EP Design Services, LLC

STORMWATER MANAGEMENT REPORT

For

M&M Realty Partners at Fair Haven, LLC

Block 31, Lot 1

Borough of Fair Haven, New Jersey

Prepared By:

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2901 Hamilton Boulevard
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July 16, 2021

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A. PROJECT NARRATIVE

1. INTRODUCTION

This storm water management report is being submitted as part of the engineering design package for a site plan known as M&M Realty Partners at Fair Haven, LLC. This report was prepared in accordance with the New Jersey Department of Environmental Protection (NJDEP) regulations, the Borough of Fair Haven, and current industry standards and practices for stormwater management.

2. LOCATION OF SITE

Lot 1, Block 31 is located at the corner of River Road (County Road #10) and Cedar Avenue in the Borough of Fair Haven, Monmouth County, New Jersey. According to the official township tax map, Lot 1 contains approximately 0.646 acres, but for the purposes of this stormwater analysis, 0.874 acres were analyzed to account for offsite runoff.

3. LAND CHARACTERISTICS

The existing topography slopes downwards to the north towards River Road where there is an existing stormwater collection system. Under existing conditions, two (2) 'B' Inlets – one located at the intersection of River Road and Cedar Avenue and one located further east along River Road – collect the majority of the site's stormwater runoff, as there are no existing drainage structures located onsite.

The site is in the Affordable Housing (AH) zone and was formerly a Sunoco gas station, which has been decommissioned and designated for redevelopment. The gas pumps and canopy have been removed but the associated one-story brick convenience store remains onsite.

The site is located in the western commercial area of the Borough, with a convenience store, a yoga studio, a pool retailer, and the Borough's volunteer fire station all located across River Road. There is a two-family house immediately adjacent to the east of the property, followed by a First Constitution Bank further east along River Road. To the west along River Road are several restaurants, small businesses and a shopping center containing a grocery store along with other businesses. There are single-family residences located further east along River Road and south along Cedar Avenue.

The proposed development will include the construction of a 3-story mixed use building, with approximately 5,812 sqft. on the first floor, 4,250 sqft. of which is designated for retail use. The second and third floors consist of approximately 17,218 sqft. of residential area. The overall post-developed area which was analyzed for drainage conditions in this report will include approximately 0.087 acres of additional impervious surface coverage compared to existing site conditions.

4. SOILS

The existing soil classification for the site is based on the "Soil Survey of Monmouth County, New Jersey", prepared by the United States Department of Agriculture (USDA), Natural Resources Soil Conservation Service in cooperation with the New Jersey Department of Agriculture.

SOIL NAME	HYDROLOGIC GROUP	"CN Value"
Freehold-Urban Land Complex (FrrC)	B	61

5. STUDY AREA AND DIAGRAMS

The drainage areas utilized to analyze and calculate the stormwater attenuation requirements for this redevelopment were established based on the hydrologic limit of disturbance and the existing and proposed topography. The following is a listing and description of the drainage areas used in this report.

Existing Areas – Areas of site pertaining to existing conditions to be hydrologically altered by the proposed redevelopment.

Proposed Areas – Areas of the site pertaining to the proposed conditions that will be hydrologically altered by the proposed development and ultimately drain to Study Point 2.

Bypass Areas – Proposed onsite areas that flow uncontrolled to Study Point 1 or Study Point 2.

Study Point #1 – The point of discharge into the Existing Type 'B' Inlet located further east along River Road.

Study Point #2 – The point of discharge into the Existing Type 'B' Inlet located at the intersection of River Road and Cedar Avenue.

Drainage Area # – Inlet Areas collected and conveyed to Study Point #2.

Roof Area – Roof area collected and conveyed to Study Point #2.

6. STORMWATER MANAGEMENT DESIGN

Stormwater Management for the site has been designed in accordance with the New Jersey Department of Environmental Protection (NJDEP) Stormwater Rules (N.J.A.C. 7:8), the New Jersey Stormwater Best Management Practices Manual, Freehold Soil Conservation District and the Township of Monroe Ordinances. The technical requirements of the NJDEP Stormwater Rules apply to major developments, defined as any development that either disturbs one or more acres of land or creates one-quarter acre or more of impervious surface and/or vehicle-traveled surfaces. The proposed development does not exceed these limits. Therefore, the project is not classified as a major development and subject to the three components of the technical requirements (Stormwater Quantity, Stormwater Quality, and Groundwater Recharge).

7. DESIGN METHODOLOGY

The proposed hydrologic calculations were developed for the subject site utilizing the Technical Release Manual (TR-55) Method. Runoff curve numbers were determined for the drainage areas and have been prepared in accordance with the TR-55 Urban Hydrology for Small Watersheds and BMP Manual.

The Time of concentration (Tc) is defined as the time for stormwater runoff to travel from the hydraulically most distant point in the watershed to the critical analysis point. Specific time of concentration (Tc) values were determined to accurately represent the existing conditions and a Tc of 6 minutes is used as the minimum Tc for proposed conditions and represents a conservative value. Hydrographs were generated for existing and proposed conditions, which were created using HydroCAD 10.00 (stormwater design software).

The following storm events were analyzed:

- The Water Quality storm consisting of 1.25 inches per 2 hours
- The 24 hour, 2-year storm consisting of 3.38 inches
- The 24 hour, 10-year storm consisting of 5.21 inches

- The 24 hour, 25-year storm consisting of 6.48 inches
- The 24 hour, 100-year storm consisting of 8.84 inches

The coefficients and curve numbers used in the routings for the pre- and post-developed drainage areas are dependent upon the land cover and amount of impervious and open space area that are present. They are a contributing factor to the amount of runoff generated from a drainage area. The pre- and post-developed drainage area coefficients and curve numbers have been determined based on the land cover in their respective condition and the soil type that is present.

Runoff "CN" values were assigned to various surfaces as follows:

Ground Cover	**"CN Value"**
Existing/Unchanged	
Impervious	98
Lawn (HSG B)	69
Proposed/Bypass	
Impervious	98
Roof	98
Lawn (HSG B)	61

8. STORMWATER QUANTITY

The Stormwater quantity standards for the project were not required to be met for the proposed site but for the purposes of this analysis, the post-developed peak flow rates from the 2, 10 and 100-year storm events were analyzed and compared to the pre-developed peak flow rates. Please refer to Appendix C "Summary of Drainage Conditions" for a tabulated summary of stormwater runoff rates and Appendices D and E for the supporting hydrographs for the existing and proposed hydrographs to Study Points #1 and #2. There will be a de minimis increase in stormwater volume due to the 0.087-acre increase in impervious coverage; however, peak flows resulting from the overall development are decreased due to the stormwater improvements, as demonstrated in Table 1. A further detailed breakdown of these peak flows is included in the Summary of Drainage Conditions (Appendix B).

Table 1: Existing vs. Proposed Peak Runoff Rate for Overall Site (cfs)

Storm	Existing Peak Runoff (cfs)	Proposed Peak Runoff (cfs)	Percent of Existing (%)
2-year	2.33	1.88	80.7%
10-year	3.78	2.99	79.1%
25-year	4.81	3.72	77.3%
100-year	6.73	5.07	75.3%

9. STORMWATER COLLECTION SYSTEM

The StormCAD program by Bentley was utilized to design the storm sewer system. Manning's Formula with a Manning's Coefficient of 0.010 and 0.013 were utilized for designing and analyzing the proposed PVC and Class IV RCP pipes, respectively. The program utilizes the rational method for calculating the flows to each inlet area. A minimum time of concentration of 10 minutes was used for the various drainage areas, which is a conservative approach. The stormwater management collection system was designed based upon the 25-year storm return frequency unless otherwise noted in the pipe chart. The stormwater management basin outlet piping was designed to accommodate the 100-year design flow from the stormwater management basins.

10. GROUNDWATER RECHARGE

In accordance with NJAC 7:8-3.5, the Groundwater Recharge requirements are not required to be met for the proposed site as it is not classified as a major development.

11. STORMWATER QUALITY

As per NJ.A.C. 7:8-5.5(e), the stormwater management measures implemented in the proposed project have been designed to reduce, to the maximum extent feasible, the post-construction nutrient load and total suspended solids (TSS) produced from the newly developed portions of the site in stormwater runoff generated by the 1.25" depth of rainfall over a period of two (2) hours - NJDEP water quality design storm.

The stormwater runoff generated from the water quality storm will not require treatment for this proposed site as it is not classified as a major development. However, the proposed development will include a small-scale bioretention basin with a 24-inch sand bottom layer designed to infiltrate 100% of the water quality storm, therefore treating onsite collected Vehicle Traveled Area (VTA) at a 90% TSS removal. Refer to Appendix D for post-development hydrograph reports.

12. BYPASS AREAS

The HydroCAD model in the proposed conditions models all stormwater runoff that is conveyed to Study Point #1 or #2, which are used to analyze peak flows. It should be noted that Bypass Area 1 is a proposed lawn area which flows offsite in a southernly direction but ultimately collects into Study Point #1 according to existing topography. It should also be noted that Bypass Area #3 includes stormwater runoff that flows in a northwesterly direction along Cedar Ave's gutter line and Bypass Area #4 also includes stormwater runoff that flows in an easterly direction along River Road's gutter line.

13. SOIL EROSION AND SEDIMENT CONTROL

In accordance with the Soil Erosion and Sediment Control Act, soil erosion measures have been incorporated into the design and are graphically depicted on the Soil Erosion and Sediment Control Plans. These measures include, but are not limited to:

- Silt Fence
- Stabilized Construction Entrances
- Storm Sewer Inlet Protection
- Steep Slope Jute Matting

14. NJDEP NONSTRUCTURAL MANAGEMENT STRATEGIES

Due to the small and compact nature of the site, no BMP features such as basins were required. Measures have been taken in the proposed design to best incorporate the suggested nonstructural stormwater management strategies. The following list is meant to address item (b) under 7:8-5.3 - 'Nonstructural Stormwater Management Strategies' section.

1. The project limit has been minimized as to protect natural drainage features. No wetlands exist on the site or adjacent to it.

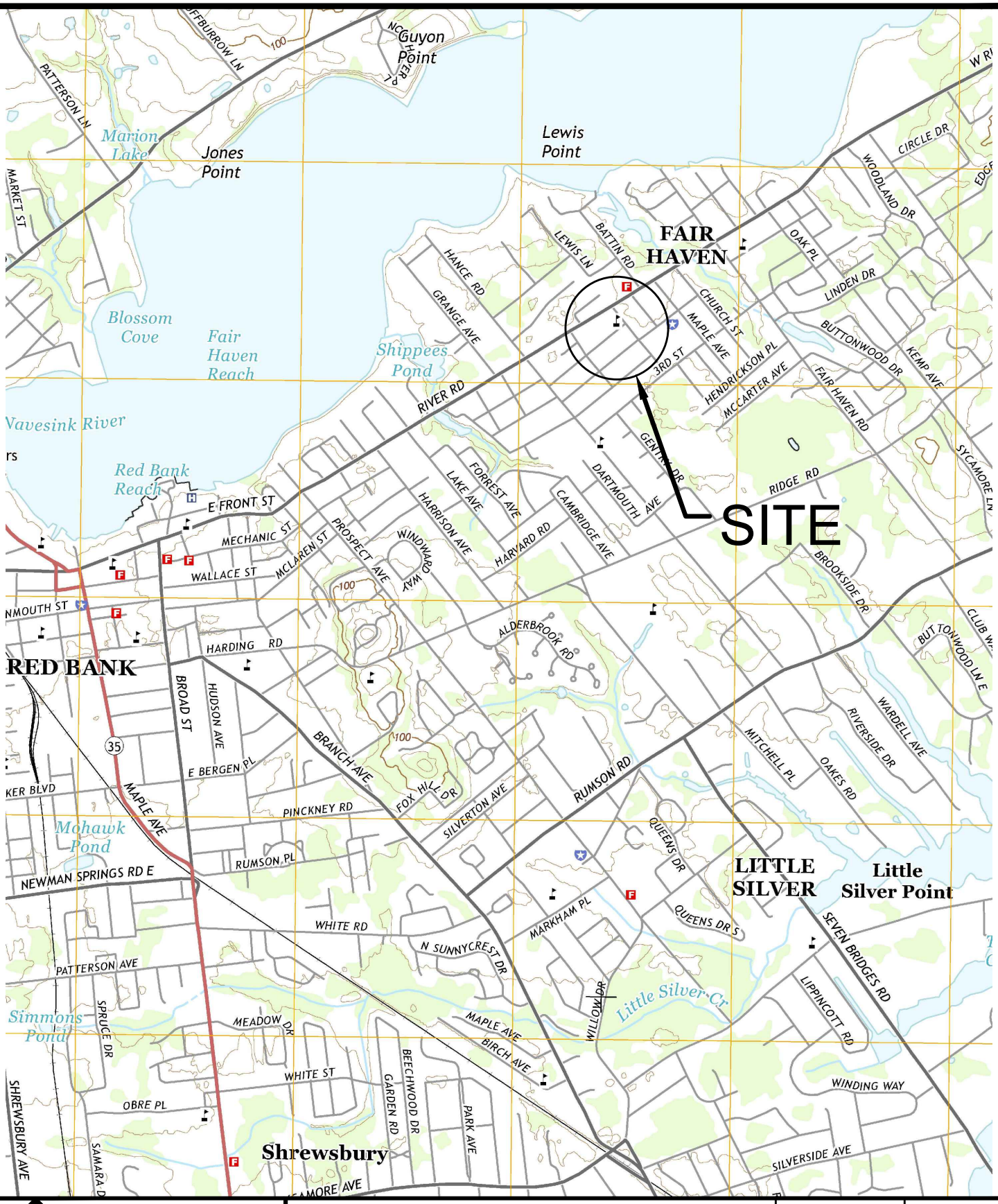
2. An effort has been made to minimize impervious area for the given use. Roof drains have been designed to discharge directly into the stormwater collection system as a means of disconnecting flows.
3. Project limits and scope have been reduced/minimized to protect the natural drainage features and vegetation.
4. The “Time of Concentration” has been reduced by the use of large volume best management practices.
5. Project limits have been minimized to prevent unnecessary clearing and grading. The project utilizes retaining walls to prevent disturbance within the surrounding areas.
6. Grading for the open space areas will be performed by lightweight construction equipment as a means to mitigate soil compaction on-site.
7. The proposed landscaping species that have been chosen are native species that can survive in the habitat without need for fertilizers or pesticides.
8. Due to the compact nature of the site, vegetated swales were not able to be utilized.

15. CONCLUSION

The proposed redevelopment will lead to a de minimis increase in overall stormwater runoff volume and due to the 0.087-acre increase in impervious coverage, but overall peak flows are reduced. The proposed stormwater management system has been designed with provisions for safe and efficient control of stormwater runoff in a manner that will not adversely affect the existing drainage patterns found in the surrounding area. It is anticipated that the proposed development will not cause any negative impacts on its surrounding areas.

Please refer to the “Summary of Drainage Conditions” chart in Appendix C for the table summary of the Stormwater Management System.

A. USGS, SOILS, FEMA, AND GEOWEB MAPS



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USGS MAP
M&M REALTY PARTNERS AT FAIR HAVEN, LLC
FOR
BLOCK 31, LOT 1
BOROUGH OF FAIR HAVEN
MONMOUTH COUNTY NEW JERSEY

DRAWN BY: YMS	CHECKED BY: PRL
DATE: 5/15/20	SCALE: 1" = 2000'
APPROVED BY: RCA	ACAD NO.: USGS
FIELD BOOK: --- PAGE: --	PROJECT NO.:
SHEET: 1 OF 1	DRAWING NO.: USGS
	REVISION

Custom Soil Resource Report
Soil Map

Map Scale: 1:635 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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: Monmouth County, New Jersey
Survey Area Data: Version 13, Sep 16, 2019

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

Date(s) aerial images were photographed: Jun 29, 2019—Jul 16, 2019

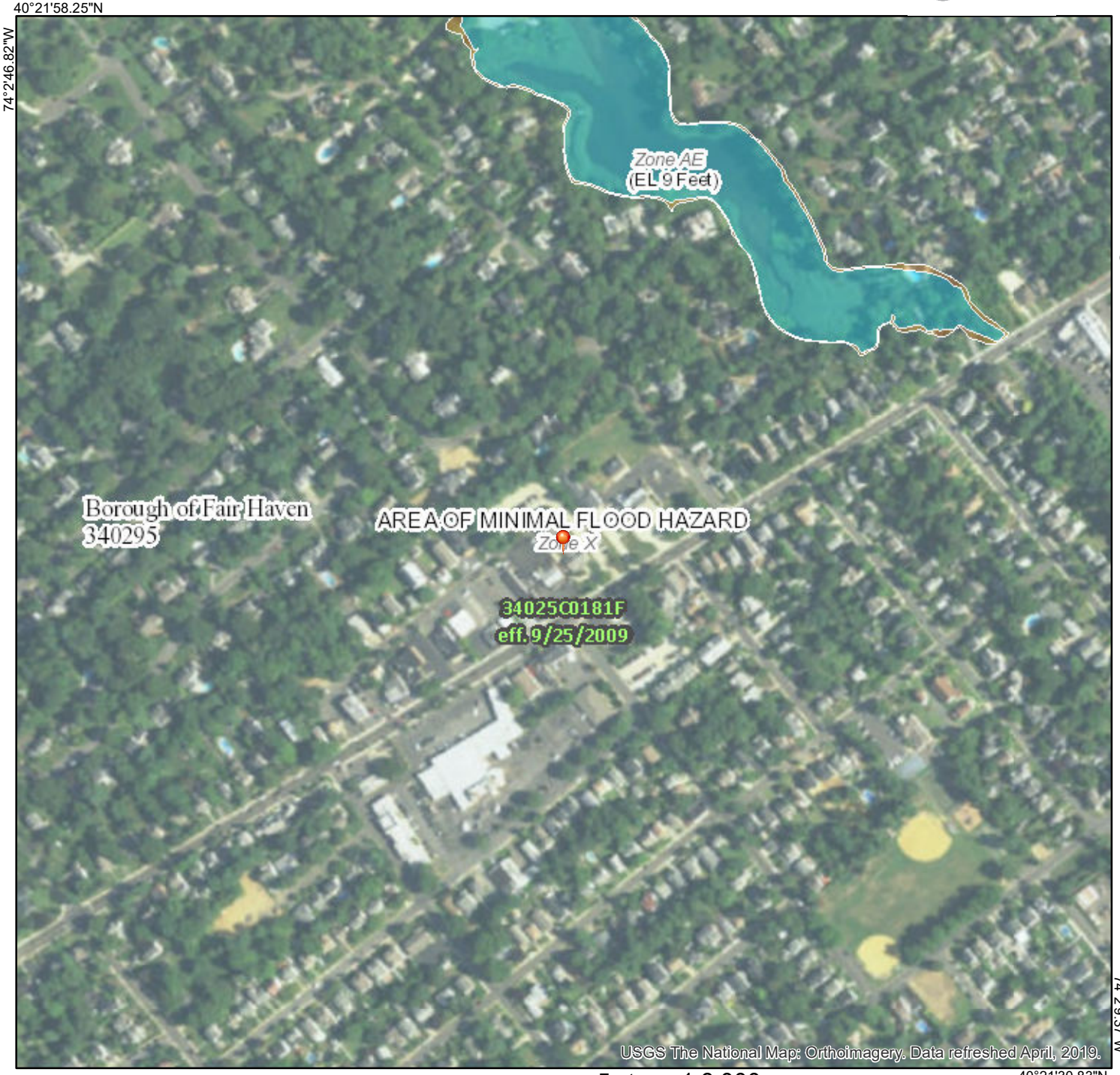
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

National Flood Hazard Layer FIRMette

FEMA

40°21'58.25"N

74°2'46.82"W



74°2'9.37"W

40°21'30.83"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

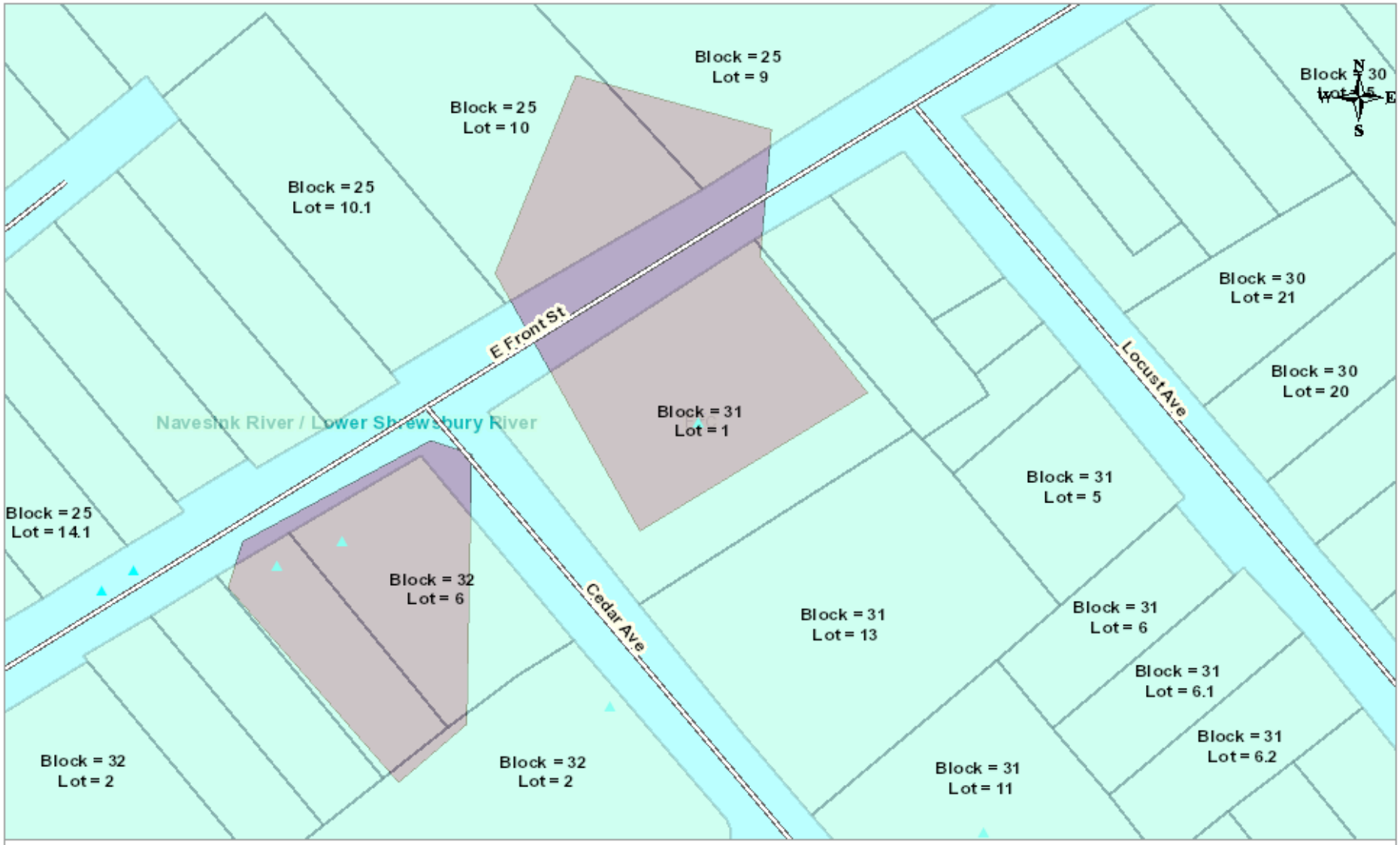
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/30/2020 at 11:49:28 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

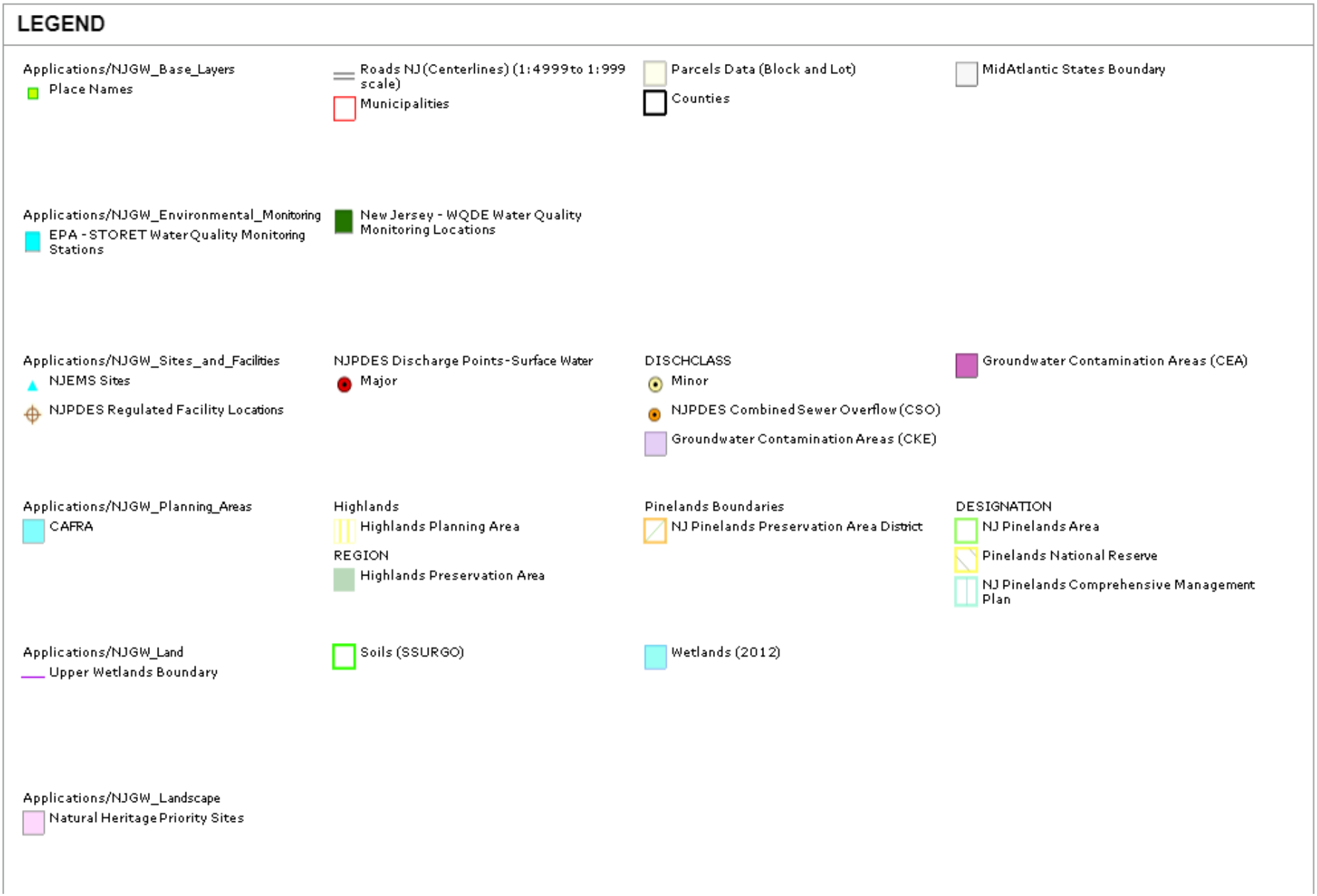
M&M PARTNERS AT FAIR HAVEN, LLC

Block 31, Lot 1



Copyright NJDEP - Map Printed On 2020-04-30 16:13

LEGEND


Applications/NJGW_Base_Layers
Place Names
Roads NJ (Centerlines) (1:4999 to 1:999 scale)
Municipalities
Parcels Data (Block and Lot)
Counties
MidAtlantic States Boundary
Applications/NJGW_Environmental_Monitoring
EPA - STORET Water Quality Monitoring Stations
New Jersey - WQDE Water Quality Monitoring Locations
Applications/NJGW_Sites_and_Facilities
NJEMS Sites
NJPDES Regulated Facility Locations
NJPDES Discharge Points - Surface Water
Major
DISCHCLASS
Minor
NJPDES Combined Sewer Overflow (CSO)
Groundwater Contamination Areas (CKE)
Groundwater Contamination Areas (CEA)
Applications/NJGW_Planning_Areas
CAFRA
Highlands
Highlands Planning Area
REGION
Highlands Preservation Area
Pinelands Boundaries
NJ Pinelands Preservation Area District
DESIGNATION
NJ Pinelands Area
Pinelands National Reserve
NJ Pinelands Comprehensive Management Plan
Applications/NJGW_Land
Upper Wetlands Boundary
Soils (SSURGO)
Wetlands (2012)
Applications/NJGW_Landscape
Natural Heritage Priority Sites

B. SUMMARY OF DRAINAGE CONDITIONS

NOAA Atlas 14, Volume 2, Version 3
Location name: Fair Haven, New Jersey, USA*
Latitude: 40.3617°, Longitude: -74.0407°
Elevation: 20.95 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

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/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.09 (3.71-4.52)	4.90 (4.43-5.41)	5.80 (5.23-6.42)	6.47 (5.83-7.15)	7.30 (6.54-8.08)	7.90 (7.03-8.72)	8.50 (7.54-9.42)	9.06 (7.97-10.1)	9.78 (8.50-10.9)	10.3 (8.90-11.6)
10-min	3.26 (2.95-3.61)	3.91 (3.53-4.33)	4.64 (4.19-5.14)	5.17 (4.66-5.71)	5.81 (5.20-6.43)	6.28 (5.59-6.94)	6.74 (5.98-7.47)	7.17 (6.31-7.96)	7.72 (6.71-8.62)	8.11 (7.00-9.11)
15-min	2.72 (2.46-3.01)	3.27 (2.96-3.62)	3.91 (3.53-4.33)	4.35 (3.92-4.82)	4.90 (4.40-5.42)	5.30 (4.72-5.86)	5.68 (5.03-6.29)	6.03 (5.30-6.70)	6.47 (5.63-7.23)	6.80 (5.86-7.64)
30-min	1.86 (1.68-2.06)	2.26 (2.04-2.50)	2.77 (2.50-3.07)	3.15 (2.84-3.49)	3.63 (3.25-4.02)	3.99 (3.55-4.41)	4.35 (3.85-4.82)	4.69 (4.13-5.21)	5.15 (4.47-5.75)	5.49 (4.73-6.16)
60-min	1.16 (1.05-1.28)	1.42 (1.28-1.57)	1.78 (1.60-1.97)	2.05 (1.85-2.27)	2.41 (2.16-2.67)	2.70 (2.40-2.98)	2.99 (2.65-3.31)	3.28 (2.89-3.65)	3.69 (3.20-4.12)	4.00 (3.45-4.49)
2-hr	0.716 (0.644-0.796)	0.874 (0.786-0.971)	1.11 (0.995-1.23)	1.28 (1.15-1.43)	1.53 (1.37-1.70)	1.73 (1.54-1.93)	1.94 (1.71-2.16)	2.16 (1.89-2.41)	2.47 (2.13-2.76)	2.71 (2.32-3.06)
3-hr	0.527 (0.476-0.587)	0.644 (0.582-0.717)	0.817 (0.737-0.909)	0.951 (0.855-1.06)	1.14 (1.02-1.27)	1.29 (1.15-1.44)	1.45 (1.28-1.62)	1.62 (1.42-1.81)	1.86 (1.60-2.09)	2.06 (1.74-2.31)
6-hr	0.337 (0.303-0.376)	0.410 (0.369-0.456)	0.517 (0.465-0.575)	0.604 (0.541-0.670)	0.728 (0.646-0.808)	0.831 (0.733-0.923)	0.941 (0.821-1.05)	1.06 (0.915-1.18)	1.23 (1.05-1.37)	1.37 (1.15-1.54)
12-hr	0.204 (0.184-0.227)	0.248 (0.223-0.275)	0.314 (0.282-0.349)	0.370 (0.331-0.410)	0.451 (0.400-0.500)	0.521 (0.459-0.576)	0.597 (0.519-0.661)	0.681 (0.584-0.755)	0.803 (0.677-0.895)	0.908 (0.753-1.01)
24-hr	0.116 (0.106-0.128)	0.141 (0.129-0.155)	0.182 (0.167-0.200)	0.217 (0.198-0.238)	0.270 (0.245-0.295)	0.317 (0.285-0.344)	0.369 (0.328-0.400)	0.427 (0.376-0.464)	0.515 (0.447-0.559)	0.592 (0.505-0.644)
2-day	0.069 (0.063-0.076)	0.083 (0.076-0.092)	0.107 (0.098-0.118)	0.128 (0.116-0.140)	0.158 (0.142-0.174)	0.184 (0.165-0.202)	0.213 (0.189-0.234)	0.245 (0.216-0.269)	0.293 (0.254-0.323)	0.335 (0.286-0.370)
3-day	0.048 (0.044-0.053)	0.059 (0.054-0.064)	0.075 (0.069-0.082)	0.089 (0.081-0.097)	0.109 (0.100-0.120)	0.127 (0.115-0.139)	0.147 (0.131-0.160)	0.168 (0.149-0.184)	0.200 (0.175-0.219)	0.228 (0.196-0.250)
4-day	0.038 (0.035-0.041)	0.046 (0.043-0.050)	0.059 (0.054-0.064)	0.070 (0.064-0.076)	0.085 (0.078-0.093)	0.099 (0.090-0.107)	0.113 (0.102-0.123)	0.130 (0.116-0.141)	0.154 (0.135-0.167)	0.174 (0.151-0.190)
7-day	0.025 (0.023-0.027)	0.030 (0.028-0.033)	0.038 (0.035-0.041)	0.045 (0.041-0.048)	0.054 (0.050-0.058)	0.062 (0.057-0.067)	0.071 (0.064-0.076)	0.080 (0.072-0.086)	0.094 (0.083-0.102)	0.105 (0.092-0.114)
10-day	0.020 (0.019-0.021)	0.024 (0.022-0.026)	0.029 (0.028-0.032)	0.034 (0.032-0.037)	0.041 (0.038-0.044)	0.046 (0.043-0.050)	0.052 (0.048-0.056)	0.058 (0.053-0.063)	0.068 (0.061-0.073)	0.076 (0.067-0.082)
20-day	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.022 (0.020-0.023)	0.025 (0.024-0.027)	0.028 (0.026-0.030)	0.031 (0.029-0.033)	0.034 (0.031-0.036)	0.038 (0.035-0.040)	0.041 (0.037-0.044)
30-day	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.016 (0.015-0.016)	0.017 (0.016-0.018)	0.020 (0.019-0.021)	0.022 (0.020-0.023)	0.024 (0.022-0.025)	0.025 (0.024-0.027)	0.028 (0.026-0.030)	0.030 (0.028-0.032)
45-day	0.009 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.014-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.019 (0.018-0.020)	0.020 (0.019-0.021)	0.022 (0.020-0.023)	0.023 (0.021-0.024)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)

[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

NOAA Atlas 14, Volume 2, Version 3
Location name: Fair Haven, New Jersey, USA*
Latitude: 40.3617°, Longitude: -74.0407°
Elevation: 20.95 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

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	**0.341** (0.309-0.377)	**0.408** (0.369-0.451)	**0.483** (0.436-0.535)	**0.539** (0.486-0.596)	**0.608** (0.545-0.673)	**0.658** (0.586-0.727)	**0.708** (0.628-0.785)	**0.755** (0.664-0.839)	**0.815** (0.708-0.910)	**0.860** (0.742-0.966)
10-min	**0.544** (0.492-0.602)	**0.651** (0.589-0.721)	**0.773** (0.698-0.856)	**0.861** (0.776-0.952)	**0.968** (0.867-1.07)	**1.05** (0.932-1.16)	**1.12** (0.996-1.25)	**1.20** (1.05-1.33)	**1.29** (1.12-1.44)	**1.35** (1.17-1.52)
15-min	**0.680** (0.615-0.752)	**0.818** (0.740-0.906)	**0.977** (0.882-1.08)	**1.09** (0.981-1.20)	**1.23** (1.10-1.36)	**1.32** (1.18-1.46)	**1.42** (1.26-1.57)	**1.51** (1.33-1.67)	**1.62** (1.41-1.81)	**1.70** (1.47-1.91)
30-min	**0.930** (0.842-1.03)	**1.13** (1.02-1.25)	**1.39** (1.25-1.53)	**1.58** (1.42-1.74)	**1.82** (1.63-2.01)	**1.99** (1.78-2.20)	**2.17** (1.93-2.41)	**2.35** (2.06-2.60)	**2.57** (2.24-2.87)	**2.75** (2.37-3.08)
60-min	**1.16** (1.05-1.28)	**1.42** (1.28-1.57)	**1.78** (1.60-1.97)	**2.05** (1.85-2.27)	**2.41** (2.16-2.67)	**2.70** (2.40-2.98)	**2.99** (2.65-3.31)	**3.28** (2.89-3.65)	**3.69** (3.20-4.12)	**4.00** (3.45-4.49)
2-hr	**1.43** (1.29-1.59)	**1.75** (1.57-1.94)	**2.21** (1.99-2.46)	**2.57** (2.30-2.85)	**3.07** (2.73-3.40)	**3.47** (3.08-3.85)	**3.89** (3.42-4.33)	**4.33** (3.78-4.82)	**4.94** (4.26-5.53)	**5.43** (4.63-6.11)
3-hr	**1.58** (1.43-1.76)	**1.93** (1.75-2.15)	**2.45** (2.21-2.73)	**2.86** (2.57-3.17)	**3.42** (3.05-3.80)	**3.89** (3.45-4.32)	**4.37** (3.84-4.86)	**4.88** (4.25-5.43)	**5.59** (4.80-6.26)	**6.17** (5.24-6.95)
6-hr	**2.02** (1.82-2.25)	**2.45** (2.21-2.73)	**3.10** (2.78-3.45)	**3.62** (3.24-4.01)	**4.36** (3.87-4.84)	**4.98** (4.39-5.52)	**5.64** (4.92-6.26)	**6.34** (5.48-7.06)	**7.36** (6.26-8.22)	**8.19** (6.88-9.19)
12-hr	**2.46** (2.22-2.74)	**2.98** (2.69-3.32)	**3.79** (3.40-4.21)	**4.45** (3.99-4.94)	**5.44** (4.82-6.02)	**6.28** (5.53-6.94)	**7.19** (6.25-7.97)	**8.20** (7.03-9.10)	**9.68** (8.15-10.8)	**10.9** (9.07-12.2)
24-hr	**2.79** (2.55-3.06)	**3.39** (3.11-3.72)	**4.37** (4.00-4.79)	**5.21** (4.76-5.70)	**6.49** (5.88-7.07)	**7.60** (6.83-8.26)	**8.85** (7.88-9.61)	**10.2** (9.03-11.1)	**12.4** (10.7-13.4)	**14.2** (12.1-15.4)
2-day	**3.30** (3.02-3.65)	**4.01** (3.67-4.42)	**5.15** (4.70-5.68)	**6.12** (5.56-6.74)	**7.57** (6.84-8.33)	**8.83** (7.92-9.70)	**10.2** (9.09-11.2)	**11.8** (10.3-12.9)	**14.1** (12.2-15.5)	**16.1** (13.7-17.7)
3-day	**3.48** (3.20-3.81)	**4.22** (3.88-4.62)	**5.40** (4.96-5.91)	**6.40** (5.85-7.00)	**7.88** (7.16-8.61)	**9.15** (8.27-9.99)	**10.5** (9.45-11.5)	**12.1** (10.7-13.2)	**14.4** (12.6-15.8)	**16.4** (14.1-18.0)
4-day	**3.65** (3.37-3.98)	**4.43** (4.09-4.82)	**5.65** (5.21-6.14)	**6.68** (6.14-7.25)	**8.19** (7.49-8.89)	**9.48** (8.61-10.3)	**10.9** (9.82-11.8)	**12.4** (11.1-13.5)	**14.7** (13.0-16.0)	**16.7** (14.5-18.2)
7-day	**4.25** (3.94-4.58)	**5.11** (4.75-5.52)	**6.41** (5.95-6.92)	**7.51** (6.95-8.09)	**9.09** (8.37-9.79)	**10.4** (9.55-11.2)	**11.9** (10.8-12.8)	**13.5** (12.1-14.5)	**15.8** (14.0-17.1)	**17.7** (15.5-19.2)
10-day	**4.78** (4.47-5.12)	**5.73** (5.36-6.13)	**7.07** (6.61-7.58)	**8.19** (7.64-8.77)	**9.78** (9.09-10.5)	**11.1** (10.3-11.9)	**12.5** (11.5-13.4)	**14.0** (12.8-15.1)	**16.3** (14.6-17.5)	**18.1** (16.1-19.6)
20-day	**6.46** (6.09-6.86)	**7.68** (7.24-8.16)	**9.23** (8.69-9.79)	**10.5** (9.84-11.1)	**12.1** (11.4-12.9)	**13.5** (12.6-14.3)	**14.8** (13.8-15.7)	**16.2** (15.0-17.2)	**18.2** (16.6-19.3)	**19.7** (17.9-21.0)
30-day	**8.01** (7.61-8.45)	**9.48** (9.00-10.0)	**11.2** (10.6-11.8)	**12.5** (11.8-13.2)	**14.3** (13.5-15.0)	**15.6** (14.7-16.5)	**17.0** (15.9-17.9)	**18.3** (17.1-19.3)	**20.1** (18.7-21.3)	**21.5** (19.8-22.8)
45-day	**10.2** (9.67-10.7)	**12.0** (11.4-12.6)	**13.9** (13.2-14.6)	**15.4** (14.6-16.2)	**17.3** (16.4-18.2)	**18.8** (17.8-19.7)	**20.2** (19.0-21.2)	**21.6** (20.3-22.7)	**23.3** (21.8-24.6)	**24.6** (22.9-26.0)
60-day	**12.2** (11.6-12.8)	**14.3** (13.6-15.0)	**16.4** (15.6-17.2)	**18.0** (17.1-18.9)	**20.0** (19.0-21.0)	**21.5** (20.4-22.5)	**22.9** (21.6-24.0)	**24.2** (22.8-25.4)	**25.8** (24.3-27.2)	**27.0** (25.3-28.5)

[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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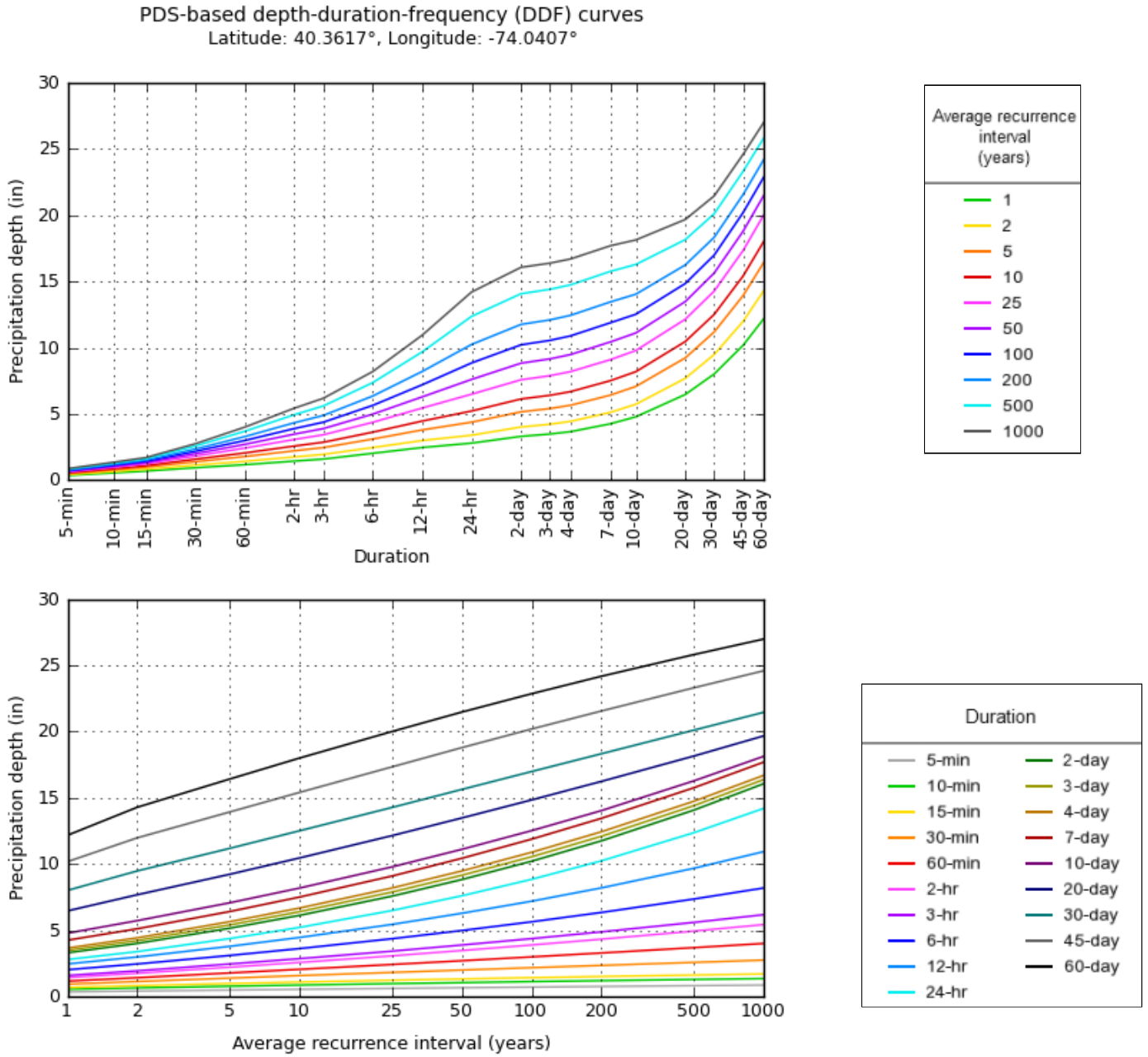
PF graphical



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Created (GMT): Fri May 14 14:31:23 2021

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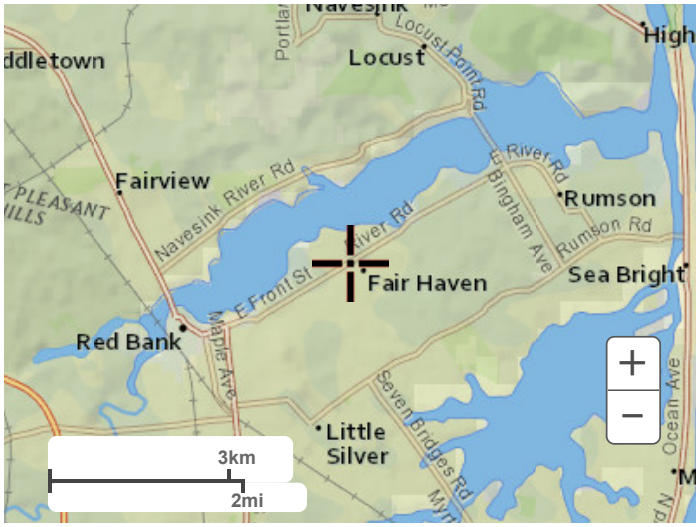
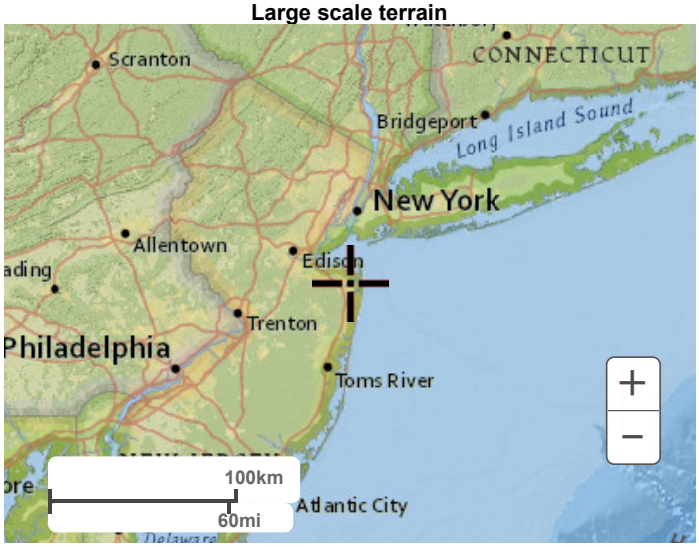
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

EXISTING DRAINAGE CONDITIONS

M&M REALTY PARTNERS AT FAIR HAVEN, LLC
BOROUGH OF FAIR HAVEN
BLOCK 31, LOT 1

"B" Soils: FfrC

						wq	2	10	25	100
					"I"	1.25	3.38	5.21	6.48	8.84
STUDY AREA	**COVERAGE TYPE**	**AREA**	**C**	**Cw**	**Tc**	**Qwq**	**Q2**	**Q10**	**Q25**	**Q100**
Existing Area #1	Impervious	0.620	**98**		**6**	0.67	1.99	3.15	3.96	5.47
	Lawn (B)	0.068	69							
		0.688		95						
Existing Area #2	Lawn (B)	0.096	69		6	0.00	0.09	0.23	0.34	0.55
		0.096		69						
TOTAL TO STUDY	Impervious	0.620	98		**6**	**0.67**	**2.08**	**3.37**	**4.29**	**6.02**
POINT #1	Lawn (B)	0.164	69							
		0.784		**92**						
Existing Area #4	Impervious	0.079	98		6	0.09	0.26	0.41	0.51	0.71
	Lawn (B)	0.011	69							
		0.090		94						
TOTAL TO STUDY	Impervious	0.079	98		**6**	**0.09**	**0.26**	**0.41**	**0.51**	**0.71**
POINT #2	Lawn (B)	0.011	69							
		0.090		**94**						
TOTAL SITE	Impervious	0.699	98		**6**	**0.76**	**2.33**	**3.78**	**4.81**	**6.73**
	Lawn (B)	0.175	69							
		0.874		**92**						

PROPOSED DRAINAGE CONDITIONS

M&M REALTY PARTNERS AT FAIR HAVEN, LLC

BOROUGH OF FAIR HAVEN

BLOCK 31, LOT 1

	"B" Soils: FfrC					wq	2	10	25	100
					"I"	1.25	3.38	5.21	6.48	8.84
STUDY AREA	**COVERAGE TYPE**	**AREA**	**C**	**Cw**	**Tc**	**Qwq**	**Q2**	**Q10**	**Q25**	**Q100**
Bypass Area #1	Lawn (B)	0.042	61		6	0.00	0.02	0.07	0.11	0.20
		0.042		61						
Bypass Area #2	Impervious	0.265	98		6	0.29	0.83	1.30	1.63	2.24
	Lawn (B)	0.014	61							
		0.279		96						
TOTAL TO STUDY POINT #1	Impervious	0.265	98		**6**	**0.29**	**0.85**	**1.37**	**1.74**	**2.43**
	Lawn (B)	0.056	61							
		0.321		**92**						
Drainage Area #1	Impervious	0.118	98		6	0.13	0.37	0.57	0.71	0.98
	Lawn (B)	0.002	61							
		0.120		97						
Drainage Area #2	Impervious	0.056	98		6	0.06	0.18	0.28	0.35	0.49
	Lawn (B)	0.006	61							
		0.062		94						
Drainage Area #3	Impervious	0.029	98		6	0.03	0.10	0.17	0.23	0.33
	Lawn (B)	0.020	61							
		0.049		83						
Roof Area #1a	Impervious	0.119	98		6	0.13	0.37	0.57	0.71	0.98
		0.119		98						
Roof Area #1b	Impervious	0.144	98		6	0.16	0.45	0.69	0.86	1.18
		0.144		98						
Bypass Area #3	Impervious	0.055	98		6	0.06	0.17	0.27	0.34	0.47
	Lawn (B)	0.004	61							
		0.059		95						
TOTAL TO STUDY POINT #2	Impervious	0.521	98		**6**	**0.06**	**1.05**	**1.65**	**2.03**	**2.71**
	Lawn (B)	0.032	61							
		0.553		**96**						
OVERALL SITE	Impervious	0.786	98		**6**	**0.35**	**1.88**	**2.99**	**3.72**	**5.07**
	Lawn (B)	0.088	61							
		0.874		**94**						

SUMMARY OF PROPOSED BASINS A & B

M&M REALTY PARTNERS AT FAIR HAVEN, LLC
BOROUGH OF FAIR HAVEN
BLOCK 31, LOT 1

						Qwq	Q2	Q10	Q25	Q100
TOTAL TO BASIN A	Impervious	0.347	98		**6**	**0.06**	**1.05**	**1.77**	**2.24**	**3.01**
	Lawn (B)	0.028	61							
		0.375		**95**						
TOTAL TO BASIN B	Impervious	0.119	98		**6**	**0.06**	**1.05**	**1.77**	**2.24**	**3.01**
		0.119		**98**						

BASIN DISCHARGES

BASIN	Qwq	Q2	Q10	Q25	Q100
Small-scale Bioretention Basin A	0.00	0.89	1.40	1.72	2.31
Small-scale Infiltration Basin B	0.00	0.00	0.00	0.00	0.00

WATER SURFACE ELEVATION

BASIN	Qwq	Q2	Q10	Q25	Q100
Small-scale Bioretention Basin A	18.58	19.14	19.39	19.61	20.10
Small-scale Infiltration Basin B	15.99	16.42	17.08	17.56	18.24

SUMMARY OF DRAINAGE CONDITIONS

M&M REALTY PARTNERS AT FAIR HAVEN, LLC
BOROUGH OF FAIR HAVEN
BLOCK 31, LOT 1

STUDY POINT #1

	Qwq	Q2	Q10	Q25	Q100
Existing Flows to Study Point #1	0.67	2.08	3.37	4.29	6.02
Proposed Conditions					
Total Post Developed Combined Flows To Study Point #1	**0.29**	**0.85**	**1.37**	**1.74**	**2.43**

STUDY POINT #2

	Qwq	Q2	Q10	Q25	Q100
Existing Flows to Study Point #2	0.09	0.26	0.41	0.51	0.71
Proposed Conditions					
Total Post Developed Combined Flows To Study Point #2	**0.06**	**1.05**	**1.65**	**2.03**	**2.71**

OVERALL SITE

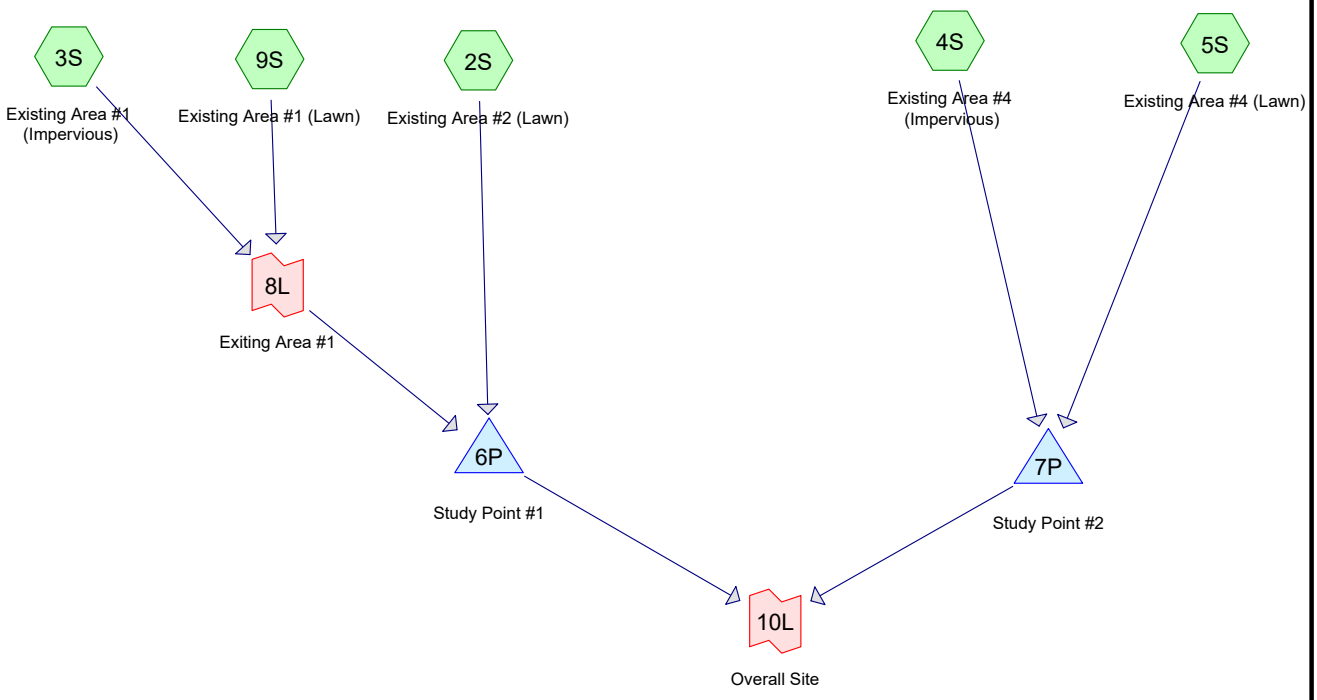
	Qwq	Q2	Q10	Q25	Q100
Existing Flows	0.76	2.33	3.78	4.81	6.73
0.699 ac. impervious coverage					
Proposed Flows	0.35	1.88	2.99	3.72	5.07
0.786 ac. impervious coverage					
Actual Percent of Existing		**80.7%**	**79.1%**		**75.3%**

C. EXISTING STORMWATER CONDITIONS

The project site is currently vacant and stormwater runoff generated from the site flows overland and is collected by an off-site drainage system. Stormwater runoff will generally flow overland in a northly direction across the project area, eventually draining to Study Points #1 and #2. All stormwater will eventually discharge into the Navesink River, which is a tidal body of water that does not require quantity reductions to be met.

For the purposes of this analysis, the project area is considered a redevelopment in an urban area with approximately 80% existing impervious coverage due to the previous onsite improvements. However, there are no existing onsite drainage improvements and the area is not physically connected to any existing stormwater management system.

Please refer to the existing drainage area map included in Appendix H.



Subcat Reach Pond Link

Routing Diagram for Existing Flows
Prepared by EP Design Services, LLC, Printed 6/24/2021
HydroCAD® 10.10-6a s/n 09902 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQ	NOAA 24-hr	D	Default	24.00	1	1.25	2
2	2 Year	NOAA 24-hr	D	Default	24.00	1	3.38	2
3	10 Year	NOAA 24-hr	D	Default	24.00	1	5.21	2
4	25 Year	NOAA 24-hr	D	Default	24.00	1	6.48	2
5	100 Year	NOAA 24-hr	D	Default	24.00	1	8.84	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.175	69	50-75% Grass cover, Fair, HSG B (2S, 5S, 9S)
0.699	98	Unconnected pavement, HSG B (3S, 4S)
0.874	**92**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.874	HSG B	2S, 3S, 4S, 5S, 9S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.874		**TOTAL AREA**

Summary for Subcatchment 2S: Existing Area #2 (Lawn)

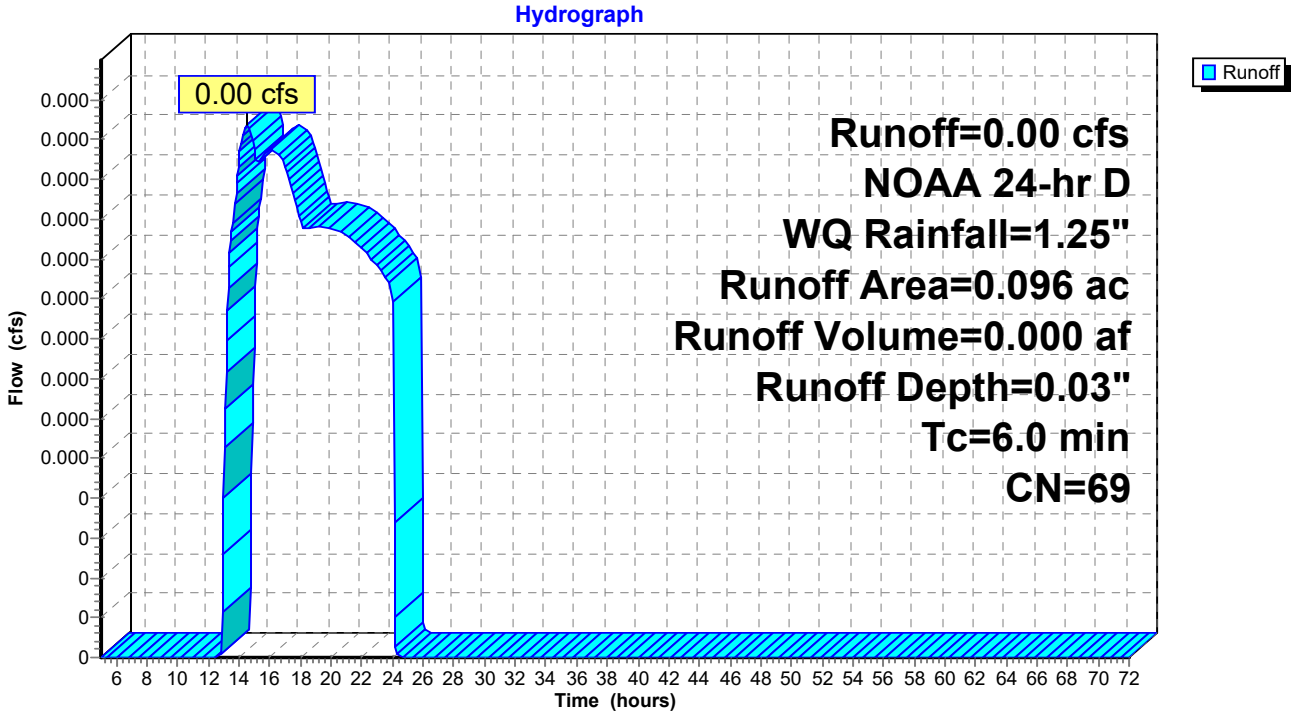
Runoff = 0.00 cfs @ 14.54 hrs, Volume= 0.000 af, Depth= 0.03"
Routed to Pond 6P : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.096	69	50-75% Grass cover, Fair, HSG B
0.096		100.00% Pervious Area

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

Subcatchment 2S: Existing Area #2 (Lawn)



Summary for Subcatchment 3S: Existing Area #1 (Impervious)

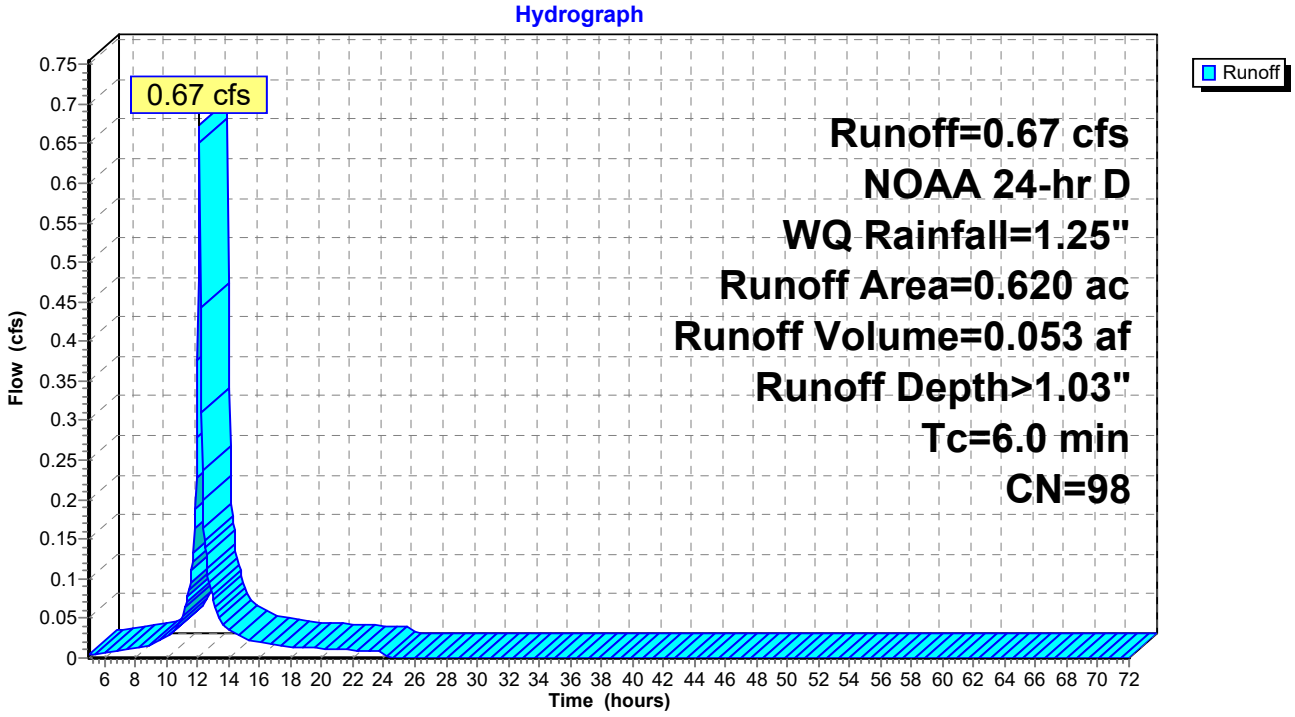
Runoff = 0.67 cfs @ 12.13 hrs, Volume= 0.053 af, Depth> 1.03"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.620	98	Unconnected pavement, HSG B
0.620		100.00% Impervious Area
0.620		100.00% Unconnected

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

Subcatchment 3S: Existing Area #1 (Impervious)



Summary for Subcatchment 4S: Existing Area #4 (Impervious)

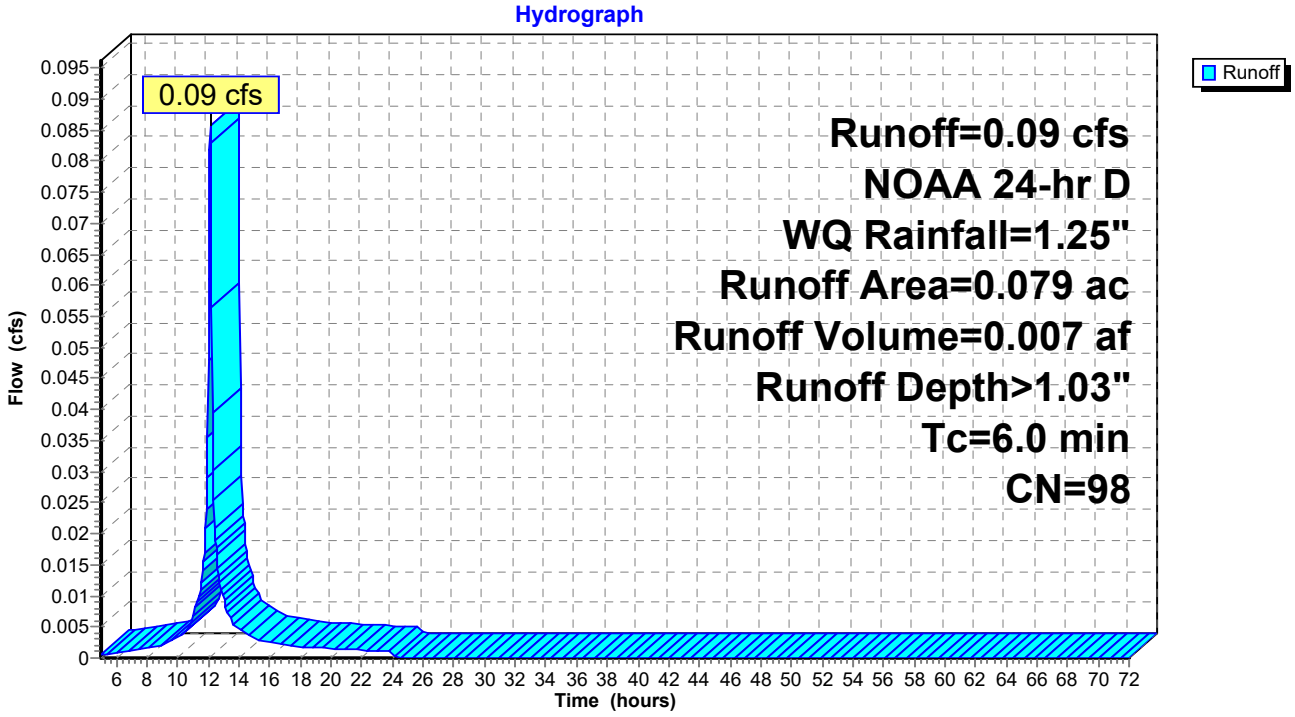
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.007 af, Depth> 1.03"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.079	98	Unconnected pavement, HSG B
0.079		100.00% Impervious Area
0.079		100.00% Unconnected

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

Subcatchment 4S: Existing Area #4 (Impervious)



Summary for Subcatchment 5S: Existing Area #4 (Lawn)

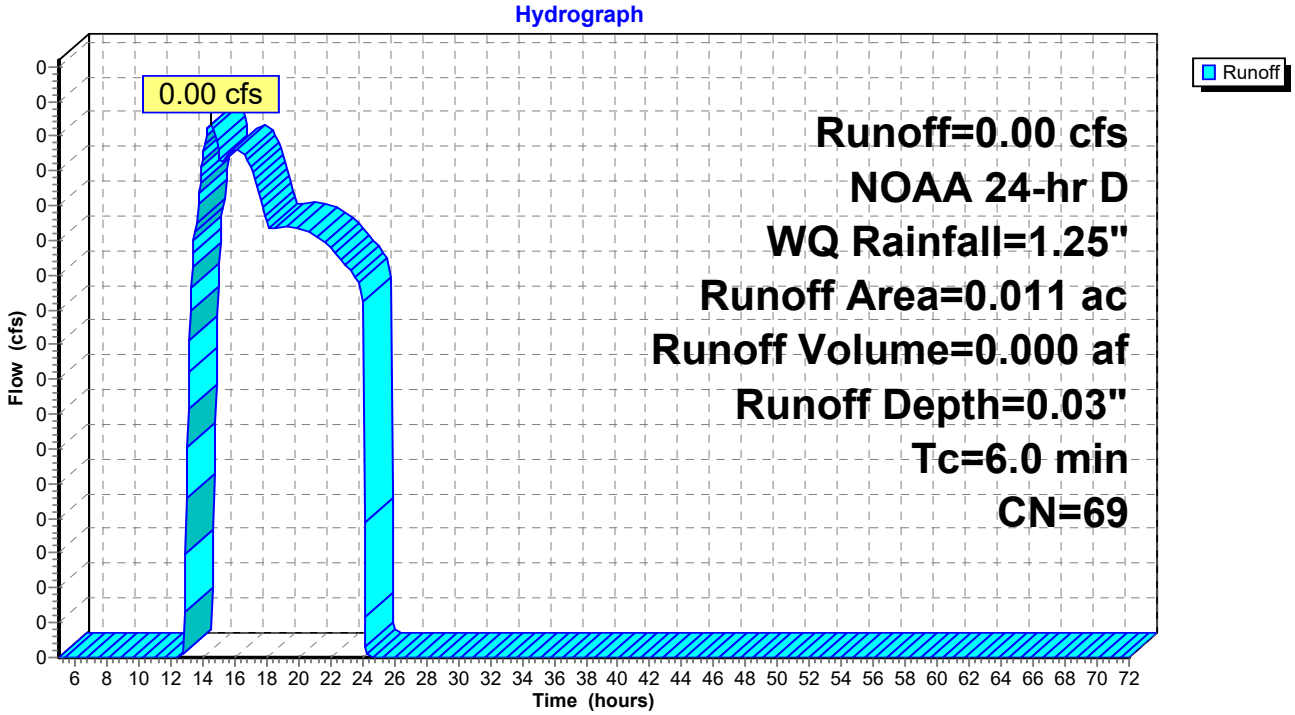
Runoff = 0.00 cfs @ 14.54 hrs, Volume= 0.000 af, Depth= 0.03"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.011	69	50-75% Grass cover, Fair, HSG B
0.011		100.00% Pervious Area

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

Subcatchment 5S: Existing Area #4 (Lawn)



Summary for Subcatchment 9S: Existing Area #1 (Lawn)

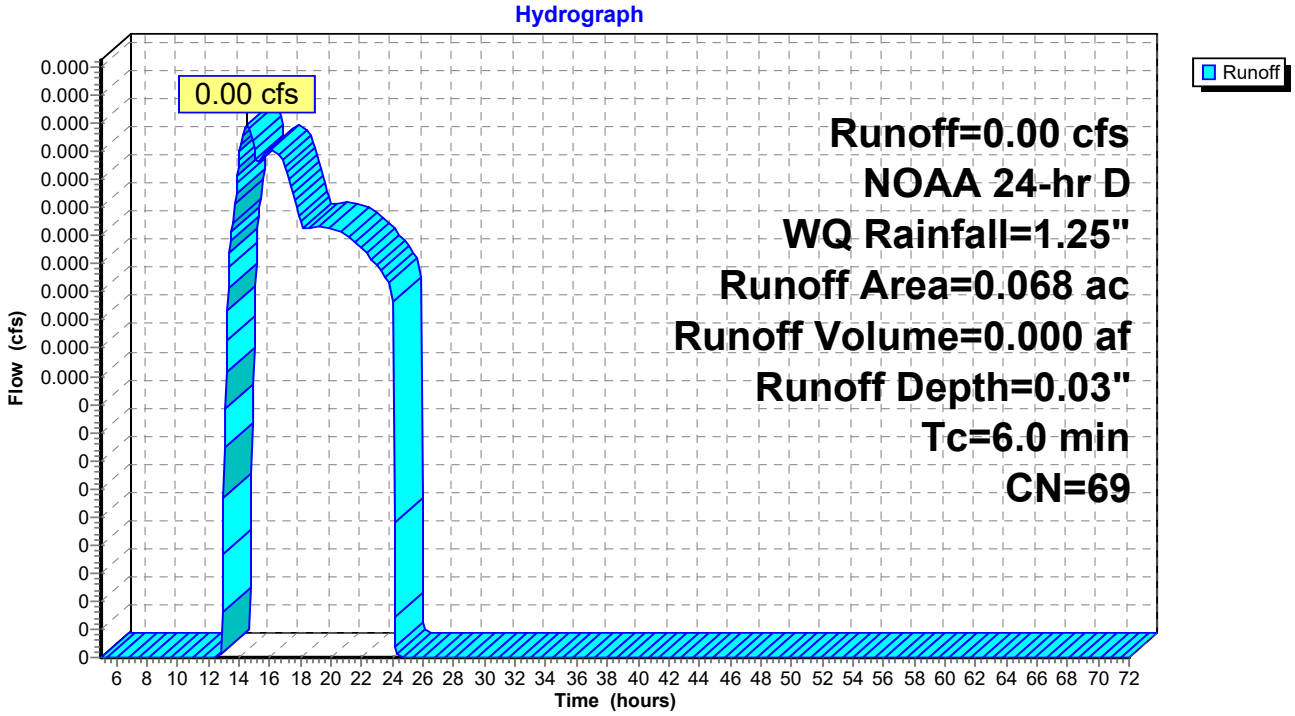
Runoff = 0.00 cfs @ 14.54 hrs, Volume= 0.000 af, Depth= 0.03"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.068	69	50-75% Grass cover, Fair, HSG B
0.068		100.00% Pervious Area

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

Subcatchment 9S: Existing Area #1 (Lawn)

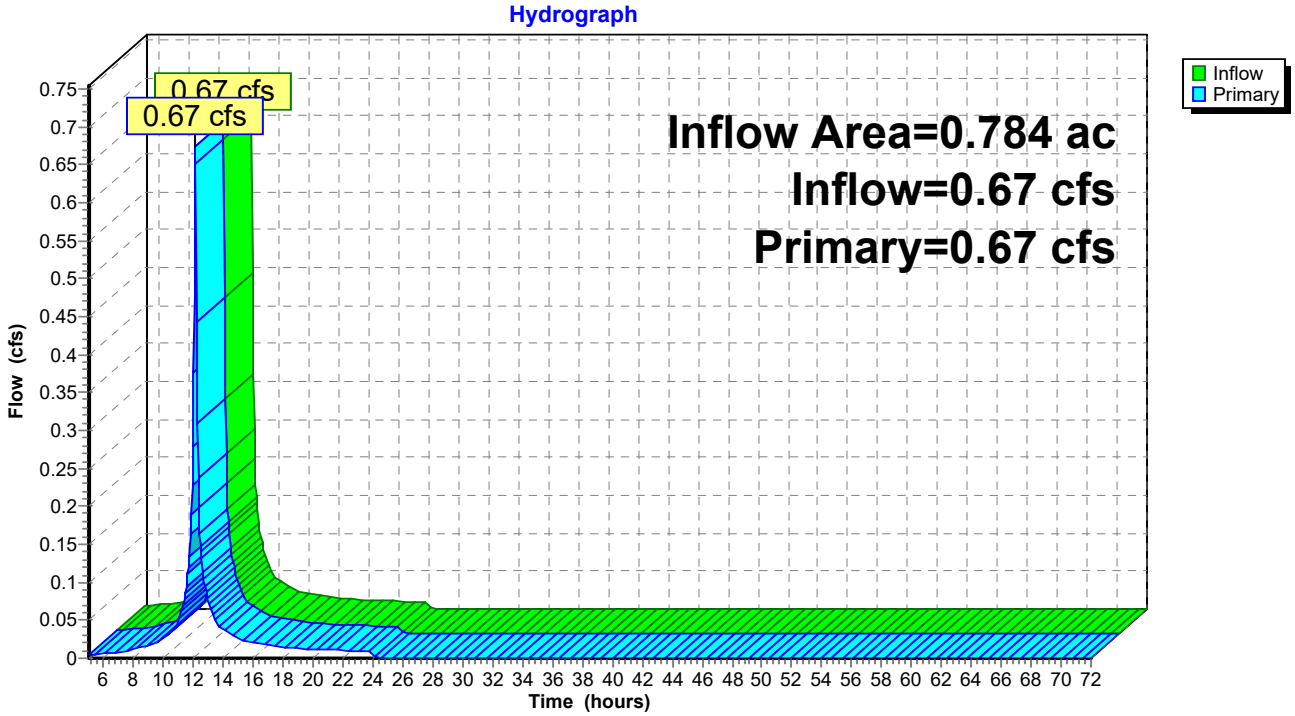


Summary for Pond 6P: Study Point #1

Inflow Area = 0.784 ac, 79.08% Impervious, Inflow Depth > 0.82" for WQ event
Inflow = 0.67 cfs @ 12.13 hrs, Volume= 0.053 af
Primary = 0.67 cfs @ 12.13 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 6P: Study Point #1

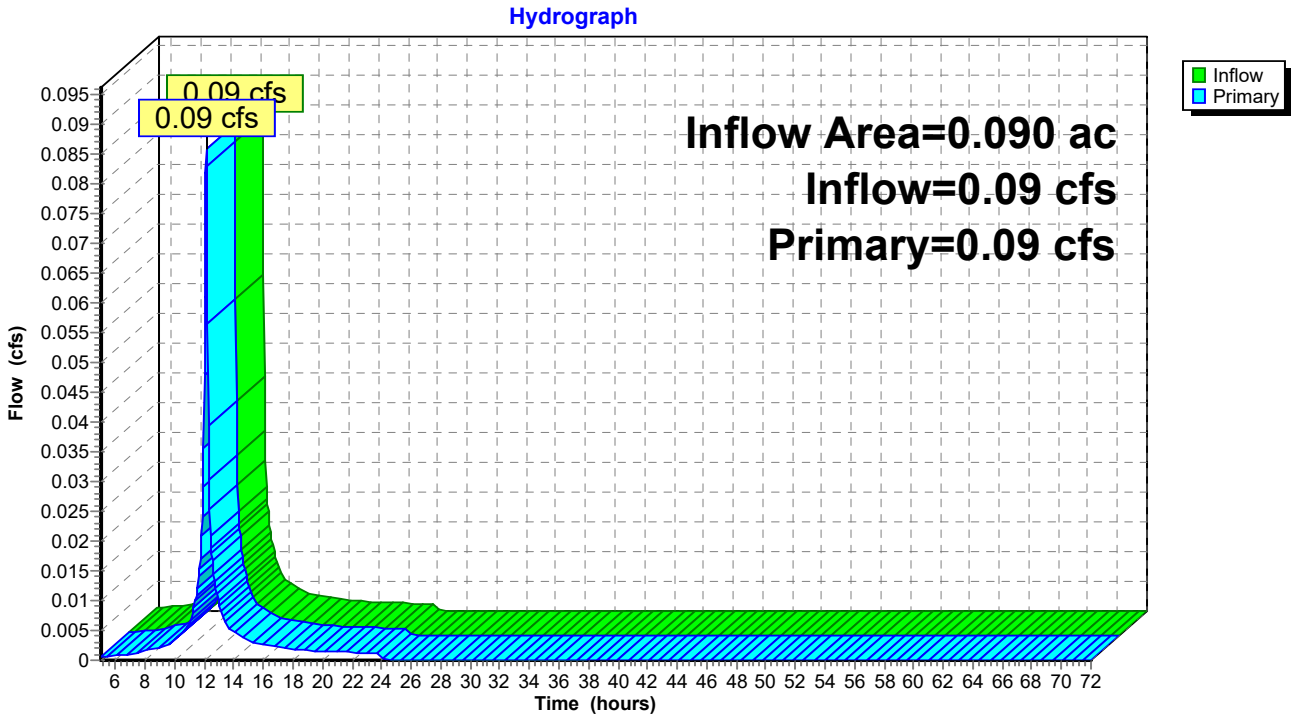


Summary for Pond 7P: Study Point #2

Inflow Area = 0.090 ac, 87.78% Impervious, Inflow Depth > 0.90" for WQ event
Inflow = 0.09 cfs @ 12.13 hrs, Volume= 0.007 af
Primary = 0.09 cfs @ 12.13 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 7P: Study Point #2

