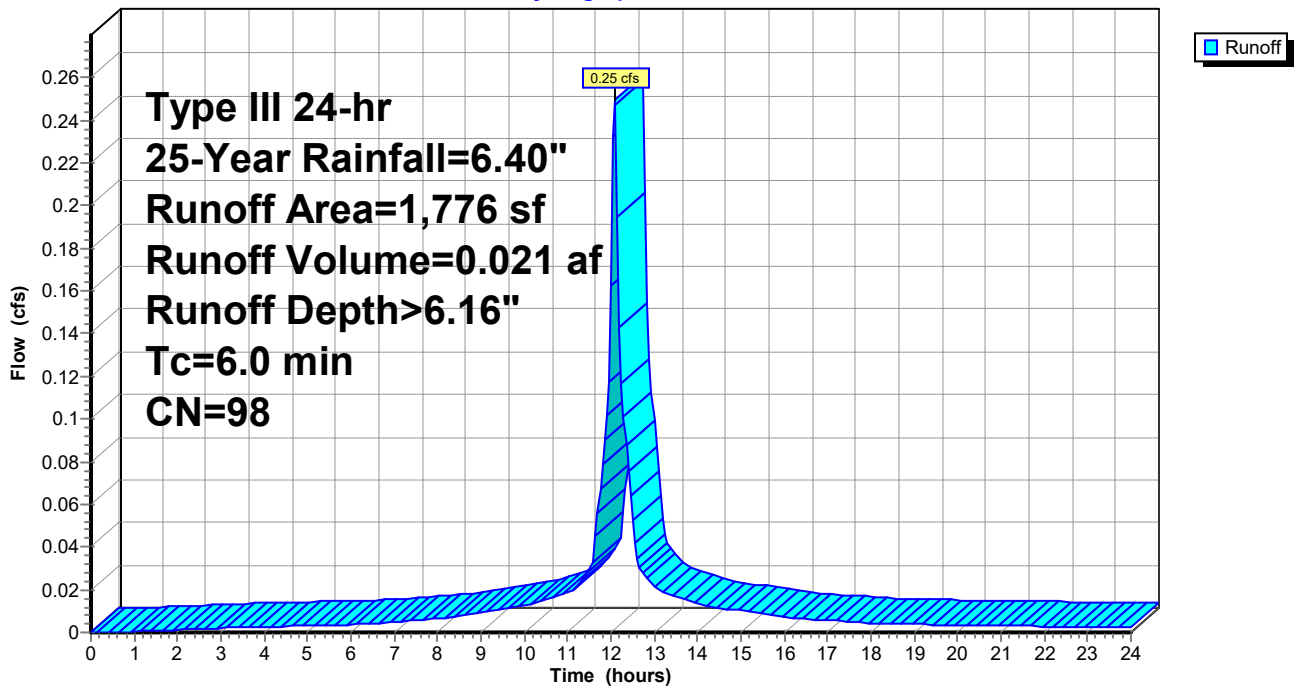
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-2: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-3: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

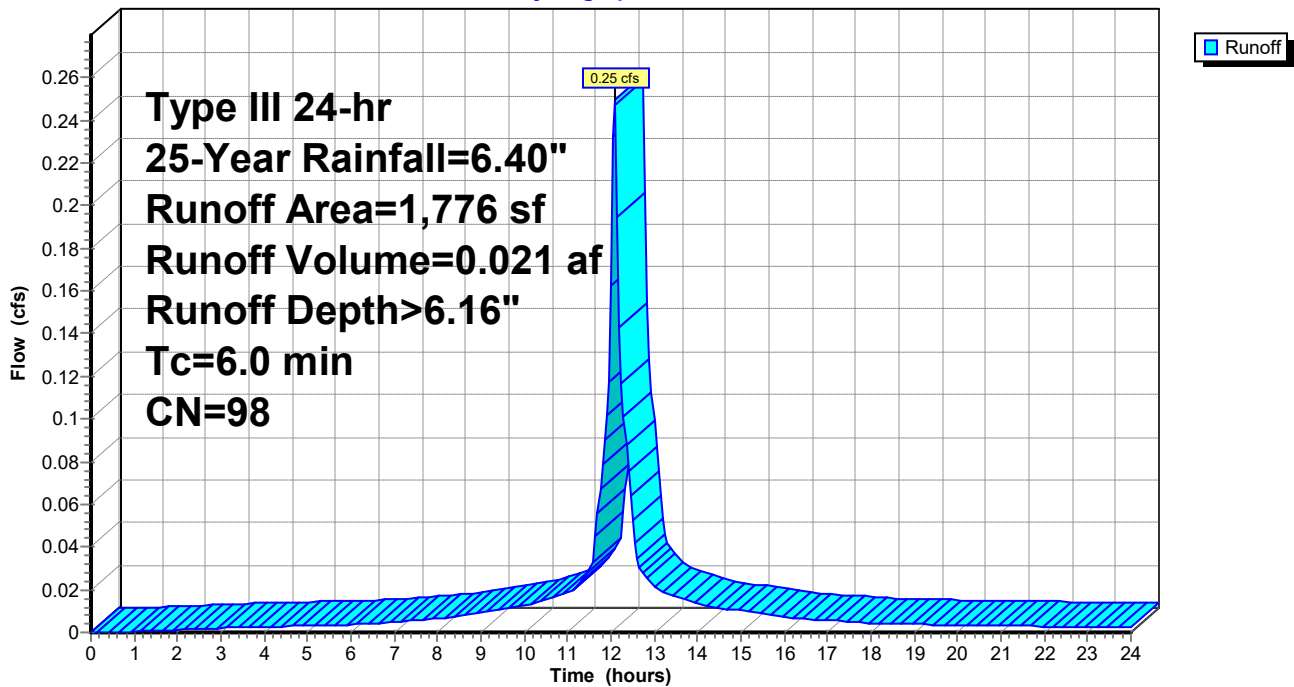
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-3: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-4: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

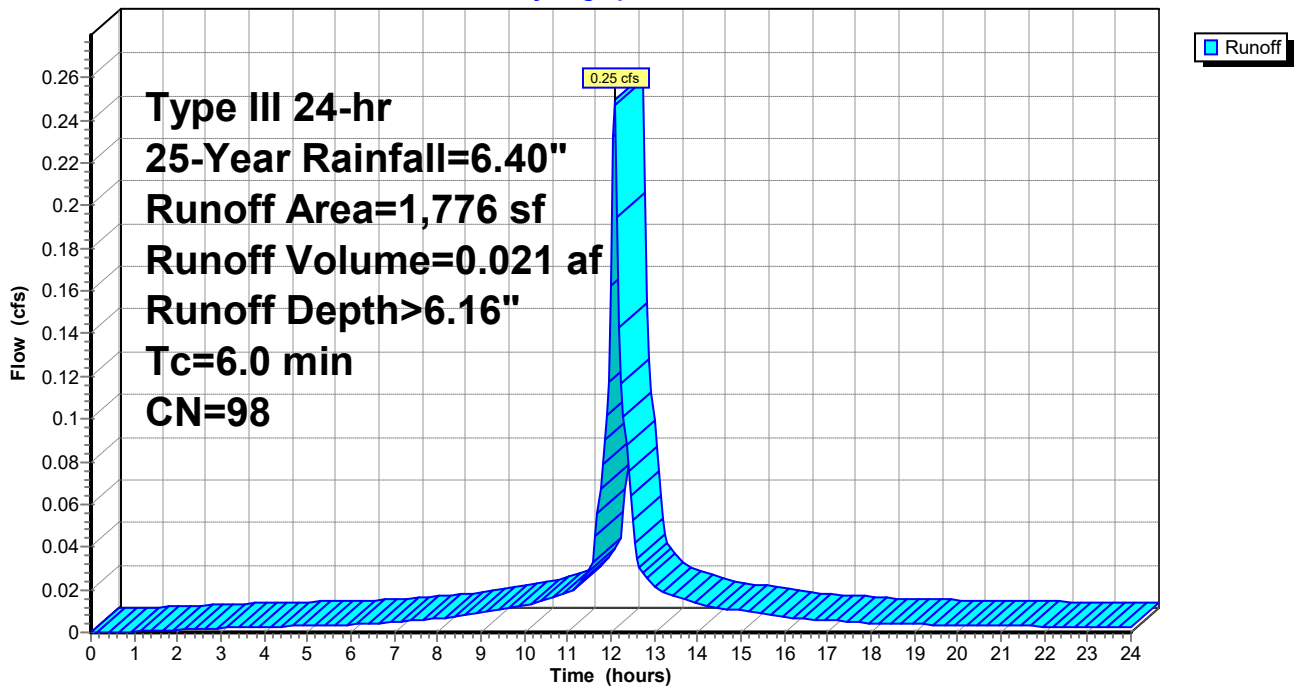
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-4: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-5: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

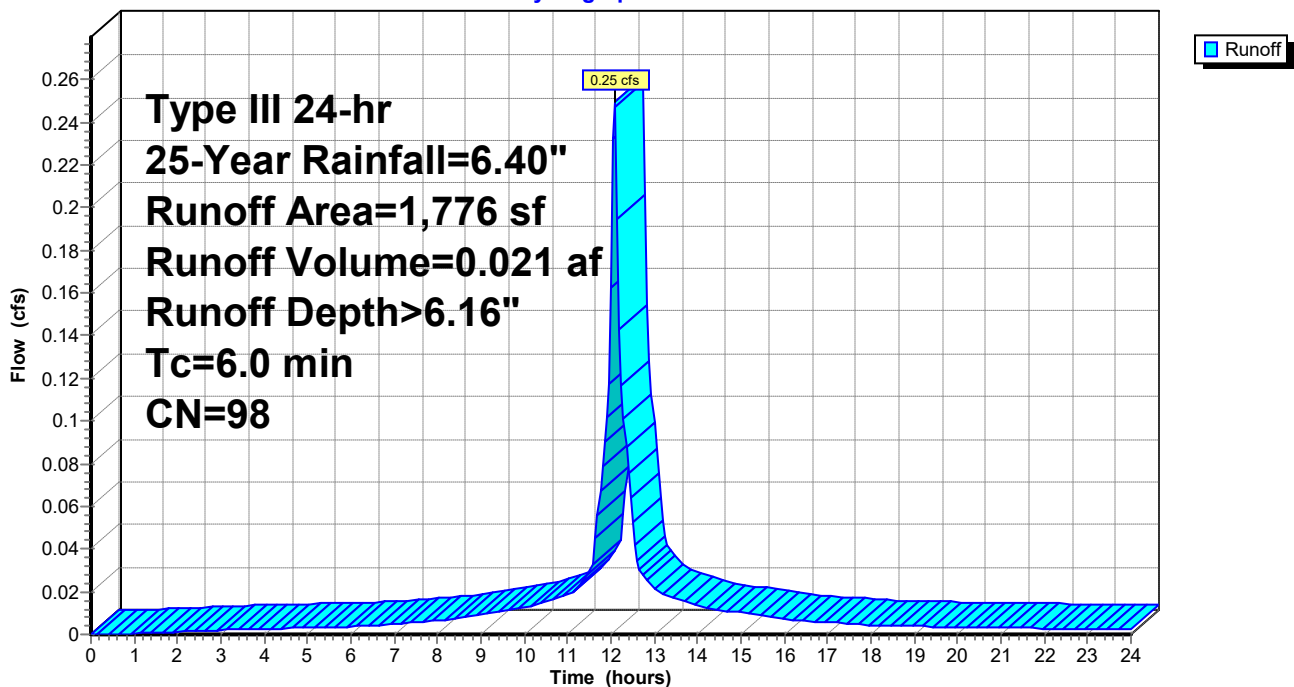
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-5: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-6: Roof

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.029 af, Depth> 6.16"

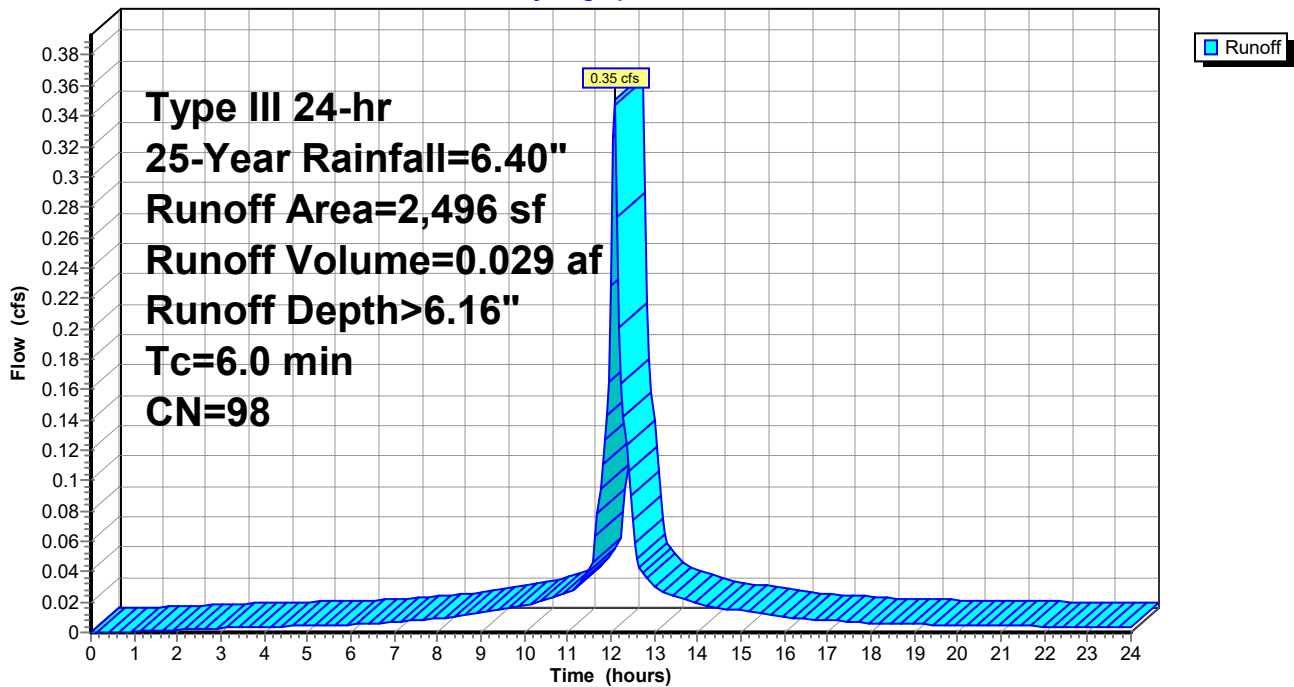
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-6: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-7: Roof

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.029 af, Depth> 6.16"

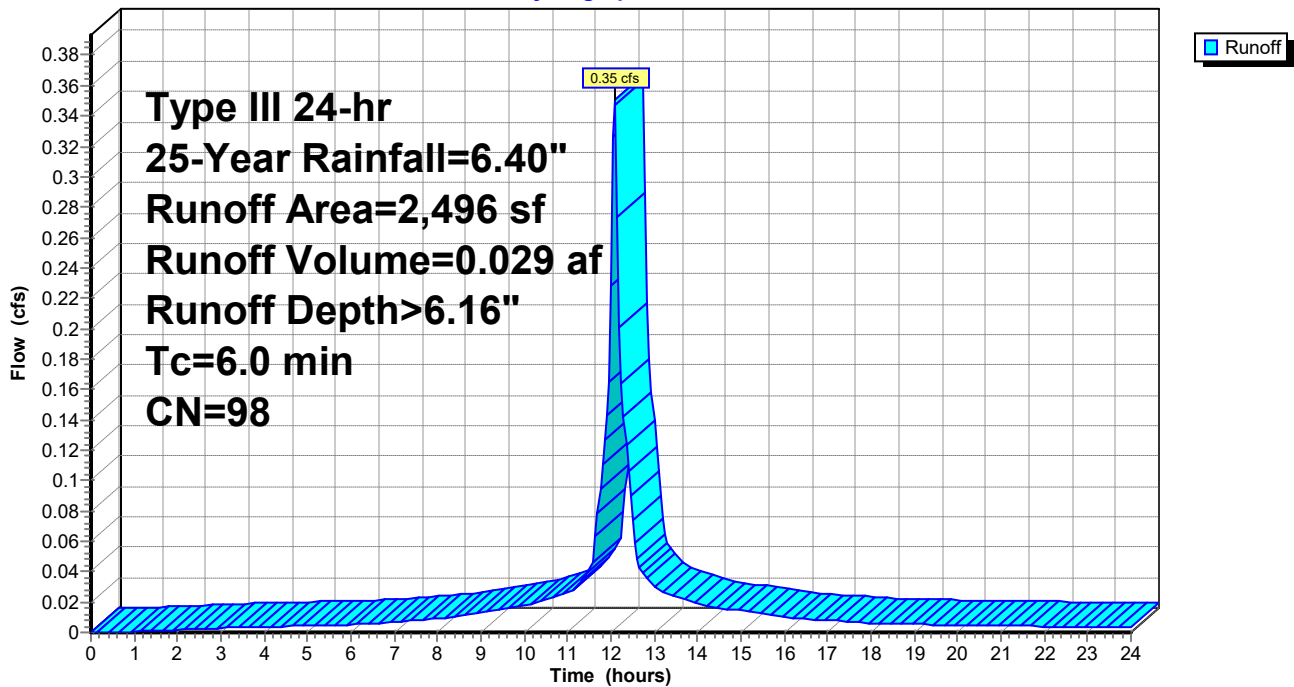
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-7: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-8: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

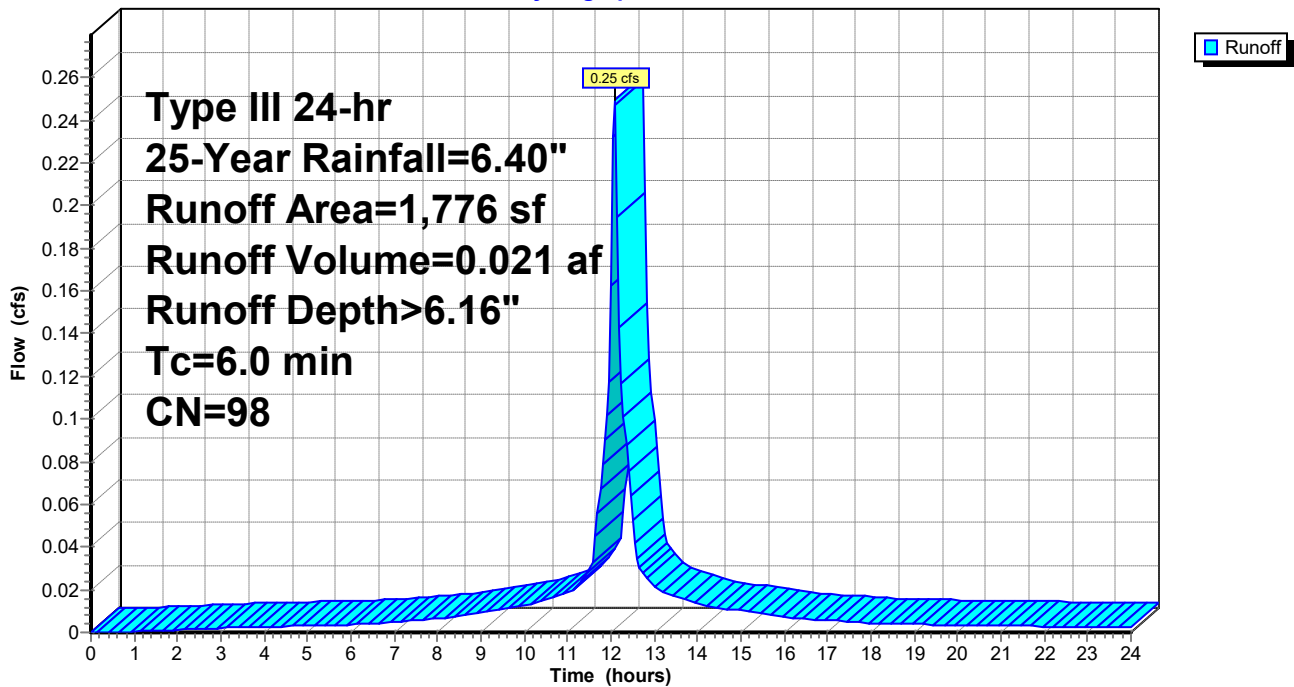
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-8: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Subcatchment R-9: Roof

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 6.16"

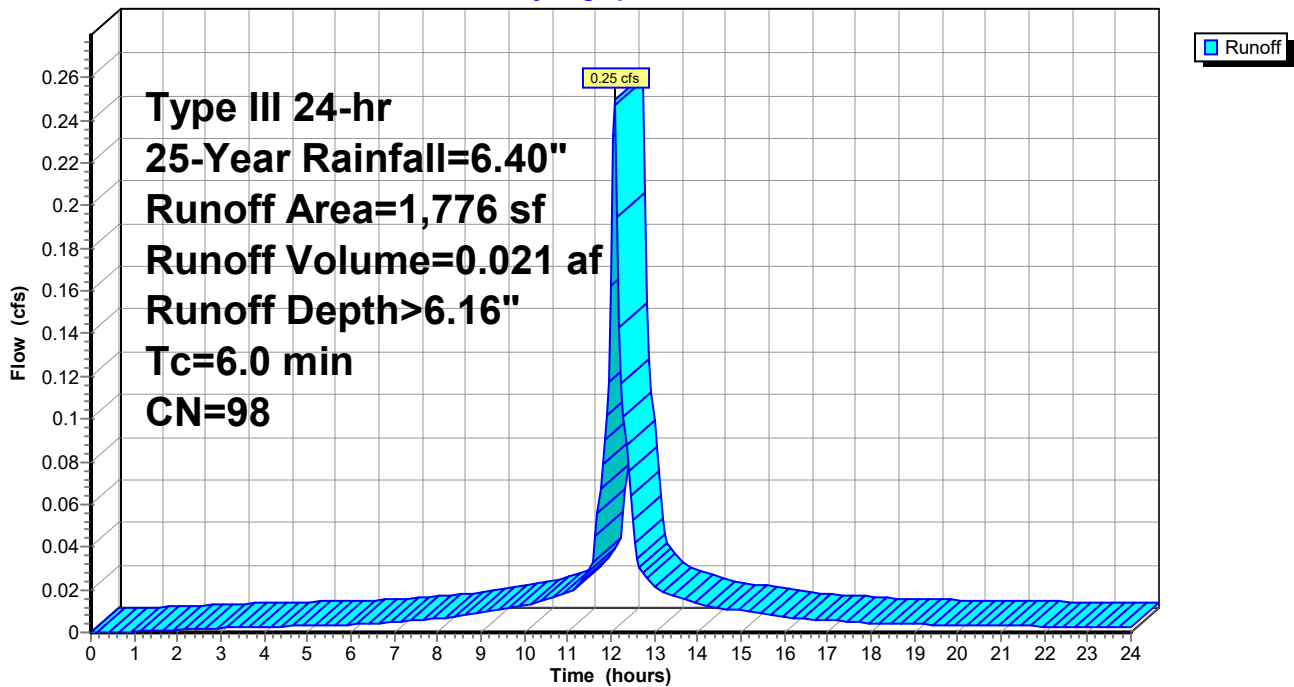
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.40"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-9: Roof

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Reach 1R: Swale

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 58.68 cfs

3.00' x 1.00' deep channel, n= 0.030

Side Slope Z-value= 3.0 '/' Top Width= 9.00'

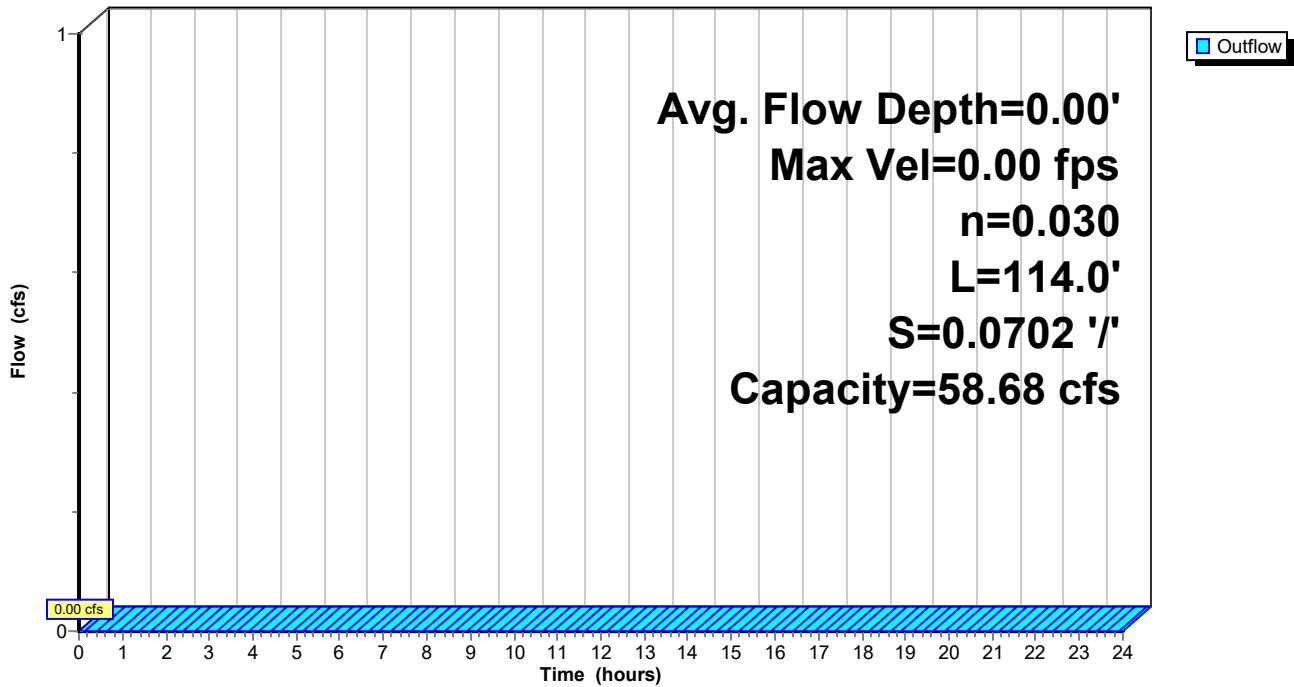
Length= 114.0' Slope= 0.0702 '/'

Inlet Invert= 261.00', Outlet Invert= 253.00'



Reach 1R: Swale

Hydrograph



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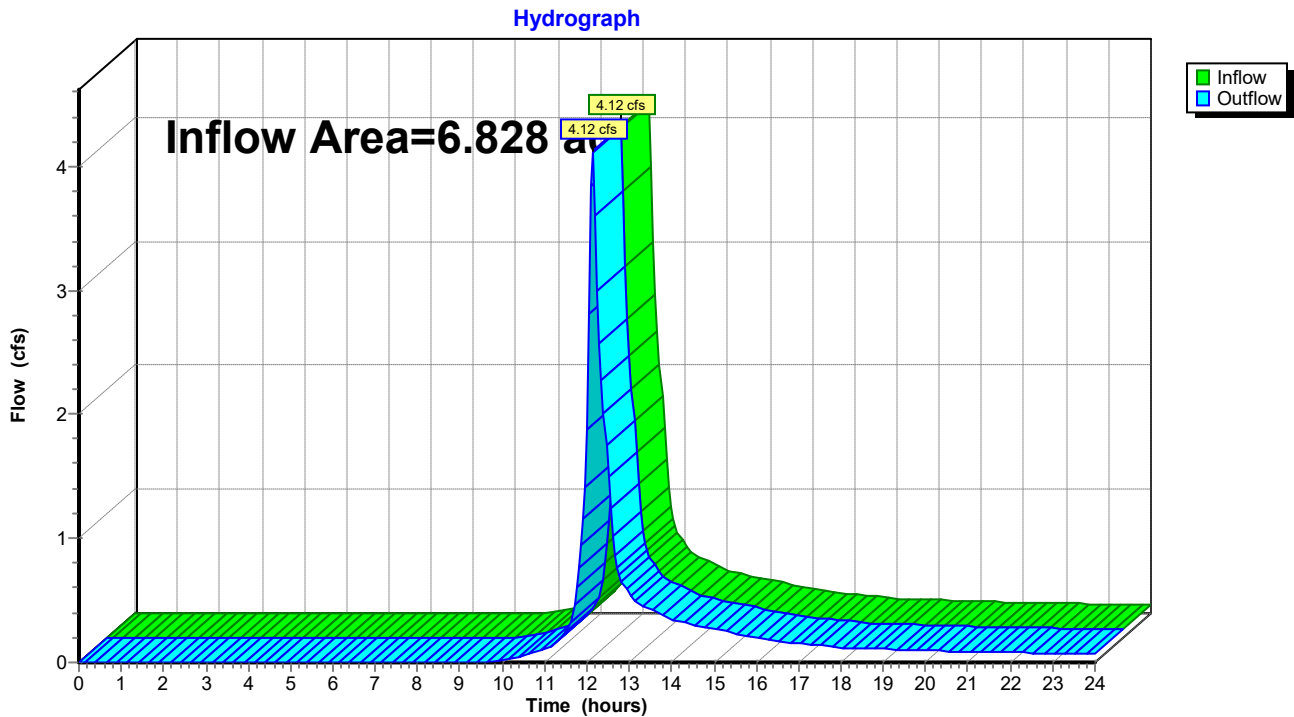
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Summary for Reach DP-1: Design Point

Inflow Area = 6.828 ac, 20.91% Impervious, Inflow Depth > 0.60" for 25-Year event
Inflow = 4.12 cfs @ 12.14 hrs, Volume= 0.339 af
Outflow = 4.12 cfs @ 12.14 hrs, Volume= 0.339 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



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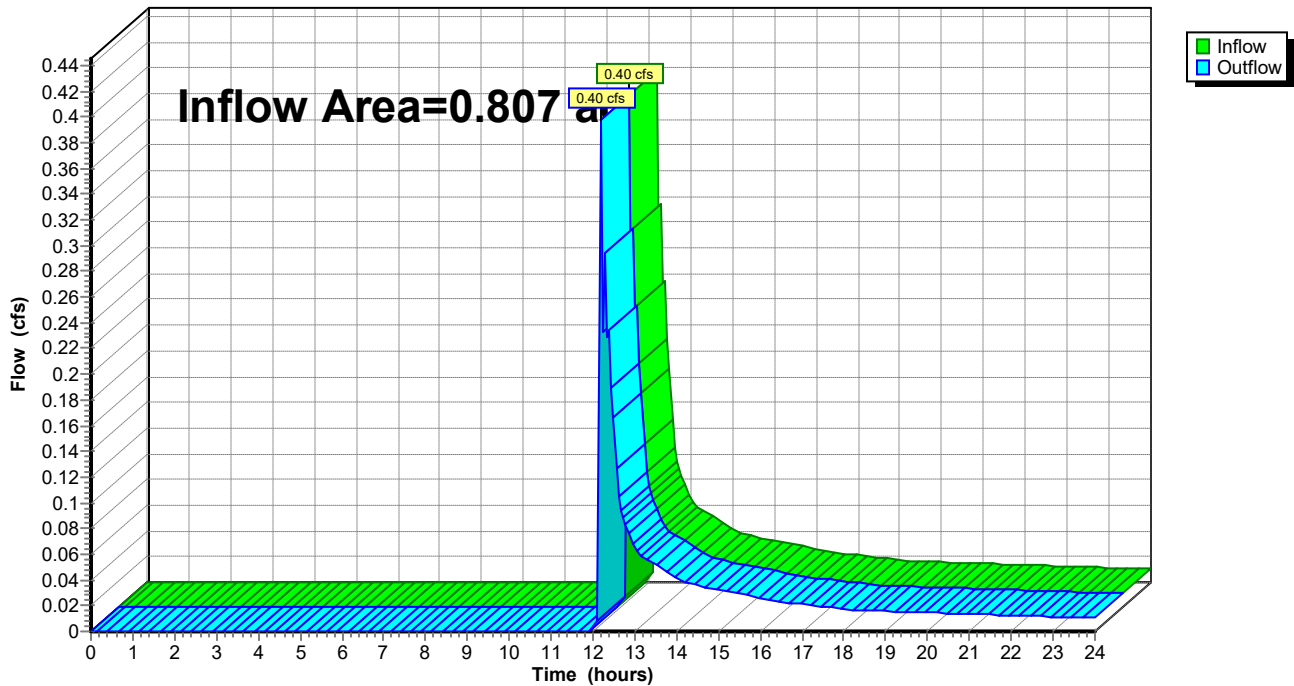
Summary for Reach DP-2: Design Point

Inflow Area = 0.807 ac, 10.10% Impervious, Inflow Depth > 0.46" for 25-Year event
Inflow = 0.40 cfs @ 12.21 hrs, Volume= 0.031 af
Outflow = 0.40 cfs @ 12.21 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Pond 1P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
Outflow = 0.04 cfs @ 12.30 hrs, Volume= 0.021 af, Atten= 85%, Lag= 12.8 min
Discarded = 0.04 cfs @ 12.30 hrs, Volume= 0.021 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 232.45' @ 12.59 hrs Surf.Area= 190 sf Storage= 255 cf

Plug-Flow detention time= 40.6 min calculated for 0.021 af (100% of inflow)

Center-of-Mass det. time= 40.4 min (784.2 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	230.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	230.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	232.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.04	1	0	0
237.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	236.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.30 hrs HW=232.04' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=230.00' (Free Discharge)

↑2=Orifice/Grate (Controls 0.00 cfs)

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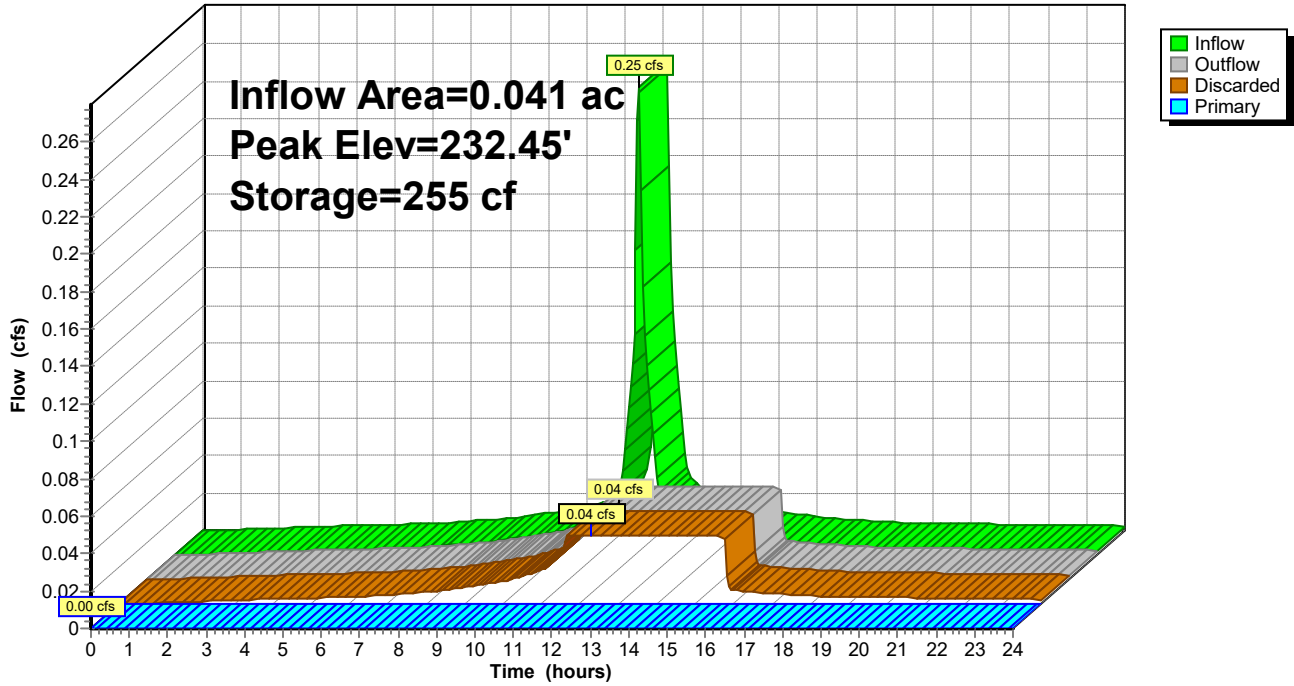
Type III 24-hr 25-Year Rainfall=6.40"

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Pond 1P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Pond 2P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
 Outflow = 0.04 cfs @ 12.30 hrs, Volume= 0.021 af, Atten= 85%, Lag= 12.8 min
 Discarded = 0.04 cfs @ 12.30 hrs, Volume= 0.021 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 235.45' @ 12.59 hrs Surf.Area= 190 sf Storage= 255 cf

Plug-Flow detention time= 40.6 min calculated for 0.021 af (100% of inflow)
 Center-of-Mass det. time= 40.4 min (784.2 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	233.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	233.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	235.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.04	1	0	0
240.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	233.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	239.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.30 hrs HW=235.04' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=233.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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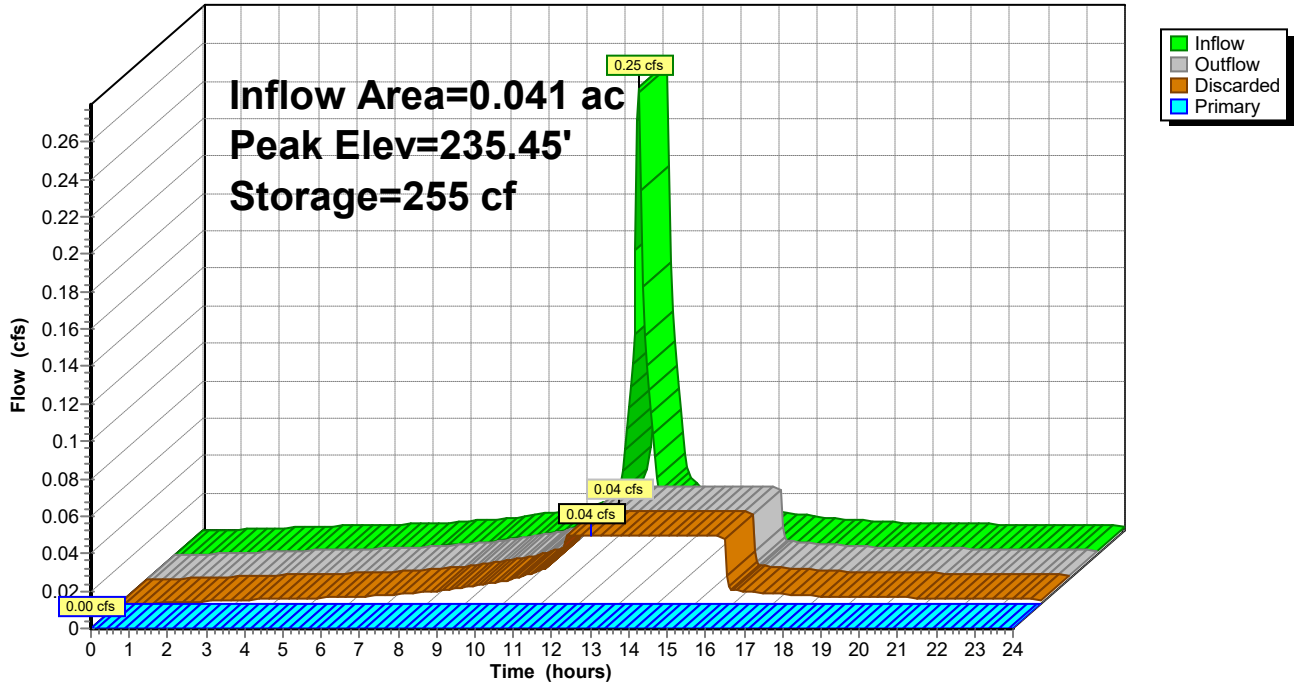
Type III 24-hr 25-Year Rainfall=6.40"

