

STORMWATER MANAGEMENT REPORT

Prepared for:

OUR LADY OF THE LAKE PARISH

Block 1906, Lot 13
22 Lakeside Avenue

Township of Verona
Essex County, New Jersey

Prepared by:



Bright View Engineering
Moving you forward

Bright View Engineering

N.J. Certificate of Authorization 24GA28347800

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Introduction

The subject property is located at 22 Lakeside Avenue in the Township of Verona, Essex County, New Jersey. The property is identified as Block 1906, Lot 13 on the Township of Verona Tax Map. The overall property is 4.50 acres in area and will hereafter be referred to as “the site”. The site is bordered by commercial uses to the north, County parkland to the east, and residential to the south and west. The scope of this study includes a stormwater analysis and stormwater management designs in accordance with Township requirements for the southwesterly portion of the site for which parking lot improvements are being proposed.

The subject area of this project is the southwesterly portion of the site which contains a single-family home and an asphalt parking lot for the Parish. The project area is not located in a flood hazard or riparian zone, and there are no mapped wetlands that impact the project. The proposed improvements include the demolition of the existing single-family home and the reconstruction of the existing Parish parking lot to include the area of the single-family home. The project also includes the demolition of a detached 2-car garage and the construction of a new detached 3-car garage. These improvements will result in the disturbance of greater than one-half acre of land and therefore qualifies as a Major Development and is subject to the requirements of Chapter 150 of the Township Ordinances.

This report summarizes the design objectives, methodology, and calculations for the conveyance, attenuation, treatment, and discharge of stormwater runoff leaving the site and is meant to accompany the Site Plan documents prepared by Bright View Engineering. Pre-development and post-development conditions are examined for analysis of the stormwater quantity, water quality, and groundwater recharge based on Chapter 150 of the Township Ordinances.

Stormwater Management Design Methodology

In accordance with Chapter 150 of the Township Code, the proposed development must meet the requirements for a major development, as appropriate, for stormwater quantity, water quality, and groundwater recharge. The assessment of stormwater runoff has been based upon the Soil Conservation Service Method (SCS) Unit Hydrograph. Theoretical storms are modeled with the 24-Hour SCS Unit Dimensionless Hydrograph using the NOAA Atlas 14 Type C 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.

The project meets the regulatory definition of Major Development as there will be a total disturbance of 1.35 acres. Additionally, there is approximately 42,000 square feet of vehicular impervious surface. In the proposed condition, the project proposes a total of approximately 36,000 square feet of vehicular impervious surface of which 4,200 square feet will be new vehicle impervious surface with the remainder being redeveloped.

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 Verona, NJ 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 the following tables

Current Adjusted, 24-Hour Rainfall Frequency Data

Event (year)	2	10	100
NOAA Atlas 14 Rainfall (inches)	3.43	5.21	8.71
Adjustment Factor	1.01	1.03	1.06
Current Adjusted Rainfall (inches)	3.46	5.37	9.23

Future Adjusted, 24-Hour Rainfall Frequency Data

Event (year)	2	10	100
NOAA Atlas 14 Rainfall (inches)	3.43	5.21	8.71
Adjustment Factor	1.19	1.22	1.33
Future Adjusted Rainfall (inches)	4.08	6.36	11.58

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 the Table below². The soils consist of hydrologic soil group (HSG) Type C, therefore the CN values used in calculations are those associated with Type C soils.

Site Soil Properties

Soil Symbol	Soil Name	Characteristics	Hydrologic Soil Group Rating
PercuuB	Peckmantown – Urban Land	Peckmantown substratum, 0 to 8 percent slopes	C
BouB	Boonton – Urban Land	Boonton substratum, 0 to 8 percent slopes	C

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 the following table.

CN Values

Land Cover Description	HSG D
Open space, Good Condition (grass cover >75%)	74
Impervious Surfaces	98

Time of Concentration

The time of concentration (T_c) 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 Appendices A & B, and full T_c calculations for each drainage area can be found in the HydroCAD summaries in Appendices A & B.

Pre-Development Site Conditions

The Property drains from west to east (from Montrose Avenue to Lakeside Avenue) and is collected and conveyed by the Lakeside Avenue drainage system, which drains into the Peckman River located just east of Lakeside Avenue. For the purpose of analysis, three (3) pre-development drainage areas have been delineated based on three (3) on-site drainage inlets and that currently receive the runoff from the project area. These drainage areas/conveyance systems ultimately combine and discharge into the Lakeside Avenue conveyance system, therefore, Lakeside Avenue is the common point of analysis for the drainage areas.

Post-Development Site Conditions

In the post development site conditions, the existing single-family dwelling will be demolished, and the parking lot will be reconstructed to include a drop-off lane as well as the removal of the existing detached 2-car garage and construction of a new detached 3-car garage. The improvement result in a minor decrease from existing conditions in impervious area (4,443 sf). Additionally, the time of concentration has been maintained such that there is no increase in the post development hydrograph above the pre development hydrograph at any point in time. As such, the project is not required to reduce the peak flows from the site. however, For the proposed conditions, the drainage patterns will match existing conditions, with runoff discharging to the

three (3) existing drainage inlets at the downstream limits of the parking lot. Runoff within the drop-off area will not be controlled and will discharge to one (1) of the two (2) existing parking lot inlets at a rate equal to or less than existing conditions. Same as existing conditions, these drainage areas/conveyance systems ultimately combine and discharge into the Lakeside Avenue conveyance system, therefore, Lakeside Avenue is the common point of analysis for the drainage areas.

Proposed Stormwater Management Strategies

Pipe Sizing

Calculations for sizing the stormwater pipe networks associated with the proposed stormwater management conveyance system can be found in Appendix F of this report. The Rational Method has been used to size the storm piping for the 25-year storm event. The calculations are based on a minimum time of concentration of 6 minute to any inlet. An Inlet Area Map is included in Appendix H.

Stormwater Quantity Controls

In compliance with the Stormwater Management Controls and outlined in the stormwater management rules, the stormwater management measures are designed to not increase the proposed rate of runoff above those which currently exist today. The following table shows the existing and proposed peak rates of runoff from the project area for these storm events (see Appendices A, B, C and D for supporting hydrograph and routing calculations for the existing and proposed condition):

Existing vs. Proposed Flow Summary
Current Adjusted Precipitation Depths

	Existing Peak Flow	Proposed Peak Flow
	CFS	CFS
2-Year Storm	3.94	3.52
10-Year Storm	6.46	6.24
100-Year Storm	11.69	12.21

Existing vs. Proposed Flow Summary
Future Adjusted Precipitation Depths

	Existing Peak Flow	Proposed Peak Flow
	CFS	CFS
2-Year Storm	4.74	2.00

10-Year Storm	7.78	4.06
100-Year Storm	14.94	10.94

In addition to the total off-site flows, the proposed drainage system has been designed so that the flow rates to the existing inlets receiving the on-site runoff do not exceed existing conditions. The following table shows the existing and proposed peak rates to each inlet for the existing and proposed conditions.

Existing Inlet 1 - Existing vs. Proposed Comparison

	Current Adjusted		Future Adjusted	
	Existing Peak Flow	Proposed Peak Flow	Existing Peak Flow	Proposed Peak Flow
	CFS	CFS	CFS	CFS
2-Year Storm	1.66	0.19	2.04	0.38
10-Year Storm	2.88	1.03	3.53	1.80
100-Year Storm	5.46	4.08	7.08	4.08

Existing Inlet 2 - Existing vs. Proposed Comparison

	Current Adjusted		Future Adjusted	
	Existing Peak Flow	Proposed Peak Flow	Existing Peak Flow	Proposed Peak Flow
	CFS	CFS	CFS	CFS
2-Year Storm	1.77	1.49	2.09	1.80
10-Year Storm	2.68	2.44	3.27	2.93
100-Year Storm	4.78	4.36	6.03	5.52

Water Quality Controls

In order to address water quality standards for the project, mechanical treatment devices (Rapterra by Contech Engineered Solutions) will be utilized. These devices have been placed to collect stormwater runoff from vehicle impervious areas and then convey runoff to the proposed collection system. The Rapterra unit has been certified by the NJDEP as a green infrastructure water quality device. There are two types of units proposed with this project. The first is a peak diversion unit which collects and infiltrates stormwater runoff based upon the water quality event. Any runoff which exceeds this rate then flows over an internal weir which is then discharged in the stormwater conveyance system. The second

system proposed is the and offline unit. This unit is designed to collect stormwater flows based upon the water quality design storm. Any runoff which exceeds the water quality design rate bypasses this system in its entirety and is collected by an adjacent stormwater inlet. Based upon the design, the following units are proposed:

Unit Number	Unit Type	Size (ft x ft)	Contributory Area (ac)	Water Quality Flow (cfs)
1-1R	Offline	10 x 6	0.29	0.91
1-2R	Offline	8 x 6	0.18	0.57
1-4R	Offline	4 x 6	0.16	0.50
2-1R	Offline	4.5 x 7.83	0.20	0.63
2-2R	Offline	8 x 6	0.18	0.57
2-3R	Peak Diversion	6 x 6	0.14	0.44

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. Due to the conditions described above, no groundwater recharge is proposed as part of the stormwater management facilities on site.

Soil Erosion and Sediment Control

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

The downstream off-site stability is met by decreasing the peak flows leaving the site by at least 50% for the 2-year storm and 75% for the 10-year storm for the areas to be disturbed.

Low-Impact Development and Nonstructural 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 nonstructural 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 below existing impervious coverage limits, and runoff will be discharged in a similar manner of existing conditions.

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

The overall impervious coverage is not being increased for the site, and pervious pavement is being proposed through the parking lot to break up the flow of runoff over the impervious surfaces.

3. 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 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.

4. 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 “N-Eco” type curb pieces. 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.

- 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, the proposed stormwater management facility intercepts stormwater from the majority of 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 “N-Eco” inlet curb pieces on storm drain inlets. Pollution prevention techniques such as water quality treatment 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.

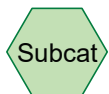
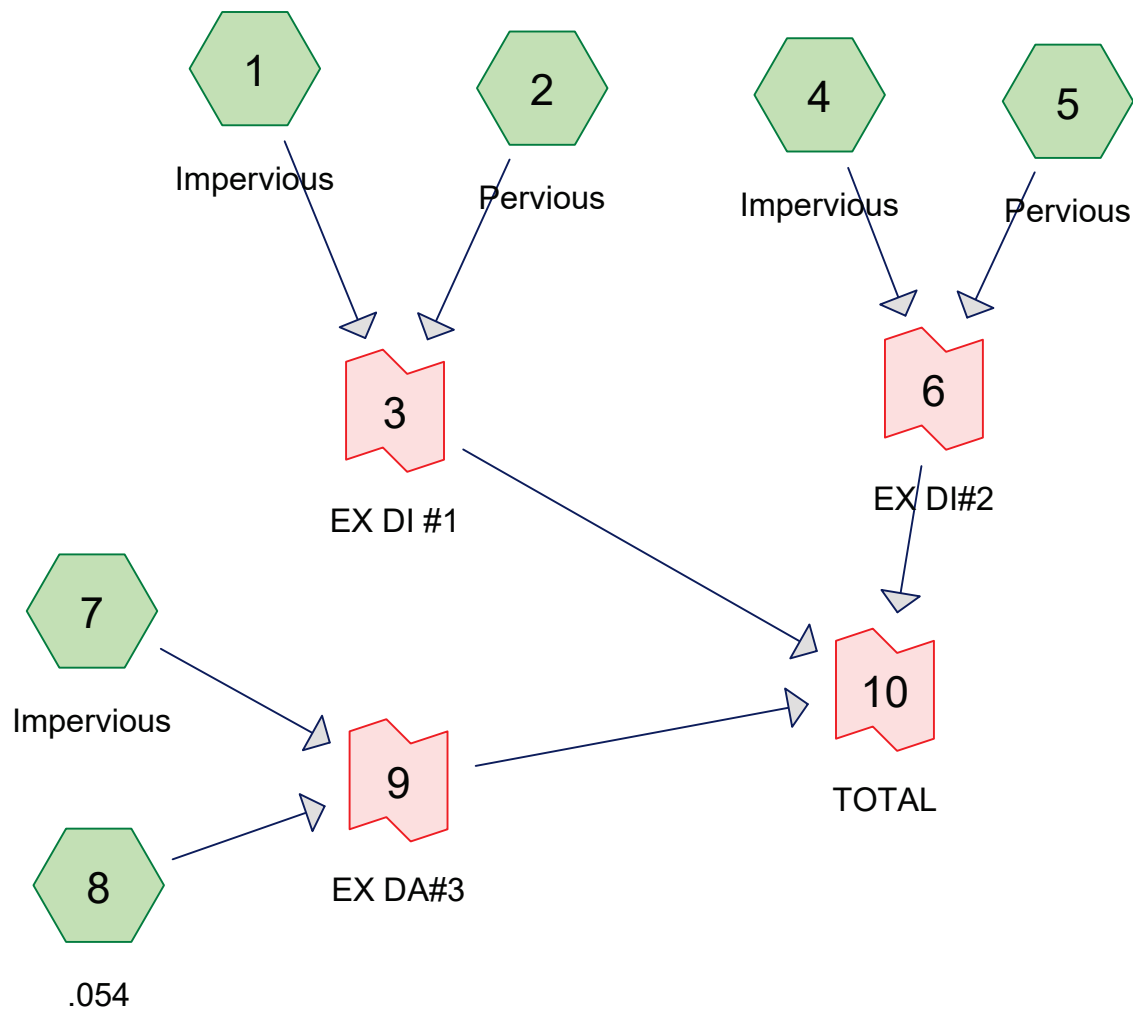
Conclusions

As demonstrated in the above sections, the stormwater management plan for the proposed development meets the current Township Stormwater Management Controls and Requirements 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, Bright View Engineering anticipates that the stormwater design will not have a negative impact to surrounding areas.

