

STORMWATER MANAGEMENT REPORT

Prepared for:

Proposed Retail Store

Block 157, Lot 5
471 Mount Pleasant Avenue

Township of West Orange
Essex County, New Jersey

Prepared by:



N.J. Certificate of Authorization 24GA28161700

30 Independence Blvd., Suite 200
Warren, NJ 07059
908-668-8300

BENJ File No. NJA230139.00

Tung-To Lam, P.E.
New Jersey Professional Engineer License No. 47863

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1. Introduction

The subject property is located at 457 Mount Pleasant Avenue in the Township of West Orange, Essex County, New Jersey. The property is identified as Block 157, Lot 5 on the Township of West Orange tax maps and is a total of 3.71 acres in size and will hereafter be referred to as “the site”. The site is bordered to the north by Mount Pleasant Place with residential properties and a Township Fire Department building beyond; to the east by residential properties and Mount Pleasant Place, to the west by Exxon Gas Station, the Rahway River, Pleasant Valley Way, and Trojan Self Storage with residential properties beyond; and to the south by Mount Pleasant Ave with Francis A. Byrne golf course beyond. A tax map and aerial map are included at the beginning of Appendix F for reference.

The site is currently an existing shopping center within the B-2 Zone. The proposed development consists of converting the existing florist footprint within the shopping center to a proposed retail store with ancillary sidewalks and parking reconfiguration. While this project proposes a decrease in total impervious surface, an increase less than 0.25 acres of regulated motor vehicle surface area, and disturbs less than 1 acre, this project is a major development due to the Township of West Orange Ordinance 2918-25, adopted May 20, 2025.

Based on the Township Ordinance, a “Major Development” means an individual “development,” including redevelopment, as well as multiple developments that individually or collectively result in:

1. The disturbance of 0.5 acres of land since February 2, 2004.
2. The creation of 5,000 SF or more of “regulated impervious surface” since February 2, 2004.
3. The creation of 5,000 SF or more of “regulated motor vehicle surface” since March 2, 2021, or
4. A combination of 2 and 3 above that totals an area of 5,000 SF or more. The same surface shall not be counted twice when determining if the combination area equals one-quarter acre or more.

The proposed project will disturb more than 0.5 acres of land and create more than 5,000 SF of regulated motor vehicle surface. Therefore, the proposed project will be required to comply with the Township requirements for water quality and quantity treatment. The site is previously disturbed and located in Planning Area-1, therefore recharge requirements will not apply.

This report summarizes the design objectives, methodology, and calculations for the conveyance, attenuation, and discharge of stormwater runoff leaving the site and is meant to accompany the Site Plan documents prepared by Bohler. Pre-development and post-development conditions are examined for analysis of the stormwater quantity, water quality, and groundwater recharge based on the *NJDEP Stormwater Management Regulations (NJAC 7:8)* and soil erosion and sediment control based on *The Standards for Soil Erosion and Sediment Control in New Jersey*.

2. Stormwater Management Design Methodology

In accordance with the *NJDEP Stormwater Management Regulations*, the proposed development must meet the requirements, if appropriate, for stormwater quantity reductions, water quality, groundwater recharge, etc. The assessment of stormwater runoff has been based upon the Soil Conservation Service Method (SCS) Unit Hydrograph as described in Chapters 7, 9, 10, 15 and 16, Part 630 Hydrology, National Engineering Handbook (NEH) (previously described in Technical

Release Number 55 (TR55), “Urban Hydrology for Small Watersheds”). Theoretical storms are modeled with the 24-Hour SCS Unit Dimensionless Hydrograph using the NOAA Atlas 14 Type D rainfall distribution and recurrence intervals of 2, 10, and 100 years. Hydrograph creation and routings are accomplished using the HydroCAD stormwater modeling program by HydroCAD Software Solutions, LLC.

2.1 Rainfall Data

Rainfall data used in the stormwater calculations of this report are obtained from different sources based on the latest NJ stormwater management regulations (NJAC 7:8). The Water Quality storm event is based on the NJ BMP Manual Chapter 5 definition of having a total rainfall depth of 1.25 inches and a total duration of two (2) hours. Twenty-four-hour rainfall frequency data in Essex County for all other storms has been obtained from the Engineering Field Handbook NJ Supplement last revised August 2012 (developed from data contained in NOAA Atlas 14 Volume 2). Per amended NJ stormwater management regulations dated July 17, 2023 the precipitation depths for the 2-, 10-, and 100-year storm events are determined using adjustment factors applied to the NOAA Atlas 14 rainfall estimates. The rainfall depth values used in this project are listed in Table 2.1 and 2.2.

TABLE 2.1 – Current Adjusted, 24-Hour Rainfall Frequency Data

Event (year)	2	10	100
NOAA Atlas 14 Rainfall (inches)	3.44	5.22	8.66
Adjustment Factor	1.01	1.03	1.06
Current Adjusted Rainfall (inches)	3.47	5.38	9.18

TABLE 2.2 – Future Adjusted, 24-Hour Rainfall Frequency Data

Event (year)	2	10	25**	100
NOAA Atlas 14 Rainfall (inches)	3.44	5.22	6.44	8.66
Adjustment Factor	1.19	1.22	1.25	1.33
Future Adjusted Rainfall (inches)	4.09	6.37	8.02	11.52

** NJAC 7:8 does not contain adjustment factors for the 25-year storm. The factors listed have been obtained from NJ Extreme Precipitation Projection Tool (<https://njprojectedprecipitationchanges.com/>) in order to estimate the increased rainfall.

2.2 Site Soils

Site soil information has been obtained from the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey database. The soil types present within the studied watershed are shown in Table 2.2. The soils consist of hydrologic soil group (HSG) Type A, therefore the CN values used in calculations are those associated with Type A soils.

TABLE 2.3 - Site Soil Properties

Soil Symbol	Soil Name	Characteristics	Hydrologic Soil Group Rating
DunC	Dunellen Sandy Loam	8-15% slopes	A
DuuB	Dunellen – Urban land	0-8% slopes	A

2.3 Curve Numbers

For determining the runoff flows, the cover types in combination with the HSG rating must be determined for each drainage area. These are used to determine the runoff curve number (CN) values that are used in the hydraulic calculations. The CN values used in this project are listed in Table 2.3.

TABLE 2.4 - CN Values

Land Cover Description	HSG A
Open space, Good Condition (grass cover >75%)	39
Impervious Surfaces	98

2.4 Time of Concentration

The time of concentration (Tc) is calculated in accordance with Chapter 15 of the NRCS National Engineering Handbook and has been calculated separately for the pervious and impervious areas within each drainage area. Where there is a long stretch of sheet flow in the proposed condition, the McCuen-Spiess formula is used to determine the appropriate length, not to exceed 100 feet. McCuen-Spiess sheet flow length calculations are provided in the beginning of Appendix A, and full Tc calculations for each drainage area can be found in the HydroCAD summaries in Appendix A.

3. Pre-Development Site Conditions

The studied watershed area is a total of 1.96 acres in size and consists of one unique drainage areas: Existing Drainage Area EDA 1A, which is described in more detail below. In the pre-development condition, the site is an existing florist shop within a shopping center with associated

parking. Currently, the runoff generated on site outfalls to the Rahway River along the western property line via overland flow. The Existing Drainage Area Map in Appendix F illustrates the limits of the existing drainage area and how it relates to the existing site conditions.

3.1 Point of Analysis #1

The existing drainage area flows to Point of Analysis #1 located along the western property line. The Existing Drainage Area Map in Appendix F illustrates the identified point of analysis and how it relates to the existing topography on the site.

3.1.1 Existing Drainage Area #1

Existing Drainage Area #1 contains 1.96 acres of land, of which 1.93 acres are impervious surface, and includes the portion of the existing site and building on which improvements are proposed. The portion of the shopping center which will not be disturbed is excluded from this analysis. The topography of the area slopes from east to west from a maximum elevation of approximately 378 to a minimum elevation of approximately 360 with slopes ranging from approximately 1% to 66%. The runoff from Existing Drainage Area #1 flows from east to west and ultimately discharges to Point of Analysis #1.

4. Post-Development Site Conditions

The post-development condition for the site includes the repurposing of the existing florist space to a proposed retail store with parking reconfiguration, sidewalks, stormwater infrastructure, and other site improvements. The proposed site is designed in a manner that generally maintains the existing drainage patterns. The studied watershed area in the post-development condition contains the same 1.96-acre area that was studied in the pre-development condition and consists of 1 unique drainage area: Proposed Drainage Area PDA 1A, which is described in more detail below.

A proposed stormwater conveyance system will collect the runoff from the proposed building and impervious areas via pervious pavement, an inlet, manholes, and stormwater piping and redirect it to the pervious pavement system and ultimately the existing inlet located along Mount Pleasant Place. The construction of the proposed improvements will disturb approximately 0.65 acres of land and will result in a reduction of approximately 0.07 acres of impervious coverage on the site in the post-development condition. The Proposed Drainage Area Map in Appendix F illustrates the limits of the proposed drainage area and how it relates to the proposed site conditions

4.1 Point of Analysis #1

The drainage area in the post development condition flows to the same Point of Analysis #1 identified in the existing condition, located along the western property line. The proposed runoff to Point of Analysis #1 meets the stormwater management criteria set forth in *NJDEP Stormwater Management Regulations* by having the post-construction hydrograph not exceed the pre-construction hydrograph at any point for the two-, 10-, and 100-year storm events. Refer to Section 4.3 Stormwater Quantity Controls for a summary of the pre-construction, allowable, and post-construction flows.

4.1.1 Proposed Drainage Area #1

Proposed Drainage Area #1 consists of approximately 1.96 acres of land, of which 1.87 acres are impervious surface, and includes the proposed portion of the building to be repurposed for retail, parking fields, sidewalks, driveways, and stormwater infrastructure. The drainage area also contains grass and landscape areas. The runoff from Proposed Drainage Area #1 flows to Rahway River, and the existing inlet along Mount Pleasant Place, which ultimately reaches Point of Analysis #1.

4.2 Stormwater Quantity Controls

The following stormwater quantity standard technique from the *NJDEP Stormwater Management Regulations* is being applied to the drainage area as noted in Section 4.1:

1. For stormwater runoff leaving the site, the post-development runoff hydrographs for the current and future/projected 2-, 10-, and 100-year storms do not exceed, at any point in time, the pre-development runoff hydrographs for the same storm events. This technique will be applied to drainage areas that, under proposed conditions, will remain unchanged or have a net decrease in impervious coverage.

**Table 4.1 - Point of Analysis #1 Existing vs. Proposed Comparison
Current Adjusted Precipitation Depths**

(Add tables for additional drainage areas as required)

	Existing Peak Flow	Proposed Peak Flow
	CFS	CFS
2-Year Storm	6.36	5.78
10-Year Storm	9.92	9.16
100-Year Storm	16.99	15.85

See Appendix A for Comparison Hydrographs.

**Table 4.2 - Point of Analysis #1 Existing vs. Proposed Comparison
Future Adjusted Precipitation Depths**

	Existing Peak Flow	Proposed Peak Flow
	CFS	CFS
2-Year Storm	7.52	6.91
10-Year Storm	11.76	10.89
100-Year Storm	21.36	20.04

See Appendix B for Comparison Hydrographs.

4.3 Water Quality Controls

As stated in the NJDEP Stormwater Management Regulations, the stormwater runoff quality standards are applicable when the development proposes an increase of one-quarter acre (10,890 square-feet) or more of regulated motor vehicle surfaces. The proposed development of the site will result in 0.18 acres (7,999 square-feet) of new motor vehicle surfaces. However, based on the West Orange Township Ordinance 2918-25 mentioned above in Section 1, 80% of the total suspended solids (TSS) must be removed for the net increase in motor vehicle surface. In order to satisfy this requirement, a pervious pavement system is proposed to treat 0.27 AC (11,639 SF).

Motor Vehicle Surface Areas on site:

Existing Motor Vehicle Surface Area: 1.96 Acres

Proposed Motor Vehicle Surface Area: 2.14 Acres

Net Increase in Motor Vehicle Surface Area: 2.14 Acres – 1.96 Acres = 0.18 Acres

Required:

Net Increase in Motor Vehicle Surface Area – 80% TSS Removal Treatment required

$[80\% (0.18 \text{ Acres})] / 2.14 \text{ Acres} = 6.72\%$

Proposed:

$[80\% (0.27 \text{ Acres})] / 2.14 \text{ Acres} = 10.09\%$

10.09% Weighted Proposed TSS Removal Rate > 6.72% Required TSS Removal Rate

As calculated the proposed weighted TSS removal rate is greater than the required rate; the project, as designed, meets the water quality requirement for the proposed development.

4.3.1 Pervious Paving Systems

Pervious paving materials have been proposed as part of the overall site design and stormwater management system to reduce the impervious surface on site, provide 80% TSS removal for motor vehicle surfaces, and reduce the flow of runoff. The pervious paving systems have been designed to have a maximum ratio of additional inflow area to the pavement surface area of less than 3:1, a maximum surface slope of 5%, a storage bed that fully contains the water quality design storm runoff volume, and to discharge the design storm within 72 hours of a rain event.

5. Table 4.3 - Pervious Paving Systems Summary

Pervious Paving System #	1
Pervious Area (Acres)	0.20
Additional Drainage Area (Acres)	0.07
Drainage Area Ratio	0.35:1
Surface Slope (%)	2
Underdrain Size (Inches)	6
Drain Time (Hours)	0.9 (WQ) 9.4 (100-Year Future Adj. Storm)

5.1 Groundwater Recharge

The subject site has been previously developed and is located within the Metropolitan Planning Area (PA1). As such, the site falls under the NJDEP's definition for an urban redevelopment area and this project will result in a decrease in impervious surfaces. Additionally, the site is a known contaminated site with soil and groundwater contamination that exceed NJDEP standards. Due to the conditions described above, no groundwater recharge is proposed as part of the stormwater management facilities on site.

5.2 Soil Erosion and Sediment Control

The Soil Erosion and Sediment Control plans and details are included within the Site Plan documents prepared by Bohler and must be followed throughout construction. Silt fences, stabilized construction entrances, temporary stockpile and inlet filters are proposed during construction. This report and the Site Plan documents prepared by Bohler are being submitted to the Hudson Essex Passaic Soil Conservation District for approval.

5.3 Low-Impact Development and Non-Structural Stormwater Management Facilities

In accordance with the NJDEP regulations (NJAC 7:8-2.4) and the latest *New Jersey Stormwater Best Management Practices Manual*, several non-structural stormwater management strategies have been incorporated into the design of the site and are listed below:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.

The footprint of the improvements has been minimized to the previously improved and/or disturbed areas. The majority of the existing wooded areas remain undisturbed. Stormwater runoff will be discharged in a similar manner of existing conditions. Riparian zone and wetland disturbance has been minimized to continue providing water quality benefits.

2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.

The overall impervious coverage is reduced by 0.07 AC. As part of the proposed site design, the minimum allowable parking and drive aisle sizes, in accordance with local ordinances, are used in lieu of larger stalls and aisles to reduce the amount of impervious surface in the post-development condition. Additionally, Pervious pavement is proposed in a portion of the parking lot.

3. Maximize the protection of natural drainage features and vegetation.

The footprint of the improvements has been minimized to the previously developed area. All of the existing wooded areas remain undisturbed. Stormwater runoff will be discharged in a similar manner of existing conditions. Riparian zone and wetland disturbance has been minimized to continue providing water quality benefits. Soil erosion measures are proposed to be utilized during construction to protect the adjoining riparian zones, wetlands, tributary corridors, and undisturbed vegetation.

4. Minimize the decrease in the "time of concentration" from pre-construction to postconstruction.

Pervious pavement has been included within the project's stormwater design to achieve maximized times of concentration. Unretained stormwater runoff from the remaining portion of the site will flow over the parking lot to the Rahway River as it does in existing conditions. The portions of the site where mill and overlay is proposed has been designed to match existing grade as closely as possible to avoid changing the existing flow paths and times of concentration.

5. Minimize soil compaction.

The project is located in Planning Area 1 (PA-1) therefore soil compaction is not required.

6. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.

A comprehensive landscape plan has been incorporated into the design of the proposed improvements which includes low maintenance landscaping. The use of lawn areas has been minimized where applicable and fertilizers and pesticides are to be used sparingly. Native plants, including ground cover, shrubs and trees, are proposed. The native plantings will also require little or no irrigation once they are established.

7. Provide other source controls to prevent or minimize the use or exposure of pollutants from development sites in order to prevent or minimize the release of those pollutants into stormwater runoff. These source controls include, but are not limited to:

- i. Development design features that help to prevent accumulation and discharge of trash and debris in drainage systems.

Proposed stormwater inlets have been specified with “eco” type curb pieces indicating the text “Dump No Waste, Drains to Waterways” and trash racks are specified for installation at the outlet control structure. In addition, a “Stormwater Management Facilities Operation & Maintenance Manual” has been prepared for use by contractors and the owners that specify that street sweeping must occur on a bi-monthly schedule. Dumpster areas are proposed throughout the site at key points. A dumpster area exists plan northeast which is to remain, and an additional 10’ X 10’ dumpster is proposed along the easterly side of the building for the proposed retail use.

- ii. Development design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments.

Spills and accumulation of pollutants are not anticipated due to the type of use proposed. However, proposed stormwater management facilities intercept stormwater from the impervious surfaces and the proposed roadways, which will provide a collection point for vehicular pollutants. The proposed pervious pavement will improve water quality from vehicular surfaces by 80%.

- iii. When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.

The soil erosion and sediment control plans address the requirement for establishing vegetation. Preventative source controls include the use of “eco” inlet curb pieces, storm drain inlets, and trash racks on outlet control structures. Pollution prevention techniques such as water quality treatment through infiltration and minimized clearing have been implemented in the design. The soil erosion and sediment control plan addresses re-stabilizing vegetation and implementing soil erosion and sediment control protection measures. Prevention and maintenance are also addressed in the Stormwater Operations and Maintenance Manual prepared for the project.

6. Conclusions

As demonstrated in the above sections, the stormwater management plan for the proposed development meets the current *NJDEP Stormwater Management Regulations and Standards for Soil Erosion and Sediment Control in New Jersey* and *West Orange Township Stormwater Ordinance*, and addresses the requirements for stormwater quantity reductions, water quality, groundwater recharge, and soil erosion and sediment control. As a result of the design calculations contained herein, Bohler anticipates that the stormwater design will not have a negative impact to surrounding areas.

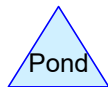
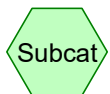
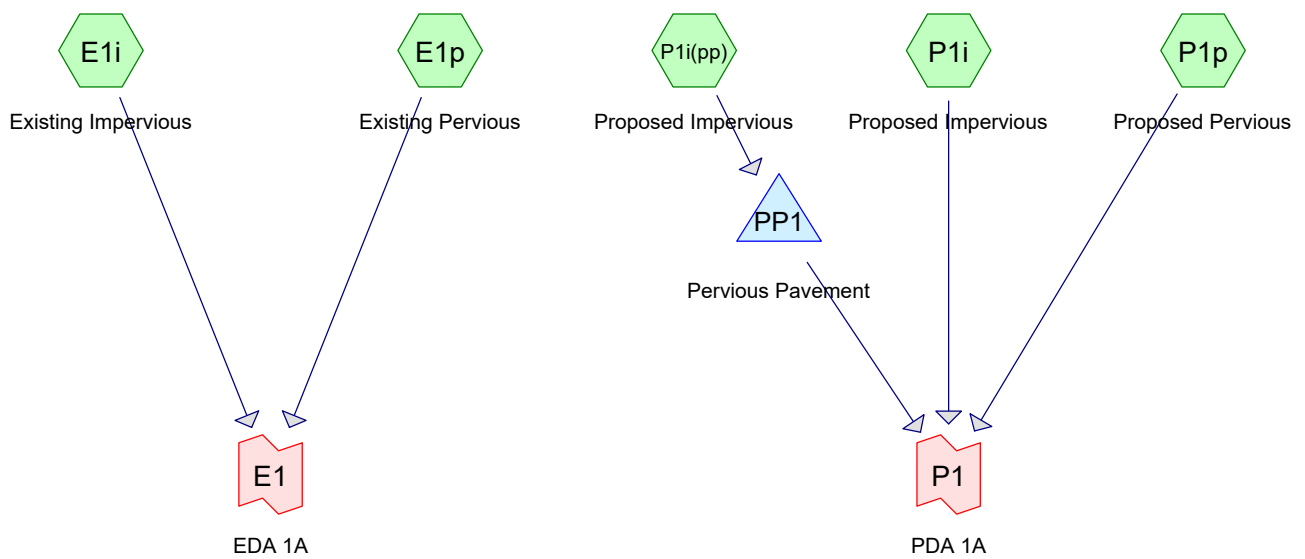
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A. PRE- vs. POST-DEVELOPMENT HYDROGRAPHS

Current Adjusted Precipitation Depths

- ◆ McCuen-Spiess Sheet Flow Length Calculations
- ◆ 2-Year Storm Event
- ◆ 10-Year Storm Event
- ◆ 100-Year Storm Event
- ◆ Pre- vs. Post Comparison

McCuen-Spiess Calcs	Grass (5%)	Pavement (4%)
Max Sheet Flow Length (L)	149.07	1818.18
Slope (S)	0.05	0.04
Manning's Roughness (N)	0.15	0.011



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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	2-Year-Current	NOAA 24-hr	D	Default	24.00	1	3.47	2	3.47
2	10-Year-Current	NOAA 24-hr	D	Default	24.00	1	5.38	2	3.47
3	100-Year-Current	NOAA 24-hr	D	Default	24.00	1	9.18	2	3.47

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,792	39	>75% Grass cover, Good, HSG A (E1p, P1p)
165,528	98	Paved parking, HSG A (E1i, P1i, P1i(pp))
170,320	96	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
170,320	HSG A	E1i, E1p, P1i, P1i(pp), P1p
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
170,320		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
4,792	0	0	0	0	4,792	>75% Grass cover, Good
165,528	0	0	0	0	165,528	Paved parking
170,320	0	0	0	0	170,320	TOTAL AREA

Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=3.24"
Flow Length=441' Tc=3.2 min CN=0/98 Runoff=6.36 cfs 22,675 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=526' Tc=8.6 min CN=39/0 Runoff=0.00 cfs 1 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=3.24"
Flow Length=443' Tc=3.1 min CN=0/98 Runoff=5.27 cfs 18,798 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=3.24"
Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=0.77 cfs 3,172 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=528' Tc=8.5 min CN=39/0 Runoff=0.00 cfs 2 cf

Pond PP1: Pervious Pavement Peak Elev=367.07' Storage=1,436 cf Inflow=0.77 cfs 3,172 cf
Outflow=0.54 cfs 2,148 cf

Link E1: EDA 1A Inflow=6.36 cfs 22,676 cf
Primary=6.36 cfs 22,676 cf

Link P1: PDA 1A Inflow=5.78 cfs 20,948 cf
Primary=5.78 cfs 20,948 cf

Total Runoff Area = 170,320 sf Runoff Volume = 44,648 cf Average Runoff Depth = 3.15"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

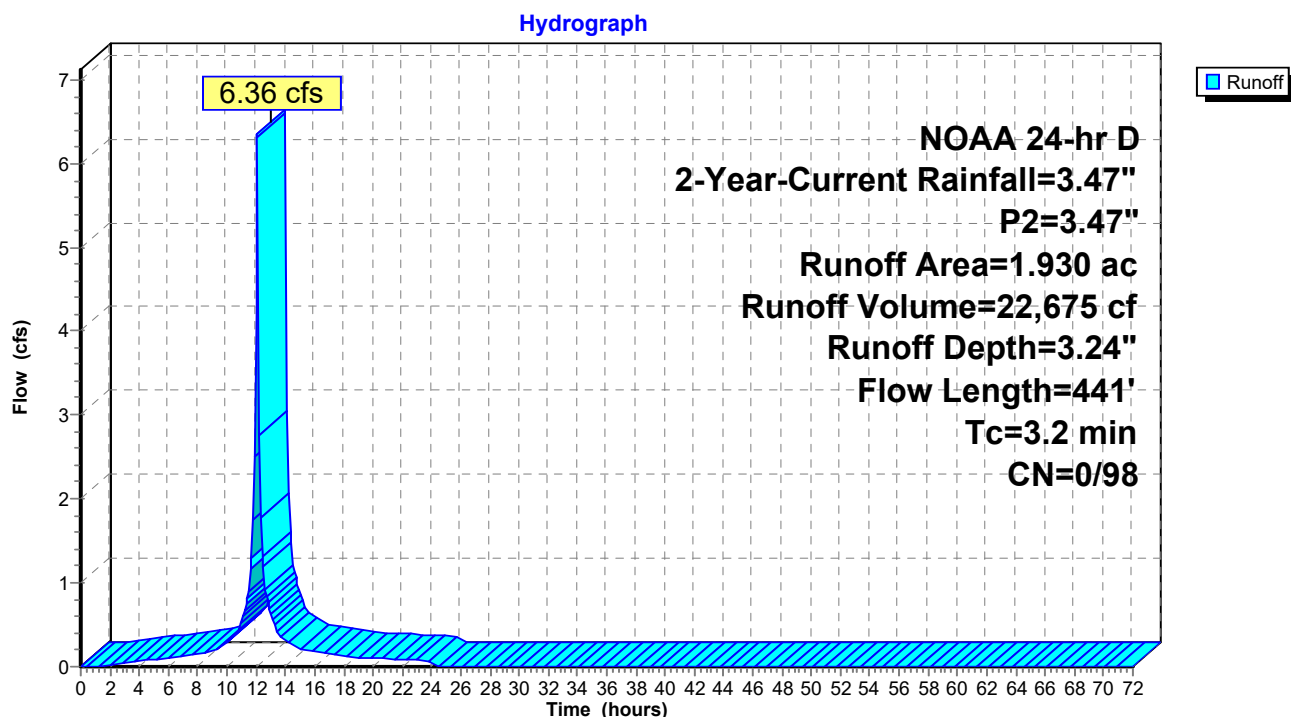
Runoff = 6.36 cfs @ 12.09 hrs, Volume= 22,675 cf, Depth= 3.24"
Routed to Link E1 : EDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Current Rainfall=3.47", P2=3.47"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.2	441	Total			

Subcatchment E1i: Existing Impervious



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 1 cf, Depth= 0.01"
Routed to Link E1 : EDA 1A

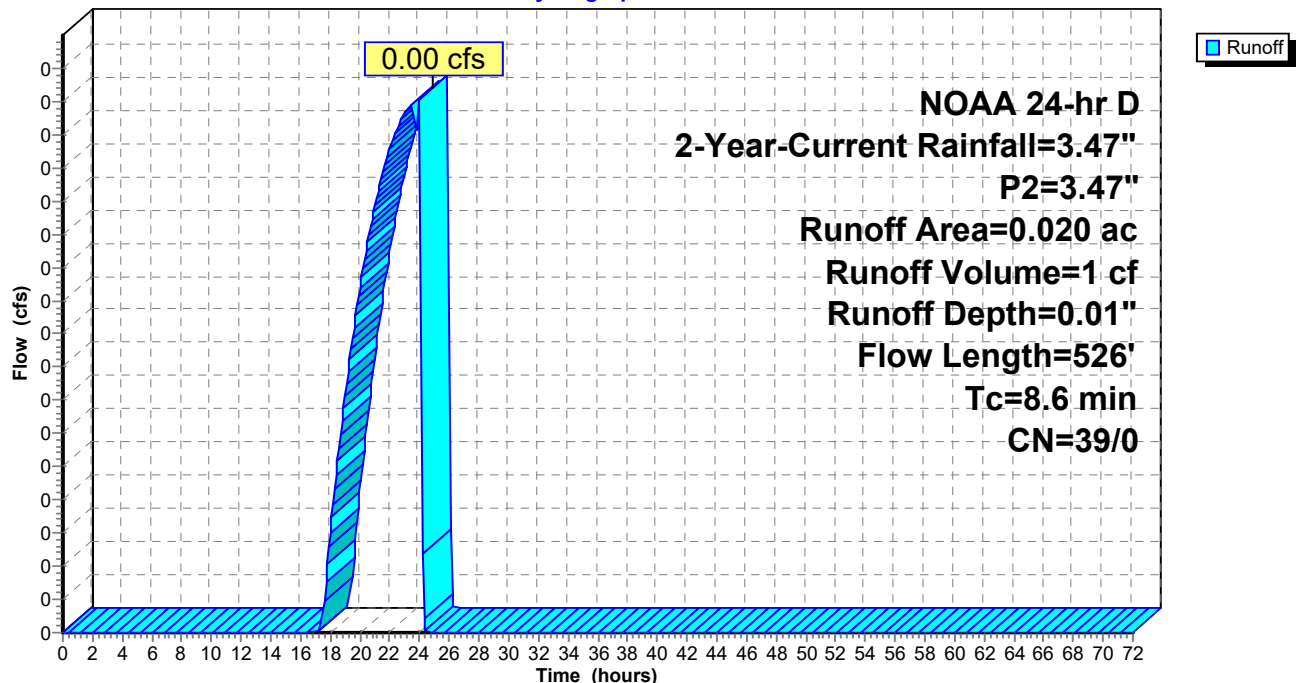
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Current Rainfall=3.47", P2=3.47"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.6	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

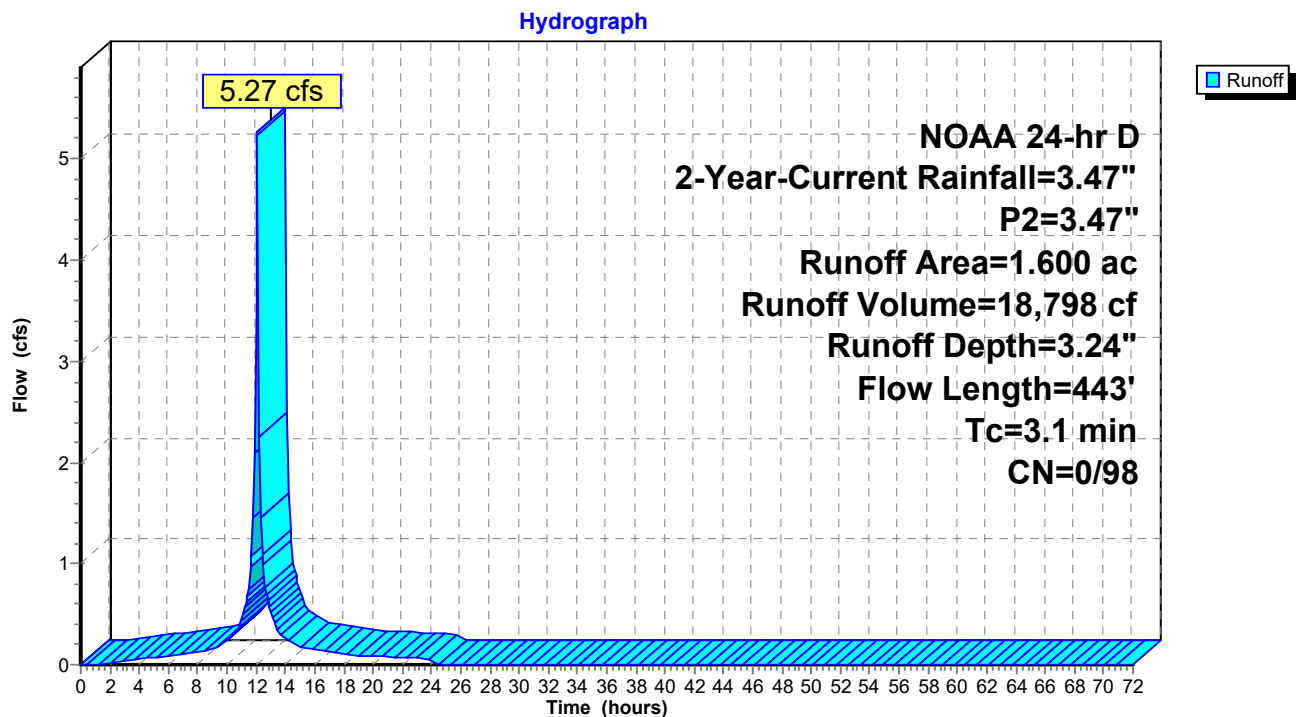
Runoff = 5.27 cfs @ 12.09 hrs, Volume= 18,798 cf, Depth= 3.24"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Current Rainfall=3.47", P2=3.47"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	443	Total			

Subcatchment P1i: Proposed Impervious



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 0.77 cfs @ 12.04 hrs, Volume= 3,172 cf, Depth= 3.24"
 Routed to Pond PP1 : Pervious Pavement

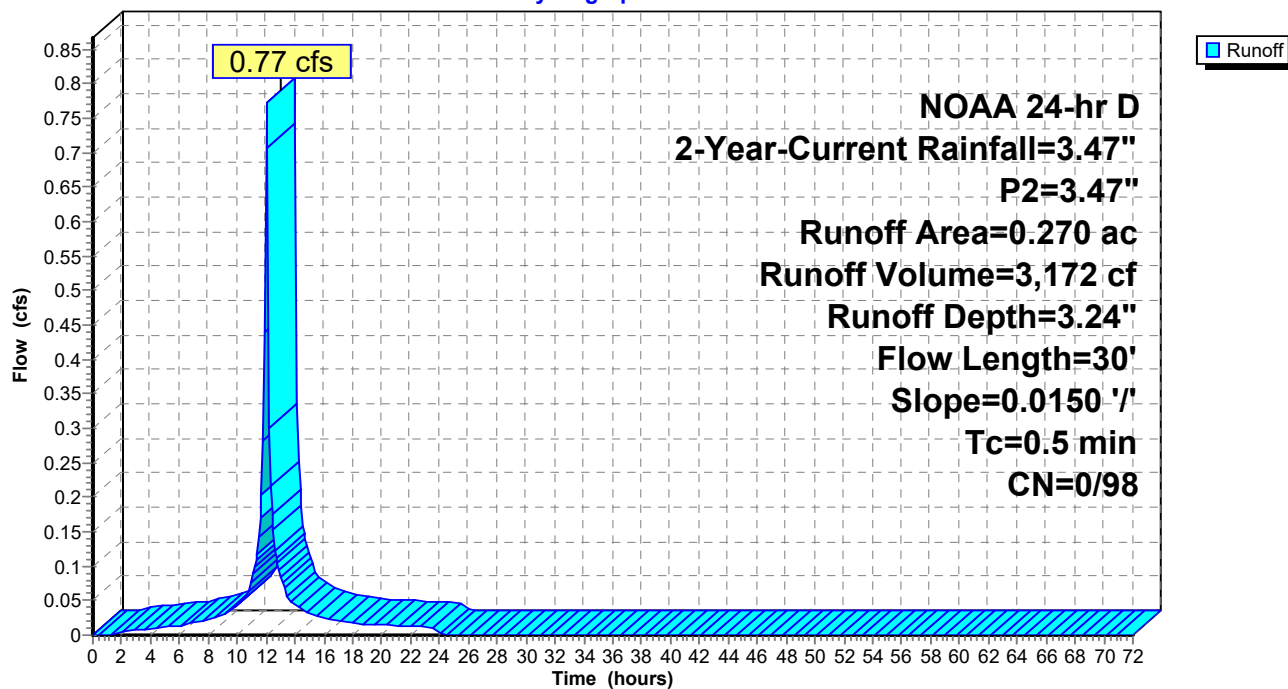
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr D 2-Year-Current Rainfall=3.47", P2=3.47"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