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Pond 2P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Pond 3P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
 Outflow = 0.04 cfs @ 12.35 hrs, Volume= 0.021 af, Atten= 85%, Lag= 15.8 min
 Discarded = 0.04 cfs @ 12.35 hrs, Volume= 0.021 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 239.44' @ 12.59 hrs Surf.Area= 190 sf Storage= 254 cf

Plug-Flow detention time= 40.3 min calculated for 0.021 af (100% of inflow)
 Center-of-Mass det. time= 40.1 min (783.9 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	237.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	237.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	239.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
239.04	1	0	0
243.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	242.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.35 hrs HW=239.17' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=237.00' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)

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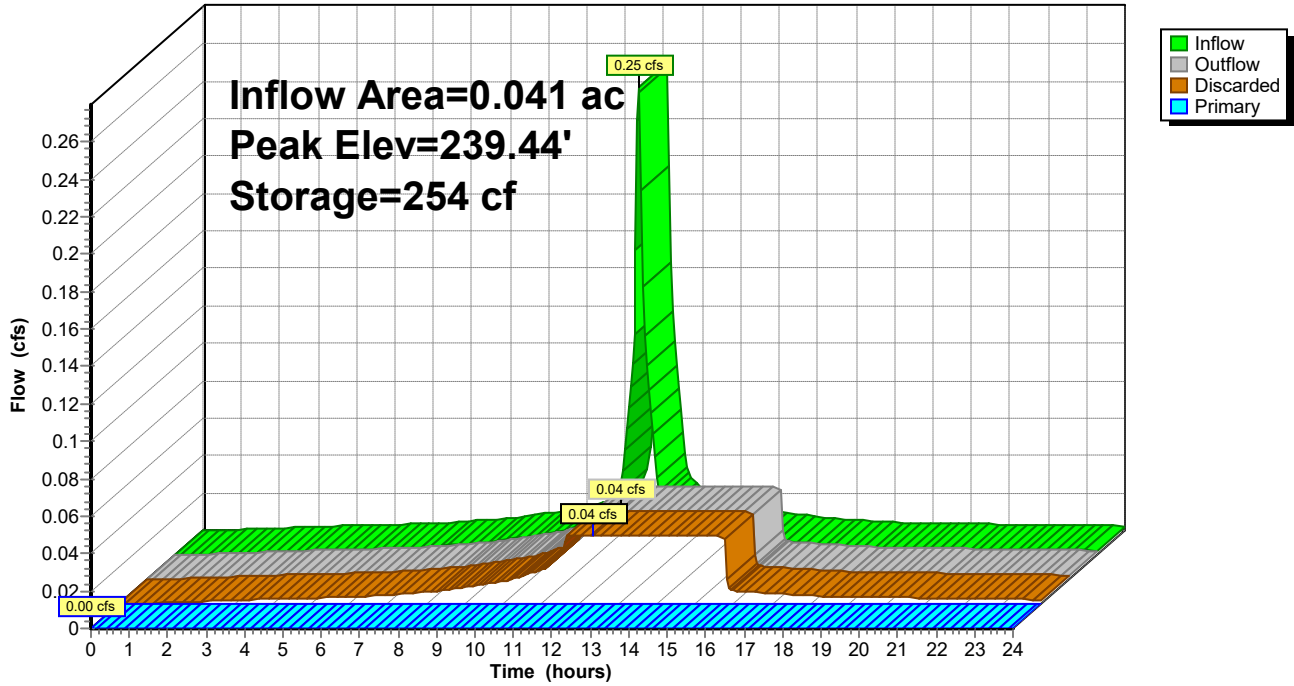
Type III 24-hr 25-Year Rainfall=6.40"

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Pond 3P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Pond 4P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
 Outflow = 0.18 cfs @ 12.21 hrs, Volume= 0.020 af, Atten= 26%, Lag= 7.3 min
 Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.017 af
 Primary = 0.17 cfs @ 12.21 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.20' @ 12.20 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 159.6 min calculated for 0.020 af (96% of inflow)
 Center-of-Mass det. time= 137.2 min (881.0 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=223.32' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.15 cfs @ 12.21 hrs HW=226.19' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.15 cfs @ 1.48 fps)

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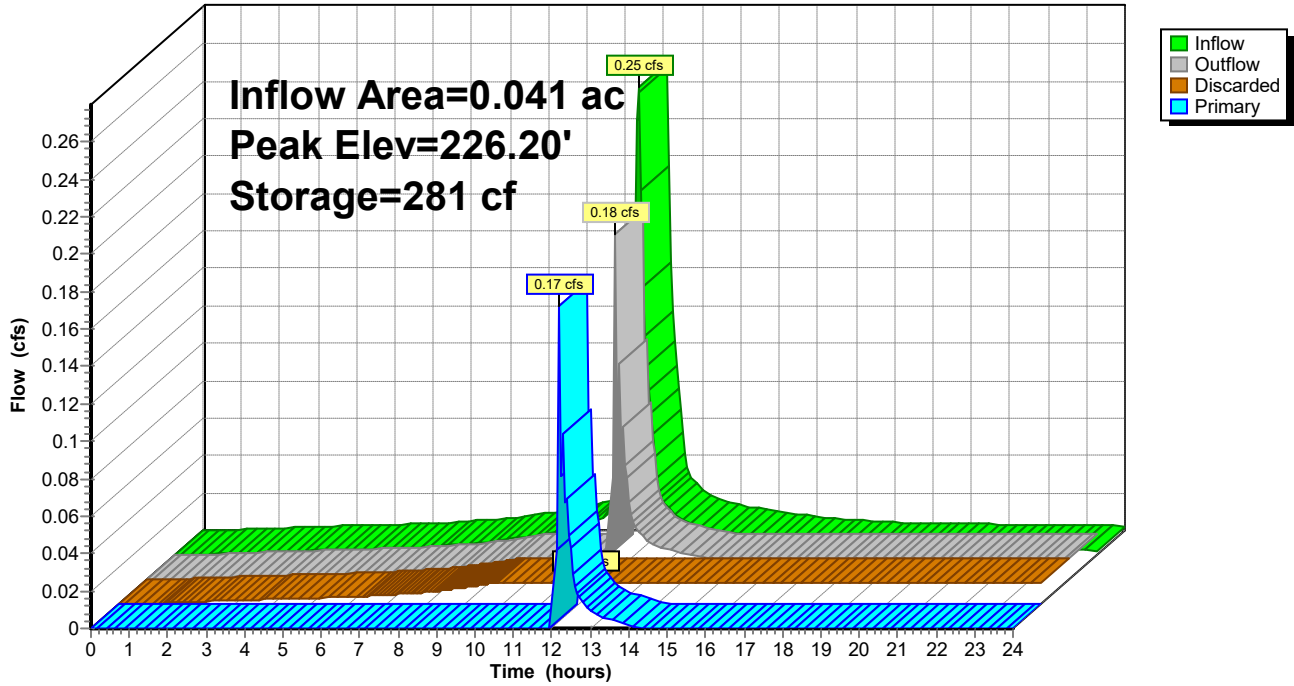
Type III 24-hr 25-Year Rainfall=6.40"

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Pond 4P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Pond 5P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
 Outflow = 0.18 cfs @ 12.21 hrs, Volume= 0.020 af, Atten= 26%, Lag= 7.3 min
 Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.017 af
 Primary = 0.17 cfs @ 12.21 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.20' @ 12.20 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 159.6 min calculated for 0.020 af (96% of inflow)
 Center-of-Mass det. time= 137.2 min (881.0 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=223.32' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.15 cfs @ 12.21 hrs HW=226.19' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.15 cfs @ 1.48 fps)

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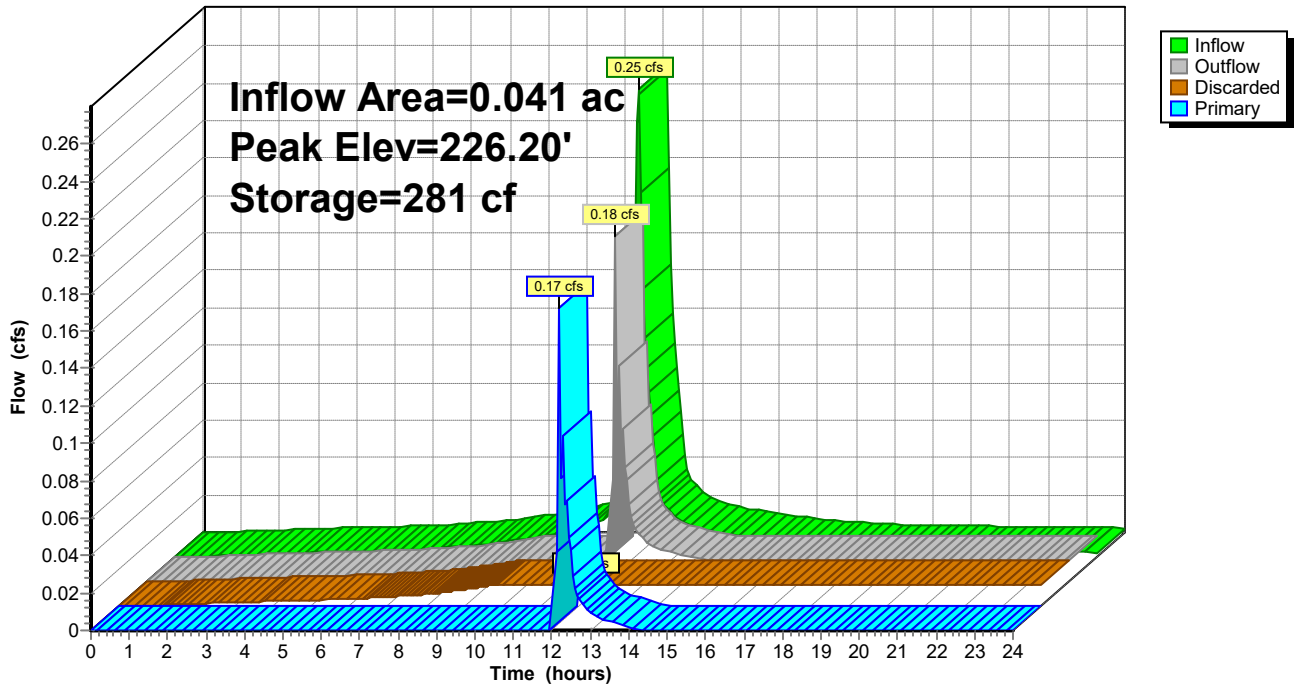
Type III 24-hr 25-Year Rainfall=6.40"

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Pond 5P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 6P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.35 cfs @ 12.09 hrs, Volume= 0.029 af
 Outflow = 0.08 cfs @ 12.51 hrs, Volume= 0.028 af, Atten= 78%, Lag= 25.6 min
 Discarded = 0.02 cfs @ 12.30 hrs, Volume= 0.027 af
 Primary = 0.06 cfs @ 12.51 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 229.11' @ 12.50 hrs Surf.Area= 351 sf Storage= 492 cf

Plug-Flow detention time= 194.0 min calculated for 0.028 af (97% of inflow)
 Center-of-Mass det. time= 173.2 min (917.0 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	224.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	224.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	226.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
226.04	1	0	0
230.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	229.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.30 hrs HW=226.15' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.05 cfs @ 12.51 hrs HW=229.10' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.05 cfs @ 1.09 fps)

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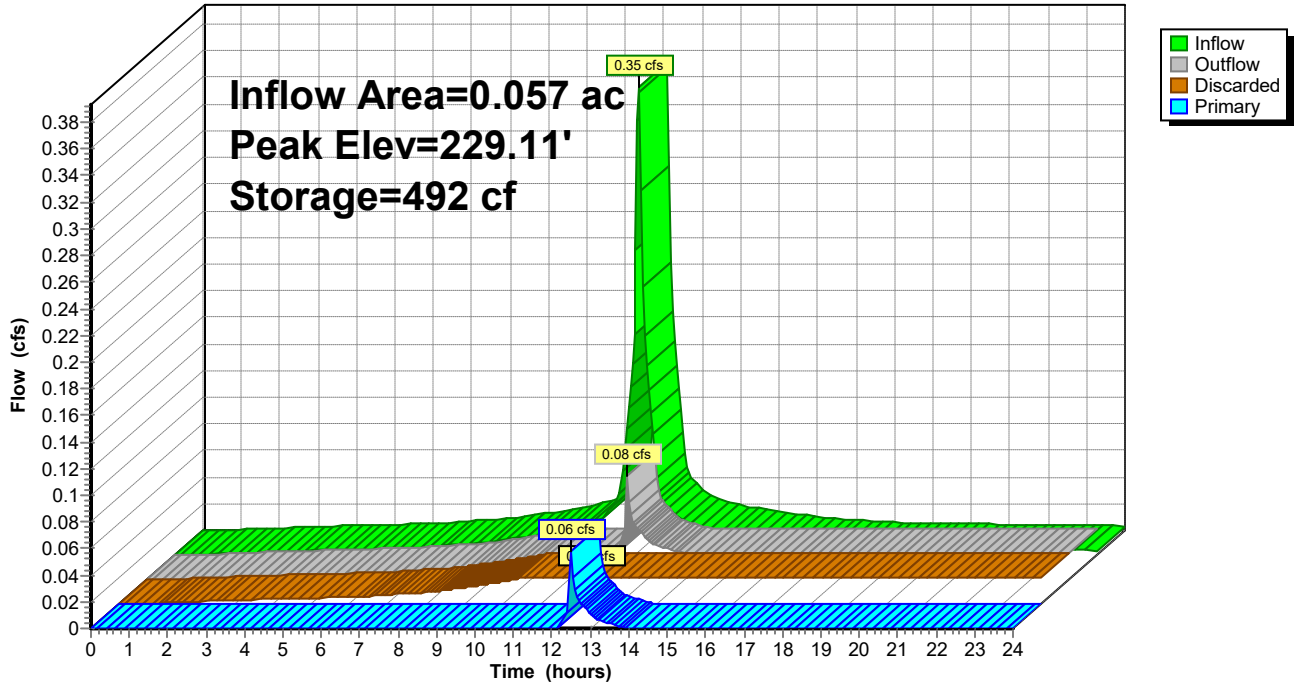
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Pond 6P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 7P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.35 cfs @ 12.09 hrs, Volume= 0.029 af
 Outflow = 0.09 cfs @ 12.55 hrs, Volume= 0.028 af, Atten= 75%, Lag= 27.7 min
 Discarded = 0.02 cfs @ 12.50 hrs, Volume= 0.027 af
 Primary = 0.07 cfs @ 12.55 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 211.12' @ 12.55 hrs Surf.Area= 351 sf Storage= 492 cf

Plug-Flow detention time= 197.6 min calculated for 0.028 af (96% of inflow)
 Center-of-Mass det. time= 174.3 min (918.1 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	205.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	208.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.04	1	0	0
212.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	211.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.50 hrs HW=211.04' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.06 cfs @ 12.55 hrs HW=211.12' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.06 cfs @ 1.16 fps)

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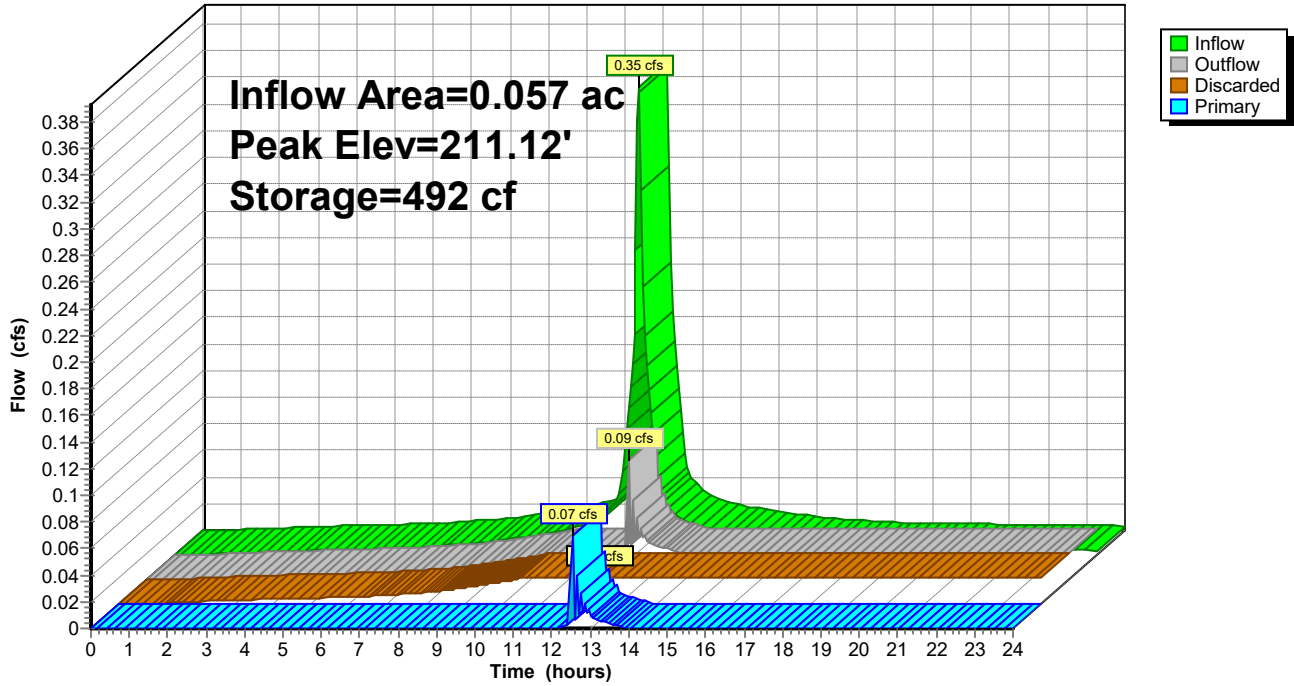
Type III 24-hr 25-Year Rainfall=6.40"

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Pond 7P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 8P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
 Outflow = 0.18 cfs @ 12.21 hrs, Volume= 0.020 af, Atten= 26%, Lag= 7.3 min
 Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.017 af
 Primary = 0.17 cfs @ 12.21 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 198.20' @ 12.20 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 159.6 min calculated for 0.020 af (96% of inflow)
 Center-of-Mass det. time= 137.2 min (881.0 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	193.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	195.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.04	1	0	0
199.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	193.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	198.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=195.32' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.15 cfs @ 12.21 hrs HW=198.19' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.15 cfs @ 1.48 fps)

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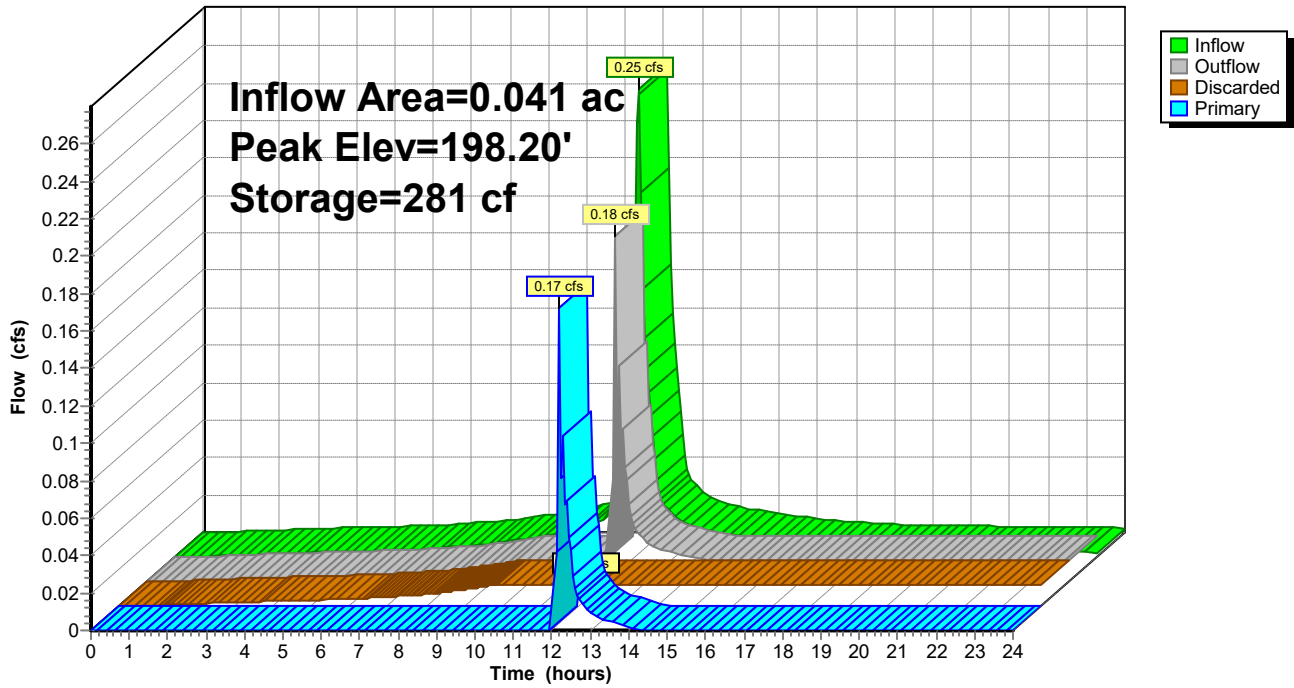
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Pond 8P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 9P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 6.16" for 25-Year event
 Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.021 af
 Outflow = 0.18 cfs @ 12.21 hrs, Volume= 0.020 af, Atten= 26%, Lag= 7.3 min
 Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.017 af
 Primary = 0.17 cfs @ 12.21 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 202.20' @ 12.20 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 159.6 min calculated for 0.020 af (96% of inflow)
 Center-of-Mass det. time= 137.2 min (881.0 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	197.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	197.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	199.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
199.04	1	0	0
203.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	197.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	202.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=199.32' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.15 cfs @ 12.21 hrs HW=202.19' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.15 cfs @ 1.48 fps)

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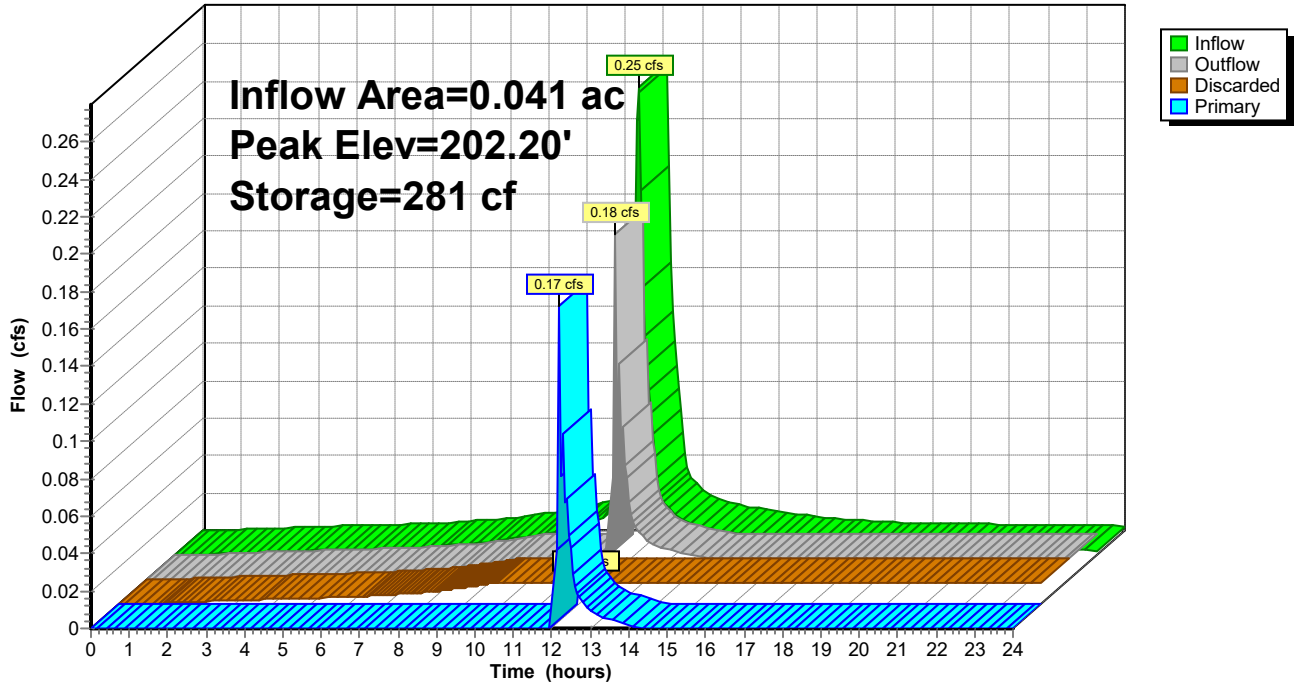
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Pond 9P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 10P: Basin

Inflow Area = 3.434 ac, 22.85% Impervious, Inflow Depth > 2.29" for 25-Year event
 Inflow = 8.32 cfs @ 12.11 hrs, Volume= 0.654 af
 Outflow = 0.36 cfs @ 16.08 hrs, Volume= 0.354 af, Atten= 96%, Lag= 238.2 min
 Discarded = 0.36 cfs @ 16.08 hrs, Volume= 0.354 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 214.10' @ 16.08 hrs Surf.Area= 6,540 sf Storage= 17,076 cf

Plug-Flow detention time= 334.4 min calculated for 0.353 af (54% of inflow)
 Center-of-Mass det. time= 213.6 min (1,063.2 - 849.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	209.40'	24,363 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
209.40	1,431	238.0	0	0	1,431	
210.00	1,887	254.0	992	992	2,075	
211.00	2,716	282.0	2,289	3,281	3,299	
212.00	3,629	309.0	3,161	6,443	4,602	
213.00	5,010	426.0	4,301	10,744	11,455	
214.00	6,399	472.0	5,690	16,434	14,773	
215.00	7,894	422.0	7,133	23,567	18,358	
215.10	8,022	423.0	796	24,363	18,438	

Device	Routing	Invert	Outlet Devices
#1	Primary	215.30'	10.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	209.40'	2.410 in/hr Exfiltration over Horizontal area
#3	Device 4	214.60'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	211.00'	12.0" Round Culvert L= 113.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.00' / 209.00' S= 0.0177 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.36 cfs @ 16.08 hrs HW=214.10' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=209.40' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Culvert** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)

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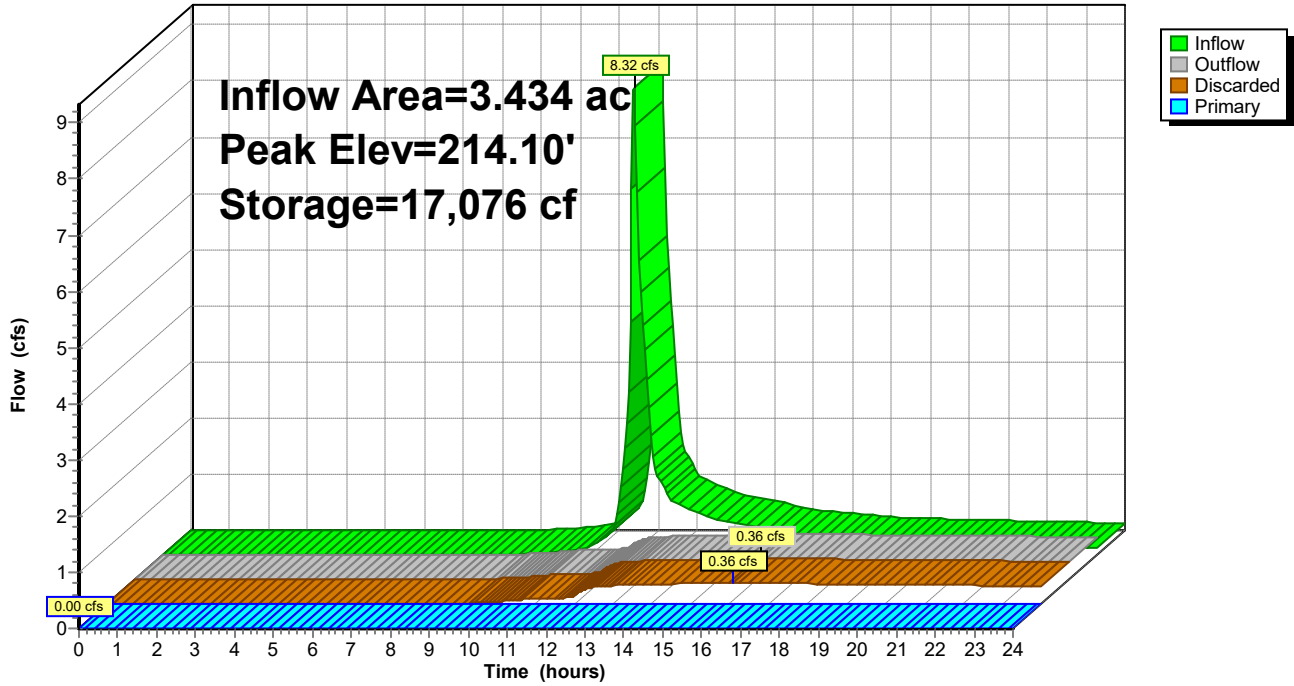
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Pond 10P: Basin

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.40"

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Summary for Pond 11P: 4x4x8 Galleys

Inflow Area = 1.852 ac, 28.92% Impervious, Inflow Depth > 1.42" for 25-Year event
 Inflow = 2.17 cfs @ 12.18 hrs, Volume= 0.220 af
 Outflow = 0.12 cfs @ 11.90 hrs, Volume= 0.120 af, Atten= 95%, Lag= 0.0 min
 Discarded = 0.12 cfs @ 11.90 hrs, Volume= 0.120 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 191.40' @ 17.23 hrs Surf.Area= 2,129 sf Storage= 5,362 cf

Plug-Flow detention time= 324.0 min calculated for 0.120 af (55% of inflow)
 Center-of-Mass det. time= 191.5 min (1,074.8 - 883.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.70'	2,307 cf	33.80'W x 63.00'L x 8.50'H Field A 18,100 cf Overall - 12,333 cf Embedded = 5,767 cf x 40.0% Voids
#2A	188.20'	9,846 cf	Concrete Galley 4x4x8 x 105 Inside #1 Inside= 42.0"W x 91.0"H => 26.79 sf x 3.50'L = 93.8 cf Outside= 52.8"W x 96.0"H => 29.36 sf x 4.00'L = 117.5 cf 105 Chambers in 7 Rows
		12,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	187.70'	2.410 in/hr Exfiltration over Horizontal area
#2	Primary	195.20'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 195.20' / 195.10' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.12 cfs @ 11.90 hrs HW=187.79' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=187.70' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

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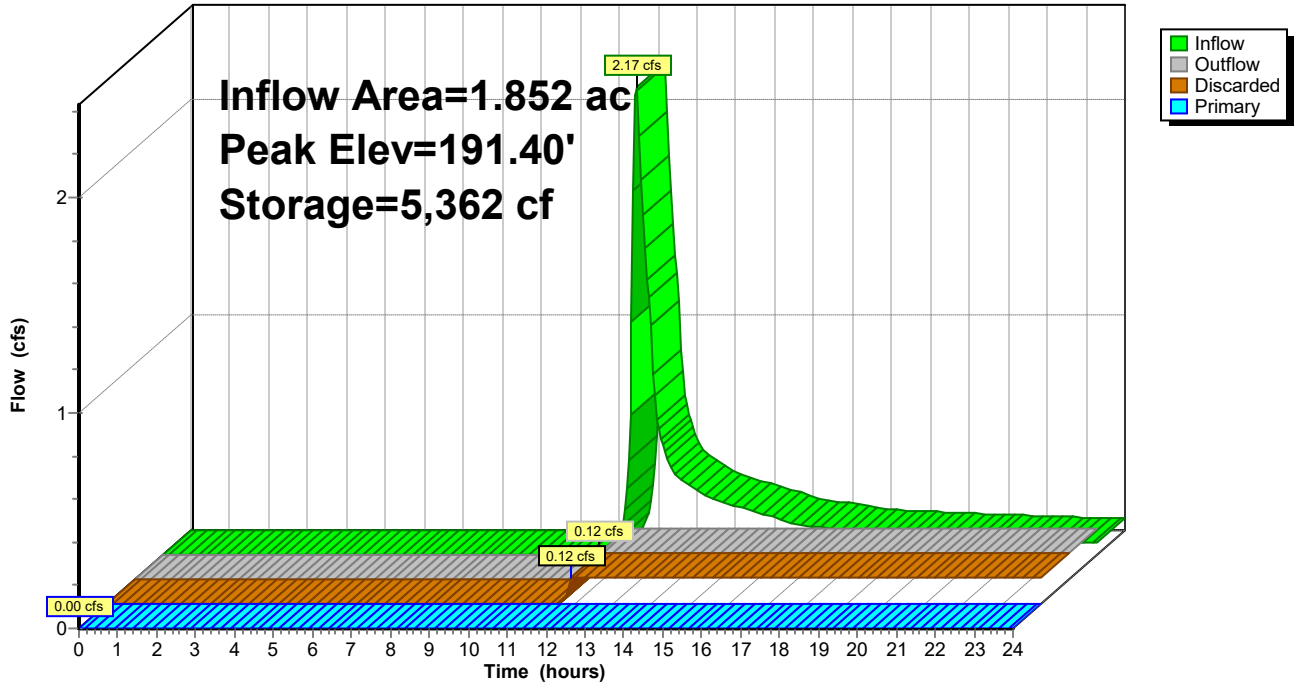
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Pond 11P: 4x4x8 Galleys

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Summary for Pond 20P: Basin Forebay

Volume	Invert	Avail.Storage	Storage Description			
#1	213.00'	488 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
213.00	385	89.0	0	0	385	
214.00	598	113.0	488	488	784	

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P-1: Offsite Runoff	Runoff Area=67,182 sf 6.98% Impervious Runoff Depth>3.31" Flow Length=361' Tc=9.4 min CN=65 Runoff=5.21 cfs 0.425 af
Subcatchment P-4: Offsite Runoff	Runoff Area=46,024 sf 5.71% Impervious Runoff Depth>3.95" Flow Length=278' Tc=7.7 min CN=71 Runoff=4.56 cfs 0.348 af
Subcatchment P-5: Lawn & Woods	Runoff Area=31,616 sf 0.00% Impervious Runoff Depth>0.64" Tc=6.0 min CN=36 Runoff=0.21 cfs 0.039 af
Subcatchment P2: Lawn & Highland Road	Runoff Area=94,674 sf 23.94% Impervious Runoff Depth>2.59" Flow Length=338' Tc=6.9 min CN=58 Runoff=6.10 cfs 0.469 af
Subcatchment P3: Lawn & Ballard Road	Runoff Area=75,676 sf 24.23% Impervious Runoff Depth>2.00" Flow Length=356' Tc=11.2 min CN=52 Runoff=3.09 cfs 0.290 af
Subcatchment R-1: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Subcatchment R-2: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Subcatchment R-3: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Subcatchment R-4: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Subcatchment R-5: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Subcatchment R-6: Roof	Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.40 cfs 0.034 af
Subcatchment R-7: Roof	Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.40 cfs 0.034 af
Subcatchment R-8: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Subcatchment R-9: Roof	Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.03" Tc=6.0 min CN=98 Runoff=0.28 cfs 0.024 af
Reach 1R: Swale	Avg. Flow Depth=0.00' Max Vel=0.00 fps n=0.030 L=114.0' S=0.0702 '/' Capacity=58.68 cfs Outflow=0.00 cfs 0.000 af
Reach DP-1: Design Point	Inflow=5.21 cfs 0.449 af Outflow=5.21 cfs 0.449 af

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Reach DP-2: Design Point

Inflow=0.66 cfs 0.049 af
Outflow=0.66 cfs 0.049 af

Pond 1P: 3 x 1 Cultec R-150XLHD

Peak Elev=236.06' Storage=266 cf Inflow=0.28 cfs 0.024 af
Discarded=0.04 cfs 0.023 af Primary=0.02 cfs 0.000 af Outflow=0.06 cfs 0.023 af

Pond 2P: 3 x 1 Cultec R-150XLHD

Peak Elev=239.06' Storage=266 cf Inflow=0.28 cfs 0.024 af
Discarded=0.04 cfs 0.023 af Primary=0.02 cfs 0.000 af Outflow=0.06 cfs 0.023 af

Pond 3P: 3 x 1 Cultec R-150XLHD

Peak Elev=242.07' Storage=265 cf Inflow=0.28 cfs 0.024 af
Discarded=0.04 cfs 0.023 af Primary=0.03 cfs 0.000 af Outflow=0.07 cfs 0.023 af

Pond 4P: 1 x 4 Cultec R-150XLHD

Peak Elev=226.24' Storage=281 cf Inflow=0.28 cfs 0.024 af
Discarded=0.01 cfs 0.017 af Primary=0.24 cfs 0.005 af Outflow=0.25 cfs 0.022 af

Pond 5P: 1 x 4 Cultec R-150XLHD

Peak Elev=226.24' Storage=281 cf Inflow=0.28 cfs 0.024 af
Discarded=0.01 cfs 0.017 af Primary=0.24 cfs 0.005 af Outflow=0.25 cfs 0.022 af

Pond 6P: 2 x 4 Cultec R-150XLHD

Peak Elev=229.18' Storage=492 cf Inflow=0.40 cfs 0.034 af
Discarded=0.02 cfs 0.028 af Primary=0.15 cfs 0.004 af Outflow=0.17 cfs 0.032 af

Pond 7P: 2 x 4 Cultec R-150XLHD

Peak Elev=211.19' Storage=492 cf Inflow=0.40 cfs 0.034 af
Discarded=0.02 cfs 0.028 af Primary=0.16 cfs 0.004 af Outflow=0.18 cfs 0.032 af

Pond 8P: 1 x 4 Cultec R-150XLHD

Peak Elev=198.24' Storage=281 cf Inflow=0.28 cfs 0.024 af
Discarded=0.01 cfs 0.017 af Primary=0.24 cfs 0.005 af Outflow=0.25 cfs 0.022 af

Pond 9P: 1 x 4 Cultec R-150XLHD

Peak Elev=202.24' Storage=281 cf Inflow=0.28 cfs 0.024 af
Discarded=0.01 cfs 0.017 af Primary=0.24 cfs 0.005 af Outflow=0.25 cfs 0.022 af

Pond 10P: Basin

Peak Elev=214.78' Storage=21,879 cf Inflow=10.73 cfs 0.828 af
Discarded=0.42 cfs 0.411 af Primary=0.11 cfs 0.024 af Outflow=0.53 cfs 0.435 af

Pond 11P: 4x4x8 Galleys

Peak Elev=193.27' Storage=8,235 cf Inflow=3.09 cfs 0.297 af
Discarded=0.12 cfs 0.122 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.122 af

Pond 20P: Basin Forebay

Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 7.635 ac Runoff Volume = 1.805 af Average Runoff Depth = 2.84"
80.23% Pervious = 6.126 ac 19.77% Impervious = 1.509 ac

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Summary for Subcatchment P-1: Offsite Runoff