APPENDIX A

Pre-Development Hydrographs

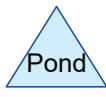
Current Adjusted Precipitation Depths



Subcat



Reach



Pond



Link

Routing Diagram for Existing Conditions

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Existing Conditions

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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 - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	3.46	2	3.46
2	10-YEAR - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	5.37	2	5.37
3	100-YEAR - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	9.23	2	9.23

Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 1: Impervious

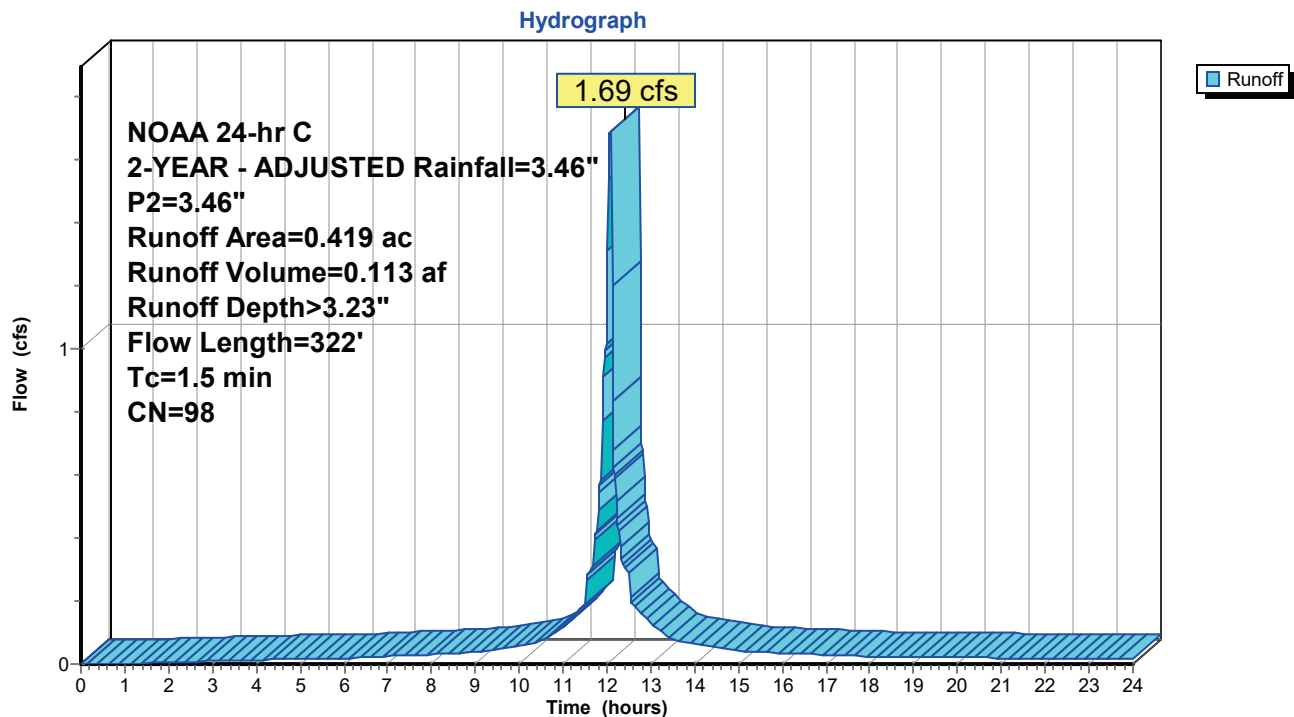
Runoff = 1.69 cfs @ 12.10 hrs, Volume= 0.113 af, Depth> 3.23"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0400	1.27		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.46"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.5	322	Total			

Subcatchment 1: Impervious



Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 2: Pervious

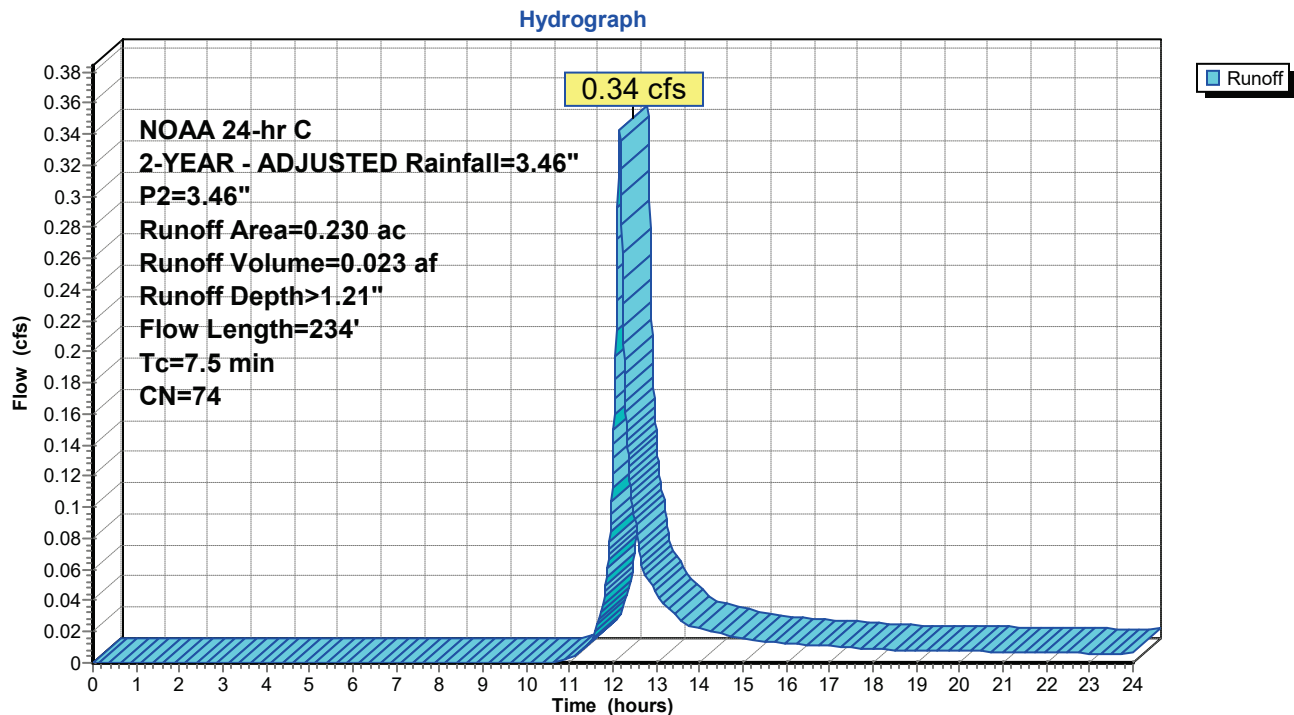
Runoff = 0.34 cfs @ 12.15 hrs, Volume= 0.023 af, Depth> 1.21"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	70	0.0600	0.18		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.46"
0.3	30	0.0390	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.46"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
7.5	234	Total			

Subcatchment 2: Pervious



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 4: Impervious

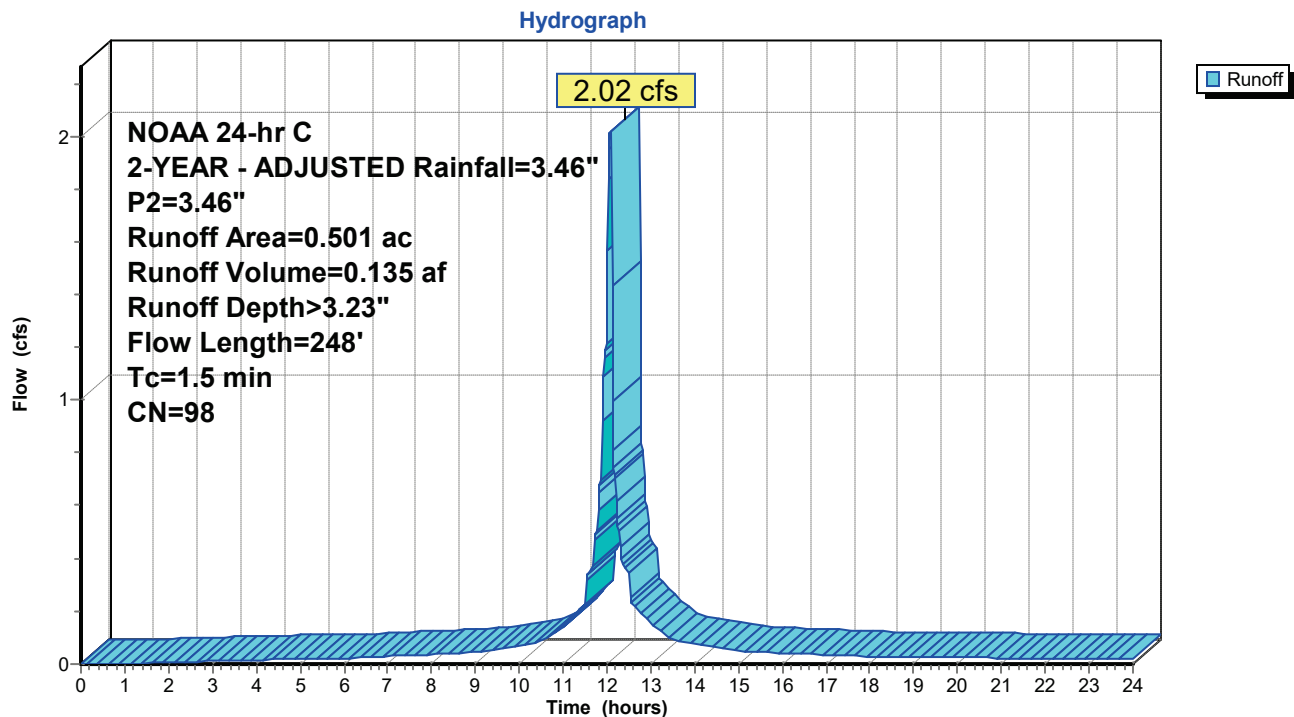
Runoff = 2.02 cfs @ 12.10 hrs, Volume= 0.135 af, Depth> 3.23"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0440	1.96		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.46"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
1.5	248	Total			