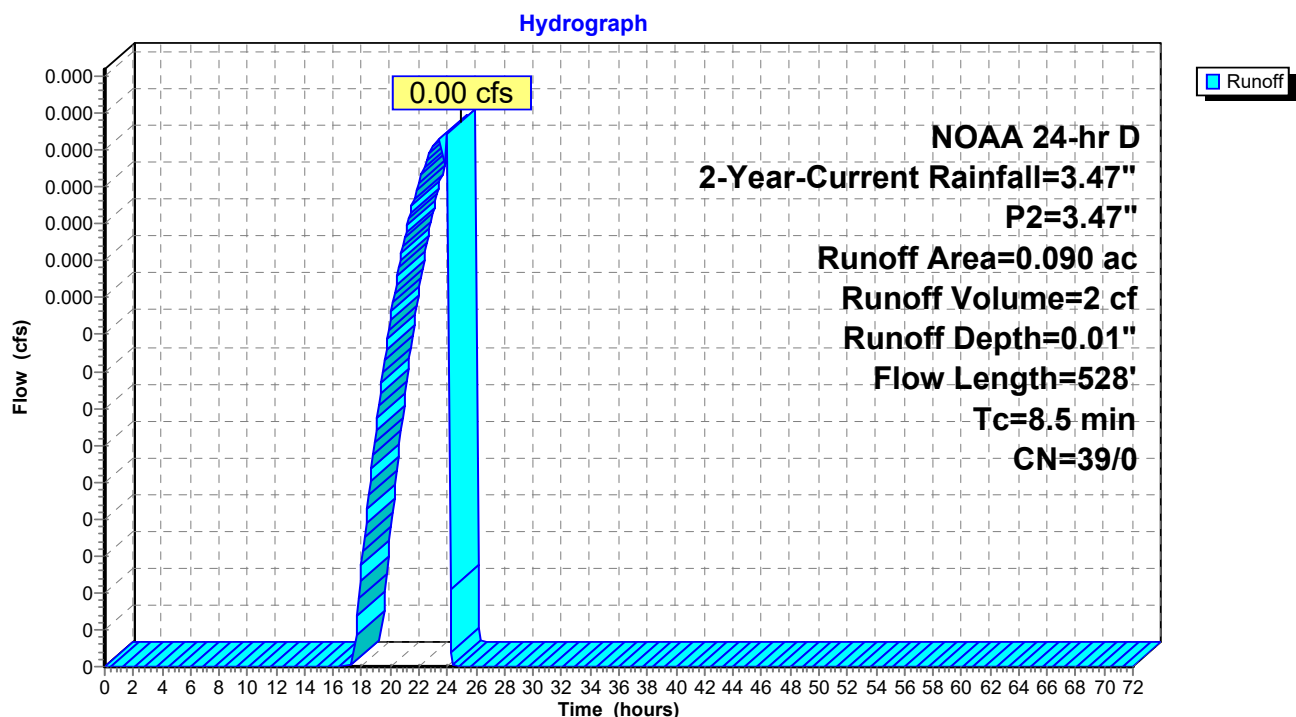
Runoff = 0.00 cfs @ 23.90 hrs, Volume= 2 cf, Depth= 0.01"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Current Rainfall=3.47", P2=3.47"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	528	Total			

Subcatchment P1p: Proposed Pervious



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 3.24" for 2-Year-Current event
 Inflow = 0.77 cfs @ 12.04 hrs, Volume= 3,172 cf
 Outflow = 0.54 cfs @ 12.15 hrs, Volume= 2,148 cf, Atten= 30%, Lag= 6.5 min
 Primary = 0.54 cfs @ 12.15 hrs, Volume= 2,148 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.07' @ 12.15 hrs Surf.Area= 8,538 sf Storage= 1,436 cf

Plug-Flow detention time= 224.1 min calculated for 2,145 cf (68% of inflow)
 Center-of-Mass det. time= 118.6 min (870.0 - 751.4)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

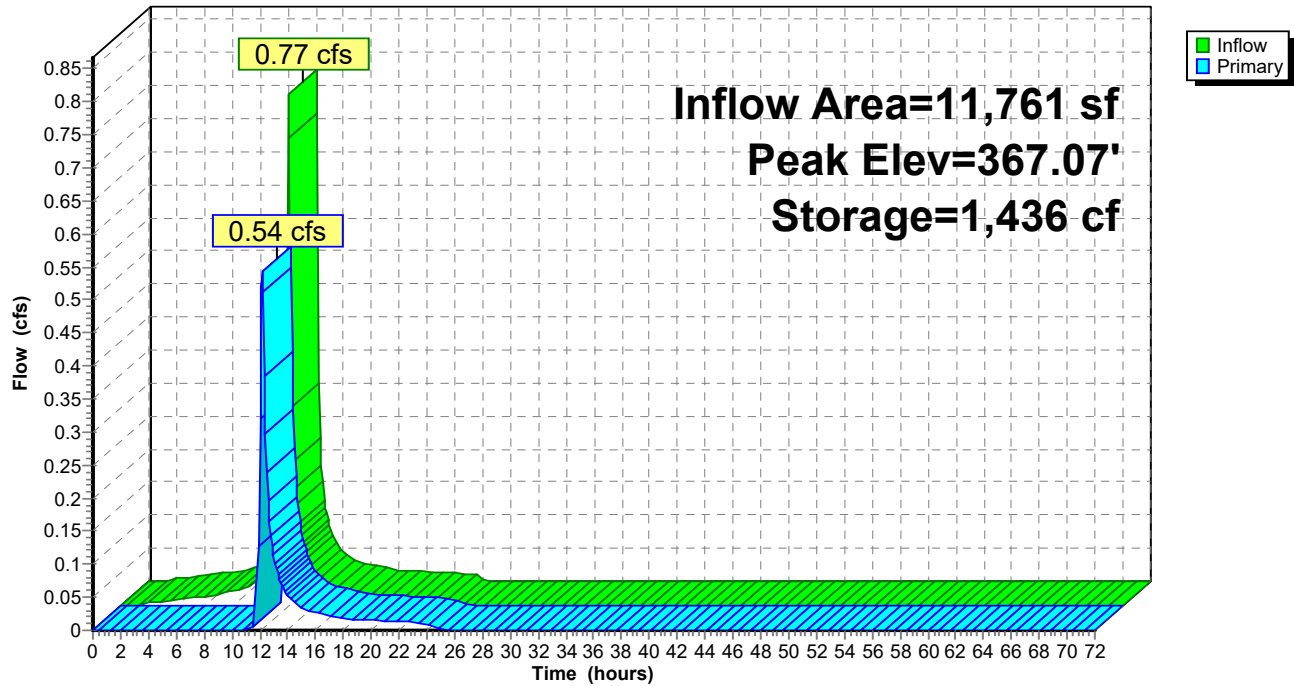
Primary OutFlow Max=0.52 cfs @ 12.15 hrs HW=367.07' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 0.52 cfs of 5.70 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 1.12 fps)

Pond PP1: Pervious Pavement

Hydrograph



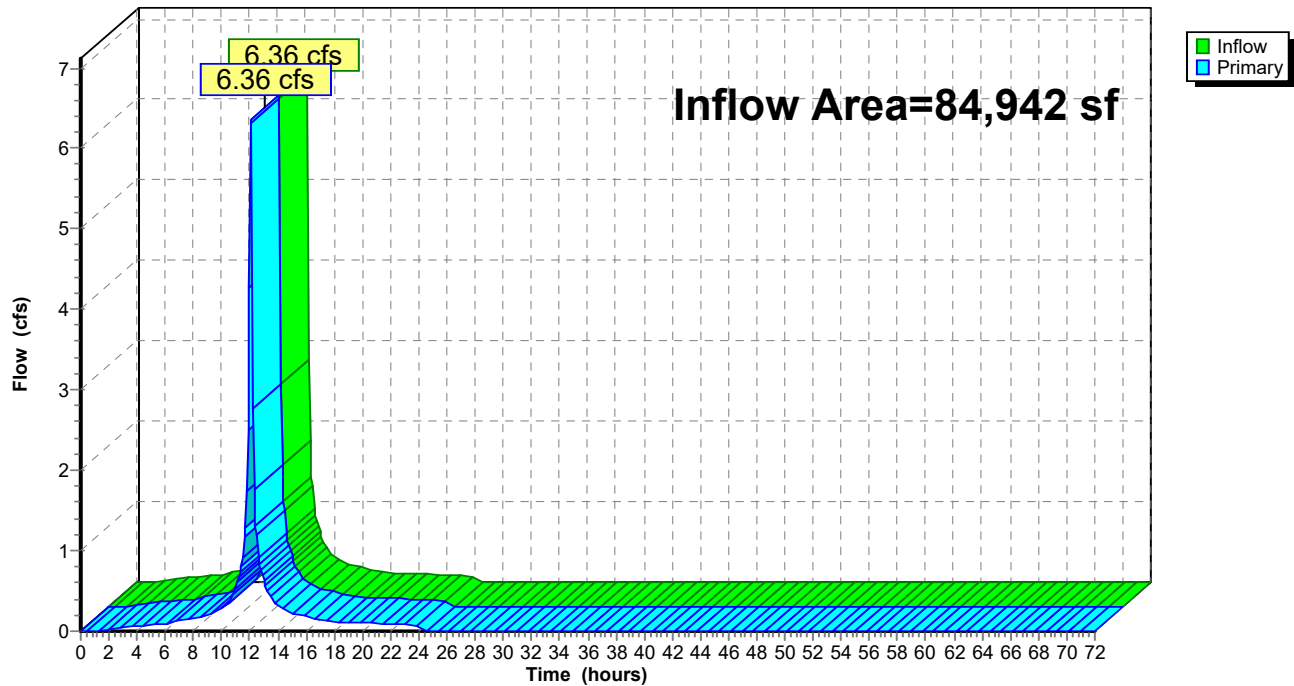
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 3.20" for 2-Year-Current event
 Inflow = 6.36 cfs @ 12.09 hrs, Volume= 22,676 cf
 Primary = 6.36 cfs @ 12.09 hrs, Volume= 22,676 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



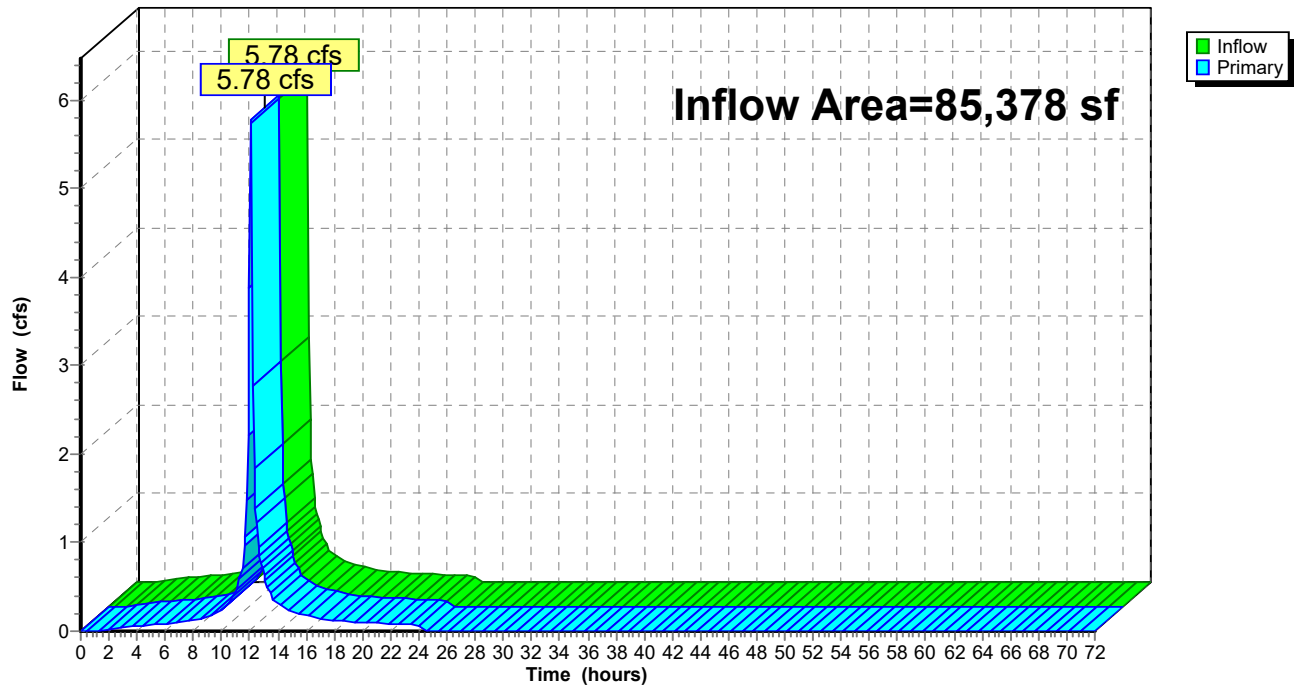
Summary for Link P1: PDA 1A

Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 2.94" for 2-Year-Current event
 Inflow = 5.78 cfs @ 12.09 hrs, Volume= 20,948 cf
 Primary = 5.78 cfs @ 12.09 hrs, Volume= 20,948 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link P1: PDA 1A

Hydrograph



Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=5.14"
 Flow Length=441' Tc=3.2 min CN=0/98 Runoff=9.92 cfs 36,029 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=0.28"
 Flow Length=526' Tc=8.6 min CN=39/0 Runoff=0.00 cfs 21 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=5.14"
 Flow Length=443' Tc=3.1 min CN=0/98 Runoff=8.22 cfs 29,868 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=5.14"
 Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=1.21 cfs 5,040 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=0.28"
 Flow Length=528' Tc=8.5 min CN=39/0 Runoff=0.01 cfs 93 cf

Pond PP1: Pervious Pavement Peak Elev=367.13' Storage=1,626 cf Inflow=1.21 cfs 5,040 cf
 Outflow=0.96 cfs 4,016 cf

Link E1: EDA 1A Inflow=9.92 cfs 36,049 cf
 Primary=9.92 cfs 36,049 cf

Link P1: PDA 1A Inflow=9.16 cfs 33,977 cf
 Primary=9.16 cfs 33,977 cf

Total Runoff Area = 170,320 sf Runoff Volume = 71,050 cf Average Runoff Depth = 5.01"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

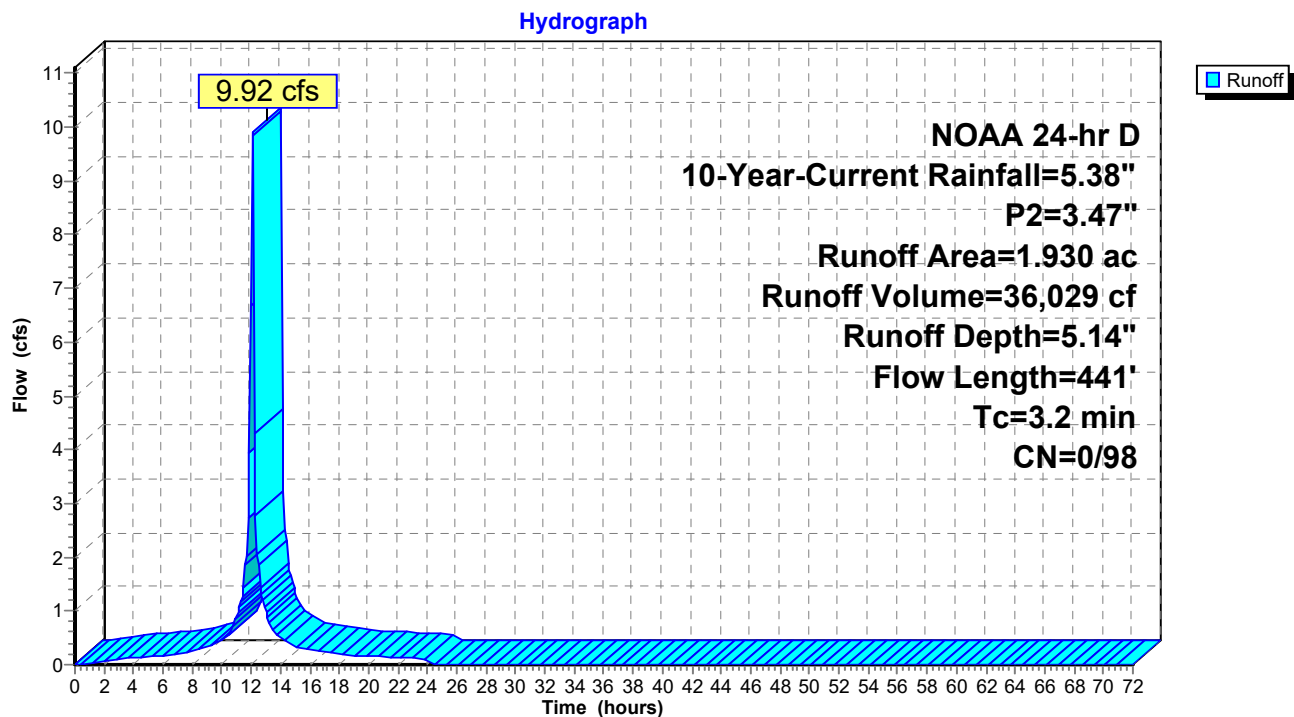
Runoff = 9.92 cfs @ 12.09 hrs, Volume= 36,029 cf, Depth= 5.14"
Routed to Link E1 : EDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Current Rainfall=5.38", P2=3.47"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.2	441	Total			

Subcatchment E1i: Existing Impervious



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.00 cfs @ 12.60 hrs, Volume= 21 cf, Depth= 0.28"
Routed to Link E1 : EDA 1A

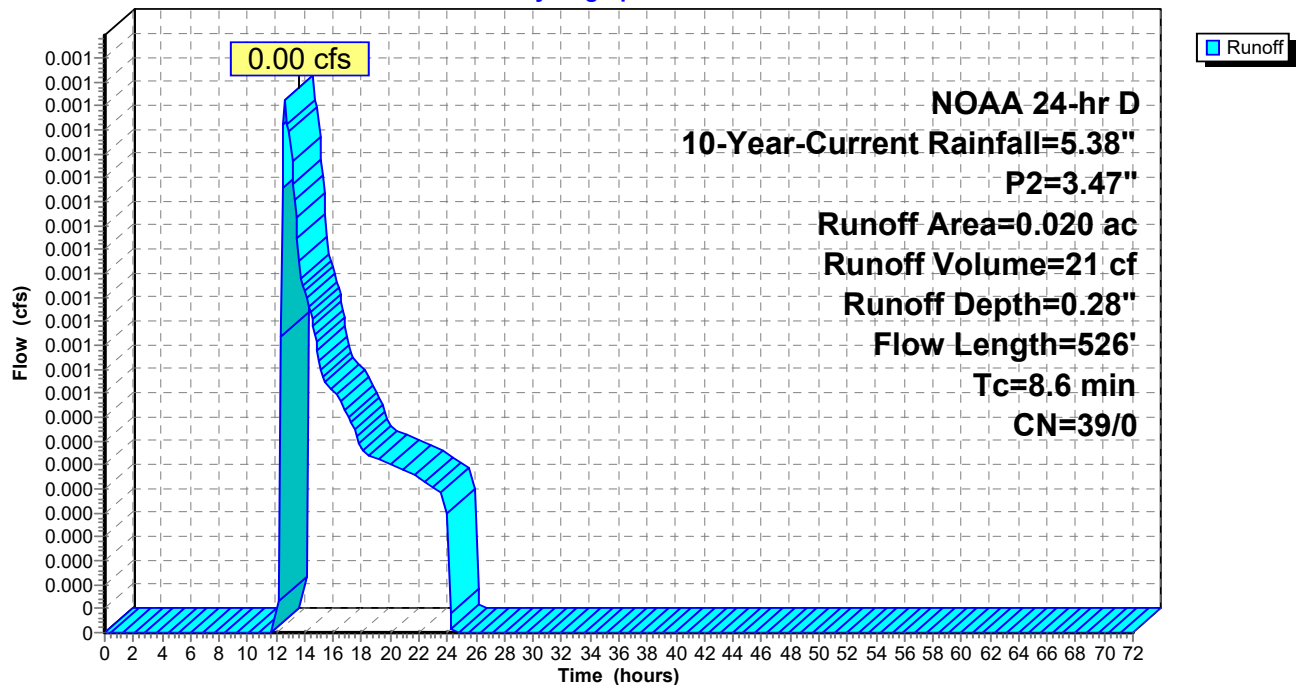
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Current Rainfall=5.38", P2=3.47"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.6	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

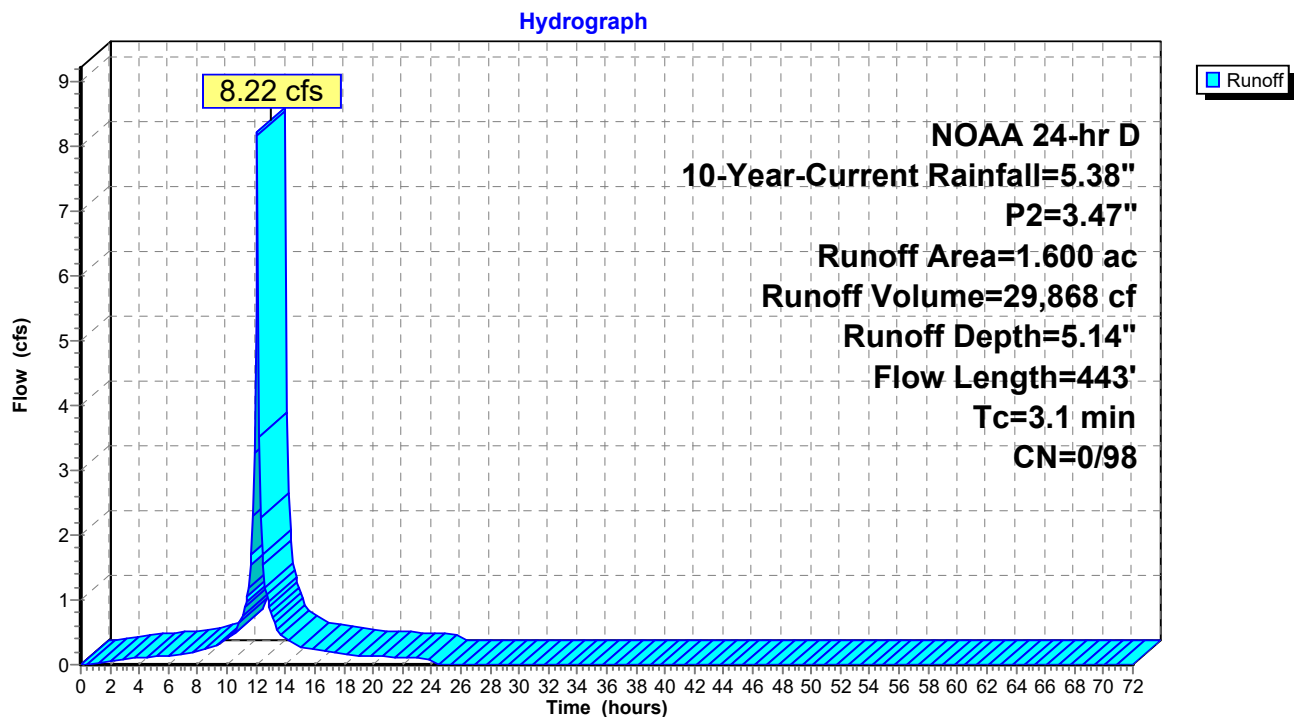
Runoff = 8.22 cfs @ 12.09 hrs, Volume= 29,868 cf, Depth= 5.14"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Current Rainfall=5.38", P2=3.47"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	443	Total			

Subcatchment P1i: Proposed Impervious



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 1.21 cfs @ 12.04 hrs, Volume= 5,040 cf, Depth= 5.14"
Routed to Pond PP1 : Pervious Pavement

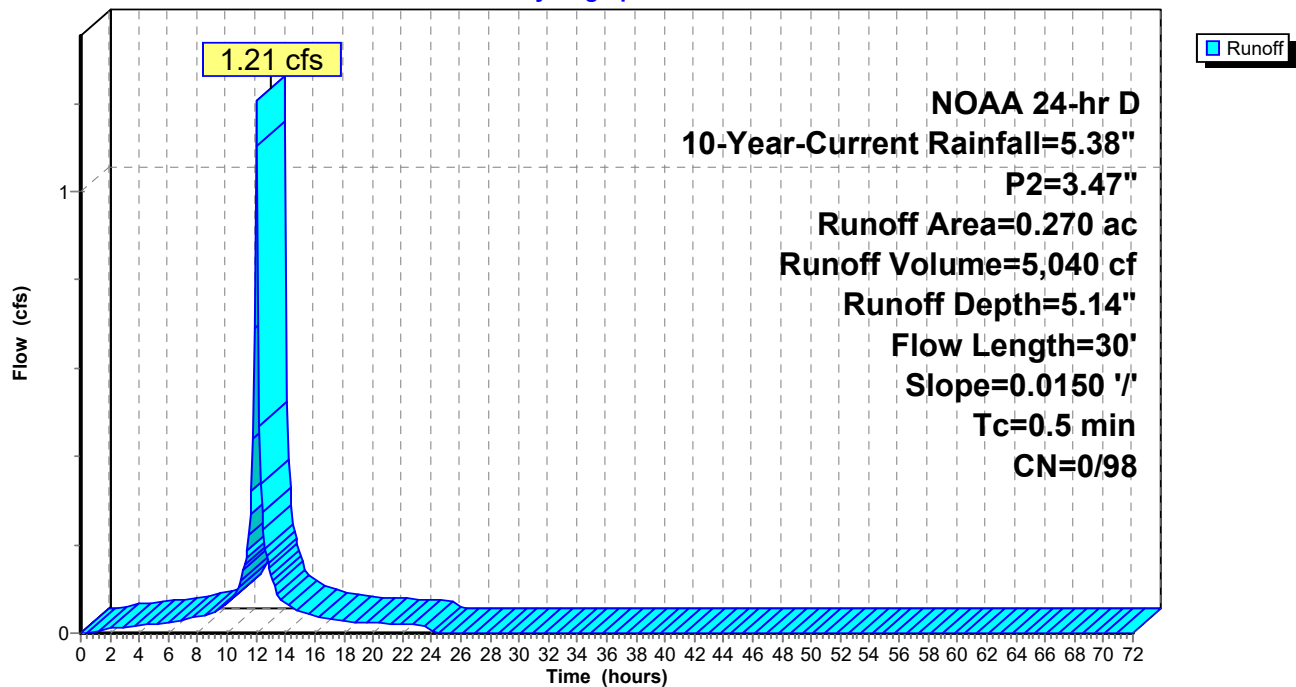
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Current Rainfall=5.38", P2=3.47"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

Runoff = 0.01 cfs @ 12.60 hrs, Volume= 93 cf, Depth= 0.28"
Routed to Link P1 : PDA 1A

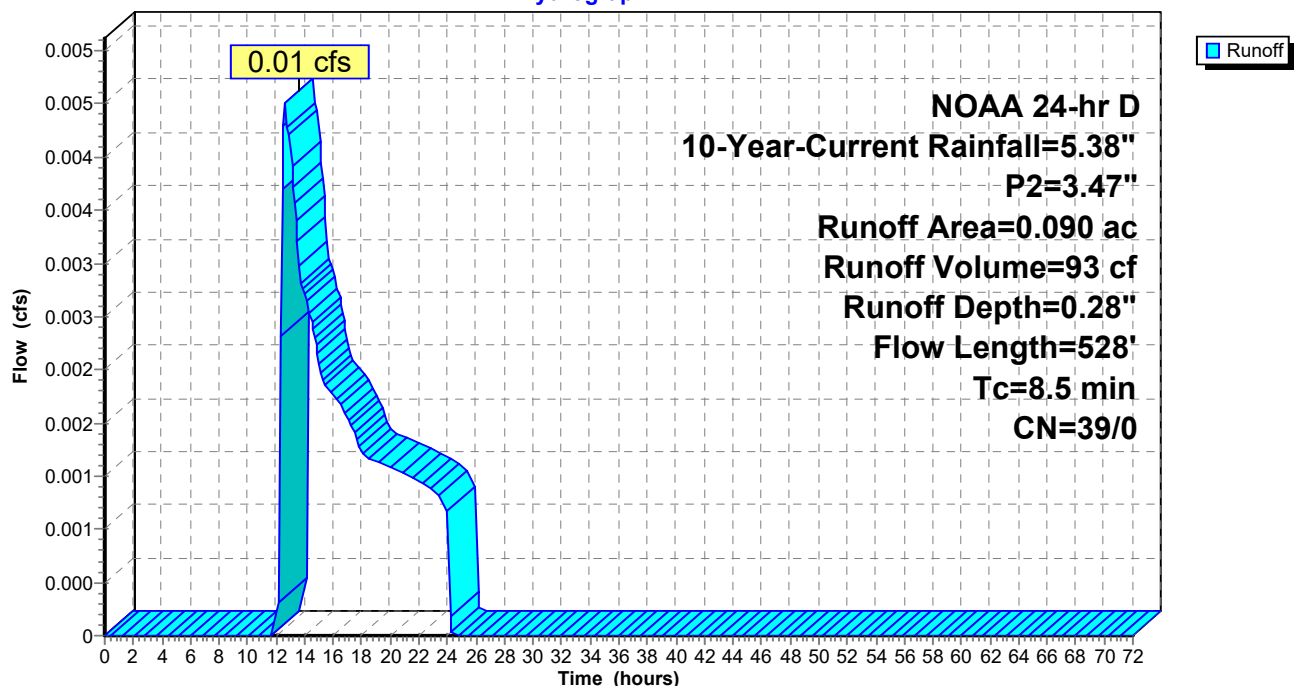
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Current Rainfall=5.38", P2=3.47"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	528	Total			

Subcatchment P1p: Proposed Pervious

Hydrograph



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 5.14" for 10-Year-Current event
 Inflow = 1.21 cfs @ 12.04 hrs, Volume= 5,040 cf
 Outflow = 0.96 cfs @ 12.12 hrs, Volume= 4,016 cf, Atten= 21%, Lag= 5.1 min
 Primary = 0.96 cfs @ 12.12 hrs, Volume= 4,016 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.13' @ 12.12 hrs Surf.Area= 8,538 sf Storage= 1,626 cf

Plug-Flow detention time= 178.7 min calculated for 4,010 cf (80% of inflow)
 Center-of-Mass det. time= 94.7 min (837.6 - 742.9)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

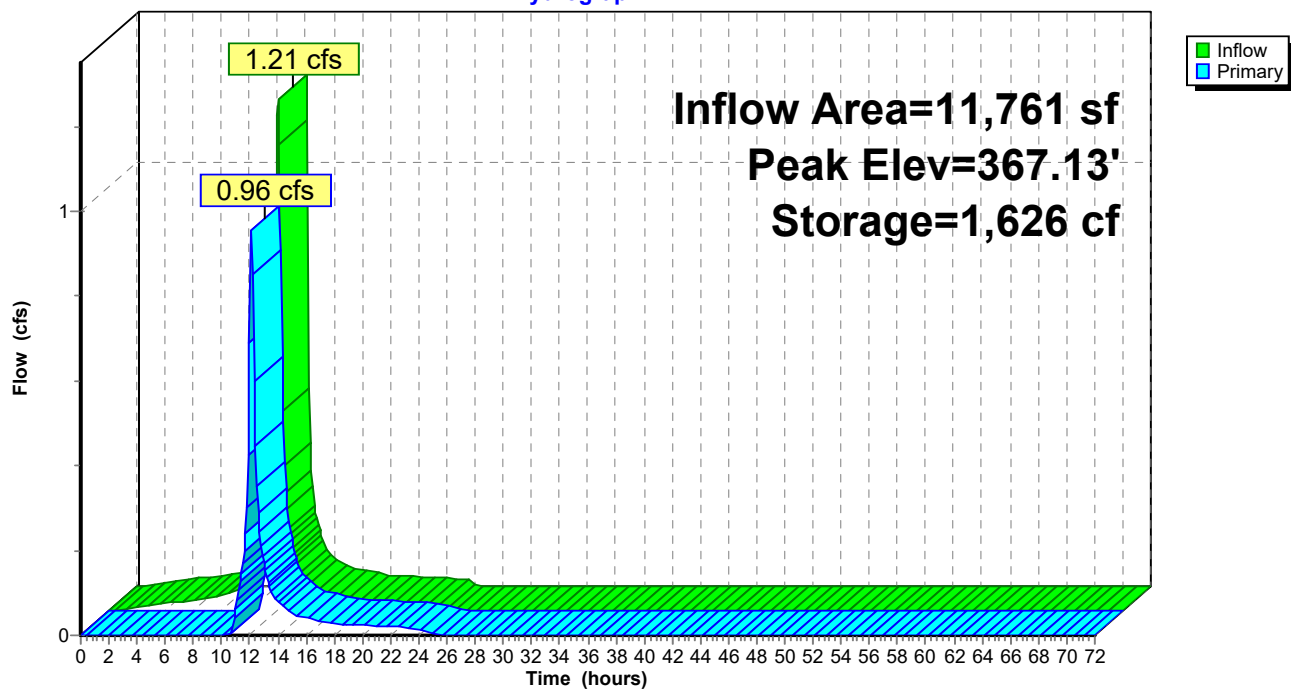
Primary OutFlow Max=0.93 cfs @ 12.12 hrs HW=367.12' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 0.93 cfs of 5.69 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.93 cfs @ 1.36 fps)

Pond PP1: Pervious Pavement

Hydrograph



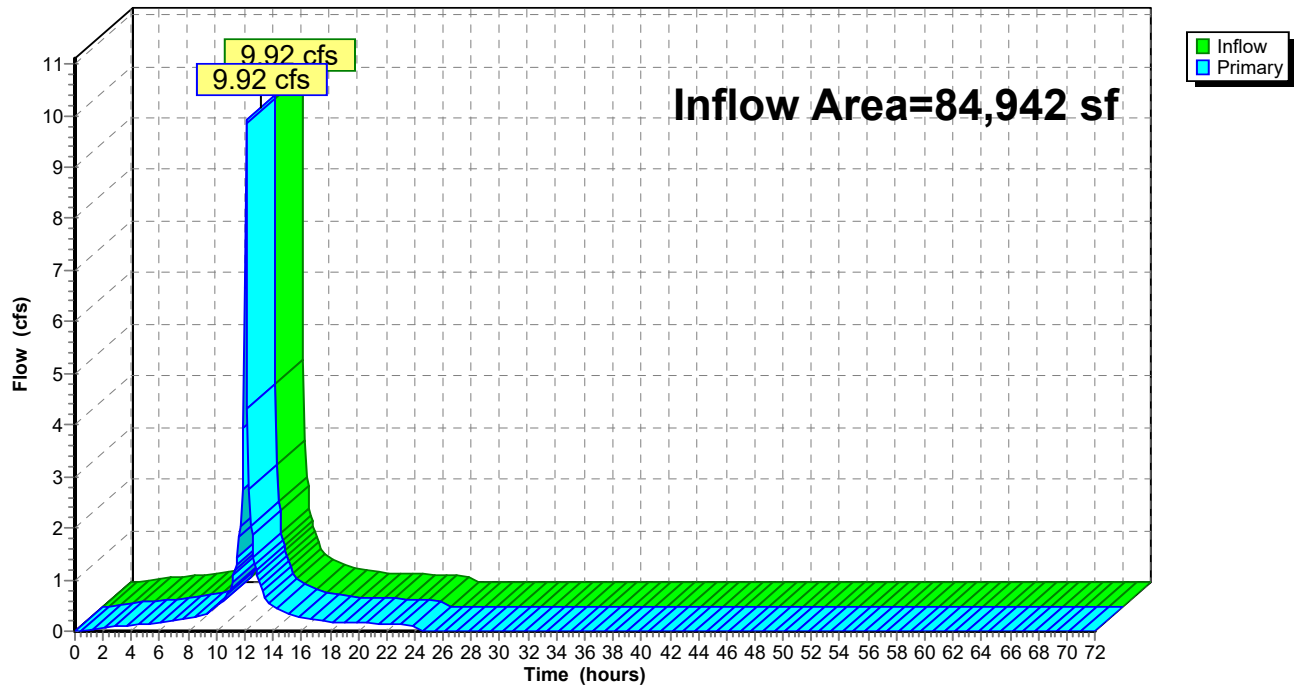
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 5.09" for 10-Year-Current event
 Inflow = 9.92 cfs @ 12.09 hrs, Volume= 36,049 cf
 Primary = 9.92 cfs @ 12.09 hrs, Volume= 36,049 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