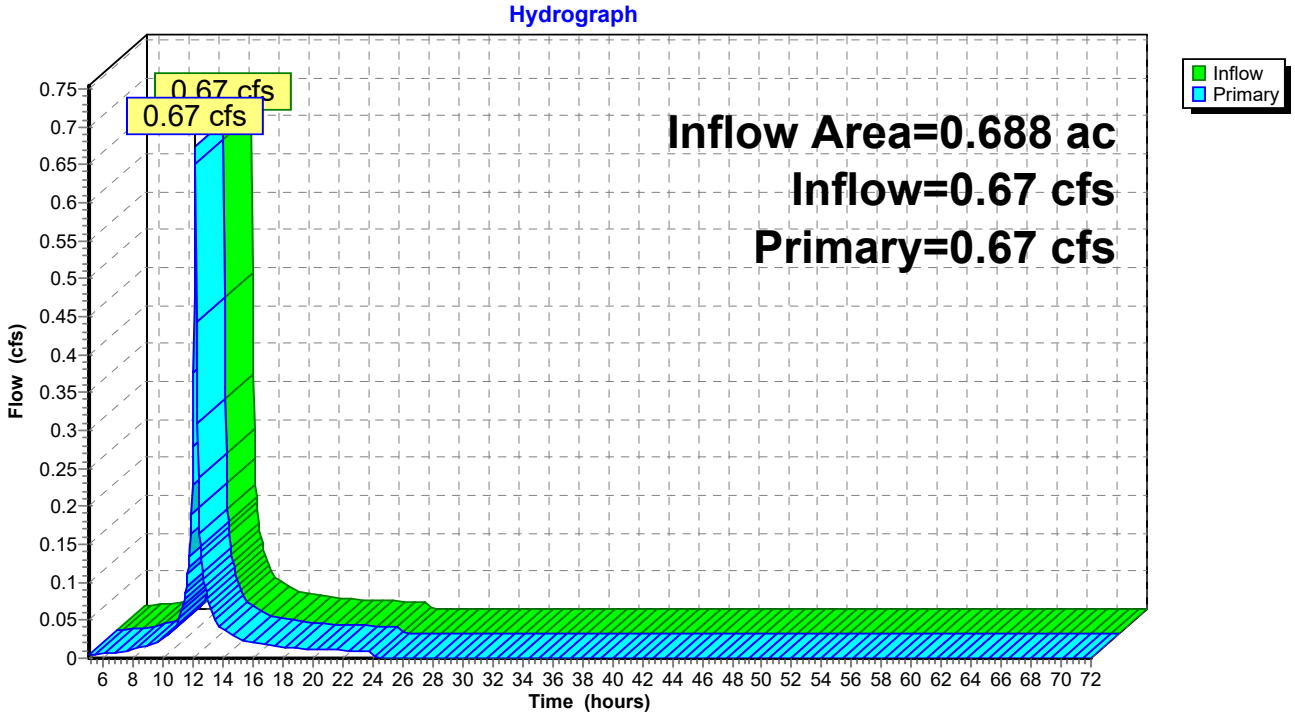


Summary for Link 8L: Exiting Area #1

Inflow Area = 0.688 ac, 90.12% Impervious, Inflow Depth > 0.93" for WQ event
Inflow = 0.67 cfs @ 12.13 hrs, Volume= 0.053 af
Primary = 0.67 cfs @ 12.13 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 6P : Study Point #1

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 8L: Exiting Area #1

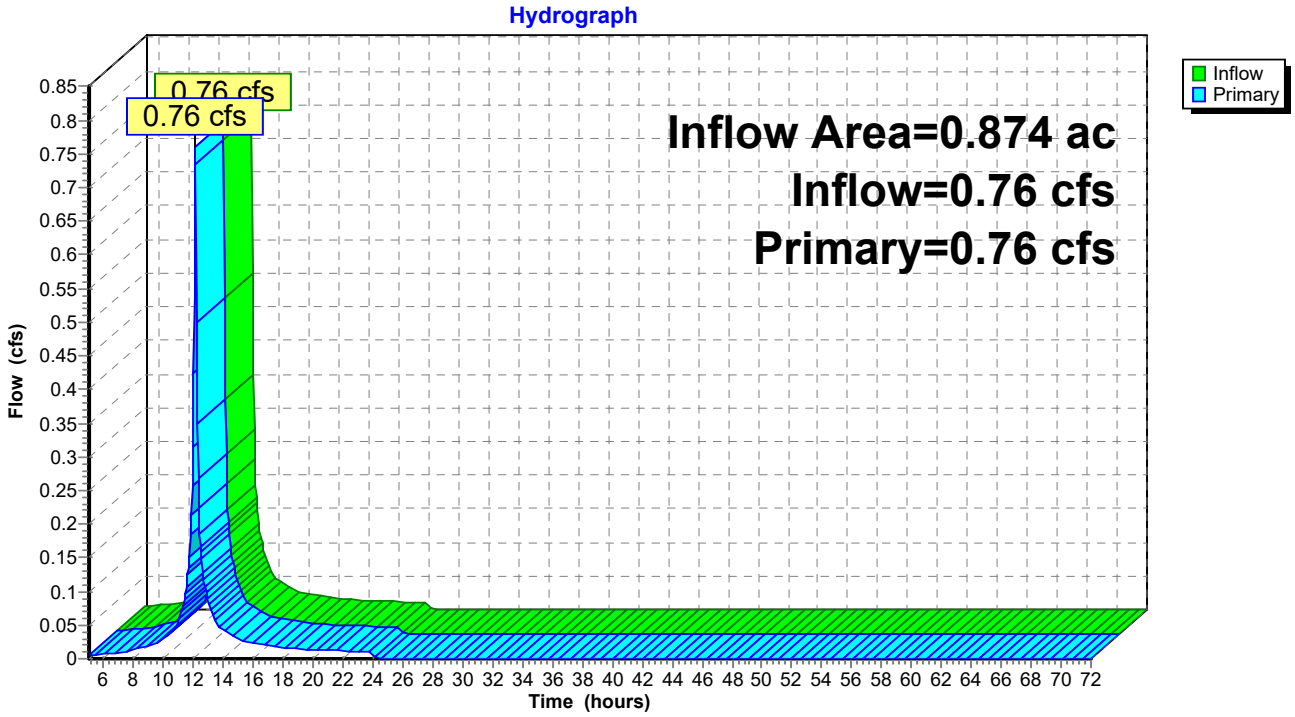


Summary for Link 10L: Overall Site

Inflow Area = 0.874 ac, 79.98% Impervious, Inflow Depth > 0.83" for WQ event
Inflow = 0.76 cfs @ 12.13 hrs, Volume= 0.060 af
Primary = 0.76 cfs @ 12.13 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 10L: Overall Site



Summary for Subcatchment 2S: Existing Area #2 (Lawn)

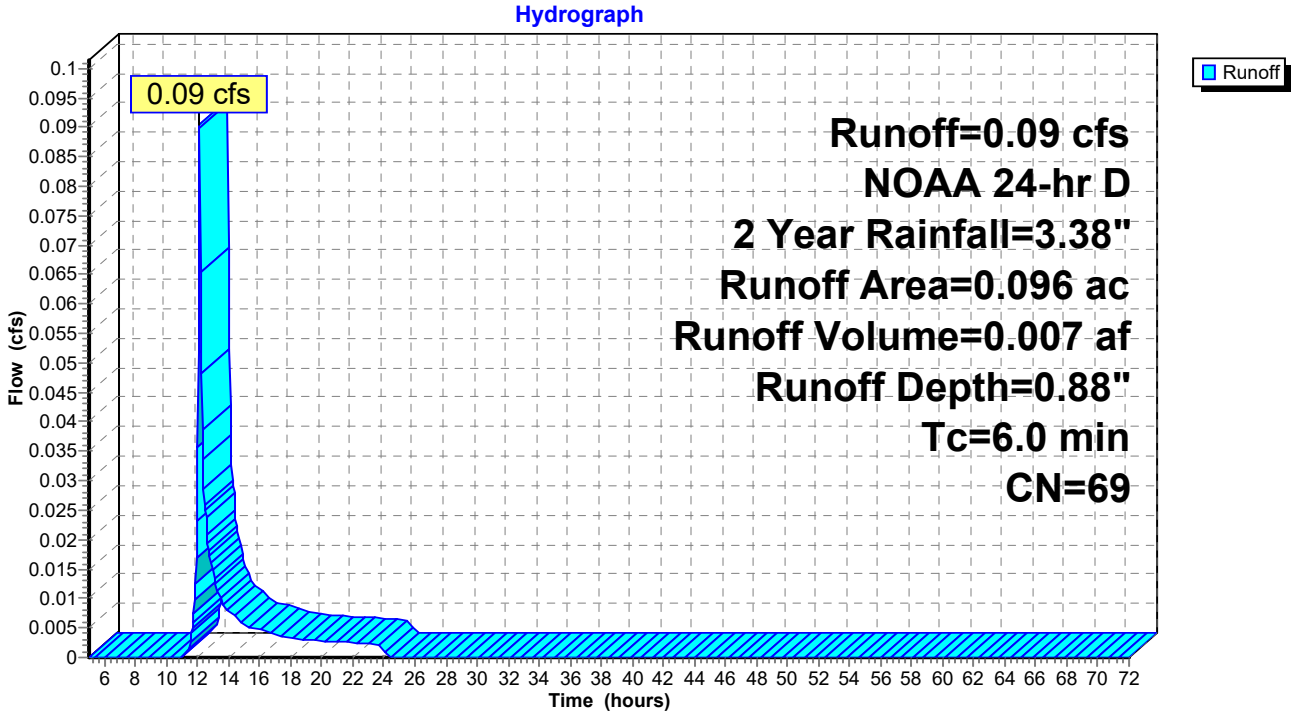
Runoff = 0.09 cfs @ 12.14 hrs, Volume= 0.007 af, Depth= 0.88"
Routed to Pond 6P : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.38"

Area (ac)	CN	Description
0.096	69	50-75% Grass cover, Fair, HSG B
0.096		100.00% Pervious Area

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

Subcatchment 2S: Existing Area #2 (Lawn)



Summary for Subcatchment 3S: Existing Area #1 (Impervious)

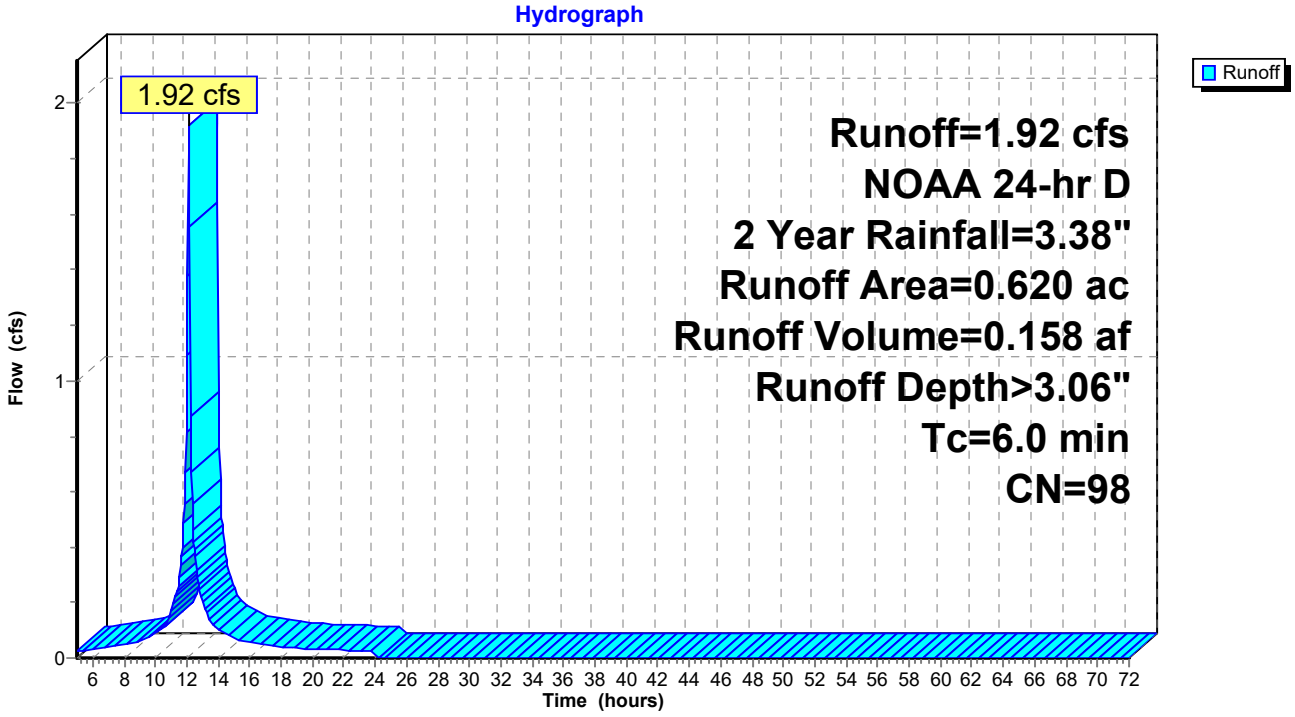
Runoff = 1.92 cfs @ 12.13 hrs, Volume= 0.158 af, Depth> 3.06"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.38"

Area (ac)	CN	Description
0.620	98	Unconnected pavement, HSG B
0.620		100.00% Impervious Area
0.620		100.00% Unconnected

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

Subcatchment 3S: Existing Area #1 (Impervious)



Summary for Subcatchment 4S: Existing Area #4 (Impervious)

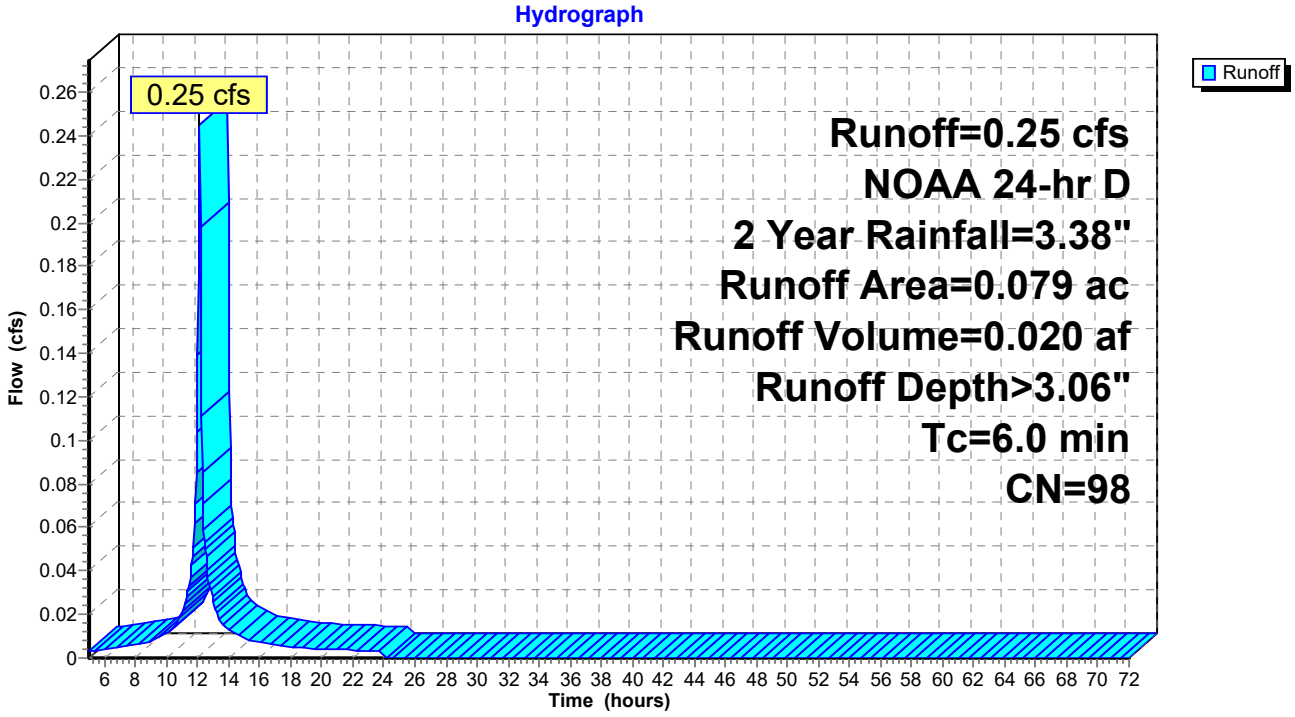
Runoff = 0.25 cfs @ 12.13 hrs, Volume= 0.020 af, Depth> 3.06"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.38"

Area (ac)	CN	Description
0.079	98	Unconnected pavement, HSG B
0.079		100.00% Impervious Area
0.079		100.00% Unconnected

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

Subcatchment 4S: Existing Area #4 (Impervious)



Summary for Subcatchment 5S: Existing Area #4 (Lawn)

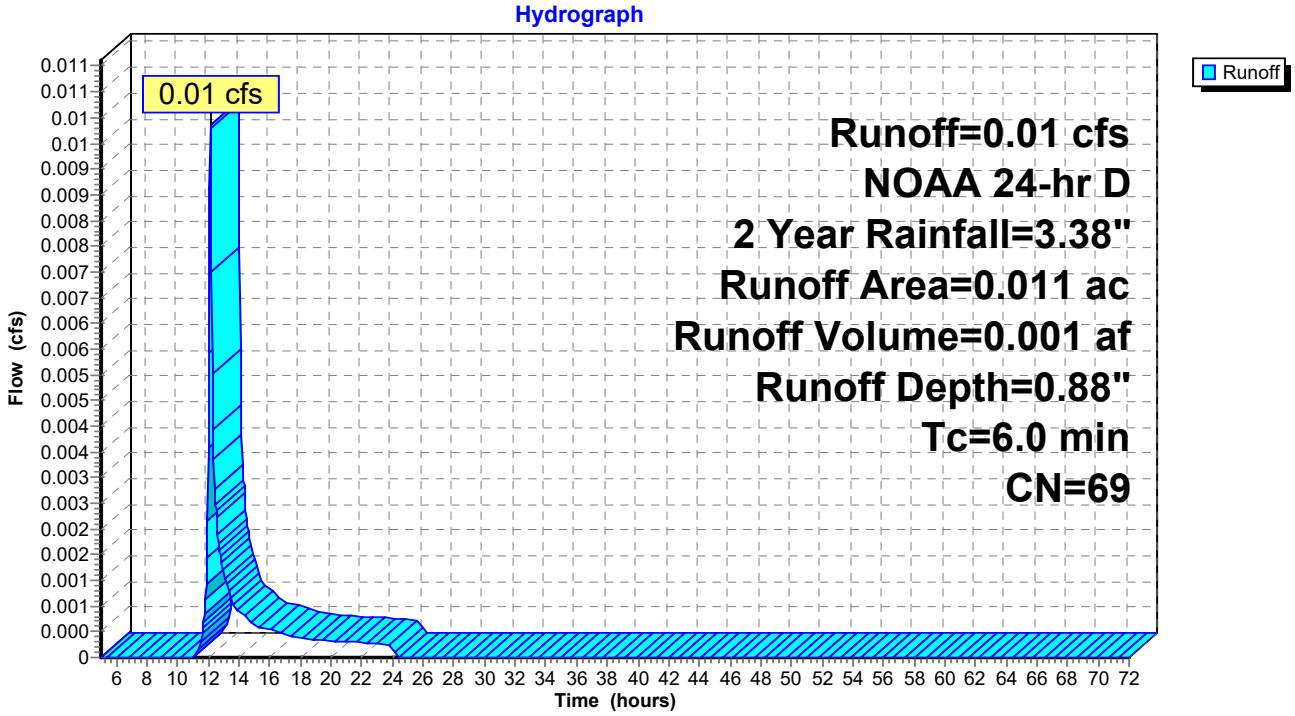
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 0.88"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.38"

Area (ac)	CN	Description
0.011	69	50-75% Grass cover, Fair, HSG B
0.011		100.00% Pervious Area

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

Subcatchment 5S: Existing Area #4 (Lawn)



Summary for Subcatchment 9S: Existing Area #1 (Lawn)

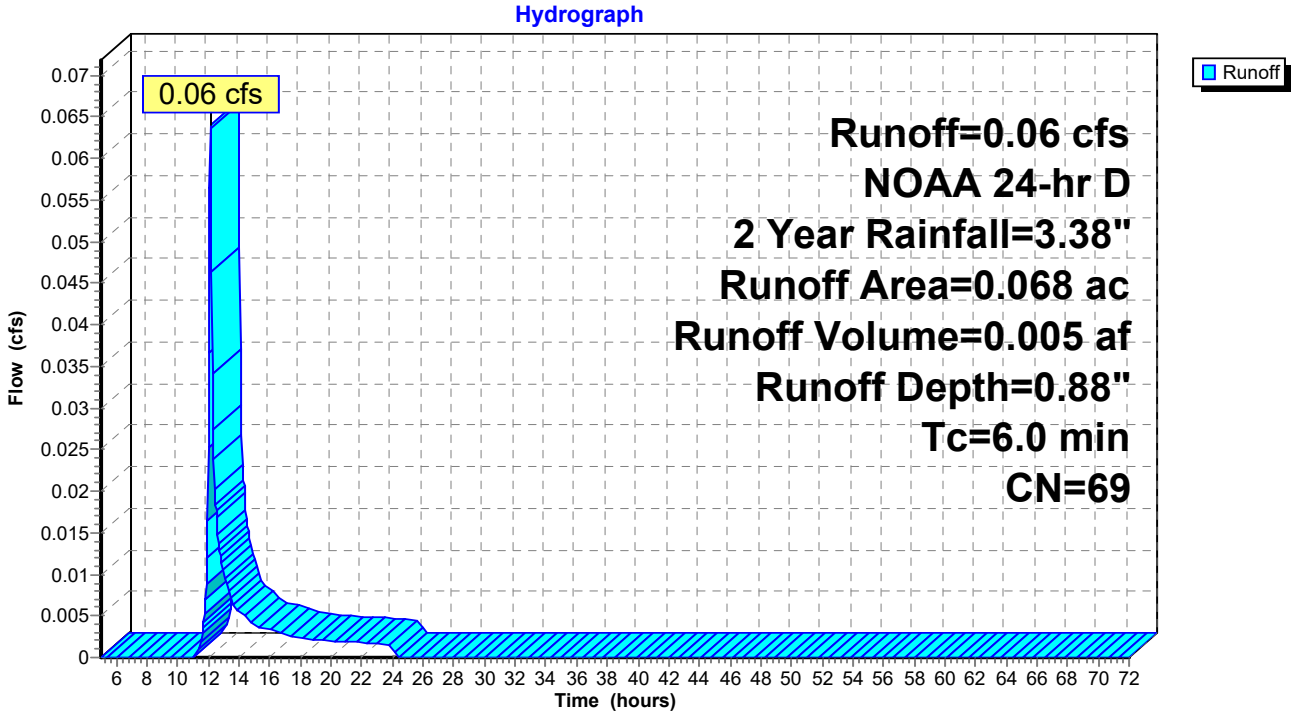
Runoff = 0.06 cfs @ 12.14 hrs, Volume= 0.005 af, Depth= 0.88"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.38"

Area (ac)	CN	Description
0.068	69	50-75% Grass cover, Fair, HSG B
0.068		100.00% Pervious Area

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

Subcatchment 9S: Existing Area #1 (Lawn)

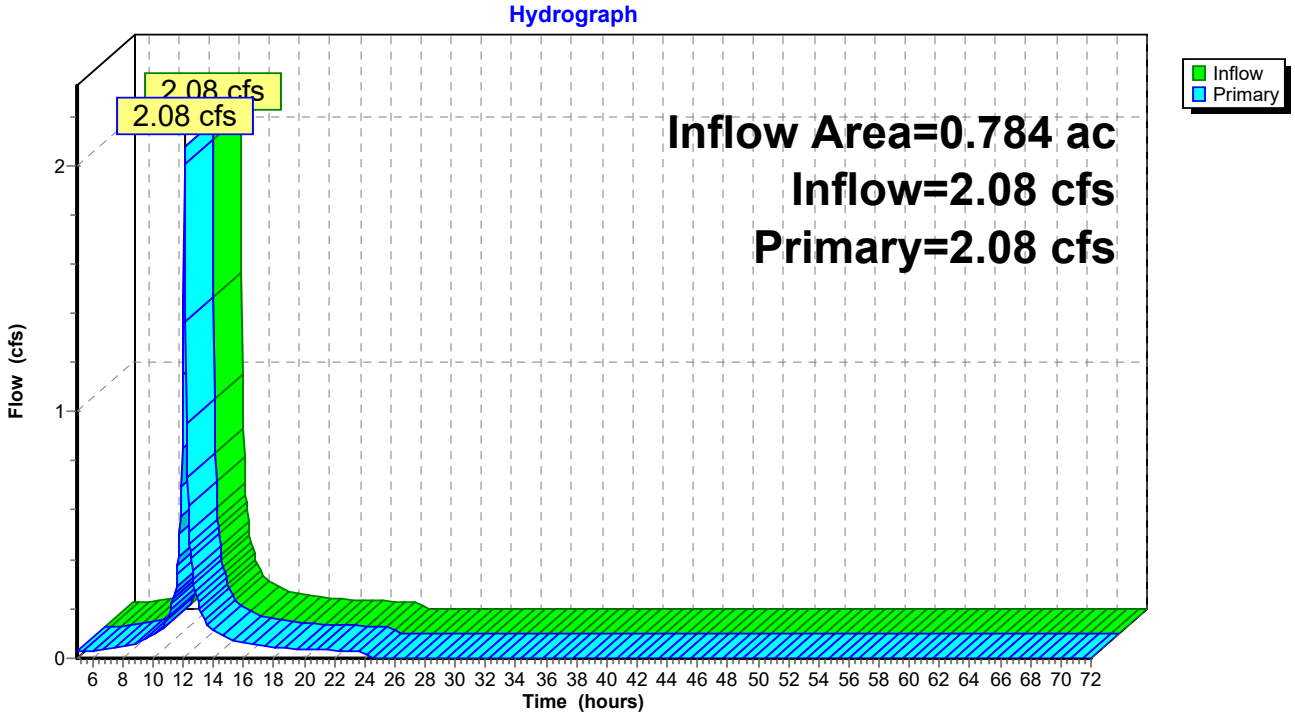


Summary for Pond 6P: Study Point #1

Inflow Area = 0.784 ac, 79.08% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 2.08 cfs @ 12.13 hrs, Volume= 0.170 af
Primary = 2.08 cfs @ 12.13 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 6P: Study Point #1

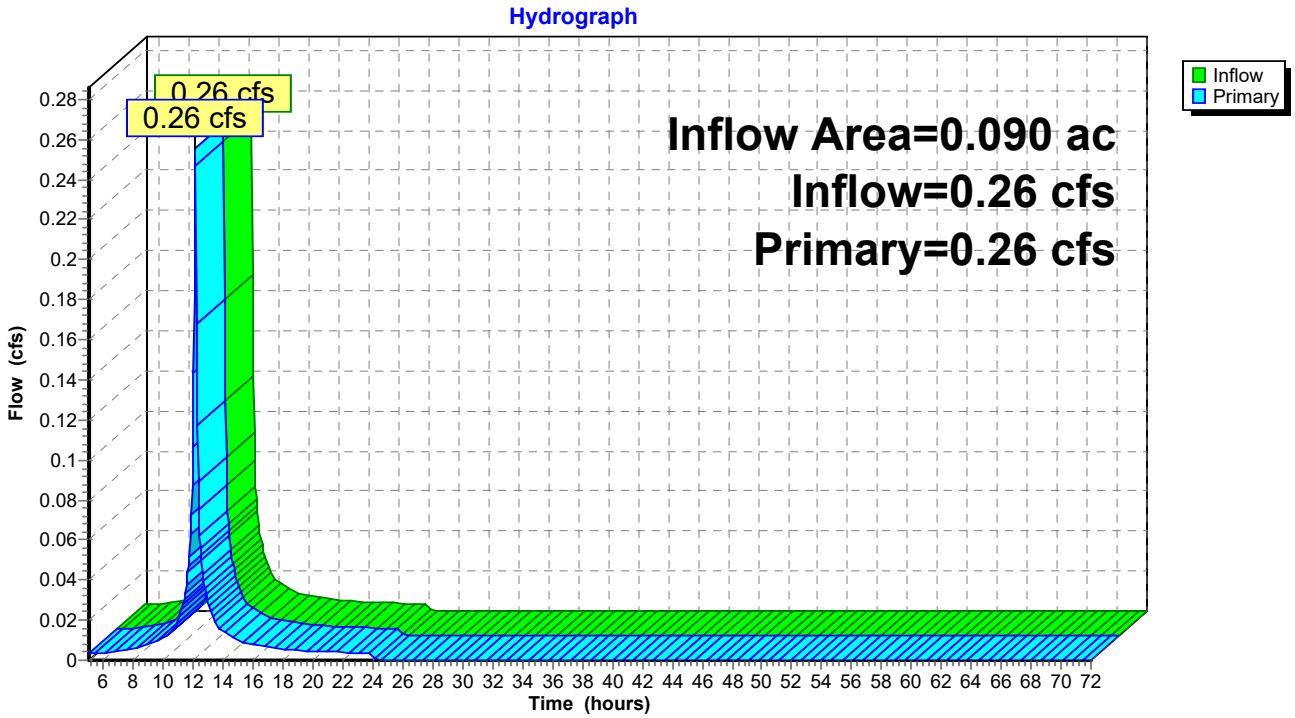


Summary for Pond 7P: Study Point #2

Inflow Area = 0.090 ac, 87.78% Impervious, Inflow Depth > 2.79" for 2 Year event
Inflow = 0.26 cfs @ 12.13 hrs, Volume= 0.021 af
Primary = 0.26 cfs @ 12.13 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 7P: Study Point #2

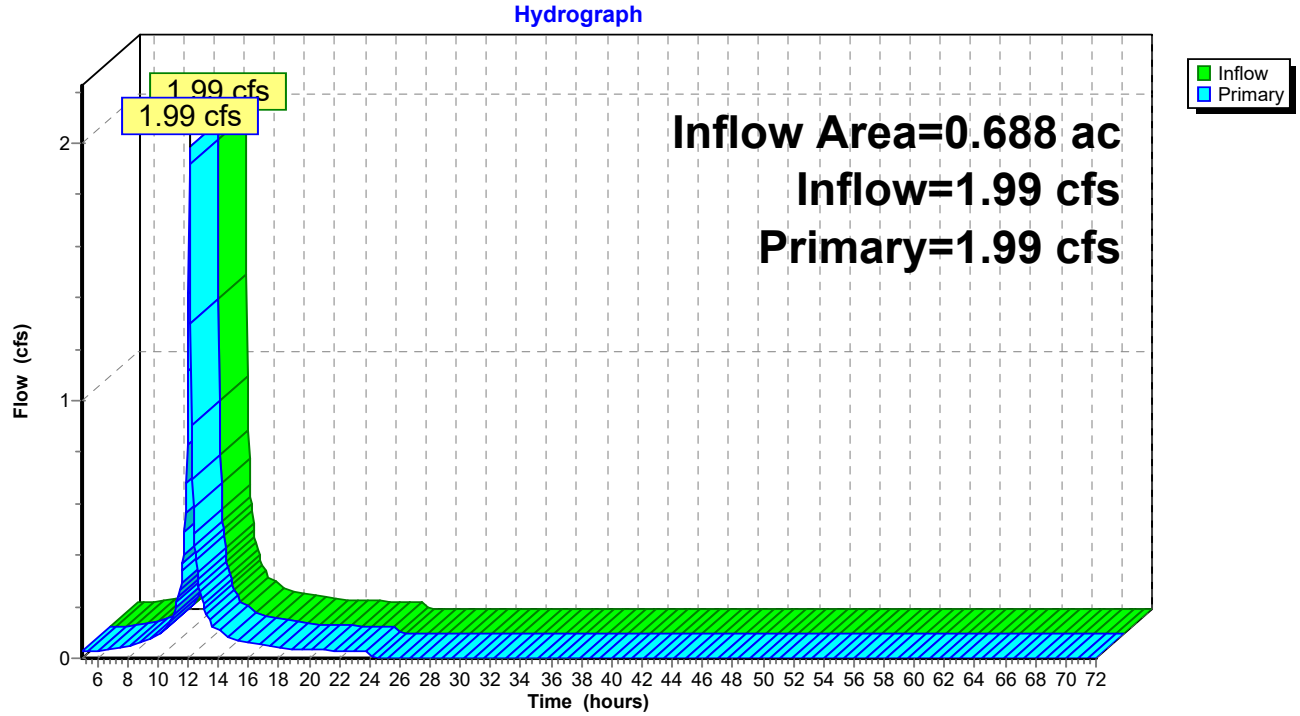


Summary for Link 8L: Exiting Area #1

Inflow Area = 0.688 ac, 90.12% Impervious, Inflow Depth > 2.84" for 2 Year event
Inflow = 1.99 cfs @ 12.13 hrs, Volume= 0.163 af
Primary = 1.99 cfs @ 12.13 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 6P : Study Point #1

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 8L: Exiting Area #1

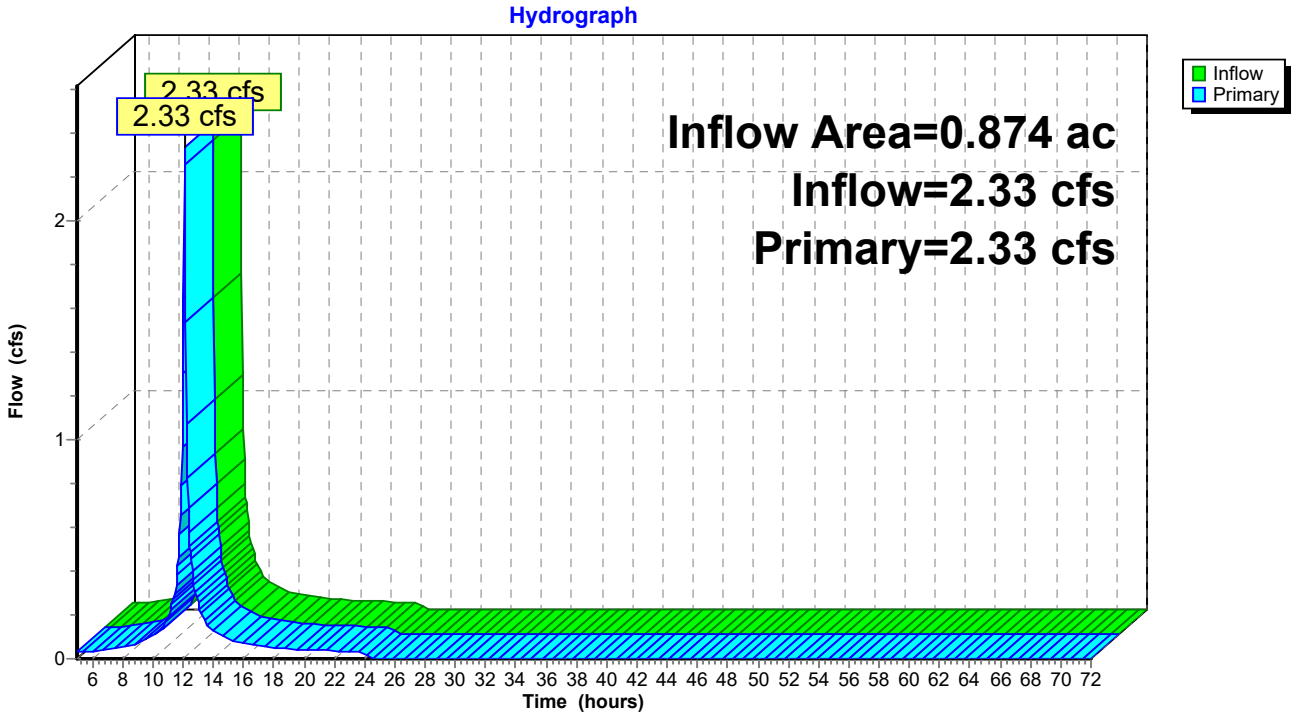


Summary for Link 10L: Overall Site

Inflow Area = 0.874 ac, 79.98% Impervious, Inflow Depth > 2.62" for 2 Year event
Inflow = 2.33 cfs @ 12.13 hrs, Volume= 0.191 af
Primary = 2.33 cfs @ 12.13 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 10L: Overall Site



Summary for Subcatchment 2S: Existing Area #2 (Lawn)

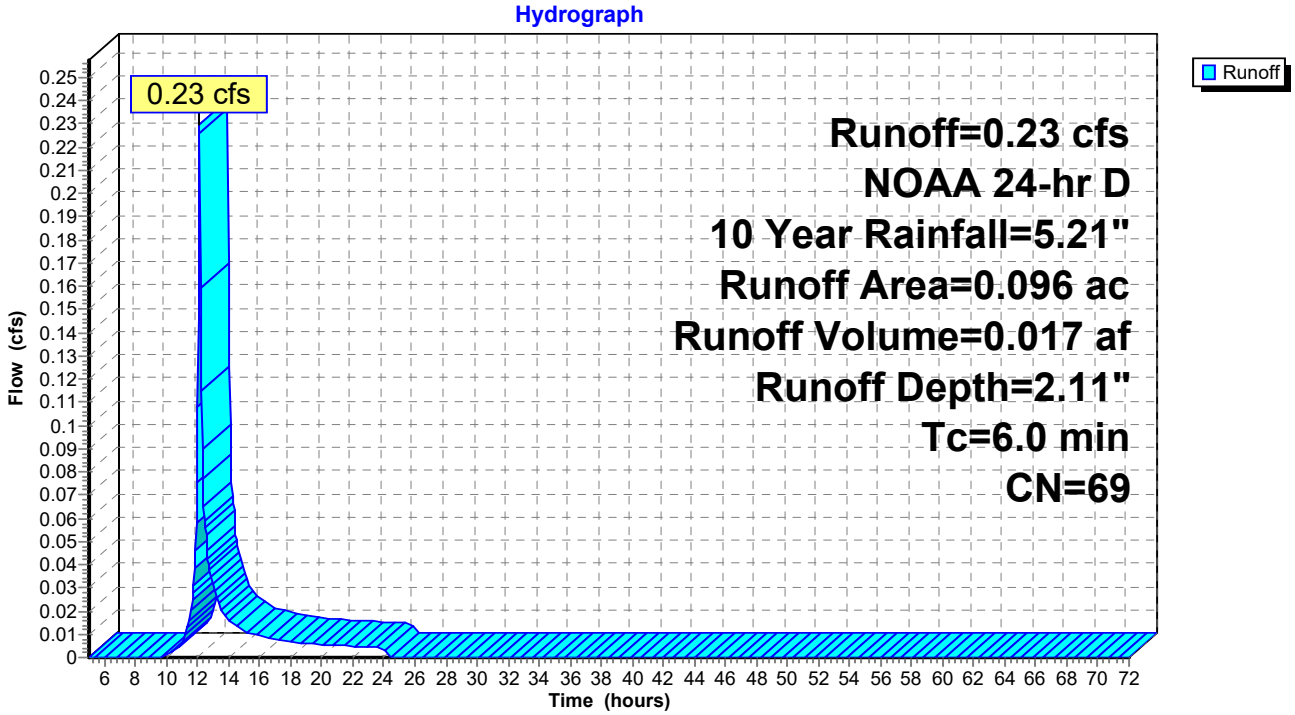
Runoff = 0.23 cfs @ 12.13 hrs, Volume= 0.017 af, Depth= 2.11"
Routed to Pond 6P : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.096	69	50-75% Grass cover, Fair, HSG B
0.096		100.00% Pervious Area

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

Subcatchment 2S: Existing Area #2 (Lawn)



Summary for Subcatchment 3S: Existing Area #1 (Impervious)

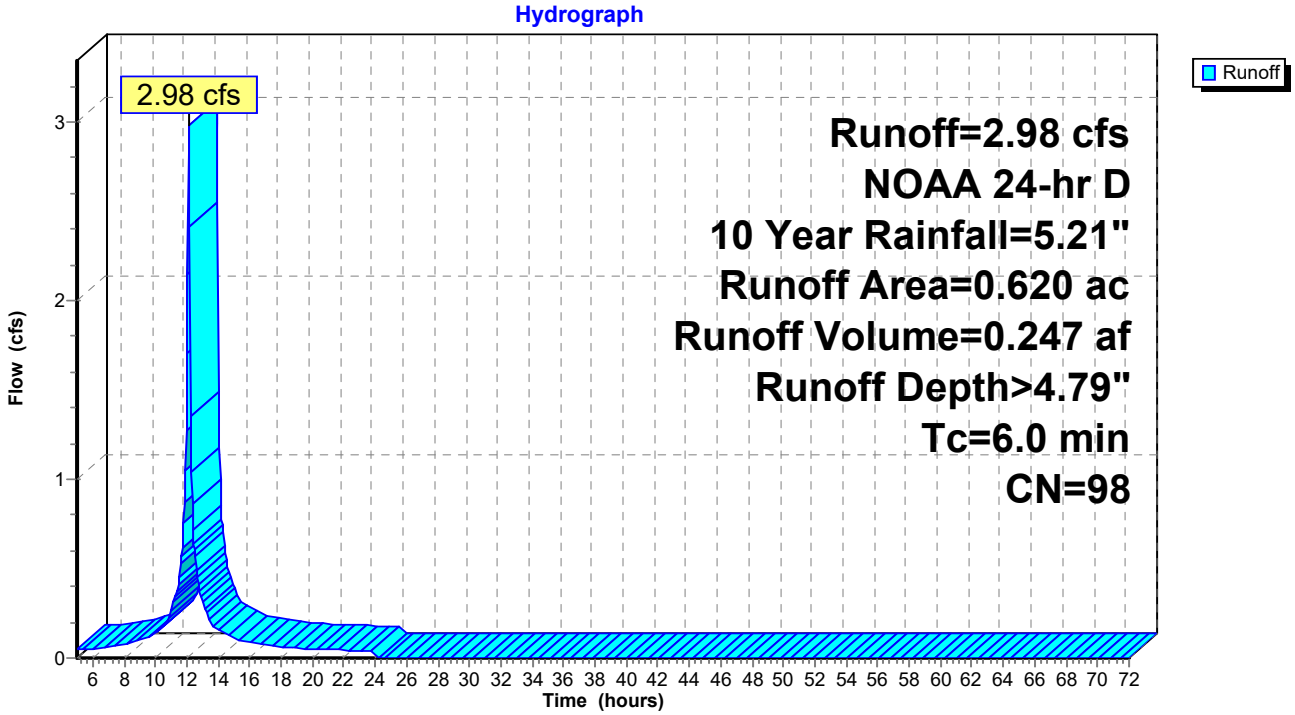
Runoff = 2.98 cfs @ 12.13 hrs, Volume= 0.247 af, Depth> 4.79"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.620	98	Unconnected pavement, HSG B
0.620		100.00% Impervious Area
0.620		100.00% Unconnected

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

Subcatchment 3S: Existing Area #1 (Impervious)



Summary for Subcatchment 4S: Existing Area #4 (Impervious)

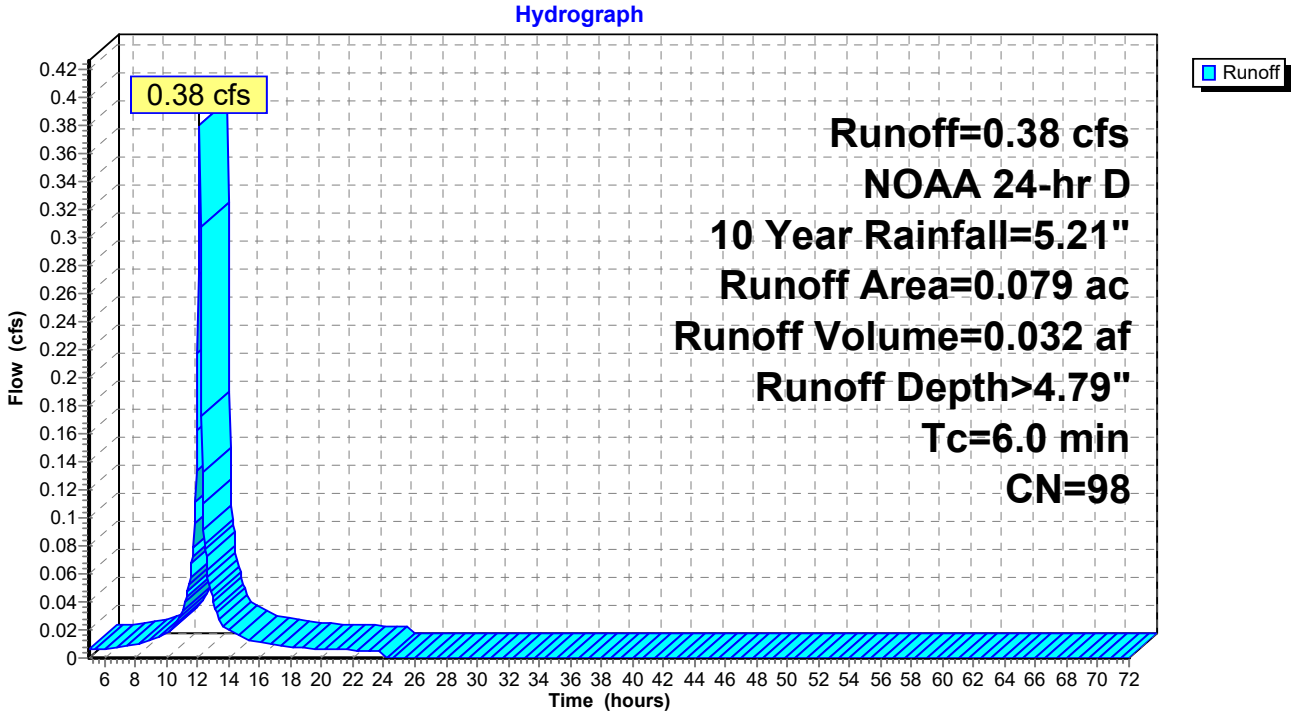
Runoff = 0.38 cfs @ 12.13 hrs, Volume= 0.032 af, Depth> 4.79"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.079	98	Unconnected pavement, HSG B
0.079		100.00% Impervious Area
0.079		100.00% Unconnected

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

Subcatchment 4S: Existing Area #4 (Impervious)



Summary for Subcatchment 5S: Existing Area #4 (Lawn)

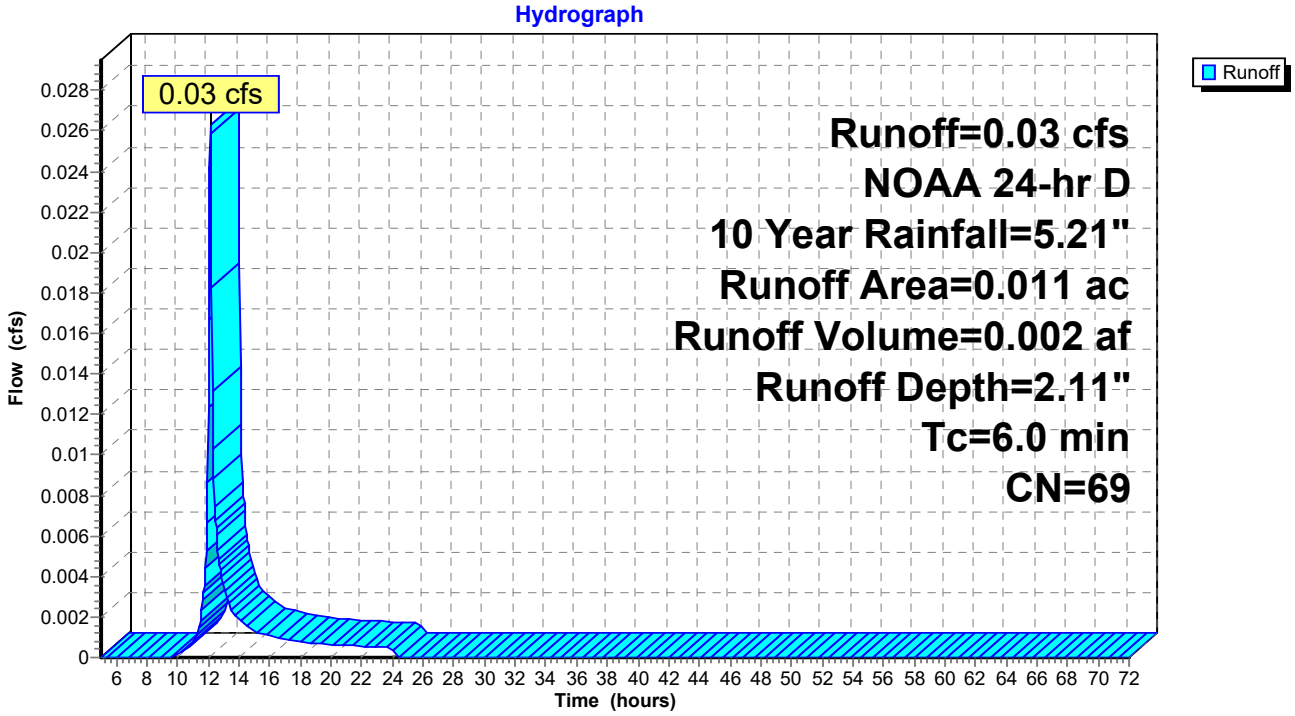
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.002 af, Depth= 2.11"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.011	69	50-75% Grass cover, Fair, HSG B
0.011		100.00% Pervious Area

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

Subcatchment 5S: Existing Area #4 (Lawn)



Summary for Subcatchment 9S: Existing Area #1 (Lawn)

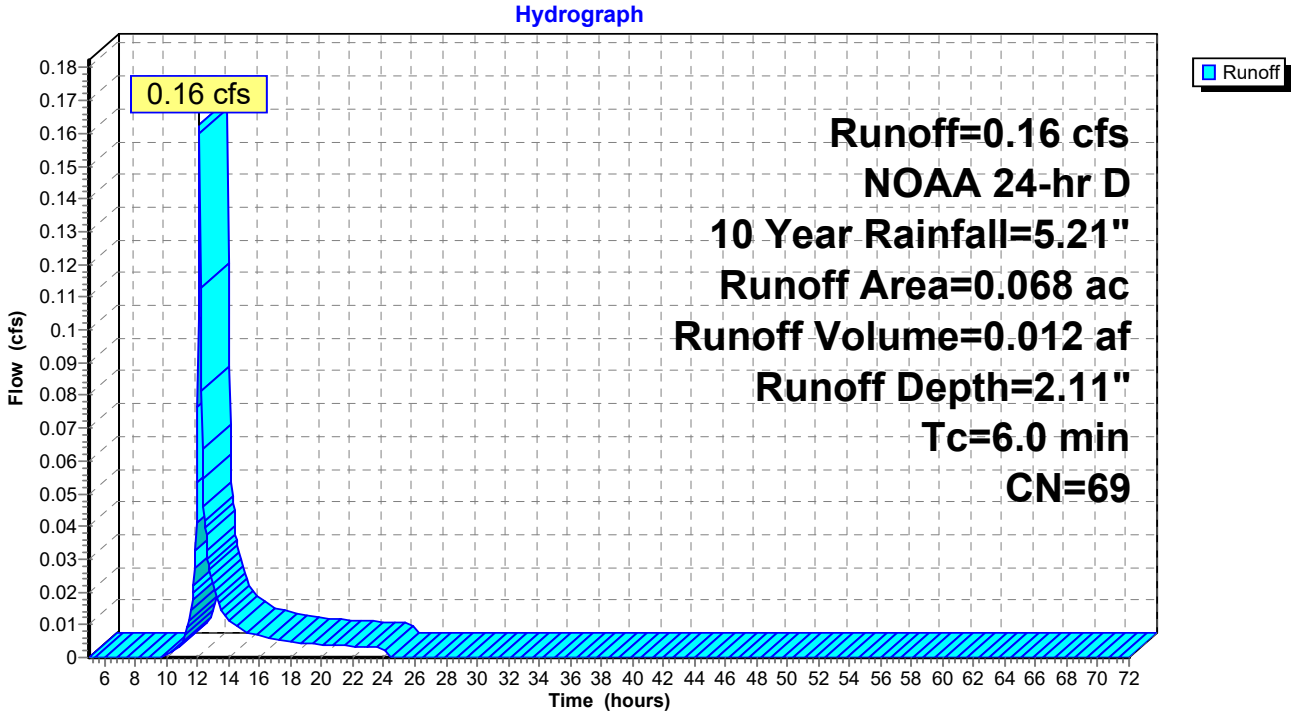
Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 2.11"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.068	69	50-75% Grass cover, Fair, HSG B
0.068		100.00% Pervious Area

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

Subcatchment 9S: Existing Area #1 (Lawn)

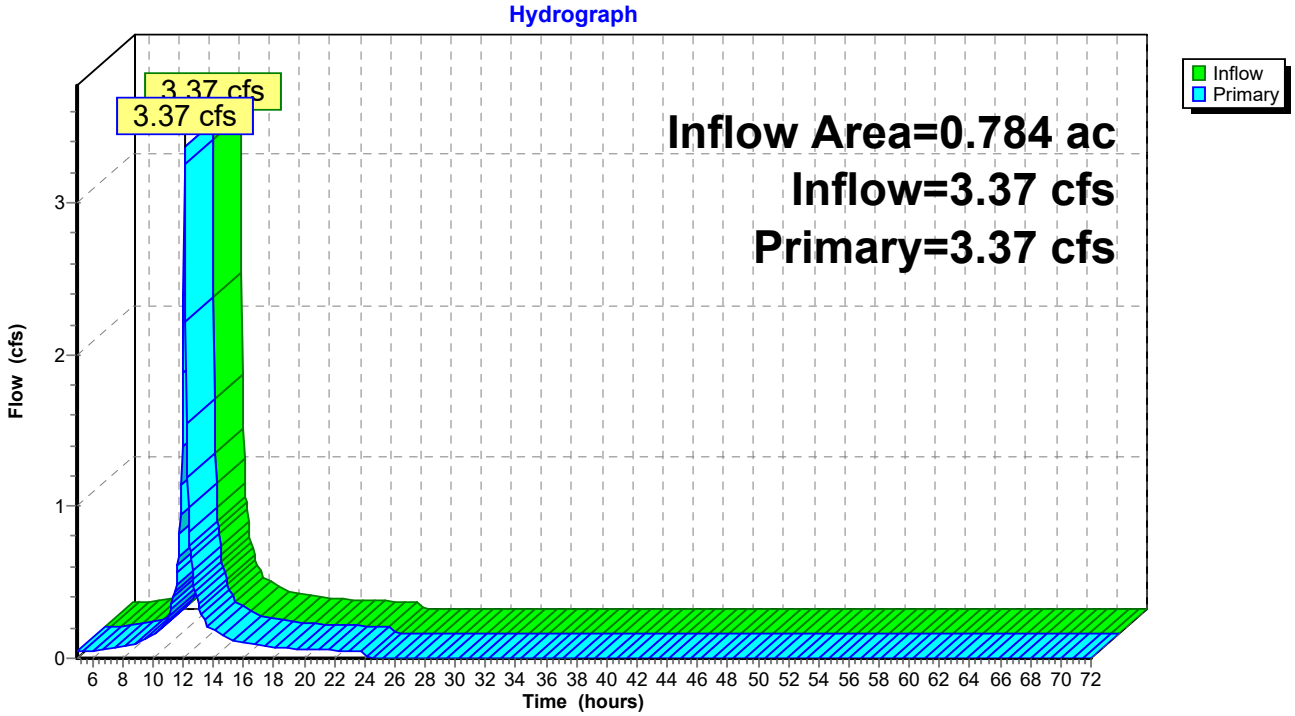


Summary for Pond 6P: Study Point #1

Inflow Area = 0.784 ac, 79.08% Impervious, Inflow Depth > 4.23" for 10 Year event
Inflow = 3.37 cfs @ 12.13 hrs, Volume= 0.276 af
Primary = 3.37 cfs @ 12.13 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 6P: Study Point #1

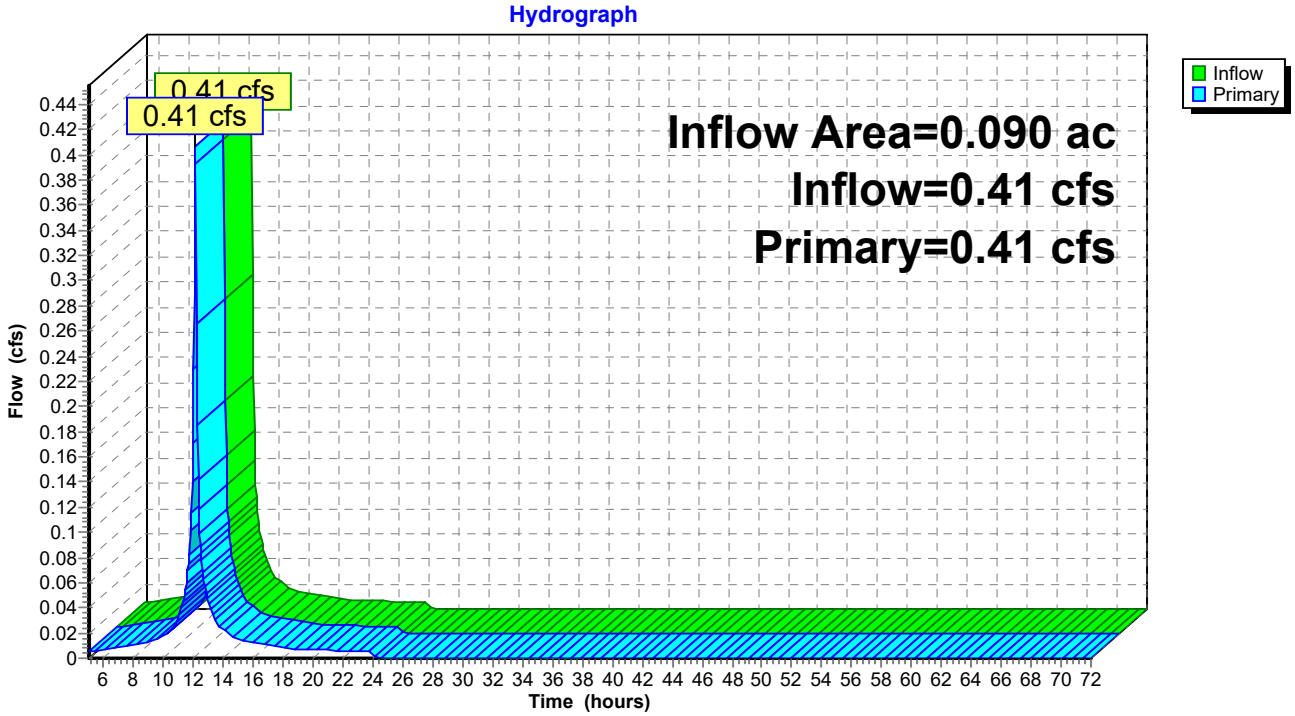


Summary for Pond 7P: Study Point #2

Inflow Area = 0.090 ac, 87.78% Impervious, Inflow Depth > 4.46" for 10 Year event
Inflow = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af
Primary = 0.41 cfs @ 12.13 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 7P: Study Point #2

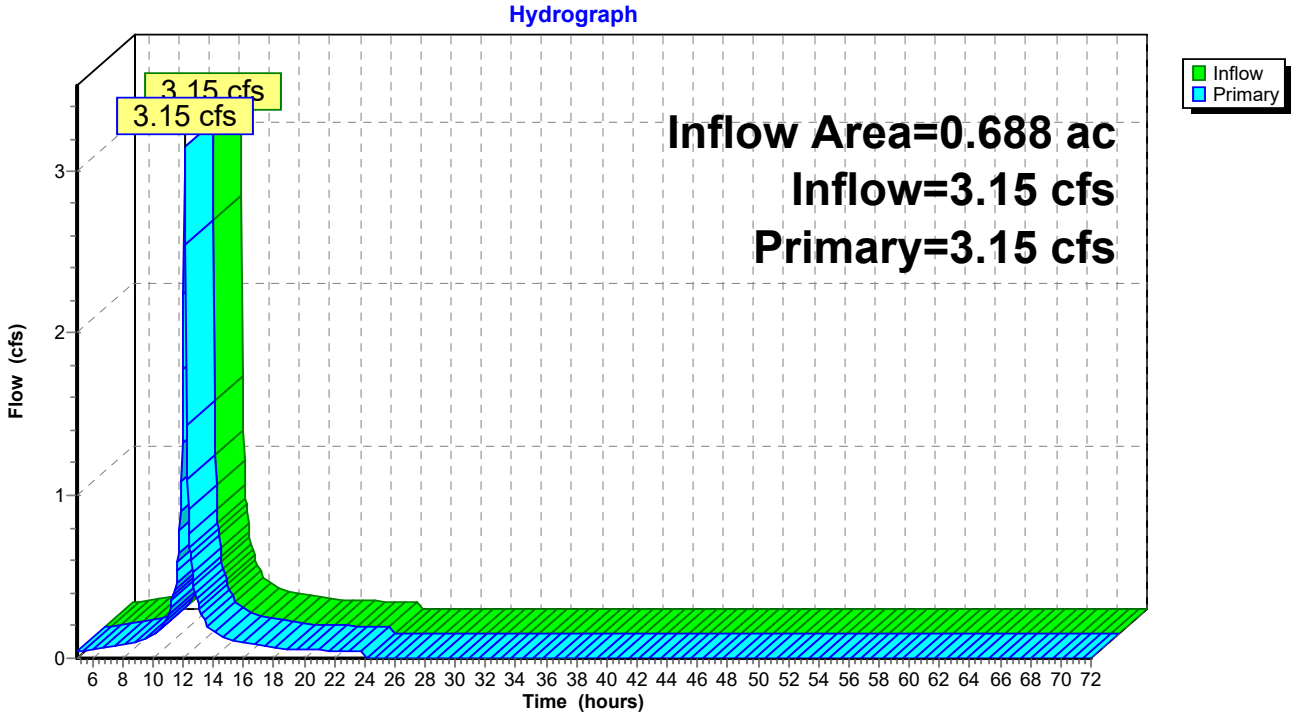


Summary for Link 8L: Exiting Area #1

Inflow Area = 0.688 ac, 90.12% Impervious, Inflow Depth > 4.53" for 10 Year event
Inflow = 3.15 cfs @ 12.13 hrs, Volume= 0.259 af
Primary = 3.15 cfs @ 12.13 hrs, Volume= 0.259 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 6P : Study Point #1

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 8L: Exiting Area #1

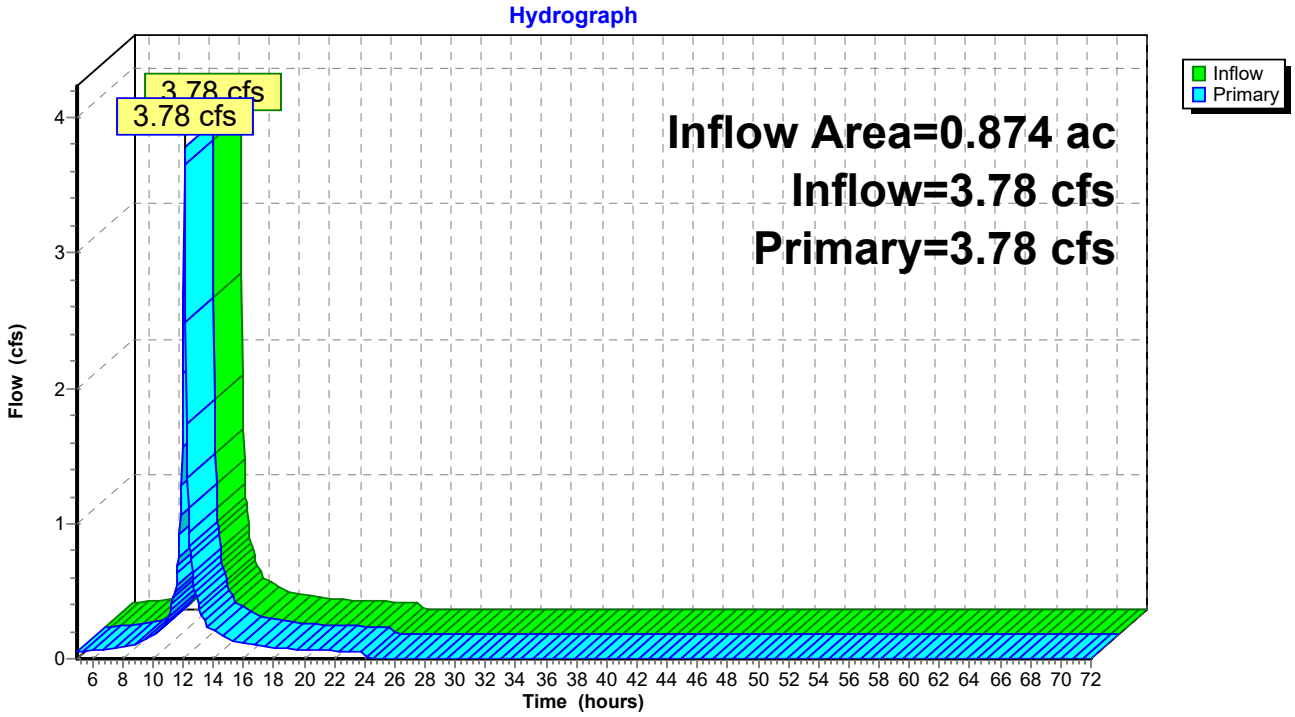


Summary for Link 10L: Overall Site

Inflow Area = 0.874 ac, 79.98% Impervious, Inflow Depth > 4.25" for 10 Year event
Inflow = 3.78 cfs @ 12.13 hrs, Volume= 0.310 af
Primary = 3.78 cfs @ 12.13 hrs, Volume= 0.310 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 10L: Overall Site



Summary for Subcatchment 2S: Existing Area #2 (Lawn)

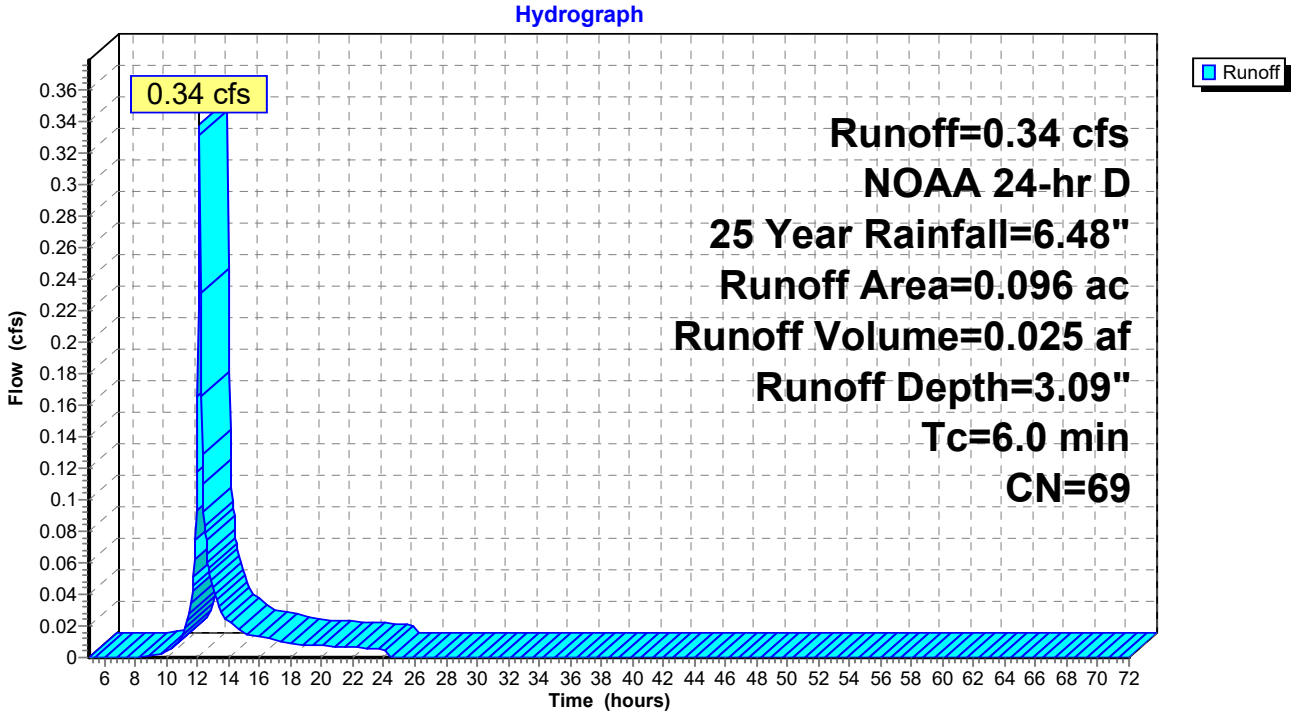
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 0.025 af, Depth= 3.09"
Routed to Pond 6P : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.48"

Area (ac)	CN	Description
0.096	69	50-75% Grass cover, Fair, HSG B
0.096		100.00% Pervious Area

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

Subcatchment 2S: Existing Area #2 (Lawn)



Summary for Subcatchment 3S: Existing Area #1 (Impervious)

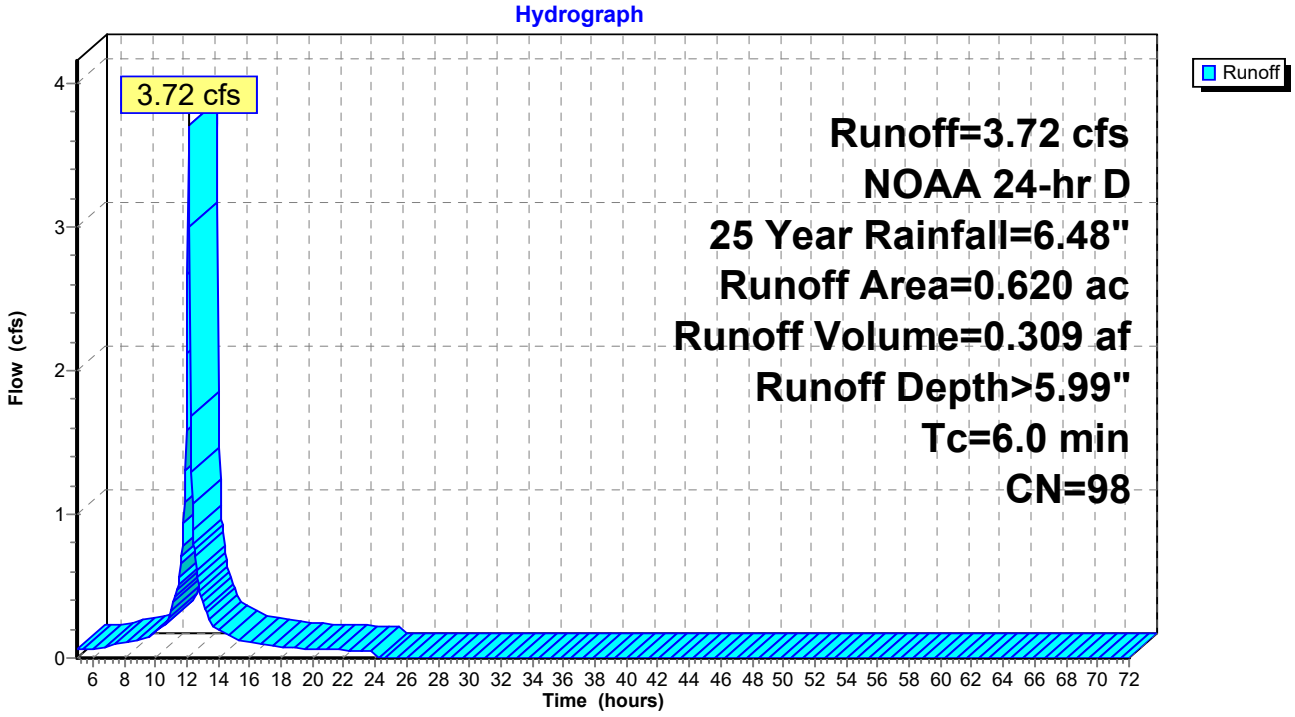
Runoff = 3.72 cfs @ 12.13 hrs, Volume= 0.309 af, Depth> 5.99"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.48"

Area (ac)	CN	Description
0.620	98	Unconnected pavement, HSG B
0.620		100.00% Impervious Area
0.620		100.00% Unconnected

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

Subcatchment 3S: Existing Area #1 (Impervious)



Summary for Subcatchment 4S: Existing Area #4 (Impervious)

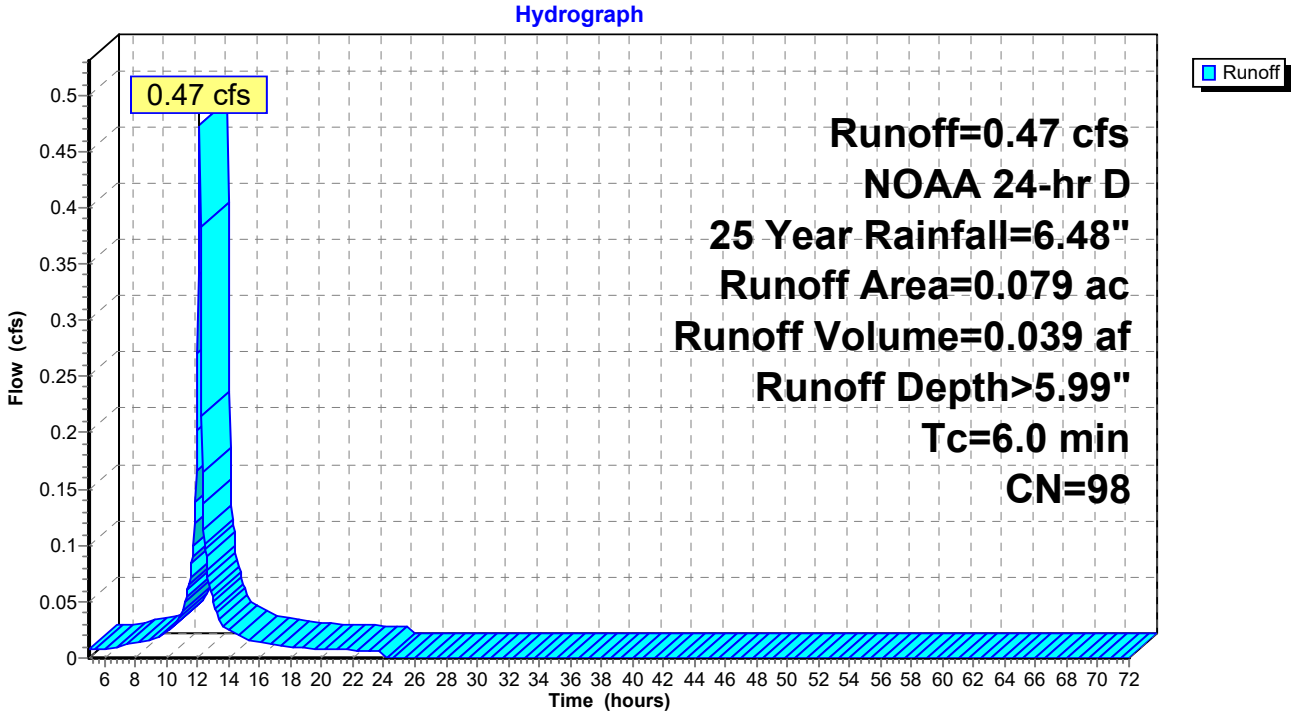
Runoff = 0.47 cfs @ 12.13 hrs, Volume= 0.039 af, Depth> 5.99"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.48"

Area (ac)	CN	Description
0.079	98	Unconnected pavement, HSG B
0.079		100.00% Impervious Area
0.079		100.00% Unconnected

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

Subcatchment 4S: Existing Area #4 (Impervious)



Summary for Subcatchment 5S: Existing Area #4 (Lawn)

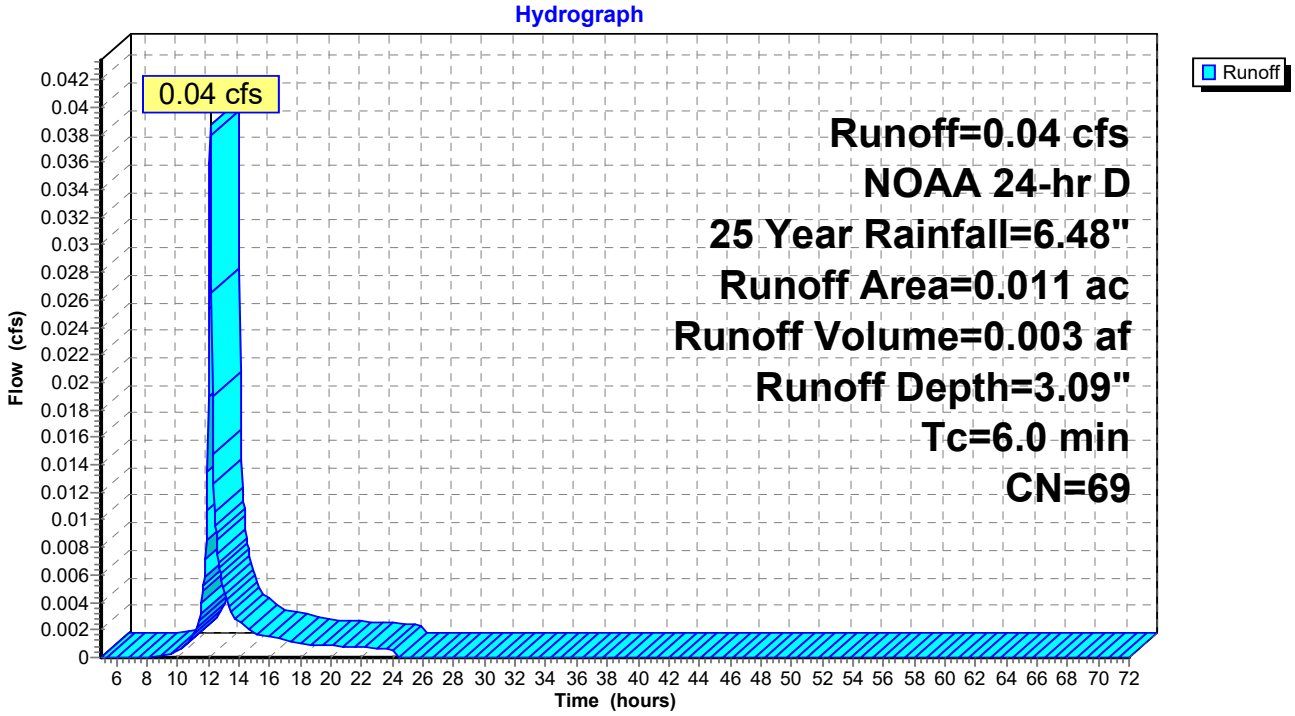
Runoff = 0.04 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 3.09"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.48"

Area (ac)	CN	Description
0.011	69	50-75% Grass cover, Fair, HSG B
0.011		100.00% Pervious Area

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

Subcatchment 5S: Existing Area #4 (Lawn)



Summary for Subcatchment 9S: Existing Area #1 (Lawn)

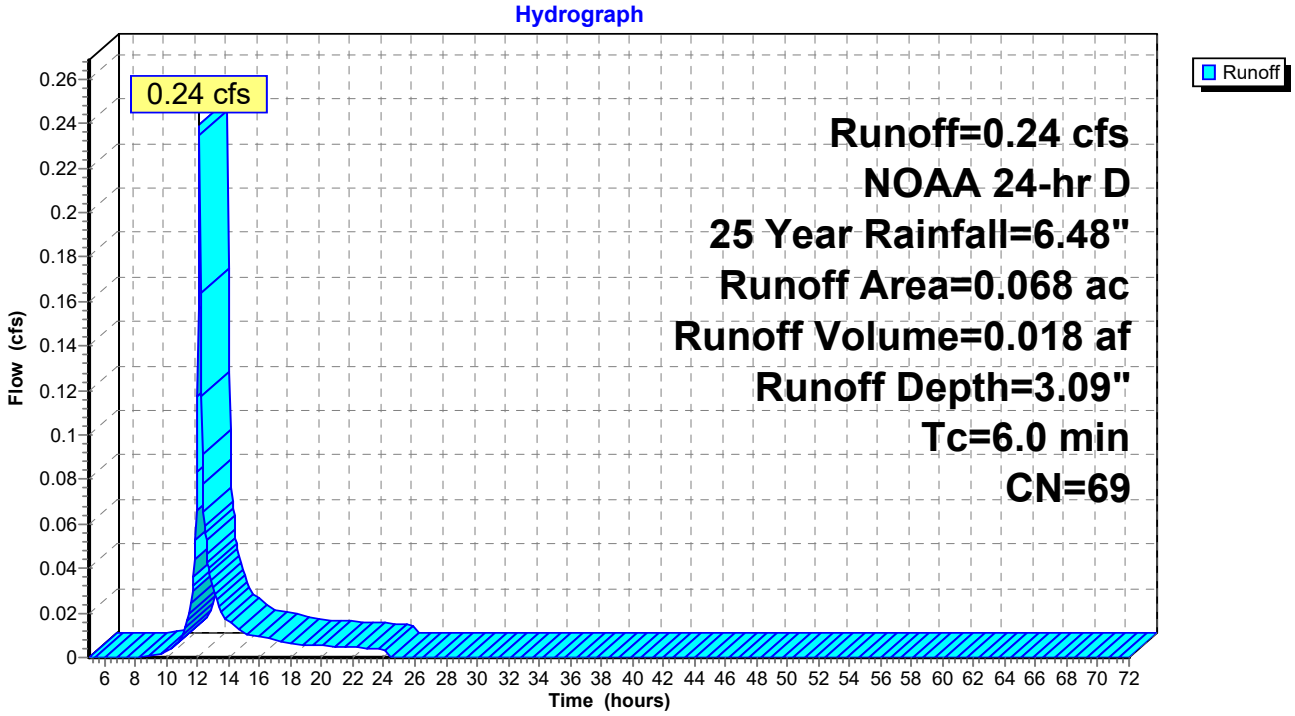
Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.018 af, Depth= 3.09"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.48"

Area (ac)	CN	Description
0.068	69	50-75% Grass cover, Fair, HSG B
0.068		100.00% Pervious Area

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

Subcatchment 9S: Existing Area #1 (Lawn)