Subcatchment 4: Impervious



Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 5: Pervious

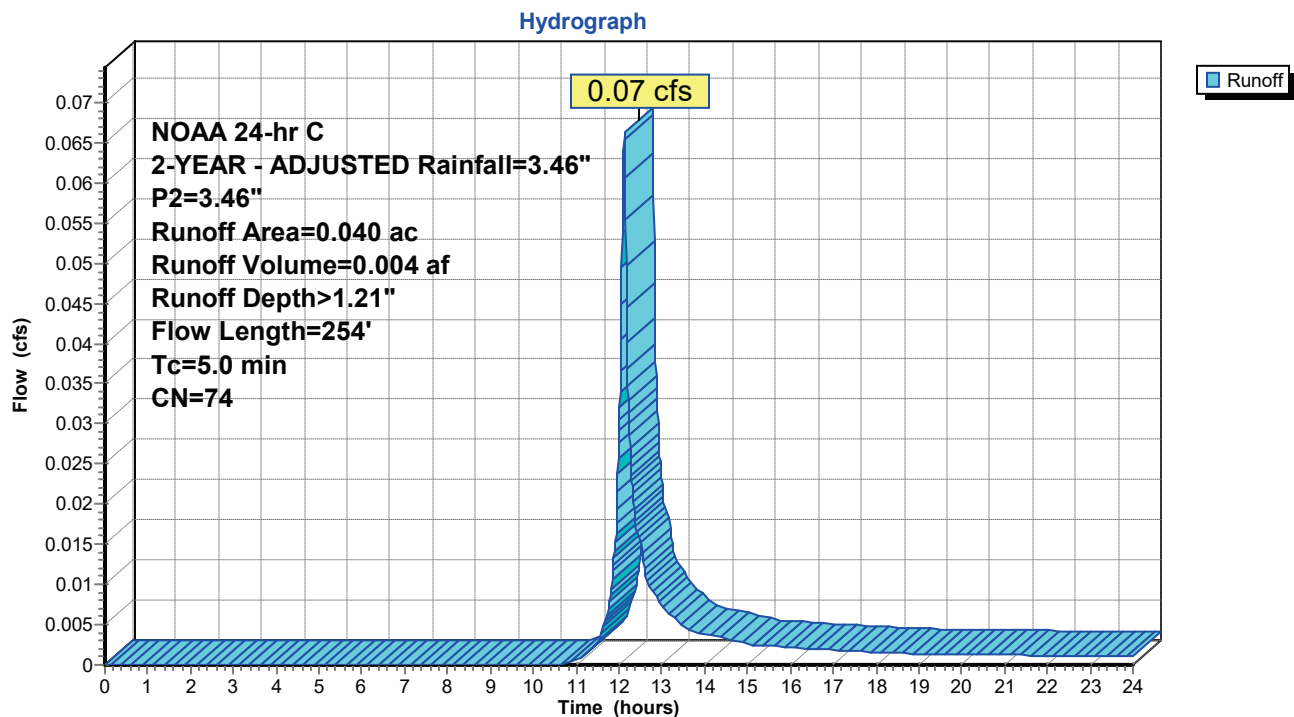
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 0.004 af, Depth> 1.21"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	28	0.0400	0.12		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.46"
0.6	72	0.0460	1.87		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.46"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
5.0	254	Total			

Subcatchment 5: Pervious



Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 7: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

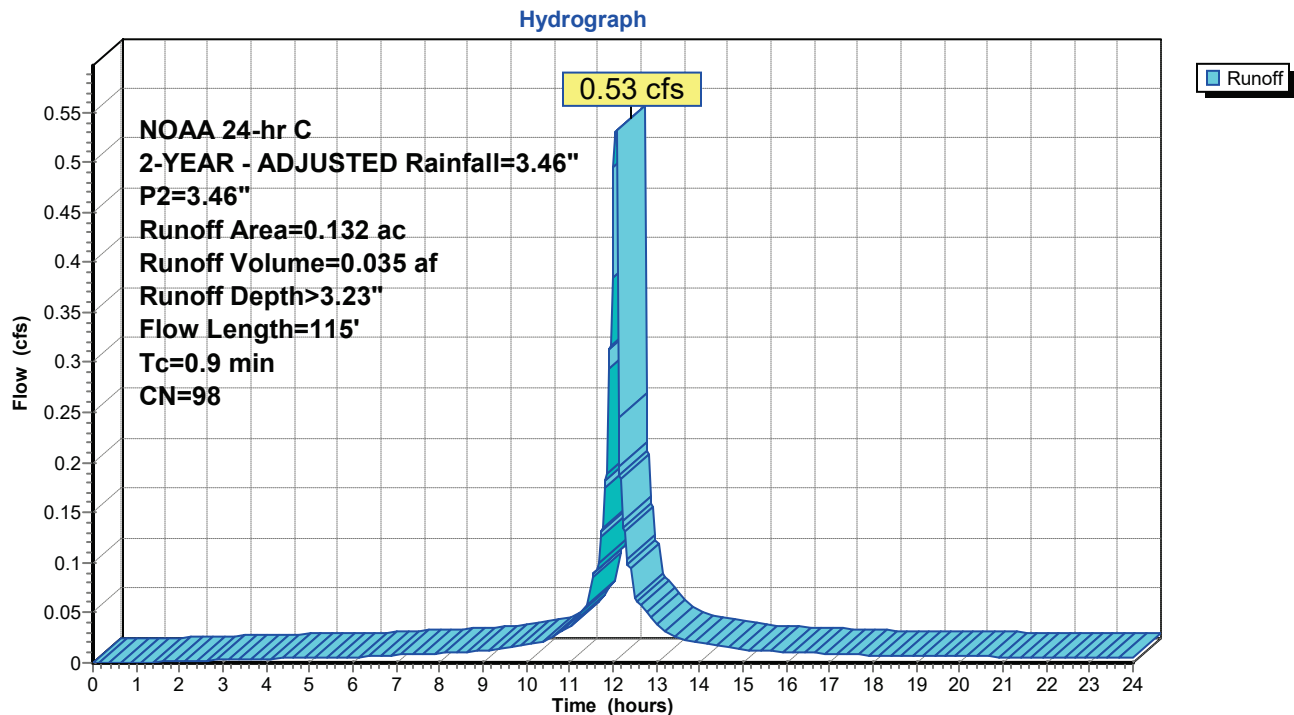
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.035 af, Depth> 3.23"
Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.73		Sheet Flow, B-C Smooth surfaces $n=0.011$ P2= 3.46"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved $K_v=20.3$ fps
0.9	115	Total			

Subcatchment 7: Impervious



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 8: .054

Runoff = 0.09 cfs @ 12.11 hrs, Volume= 0.005 af, Depth> 1.21"
Routed to Link 9 : EX DA#3

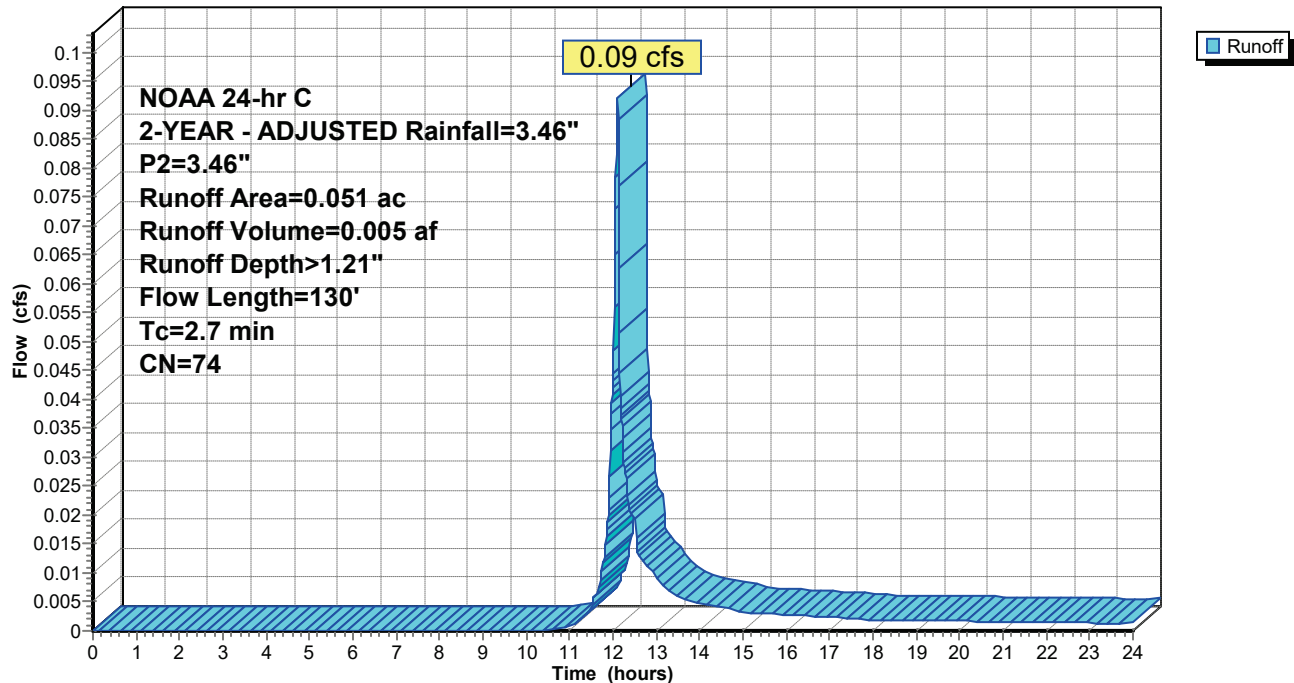
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	15	0.0850	0.15		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.46"
0.9	85	0.0300	1.63		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.46"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
2.7	130	Total			

Subcatchment 8: .054

Hydrograph



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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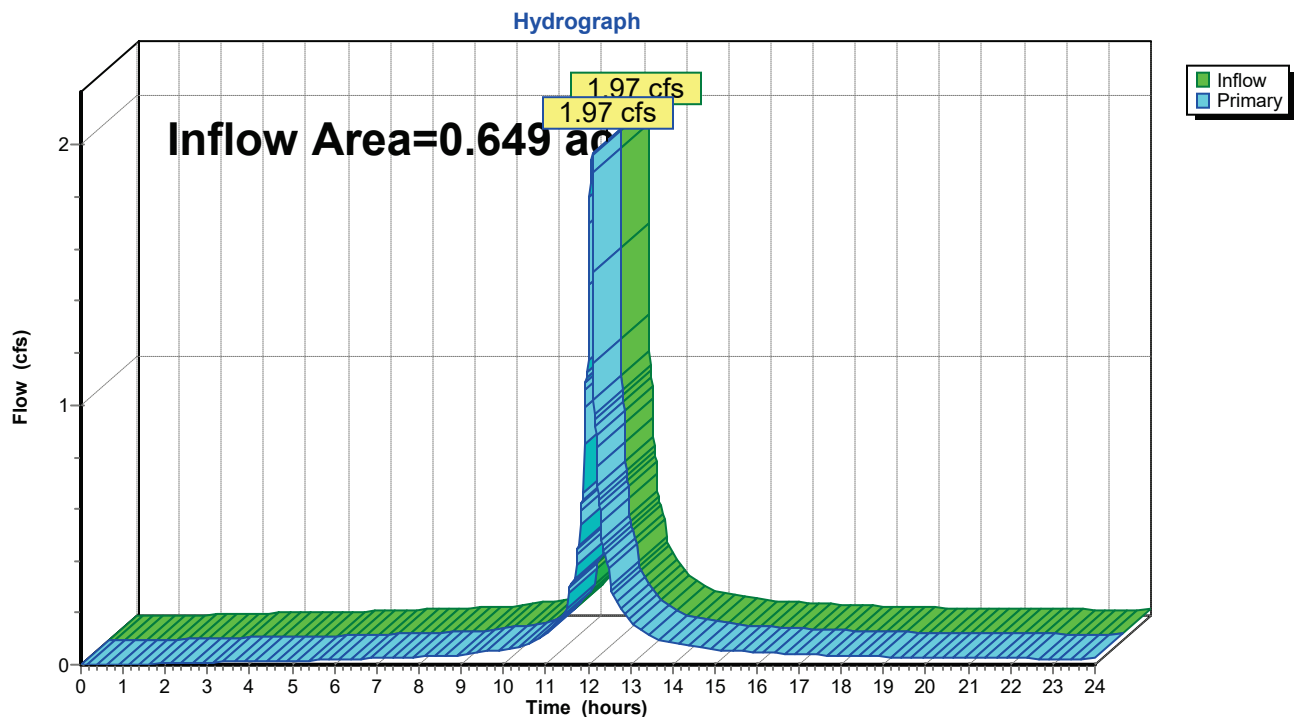
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Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 2.51" for 2-YEAR - ADJUSTED event
Inflow = 1.97 cfs @ 12.10 hrs, Volume= 0.136 af
Primary = 1.97 cfs @ 12.10 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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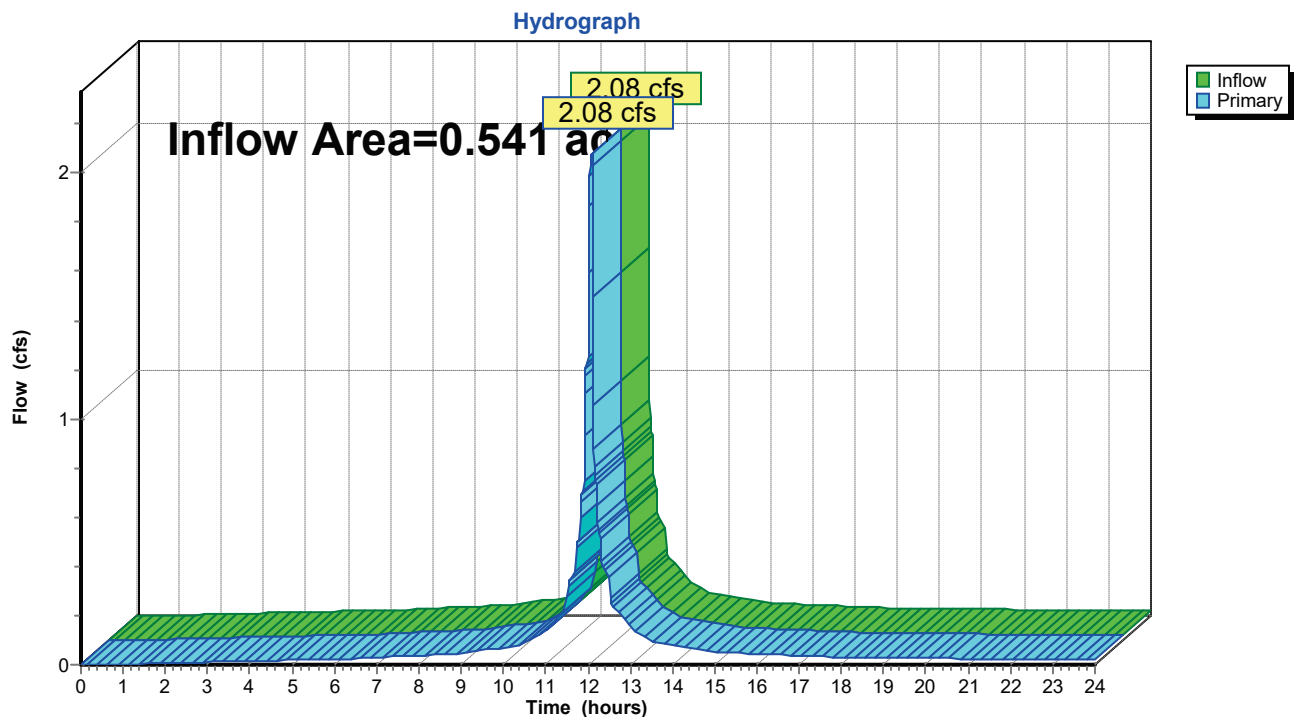
Page 10

Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 3.08" for 2-YEAR - ADJUSTED event
Inflow = 2.08 cfs @ 12.10 hrs, Volume= 0.139 af
Primary = 2.08 cfs @ 12.10 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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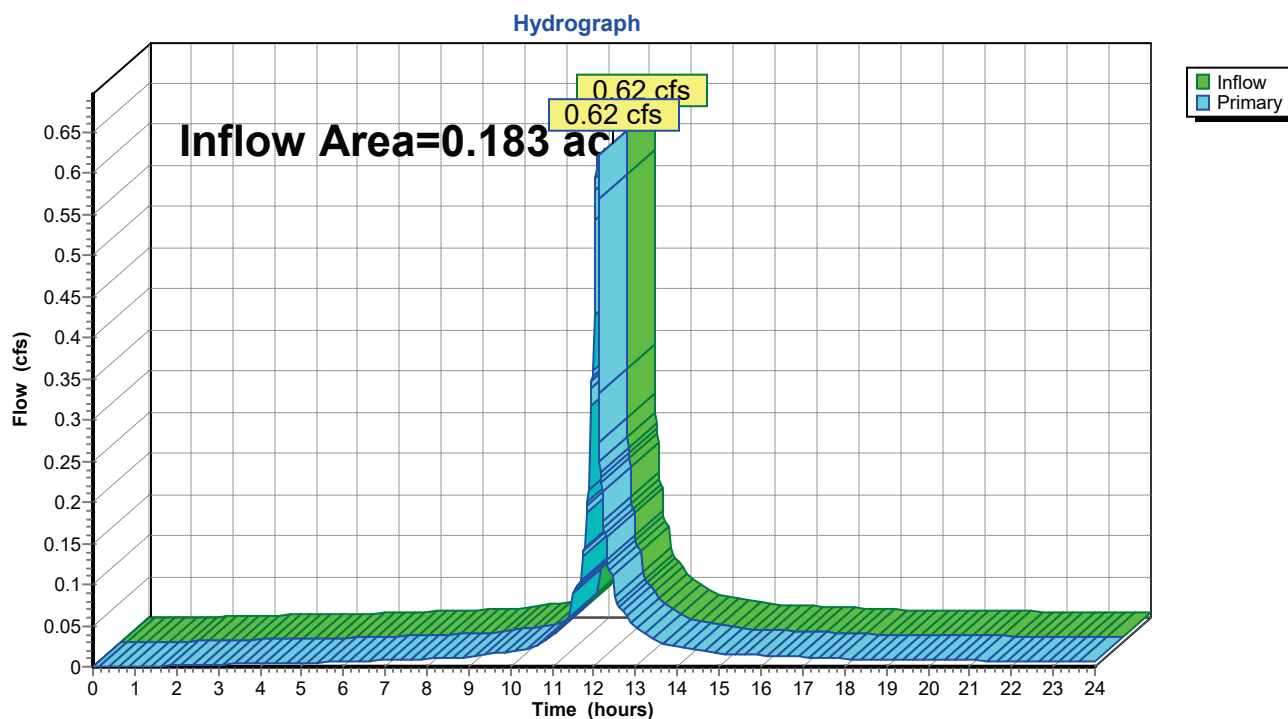
Page 11

Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 2.66" for 2-YEAR - ADJUSTED event
Inflow = 0.62 cfs @ 12.10 hrs, Volume= 0.041 af
Primary = 0.62 cfs @ 12.10 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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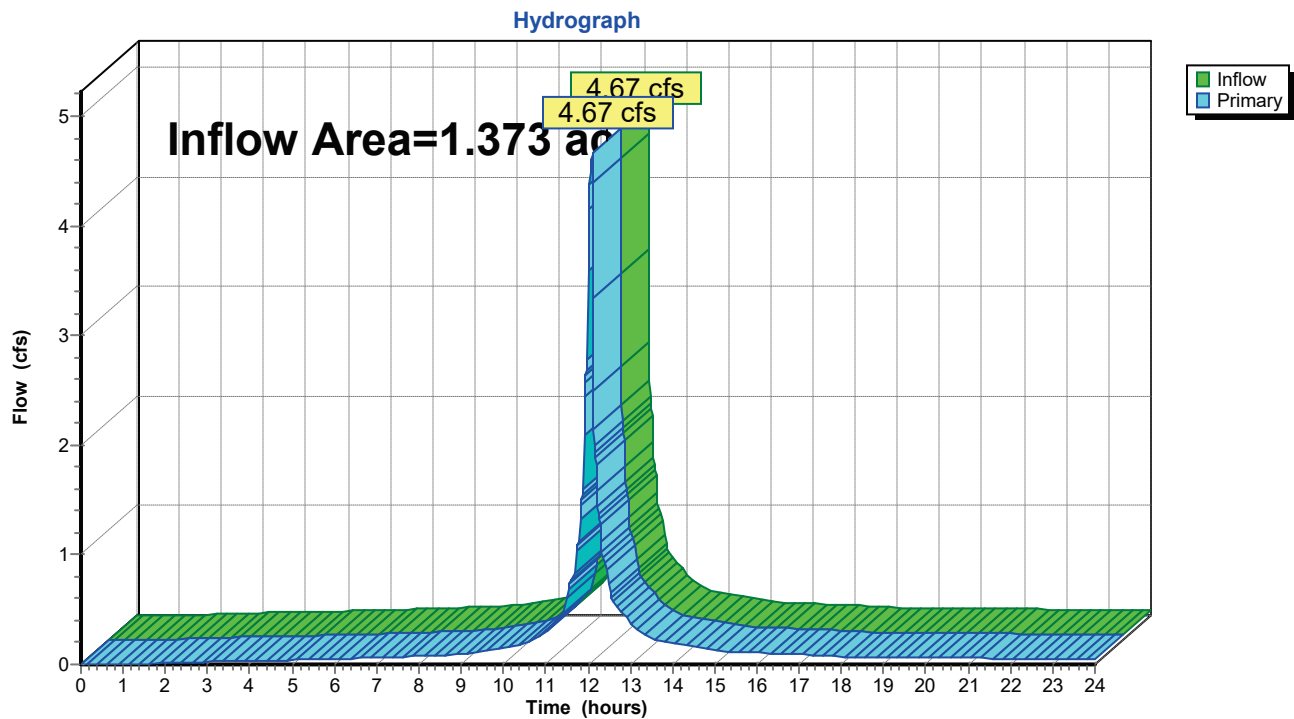
Page 12

Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 2.75" for 2-YEAR - ADJUSTED event
Inflow = 4.67 cfs @ 12.10 hrs, Volume= 0.315 af
Primary = 4.67 cfs @ 12.10 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 10: TOTAL



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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Summary for Subcatchment 1: Impervious

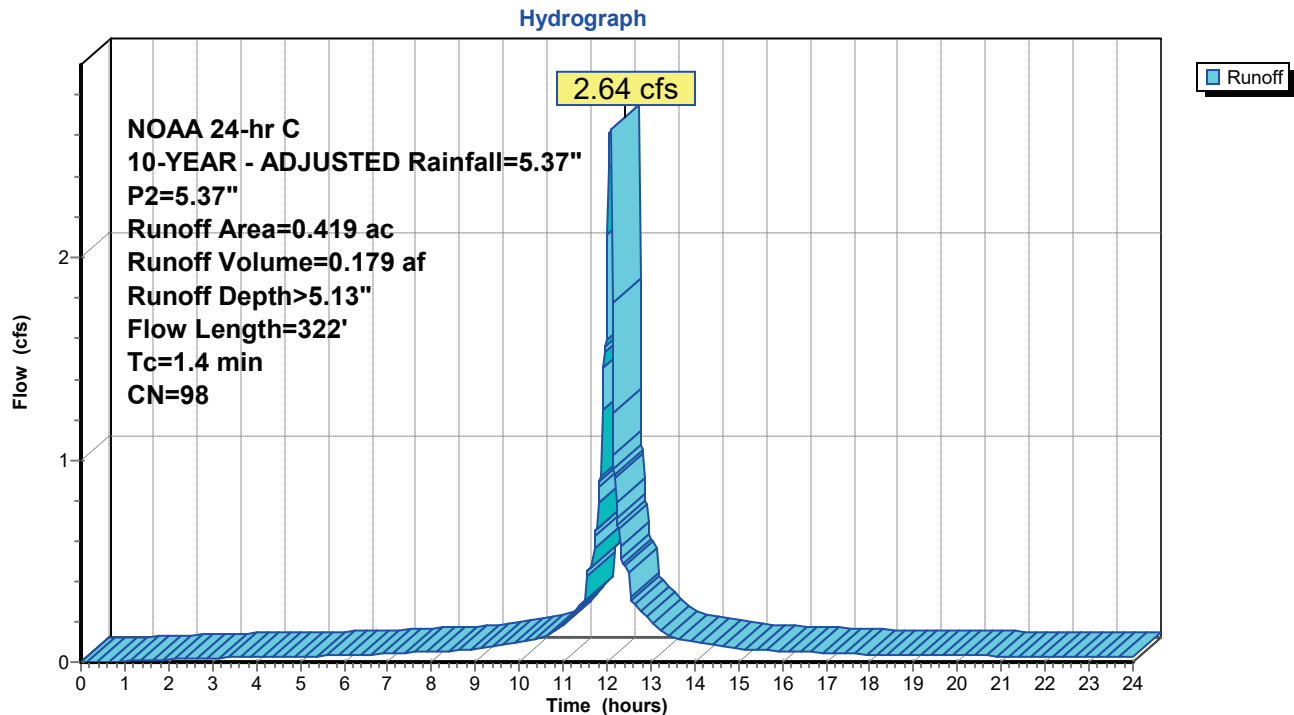
Runoff = 2.64 cfs @ 12.09 hrs, Volume= 0.179 af, Depth> 5.13"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	14	0.0400	1.59		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 5.37"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.4	322	Total			

Subcatchment 1: Impervious



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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Summary for Subcatchment 2: Pervious