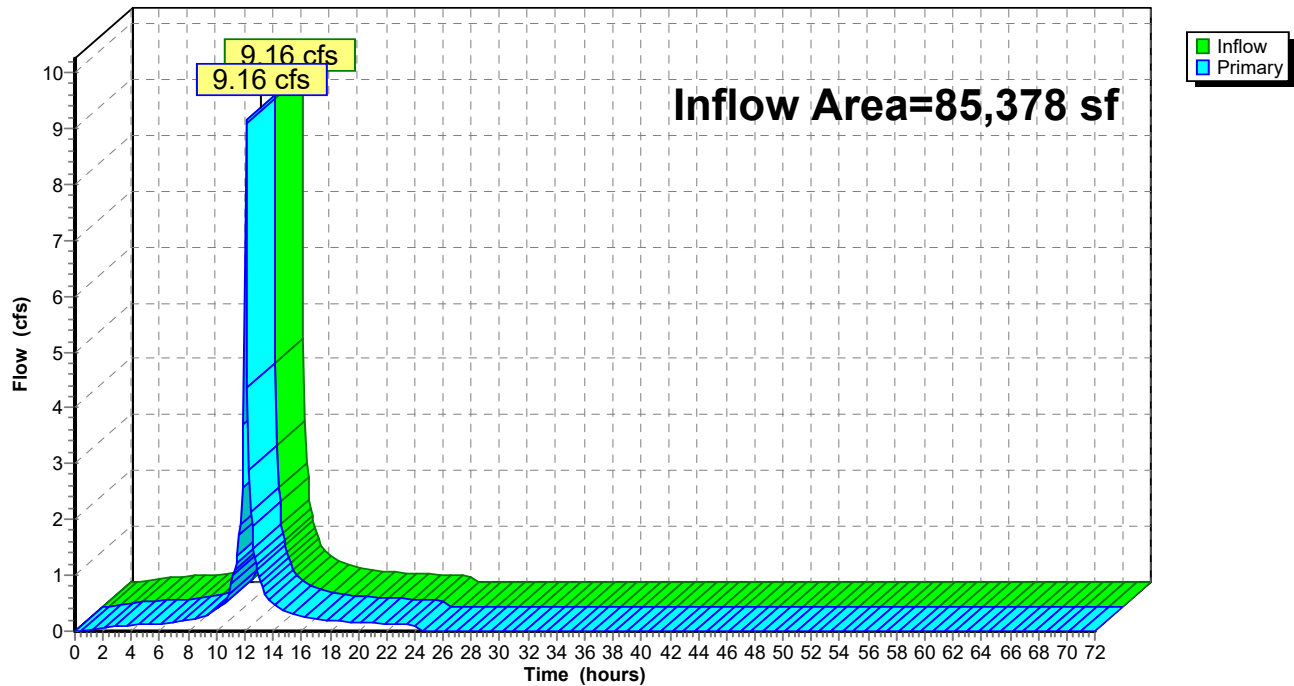
Summary for Link P1: PDA 1A

Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 4.78" for 10-Year-Current event
 Inflow = 9.16 cfs @ 12.09 hrs, Volume= 33,977 cf
 Primary = 9.16 cfs @ 12.09 hrs, Volume= 33,977 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link P1: PDA 1A

Hydrograph



Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=8.94"
Flow Length=441' Tc=3.2 min CN=0/98 Runoff=16.97 cfs 62,630 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=1.69"
Flow Length=526' Tc=8.6 min CN=39/0 Runoff=0.03 cfs 123 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=8.94"
Flow Length=443' Tc=3.1 min CN=0/98 Runoff=14.08 cfs 51,921 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=8.94"
Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=2.07 cfs 8,762 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=1.69"
Flow Length=528' Tc=8.5 min CN=39/0 Runoff=0.12 cfs 552 cf

Pond PP1: Pervious Pavement Peak Elev=367.21' Storage=1,916 cf Inflow=2.07 cfs 8,762 cf
Outflow=1.72 cfs 7,737 cf

Link E1: EDA 1A Inflow=16.99 cfs 62,752 cf
Primary=16.99 cfs 62,752 cf

Link P1: PDA 1A Inflow=15.85 cfs 60,210 cf
Primary=15.85 cfs 60,210 cf

Total Runoff Area = 170,320 sf Runoff Volume = 123,986 cf Average Runoff Depth = 8.74"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

Runoff = 16.97 cfs @ 12.09 hrs, Volume= 62,630 cf, Depth= 8.94"
Routed to Link E1 : EDA 1A

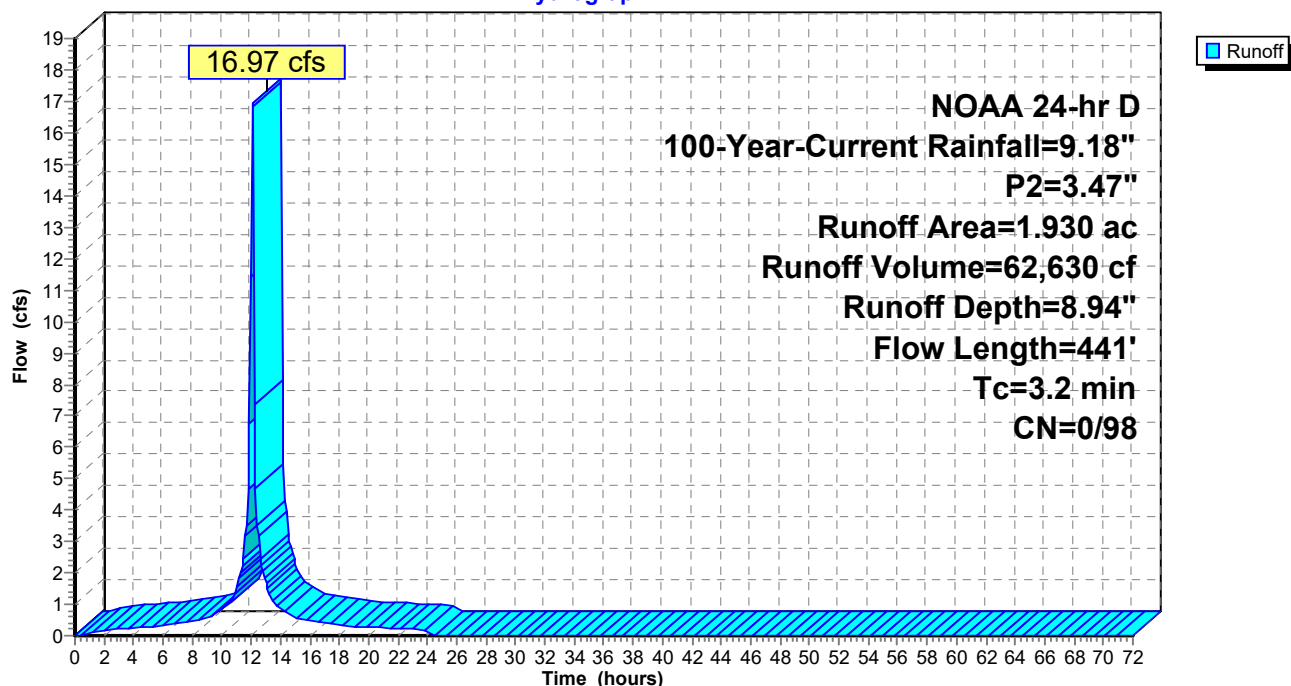
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Current Rainfall=9.18", P2=3.47"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.2	441	Total			

Subcatchment E1i: Existing Impervious

Hydrograph



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.03 cfs @ 12.20 hrs, Volume= 123 cf, Depth= 1.69"
Routed to Link E1 : EDA 1A

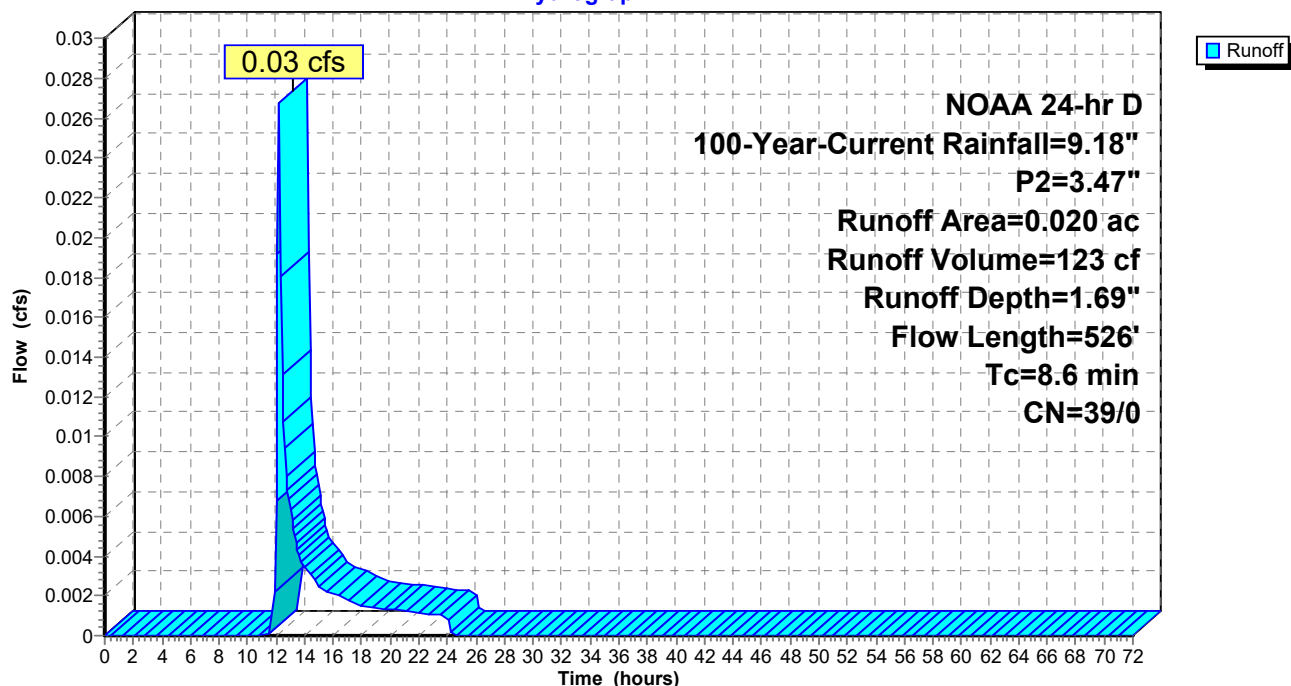
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Current Rainfall=9.18", P2=3.47"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.6	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

Runoff = 14.08 cfs @ 12.09 hrs, Volume= 51,921 cf, Depth= 8.94"
Routed to Link P1 : PDA 1A

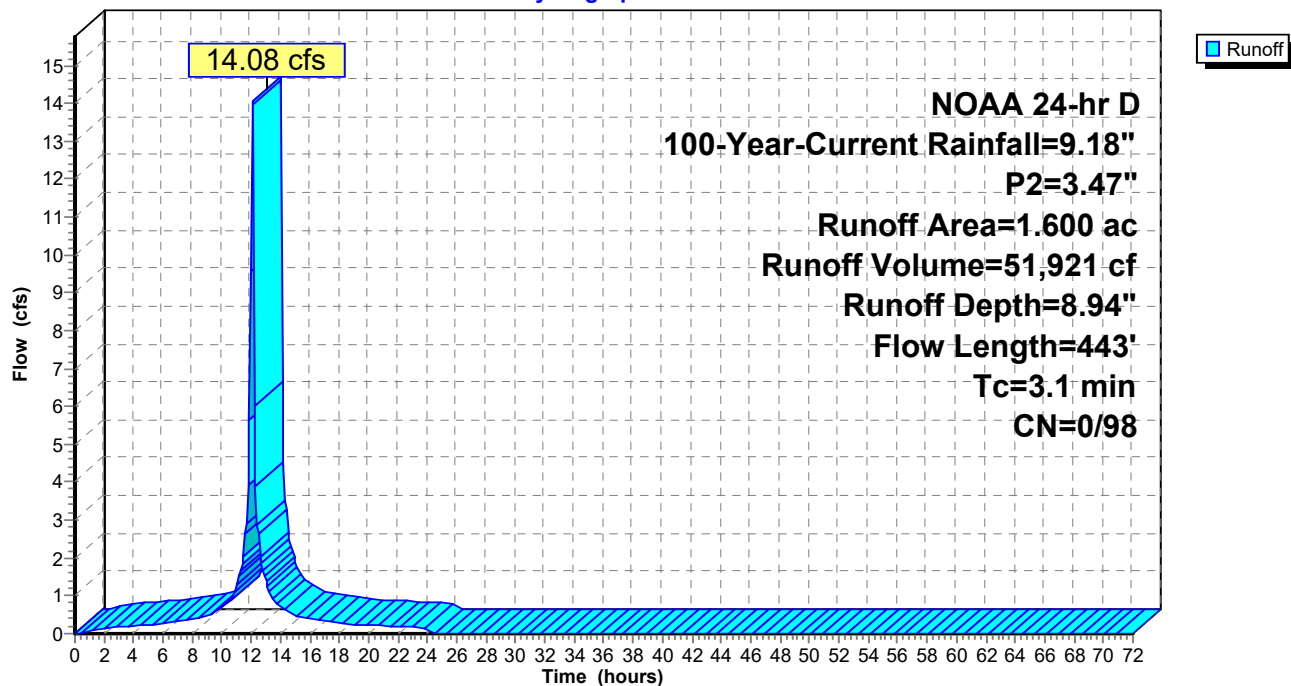
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Current Rainfall=9.18", P2=3.47"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	443	Total			

Subcatchment P1i: Proposed Impervious

Hydrograph



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 2.07 cfs @ 12.04 hrs, Volume= 8,762 cf, Depth= 8.94"
Routed to Pond PP1 : Pervious Pavement

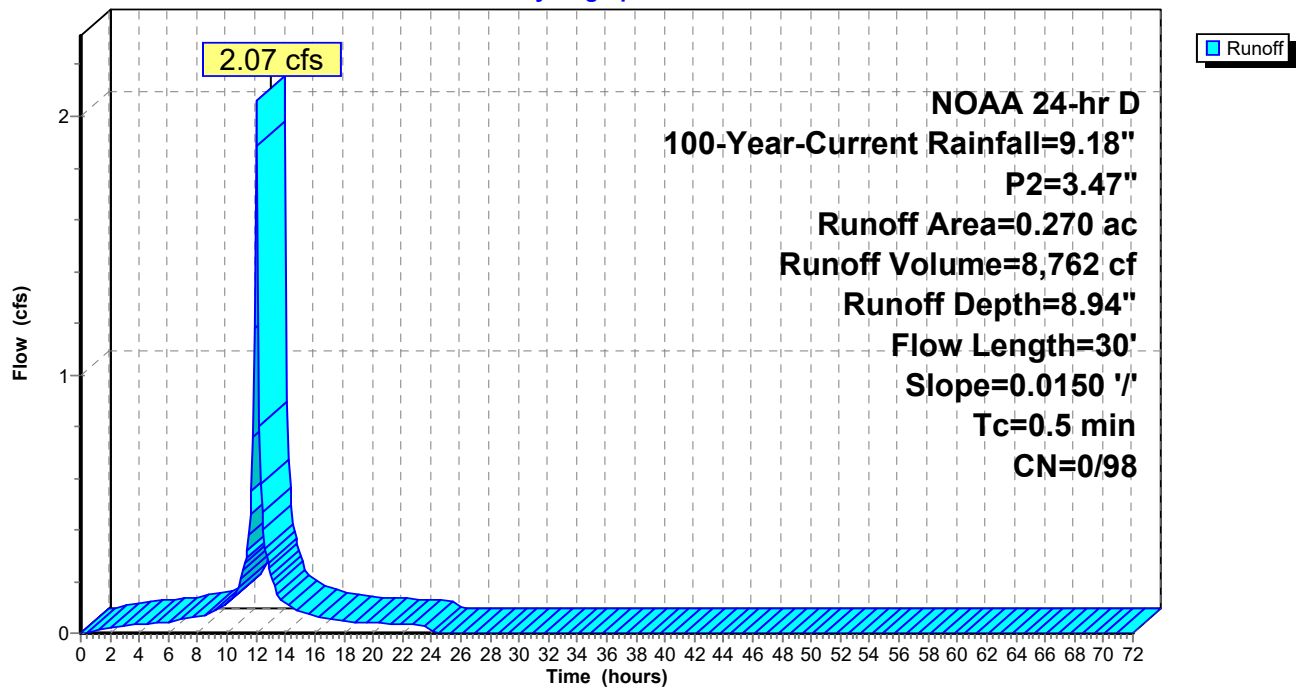
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Current Rainfall=9.18", P2=3.47"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

Runoff = 0.12 cfs @ 12.20 hrs, Volume= 552 cf, Depth= 1.69"
Routed to Link P1 : PDA 1A

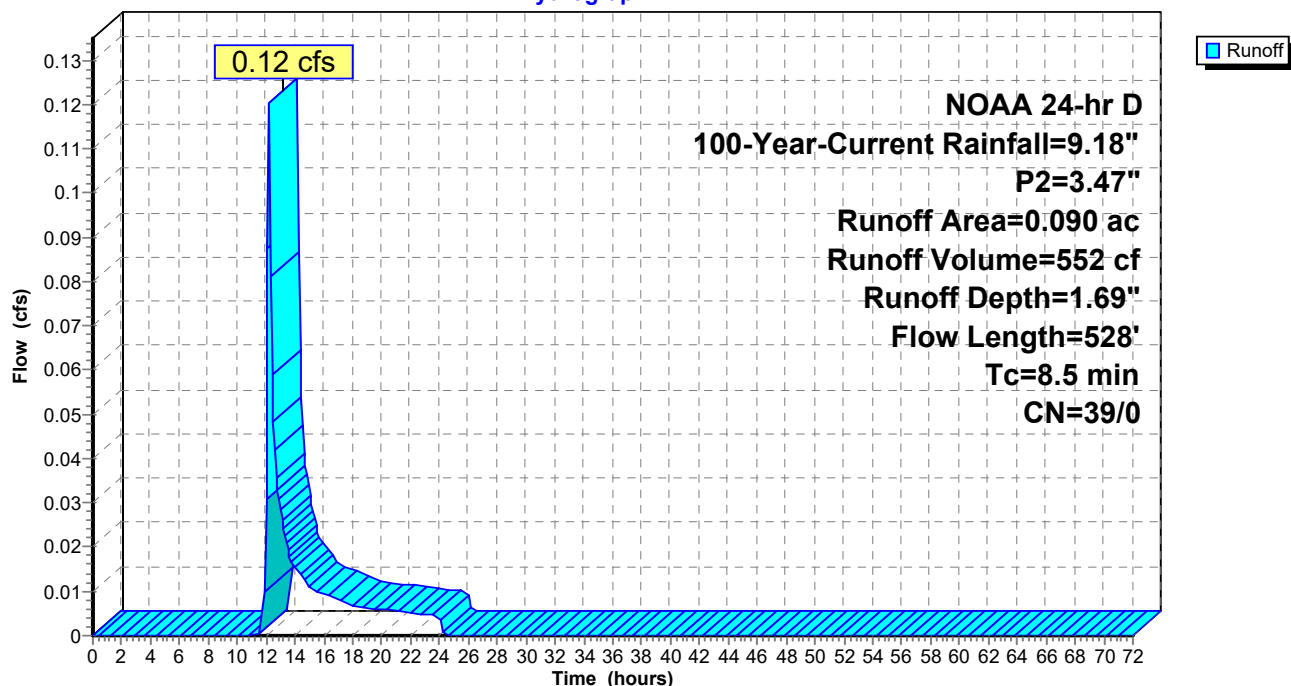
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Current Rainfall=9.18", P2=3.47"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	528	Total			

Subcatchment P1p: Proposed Pervious

Hydrograph



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 8.94" for 100-Year-Current event
 Inflow = 2.07 cfs @ 12.04 hrs, Volume= 8,762 cf
 Outflow = 1.72 cfs @ 12.11 hrs, Volume= 7,737 cf, Atten= 17%, Lag= 4.6 min
 Primary = 1.72 cfs @ 12.11 hrs, Volume= 7,737 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.21' @ 12.11 hrs Surf.Area= 8,538 sf Storage= 1,916 cf

Plug-Flow detention time= 132.4 min calculated for 7,726 cf (88% of inflow)
 Center-of-Mass det. time= 72.7 min (807.9 - 735.2)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

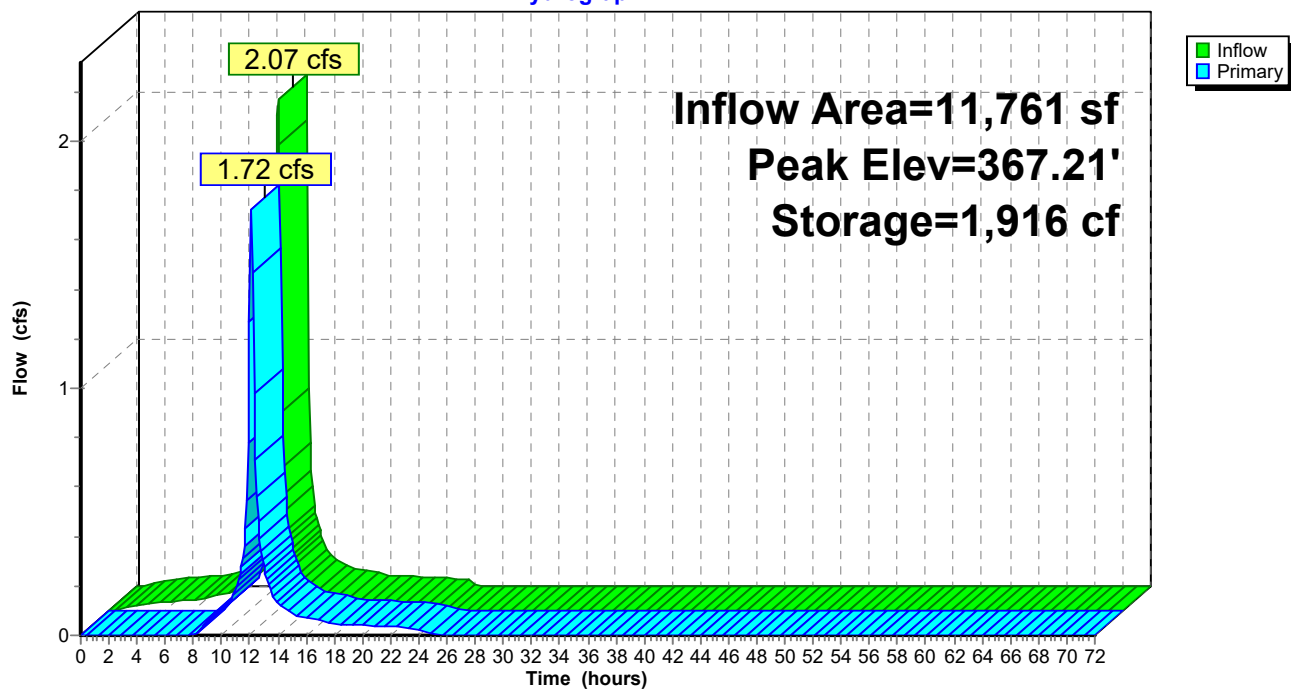
Primary OutFlow Max=1.68 cfs @ 12.11 hrs HW=367.21' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 1.68 cfs of 5.52 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 1.68 cfs @ 1.66 fps)

Pond PP1: Pervious Pavement

Hydrograph



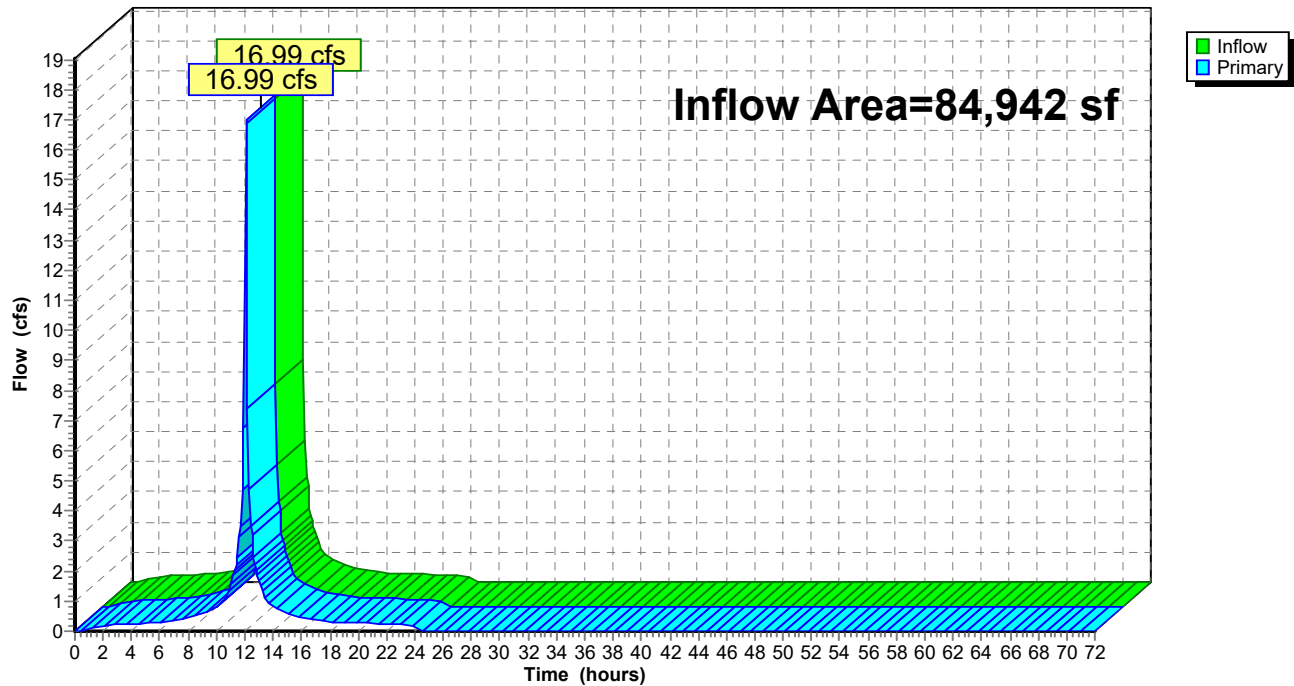
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 8.87" for 100-Year-Current event
 Inflow = 16.99 cfs @ 12.09 hrs, Volume= 62,752 cf
 Primary = 16.99 cfs @ 12.09 hrs, Volume= 62,752 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



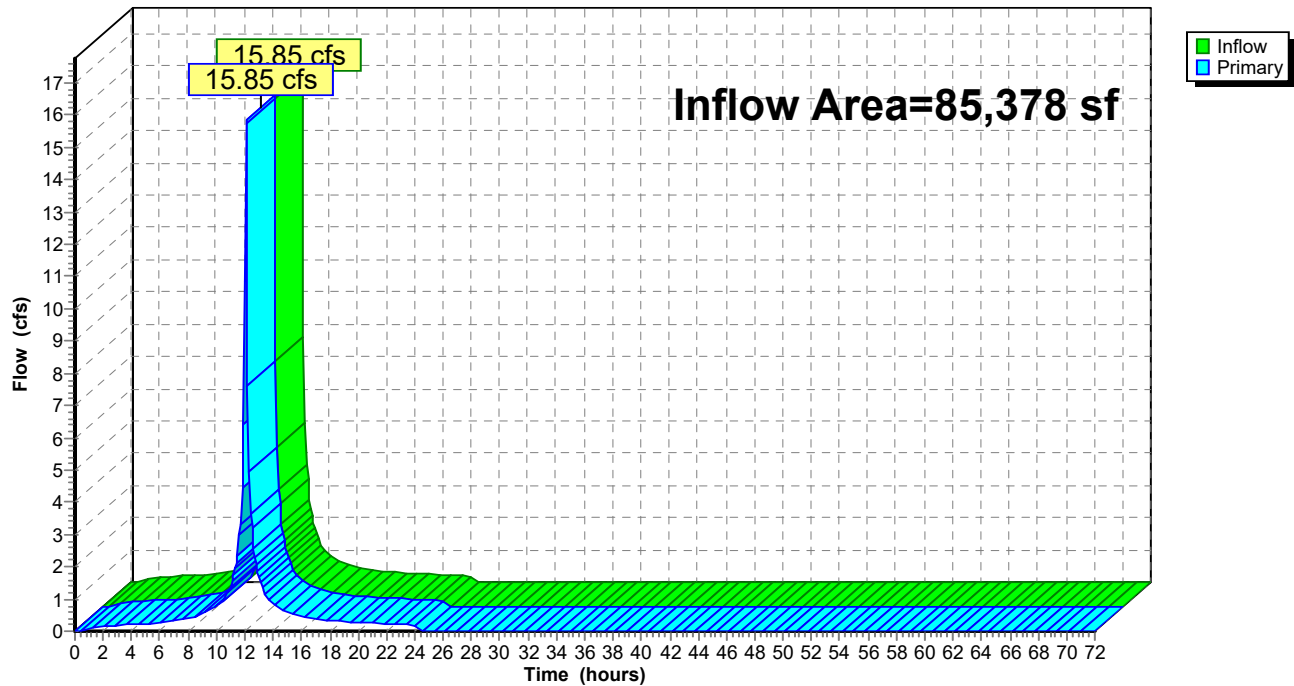
Summary for Link P1: PDA 1A

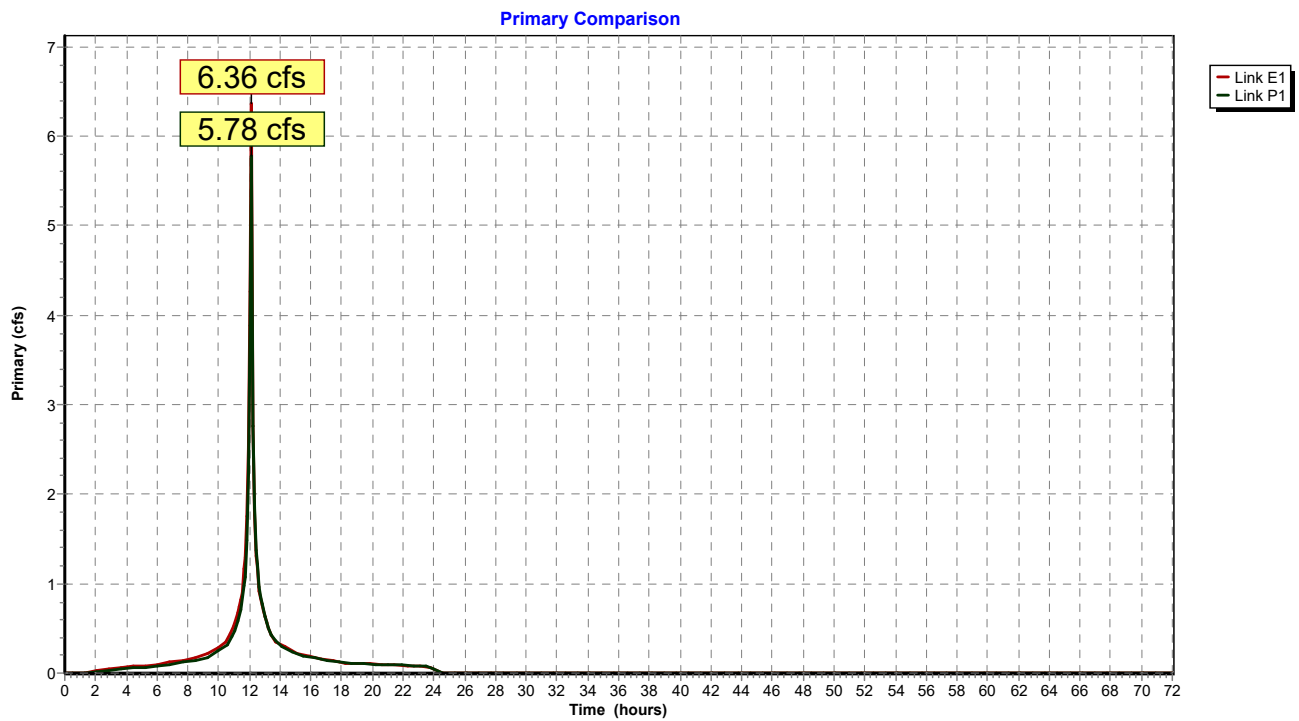
Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 8.46" for 100-Year-Current event
 Inflow = 15.85 cfs @ 12.09 hrs, Volume= 60,210 cf
 Primary = 15.85 cfs @ 12.09 hrs, Volume= 60,210 cf, Atten= 0%, Lag= 0.0 min

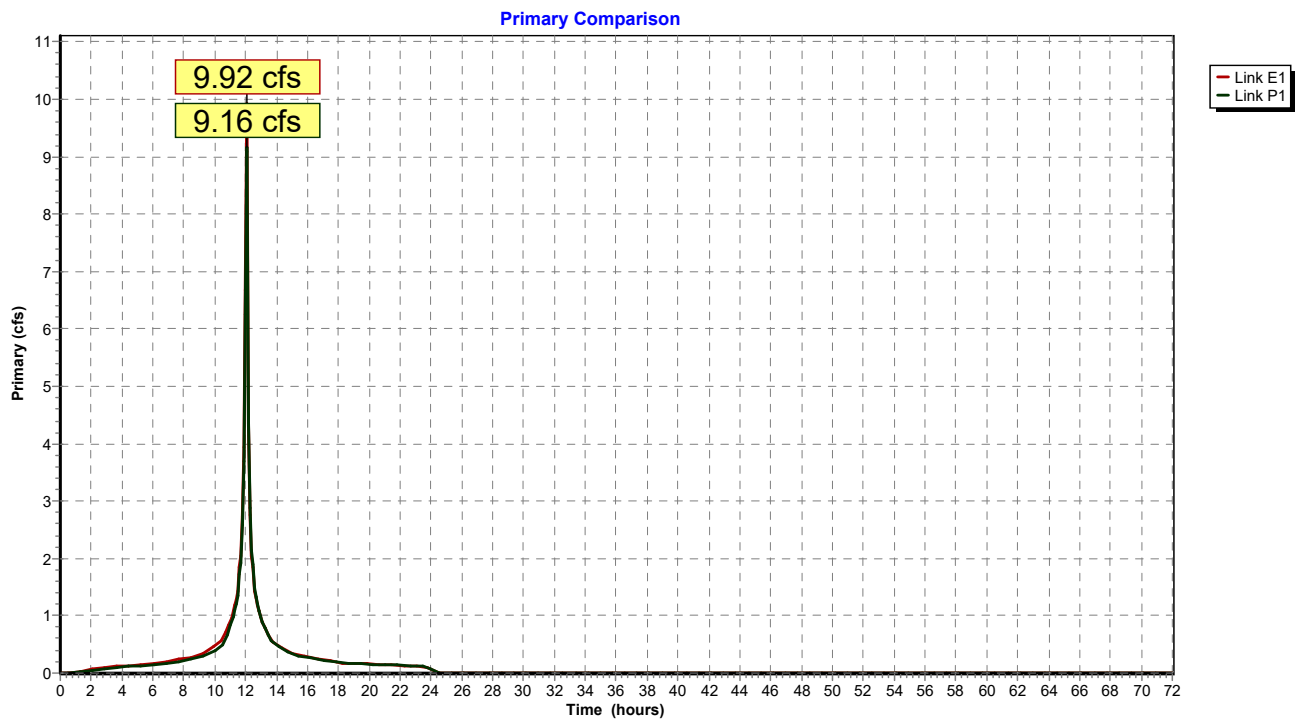
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