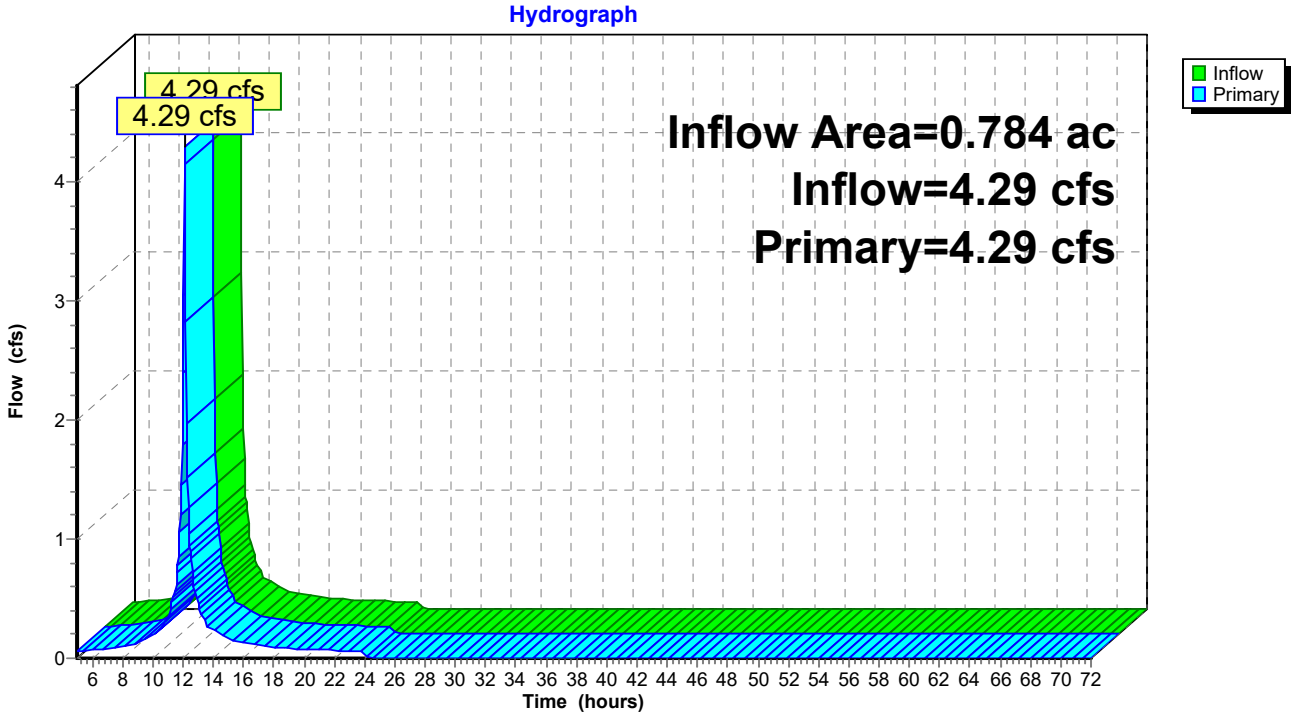


Summary for Pond 6P: Study Point #1

Inflow Area = 0.784 ac, 79.08% Impervious, Inflow Depth > 5.38" for 25 Year event
Inflow = 4.29 cfs @ 12.13 hrs, Volume= 0.352 af
Primary = 4.29 cfs @ 12.13 hrs, Volume= 0.352 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 6P: Study Point #1

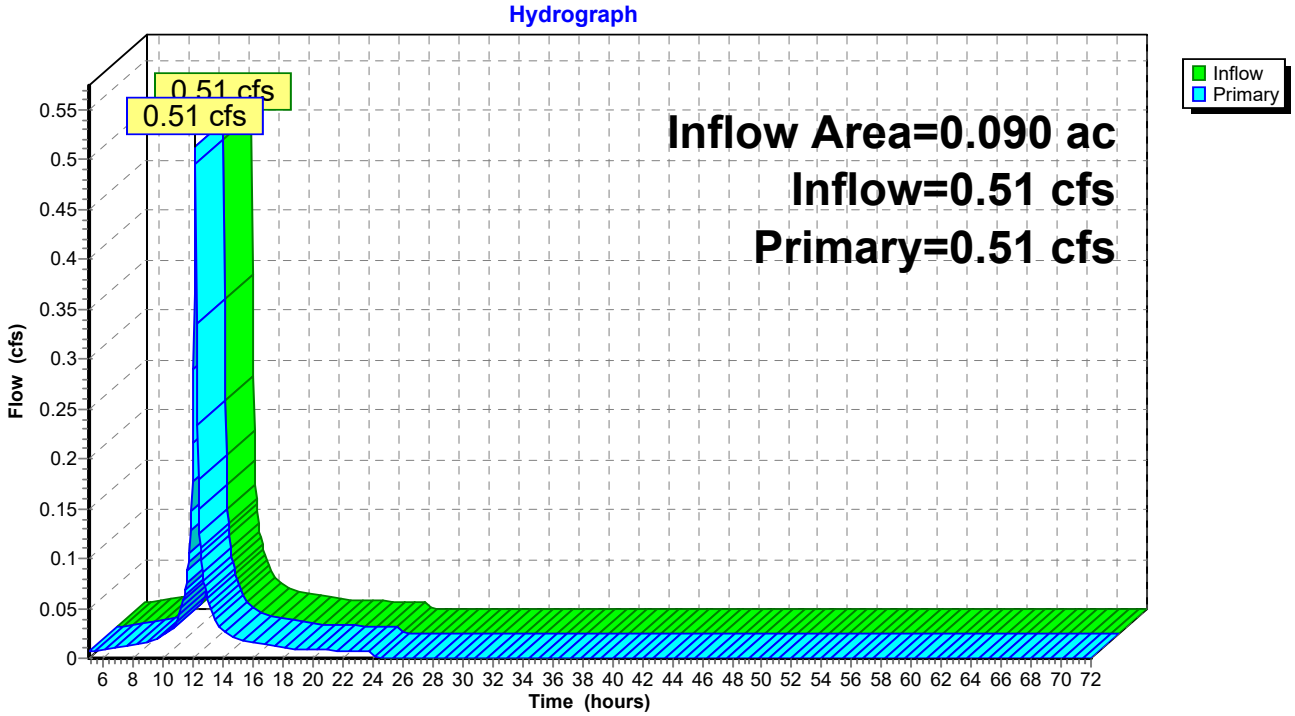


Summary for Pond 7P: Study Point #2

Inflow Area = 0.090 ac, 87.78% Impervious, Inflow Depth > 5.63" for 25 Year event
Inflow = 0.51 cfs @ 12.13 hrs, Volume= 0.042 af
Primary = 0.51 cfs @ 12.13 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 7P: Study Point #2

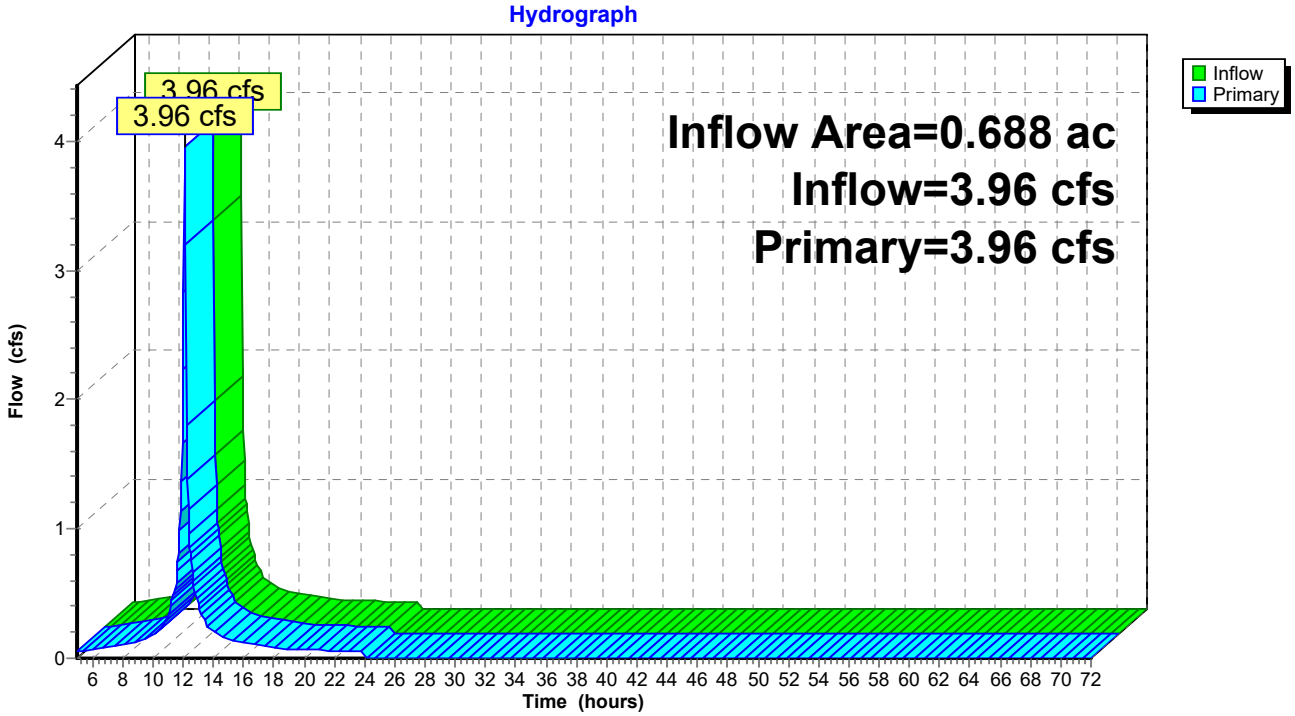


Summary for Link 8L: Exiting Area #1

Inflow Area = 0.688 ac, 90.12% Impervious, Inflow Depth > 5.70" for 25 Year event
Inflow = 3.96 cfs @ 12.13 hrs, Volume= 0.327 af
Primary = 3.96 cfs @ 12.13 hrs, Volume= 0.327 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 6P : Study Point #1

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 8L: Exiting Area #1

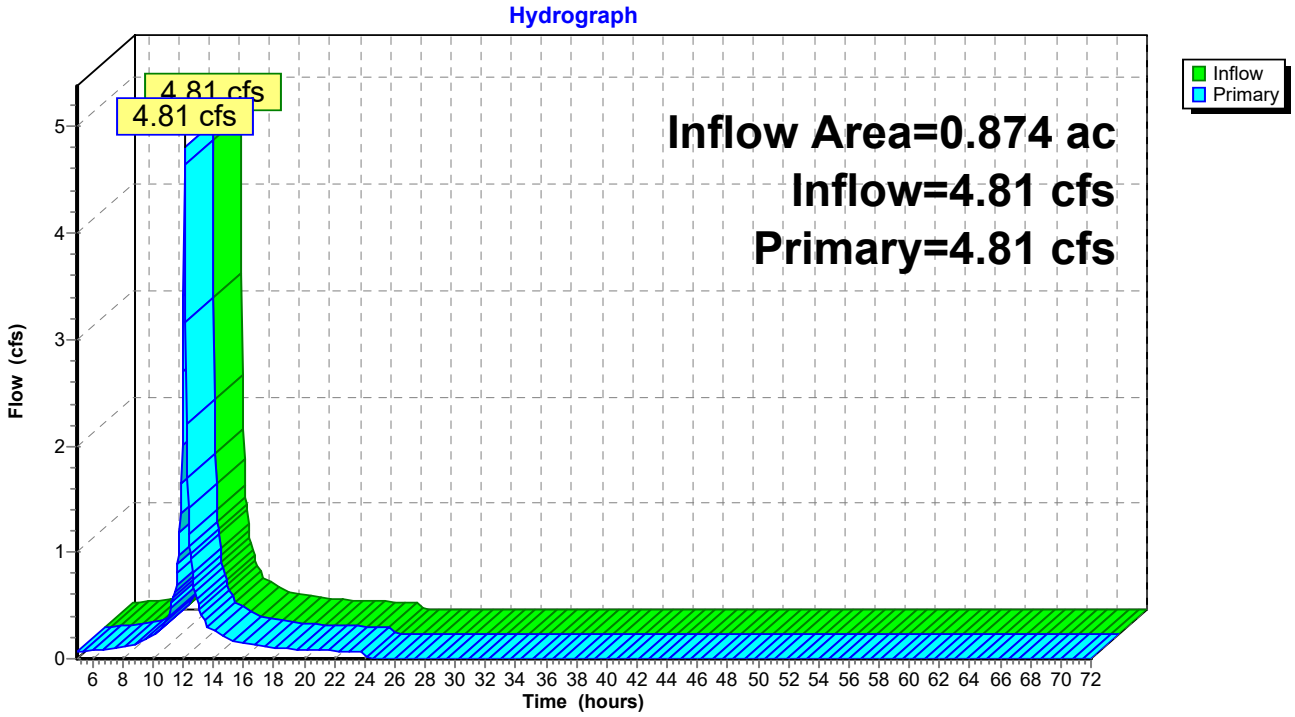


Summary for Link 10L: Overall Site

Inflow Area = 0.874 ac, 79.98% Impervious, Inflow Depth > 5.41" for 25 Year event
Inflow = 4.81 cfs @ 12.13 hrs, Volume= 0.394 af
Primary = 4.81 cfs @ 12.13 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 10L: Overall Site



Summary for Subcatchment 2S: Existing Area #2 (Lawn)

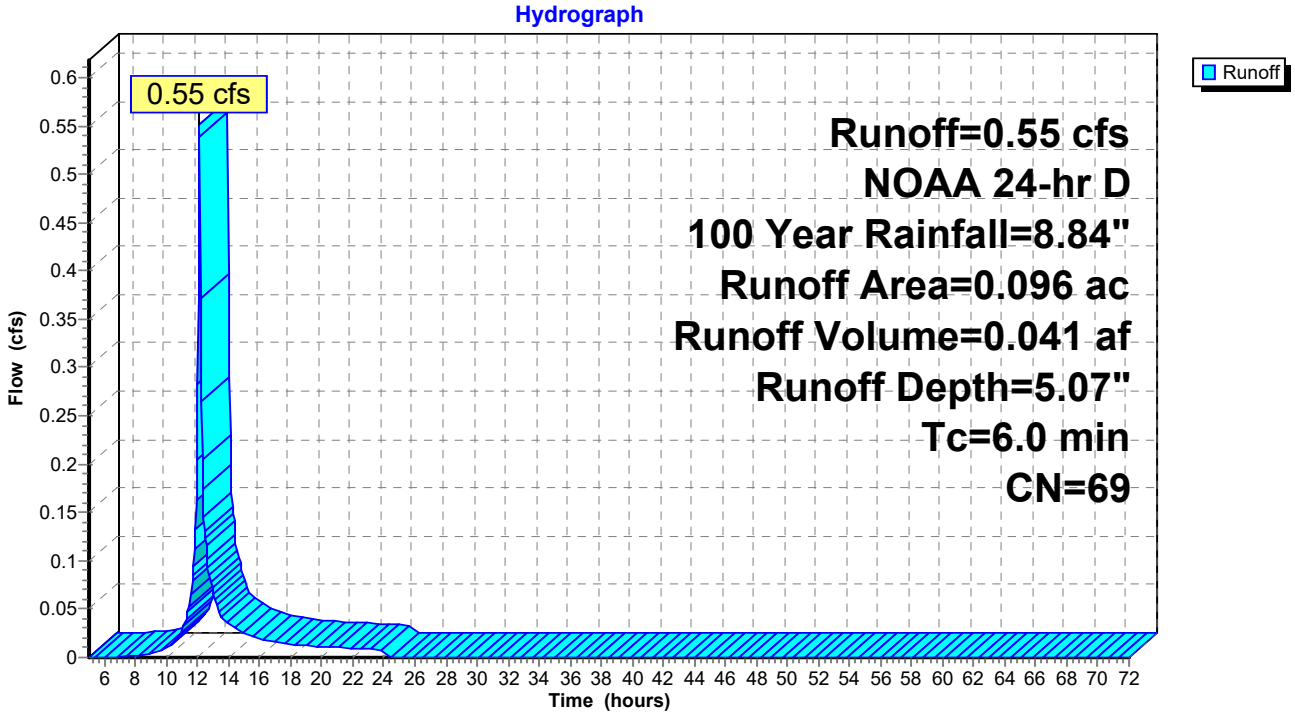
Runoff = 0.55 cfs @ 12.13 hrs, Volume= 0.041 af, Depth= 5.07"
Routed to Pond 6P : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.84"

Area (ac)	CN	Description
0.096	69	50-75% Grass cover, Fair, HSG B
0.096		100.00% Pervious Area

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

Subcatchment 2S: Existing Area #2 (Lawn)



Summary for Subcatchment 3S: Existing Area #1 (Impervious)

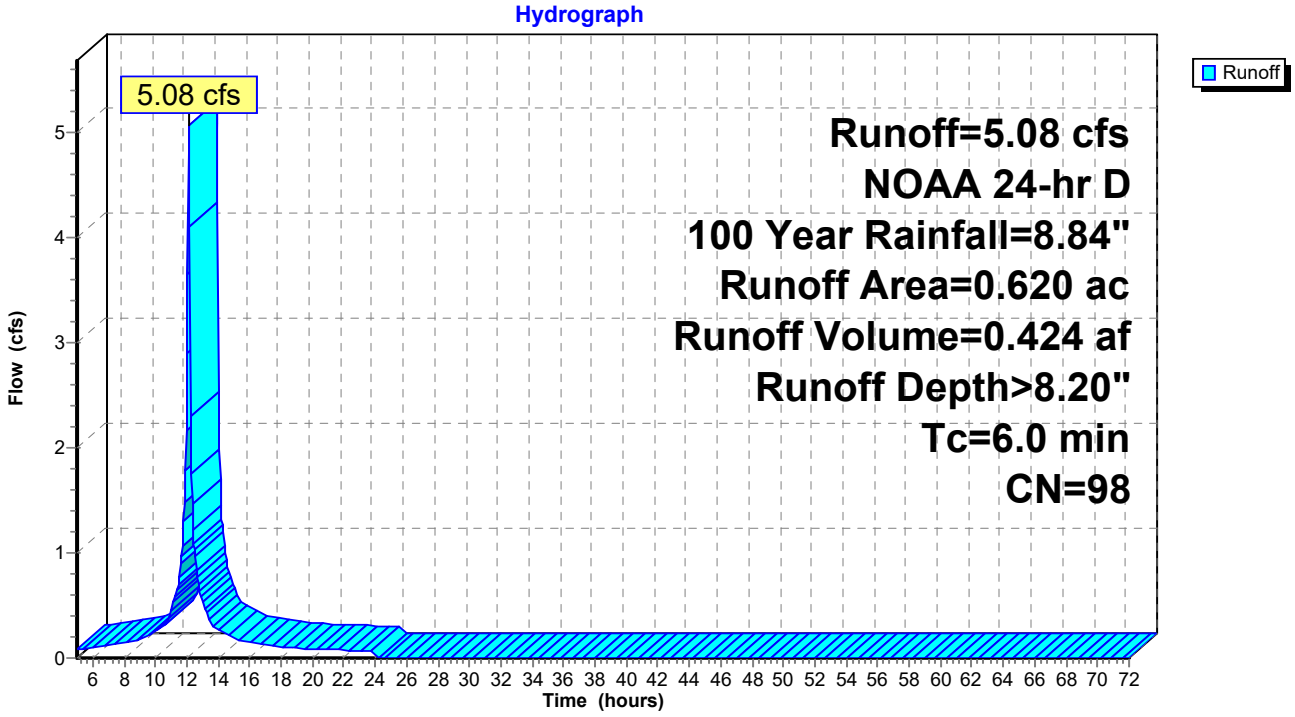
Runoff = 5.08 cfs @ 12.13 hrs, Volume= 0.424 af, Depth> 8.20"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.84"

Area (ac)	CN	Description
0.620	98	Unconnected pavement, HSG B
0.620		100.00% Impervious Area
0.620		100.00% Unconnected

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

Subcatchment 3S: Existing Area #1 (Impervious)



Summary for Subcatchment 4S: Existing Area #4 (Impervious)

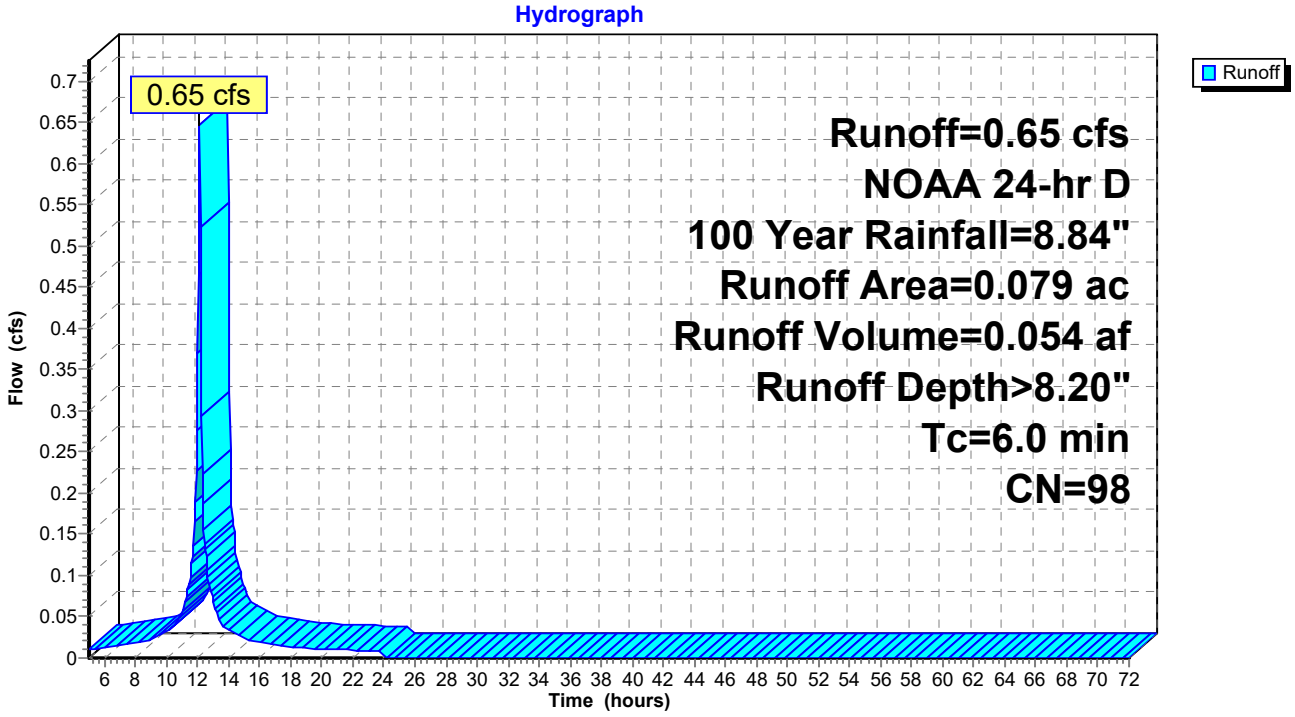
Runoff = 0.65 cfs @ 12.13 hrs, Volume= 0.054 af, Depth> 8.20"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.84"

Area (ac)	CN	Description
0.079	98	Unconnected pavement, HSG B
0.079		100.00% Impervious Area
0.079		100.00% Unconnected

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

Subcatchment 4S: Existing Area #4 (Impervious)



Summary for Subcatchment 5S: Existing Area #4 (Lawn)

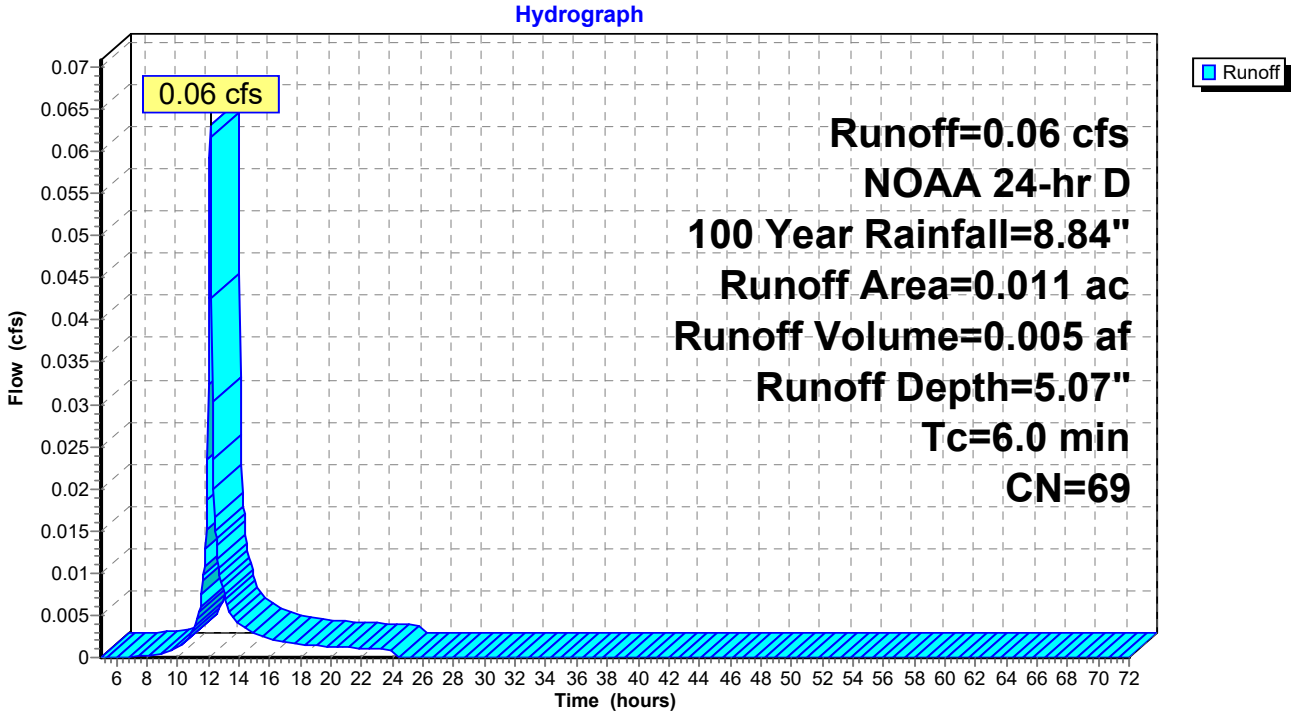
Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 5.07"
Routed to Pond 7P : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.84"

Area (ac)	CN	Description
0.011	69	50-75% Grass cover, Fair, HSG B
0.011		100.00% Pervious Area

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

Subcatchment 5S: Existing Area #4 (Lawn)



Summary for Subcatchment 9S: Existing Area #1 (Lawn)

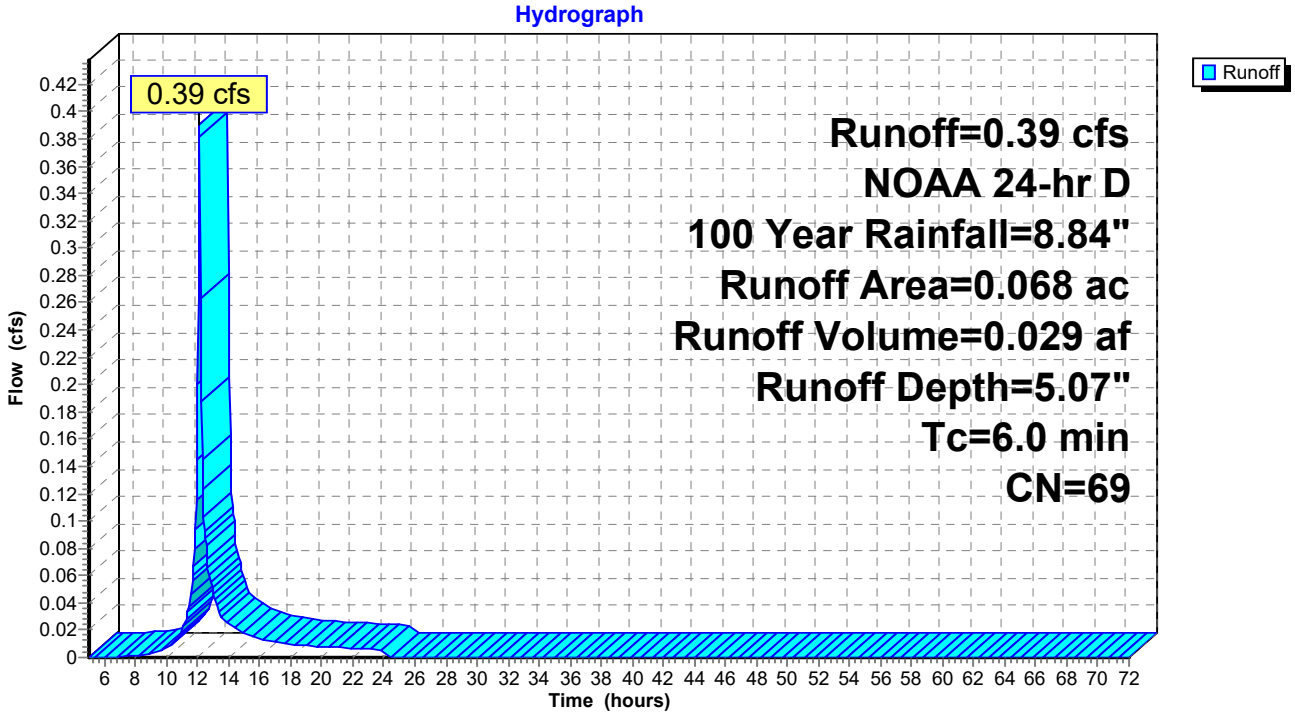
Runoff = 0.39 cfs @ 12.13 hrs, Volume= 0.029 af, Depth= 5.07"
Routed to Link 8L : Exiting Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.84"

Area (ac)	CN	Description
0.068	69	50-75% Grass cover, Fair, HSG B
0.068		100.00% Pervious Area

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

Subcatchment 9S: Existing Area #1 (Lawn)

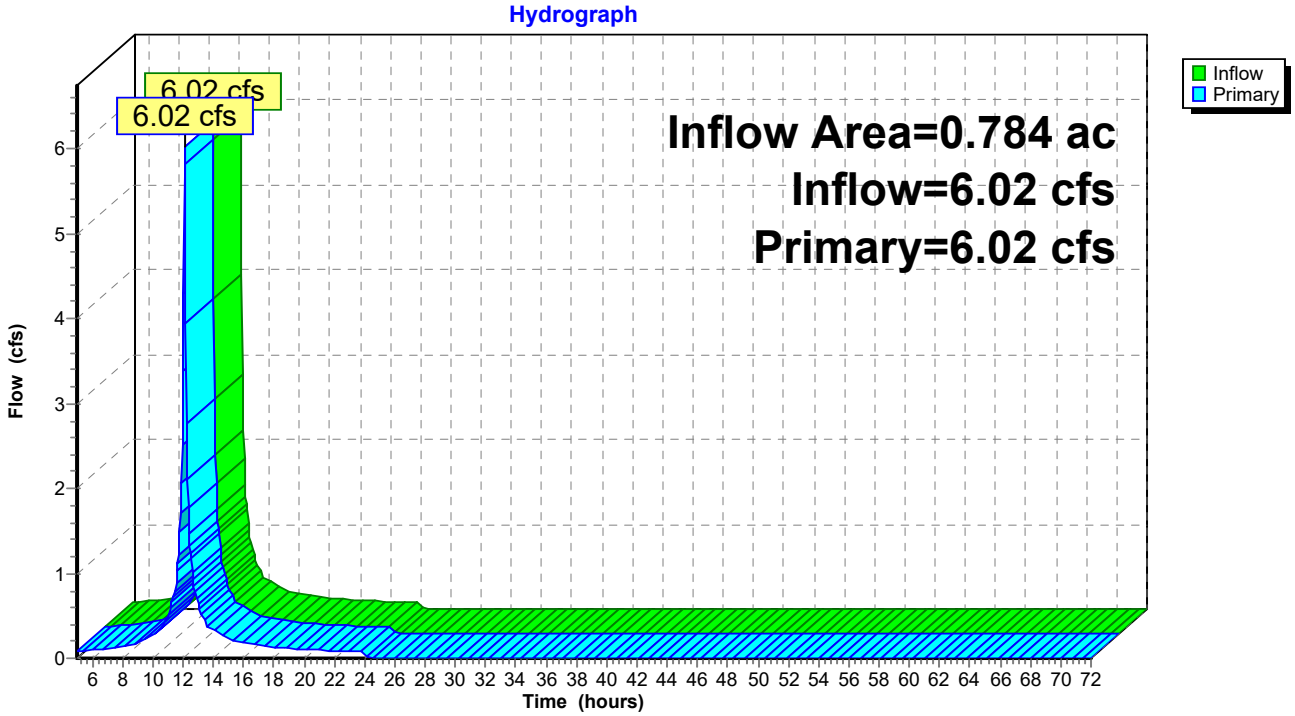


Summary for Pond 6P: Study Point #1

Inflow Area = 0.784 ac, 79.08% Impervious, Inflow Depth > 7.55" for 100 Year event
Inflow = 6.02 cfs @ 12.13 hrs, Volume= 0.493 af
Primary = 6.02 cfs @ 12.13 hrs, Volume= 0.493 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 6P: Study Point #1

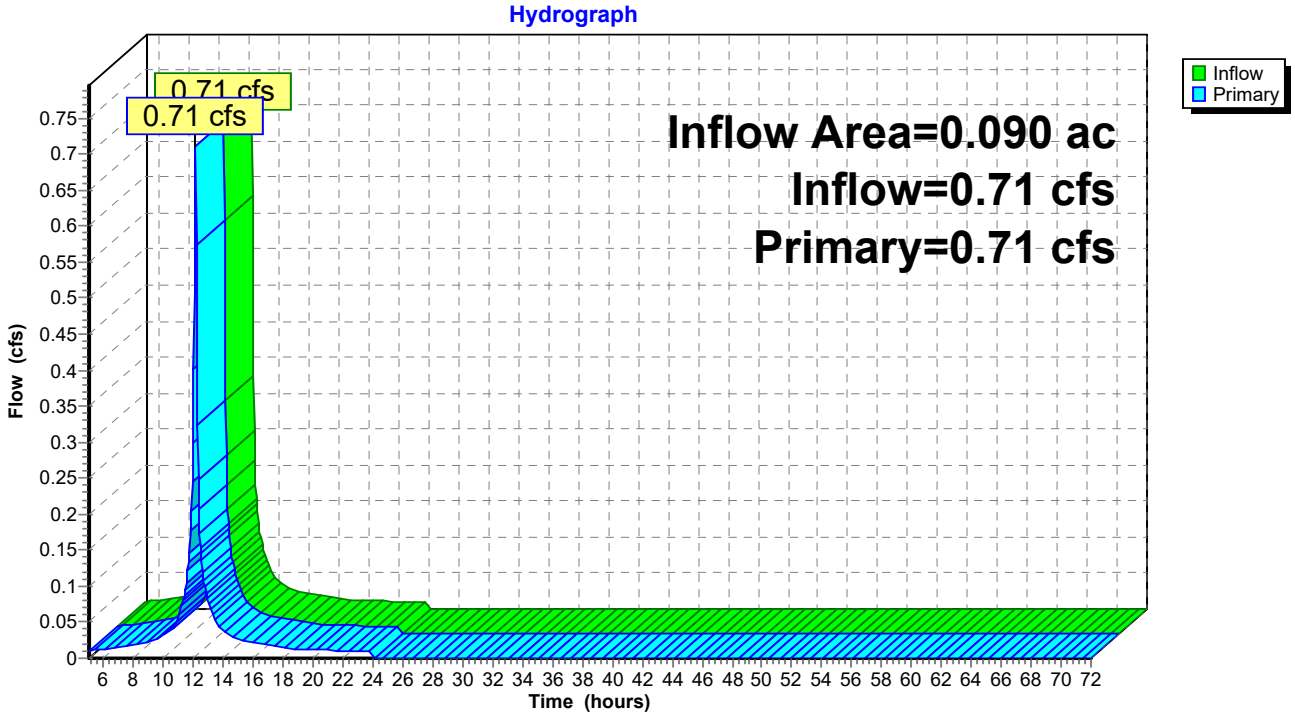


Summary for Pond 7P: Study Point #2

Inflow Area = 0.090 ac, 87.78% Impervious, Inflow Depth > 7.82" for 100 Year event
Inflow = 0.71 cfs @ 12.13 hrs, Volume= 0.059 af
Primary = 0.71 cfs @ 12.13 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10L : Overall Site

Routing by Stor-Ind method, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Pond 7P: Study Point #2

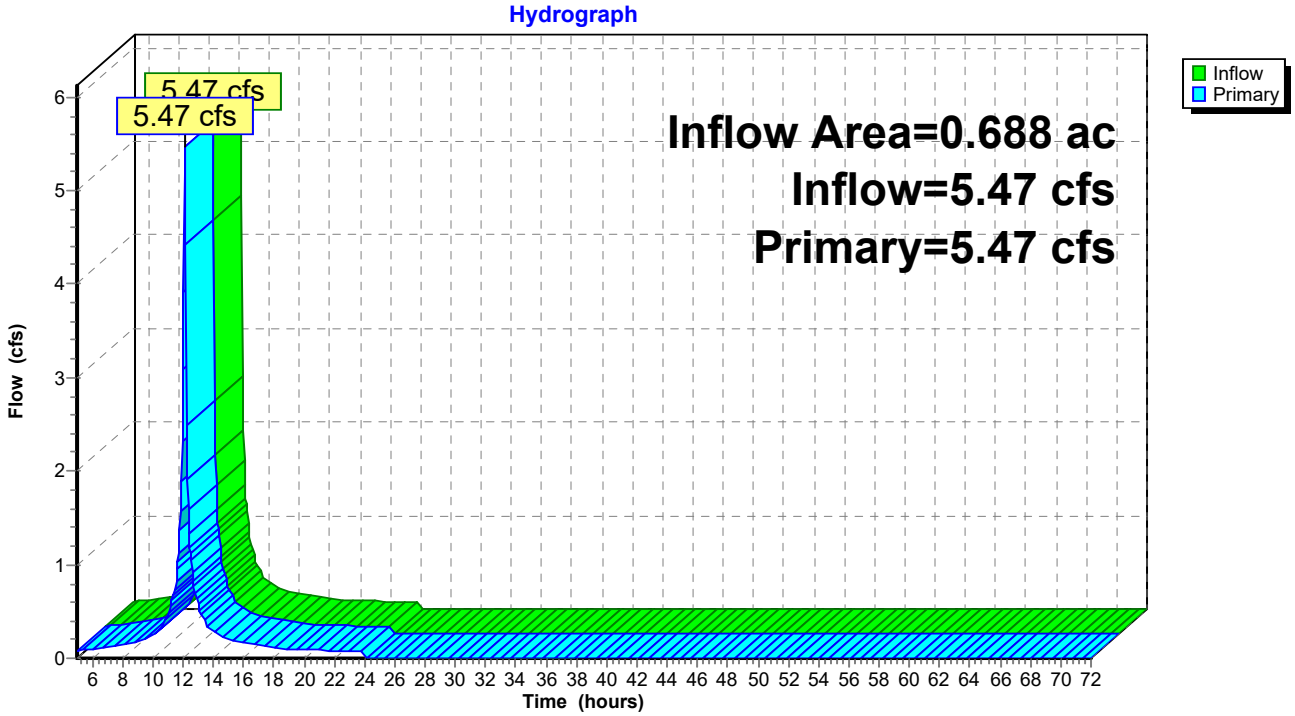


Summary for Link 8L: Exiting Area #1

Inflow Area = 0.688 ac, 90.12% Impervious, Inflow Depth > 7.89" for 100 Year event
Inflow = 5.47 cfs @ 12.13 hrs, Volume= 0.453 af
Primary = 5.47 cfs @ 12.13 hrs, Volume= 0.453 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 6P : Study Point #1

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 8L: Exiting Area #1

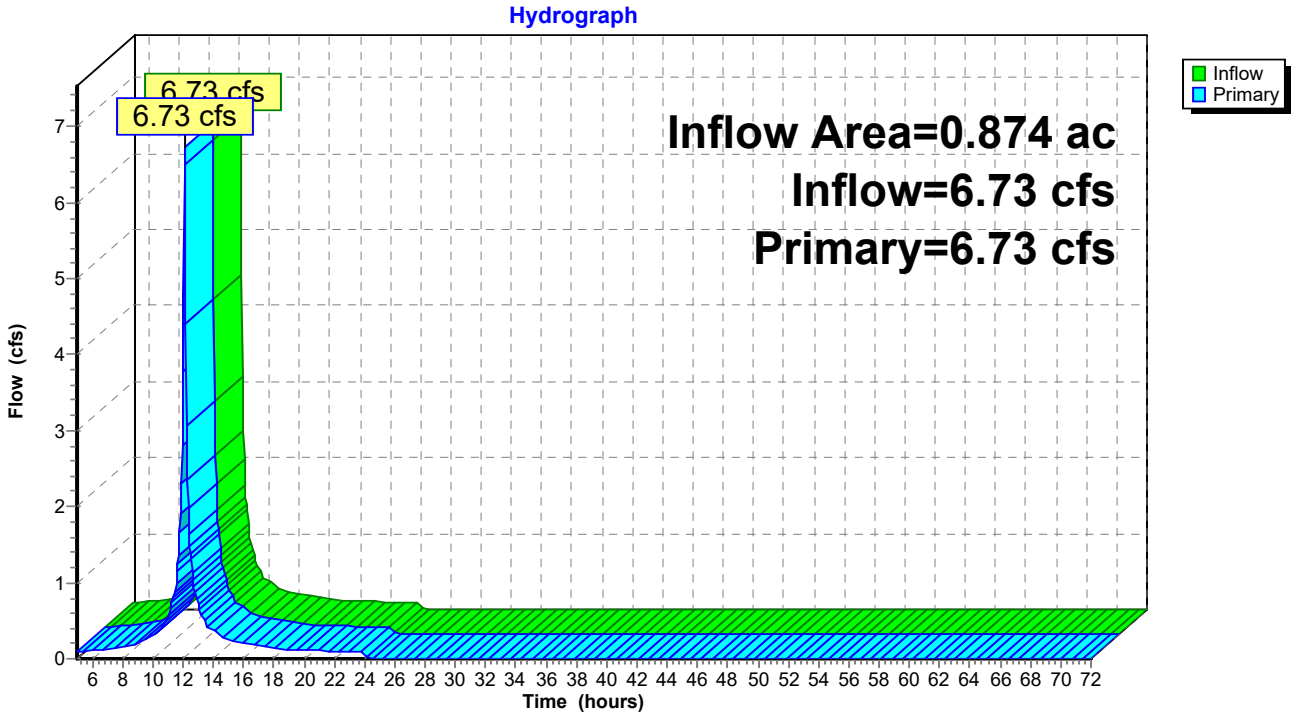


Summary for Link 10L: Overall Site

Inflow Area = 0.874 ac, 79.98% Impervious, Inflow Depth > 7.58" for 100 Year event
Inflow = 6.73 cfs @ 12.13 hrs, Volume= 0.552 af
Primary = 6.73 cfs @ 12.13 hrs, Volume= 0.552 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-72.00 hrs, dt= 0.05 hrs

Link 10L: Overall Site



D. PROPOSED STORMWATER CONDITIONS

Stormwater runoff will be collected onsite through two (2) proposed 'E' inlets and routed through PVC and Class V reinforced concrete pipes to Small-scale Bioretention Basin #A. In addition, a portion of roof runoff will be routed to the proposed underground Small-scale Infiltration Basin #B, which infiltrates all of the design storms up to the 24-hour, 100 year storm, but an overflow culvert is included in the design to account for any emergency conditions in which infiltration may fail.

The basins ultimately discharge to Study Point #2, which is an existing Type "B" Inlet located at the easterly corner of the intersection of River Road (C.R. 10) and Cedar Avenue. The proposed small-scale bioretention basin will also collect overland runoff. A minimum time of concentration of 6 minutes was utilized for calculations.

The Drainage Area associated with Study Point #1 consists of Bypass Area #1 and Bypass Area #2.

Bypass Area #1 consists of the southern portion of the site which contains approximately 0.042 acres of lawn area and generated stormwater runoff flows offsite uncontrolled in a southerly direction but ultimately flows north towards Study Point #1.

Bypass Area #2 consists of the egress driveway to River Road as well as the site frontage along River Road and the gutter runoff from River Road. The area is approximately 0.279 acres and generated runoff flows east towards Study Point #1.

The Drainage Area associated with Study Point #2 consists of Proposed Drainage Areas #1, #2 and #3, Bypass Area #3, and the roof area of the proposed 3-story mixed use building.

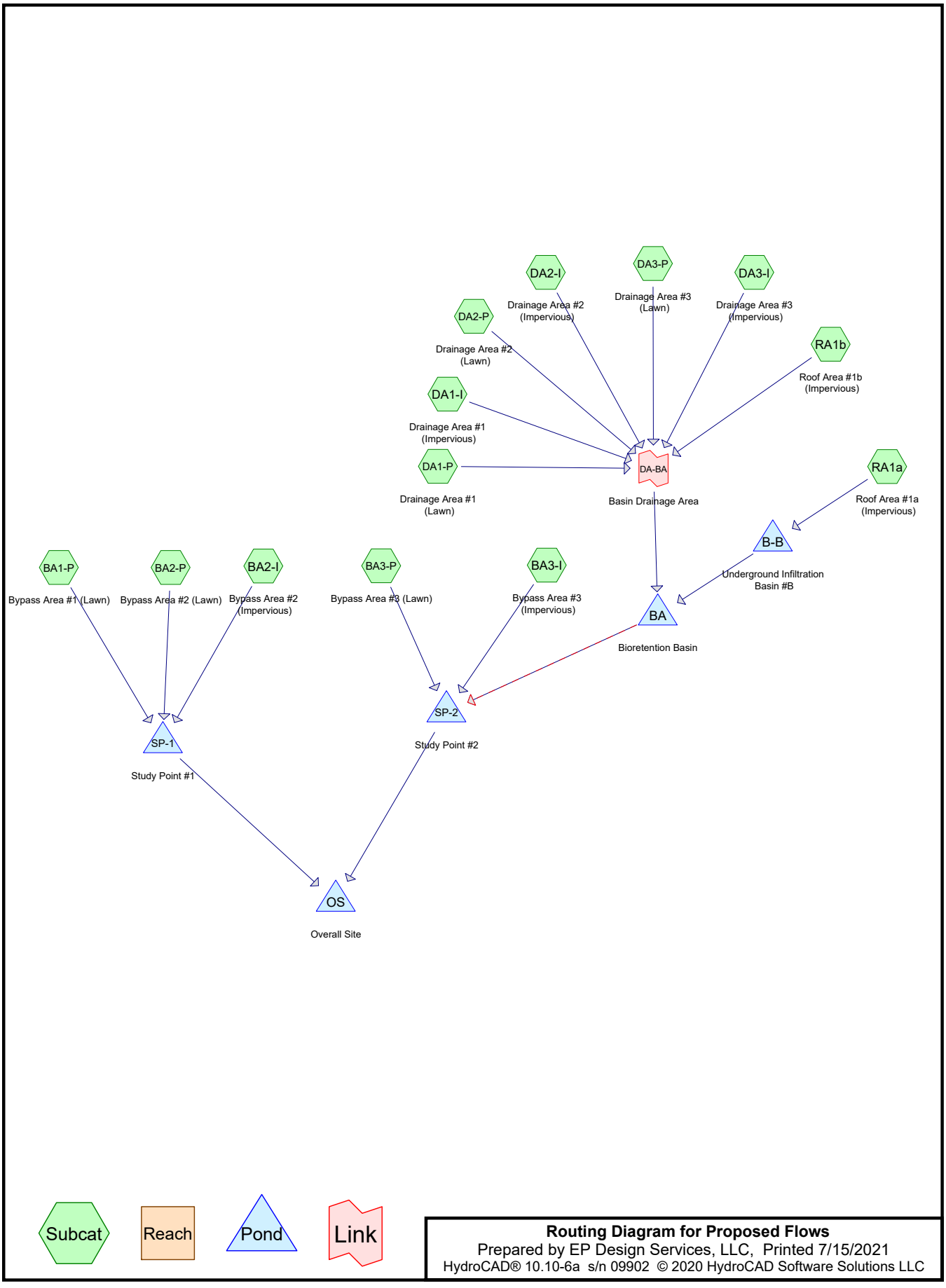
Drainage Areas #1, #2 consist mainly of the impervious parking area behind the proposed building which contain approximately 0.120 and 0.062 acres, respectively, and generated stormwater runoff flows into the proposed onsite 'E' inlets.

Drainage Area #3 consist mainly of the impervious walkway area and offsite sidewalk along the western end of the proposed building and along Cedar Ave which contains approximately 0.024 acres, and generated stormwater runoff flows directly into proposed Bioretention Basin A.

Bypass Area #3 consists mainly of the Cedar Avenue Northern drive lane as well as the area to the west of the high point located at the proposed driveway entrance. Generated stormwater runoff flows north along Cedar Avenue's gutter line towards Study Point #2.

Post-development discharge rates have been significantly reduced to Study Point #1 but have increased to Study Point #2 due to stormwater runoff being redirected through the proposed onsite drainage improvements. However, when analyzing the overall site, the overall peak flows from the 24 hour-2-year, 25-year, and 100-year design storms are reduced due to the proposed drainage improvements, although 0.087 acres of impervious cover will be added to the site. Therefore, the proposed stormwater management system will not adversely affect the downstream storm sewer system or the surrounding properties.

Please refer to the proposed drainage area map included in Appendix H.



Routing Diagram for Proposed Flows
Prepared by EP Design Services, LLC, Printed 7/15/2021
HydroCAD® 10.10-6a s/n 09902 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQ	NOAA 24-hr	D	Default	24.00	1	1.25	2
2	2 Year	NOAA 24-hr	D	Default	24.00	1	3.39	2
3	10 Year	NOAA 24-hr	D	Default	24.00	1	5.21	2
4	25 Year	NOAA 24-hr	D	Default	24.00	1	6.49	2
5	100 Year	NOAA 24-hr	D	Default	24.00	1	8.85	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.088	61	>75% Grass cover, Good, HSG B (BA1-P, BA2-P, BA3-P, DA1-P, DA2-P, DA3-P)
0.786	98	Unconnected pavement, HSG B (BA2-I, BA3-I, DA1-I, DA2-I, DA3-I, RA1a, RA1b)
0.874	**94**	**TOTAL AREA**

Summary for Subcatchment BA1-P: Bypass Area #1 (Lawn)

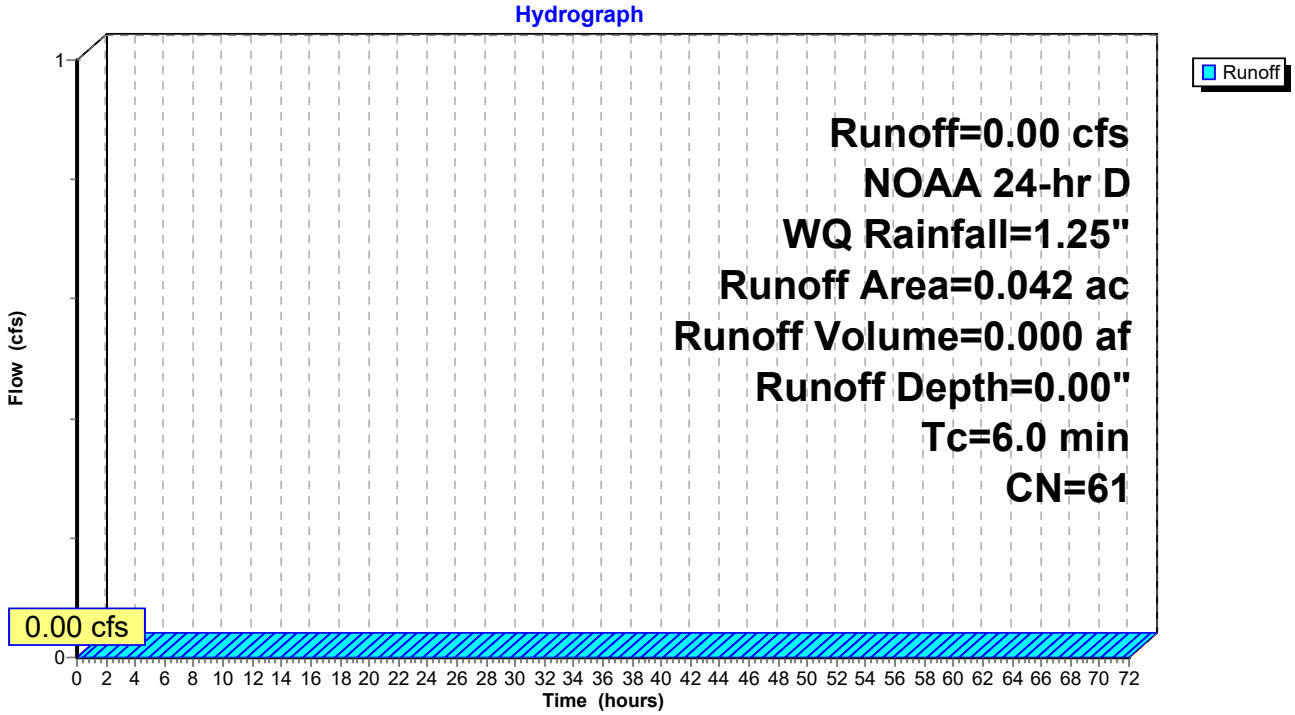
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.042	61	>75% Grass cover, Good, HSG B
0.042		100.00% Pervious Area

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

Subcatchment BA1-P: Bypass Area #1 (Lawn)



Summary for Subcatchment BA2-I: Bypass Area #2 (Impervious)

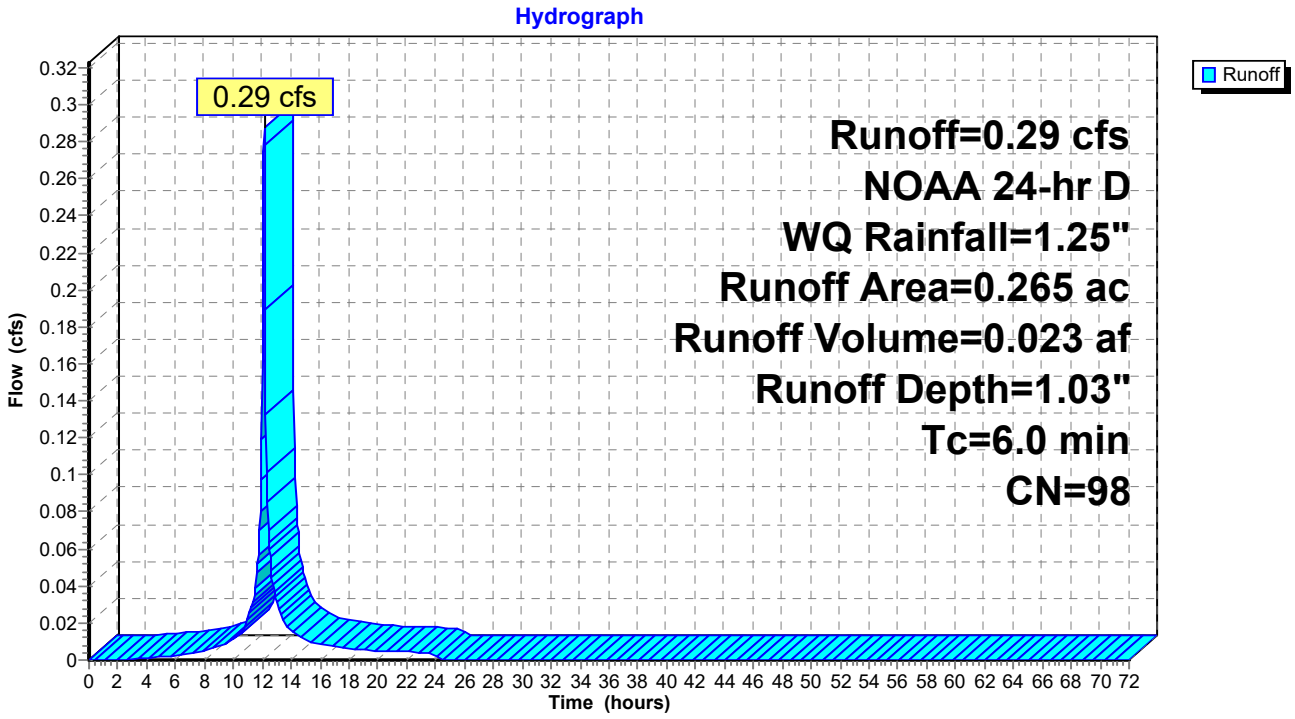
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 1.03"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.265	98	Unconnected pavement, HSG B
0.265		100.00% Impervious Area
0.265		100.00% Unconnected

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

Subcatchment BA2-I: Bypass Area #2 (Impervious)



Summary for Subcatchment BA2-P: Bypass Area #2 (Lawn)

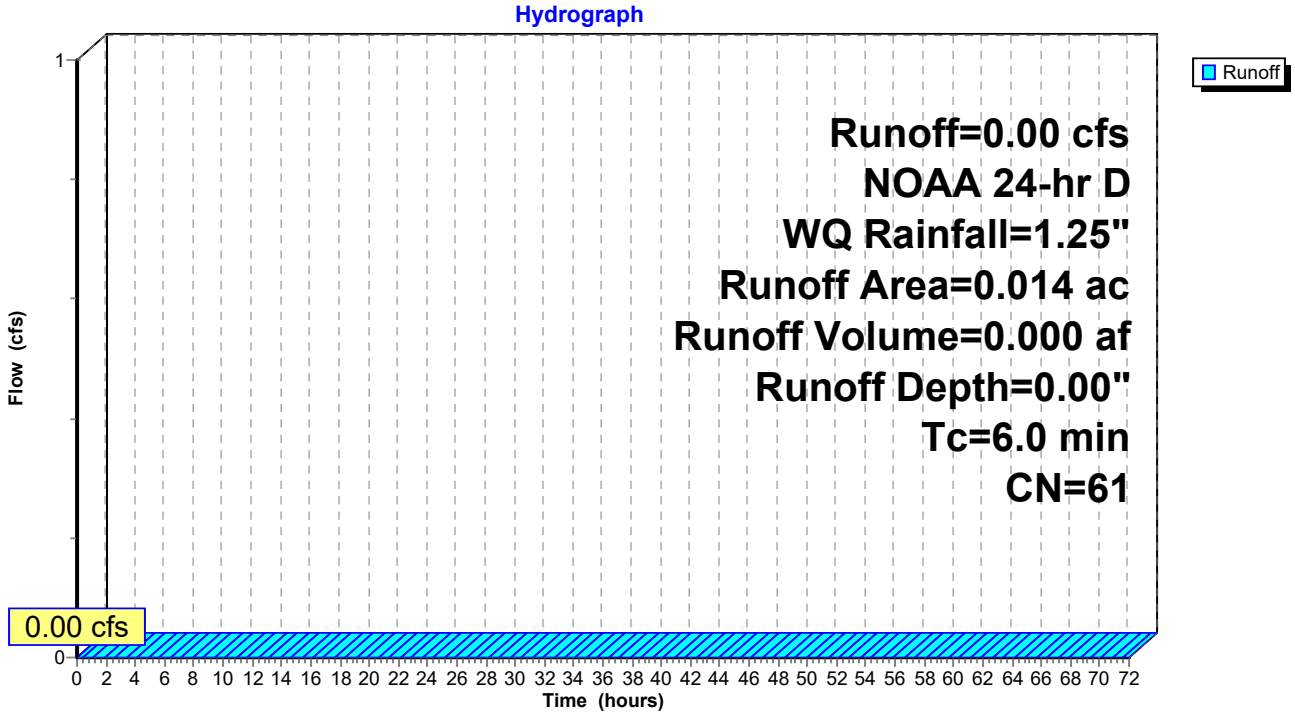
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.014	61	>75% Grass cover, Good, HSG B
	0.014		100.00% Pervious Area

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

Subcatchment BA2-P: Bypass Area #2 (Lawn)



Summary for Subcatchment BA3-I: Bypass Area #3 (Impervious)

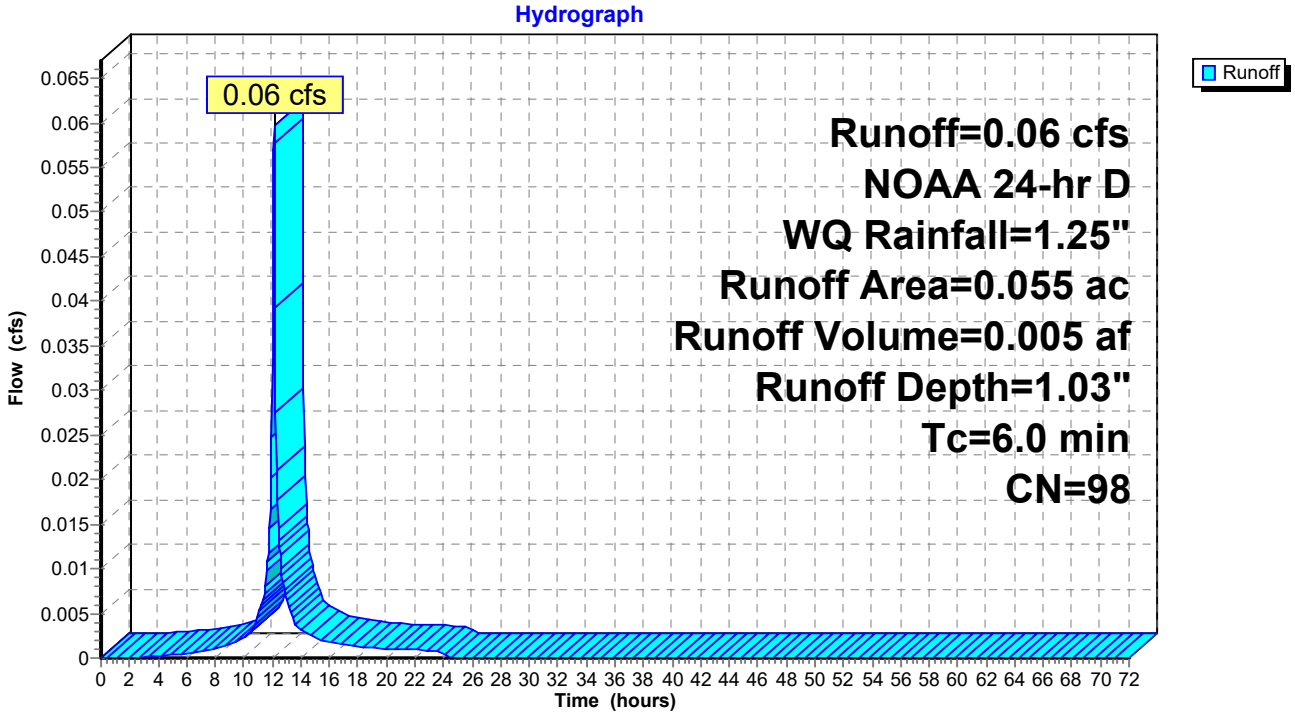
Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 1.03"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.055	98	Unconnected pavement, HSG B
0.055		100.00% Impervious Area
0.055		100.00% Unconnected

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

Subcatchment BA3-I: Bypass Area #3 (Impervious)



Summary for Subcatchment BA3-P: Bypass Area #3 (Lawn)

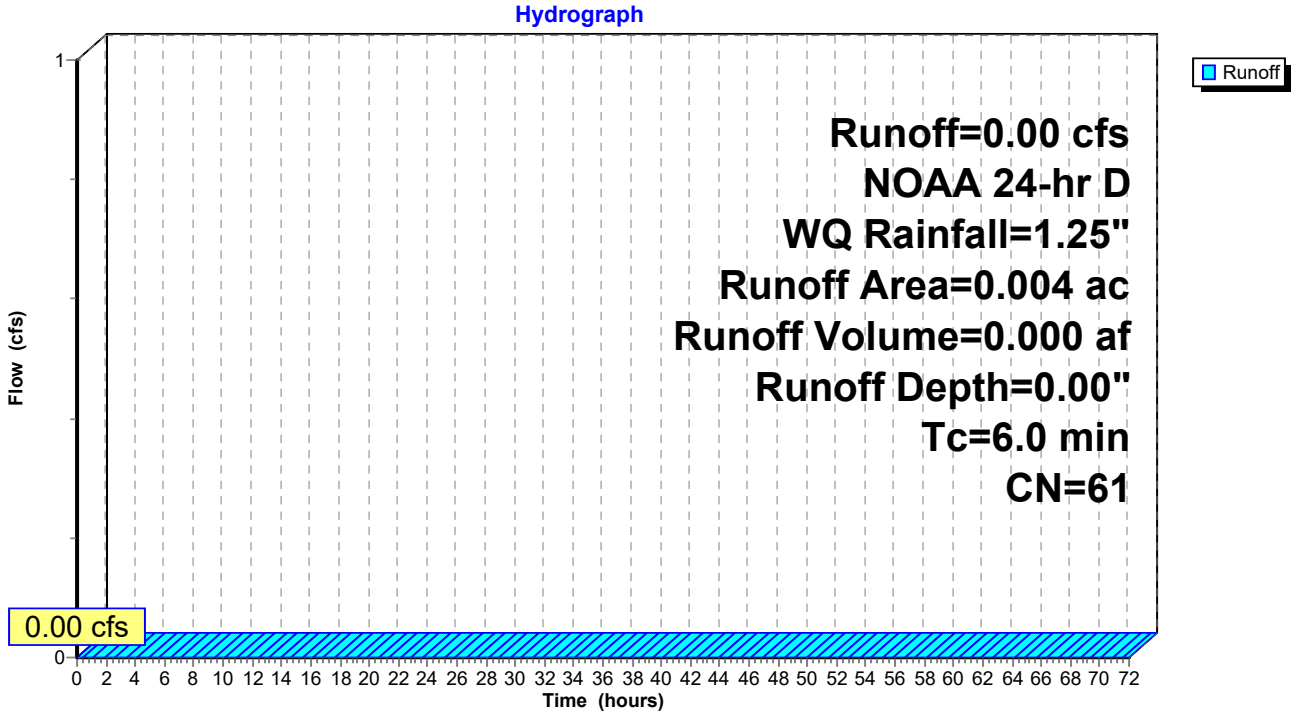
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.004	61	>75% Grass cover, Good, HSG B
0.004		100.00% Pervious Area

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

Subcatchment BA3-P: Bypass Area #3 (Lawn)



Summary for Subcatchment DA1-I: Drainage Area #1 (Impervious)

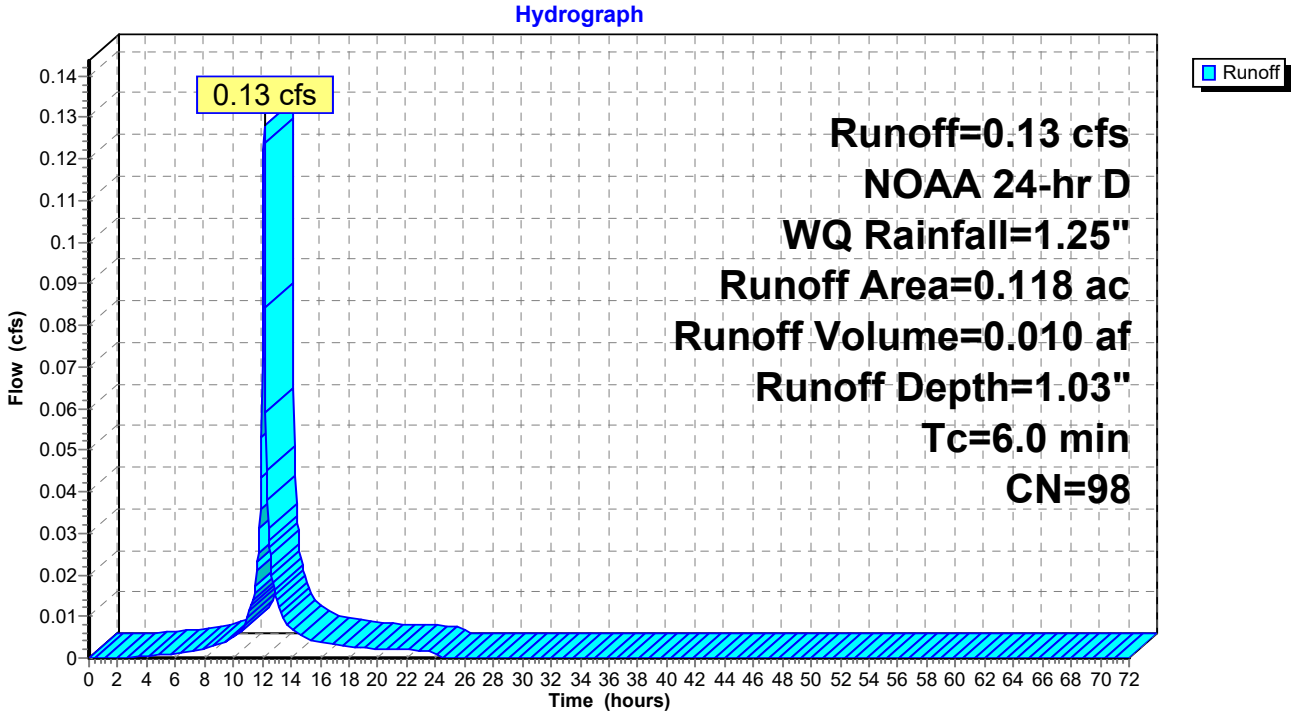
Runoff = 0.13 cfs @ 12.13 hrs, Volume= 0.010 af, Depth= 1.03"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.118	98	Unconnected pavement, HSG B
0.118		100.00% Impervious Area
0.118		100.00% Unconnected

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

Subcatchment DA1-I: Drainage Area #1 (Impervious)



Summary for Subcatchment DA1-P: Drainage Area #1 (Lawn)

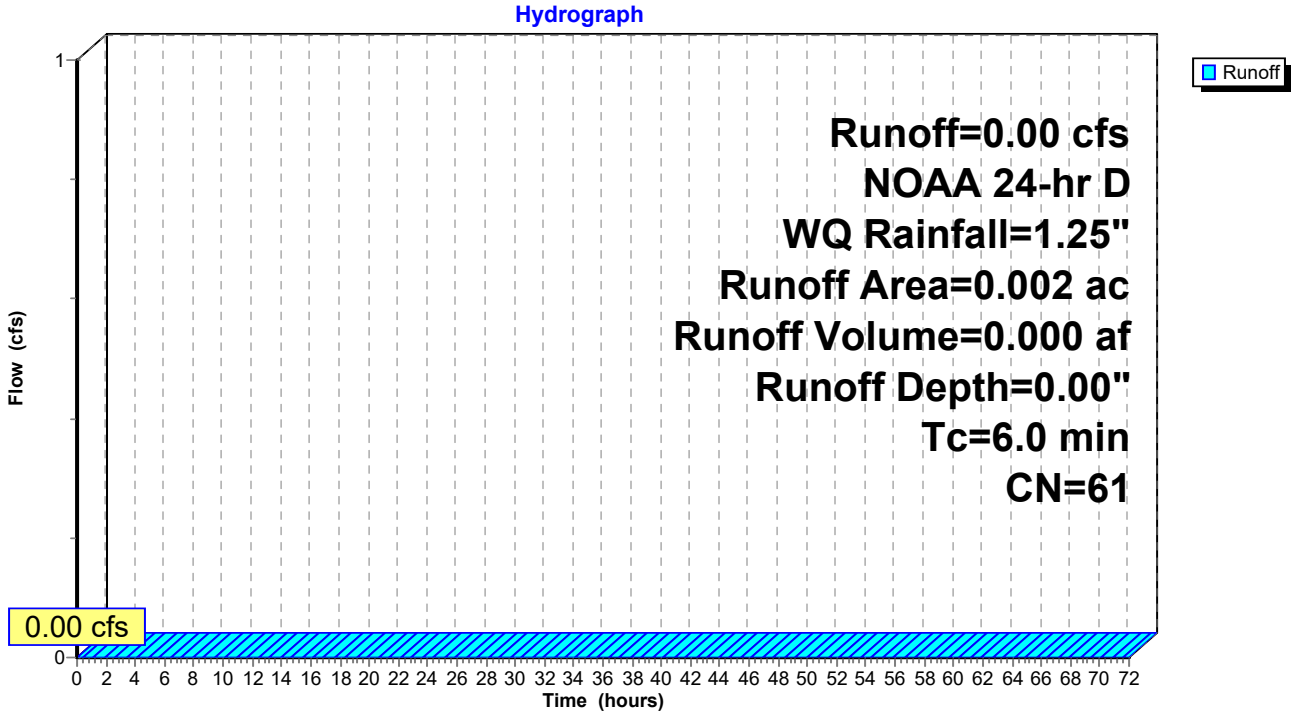
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.002	61	>75% Grass cover, Good, HSG B
0.002		100.00% Pervious Area

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

Subcatchment DA1-P: Drainage Area #1 (Lawn)



Summary for Subcatchment DA2-I: Drainage Area #2 (Impervious)

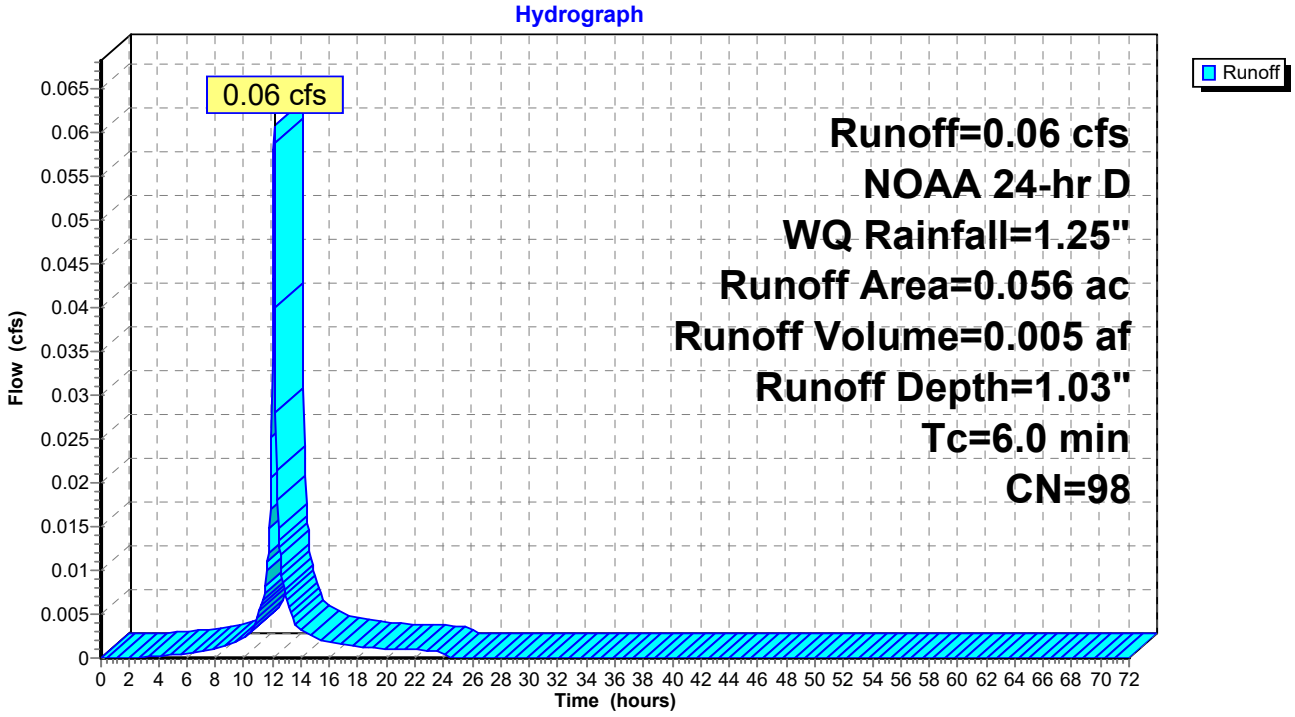
Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 1.03"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.056	98	Unconnected pavement, HSG B
0.056		100.00% Impervious Area
0.056		100.00% Unconnected

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

Subcatchment DA2-I: Drainage Area #2 (Impervious)



Summary for Subcatchment DA2-P: Drainage Area #2 (Lawn)

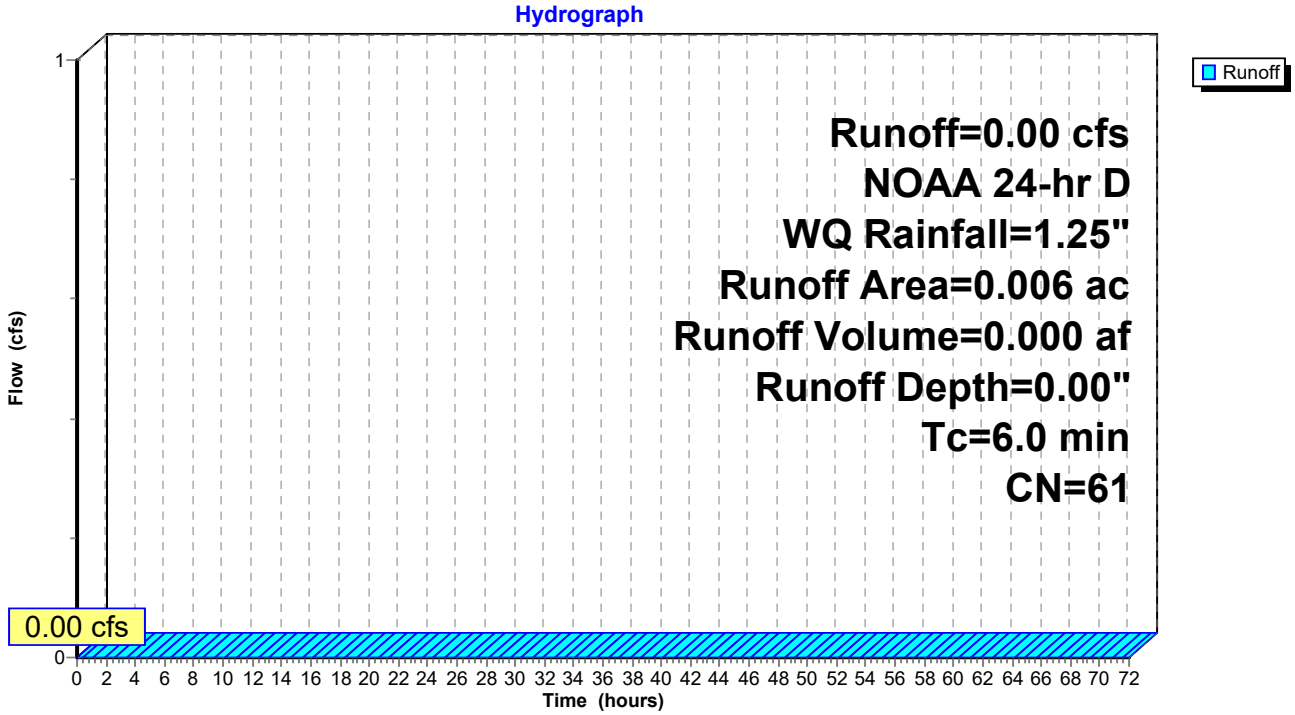
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.006	61	>75% Grass cover, Good, HSG B
0.006		100.00% Pervious Area

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

Subcatchment DA2-P: Drainage Area #2 (Lawn)



Summary for Subcatchment DA3-I: Drainage Area #3 (Impervious)

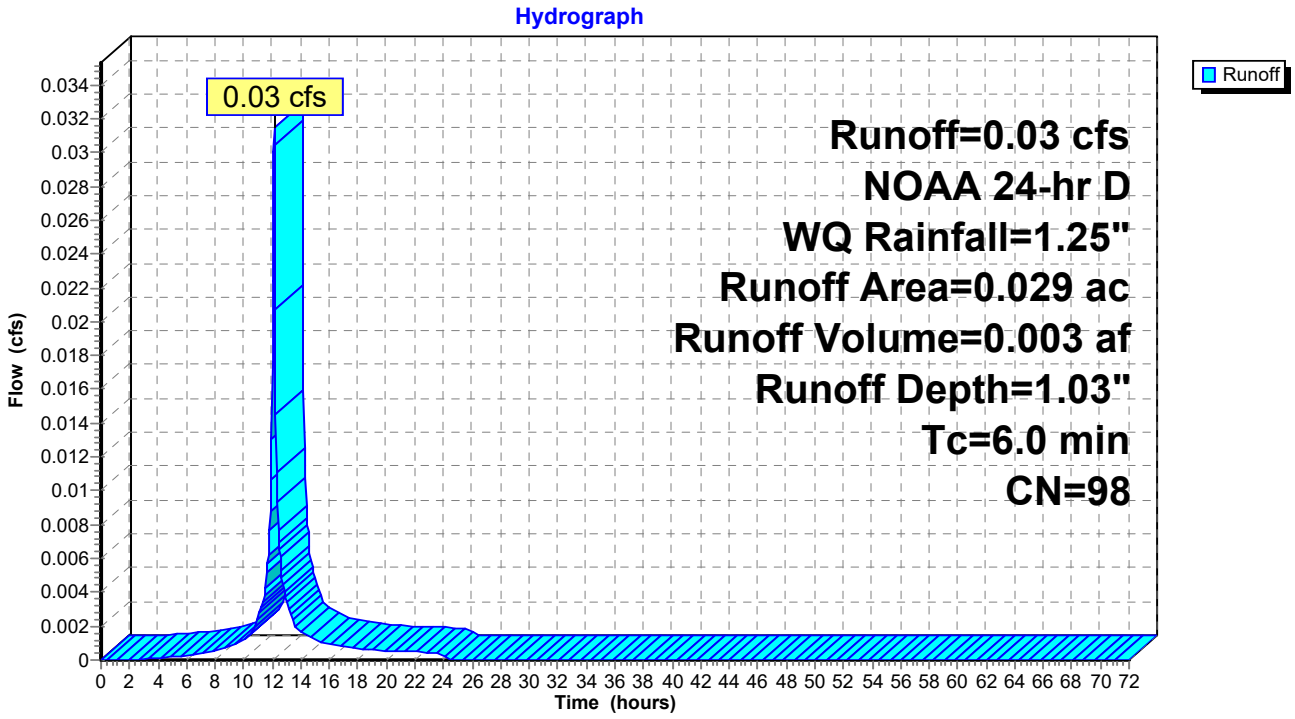
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 1.03"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.029	98	Unconnected pavement, HSG B
0.029		100.00% Impervious Area
0.029		100.00% Unconnected

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

Subcatchment DA3-I: Drainage Area #3 (Impervious)



Summary for Subcatchment DA3-P: Drainage Area #3 (Lawn)