Runoff = 5.21 cfs @ 12.14 hrs, Volume= 0.425 af, Depth> 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 2,729	98	Roof, offsite
* 14,859	39	>75% Grass cover, Good, HSG A, offsite
* 20,436	74	>75% Grass cover, Good, HSG C, offsite
* 20,439	70	Woods, Good, HSG C, offsite
* 1,960	98	Paved driveways
777	39	>75% Grass cover, Good, HSG A
4,674	74	>75% Grass cover, Good, HSG C
1,308	30	Woods, Good, HSG A
67,182	65	Weighted Average
62,493		93.02% Pervious Area
4,689		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	17	0.0100	0.09		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
0.5	10	0.3300	0.34		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
4.0	23	0.0650	0.09		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.34"
0.2	14	0.0710	1.33		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.3	217	0.1500	2.71		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0375	3.93		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
9.4	361	Total			

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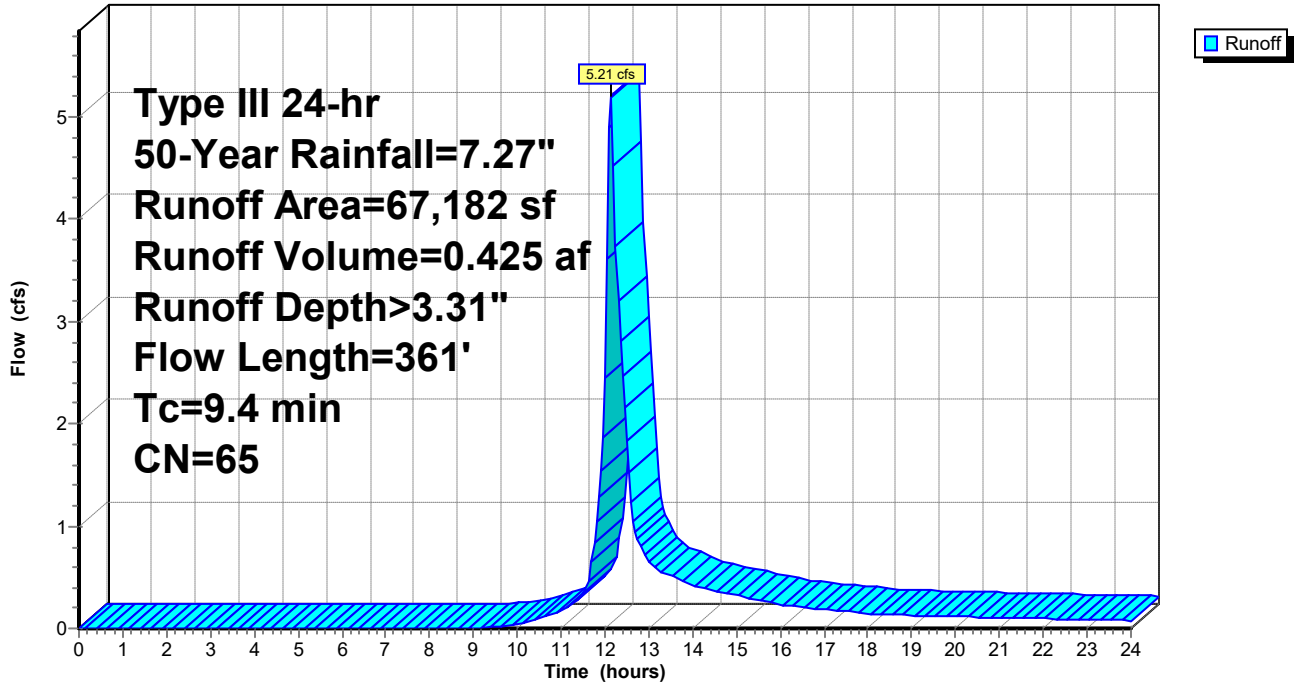
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Subcatchment P-1: Offsite Runoff

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Summary for Subcatchment P-4: Offsite Runoff

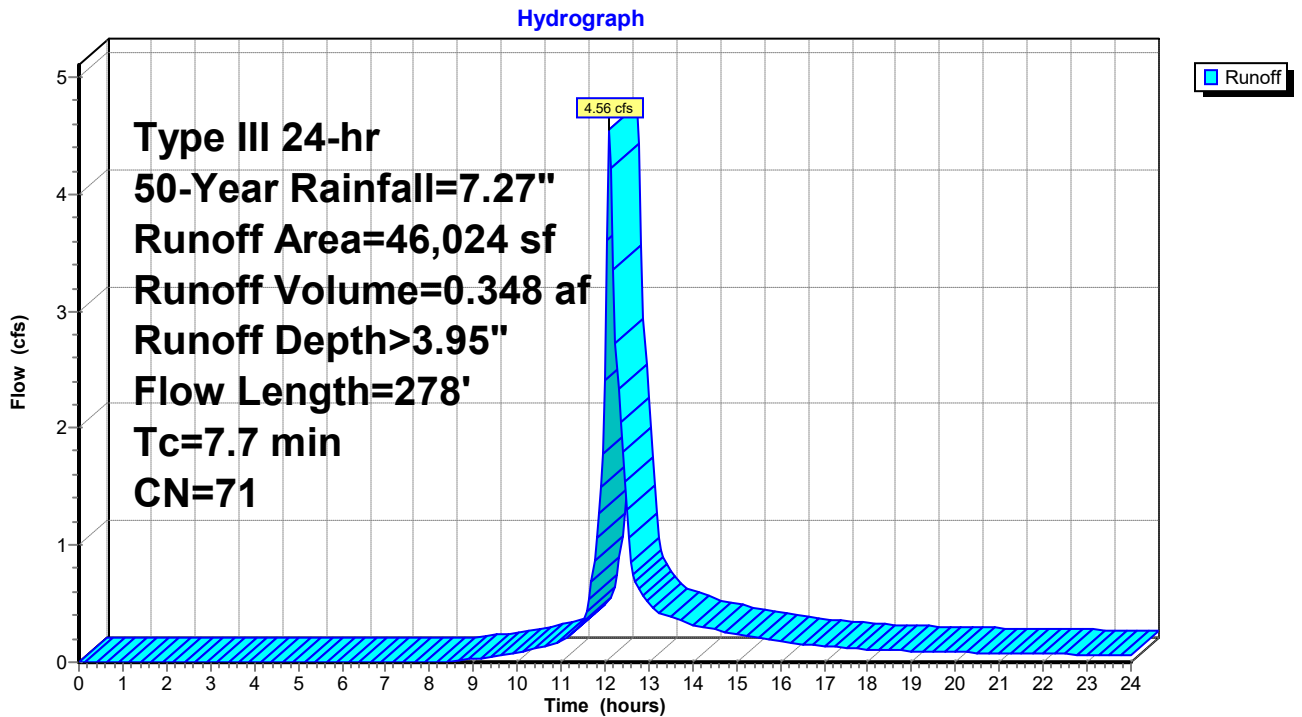
Runoff = 4.56 cfs @ 12.11 hrs, Volume= 0.348 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,694	98	Roof, offsite
* 933	98	Pavement, offsite
* 4,400	74	>75% Grass cover, Good, HSG C, offsite
* 1,470	30	Woods, Good, HSG A, offsite
* 37,527	70	Woods, Good, HSG C, offsite
46,024	71	Weighted Average
43,397		94.29% Pervious Area
2,627		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
2.2	228	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
7.7	278	Total			

Subcatchment P-4: Offsite Runoff



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Summary for Subcatchment P-5: Lawn & Woods

Runoff = 0.21 cfs @ 12.30 hrs, Volume= 0.039 af, Depth> 0.64"

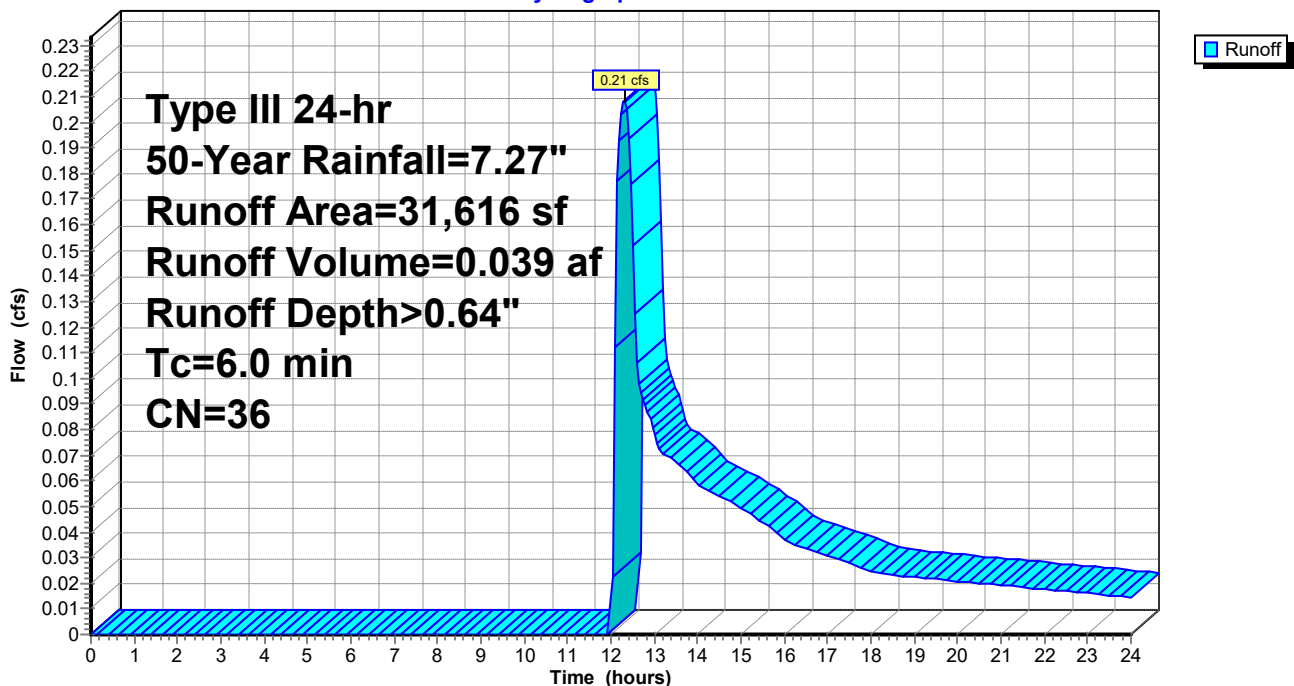
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
*	0	98 Roof, offsite
*	0	98 Pavement, offsite
*	0	39 >75% Grass cover, Good, HSG A, offsite
*	0	74 >75% Grass cover, Good, HSG C, offsite
*	0	30 Woods, Good, HSG A, offsite
*	0	70 Woods, Good, HSG C, offsite
*	0	98 Roof
*	0	98 Paved driveways
22,623	39	>75% Grass cover, Good, HSG A
8,993	30	Woods, Good, HSG A
0	70	Woods, Good, HSG C
31,616	36	Weighted Average
31,616		100.00% Pervious Area

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

Subcatchment P-5: Lawn & Woods

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Summary for Subcatchment P2: Lawn & Highland Road

Runoff = 6.10 cfs @ 12.11 hrs, Volume= 0.469 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 22,666	98	Paved driveways
57,693	39	>75% Grass cover, Good, HSG A
14,315	74	>75% Grass cover, Good, HSG C
94,674	58	Weighted Average
72,008		76.06% Pervious Area
22,666		23.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.4	23	0.0200	0.99		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.8	153	0.0260	3.27		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.2	112	0.0400	10.72	8.42	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
6.9	338	Total			

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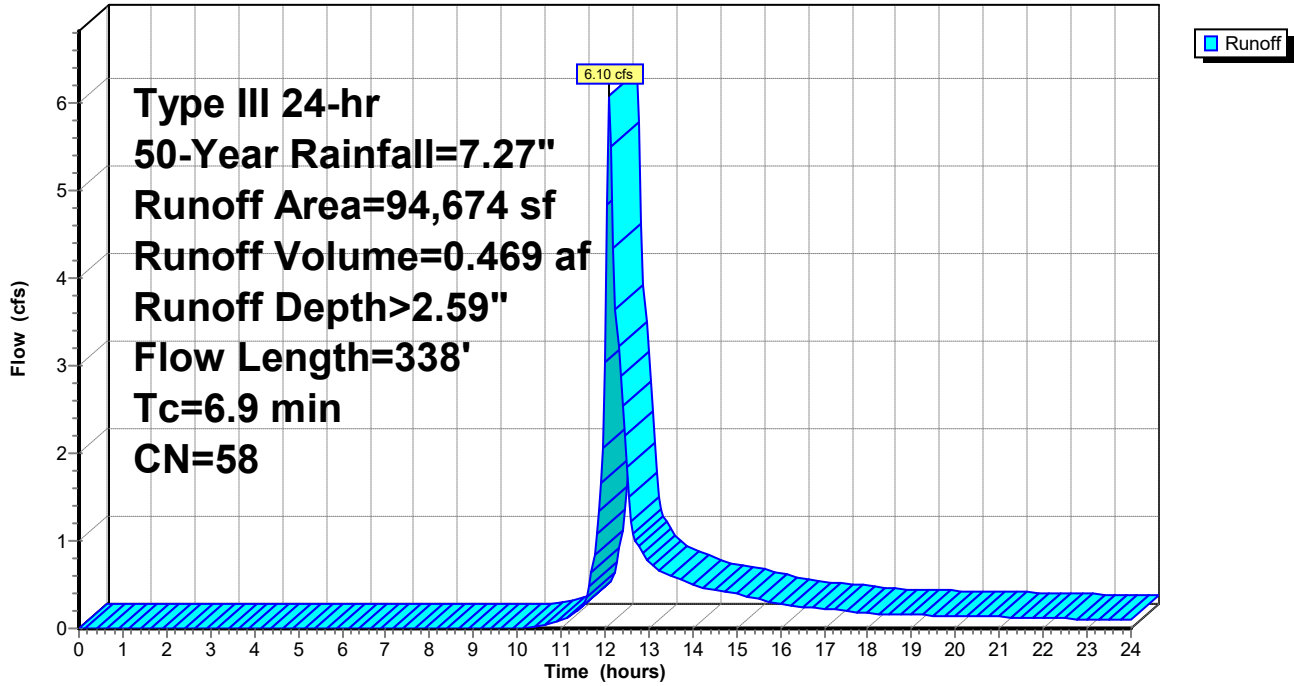
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Subcatchment P2: Lawn & Highland Road

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Summary for Subcatchment P3: Lawn & Ballard Road

Runoff = 3.09 cfs @ 12.17 hrs, Volume= 0.290 af, Depth> 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,687	98	Roof, offsite
* 469	98	Pavement, offsite
* 22,183	39	>75% Grass cover, Good, HSG A, offsite
* 9,255	30	Woods, Good, HSG A, offsite
* 16,183	98	Paved driveways
21,959	39	>75% Grass cover, Good, HSG A
3,940	30	Woods, Good, HSG A
75,676	52	Weighted Average
57,337		75.77% Pervious Area
18,339		24.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		Sheet Flow, TC up until 50' length Woods: Light underbrush n= 0.400 P2= 3.34"
2.4	101	0.0200	0.71		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
0.7	120	0.0200	2.87		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.3	85	0.0100	5.36	4.21	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
11.2	356	Total			

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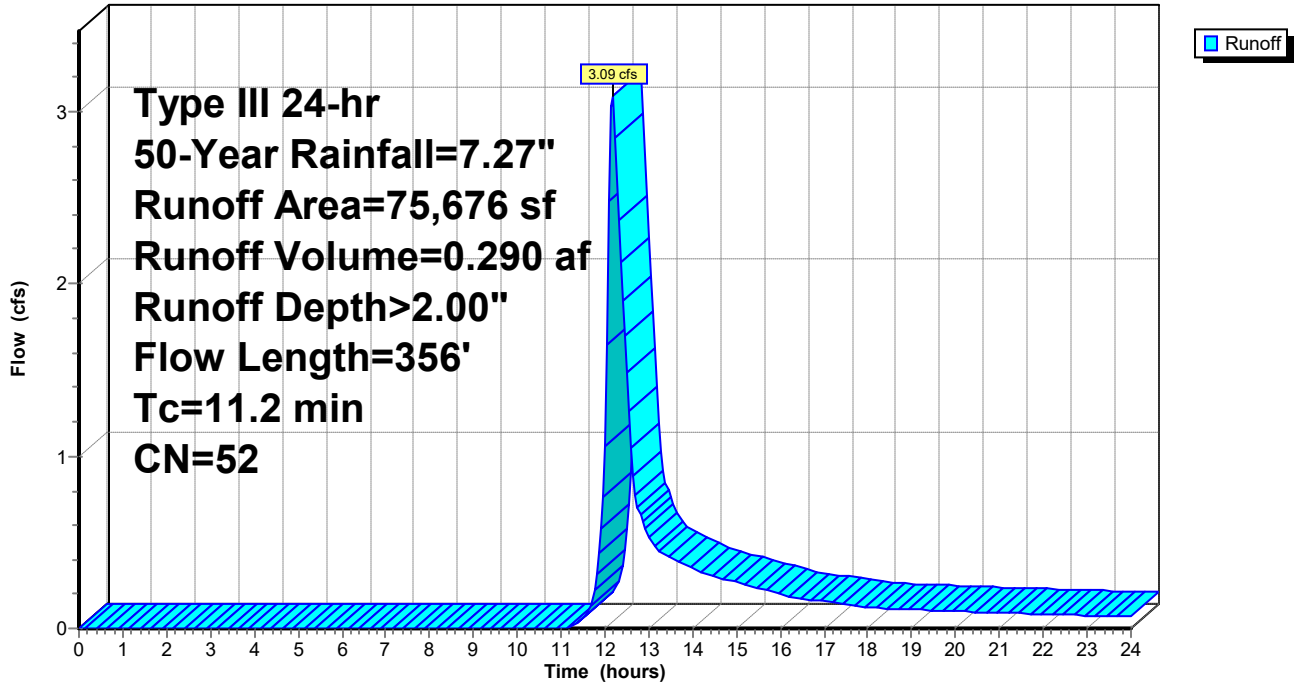
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Subcatchment P3: Lawn & Ballard Road

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Summary for Subcatchment R-1: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

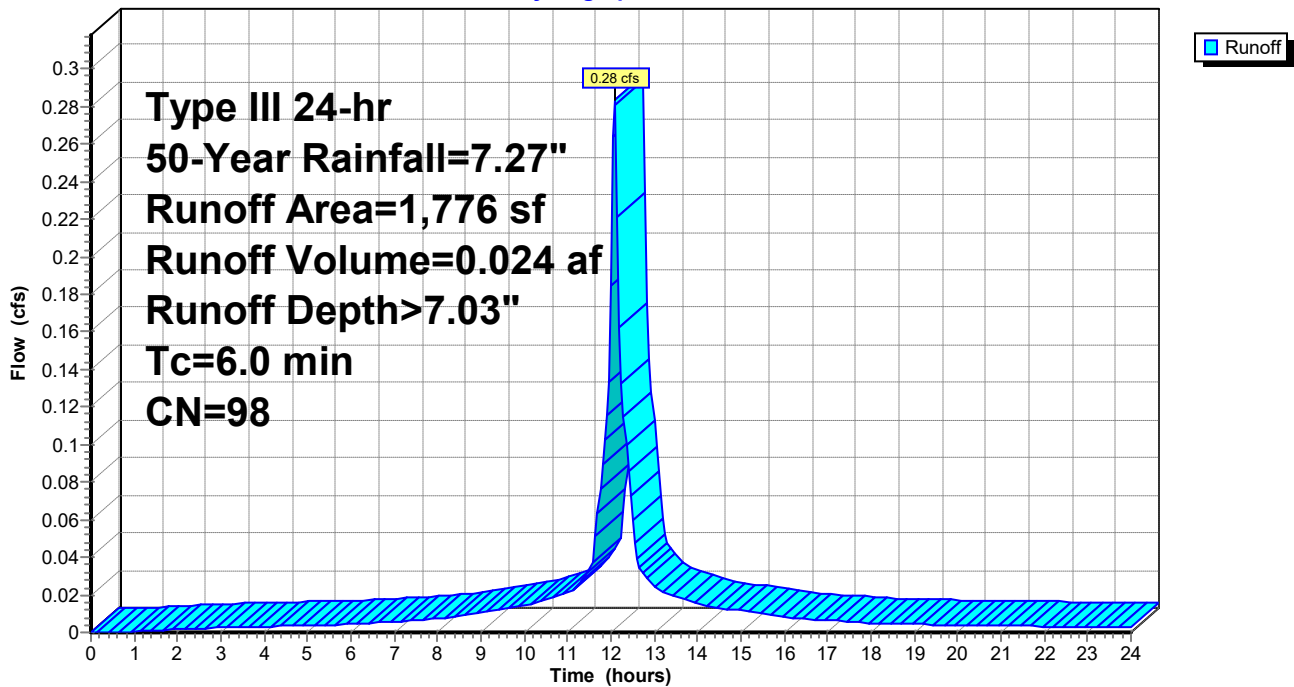
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-1: Roof

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Summary for Subcatchment R-2: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

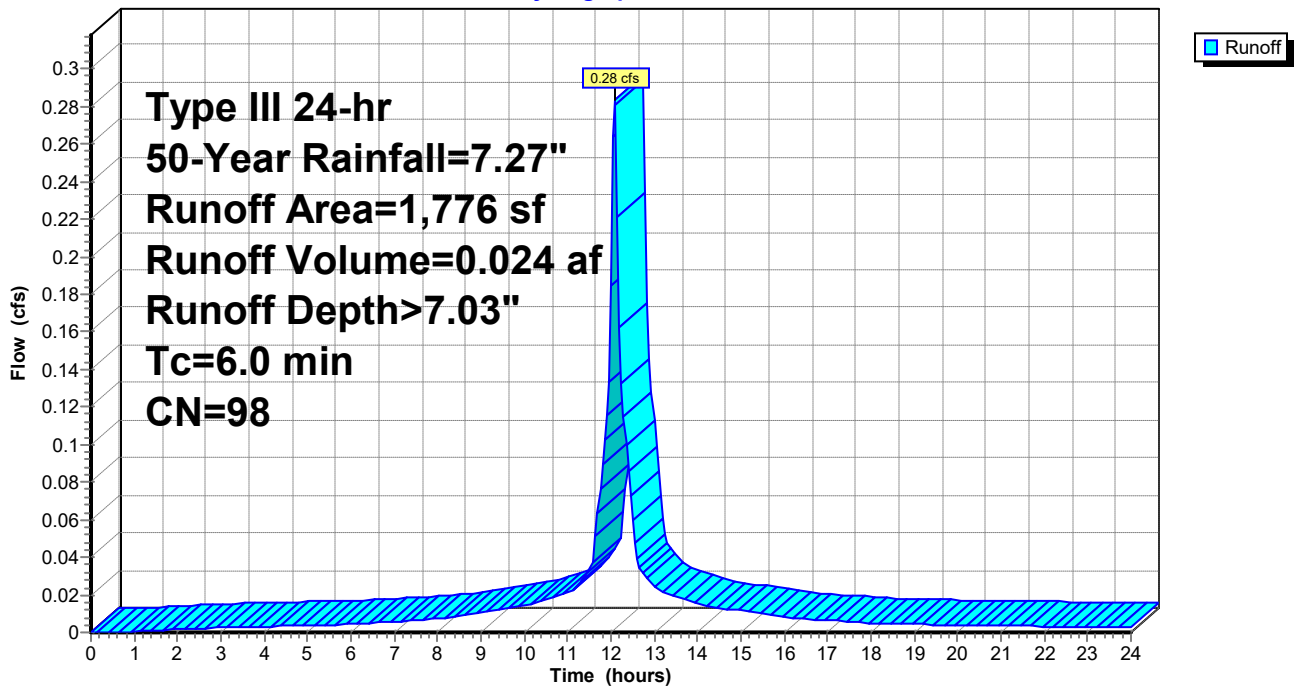
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-2: Roof

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Summary for Subcatchment R-3: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

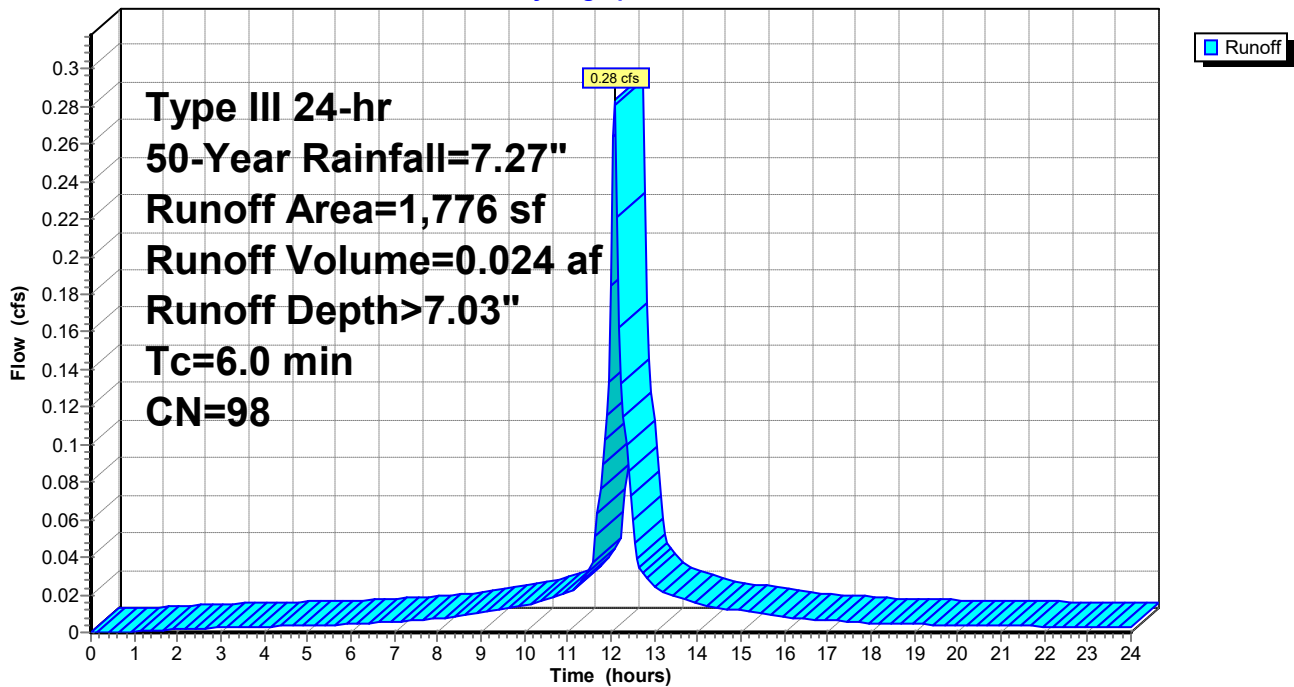
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-3: Roof

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Summary for Subcatchment R-4: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

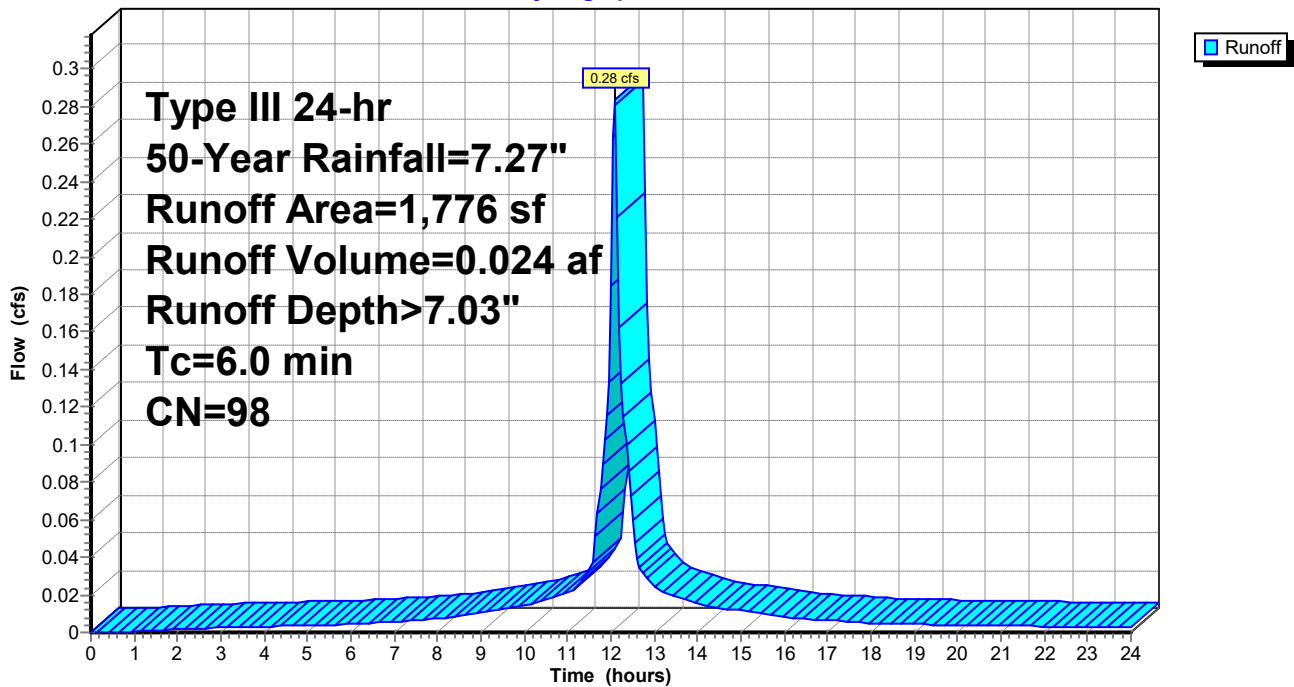
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-4: Roof

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Summary for Subcatchment R-5: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

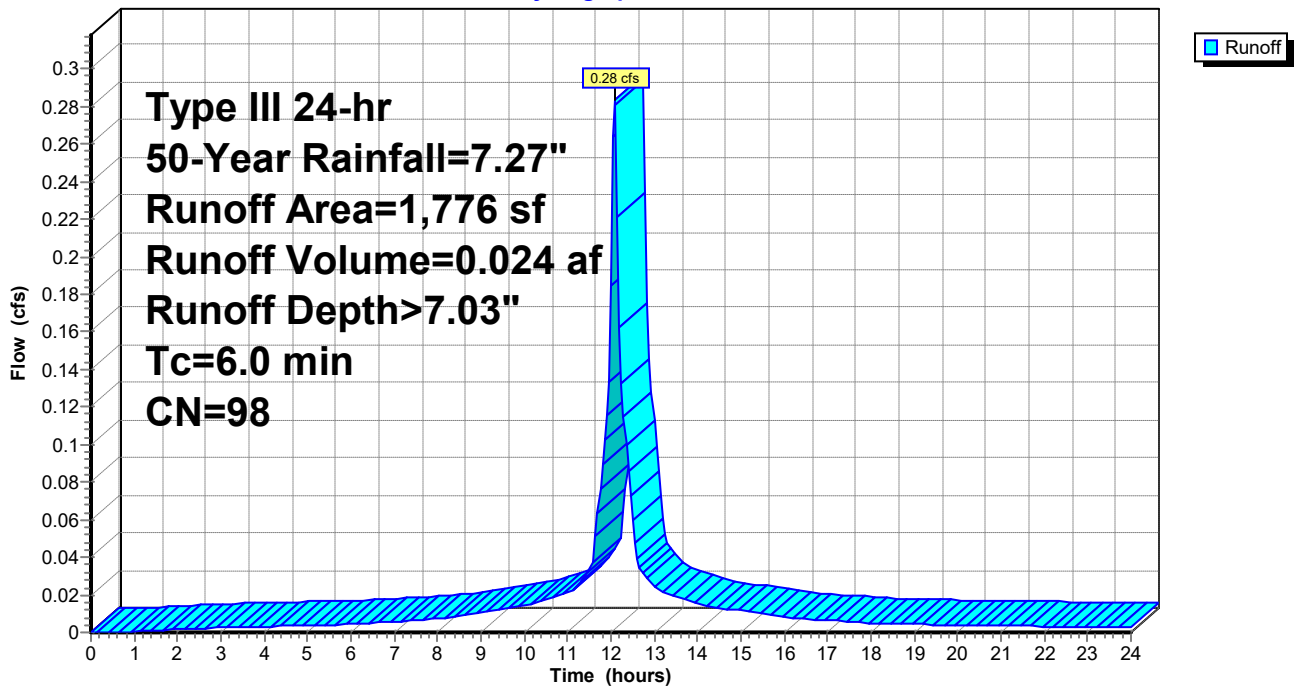
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-5: Roof

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Subcatchment R-6: Roof

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af, Depth> 7.03"

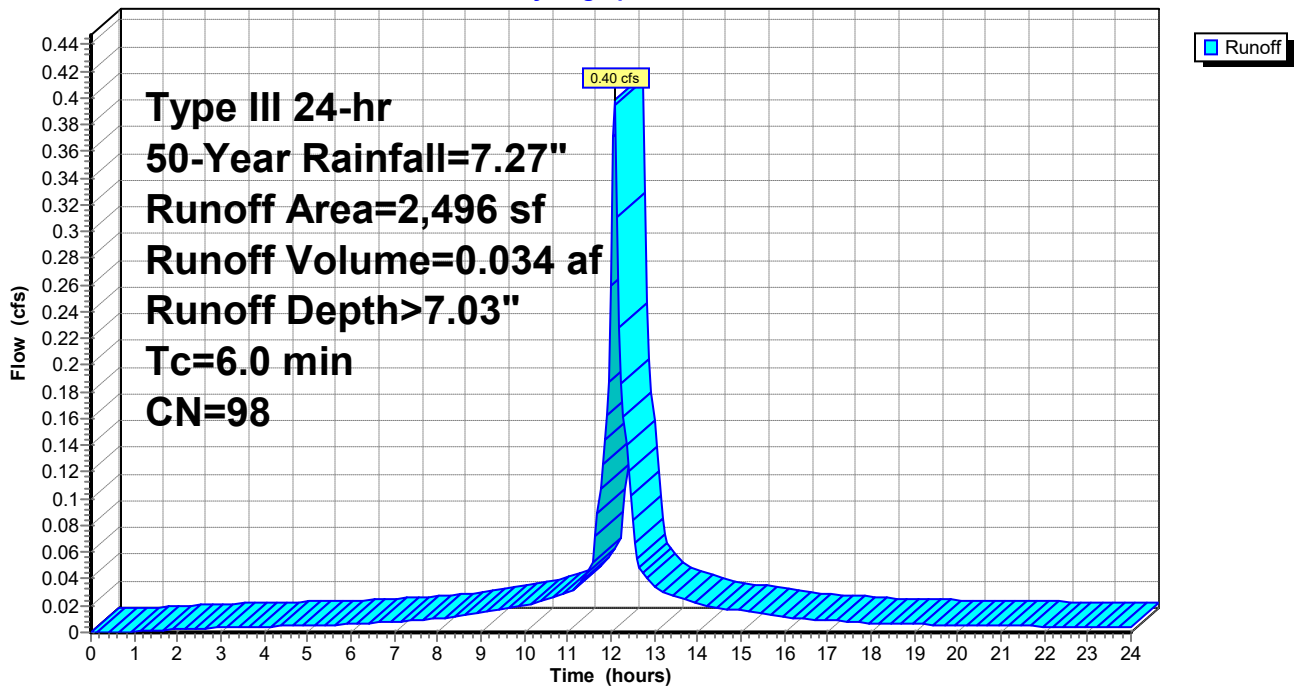
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-6: Roof

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Subcatchment R-7: Roof

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af, Depth> 7.03"

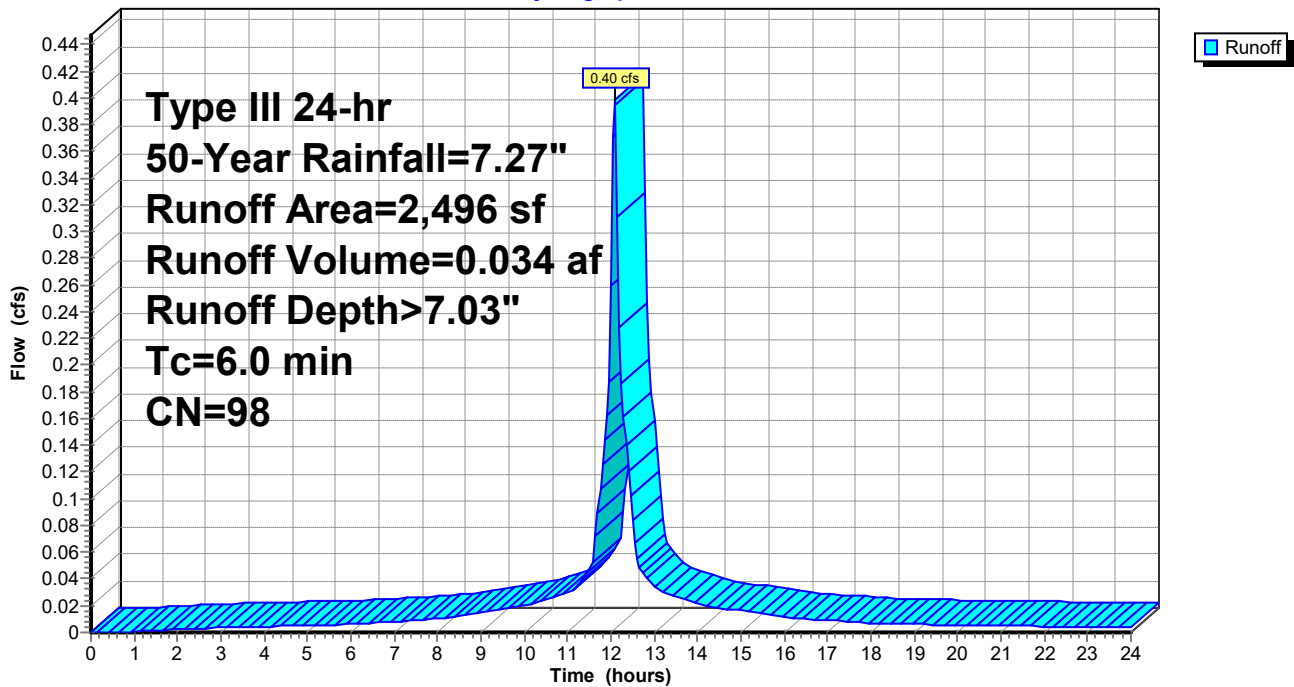
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-7: Roof

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Subcatchment R-8: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