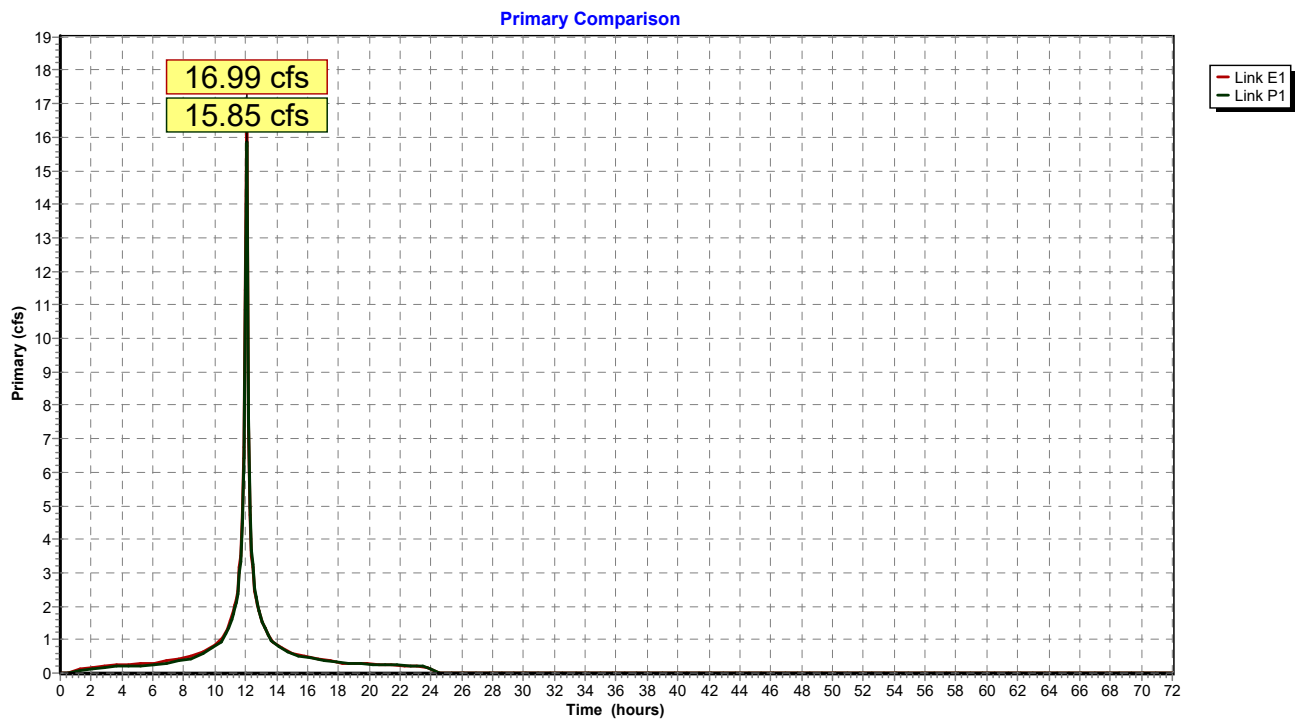
Link P1: PDA 1A

Hydrograph





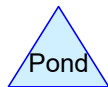
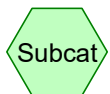
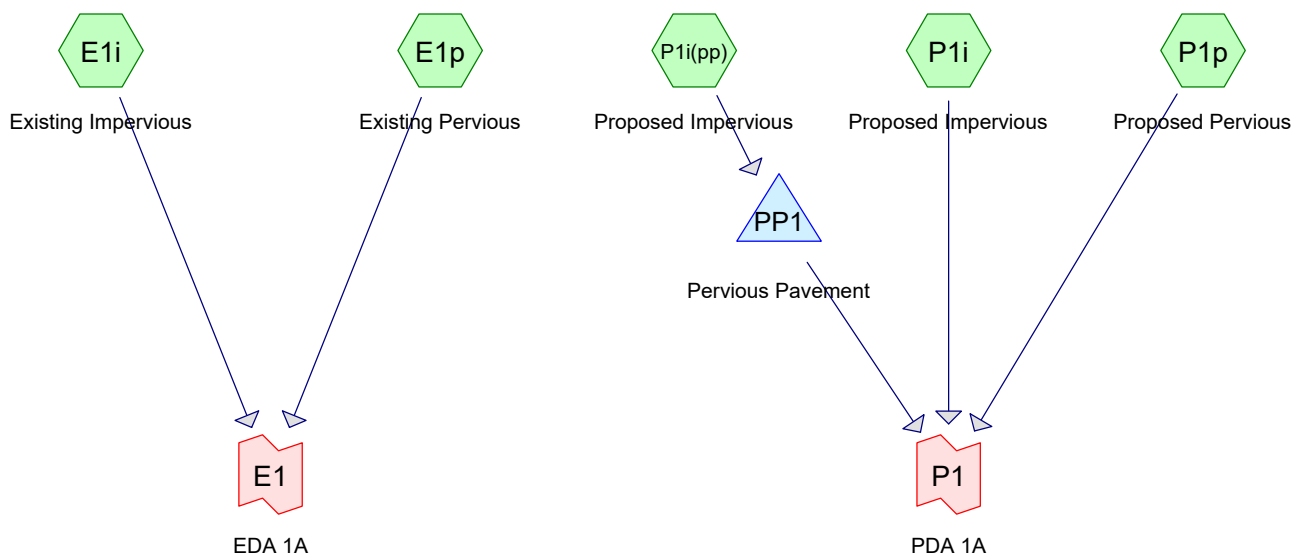




B. PRE- vs. POST-DEVELOPMENT HYDROGRAPHS

Future Adjusted Precipitation Depths

- ◆ 2-Year Storm Event
- ◆ 10-Year Storm Event
- ◆ 25-Year Storm Event
- ◆ 100-Year Storm Event
- ◆ Pre- vs. Post Comparison



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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	2-Year-Future	NOAA 24-hr	D	Default	24.00	1	4.09	2	4.09
2	10-Year-Future	NOAA 24-hr	D	Default	24.00	1	6.37	2	4.09
3	100-Year-Future	NOAA 24-hr	D	Default	24.00	1	11.52	2	4.09
4	25-Year-Future	NOAA 24-hr	D	Default	24.00	1	8.02	2	3.47

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,792	39	>75% Grass cover, Good, HSG A (E1p, P1p)
165,528	98	Paved parking, HSG A (E1i, P1i, P1i(pp))
170,320	96	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
170,320	HSG A	E1i, E1p, P1i, P1i(pp), P1p
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
170,320		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
4,792	0	0	0	0	4,792	>75% Grass cover, Good
165,528	0	0	0	0	165,528	Paved parking
170,320	0	0	0	0	170,320	TOTAL AREA

Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=3.85"
 Flow Length=441' Tc=3.1 min CN=0/98 Runoff=7.52 cfs 27,007 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=0.06"
 Flow Length=526' Tc=8.2 min CN=39/0 Runoff=0.00 cfs 4 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=3.85"
 Flow Length=443' Tc=3.0 min CN=0/98 Runoff=6.24 cfs 22,389 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=3.85"
 Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=0.92 cfs 3,778 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=0.06"
 Flow Length=528' Tc=8.1 min CN=39/0 Runoff=0.00 cfs 18 cf

Pond PP1: Pervious Pavement Peak Elev=367.09' Storage=1,510 cf Inflow=0.92 cfs 3,778 cf
 Outflow=0.70 cfs 2,754 cf

Link E1: EDA 1A Inflow=7.52 cfs 27,011 cf
 Primary=7.52 cfs 27,011 cf

Link P1: PDA 1A Inflow=6.91 cfs 25,161 cf
 Primary=6.91 cfs 25,161 cf

Total Runoff Area = 170,320 sf Runoff Volume = 53,197 cf Average Runoff Depth = 3.75"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

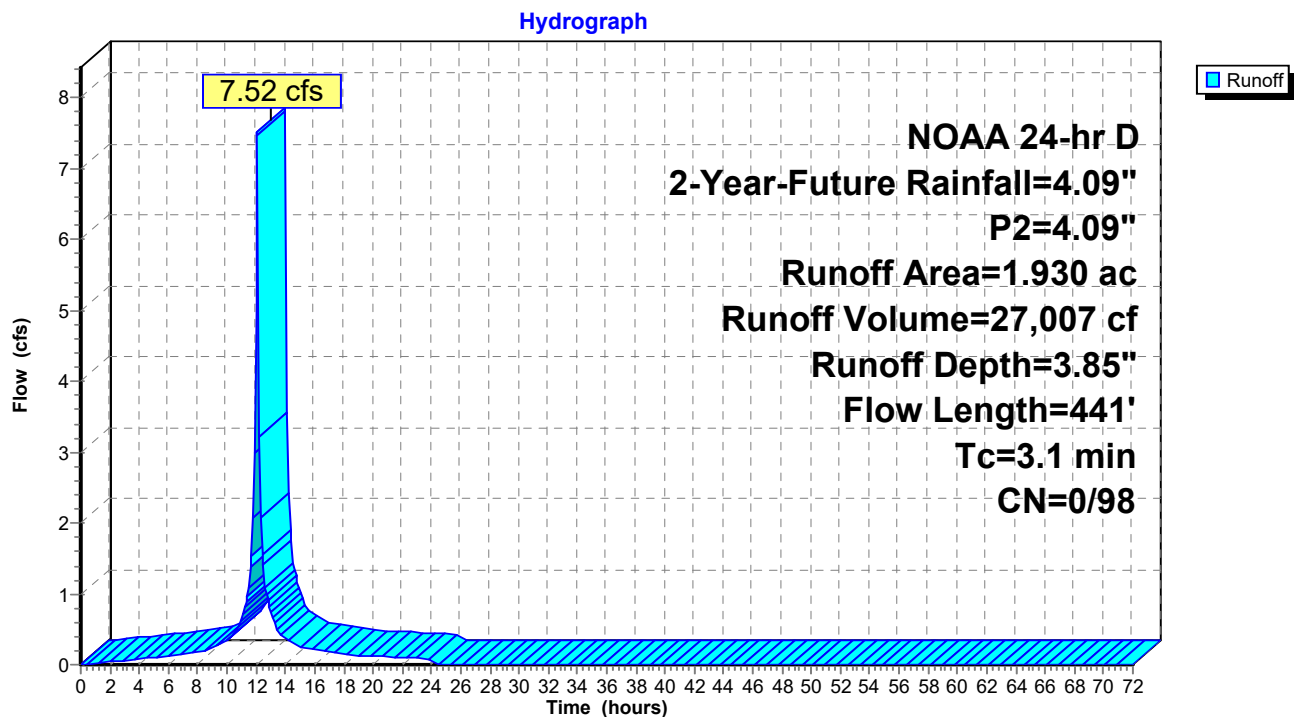
Runoff = 7.52 cfs @ 12.09 hrs, Volume= 27,007 cf, Depth= 3.85"
Routed to Link E1 : EDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Future Rainfall=4.09", P2=4.09"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	441	Total			

Subcatchment E1i: Existing Impervious



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.00 cfs @ 16.78 hrs, Volume= 4 cf, Depth= 0.06"
Routed to Link E1 : EDA 1A

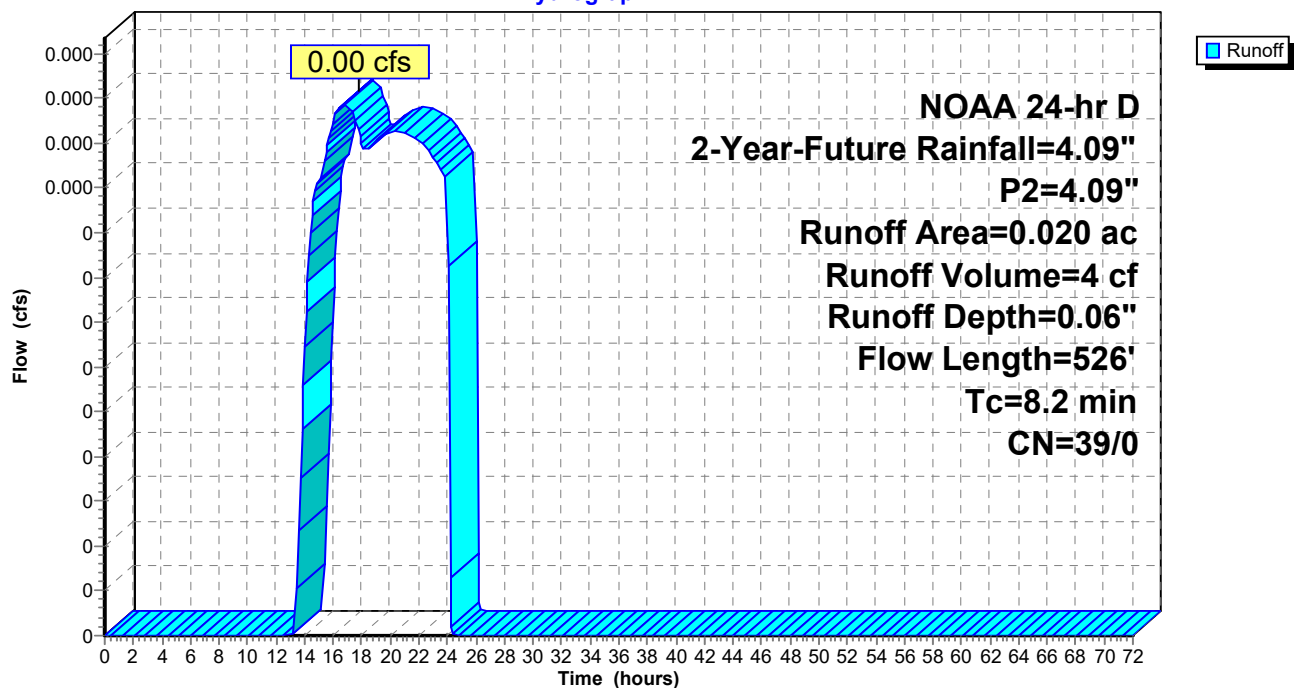
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Future Rainfall=4.09", P2=4.09"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

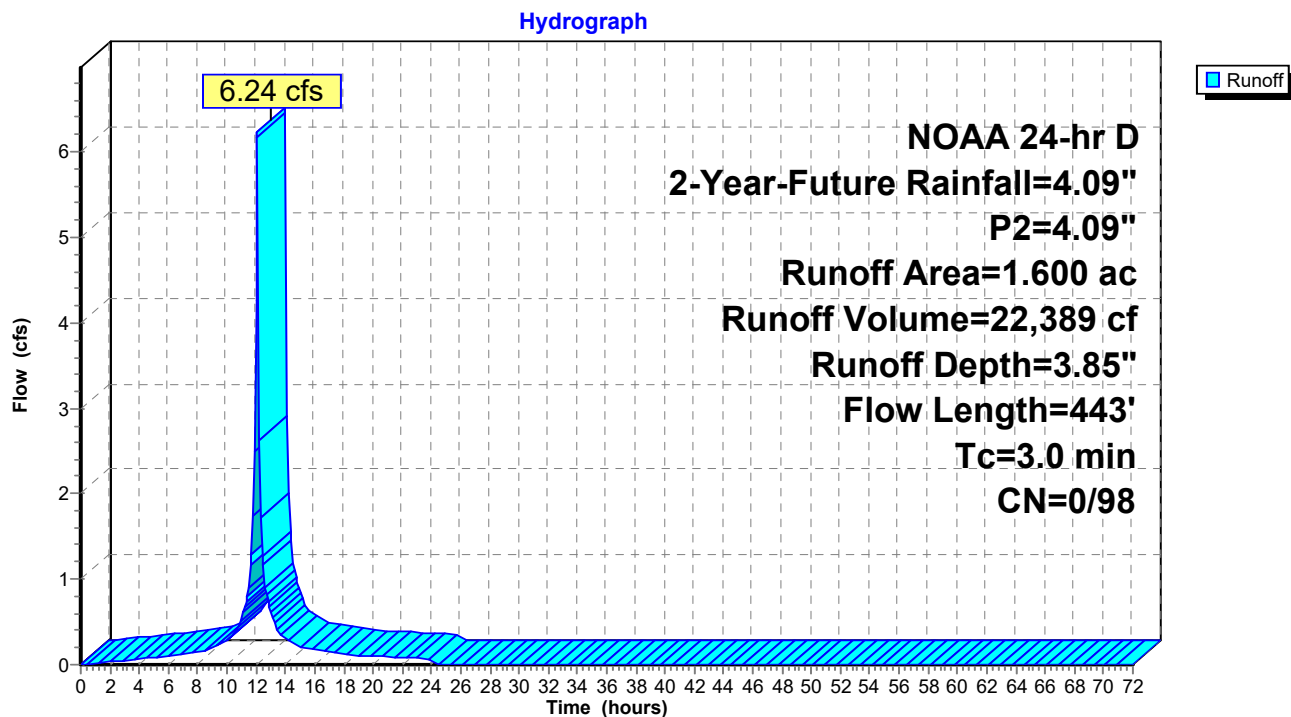
Runoff = 6.24 cfs @ 12.09 hrs, Volume= 22,389 cf, Depth= 3.85"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Future Rainfall=4.09", P2=4.09"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.0	443	Total			

Subcatchment P1i: Proposed Impervious



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 0.92 cfs @ 12.04 hrs, Volume= 3,778 cf, Depth= 3.85"
Routed to Pond PP1 : Pervious Pavement

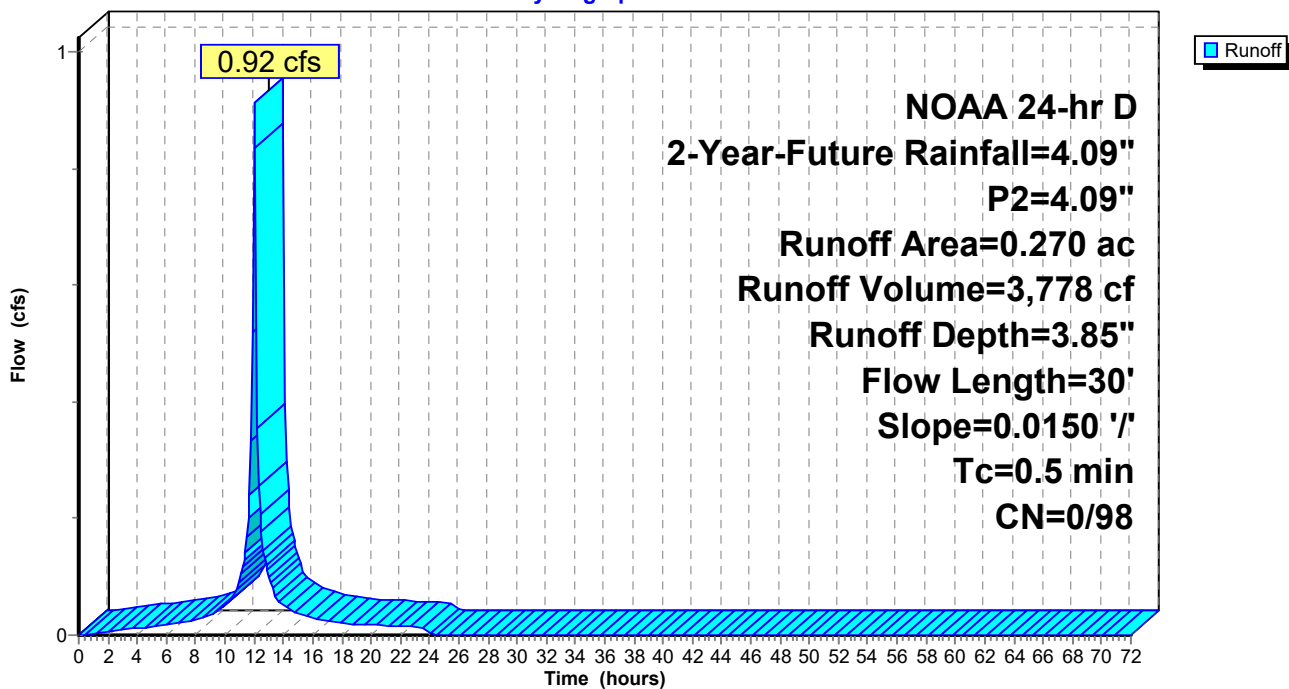
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Future Rainfall=4.09", P2=4.09"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

Runoff = 0.00 cfs @ 16.78 hrs, Volume= 18 cf, Depth= 0.06"
Routed to Link P1 : PDA 1A

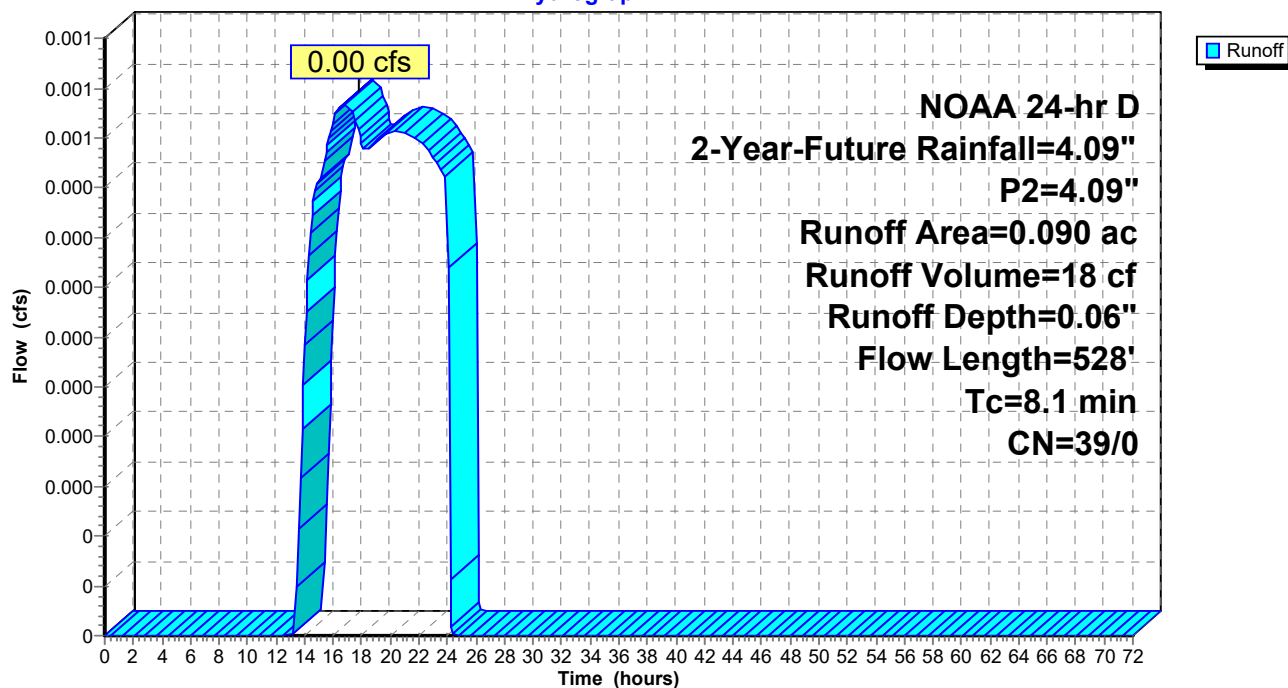
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year-Future Rainfall=4.09", P2=4.09"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.1	528	Total			

Subcatchment P1p: Proposed Pervious

Hydrograph



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 3.85" for 2-Year-Future event
 Inflow = 0.92 cfs @ 12.04 hrs, Volume= 3,778 cf
 Outflow = 0.70 cfs @ 12.13 hrs, Volume= 2,754 cf, Atten= 24%, Lag= 5.5 min
 Primary = 0.70 cfs @ 12.13 hrs, Volume= 2,754 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.09' @ 12.13 hrs Surf.Area= 8,538 sf Storage= 1,510 cf

Plug-Flow detention time= 208.0 min calculated for 2,754 cf (73% of inflow)
 Center-of-Mass det. time= 108.1 min (856.1 - 748.0)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

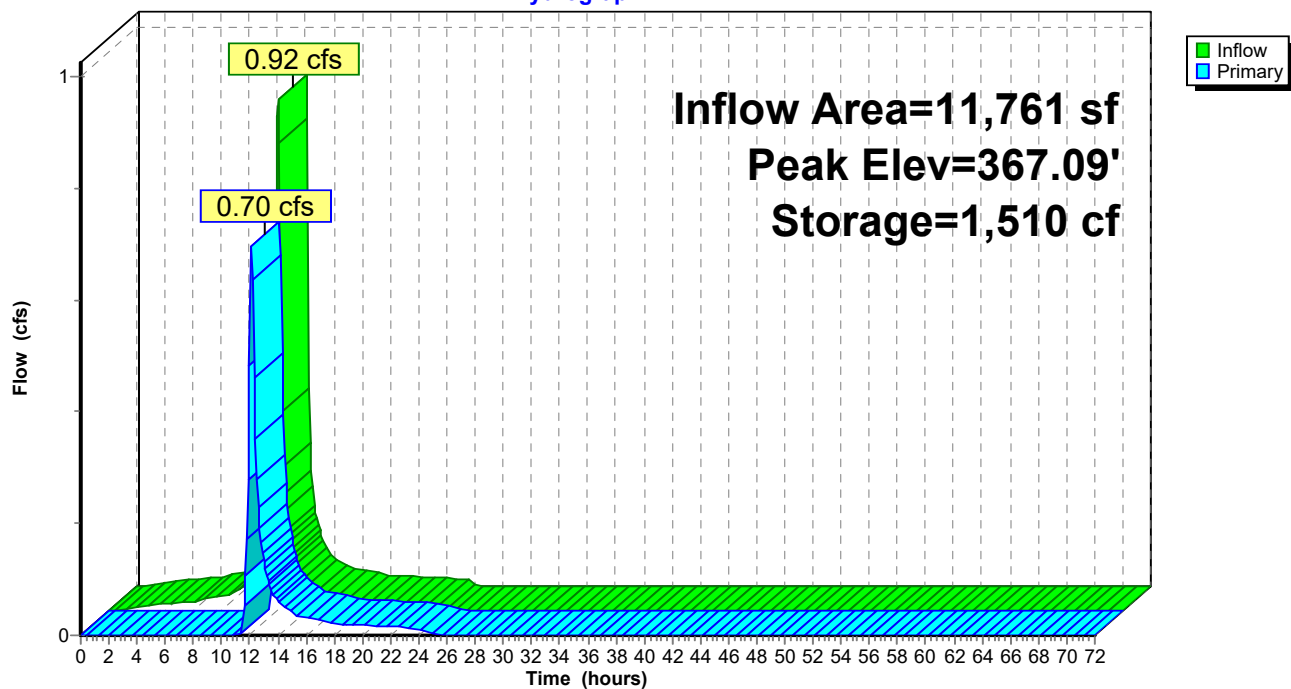
Primary OutFlow Max=0.67 cfs @ 12.13 hrs HW=367.09' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 0.67 cfs of 5.71 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.67 cfs @ 1.22 fps)

Pond PP1: Pervious Pavement

Hydrograph



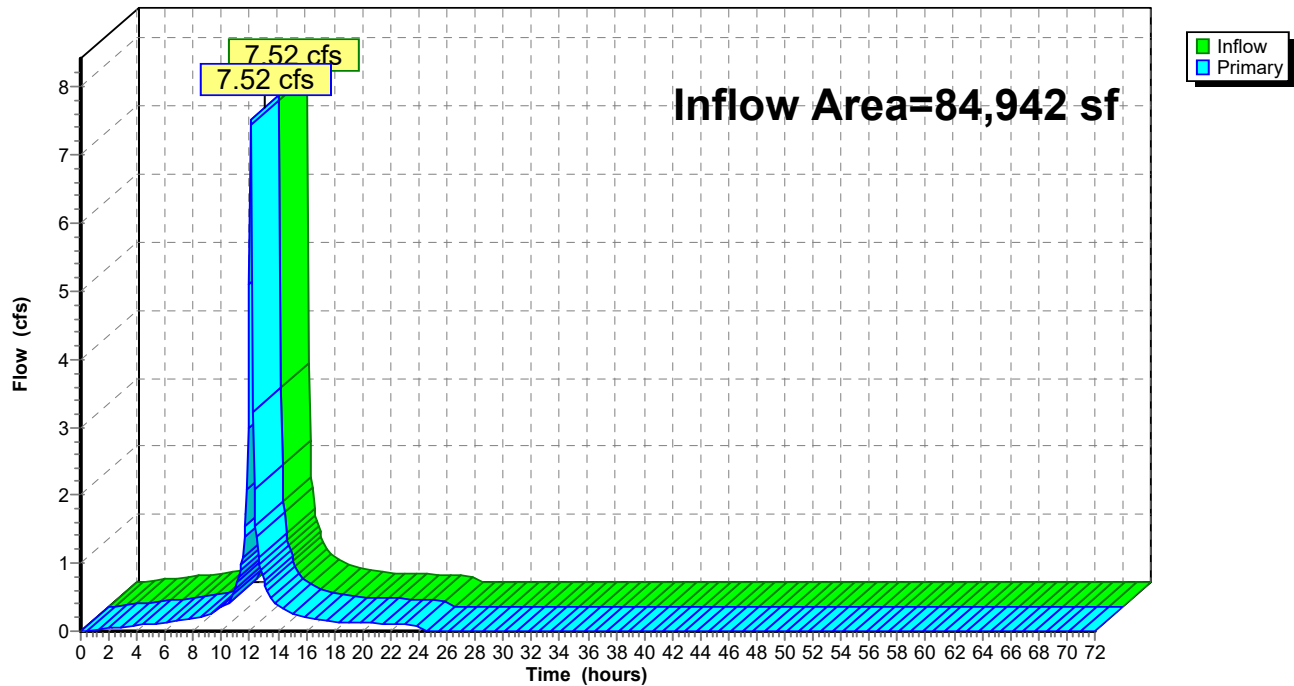
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 3.82" for 2-Year-Future event
 Inflow = 7.52 cfs @ 12.09 hrs, Volume= 27,011 cf
 Primary = 7.52 cfs @ 12.09 hrs, Volume= 27,011 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



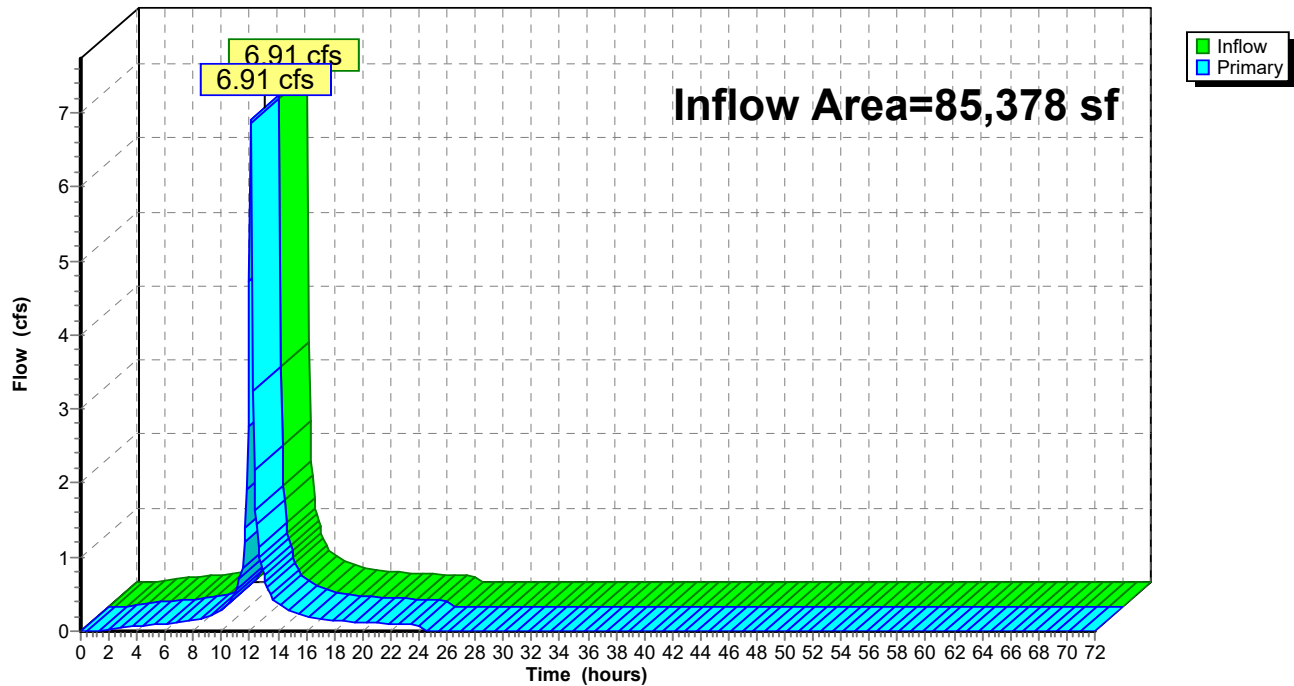
Summary for Link P1: PDA 1A

Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 3.54" for 2-Year-Future event
 Inflow = 6.91 cfs @ 12.09 hrs, Volume= 25,161 cf
 Primary = 6.91 cfs @ 12.09 hrs, Volume= 25,161 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link P1: PDA 1A

Hydrograph



Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=6.13"
 Flow Length=441' Tc=3.1 min CN=0/98 Runoff=11.76 cfs 42,957 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=0.56"
 Flow Length=526' Tc=8.2 min CN=39/0 Runoff=0.00 cfs 40 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=6.13"
 Flow Length=443' Tc=3.0 min CN=0/98 Runoff=9.76 cfs 35,612 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=6.13"
 Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=1.43 cfs 6,009 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=0.56"
 Flow Length=528' Tc=8.1 min CN=39/0 Runoff=0.02 cfs 182 cf

Pond PP1: Pervious Pavement Peak Elev=367.15' Storage=1,706 cf Inflow=1.43 cfs 6,009 cf
 Outflow=1.15 cfs 4,985 cf

Link E1: EDA 1A Inflow=11.76 cfs 42,997 cf
 Primary=11.76 cfs 42,997 cf

Link P1: PDA 1A Inflow=10.89 cfs 40,778 cf
 Primary=10.89 cfs 40,778 cf

Total Runoff Area = 170,320 sf Runoff Volume = 84,800 cf Average Runoff Depth = 5.97"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

Runoff = 11.76 cfs @ 12.09 hrs, Volume= 42,957 cf, Depth= 6.13"
Routed to Link E1 : EDA 1A

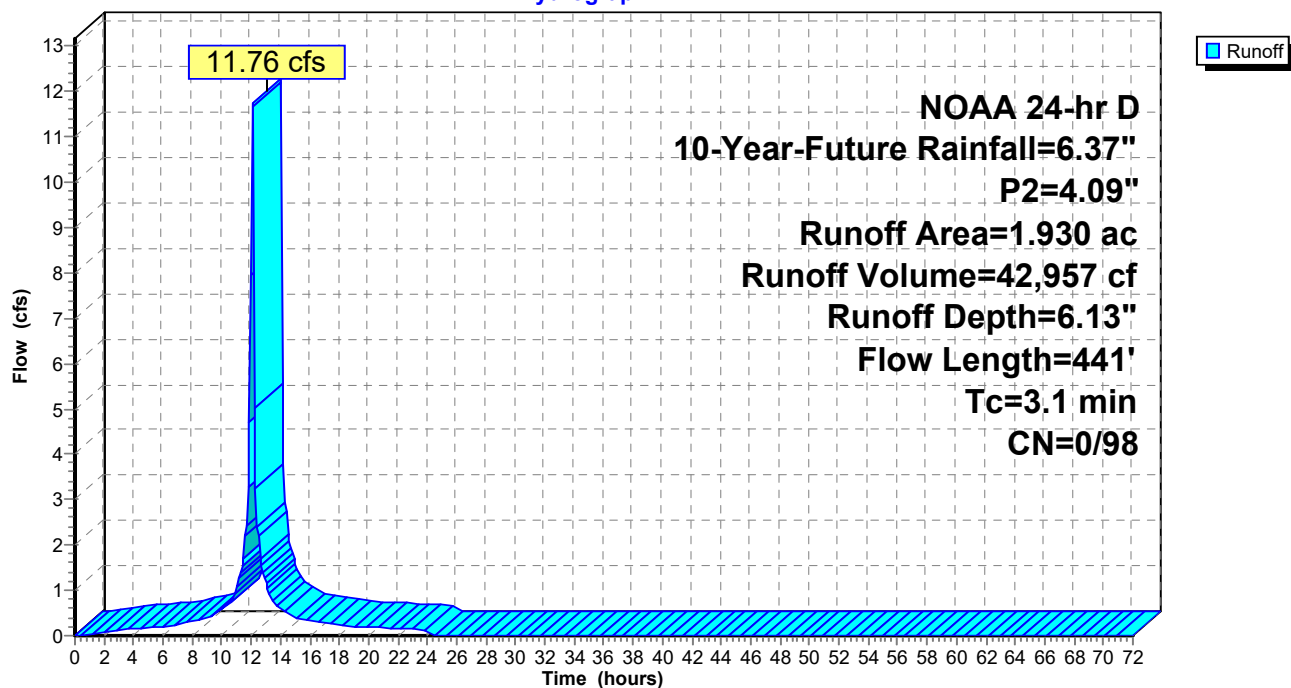
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Future Rainfall=6.37", P2=4.09"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	441	Total			

Subcatchment E1i: Existing Impervious

Hydrograph



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.00 cfs @ 12.25 hrs, Volume= 40 cf, Depth= 0.56"
Routed to Link E1 : EDA 1A