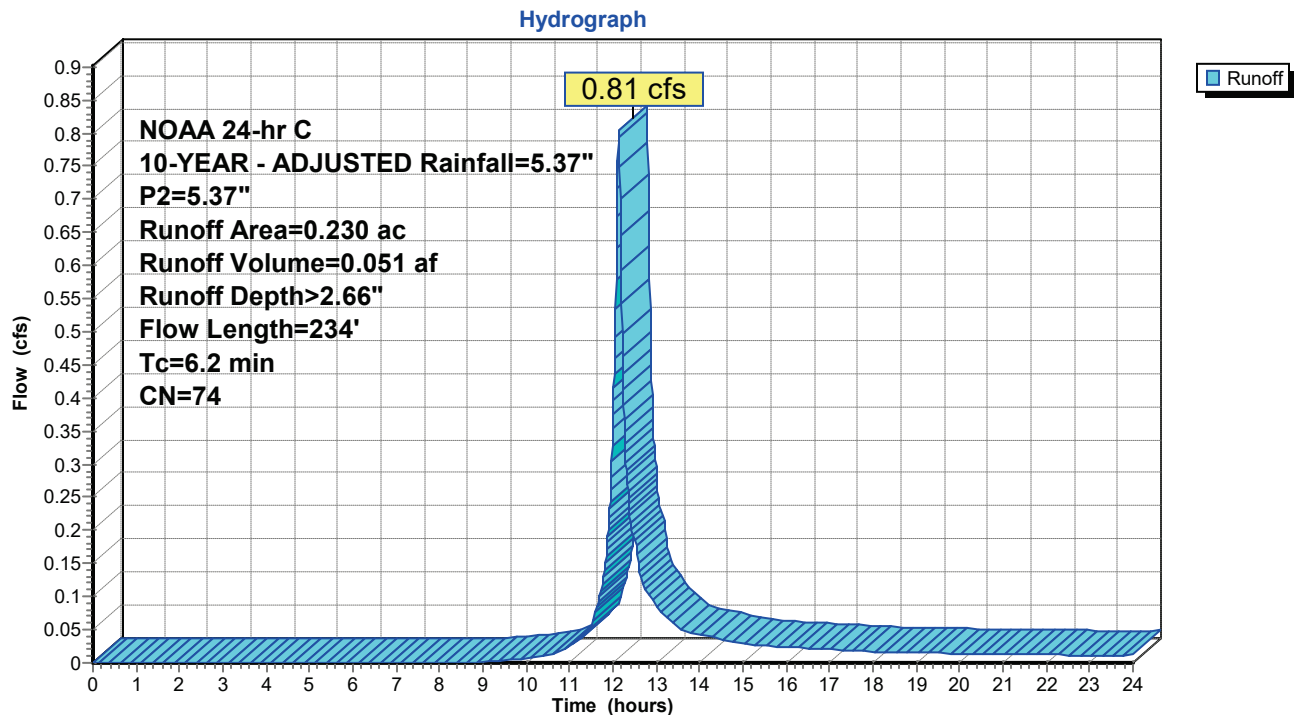
Runoff = 0.81 cfs @ 12.14 hrs, Volume= 0.051 af, Depth> 2.66"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	70	0.0600	0.22		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 5.37"
0.3	30	0.0390	1.83		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 5.37"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
6.2	234	Total			

Subcatchment 2: Pervious



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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Summary for Subcatchment 4: Impervious

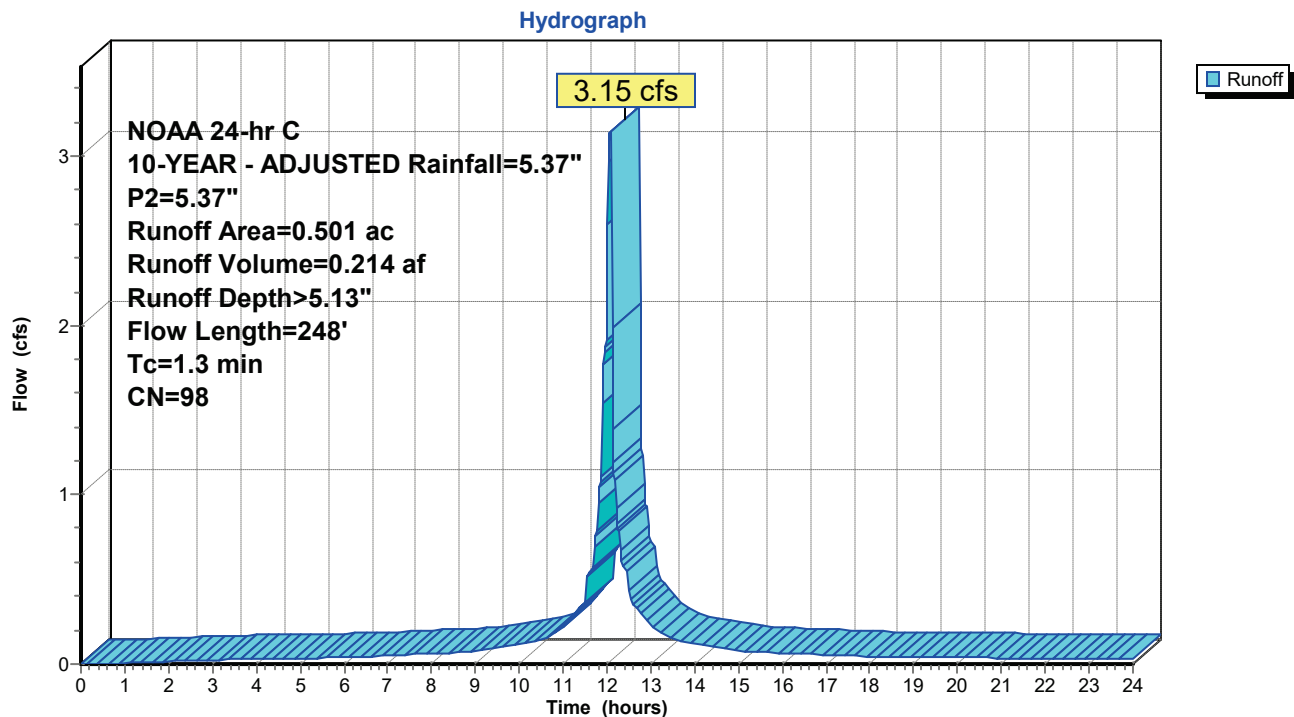
Runoff = 3.15 cfs @ 12.09 hrs, Volume= 0.214 af, Depth> 5.13"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	100	0.0440	2.44		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 5.37"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
1.3	248	Total			

Subcatchment 4: Impervious



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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Summary for Subcatchment 5: Pervious

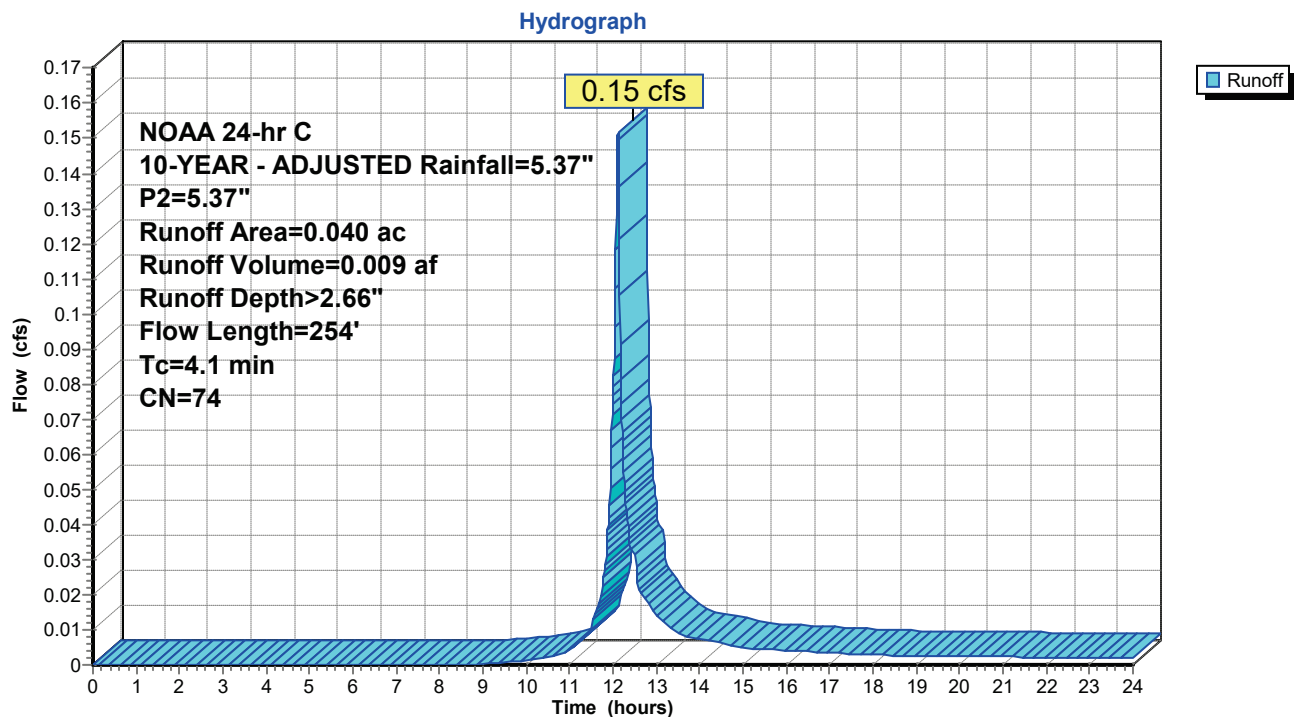
Runoff = 0.15 cfs @ 12.12 hrs, Volume= 0.009 af, Depth> 2.66"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	28	0.0400	0.15		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 5.37"
0.5	72	0.0460	2.33		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 5.37"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
4.1	254	Total			

Subcatchment 5: Pervious



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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Summary for Subcatchment 7: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

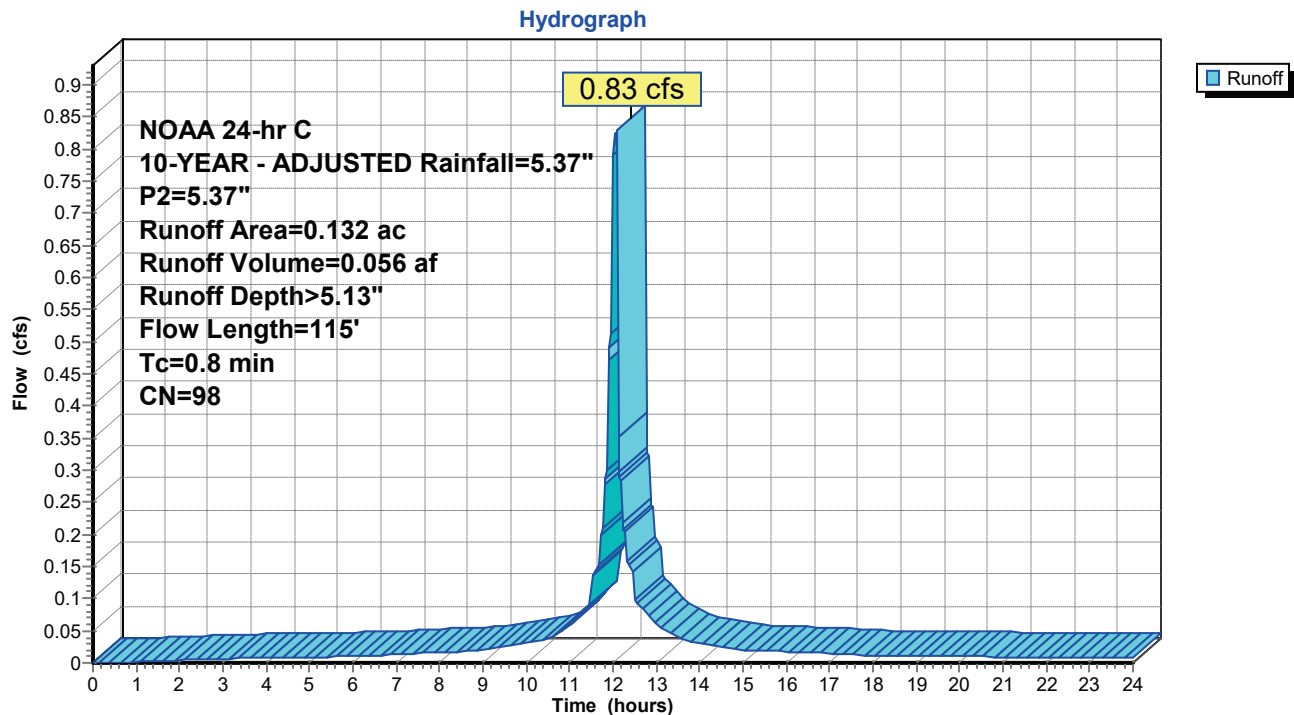
Runoff = 0.83 cfs @ 12.09 hrs, Volume= 0.056 af, Depth> 5.13"
Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	85	0.0350	2.16		Sheet Flow, B-C Smooth surfaces $n=0.011$ P2= 5.37"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved $K_v=20.3$ fps
0.8	115	Total			