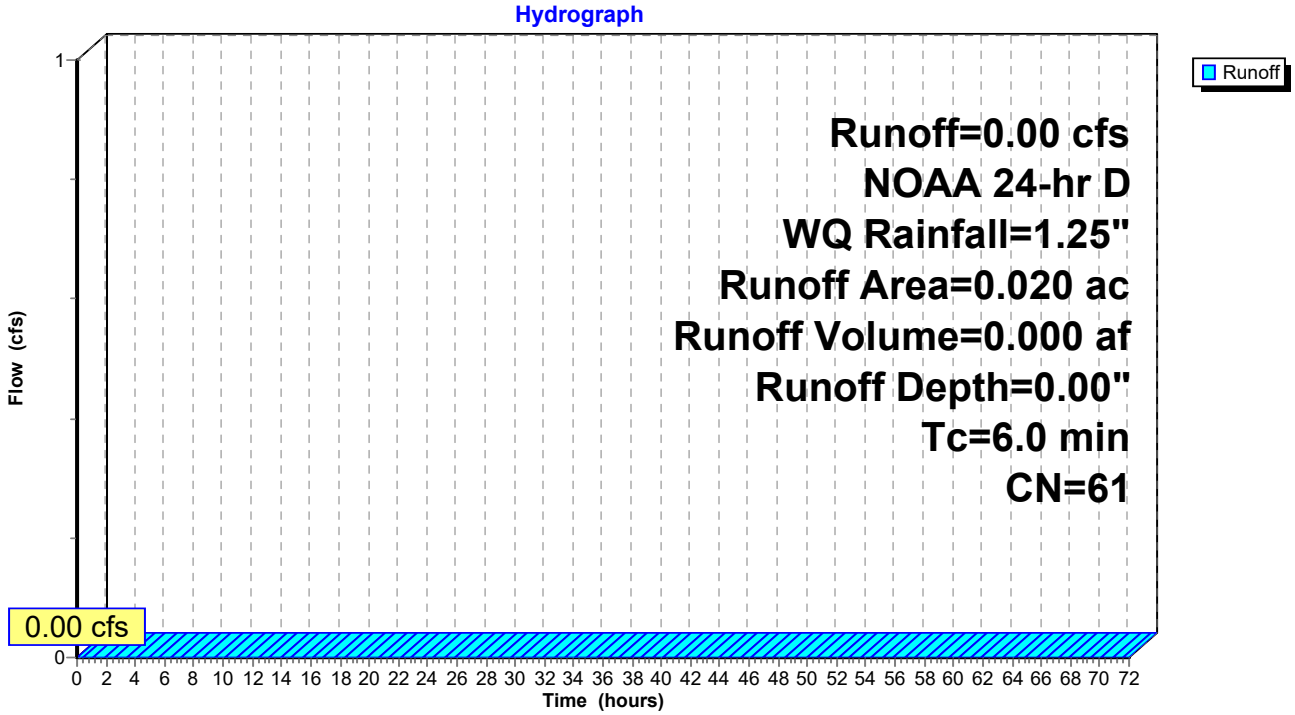
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.020	61	>75% Grass cover, Good, HSG B
0.020		100.00% Pervious Area

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

Subcatchment DA3-P: Drainage Area #3 (Lawn)



Summary for Subcatchment RA1a: Roof Area #1a (Impervious)

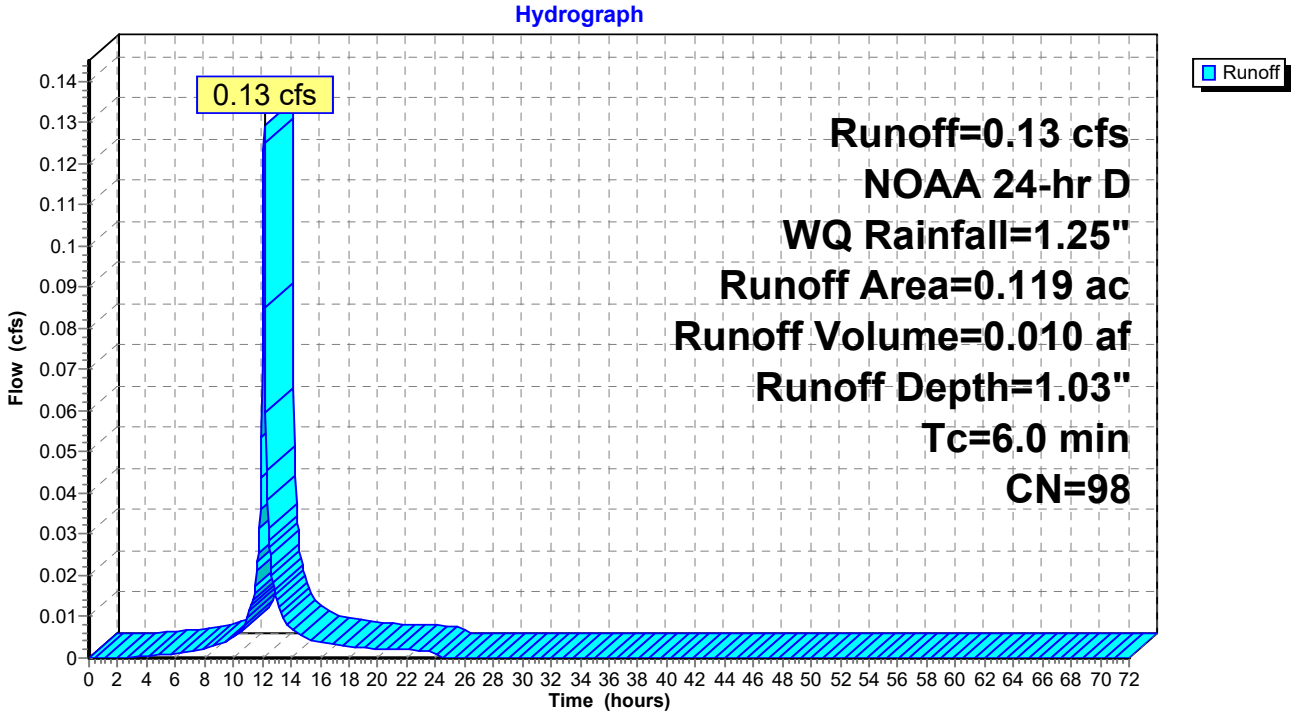
Runoff = 0.13 cfs @ 12.13 hrs, Volume= 0.010 af, Depth= 1.03"
Routed to Pond B-B : Underground Infiltration Basin #B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.119	98	Unconnected pavement, HSG B
0.119		100.00% Impervious Area
0.119		100.00% Unconnected

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

Subcatchment RA1a: Roof Area #1a (Impervious)



Summary for Subcatchment RA1b: Roof Area #1b (Impervious)

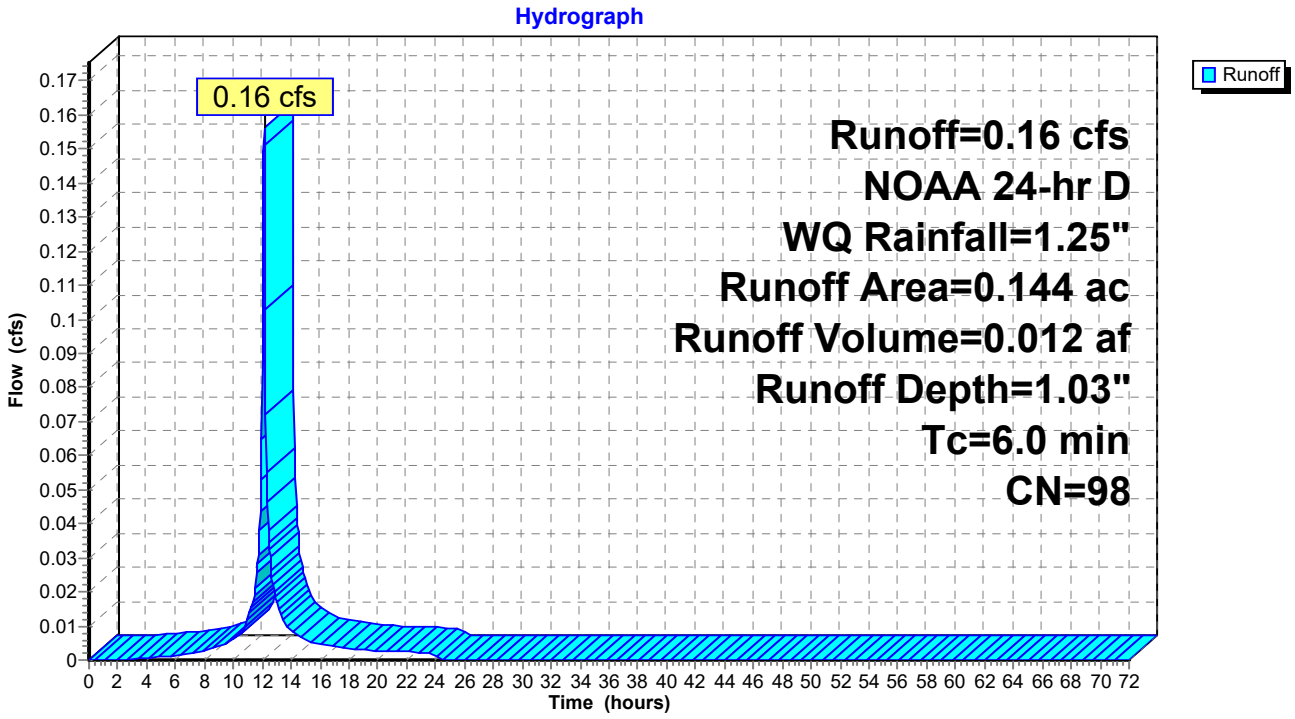
Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 1.03"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D WQ Rainfall=1.25"

Area (ac)	CN	Description
0.144	98	Unconnected pavement, HSG B
0.144		100.00% Impervious Area
0.144		100.00% Unconnected

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

Subcatchment RA1b: Roof Area #1b (Impervious)



Summary for Pond B-B: Underground Infiltration Basin #B

Inflow Area = 0.119 ac,100.00% Impervious, Inflow Depth = 1.03" for WQ event
Inflow = 0.13 cfs @ 12.13 hrs, Volume= 0.010 af
Outflow = 0.13 cfs @ 12.14 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.13 cfs @ 12.14 hrs, Volume= 0.010 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BA : Bioretention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 15.99' @ 12.14 hrs Surf.Area= 0.018 ac Storage= 0.000 af

Plug-Flow detention time= 0.4 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (785.5 - 785.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.98'	0.020 af	**11.50'W x 67.28'L x 3.33'H Field A** 0.059 af Overall - 0.009 af Embedded = 0.050 af x 40.0% Voids
#2A	17.48'	0.009 af	**ADS_StormTech SC-310 +Cap** x 27 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 27 Chambers in 3 Rows
		0.029 af	Total Available Storage

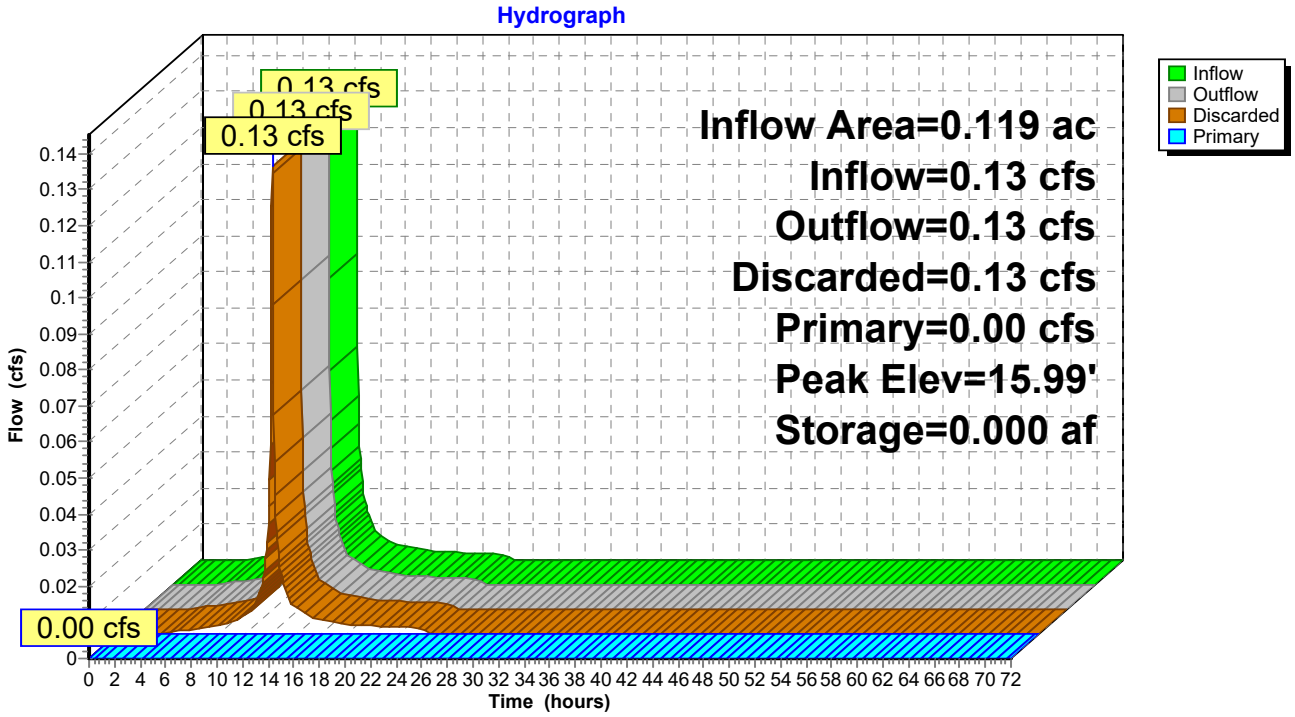
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.59'	**8.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.59' / 18.45' S= 0.0048 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Discarded	15.98'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.12 cfs @ 12.14 hrs HW=15.99' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.98' TW=18.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond B-B: Underground Infiltration Basin #B



Hydrograph for Pond B-B: Underground Infiltration Basin #B

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	15.98	0.00	0.00	**0.00**
2.50	0.00	0.000	15.98	0.00	0.00	0.00
5.00	0.00	0.000	15.98	0.00	0.00	0.00
7.50	0.00	0.000	15.98	0.00	0.00	0.00
10.00	**0.01**	**0.000**	**15.98**	**0.01**	**0.01**	0.00
12.50	**0.03**	**0.000**	**15.98**	**0.03**	**0.03**	0.00
15.00	0.00	0.000	15.98	0.00	0.00	0.00
17.50	0.00	0.000	15.98	0.00	0.00	0.00
20.00	0.00	0.000	15.98	0.00	0.00	0.00
22.50	0.00	0.000	15.98	0.00	0.00	0.00
25.00	0.00	0.000	15.98	0.00	0.00	0.00
27.50	0.00	0.000	15.98	0.00	0.00	0.00
30.00	0.00	0.000	15.98	0.00	0.00	0.00
32.50	0.00	0.000	15.98	0.00	0.00	0.00
35.00	0.00	0.000	15.98	0.00	0.00	0.00
37.50	0.00	0.000	15.98	0.00	0.00	0.00
40.00	0.00	0.000	15.98	0.00	0.00	0.00
42.50	0.00	0.000	15.98	0.00	0.00	0.00
45.00	0.00	0.000	15.98	0.00	0.00	0.00
47.50	0.00	0.000	15.98	0.00	0.00	0.00
50.00	0.00	0.000	15.98	0.00	0.00	0.00
52.50	0.00	0.000	15.98	0.00	0.00	0.00
55.00	0.00	0.000	15.98	0.00	0.00	0.00
57.50	0.00	0.000	15.98	0.00	0.00	0.00
60.00	0.00	0.000	15.98	0.00	0.00	0.00
62.50	0.00	0.000	15.98	0.00	0.00	0.00
65.00	0.00	0.000	15.98	0.00	0.00	0.00
67.50	0.00	0.000	15.98	0.00	0.00	0.00
70.00	0.00	0.000	15.98	0.00	0.00	0.00

Stage-Discharge for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
15.98	0.00	**0.00**	0.00
16.03	0.14	**0.14**	0.00
16.08	0.14	0.14	0.00
16.13	0.14	0.14	0.00
16.18	0.14	0.14	0.00
16.23	0.14	0.14	0.00
16.28	0.14	0.14	0.00
16.33	0.14	0.14	0.00
16.38	0.14	0.14	0.00
16.43	0.14	0.14	0.00
16.48	0.14	0.14	0.00
16.53	0.14	0.14	0.00
16.58	0.14	0.14	0.00
16.63	0.14	0.14	0.00
16.68	0.14	0.14	0.00
16.73	0.14	0.14	0.00
16.78	0.14	0.14	0.00
16.83	0.14	0.14	0.00
16.88	0.14	0.14	0.00
16.93	0.14	0.14	0.00
16.98	0.14	0.14	0.00
17.03	0.14	0.14	0.00
17.08	0.14	0.14	0.00
17.13	0.14	0.14	0.00
17.18	0.14	0.14	0.00
17.23	0.14	0.14	0.00
17.28	0.14	0.14	0.00
17.33	0.14	0.14	0.00
17.38	0.14	0.14	0.00
17.43	0.14	0.14	0.00
17.48	0.14	0.14	0.00
17.53	0.14	0.14	0.00
17.58	0.14	0.14	0.00
17.63	0.14	0.14	0.00
17.68	0.14	0.14	0.00
17.73	0.14	0.14	0.00
17.78	0.14	0.14	0.00
17.83	0.14	0.14	0.00
17.88	0.14	0.14	0.00
17.93	0.14	0.14	0.00
17.98	0.14	0.14	0.00
18.03	0.14	0.14	0.00
18.08	0.14	0.14	0.00
18.13	0.14	0.14	0.00
18.18	0.14	0.14	0.00
18.23	0.14	0.14	0.00
18.28	0.14	0.14	0.00
18.33	0.14	0.14	0.00
18.38	0.14	0.14	0.00
18.43	0.14	0.14	0.00
18.48	0.14	0.14	0.00
18.53	0.14	0.14	0.00
18.58	0.14	0.14	0.00
18.63	0.15	0.14	0.00
18.68	0.17	0.14	0.02
18.73	0.20	0.14	0.05
18.78	0.24	0.14	0.09
18.83	0.29	0.14	0.14
18.88	0.34	0.14	0.20
18.93	0.41	0.14	0.27
18.98	0.48	0.14	0.34
19.03	0.55	0.14	0.41
19.08	0.63	0.14	0.49
19.13	0.71	0.14	0.57
19.18	0.79	0.14	0.65
19.23	0.87	0.14	0.73
19.28	**0.94**	0.14	**0.79**

Stage-Area-Storage for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Surface (acres)	Storage (acre-feet)
15.98	**0.018**	0.000
16.03	0.018	0.000
16.08	0.018	0.001
16.13	0.018	0.001
16.18	0.018	0.001
16.23	0.018	0.002
16.28	0.018	0.002
16.33	0.018	0.002
16.38	0.018	0.003
16.43	0.018	0.003
16.48	0.018	0.004
16.53	0.018	0.004
16.58	0.018	0.004
16.63	0.018	0.005
16.68	0.018	0.005
16.73	0.018	0.005
16.78	0.018	0.006
16.83	0.018	0.006
16.88	0.018	0.006
16.93	0.018	0.007
16.98	0.018	0.007
17.03	0.018	0.007
17.08	0.018	0.008
17.13	0.018	0.008
17.18	0.018	0.009
17.23	0.018	0.009
17.28	0.018	0.009
17.33	0.018	0.010
17.38	0.018	0.010
17.43	0.018	0.010
17.48	0.018	0.011
17.53	0.018	0.011
17.58	0.018	0.012
17.63	0.018	0.013
17.68	0.018	0.013
17.73	0.018	0.014
17.78	0.018	0.015
17.83	0.018	0.015
17.88	0.018	0.016
17.93	0.018	0.017
17.98	0.018	0.017
18.03	0.018	0.018
18.08	0.018	0.018
18.13	0.018	0.019
18.18	0.018	0.020
18.23	0.018	0.020
18.28	0.018	0.021
18.33	0.018	0.021
18.38	0.018	0.022
18.43	0.018	0.022
18.48	0.018	0.023
18.53	0.018	0.023
18.58	0.018	0.024
18.63	0.018	0.024
18.68	0.018	0.025
18.73	0.018	0.025
18.78	0.018	0.025
18.83	0.018	0.026
18.88	0.018	0.026
18.93	0.018	0.026
18.98	0.018	0.027
19.03	0.018	0.027
19.08	0.018	0.028
19.13	0.018	0.028
19.18	0.018	0.028
19.23	0.018	0.029
19.28	0.018	**0.029**

Summary for Pond BA: Bioretention Basin

Inflow Area = 0.494 ac, 94.33% Impervious, Inflow Depth = 0.73" for WQ event
Inflow = 0.38 cfs @ 12.13 hrs, Volume= 0.030 af
Outflow = 0.08 cfs @ 12.47 hrs, Volume= 0.030 af, Atten= 79%, Lag= 20.7 min
Discarded = 0.08 cfs @ 11.95 hrs, Volume= 0.030 af
Primary = 0.00 cfs @ 12.47 hrs, Volume= 0.000 af
Routed to Pond SP-2 : Study Point #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond SP-2 : Study Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 18.58' @ 12.47 hrs Surf.Area= 436 sf Storage= 255 cf

Plug-Flow detention time= 16.0 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 16.0 min (801.2 - 785.2)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	1,090 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	436	0	0
19.00	436	436	436
20.00	436	436	872
20.50	436	218	1,090

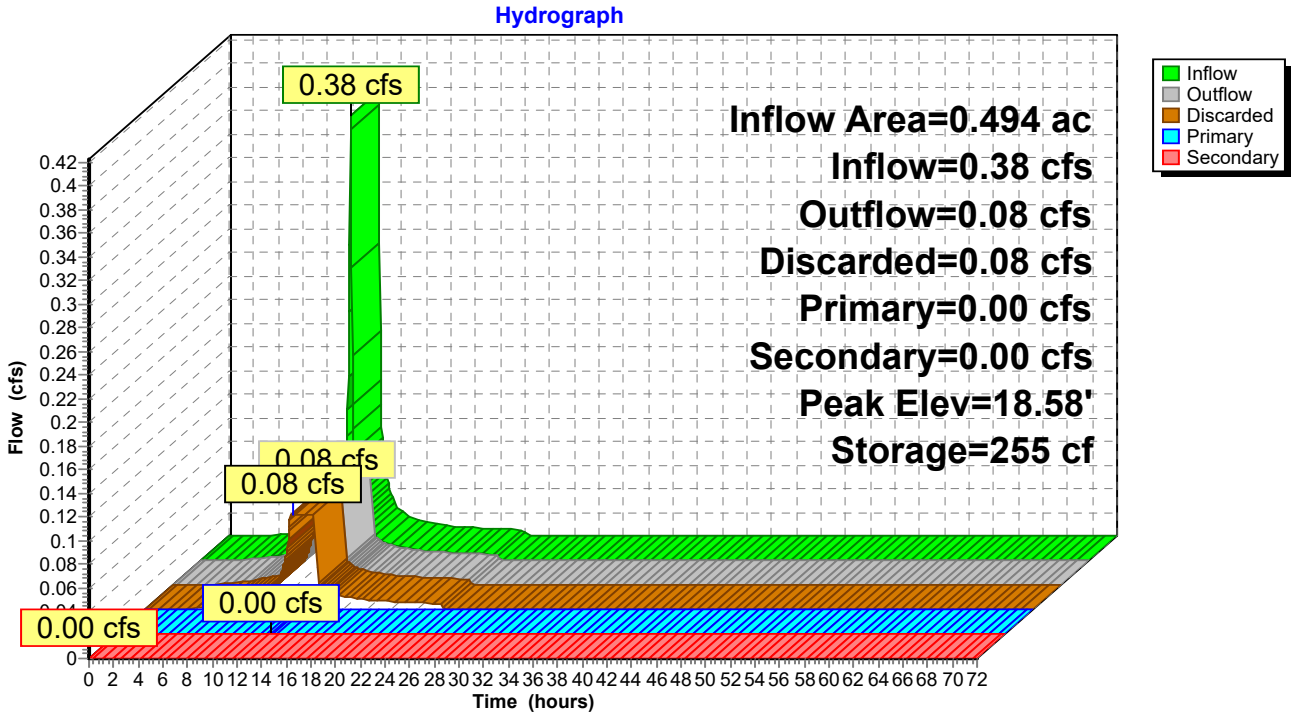
Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**15.0" Round Culvert** L= 17.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 17.90' / 17.60' S= 0.0171 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	18.58'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	20.00'	**24.0" Vert. Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	18.00'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	20.35'	**2.8' long x 1.0' breadth Emergency Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.08 cfs @ 11.95 hrs HW=18.06' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 12.47 hrs HW=18.58' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 1.92 cfs potential flow)
├**2=Orifice** (Orifice Controls 0.00 cfs @ 0.20 fps)
└**3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=0.00' (Dynamic Tailwater)
└**5=Emergency Spillway** (Controls 0.00 cfs)

Pond BA: Bioretention Basin



Hydrograph for Pond BA: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	18.00	0.00	0.00	0.00	**0.00**
2.50	0.00	0	18.00	0.00	0.00	0.00	0.00
5.00	0.00	0	18.00	0.00	0.00	0.00	0.00
7.50	0.01	0	18.00	0.01	0.01	0.00	0.00
10.00	**0.02**	**1**	**18.00**	**0.01**	**0.01**	**0.00**	0.00
12.50	**0.08**	**254**	**18.58**	**0.08**	**0.08**	**0.00**	0.00
15.00	0.01	1	18.00	0.01	0.01	0.00	0.00
17.50	0.01	0	18.00	0.01	0.01	0.00	0.00
20.00	0.01	0	18.00	0.01	0.01	0.00	0.00
22.50	0.01	0	18.00	0.01	0.01	0.00	0.00
25.00	0.00	0	18.00	0.00	0.00	0.00	0.00
27.50	0.00	0	18.00	0.00	0.00	0.00	0.00
30.00	0.00	0	18.00	0.00	0.00	0.00	0.00
32.50	0.00	0	18.00	0.00	0.00	0.00	0.00
35.00	0.00	0	18.00	0.00	0.00	0.00	0.00
37.50	0.00	0	18.00	0.00	0.00	0.00	0.00
40.00	0.00	0	18.00	0.00	0.00	0.00	0.00
42.50	0.00	0	18.00	0.00	0.00	0.00	0.00
45.00	0.00	0	18.00	0.00	0.00	0.00	0.00
47.50	0.00	0	18.00	0.00	0.00	0.00	0.00
50.00	0.00	0	18.00	0.00	0.00	0.00	0.00
52.50	0.00	0	18.00	0.00	0.00	0.00	0.00
55.00	0.00	0	18.00	0.00	0.00	0.00	0.00
57.50	0.00	0	18.00	0.00	0.00	0.00	0.00
60.00	0.00	0	18.00	0.00	0.00	0.00	0.00
62.50	0.00	0	18.00	0.00	0.00	0.00	0.00
65.00	0.00	0	18.00	0.00	0.00	0.00	0.00
67.50	0.00	0	18.00	0.00	0.00	0.00	0.00
70.00	0.00	0	18.00	0.00	0.00	0.00	0.00

Stage-Discharge for Pond BA: Bioretention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
18.00	0.00	**0.00**	0.00	0.00
18.10	0.08	**0.08**	0.00	0.00
18.20	0.08	0.08	0.00	0.00
18.30	0.08	0.08	0.00	0.00
18.40	0.08	0.08	0.00	0.00
18.50	0.08	0.08	0.00	0.00
18.60	0.08	0.08	0.00	0.00
18.70	0.13	0.08	0.05	0.00
18.80	0.25	0.08	0.17	0.00
18.90	0.43	0.08	0.35	0.00
19.00	0.64	0.08	0.56	0.00
19.10	0.88	0.08	0.80	0.00
19.20	1.13	0.08	1.05	0.00
19.30	1.34	0.08	1.26	0.00
19.40	1.50	0.08	1.42	0.00
19.50	1.65	0.08	1.57	0.00
19.60	1.79	0.08	1.71	0.00
19.70	1.92	0.08	1.84	0.00
19.80	2.04	0.08	1.96	0.00
19.90	2.15	0.08	2.07	0.00
20.00	2.26	0.08	2.17	0.00
20.10	2.42	0.08	2.34	0.00
20.20	2.70	0.08	2.62	0.00
20.30	3.10	0.08	3.02	0.00
20.40	3.69	0.08	3.52	0.08
20.50	4.64	0.08	4.12	0.44
20.60	5.84	0.08	4.82	0.94
20.70	7.25	0.08	5.60	1.57
20.80	8.85	0.08	6.46	2.31
20.90	10.61	0.08	7.40	3.13
21.00	12.54	0.08	8.39	4.07
21.10	14.66	0.08	9.44	5.14
21.20	16.07	0.08	9.66	6.32
21.30	17.57	0.08	9.84	7.64
21.40	19.15	0.08	10.02	9.05
21.50	20.82	0.08	10.19	10.55
21.60	22.61	0.08	10.36	12.17
21.70	24.53	0.08	10.53	13.92
21.80	26.52	0.08	10.69	15.74
21.90	28.55	0.08	10.86	17.61
22.00	**30.61**	0.08	**11.01**	**19.51**

Stage-Area-Storage for Pond BA: Bioretention Basin

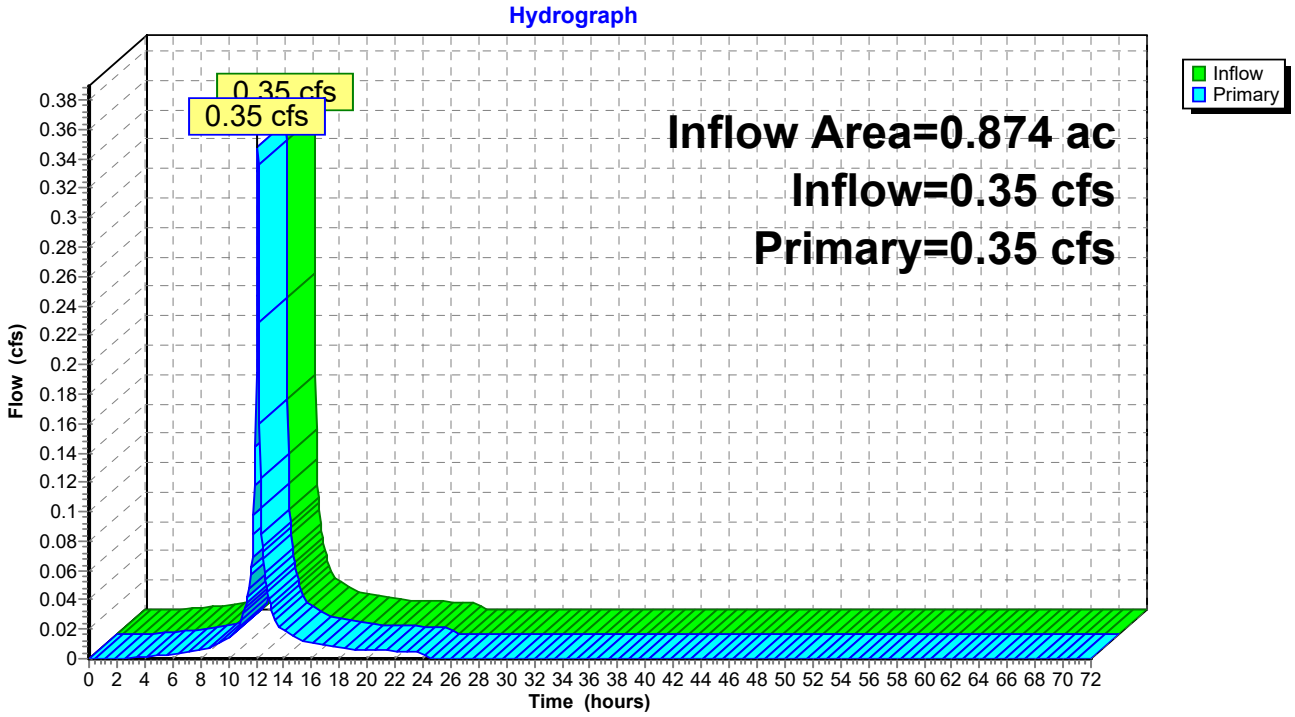
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
18.00	**436**	0
18.05	436	22
18.10	436	44
18.15	436	65
18.20	436	87
18.25	436	109
18.30	436	131
18.35	436	153
18.40	436	174
18.45	436	196
18.50	436	218
18.55	436	240
18.60	436	262
18.65	436	283
18.70	436	305
18.75	436	327
18.80	436	349
18.85	436	371
18.90	436	392
18.95	436	414
19.00	436	436
19.05	436	458
19.10	436	480
19.15	436	501
19.20	436	523
19.25	436	545
19.30	436	567
19.35	436	589
19.40	436	610
19.45	436	632
19.50	436	654
19.55	436	676
19.60	436	698
19.65	436	719
19.70	436	741
19.75	436	763
19.80	436	785
19.85	436	807
19.90	436	828
19.95	436	850
20.00	436	872
20.05	436	894
20.10	436	916
20.15	436	937
20.20	436	959
20.25	436	981
20.30	436	1,003
20.35	436	1,025
20.40	436	1,046
20.45	436	1,068
20.50	436	**1,090**
20.55	436	1,090
20.60	436	1,090
20.65	436	1,090
20.70	436	1,090
20.75	436	1,090
20.80	436	1,090
20.85	436	1,090
20.90	436	1,090
20.95	436	1,090
21.00	436	1,090
21.05	436	1,090
21.10	436	1,090
21.15	436	1,090
21.20	436	1,090
21.25	436	1,090
21.30	436	1,090
21.35	436	1,090
21.40	436	1,090
21.45	436	1,090
21.50	436	1,090
21.55	436	1,090
21.60	436	1,090
21.65	436	1,090
21.70	436	1,090
21.75	436	1,090
21.80	436	1,090
21.85	436	1,090
21.90	436	1,090
21.95	436	1,090
22.00	436	1,090

Summary for Pond OS: Overall Site

Inflow Area = 0.874 ac, 89.93% Impervious, Inflow Depth = 0.38" for WQ event
Inflow = 0.35 cfs @ 12.13 hrs, Volume= 0.028 af
Primary = 0.35 cfs @ 12.13 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond OS: Overall Site

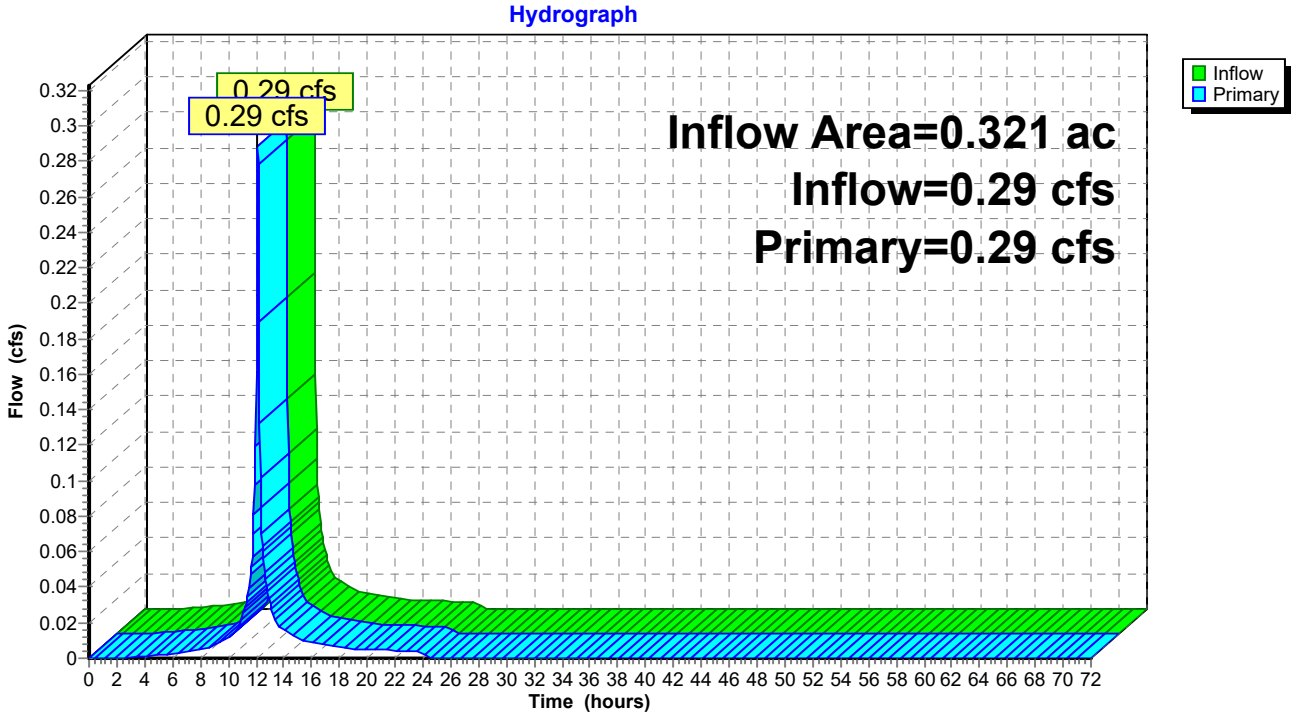


Summary for Pond SP-1: Study Point #1

Inflow Area = 0.321 ac, 82.55% Impervious, Inflow Depth = 0.85" for WQ event
Inflow = 0.29 cfs @ 12.13 hrs, Volume= 0.023 af
Primary = 0.29 cfs @ 12.13 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-1: Study Point #1

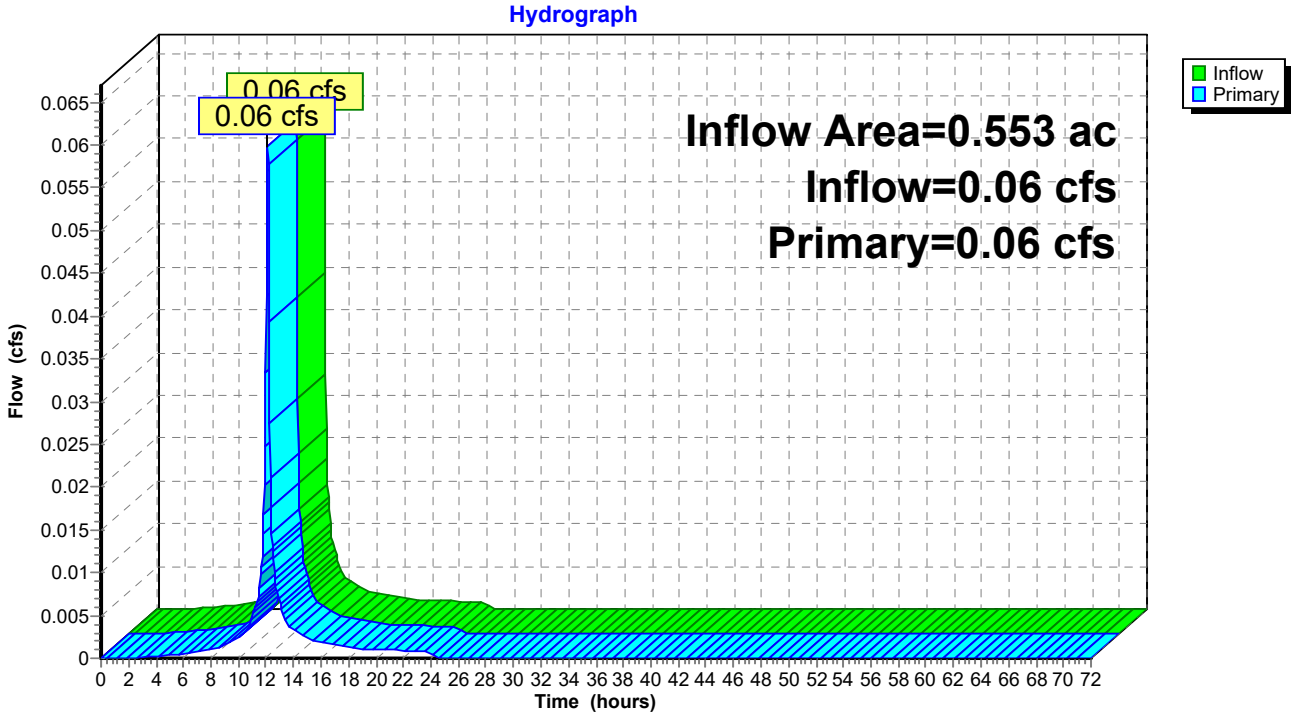


Summary for Pond SP-2: Study Point #2

Inflow Area = 0.553 ac, 94.21% Impervious, Inflow Depth = 0.10" for WQ event
Inflow = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af
Primary = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-2: Study Point #2

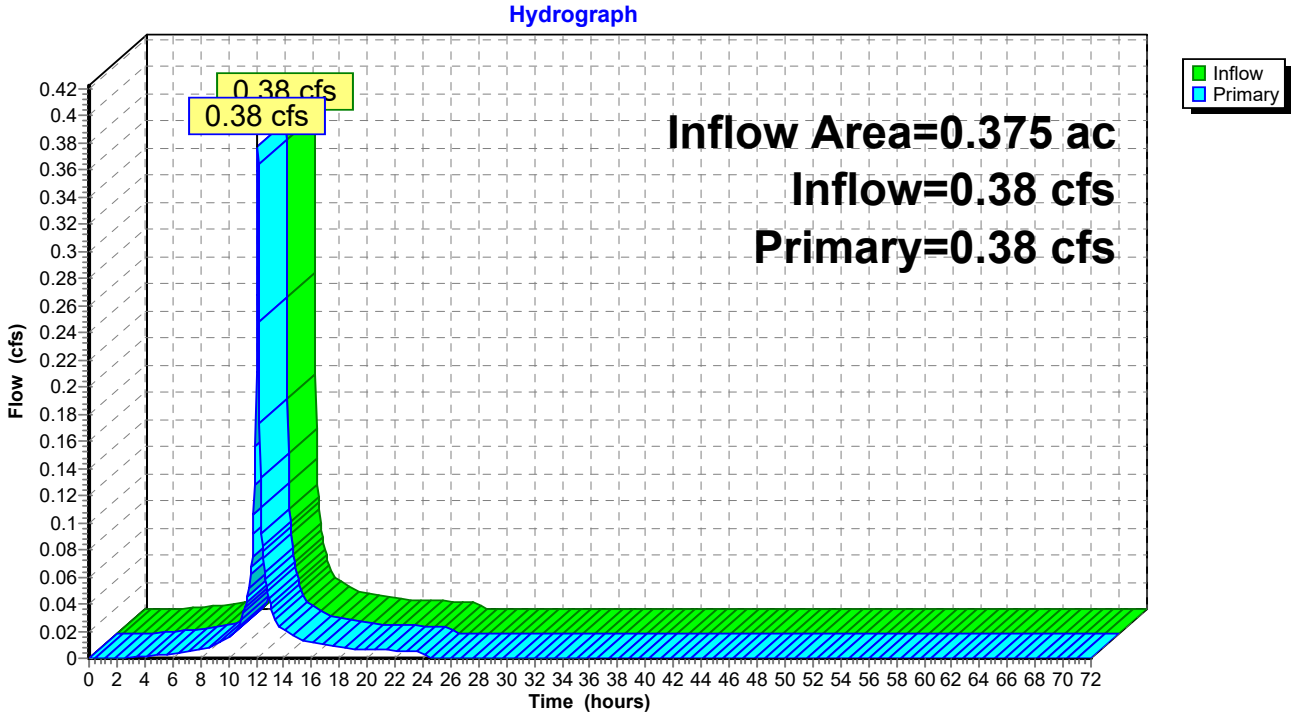


Summary for Link DA-BA: Basin Drainage Area

Inflow Area = 0.375 ac, 92.53% Impervious, Inflow Depth = 0.96" for WQ event
Inflow = 0.38 cfs @ 12.13 hrs, Volume= 0.030 af
Primary = 0.38 cfs @ 12.13 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BA : Bioretention Basin

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link DA-BA: Basin Drainage Area



Summary for Subcatchment BA1-P: Bypass Area #1 (Lawn)

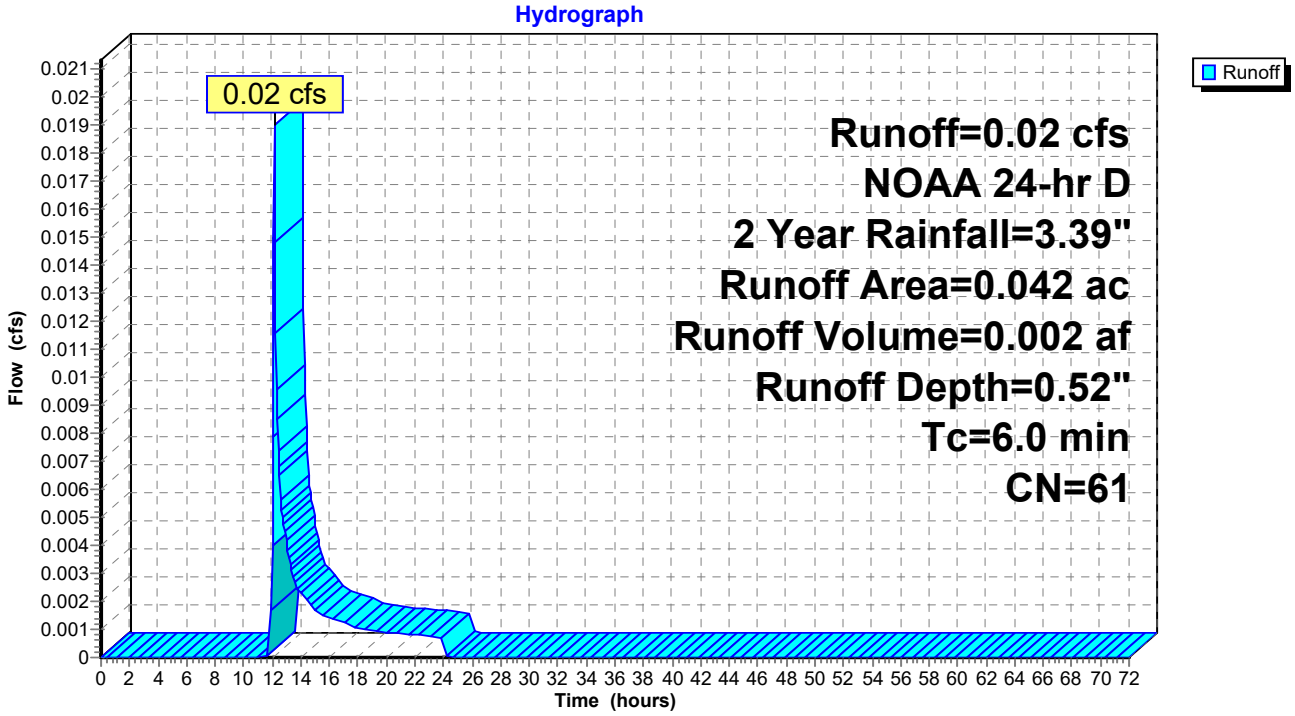
Runoff = 0.02 cfs @ 12.15 hrs, Volume= 0.002 af, Depth= 0.52"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.042	61	>75% Grass cover, Good, HSG B
0.042		100.00% Pervious Area

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

Subcatchment BA1-P: Bypass Area #1 (Lawn)



Summary for Subcatchment BA2-I: Bypass Area #2 (Impervious)

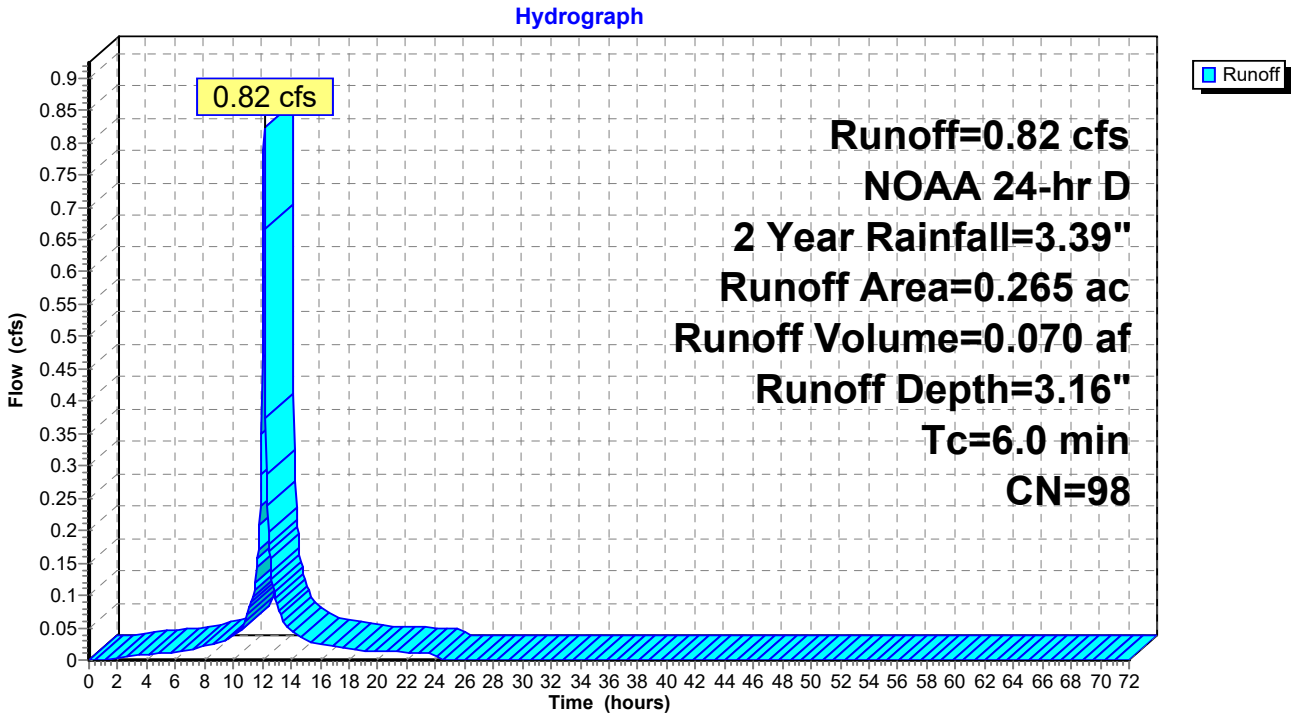
Runoff = 0.82 cfs @ 12.13 hrs, Volume= 0.070 af, Depth= 3.16"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.265	98	Unconnected pavement, HSG B
0.265		100.00% Impervious Area
0.265		100.00% Unconnected

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

Subcatchment BA2-I: Bypass Area #2 (Impervious)



Summary for Subcatchment BA2-P: Bypass Area #2 (Lawn)

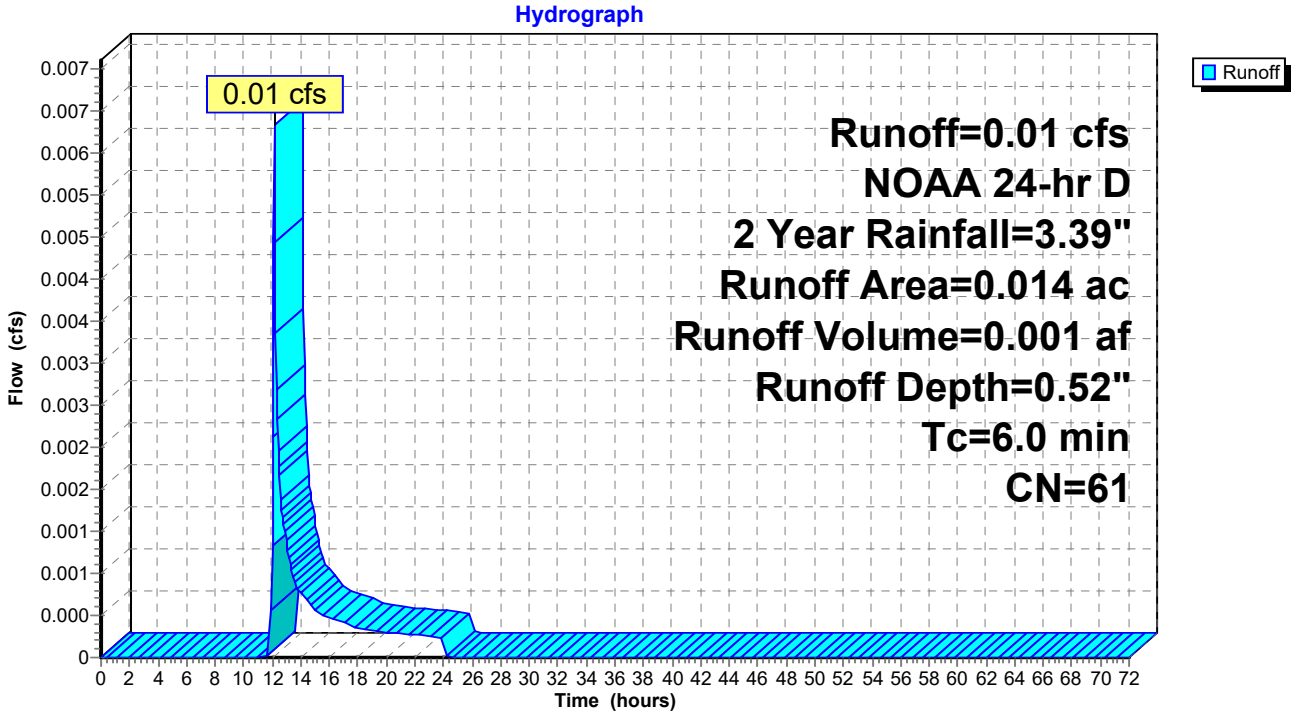
Runoff = 0.01 cfs @ 12.15 hrs, Volume= 0.001 af, Depth= 0.52"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

	Area (ac)	CN	Description
*	0.014	61	>75% Grass cover, Good, HSG B
	0.014		100.00% Pervious Area

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

Subcatchment BA2-P: Bypass Area #2 (Lawn)



Summary for Subcatchment BA3-I: Bypass Area #3 (Impervious)

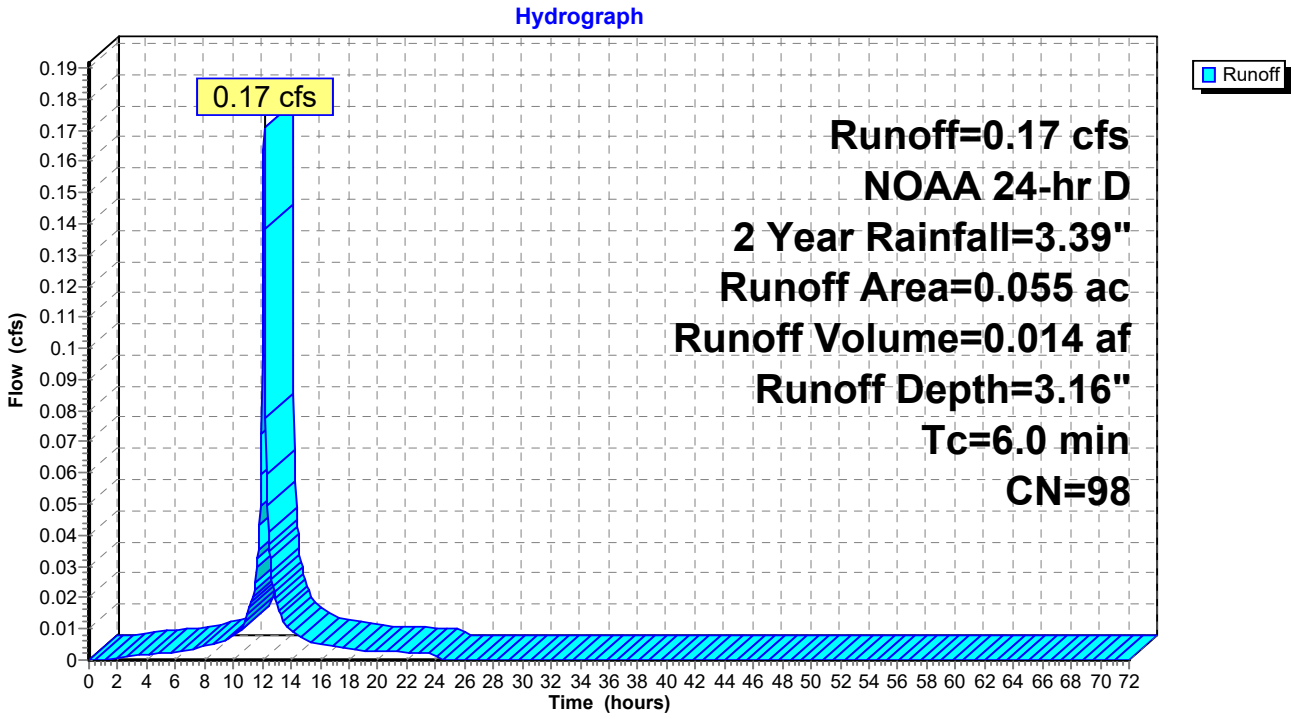
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.014 af, Depth= 3.16"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.055	98	Unconnected pavement, HSG B
0.055		100.00% Impervious Area
0.055		100.00% Unconnected

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

Subcatchment BA3-I: Bypass Area #3 (Impervious)



Summary for Subcatchment BA3-P: Bypass Area #3 (Lawn)

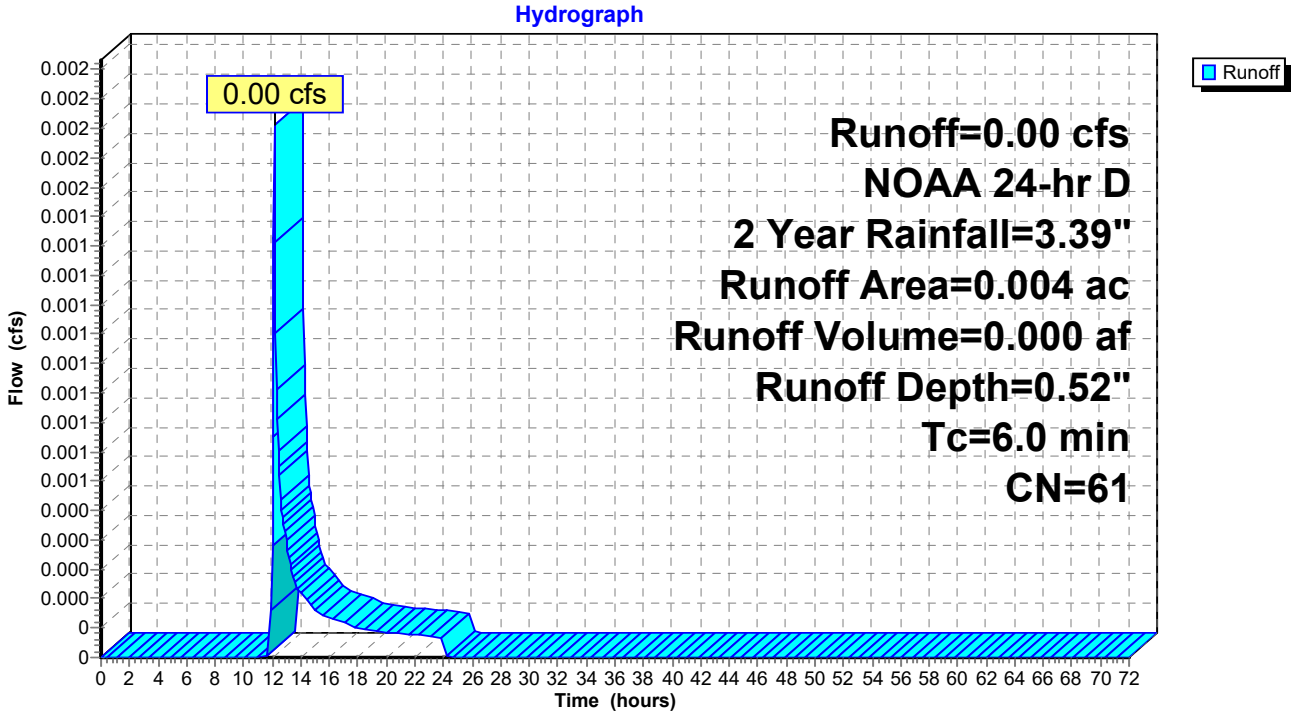
Runoff = 0.00 cfs @ 12.15 hrs, Volume= 0.000 af, Depth= 0.52"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.004	61	>75% Grass cover, Good, HSG B
0.004		100.00% Pervious Area

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

Subcatchment BA3-P: Bypass Area #3 (Lawn)



Summary for Subcatchment DA1-I: Drainage Area #1 (Impervious)

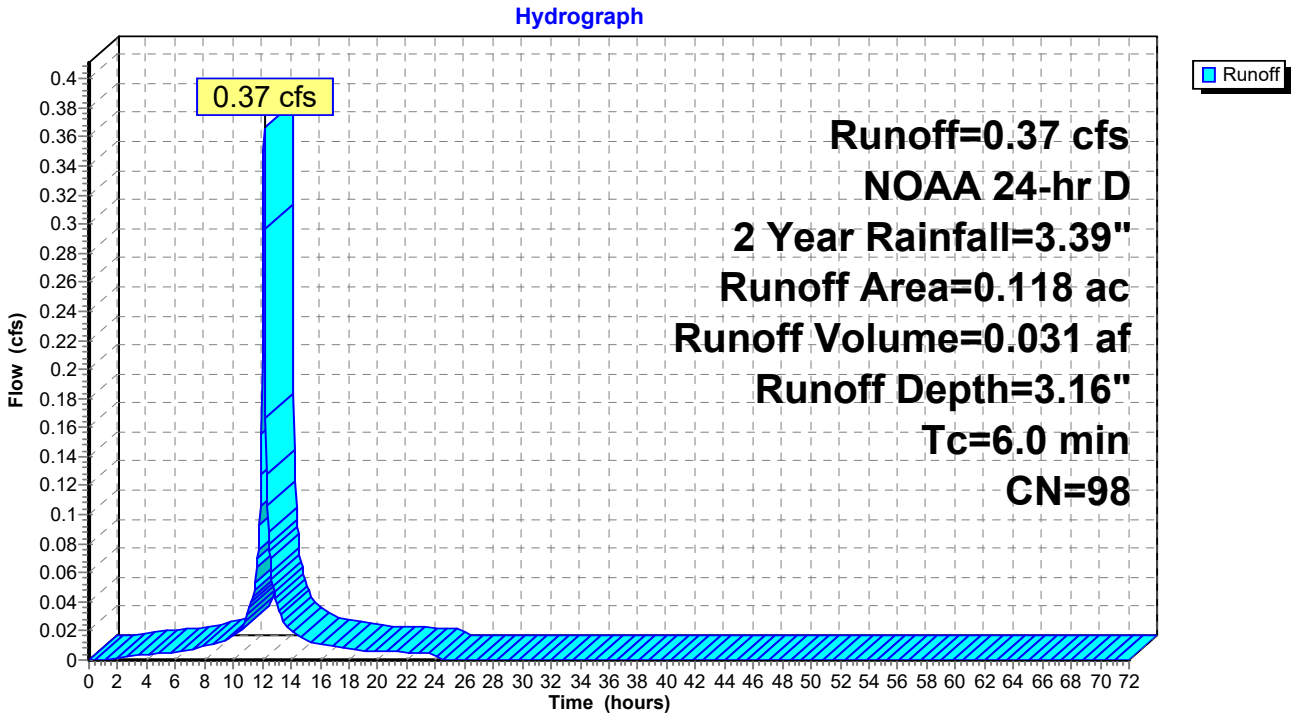
Runoff = 0.37 cfs @ 12.13 hrs, Volume= 0.031 af, Depth= 3.16"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.118	98	Unconnected pavement, HSG B
0.118		100.00% Impervious Area
0.118		100.00% Unconnected

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

Subcatchment DA1-I: Drainage Area #1 (Impervious)



Summary for Subcatchment DA1-P: Drainage Area #1 (Lawn)

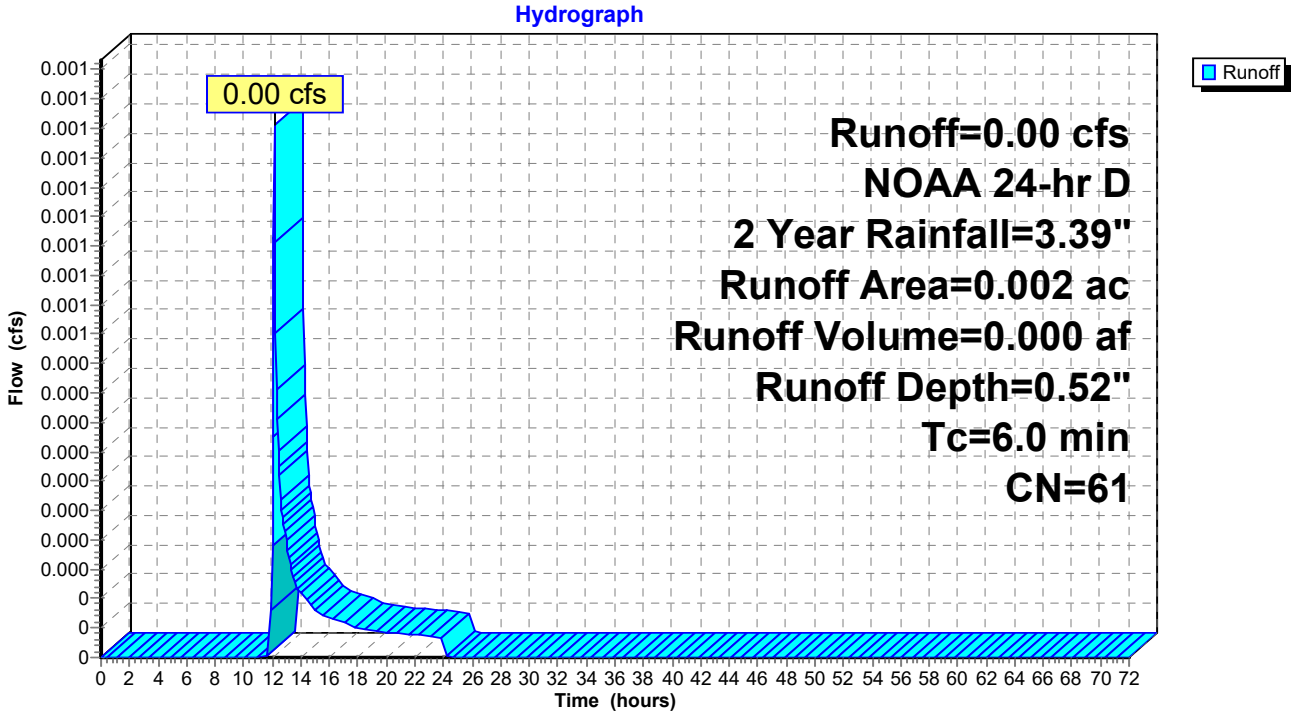
Runoff = 0.00 cfs @ 12.15 hrs, Volume= 0.000 af, Depth= 0.52"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.002	61	>75% Grass cover, Good, HSG B
0.002		100.00% Pervious Area

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

Subcatchment DA1-P: Drainage Area #1 (Lawn)



Summary for Subcatchment DA2-I: Drainage Area #2 (Impervious)

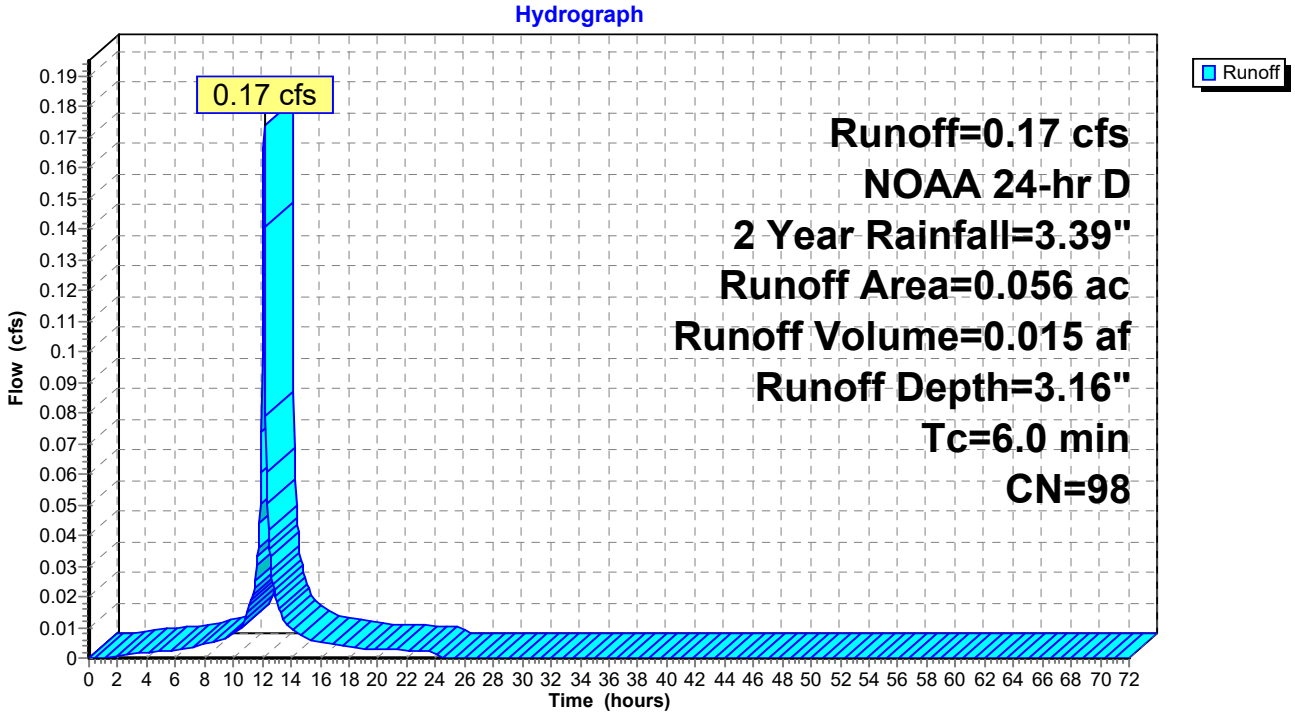
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 3.16"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.056	98	Unconnected pavement, HSG B
0.056		100.00% Impervious Area
0.056		100.00% Unconnected

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

Subcatchment DA2-I: Drainage Area #2 (Impervious)



Summary for Subcatchment DA2-P: Drainage Area #2 (Lawn)

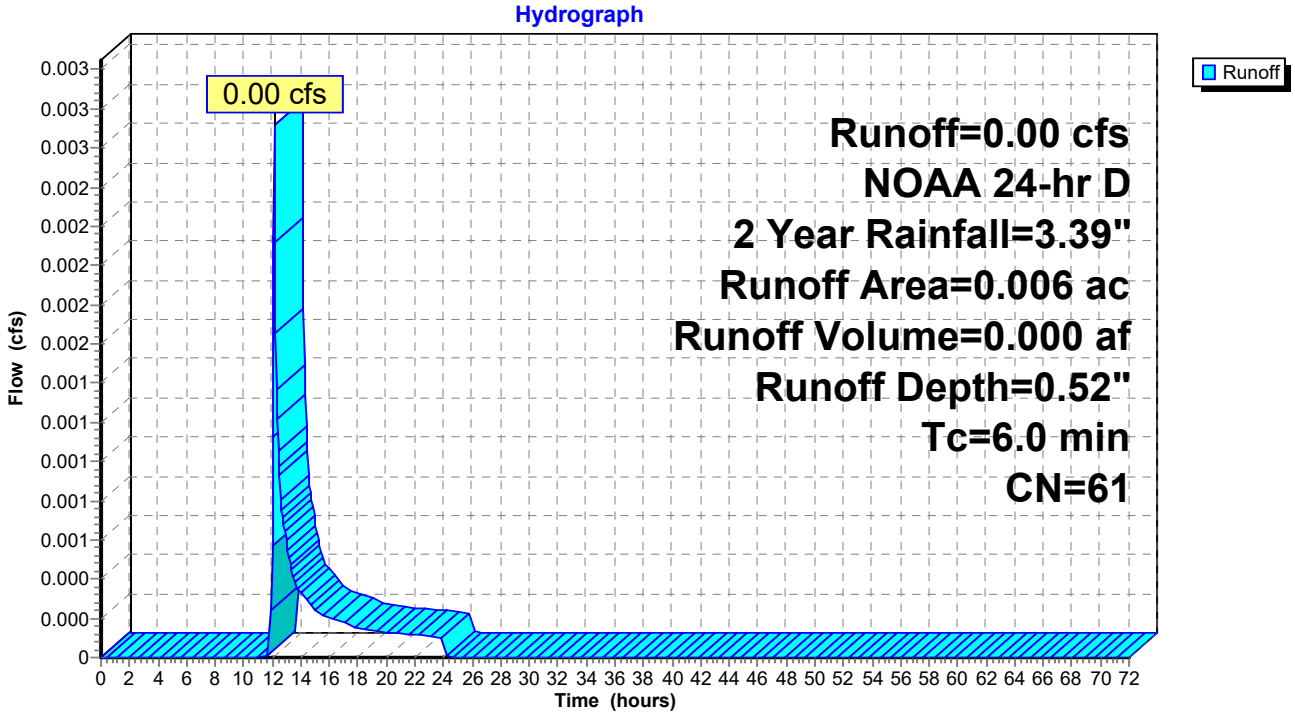
Runoff = 0.00 cfs @ 12.15 hrs, Volume= 0.000 af, Depth= 0.52"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.006	61	>75% Grass cover, Good, HSG B
0.006		100.00% Pervious Area

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

Subcatchment DA2-P: Drainage Area #2 (Lawn)



Summary for Subcatchment DA3-I: Drainage Area #3 (Impervious)

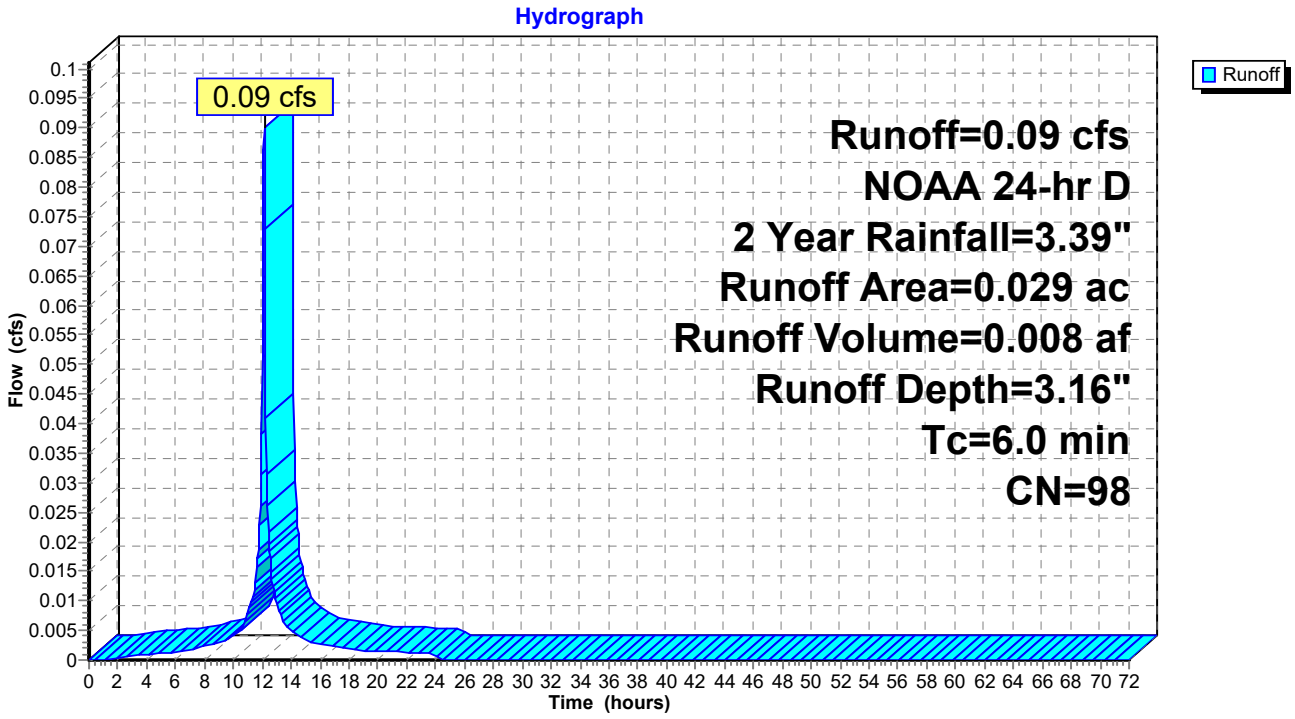
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 3.16"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.029	98	Unconnected pavement, HSG B
0.029		100.00% Impervious Area
0.029		100.00% Unconnected

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

Subcatchment DA3-I: Drainage Area #3 (Impervious)



Summary for Subcatchment DA3-P: Drainage Area #3 (Lawn)

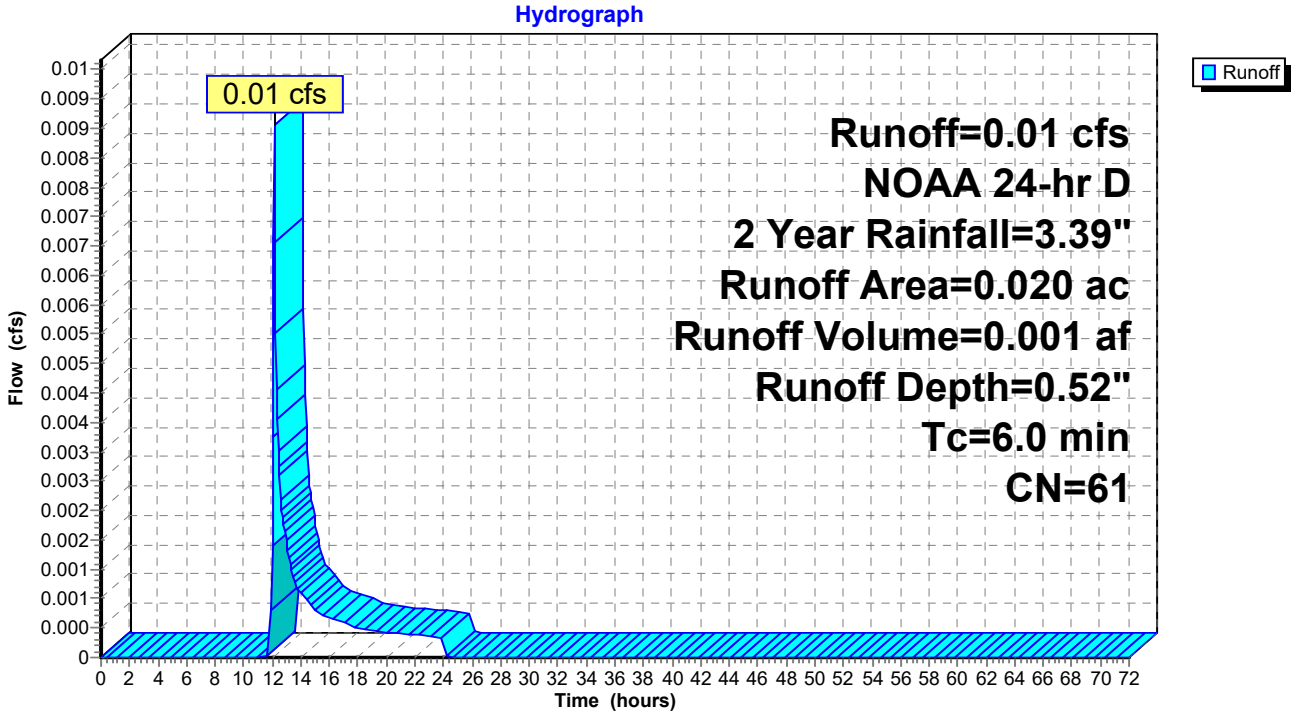
Runoff = 0.01 cfs @ 12.15 hrs, Volume= 0.001 af, Depth= 0.52"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.020	61	>75% Grass cover, Good, HSG B
0.020		100.00% Pervious Area

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

Subcatchment DA3-P: Drainage Area #3 (Lawn)



Summary for Subcatchment RA1a: Roof Area #1a (Impervious)

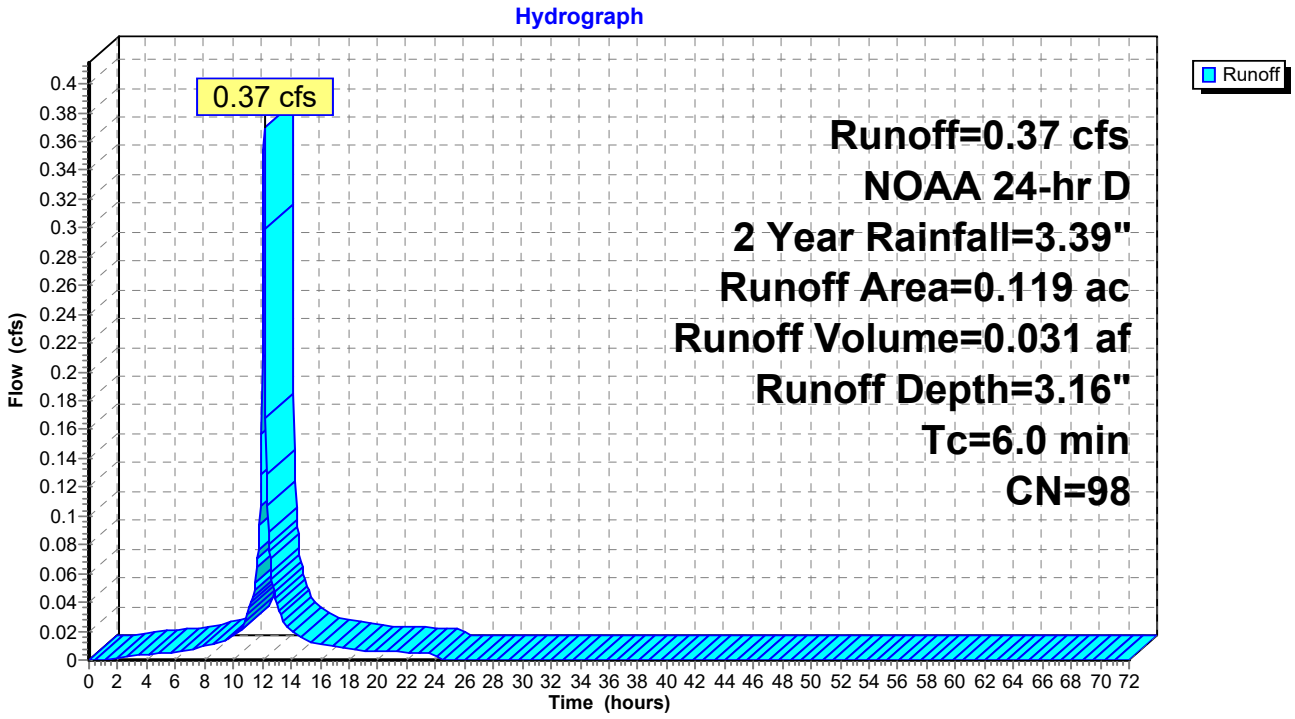
Runoff = 0.37 cfs @ 12.13 hrs, Volume= 0.031 af, Depth= 3.16"
Routed to Pond B-B : Underground Infiltration Basin #B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.119	98	Unconnected pavement, HSG B
0.119		100.00% Impervious Area
0.119		100.00% Unconnected