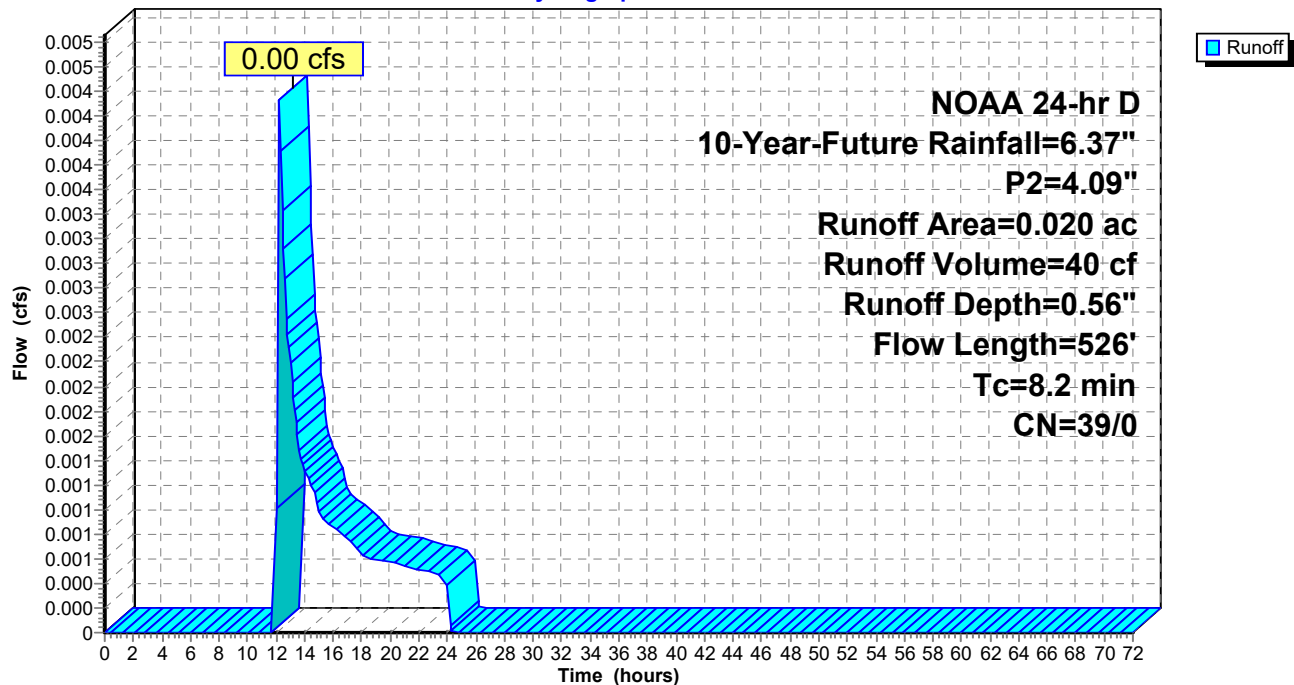
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Future Rainfall=6.37", P2=4.09"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

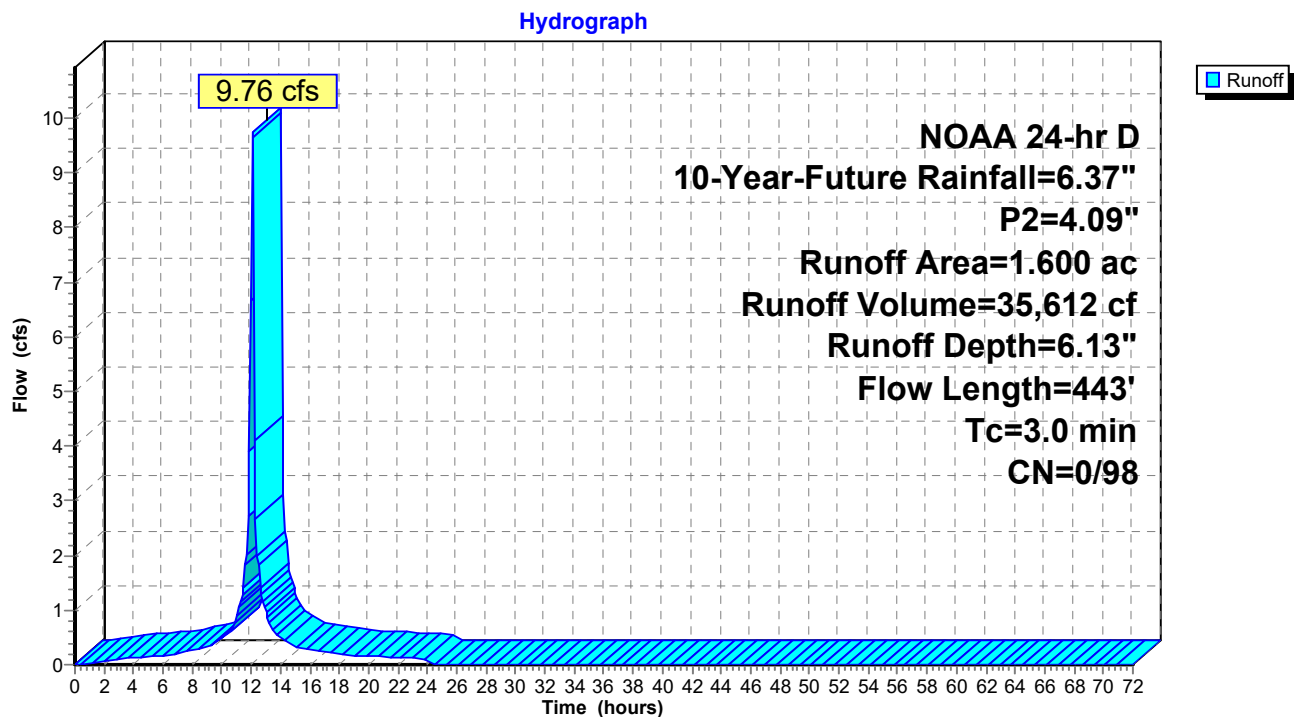
Runoff = 9.76 cfs @ 12.08 hrs, Volume= 35,612 cf, Depth= 6.13"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Future Rainfall=6.37", P2=4.09"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.0	443	Total			

Subcatchment P1i: Proposed Impervious



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 1.43 cfs @ 12.04 hrs, Volume= 6,009 cf, Depth= 6.13"
Routed to Pond PP1 : Pervious Pavement

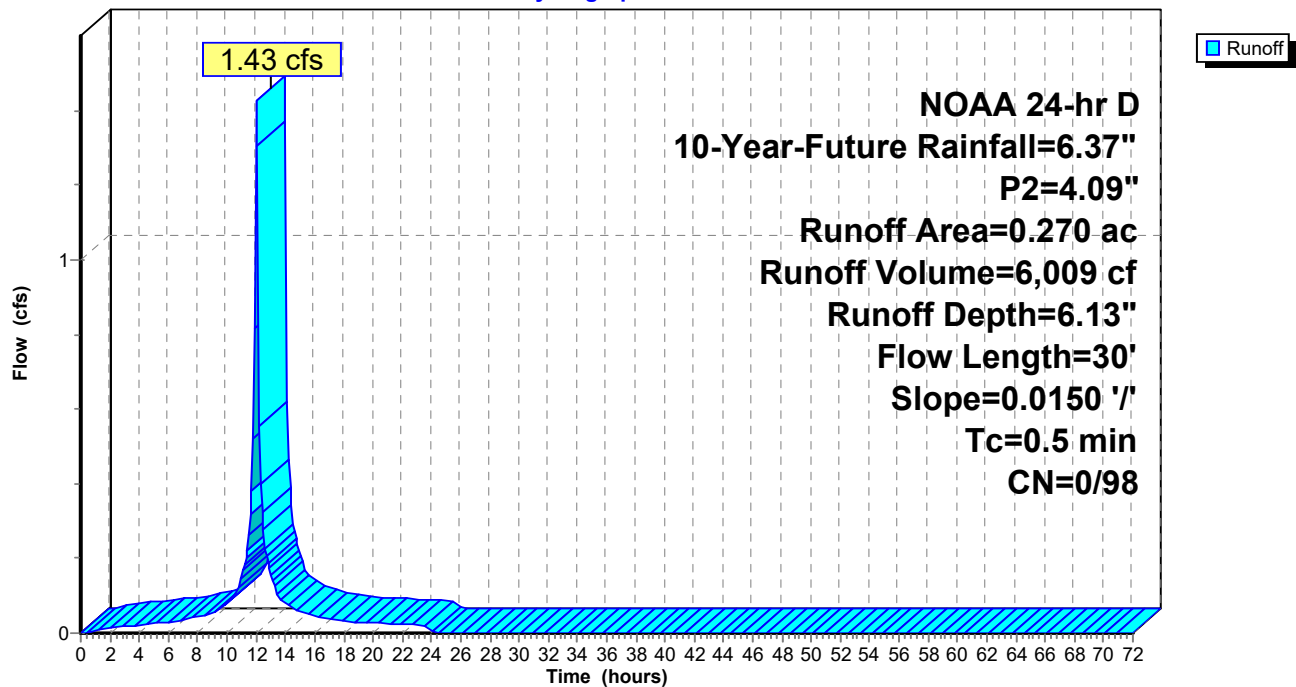
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Future Rainfall=6.37", P2=4.09"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

Runoff = 0.02 cfs @ 12.25 hrs, Volume= 182 cf, Depth= 0.56"
Routed to Link P1 : PDA 1A

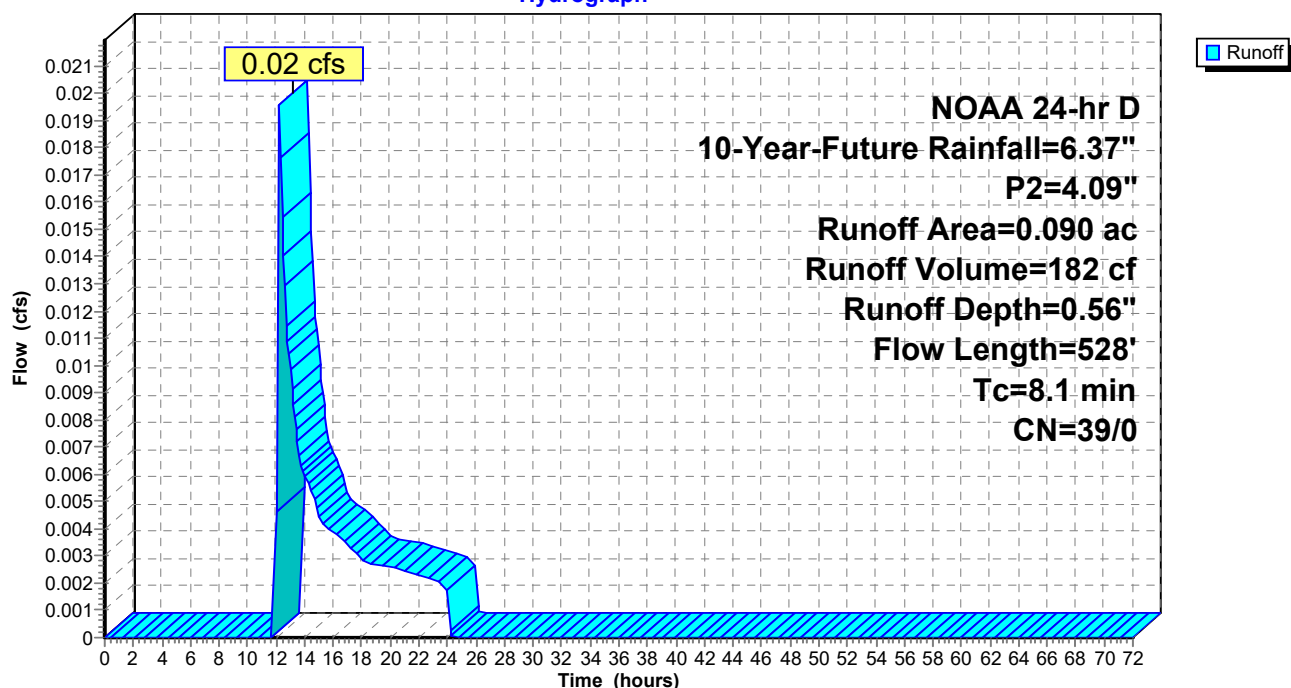
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year-Future Rainfall=6.37", P2=4.09"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.1	528	Total			

Subcatchment P1p: Proposed Pervious

Hydrograph



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 6.13" for 10-Year-Future event
 Inflow = 1.43 cfs @ 12.04 hrs, Volume= 6,009 cf
 Outflow = 1.15 cfs @ 12.12 hrs, Volume= 4,985 cf, Atten= 19%, Lag= 4.9 min
 Primary = 1.15 cfs @ 12.12 hrs, Volume= 4,985 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.15' @ 12.12 hrs Surf.Area= 8,538 sf Storage= 1,706 cf

Plug-Flow detention time= 163.5 min calculated for 4,978 cf (83% of inflow)
 Center-of-Mass det. time= 87.5 min (827.7 - 740.2)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

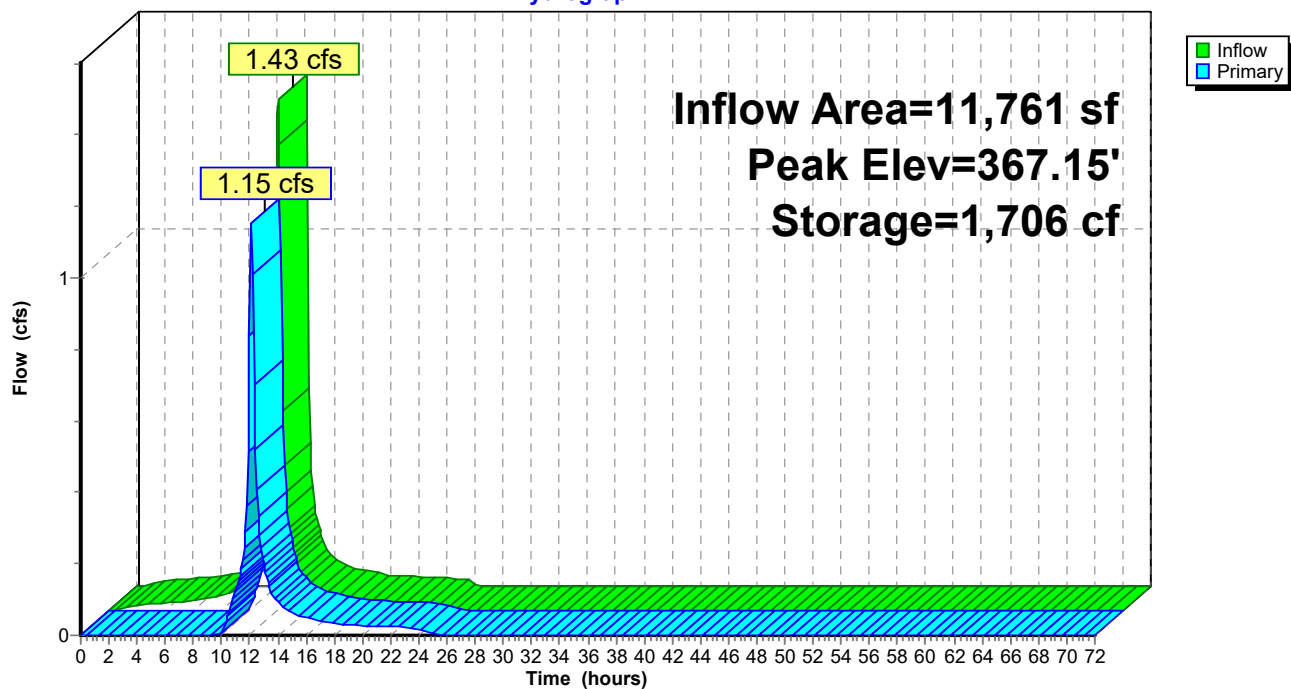
Primary OutFlow Max=1.12 cfs @ 12.12 hrs HW=367.15' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 1.12 cfs of 5.64 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 1.12 cfs @ 1.45 fps)

Pond PP1: Pervious Pavement

Hydrograph



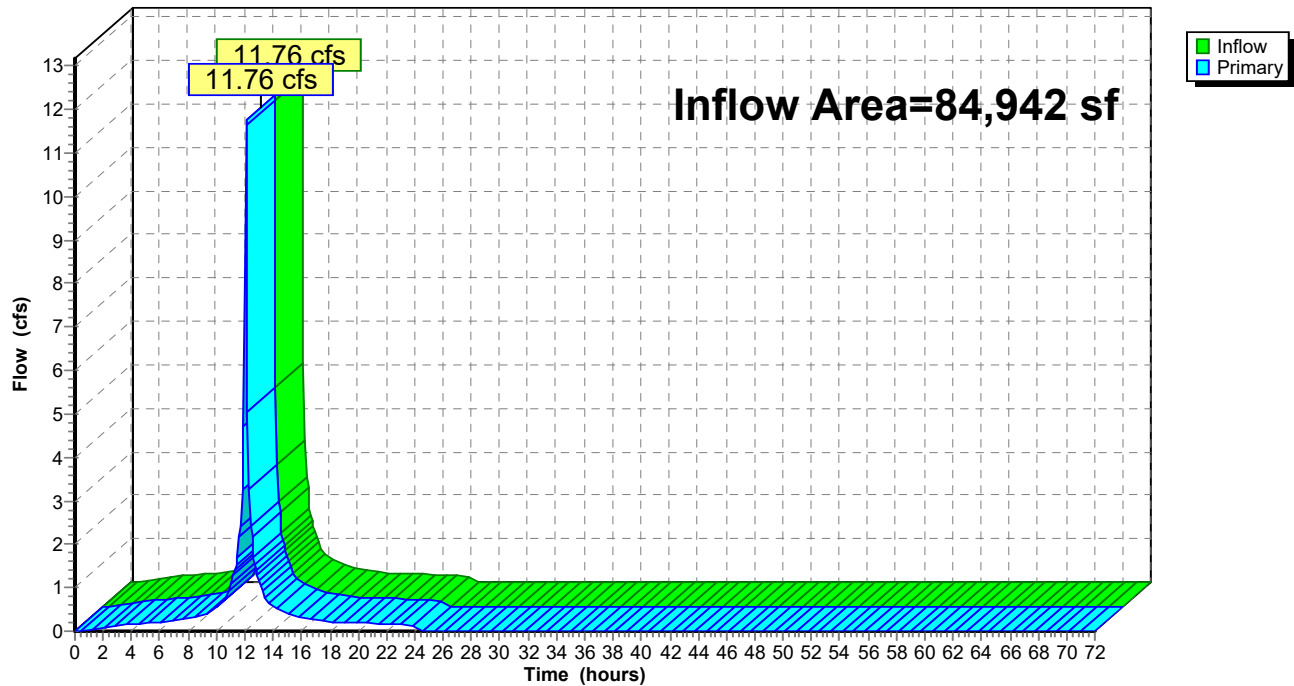
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 6.07" for 10-Year-Future event
 Inflow = 11.76 cfs @ 12.09 hrs, Volume= 42,997 cf
 Primary = 11.76 cfs @ 12.09 hrs, Volume= 42,997 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



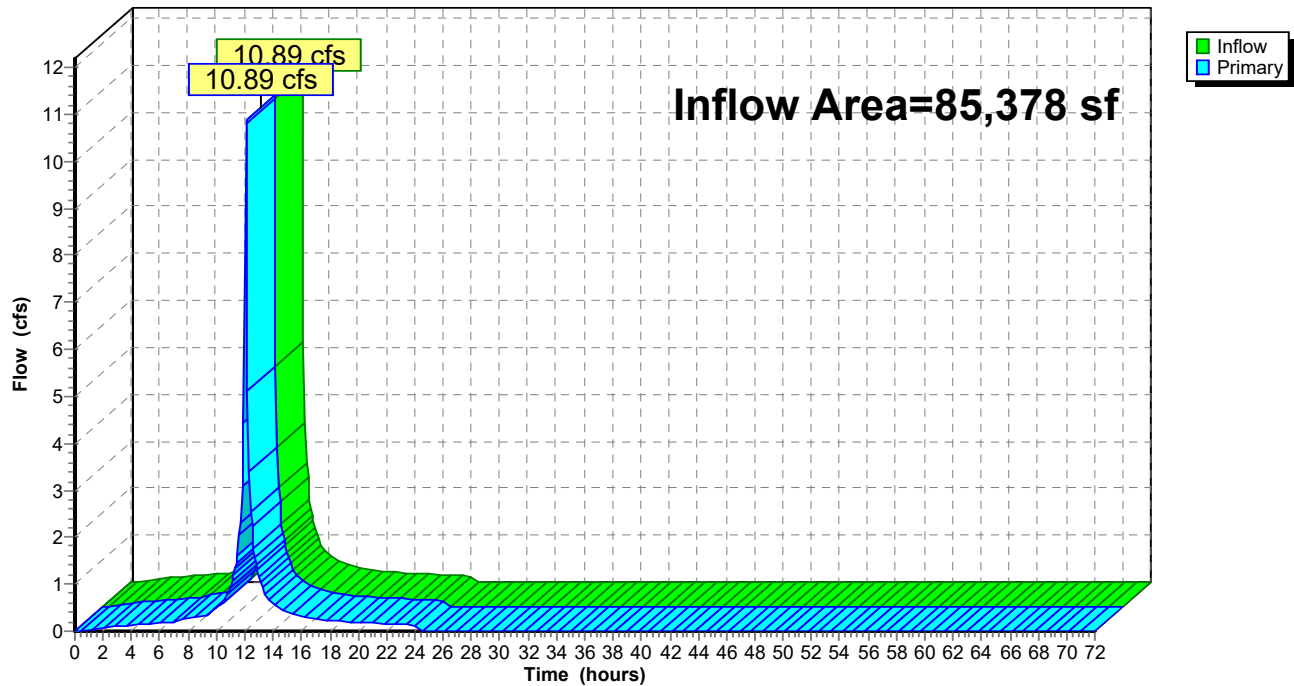
Summary for Link P1: PDA 1A

Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 5.73" for 10-Year-Future event
 Inflow = 10.89 cfs @ 12.09 hrs, Volume= 40,778 cf
 Primary = 10.89 cfs @ 12.09 hrs, Volume= 40,778 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link P1: PDA 1A

Hydrograph



Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=11.28"
Flow Length=441' Tc=3.1 min CN=0/98 Runoff=21.32 cfs 79,017 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=2.93"
Flow Length=526' Tc=8.2 min CN=39/0 Runoff=0.05 cfs 213 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=11.28"
Flow Length=443' Tc=3.0 min CN=0/98 Runoff=17.68 cfs 65,506 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=11.28"
Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=2.60 cfs 11,054 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=2.93"
Flow Length=528' Tc=8.1 min CN=39/0 Runoff=0.23 cfs 957 cf

Pond PP1: Pervious Pavement Peak Elev=367.26' Storage=2,077 cf Inflow=2.60 cfs 11,054 cf
Outflow=2.20 cfs 10,030 cf

Link E1: EDA 1A Inflow=21.36 cfs 79,230 cf
Primary=21.36 cfs 79,230 cf

Link P1: PDA 1A Inflow=20.04 cfs 76,493 cf
Primary=20.04 cfs 76,493 cf

Total Runoff Area = 170,320 sf Runoff Volume = 156,748 cf Average Runoff Depth = 11.04"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

Runoff = 21.32 cfs @ 12.09 hrs, Volume= 79,017 cf, Depth=11.28"
Routed to Link E1 : EDA 1A

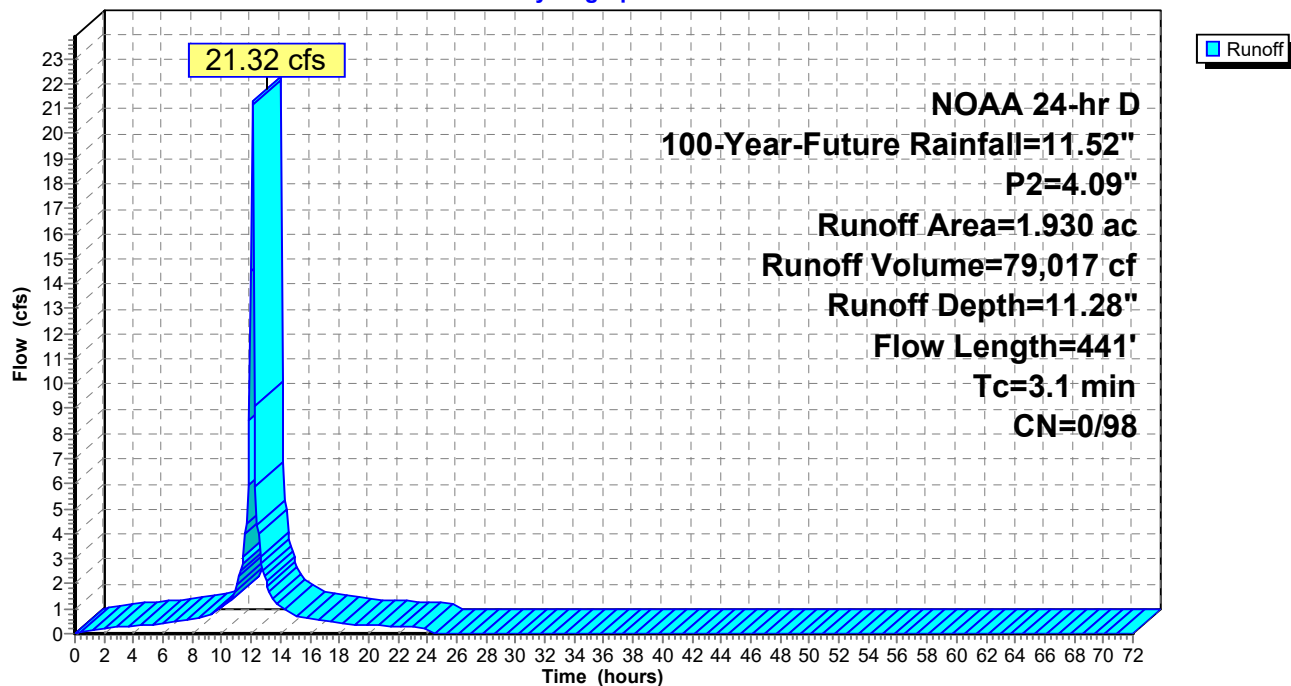
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Future Rainfall=11.52", P2=4.09"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	441	Total			

Subcatchment E1i: Existing Impervious

Hydrograph



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.05 cfs @ 12.18 hrs, Volume= 213 cf, Depth= 2.93"
Routed to Link E1 : EDA 1A

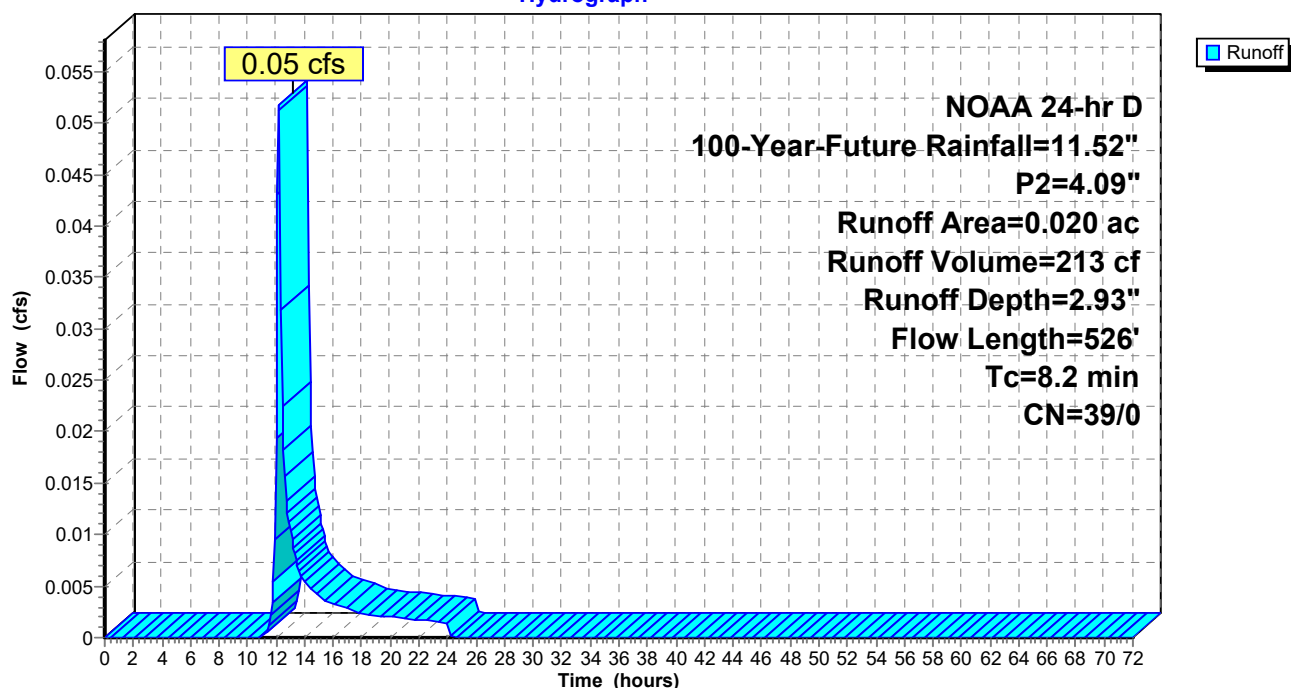
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Future Rainfall=11.52", P2=4.09"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

Runoff = 17.68 cfs @ 12.08 hrs, Volume= 65,506 cf, Depth=11.28"
Routed to Link P1 : PDA 1A

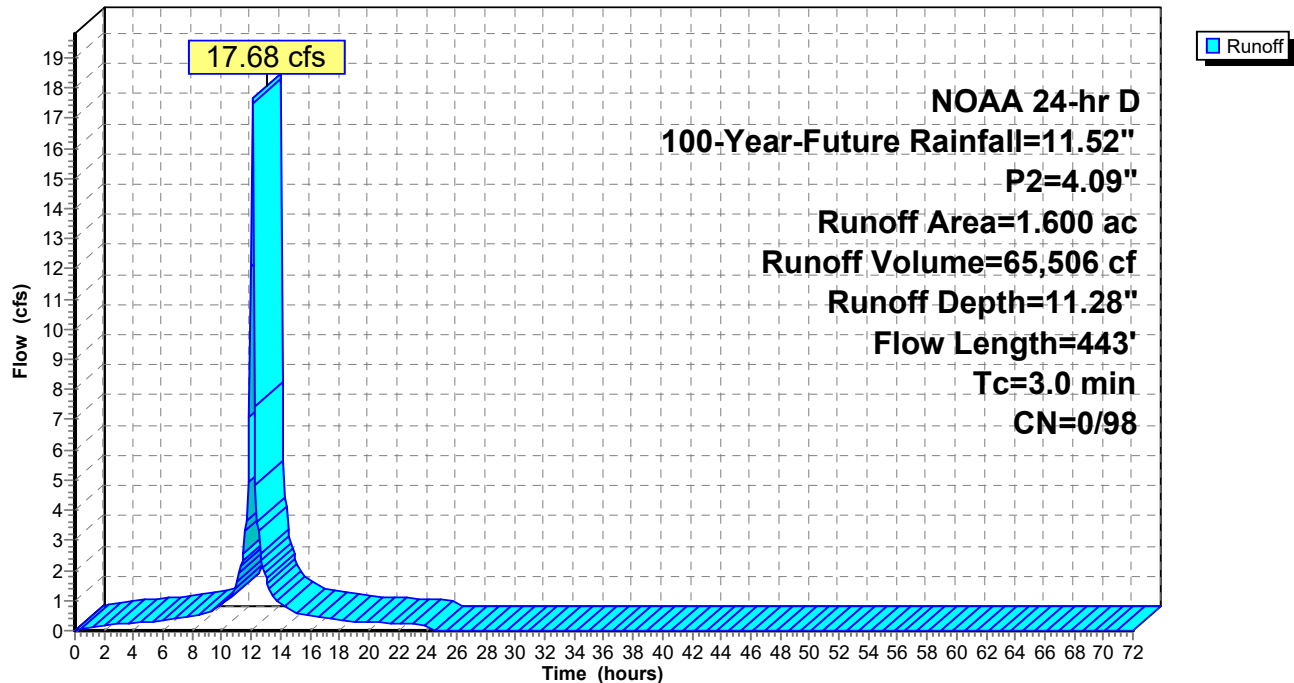
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Future Rainfall=11.52", P2=4.09"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.0	443	Total			

Subcatchment P1i: Proposed Impervious

Hydrograph



Summary for Subcatchment P1i(pp): Proposed Impervious

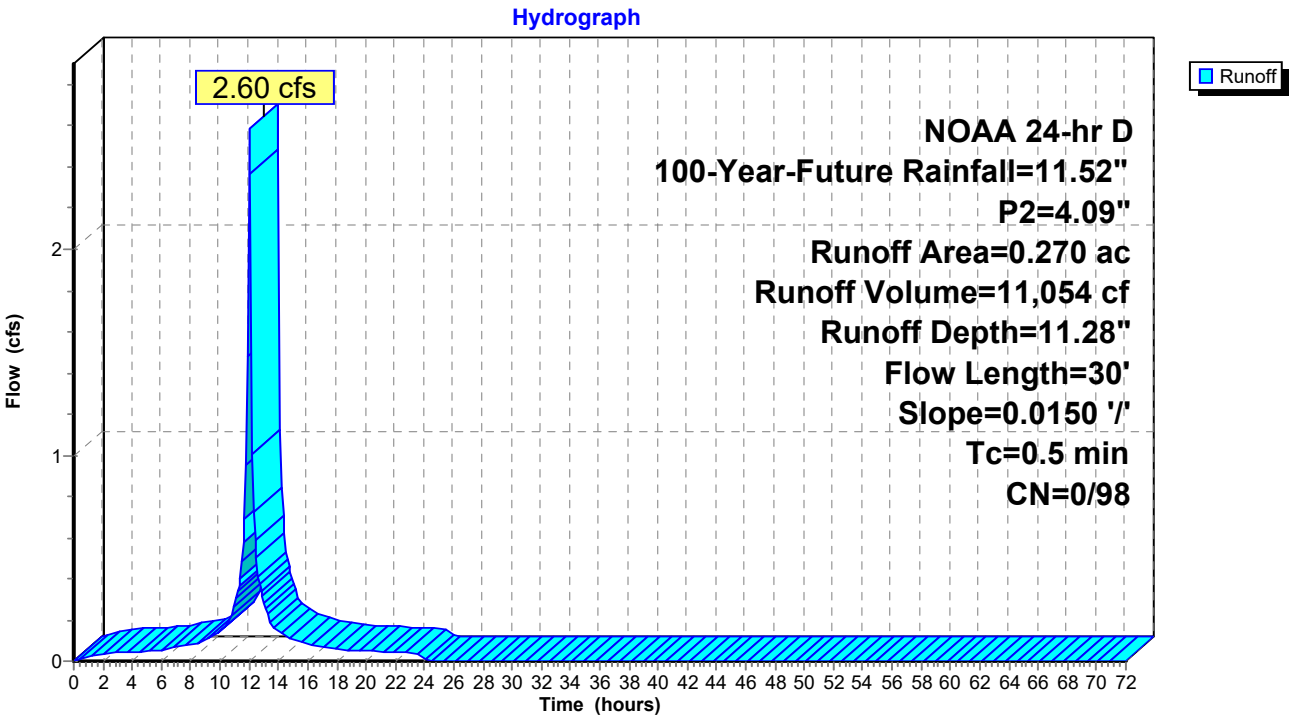
Runoff = 2.60 cfs @ 12.04 hrs, Volume= 11,054 cf, Depth=11.28"
Routed to Pond PP1 : Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Future Rainfall=11.52", P2=4.09"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"

Subcatchment P1i(pp): Proposed Impervious



Summary for Subcatchment P1p: Proposed Pervious

Runoff = 0.23 cfs @ 12.18 hrs, Volume= 957 cf, Depth= 2.93"
Routed to Link P1 : PDA 1A

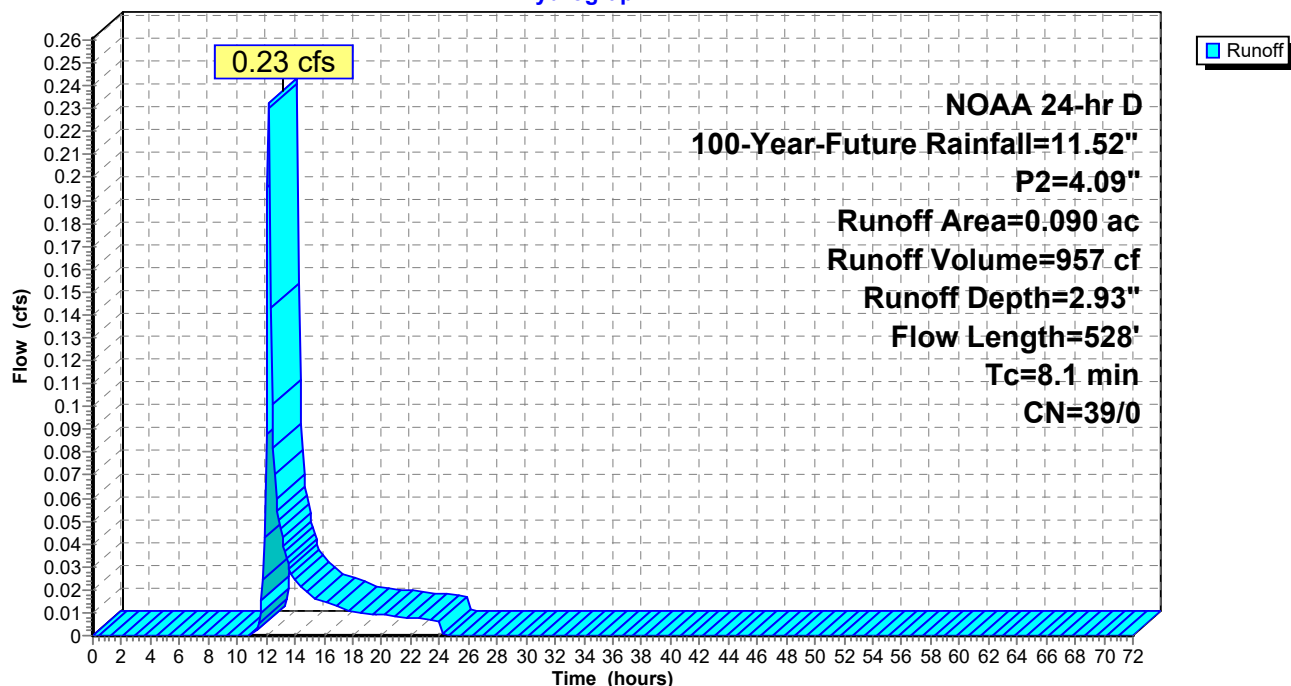
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year-Future Rainfall=11.52", P2=4.09"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.1	528	Total			