Subcatchment 7: Impervious



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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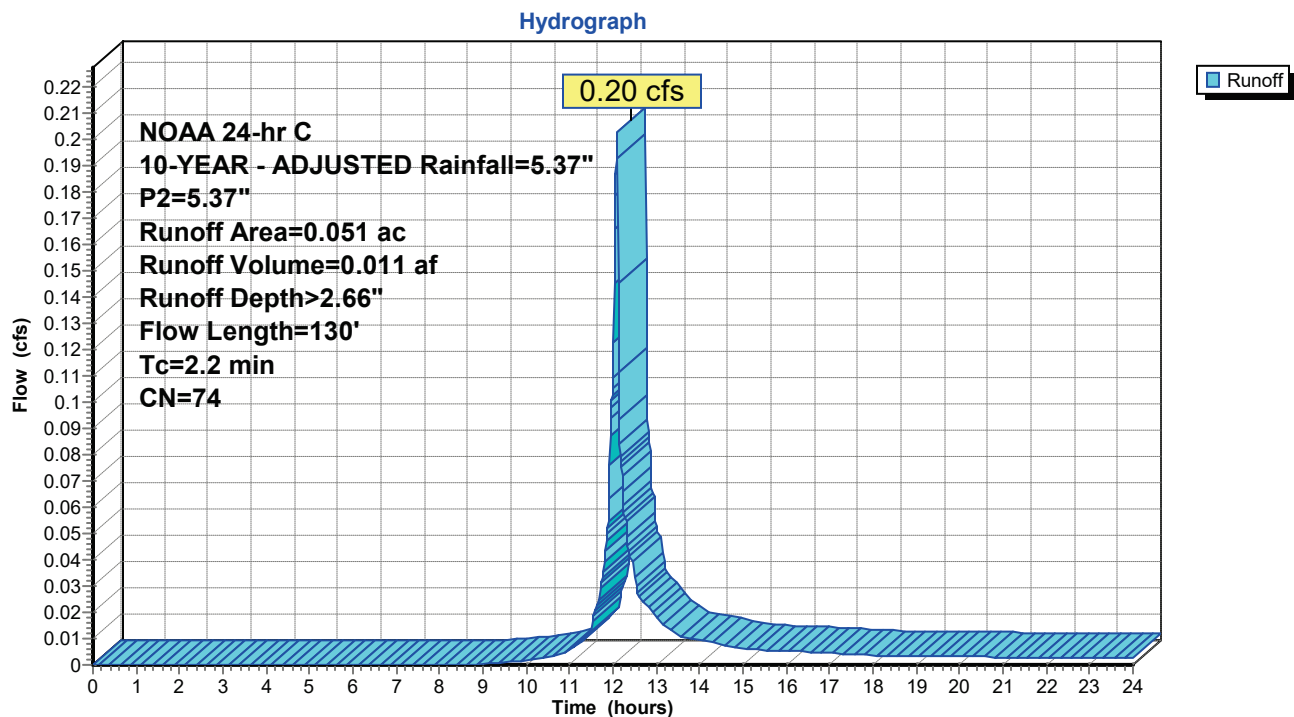
Summary for Subcatchment 8: .054

Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.011 af, Depth> 2.66"
Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	15	0.0850	0.18		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 5.37"
0.7	85	0.0300	2.03		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 5.37"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
2.2	130	Total			

Subcatchment 8: .054

Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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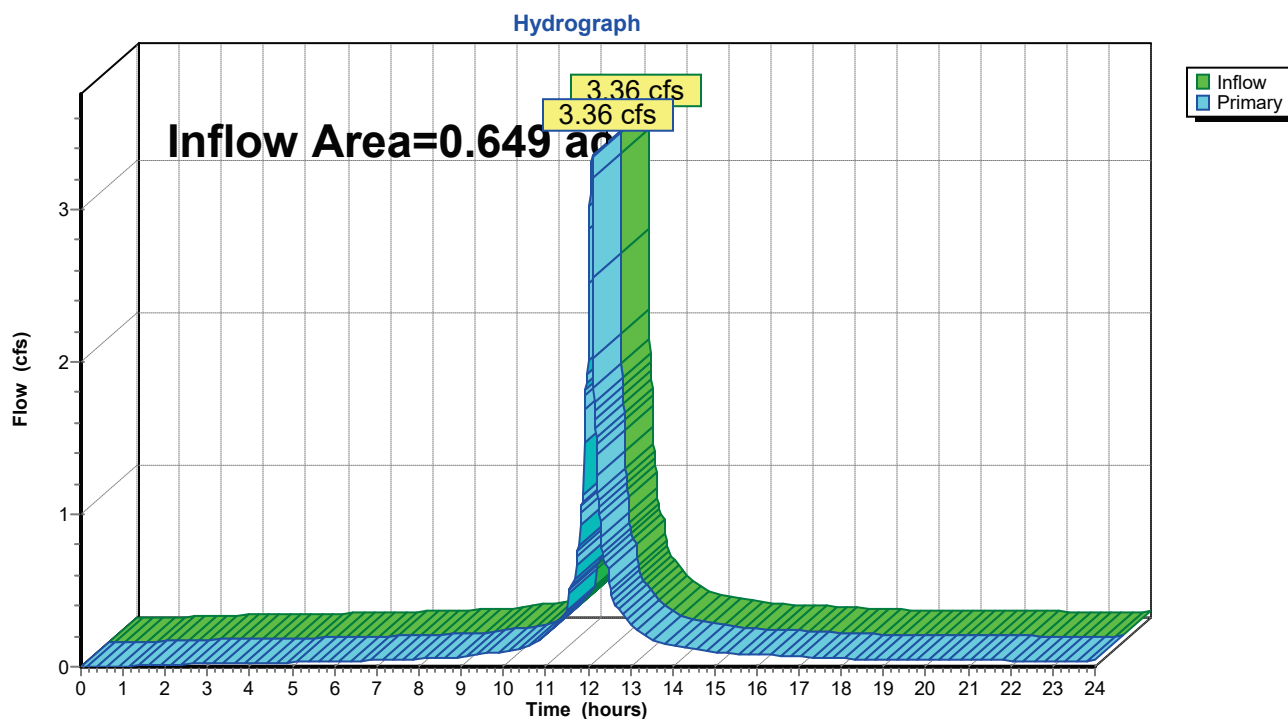
Page 19

Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 4.25" for 10-YEAR - ADJUSTED event
Inflow = 3.36 cfs @ 12.10 hrs, Volume= 0.230 af
Primary = 3.36 cfs @ 12.10 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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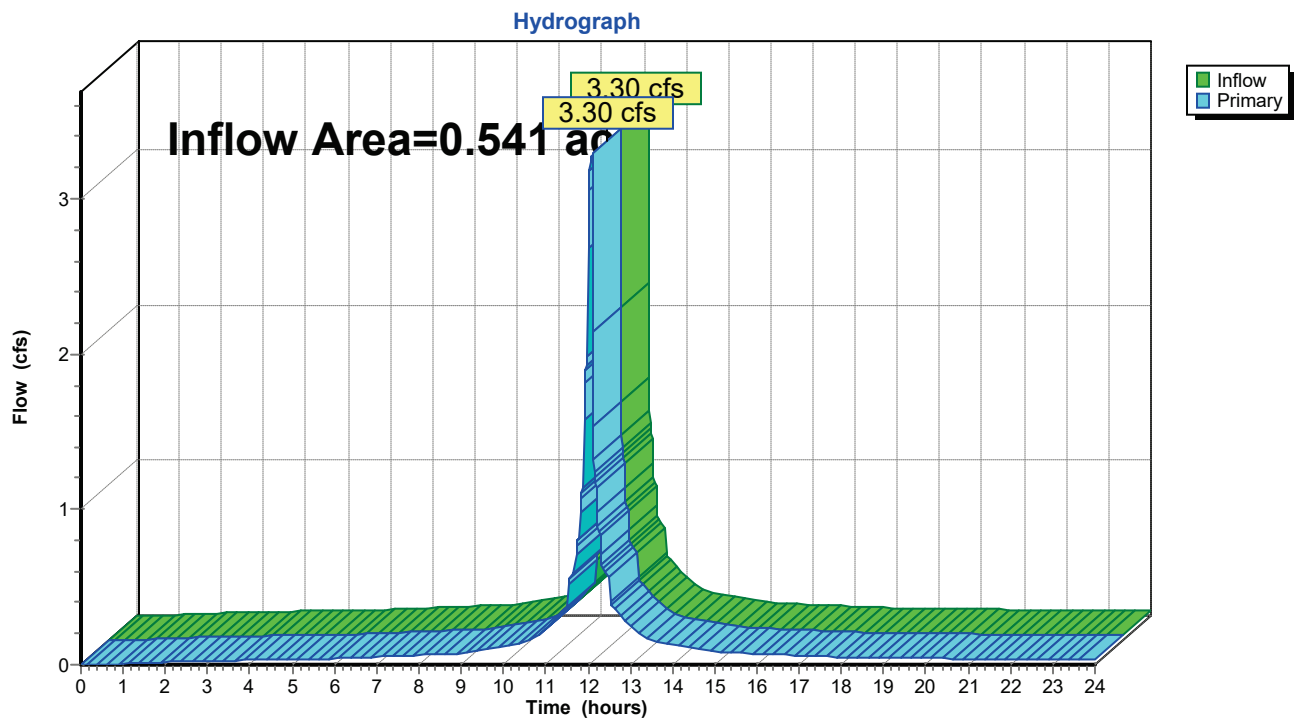
Page 20

Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 4.95" for 10-YEAR - ADJUSTED event
Inflow = 3.30 cfs @ 12.10 hrs, Volume= 0.223 af
Primary = 3.30 cfs @ 12.10 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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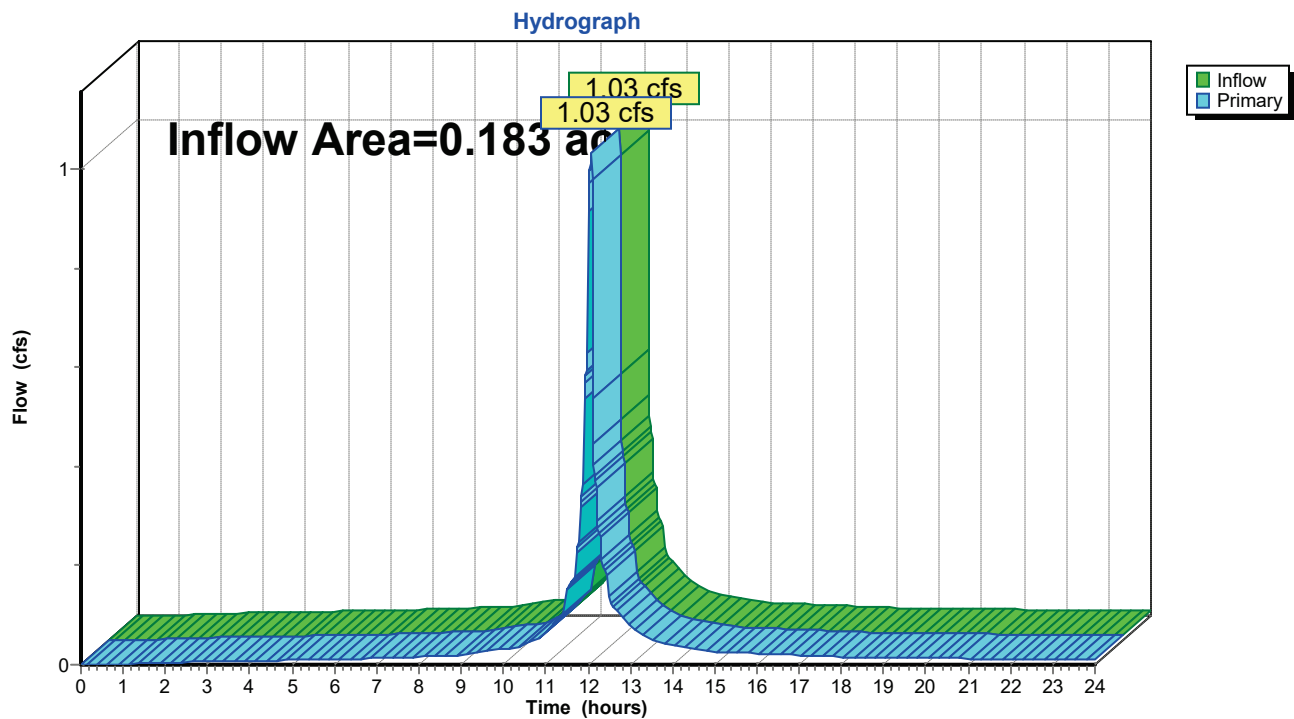
Page 21

Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 4.44" for 10-YEAR - ADJUSTED event
Inflow = 1.03 cfs @ 12.09 hrs, Volume= 0.068 af
Primary = 1.03 cfs @ 12.09 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3



Existing Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=5.37"