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

Subcatchment RA1a: Roof Area #1a (Impervious)



Summary for Subcatchment RA1b: Roof Area #1b (Impervious)

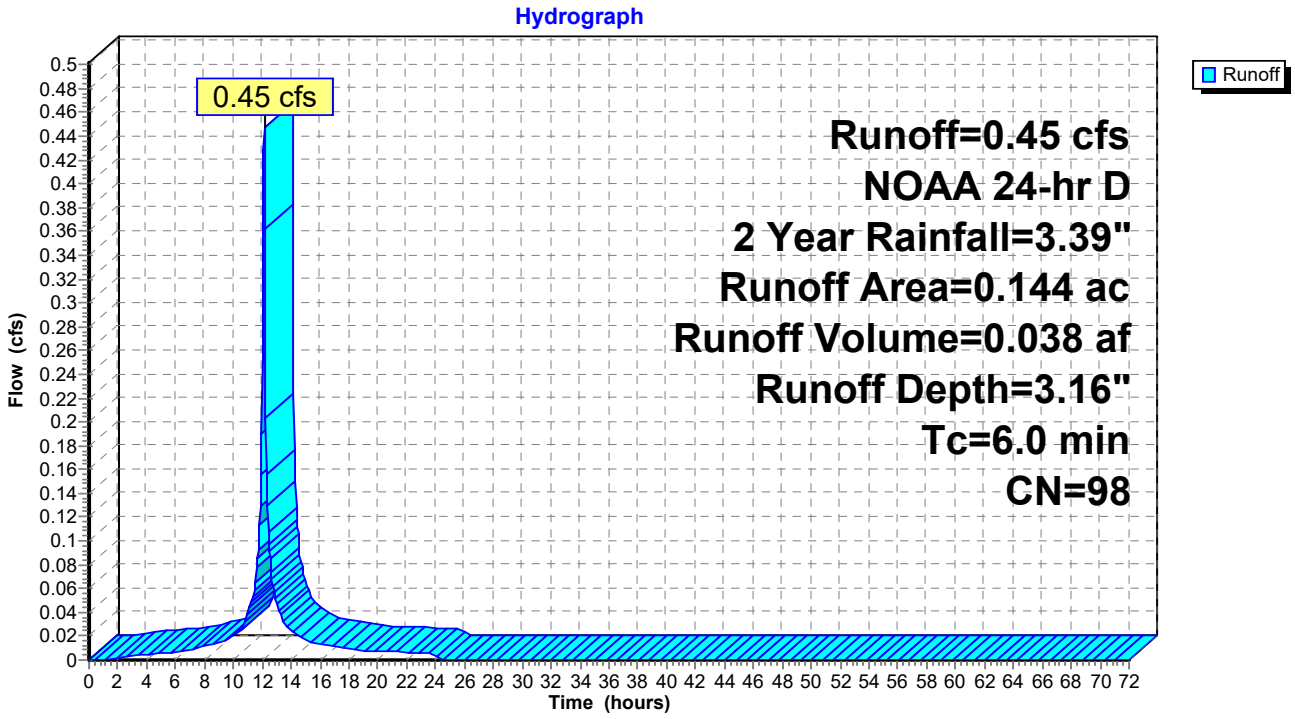
Runoff = 0.45 cfs @ 12.13 hrs, Volume= 0.038 af, Depth= 3.16"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 Year Rainfall=3.39"

Area (ac)	CN	Description
0.144	98	Unconnected pavement, HSG B
0.144		100.00% Impervious Area
0.144		100.00% Unconnected

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

Subcatchment RA1b: Roof Area #1b (Impervious)



Summary for Pond B-B: Underground Infiltration Basin #B

Inflow Area = 0.119 ac,100.00% Impervious, Inflow Depth = 3.16" for 2 Year event
Inflow = 0.37 cfs @ 12.13 hrs, Volume= 0.031 af
Outflow = 0.14 cfs @ 12.00 hrs, Volume= 0.031 af, Atten= 61%, Lag= 0.0 min
Discarded = 0.14 cfs @ 12.00 hrs, Volume= 0.031 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BA : Bioretention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 16.42' @ 12.28 hrs Surf.Area= 0.018 ac Storage= 0.003 af

Plug-Flow detention time= 3.3 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 3.3 min (760.3 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.98'	0.020 af	**11.50'W x 67.28'L x 3.33'H Field A** 0.059 af Overall - 0.009 af Embedded = 0.050 af x 40.0% Voids
#2A	17.48'	0.009 af	**ADS_StormTech SC-310 +Cap** x 27 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 27 Chambers in 3 Rows
		0.029 af	Total Available Storage

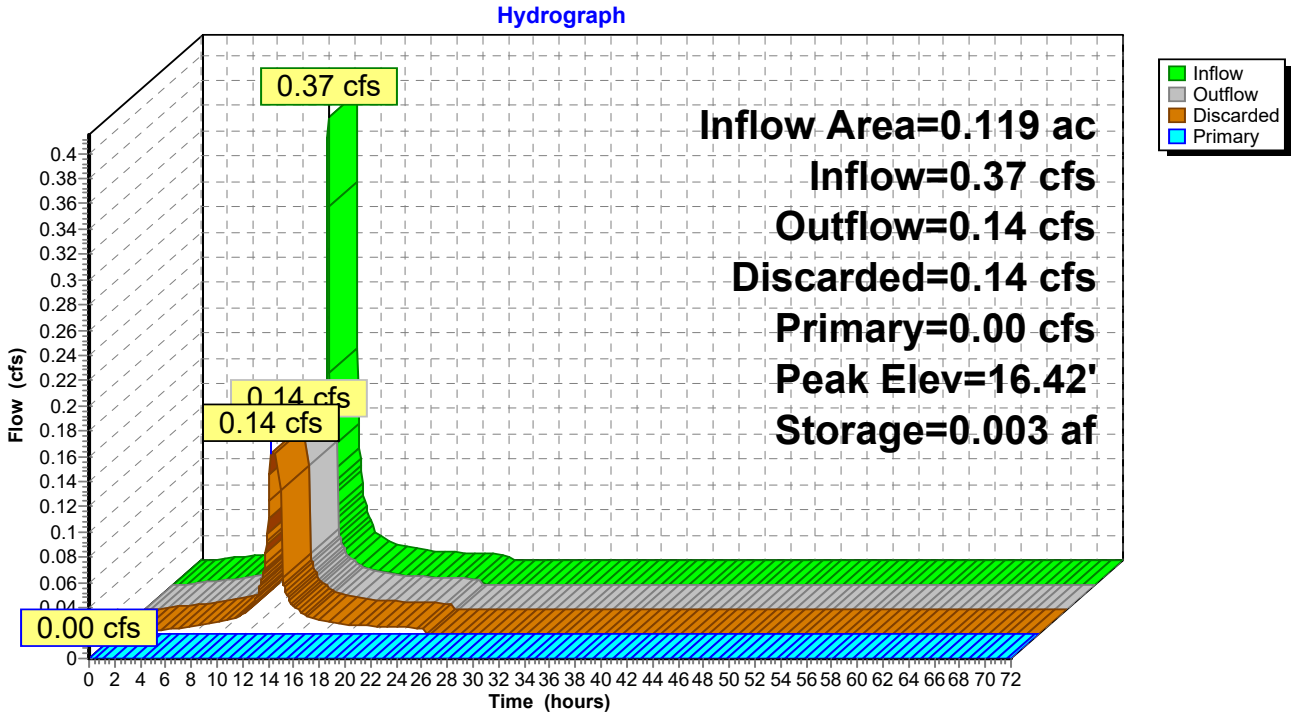
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.59'	**8.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.59' / 18.45' S= 0.0048 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Discarded	15.98'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 12.00 hrs HW=16.02' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.98' TW=18.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond B-B: Underground Infiltration Basin #B



Hydrograph for Pond B-B: Underground Infiltration Basin #B

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	15.98	0.00	0.00	**0.00**
2.50	0.00	0.000	15.98	0.00	0.00	0.00
5.00	0.00	0.000	15.98	0.00	0.00	0.00
7.50	0.01	0.000	15.98	0.01	0.01	0.00
10.00	**0.02**	**0.000**	**15.98**	**0.02**	**0.02**	0.00
12.50	**0.08**	**0.002**	**16.31**	**0.14**	**0.14**	0.00
15.00	0.01	0.000	15.98	0.01	0.01	0.00
17.50	0.01	0.000	15.98	0.01	0.01	0.00
20.00	0.01	0.000	15.98	0.01	0.01	0.00
22.50	0.01	0.000	15.98	0.01	0.01	0.00
25.00	0.00	0.000	15.98	0.00	0.00	0.00
27.50	0.00	0.000	15.98	0.00	0.00	0.00
30.00	0.00	0.000	15.98	0.00	0.00	0.00
32.50	0.00	0.000	15.98	0.00	0.00	0.00
35.00	0.00	0.000	15.98	0.00	0.00	0.00
37.50	0.00	0.000	15.98	0.00	0.00	0.00
40.00	0.00	0.000	15.98	0.00	0.00	0.00
42.50	0.00	0.000	15.98	0.00	0.00	0.00
45.00	0.00	0.000	15.98	0.00	0.00	0.00
47.50	0.00	0.000	15.98	0.00	0.00	0.00
50.00	0.00	0.000	15.98	0.00	0.00	0.00
52.50	0.00	0.000	15.98	0.00	0.00	0.00
55.00	0.00	0.000	15.98	0.00	0.00	0.00
57.50	0.00	0.000	15.98	0.00	0.00	0.00
60.00	0.00	0.000	15.98	0.00	0.00	0.00
62.50	0.00	0.000	15.98	0.00	0.00	0.00
65.00	0.00	0.000	15.98	0.00	0.00	0.00
67.50	0.00	0.000	15.98	0.00	0.00	0.00
70.00	0.00	0.000	15.98	0.00	0.00	0.00

Stage-Discharge for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
15.98	0.00	**0.00**	0.00
16.03	0.14	**0.14**	0.00
16.08	0.14	0.14	0.00
16.13	0.14	0.14	0.00
16.18	0.14	0.14	0.00
16.23	0.14	0.14	0.00
16.28	0.14	0.14	0.00
16.33	0.14	0.14	0.00
16.38	0.14	0.14	0.00
16.43	0.14	0.14	0.00
16.48	0.14	0.14	0.00
16.53	0.14	0.14	0.00
16.58	0.14	0.14	0.00
16.63	0.14	0.14	0.00
16.68	0.14	0.14	0.00
16.73	0.14	0.14	0.00
16.78	0.14	0.14	0.00
16.83	0.14	0.14	0.00
16.88	0.14	0.14	0.00
16.93	0.14	0.14	0.00
16.98	0.14	0.14	0.00
17.03	0.14	0.14	0.00
17.08	0.14	0.14	0.00
17.13	0.14	0.14	0.00
17.18	0.14	0.14	0.00
17.23	0.14	0.14	0.00
17.28	0.14	0.14	0.00
17.33	0.14	0.14	0.00
17.38	0.14	0.14	0.00
17.43	0.14	0.14	0.00
17.48	0.14	0.14	0.00
17.53	0.14	0.14	0.00
17.58	0.14	0.14	0.00
17.63	0.14	0.14	0.00
17.68	0.14	0.14	0.00
17.73	0.14	0.14	0.00
17.78	0.14	0.14	0.00
17.83	0.14	0.14	0.00
17.88	0.14	0.14	0.00
17.93	0.14	0.14	0.00
17.98	0.14	0.14	0.00
18.03	0.14	0.14	0.00
18.08	0.14	0.14	0.00
18.13	0.14	0.14	0.00
18.18	0.14	0.14	0.00
18.23	0.14	0.14	0.00
18.28	0.14	0.14	0.00
18.33	0.14	0.14	0.00
18.38	0.14	0.14	0.00
18.43	0.14	0.14	0.00
18.48	0.14	0.14	0.00
18.53	0.14	0.14	0.00
18.58	0.14	0.14	0.00
18.63	0.15	0.14	0.00
18.68	0.17	0.14	0.02
18.73	0.20	0.14	0.05
18.78	0.24	0.14	0.09
18.83	0.29	0.14	0.14
18.88	0.34	0.14	0.20
18.93	0.41	0.14	0.27
18.98	0.48	0.14	0.34
19.03	0.55	0.14	0.41
19.08	0.63	0.14	0.49
19.13	0.71	0.14	0.57
19.18	0.79	0.14	0.65
19.23	0.87	0.14	0.73
19.28	**0.94**	0.14	**0.79**

Stage-Area-Storage for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Surface (acres)	Storage (acre-feet)
15.98	**0.018**	0.000
16.03	0.018	0.000
16.08	0.018	0.001
16.13	0.018	0.001
16.18	0.018	0.001
16.23	0.018	0.002
16.28	0.018	0.002
16.33	0.018	0.002
16.38	0.018	0.003
16.43	0.018	0.003
16.48	0.018	0.004
16.53	0.018	0.004
16.58	0.018	0.004
16.63	0.018	0.005
16.68	0.018	0.005
16.73	0.018	0.005
16.78	0.018	0.006
16.83	0.018	0.006
16.88	0.018	0.006
16.93	0.018	0.007
16.98	0.018	0.007
17.03	0.018	0.007
17.08	0.018	0.008
17.13	0.018	0.008
17.18	0.018	0.009
17.23	0.018	0.009
17.28	0.018	0.009
17.33	0.018	0.010
17.38	0.018	0.010
17.43	0.018	0.010
17.48	0.018	0.011
17.53	0.018	0.011
17.58	0.018	0.012
17.63	0.018	0.013
17.68	0.018	0.013
17.73	0.018	0.014
17.78	0.018	0.015
17.83	0.018	0.015
17.88	0.018	0.016
17.93	0.018	0.017
17.98	0.018	0.017
18.03	0.018	0.018
18.08	0.018	0.018
18.13	0.018	0.019
18.18	0.018	0.020
18.23	0.018	0.020
18.28	0.018	0.021
18.33	0.018	0.021
18.38	0.018	0.022
18.43	0.018	0.022
18.48	0.018	0.023
18.53	0.018	0.023
18.58	0.018	0.024
18.63	0.018	0.024
18.68	0.018	0.025
18.73	0.018	0.025
18.78	0.018	0.025
18.83	0.018	0.026
18.88	0.018	0.026
18.93	0.018	0.026
18.98	0.018	0.027
19.03	0.018	0.027
19.08	0.018	0.028
19.13	0.018	0.028
19.18	0.018	0.028
19.23	0.018	0.029
19.28	0.018	**0.029**

Summary for Pond BA: Bioretention Basin

Inflow Area = 0.494 ac, 94.33% Impervious, Inflow Depth = 2.25" for 2 Year event
Inflow = 1.09 cfs @ 12.13 hrs, Volume= 0.093 af
Outflow = 0.97 cfs @ 12.16 hrs, Volume= 0.093 af, Atten= 11%, Lag= 2.2 min
Discarded = 0.08 cfs @ 11.15 hrs, Volume= 0.065 af
Primary = 0.89 cfs @ 12.16 hrs, Volume= 0.028 af
Routed to Pond SP-2 : Study Point #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond SP-2 : Study Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 19.14' @ 12.16 hrs Surf.Area= 436 sf Storage= 495 cf

Plug-Flow detention time= 15.4 min calculated for 0.092 af (100% of inflow)
Center-of-Mass det. time= 15.4 min (774.7 - 759.3)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	1,090 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	436	0	0
19.00	436	436	436
20.00	436	436	872
20.50	436	218	1,090

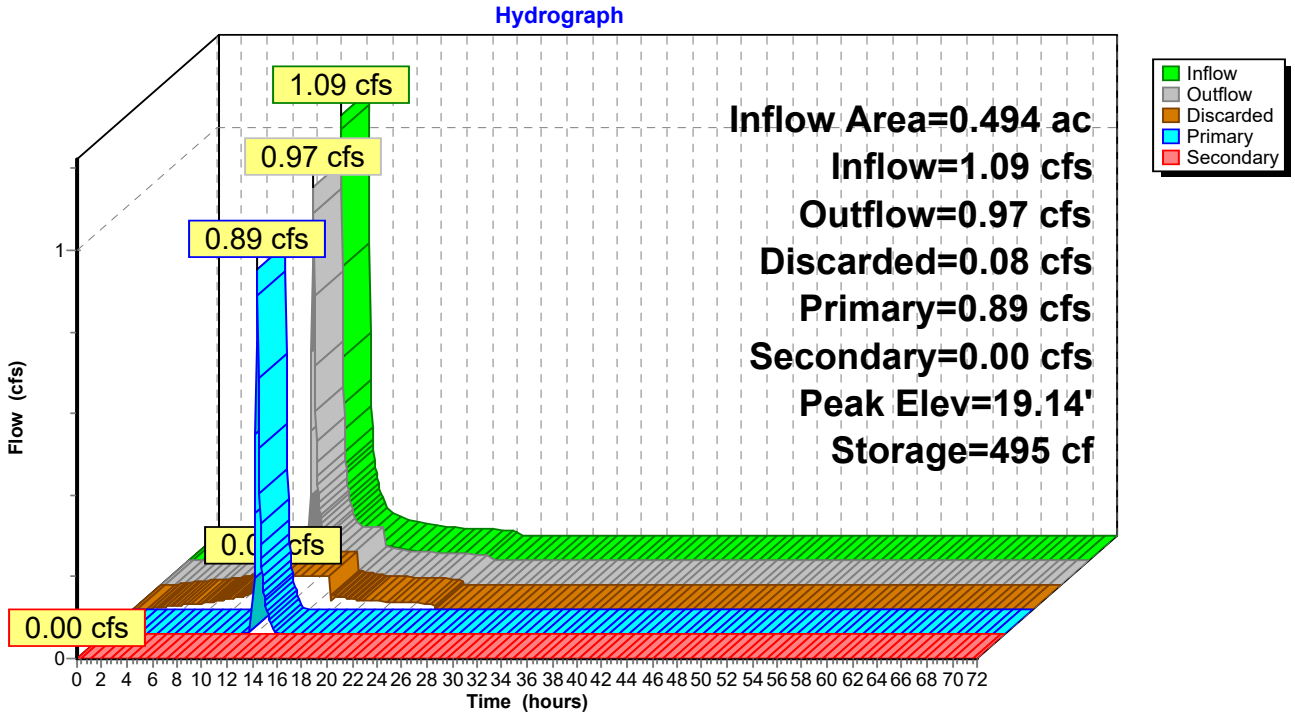
Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**15.0" Round Culvert** L= 17.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 17.90' / 17.60' S= 0.0171 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	18.58'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	20.00'	**24.0" Vert. Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	18.00'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	20.35'	**2.8' long x 1.0' breadth Emergency Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.08 cfs @ 11.15 hrs HW=18.04' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.87 cfs @ 12.16 hrs HW=19.13' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.87 cfs of 4.60 cfs potential flow)
├**2=Orifice** (Orifice Controls 0.87 cfs @ 2.52 fps)
└**3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=0.00' (Dynamic Tailwater)
└**5=Emergency Spillway** (Controls 0.00 cfs)

Pond BA: Bioretention Basin



Hydrograph for Pond BA: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	18.00	0.00	0.00	0.00	**0.00**
2.50	0.01	0	18.00	0.01	0.01	0.00	0.00
5.00	0.01	1	18.00	0.01	0.01	0.00	0.00
7.50	0.02	1	18.00	0.02	0.02	0.00	0.00
10.00	**0.05**	**3**	**18.01**	**0.05**	**0.05**	**0.00**	0.00
12.50	**0.22**	**352**	**18.81**	**0.27**	**0.08**	**0.18**	0.00
15.00	0.04	132	18.30	0.08	0.08	0.00	0.00
17.50	0.02	1	18.00	0.02	0.02	0.00	0.00
20.00	0.02	1	18.00	0.02	0.02	0.00	0.00
22.50	0.02	1	18.00	0.02	0.02	0.00	0.00
25.00	0.00	0	18.00	0.00	0.00	0.00	0.00
27.50	0.00	0	18.00	0.00	0.00	0.00	0.00
30.00	0.00	0	18.00	0.00	0.00	0.00	0.00
32.50	0.00	0	18.00	0.00	0.00	0.00	0.00
35.00	0.00	0	18.00	0.00	0.00	0.00	0.00
37.50	0.00	0	18.00	0.00	0.00	0.00	0.00
40.00	0.00	0	18.00	0.00	0.00	0.00	0.00
42.50	0.00	0	18.00	0.00	0.00	0.00	0.00
45.00	0.00	0	18.00	0.00	0.00	0.00	0.00
47.50	0.00	0	18.00	0.00	0.00	0.00	0.00
50.00	0.00	0	18.00	0.00	0.00	0.00	0.00
52.50	0.00	0	18.00	0.00	0.00	0.00	0.00
55.00	0.00	0	18.00	0.00	0.00	0.00	0.00
57.50	0.00	0	18.00	0.00	0.00	0.00	0.00
60.00	0.00	0	18.00	0.00	0.00	0.00	0.00
62.50	0.00	0	18.00	0.00	0.00	0.00	0.00
65.00	0.00	0	18.00	0.00	0.00	0.00	0.00
67.50	0.00	0	18.00	0.00	0.00	0.00	0.00
70.00	0.00	0	18.00	0.00	0.00	0.00	0.00

Stage-Discharge for Pond BA: Bioretention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
18.00	0.00	**0.00**	0.00	0.00
18.10	0.08	**0.08**	0.00	0.00
18.20	0.08	0.08	0.00	0.00
18.30	0.08	0.08	0.00	0.00
18.40	0.08	0.08	0.00	0.00
18.50	0.08	0.08	0.00	0.00
18.60	0.08	0.08	0.00	0.00
18.70	0.13	0.08	0.05	0.00
18.80	0.25	0.08	0.17	0.00
18.90	0.43	0.08	0.35	0.00
19.00	0.64	0.08	0.56	0.00
19.10	0.88	0.08	0.80	0.00
19.20	1.13	0.08	1.05	0.00
19.30	1.34	0.08	1.26	0.00
19.40	1.50	0.08	1.42	0.00
19.50	1.65	0.08	1.57	0.00
19.60	1.79	0.08	1.71	0.00
19.70	1.92	0.08	1.84	0.00
19.80	2.04	0.08	1.96	0.00
19.90	2.15	0.08	2.07	0.00
20.00	2.26	0.08	2.17	0.00
20.10	2.42	0.08	2.34	0.00
20.20	2.70	0.08	2.62	0.00
20.30	3.10	0.08	3.02	0.00
20.40	3.69	0.08	3.52	0.08
20.50	4.64	0.08	4.12	0.44
20.60	5.84	0.08	4.82	0.94
20.70	7.25	0.08	5.60	1.57
20.80	8.85	0.08	6.46	2.31
20.90	10.61	0.08	7.40	3.13
21.00	12.54	0.08	8.39	4.07
21.10	14.66	0.08	9.44	5.14
21.20	16.07	0.08	9.66	6.32
21.30	17.57	0.08	9.84	7.64
21.40	19.15	0.08	10.02	9.05
21.50	20.82	0.08	10.19	10.55
21.60	22.61	0.08	10.36	12.17
21.70	24.53	0.08	10.53	13.92
21.80	26.52	0.08	10.69	15.74
21.90	28.55	0.08	10.86	17.61
22.00	**30.61**	0.08	**11.01**	**19.51**

Stage-Area-Storage for Pond BA: Bioretention Basin

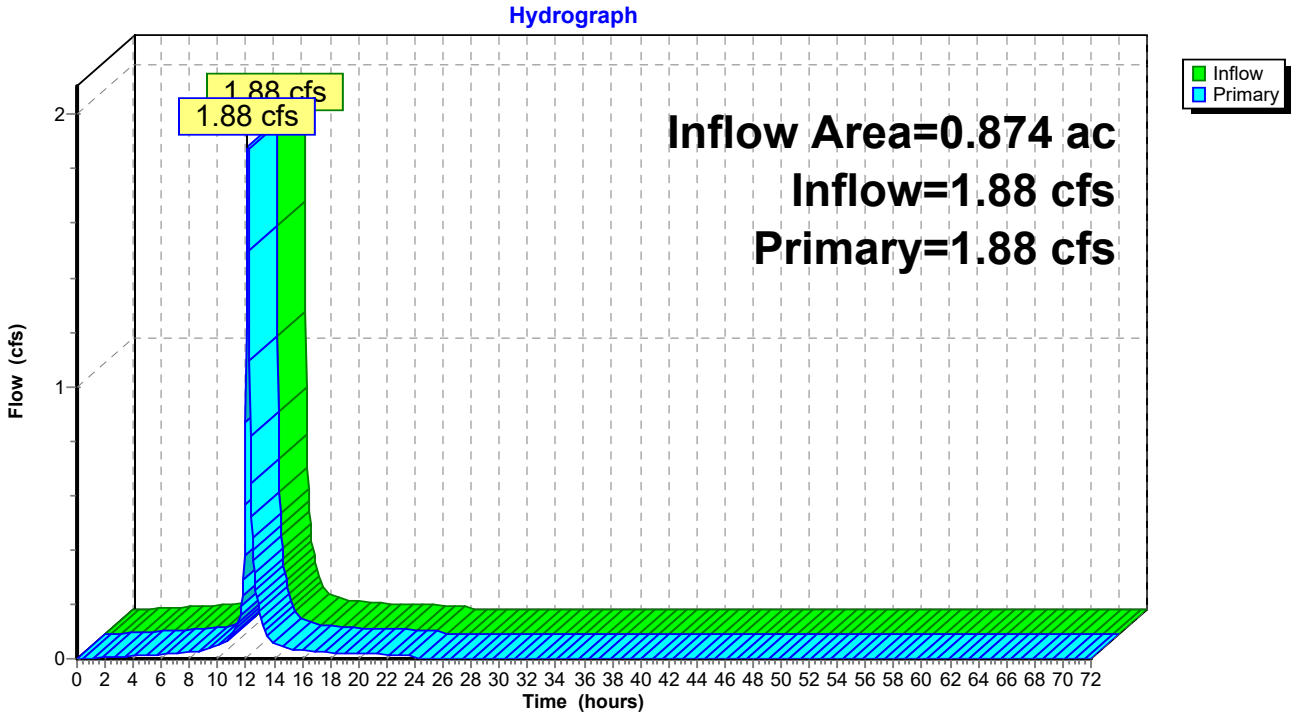
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
18.00	**436**	0
18.05	436	22
18.10	436	44
18.15	436	65
18.20	436	87
18.25	436	109
18.30	436	131
18.35	436	153
18.40	436	174
18.45	436	196
18.50	436	218
18.55	436	240
18.60	436	262
18.65	436	283
18.70	436	305
18.75	436	327
18.80	436	349
18.85	436	371
18.90	436	392
18.95	436	414
19.00	436	436
19.05	436	458
19.10	436	480
19.15	436	501
19.20	436	523
19.25	436	545
19.30	436	567
19.35	436	589
19.40	436	610
19.45	436	632
19.50	436	654
19.55	436	676
19.60	436	698
19.65	436	719
19.70	436	741
19.75	436	763
19.80	436	785
19.85	436	807
19.90	436	828
19.95	436	850
20.00	436	872
20.05	436	894
20.10	436	916
20.15	436	937
20.20	436	959
20.25	436	981
20.30	436	1,003
20.35	436	1,025
20.40	436	1,046
20.45	436	1,068
20.50	436	**1,090**
20.55	436	1,090
20.60	436	1,090
20.65	436	1,090
20.70	436	1,090
20.75	436	1,090
20.80	436	1,090
20.85	436	1,090
20.90	436	1,090
20.95	436	1,090
21.00	436	1,090
21.05	436	1,090
21.10	436	1,090
21.15	436	1,090
21.20	436	1,090
21.25	436	1,090
21.30	436	1,090
21.35	436	1,090
21.40	436	1,090
21.45	436	1,090
21.50	436	1,090
21.55	436	1,090
21.60	436	1,090
21.65	436	1,090
21.70	436	1,090
21.75	436	1,090
21.80	436	1,090
21.85	436	1,090
21.90	436	1,090
21.95	436	1,090
22.00	436	1,090

Summary for Pond OS: Overall Site

Inflow Area = 0.874 ac, 89.93% Impervious, Inflow Depth = 1.57" for 2 Year event
Inflow = 1.88 cfs @ 12.14 hrs, Volume= 0.115 af
Primary = 1.88 cfs @ 12.14 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond OS: Overall Site

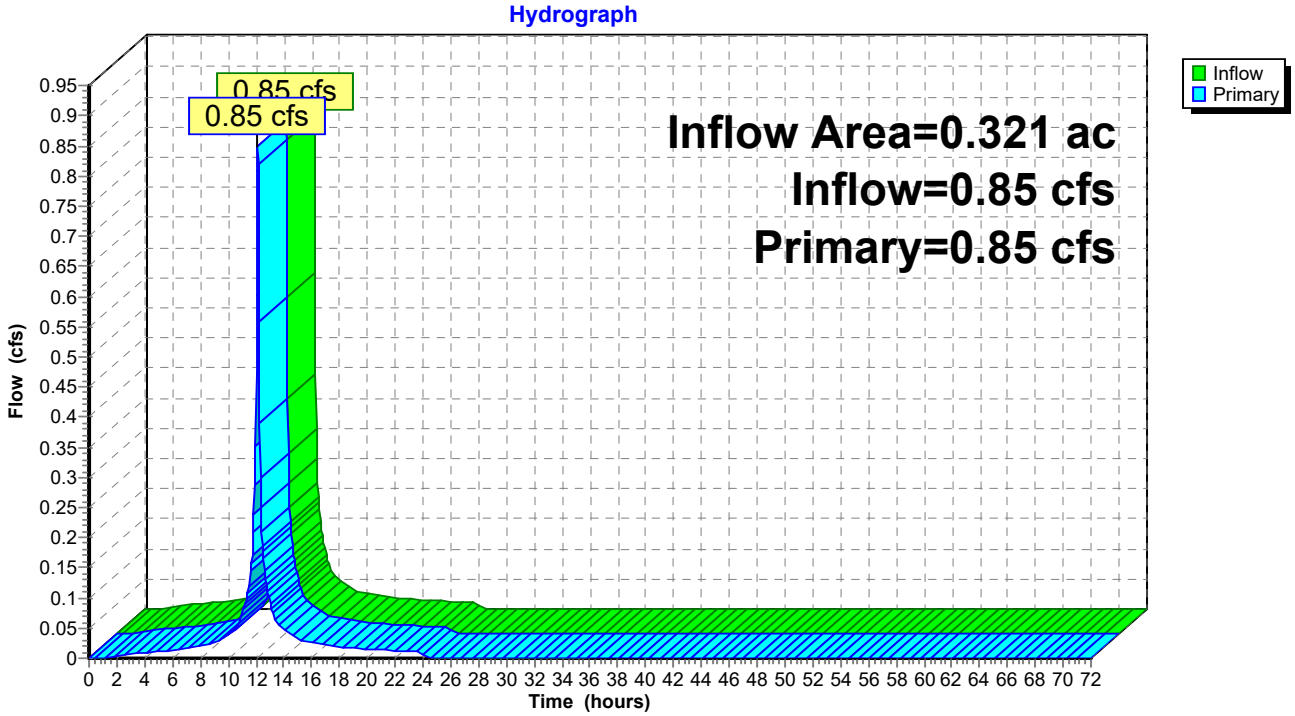


Summary for Pond SP-1: Study Point #1

Inflow Area = 0.321 ac, 82.55% Impervious, Inflow Depth = 2.70" for 2 Year event
Inflow = 0.85 cfs @ 12.13 hrs, Volume= 0.072 af
Primary = 0.85 cfs @ 12.13 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-1: Study Point #1

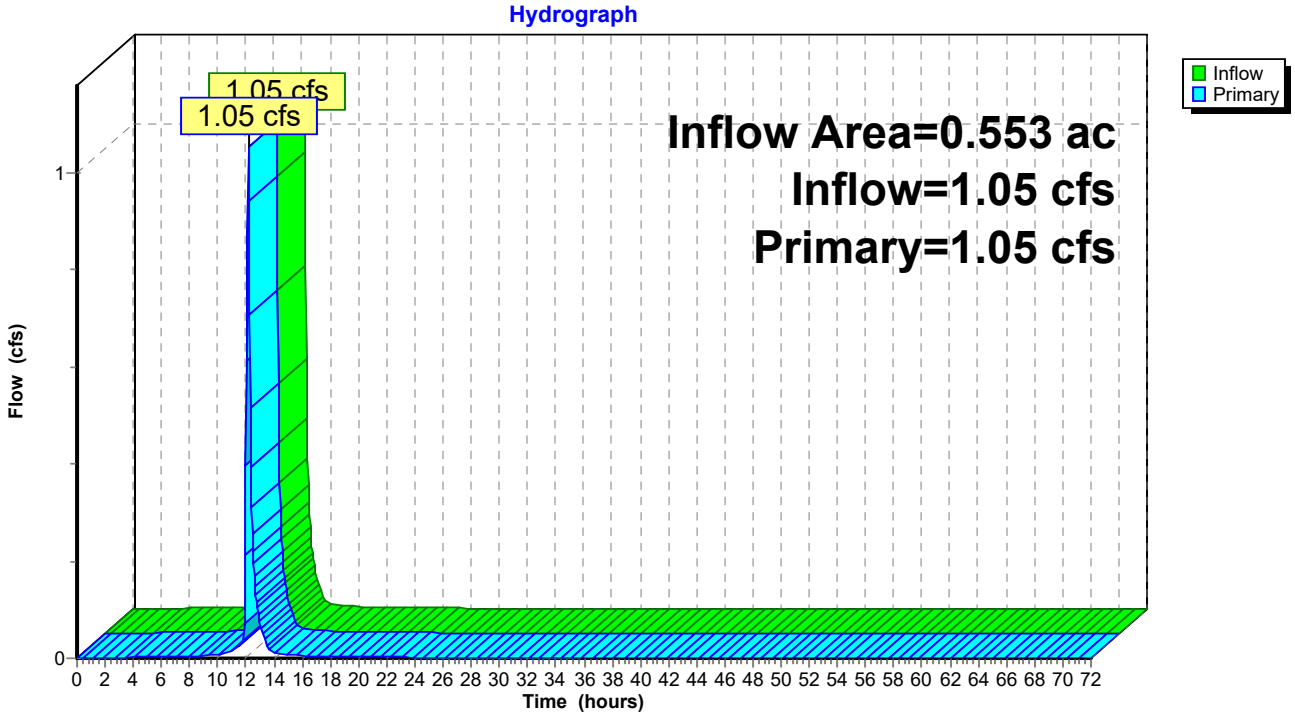


Summary for Pond SP-2: Study Point #2

Inflow Area = 0.553 ac, 94.21% Impervious, Inflow Depth = 0.92" for 2 Year event
Inflow = 1.05 cfs @ 12.16 hrs, Volume= 0.042 af
Primary = 1.05 cfs @ 12.16 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-2: Study Point #2

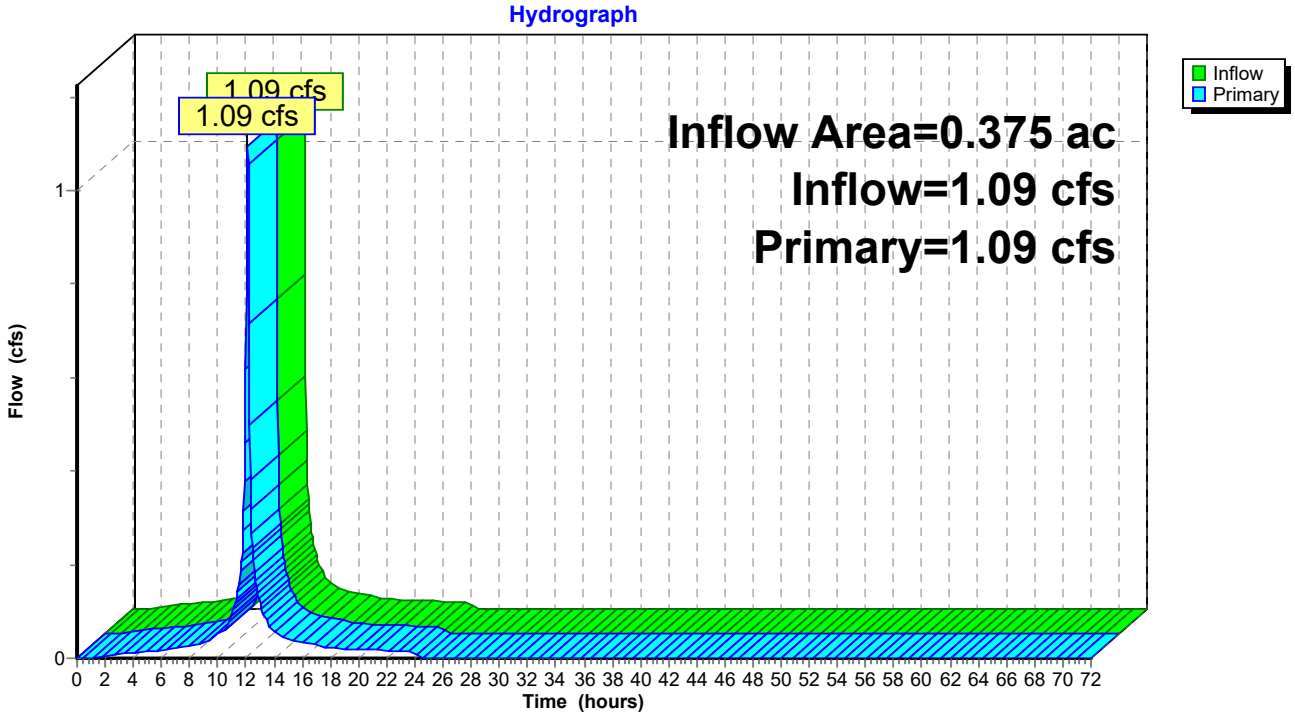


Summary for Link DA-BA: Basin Drainage Area

Inflow Area = 0.375 ac, 92.53% Impervious, Inflow Depth = 2.96" for 2 Year event
Inflow = 1.09 cfs @ 12.13 hrs, Volume= 0.093 af
Primary = 1.09 cfs @ 12.13 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BA : Bioretention Basin

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link DA-BA: Basin Drainage Area



Summary for Subcatchment BA1-P: Bypass Area #1 (Lawn)

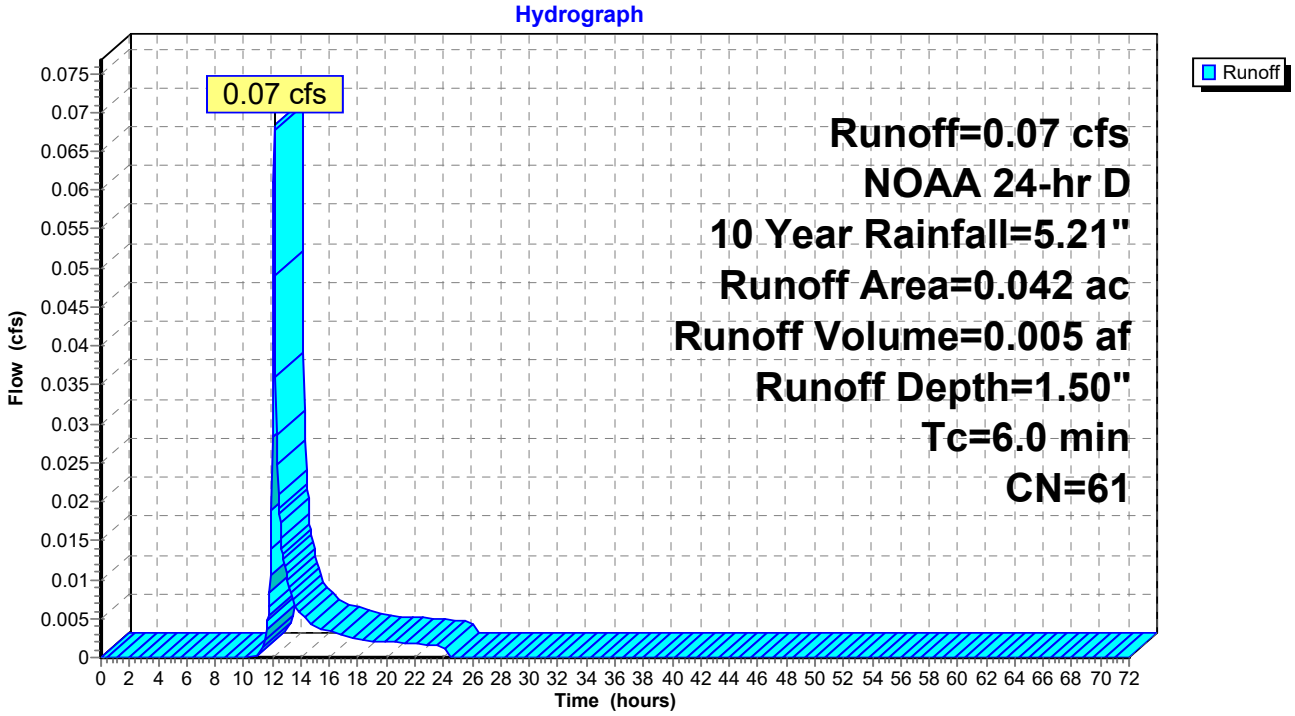
Runoff = 0.07 cfs @ 12.14 hrs, Volume= 0.005 af, Depth= 1.50"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.042	61	>75% Grass cover, Good, HSG B
0.042		100.00% Pervious Area

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

Subcatchment BA1-P: Bypass Area #1 (Lawn)



Summary for Subcatchment BA2-I: Bypass Area #2 (Impervious)

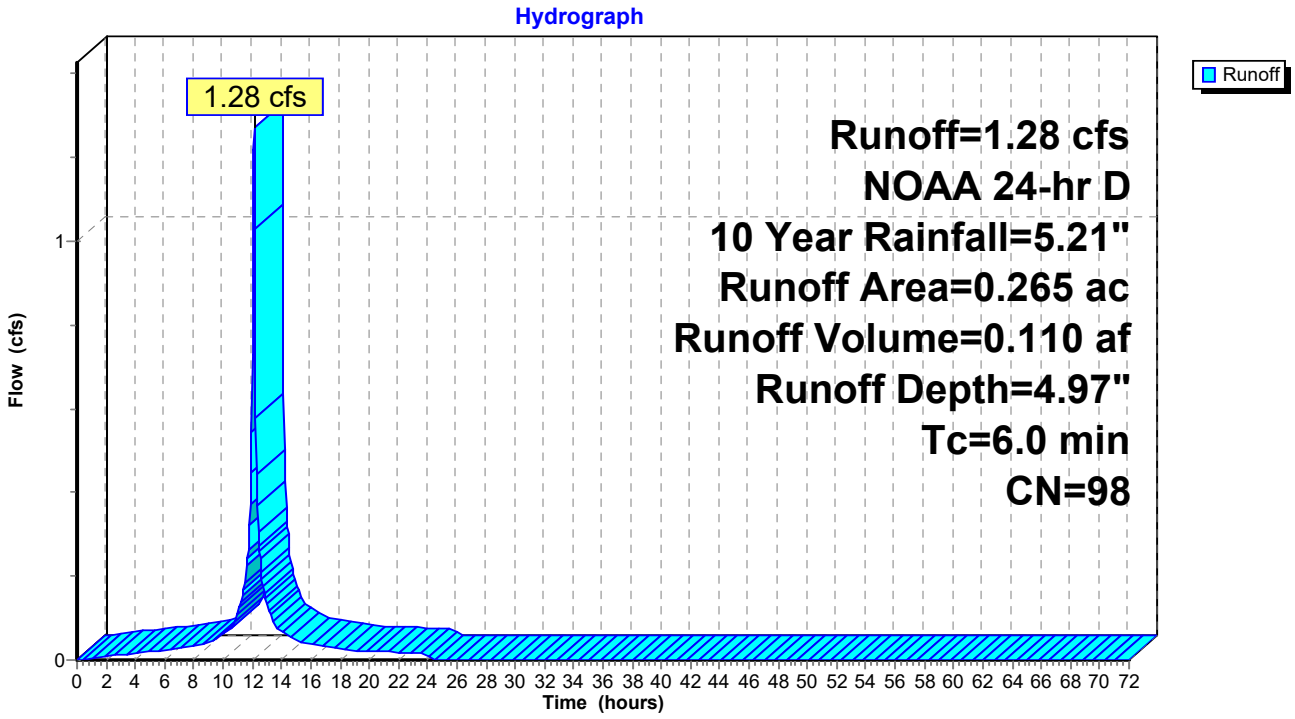
Runoff = 1.28 cfs @ 12.13 hrs, Volume= 0.110 af, Depth= 4.97"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.265	98	Unconnected pavement, HSG B
0.265		100.00% Impervious Area
0.265		100.00% Unconnected

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

Subcatchment BA2-I: Bypass Area #2 (Impervious)



Summary for Subcatchment BA2-P: Bypass Area #2 (Lawn)

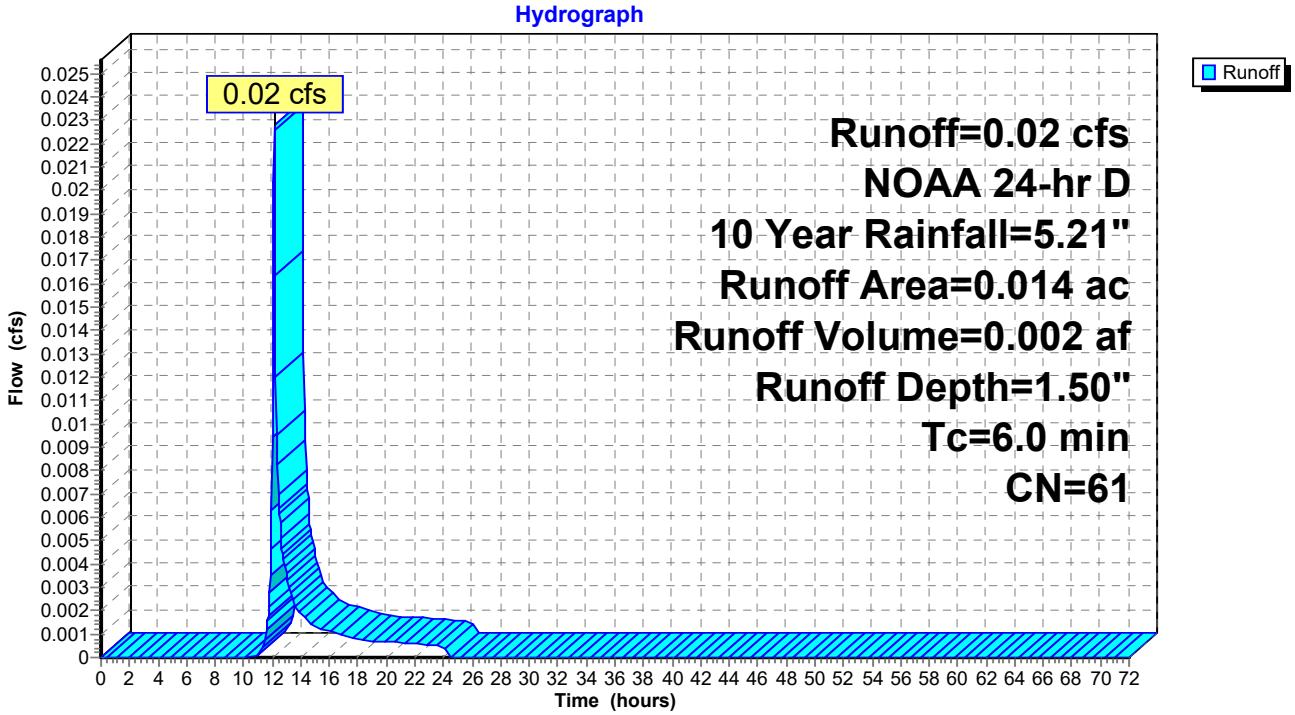
Runoff = 0.02 cfs @ 12.14 hrs, Volume= 0.002 af, Depth= 1.50"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

	Area (ac)	CN	Description
*	0.014	61	>75% Grass cover, Good, HSG B
	0.014		100.00% Pervious Area

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

Subcatchment BA2-P: Bypass Area #2 (Lawn)



Summary for Subcatchment BA3-I: Bypass Area #3 (Impervious)

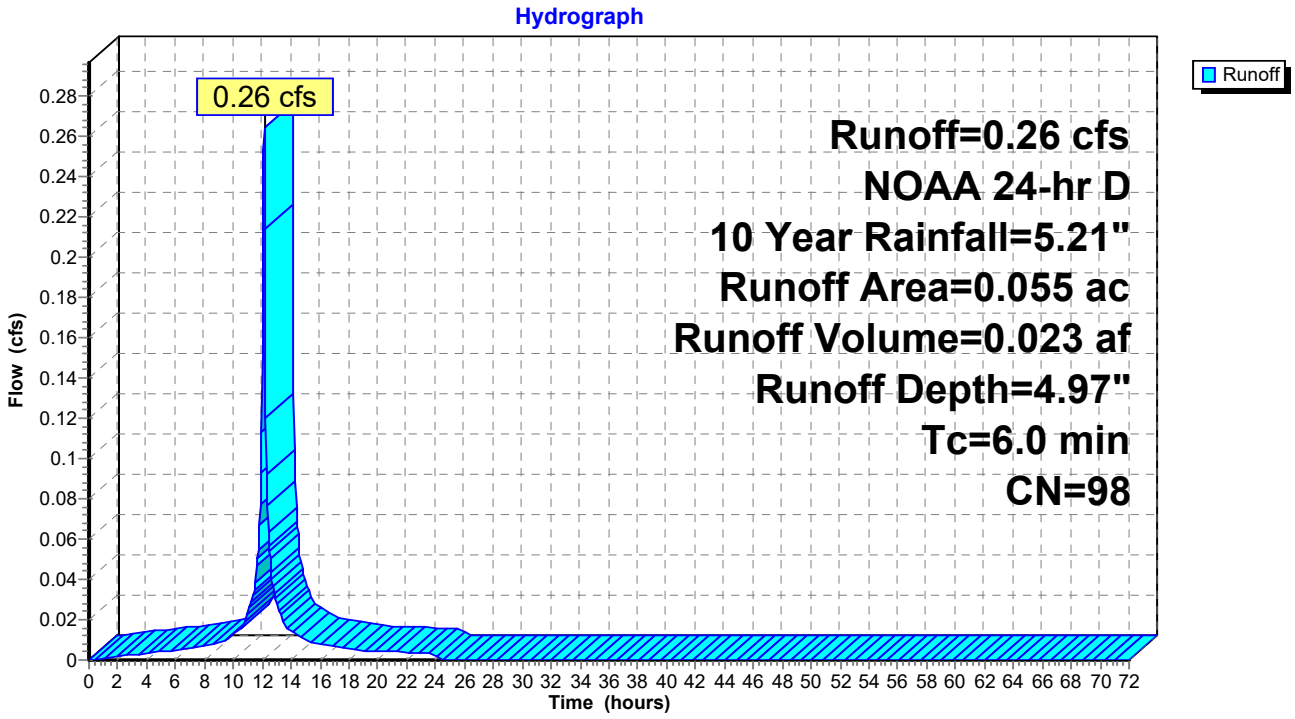
Runoff = 0.26 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 4.97"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.055	98	Unconnected pavement, HSG B
0.055		100.00% Impervious Area
0.055		100.00% Unconnected

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

Subcatchment BA3-I: Bypass Area #3 (Impervious)



Summary for Subcatchment BA3-P: Bypass Area #3 (Lawn)

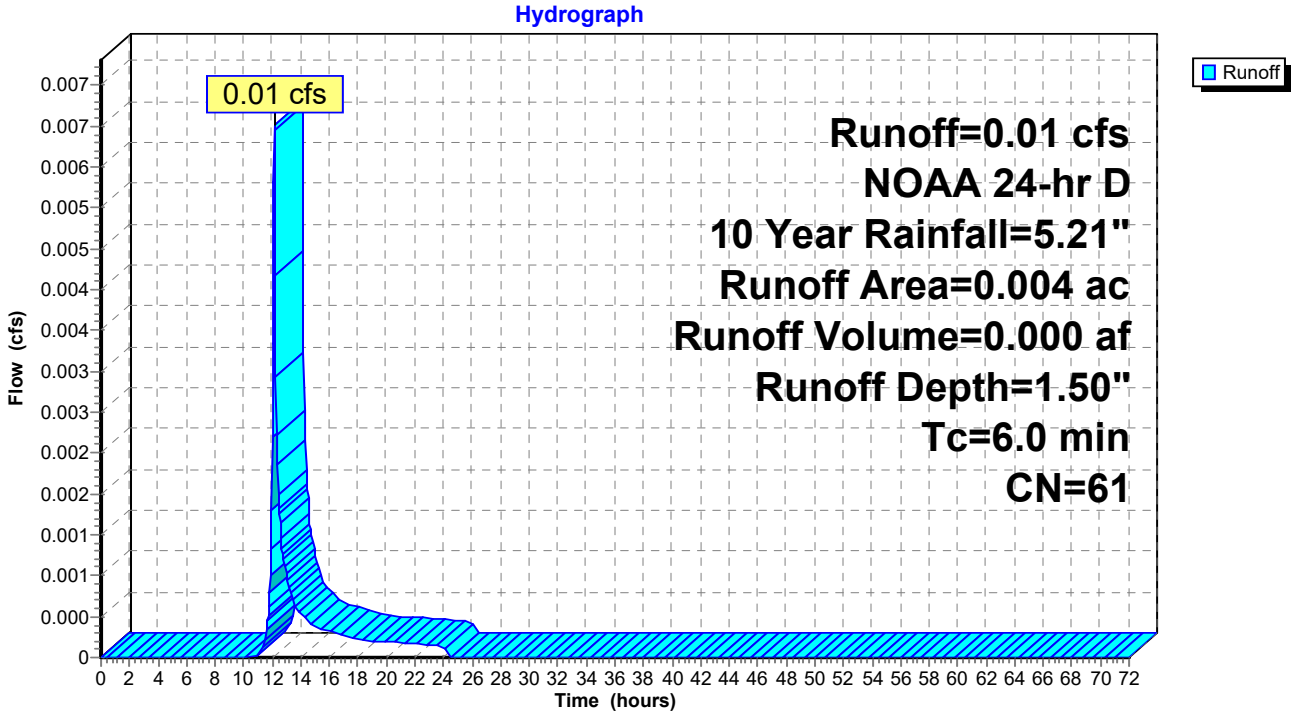
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.000 af, Depth= 1.50"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.004	61	>75% Grass cover, Good, HSG B
0.004		100.00% Pervious Area

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

Subcatchment BA3-P: Bypass Area #3 (Lawn)



Summary for Subcatchment DA1-I: Drainage Area #1 (Impervious)

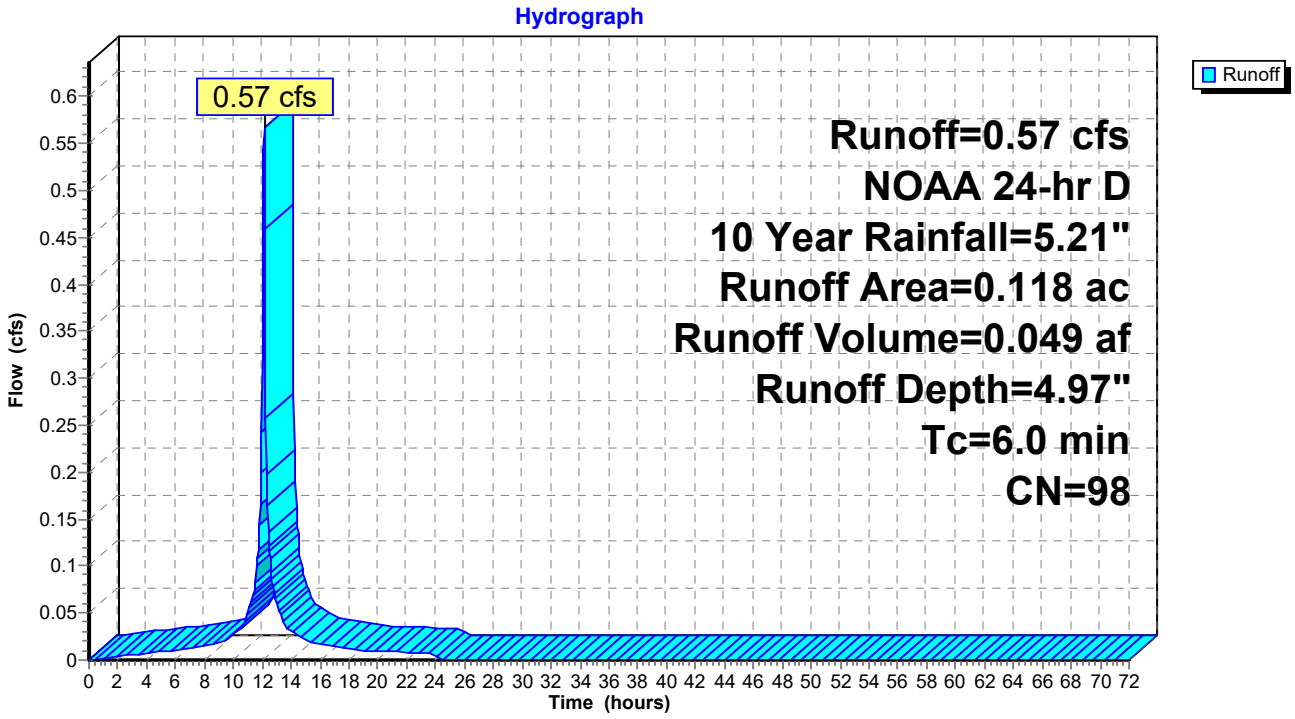
Runoff = 0.57 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 4.97"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.118	98	Unconnected pavement, HSG B
0.118		100.00% Impervious Area
0.118		100.00% Unconnected

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

Subcatchment DA1-I: Drainage Area #1 (Impervious)



Summary for Subcatchment DA1-P: Drainage Area #1 (Lawn)

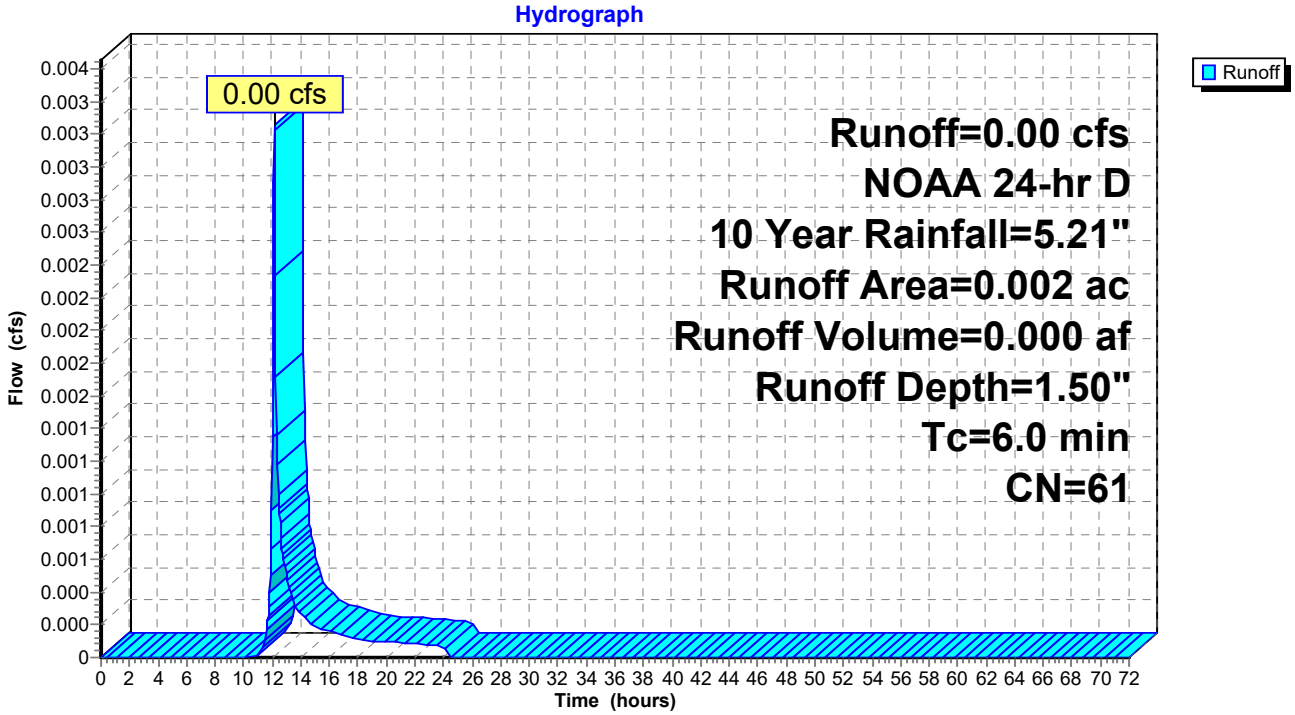
Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.000 af, Depth= 1.50"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.002	61	>75% Grass cover, Good, HSG B
0.002		100.00% Pervious Area

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

Subcatchment DA1-P: Drainage Area #1 (Lawn)



Summary for Subcatchment DA2-I: Drainage Area #2 (Impervious)

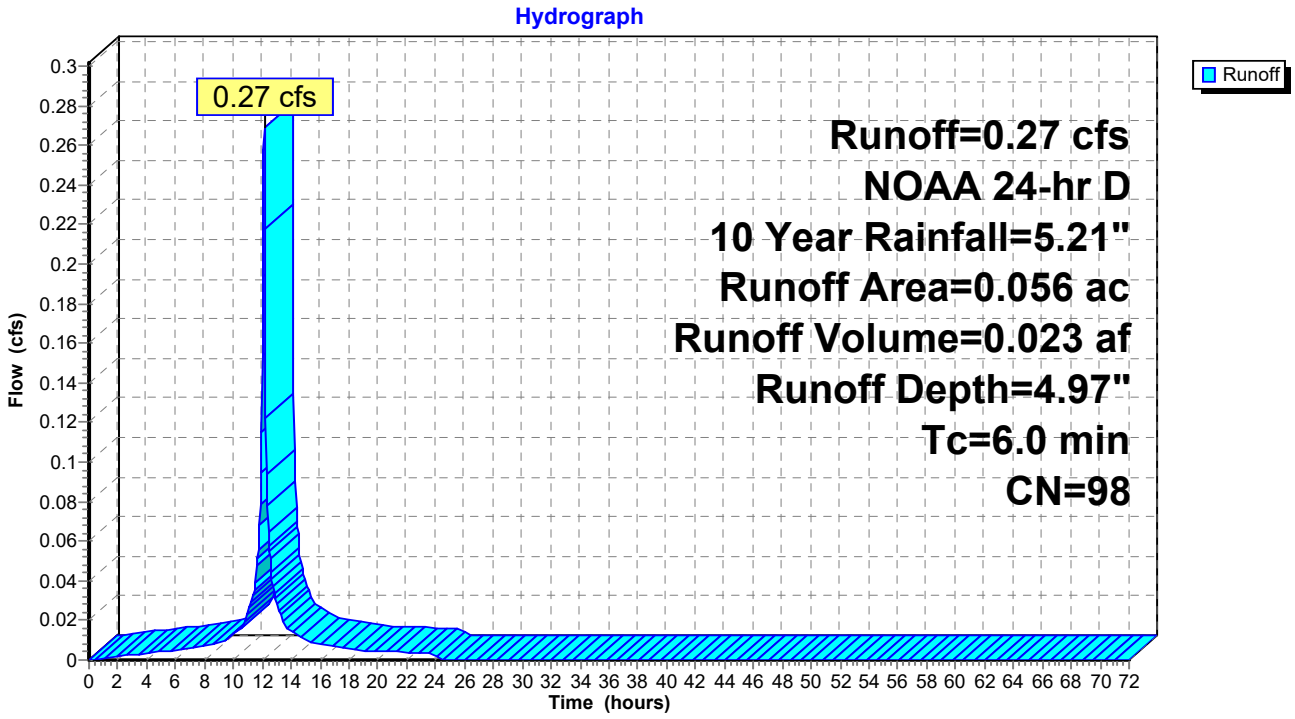
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 4.97"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.056	98	Unconnected pavement, HSG B
0.056		100.00% Impervious Area
0.056		100.00% Unconnected

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

Subcatchment DA2-I: Drainage Area #2 (Impervious)



Summary for Subcatchment DA2-P: Drainage Area #2 (Lawn)

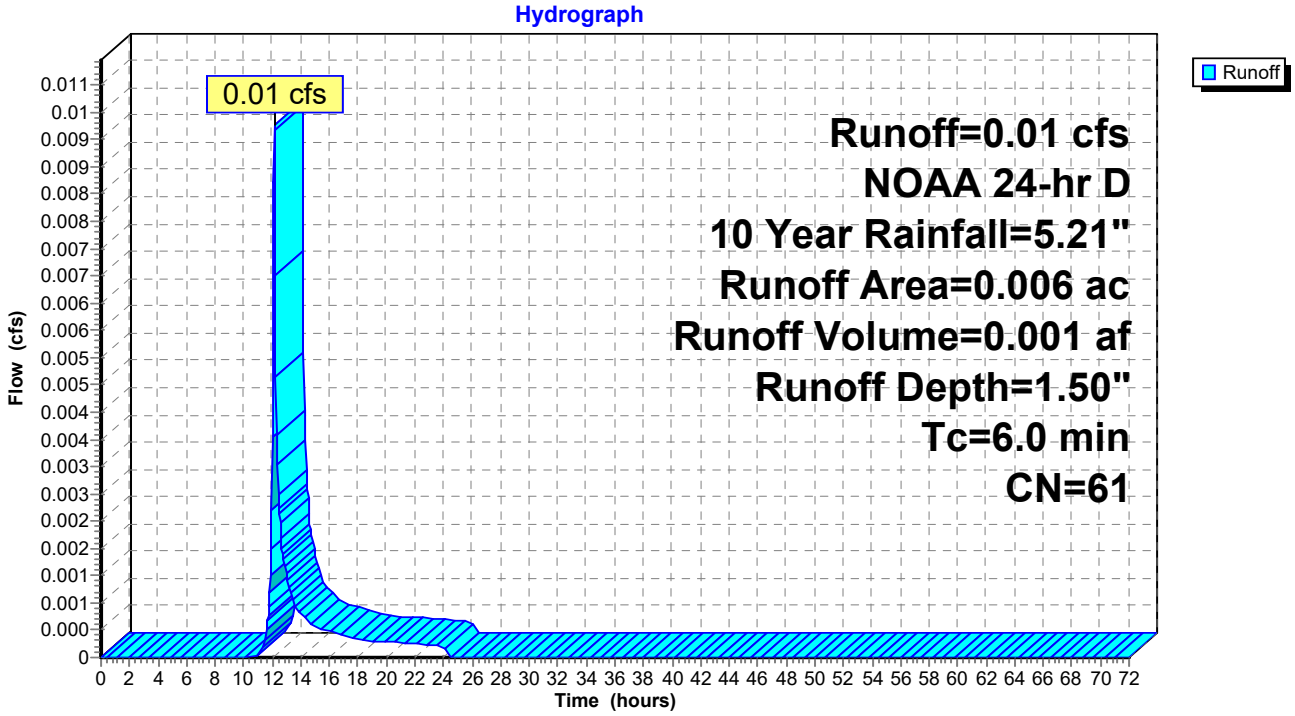
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 1.50"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.006	61	>75% Grass cover, Good, HSG B
0.006		100.00% Pervious Area

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

Subcatchment DA2-P: Drainage Area #2 (Lawn)



Summary for Subcatchment DA3-I: Drainage Area #3 (Impervious)

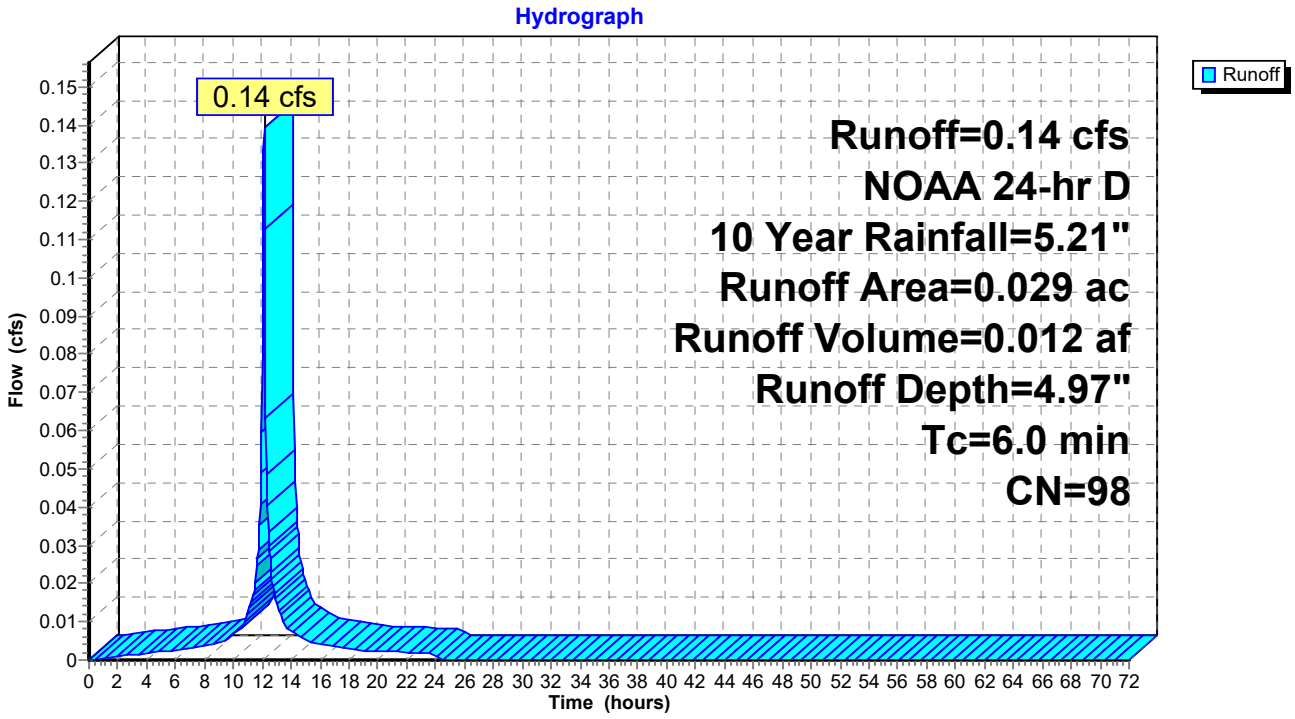
Runoff = 0.14 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 4.97"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.029	98	Unconnected pavement, HSG B
0.029		100.00% Impervious Area
0.029		100.00% Unconnected

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

Subcatchment DA3-I: Drainage Area #3 (Impervious)



Summary for Subcatchment DA3-P: Drainage Area #3 (Lawn)

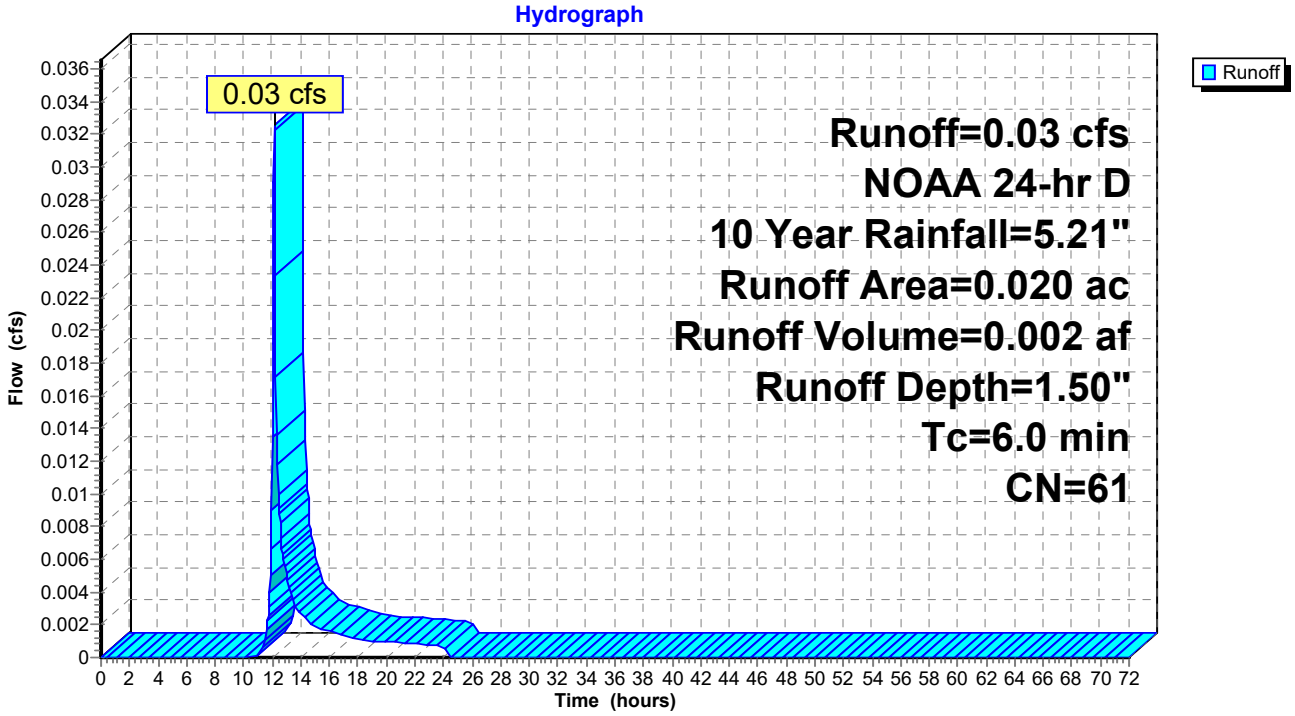
Runoff = 0.03 cfs @ 12.14 hrs, Volume= 0.002 af, Depth= 1.50"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.020	61	>75% Grass cover, Good, HSG B
0.020		100.00% Pervious Area

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

Subcatchment DA3-P: Drainage Area #3 (Lawn)



Summary for Subcatchment RA1a: Roof Area #1a (Impervious)

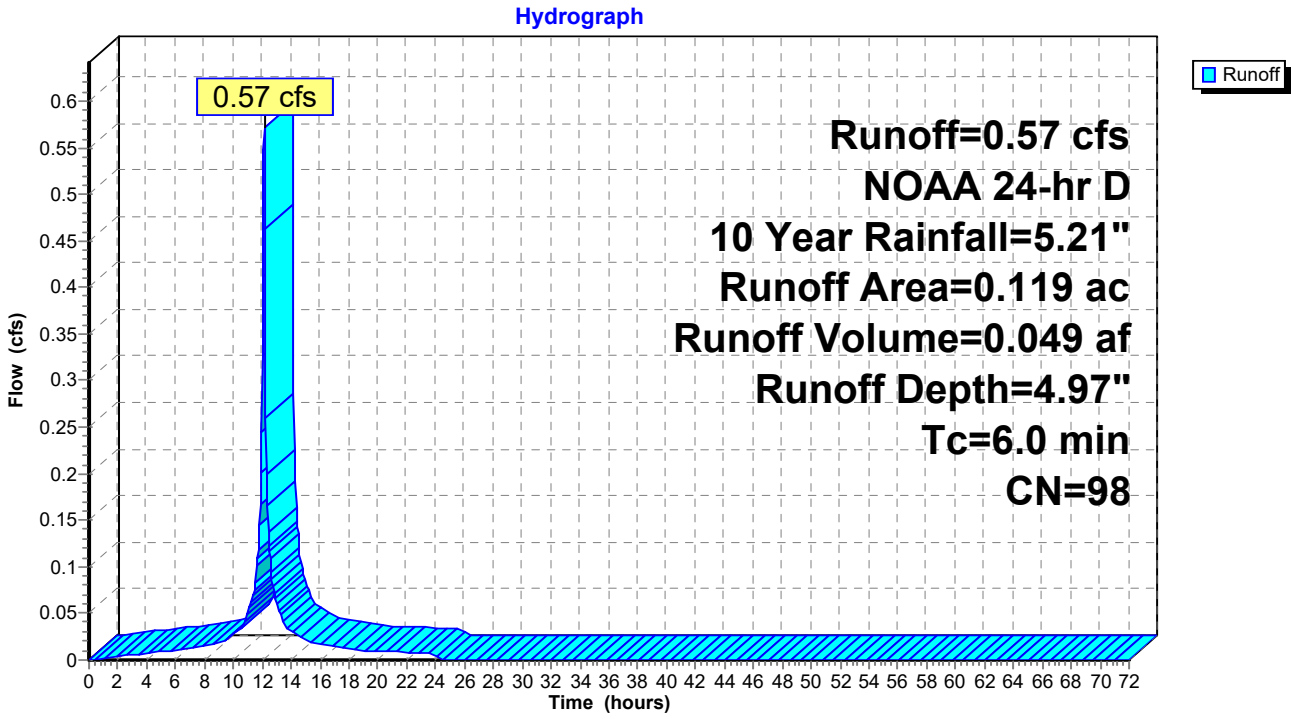
Runoff = 0.57 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 4.97"
Routed to Pond B-B : Underground Infiltration Basin #B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.119	98	Unconnected pavement, HSG B
0.119		100.00% Impervious Area
0.119		100.00% Unconnected

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

Subcatchment RA1a: Roof Area #1a (Impervious)



Summary for Subcatchment RA1b: Roof Area #1b (Impervious)

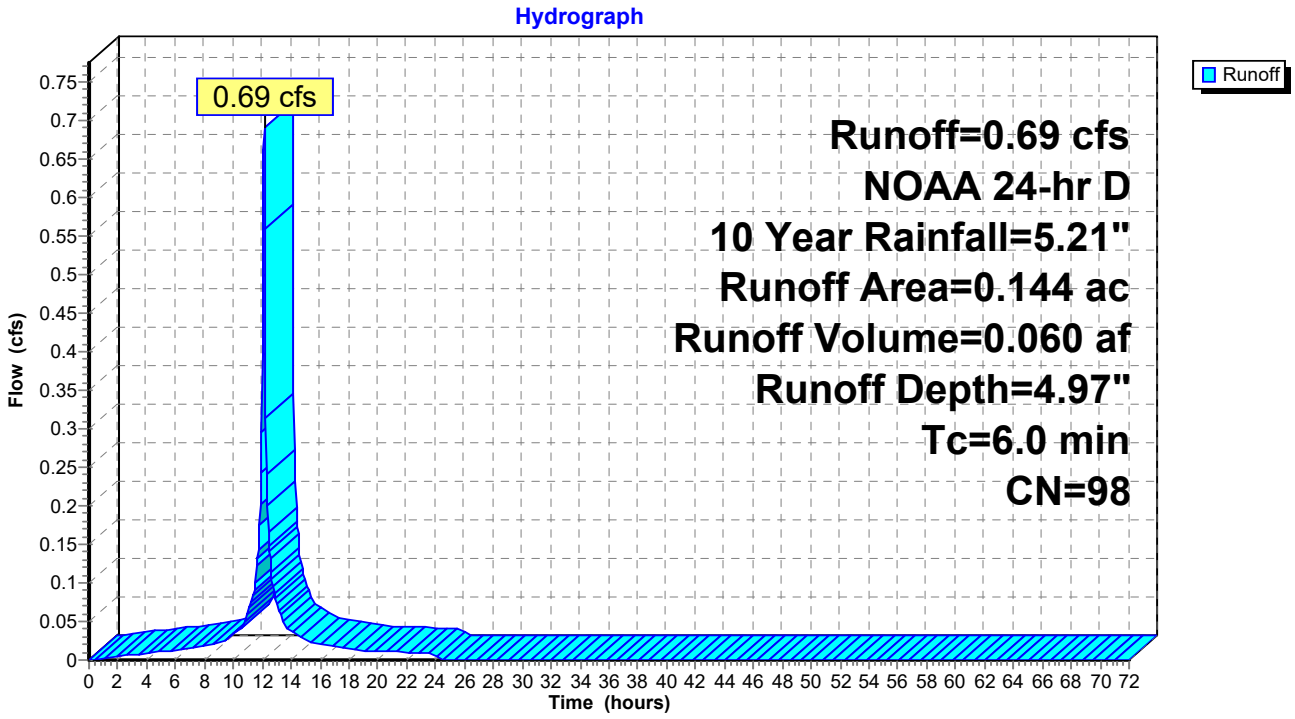
Runoff = 0.69 cfs @ 12.13 hrs, Volume= 0.060 af, Depth= 4.97"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 Year Rainfall=5.21"

Area (ac)	CN	Description
0.144	98	Unconnected pavement, HSG B
0.144		100.00% Impervious Area
0.144		100.00% Unconnected

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

Subcatchment RA1b: Roof Area #1b (Impervious)



Summary for Pond B-B: Underground Infiltration Basin #B

Inflow Area = 0.119 ac,100.00% Impervious, Inflow Depth = 4.97" for 10 Year event
Inflow = 0.57 cfs @ 12.13 hrs, Volume= 0.049 af
Outflow = 0.14 cfs @ 11.90 hrs, Volume= 0.049 af, Atten= 75%, Lag= 0.0 min
Discarded = 0.14 cfs @ 11.90 hrs, Volume= 0.049 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BA : Bioretention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 17.08' @ 12.39 hrs Surf.Area= 0.018 ac Storage= 0.008 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.0 min (758.5 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.98'	0.020 af	**11.50'W x 67.28'L x 3.33'H Field A** 0.059 af Overall - 0.009 af Embedded = 0.050 af x 40.0% Voids
#2A	17.48'	0.009 af	**ADS_StormTech SC-310 +Cap** x 27 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 27 Chambers in 3 Rows
		0.029 af	Total Available Storage