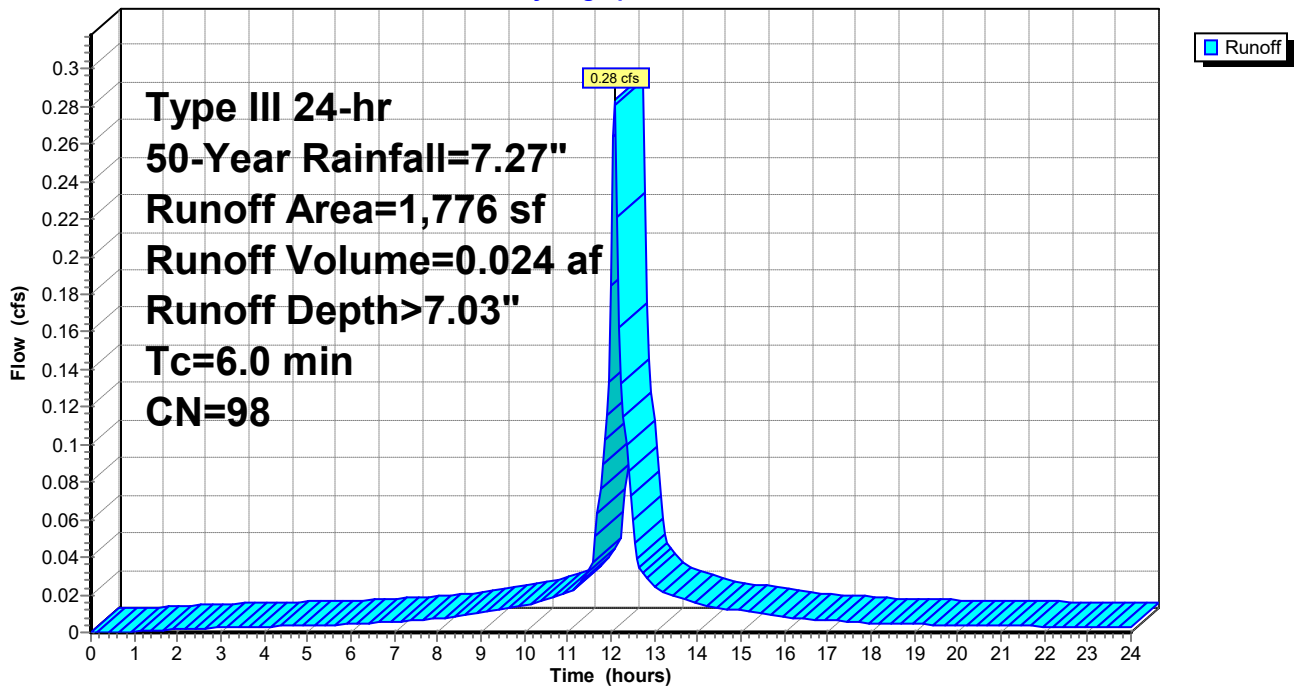
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-8: Roof

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Subcatchment R-9: Roof

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 7.03"

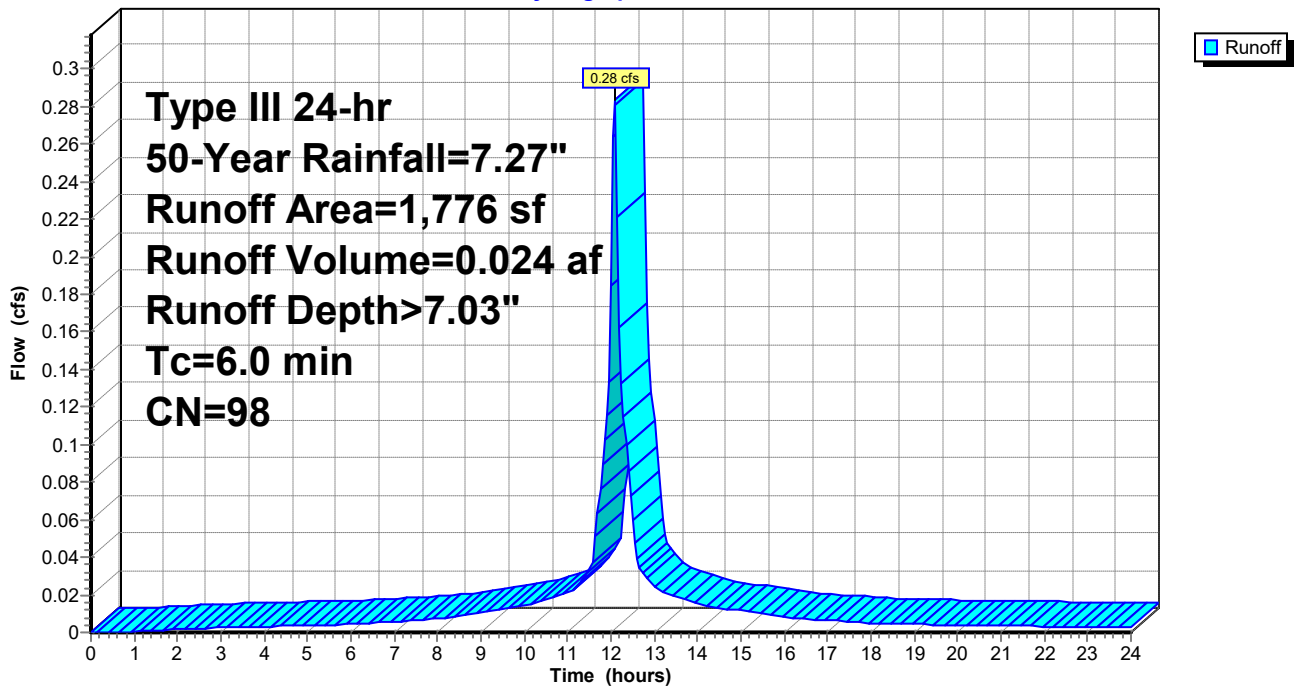
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=7.27"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-9: Roof

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Reach 1R: Swale

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 58.68 cfs

3.00' x 1.00' deep channel, n= 0.030

Side Slope Z-value= 3.0 '/' Top Width= 9.00'

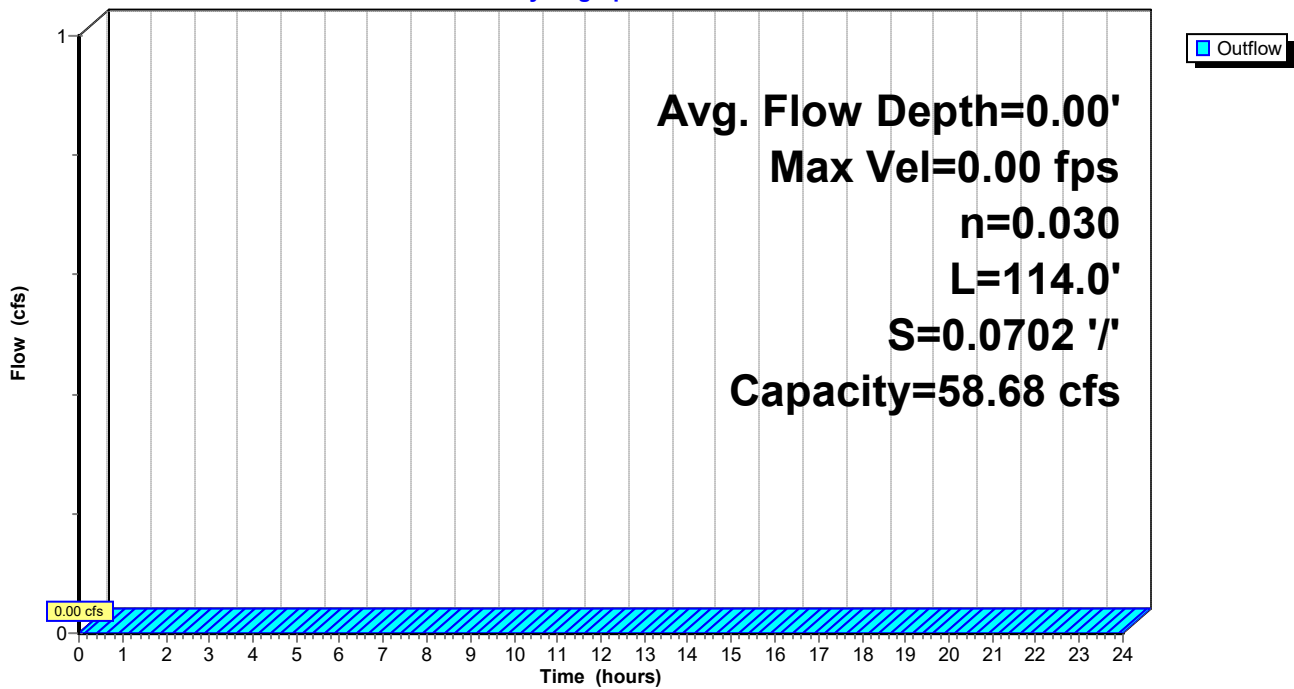
Length= 114.0' Slope= 0.0702 '/'

Inlet Invert= 261.00', Outlet Invert= 253.00'



Reach 1R: Swale

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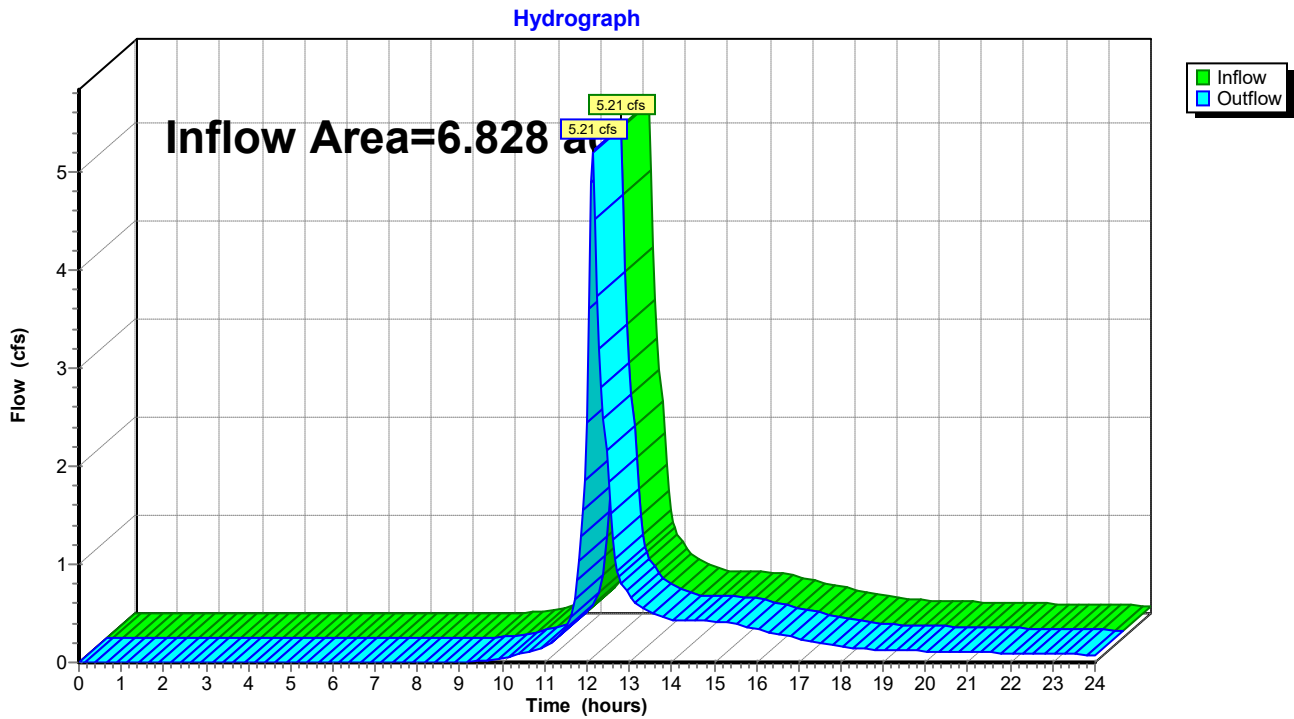
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Summary for Reach DP-1: Design Point

Inflow Area = 6.828 ac, 20.91% Impervious, Inflow Depth > 0.79" for 50-Year event
Inflow = 5.21 cfs @ 12.14 hrs, Volume= 0.449 af
Outflow = 5.21 cfs @ 12.14 hrs, Volume= 0.449 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point



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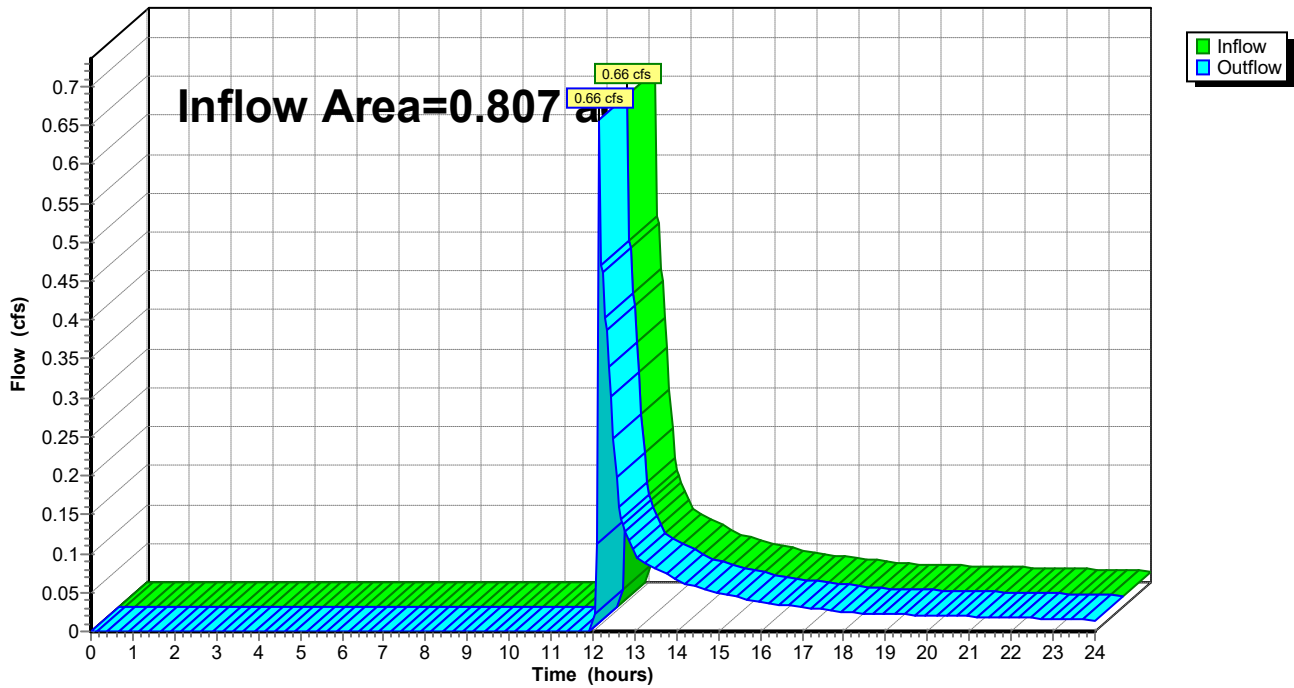
Summary for Reach DP-2: Design Point

Inflow Area = 0.807 ac, 10.10% Impervious, Inflow Depth > 0.73" for 50-Year event
Inflow = 0.66 cfs @ 12.16 hrs, Volume= 0.049 af
Outflow = 0.66 cfs @ 12.16 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Pond 1P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.06 cfs @ 12.31 hrs, Volume= 0.023 af, Atten= 79%, Lag= 13.4 min
 Discarded = 0.04 cfs @ 12.20 hrs, Volume= 0.023 af
 Primary = 0.02 cfs @ 12.31 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 236.06' @ 12.30 hrs Surf.Area= 190 sf Storage= 266 cf

Plug-Flow detention time= 63.6 min calculated for 0.023 af (96% of inflow)
 Center-of-Mass det. time= 42.7 min (784.7 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	230.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	230.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	232.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.04	1	0	0
237.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	236.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.20 hrs HW=232.13' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.01 cfs @ 12.31 hrs HW=236.05' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.79 fps)

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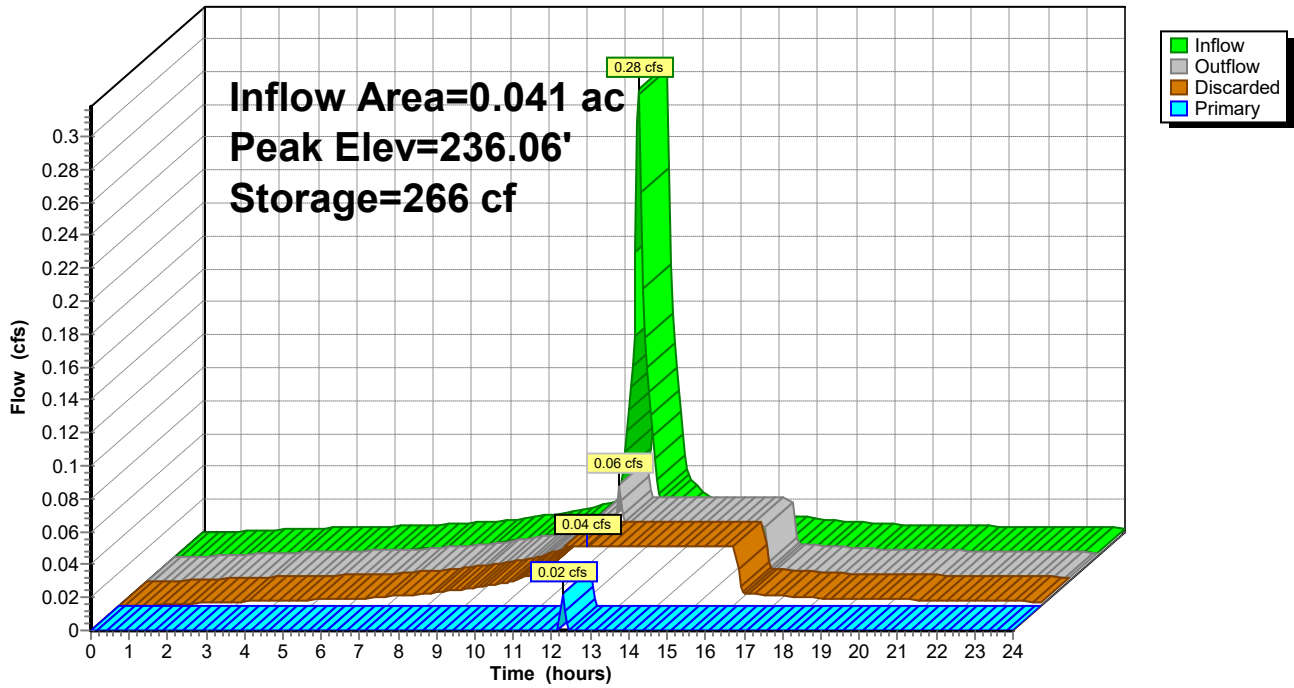
Type III 24-hr 50-Year Rainfall=7.27"

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Pond 1P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Pond 2P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.06 cfs @ 12.31 hrs, Volume= 0.023 af, Atten= 79%, Lag= 13.4 min
 Discarded = 0.04 cfs @ 12.20 hrs, Volume= 0.023 af
 Primary = 0.02 cfs @ 12.31 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 239.06' @ 12.30 hrs Surf.Area= 190 sf Storage= 266 cf

Plug-Flow detention time= 63.6 min calculated for 0.023 af (96% of inflow)
 Center-of-Mass det. time= 42.7 min (784.7 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	233.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	233.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	235.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.04	1	0	0
240.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	233.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	239.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.20 hrs HW=235.13' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.01 cfs @ 12.31 hrs HW=239.05' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.79 fps)

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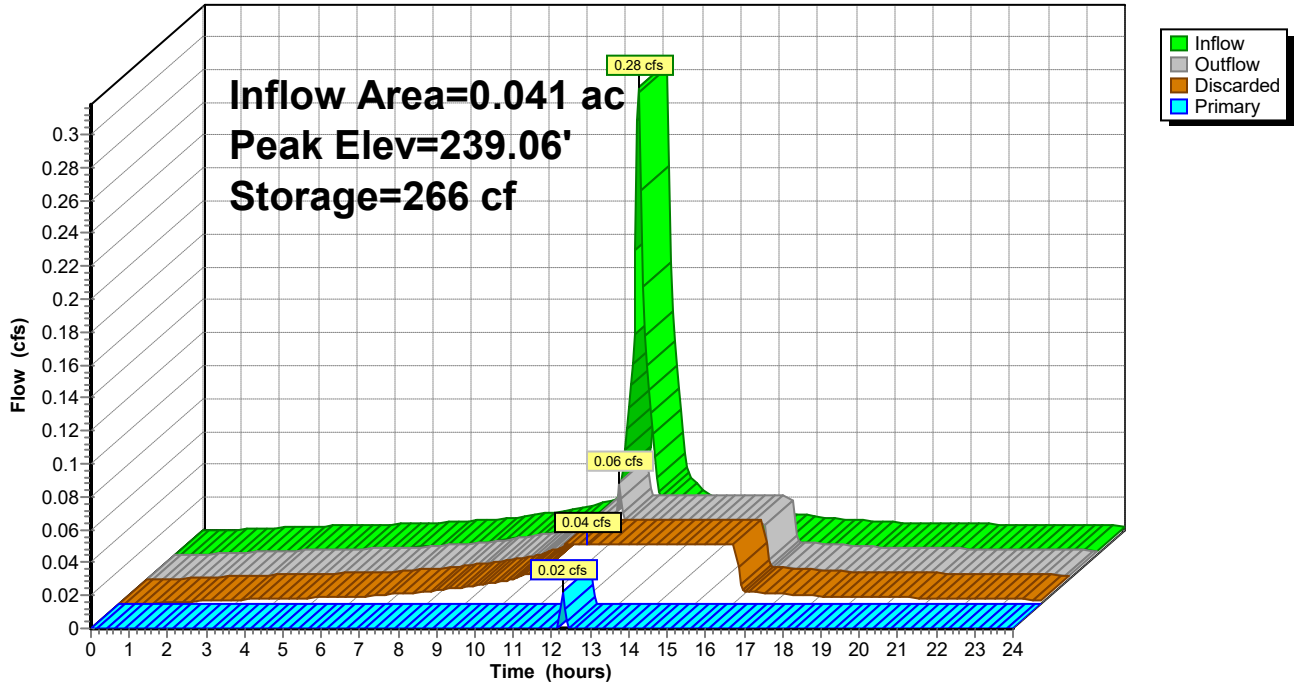
Type III 24-hr 50-Year Rainfall=7.27"

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Pond 2P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 3P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.07 cfs @ 12.31 hrs, Volume= 0.023 af, Atten= 77%, Lag= 13.5 min
 Discarded = 0.04 cfs @ 12.20 hrs, Volume= 0.023 af
 Primary = 0.03 cfs @ 12.31 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 242.07' @ 12.30 hrs Surf.Area= 190 sf Storage= 265 cf

Plug-Flow detention time= 61.7 min calculated for 0.023 af (97% of inflow)
 Center-of-Mass det. time= 42.2 min (784.2 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	237.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	237.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	239.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
239.04	1	0	0
243.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	242.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.20 hrs HW=239.12' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.02 cfs @ 12.31 hrs HW=242.07' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.02 cfs @ 0.88 fps)

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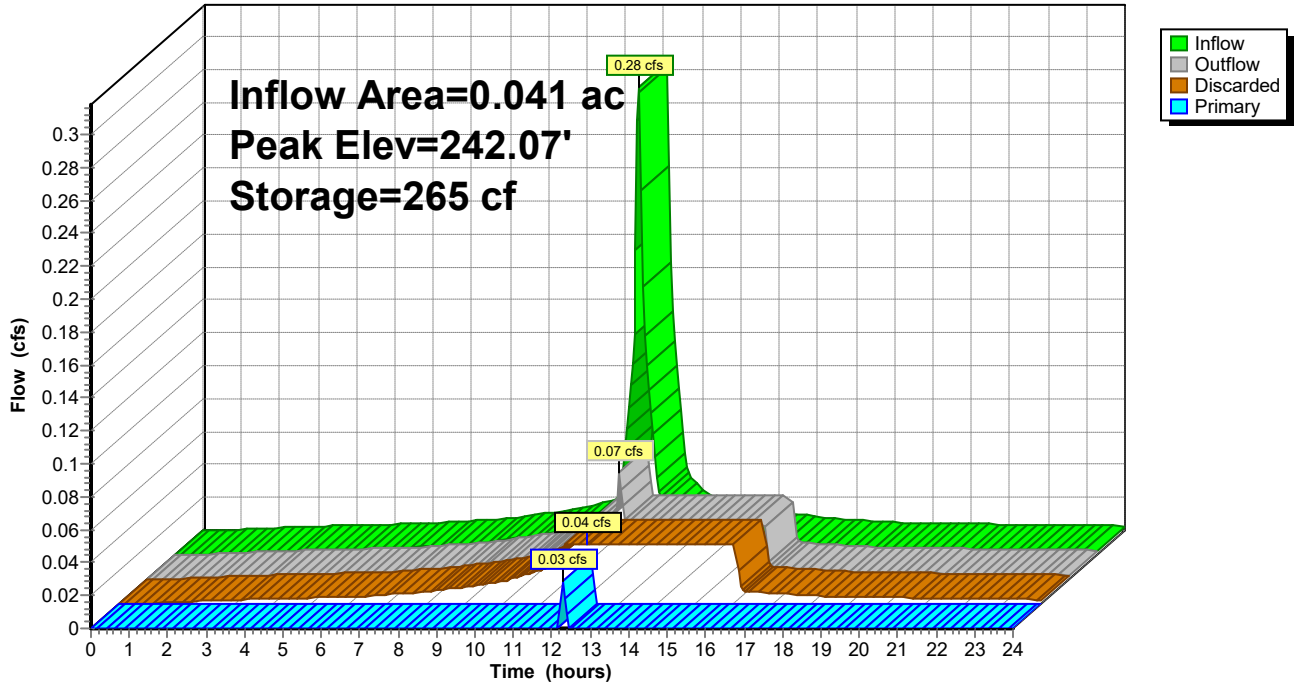
Type III 24-hr 50-Year Rainfall=7.27"

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Pond 3P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 4P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.25 cfs @ 12.16 hrs, Volume= 0.022 af, Atten= 13%, Lag= 4.5 min
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.017 af
 Primary = 0.24 cfs @ 12.16 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.24' @ 12.15 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 156.9 min calculated for 0.022 af (93% of inflow)
 Center-of-Mass det. time= 119.1 min (861.2 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=223.40' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.21 cfs @ 12.16 hrs HW=226.23' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.21 cfs @ 1.63 fps)

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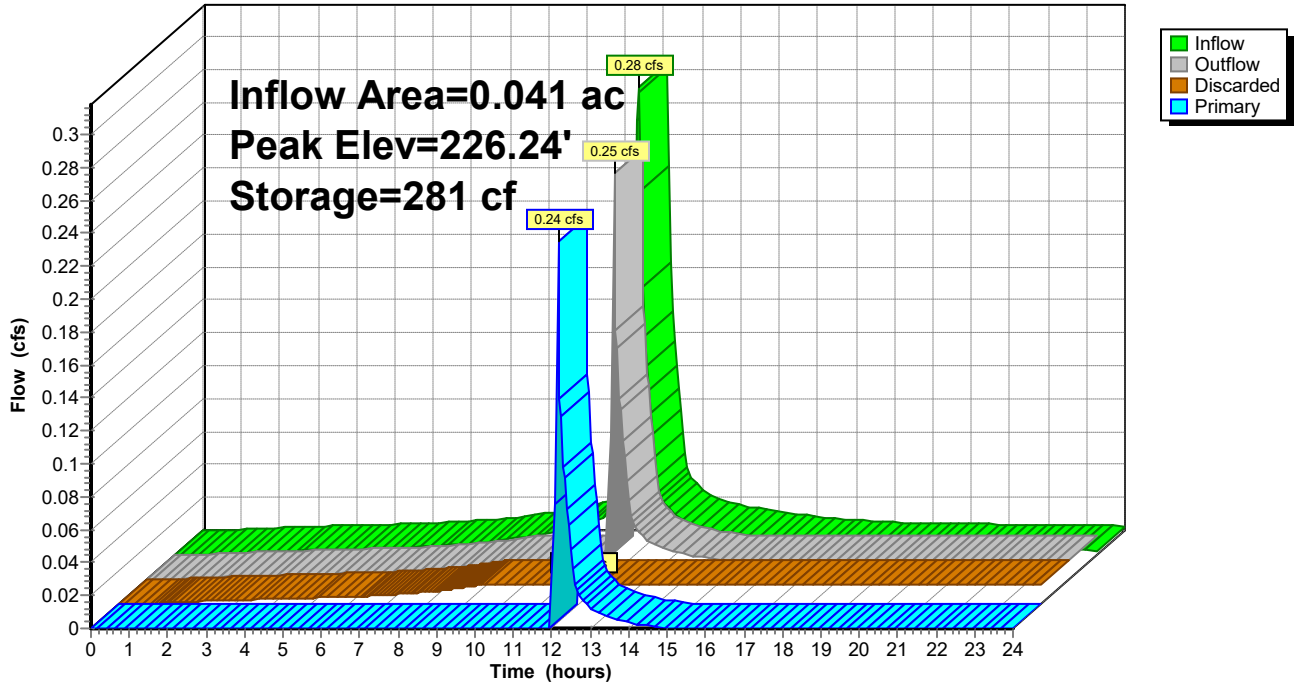
Type III 24-hr 50-Year Rainfall=7.27"

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Pond 4P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Pond 5P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.25 cfs @ 12.16 hrs, Volume= 0.022 af, Atten= 13%, Lag= 4.5 min
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.017 af
 Primary = 0.24 cfs @ 12.16 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.24' @ 12.15 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 156.9 min calculated for 0.022 af (93% of inflow)
 Center-of-Mass det. time= 119.1 min (861.2 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=223.40' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.21 cfs @ 12.16 hrs HW=226.23' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.21 cfs @ 1.63 fps)

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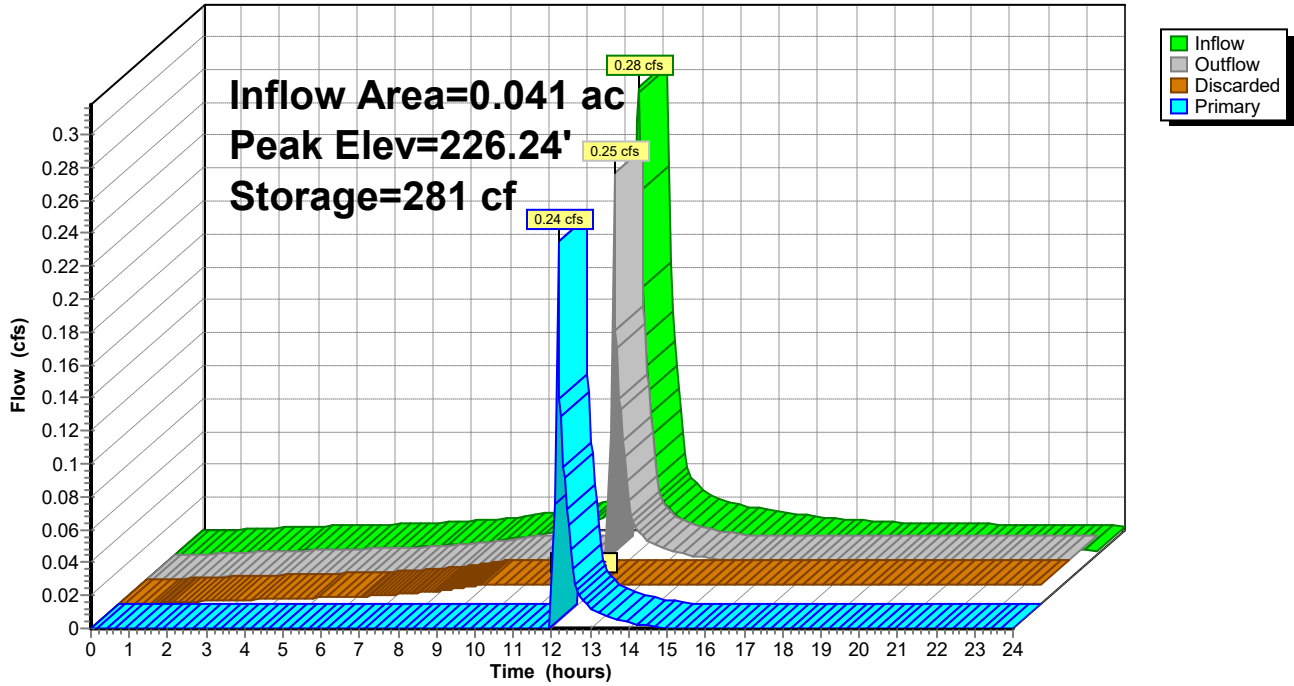
Type III 24-hr 50-Year Rainfall=7.27"

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Pond 5P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 50-Year Rainfall=7.27"

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Summary for Pond 6P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af
 Outflow = 0.17 cfs @ 12.34 hrs, Volume= 0.032 af, Atten= 58%, Lag= 15.4 min
 Discarded = 0.02 cfs @ 12.20 hrs, Volume= 0.028 af
 Primary = 0.15 cfs @ 12.34 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 229.18' @ 12.35 hrs Surf.Area= 351 sf Storage= 492 cf

Plug-Flow detention time= 184.9 min calculated for 0.031 af (94% of inflow)
 Center-of-Mass det. time= 150.6 min (892.6 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	224.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	224.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	226.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
226.04	1	0	0
230.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	229.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.20 hrs HW=226.28' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.14 cfs @ 12.34 hrs HW=229.18' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.14 cfs @ 1.45 fps)

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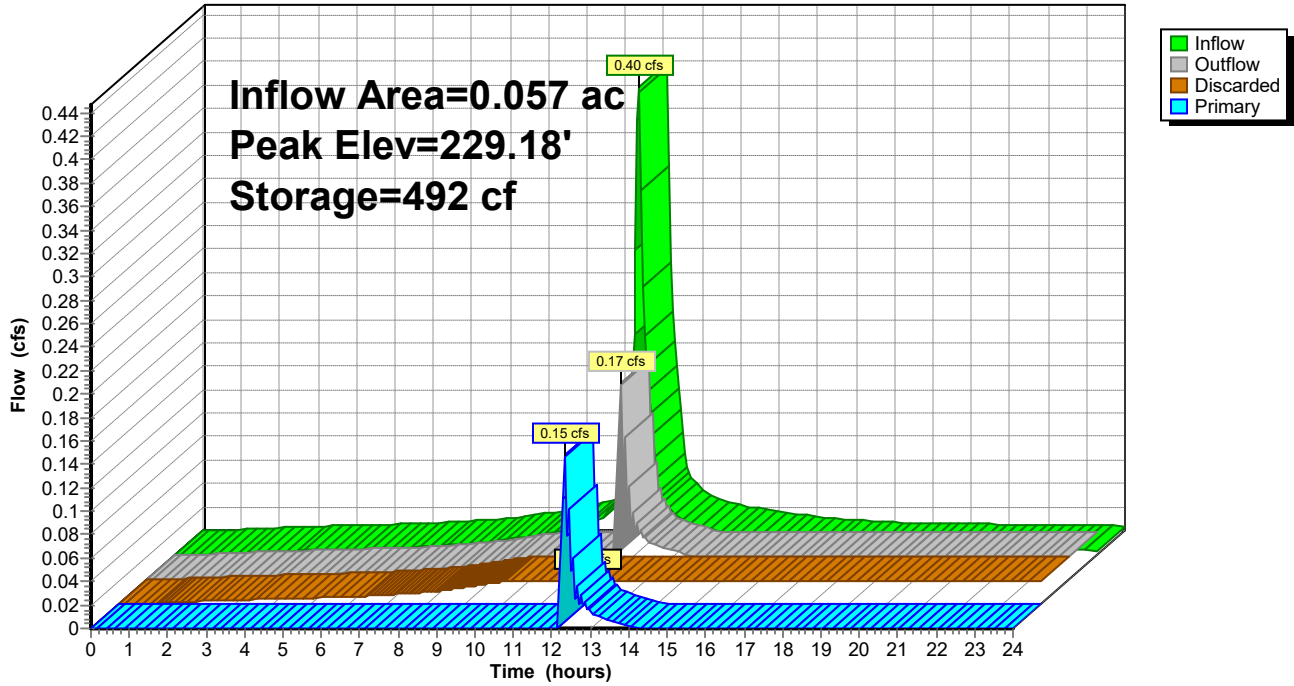
Type III 24-hr 50-Year Rainfall=7.27"

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Pond 6P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 7P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.034 af
 Outflow = 0.18 cfs @ 12.31 hrs, Volume= 0.032 af, Atten= 55%, Lag= 13.7 min
 Discarded = 0.02 cfs @ 12.30 hrs, Volume= 0.028 af
 Primary = 0.16 cfs @ 12.31 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 211.19' @ 12.30 hrs Surf.Area= 351 sf Storage= 492 cf

Plug-Flow detention time= 184.5 min calculated for 0.032 af (94% of inflow)
 Center-of-Mass det. time= 150.6 min (892.6 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	205.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	208.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.04	1	0	0
212.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	211.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.30 hrs HW=211.19' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.14 cfs @ 12.31 hrs HW=211.18' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.14 cfs @ 1.44 fps)

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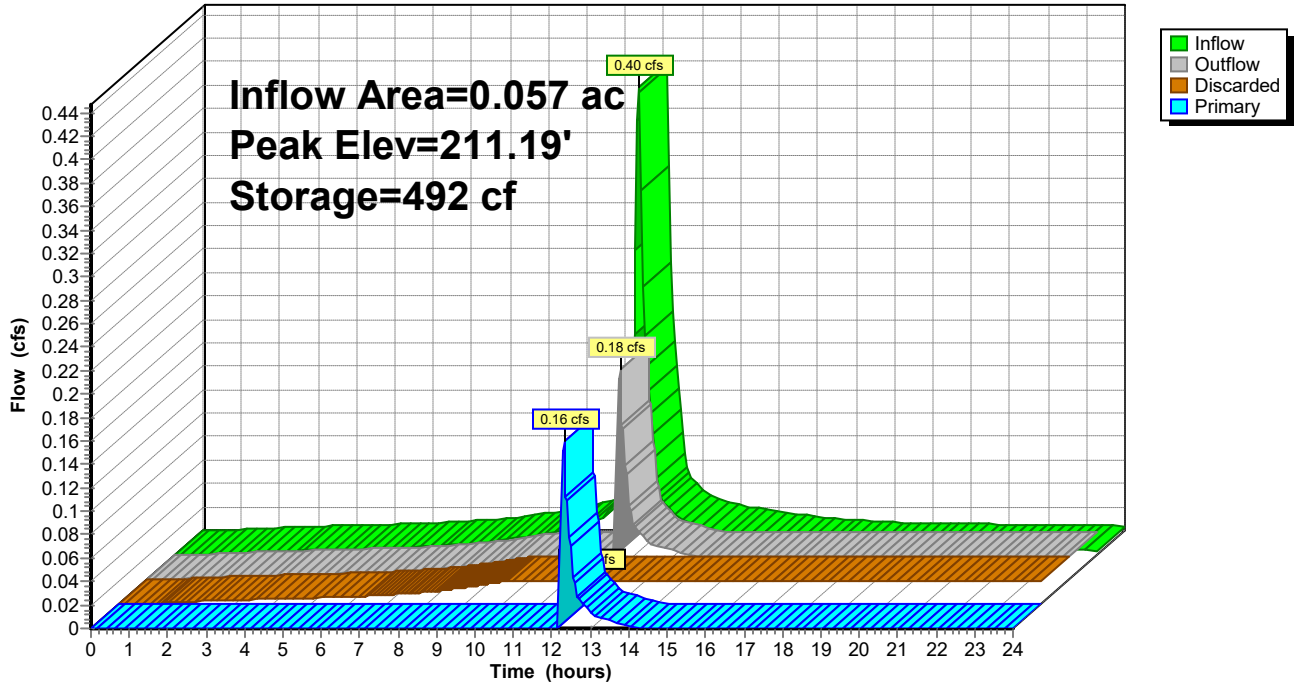
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Pond 7P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 8P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.25 cfs @ 12.16 hrs, Volume= 0.022 af, Atten= 13%, Lag= 4.5 min
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.017 af
 Primary = 0.24 cfs @ 12.16 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 198.24' @ 12.15 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 156.9 min calculated for 0.022 af (93% of inflow)
 Center-of-Mass det. time= 119.1 min (861.2 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	193.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	195.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.04	1	0	0
199.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	193.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	198.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=195.40' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.21 cfs @ 12.16 hrs HW=198.23' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.21 cfs @ 1.63 fps)