Subcatchment P1p: Proposed Pervious

Hydrograph



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 11.28" for 100-Year-Future event
 Inflow = 2.60 cfs @ 12.04 hrs, Volume= 11,054 cf
 Outflow = 2.20 cfs @ 12.11 hrs, Volume= 10,030 cf, Atten= 15%, Lag= 4.4 min
 Primary = 2.20 cfs @ 12.11 hrs, Volume= 10,030 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.26' @ 12.11 hrs Surf.Area= 8,538 sf Storage= 2,077 cf

Plug-Flow detention time= 116.8 min calculated for 10,030 cf (91% of inflow)
 Center-of-Mass det. time= 63.9 min (796.6 - 732.7)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 ' / ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

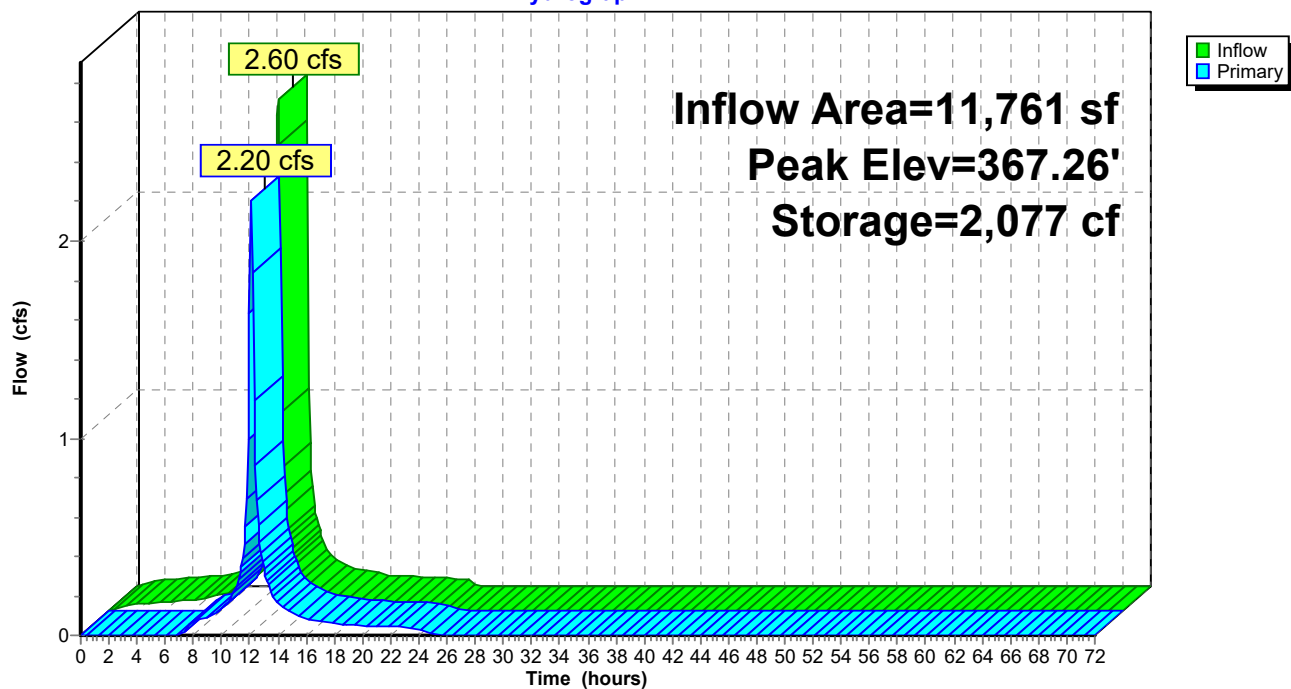
Primary OutFlow Max=2.16 cfs @ 12.11 hrs HW=367.25' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 2.16 cfs of 5.59 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 2.16 cfs @ 1.80 fps)

Pond PP1: Pervious Pavement

Hydrograph



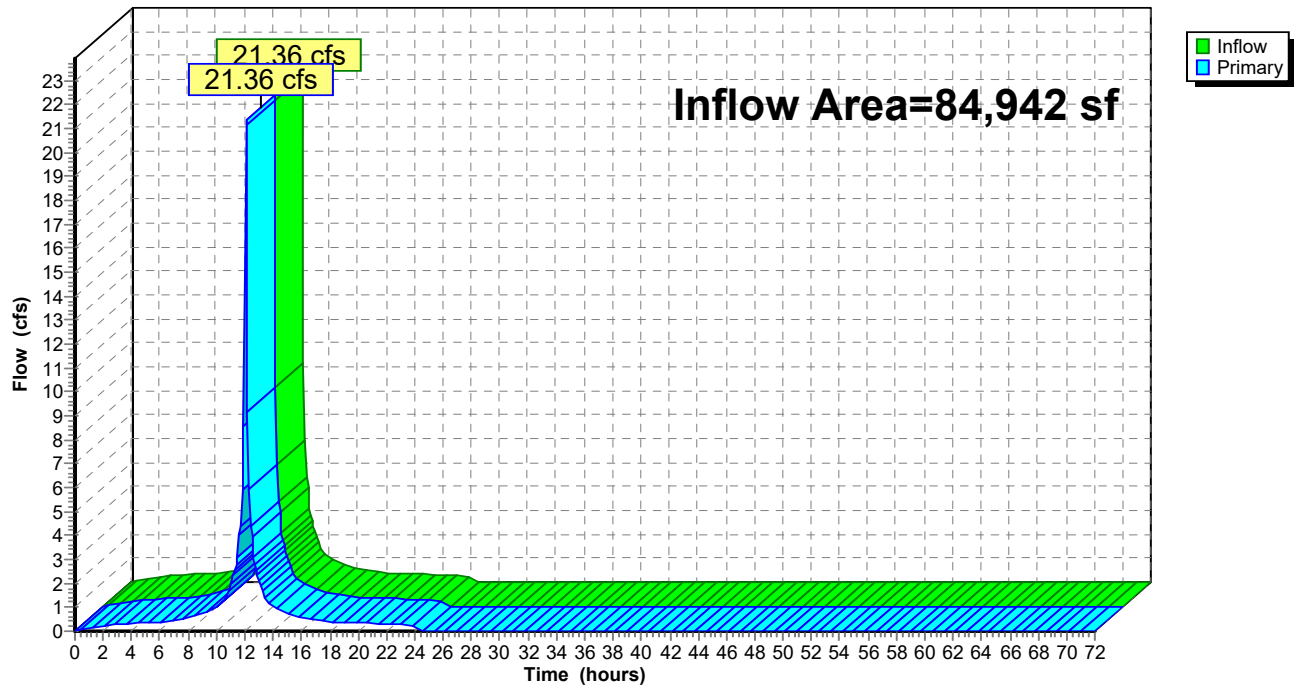
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 11.19" for 100-Year-Future event
 Inflow = 21.36 cfs @ 12.09 hrs, Volume= 79,230 cf
 Primary = 21.36 cfs @ 12.09 hrs, Volume= 79,230 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



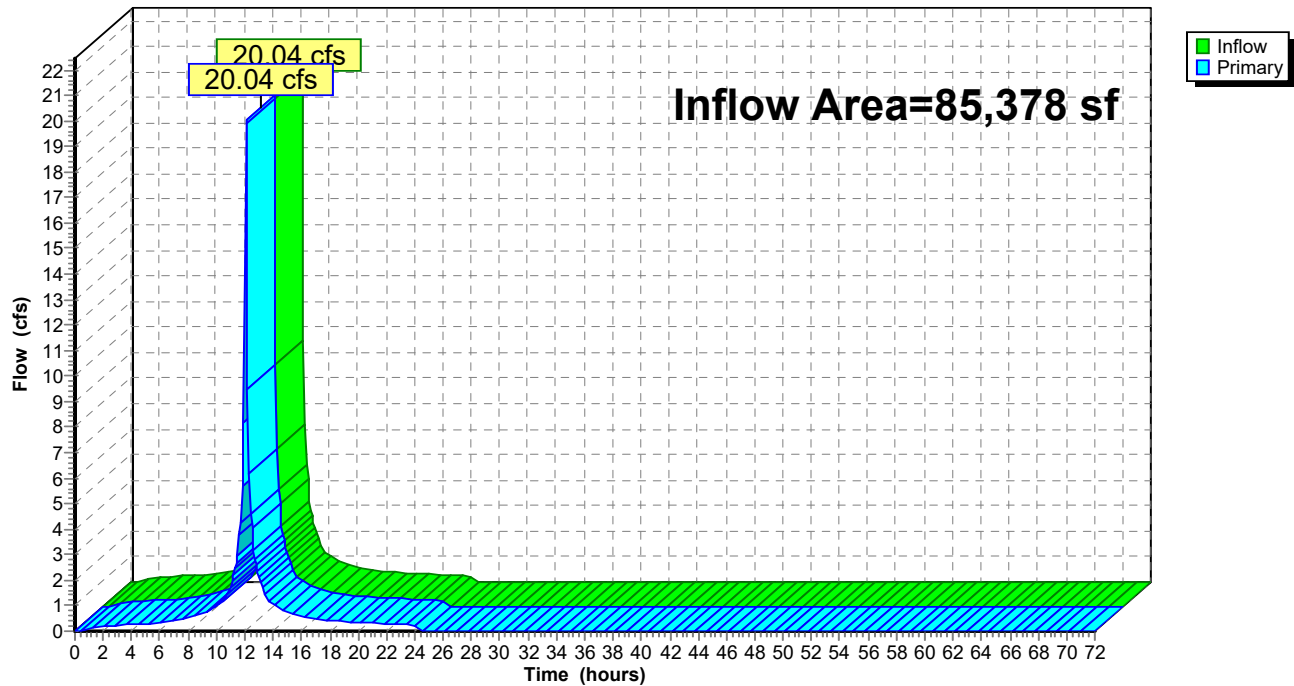
Summary for Link P1: PDA 1A

Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 10.75" for 100-Year-Future event
 Inflow = 20.04 cfs @ 12.09 hrs, Volume= 76,493 cf
 Primary = 20.04 cfs @ 12.09 hrs, Volume= 76,493 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link P1: PDA 1A

Hydrograph



Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=7.78"
Flow Length=441' Tc=3.2 min CN=0/98 Runoff=14.82 cfs 54,507 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=1.17"
Flow Length=526' Tc=8.6 min CN=39/0 Runoff=0.02 cfs 85 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=7.78"
Flow Length=443' Tc=3.1 min CN=0/98 Runoff=12.29 cfs 45,187 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=7.78"
Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=1.81 cfs 7,625 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=1.17"
Flow Length=528' Tc=8.5 min CN=39/0 Runoff=0.07 cfs 381 cf

Pond PP1: Pervious Pavement Peak Elev=367.19' Storage=1,832 cf Inflow=1.81 cfs 7,625 cf
Outflow=1.49 cfs 6,601 cf

Link E1: EDA 1A Inflow=14.83 cfs 54,592 cf
Primary=14.83 cfs 54,592 cf

Link P1: PDA 1A Inflow=13.79 cfs 52,169 cf
Primary=13.79 cfs 52,169 cf

Total Runoff Area = 170,320 sf Runoff Volume = 107,785 cf Average Runoff Depth = 7.59"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

Runoff = 14.82 cfs @ 12.09 hrs, Volume= 54,507 cf, Depth= 7.78"
Routed to Link E1 : EDA 1A

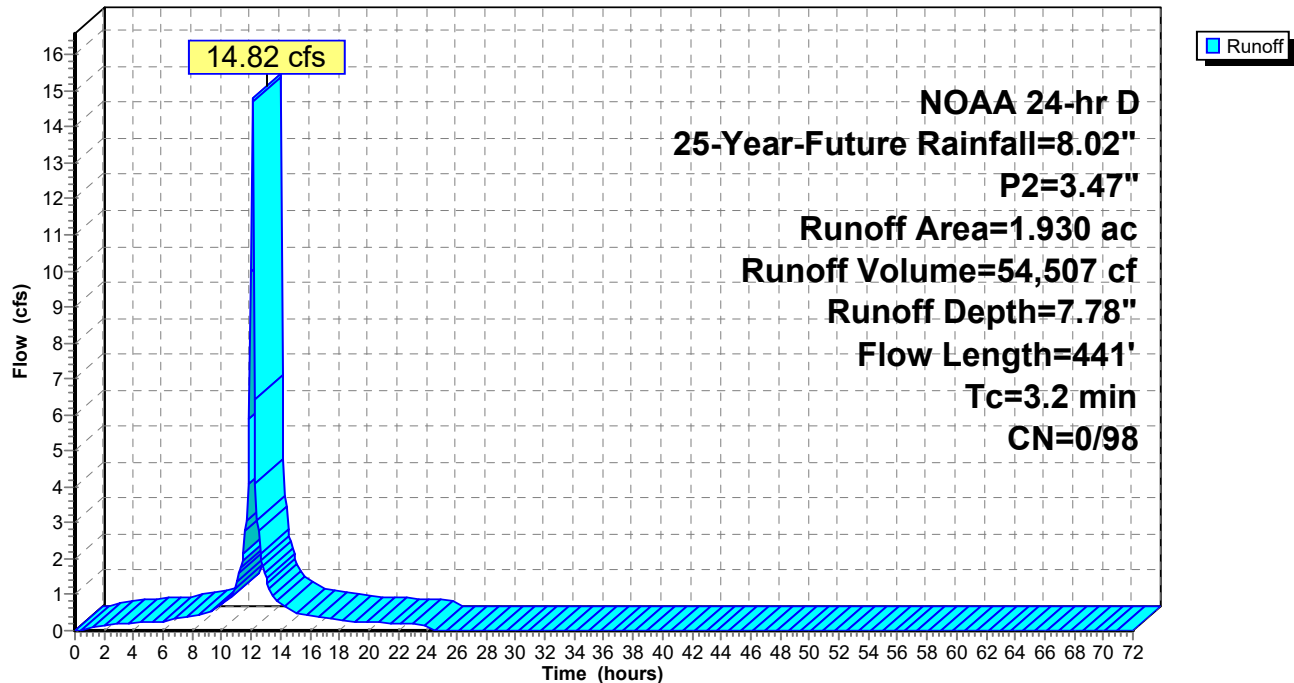
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 25-Year-Future Rainfall=8.02", P2=3.47"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.2	441	Total			

Subcatchment E1i: Existing Impervious

Hydrograph



Summary for Subcatchment E1p: Existing Pervious

Runoff = 0.02 cfs @ 12.21 hrs, Volume= 85 cf, Depth= 1.17"
Routed to Link E1 : EDA 1A

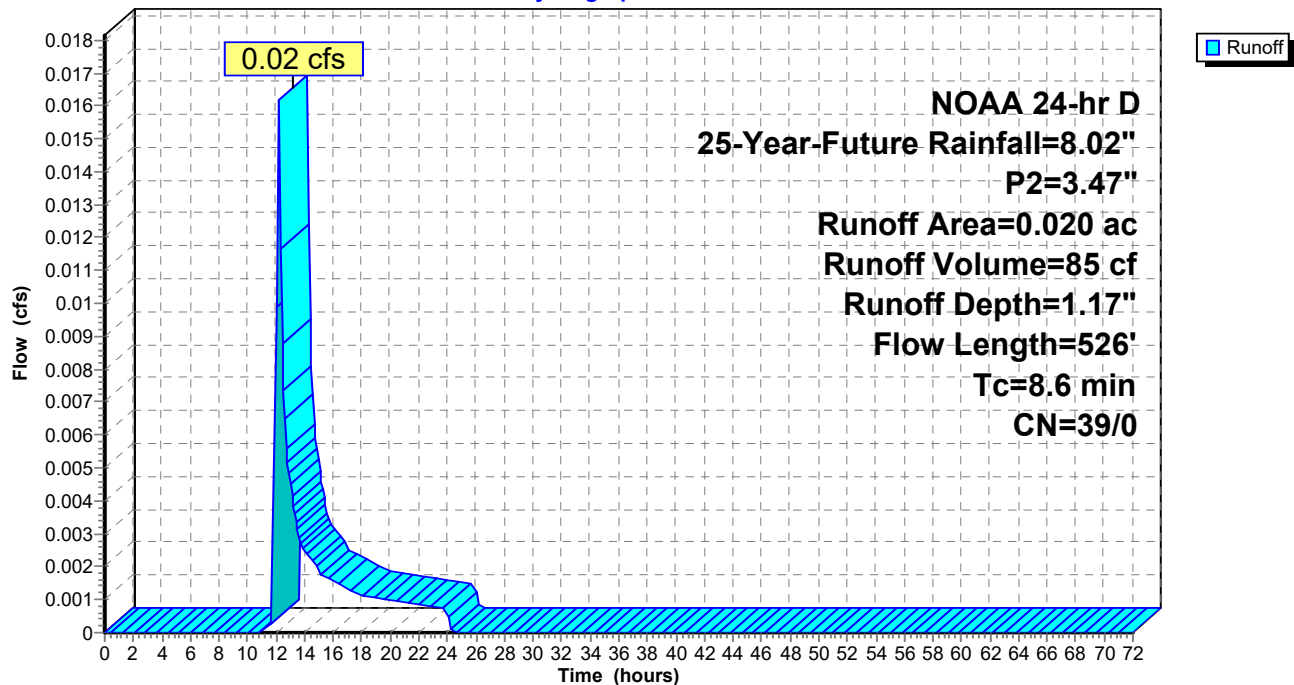
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 25-Year-Future Rainfall=8.02", P2=3.47"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.6	526	Total			

Subcatchment E1p: Existing Pervious

Hydrograph



Summary for Subcatchment P1i: Proposed Impervious

Runoff = 12.29 cfs @ 12.09 hrs, Volume= 45,187 cf, Depth= 7.78"
Routed to Link P1 : PDA 1A

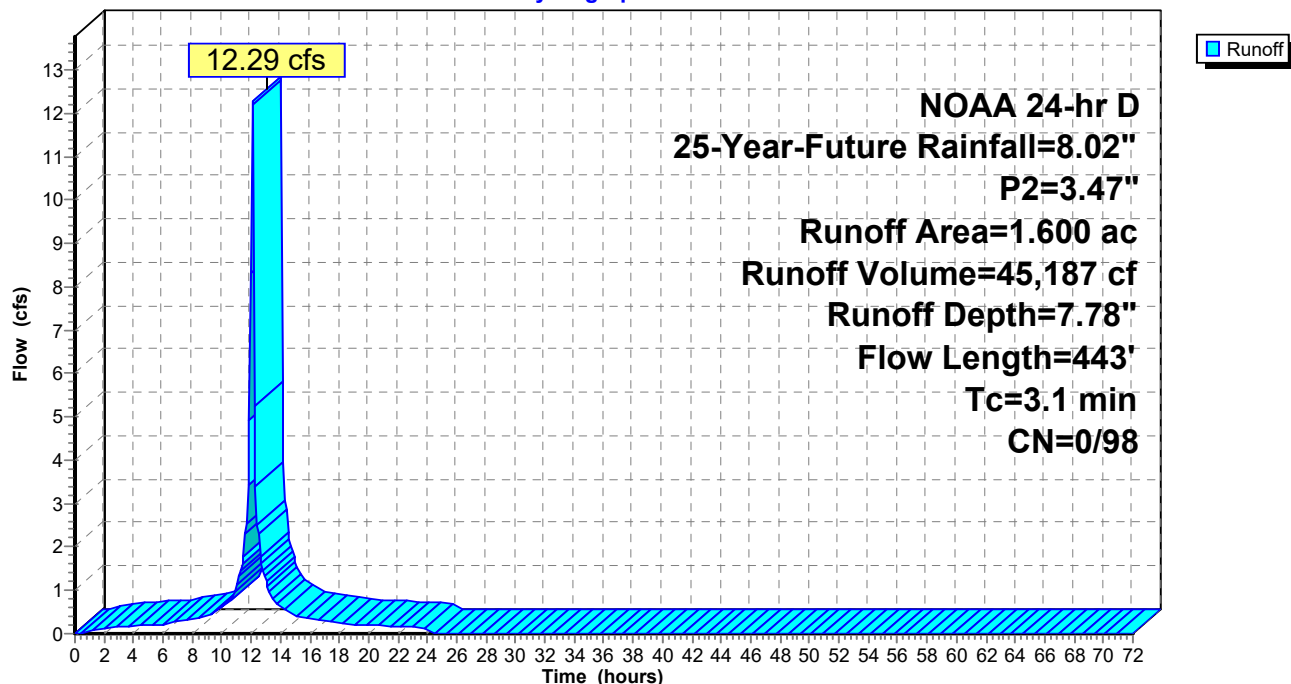
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 25-Year-Future Rainfall=8.02", P2=3.47"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.89		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	443	Total			

Subcatchment P1i: Proposed Impervious

Hydrograph



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 1.81 cfs @ 12.04 hrs, Volume= 7,625 cf, Depth= 7.78"
Routed to Pond PP1 : Pervious Pavement

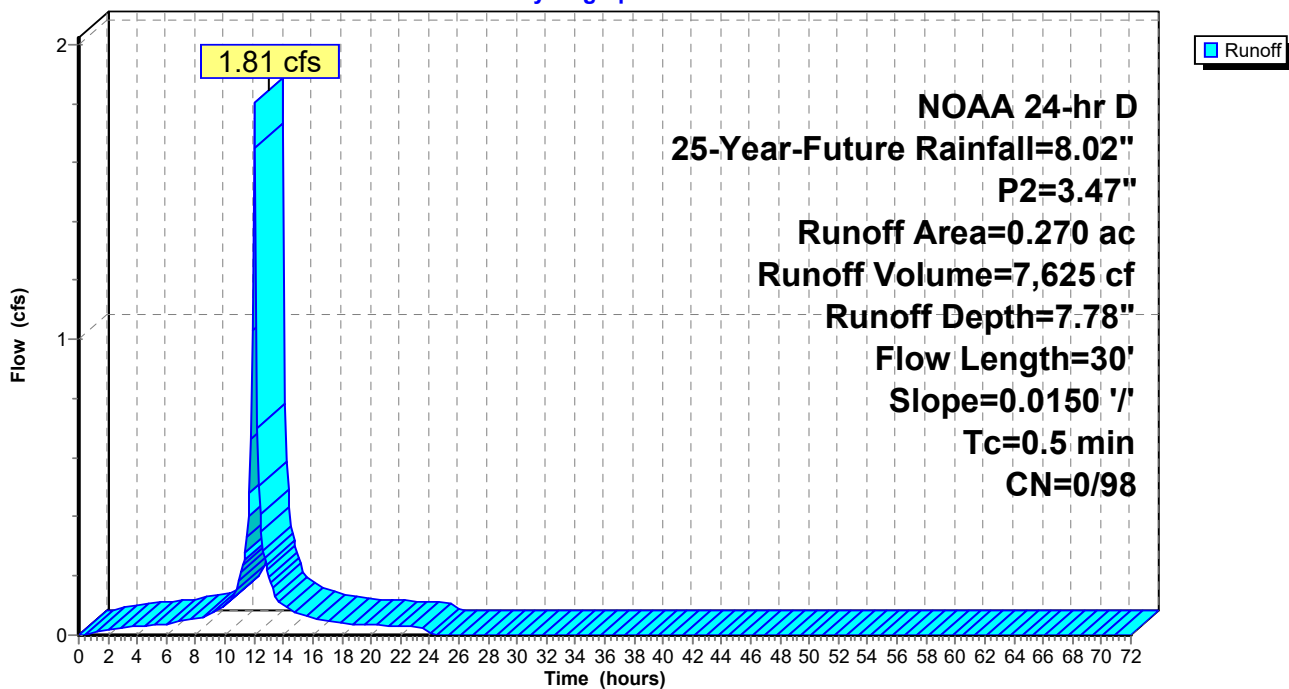
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 25-Year-Future Rainfall=8.02", P2=3.47"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.00		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

Runoff = 0.07 cfs @ 12.21 hrs, Volume= 381 cf, Depth= 1.17"
Routed to Link P1 : PDA 1A

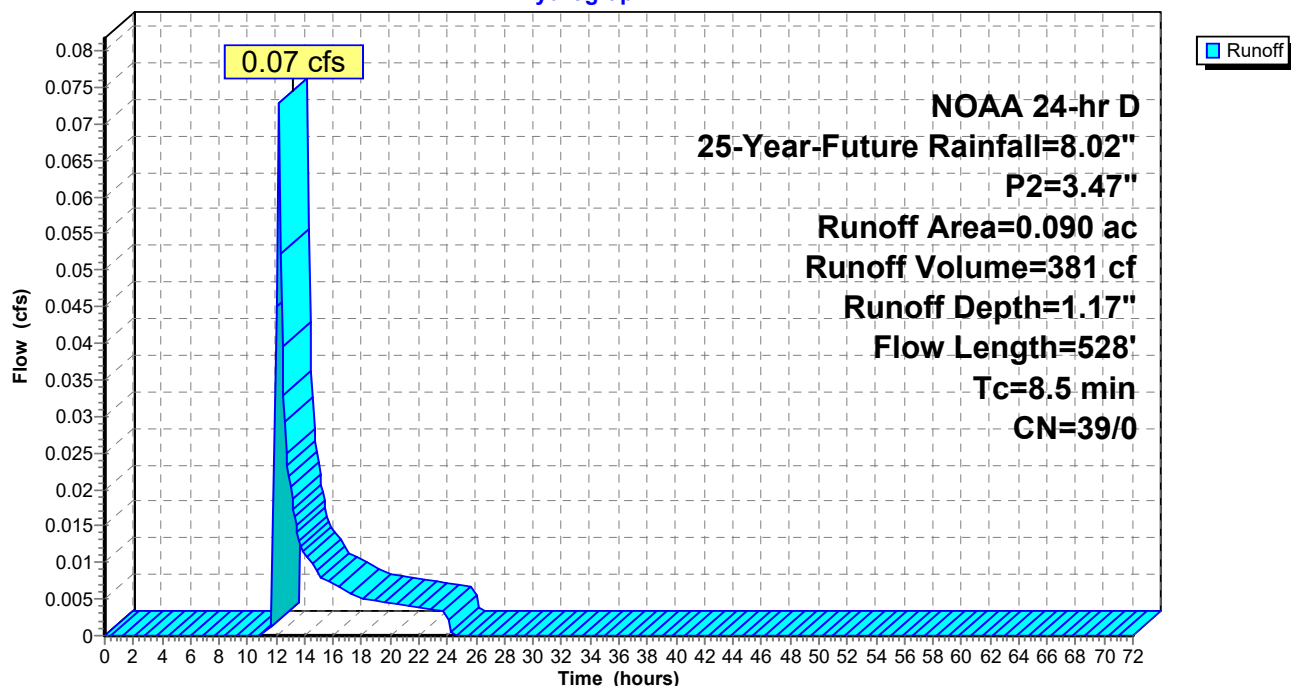
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 25-Year-Future Rainfall=8.02", P2=3.47"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	85	0.0500	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.47"
0.2	15	0.0400	1.29		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.47"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.5	528	Total			

Subcatchment P1p: Proposed Pervious

Hydrograph



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 7.78" for 25-Year-Future event
 Inflow = 1.81 cfs @ 12.04 hrs, Volume= 7,625 cf
 Outflow = 1.49 cfs @ 12.12 hrs, Volume= 6,601 cf, Atten= 18%, Lag= 4.7 min
 Primary = 1.49 cfs @ 12.12 hrs, Volume= 6,601 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 367.19' @ 12.12 hrs Surf.Area= 8,538 sf Storage= 1,832 cf

Plug-Flow detention time= 143.6 min calculated for 6,592 cf (86% of inflow)
 Center-of-Mass det. time= 78.1 min (815.0 - 736.9)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

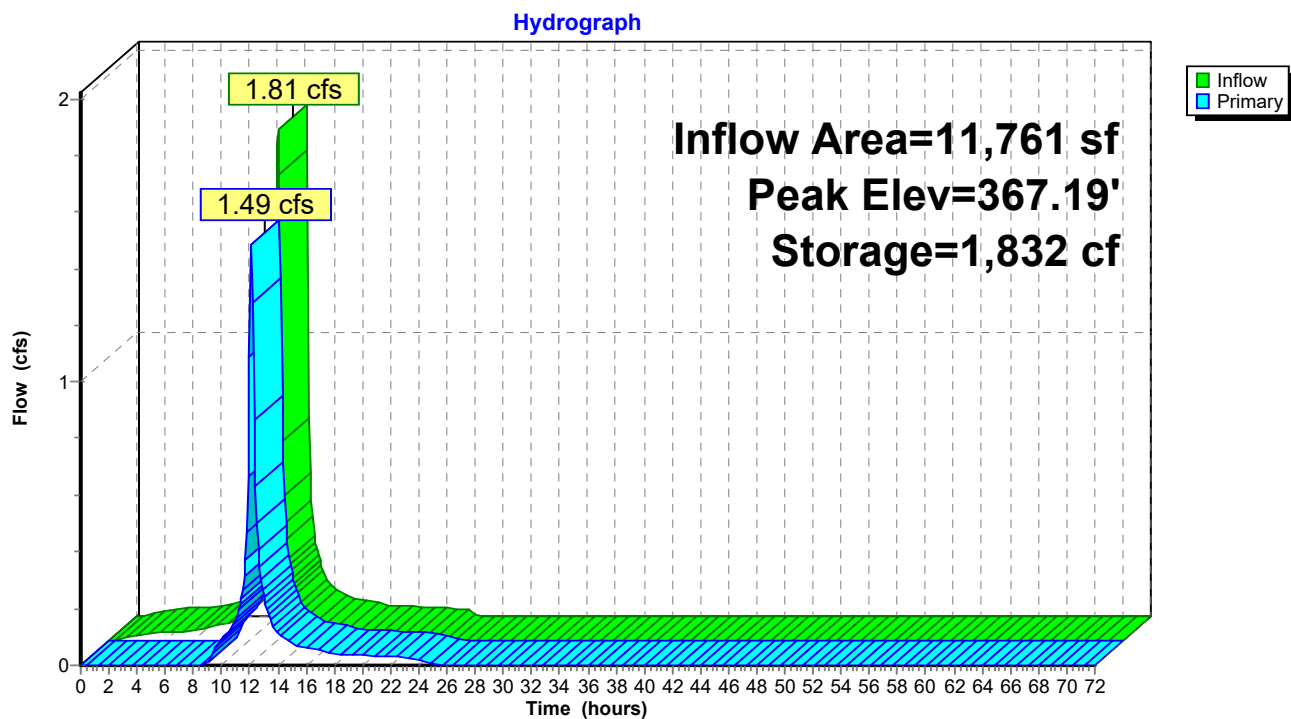
Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.45 cfs @ 12.12 hrs HW=367.18' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 1.45 cfs of 5.48 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 1.45 cfs @ 1.58 fps)

Pond PP1: Pervious Pavement



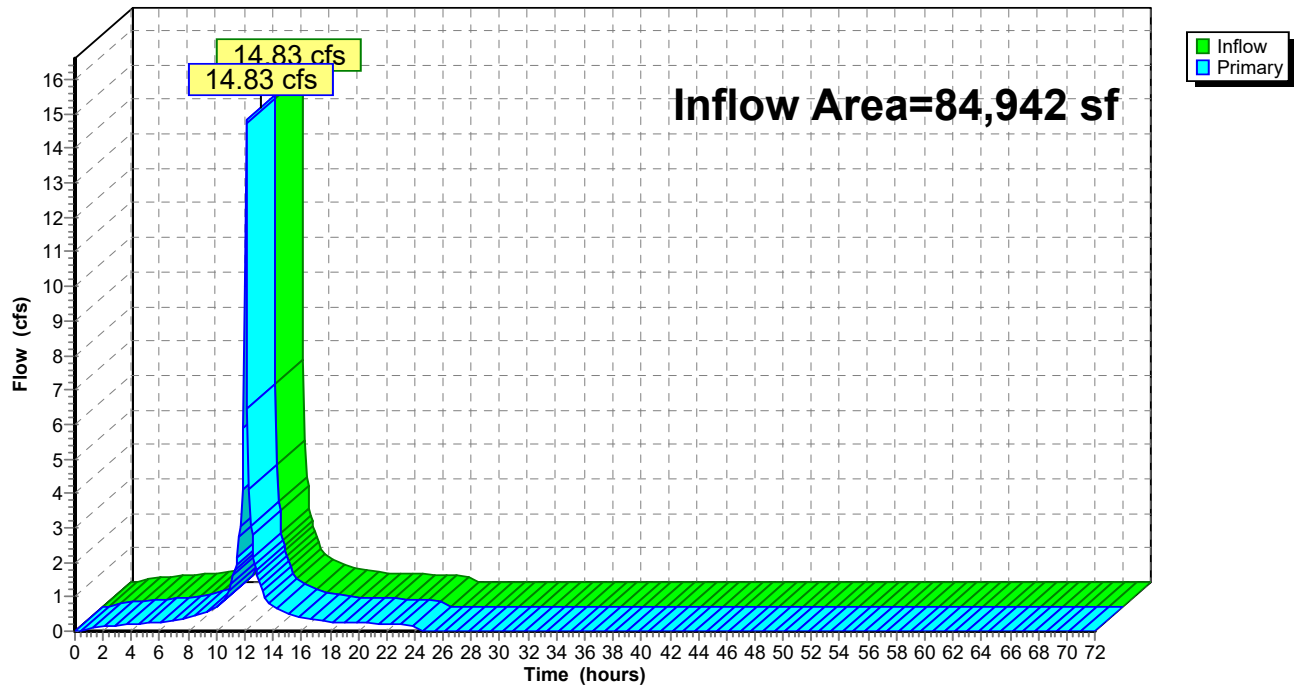
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 7.71" for 25-Year-Future event
 Inflow = 14.83 cfs @ 12.09 hrs, Volume= 54,592 cf
 Primary = 14.83 cfs @ 12.09 hrs, Volume= 54,592 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