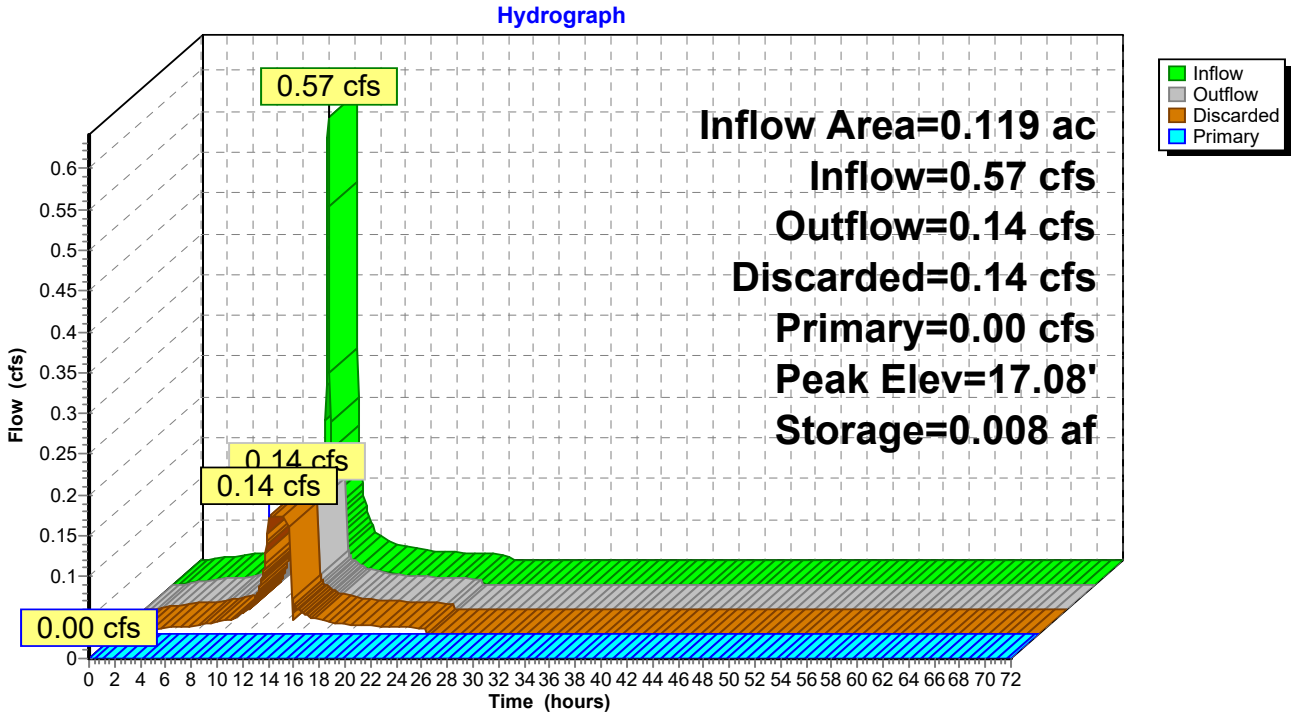
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.59'	**8.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.59' / 18.45' S= 0.0048 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Discarded	15.98'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 11.90 hrs HW=16.02' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.98' TW=18.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond B-B: Underground Infiltration Basin #B



Hydrograph for Pond B-B: Underground Infiltration Basin #B

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	15.98	0.00	0.00	**0.00**
2.50	0.00	0.000	15.98	0.00	0.00	0.00
5.00	0.01	0.000	15.98	0.01	0.01	0.00
7.50	0.01	0.000	15.98	0.01	0.01	0.00
10.00	**0.03**	**0.000**	**15.98**	**0.03**	**0.03**	0.00
12.50	**0.12**	**0.008**	**17.06**	**0.14**	**0.14**	0.00
15.00	0.02	0.000	15.98	0.02	0.02	0.00
17.50	0.01	0.000	15.98	0.01	0.01	0.00
20.00	0.01	0.000	15.98	0.01	0.01	0.00
22.50	0.01	0.000	15.98	0.01	0.01	0.00
25.00	0.00	0.000	15.98	0.00	0.00	0.00
27.50	0.00	0.000	15.98	0.00	0.00	0.00
30.00	0.00	0.000	15.98	0.00	0.00	0.00
32.50	0.00	0.000	15.98	0.00	0.00	0.00
35.00	0.00	0.000	15.98	0.00	0.00	0.00
37.50	0.00	0.000	15.98	0.00	0.00	0.00
40.00	0.00	0.000	15.98	0.00	0.00	0.00
42.50	0.00	0.000	15.98	0.00	0.00	0.00
45.00	0.00	0.000	15.98	0.00	0.00	0.00
47.50	0.00	0.000	15.98	0.00	0.00	0.00
50.00	0.00	0.000	15.98	0.00	0.00	0.00
52.50	0.00	0.000	15.98	0.00	0.00	0.00
55.00	0.00	0.000	15.98	0.00	0.00	0.00
57.50	0.00	0.000	15.98	0.00	0.00	0.00
60.00	0.00	0.000	15.98	0.00	0.00	0.00
62.50	0.00	0.000	15.98	0.00	0.00	0.00
65.00	0.00	0.000	15.98	0.00	0.00	0.00
67.50	0.00	0.000	15.98	0.00	0.00	0.00
70.00	0.00	0.000	15.98	0.00	0.00	0.00

Stage-Discharge for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
15.98	0.00	**0.00**	0.00
16.03	0.14	**0.14**	0.00
16.08	0.14	0.14	0.00
16.13	0.14	0.14	0.00
16.18	0.14	0.14	0.00
16.23	0.14	0.14	0.00
16.28	0.14	0.14	0.00
16.33	0.14	0.14	0.00
16.38	0.14	0.14	0.00
16.43	0.14	0.14	0.00
16.48	0.14	0.14	0.00
16.53	0.14	0.14	0.00
16.58	0.14	0.14	0.00
16.63	0.14	0.14	0.00
16.68	0.14	0.14	0.00
16.73	0.14	0.14	0.00
16.78	0.14	0.14	0.00
16.83	0.14	0.14	0.00
16.88	0.14	0.14	0.00
16.93	0.14	0.14	0.00
16.98	0.14	0.14	0.00
17.03	0.14	0.14	0.00
17.08	0.14	0.14	0.00
17.13	0.14	0.14	0.00
17.18	0.14	0.14	0.00
17.23	0.14	0.14	0.00
17.28	0.14	0.14	0.00
17.33	0.14	0.14	0.00
17.38	0.14	0.14	0.00
17.43	0.14	0.14	0.00
17.48	0.14	0.14	0.00
17.53	0.14	0.14	0.00
17.58	0.14	0.14	0.00
17.63	0.14	0.14	0.00
17.68	0.14	0.14	0.00
17.73	0.14	0.14	0.00
17.78	0.14	0.14	0.00
17.83	0.14	0.14	0.00
17.88	0.14	0.14	0.00
17.93	0.14	0.14	0.00
17.98	0.14	0.14	0.00
18.03	0.14	0.14	0.00
18.08	0.14	0.14	0.00
18.13	0.14	0.14	0.00
18.18	0.14	0.14	0.00
18.23	0.14	0.14	0.00
18.28	0.14	0.14	0.00
18.33	0.14	0.14	0.00
18.38	0.14	0.14	0.00
18.43	0.14	0.14	0.00
18.48	0.14	0.14	0.00
18.53	0.14	0.14	0.00
18.58	0.14	0.14	0.00
18.63	0.15	0.14	0.00
18.68	0.17	0.14	0.02
18.73	0.20	0.14	0.05
18.78	0.24	0.14	0.09
18.83	0.29	0.14	0.14
18.88	0.34	0.14	0.20
18.93	0.41	0.14	0.27
18.98	0.48	0.14	0.34
19.03	0.55	0.14	0.41
19.08	0.63	0.14	0.49
19.13	0.71	0.14	0.57
19.18	0.79	0.14	0.65
19.23	0.87	0.14	0.73
19.28	**0.94**	0.14	**0.79**

Stage-Area-Storage for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Surface (acres)	Storage (acre-feet)
15.98	**0.018**	0.000
16.03	0.018	0.000
16.08	0.018	0.001
16.13	0.018	0.001
16.18	0.018	0.001
16.23	0.018	0.002
16.28	0.018	0.002
16.33	0.018	0.002
16.38	0.018	0.003
16.43	0.018	0.003
16.48	0.018	0.004
16.53	0.018	0.004
16.58	0.018	0.004
16.63	0.018	0.005
16.68	0.018	0.005
16.73	0.018	0.005
16.78	0.018	0.006
16.83	0.018	0.006
16.88	0.018	0.006
16.93	0.018	0.007
16.98	0.018	0.007
17.03	0.018	0.007
17.08	0.018	0.008
17.13	0.018	0.008
17.18	0.018	0.009
17.23	0.018	0.009
17.28	0.018	0.009
17.33	0.018	0.010
17.38	0.018	0.010
17.43	0.018	0.010
17.48	0.018	0.011
17.53	0.018	0.011
17.58	0.018	0.012
17.63	0.018	0.013
17.68	0.018	0.013
17.73	0.018	0.014
17.78	0.018	0.015
17.83	0.018	0.015
17.88	0.018	0.016
17.93	0.018	0.017
17.98	0.018	0.017
18.03	0.018	0.018
18.08	0.018	0.018
18.13	0.018	0.019
18.18	0.018	0.020
18.23	0.018	0.020
18.28	0.018	0.021
18.33	0.018	0.021
18.38	0.018	0.022
18.43	0.018	0.022
18.48	0.018	0.023
18.53	0.018	0.023
18.58	0.018	0.024
18.63	0.018	0.024
18.68	0.018	0.025
18.73	0.018	0.025
18.78	0.018	0.025
18.83	0.018	0.026
18.88	0.018	0.026
18.93	0.018	0.026
18.98	0.018	0.027
19.03	0.018	0.027
19.08	0.018	0.028
19.13	0.018	0.028
19.18	0.018	0.028
19.23	0.018	0.029
19.28	0.018	**0.029**

Summary for Pond BA: Bioretention Basin

Inflow Area = 0.494 ac, 94.33% Impervious, Inflow Depth = 3.58" for 10 Year event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 0.147 af
Outflow = 1.48 cfs @ 12.17 hrs, Volume= 0.147 af, Atten= 14%, Lag= 2.4 min
Discarded = 0.08 cfs @ 10.50 hrs, Volume= 0.088 af
Primary = 1.40 cfs @ 12.17 hrs, Volume= 0.060 af
Routed to Pond SP-2 : Study Point #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond SP-2 : Study Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 19.39' @ 12.17 hrs Surf.Area= 436 sf Storage= 605 cf

Plug-Flow detention time= 15.3 min calculated for 0.147 af (100% of inflow)
Center-of-Mass det. time= 15.3 min (767.0 - 751.8)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	1,090 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	436	0	0
19.00	436	436	436
20.00	436	436	872
20.50	436	218	1,090

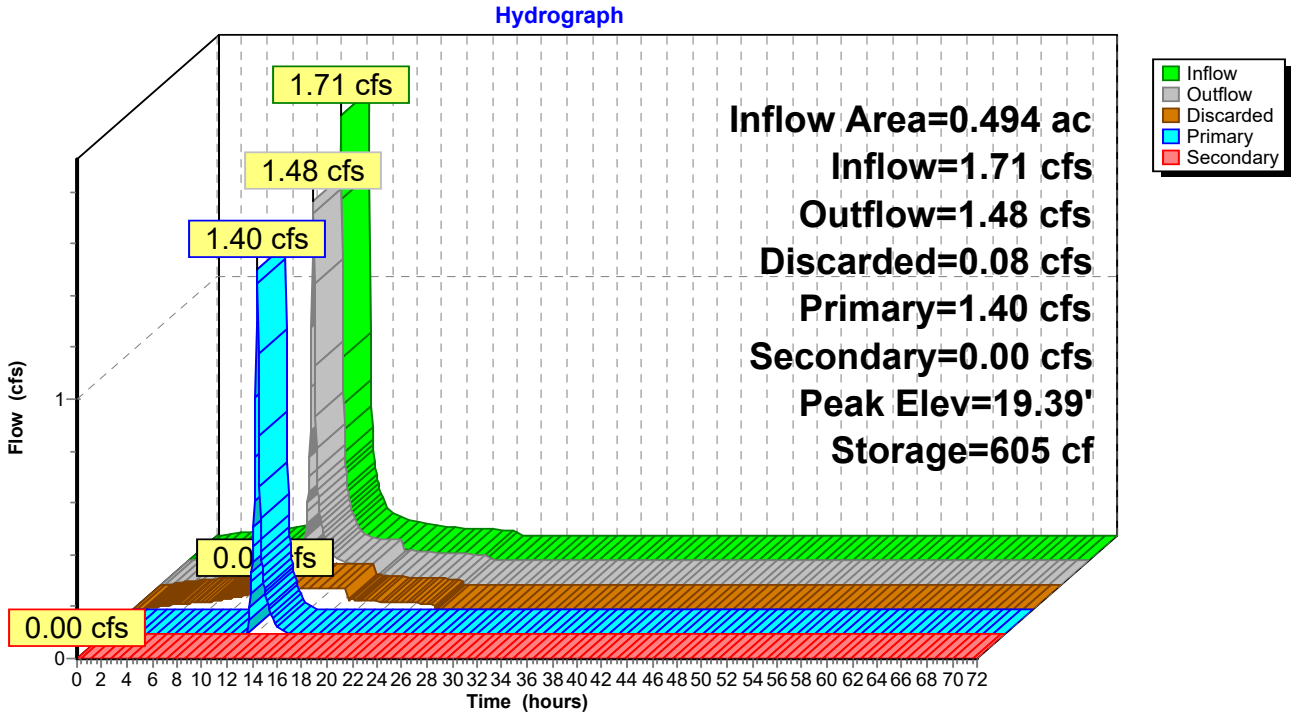
Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**15.0" Round Culvert** L= 17.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 17.90' / 17.60' S= 0.0171 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	18.58'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	20.00'	**24.0" Vert. Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	18.00'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	20.35'	**2.8' long x 1.0' breadth Emergency Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.08 cfs @ 10.50 hrs HW=18.04' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.37 cfs @ 12.17 hrs HW=19.37' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.37 cfs of 5.44 cfs potential flow)
├**2=Orifice** (Orifice Controls 1.37 cfs @ 3.11 fps)
└**3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=0.00' (Dynamic Tailwater)
└**5=Emergency Spillway** (Controls 0.00 cfs)

Pond BA: Bioretention Basin



Hydrograph for Pond BA: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	18.00	0.00	0.00	0.00	**0.00**
2.50	0.01	1	18.00	0.01	0.01	0.00	0.00
5.00	0.03	1	18.00	0.03	0.03	0.00	0.00
7.50	0.04	2	18.01	0.04	0.04	0.00	0.00
10.00	**0.08**	**4**	**18.01**	**0.08**	**0.08**	**0.00**	0.00
12.50	**0.35**	**386**	**18.88**	**0.40**	**0.08**	**0.32**	0.00
15.00	0.06	248	18.57	0.08	0.08	0.00	0.00
17.50	0.04	2	18.00	0.04	0.04	0.00	0.00
20.00	0.03	2	18.00	0.03	0.03	0.00	0.00
22.50	0.02	1	18.00	0.02	0.02	0.00	0.00
25.00	0.00	0	18.00	0.00	0.00	0.00	0.00
27.50	0.00	0	18.00	0.00	0.00	0.00	0.00
30.00	0.00	0	18.00	0.00	0.00	0.00	0.00
32.50	0.00	0	18.00	0.00	0.00	0.00	0.00
35.00	0.00	0	18.00	0.00	0.00	0.00	0.00
37.50	0.00	0	18.00	0.00	0.00	0.00	0.00
40.00	0.00	0	18.00	0.00	0.00	0.00	0.00
42.50	0.00	0	18.00	0.00	0.00	0.00	0.00
45.00	0.00	0	18.00	0.00	0.00	0.00	0.00
47.50	0.00	0	18.00	0.00	0.00	0.00	0.00
50.00	0.00	0	18.00	0.00	0.00	0.00	0.00
52.50	0.00	0	18.00	0.00	0.00	0.00	0.00
55.00	0.00	0	18.00	0.00	0.00	0.00	0.00
57.50	0.00	0	18.00	0.00	0.00	0.00	0.00
60.00	0.00	0	18.00	0.00	0.00	0.00	0.00
62.50	0.00	0	18.00	0.00	0.00	0.00	0.00
65.00	0.00	0	18.00	0.00	0.00	0.00	0.00
67.50	0.00	0	18.00	0.00	0.00	0.00	0.00
70.00	0.00	0	18.00	0.00	0.00	0.00	0.00

Stage-Discharge for Pond BA: Bioretention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
18.00	0.00	**0.00**	0.00	0.00
18.10	0.08	**0.08**	0.00	0.00
18.20	0.08	0.08	0.00	0.00
18.30	0.08	0.08	0.00	0.00
18.40	0.08	0.08	0.00	0.00
18.50	0.08	0.08	0.00	0.00
18.60	0.08	0.08	0.00	0.00
18.70	0.13	0.08	0.05	0.00
18.80	0.25	0.08	0.17	0.00
18.90	0.43	0.08	0.35	0.00
19.00	0.64	0.08	0.56	0.00
19.10	0.88	0.08	0.80	0.00
19.20	1.13	0.08	1.05	0.00
19.30	1.34	0.08	1.26	0.00
19.40	1.50	0.08	1.42	0.00
19.50	1.65	0.08	1.57	0.00
19.60	1.79	0.08	1.71	0.00
19.70	1.92	0.08	1.84	0.00
19.80	2.04	0.08	1.96	0.00
19.90	2.15	0.08	2.07	0.00
20.00	2.26	0.08	2.17	0.00
20.10	2.42	0.08	2.34	0.00
20.20	2.70	0.08	2.62	0.00
20.30	3.10	0.08	3.02	0.00
20.40	3.69	0.08	3.52	0.08
20.50	4.64	0.08	4.12	0.44
20.60	5.84	0.08	4.82	0.94
20.70	7.25	0.08	5.60	1.57
20.80	8.85	0.08	6.46	2.31
20.90	10.61	0.08	7.40	3.13
21.00	12.54	0.08	8.39	4.07
21.10	14.66	0.08	9.44	5.14
21.20	16.07	0.08	9.66	6.32
21.30	17.57	0.08	9.84	7.64
21.40	19.15	0.08	10.02	9.05
21.50	20.82	0.08	10.19	10.55
21.60	22.61	0.08	10.36	12.17
21.70	24.53	0.08	10.53	13.92
21.80	26.52	0.08	10.69	15.74
21.90	28.55	0.08	10.86	17.61
22.00	**30.61**	0.08	**11.01**	**19.51**

Stage-Area-Storage for Pond BA: Bioretention Basin

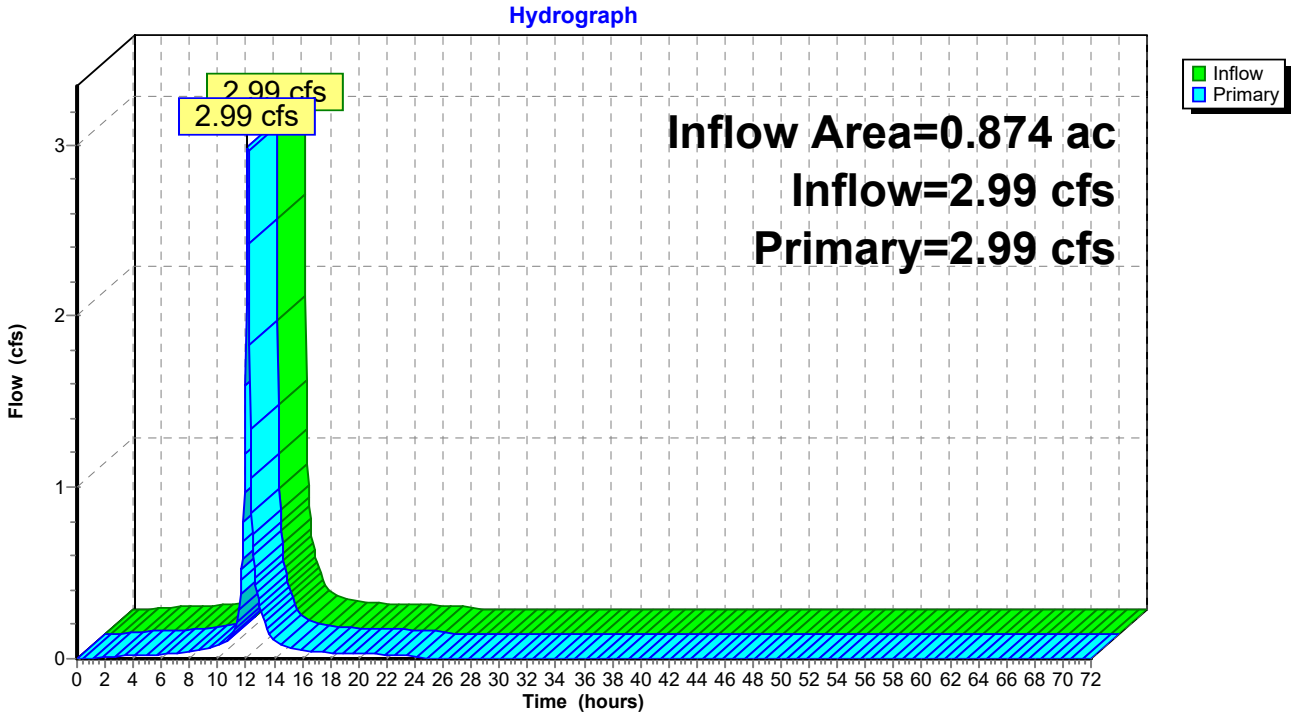
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
18.00	**436**	0
18.05	436	22
18.10	436	44
18.15	436	65
18.20	436	87
18.25	436	109
18.30	436	131
18.35	436	153
18.40	436	174
18.45	436	196
18.50	436	218
18.55	436	240
18.60	436	262
18.65	436	283
18.70	436	305
18.75	436	327
18.80	436	349
18.85	436	371
18.90	436	392
18.95	436	414
19.00	436	436
19.05	436	458
19.10	436	480
19.15	436	501
19.20	436	523
19.25	436	545
19.30	436	567
19.35	436	589
19.40	436	610
19.45	436	632
19.50	436	654
19.55	436	676
19.60	436	698
19.65	436	719
19.70	436	741
19.75	436	763
19.80	436	785
19.85	436	807
19.90	436	828
19.95	436	850
20.00	436	872
20.05	436	894
20.10	436	916
20.15	436	937
20.20	436	959
20.25	436	981
20.30	436	1,003
20.35	436	1,025
20.40	436	1,046
20.45	436	1,068
20.50	436	**1,090**
20.55	436	1,090
20.60	436	1,090
20.65	436	1,090
20.70	436	1,090
20.75	436	1,090
20.80	436	1,090
20.85	436	1,090
20.90	436	1,090
20.95	436	1,090
21.00	436	1,090
21.05	436	1,090
21.10	436	1,090
21.15	436	1,090
21.20	436	1,090
21.25	436	1,090
21.30	436	1,090
21.35	436	1,090
21.40	436	1,090
21.45	436	1,090
21.50	436	1,090
21.55	436	1,090
21.60	436	1,090
21.65	436	1,090
21.70	436	1,090
21.75	436	1,090
21.80	436	1,090
21.85	436	1,090
21.90	436	1,090
21.95	436	1,090
22.00	436	1,090

Summary for Pond OS: Overall Site

Inflow Area = 0.874 ac, 89.93% Impervious, Inflow Depth = 2.74" for 10 Year event
Inflow = 2.99 cfs @ 12.14 hrs, Volume= 0.200 af
Primary = 2.99 cfs @ 12.14 hrs, Volume= 0.200 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond OS: Overall Site

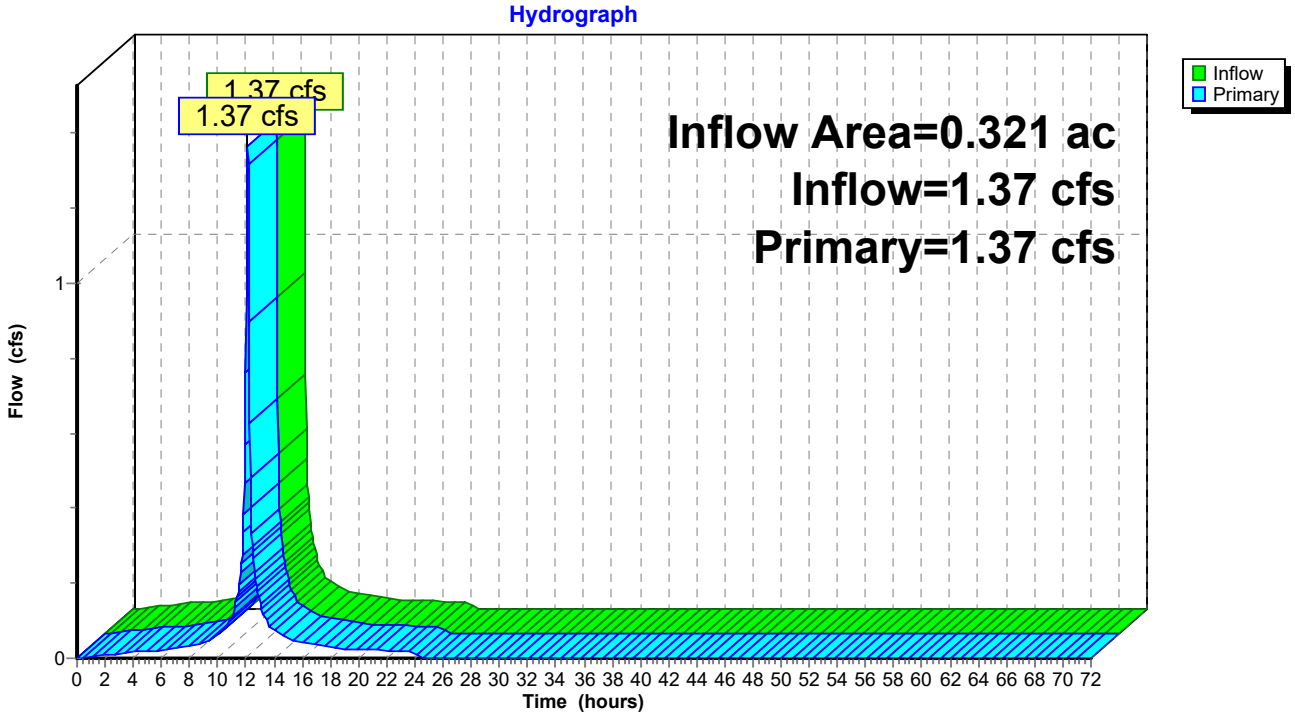


Summary for Pond SP-1: Study Point #1

Inflow Area = 0.321 ac, 82.55% Impervious, Inflow Depth = 4.37" for 10 Year event
Inflow = 1.37 cfs @ 12.13 hrs, Volume= 0.117 af
Primary = 1.37 cfs @ 12.13 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-1: Study Point #1

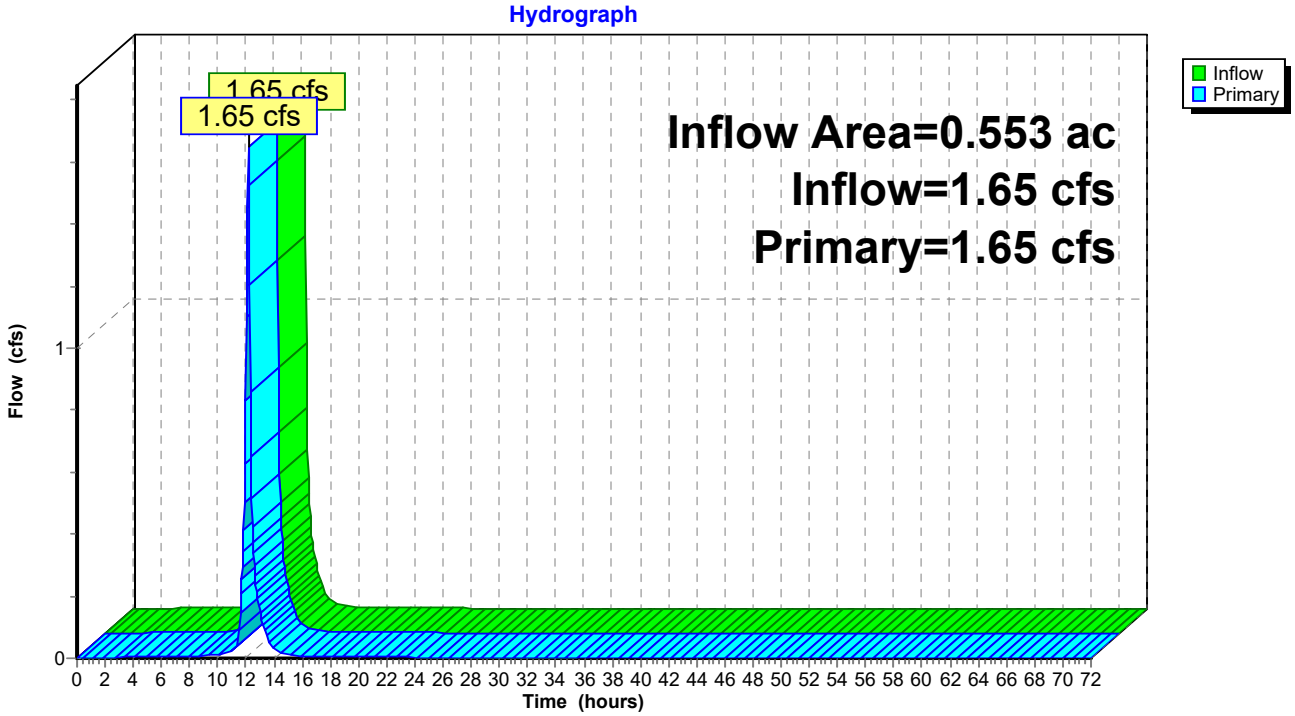


Summary for Pond SP-2: Study Point #2

Inflow Area = 0.553 ac, 94.21% Impervious, Inflow Depth = 1.80" for 10 Year event
Inflow = 1.65 cfs @ 12.16 hrs, Volume= 0.083 af
Primary = 1.65 cfs @ 12.16 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-2: Study Point #2

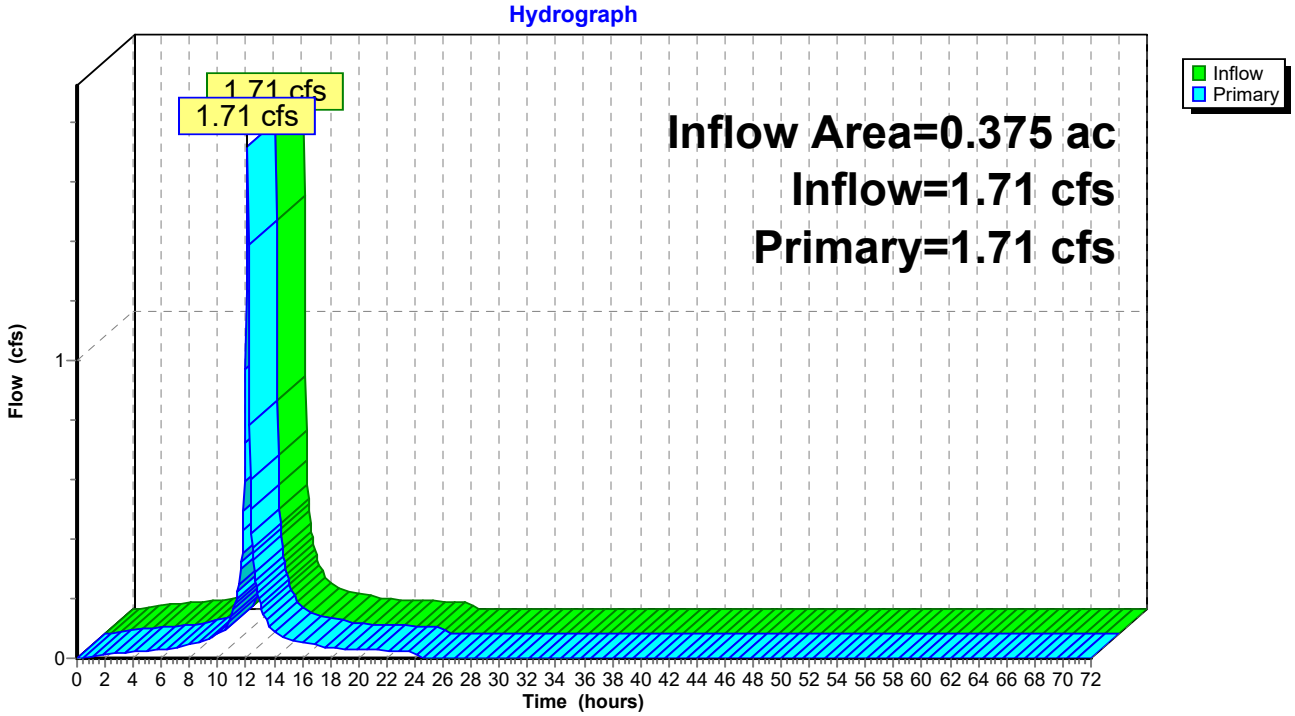


Summary for Link DA-BA: Basin Drainage Area

Inflow Area = 0.375 ac, 92.53% Impervious, Inflow Depth = 4.71" for 10 Year event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 0.147 af
Primary = 1.71 cfs @ 12.13 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BA : Bioretention Basin

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link DA-BA: Basin Drainage Area



Summary for Subcatchment BA1-P: Bypass Area #1 (Lawn)

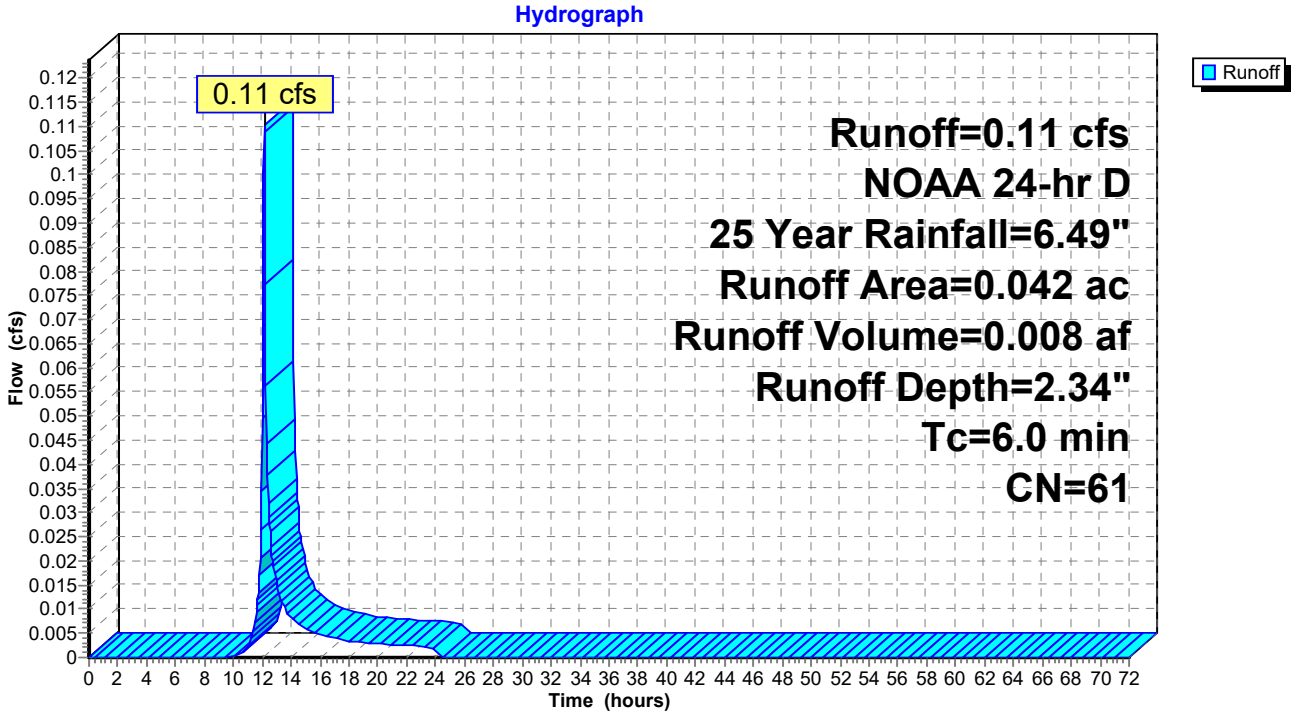
Runoff = 0.11 cfs @ 12.14 hrs, Volume= 0.008 af, Depth= 2.34"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.042	61	>75% Grass cover, Good, HSG B
0.042		100.00% Pervious Area

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

Subcatchment BA1-P: Bypass Area #1 (Lawn)



Summary for Subcatchment BA2-I: Bypass Area #2 (Impervious)

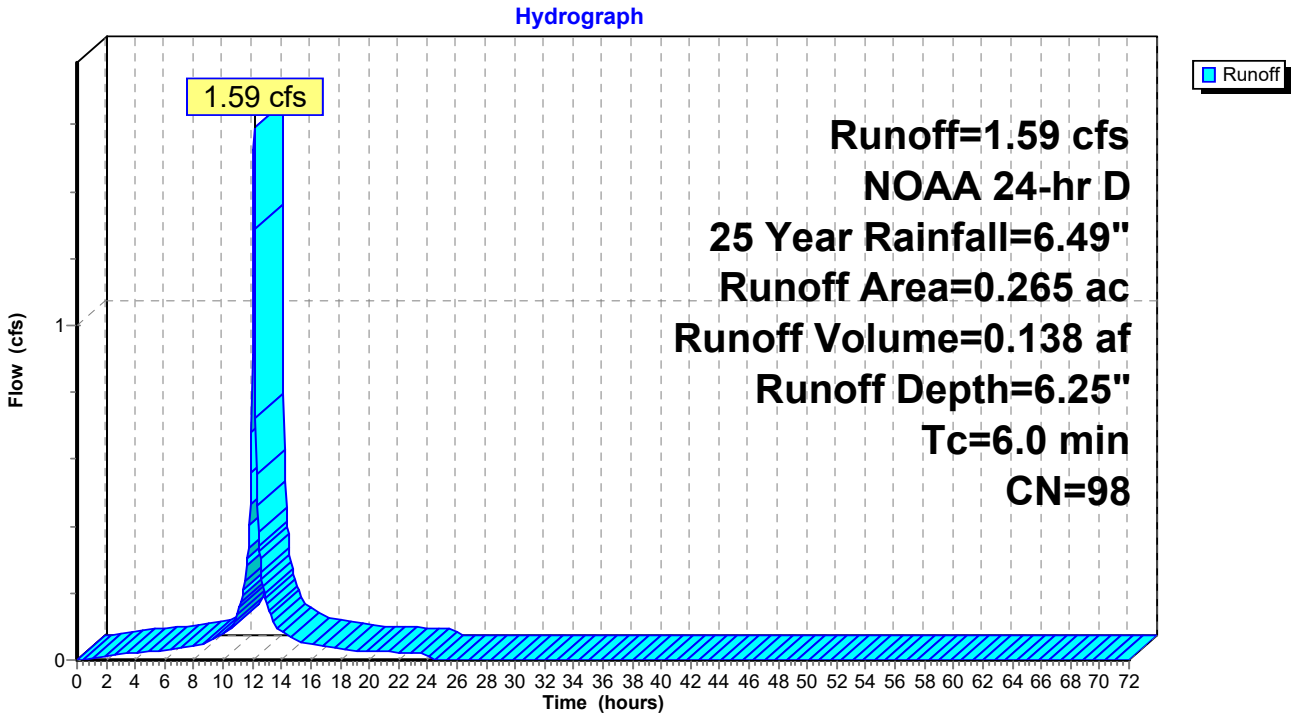
Runoff = 1.59 cfs @ 12.13 hrs, Volume= 0.138 af, Depth= 6.25"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.265	98	Unconnected pavement, HSG B
0.265		100.00% Impervious Area
0.265		100.00% Unconnected

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

Subcatchment BA2-I: Bypass Area #2 (Impervious)



Summary for Subcatchment BA2-P: Bypass Area #2 (Lawn)

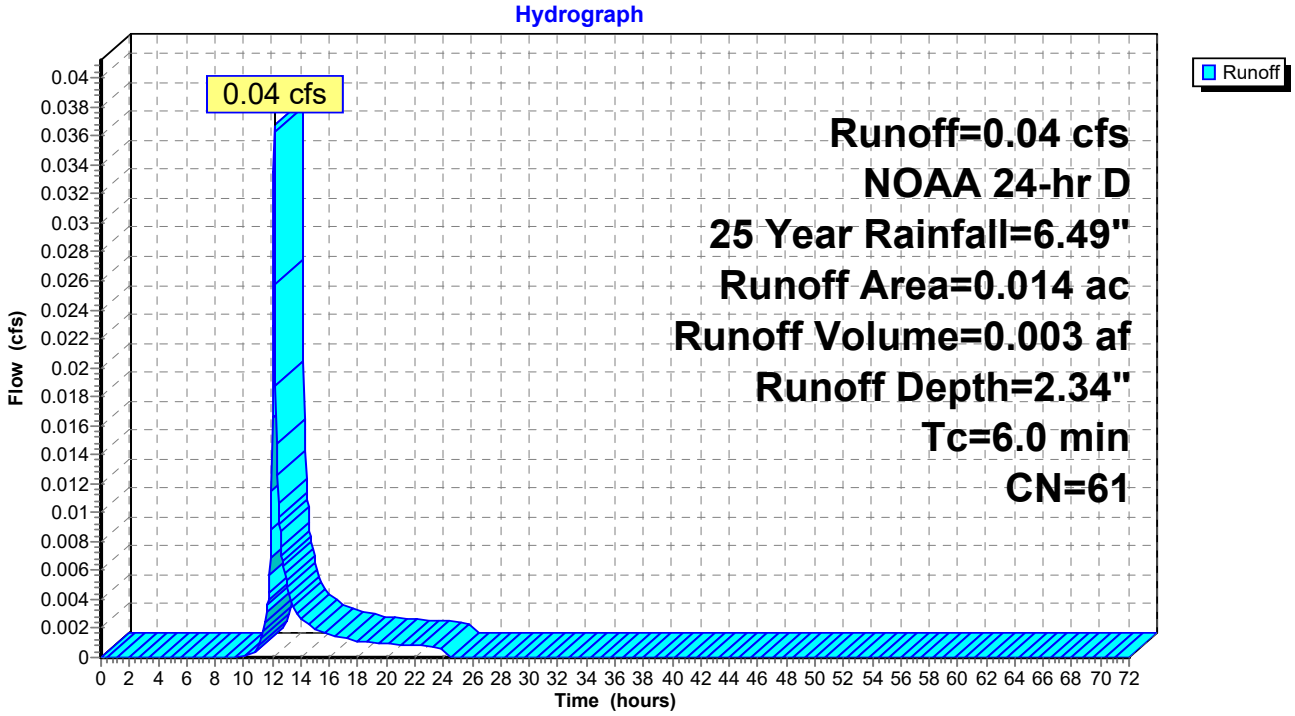
Runoff = 0.04 cfs @ 12.14 hrs, Volume= 0.003 af, Depth= 2.34"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

	Area (ac)	CN	Description
*	0.014	61	>75% Grass cover, Good, HSG B
	0.014		100.00% Pervious Area

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

Subcatchment BA2-P: Bypass Area #2 (Lawn)



Summary for Subcatchment BA3-I: Bypass Area #3 (Impervious)

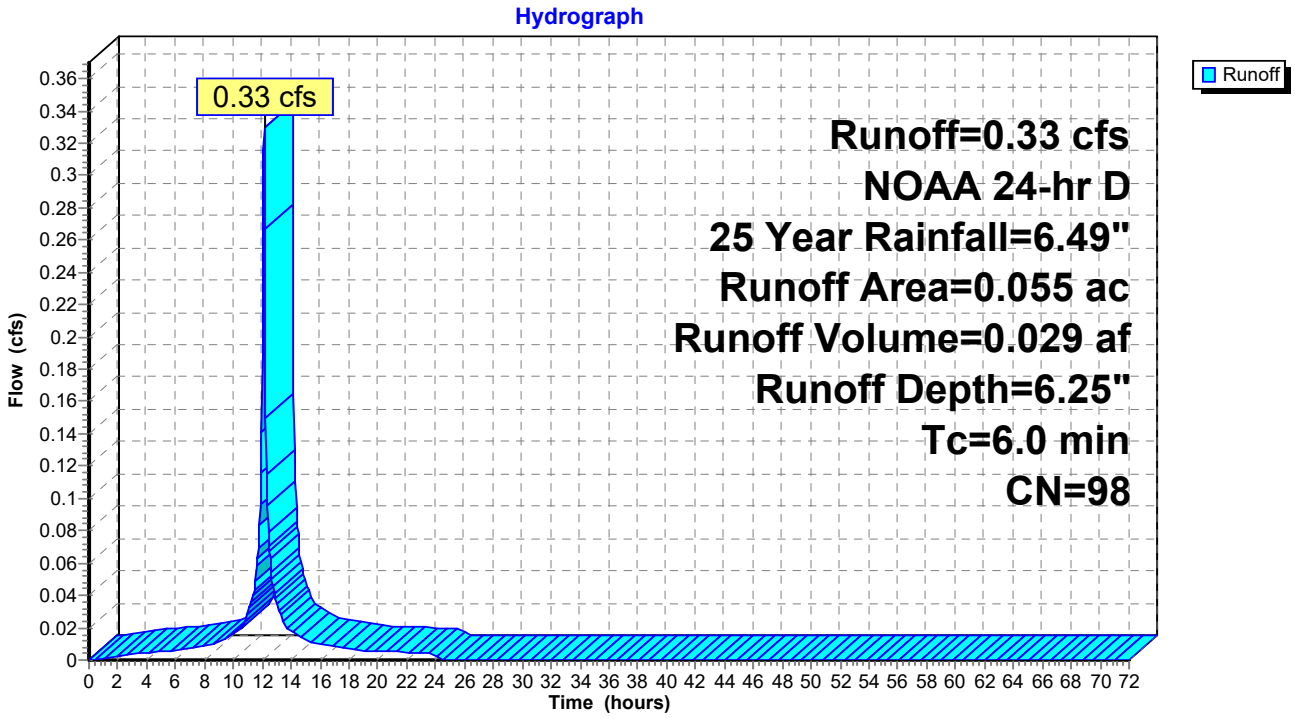
Runoff = 0.33 cfs @ 12.13 hrs, Volume= 0.029 af, Depth= 6.25"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.055	98	Unconnected pavement, HSG B
0.055		100.00% Impervious Area
0.055		100.00% Unconnected

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

Subcatchment BA3-I: Bypass Area #3 (Impervious)



Summary for Subcatchment BA3-P: Bypass Area #3 (Lawn)

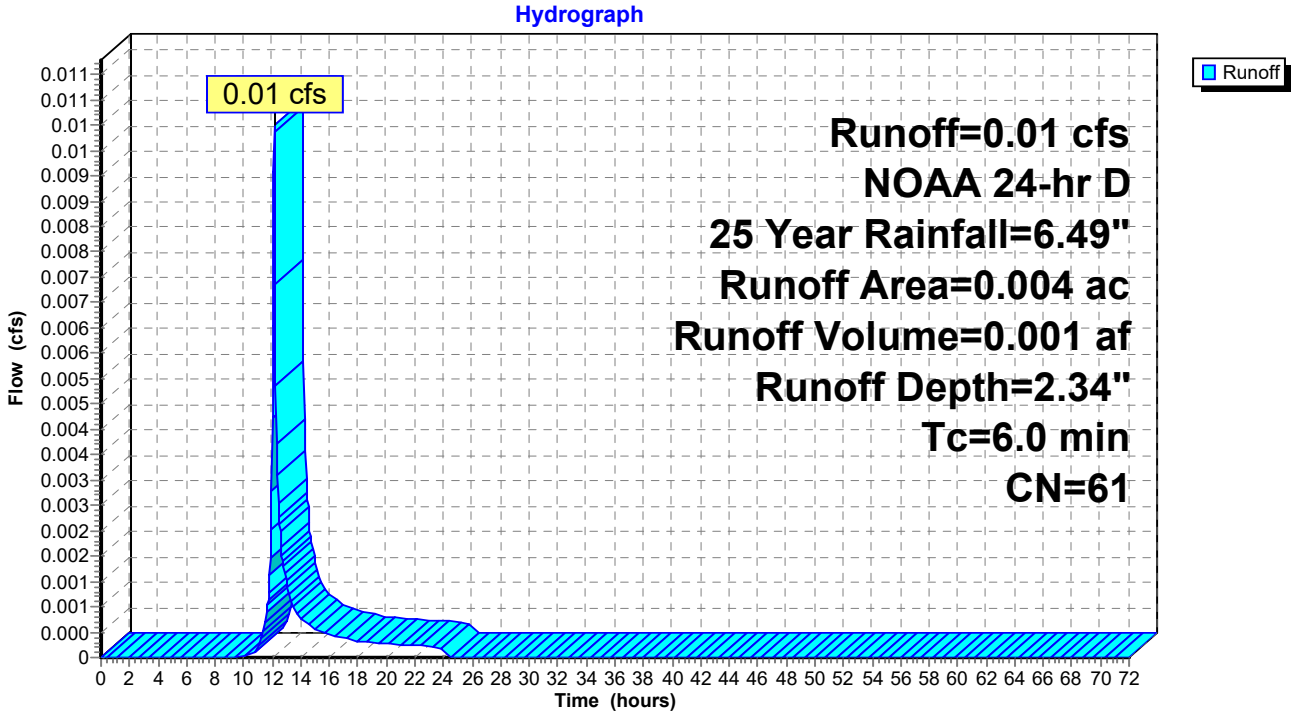
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 2.34"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.004	61	>75% Grass cover, Good, HSG B
0.004		100.00% Pervious Area

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

Subcatchment BA3-P: Bypass Area #3 (Lawn)



Summary for Subcatchment DA1-I: Drainage Area #1 (Impervious)

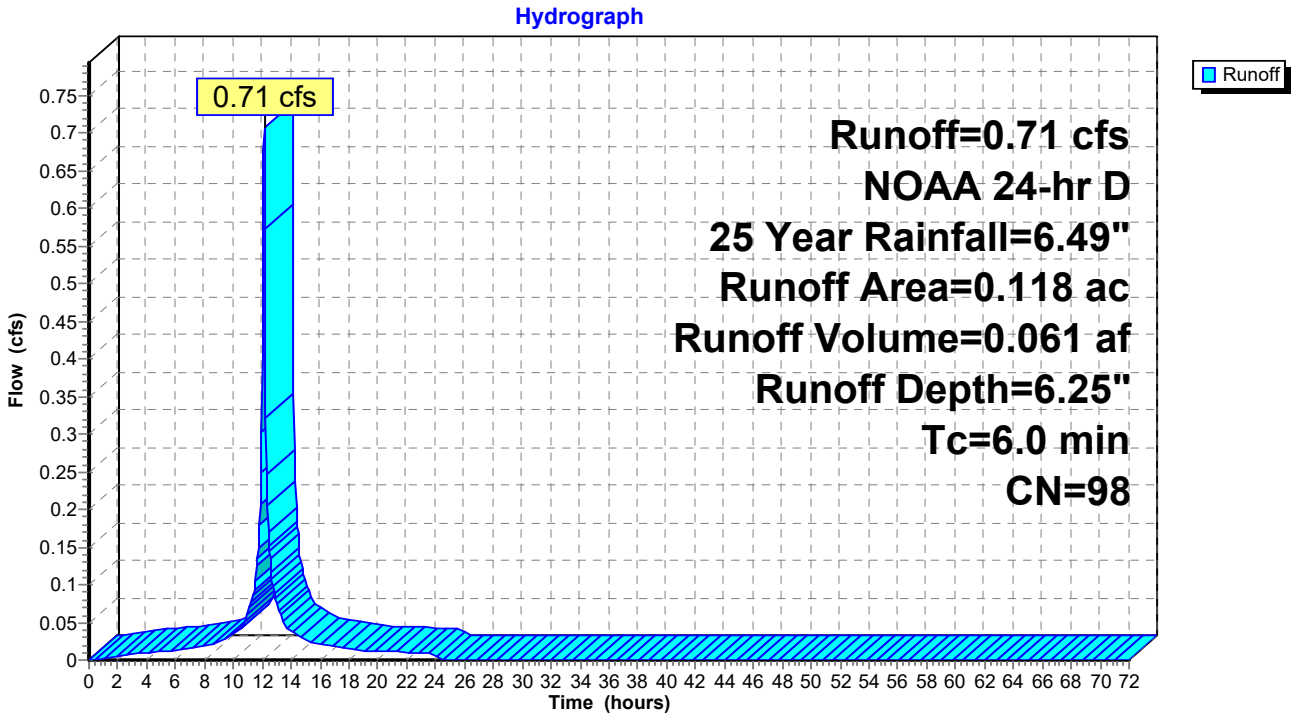
Runoff = 0.71 cfs @ 12.13 hrs, Volume= 0.061 af, Depth= 6.25"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.118	98	Unconnected pavement, HSG B
0.118		100.00% Impervious Area
0.118		100.00% Unconnected

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

Subcatchment DA1-I: Drainage Area #1 (Impervious)



Summary for Subcatchment DA1-P: Drainage Area #1 (Lawn)

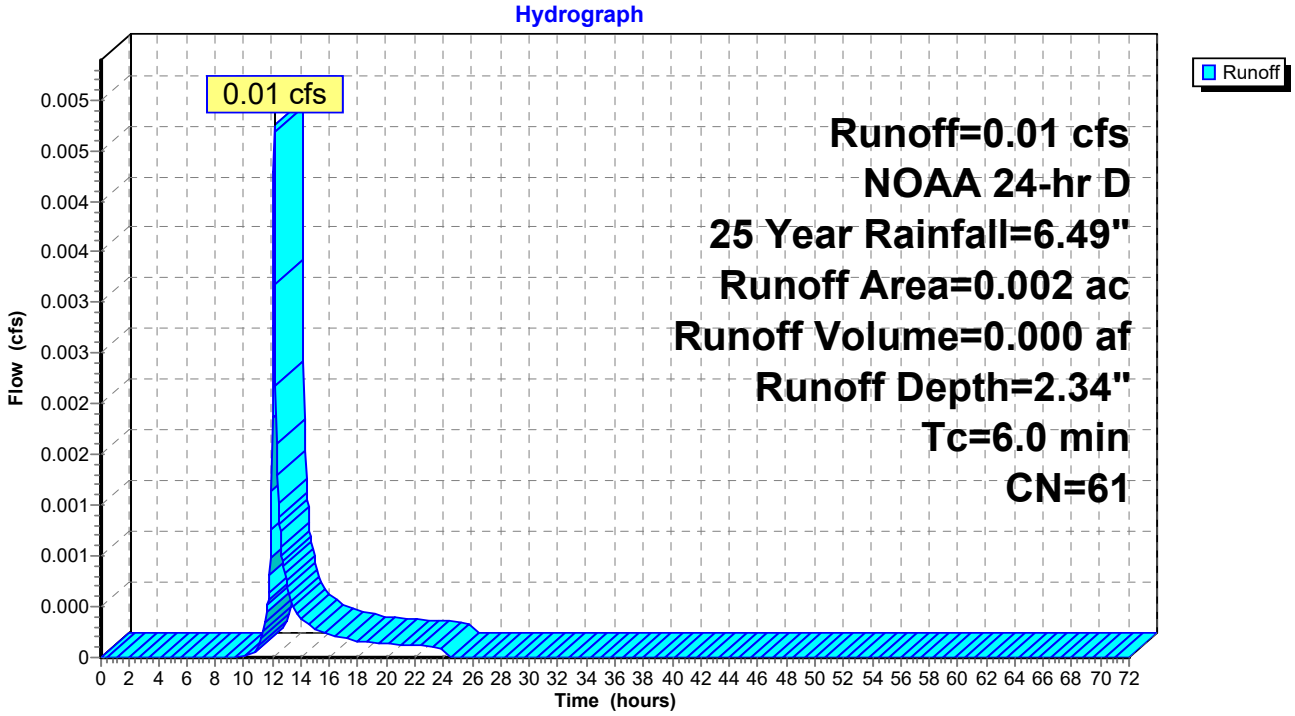
Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.000 af, Depth= 2.34"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.002	61	>75% Grass cover, Good, HSG B
0.002		100.00% Pervious Area

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

Subcatchment DA1-P: Drainage Area #1 (Lawn)



Summary for Subcatchment DA2-I: Drainage Area #2 (Impervious)

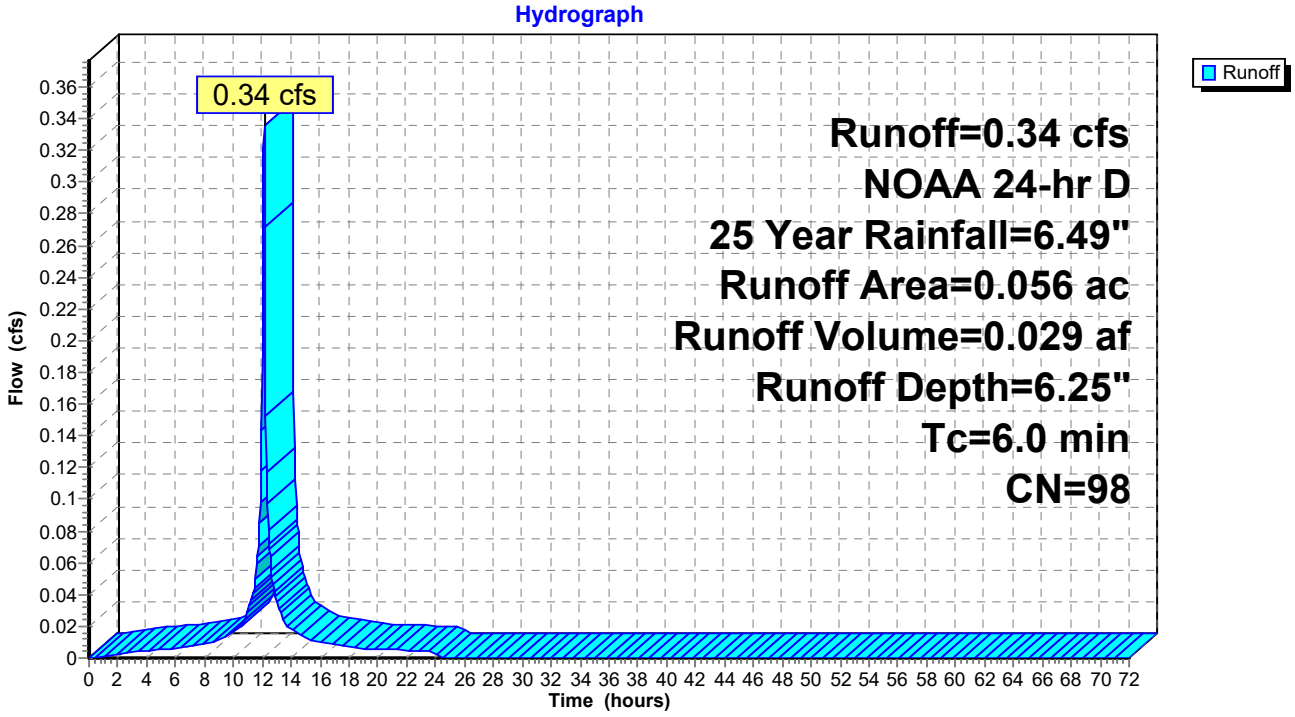
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 0.029 af, Depth= 6.25"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.056	98	Unconnected pavement, HSG B
0.056		100.00% Impervious Area
0.056		100.00% Unconnected

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

Subcatchment DA2-I: Drainage Area #2 (Impervious)



Summary for Subcatchment DA2-P: Drainage Area #2 (Lawn)

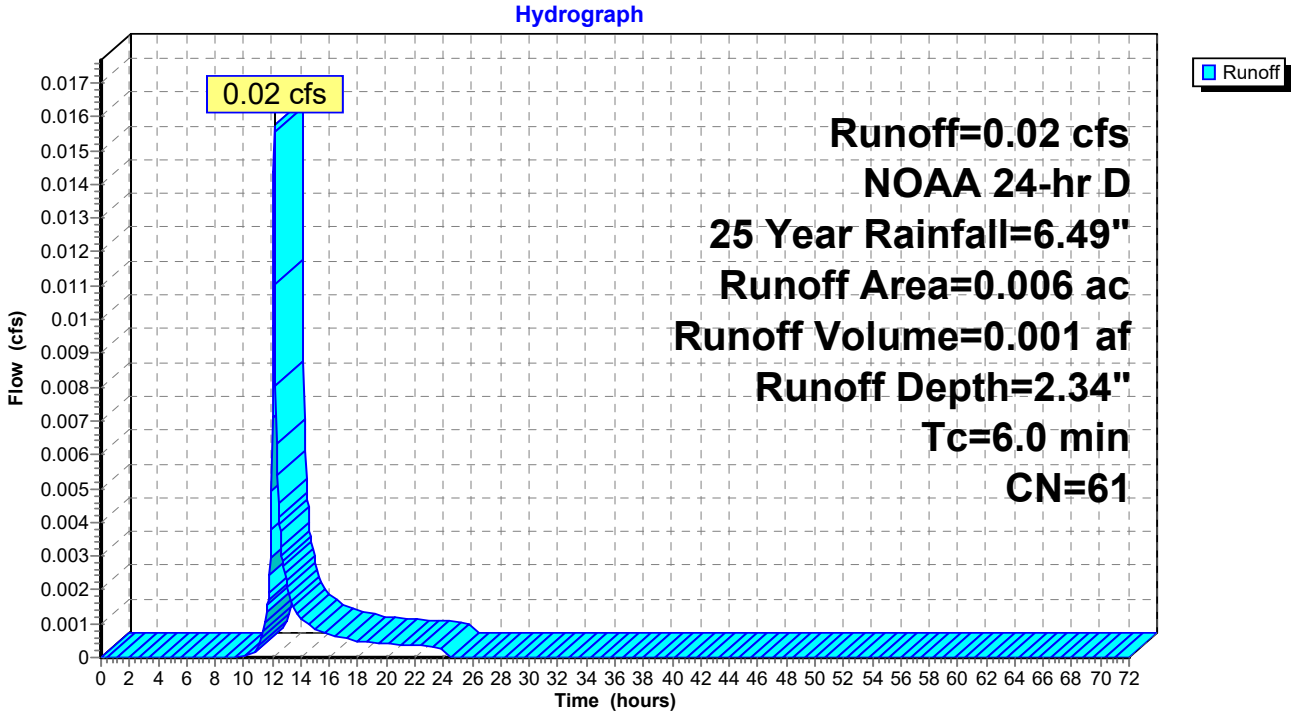
Runoff = 0.02 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 2.34"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.006	61	>75% Grass cover, Good, HSG B
0.006		100.00% Pervious Area

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

Subcatchment DA2-P: Drainage Area #2 (Lawn)



Summary for Subcatchment DA3-I: Drainage Area #3 (Impervious)

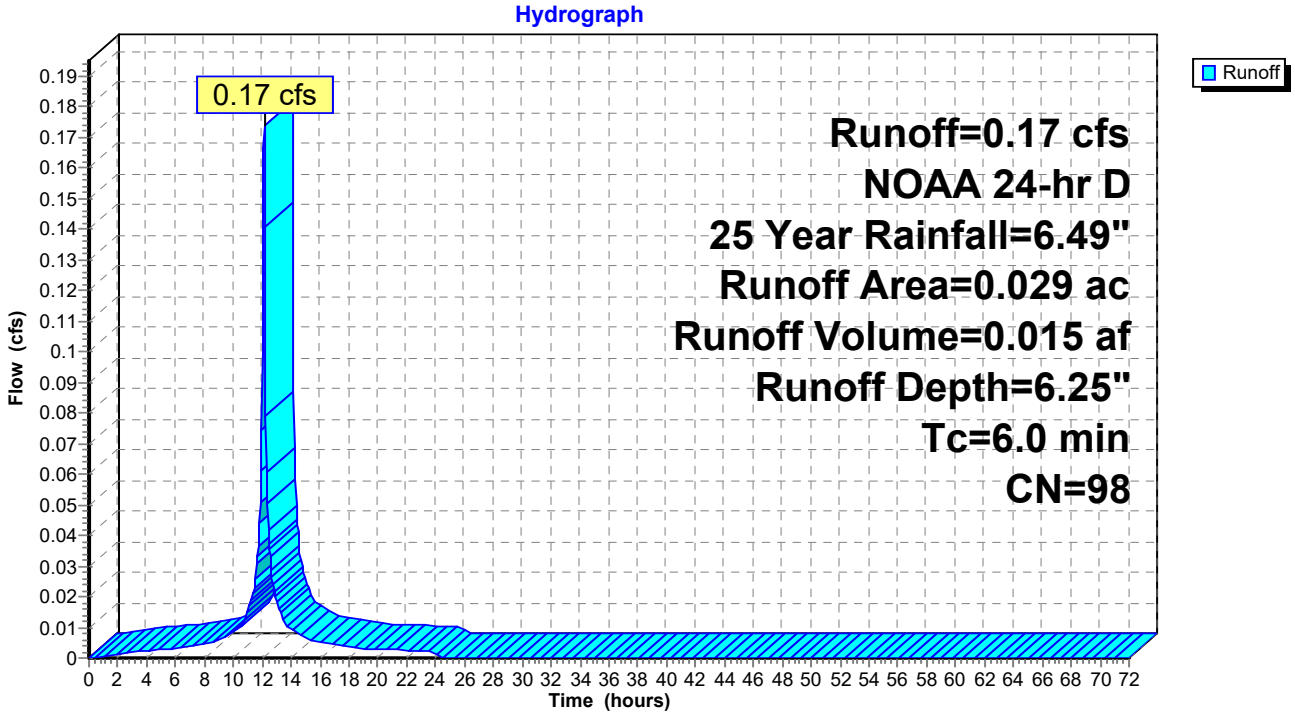
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 6.25"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.029	98	Unconnected pavement, HSG B
0.029		100.00% Impervious Area
0.029		100.00% Unconnected

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

Subcatchment DA3-I: Drainage Area #3 (Impervious)



Summary for Subcatchment DA3-P: Drainage Area #3 (Lawn)

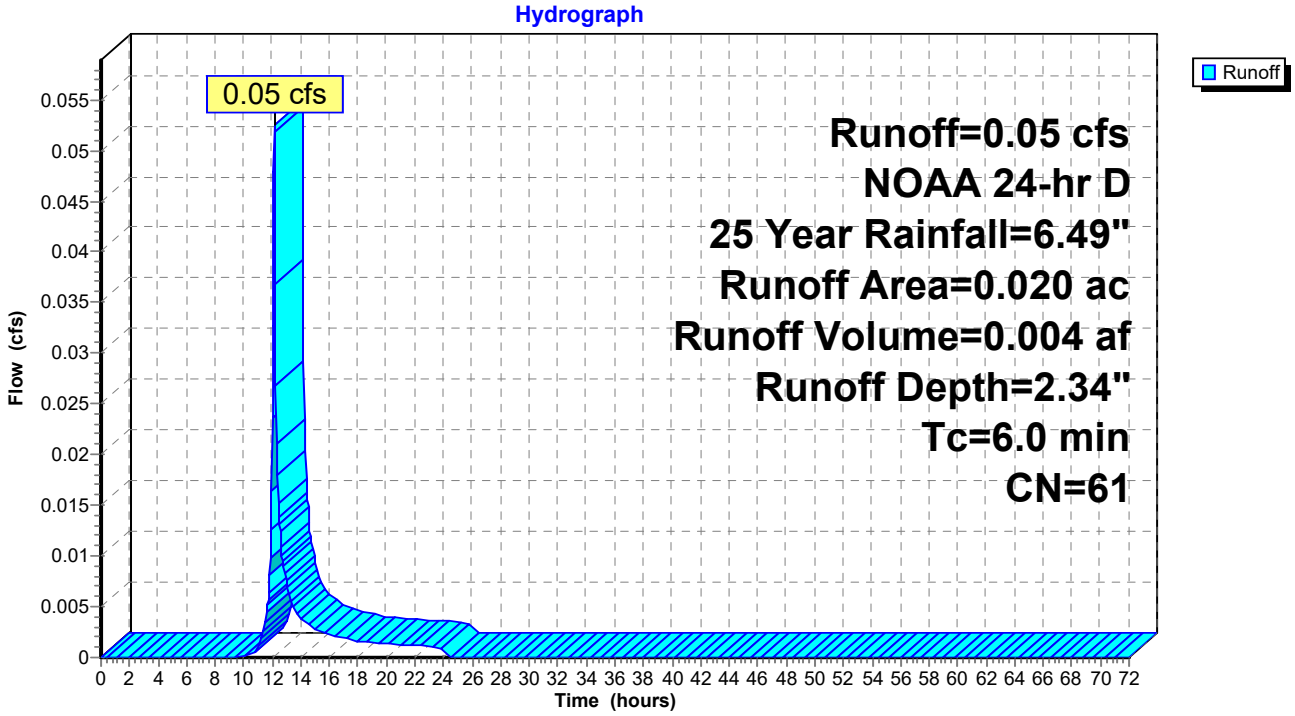
Runoff = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af, Depth= 2.34"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.020	61	>75% Grass cover, Good, HSG B
0.020		100.00% Pervious Area

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

Subcatchment DA3-P: Drainage Area #3 (Lawn)



Summary for Subcatchment RA1a: Roof Area #1a (Impervious)

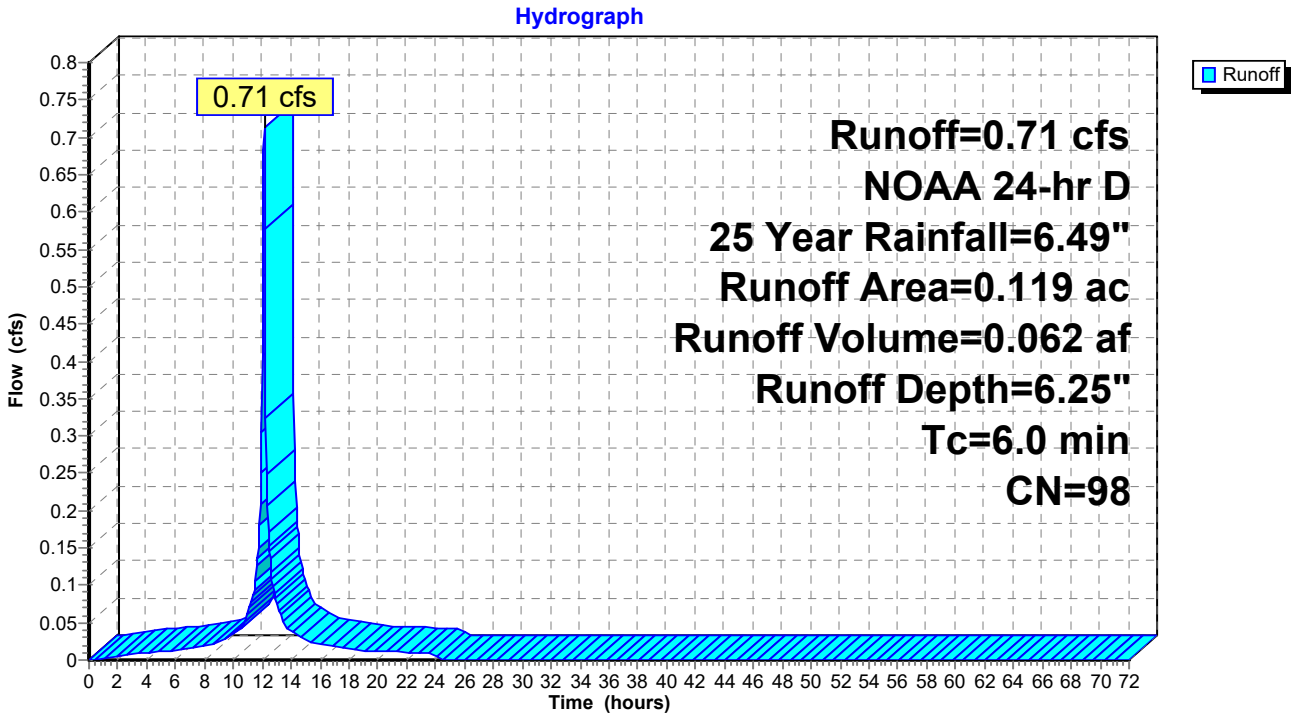
Runoff = 0.71 cfs @ 12.13 hrs, Volume= 0.062 af, Depth= 6.25"
Routed to Pond B-B : Underground Infiltration Basin #B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.119	98	Unconnected pavement, HSG B
0.119		100.00% Impervious Area
0.119		100.00% Unconnected

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

Subcatchment RA1a: Roof Area #1a (Impervious)



Summary for Subcatchment RA1b: Roof Area #1b (Impervious)

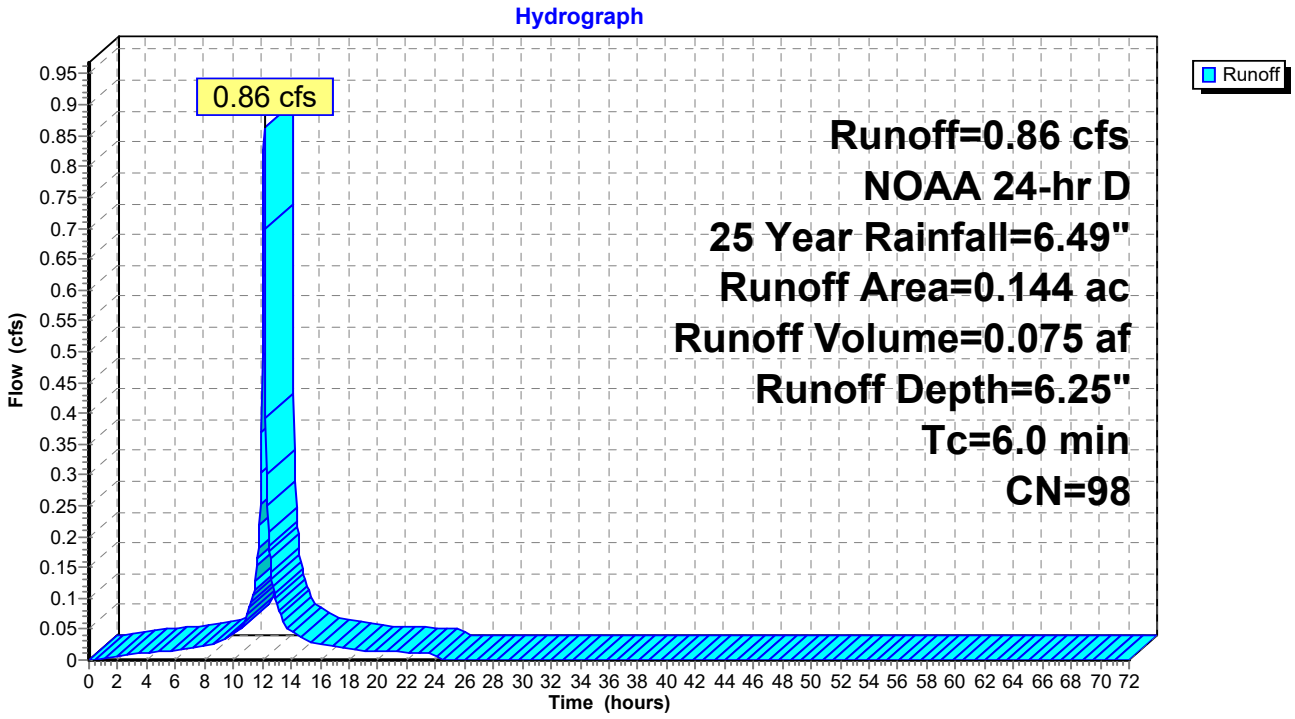
Runoff = 0.86 cfs @ 12.13 hrs, Volume= 0.075 af, Depth= 6.25"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25 Year Rainfall=6.49"

Area (ac)	CN	Description
0.144	98	Unconnected pavement, HSG B
0.144		100.00% Impervious Area
0.144		100.00% Unconnected

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

Subcatchment RA1b: Roof Area #1b (Impervious)



Summary for Pond B-B: Underground Infiltration Basin #B

Inflow Area = 0.119 ac,100.00% Impervious, Inflow Depth = 6.25" for 25 Year event
Inflow = 0.71 cfs @ 12.13 hrs, Volume= 0.062 af
Outflow = 0.14 cfs @ 11.85 hrs, Volume= 0.062 af, Atten= 80%, Lag= 0.0 min
Discarded = 0.14 cfs @ 11.85 hrs, Volume= 0.062 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BA : Bioretention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 17.56' @ 12.51 hrs Surf.Area= 0.018 ac Storage= 0.012 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 16.6 min (761.6 - 745.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.98'	0.020 af	**11.50'W x 67.28'L x 3.33'H Field A** 0.059 af Overall - 0.009 af Embedded = 0.050 af x 40.0% Voids
#2A	17.48'	0.009 af	**ADS_StormTech SC-310 +Cap** x 27 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 27 Chambers in 3 Rows
		0.029 af	Total Available Storage

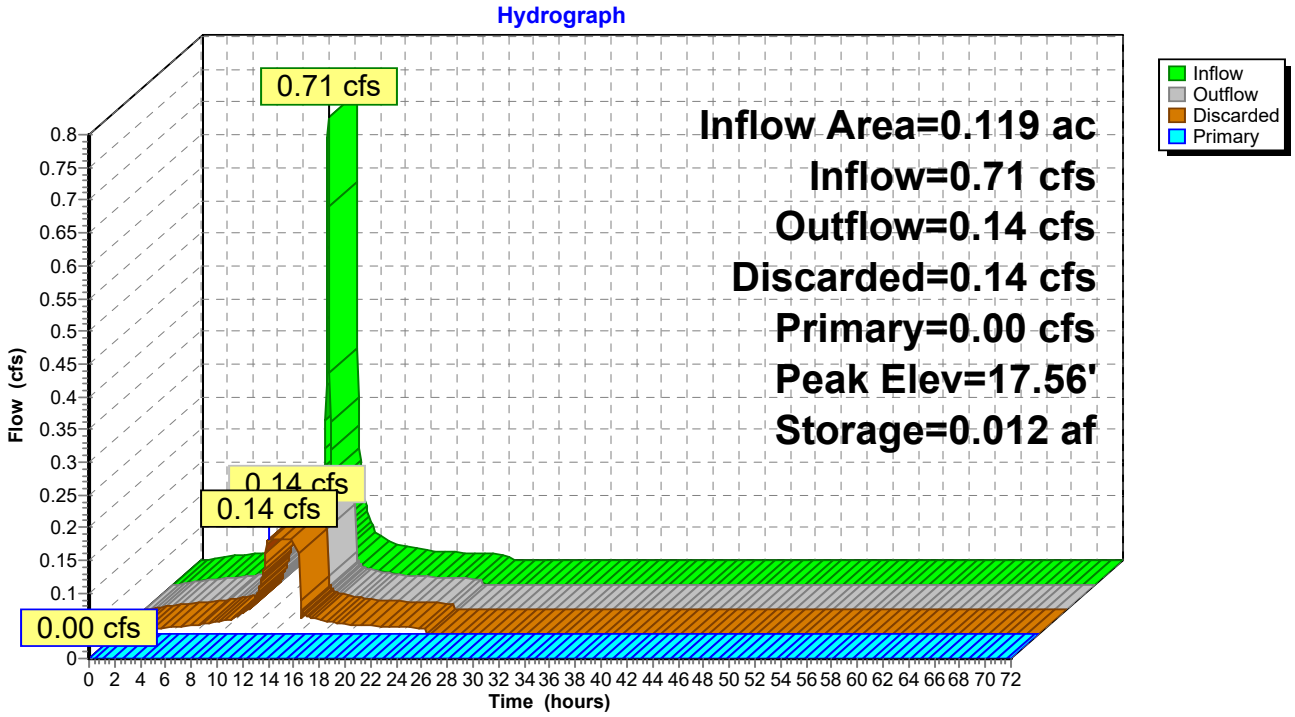
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.59'	**8.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.59' / 18.45' S= 0.0048 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Discarded	15.98'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 11.85 hrs HW=16.04' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.98' TW=18.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond B-B: Underground Infiltration Basin #B



Hydrograph for Pond B-B: Underground Infiltration Basin #B

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	15.98	0.00	0.00	**0.00**
2.50	0.01	0.000	15.98	0.01	0.01	0.00
5.00	0.01	0.000	15.98	0.01	0.01	0.00
7.50	0.02	0.000	15.98	0.02	0.02	0.00
10.00	**0.04**	0.000	15.98	**0.04**	**0.04**	0.00
12.50	**0.15**	**0.012**	**17.56**	**0.14**	**0.14**	0.00
15.00	0.03	0.000	15.98	0.03	0.03	0.00
17.50	0.02	0.000	15.98	0.02	0.02	0.00
20.00	0.01	0.000	15.98	0.01	0.01	0.00
22.50	0.01	0.000	15.98	0.01	0.01	0.00
25.00	0.00	0.000	15.98	0.00	0.00	0.00
27.50	0.00	0.000	15.98	0.00	0.00	0.00
30.00	0.00	0.000	15.98	0.00	0.00	0.00
32.50	0.00	0.000	15.98	0.00	0.00	0.00
35.00	0.00	0.000	15.98	0.00	0.00	0.00
37.50	0.00	0.000	15.98	0.00	0.00	0.00
40.00	0.00	0.000	15.98	0.00	0.00	0.00
42.50	0.00	0.000	15.98	0.00	0.00	0.00
45.00	0.00	0.000	15.98	0.00	0.00	0.00
47.50	0.00	0.000	15.98	0.00	0.00	0.00
50.00	0.00	0.000	15.98	0.00	0.00	0.00
52.50	0.00	0.000	15.98	0.00	0.00	0.00
55.00	0.00	0.000	15.98	0.00	0.00	0.00
57.50	0.00	0.000	15.98	0.00	0.00	0.00
60.00	0.00	0.000	15.98	0.00	0.00	0.00
62.50	0.00	0.000	15.98	0.00	0.00	0.00
65.00	0.00	0.000	15.98	0.00	0.00	0.00
67.50	0.00	0.000	15.98	0.00	0.00	0.00
70.00	0.00	0.000	15.98	0.00	0.00	0.00