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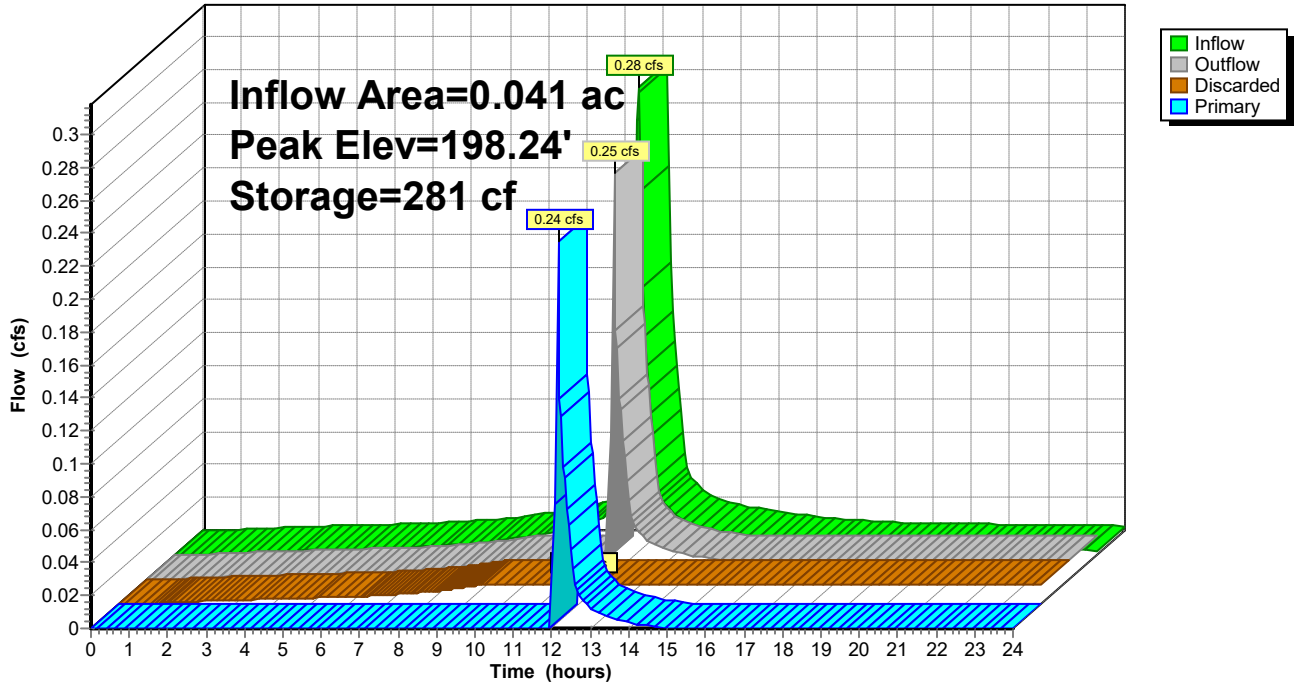
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Pond 8P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 9P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.03" for 50-Year event
 Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.024 af
 Outflow = 0.25 cfs @ 12.16 hrs, Volume= 0.022 af, Atten= 13%, Lag= 4.5 min
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.017 af
 Primary = 0.24 cfs @ 12.16 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 202.24' @ 12.15 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 156.9 min calculated for 0.022 af (93% of inflow)
 Center-of-Mass det. time= 119.1 min (861.2 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	197.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	197.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	199.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
199.04	1	0	0
203.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	197.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	202.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=199.40' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.21 cfs @ 12.16 hrs HW=202.23' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.21 cfs @ 1.63 fps)

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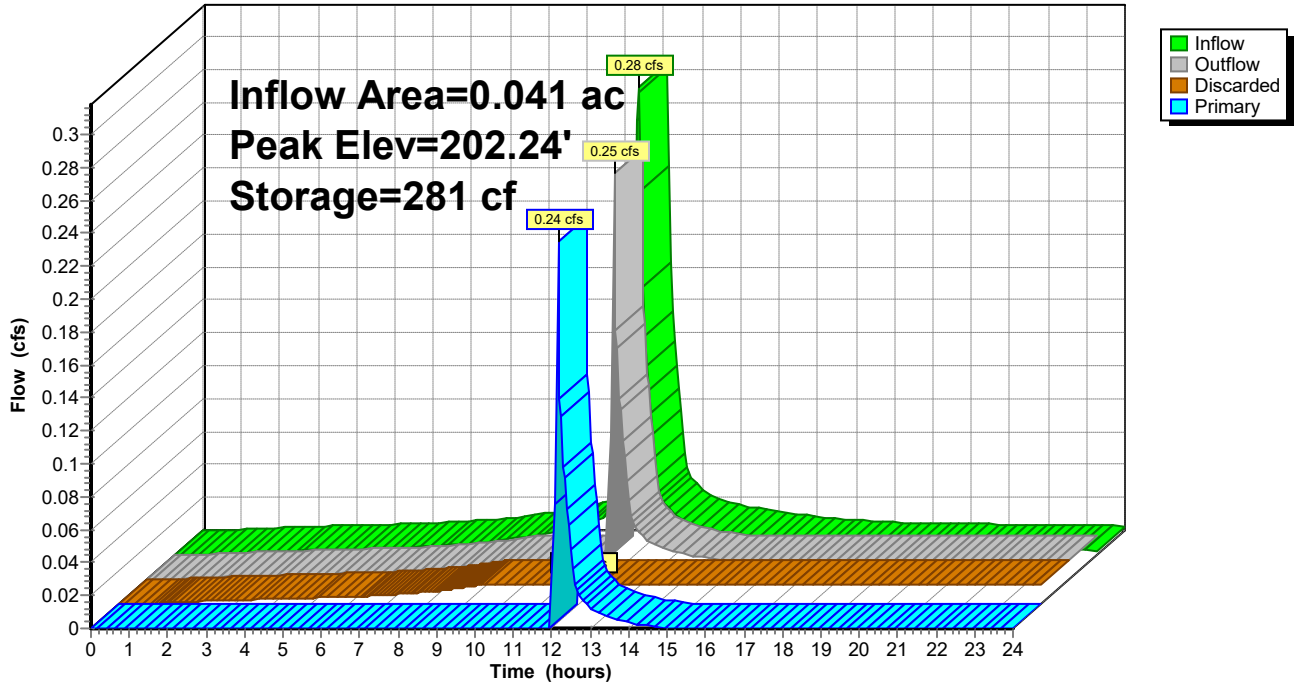
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Pond 9P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 10P: Basin

Inflow Area = 3.434 ac, 22.85% Impervious, Inflow Depth > 2.89" for 50-Year event
 Inflow = 10.73 cfs @ 12.12 hrs, Volume= 0.828 af
 Outflow = 0.53 cfs @ 15.57 hrs, Volume= 0.435 af, Atten= 95%, Lag= 207.3 min
 Discarded = 0.42 cfs @ 15.57 hrs, Volume= 0.411 af
 Primary = 0.11 cfs @ 15.57 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 214.78' @ 15.57 hrs Surf.Area= 7,554 sf Storage= 21,879 cf

Plug-Flow detention time= 330.4 min calculated for 0.434 af (52% of inflow)
 Center-of-Mass det. time= 211.5 min (1,054.4 - 842.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	209.40'	24,363 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
209.40	1,431	238.0	0	0	1,431	
210.00	1,887	254.0	992	992	2,075	
211.00	2,716	282.0	2,289	3,281	3,299	
212.00	3,629	309.0	3,161	6,443	4,602	
213.00	5,010	426.0	4,301	10,744	11,455	
214.00	6,399	472.0	5,690	16,434	14,773	
215.00	7,894	422.0	7,133	23,567	18,358	
215.10	8,022	423.0	796	24,363	18,438	

Device	Routing	Invert	Outlet Devices
#1	Primary	215.30'	10.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	209.40'	2.410 in/hr Exfiltration over Horizontal area
#3	Device 4	214.60'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Primary	211.00'	12.0" Round Culvert L= 113.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.00' / 209.00' S= 0.0177 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.42 cfs @ 15.57 hrs HW=214.78' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.11 cfs @ 15.57 hrs HW=214.78' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Culvert** (Passes 0.11 cfs of 5.41 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.11 cfs @ 1.45 fps)

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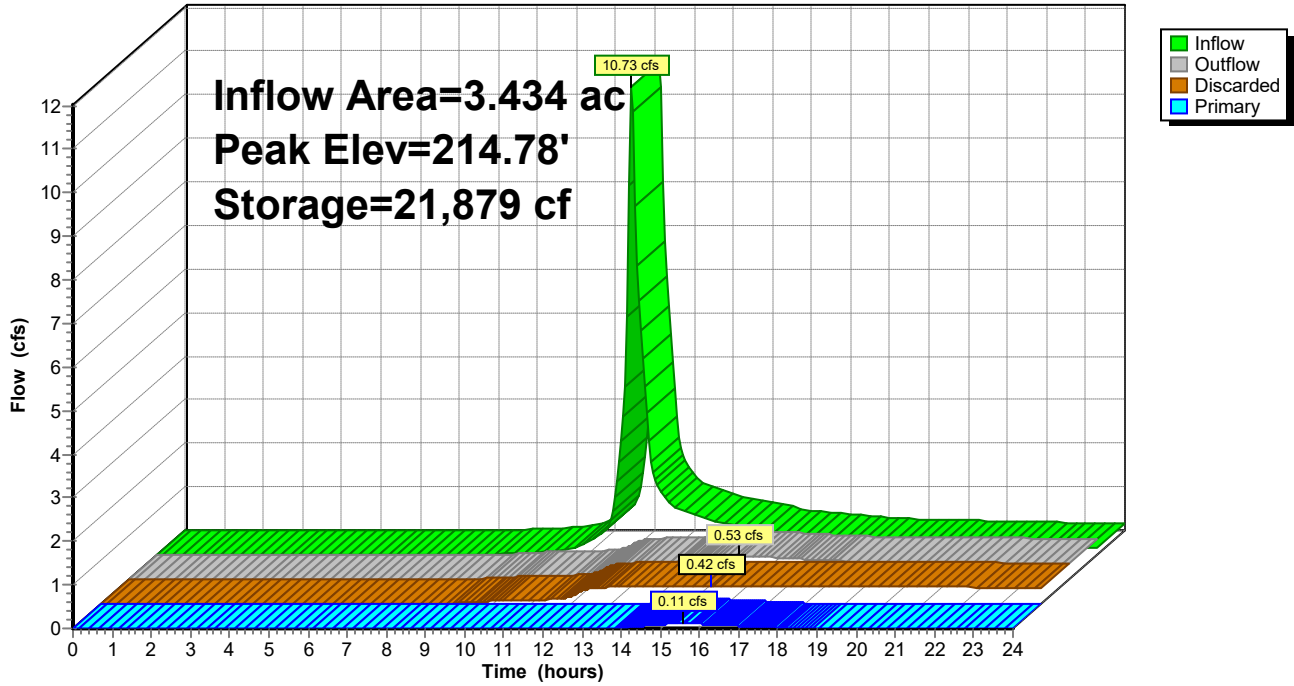
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Pond 10P: Basin

Hydrograph



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Summary for Pond 11P: 4x4x8 Galleys

Inflow Area = 1.852 ac, 28.92% Impervious, Inflow Depth > 1.93" for 50-Year event
Inflow = 3.09 cfs @ 12.17 hrs, Volume= 0.297 af
Outflow = 0.12 cfs @ 11.80 hrs, Volume= 0.122 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.12 cfs @ 11.80 hrs, Volume= 0.122 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 193.27' @ 18.13 hrs Surf.Area= 2,129 sf Storage= 8,235 cf

Plug-Flow detention time= 335.2 min calculated for 0.122 af (41% of inflow)
Center-of-Mass det. time= 196.9 min (1,069.1 - 872.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.70'	2,307 cf	33.80'W x 63.00'L x 8.50'H Field A 18,100 cf Overall - 12,333 cf Embedded = 5,767 cf x 40.0% Voids
#2A	188.20'	9,846 cf	Concrete Galley 4x4x8 x 105 Inside #1 Inside= 42.0"W x 91.0"H => 26.79 sf x 3.50'L = 93.8 cf Outside= 52.8"W x 96.0"H => 29.36 sf x 4.00'L = 117.5 cf 105 Chambers in 7 Rows
		12,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	187.70'	2.410 in/hr Exfiltration over Horizontal area
#2	Primary	195.20'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 195.20' / 195.10' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.12 cfs @ 11.80 hrs HW=187.81' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=187.70' (Free Discharge)

↑2=Culvert (Controls 0.00 cfs)

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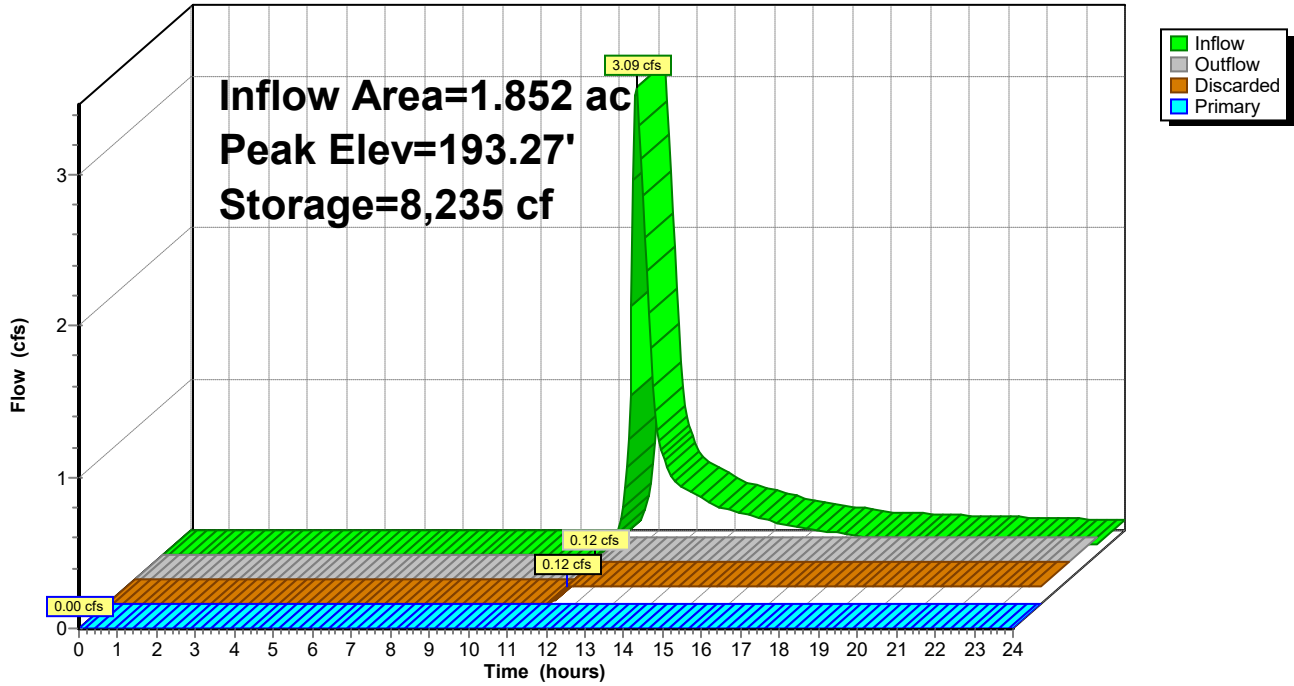
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Pond 11P: 4x4x8 Galleys

Hydrograph



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Summary for Pond 20P: Basin Forebay

Volume	Invert	Avail.Storage	Storage Description			
#1	213.00'	488 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
213.00	385	89.0	0	0	385	
214.00	598	113.0	488	488	784	

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P-1: Offsite Runoff Runoff Area=67,182 sf 6.98% Impervious Runoff Depth>4.07"
Flow Length=361' Tc=9.4 min CN=65 Runoff=6.44 cfs 0.523 af

Subcatchment P-4: Offsite Runoff Runoff Area=46,024 sf 5.71% Impervious Runoff Depth>4.77"
Flow Length=278' Tc=7.7 min CN=71 Runoff=5.50 cfs 0.420 af

Subcatchment P-5: Lawn & Woods Runoff Area=31,616 sf 0.00% Impervious Runoff Depth>0.97"
Tc=6.0 min CN=36 Runoff=0.42 cfs 0.059 af

Subcatchment P2: Lawn & Highland Road Runoff Area=94,674 sf 23.94% Impervious Runoff Depth>3.27"
Flow Length=338' Tc=6.9 min CN=58 Runoff=7.81 cfs 0.592 af

Subcatchment P3: Lawn & Ballard Road Runoff Area=75,676 sf 24.23% Impervious Runoff Depth>2.60"
Flow Length=356' Tc=11.2 min CN=52 Runoff=4.16 cfs 0.376 af

Subcatchment R-1: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Subcatchment R-2: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Subcatchment R-3: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Subcatchment R-4: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Subcatchment R-5: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Subcatchment R-6: Roof Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.038 af

Subcatchment R-7: Roof Runoff Area=2,496 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.038 af

Subcatchment R-8: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Subcatchment R-9: Roof Runoff Area=1,776 sf 100.00% Impervious Runoff Depth>7.98"
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

Reach 1R: Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.030 L=114.0' S=0.0702 '/' Capacity=58.68 cfs Outflow=0.00 cfs 0.000 af

Reach DP-1: Design Point Inflow=6.44 cfs 0.717 af
Outflow=6.44 cfs 0.717 af

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Reach DP-2: Design Point

Inflow=1.12 cfs 0.074 af
Outflow=1.12 cfs 0.074 af

Pond 1P: 3 x 1 Cultec R-150XLHD

Peak Elev=236.18' Storage=266 cf Inflow=0.32 cfs 0.027 af
Discarded=0.04 cfs 0.025 af Primary=0.15 cfs 0.002 af Outflow=0.19 cfs 0.027 af

Pond 2P: 3 x 1 Cultec R-150XLHD

Peak Elev=239.18' Storage=266 cf Inflow=0.32 cfs 0.027 af
Discarded=0.04 cfs 0.025 af Primary=0.15 cfs 0.002 af Outflow=0.19 cfs 0.027 af

Pond 3P: 3 x 1 Cultec R-150XLHD

Peak Elev=242.19' Storage=265 cf Inflow=0.32 cfs 0.027 af
Discarded=0.04 cfs 0.025 af Primary=0.16 cfs 0.003 af Outflow=0.19 cfs 0.027 af

Pond 4P: 1 x 4 Cultec R-150XLHD

Peak Elev=226.34' Storage=281 cf Inflow=0.32 cfs 0.027 af
Discarded=0.01 cfs 0.018 af Primary=0.36 cfs 0.008 af Outflow=0.37 cfs 0.025 af

Pond 5P: 1 x 4 Cultec R-150XLHD

Peak Elev=226.34' Storage=281 cf Inflow=0.32 cfs 0.027 af
Discarded=0.01 cfs 0.018 af Primary=0.36 cfs 0.008 af Outflow=0.37 cfs 0.025 af

Pond 6P: 2 x 4 Cultec R-150XLHD

Peak Elev=229.26' Storage=492 cf Inflow=0.45 cfs 0.038 af
Discarded=0.02 cfs 0.029 af Primary=0.26 cfs 0.007 af Outflow=0.28 cfs 0.035 af

Pond 7P: 2 x 4 Cultec R-150XLHD

Peak Elev=211.29' Storage=492 cf Inflow=0.45 cfs 0.038 af
Discarded=0.02 cfs 0.029 af Primary=0.30 cfs 0.007 af Outflow=0.32 cfs 0.035 af

Pond 8P: 1 x 4 Cultec R-150XLHD

Peak Elev=198.34' Storage=281 cf Inflow=0.32 cfs 0.027 af
Discarded=0.01 cfs 0.018 af Primary=0.36 cfs 0.008 af Outflow=0.37 cfs 0.025 af

Pond 9P: 1 x 4 Cultec R-150XLHD

Peak Elev=202.34' Storage=281 cf Inflow=0.32 cfs 0.027 af
Discarded=0.01 cfs 0.018 af Primary=0.36 cfs 0.008 af Outflow=0.37 cfs 0.025 af

Pond 10P: Basin

Peak Elev=215.09' Storage=24,285 cf Inflow=14.03 cfs 1.034 af
Discarded=0.45 cfs 0.435 af Primary=0.66 cfs 0.181 af Outflow=1.10 cfs 0.616 af

Pond 11P: 4x4x8 Galleys

Peak Elev=195.33' Storage=11,369 cf Inflow=4.56 cfs 0.389 af
Discarded=0.12 cfs 0.125 af Primary=0.06 cfs 0.013 af Outflow=0.18 cfs 0.138 af

Pond 20P: Basin Forebay

Peak Elev=0.00' Storage=0 cf

Total Runoff Area = 7.635 ac Runoff Volume = 2.234 af Average Runoff Depth = 3.51"
80.23% Pervious = 6.126 ac 19.77% Impervious = 1.509 ac

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Summary for Subcatchment P-1: Offsite Runoff

Runoff = 6.44 cfs @ 12.14 hrs, Volume= 0.523 af, Depth> 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 2,729	98	Roof, offsite
* 14,859	39	>75% Grass cover, Good, HSG A, offsite
* 20,436	74	>75% Grass cover, Good, HSG C, offsite
* 20,439	70	Woods, Good, HSG C, offsite
* 1,960	98	Paved driveways
777	39	>75% Grass cover, Good, HSG A
4,674	74	>75% Grass cover, Good, HSG C
1,308	30	Woods, Good, HSG A
67,182	65	Weighted Average
62,493		93.02% Pervious Area
4,689		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	17	0.0100	0.09		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
0.5	10	0.3300	0.34		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.34"
4.0	23	0.0650	0.09		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.34"
0.2	14	0.0710	1.33		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
1.3	217	0.1500	2.71		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.3	80	0.0375	3.93		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
9.4	361	Total			

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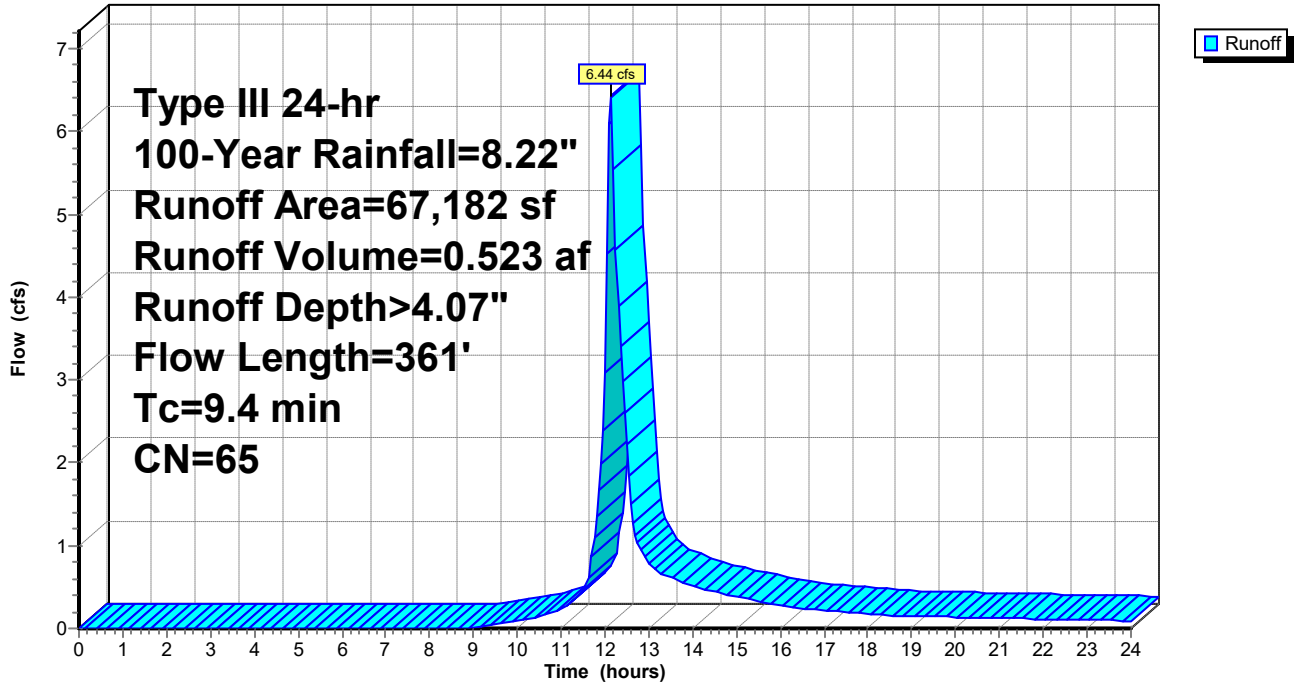
Type III 24-hr 100-Year Rainfall=8.22"

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Subcatchment P-1: Offsite Runoff

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Subcatchment P-4: Offsite Runoff

Runoff = 5.50 cfs @ 12.11 hrs, Volume= 0.420 af, Depth> 4.77"

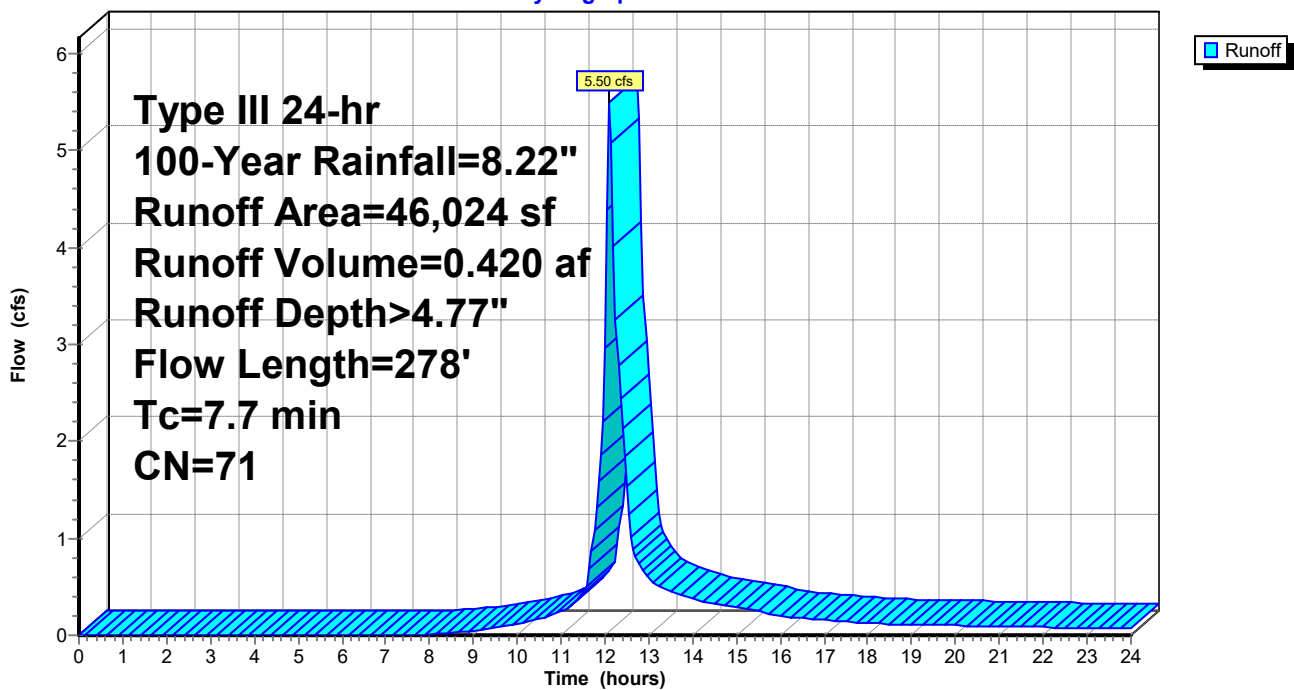
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.22"

	Area (sf)	CN	Description
*	1,694	98	Roof, offsite
*	933	98	Pavement, offsite
*	4,400	74	>75% Grass cover, Good, HSG C, offsite
*	1,470	30	Woods, Good, HSG A, offsite
*	37,527	70	Woods, Good, HSG C, offsite
	46,024	71	Weighted Average
	43,397		94.29% Pervious Area
	2,627		5.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
2.2	228	0.1240	1.76		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
7.7	278	Total			

Subcatchment P-4: Offsite Runoff

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Subcatchment P-5: Lawn & Woods

Runoff = 0.42 cfs @ 12.15 hrs, Volume= 0.059 af, Depth> 0.97"

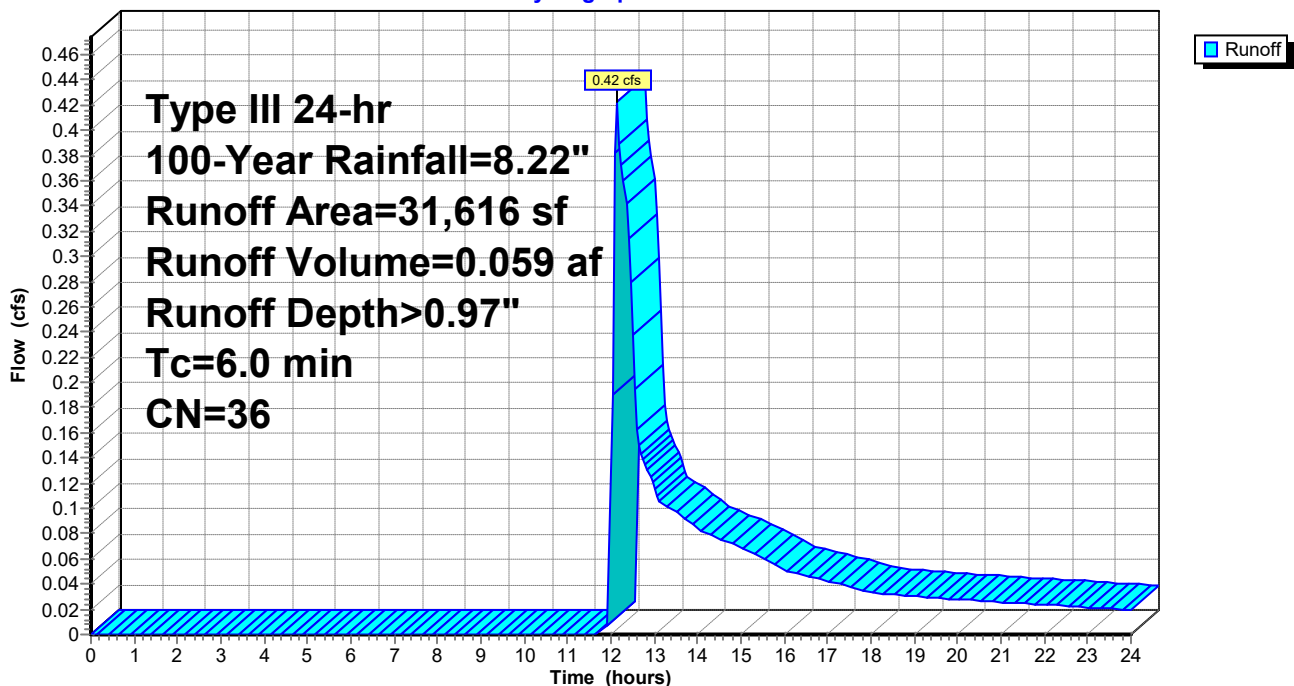
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
*	0	98 Roof, offsite
*	0	98 Pavement, offsite
*	0	39 >75% Grass cover, Good, HSG A, offsite
*	0	74 >75% Grass cover, Good, HSG C, offsite
*	0	30 Woods, Good, HSG A, offsite
*	0	70 Woods, Good, HSG C, offsite
*	0	98 Roof
*	0	98 Paved driveways
22,623	39	>75% Grass cover, Good, HSG A
8,993	30	Woods, Good, HSG A
0	70	Woods, Good, HSG C
31,616	36	Weighted Average
31,616		100.00% Pervious Area

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

Subcatchment P-5: Lawn & Woods

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Subcatchment P2: Lawn & Highland Road

Runoff = 7.81 cfs @ 12.11 hrs, Volume= 0.592 af, Depth> 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 22,666	98	Paved driveways
57,693	39	>75% Grass cover, Good, HSG A
14,315	74	>75% Grass cover, Good, HSG C
94,674	58	Weighted Average
72,008		76.06% Pervious Area
22,666		23.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		Sheet Flow, TC up until 50' length Grass: Short n= 0.150 P2= 3.34"
0.4	23	0.0200	0.99		Shallow Concentrated Flow, Shallow Concentrated Flow Short Grass Pasture Kv= 7.0 fps
0.8	153	0.0260	3.27		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.2	112	0.0400	10.72	8.42	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
6.9	338	Total			

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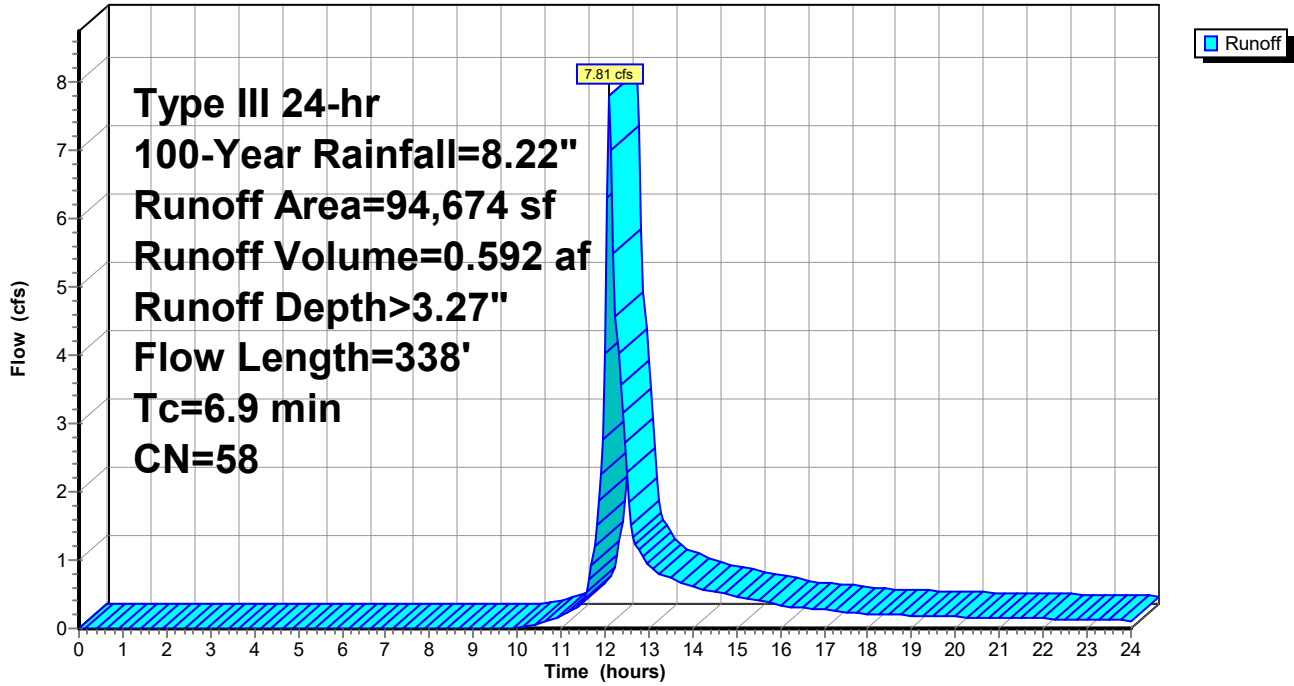
Type III 24-hr 100-Year Rainfall=8.22"

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Subcatchment P2: Lawn & Highland Road

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Subcatchment P3: Lawn & Ballard Road

Runoff = 4.16 cfs @ 12.17 hrs, Volume= 0.376 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,687	98	Roof, offsite
* 469	98	Pavement, offsite
* 22,183	39	>75% Grass cover, Good, HSG A, offsite
* 9,255	30	Woods, Good, HSG A, offsite
* 16,183	98	Paved driveways
21,959	39	>75% Grass cover, Good, HSG A
3,940	30	Woods, Good, HSG A
75,676	52	Weighted Average
57,337		75.77% Pervious Area
18,339		24.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		Sheet Flow, TC up until 50' length Woods: Light underbrush n= 0.400 P2= 3.34"
2.4	101	0.0200	0.71		Shallow Concentrated Flow, Shallow Concentrated Flow Woodland Kv= 5.0 fps
0.7	120	0.0200	2.87		Shallow Concentrated Flow, Shallow Concentrated Flow Paved Kv= 20.3 fps
0.3	85	0.0100	5.36	4.21	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
11.2	356	Total			

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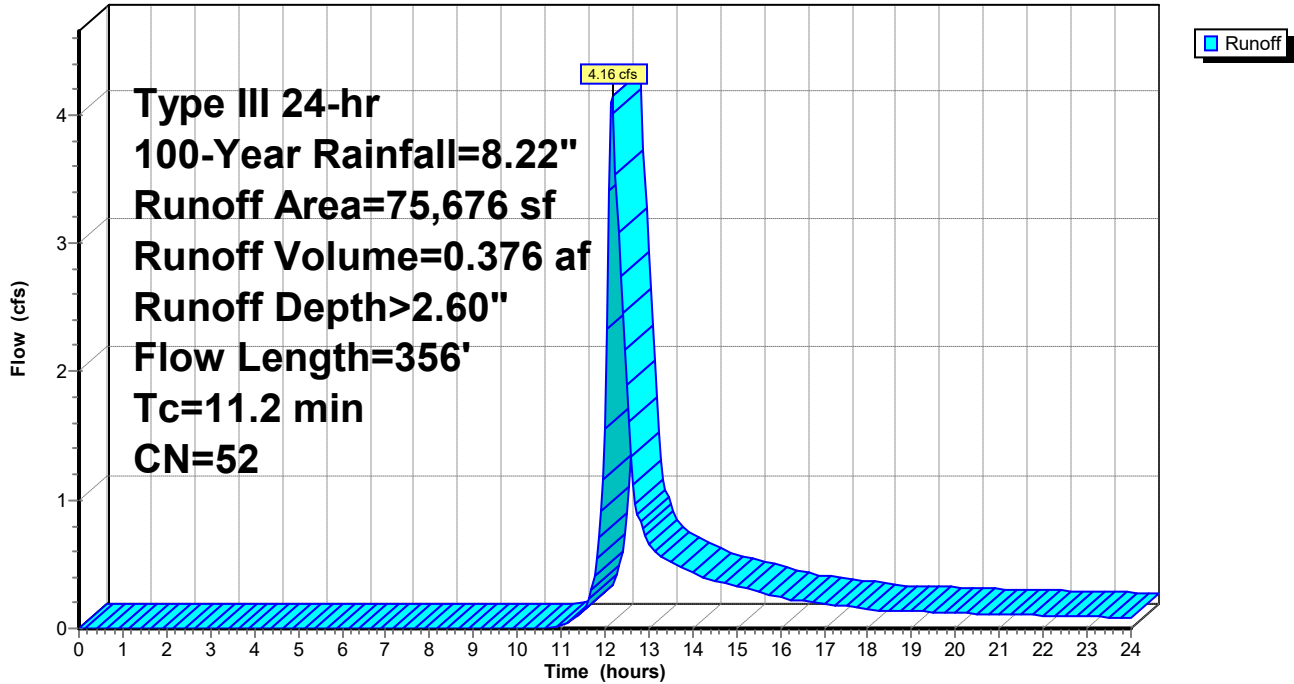
Type III 24-hr 100-Year Rainfall=8.22"

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Subcatchment P3: Lawn & Ballard Road

Hydrograph



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Summary for Subcatchment R-1: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