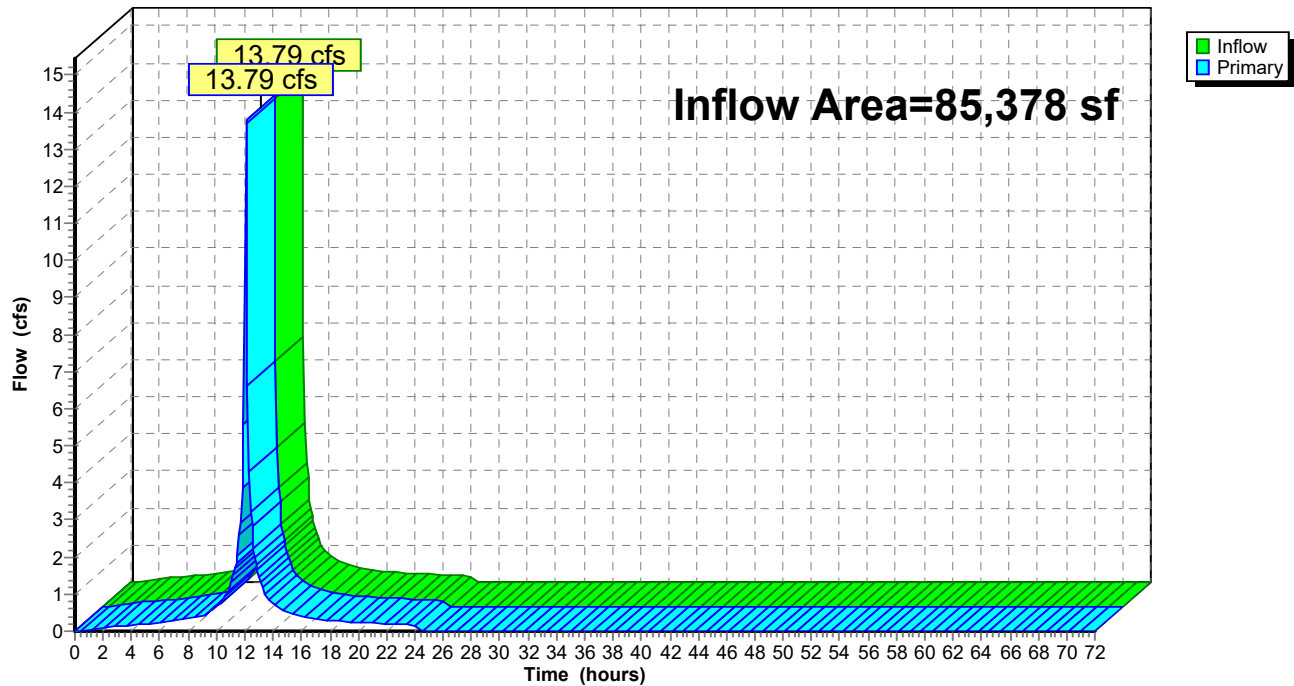
Summary for Link P1: PDA 1A

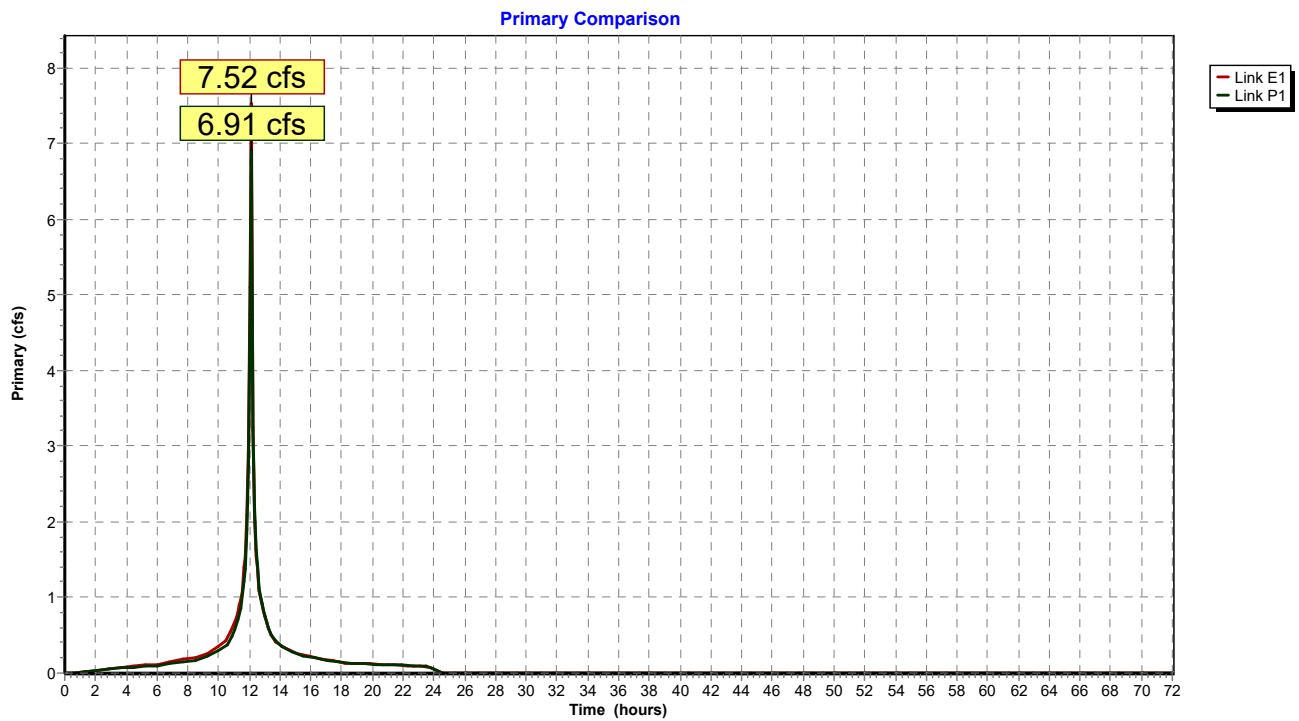
Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 7.33" for 25-Year-Future event
 Inflow = 13.79 cfs @ 12.09 hrs, Volume= 52,169 cf
 Primary = 13.79 cfs @ 12.09 hrs, Volume= 52,169 cf, Atten= 0%, Lag= 0.0 min

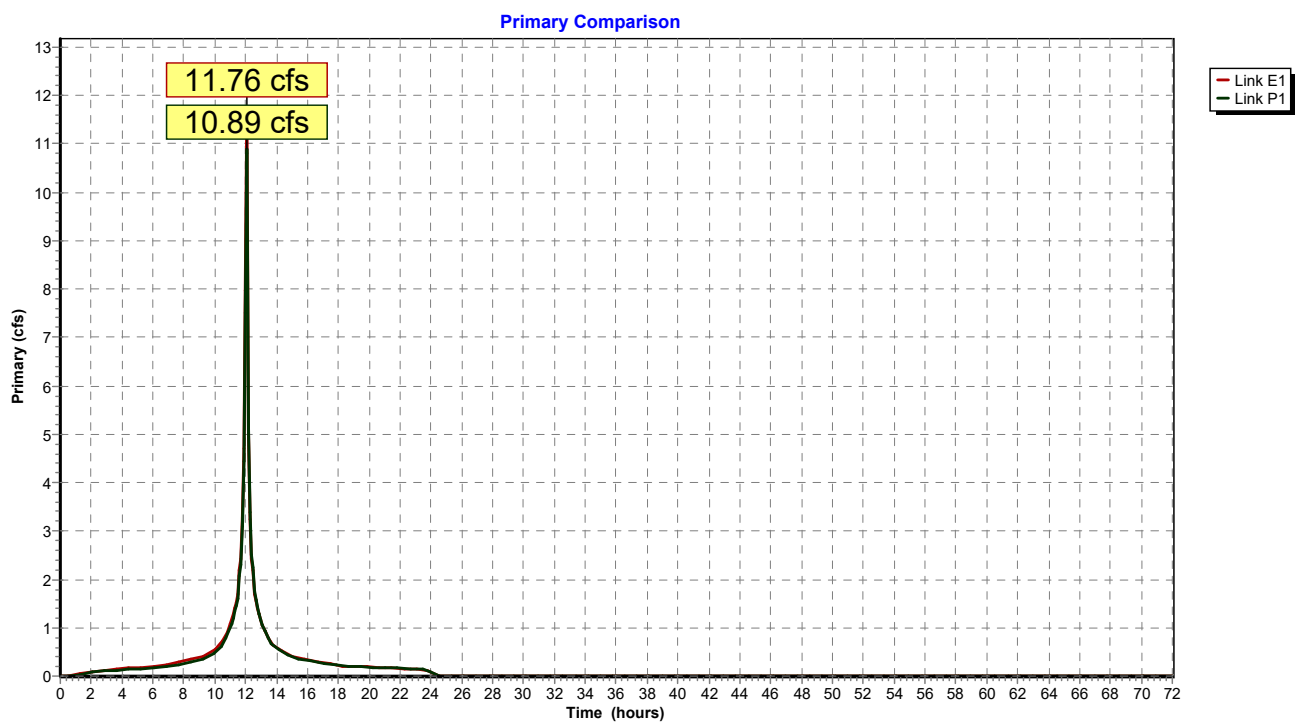
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

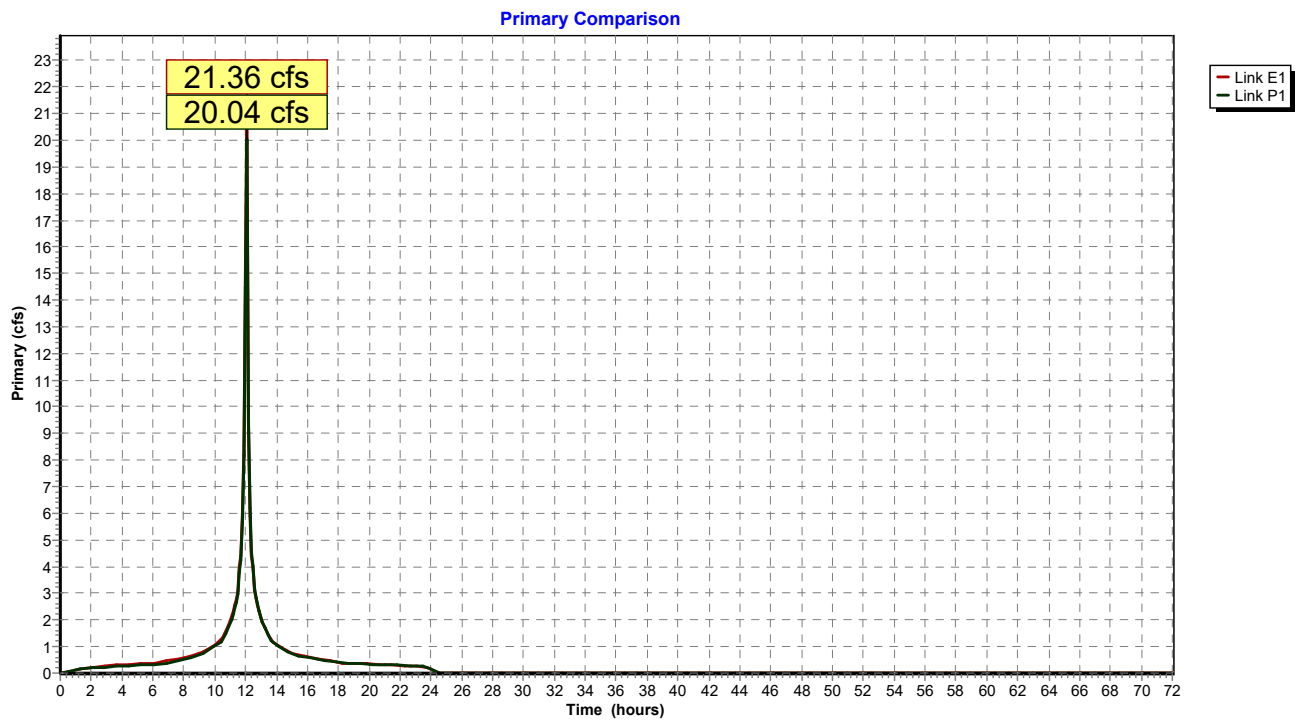
Link P1: PDA 1A

Hydrograph



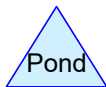
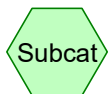
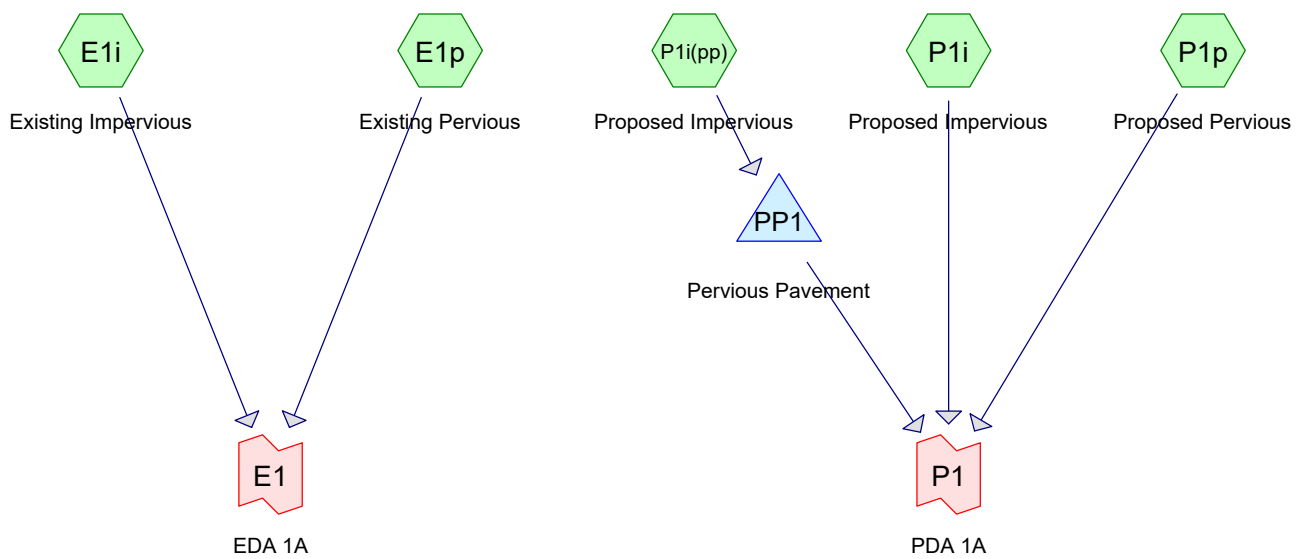






C. WATER QUALITY

- ◆ **Water Quality Storm Hydrograph**



NJA230139 - REV 2

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Page 2

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2	4.09

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,792	39	>75% Grass cover, Good, HSG A (E1p, P1p)
165,528	98	Paved parking, HSG A (E1i, P1i, P1i(pp))
170,320	96	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
170,320	HSG A	E1i, E1p, P1i, P1i(pp), P1p
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
170,320		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
4,792	0	0	0	0	4,792	>75% Grass cover, Good
165,528	0	0	0	0	165,528	Paved parking
170,320	0	0	0	0	170,320	TOTAL AREA

NJA230139 - REV 2

NJ DEP 2-hr WQ Rainfall=1.25", P2=4.09"

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Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points x 9
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1i: Existing Impervious Runoff Area=1.930 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=441' Tc=3.1 min CN=0/98 Runoff=5.44 cfs 7,248 cf

SubcatchmentE1p: Existing Pervious Runoff Area=0.020 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=526' Tc=8.2 min CN=39/0 Runoff=0.00 cfs 0 cf

SubcatchmentP1i: Proposed Impervious Runoff Area=1.600 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=443' Tc=3.0 min CN=0/98 Runoff=4.50 cfs 6,009 cf

SubcatchmentP1i(pp): Proposed Runoff Area=0.270 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=30' Slope=0.0150 '/' Tc=0.5 min CN=0/98 Runoff=0.81 cfs 1,014 cf

SubcatchmentP1p: Proposed Pervious Runoff Area=0.090 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=528' Tc=8.1 min CN=39/0 Runoff=0.00 cfs 0 cf

Pond PP1: Pervious Pavement Peak Elev=366.95' Storage=1,014 cf Inflow=0.81 cfs 1,014 cf
Outflow=0.00 cfs 0 cf

Link E1: EDA 1A Inflow=5.44 cfs 7,248 cf
Primary=5.44 cfs 7,248 cf

Link P1: PDA 1A Inflow=4.50 cfs 6,009 cf
Primary=4.50 cfs 6,009 cf

Total Runoff Area = 170,320 sf Runoff Volume = 14,271 cf Average Runoff Depth = 1.01"
2.81% Pervious = 4,792 sf 97.19% Impervious = 165,528 sf

Summary for Subcatchment E1i: Existing Impervious

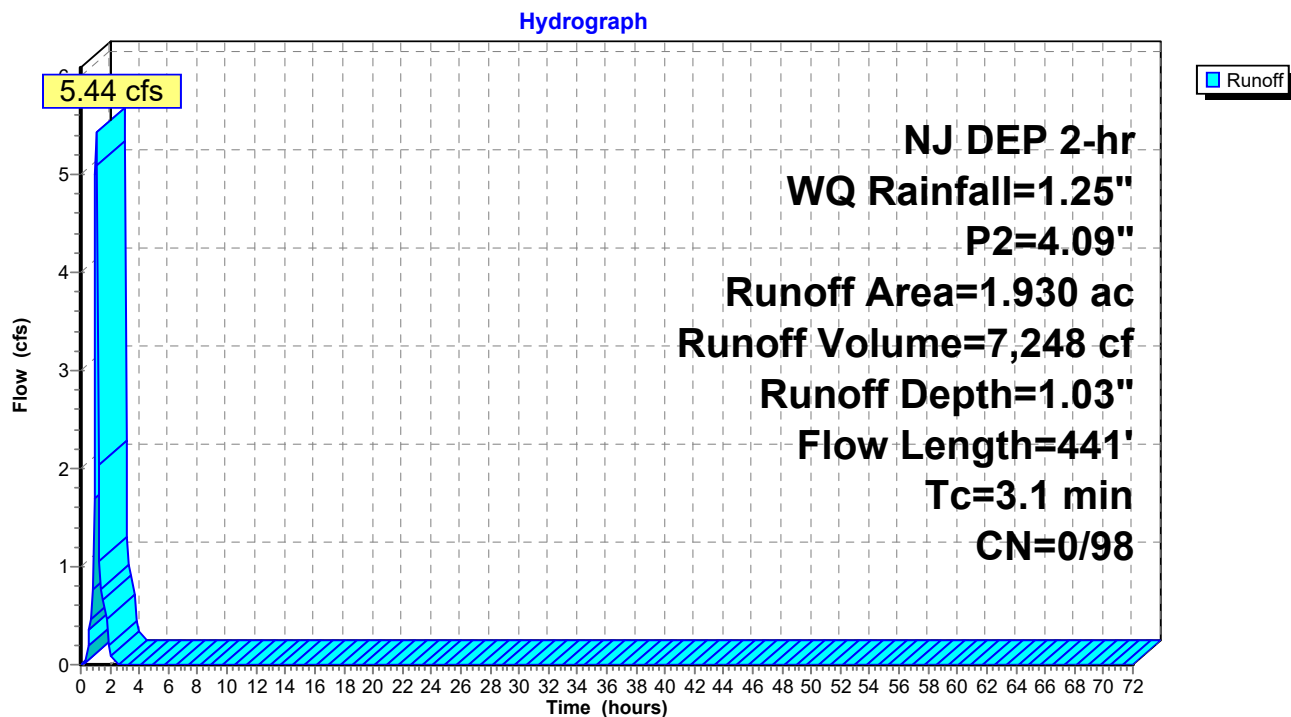
Runoff = 5.44 cfs @ 1.05 hrs, Volume= 7,248 cf, Depth= 1.03"
Routed to Link E1 : EDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25", P2=4.09"

Area (ac)	CN	Description
1.930	98	Paved parking, HSG A
1.930	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.1	441	Total			

Subcatchment E1i: Existing Impervious



Summary for Subcatchment E1p: Existing Pervious

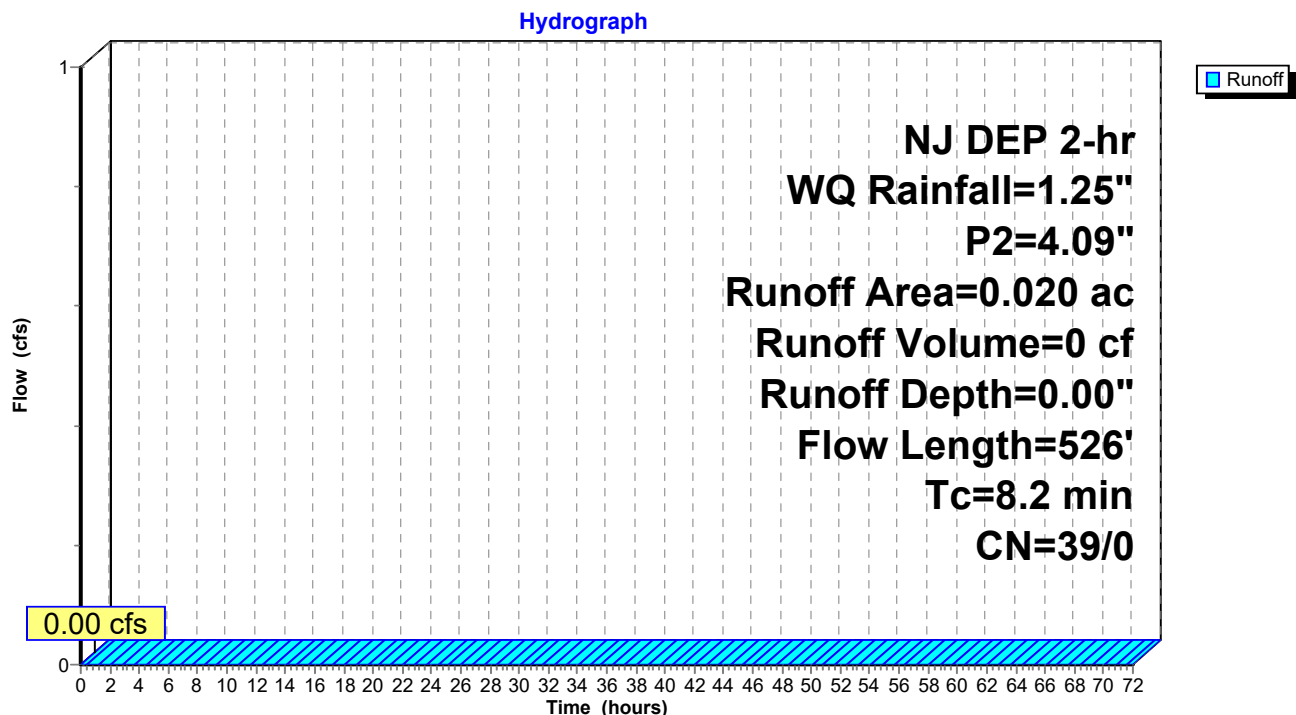
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link E1 : EDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25", P2=4.09"

Area (ac)	CN	Description
0.020	39	>75% Grass cover, Good, HSG A
0.020	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.1	285	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	526	Total			

Subcatchment E1p: Existing Pervious



Summary for Subcatchment P1i: Proposed Impervious

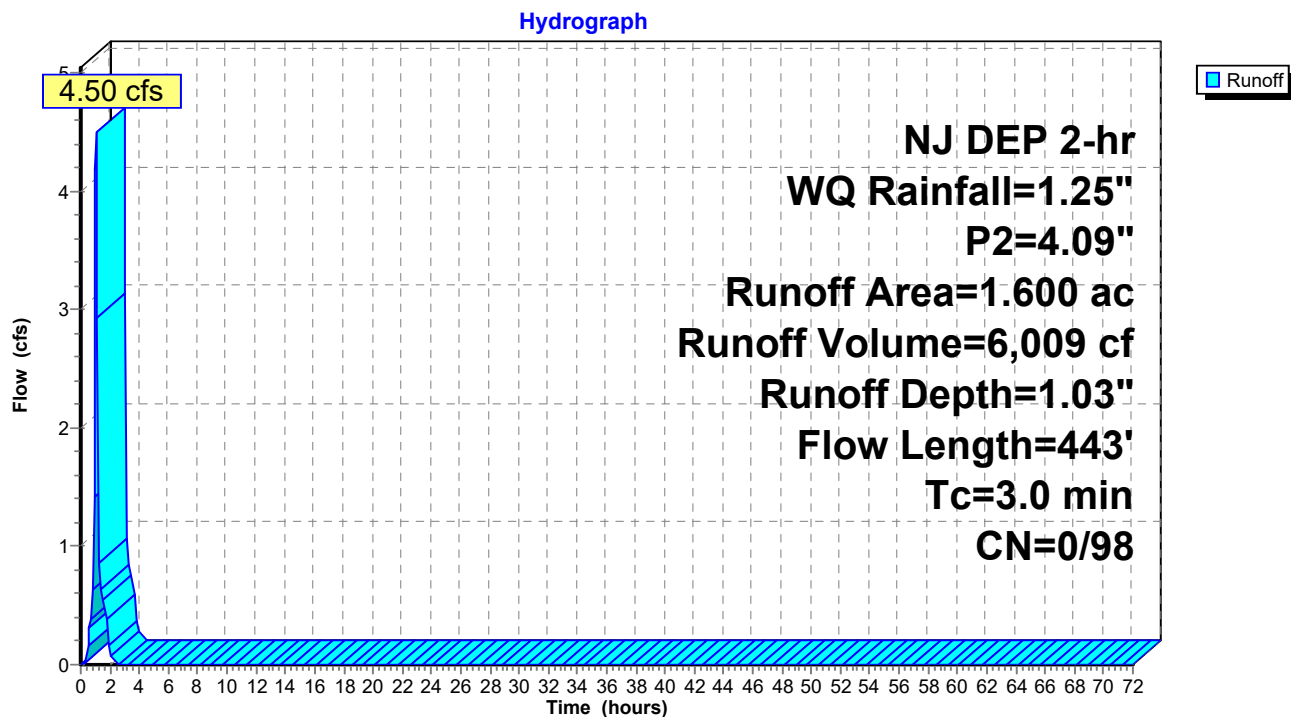
Runoff = 4.50 cfs @ 1.05 hrs, Volume= 6,009 cf, Depth= 1.03"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25", P2=4.09"

Area (ac)	CN	Description
1.600	98	Paved parking, HSG A
1.600	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0400	2.05		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.1	36	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
3.0	443	Total			

Subcatchment P1i: Proposed Impervious



Summary for Subcatchment P1i(pp): Proposed Impervious

Runoff = 0.81 cfs @ 1.01 hrs, Volume= 1,014 cf, Depth= 1.03"
 Routed to Pond PP1 : Pervious Pavement

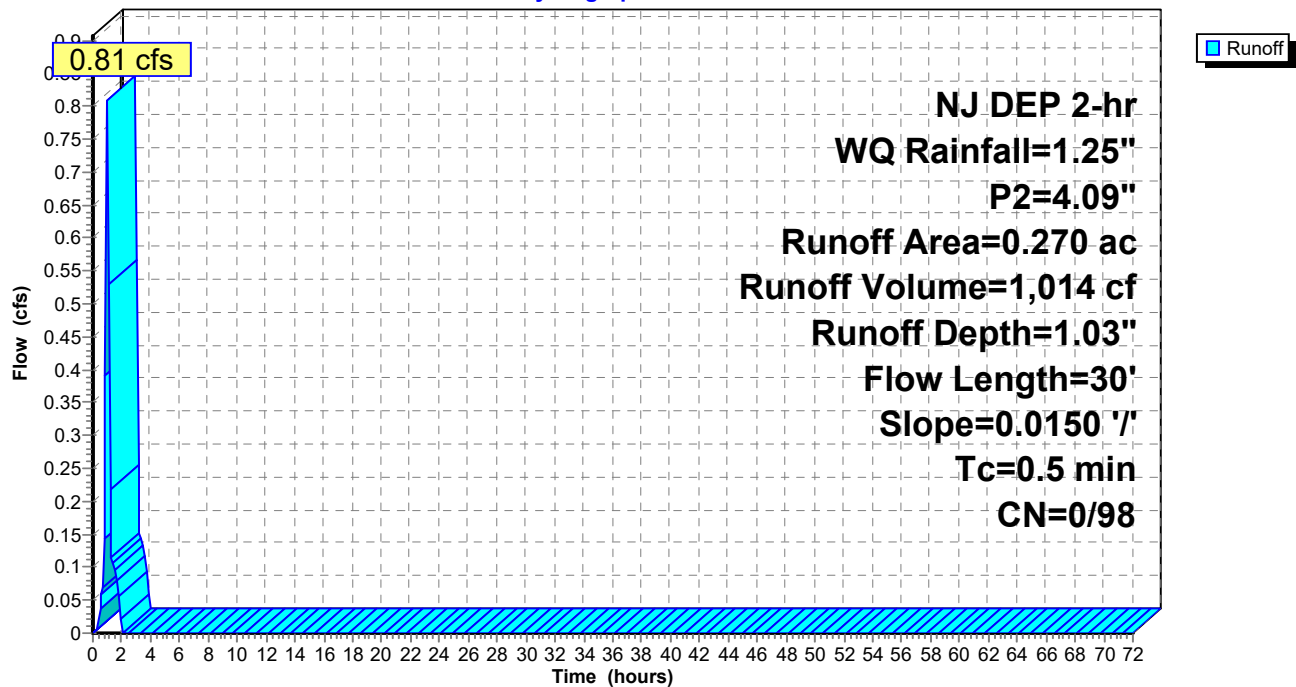
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NJ DEP 2-hr WQ Rainfall=1.25", P2=4.09"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG A
0.270	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0150	1.09		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"

Subcatchment P1i(pp): Proposed Impervious

Hydrograph



Summary for Subcatchment P1p: Proposed Pervious

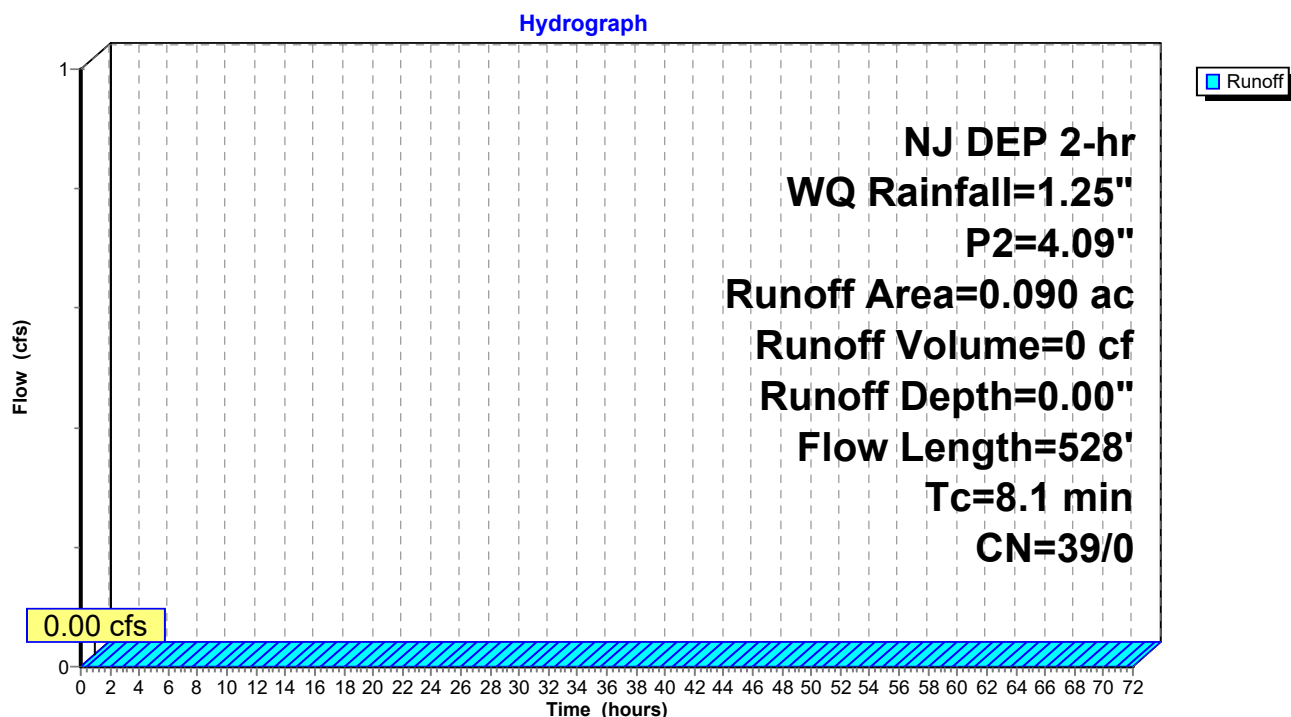
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link P1 : PDA 1A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25", P2=4.09"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.090	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	85	0.0500	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 4.09"
0.2	15	0.0400	1.40		Sheet Flow, Smooth surfaces n= 0.011 P2= 4.09"
0.5	121	0.0400	4.06		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.0	287	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	20	0.6600	4.06		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.1	528	Total			

Subcatchment P1p: Proposed Pervious



Summary for Pond PP1: Pervious Pavement

Inflow Area = 11,761 sf, 100.00% Impervious, Inflow Depth = 1.03" for WQ event
 Inflow = 0.81 cfs @ 1.01 hrs, Volume= 1,014 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link P1 : PDA 1A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 9
 Peak Elev= 366.95' @ 2.10 hrs Surf.Area= 8,538 sf Storage= 1,014 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	366.65'	3,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 8,538 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.65	8,538	0	0
367.65	8,538	8,538	8,538

Device	Routing	Invert	Outlet Devices
#1	Primary	365.50'	15.0" Round RCP_Round 15" L= 273.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 365.50' / 364.15' S= 0.0049 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	366.95'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

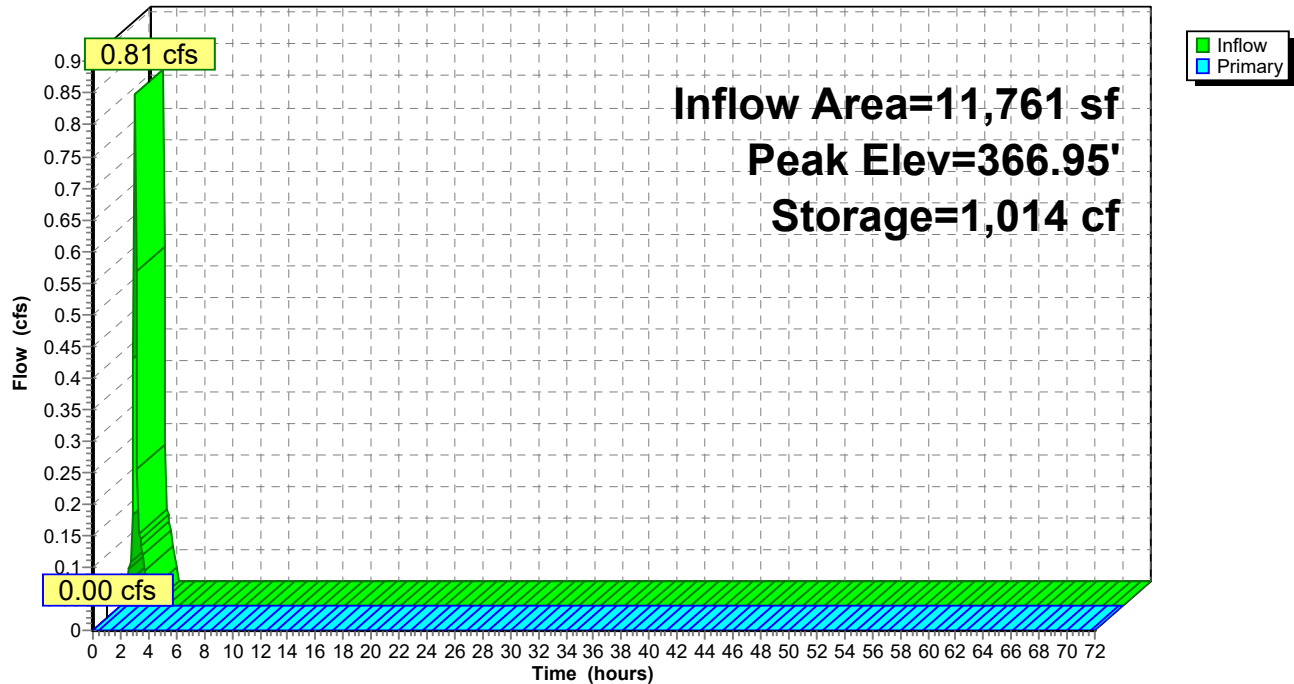
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=366.65' TW=0.00' (Dynamic Tailwater)

↑ **1=RCP_Round 15"** (Passes 0.00 cfs of 4.21 cfs potential flow)

↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond PP1: Pervious Pavement

Hydrograph



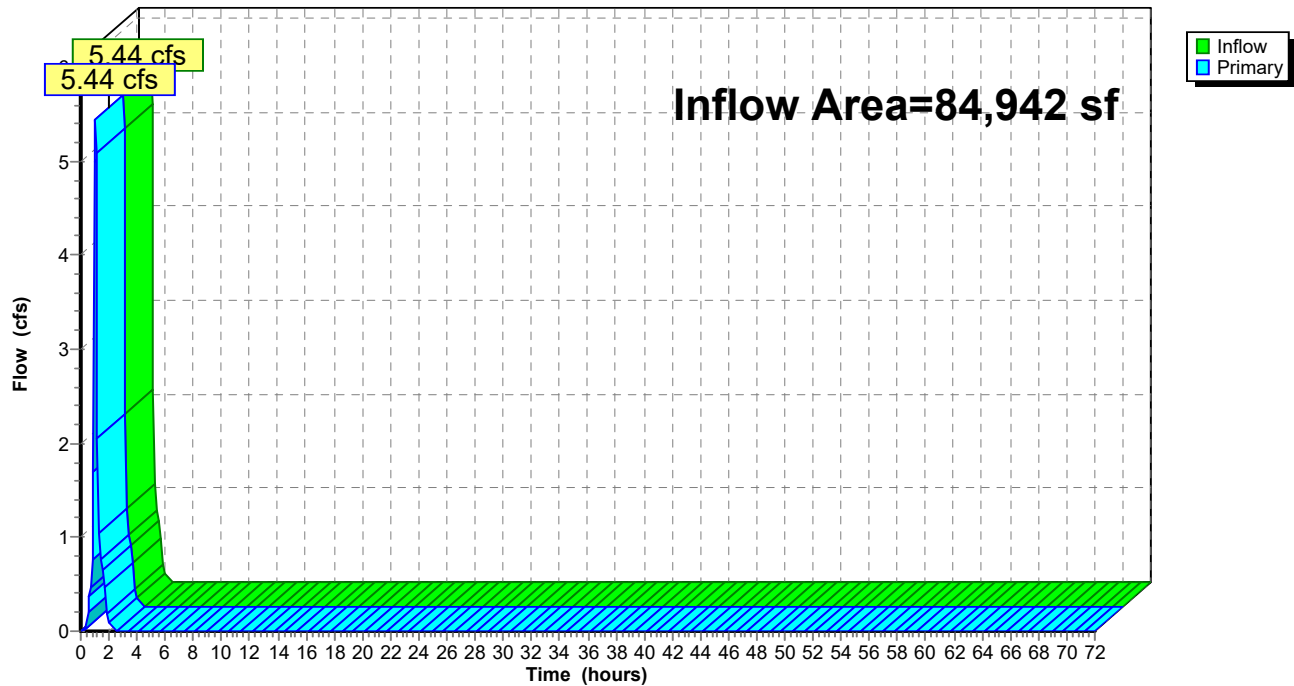
Summary for Link E1: EDA 1A

Inflow Area = 84,942 sf, 98.97% Impervious, Inflow Depth = 1.02" for WQ event
 Inflow = 5.44 cfs @ 1.05 hrs, Volume= 7,248 cf
 Primary = 5.44 cfs @ 1.05 hrs, Volume= 7,248 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link E1: EDA 1A

Hydrograph



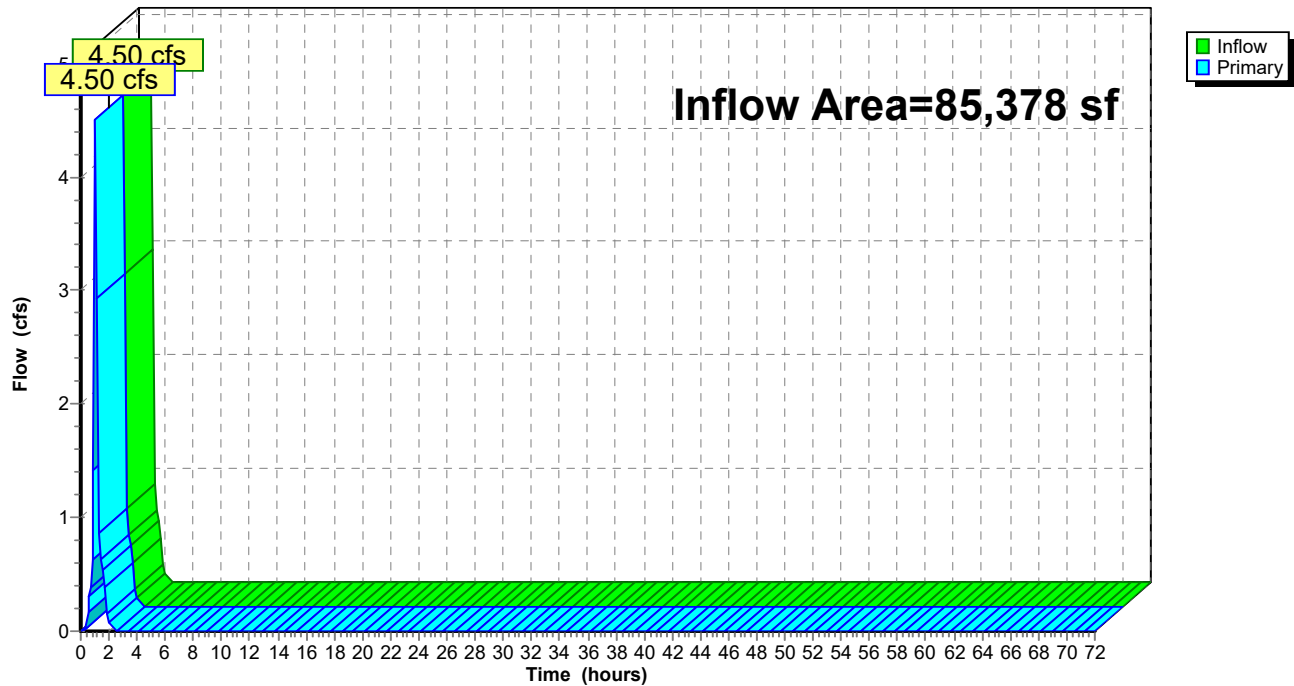
Summary for Link P1: PDA 1A

Inflow Area = 85,378 sf, 95.41% Impervious, Inflow Depth = 0.84" for WQ event
 Inflow = 4.50 cfs @ 1.05 hrs, Volume= 6,009 cf
 Primary = 4.50 cfs @ 1.05 hrs, Volume= 6,009 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link P1: PDA 1A

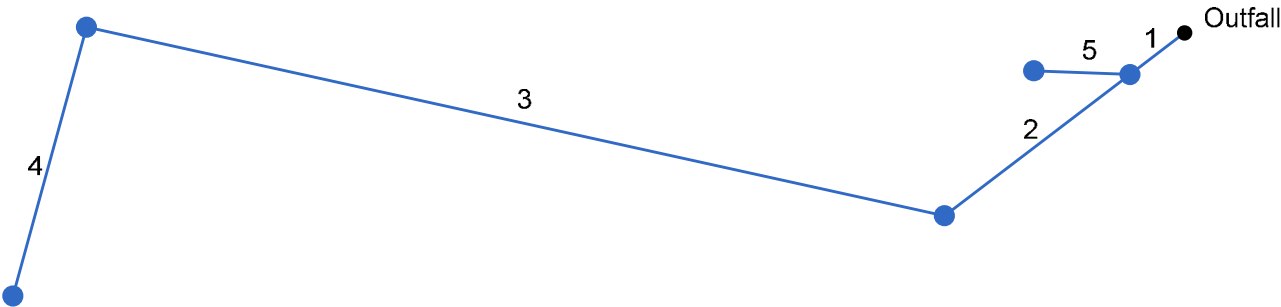
Hydrograph



D. CONVEYANCE CALCULATIONS

- ◆ **Pipe Sizing**
- ◆ **Pervious Pavement Underdrain Sizing**

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	15.000	0.00	0.34	0.00	0.00	0.34	0.0	12.2	6.0	3.66	4.42	4.35	15	0.40	364.15	364.21	364.92	365.06	367.37	368.08	SD-3
2	1	51.000	0.00	0.00	0.00	0.00	0.00	0.0	11.7	0.0	1.63	4.14	1.68	15	0.41	364.21	364.42	365.24	365.26	368.08	368.25	SD-3(2)
3	2	191.776	0.00	0.00	0.00	0.00	0.00	10.0	10.4	0.0	1.63	4.07	2.51	15	0.40	364.42	365.18	365.32	365.71	368.25	368.44	SD-2
4	3	61.000	0.00	0.00	0.00	0.00	0.00	10.0	10.0	0.0	1.49	4.13	2.53	15	0.41	365.18	365.43	365.88	365.97	368.44	368.32	SD-1
5	1	21.000	0.34	0.34	0.99	0.34	0.34	10.0	10.0	6.5	2.18	7.00	2.92	15	1.00	364.21	364.42	365.24	365.01	368.08	367.60	
Project File: West Orange Storm - Rev 2a.stm																Number of lines: 5				Run Date: 12/11/2025		
NOTES:Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period =Yrs. 25 ; c = cir e = ellip b = box																						

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30 Independence Boulevard, Warren, NJ 07059
(908) 668-8300

Date: 7/31/2025
Project: West Orange
Project No: NJA230139.00

Calculated By: CRA
Checked By: TXL

Requirement: The capacity of the underdrains must be sufficient to allow the systems to drain within 72 hours.

Note: Below drain time calculations ensure underdrain size is sized to allow the system to drain within 72 hours and does not take into consideration outlet control structure. Calculations for drain time considering outlet control section provided in Basin Drain Time calculations in the Appendix of this report.

Water Quality Pervious Pavement Drain Time: (Drain Time = Water Quality Design Storm Volume / Underdrain Flow Rate)

1,014 Water Quality Volume (CF)

Calculated Drain Time = 1,014 CF / 0.33 CFS * (1 hr / 60 min) * (1 min / 60 sec) = 0.9 hours < 72 hours

100-Year Storm Event Pervious Pavement Drain Time: (100-Yr Design Storm Runoff Volume / Underdrain Flow Rate)

11,054 100-Year Volume (CF)

Calculated Drain Time = 11,054 CF / 0.33 CFS * (1 hr / 60 min) * (1 min / 60 sec) = 9.4 hours < 72 hours

Manning's Equation

Design Parameters:

Pipe Diameter, D	6 in
Pipe Material	PVC
Slope, s	0.20 %
Flow Depth, y	FULL

Calculations:

Cross-Sectional Area, $A = D^2 / 8 [\theta - \sin(\theta)] =$	0.20 ft ²
Manning's Coefficient, n	0.010
Hydraulic Radius, R	0.13 ft
Angle, $\theta =$	6.28 radians
Wetted Perimeter, $P = \theta D / 2$	1.57 ft
Flow Depth, y	0.50 ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$	0.00 ft
Gravity Constant, g	32.174 ft/s ²
Froude Number, F	0.00

Subcritical Flow

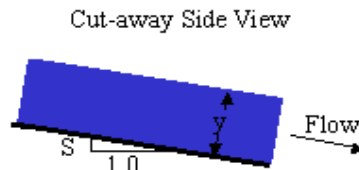
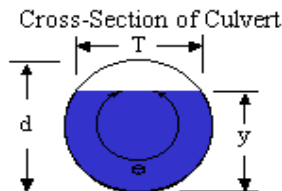
• Flow & Velocity:

Flow, $Q_o = \frac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$

0.33 cfs
0.21 MGD

Velocity, $V = Q/A$

1.66 fps



$$Q = VA \quad V = \frac{k}{n} R^{2/3} s^{1/2} \quad R = \frac{A}{P} \quad A = \frac{d^2}{8} (\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \quad y = \frac{d}{2} \left[1 - \cos\left(\frac{\theta}{2}\right) \right] \quad T = 2\sqrt{y(d-y)} \quad F = V \sqrt{\frac{T}{gA \cos(\tan^{-1} S)}}$$

E. SUPPORTING DOCUMENTS

- ◆ **NOAA Atlas 14 Precipitation Estimate Report**

Current Precipitation Adjustment Factors										
County	2-year Design Storm			10-year Design Storm			100-year Design Storm			County
	NOAA Atlas 14 (inches)	Adjustment Factor	Current (inches)	NOAA Atlas 14 (inches)	Adjustment Factor	Current (inches)	NOAA Atlas 14 (inches)	Adjustment Factor	Current (inches)	
Atlantic	3.31	1.01	3.34	5.16	1.02	5.26	8.90	1.03	9.17	Atlantic
Bergen	3.34	1.01	3.37	5.07	1.03	5.22	8.47	1.06	8.98	Bergen
Burlington	3.36	0.99	3.33	5.18	1.01	5.23	8.81	1.04	9.16	Burlington
Camden	3.31	1.03	3.41	5.06	1.04	5.26	8.52	1.05	8.95	Camden
Cape May	3.25	1.03	3.35	5.07	1.03	5.22	8.73	1.04	9.08	Cape May
Cumberland	3.27	1.03	3.37	5.09	1.03	5.24	8.76	1.01	8.85	Cumberland
Essex	3.44	1.01	3.47	5.22	1.03	5.38	8.66	1.06	9.18	Essex
Gloucester	3.29	1.05	3.45	5.05	1.06	5.35	8.55	1.06	9.06	Gloucester
Hudson	3.31	1.03	3.41	5.02	1.05	5.27	8.31	1.09	9.06	Hudson
Hunterdon	3.38	1.02	3.45	5.00	1.05	5.25	8.03	1.13	9.07	Hunterdon
Mercer	3.31	1.01	3.34	5.01	1.02	5.11	8.33	1.04	8.66	Mercer
Middlesex	3.35	1.00	3.35	5.12	1.01	5.17	8.63	1.03	8.89	Middlesex
Monmouth	3.38	1.00	3.38	5.23	1.01	5.28	8.94	1.02	9.12	Monmouth
Morris	3.54	1.01	3.58	5.24	1.03	5.40	8.35	1.06	8.85	Morris
Ocean	3.42	1.00	3.42	5.33	1.01	5.38	9.20	1.03	9.48	Ocean
Passaic	3.47	1.00	3.47	5.23	1.02	5.33	8.62	1.05	9.05	Passaic
Salem	3.26	1.02	3.33	5.00	1.03	5.15	8.45	1.03	8.70	Salem
Somerset	3.34	1.00	3.34	5.01	1.03	5.16	8.21	1.09	8.95	Somerset
Sussex	3.22	1.03	3.32	4.70	1.04	4.89	7.58	1.07	8.11	Sussex
Union	3.39	1.01	3.42	5.17	1.03	5.33	8.69	1.06	9.21	Union
Warren	3.34	1.02	3.41	4.89	1.07	5.23	7.82	1.15	8.99	Warren

Future/Projected Precipitation Adjustment Factors													
County	2-year Design Storm			10-year Design Storm			25-year Design Storm*			100-year Design Storm			County
	NOAA Atlas 14 (inches)	Adjustment Factor	Future (inches)	NOAA Atlas 14 (inches)	Adjustment Factor	Future (inches)	NOAA Atlas 14 (inches)	Adjustment Factor*	Future (inches)	NOAA Atlas 14 (inches)	Adjustment Factor	Future (inches)	
Atlantic	3.31	1.22	4.04	5.16	1.24	6.40	6.46	1.27	8.21	8.90	1.39	12.37	Atlantic
Bergen	3.34	1.20	4.01	5.07	1.23	6.24	6.28	1.26	7.94	8.47	1.37	11.60	Bergen
Burlington	3.36	1.17	3.93	5.18	1.18	6.11	6.45	1.22	7.84	8.81	1.32	11.63	Burlington
Camden	3.31	1.18	3.91	5.06	1.22	6.17	6.28	1.27	7.96	8.52	1.39	11.84	Camden
Cape May	3.25	1.21	3.93	5.07	1.24	6.29	6.34	1.26	7.99	8.73	1.32	11.52	Cape May
Cumberland	3.27	1.20	3.92	5.09	1.21	6.16	6.37	1.26	8.03	8.76	1.39	12.18	Cumberland
Essex	3.44	1.19	4.09	5.22	1.22	6.37	6.44	1.25	8.02	8.66	1.33	11.52	Essex
Gloucester	3.29	1.19	3.92	5.05	1.23	6.21	6.29	1.27	8.01	8.55	1.41	12.06	Gloucester
Hudson	3.31	1.19	3.94	5.02	1.19	5.97	6.19	1.20	7.41	8.31	1.23	10.22	Hudson
Hunterdon	3.38	1.19	4.02	5.00	1.23	6.15	6.09	1.28	7.82	8.03	1.42	11.40	Hunterdon
Mercer	3.31	1.16	3.84	5.01	1.17	5.86	6.19	1.22	7.55	8.33	1.36	11.33	Mercer
Middlesex	3.35	1.19	3.99	5.12	1.21	6.20	6.36	1.24	7.91	8.63	1.33	11.48	Middlesex
Monmouth	3.38	1.19	4.02	5.23	1.19	6.22	6.53	1.20	7.86	8.94	1.26	11.26	Monmouth
Morris	3.54	1.23	4.35	5.24	1.28	6.71	6.37	1.35	8.59	8.35	1.46	12.19	Morris
Ocean	3.42	1.18	4.04	5.33	1.19	6.34	6.68	1.20	8.00	9.20	1.24	11.41	Ocean
Passaic	3.47	1.21	4.20	5.23	1.27	6.64	6.43	1.33	8.53	8.62	1.50	12.93	Passaic
Salem	3.26	1.20	3.91	5.00	1.23	6.15	6.22	1.25	7.77	8.45	1.32	11.15	Salem
Somerset	3.34	1.19	3.97	5.01	1.24	6.21	6.15	1.32	8.11	8.21	1.48	12.15	Somerset
Sussex	3.22	1.24	3.99	4.70	1.29	6.06	5.72	1.35	7.73	7.58	1.50	11.37	Sussex
Union	3.39	1.20	4.07	5.17	1.23	6.36	6.42	1.27	8.16	8.69	1.35	11.73	Union
Warren	3.34	1.20	4.01	4.89	1.25	6.11	5.93	1.30	7.68	7.82	1.37	10.71	Warren

* Note - NJAC 7:8 & 7:13 do not contain adjustment factors for the 25-year storm. The factors listed have been obtained from NJ Extreme Precipitation Projection Tool (<https://njprojectedprecipitationchanges.com/>)

F. MAPS

- ◆ Tax Map
- ◆ Zoning Map
- ◆ Aerial Map
- ◆ USGS Map
- ◆ State Planning Area Map
- ◆ NJDEP Potential Freshwater Wetlands Map
- ◆ NJDEP Stream Map
- ◆ HUC-14 Sub-Watershed Map
- ◆ FEMA FIRM Map
- ◆ NJDEP Potential Threatened/Endangered Species Habitat Map
- ◆ NJDEP Known Contaminated Site Map
- ◆ Hydrologic Soils Group Map
- ◆ Depth to Seasonal High Water Table Map
- ◆ Drainage Area Maps
 - Existing Drainage Area Map
 - Proposed Drainage Area Map



Tax Map

Source: West Orange Township Tax Map, Sheet #87

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

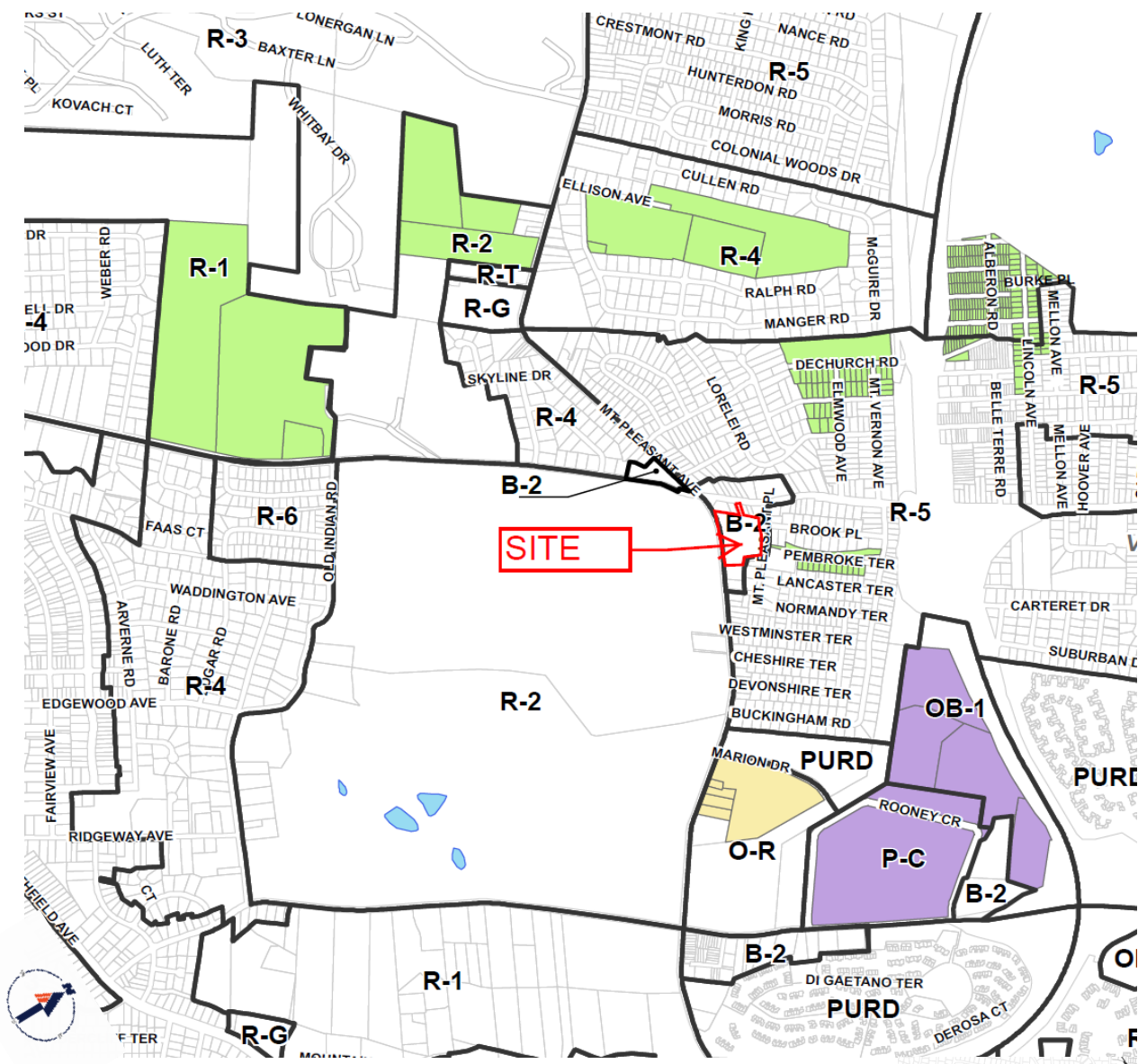
Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

BOHLER //



Zoning Map

- Legend**
- R-1 Zoning District
 - Fair Share Plan Overlay
 - Conservation Overlay
 - Downtown Redevelopment Area
 - Organon Redevelopment Area
 - Essex Green/Executive Drive Redevelopment Area
 - 46 Mount Pleasant Avenue Redevelopment Area
 - Central Avenue Redevelopment Area
 - Valley Road (Harvard Press) Redevelopment Area

Source: West Orange Township Zone Map

Date Access: 07/31/2025

Proposed Retail Store

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Township of West Orange, Essex County, NJ

BENJ #NJA230139

Prepared by: RF

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Checked by: CA

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Aerial Map

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

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BENJ #NJA230139

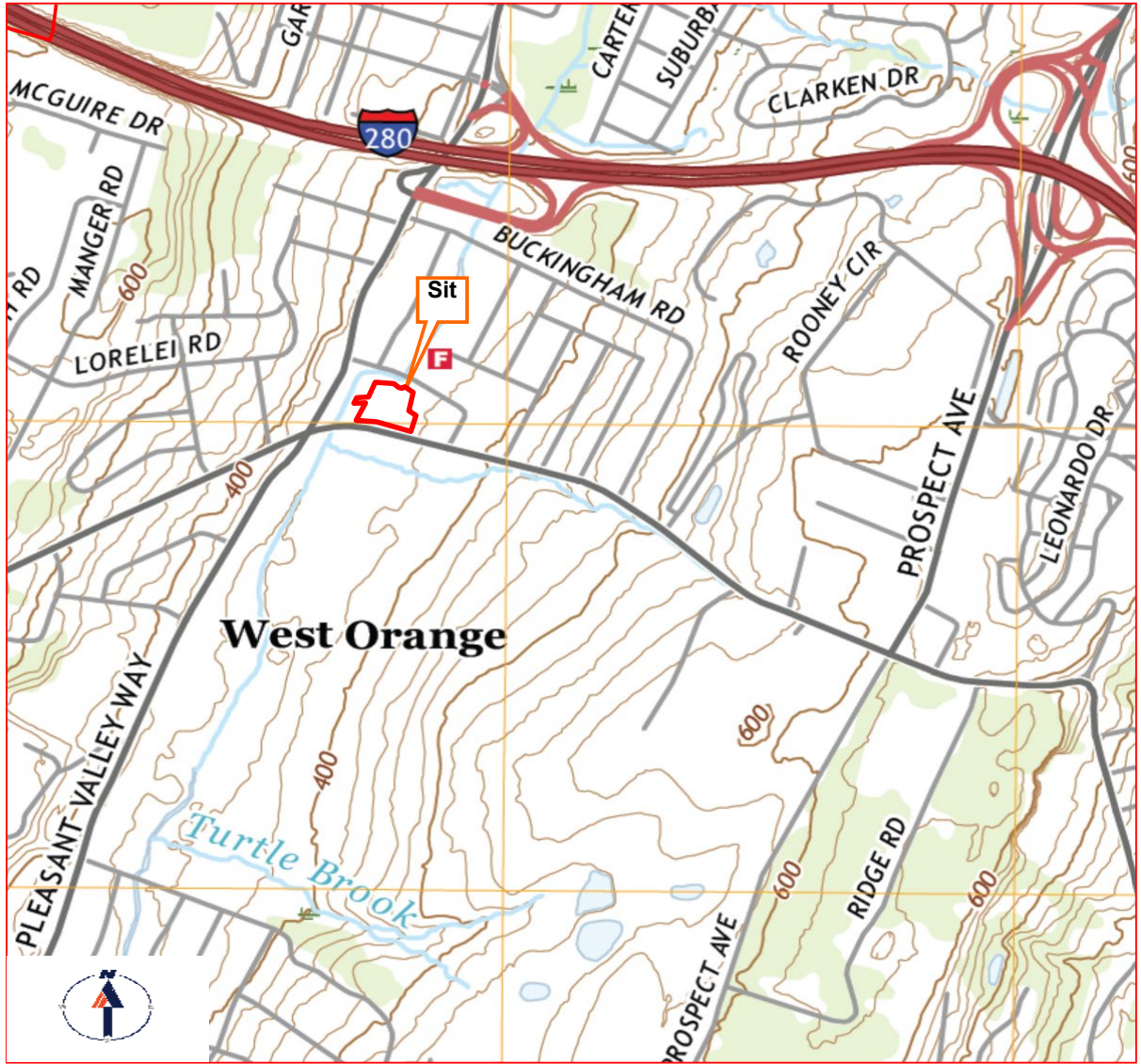
Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

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USGS Map

556,382-ft. E; 713,930-ft. N

Caldwell Quadrangle

Source: USGS, 2019

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

Prepared by: RF

Date: 7/31/2025

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State Planning Area Map

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

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Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

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NJDEP Potential Freshwater Wetlands Map

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

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Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

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NJDEP Stream Map

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

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Date: 7/31/2025

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HUC-14 Sub-Watershed Map

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

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FEMA Flood Map

Source: FEMA FIRM Map #34013C0092F, Date 06/04/2007

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

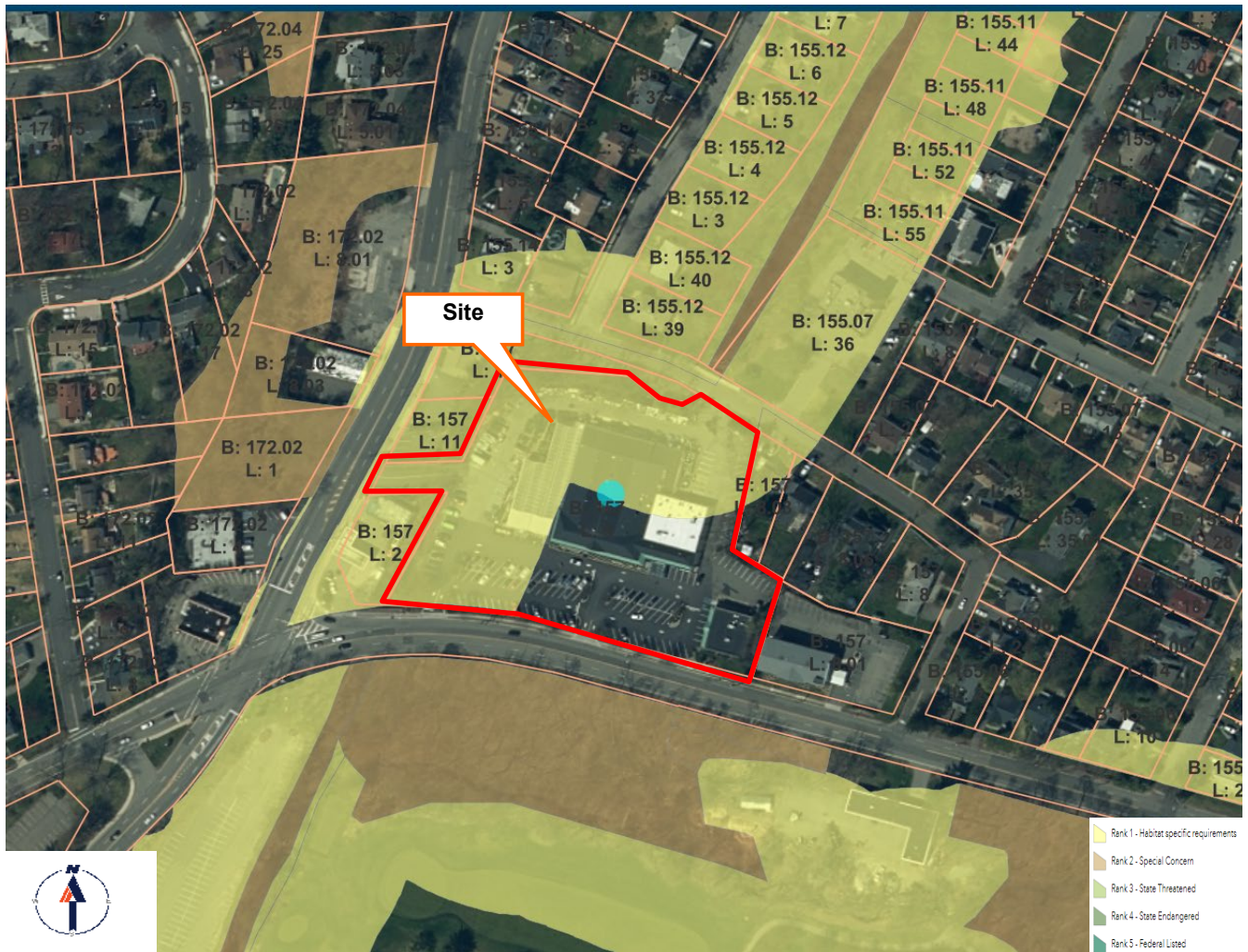
Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

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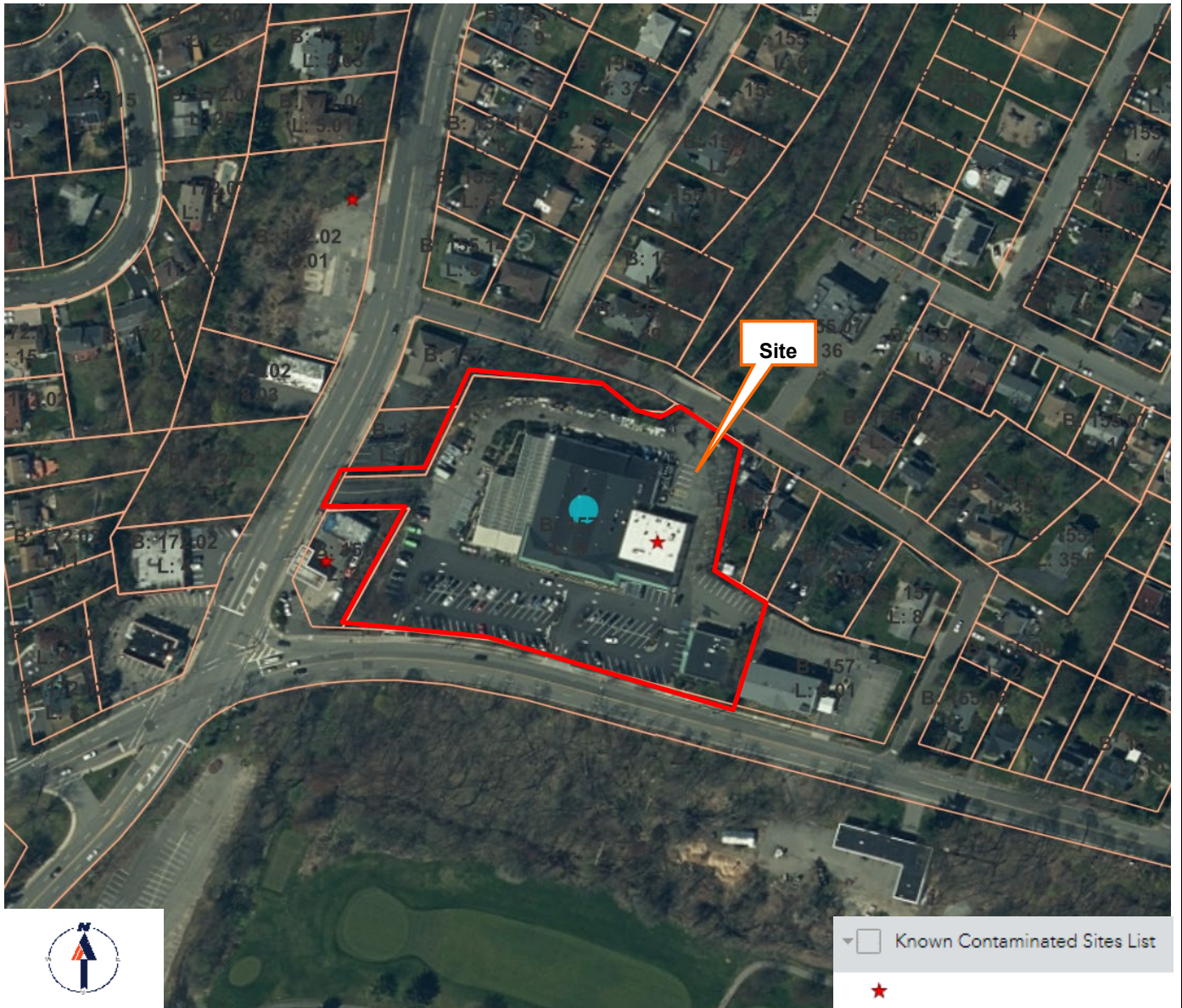
NJDEP Potential Threatened/Endangered Species Habitat

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue Block 157; Lot 5		Township of West Orange, Essex County, NJ	
BENJ #NJA230139		BOHLER //	
Prepared by: RF	Date: 7/31/2025		
Checked by: CA	Scale: NTS		



NJDEP Known Contaminated Sites

Source: NJ GeoWeb

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

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Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DunC	Dunellen sandy loam, 8 to 15 percent slopes	A	1.6	13.1%
DuuB	Dunellen - Urban land, Dunellen substratum complex, 0 to 8 percent slopes	A	10.8	86.9%
Totals for Area of Interest			12.4	100.0%

Hydrologic Soils Group

Source: NRCS Web Soil Survey, 2024

Date Access: 07/31/2025

Proposed Retail Store

457 Mount Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

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- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
DunC	Dunellen sandy loam, 8 to 15 percent slopes	>200	1.4	12.2%
DuuB	Dunellen - Urban land, Dunellen substratum complex, 0 to 8 percent slopes	>200	10.0	87.8%
Totals for Area of Interest			11.4	100.0%

Depth to Seasonal High Water Table

Source: NRCS Web Soil Survey, 2024

Date Access: 07/31/2025

Proposed Retail Store

457 Mount P Pleasant Avenue
Block 157; Lot 5

Township of West Orange, Essex County, NJ

BENJ #NJA230139

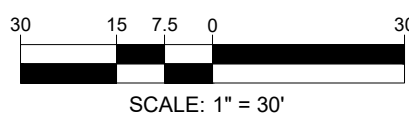
Prepared by: RF

Date: 7/31/2025

Checked by: CA

Scale: NTS

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[illegible]

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REVIEW AND APPROVAL. IT IS NOT INTENDED AS A CONSTRUCTION
DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT:

FOR

PROPOSED
RETAIL STORE

BOHLER 
BOHLER ENGINEERING NJ, LLC

**30 INDEPENDENCE BLVD., SUITE 200
WARREN, NJ 07059**

Phone: (908) 668-8300
Fax: (908) 754-4401

www.BohlerEngineering.com

NJ CERT. OF AUTHORIZATION NO. 24GA28400600 & MH-000122

SHEET TITLE:

EXISTING DRAINAGE AREA MAP

SHEET NUMBER: _____

C-01

ORG. DATE - 08/04/2025