Stage-Discharge for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
15.98	0.00	**0.00**	0.00
16.03	0.14	**0.14**	0.00
16.08	0.14	0.14	0.00
16.13	0.14	0.14	0.00
16.18	0.14	0.14	0.00
16.23	0.14	0.14	0.00
16.28	0.14	0.14	0.00
16.33	0.14	0.14	0.00
16.38	0.14	0.14	0.00
16.43	0.14	0.14	0.00
16.48	0.14	0.14	0.00
16.53	0.14	0.14	0.00
16.58	0.14	0.14	0.00
16.63	0.14	0.14	0.00
16.68	0.14	0.14	0.00
16.73	0.14	0.14	0.00
16.78	0.14	0.14	0.00
16.83	0.14	0.14	0.00
16.88	0.14	0.14	0.00
16.93	0.14	0.14	0.00
16.98	0.14	0.14	0.00
17.03	0.14	0.14	0.00
17.08	0.14	0.14	0.00
17.13	0.14	0.14	0.00
17.18	0.14	0.14	0.00
17.23	0.14	0.14	0.00
17.28	0.14	0.14	0.00
17.33	0.14	0.14	0.00
17.38	0.14	0.14	0.00
17.43	0.14	0.14	0.00
17.48	0.14	0.14	0.00
17.53	0.14	0.14	0.00
17.58	0.14	0.14	0.00
17.63	0.14	0.14	0.00
17.68	0.14	0.14	0.00
17.73	0.14	0.14	0.00
17.78	0.14	0.14	0.00
17.83	0.14	0.14	0.00
17.88	0.14	0.14	0.00
17.93	0.14	0.14	0.00
17.98	0.14	0.14	0.00
18.03	0.14	0.14	0.00
18.08	0.14	0.14	0.00
18.13	0.14	0.14	0.00
18.18	0.14	0.14	0.00
18.23	0.14	0.14	0.00
18.28	0.14	0.14	0.00
18.33	0.14	0.14	0.00
18.38	0.14	0.14	0.00
18.43	0.14	0.14	0.00
18.48	0.14	0.14	0.00
18.53	0.14	0.14	0.00
18.58	0.14	0.14	0.00
18.63	0.15	0.14	0.00
18.68	0.17	0.14	0.02
18.73	0.20	0.14	0.05
18.78	0.24	0.14	0.09
18.83	0.29	0.14	0.14
18.88	0.34	0.14	0.20
18.93	0.41	0.14	0.27
18.98	0.48	0.14	0.34
19.03	0.55	0.14	0.41
19.08	0.63	0.14	0.49
19.13	0.71	0.14	0.57
19.18	0.79	0.14	0.65
19.23	0.87	0.14	0.73
19.28	**0.94**	0.14	**0.79**

Stage-Area-Storage for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Surface (acres)	Storage (acre-feet)
15.98	**0.018**	0.000
16.03	0.018	0.000
16.08	0.018	0.001
16.13	0.018	0.001
16.18	0.018	0.001
16.23	0.018	0.002
16.28	0.018	0.002
16.33	0.018	0.002
16.38	0.018	0.003
16.43	0.018	0.003
16.48	0.018	0.004
16.53	0.018	0.004
16.58	0.018	0.004
16.63	0.018	0.005
16.68	0.018	0.005
16.73	0.018	0.005
16.78	0.018	0.006
16.83	0.018	0.006
16.88	0.018	0.006
16.93	0.018	0.007
16.98	0.018	0.007
17.03	0.018	0.007
17.08	0.018	0.008
17.13	0.018	0.008
17.18	0.018	0.009
17.23	0.018	0.009
17.28	0.018	0.009
17.33	0.018	0.010
17.38	0.018	0.010
17.43	0.018	0.010
17.48	0.018	0.011
17.53	0.018	0.011
17.58	0.018	0.012
17.63	0.018	0.013
17.68	0.018	0.013
17.73	0.018	0.014
17.78	0.018	0.015
17.83	0.018	0.015
17.88	0.018	0.016
17.93	0.018	0.017
17.98	0.018	0.017
18.03	0.018	0.018
18.08	0.018	0.018
18.13	0.018	0.019
18.18	0.018	0.020
18.23	0.018	0.020
18.28	0.018	0.021
18.33	0.018	0.021
18.38	0.018	0.022
18.43	0.018	0.022
18.48	0.018	0.023
18.53	0.018	0.023
18.58	0.018	0.024
18.63	0.018	0.024
18.68	0.018	0.025
18.73	0.018	0.025
18.78	0.018	0.025
18.83	0.018	0.026
18.88	0.018	0.026
18.93	0.018	0.026
18.98	0.018	0.027
19.03	0.018	0.027
19.08	0.018	0.028
19.13	0.018	0.028
19.18	0.018	0.028
19.23	0.018	0.029
19.28	0.018	**0.029**

Summary for Pond BA: Bioretention Basin

Inflow Area = 0.494 ac, 94.33% Impervious, Inflow Depth = 4.52" for 25 Year event
Inflow = 2.16 cfs @ 12.13 hrs, Volume= 0.186 af
Outflow = 1.80 cfs @ 12.17 hrs, Volume= 0.186 af, Atten= 16%, Lag= 2.7 min
Discarded = 0.08 cfs @ 9.85 hrs, Volume= 0.101 af
Primary = 1.72 cfs @ 12.17 hrs, Volume= 0.085 af
Routed to Pond SP-2 : Study Point #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond SP-2 : Study Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 19.61' @ 12.17 hrs Surf.Area= 436 sf Storage= 702 cf

Plug-Flow detention time= 15.5 min calculated for 0.186 af (100% of inflow)
Center-of-Mass det. time= 15.5 min (764.1 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	1,090 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	436	0	0
19.00	436	436	436
20.00	436	436	872
20.50	436	218	1,090

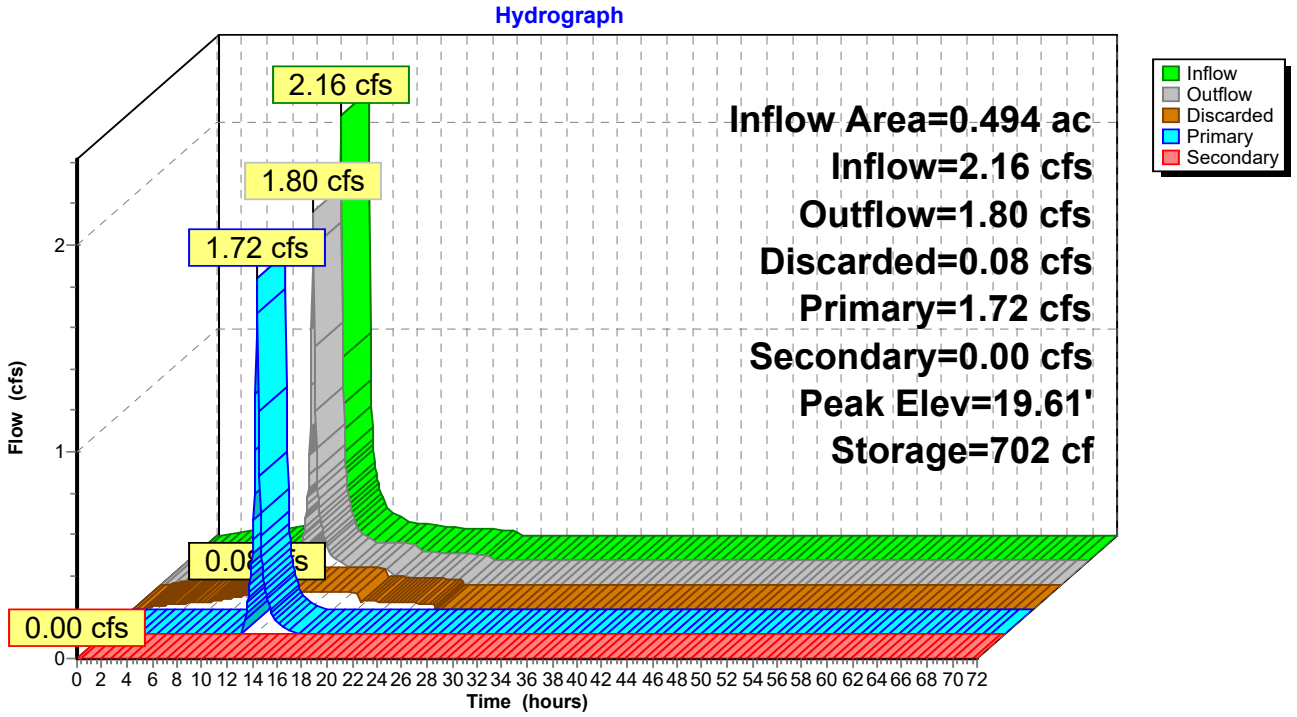
Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**15.0" Round Culvert** L= 17.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 17.90' / 17.60' S= 0.0171 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	18.58'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	20.00'	**24.0" Vert. Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	18.00'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	20.35'	**2.8' long x 1.0' breadth Emergency Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.08 cfs @ 9.85 hrs HW=18.04' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.69 cfs @ 12.17 hrs HW=19.59' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.69 cfs of 6.09 cfs potential flow)
├**2=Orifice** (Orifice Controls 1.69 cfs @ 3.83 fps)
└**3=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=0.00' (Dynamic Tailwater)
└**5=Emergency Spillway** (Controls 0.00 cfs)

Pond BA: Bioretention Basin



Hydrograph for Pond BA: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	18.00	0.00	0.00	0.00	**0.00**
2.50	0.02	1	18.00	0.02	0.02	0.00	0.00
5.00	0.03	2	18.00	0.03	0.03	0.00	0.00
7.50	0.05	3	18.01	0.05	**0.05**	0.00	0.00
10.00	**0.10**	**28**	**18.06**	**0.08**	**0.08**	**0.00**	0.00
12.50	**0.44**	**407**	**18.93**	**0.49**	0.08	**0.41**	0.00
15.00	0.08	273	18.63	0.09	0.08	0.01	0.00
17.50	0.05	100	18.23	0.08	0.08	0.00	0.00
20.00	0.04	2	18.00	0.04	0.04	0.00	0.00
22.50	0.03	2	18.00	0.03	0.03	0.00	0.00
25.00	0.00	0	18.00	0.00	0.00	0.00	0.00
27.50	0.00	0	18.00	0.00	0.00	0.00	0.00
30.00	0.00	0	18.00	0.00	0.00	0.00	0.00
32.50	0.00	0	18.00	0.00	0.00	0.00	0.00
35.00	0.00	0	18.00	0.00	0.00	0.00	0.00
37.50	0.00	0	18.00	0.00	0.00	0.00	0.00
40.00	0.00	0	18.00	0.00	0.00	0.00	0.00
42.50	0.00	0	18.00	0.00	0.00	0.00	0.00
45.00	0.00	0	18.00	0.00	0.00	0.00	0.00
47.50	0.00	0	18.00	0.00	0.00	0.00	0.00
50.00	0.00	0	18.00	0.00	0.00	0.00	0.00
52.50	0.00	0	18.00	0.00	0.00	0.00	0.00
55.00	0.00	0	18.00	0.00	0.00	0.00	0.00
57.50	0.00	0	18.00	0.00	0.00	0.00	0.00
60.00	0.00	0	18.00	0.00	0.00	0.00	0.00
62.50	0.00	0	18.00	0.00	0.00	0.00	0.00
65.00	0.00	0	18.00	0.00	0.00	0.00	0.00
67.50	0.00	0	18.00	0.00	0.00	0.00	0.00
70.00	0.00	0	18.00	0.00	0.00	0.00	0.00

Stage-Discharge for Pond BA: Bioretention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
18.00	0.00	**0.00**	0.00	0.00
18.10	0.08	**0.08**	0.00	0.00
18.20	0.08	0.08	0.00	0.00
18.30	0.08	0.08	0.00	0.00
18.40	0.08	0.08	0.00	0.00
18.50	0.08	0.08	0.00	0.00
18.60	0.08	0.08	0.00	0.00
18.70	0.13	0.08	0.05	0.00
18.80	0.25	0.08	0.17	0.00
18.90	0.43	0.08	0.35	0.00
19.00	0.64	0.08	0.56	0.00
19.10	0.88	0.08	0.80	0.00
19.20	1.13	0.08	1.05	0.00
19.30	1.34	0.08	1.26	0.00
19.40	1.50	0.08	1.42	0.00
19.50	1.65	0.08	1.57	0.00
19.60	1.79	0.08	1.71	0.00
19.70	1.92	0.08	1.84	0.00
19.80	2.04	0.08	1.96	0.00
19.90	2.15	0.08	2.07	0.00
20.00	2.26	0.08	2.17	0.00
20.10	2.42	0.08	2.34	0.00
20.20	2.70	0.08	2.62	0.00
20.30	3.10	0.08	3.02	0.00
20.40	3.69	0.08	3.52	0.08
20.50	4.64	0.08	4.12	0.44
20.60	5.84	0.08	4.82	0.94
20.70	7.25	0.08	5.60	1.57
20.80	8.85	0.08	6.46	2.31
20.90	10.61	0.08	7.40	3.13
21.00	12.54	0.08	8.39	4.07
21.10	14.66	0.08	9.44	5.14
21.20	16.07	0.08	9.66	6.32
21.30	17.57	0.08	9.84	7.64
21.40	19.15	0.08	10.02	9.05
21.50	20.82	0.08	10.19	10.55
21.60	22.61	0.08	10.36	12.17
21.70	24.53	0.08	10.53	13.92
21.80	26.52	0.08	10.69	15.74
21.90	28.55	0.08	10.86	17.61
22.00	**30.61**	0.08	**11.01**	**19.51**

Stage-Area-Storage for Pond BA: Bioretention Basin

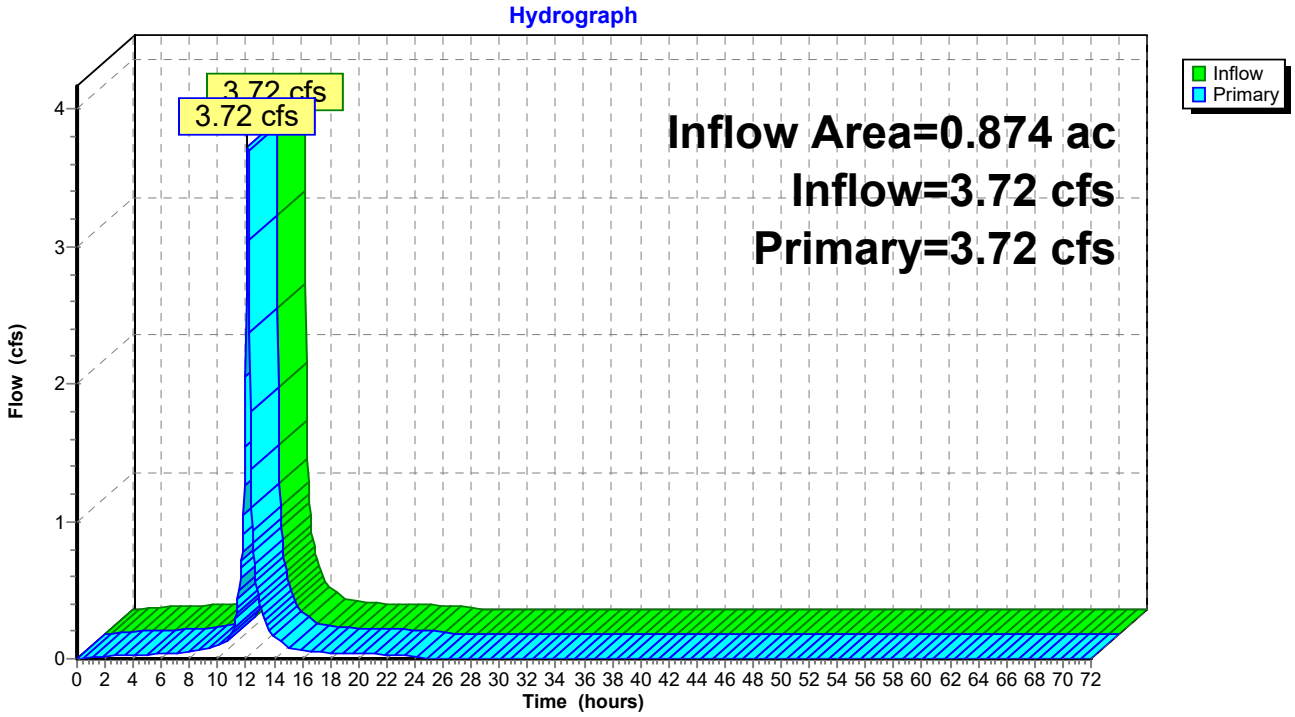
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
18.00	**436**	0
18.05	436	22
18.10	436	44
18.15	436	65
18.20	436	87
18.25	436	109
18.30	436	131
18.35	436	153
18.40	436	174
18.45	436	196
18.50	436	218
18.55	436	240
18.60	436	262
18.65	436	283
18.70	436	305
18.75	436	327
18.80	436	349
18.85	436	371
18.90	436	392
18.95	436	414
19.00	436	436
19.05	436	458
19.10	436	480
19.15	436	501
19.20	436	523
19.25	436	545
19.30	436	567
19.35	436	589
19.40	436	610
19.45	436	632
19.50	436	654
19.55	436	676
19.60	436	698
19.65	436	719
19.70	436	741
19.75	436	763
19.80	436	785
19.85	436	807
19.90	436	828
19.95	436	850
20.00	436	872
20.05	436	894
20.10	436	916
20.15	436	937
20.20	436	959
20.25	436	981
20.30	436	1,003
20.35	436	1,025
20.40	436	1,046
20.45	436	1,068
20.50	436	**1,090**
20.55	436	1,090
20.60	436	1,090
20.65	436	1,090
20.70	436	1,090
20.75	436	1,090
20.80	436	1,090
20.85	436	1,090
20.90	436	1,090
20.95	436	1,090
21.00	436	1,090
21.05	436	1,090
21.10	436	1,090
21.15	436	1,090
21.20	436	1,090
21.25	436	1,090
21.30	436	1,090
21.35	436	1,090
21.40	436	1,090
21.45	436	1,090
21.50	436	1,090
21.55	436	1,090
21.60	436	1,090
21.65	436	1,090
21.70	436	1,090
21.75	436	1,090
21.80	436	1,090
21.85	436	1,090
21.90	436	1,090
21.95	436	1,090
22.00	436	1,090

Summary for Pond OS: Overall Site

Inflow Area = 0.874 ac, 89.93% Impervious, Inflow Depth = 3.62" for 25 Year event
Inflow = 3.72 cfs @ 12.14 hrs, Volume= 0.264 af
Primary = 3.72 cfs @ 12.14 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond OS: Overall Site

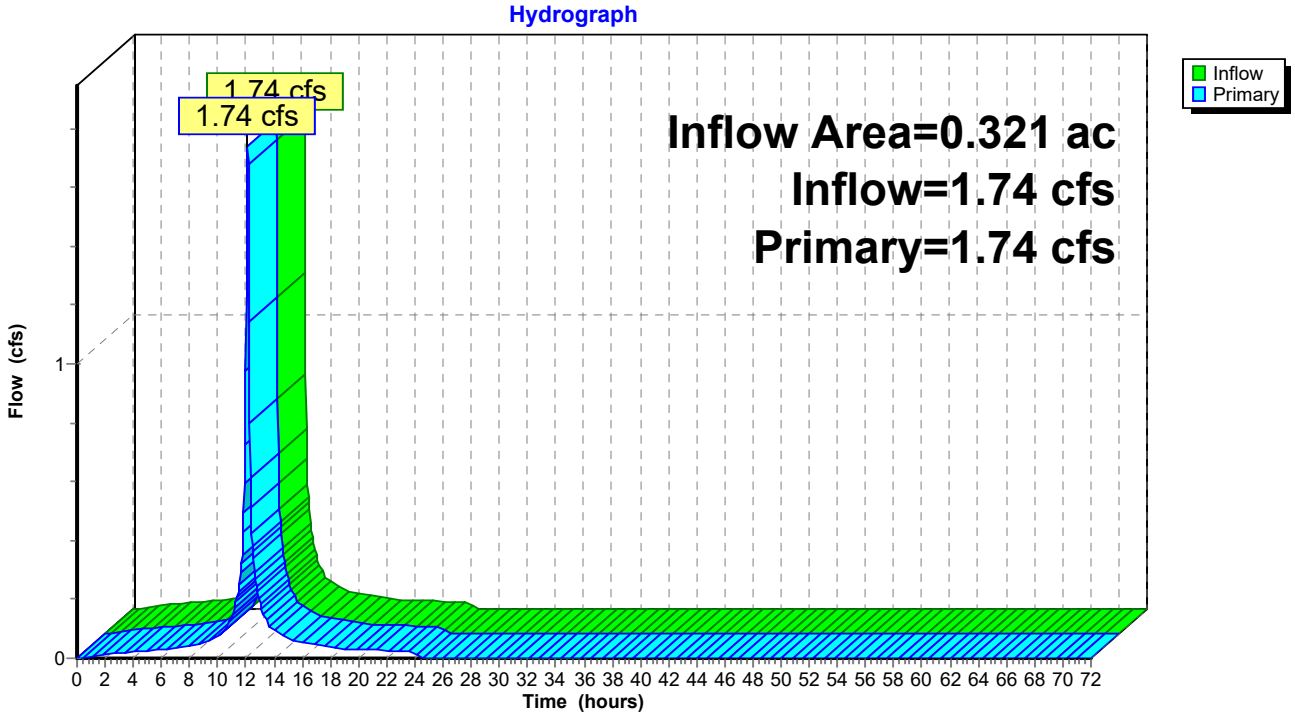


Summary for Pond SP-1: Study Point #1

Inflow Area = 0.321 ac, 82.55% Impervious, Inflow Depth = 5.57" for 25 Year event
Inflow = 1.74 cfs @ 12.13 hrs, Volume= 0.149 af
Primary = 1.74 cfs @ 12.13 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-1: Study Point #1

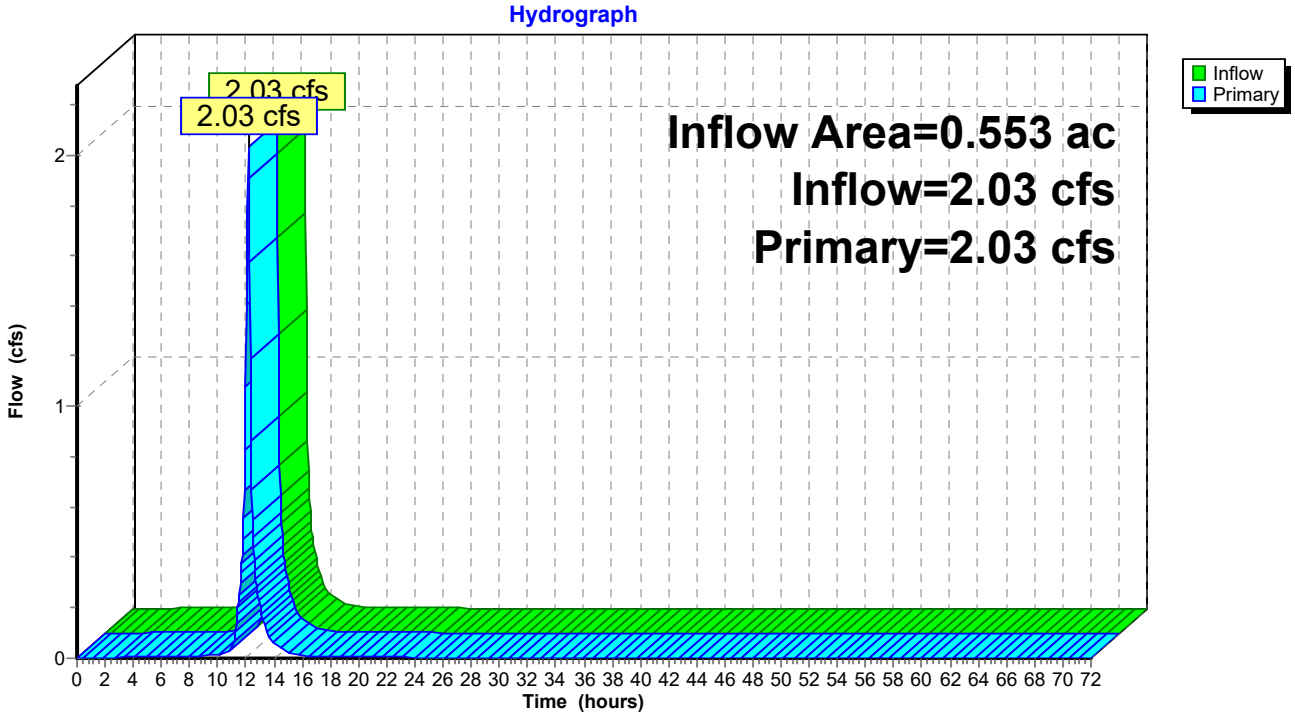


Summary for Pond SP-2: Study Point #2

Inflow Area = 0.553 ac, 94.21% Impervious, Inflow Depth = 2.49" for 25 Year event
Inflow = 2.03 cfs @ 12.16 hrs, Volume= 0.115 af
Primary = 2.03 cfs @ 12.16 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-2: Study Point #2

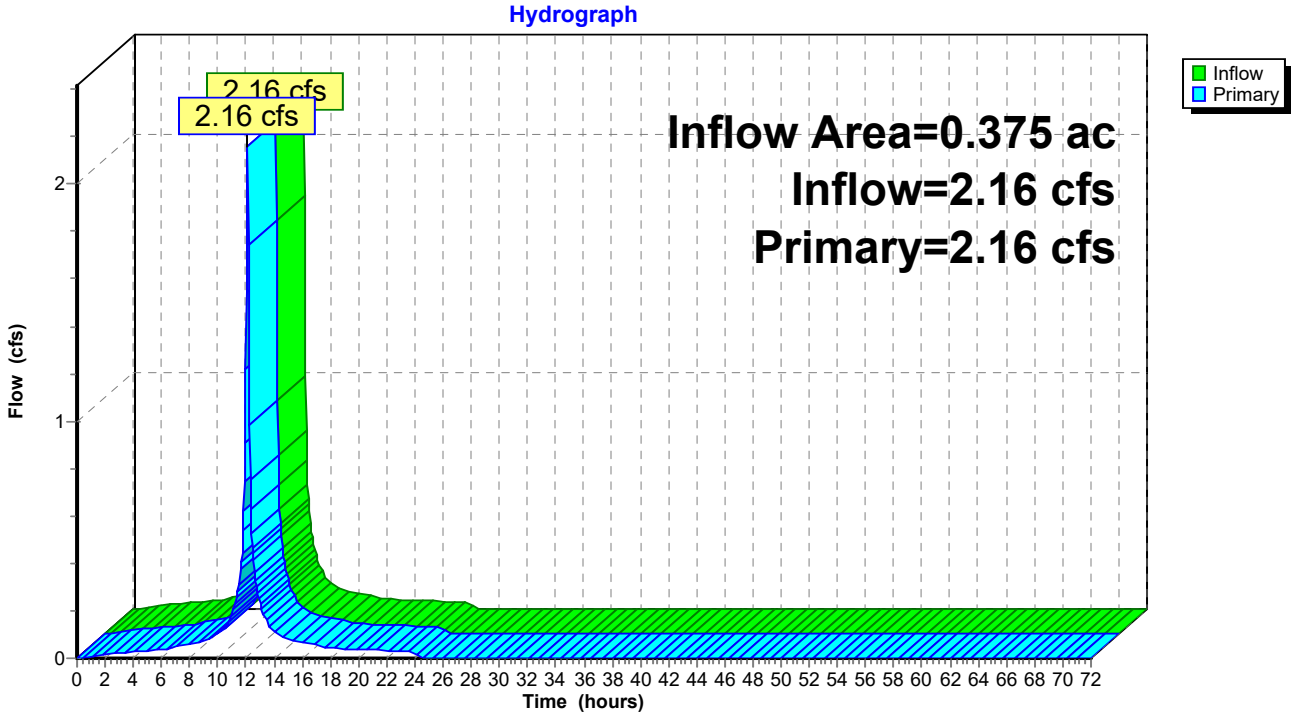


Summary for Link DA-BA: Basin Drainage Area

Inflow Area = 0.375 ac, 92.53% Impervious, Inflow Depth = 5.96" for 25 Year event
Inflow = 2.16 cfs @ 12.13 hrs, Volume= 0.186 af
Primary = 2.16 cfs @ 12.13 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BA : Bioretention Basin

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link DA-BA: Basin Drainage Area



Summary for Subcatchment BA1-P: Bypass Area #1 (Lawn)

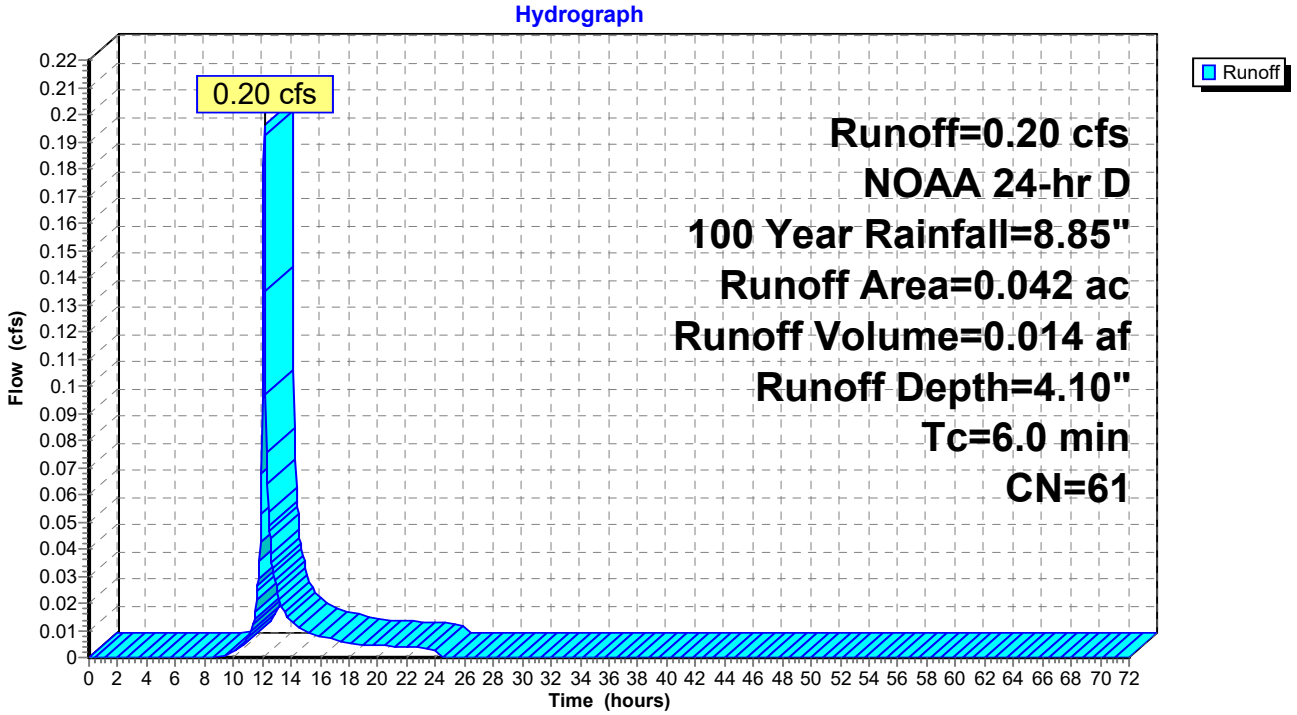
Runoff = 0.20 cfs @ 12.13 hrs, Volume= 0.014 af, Depth= 4.10"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.042	61	>75% Grass cover, Good, HSG B
0.042		100.00% Pervious Area

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

Subcatchment BA1-P: Bypass Area #1 (Lawn)



Summary for Subcatchment BA2-I: Bypass Area #2 (Impervious)

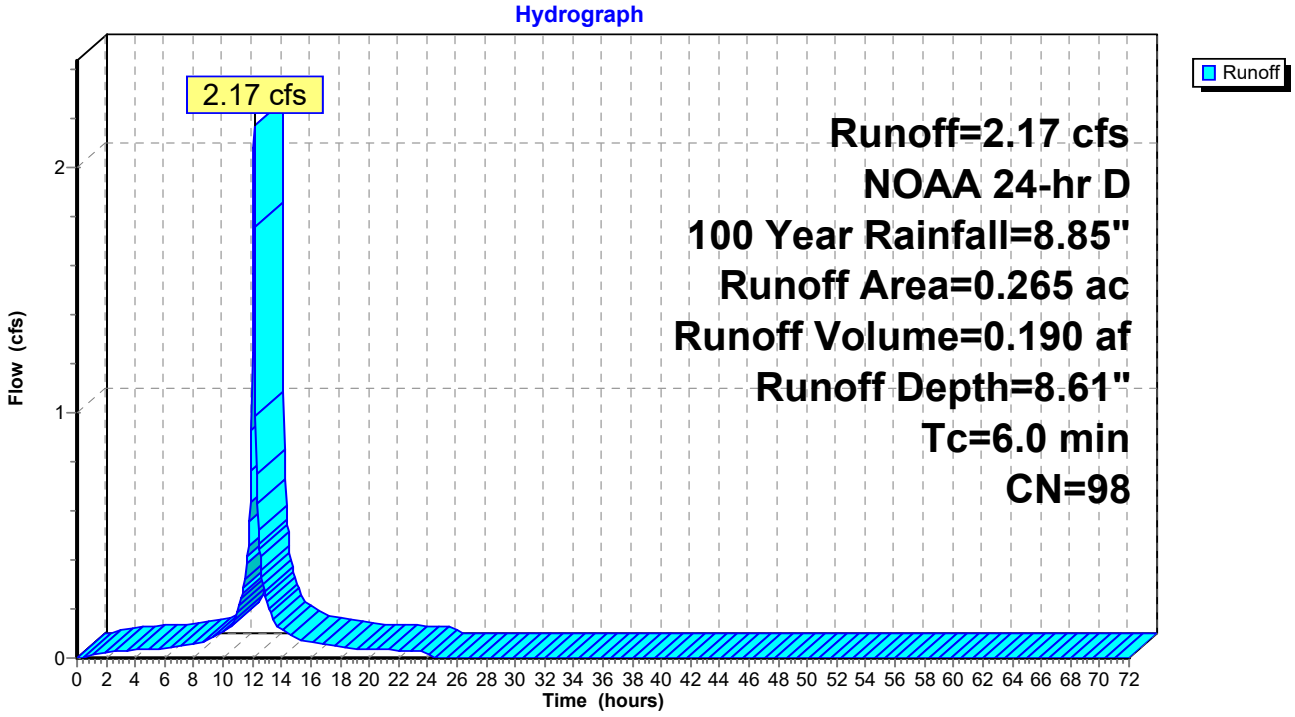
Runoff = 2.17 cfs @ 12.13 hrs, Volume= 0.190 af, Depth= 8.61"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.265	98	Unconnected pavement, HSG B
0.265		100.00% Impervious Area
0.265		100.00% Unconnected

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

Subcatchment BA2-I: Bypass Area #2 (Impervious)



Summary for Subcatchment BA2-P: Bypass Area #2 (Lawn)

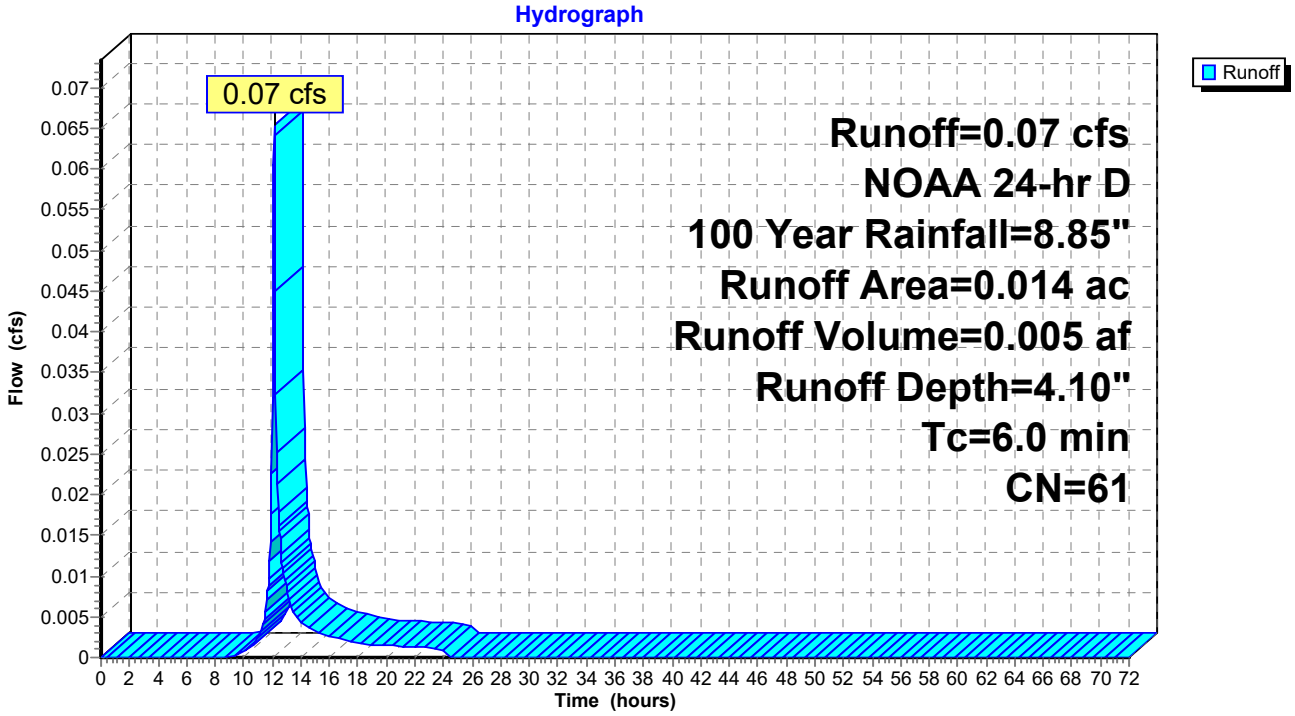
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 4.10"
Routed to Pond SP-1 : Study Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

	Area (ac)	CN	Description
*	0.014	61	>75% Grass cover, Good, HSG B
	0.014		100.00% Pervious Area

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

Subcatchment BA2-P: Bypass Area #2 (Lawn)



Summary for Subcatchment BA3-I: Bypass Area #3 (Impervious)

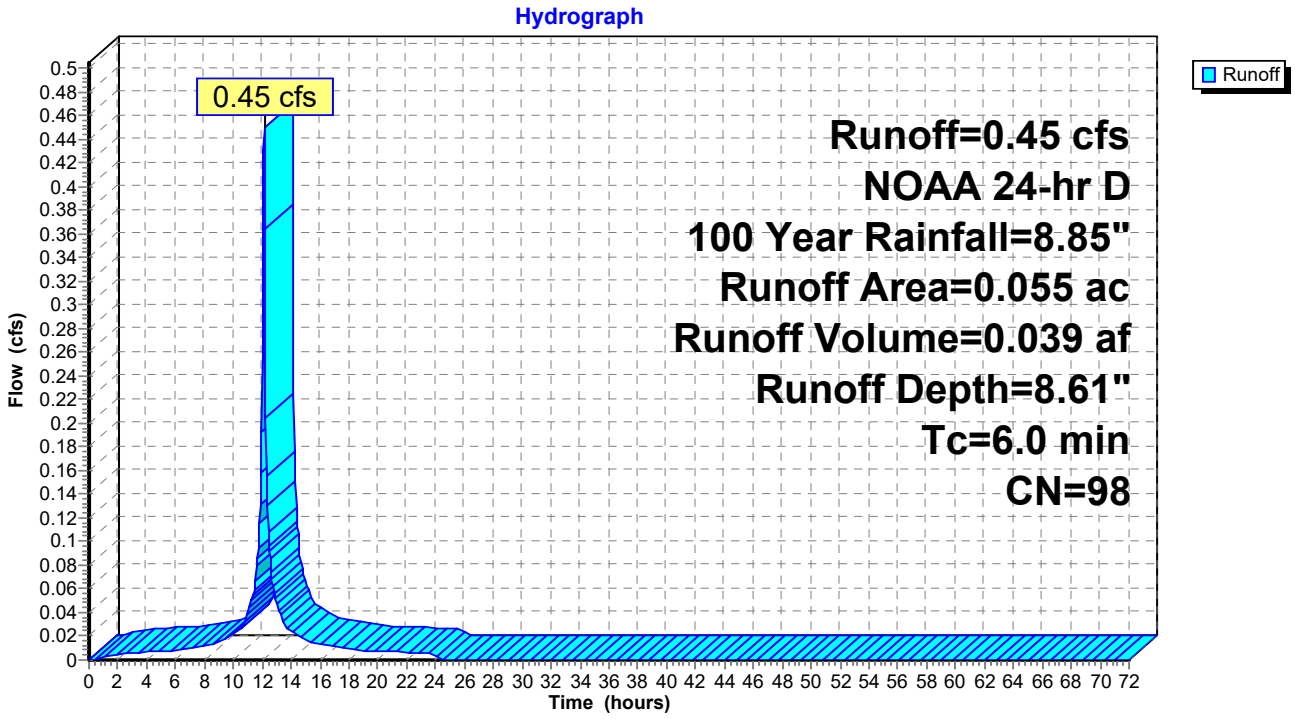
Runoff = 0.45 cfs @ 12.13 hrs, Volume= 0.039 af, Depth= 8.61"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.055	98	Unconnected pavement, HSG B
0.055		100.00% Impervious Area
0.055		100.00% Unconnected

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

Subcatchment BA3-I: Bypass Area #3 (Impervious)



Summary for Subcatchment BA3-P: Bypass Area #3 (Lawn)

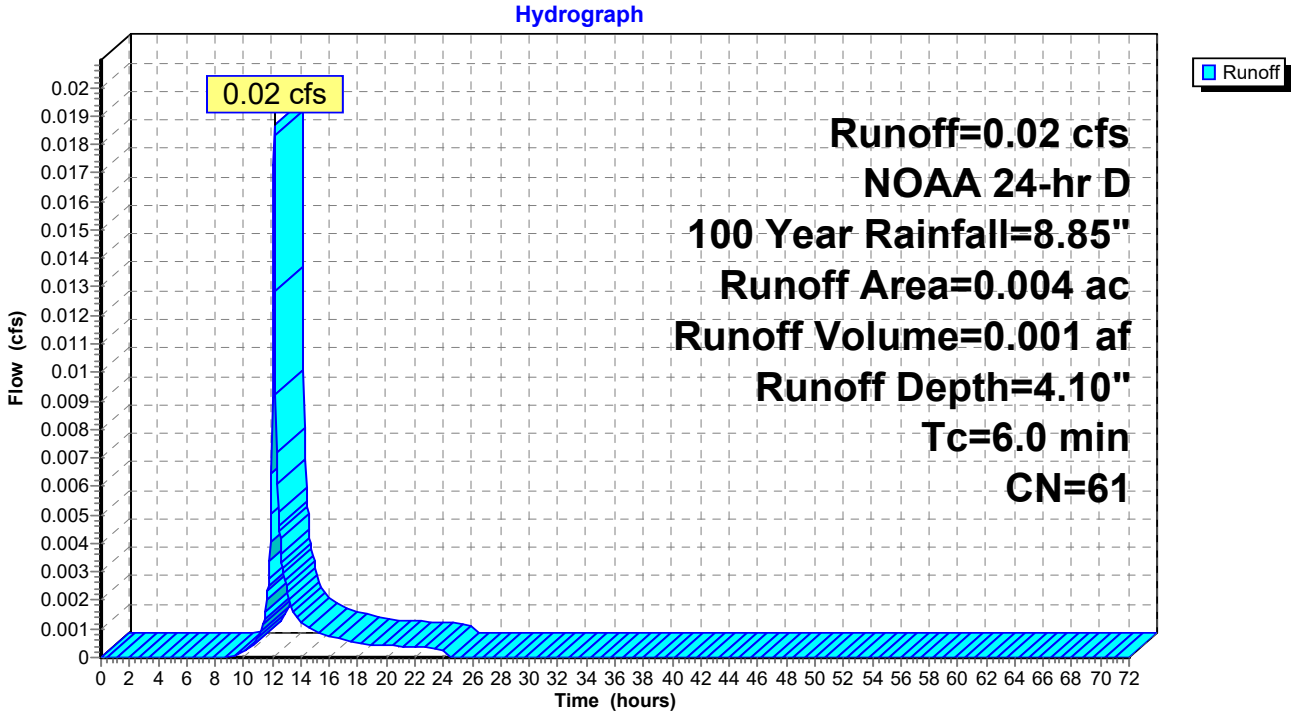
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 4.10"
Routed to Pond SP-2 : Study Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.004	61	>75% Grass cover, Good, HSG B
0.004		100.00% Pervious Area

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

Subcatchment BA3-P: Bypass Area #3 (Lawn)



Summary for Subcatchment DA1-I: Drainage Area #1 (Impervious)

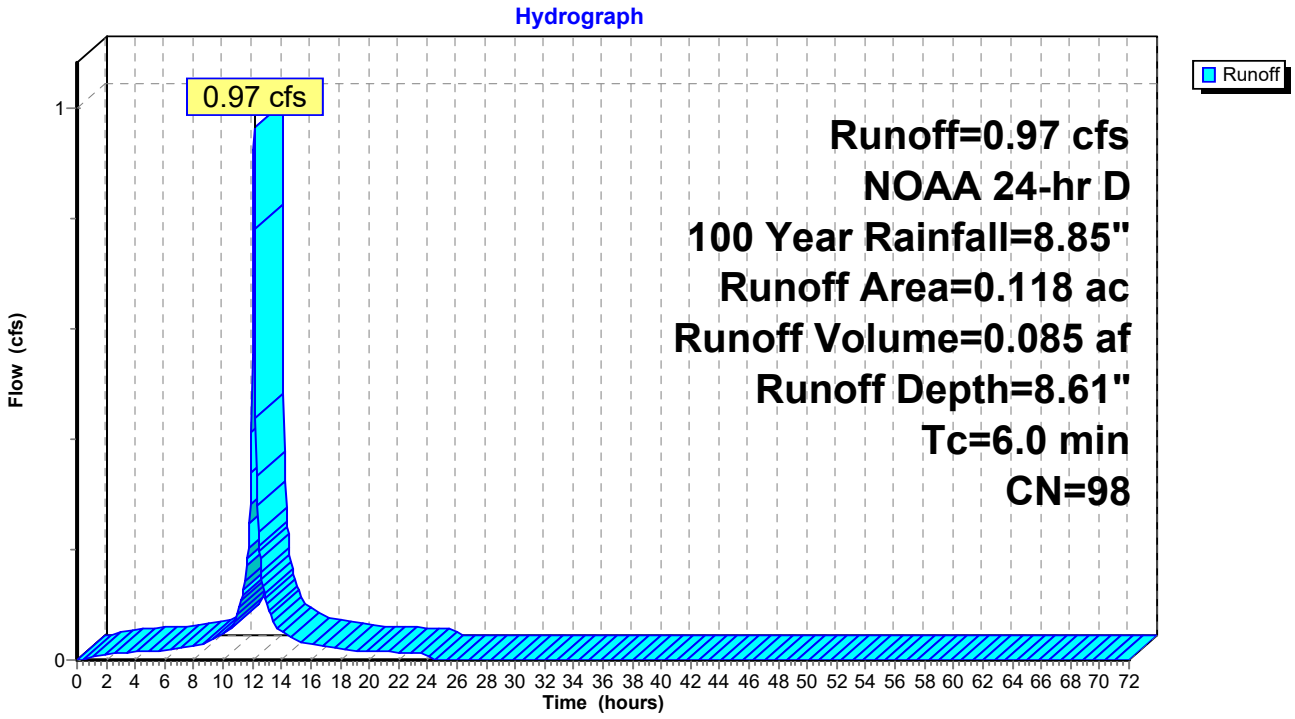
Runoff = 0.97 cfs @ 12.13 hrs, Volume= 0.085 af, Depth= 8.61"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.118	98	Unconnected pavement, HSG B
0.118		100.00% Impervious Area
0.118		100.00% Unconnected

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

Subcatchment DA1-I: Drainage Area #1 (Impervious)



Summary for Subcatchment DA1-P: Drainage Area #1 (Lawn)

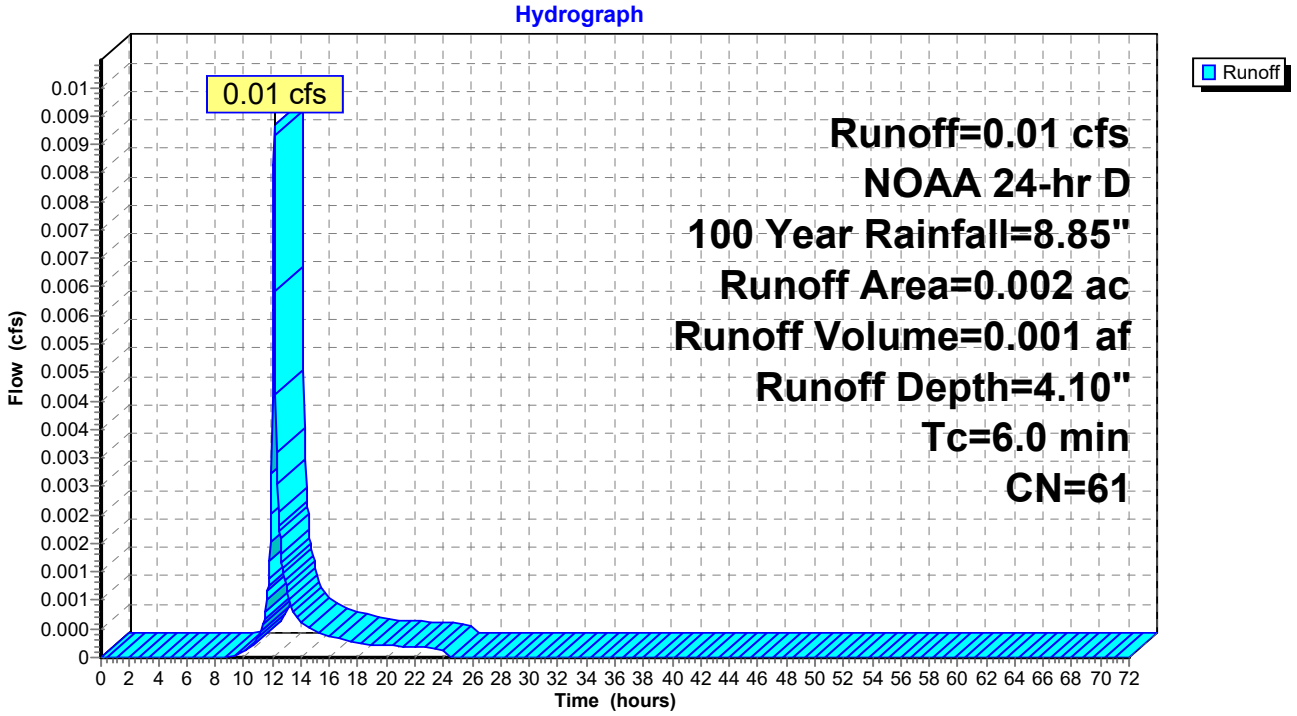
Runoff = 0.01 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 4.10"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.002	61	>75% Grass cover, Good, HSG B
0.002		100.00% Pervious Area

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

Subcatchment DA1-P: Drainage Area #1 (Lawn)



Summary for Subcatchment DA2-I: Drainage Area #2 (Impervious)

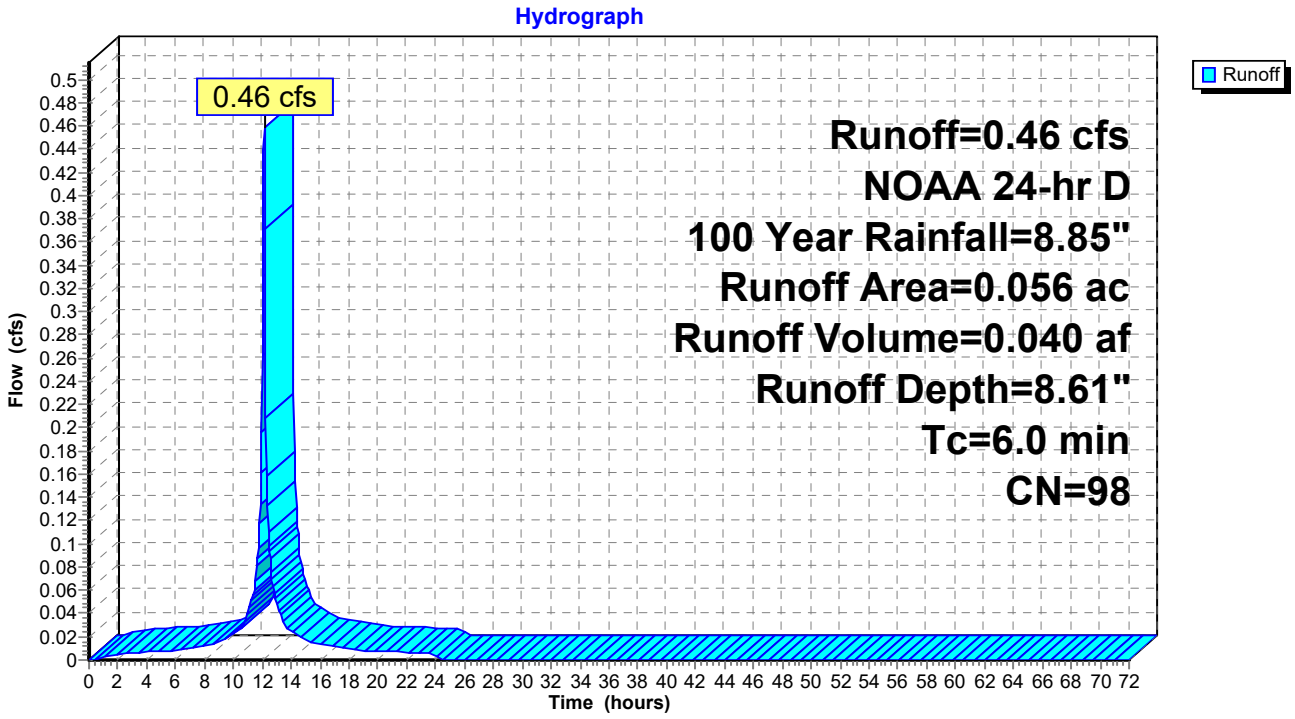
Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.040 af, Depth= 8.61"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.056	98	Unconnected pavement, HSG B
0.056		100.00% Impervious Area
0.056		100.00% Unconnected

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

Subcatchment DA2-I: Drainage Area #2 (Impervious)



Summary for Subcatchment DA2-P: Drainage Area #2 (Lawn)

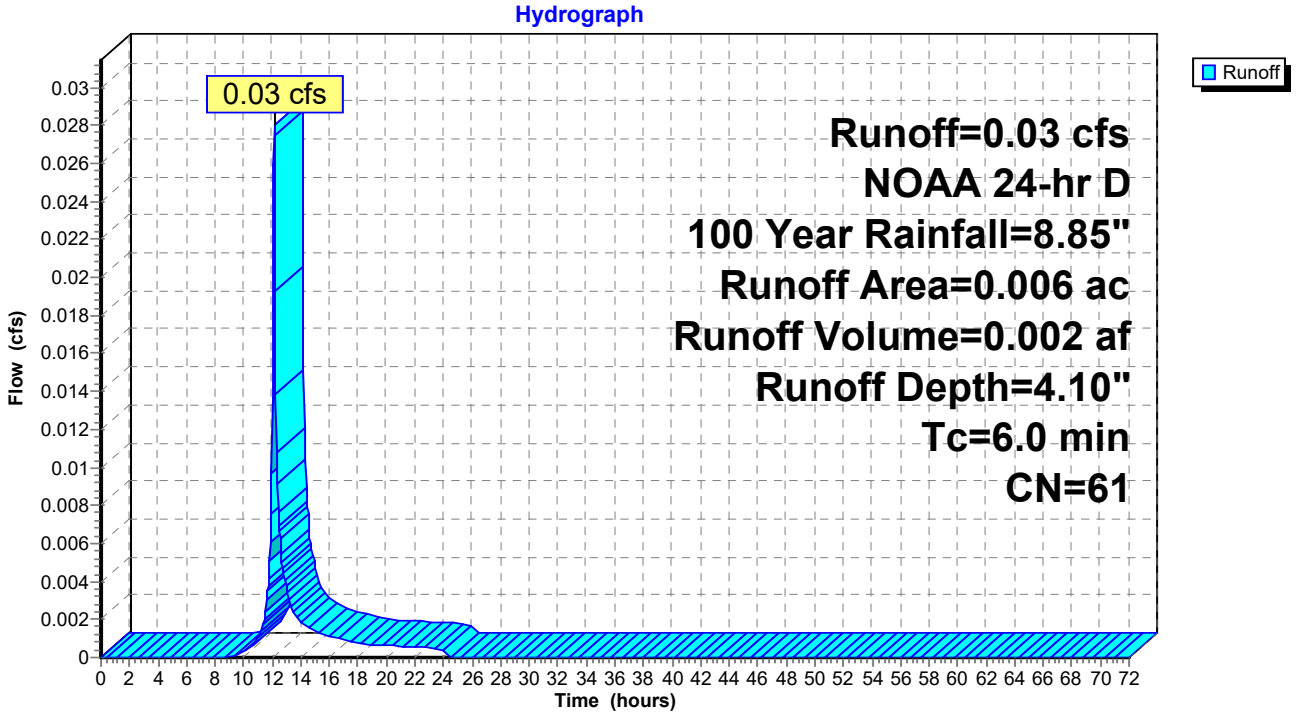
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.002 af, Depth= 4.10"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.006	61	>75% Grass cover, Good, HSG B
0.006		100.00% Pervious Area

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

Subcatchment DA2-P: Drainage Area #2 (Lawn)



Summary for Subcatchment DA3-I: Drainage Area #3 (Impervious)

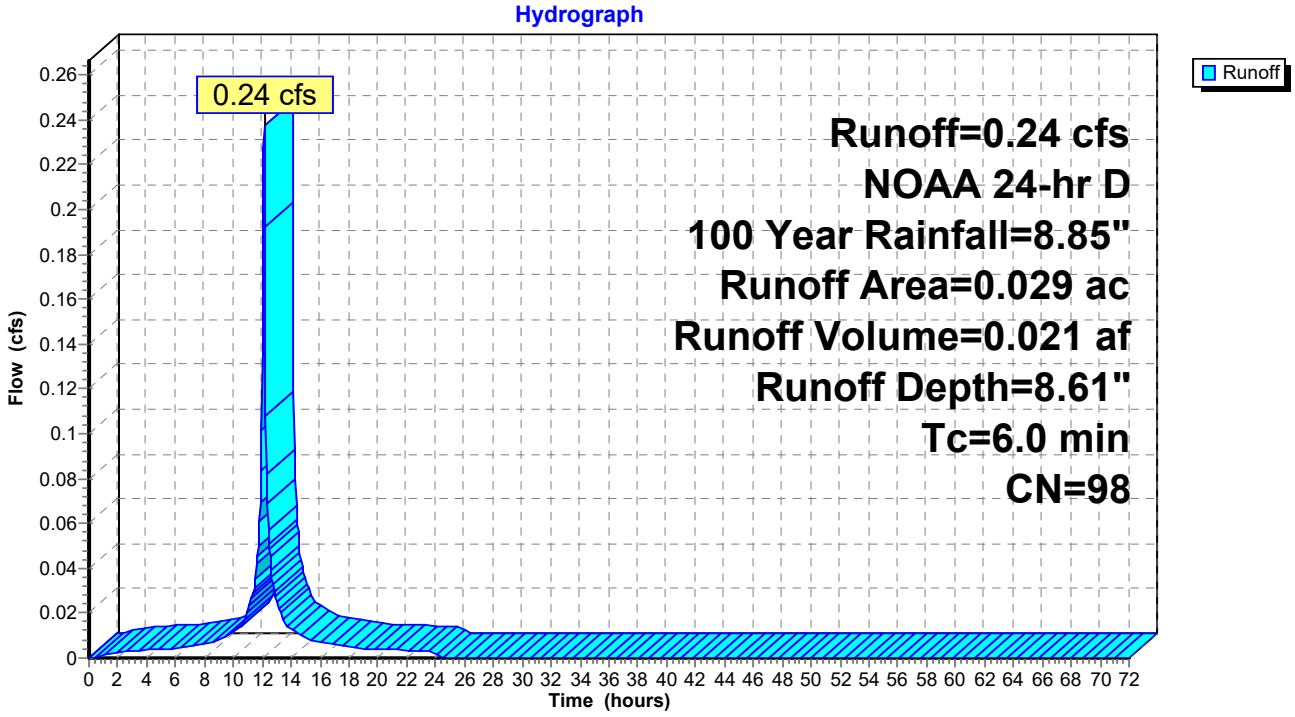
Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.021 af, Depth= 8.61"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.029	98	Unconnected pavement, HSG B
0.029		100.00% Impervious Area
0.029		100.00% Unconnected

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

Subcatchment DA3-I: Drainage Area #3 (Impervious)



Summary for Subcatchment DA3-P: Drainage Area #3 (Lawn)

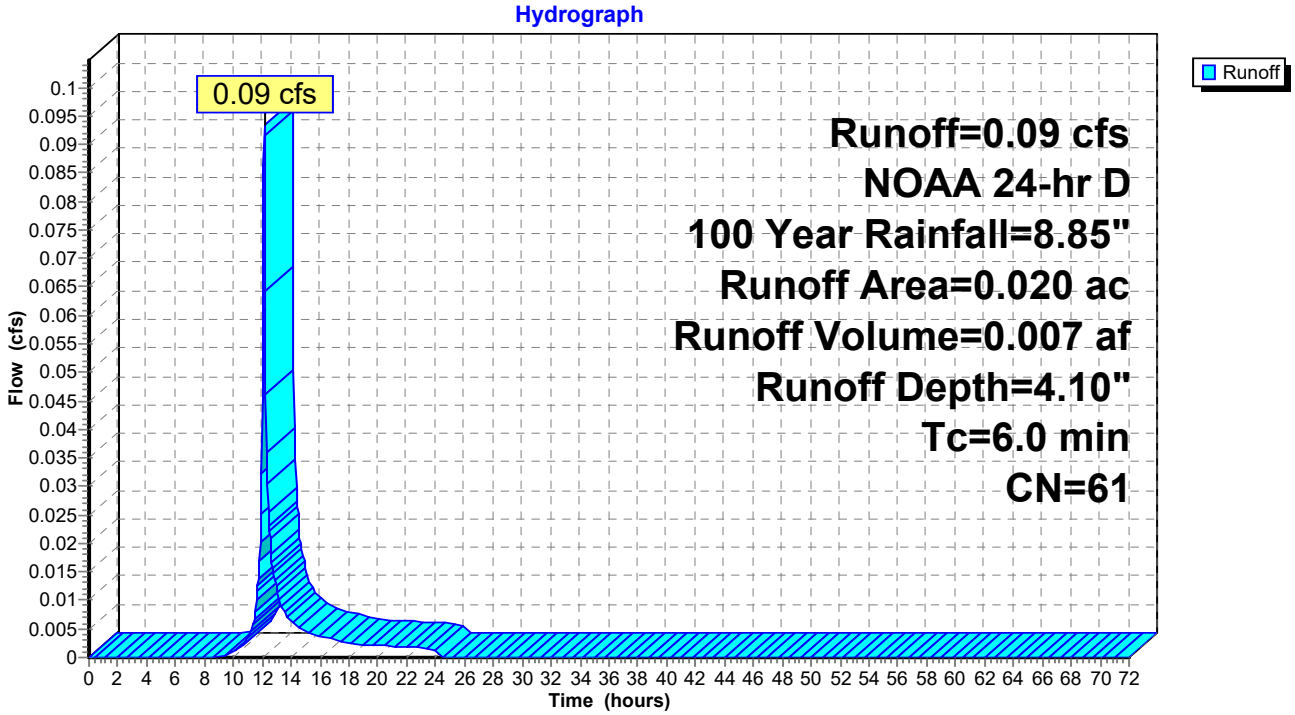
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.007 af, Depth= 4.10"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.020	61	>75% Grass cover, Good, HSG B
0.020		100.00% Pervious Area

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

Subcatchment DA3-P: Drainage Area #3 (Lawn)



Summary for Subcatchment RA1a: Roof Area #1a (Impervious)

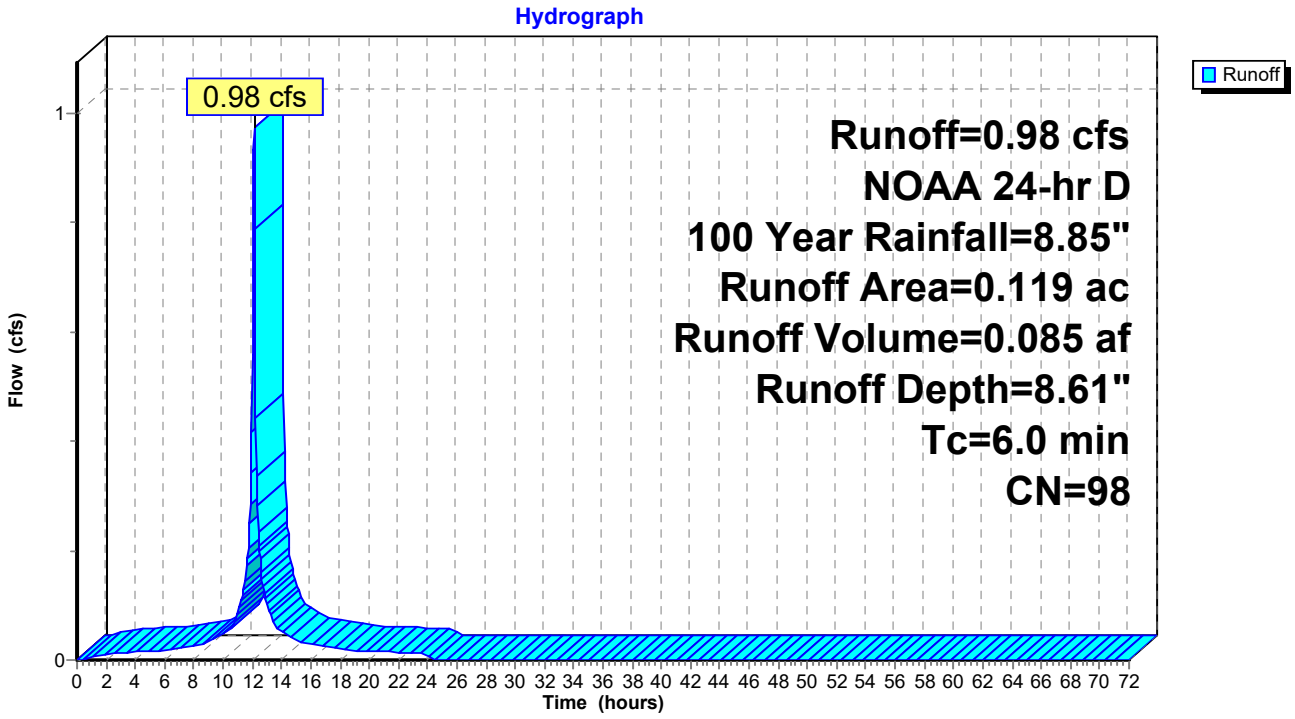
Runoff = 0.98 cfs @ 12.13 hrs, Volume= 0.085 af, Depth= 8.61"
Routed to Pond B-B : Underground Infiltration Basin #B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.119	98	Unconnected pavement, HSG B
0.119		100.00% Impervious Area
0.119		100.00% Unconnected

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

Subcatchment RA1a: Roof Area #1a (Impervious)



Summary for Subcatchment RA1b: Roof Area #1b (Impervious)

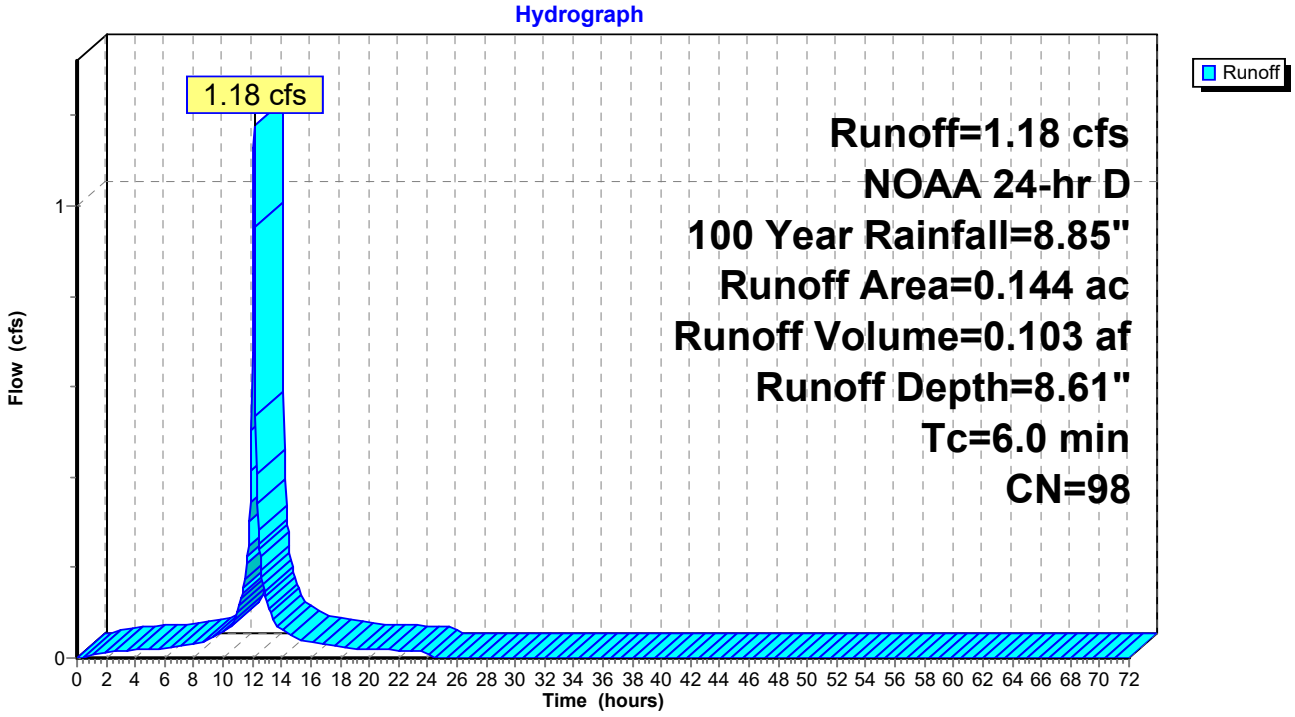
Runoff = 1.18 cfs @ 12.13 hrs, Volume= 0.103 af, Depth= 8.61"
Routed to Link DA-BA : Basin Drainage Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 Year Rainfall=8.85"

Area (ac)	CN	Description
0.144	98	Unconnected pavement, HSG B
0.144		100.00% Impervious Area
0.144		100.00% Unconnected

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

Subcatchment RA1b: Roof Area #1b (Impervious)



Summary for Pond B-B: Underground Infiltration Basin #B

Inflow Area = 0.119 ac,100.00% Impervious, Inflow Depth = 8.61" for 100 Year event
Inflow = 0.98 cfs @ 12.13 hrs, Volume= 0.085 af
Outflow = 0.14 cfs @ 11.65 hrs, Volume= 0.085 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.14 cfs @ 11.65 hrs, Volume= 0.085 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BA : Bioretention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 18.24' @ 12.67 hrs Surf.Area= 0.018 ac Storage= 0.020 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 32.7 min (773.5 - 740.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.98'	0.020 af	**11.50'W x 67.28'L x 3.33'H Field A** 0.059 af Overall - 0.009 af Embedded = 0.050 af x 40.0% Voids
#2A	17.48'	0.009 af	**ADS_StormTech SC-310 +Cap** x 27 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 27 Chambers in 3 Rows
		0.029 af	Total Available Storage

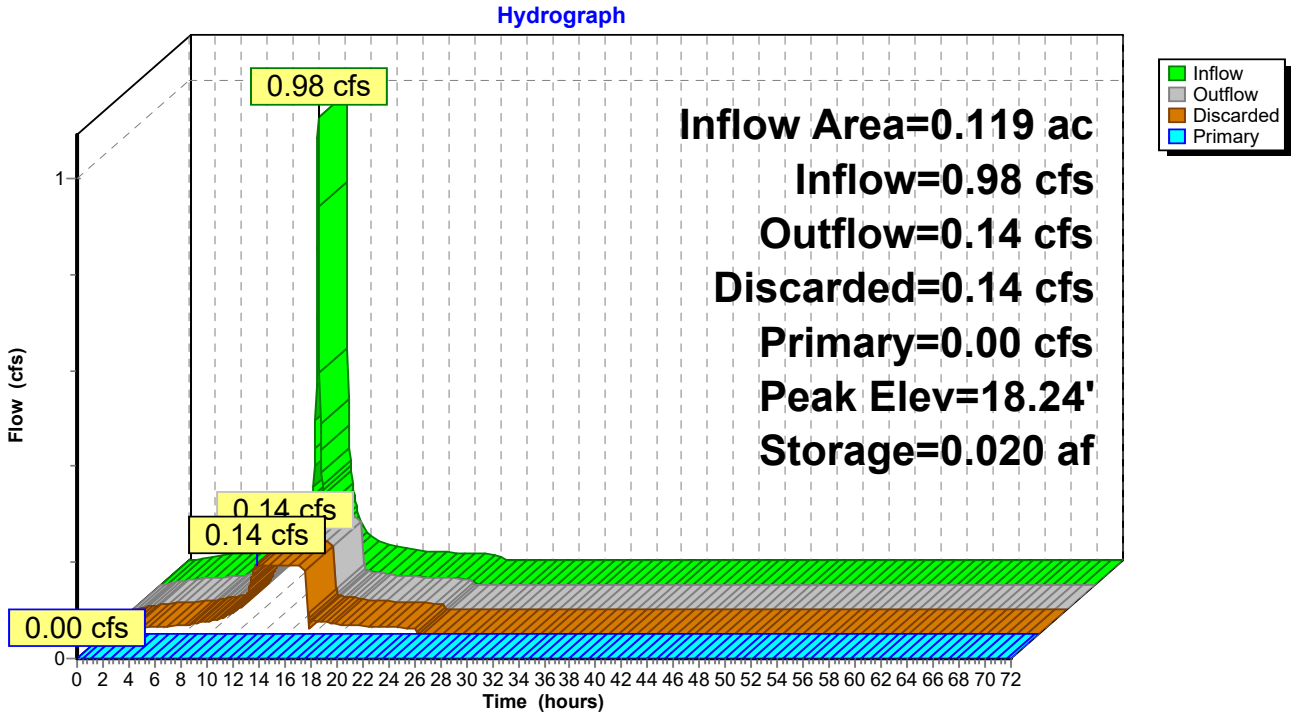
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.59'	**8.0" Round Culvert** L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.59' / 18.45' S= 0.0048 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#2	Discarded	15.98'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 11.65 hrs HW=16.02' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.98' TW=18.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond B-B: Underground Infiltration Basin #B



Hydrograph for Pond B-B: Underground Infiltration Basin #B

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	15.98	0.00	0.00	**0.00**
2.50	0.01	0.000	15.98	0.01	0.01	0.00
5.00	0.02	0.000	15.98	0.02	0.02	0.00
7.50	0.02	0.000	15.98	0.02	0.02	0.00
10.00	**0.05**	0.000	15.98	**0.05**	**0.05**	0.00
12.50	**0.20**	**0.020**	**18.20**	**0.14**	**0.14**	0.00
15.00	0.04	**0.005**	**16.74**	0.14	0.14	0.00
17.50	0.02	0.000	15.98	0.02	0.02	0.00
20.00	0.02	0.000	15.98	0.02	0.02	0.00
22.50	0.01	0.000	15.98	0.01	0.01	0.00
25.00	0.00	0.000	15.98	0.00	0.00	0.00
27.50	0.00	0.000	15.98	0.00	0.00	0.00
30.00	0.00	0.000	15.98	0.00	0.00	0.00
32.50	0.00	0.000	15.98	0.00	0.00	0.00
35.00	0.00	0.000	15.98	0.00	0.00	0.00
37.50	0.00	0.000	15.98	0.00	0.00	0.00
40.00	0.00	0.000	15.98	0.00	0.00	0.00
42.50	0.00	0.000	15.98	0.00	0.00	0.00
45.00	0.00	0.000	15.98	0.00	0.00	0.00
47.50	0.00	0.000	15.98	0.00	0.00	0.00
50.00	0.00	0.000	15.98	0.00	0.00	0.00
52.50	0.00	0.000	15.98	0.00	0.00	0.00
55.00	0.00	0.000	15.98	0.00	0.00	0.00
57.50	0.00	0.000	15.98	0.00	0.00	0.00
60.00	0.00	0.000	15.98	0.00	0.00	0.00
62.50	0.00	0.000	15.98	0.00	0.00	0.00
65.00	0.00	0.000	15.98	0.00	0.00	0.00
67.50	0.00	0.000	15.98	0.00	0.00	0.00
70.00	0.00	0.000	15.98	0.00	0.00	0.00

Stage-Discharge for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
15.98	0.00	**0.00**	0.00
16.03	0.14	**0.14**	0.00
16.08	0.14	0.14	0.00
16.13	0.14	0.14	0.00
16.18	0.14	0.14	0.00
16.23	0.14	0.14	0.00
16.28	0.14	0.14	0.00
16.33	0.14	0.14	0.00
16.38	0.14	0.14	0.00
16.43	0.14	0.14	0.00
16.48	0.14	0.14	0.00
16.53	0.14	0.14	0.00
16.58	0.14	0.14	0.00
16.63	0.14	0.14	0.00
16.68	0.14	0.14	0.00
16.73	0.14	0.14	0.00
16.78	0.14	0.14	0.00
16.83	0.14	0.14	0.00
16.88	0.14	0.14	0.00
16.93	0.14	0.14	0.00
16.98	0.14	0.14	0.00
17.03	0.14	0.14	0.00
17.08	0.14	0.14	0.00
17.13	0.14	0.14	0.00
17.18	0.14	0.14	0.00
17.23	0.14	0.14	0.00
17.28	0.14	0.14	0.00
17.33	0.14	0.14	0.00
17.38	0.14	0.14	0.00
17.43	0.14	0.14	0.00
17.48	0.14	0.14	0.00
17.53	0.14	0.14	0.00
17.58	0.14	0.14	0.00
17.63	0.14	0.14	0.00
17.68	0.14	0.14	0.00
17.73	0.14	0.14	0.00
17.78	0.14	0.14	0.00
17.83	0.14	0.14	0.00
17.88	0.14	0.14	0.00
17.93	0.14	0.14	0.00
17.98	0.14	0.14	0.00
18.03	0.14	0.14	0.00
18.08	0.14	0.14	0.00
18.13	0.14	0.14	0.00
18.18	0.14	0.14	0.00
18.23	0.14	0.14	0.00
18.28	0.14	0.14	0.00
18.33	0.14	0.14	0.00
18.38	0.14	0.14	0.00
18.43	0.14	0.14	0.00
18.48	0.14	0.14	0.00
18.53	0.14	0.14	0.00
18.58	0.14	0.14	0.00
18.63	0.15	0.14	0.00
18.68	0.17	0.14	0.02
18.73	0.20	0.14	0.05
18.78	0.24	0.14	0.09
18.83	0.29	0.14	0.14
18.88	0.34	0.14	0.20
18.93	0.41	0.14	0.27
18.98	0.48	0.14	0.34
19.03	0.55	0.14	0.41
19.08	0.63	0.14	0.49
19.13	0.71	0.14	0.57
19.18	0.79	0.14	0.65
19.23	0.87	0.14	0.73
19.28	**0.94**	0.14	**0.79**

Stage-Area-Storage for Pond B-B: Underground Infiltration Basin #B

Elevation (feet)	Surface (acres)	Storage (acre-feet)
15.98	**0.018**	0.000
16.03	0.018	0.000
16.08	0.018	0.001
16.13	0.018	0.001
16.18	0.018	0.001
16.23	0.018	0.002
16.28	0.018	0.002
16.33	0.018	0.002
16.38	0.018	0.003
16.43	0.018	0.003
16.48	0.018	0.004
16.53	0.018	0.004
16.58	0.018	0.004
16.63	0.018	0.005
16.68	0.018	0.005
16.73	0.018	0.005
16.78	0.018	0.006
16.83	0.018	0.006
16.88	0.018	0.006
16.93	0.018	0.007
16.98	0.018	0.007
17.03	0.018	0.007
17.08	0.018	0.008
17.13	0.018	0.008
17.18	0.018	0.009
17.23	0.018	0.009
17.28	0.018	0.009
17.33	0.018	0.010
17.38	0.018	0.010
17.43	0.018	0.010
17.48	0.018	0.011
17.53	0.018	0.011
17.58	0.018	0.012
17.63	0.018	0.013
17.68	0.018	0.013
17.73	0.018	0.014
17.78	0.018	0.015
17.83	0.018	0.015
17.88	0.018	0.016
17.93	0.018	0.017
17.98	0.018	0.017
18.03	0.018	0.018
18.08	0.018	0.018
18.13	0.018	0.019
18.18	0.018	0.020
18.23	0.018	0.020
18.28	0.018	0.021
18.33	0.018	0.021
18.38	0.018	0.022
18.43	0.018	0.022
18.48	0.018	0.023
18.53	0.018	0.023
18.58	0.018	0.024
18.63	0.018	0.024
18.68	0.018	0.025
18.73	0.018	0.025
18.78	0.018	0.025
18.83	0.018	0.026
18.88	0.018	0.026
18.93	0.018	0.026
18.98	0.018	0.027
19.03	0.018	0.027
19.08	0.018	0.028
19.13	0.018	0.028
19.18	0.018	0.028
19.23	0.018	0.029
19.28	0.018	**0.029**

Summary for Pond BA: Bioretention Basin

Inflow Area = 0.494 ac, 94.33% Impervious, Inflow Depth = 6.28" for 100 Year event
Inflow = 2.98 cfs @ 12.13 hrs, Volume= 0.259 af
Outflow = 2.39 cfs @ 12.18 hrs, Volume= 0.259 af, Atten= 20%, Lag= 3.3 min
Discarded = 0.08 cfs @ 8.85 hrs, Volume= 0.122 af
Primary = 2.31 cfs @ 12.18 hrs, Volume= 0.137 af
Routed to Pond SP-2 : Study Point #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond SP-2 : Study Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 20.10' @ 12.18 hrs Surf.Area= 436 sf Storage= 914 cf

Plug-Flow detention time= 16.0 min calculated for 0.258 af (100% of inflow)
Center-of-Mass det. time= 16.0 min (760.8 - 744.8)

Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	1,090 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	436	0	0
19.00	436	436	436
20.00	436	436	872
20.50	436	218	1,090