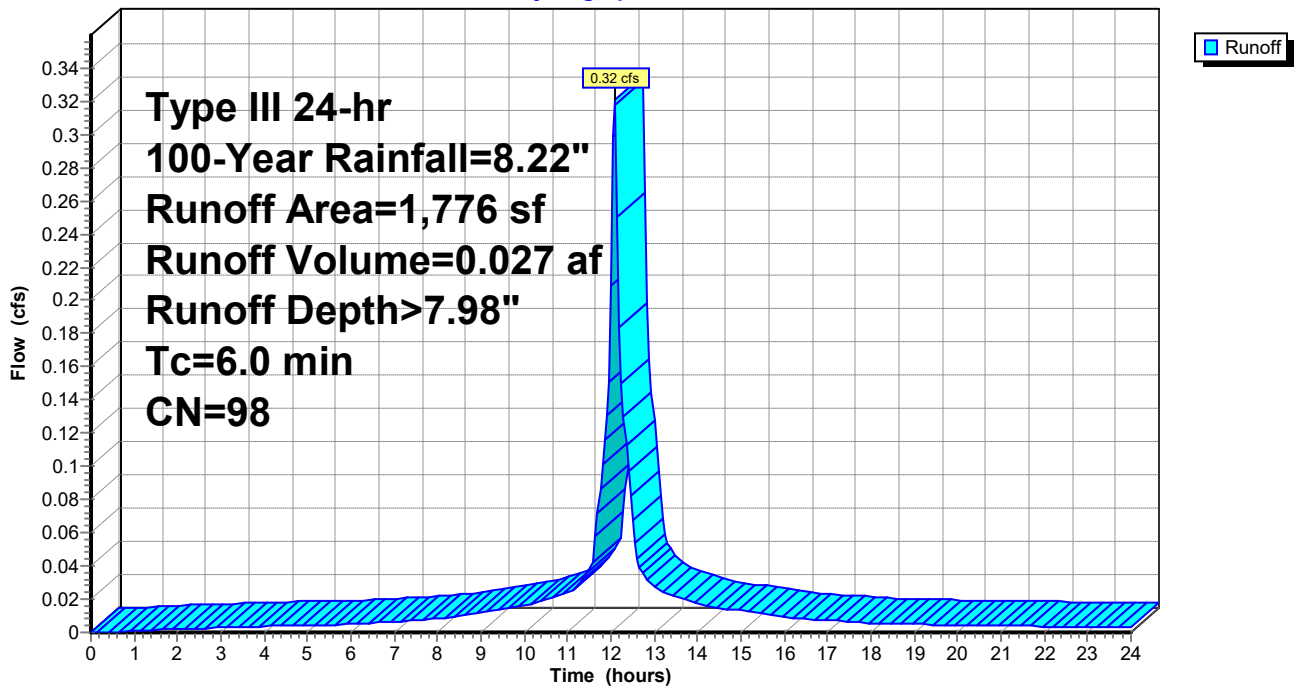
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-1: Roof

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Subcatchment R-2: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

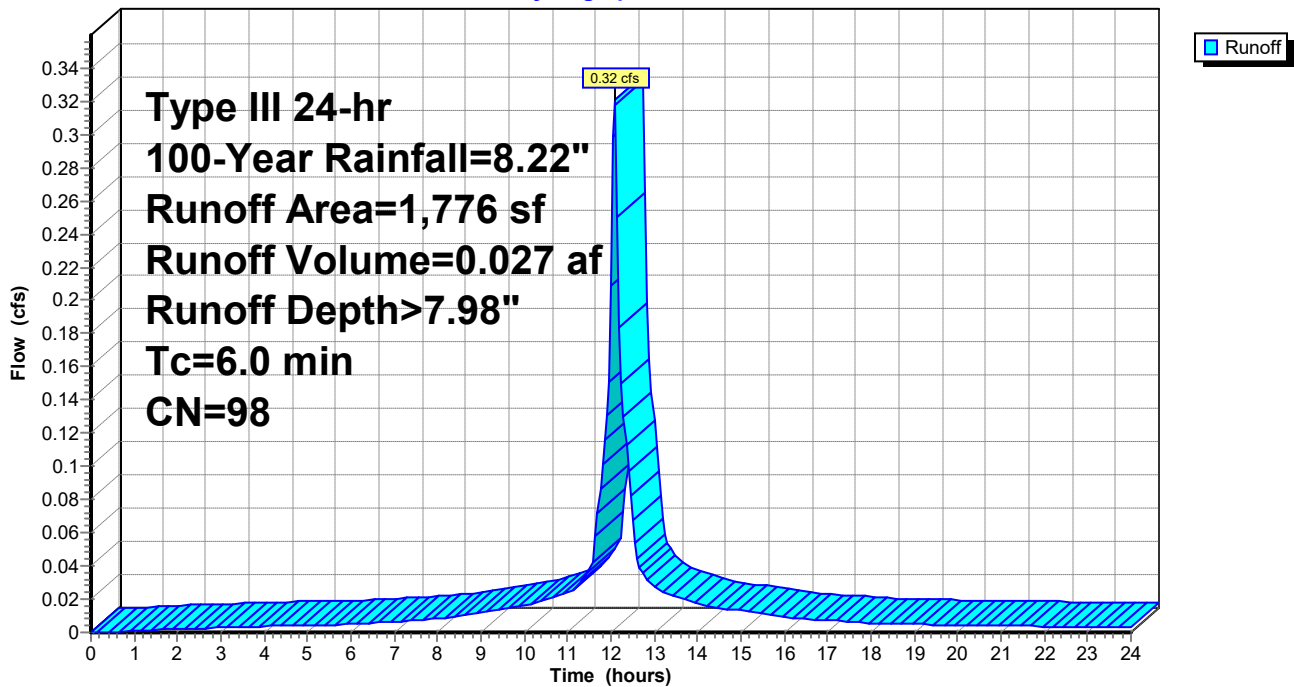
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-2: Roof

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Subcatchment R-3: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

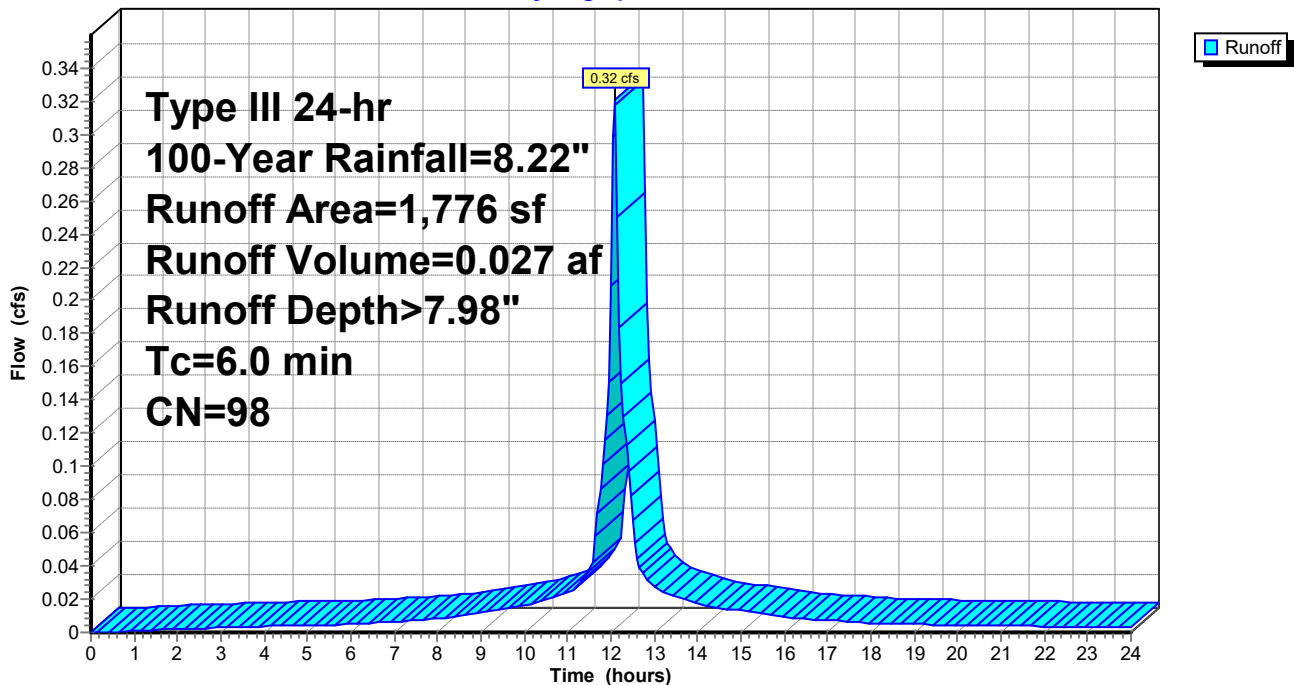
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-3: Roof

Hydrograph



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Summary for Subcatchment R-4: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

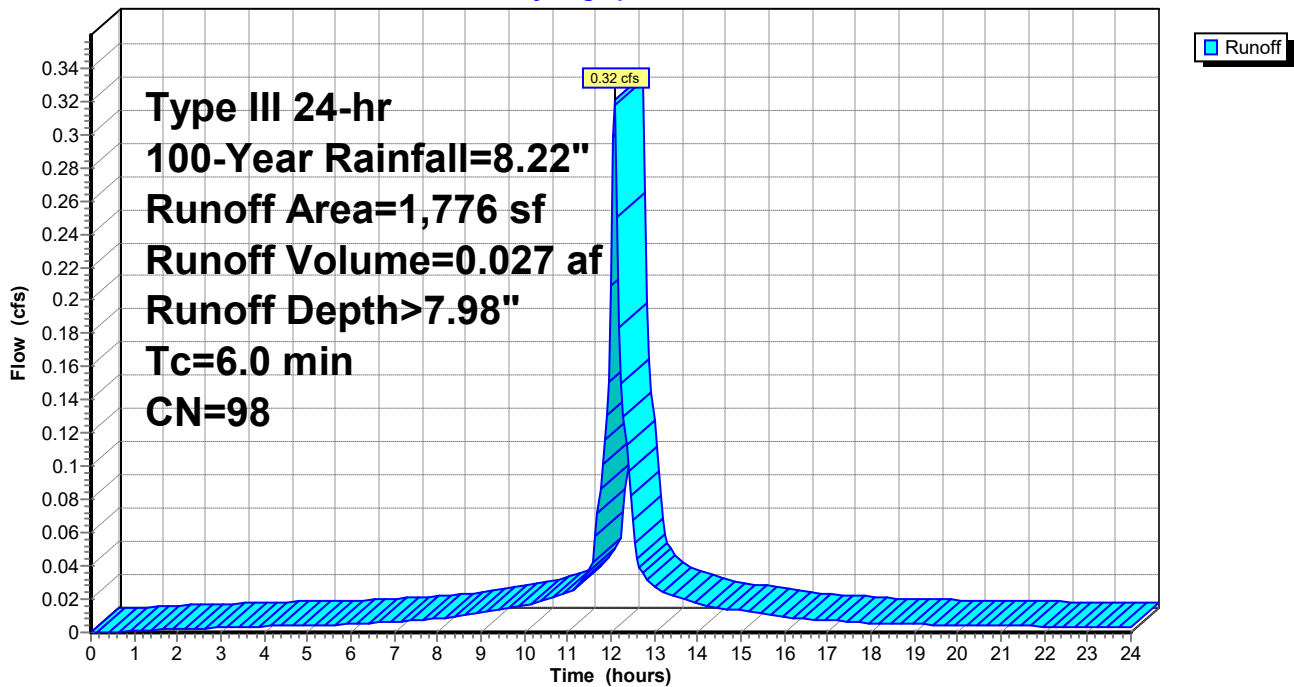
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-4: Roof

Hydrograph



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Summary for Subcatchment R-5: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

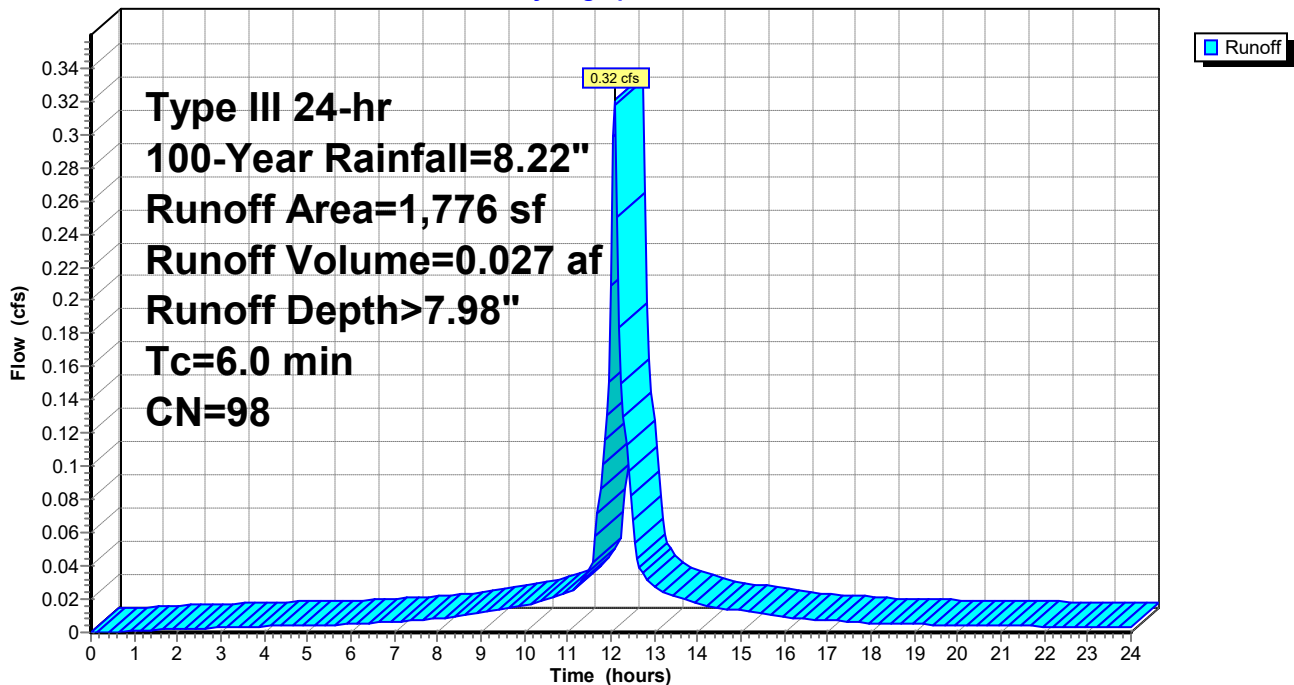
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-5: Roof

Hydrograph



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Summary for Subcatchment R-6: Roof

Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.038 af, Depth> 7.98"

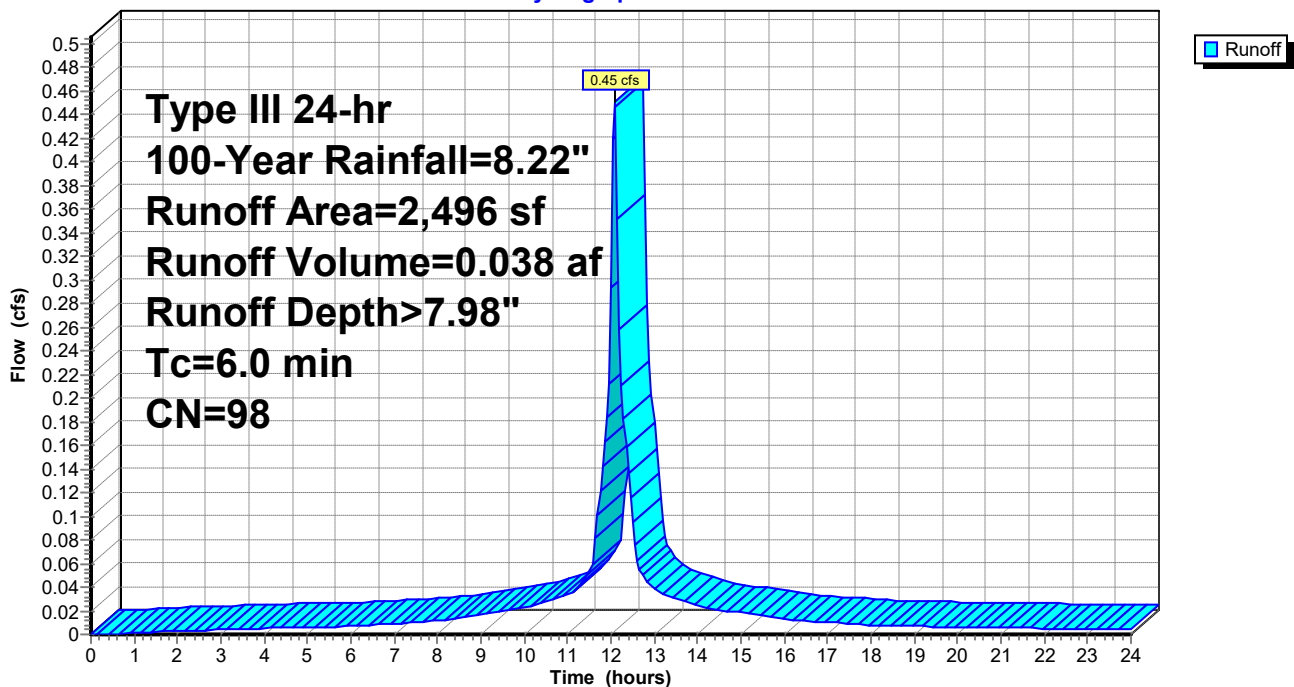
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-6: Roof

Hydrograph



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Summary for Subcatchment R-7: Roof

Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.038 af, Depth> 7.98"

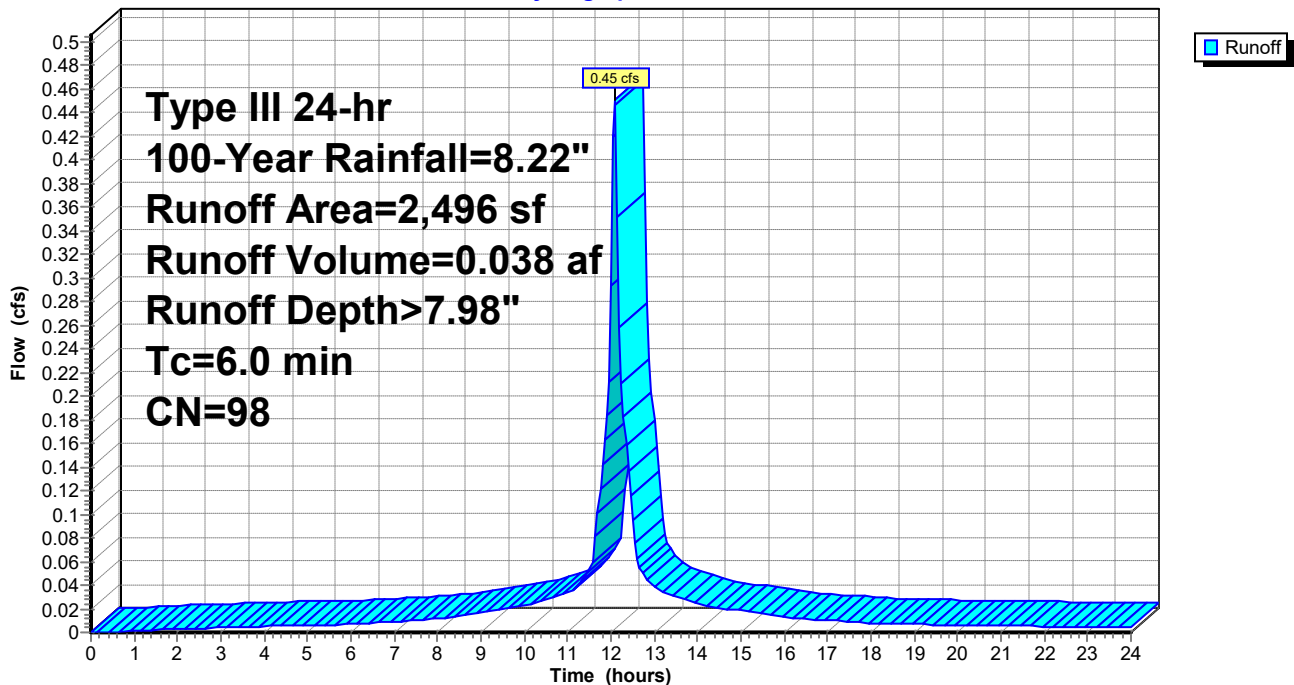
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 2,496	98	Roof
2,496		100.00% Impervious Area

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

Subcatchment R-7: Roof

Hydrograph



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Summary for Subcatchment R-8: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

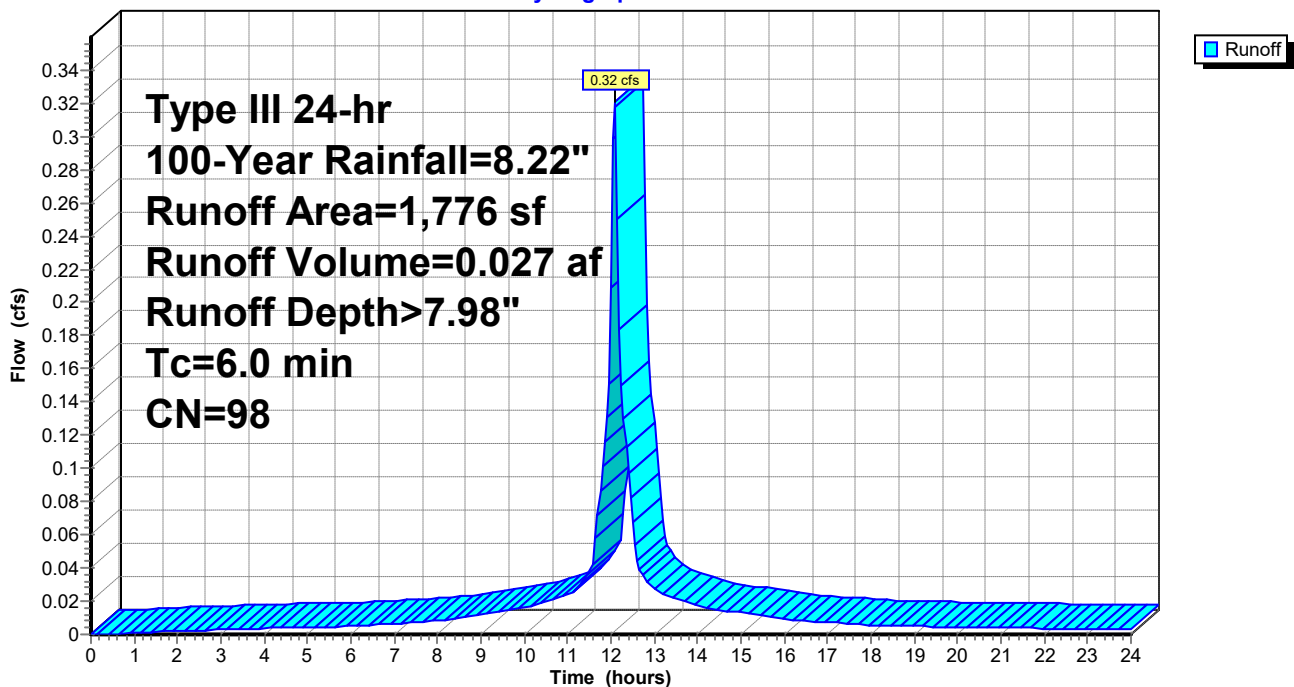
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
* 1,776	98	Roof
1,776		100.00% Impervious Area

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

Subcatchment R-8: Roof

Hydrograph



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Summary for Subcatchment R-9: Roof

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 7.98"

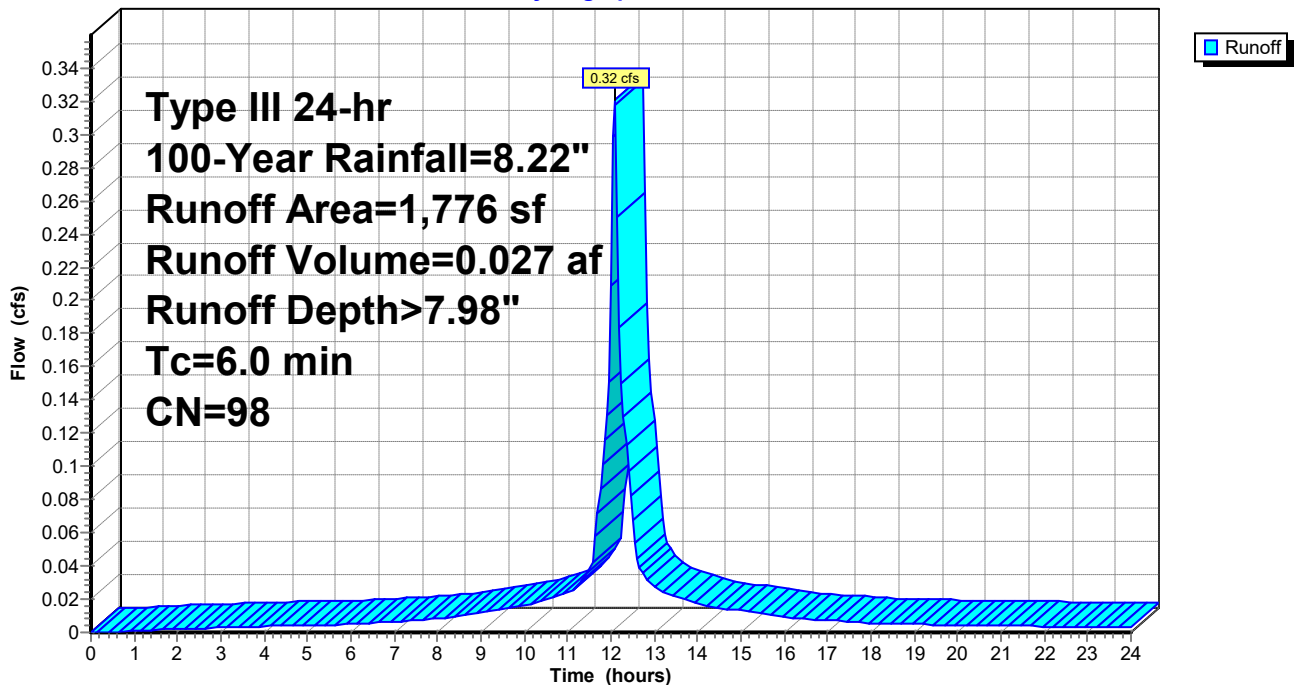
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.22"

	Area (sf)	CN	Description
*	1,776	98	Roof
	1,776		100.00% Impervious Area

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

Subcatchment R-9: Roof

Hydrograph



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Summary for Reach 1R: Swale

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 58.68 cfs

3.00' x 1.00' deep channel, n= 0.030

Side Slope Z-value= 3.0 '/' Top Width= 9.00'

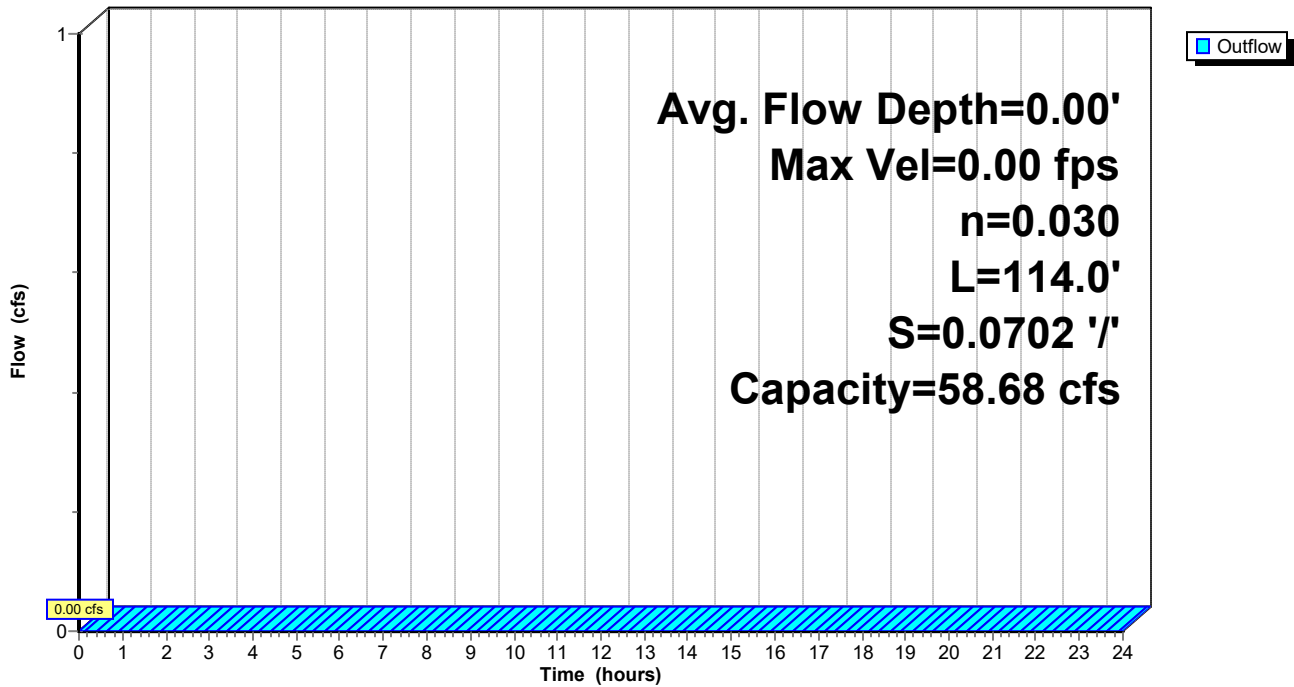
Length= 114.0' Slope= 0.0702 '/'

Inlet Invert= 261.00', Outlet Invert= 253.00'



Reach 1R: Swale

Hydrograph



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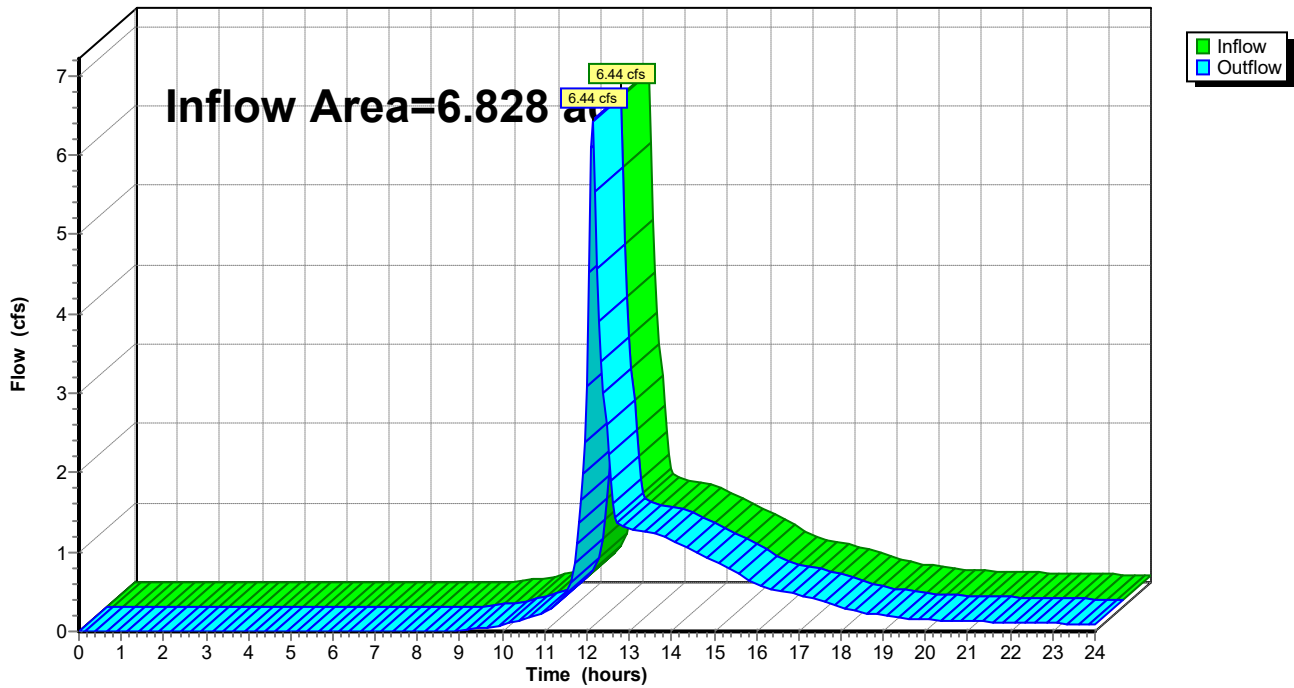
Summary for Reach DP-1: Design Point

Inflow Area = 6.828 ac, 20.91% Impervious, Inflow Depth > 1.26" for 100-Year event
Inflow = 6.44 cfs @ 12.14 hrs, Volume= 0.717 af
Outflow = 6.44 cfs @ 12.14 hrs, Volume= 0.717 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Design Point

Hydrograph



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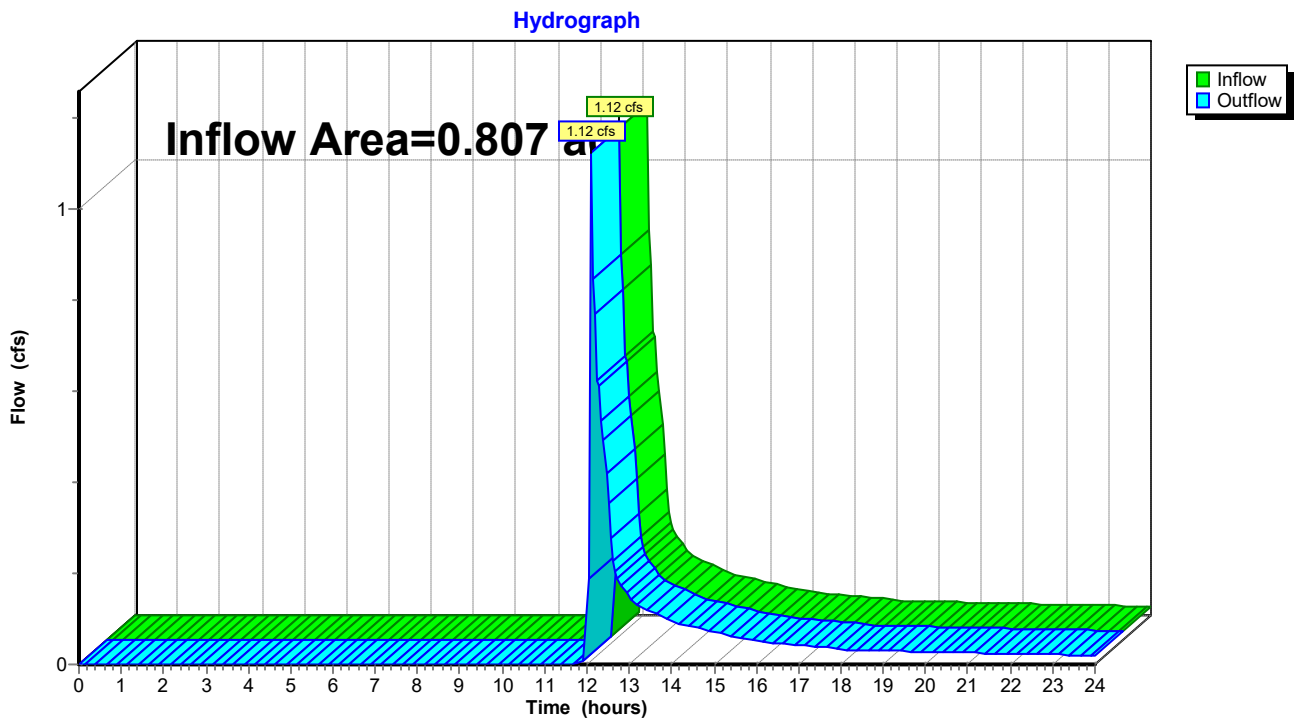
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Summary for Reach DP-2: Design Point

Inflow Area = 0.807 ac, 10.10% Impervious, Inflow Depth > 1.09" for 100-Year event
Inflow = 1.12 cfs @ 12.11 hrs, Volume= 0.074 af
Outflow = 1.12 cfs @ 12.11 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-2: Design Point



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Summary for Pond 1P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
 Outflow = 0.19 cfs @ 12.22 hrs, Volume= 0.027 af, Atten= 42%, Lag= 7.7 min
 Discarded = 0.04 cfs @ 12.15 hrs, Volume= 0.025 af
 Primary = 0.15 cfs @ 12.22 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 236.18' @ 12.20 hrs Surf.Area= 190 sf Storage= 266 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 39.8 min (780.3 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	230.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	230.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	232.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.04	1	0	0
237.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	236.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.15 hrs HW=232.25' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.13 cfs @ 12.22 hrs HW=236.17' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.13 cfs @ 1.42 fps)

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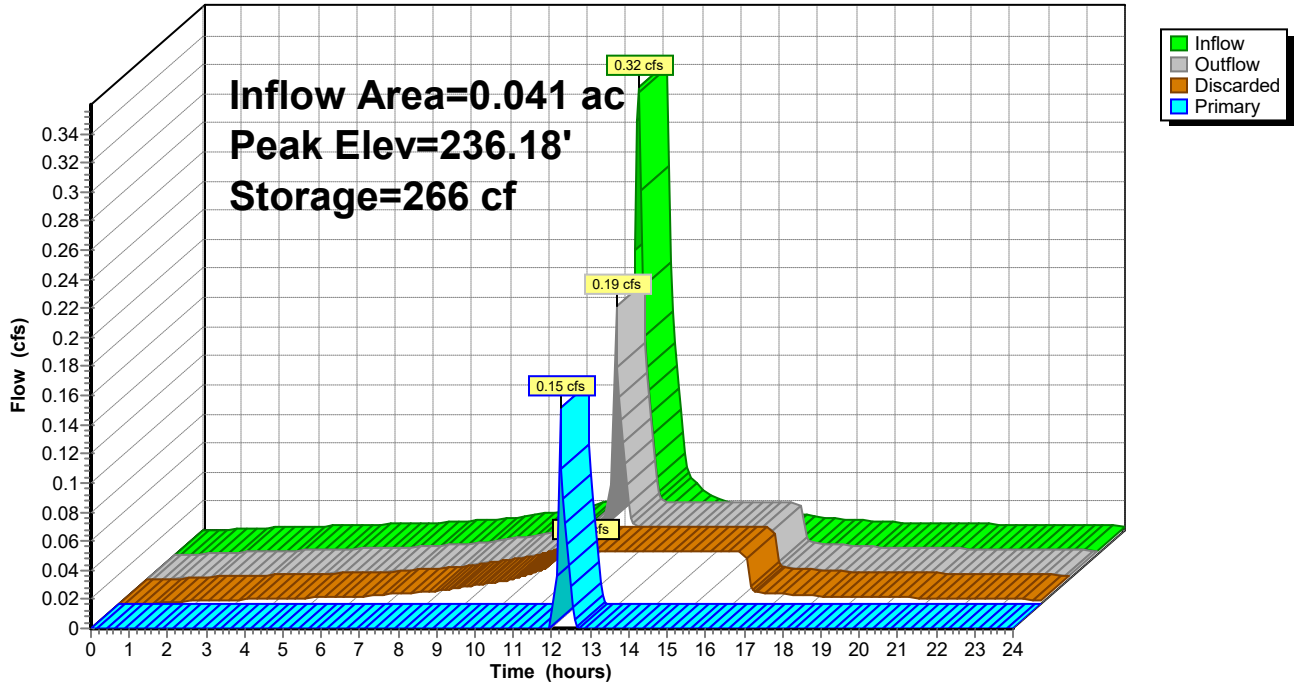
Type III 24-hr 100-Year Rainfall=8.22"