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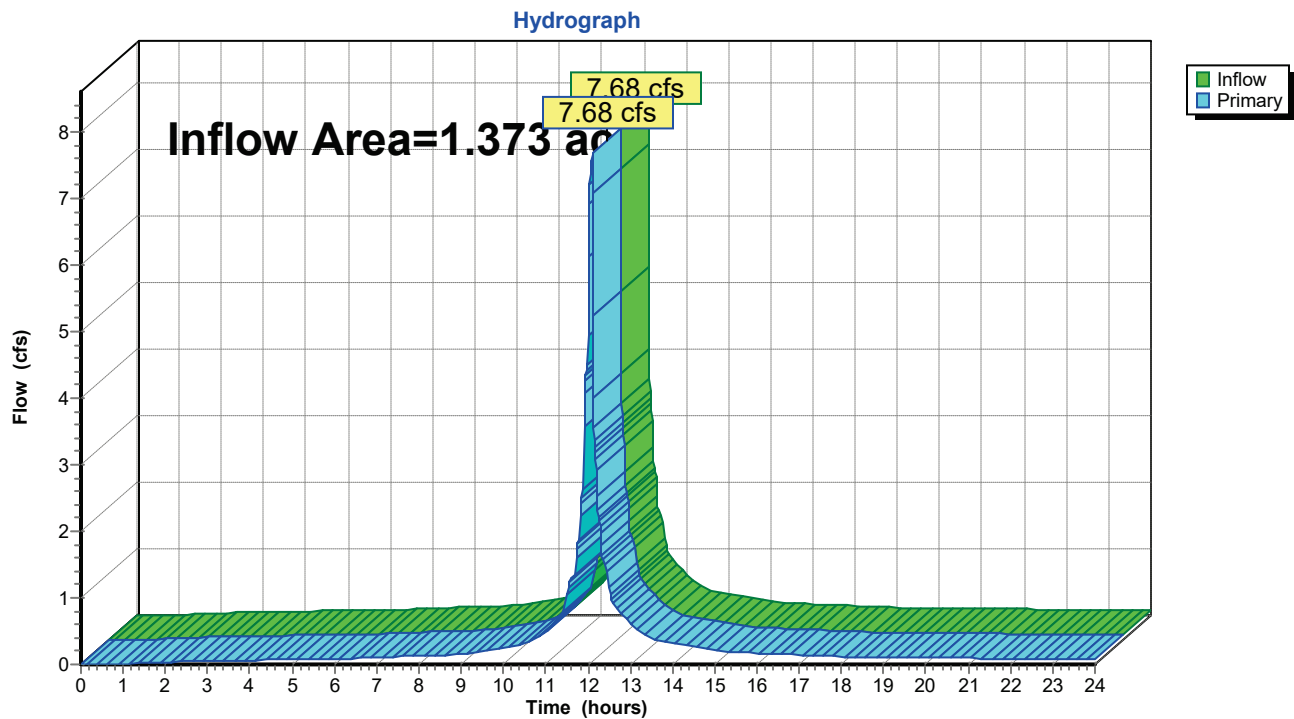
Page 22

Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 4.55" for 10-YEAR - ADJUSTED event
Inflow = 7.68 cfs @ 12.10 hrs, Volume= 0.521 af
Primary = 7.68 cfs @ 12.10 hrs, Volume= 0.521 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 10: TOTAL



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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Summary for Subcatchment 1: Impervious

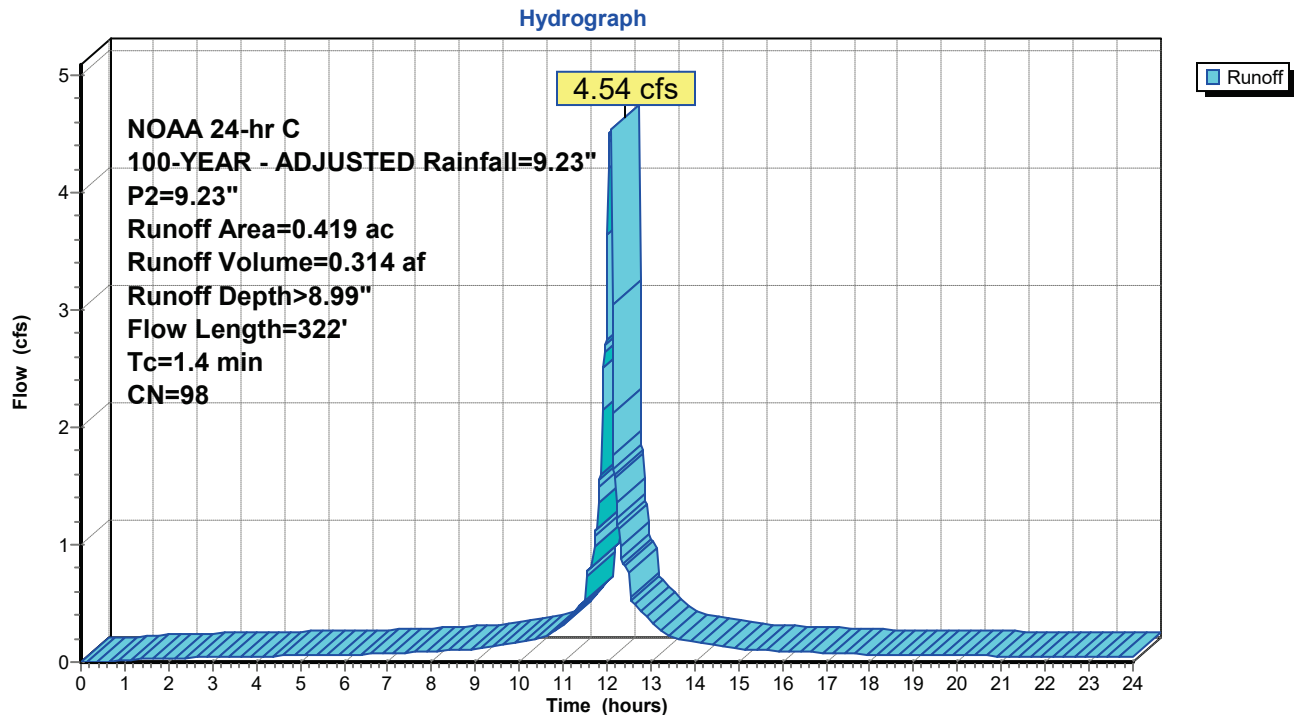
Runoff = 4.54 cfs @ 12.09 hrs, Volume= 0.314 af, Depth> 8.99"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	14	0.0400	2.08		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 9.23"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.4	322	Total			

Subcatchment 1: Impervious



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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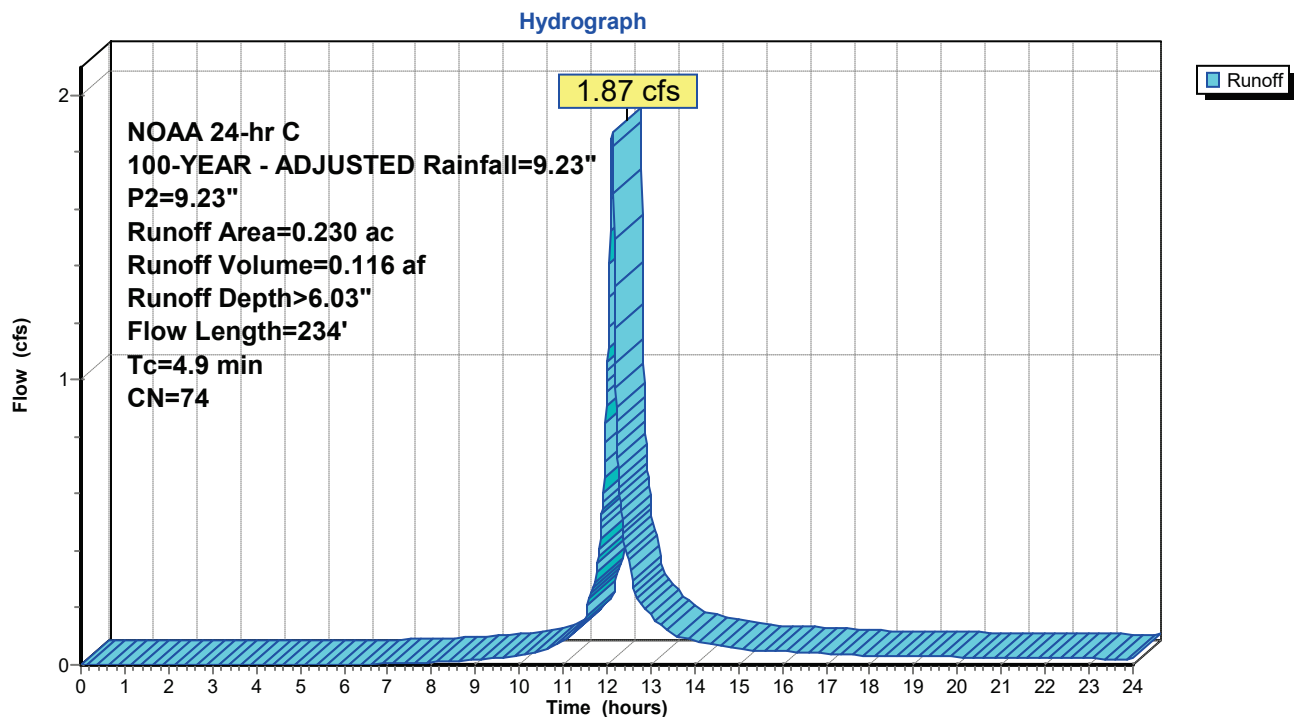
Summary for Subcatchment 2: Pervious

Runoff = 1.87 cfs @ 12.12 hrs, Volume= 0.116 af, Depth> 6.03"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	70	0.0600	0.29		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 9.23"
0.2	30	0.0390	2.40		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 9.23"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
4.9	234	Total			

Subcatchment 2: Pervious

Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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Summary for Subcatchment 4: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

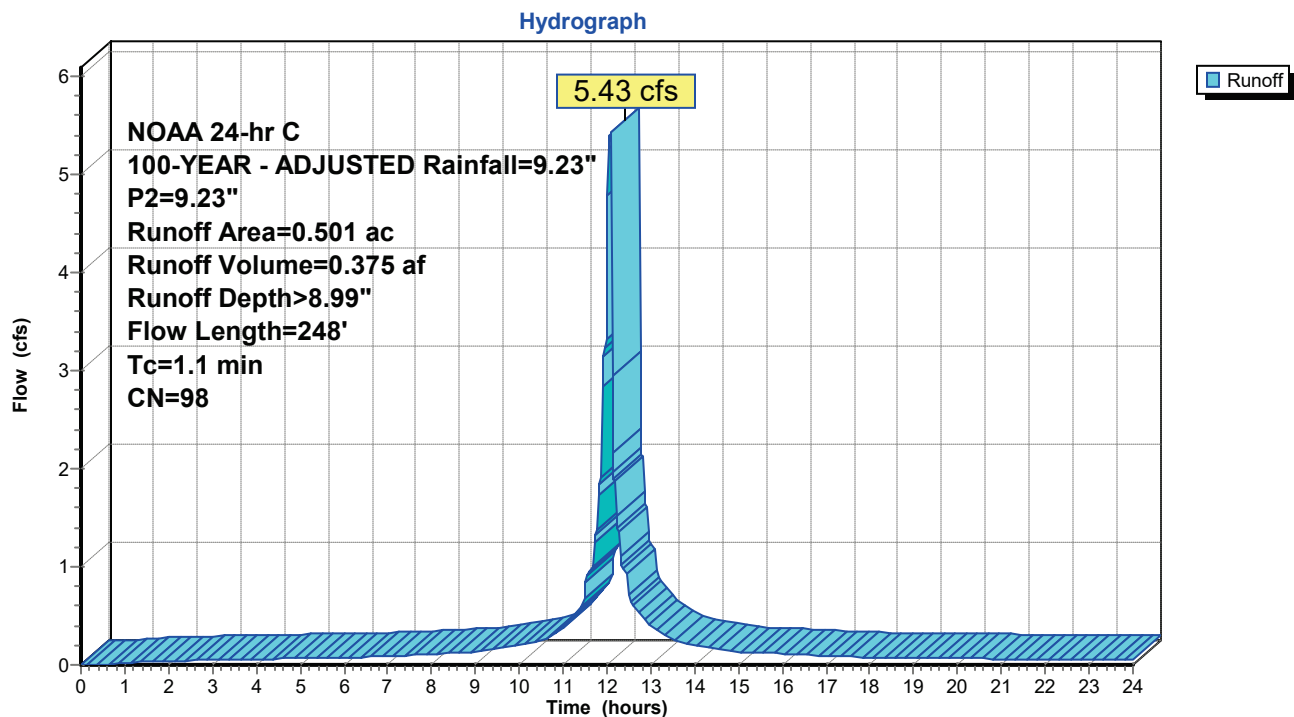
Runoff = 5.43 cfs @ 12.09 hrs, Volume= 0.375 af, Depth> 8.99"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.0440	3.20		Sheet Flow, A-B Smooth surfaces $n=0.011$ P2= 9.23"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D Paved $K_v=20.3$ fps
1.1	248	Total			

Subcatchment 4: Impervious



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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Summary for Subcatchment 5: Pervious