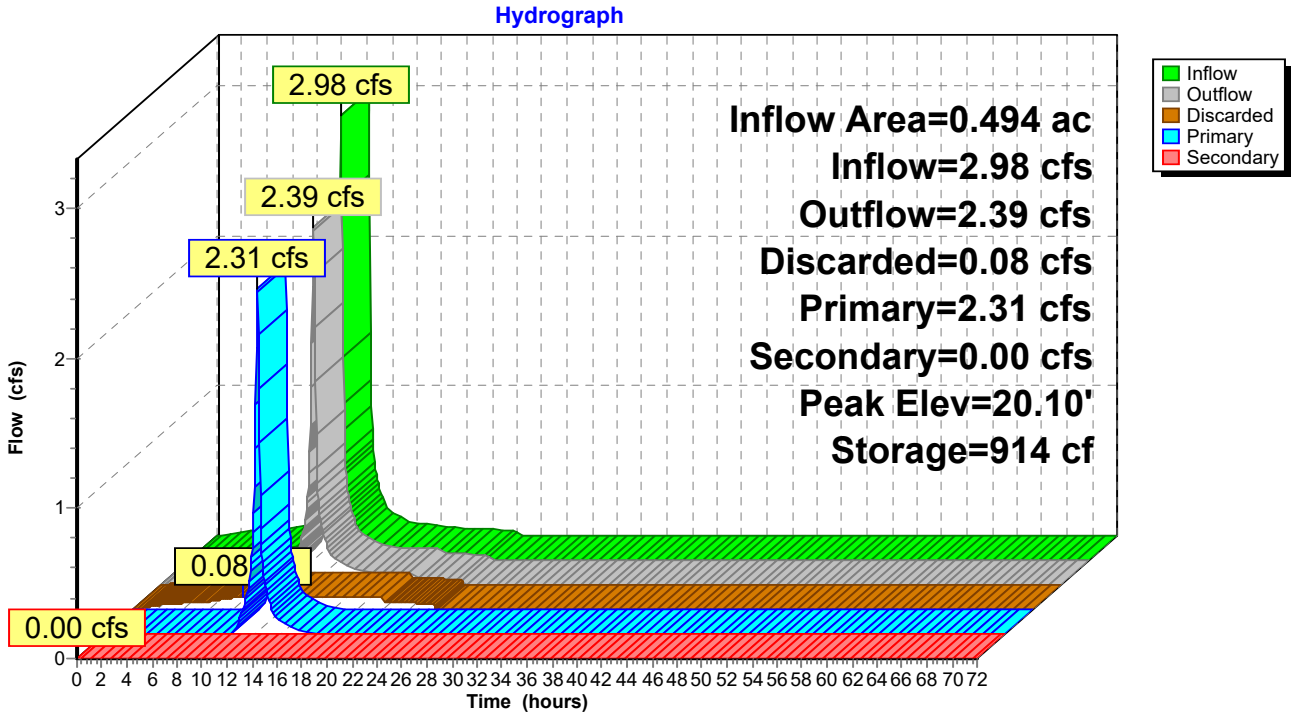
Device	Routing	Invert	Outlet Devices
#1	Primary	17.90'	**15.0" Round Culvert** L= 17.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 17.90' / 17.60' S= 0.0171 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	18.58'	**9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	20.00'	**24.0" Vert. Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	18.00'	**8.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	20.35'	**2.8' long x 1.0' breadth Emergency Spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.08 cfs @ 8.85 hrs HW=18.04' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=2.27 cfs @ 12.18 hrs HW=20.06' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.27 cfs of 7.33 cfs potential flow)
├**2=Orifice** (Orifice Controls 2.24 cfs @ 5.07 fps)
└**3=Grate** (Orifice Controls 0.03 cfs @ 0.87 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=0.00' (Dynamic Tailwater)
└**5=Emergency Spillway** (Controls 0.00 cfs)

Pond BA: Bioretention Basin



Hydrograph for Pond BA: Bioretention Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	18.00	0.00	0.00	0.00	**0.00**
2.50	0.03	2	18.00	0.03	0.03	0.00	0.00
5.00	0.05	3	18.01	0.05	0.05	0.00	0.00
7.50	0.07	4	18.01	0.07	**0.07**	0.00	0.00
10.00	**0.14**	**156**	**18.36**	**0.08**	**0.08**	**0.00**	0.00
12.50	**0.61**	**443**	**19.02**	**0.68**	0.08	**0.60**	0.00
15.00	0.11	295	18.68	0.12	0.08	0.04	0.00
17.50	0.07	241	18.55	0.08	0.08	0.00	0.00
20.00	0.05	20	18.05	0.08	0.08	0.00	0.00
22.50	0.04	2	18.01	0.04	0.04	0.00	0.00
25.00	0.00	0	18.00	0.00	0.00	0.00	0.00
27.50	0.00	0	18.00	0.00	0.00	0.00	0.00
30.00	0.00	0	18.00	0.00	0.00	0.00	0.00
32.50	0.00	0	18.00	0.00	0.00	0.00	0.00
35.00	0.00	0	18.00	0.00	0.00	0.00	0.00
37.50	0.00	0	18.00	0.00	0.00	0.00	0.00
40.00	0.00	0	18.00	0.00	0.00	0.00	0.00
42.50	0.00	0	18.00	0.00	0.00	0.00	0.00
45.00	0.00	0	18.00	0.00	0.00	0.00	0.00
47.50	0.00	0	18.00	0.00	0.00	0.00	0.00
50.00	0.00	0	18.00	0.00	0.00	0.00	0.00
52.50	0.00	0	18.00	0.00	0.00	0.00	0.00
55.00	0.00	0	18.00	0.00	0.00	0.00	0.00
57.50	0.00	0	18.00	0.00	0.00	0.00	0.00
60.00	0.00	0	18.00	0.00	0.00	0.00	0.00
62.50	0.00	0	18.00	0.00	0.00	0.00	0.00
65.00	0.00	0	18.00	0.00	0.00	0.00	0.00
67.50	0.00	0	18.00	0.00	0.00	0.00	0.00
70.00	0.00	0	18.00	0.00	0.00	0.00	0.00

Stage-Discharge for Pond BA: Bioretention Basin

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
18.00	0.00	**0.00**	0.00	0.00
18.10	0.08	**0.08**	0.00	0.00
18.20	0.08	0.08	0.00	0.00
18.30	0.08	0.08	0.00	0.00
18.40	0.08	0.08	0.00	0.00
18.50	0.08	0.08	0.00	0.00
18.60	0.08	0.08	0.00	0.00
18.70	0.13	0.08	0.05	0.00
18.80	0.25	0.08	0.17	0.00
18.90	0.43	0.08	0.35	0.00
19.00	0.64	0.08	0.56	0.00
19.10	0.88	0.08	0.80	0.00
19.20	1.13	0.08	1.05	0.00
19.30	1.34	0.08	1.26	0.00
19.40	1.50	0.08	1.42	0.00
19.50	1.65	0.08	1.57	0.00
19.60	1.79	0.08	1.71	0.00
19.70	1.92	0.08	1.84	0.00
19.80	2.04	0.08	1.96	0.00
19.90	2.15	0.08	2.07	0.00
20.00	2.26	0.08	2.17	0.00
20.10	2.42	0.08	2.34	0.00
20.20	2.70	0.08	2.62	0.00
20.30	3.10	0.08	3.02	0.00
20.40	3.69	0.08	3.52	0.08
20.50	4.64	0.08	4.12	0.44
20.60	5.84	0.08	4.82	0.94
20.70	7.25	0.08	5.60	1.57
20.80	8.85	0.08	6.46	2.31
20.90	10.61	0.08	7.40	3.13
21.00	12.54	0.08	8.39	4.07
21.10	14.66	0.08	9.44	5.14
21.20	16.07	0.08	9.66	6.32
21.30	17.57	0.08	9.84	7.64
21.40	19.15	0.08	10.02	9.05
21.50	20.82	0.08	10.19	10.55
21.60	22.61	0.08	10.36	12.17
21.70	24.53	0.08	10.53	13.92
21.80	26.52	0.08	10.69	15.74
21.90	28.55	0.08	10.86	17.61
22.00	**30.61**	0.08	**11.01**	**19.51**

Stage-Area-Storage for Pond BA: Bioretention Basin

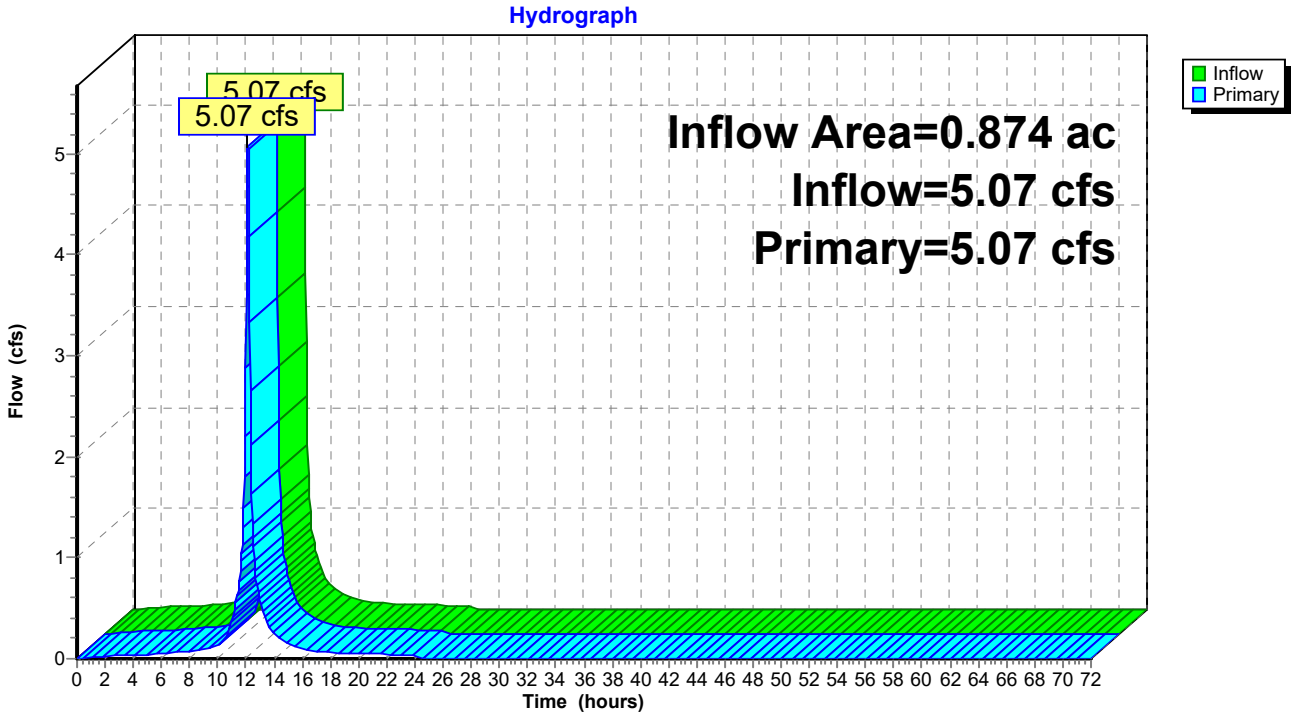
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
18.00	**436**	0
18.05	436	22
18.10	436	44
18.15	436	65
18.20	436	87
18.25	436	109
18.30	436	131
18.35	436	153
18.40	436	174
18.45	436	196
18.50	436	218
18.55	436	240
18.60	436	262
18.65	436	283
18.70	436	305
18.75	436	327
18.80	436	349
18.85	436	371
18.90	436	392
18.95	436	414
19.00	436	436
19.05	436	458
19.10	436	480
19.15	436	501
19.20	436	523
19.25	436	545
19.30	436	567
19.35	436	589
19.40	436	610
19.45	436	632
19.50	436	654
19.55	436	676
19.60	436	698
19.65	436	719
19.70	436	741
19.75	436	763
19.80	436	785
19.85	436	807
19.90	436	828
19.95	436	850
20.00	436	872
20.05	436	894
20.10	436	916
20.15	436	937
20.20	436	959
20.25	436	981
20.30	436	1,003
20.35	436	1,025
20.40	436	1,046
20.45	436	1,068
20.50	436	**1,090**
20.55	436	1,090
20.60	436	1,090
20.65	436	1,090
20.70	436	1,090
20.75	436	1,090
20.80	436	1,090
20.85	436	1,090
20.90	436	1,090
20.95	436	1,090
21.00	436	1,090
21.05	436	1,090
21.10	436	1,090
21.15	436	1,090
21.20	436	1,090
21.25	436	1,090
21.30	436	1,090
21.35	436	1,090
21.40	436	1,090
21.45	436	1,090
21.50	436	1,090
21.55	436	1,090
21.60	436	1,090
21.65	436	1,090
21.70	436	1,090
21.75	436	1,090
21.80	436	1,090
21.85	436	1,090
21.90	436	1,090
21.95	436	1,090
22.00	436	1,090

Summary for Pond OS: Overall Site

Inflow Area = 0.874 ac, 89.93% Impervious, Inflow Depth = 5.32" for 100 Year event
Inflow = 5.07 cfs @ 12.14 hrs, Volume= 0.387 af
Primary = 5.07 cfs @ 12.14 hrs, Volume= 0.387 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond OS: Overall Site



Hydrograph for Pond OS: Overall Site

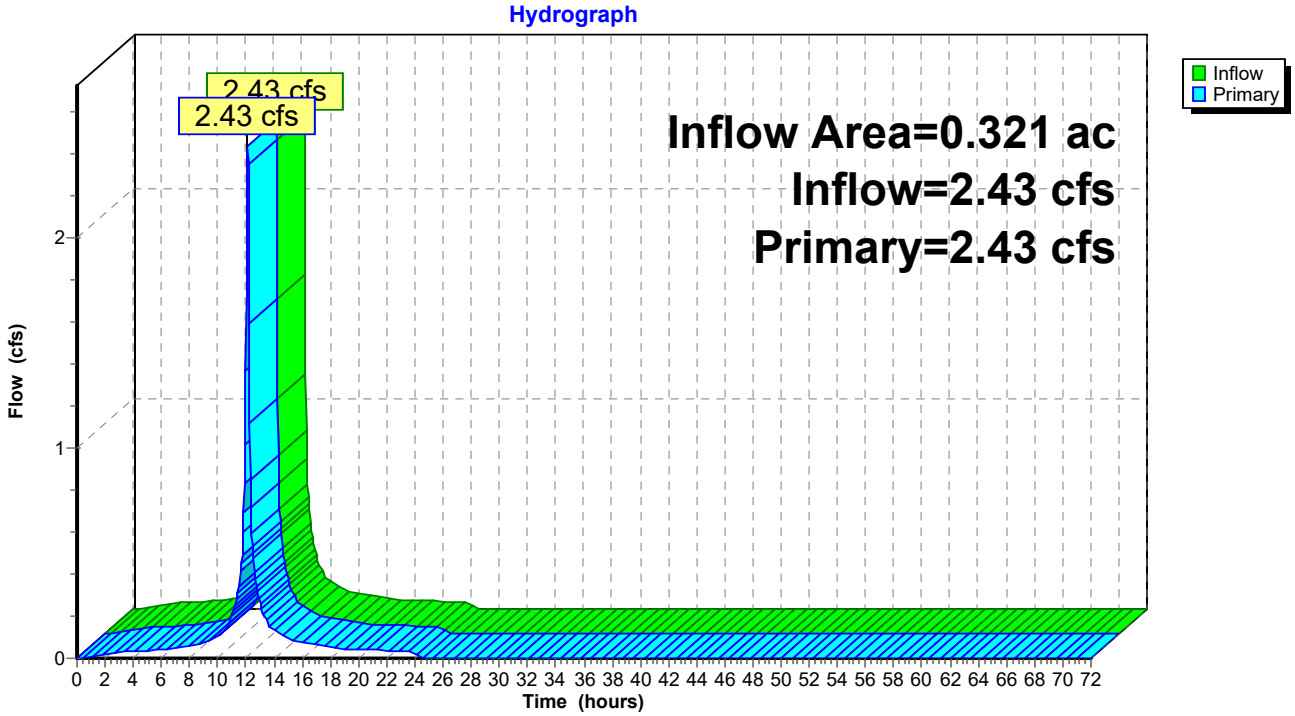
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.01		0.01
2.00	0.03		0.03
3.00	0.03		0.03
4.00	0.04		0.04
5.00	0.04		0.04
6.00	0.05		0.05
7.00	0.06		0.06
8.00	0.07		0.07
9.00	0.09		0.09
10.00	0.13		0.13
11.00	0.40		0.40
12.00	**2.87**		**2.87**
13.00	**0.58**		**0.58**
14.00	0.24		0.24
15.00	0.14		0.14
16.00	0.10		0.10
17.00	0.07		0.07
18.00	0.06		0.06
19.00	0.05		0.05
20.00	0.05		0.05
21.00	0.05		0.05
22.00	0.04		0.04
23.00	0.04		0.04
24.00	0.04		0.04
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond SP-1: Study Point #1

Inflow Area = 0.321 ac, 82.55% Impervious, Inflow Depth = 7.82" for 100 Year event
Inflow = 2.43 cfs @ 12.13 hrs, Volume= 0.209 af
Primary = 2.43 cfs @ 12.13 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-1: Study Point #1



Hydrograph for Pond SP-1: Study Point #1

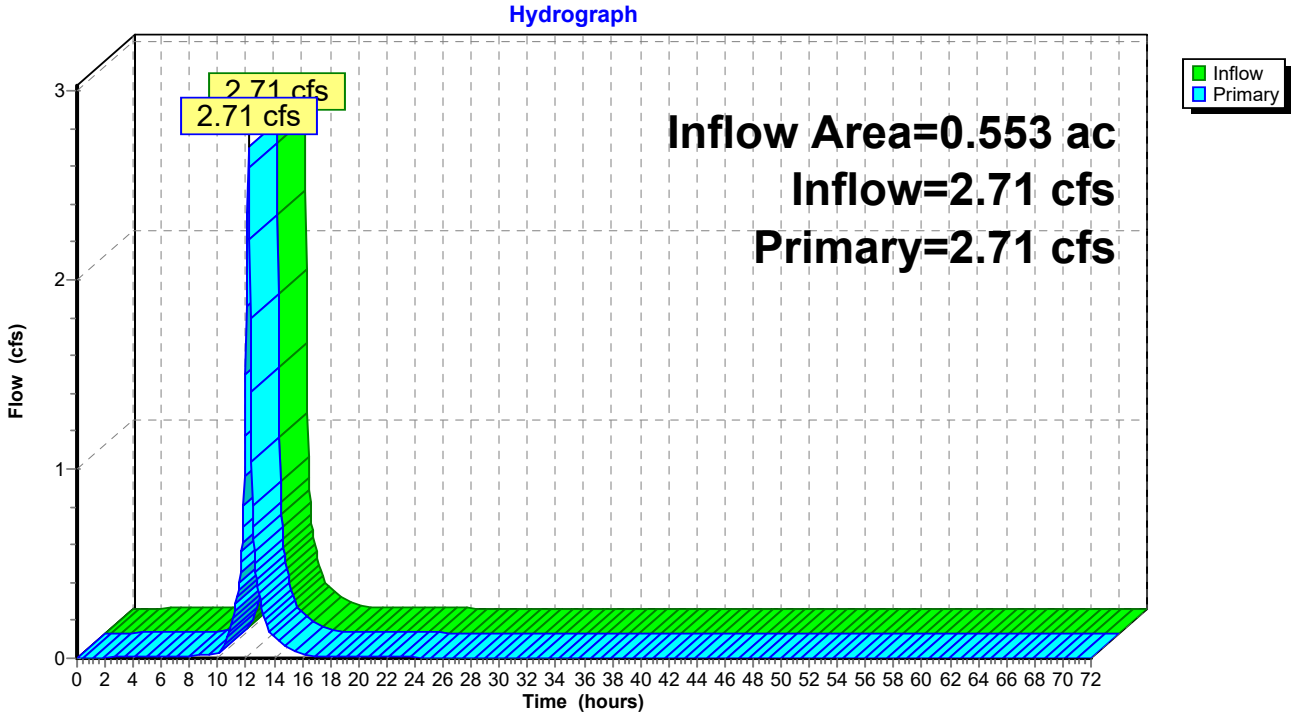
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00		0.00
1.00	0.01		0.01
2.00	0.02		0.02
3.00	0.03		0.03
4.00	0.03		0.03
5.00	0.04		0.04
6.00	0.04		0.04
7.00	0.05		0.05
8.00	0.06		0.06
9.00	0.07		0.07
10.00	0.11		0.11
11.00	0.20		0.20
12.00	**1.37**		**1.37**
13.00	**0.27**		**0.27**
14.00	0.13		0.13
15.00	0.09		0.09
16.00	0.07		0.07
17.00	0.06		0.06
18.00	0.05		0.05
19.00	0.05		0.05
20.00	0.04		0.04
21.00	0.04		0.04
22.00	0.04		0.04
23.00	0.03		0.03
24.00	0.03		0.03
25.00	0.00		0.00
26.00	0.00		0.00
27.00	0.00		0.00
28.00	0.00		0.00
29.00	0.00		0.00
30.00	0.00		0.00
31.00	0.00		0.00
32.00	0.00		0.00
33.00	0.00		0.00
34.00	0.00		0.00
35.00	0.00		0.00
36.00	0.00		0.00
37.00	0.00		0.00
38.00	0.00		0.00
39.00	0.00		0.00
40.00	0.00		0.00
41.00	0.00		0.00
42.00	0.00		0.00
43.00	0.00		0.00
44.00	0.00		0.00
45.00	0.00		0.00
46.00	0.00		0.00
47.00	0.00		0.00
48.00	0.00		0.00
49.00	0.00		0.00
50.00	0.00		0.00
51.00	0.00		0.00
52.00	0.00		0.00
53.00	0.00		0.00
54.00	0.00		0.00
55.00	0.00		0.00
56.00	0.00		0.00
57.00	0.00		0.00
58.00	0.00		0.00
59.00	0.00		0.00
60.00	0.00		0.00
61.00	0.00		0.00
62.00	0.00		0.00
63.00	0.00		0.00
64.00	0.00		0.00
65.00	0.00		0.00
66.00	0.00		0.00
67.00	0.00		0.00
68.00	0.00		0.00
69.00	0.00		0.00
70.00	0.00		0.00
71.00	0.00		0.00
72.00	0.00		0.00

Summary for Pond SP-2: Study Point #2

Inflow Area = 0.553 ac, 94.21% Impervious, Inflow Depth = 3.86" for 100 Year event
Inflow = 2.71 cfs @ 12.16 hrs, Volume= 0.178 af
Primary = 2.71 cfs @ 12.16 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
Routed to Pond OS : Overall Site

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2

Pond SP-2: Study Point #2

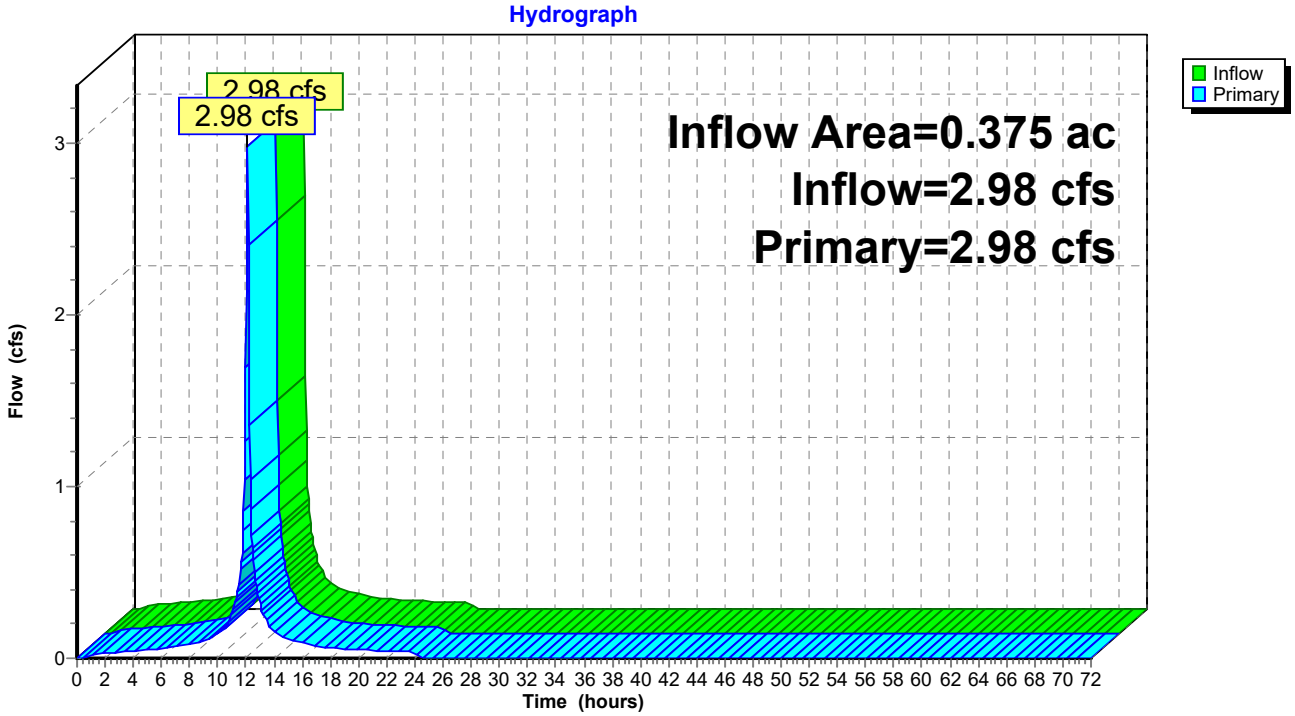


Summary for Link DA-BA: Basin Drainage Area

Inflow Area = 0.375 ac, 92.53% Impervious, Inflow Depth = 8.27" for 100 Year event
Inflow = 2.98 cfs @ 12.13 hrs, Volume= 0.259 af
Primary = 2.98 cfs @ 12.13 hrs, Volume= 0.259 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BA : Bioretention Basin

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link DA-BA: Basin Drainage Area



E. STORM SEWER PIPE CHART & CONDUIT OUTLET PROTECTION CALCULATIONS

FlexTable: Conduit Table

Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Manning's n	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Area (Flow) (ft^2)	System Flow Time (min)	Flow (cfs)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	System Intensity (in/h)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Upstream Inlet Tc (hours)	Upstream Inlet C	Upstream Inlet Area (acres)	System CA (acres)
CO-2	Bioretention Basin #A	11.8	6.0	PVC	0.010	0.025	18.29	18.00	1.89	1.63	0.1	10.020	0.83	1.15	72.3	6.40	5.806	18.74	18.34	20.68	20.13	0.167	0.990	0.144	0.143
OS-A	Existing Inlet	10.7	15.0	Concrete	0.013	0.008	17.69	17.60	1.06	1.28	0.4	0.000	1.72	5.93	29.0	4.18	7.300	18.21	18.07	20.00	20.13	0.000	(N/A)	(N/A)	0.000
CO-1	Infiltration Basin #B	47.4	8.0	PVC	0.010	0.010	18.92	18.45	1.16	1.74	0.2	10.020	0.69	1.56	44.1	4.34	5.806	19.31	18.76	20.75	20.86	0.167	0.990	0.119	0.118
Infiltration Basin #B	E INLET #1	29.1	8.0	PVC	0.010	0.005	18.59	18.45	1.44	1.27	0.0	0.000	0.00	1.09	0.1	0.49	7.300	18.87	18.87	20.70	20.39	0.000	(N/A)	(N/A)	0.000
E INLET #1	E INLET #2	97.0	8.0	PVC	0.010	0.004	18.45	18.09	1.27	1.39	0.2	10.020	0.69	0.96	72.0	2.98	5.806	18.87	18.53	20.39	20.15	0.167	0.980	0.120	0.118
E INLET #2	Bioretention Basin #A	25.5	15.0	Concrete	0.013	0.004	18.09	18.00	0.81	0.88	0.4	10.562	1.03	3.84	26.8	2.65	5.708	18.53	18.40	20.15	20.13	0.167	0.980	0.062	0.178

FlexTable: Catch Basin Table

Label	Inlet Drainage Area (acres)	Inlet C	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Spread / Top Width (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Total Inlet Tc (hours)	Flow (Total Out) (cfs)	Total Rational Flow to Inlet (cfs)	Total Inlet Intensity (in/h)
E INLET #1	0.120	0.980	20.30	20.30	18.45	100.0	0.69	18.87	18.87	6.2	0.00	2.98	0.167	0.69	0.69	5.806
E INLET #2	0.062	0.980	20.40	20.40	18.09	100.0	0.36	18.53	18.53	4.5	2.81	2.65	0.167	1.03	0.36	5.806

FlexTable: Manhole Table

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Downstream Conduit	Downstream Conduit Flow (cfs)	Elevation (Invert) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Elevation (Invert in 2) (ft)	Hydraulic Grade Line (Out) (ft)	Flow (Known) (cfs)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CO-1	20.75	20.75	CO-1 - #BASIN B	0.69	18.92	(N/A)	0.69	0.39	19.31	(N/A)	19.31	0.00	3.23	3.23
CO-2	20.68	20.68	CO-2 - #2	0.83	18.29	(N/A)	0.83	0.45	18.74	(N/A)	18.74	0.00	4.48	4.48
Infiltration Basin #B	20.70	20.70	BASIN B - #1	0.00	18.59	(N/A)	0.00	0.28	18.87	(N/A)	18.87	0.00	0.01	0.01
OS-A	20.00	20.00	OS-A - Ex.	1.72	17.69	(N/A)	1.72	0.52	18.21	(N/A)	18.21	1.72	3.56	3.56

FlexTable: Conduit Table

Start Node	Stop Node	Length (User Defined) (ft)	Diameter (in)	Material	Manning's n	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Area (Flow) (ft²)	System Flow Time (min)	Flow (cfs)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Velocity (ft/s)	System Intensity (in/h)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Upstream Inlet Tc (hours)	Upstream Inlet C	Upstream Inlet Area (acres)	System CA (acres)
E INLET #1	E INLET #2	97.0	8.0	PVC	0.010	0.004	18.45	18.09	1.27	1.39	0.3	10.020	0.80	0.96	83.5	3.07	6.736	18.92	18.57	20.39	20.15	0.167	0.980	0.120	0.118
E INLET #2	Bioretention Basin #A	25.5	15.0	Concrete	0.013	0.004	18.09	18.00	0.81	0.88	0.4	10.547	1.19	3.84	31.1	2.76	6.624	18.57	18.43	20.15	20.13	0.167	0.980	0.062	0.178
CO-1	Infiltration Basin #B	47.4	8.0	PVC	0.010	0.010	18.92	18.45	1.16	1.74	0.2	10.020	0.80	1.56	51.1	4.51	6.736	19.34	18.79	20.75	20.86	0.167	0.990	0.119	0.118
CO-2	Bioretention Basin #A	11.8	6.0	PVC	0.010	0.025	18.29	18.00	1.89	1.63	0.1	10.020	0.97	1.15	83.9	6.58	6.736	18.76	18.38	20.68	20.13	0.167	0.990	0.144	0.143
OS-A	Existing Inlet	10.7	15.0	Concrete	0.013	0.008	17.69	17.60	1.06	1.28	0.5	0.000	2.31	5.93	39.0	4.53	8.500	18.30	18.15	20.00	20.13	0.000	(N/A)	(N/A)	0.000
Infiltration Basin #B	E INLET #1	29.1	8.0	PVC	0.010	0.005	18.59	18.45	1.44	1.27	0.0	0.000	0.00	1.09	0.1	0.49	8.500	18.92	18.92	20.70	20.39	0.000	(N/A)	(N/A)	0.000

FlexTable: Catch Basin Table

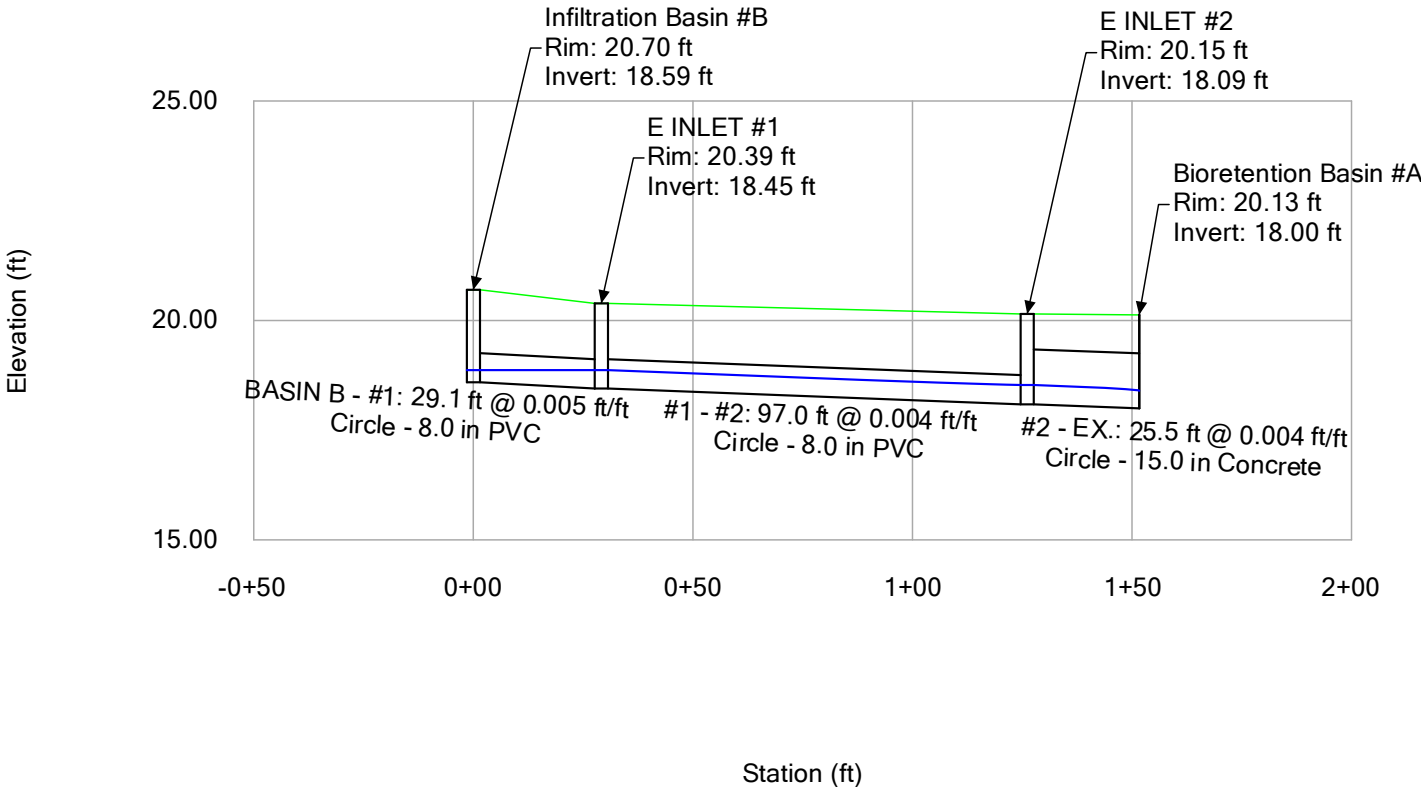
Label	Inlet Drainage Area (acres)	Inlet C	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Spread / Top Width (ft)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)	Total Inlet Tc (hours)	Flow (Total Out) (cfs)	Total Rational Flow to Inlet (cfs)	Total Inlet Intensity (in/h)
E INLET #1	0.120	0.980	20.30	20.30	18.45	100.0	0.80	18.92	18.92	6.7	0.00	3.07	0.167	0.80	0.80	6.736
E INLET #2	0.062	0.980	20.40	20.40	18.09	100.0	0.41	18.57	18.57	4.8	2.99	2.77	0.167	1.19	0.41	6.736

FlexTable: Manhole Table

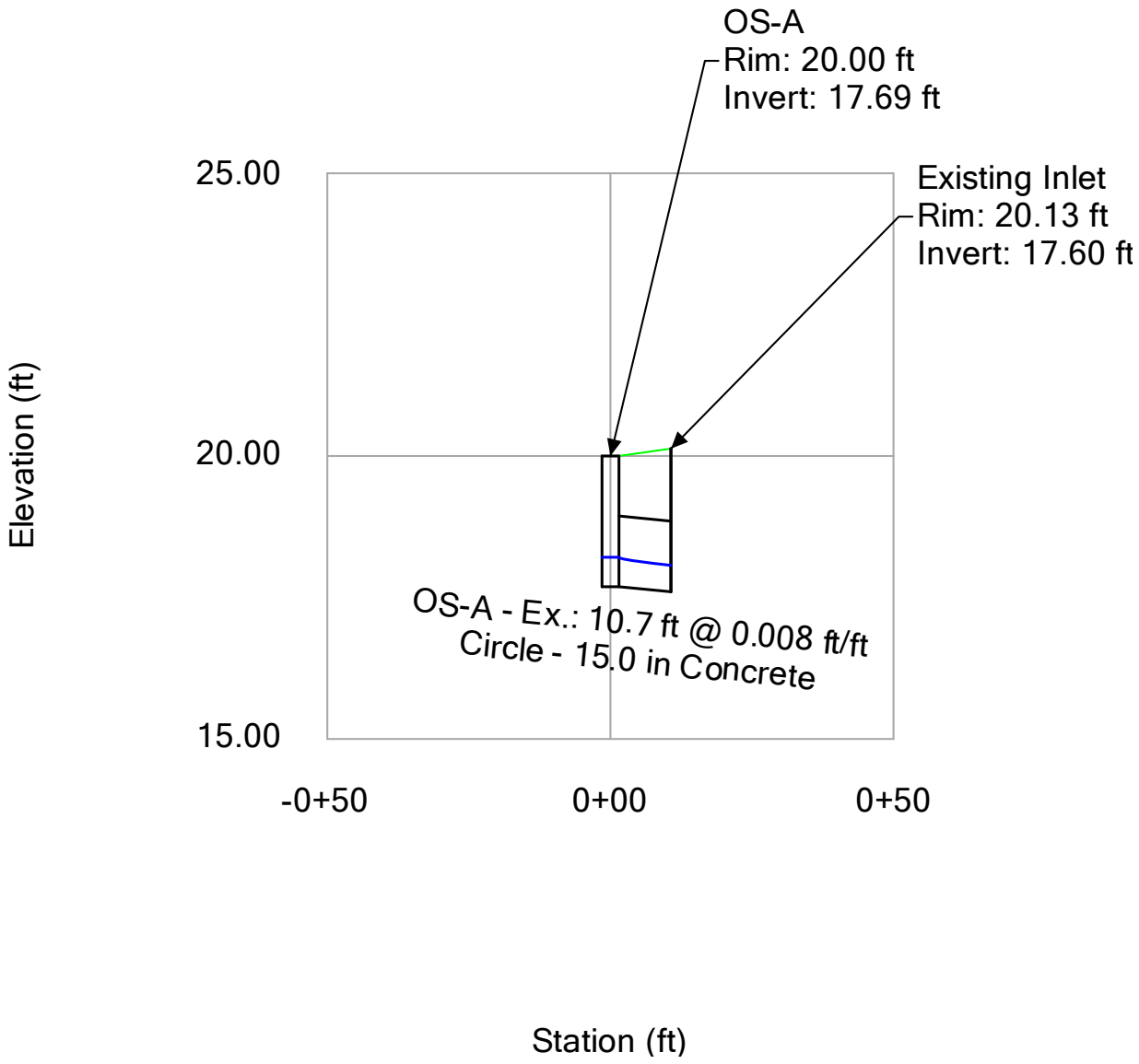
Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Downstream Conduit	Downstream Conduit Flow (cfs)	Elevation (Invert) (ft)	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (In) (ft)	Elevation (Invert in 2) (ft)	Hydraulic Grade Line (Out) (ft)	Flow (Known) (cfs)	Velocity (In) (ft/s)	Velocity (Out) (ft/s)
CO-1	20.75	20.75	CO-1 - #BASIN B	0.80	18.92	(N/A)	0.80	0.42	19.34	(N/A)	19.34	0.00	3.42	3.42
CO-2	20.68	20.68	CO-2 - #2	0.97	18.29	(N/A)	0.97	0.47	18.76	(N/A)	18.76	0.00	5.06	5.06
Infiltration Basin #B	20.70	20.70	BASIN B - #1	0.00	18.59	(N/A)	0.00	0.33	18.92	(N/A)	18.92	0.00	0.01	0.01
OS-A	20.00	20.00	OS-A - Ex.	2.31	17.69	(N/A)	2.31	0.61	18.30	(N/A)	18.30	2.31	3.90	3.90

Profile Report

Engineering Profile - Infiltration Basin #B - Bioretention Basin #A (Pipe Design (25 Year).stsw)

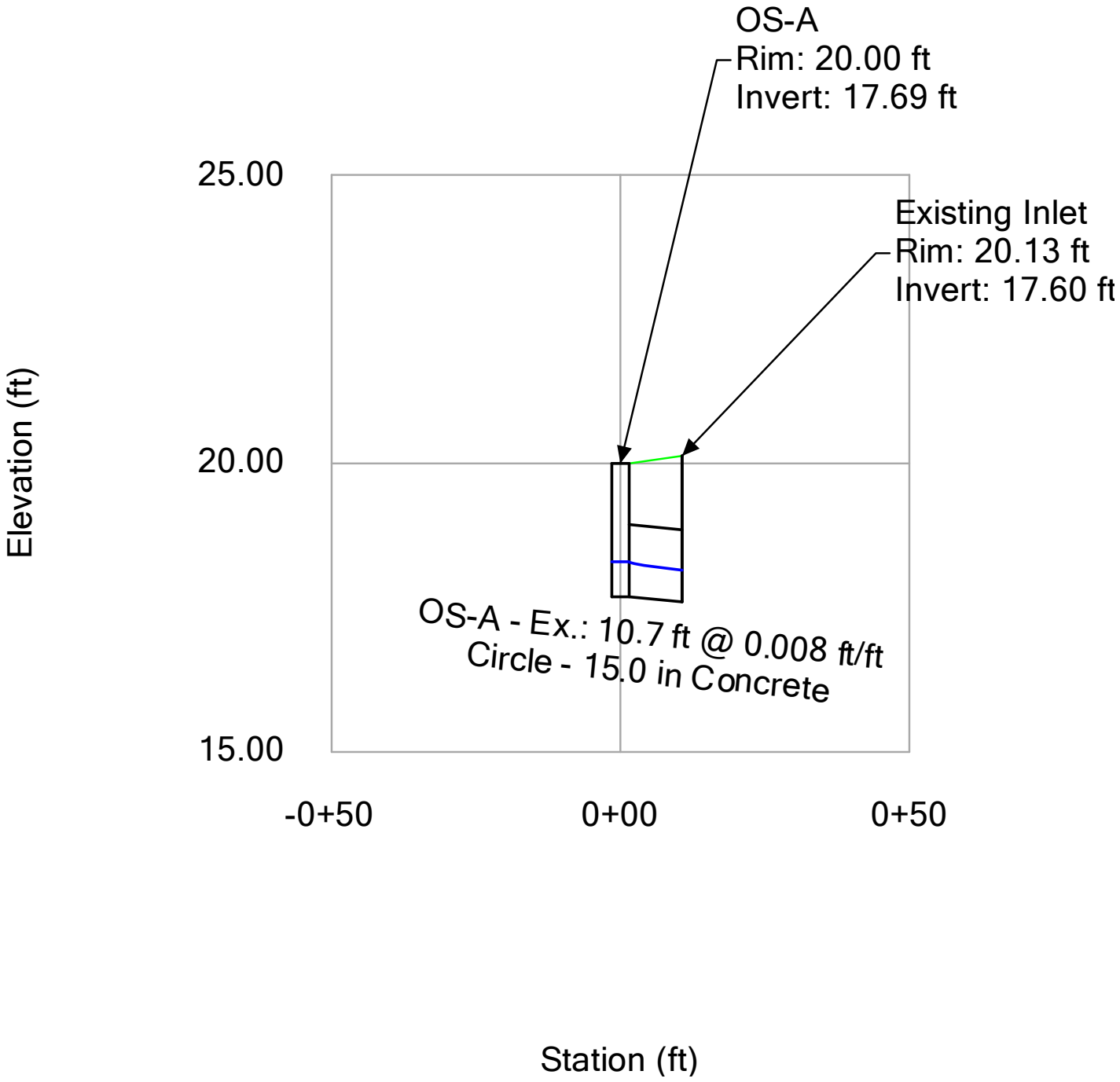


Profile Report
Engineering Profile - OS-A - Exiting Inlet (Pipe Design (25 Year).stsw)



Profile Report

Engineering Profile - OS-A - Exiting Inlet (Pipe Design (100 Year).stsw)



RIPRAP CALCULATIONS
TW > 0.5Do
NJ Standards for SESC, Ch. 12, May 2012

Date: 5/12/2021
Job Name: Fair Haven
Designed by: Yasseen Saad
Checked by: Paul Latham

Structure: RR Apron #1
Select TW Conditions: TW > 0.5Do

Q =	**1.03 c.f.s.**	W_o=	**1.25 Ft.**
D_o=	**1.25 Ft.**	q=Q/W_o=	**0.82 c.f.s.**
		TW =	**1.14 Ft.**

Length of apron (La)

$La = \frac{3q}{D_o^{1/2}}$ = **2.2 Ft.** — **3 Ft. Provided**

Width of apron (W_1) (downstream end)

W1 = 3Wo + 0.4La = **4.6 Ft.** — **5 Ft. Provided**

Width of apron (W_2) (outlet end)

$W_2 = 3W_o$ = **3.8 Ft.** — **4 Ft. Provided**

d_{50} Stone size

$d_{50} = \frac{0.016 * q^{1.33}}{TW}$ = **0.01 Ft.**

1 " Stone Calculated
3 " Stone Used for Construction
NJ Standards require d_{50}=3" min, NJDOT requires d_{50}=6" min

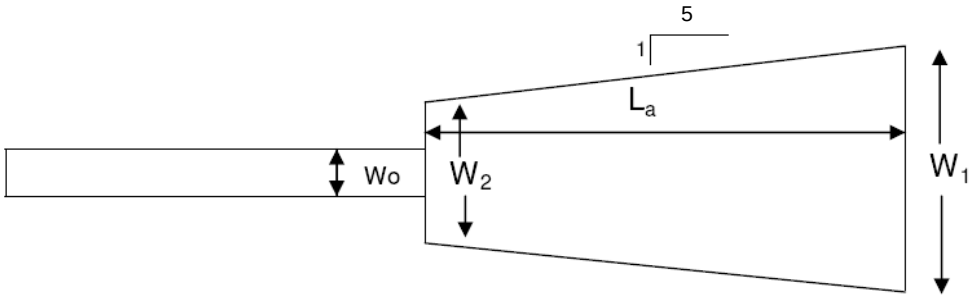
Apron Thickness (T)

T = d_{50} Stone size x 2 if filter fabric is used
T = d_{50} Stone size x 3 if no filter fabric is used

Select Apron Design
Use Filter Fabric

T = 6 " Thick with fabric
Volume of riprap = 0.25 CY

Structure RR Apron #1 Detail



W2 = 4' **La = 3'** **W1 = 5'**

Notes:

RIPRAP CALCULATIONS
TW > 0.5Do
NJ Standards for SESC, Ch. 12, May 2012

Date: 5/12/2021
Job Name: Fair Haven
Designed by: Yasseen Saad
Checked by: Paul Latham

Structure: RR Apron #2
Select TW Conditions: TW > 0.5Do

Q =	**0.83 c.f.s.**	W_o=	**0.50 Ft.**
D_o=	**0.50 Ft.**	q=Q/W_o=	**1.66 c.f.s.**
		TW =	**1.14 Ft.**

Length of apron (La)

$La = \frac{3q}{D_o^{1/2}}$ = **7.0 Ft.** **8 Ft. Provided**

Width of apron (W_1) (downstream end)

W1 = 3Wo + 0.4La = **4.3 Ft.** **5 Ft. Provided**

Width of apron (W_2) (outlet end)

$W_2 = 3W_o$ = **1.5 Ft.** **2 Ft. Provided**

d_{50} Stone size

$d_{50} = \frac{0.016 * q^{1.33}}{TW}$ = **0.03 Ft.**

1 " Stone Calculated
3 " Stone Used for Construction
NJ Standards require d_{50}=3" min, NJDOT requires d_{50}=6" min

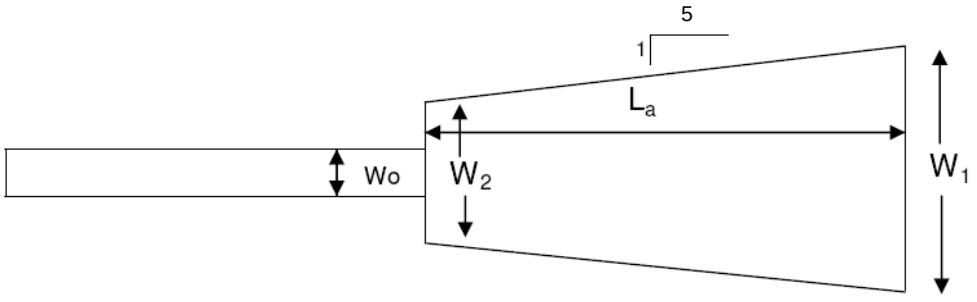
Apron Thickness (T)

T = d_{50} Stone size x 2 if filter fabric is used
T = d_{50} Stone size x 3 if no filter fabric is used

Select Apron Design
Use Filter Fabric

T = 6 " Thick with fabric
Volume of riprap = 0.52 CY

Structure RR Apron #2 Detail



W2 = 2' **La = 8'** **W1 = 5'**

Notes:

F. CUSTOM NRCS SOILS REPORT & TEST PIT REPORT

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 Monmouth County, New Jersey

April 30, 2020

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:635 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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: Monmouth County, New Jersey
Survey Area Data: Version 13, Sep 16, 2019

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

Date(s) aerial images were photographed: Jun 29, 2019—Jul 16, 2019

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
FrrC	Freehold-Urban land complex, 0 to 10 percent slopes	0.8	100.0%
Totals for Area of Interest		**0.8**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

Monmouth County, New Jersey

FrrC—Freehold-Urban land complex, 0 to 10 percent slopes

Map Unit Setting

National map unit symbol: 4j7m
Elevation: 40 to 110 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

Freehold and similar soils: 60 percent
Urban land: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freehold

Setting

Landform: Low hills, knolls
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Glauconite bearing loamy eolian deposits and/or glauconite bearing loamy fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt1 - 10 to 14 inches: sandy loam
Bt2 - 14 to 21 inches: sandy clay loam
Bt3 - 21 to 35 inches: sandy loam
C - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Low hills, knolls
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Interpretive groups

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

Minor Components

Colts neck

Percent of map unit: 5 percent
Landform: Low hills, knolls
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Collington

Percent of map unit: 5 percent
Landform: Low hills, knolls
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

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EP Design Services, LLC

Groundwater Report

M&M Realty Partners at Fair Haven

Block 31, Lot 1
Borough of Fair Haven, Monmouth County, New Jersey

June 11, 2021

Prepared for:
M&M Realty Partners at Fair Haven, LLC.
1260 Stelton Road
Piscataway, NJ 08854

Prepared By:
EP Design Services, LLC
2901 Hamilton Blvd.
South Plainfield, NJ 07080

_____

Bradford J. Aller, PE, CME
Chief Engineer
Registered Professional Engineer
NJ License Number: GE43435

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3. Purpose and Scope of Services ……2

4. Subsurface Exploration ……2

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Appendix A……Test Pit Location Plan

Appendix B……Test Pit Logs

Appendix C……Web Soil Survey Map

1. INTRODUCTION

The report here-in presents the findings of the field exploration performed by EP Design Services, LLC (EPDS) at the proposed project site, commonly known as M&M Realty Partners at Fair Haven. The location of the testing was provided by the EPDS design Engineer for the design of a Stormwater Management (SWM) bioretention recharge basin within the planned development. The existing site consists of an abandoned gas station facility. All presented data and conclusions in this report are based on proper engineering practices, accepted laboratory testing protocol, and direct field observations. EPDS evaluated the subsurface conditions during Test Pit excavations and the results of our findings are presented in the attached Test Pit logs. This report provides a discussion of the subsurface soil conditions encountered and the groundwater conditions observed during the course of our exploration.

2. SITE DESCRIPTION

The planned site development is located at the southeastern quadrant of the intersection of River Road and Cedar Avenue in the Borough of Fair Haven, Monmouth County, New Jersey and is identified as Lot 1 of Block 31 on the Borough Tax Maps.

The existing site conditions at the time of our exploration consisted of an abandoned gas station facility that included a one-story building, asphalt paved parking and driveways areas, an exterior concrete pad, trash enclosure, and curb islands with landscaping. The ground surface cover at the locations explored within the planned SWM bioretention basin consisted of paved asphalt. The locations of the fuel tanks associated with the previous establishment were previously removed from the site and the resultant excavation backfilled with fill to the existing ground surface level.

The proposed site development will consist of a 4,250 square-foot building with a full building basement will occupy commercial businesses at the ground floor level and fourteen (14) residential units within the second and third floor levels. Proposed site features will include new perimeter concrete sidewalk, internal paver walkways, asphalt paved parking and driveway areas, a dumpster enclosure, a brick retaining wall, a SWM bioretention basin, underground utilities, and site lighting and landscaping.

3. PURPOSE AND SCOPE OF SERVICES

The purpose of our exploration was to evaluate the existing subsurface soil and groundwater conditions within the influence zone of the planned SWM bioretention basin in order to determine the Seasonal High Water Table (SHWT) level. A representative of EPDS was present at the site during the excavation of two (2) test pits to provide continuous observations. The test pit locations are shown on the map located in Appendix "A." The test pit logs" and the findings presented shown in Appendix "B were based on our field observations and evaluations of the encountered soil stratum(s), depths to observed ground water, and depths to the observed SHWT level based on soil morphology conditions. All the findings and information provided in this report are subject to the limitations described in Section No. 8.

4. SUBSURFACE EXPLORATION

The subsurface conditions were evaluated by a member EPDS to document the SHWT levels and existing groundwater elevations on the date and time of our investigation. Two (2) test pits were excavated by EP Excavating, LLC using a CAT 316 excavator on June 9, 2021 under the direction and observations of a member from EPDS's Geotechnical Department. All soils encountered were classified in the field in accordance to N.J.A.C, 7:9A, Subchapter 5.3 - Terminology Required for Soil Logs. The Test Pit depths extended to about thirteen (13) feet below the existing ground surface level. The Test Pit termination and infiltration testing depths were established based on a minimum of two (2) feet below the proposed bottom of the SWM basin level, a minimum of one (1) foot above the estimated SHWT, and following the requirements of the latest New Jersey Best Management Practice (BMP) manual.

Groundwater elevations may fluctuate for several reasons, including: surface disruption from construction activities, seasonal changes, varying conditions, tidal fluctuations, or amounts of precipitation. The subsurface profiles exposed during the excavations were also evaluated for the presence of soil mottling, which can aid in the determination of the SHWT. Table 1 summarizes the depths of the groundwater levels observed during the explorations.

5. INFILTRATION TESTING

EPDS performed subsurface infiltration testing below the planned SWM bioretention bottom level using a double-ring infiltrometer following the specification of ASTM- D3385 and the requirements of Chapter 12, Soil Testing Criteria, within the latest New Jersey Best Management

Practice (BMP) manual. One test was performed within each Test Pit. The infiltration testing depths were performed at a level above one (1) foot from the estimated SHWT level and two (2) feet below the bottom of basin level. Table 1 below summarizes the infiltration rates and K-Class designation based on the results of our testing in observations. The soil conditions at the infiltration level were observed to consist of sand with minor quantities of silts and gravel, with classifications of SP and Sand and Loamy Sand, in accordance with the Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA), respectively.

Table 1. Depths to GWT and SHWT

Test Pit #	Ground Surface Elevation	Infil. Test Elevation	GWT Elevation	SHWT Elevation	Intake Rate (in/hr)	Hydraulic Conductivity (in/hr)	USDA K-Class	USDA
TP-1	22.10’	15.60’	NWE	NWE	20	6.75	K5	SAND
TP-2	21.79’	16.29’	NWE	NWE	16	5.5	K4	LOAMY SAND

*Note: NWE = No Water Encountered, GWT = Ground Water Table

The permeability rates (intake rate) presented in the above table were directly observed during the infiltration testing using the double-ring infiltrometer and the hydraulic conductivity value was estimated from the conversion graph provided in the Addendum section of Chapter 12, Soil Testing Criteria, of the New Jersey BMP manual.

6. SUBSURFACE CONDITIONS

Based on our review of the project site’s location from The National Resources Conservation Service (NRCS) Web Soil Survey, the site soils consist of the following geological classification, hydraulic group, and the approximate percentage existing within the total site area:

1. *Freehold Urban Land Complex* (FrrC) classified as Hydraulic Soil Group B (100.0%)

The official web soil survey can be found in Appendix “C.” The above soil classifications from the NRCS were observed to be generally consistent with our observations during the exploration.

7. SUMMARY AND DISCUSSION

The SHWT level was not encountered in the test pits performed for this study. According to the BMP Manual with regards to stormwater design of subsurface detention basins, any component of the basin, including piping and bedding material, must be a minimum of one (1) foot above the SHWT at each proposed basin location.

EPDS recommends that if conflicts to the findings presented in this report are encountered during the design phase of the stormwater management basins, then monitoring wells should be considered for installation within the planned basin locations to more accurately determine the SHWT levels. If monitoring wells are installed within the planned basin locations, we recommend the geotechnical engineer performing the evaluations report the results of their findings to EPDS.

8. LIMITATIONS

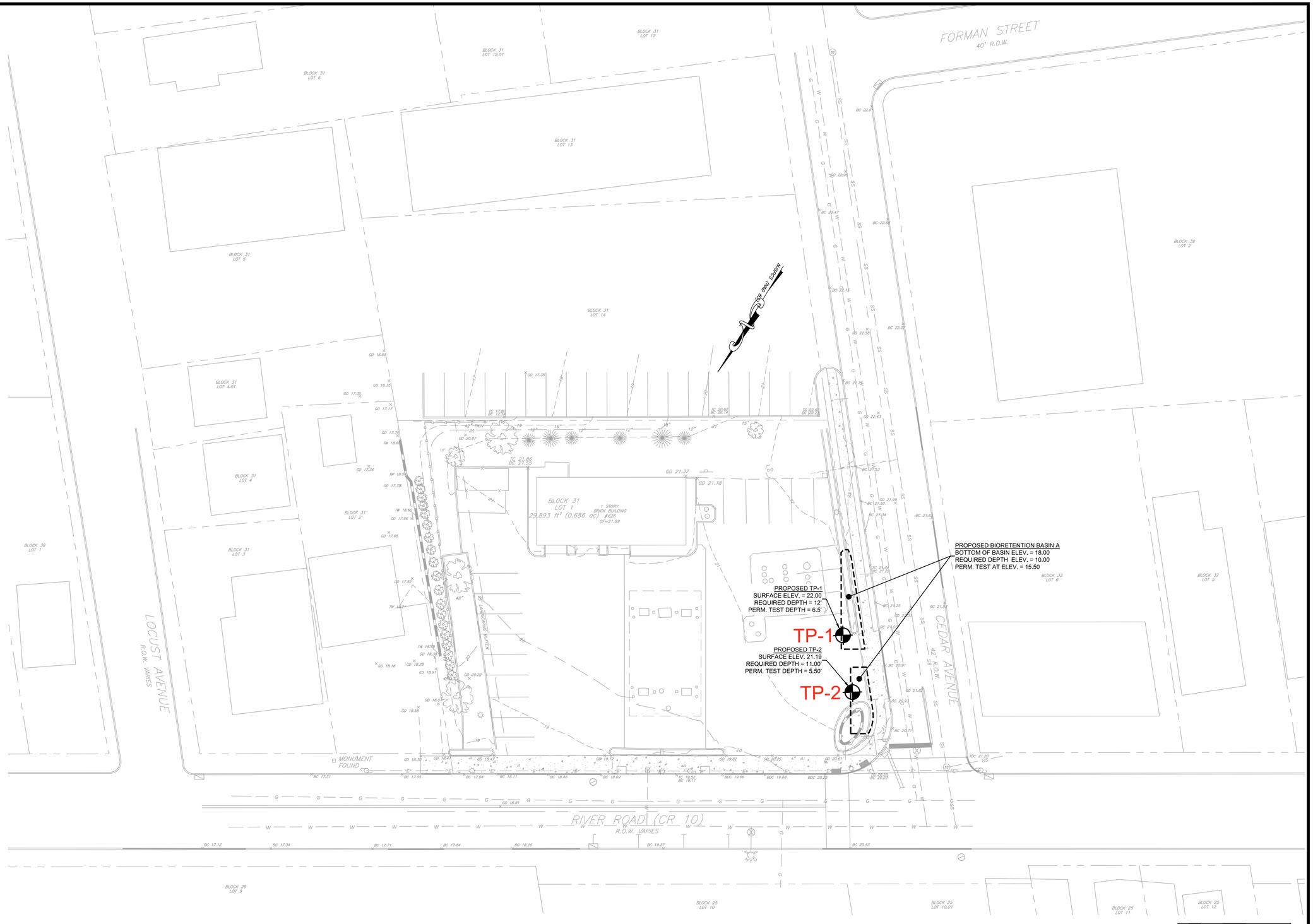
The work performed for the proposed project site by EPDS, and presented in this report, was performed strictly to determine the estimated average seasonal high-water levels (SHWL). This report is not a structural assessment of the geotechnical properties of the soils encountered, nor is it an environmental assessment. No assumptions shall be made other than stated here-in. The recommendations included in this report are contingent upon actual field conditions during construction and may change. EPDS should be notified by the excavation contractor if field conditions differ than observed in this report.

APPENDIX “A”
Test Pit Location Plan

LEGEND

EXISTING

- 124 — EXIST. 1ft COUNTOUR LINE
- 125 — EXIST. 5ft CONTOUR LINE
- W — EXIST. POTABLE WATER LINE
- SS — EXIST. SANITARY SEWER LINE
- G — EXIST. GAS LINE
- E — EXIST. ELECTRIC LINE
- "E" — EXIST. OVERHEAD ELECTRIC LINE
- EXIST. FENCE LINE
- EXIST. CURB LINE
- EXIST. TREE LINE
- EXIST. CONC. SIDEWALK
- PROPERTY BOUNDARY LINE
- PRIMARY BUILDING SETBACK LINE
- EXIST. STORM PIPE
- TC 100.50 GD 100.00 — EXIST. SPOT ELEVATION
- EXIST. FIRE HYDRANT
- EXIST. SIAMESE CONNECTION
- EXIST. LIGHT POLE
- EXIST. "B" INLET
- EXIST. UTILITY POLE
- EXIST. MANHOLE
- EXIST. "A" OR "E" INLET



SCALE: 1" = 20'

NO.	REVISIONS	DATE	BY

THIS WORK PREPARED UNDER MY IMMEDIATE SUPERVISION

BRADFORD J. ALLER
PROFESSIONAL ENGINEER

5/19/21
DATE

N.J.P.E. LIC. NO. GE 43435

DRAWN BY: YMS	CHECKED BY: PRL
DATE: 5/19/21	SCALE: 1" = 20'
APPROVED BY: BJA	ACAD NO.: 201-TP
FIELD BOOK: *** PAGE: ***	PROJECT NO.:
SHEET 1 OF 1	DRAWING NO. 201-TP
	REVISION

EP DESIGN SERVICES, LLC
State of New Jersey Certificate of Authorization #: 24GA28126500
2901 Hamilton Boulevard
South Plainfield, New Jersey 07080
(908) 205-0443 Fax: (908) 755-3272

PROPOSED TEST PIT LOCATION PLAN

M&M REALTY PARTNERS AT FAIR HAVEN, LLC

FOR

BLOCK 31, LOT 1

BOROUGH OF FAIR HAVEN

MONMOUTH COUNTY NEW JERSEY

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File: H:\Engineering\Projects\Commercial\Fair Haven Block(03) Reports\(01) Stormwater Mgmt\Test Pit Plan\201-TP.dwg, ---, Layout1

APPENDIX “B”
Test Pit Logs

EP Design Services, LLC

Record of Subsurface Exploration

Project:	M&M Realty Partners at Fair Haven			Project Number:	N/A		
Location:	Fair Haven, NJ			Reviewed By:	Brad Aller, PE		
Surface EL (Ft):	22.10	Start Date:	6/9/2021	Water Depth/EL mls (ft.) / fbgs:		Estimated Seasonal High Groundwater Depth and Elevation	
SWB EL (Ft):	18.00	End Date:	6/9/2021	During Excav.:	NE		
Termination EL (Ft):	9.10	Logged By:	J. Martelli	At Completion:	NE	Ft. BGS:	NE
Test Pit Location:	Basin A	Contractor:	EPX			EL (Ft.):	NE
Test Method:	Excavate	Equipment:	CAT 316				

Sample Information		Depth (ft.)	USCS Symbol	Material Description and Identification	Remarks
Depth (in.)	Sample No.				
		0		5 in. of Asphalt over 4 in. of stone subbase — 9 In.	
16	S-1	1	FILL	7.5 YR 4/4, Brown Sand, Angular Blocky, Moist, Friable	
		2			Asphalt fragments to 36 In.
				36 In.	
36	S-2	3	SP	7.5 YR 4/4, Brown Sand, Angular Blocky, Moist, Friable	
48	S-3	4		- Loose at 48 In.	
		5		- Friable at 60 In.	Partial collapse at 5 Ft.
		6			
		7			Infil. testing at 6.5 Ft.
90	S-4	8		- 10 YR 3/3 Dark Brown layer at 7.5 Ft.	
				- 10 YR 6/8 Brownish Yellow at 8.5 Ft.	
108	S-5	9			
		10			
		11			
		12			
				156 In.	
		13		Test Pit terminated at 13.0 Ft. at EL 9.10	
		14			
		15			

NOTES:
NE: Not Encountered
BGS: Below Ground Surface
In.: Inch
Ft.: Feet
EL: Elevation
SWM: Stormwater Management
EASHWT: Estimated Average Seasonal High Water Table
▽ : Observed Ground Water Level
▼ : EASHWT

EP Design Services, LLC

Record of Subsurface Exploration

Project:	M&M Realty Partners at Fair Haven			Project Number:	N/A		
Location:	Fair Haven, NJ			Reviewed By:	Brad Aller, PE		
Surface EL (Ft):	21.79	Start Date:	6/9/2021	Water Depth/EL mls (ft.) / fbgs:		Estimated Seasonal High Groundwater Depth and Elevation	
SWB EL (Ft):	18.00	End Date:	6/9/2021	During Excav.:	NE		
Termination EL (Ft):	8.79	Logged By:	J. Martelli	At Completion:	NE	Ft. BGS:	NE
Test Pit Location:	Basin A	Contractor:	EPX			EL (Ft.):	NE
Test Method:	Excavate	Equipment:	CAT 316				

Sample Information		Depth (ft.)	USCS Symbol	Material Description and Identification	Remarks
Depth (in.)	Sample No.				
		1	FILL	5 in. of Asphalt over 4 in. of stone subbase 9 In. 7.5 YR 4/6, Strong Brown Sand, Angular Blocky, Moist, Friable	
14	S-1	2		24 In. 7.5 YR 4/4, Brown Sand, Angular Blocky, Moist, Friable	2 In. dia. electrical - conduit at 16 In.
37	S-2	3			Partial collapse at 3 Ft.
		4		- Loose at 28 In.	
60	S-3	5		- 10 YR 5/6 Brownish Yellow, Friable at 5 Ft.	
		6			Infil. testing at 5.5 Ft.
		7	SP	- Loose at 48 In.	
		8			
		9			
		10			
		11			
		12			
		13		156 In. Test Pit terminated at 13.0 Ft. at EL 8.79	
		14			
		15			

NOTES:
NE: Not Encountered
BGS: Below Ground Surface
In.: Inch
Ft.: Feet
EL: Elevation
SWM: Stormwater Management
EASHWT: Estimated Average Seasonal High Water Table
▽ : Observed Ground Water Level
▼ : EASHWT

G. GROUNDWATER MOUNDING ANALYSIS

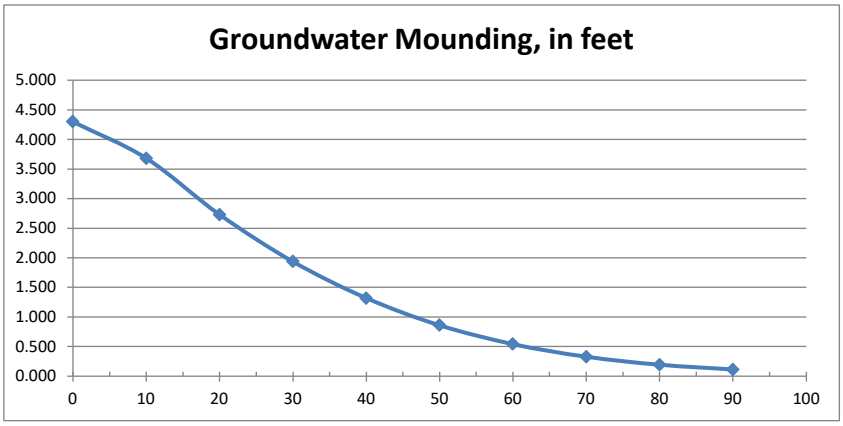
Input Values

8.00	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
40.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
8.000	x	1/2 length of basin (x direction, in feet)
54.500	y	1/2 width of basin (y direction, in feet)
4.50	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

14.300	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
4.300	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
4.300	0
3.682	10
2.727	20
1.936	30
1.318	40
0.860	50
0.539	60
0.326	70
0.191	80
0.109	90

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

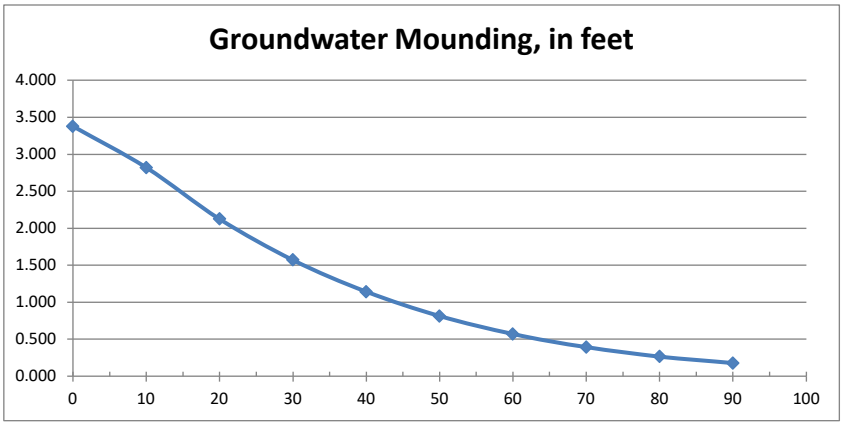
Input Values

8.00	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
40.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
6.000	x	1/2 length of basin (x direction, in feet)
33.500	y	1/2 width of basin (y direction, in feet)
7.08	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

13.376	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.376	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.376	0
2.820	10
2.124	20
1.570	30
1.139	40
0.812	50
0.568	60
0.390	70
0.264	80
0.176	90

Re-Calculate Now



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H. EXISTING AND PROPOSED DRAINAGE AREA MAPS

LEGEND

PROPOSED

- PROP. 1ft COUNTOUR LINE (123)
- PROP. 5ft CONTOUR LINE (125)
- PROP. POTABLE WATER LINE (W)
- PROP. SANITARY SEWER LINE (SS)
- PROP. GAS LINE (G)
- PROP. ELECTRIC LINE (E)
- PROP. OVERHEAD ELECTRIC LINE (*E*)
- PROP. FENCE LINE (X—X)
- PROP. CURB LINE
- PROP. TREE LINE
- PROP. STORM PIPE
- PROP. CONCRETE SIDEWALK
- PROP. SPOT ELEVATION (TC100.00 BC 100.00)
- PROP. FIRE HYDRANT
- PROP. SIAMESE CONNECTION
- PROP. LIGHT POLE
- PROP. "B" INLET
- PROP. UTILITY POLE
- PROP. MANHOLE
- PROP. "A" OR "E" INLET

EXISTING

- EXIST. 1ft COUNTOUR LINE (124)
- EXIST. 5ft CONTOUR LINE (125)
- EXIST. POTABLE WATER LINE (W)
- EXIST. SANITARY SEWER LINE (SS)
- EXIST. GAS LINE (G)
- EXIST. ELECTRIC LINE (E)
- EXIST. OVERHEAD ELECTRIC LINE ("E")
- EXIST. FENCE LINE
- EXIST. CURB LINE
- EXIST. TREE LINE
- EXIST. CONC. SIDEWALK
- PROPERTY BOUNDARY LINE
- PRIMARY BUILDING SETBACK LINE
- EXIST. STORM PIPE
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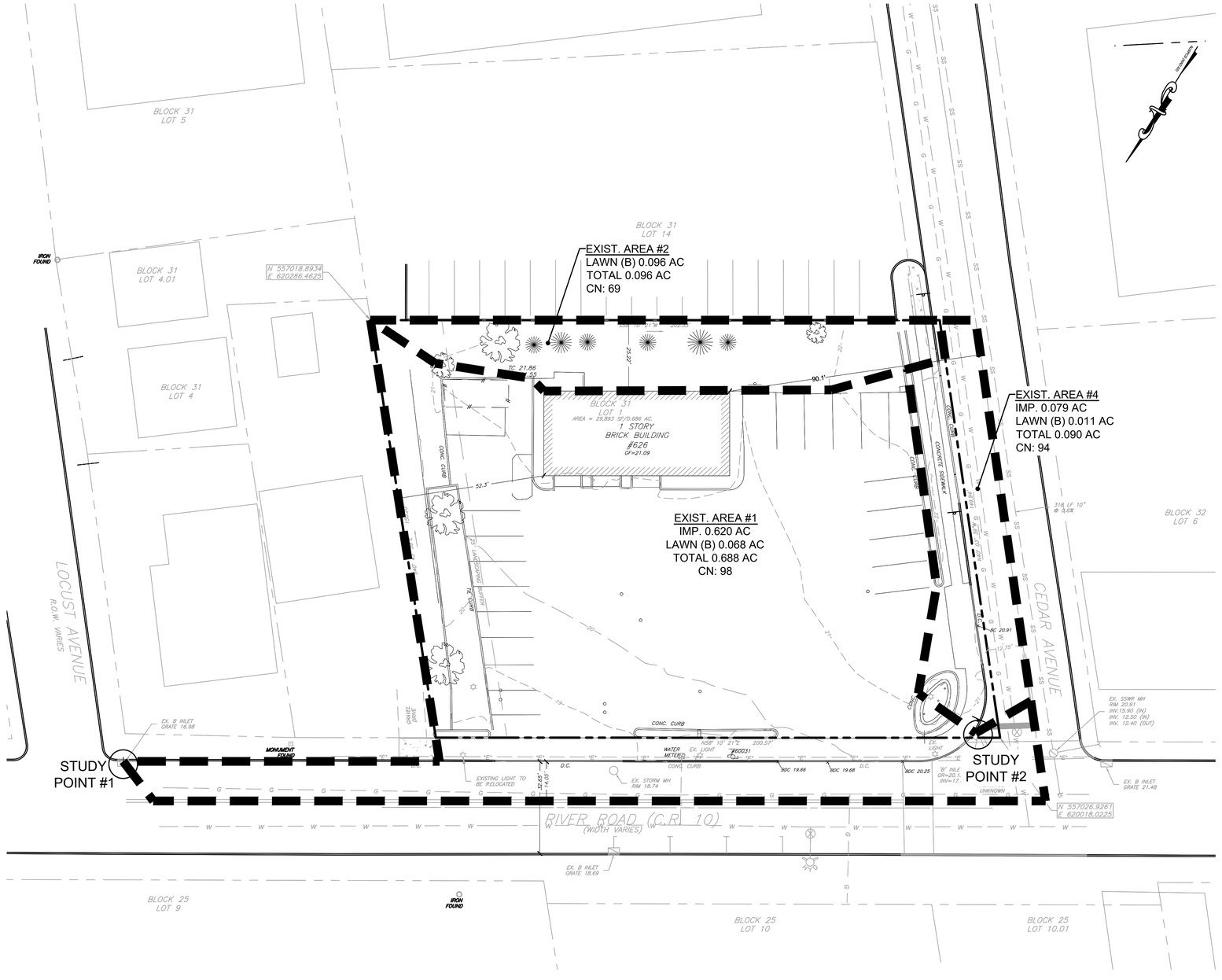

10' 0 10' 20' 40'

SCALE: 1" = 20'

NO.	REVISIONS	DATE	BY

THIS WORK PREPARED UNDER MY IMMEDIATE SUPERVISION
BRADFORD J. ALLER
PROFESSIONAL ENGINEER
7/16/21
DATE
N.J.P.E. LIC. NO. GE 43435

DRAWN BY: YMS	CHECKED BY: PRL		
DATE: 7/16/21	SCALE: 1"=20'		
APPROVED BY: BJA	ACAD NO.: SWM-1		
FIELD BOOK: *** PAGE: **	PROJECT NO.: --		
SHEET: 1 OF 2	DRAWING NO.: SWM-1	REVISION: --	

EP DESIGN SERVICES, LLC
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EXISTING DRAINAGE AREA MAP
INVESTORS SAVINGS BANK
FOR
BLOCK 31, LOT 1
BOROUGH OF FAIR HAVEN

MONMOUTH COUNTY NEW JERSEY

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LEGEND

PROPOSED

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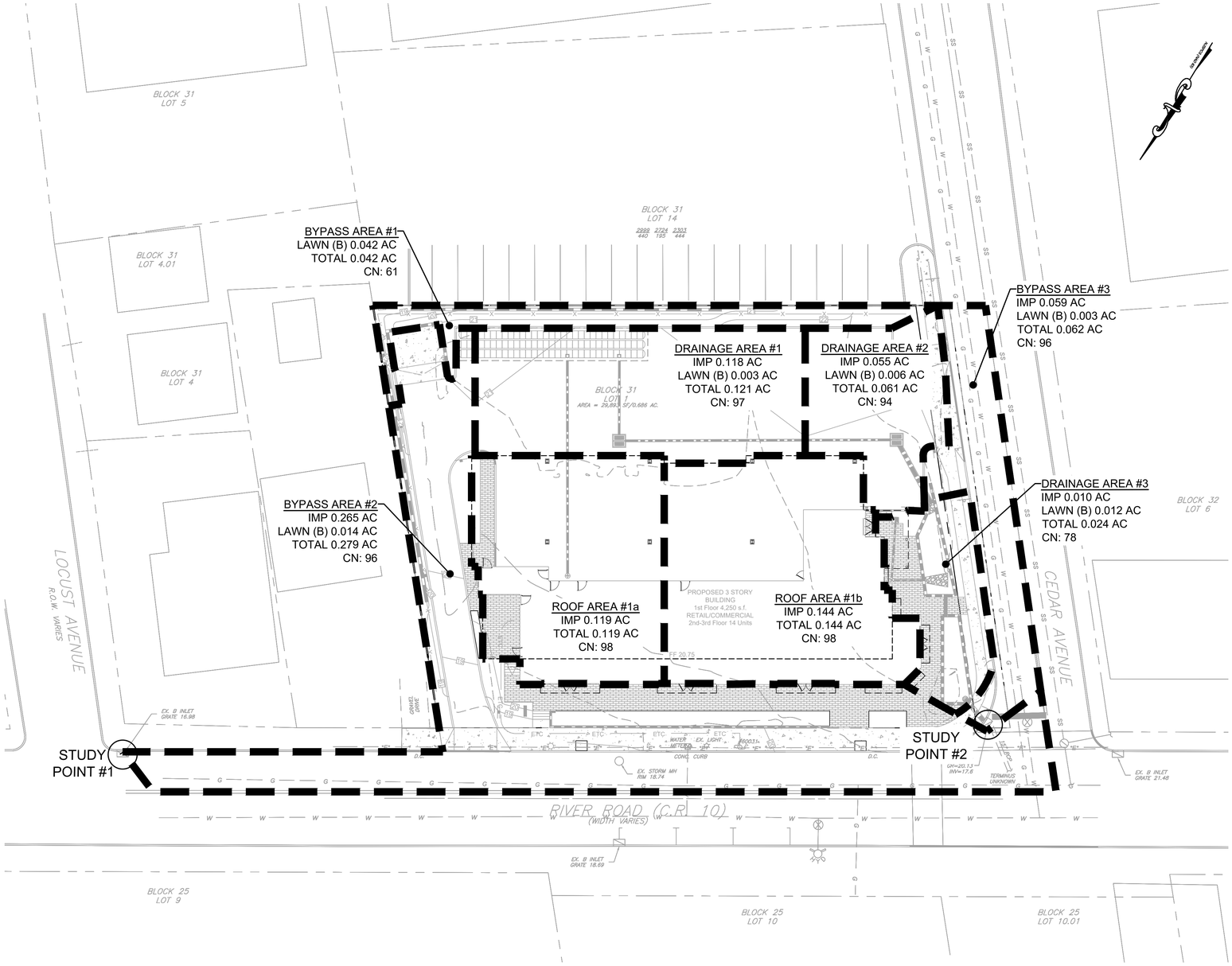
- EXIST. POTABLE WATER LINE (W)
- EXIST. SANITARY SEWER LINE (SS)
- EXIST. GAS LINE (G)
- EXIST. ELECTRIC LINE (E)
- EXIST. OVERHEAD ELECTRIC LINE (*E*)
- EXIST. FENCE LINE
- EXIST. CURB LINE
- EXIST. TREE LINE
- EXIST. CONC. SIDEWALK
- PROPERTY BOUNDARY LINE
- PRIMARY BUILDING SETBACK LINE
- EXIST. STORM PIPE
- EXIST. SPOT ELEVATION (TC100.00 BC 100.00)
- EXIST. FIRE HYDRANT
- EXIST. SIAMESE CONNECTION
- EXIST. LIGHT POLE
- EXIST. "B" INLET
- EXIST. UTILITY POLE
- EXIST. MANHOLE
- EXIST. "A" OR "E" INLET



10' 0 10' 20' 40'

SCALE: 1" = 20'

NO.	REVISIONS	DATE	BY

THIS WORK PREPARED UNDER MY IMMEDIATE SUPERVISION
BRADFORD J. ALLER
PROFESSIONAL ENGINEER
7/16/21
DATE
N.J.P.E. LIC. NO. GE 43435

DRAWN BY: YMS	CHECKED BY: PRL
DATE: 7/16/21	SCALE: 1"=20'
APPROVED BY: RCA	ACAD NO.: SWM-2
FIELD BOOK: *** PAGE: **	PROJECT NO.: --
SHEET: 2 OF 2	DRAWING NO.: SWM-2
	REVISION: --

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PROPOSED DRAINAGE AREA MAP
INVESTORS SAVINGS BANK
FOR
BLOCK 31, LOT 1
BOROUGH OF FAIR HAVEN

MONMOUTH COUNTY NEW JERSEY

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