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Pond 1P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.22"

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Summary for Pond 2P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
 Outflow = 0.19 cfs @ 12.22 hrs, Volume= 0.027 af, Atten= 42%, Lag= 7.7 min
 Discarded = 0.04 cfs @ 12.15 hrs, Volume= 0.025 af
 Primary = 0.15 cfs @ 12.22 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 239.18' @ 12.20 hrs Surf.Area= 190 sf Storage= 266 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 39.8 min (780.3 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	233.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	233.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	235.04'	5 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		267 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.04	1	0	0
240.00	1	5	5

Device	Routing	Invert	Outlet Devices
#1	Discarded	233.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	239.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.15 hrs HW=235.25' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.13 cfs @ 12.22 hrs HW=239.17' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.13 cfs @ 1.42 fps)

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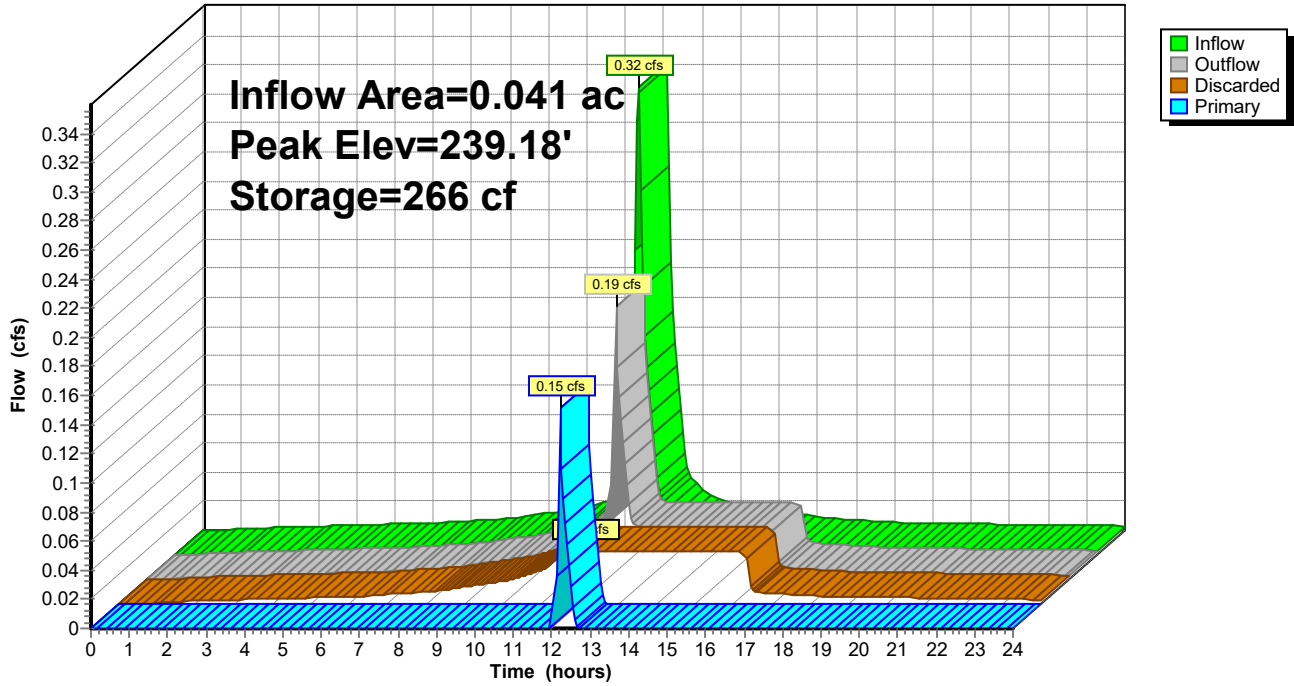
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Pond 2P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 3P: 3 x 1 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
 Outflow = 0.19 cfs @ 12.22 hrs, Volume= 0.027 af, Atten= 40%, Lag= 7.8 min
 Discarded = 0.04 cfs @ 12.15 hrs, Volume= 0.025 af
 Primary = 0.16 cfs @ 12.22 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 242.19' @ 12.20 hrs Surf.Area= 190 sf Storage= 265 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 39.3 min (779.7 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	237.00'	145 cf	14.50'W x 13.00'L x 2.54'H Field A 479 cf Overall - 117 cf Embedded = 363 cf x 40.0% Voids
#2A	237.50'	117 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 4 rows
#3	239.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		266 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
239.04	1	0	0
243.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	242.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.15 hrs HW=239.24' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.14 cfs @ 12.22 hrs HW=242.18' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.14 cfs @ 1.44 fps)

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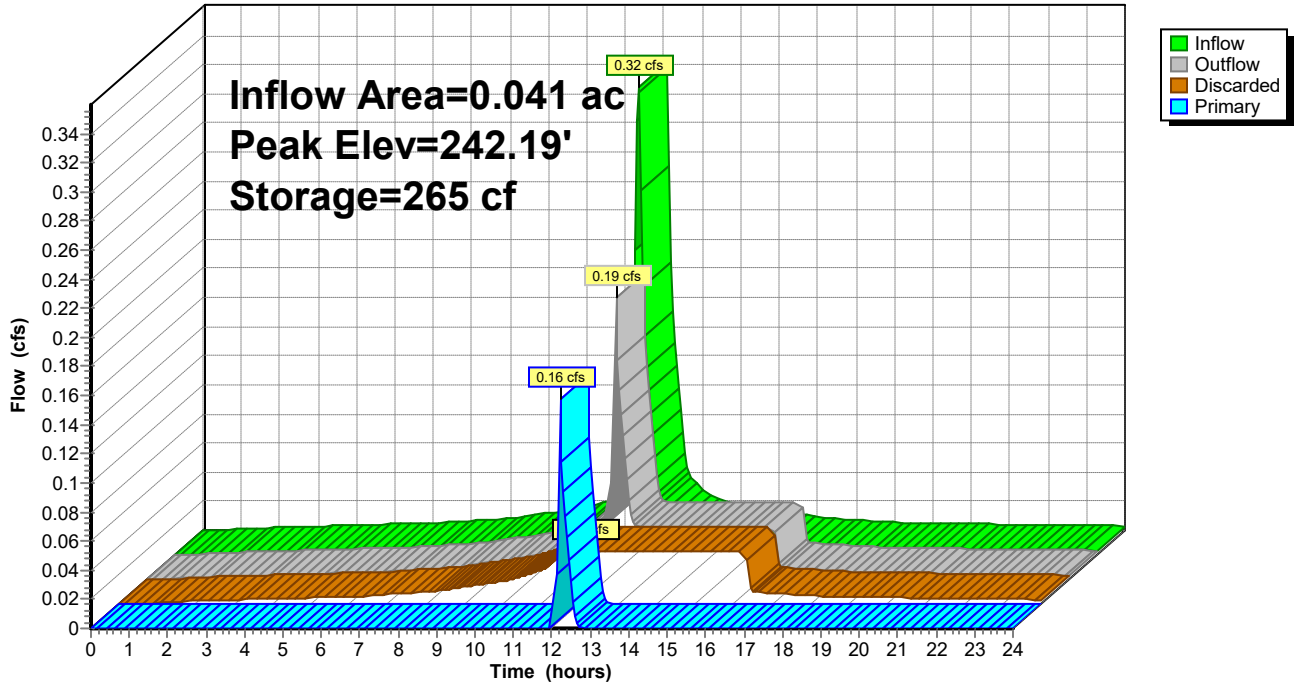
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Pond 3P: 3 x 1 Cultec R-150XLHD

Hydrograph



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Summary for Pond 4P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
 Outflow = 0.37 cfs @ 12.11 hrs, Volume= 0.025 af, Atten= 0%, Lag= 1.5 min
 Discarded = 0.01 cfs @ 12.05 hrs, Volume= 0.018 af
 Primary = 0.36 cfs @ 12.11 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.34' @ 12.10 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 141.4 min calculated for 0.025 af (93% of inflow)
 Center-of-Mass det. time= 100.9 min (841.4 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.05 hrs HW=223.38' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.33 cfs @ 12.11 hrs HW=226.31' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.33 cfs @ 1.91 fps)

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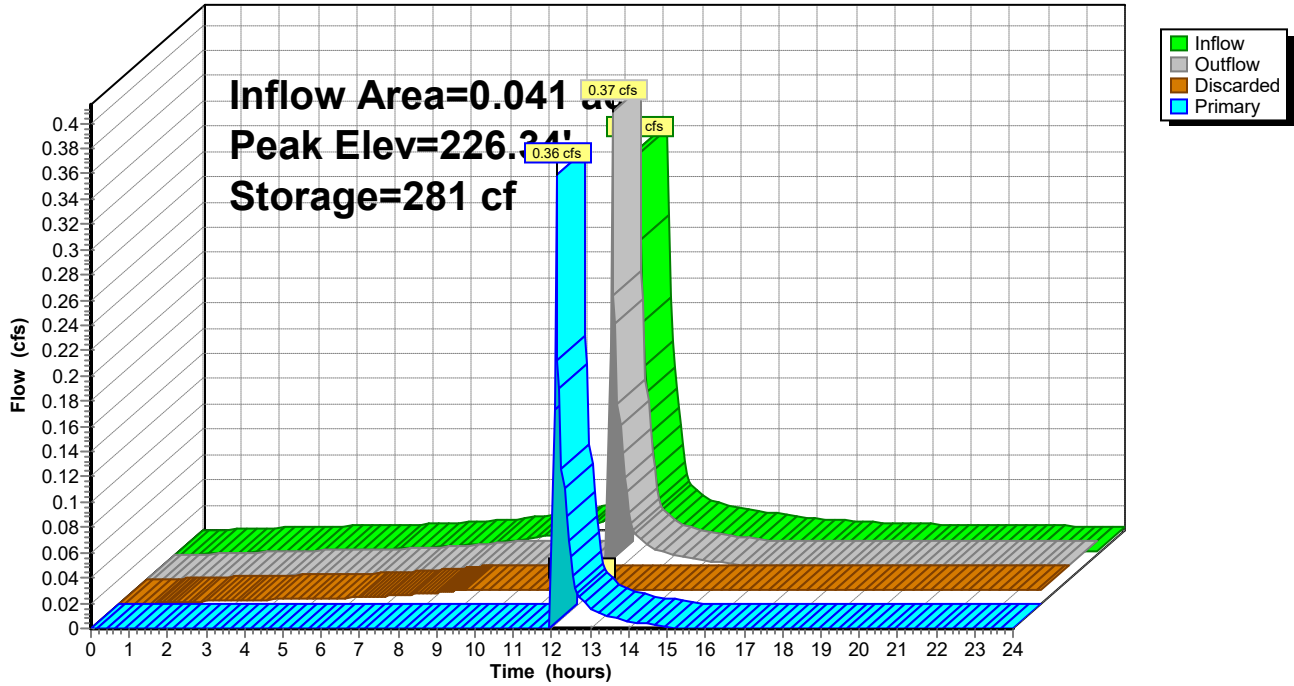
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Pond 4P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 5P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
 Outflow = 0.37 cfs @ 12.11 hrs, Volume= 0.025 af, Atten= 0%, Lag= 1.5 min
 Discarded = 0.01 cfs @ 12.05 hrs, Volume= 0.018 af
 Primary = 0.36 cfs @ 12.11 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 226.34' @ 12.10 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 141.4 min calculated for 0.025 af (93% of inflow)
 Center-of-Mass det. time= 100.9 min (841.4 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	221.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	221.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	223.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
223.04	1	0	0
227.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	221.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	226.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.05 hrs HW=223.38' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.33 cfs @ 12.11 hrs HW=226.31' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.33 cfs @ 1.91 fps)

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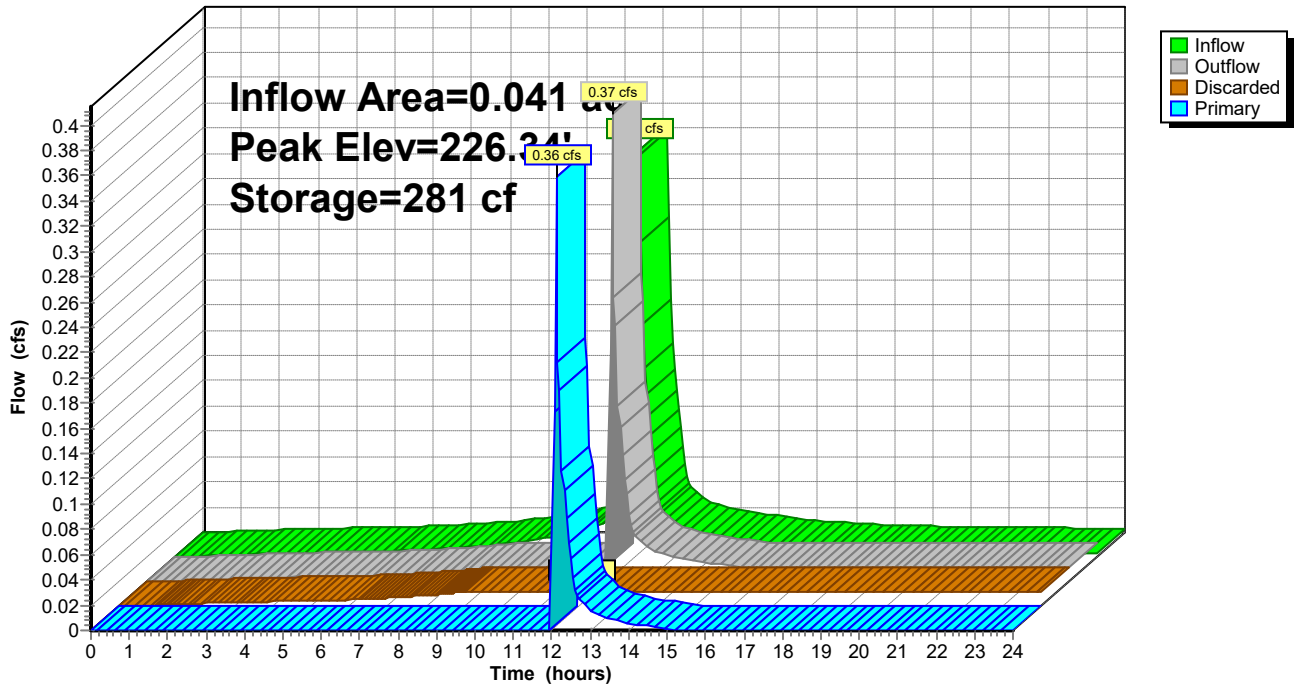
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Pond 5P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 6P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.45 cfs @ 12.09 hrs, Volume= 0.038 af
 Outflow = 0.28 cfs @ 12.21 hrs, Volume= 0.035 af, Atten= 37%, Lag= 7.7 min
 Discarded = 0.02 cfs @ 12.15 hrs, Volume= 0.029 af
 Primary = 0.26 cfs @ 12.21 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 229.26' @ 12.20 hrs Surf.Area= 351 sf Storage= 492 cf

Plug-Flow detention time= 171.7 min calculated for 0.035 af (92% of inflow)
 Center-of-Mass det. time= 129.8 min (870.3 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	224.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	224.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	226.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
226.04	1	0	0
230.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	229.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.15 hrs HW=226.49' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.23 cfs @ 12.21 hrs HW=229.24' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.23 cfs @ 1.68 fps)

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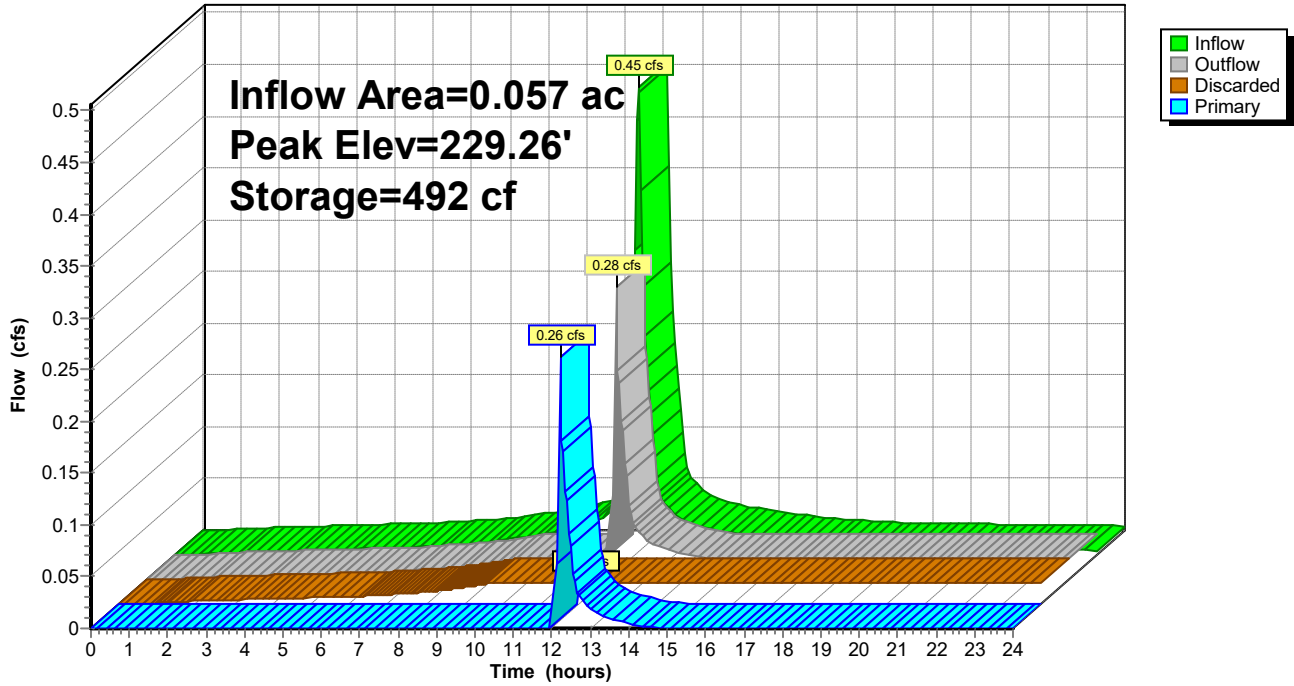
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Pond 6P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 7P: 2 x 4 Cultec R-150XLHD

Inflow Area = 0.057 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.45 cfs @ 12.09 hrs, Volume= 0.038 af
 Outflow = 0.32 cfs @ 12.21 hrs, Volume= 0.035 af, Atten= 30%, Lag= 7.3 min
 Discarded = 0.02 cfs @ 12.20 hrs, Volume= 0.029 af
 Primary = 0.30 cfs @ 12.21 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 211.29' @ 12.20 hrs Surf.Area= 351 sf Storage= 492 cf

Plug-Flow detention time= 171.3 min calculated for 0.035 af (92% of inflow)
 Center-of-Mass det. time= 129.9 min (870.3 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.00'	267 cf	8.00'W x 43.75'L x 2.54'H Field A 890 cf Overall - 221 cf Embedded = 668 cf x 40.0% Voids
#2A	205.50'	221 cf	Cultec R-150XLHD x 8 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
#3	208.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.04	1	0	0
212.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	211.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.20 hrs HW=211.29' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.27 cfs @ 12.21 hrs HW=211.27' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.27 cfs @ 1.77 fps)

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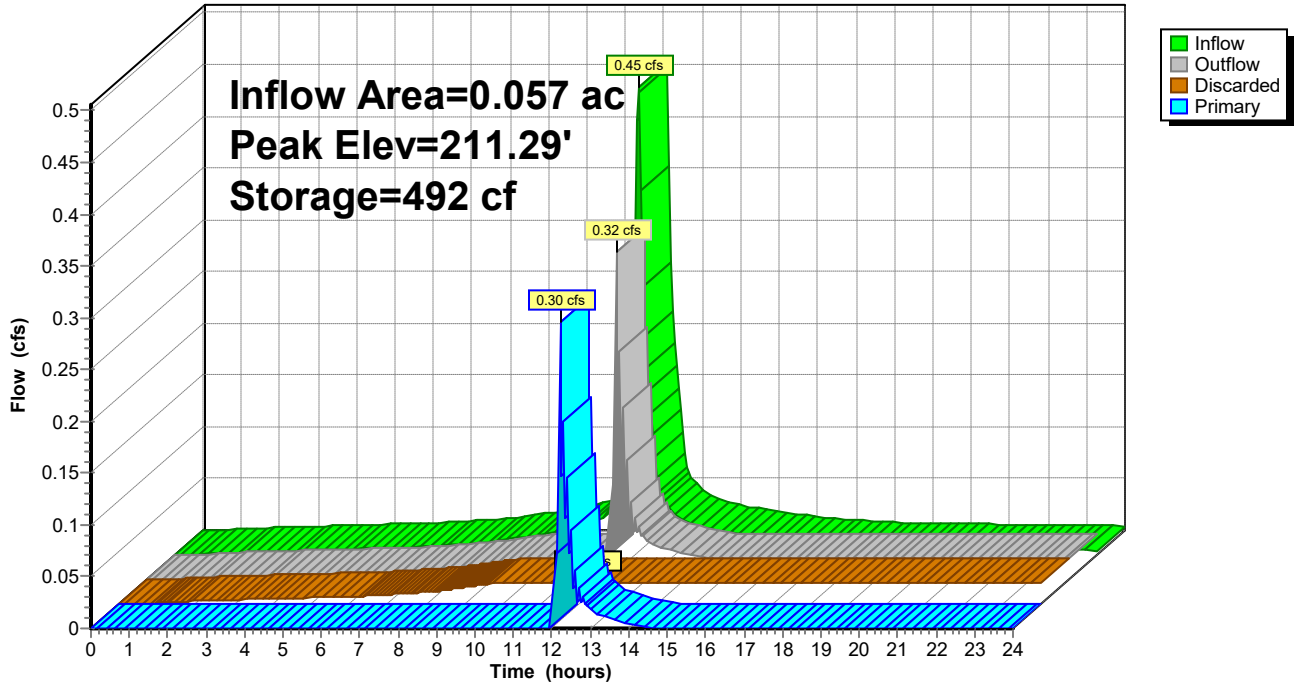
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Pond 7P: 2 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 8P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
 Outflow = 0.37 cfs @ 12.11 hrs, Volume= 0.025 af, Atten= 0%, Lag= 1.5 min
 Discarded = 0.01 cfs @ 12.05 hrs, Volume= 0.018 af
 Primary = 0.36 cfs @ 12.11 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
 Peak Elev= 198.34' @ 12.10 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 141.4 min calculated for 0.025 af (93% of inflow)
 Center-of-Mass det. time= 100.9 min (841.4 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.00'	167 cf	4.75"W x 43.75"L x 2.54"H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	193.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	195.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.04	1	0	0
199.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	193.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	198.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.05 hrs HW=195.38' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.33 cfs @ 12.11 hrs HW=198.31' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.33 cfs @ 1.91 fps)

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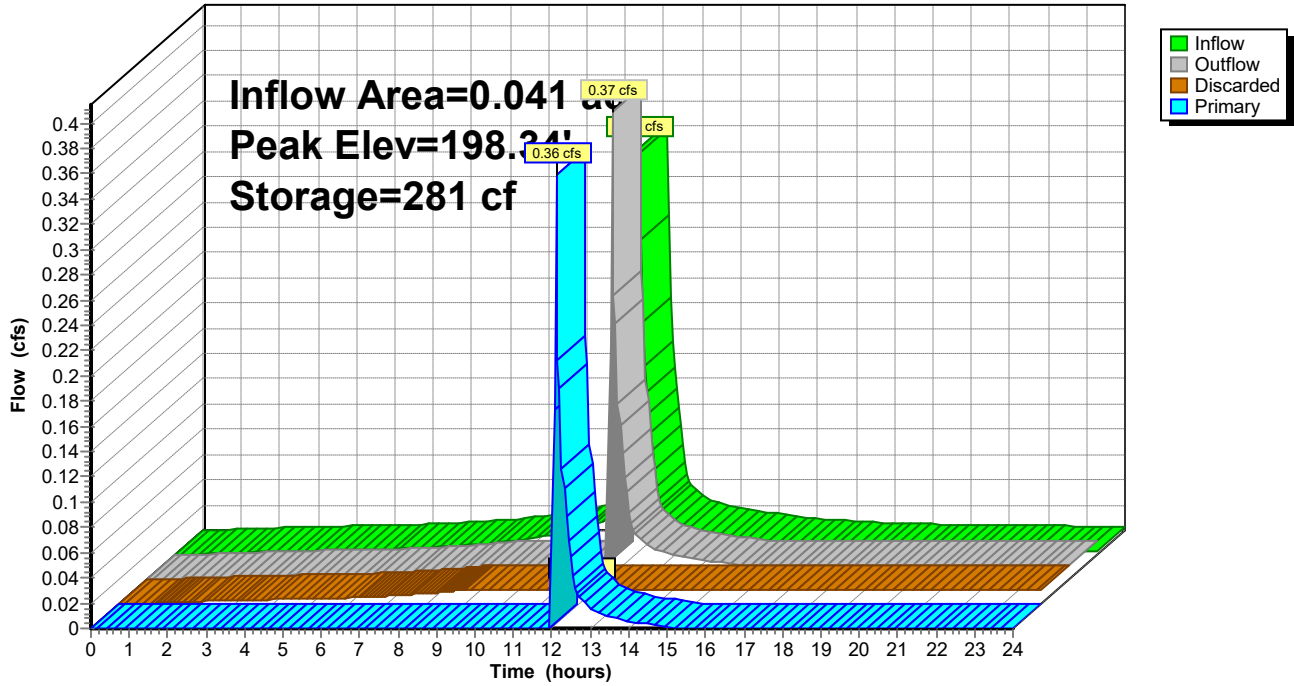
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Pond 8P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 9P: 1 x 4 Cultec R-150XLHD

Inflow Area = 0.041 ac, 100.00% Impervious, Inflow Depth > 7.98" for 100-Year event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af
Outflow = 0.37 cfs @ 12.11 hrs, Volume= 0.025 af, Atten= 0%, Lag= 1.5 min
Discarded = 0.01 cfs @ 12.05 hrs, Volume= 0.018 af
Primary = 0.36 cfs @ 12.11 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 5
Peak Elev= 202.34' @ 12.10 hrs Surf.Area= 209 sf Storage= 281 cf

Plug-Flow detention time= 141.4 min calculated for 0.025 af (93% of inflow)
Center-of-Mass det. time= 100.9 min (841.4 - 740.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	197.00'	167 cf	4.75'W x 43.75'L x 2.54'H Field A 528 cf Overall - 111 cf Embedded = 418 cf x 40.0% Voids
#2A	197.50'	111 cf	Cultec R-150XLHD x 4 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
#3	199.04'	4 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
199.04	1	0	0
203.00	1	4	4

Device	Routing	Invert	Outlet Devices
#1	Discarded	197.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	202.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.05 hrs HW=199.38' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.33 cfs @ 12.11 hrs HW=202.31' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.33 cfs @ 1.91 fps)

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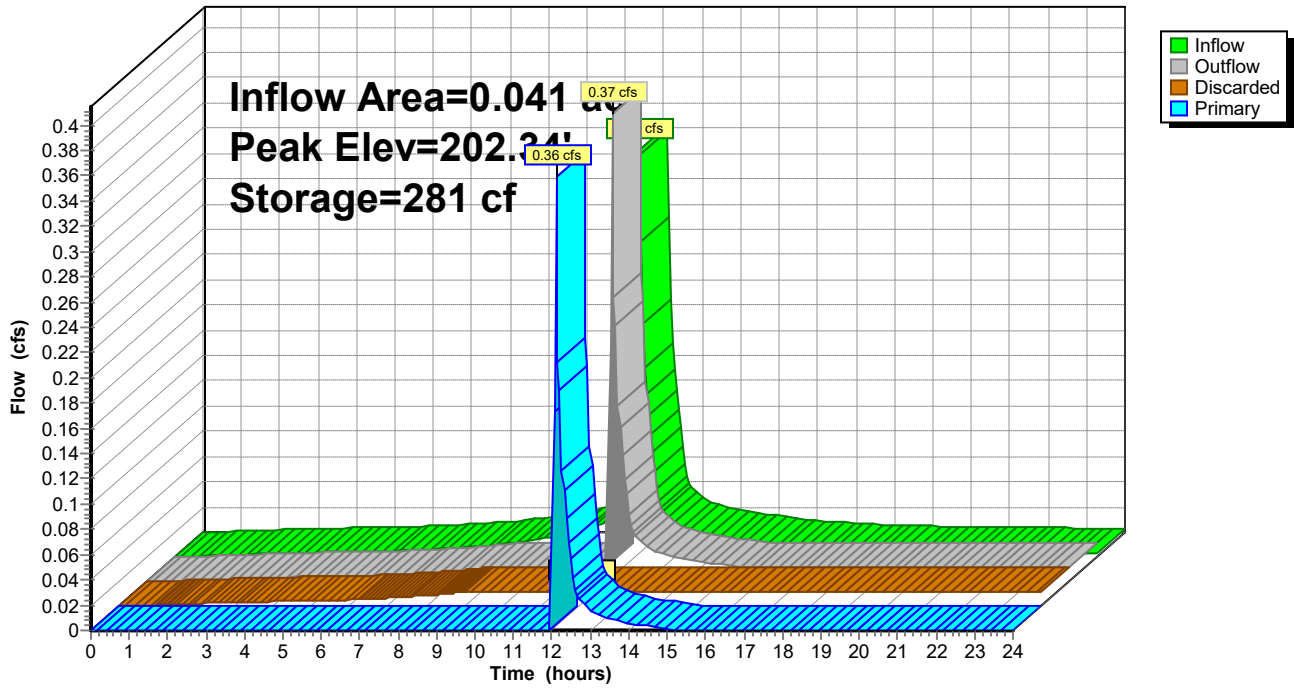
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Pond 9P: 1 x 4 Cultec R-150XLHD

Hydrograph



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Summary for Pond 10P: Basin

Inflow Area = 3.434 ac, 22.85% Impervious, Inflow Depth > 3.61" for 100-Year event
 Inflow = 14.03 cfs @ 12.11 hrs, Volume= 1.034 af
 Outflow = 1.10 cfs @ 13.77 hrs, Volume= 0.616 af, Atten= 92%, Lag= 99.6 min
 Discarded = 0.45 cfs @ 13.77 hrs, Volume= 0.435 af
 Primary = 0.66 cfs @ 13.77 hrs, Volume= 0.181 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 215.09' @ 13.77 hrs Surf.Area= 8,009 sf Storage= 24,285 cf

Plug-Flow detention time= 277.2 min calculated for 0.616 af (60% of inflow)
 Center-of-Mass det. time= 166.5 min (1,002.6 - 836.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	209.40'	24,363 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
209.40	1,431	238.0	0	0	1,431	
210.00	1,887	254.0	992	992	2,075	
211.00	2,716	282.0	2,289	3,281	3,299	
212.00	3,629	309.0	3,161	6,443	4,602	
213.00	5,010	426.0	4,301	10,744	11,455	
214.00	6,399	472.0	5,690	16,434	14,773	
215.00	7,894	422.0	7,133	23,567	18,358	
215.10	8,022	423.0	796	24,363	18,438	

Device	Routing	Invert	Outlet Devices						
#1	Primary	215.30'	10.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63						
#2	Discarded	209.40'	2.410 in/hr Exfiltration over Horizontal area						
#3	Device 4	214.60'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads						
#4	Primary	211.00'	12.0" Round Culvert L= 113.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.00' / 209.00' S= 0.0177 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf						

Discarded OutFlow Max=0.45 cfs @ 13.77 hrs HW=215.09' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.45 cfs)

Primary OutFlow Max=0.66 cfs @ 13.77 hrs HW=215.09' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↑ **4=Culvert** (Passes 0.66 cfs of 5.66 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.66 cfs @ 2.38 fps)

Post Dev Hydrocad Report

Prepared by MP Design Consultants

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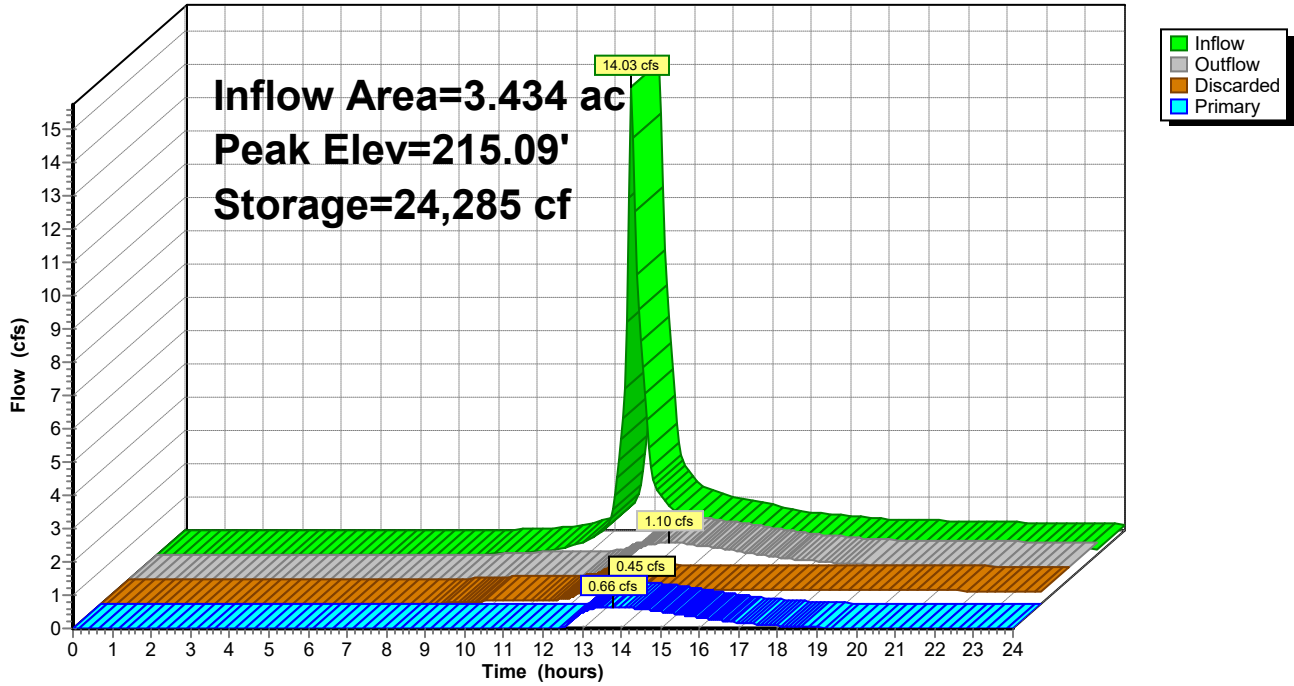
Type III 24-hr 100-Year Rainfall=8.22"

Printed 1/22/2026

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Pond 10P: Basin

Hydrograph



Post Dev Hydrocad Report

Type III 24-hr 100-Year Rainfall=8.22"

Prepared by MP Design Consultants

Printed 1/22/2026

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Summary for Pond 11P: 4x4x8 Galleys

Inflow Area = 1.852 ac, 28.92% Impervious, Inflow Depth > 2.52" for 100-Year event
 Inflow = 4.56 cfs @ 12.19 hrs, Volume= 0.389 af
 Outflow = 0.18 cfs @ 17.24 hrs, Volume= 0.138 af, Atten= 96%, Lag= 302.5 min
 Discarded = 0.12 cfs @ 11.60 hrs, Volume= 0.125 af
 Primary = 0.06 cfs @ 17.24 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 195.33' @ 17.24 hrs Surf.Area= 2,129 sf Storage= 11,369 cf

Plug-Flow detention time= 333.7 min calculated for 0.137 af (35% of inflow)
 Center-of-Mass det. time= 199.3 min (1,062.3 - 863.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.70'	2,307 cf	33.80'W x 63.00'L x 8.50'H Field A 18,100 cf Overall - 12,333 cf Embedded = 5,767 cf x 40.0% Voids
#2A	188.20'	9,846 cf	Concrete Galley 4x4x8 x 105 Inside #1 Inside= 42.0"W x 91.0"H => 26.79 sf x 3.50'L = 93.8 cf Outside= 52.8"W x 96.0"H => 29.36 sf x 4.00'L = 117.5 cf 105 Chambers in 7 Rows
		12,153 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	187.70'	2.410 in/hr Exfiltration over Horizontal area
#2	Primary	195.20'	12.0" Round Culvert L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 195.20' / 195.10' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.12 cfs @ 11.60 hrs HW=187.79' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.06 cfs @ 17.24 hrs HW=195.33' (Free Discharge)

↑2=Culvert (Inlet Controls 0.06 cfs @ 0.98 fps)

Post Dev Hydrocad Report

Prepared by MP Design Consultants

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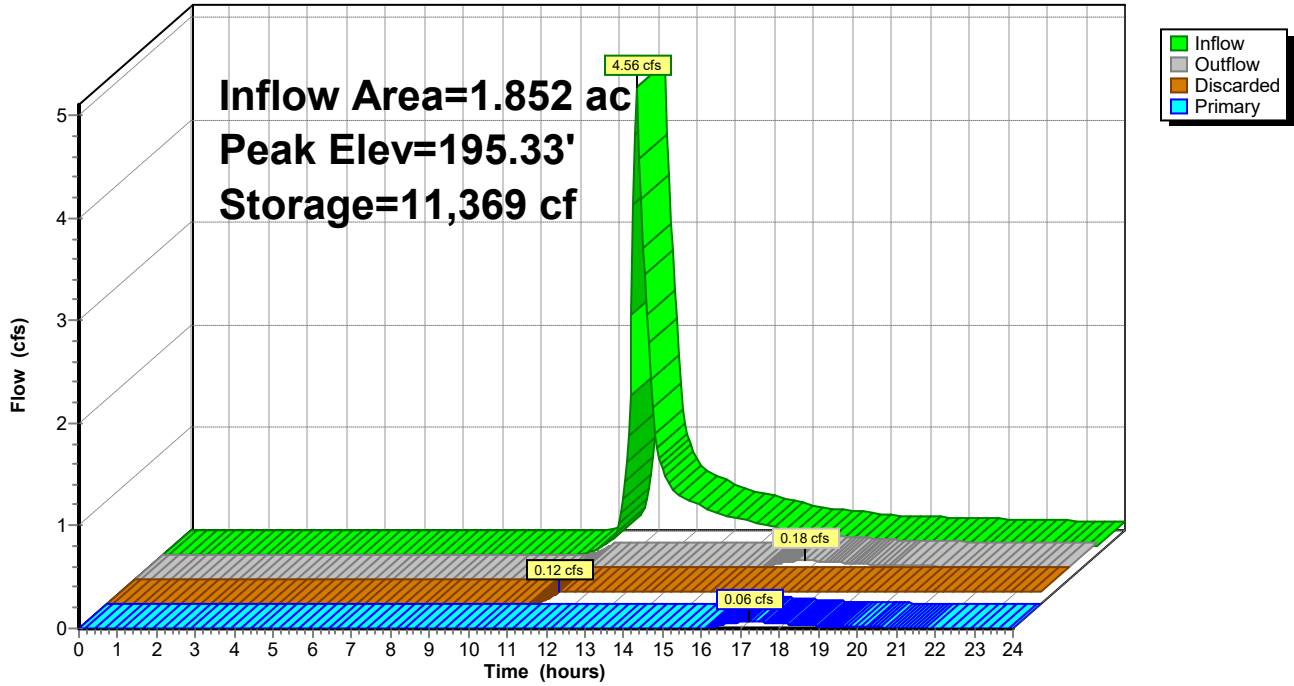
Type III 24-hr 100-Year Rainfall=8.22"

Printed 1/22/2026

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Pond 11P: 4x4x8 Galleys

Hydrograph



Post Dev Hydrocad Report

Type III 24-hr 100-Year Rainfall=8.22"

Prepared by MP Design Consultants

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Summary for Pond 20P: Basin Forebay

Volume	Invert	Avail.Storage	Storage Description			
#1	213.00'	488 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
213.00	385	89.0	0	0	385	
214.00	598	113.0	488	488	784	

APPENDIX F

Pipe Hydraulics Calculations

MP DESIGN CONSULTANTS

PIPE HYDRAULICS

DESIGN STORM: 25 Yr.

LOCATION		AREA (Acre)		C	CxK	FLOW TIME		RAINFALL INTENSITY (i)	FLOW ACTUAL	DESIGN										STATEMENT
STREET OR PROPERTY	FROM	TO	INCREMENTAL (A)	TOTAL (A)			TO INLET (Min)	IN PIPE T= (L/V _f)/60 (Min)	Q _{act} =C _x K _i	PIPE SIZE (Inches)	PIPE TYPE	PIPE LENGTH (Ft)	PIPE SLOPE (Ft/Ft)	n	VEL _{FULL} V _f =(1.486Q _f ^{0.58}) ^{1.48}	FLOW _{FULL} Q _f =V _f A	VEL _{ACTUAL} V _f =(Q _f /A) ^{0.58}			
OVERLAND	DI-1	DMH-3	0.88		0.33	0.27	5.0	0.7	6.4	1.7	12	HDPE	190	0.006	0.011	4.2	3.3	4.2	FREEFLOW	
OVERLAND	DI-2	DMH-3	0.27		0.34	0.09	5.0	0.0	6.4	0.6	12	HDPE	10	0.020	0.011	6.0	6.0	4.5	FREEFLOW	
PAVEMENT	DMH-3	EX.CB		1.05	0.36		5.0	0.1	6.4	2.3	35	HDPE	35	0.011	0.011	4.4	4.4	5.7	FREEFLOW	
PAVEMENT	CB-4	DMH-9	0.09		0.77	0.07	5.0	1.5	6.4	0.4	12	HDPE	280	0.008	0.011	3.8	3.8	3.0	FREEFLOW	
PAVEMENT	CB-5	DMH-9	1.46		0.48	0.71	5.0	0.0	6.4	4.5	18	HDPE	5	0.010	0.011	12.4	12.4	6.4	FREEFLOW	
OVERLAND	DI-6	DMH-7	1.17		0.33	0.39	5.0	0.1	6.4	2.5	12	HDPE	72	0.042	0.011	8.7	8.7	9.2	FREEFLOW	
OVERLAND	DMH-7	DMH-8		1.17	0.39		5.0	0.2	6.4	2.5	12	HDPE	76	0.020	0.011	6.0	6.0	7.2	FREEFLOW	
PAVEMENT	DMH-8	DMH-9		1.17	0.39		5.0	0.6	6.4	2.5	12	HDPE	260	0.017	0.011	5.5	5.5	6.8	FREEFLOW	
OVERLAND	DMH-9	DMH-10		2.72	1.17	1.17	5.0	0.1	6.4	7.5	18	HDPE	71	0.020	0.011	17.6	17.6	9.6	FREEFLOW	
OVERLAND	DMH-10	FE-11		2.72	1.17	1.17	5.0	0.1	6.4	7.5	18	HDPE	40	0.013	0.011	14.2	14.2	8.2	FREEFLOW	
OVERLAND	OCS-12	DMH-13					5.0		6.4		12	HDPE	191		0.053	9.7		FREEFLOW		
PAVEMENT	DMH-13	DMH-17					5.0		6.4		12	HDPE	145		0.023	6.4		FREEFLOW		
PAVEMENT	CB-14	DMH-15	0.47		0.47	0.22	5.0	0.4	6.4	1.4	12	HDPE	100	0.005	0.011	3.0	3.0	3.7	FREEFLOW	
PAVEMENT	CB-15	DMH-16	1.27		0.44	0.56	5.0	0.1	6.4	3.6	18	HDPE	30	0.017	0.011	16.2	16.2	7.2	FREEFLOW	
PAVEMENT	DMH-16	RECH		1.74	0.78		5.0	0.1	6.4	5.0	18	HDPE	20	0.010	0.011	12.4	12.4	6.6	FREEFLOW	
PAVEMENT	DMH-17	DMH-17					5.0				12	HDPE	10	0.010	0.011	5.4	4.2		FREEFLOW	
PAVEMENT	DMH-17	DMH-18					5.0				12	HDPE	172	0.014	0.011	6.4	5.0		FREEFLOW	

PROJECT _____
 LOCATION _____
 JOB NO. _____
 FILE NO. _____

CALC BY _____
 DATE _____
 CHKD BY _____
 DATE _____

APPENDIX G

Cut and Fill Calculations & Riprap sizing calculations

Upland Road Ashland
Cut & Fill Calculations

Elevation	cut area (sq.ft.)	cut volume (cu.ft.)
185	0	-800
190	-320	-4602.5
195	-1521	-6607.5
200	-1122	-3092.5
205	-115	17627.5
210	7166	31770
215	5542	-15075
220	-11572	-12440
225	-18084	-37392.5
230	-20690	-47255
235	-1733	-2400
240	7394	19917.5
245	6596	16490
250	3127	7817.5
255	1788	4470
260	773	1932.5
265	573	1432.5
270	0	0

Assumed 2 ft top/sub removal for paved areas

Assumed 8 ft foundation

-28207.5 cu.ft.

-1045 cu.yd

3000 cu.yd

5200 cu.yd.

7155 cu.yd

Top/subsoil

Foundation

Net Cut Area

Riprap Apron Sizing

FE 11 TO FOREBAY

$$L = 4 * D = 4 * 1.5 = 6.0 \text{ ft}$$

$$\text{Depth} = 3.3 * D_{50} = 3.3 * 6 = 19.8 \text{ in} = 1.65 \text{ ft}$$

$$W1 = 3 * D = 3 * 1.5 \text{ ft} = 4.5 \text{ ft}$$

$$W2 = (3 * D) + (2/3)L = (3 * 1.5 \text{ ft}) + (2/3) * 6.0 \text{ ft} = 8.5 \text{ ft}$$

$$D_{50} = 0.2D(q/(g^{1/2} * D^{2.5})(D/TW)) = (0.2 * 1.5 \text{ ft}) * (9.6 \text{ cfs} / (32.2 \text{ ft/s}^2)^{1/2} * 1.5^{2.5}) * (1.5 \text{ ft} / 0.60 \text{ ft})$$
$$= 0.3 * 0.614 * 2.5 = 0.461 \text{ ft} = 5.5 \text{ in} = \text{Riprap Class 2}$$

APPENDIX H

Recharge Calculations

**Upland Rd
 Ashland, MA**

Minimum Required Recharge Volume

NRCS Hydrologic Soil Type	Approx. Soil Texture	Target Depth Factor (inches)	Impervious Area (acres)	Required Recharge	
				(ac-ft)	(cf)
A	sand	0.60	1.20	0.060	2,614
B	loam	0.35	0.00	0.000	0
C	silty loam	0.25	0.14	0.003	127
D	clay	0.10	0.00	0.000	0
Totals =			1.34	0.063	2,741

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Recharge Chambers	Static Storage Volume (cf)
1	262
2	262
3	262
4	278
5	278
6	488
7	488
8	278
9	278
10	20,534
11	11,168
	34,576

Rawls Rates

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate (inches/hour)
sand	A	8.27
loamy sand	A	2.41
sandy loam	B	1.02
loam	B	0.52
silt loam	C	0.27
sandy clay loam	C	0.17
clay loam	D	0.09
silty clay loam	D	0.06
sandy clay	D	0.05
silty clay	D	0.04
clay	D	0.02

Refer to Massachusetts Stormwater Handbook Volume 3, Chapter 1, page 22 dated February 2008.

APPENDIX I

Drawdown Calculations

Upland Rd Ashland, MA						
Drawdown Time Calculations Summary						
Description	Storage Volume (Cubic Feet)	NRCS Hydraulic Soil Group (HSG)	K (Inches/Hour)	Bottom Area (Square Feet)	Drawdown Time (Hours)	Outlet Invert Elevation
BMP #1- Recharge Chambers	262	A - Sand	8.27	189	2.0	
BMP #2- Recharge Chambers	262	A - Sand	8.27	189	2.0	
BMP #3- Recharge Chambers	262	A - Sand	8.27	189	2.0	
BMP #4- Recharge Chambers	278	A - Loamy Sand	2.41	208	6.7	
BMP #5- Recharge Chambers	278	A - Loamy Sand	2.41	208	6.7	
BMP #6- Recharge Chambers	488	A - Loamy Sand	2.41	359	6.8	
BMP #7- Recharge Chambers	488	A - Loamy Sand	2.41	350	6.9	
BMP #8- Recharge Chambers	278	A - Loamy Sand	2.41	208	6.7	
BMP #9- Recharge Chambers	278	A - Loamy Sand	2.41	208	6.7	
BMP #10- Infiltration Basin	20,534	A - Loamy Sand	2.41	1,431	71.4	
BMP #11 - Concrete Galleys	11,168	A - Loamy Sand	2.41	2,129	26.1	

Notes:

1. Saturated hydraulic conductivity based on Rawls Rates Table.

Rawls Rates Table		
Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate (inches/hour)
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

$$\text{Time}_{\text{drawdown}} = \frac{Rv}{(K)(\text{Bottom Area})}$$

Where:

Time_{drawdown} = time it takes the basin to drain completely (hours)

Rv = storage volume (cubic feet)

K = saturated hydraulic conductivity (feet/hour)

Bottom Area = bottom area of recharge structure (square feet)

1. Refer to Massachusetts Stormwater Handbook Volume 3, Chapter 1, Page 22 dated February 2008.

APPENDIX J

Water Quality Calculations

**Upland Rd
 Ashland, MA**

BMP Forebay Volume and Water Quality Volume Calculations Summary

Description	BMP Type	Total Impervious Tributary Area (acres)	Pre-treatment Runoff Depth (inches)	Required Pre-treatment (cubic feet)	Provided Pre-treatment (cubic feet)	WQ Runoff Depth** (inches)	Required WQ Volume (cubic feet)	Provided WQ Volume (cubic feet)
10P	Infiltration Basin	0.52	0.10	189	488	0.5	944	20,534
11P	Concrete Galleys	0.37	-	-	-	0.5	672	11,168

Total

0.89

APPENDIX K

TSS Removal Calculations

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:

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Sediment Forebay	0.25	1.00	0.25	0.75
	Infiltration Basin	0.80	0.75	0.60	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15

Total TSS Removal =

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

Project:
 Prepared By:
 Date:

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

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:

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Subsurface Infiltration Structure	0.80	1.00	0.80	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20

Total TSS Removal =

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

Project:
 Prepared By:
 Date:

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

APPENDIX L

Long-Term Pollution Prevention Plan (LTPP) and Stormwater Operation & Maintenance Plan

LONG-TERM POLLUTION PREVENTION AND STORMWATER OPERATION & MAINTENANCE PLAN

Prepared For:

**Depietri Group LLC
Ballard and Highland Road
Ashland, MA 01721**

Prepared By:



**MP Design Consultants
118 Turnpike Road, Suite 200
Southborough, MA 01772**

Date:

January 27, 2026

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List of Appendices

Appendix A – Sample Inspection Form

Appendix B – Inspection & Maintenance Cultec Subsurface Infiltration System

1 Introduction

The Long-Term Pollution Prevention (LTPP) and Stormwater Operation and Maintenance (O&M) Plan, filed with the Town of Natick, shall be implemented at JBJ Construction Corporation development located at 24 Second Street to ensure long-term functioning of the stormwater management system (System), and to provide suitable practices for source control of pollutants.

The System has been designed in accordance with the ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act, which relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. Preventative maintenance of the System is essential in the protection of these interests.

1.1 Responsible Party

The Owner possesses the primary responsibility for overseeing and implementing the LTPP and Stormwater O&M Plan. When necessary, the Owner shall designate responsibility to a professional engineer or other technical professional with expertise and experience with stormwater management facilities for the proper operation and maintenance of the System. 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 LTPP and Stormwater O&M Plan.

Operator Name and Address:

Depietri Group
118 Turnpike Road
Southborough MA, 01772

1.2 Documentation

An Inspection and Maintenance Log and Schedule shall be kept by the Owner or designated responsible party summarizing inspections, maintenance, repairs and any corrective actions taken. At a minimum, the Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task.

1.3 References

The LTPP and Stormwater O&M Plan references the following documents:

Site Plans:

Plans titled "HIGHLAND RD AND BALLARD RD PROPOSED DEVELOPMENT PLANS" dated January 27, 2026 (or as amended), prepared by MP Design Consultants.

Stormwater Management Memo:

Report titled "Stormwater Management Memo" prepared for Depietri Group dated January 27, 2026 (or as amended), prepared by MP Design Consultants.

2 Operations and Maintenance Program

The Owner or designated responsible party shall conduct the Stormwater O&M Program set forth in this document, ensure that inspections and record keeping are timely and accurate, and that cleaning and maintenance are performed in accordance with the recommended frequency for each System component. The Owner or designated responsible party shall also maintain all System components to function as they were designed to. Estimated annual cost of the Maintenance Program is \$5,000.

Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. Inspection findings shall include items such as physical conditions of the System components, depth of sediment in structures, evidence of overtopping or debris blockage, and maintenance required for each System component. Refer to Appendix A, Inspection and Maintenance Log Form for a sample form.

2.1 Inspection and Maintenance Frequency

The following areas and System components shall be inspected by the Owner or designated responsible party and maintained as specified below. The inspection and maintenance frequencies described below may be adjusted based on results gathered during inspections. Any adjustments to the below-mentioned inspection and maintenance schedule shall be relayed to the proper authorities to ensure reporting requirements are met. Any deficiencies to the following areas and systems shall be corrected upon discovery.

2.1.1 Yard Cleanout

Yard Cleanouts shall be inspected on an annual basis and cleaned or maintained as necessary. Inspections shall include ensuring the cleanout and cover are in good condition and checking if litter or accumulated sediment is obstructing flow through the structure. Common corrective actions include removal of litter and accumulated sediment.

2.1.2 Storm Drain Piping

Storm drain piping shall be inspected on an annual basis and cleaned or maintained as necessary. Inspection shall include checking if litter or accumulated sediment is obstructing flow. Typical observations that would indicate the storm drain piping is not functioning properly are roof gutter overflows or no discharge of runoff into the detention areas during a storm event. Common corrective actions include removal of litter and accumulated sediment.

2.1.3 Drainage Structures (Yard Clean Out)

Drainage Inlets will be inspected quarterly and cleaned to ensure that the pipe connections are working in their intended fashion and that they are free of debris. Sediments and hydrocarbons will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations. The method of sediment removal will be by hand or vacuum and disposal must be documented.

2.1.4 Subsurface Infiltration System

The subsurface system (concrete galleys) shall be inspected following every storm event in excess of 0.5 inches of rain in a 24-hour period during the first 3 months following installation, and then twice annually, once in the fall and then in the spring after the snow melts. Sediment removal will take place at the completion of construction and as deemed necessary based on the inspections.

2.1.5 Infiltration Basin

The Infiltration Basin area shall be inspected bi-annually and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is adequate, if litter or accumulated sediment is obstructing the overflow path and checking if there are signs of erosion. Common corrective actions include removal of litter and accumulated sediment, mowing, and re-stabilization of eroded areas.

3 Practices for Long-Term Pollution Prevention (LTPP)

The Owner or designated responsible party shall implement the LTPP practices set forth in this document.

3.1 Good Housekeeping Measures

The Owner or designated responsible party shall implement the following good housekeeping measures to ensure long-term pollution prevention and provide suitable practices for source control of pollutants.

3.1.1 Vehicles Washing Controls

The washing of vehicles is not anticipated at this site. In the event that vehicle washing is conducted at the site, it will be performed in a location where runoff can be collected in the closed stormwater collection system and directed to a stormwater quality unit. Runoff resulting from vehicle washing will not be directly discharged to a wetland.

3.1.2 Snow Management Guidelines

Snow shall not be dumped directly into water bodies, wetlands and surrounding buffer zones, or stormwater BMPs. Snow pile sites shall be in areas with relatively level slopes with stabilized groundcover, and a linear sedimentation control barrier shall be placed securely on the downgradient side of a snow pile. At the end of the snow season, debris accumulated sediment shall be cleared from the snow pile site and properly disposed of in accordance with local, state and federal guidelines and regulations.

3.1.3 Mosquito Control Guidelines

If evidence of mosquitos is found in any of the sediment forebays, larvicide may be applied by a licensed pesticide applicator in compliance with all pesticide label requirements, as well as any applicable local, state, or federal guidelines and regulations.

3.1.4 Pet Waste Management

Scoop up and seal pet waste in a plastic bag and dispose of properly in a closed solid waste container.

3.1.5 Solid Waste Management

Dispose of or recycle solid waste in closed containers and in accordance with any applicable local, state and federal guidelines and regulations.

3.1.6 Material Storage and Spill Prevention

Deicing chemicals, fertilizers, herbicides, pesticides, or other hazardous materials shall be stored under a roof or other structure and shall be kept in original containers unless they are not resealable. Manufacturer's labels and material safety data sheets shall be retained. Try to store only enough product required for the job, and when possible, all of a product shall be used before disposing of the container. Manufacturer, local, state and federal guidelines and regulations for proper use and disposal shall be followed.

The manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be made aware of the procedures and the location of the information and cleanup supplies. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on-site. Equipment and materials shall include, but not be limited to, brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand or sawdust, as well as plastic and metal containers specifically for this purpose. All spills shall be cleaned up immediately after discovery.

3.1.7 Routine Inspection and Maintenance of Stormwater BMPs

Conduct inspection and maintenance of the stormwater BMPs in accordance with the Stormwater O&M Program discussed above.

3.1.8 Maintenance of Landscaped Areas

Routine mowing shall be conducted on a consistent basis with grass cut to an adequate height to maintain a healthy and full vegetative cover. Bare areas, areas of sparse growth, and signs of erosion shall be addressed in accordance with the Stormwater O&M Program discussed above.

3.1.9 Prohibition of Illicit Discharges

Illicit discharges are discharges that do not entirely consist of stormwater, except for certain specified non-stormwater discharges such as firefighting activities, water line flushing, irrigation systems, lawn watering, and wash water from buildings without detergents. There are no known or proposed illicit connections associated with the Project, however if a potential illicit discharge is detected it shall be investigated to determine the nature and source of the discharge, and if required action shall be taken to eliminate the illicit discharge.

APPENDIX A

Inspection and Maintenance Log

Highland Rd and Ballard Rd Development

SAMPLE Inspection and Maintenance Log Form

Inspector or Maintenance Personnel Name: _____

Date: _____

- Routine
- Response to Rainfall Event (_____ inches)
- Other (describe) _____

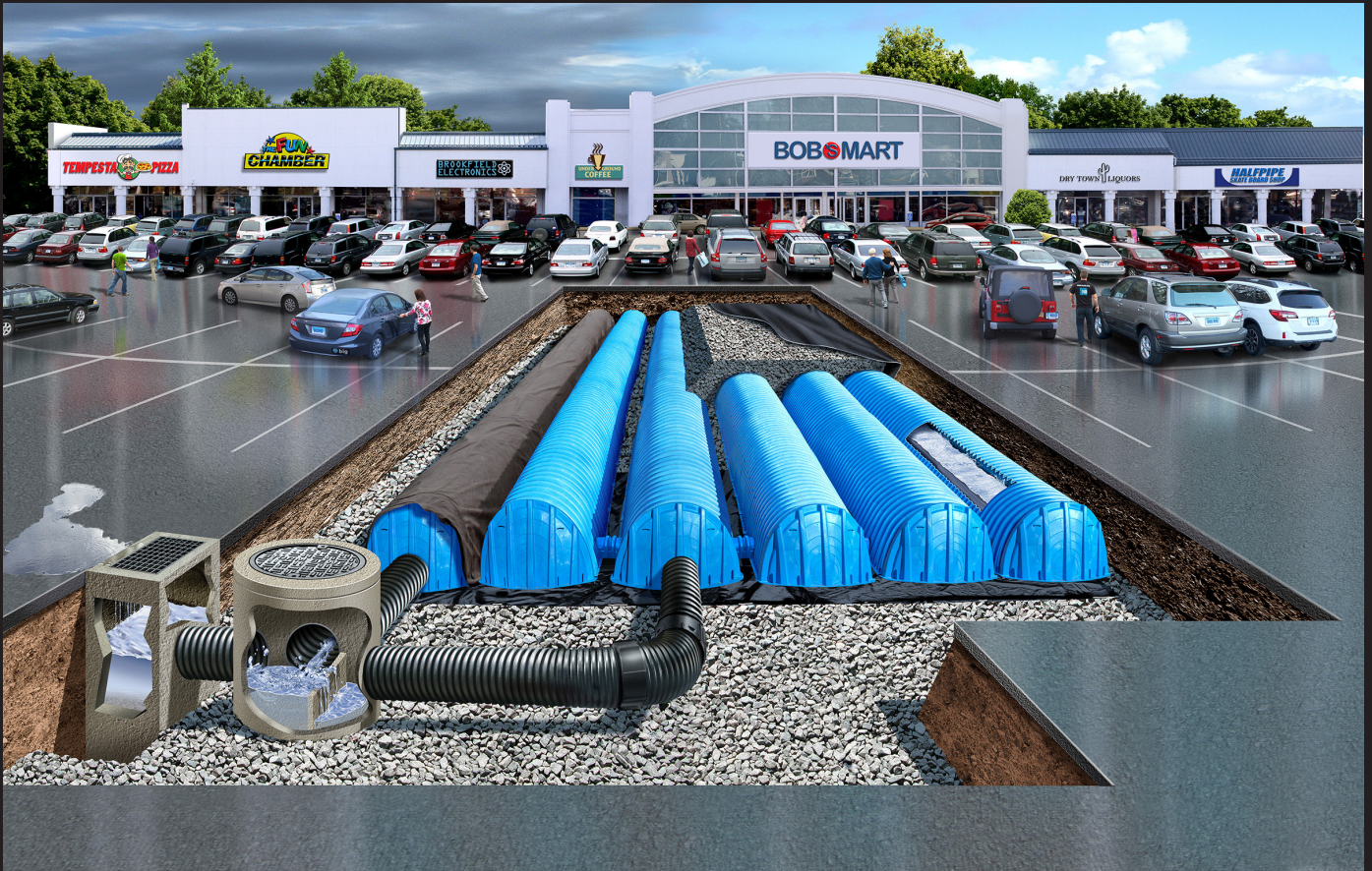
BMP	Required Inspection Frequency	Maintenance Frequency	Comments	Follow-up Action Required (Yes / No)
Yard Cleanout	Annually	As Needed		
Storm Drain Piping	Annually	As Needed		
Flared End Section and Stone Apron	Quarterly	As Needed		
Drainage Structures (Catch Basins and Manholes)	Quarterly	As Needed		
Infiltration Basin	Bi-annually	As Needed		
Subsurface Infiltration System (As-Built)	Bi-annually	As Needed		

APPENDIX B

Operation & Maintenance Cultec Subsurface Infiltration System

CONTACTOR® & RECHARGER®

STORMWATER MANAGEMENT SOLUTIONS



OPERATION & MAINTENANCE GUIDELINES FOR CULTEC STORMWATER MANAGEMENT SYSTEMS



OPERATIONS AND MAINTENANCE GUIDELINES

Published by

CULTEC

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U.S. Patents 6,129,482; 6,322,288; 6,854,925; 7,226,241; 7,806,627; 8,366,346; 8,425,148; U.S. Designs D613,819; D638,095; D668,318; Canadian Patent 2,450,565; 2,591,255; Canadian Designs 129144; 135983; 159073; 160977; and/or other U.S. or Foreign Patent(s) or Patent(s) Pending.

Contact Information:

For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at CT-CustomerService@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail CT-Tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CLT057 11-23

November 2023

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC. All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings. Actual designs may vary.

This manual contains guidelines recommended by CULTEC and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

- A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to determine if any sediment has accumulated in the inlet row.
- B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.
 1. **Manhole Access**
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. StormFilter Access

Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

- C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

- A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.
- B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.
- C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.
- D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance

The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance

The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	<ul style="list-style-type: none"> Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	<ul style="list-style-type: none"> Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	<ul style="list-style-type: none"> Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	<ul style="list-style-type: none"> Clean stormwater management chambers and feed connectors of any debris. Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	<ul style="list-style-type: none"> Clean stormwater management chambers and feed connectors of any debris. Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. Attain the appropriate approvals as required. Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1 st year	<ul style="list-style-type: none"> Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	<ul style="list-style-type: none"> Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	<ul style="list-style-type: none"> Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC at 1-800-428-5832.

WQMP Operation & Maintenance (O&M) Plan

Project Name: _____

Prepared for:

Project Name: _____

Address: _____

City, State Zip: _____

Prepared on:

Date: _____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer’s maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ____

BMP SITE PLAN

Site plan is preferred on minimum 11" by 17" colored sheets, as long as legible.



Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
<input type="checkbox"/> Month 1	Date:	
<input type="checkbox"/> Month 2	Date:	
<input type="checkbox"/> Month 3	Date:	
<input type="checkbox"/> Month 4	Date:	
<input type="checkbox"/> Month 5	Date:	
<input type="checkbox"/> Month 6	Date:	
<input type="checkbox"/> Month 7	Date:	
<input type="checkbox"/> Month 8	Date:	
<input type="checkbox"/> Month 9	Date:	
<input type="checkbox"/> Month 10	Date:	
<input type="checkbox"/> Month 11	Date:	
<input type="checkbox"/> Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
<input type="checkbox"/> Year 1	Date:	
<input type="checkbox"/> Year 4	Date:	
<input type="checkbox"/> Year 7	Date:	
<input type="checkbox"/> Year 10	Date:	
<input type="checkbox"/> Year 13	Date:	
<input type="checkbox"/> Year 16	Date:	
<input type="checkbox"/> Year 19	Date:	
<input type="checkbox"/> Year 22	Date:	

Major Maintenance

Frequency		Action
Inlets and Outlets	Every 3 years	
	Notes	
	<input type="checkbox"/> Year 1	Date:
	<input type="checkbox"/> Year 4	Date:
	<input type="checkbox"/> Year 7	Date:
	<input type="checkbox"/> Year 10	Date:
	<input type="checkbox"/> Year 13	Date:
	<input type="checkbox"/> Year 16	Date:
	<input type="checkbox"/> Year 19	Date:
	<input type="checkbox"/> Year 22	Date:
	Spring and Fall	
	Notes	
	<input type="checkbox"/> Spring	Date:
	<input type="checkbox"/> Fall	Date:
	<input type="checkbox"/> Spring	Date:
	<input type="checkbox"/> Fall	Date:
	<input type="checkbox"/> Spring	Date:
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
CULTEC Stormwater Chambers	2 years after commissioning	
	<input type="checkbox"/> Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. <input type="checkbox"/> Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.	
	Notes	
<input type="checkbox"/> Year 2	Date:	

Major Maintenance

Frequency		Action	
CULTEC Stormwater Chambers	9 years after commissioning every 9 years following		
	<ul style="list-style-type: none"> <input type="checkbox"/> Clean stormwater management chambers and feed connectors of any debris. <input type="checkbox"/> Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. <input type="checkbox"/> Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended. 		
	Notes		
	<input type="checkbox"/> Year 9	Date:	
	<input type="checkbox"/> Year 18	Date:	
	<input type="checkbox"/> Year 27	Date:	
	<input type="checkbox"/> Year 36	Date:	
45 years after commissioning			
<ul style="list-style-type: none"> <input type="checkbox"/> Clean stormwater management chambers and feed connectors of any debris. <input type="checkbox"/> Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. <input type="checkbox"/> Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. <input type="checkbox"/> Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. <input type="checkbox"/> Attain the appropriate approvals as required. <input type="checkbox"/> Establish a new operation and maintenance schedule. 			
Notes			
<input type="checkbox"/> Year 45	Date:		

Major Maintenance

Frequency		Action	
Surrounding Site	Monthly in 1st year		
	<input type="checkbox"/> Check for depressions in areas over and surrounding the stormwater management system.		
	Notes		
	<input type="checkbox"/> Month 1	Date:	
	<input type="checkbox"/> Month 2	Date:	
	<input type="checkbox"/> Month 3	Date:	
	<input type="checkbox"/> Month 4	Date:	
	<input type="checkbox"/> Month 5	Date:	
	<input type="checkbox"/> Month 6	Date:	
	<input type="checkbox"/> Month 7	Date:	
	<input type="checkbox"/> Month 8	Date:	
	<input type="checkbox"/> Month 9	Date:	
	<input type="checkbox"/> Month 10	Date:	
	<input type="checkbox"/> Month 11	Date:	
	<input type="checkbox"/> Month 12	Date:	
	Spring and Fall		
	<input type="checkbox"/> Check for depressions in areas over and surrounding the stormwater management system.		
	Notes		
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	Yearly		
	<input type="checkbox"/> Confirm that no unauthorized modifications have been performed to the site.		
Notes			
<input type="checkbox"/> Year 1	Date:		
<input type="checkbox"/> Year 2	Date:		
<input type="checkbox"/> Year 3	Date:		
<input type="checkbox"/> Year 4	Date:		
<input type="checkbox"/> Year 5	Date:		
<input type="checkbox"/> Year 6	Date:		
<input type="checkbox"/> Year 7	Date:		



CULTEC

878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA

P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

APPENDIX M

Illicit Discharge Compliance Statement

January 19, 2026

Town of Ashland
Town Office
101 Main Street
Ashland, MA 01721

**Re: Stormwater Management – Illicit Discharge Compliance Statement
Highland Rd and Ballard Rd Proposed Development Plans,
Ashland, MA**

Dear Planning Board Members,

This statement is provided in accordance with the provisions of Massachusetts Stormwater Management Standards (the Standards), Standard 10, and the Massachusetts Stormwater Handbook, and the Town of Ashland Stormwater Management Bylaw and Regulations.

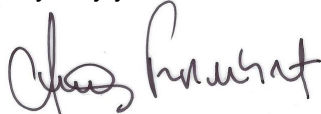
To the best of the Owner's and Engineer's knowledge, based on field observations and available documentation, no illicit discharges exist on the Project Site, and no illicit discharges are proposed as part of the Project.

The Project's Operation & Maintenance Plan has been designed to prevent non-stormwater discharges to all on-site stormwater Best Management Practices and complies with the inspection, reporting, and long-term maintenance requirements of Ashland's Stormwater Management Bylaw (Chapter 343).

The Owner acknowledges responsibility for ensuring that all required inspections are performed during construction and throughout the life of the stormwater system, and for maintaining documentation as required by the Town of Ashland.

Any illicit discharges identified during construction or during long-term operation will be immediately eliminated and reported to the Town in accordance with the Bylaw and the Massachusetts Stormwater Handbook.

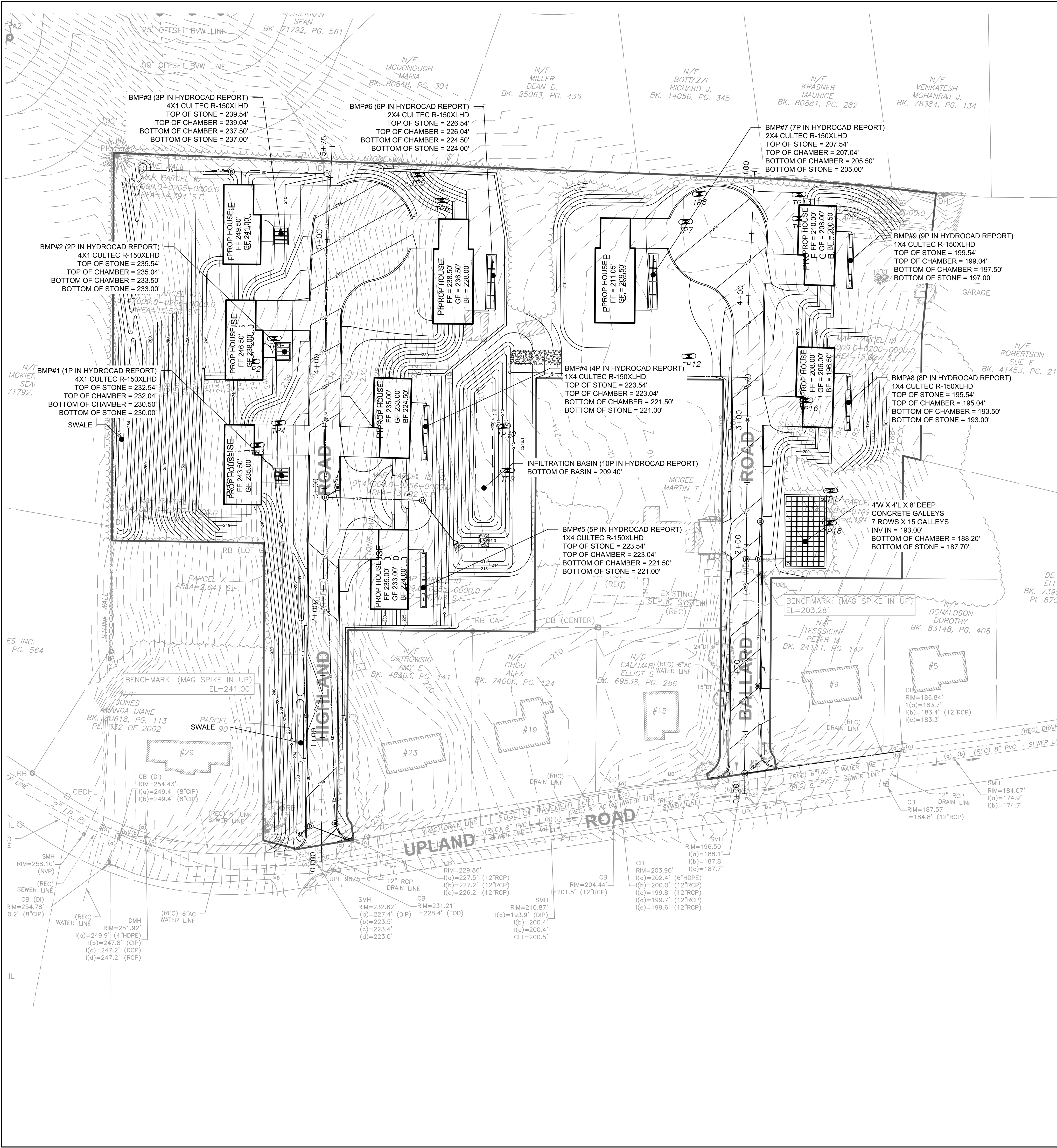
Very truly yours,



Carlos Ferreira | Engineer

APPENDIX N

O&M Plan



- ### GENERAL NOTES
- THE PROPERTY LINES SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL FIELD SURVEY CONDUCTED NOVEMBER 2025 BY BRYAN PARMENTER PLS STAMPED LICENSE NUMBER 48193.
 - PROJECT REFERENCES MASSACHUSETTS HORIZONTAL DATUM NAD83 AND TOPOGRAPHICAL ELEVATIONS VERTICAL DATUM NAVD88.
 - ALL SURVEY INFORMATION IS BACKGROUND INFORMATION FOR DESIGN ENGINEER PLANS.
 - GENERAL CONTRACTOR SHALL COORDINATE PROPOSED UTILITIES PRIOR TO CONSTRUCTION TO VERIFY SIZE, MATERIAL AND SUITABILITY OF EXISTING UTILITIES. COORDINATE WITH UTILITY PROVIDER AND NOTIFY THE DESIGNER ENGINEER OF ANY CONFLICTS. IF EXISTING SERVICES CANNOT BE REUSED, A NEW SERVICE CONNECTION SHALL BE MADE TO THE EXISTING MAIN OR LINE IN ACCORDANCE TO THE TOWN/CITY REQUIREMENTS INCLUDING PATCHING WHERE DEEMED NECESSARY.
 - AT THE END OF CONSTRUCTION, ALL DRAINAGE STRUCTURES ARE TO BE CLEANED OF SILT, STONES AND OTHER DEBRIS.
 - CIVIL ENGINEER DESIGN BASED ON PROVIDED SURVEY BY SURVEYOR. ENGINEER NOT RESPONSIBLE FOR ANY DISCREPANCY IN THE PROVIDED SURVEY.
 - ALL SLOPES, UNLESS OTHERWISE SPECIFIED, SHALL BE LOAMED AND SEEDED FOR STABILIZATION AS SOON AS POSSIBLE TO PREVENT EROSION INTO WETLAND RESOURCE AREAS, ABUTTING PROPERTIES, OR PUBLIC WAYS. EROSION CONTROL BLANKETS ARE REQUIRED FOR ALL 2H:1V SLOPES. SLOPES MAY NOT EXCEED 2H:1V.
 - DIG SAFE NOTE: IN ACCORDANCE WITH MGL. CH. 82, SEC. 40 INCLUDING AMENDMENTS, ALL CONTRACTORS SHALL NOTIFY UTILITY COMPANIES AND GOVERNMENT AGENCIES, IN WRITING, OF THE INTENT TO EXCAVATE, BLAST, DEMOLISH, BORE, OR PERFORM OTHER EARTH MOVING OPERATIONS NO LESS THAN 72 HOURS AND NO MORE THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF SUCH WORK (EXCLUSIVE OF SATURDAYS, SUNDAYS, AND LEGAL HOLIDAYS) OR CALL "DIG SAFE" AT 1-888-DIG-SAFE.
 - LOCATION OF UNDERGROUND UTILITIES ON THIS PLAN ARE APPROXIMATE ONLY AND ARE BASED ON A COMBINATION OF ACTUAL FIELD LOCATIONS OF VISIBLE STRUCTURES AND RECORD PLAN COMPILATIONS. EXISTING UTILITY LOCATIONS AND ELEVATIONS SHOWN SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION. TEST PITS SHALL BE PERFORMED BY CONTRACTOR PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL INFORM THE DESIGN ENGINEER OF ANY DISCREPANCIES PRIOR TO THE START OF ANY CONSTRUCTION.

LEGEND

SUBJECT PARCEL	---
EXISTING MINOR CONTOUR	---291---
EXISTING MAJOR CONTOUR	---290---
PROPOSED SPOT GRADE	X 132
PROPOSED CONTOUR	---290---
TEST PITS	TP-X

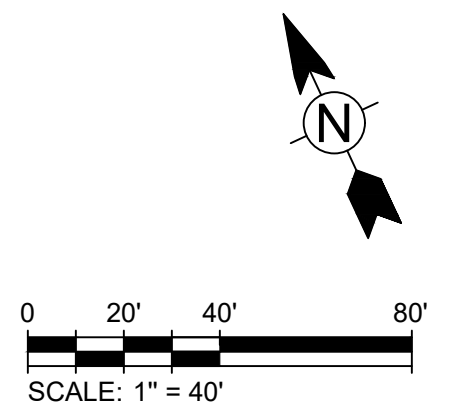


OWNER/APPLICANT:
DEPIETRI GROUP
118 TURNPIKE ROAD,
SOUTHBOROUGH, MA 01772

PROJECT:
HIGHLAND RD & BALLARD RD
HIGHLAND RD & BALLARD RD,
ASHLAND, MA 01721

REVISIONS:		
No.	DATE	DESCRIPTION

DRAWN BY: EP
CHECKED BY: MDC
DATE: 02/02/2026
SCALE: 1" = 40'
SHEET TITLE:
O&M PLAN



SHEET:
C-O&M