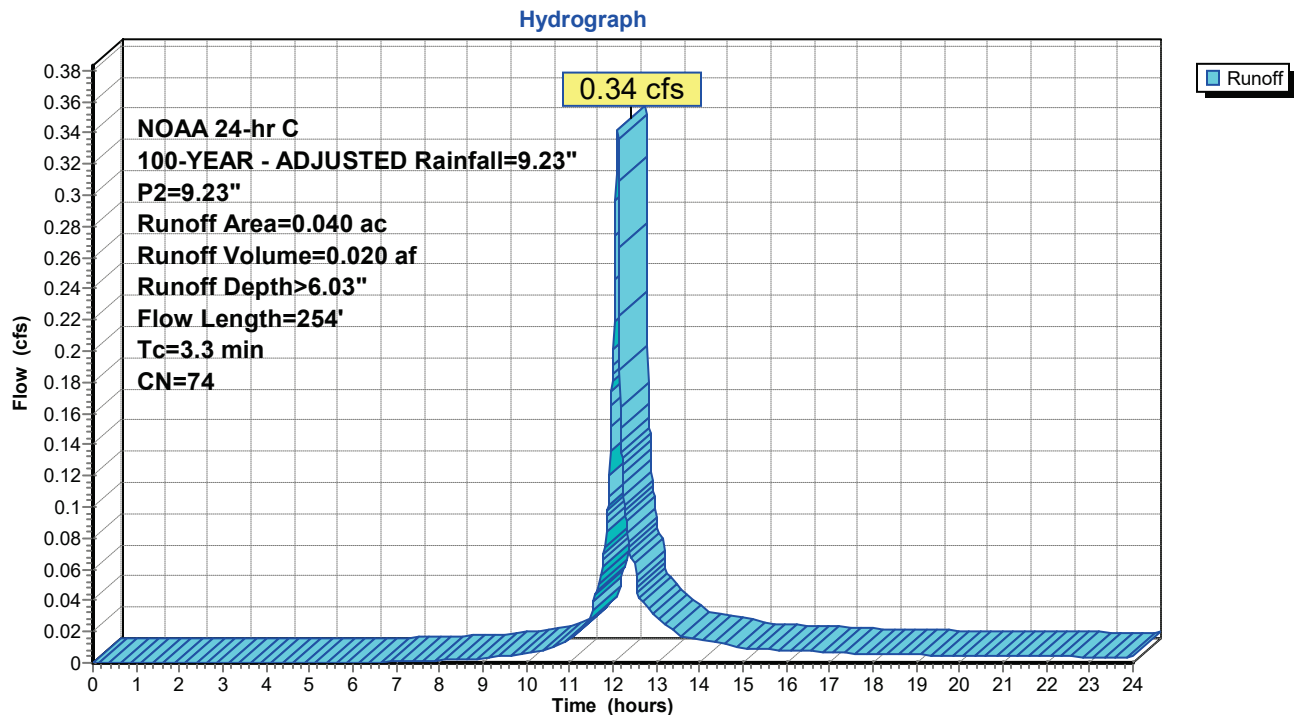
Runoff = 0.34 cfs @ 12.11 hrs, Volume= 0.020 af, Depth> 6.03"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	28	0.0400	0.20		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 9.23"
0.4	72	0.0460	3.05		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 9.23"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
3.3	254	Total			

Subcatchment 5: Pervious



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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Summary for Subcatchment 7: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

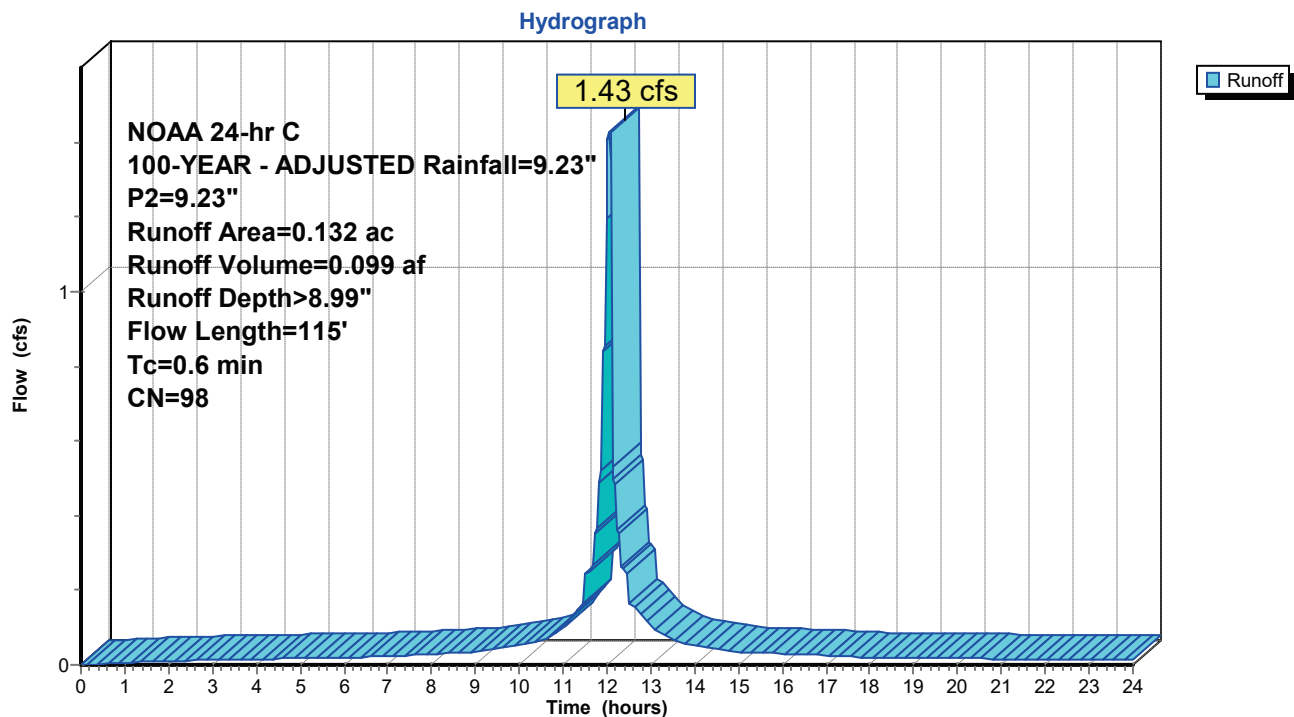
Runoff = 1.43 cfs @ 12.09 hrs, Volume= 0.099 af, Depth> 8.99"
Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	85	0.0350	2.83		Sheet Flow, B-C Smooth surfaces $n=0.011$ P2= 9.23"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved $K_v=20.3$ fps
0.6	115	Total			

Subcatchment 7: Impervious



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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Summary for Subcatchment 8: .054

Runoff = 0.45 cfs @ 12.10 hrs, Volume= 0.026 af, Depth> 6.04"
Routed to Link 9 : EX DA#3

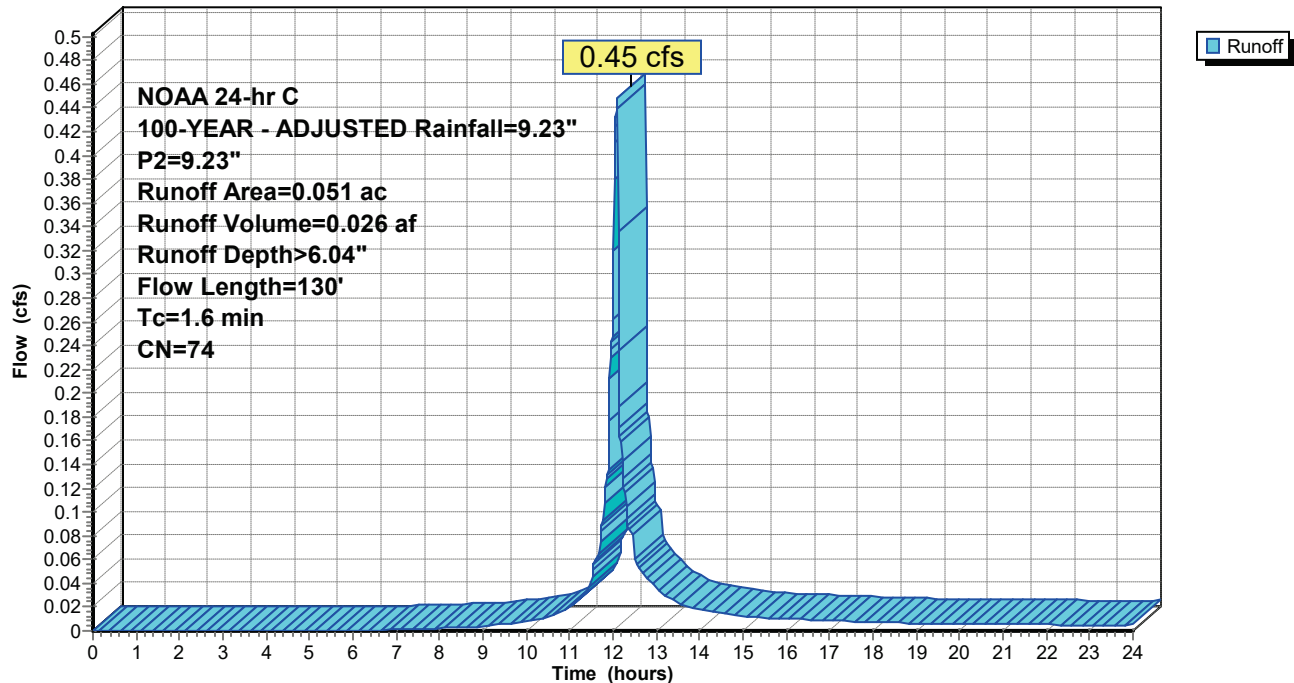
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	15	0.0850	0.24		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 9.23"
0.5	85	0.0300	2.66		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 9.23"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
1.6	130	Total			

Subcatchment 8: .054

Hydrograph



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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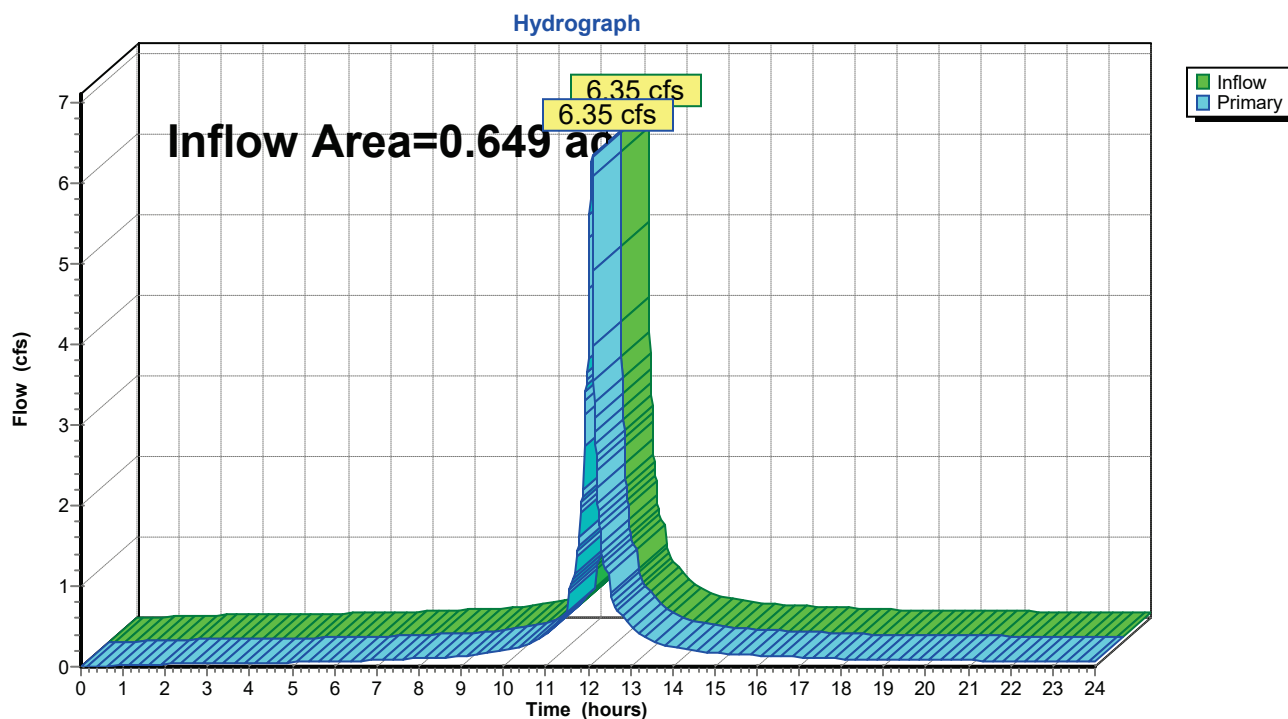
Page 29

Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 7.94" for 100-YEAR - ADJUSTED event
Inflow = 6.35 cfs @ 12.10 hrs, Volume= 0.429 af
Primary = 6.35 cfs @ 12.10 hrs, Volume= 0.429 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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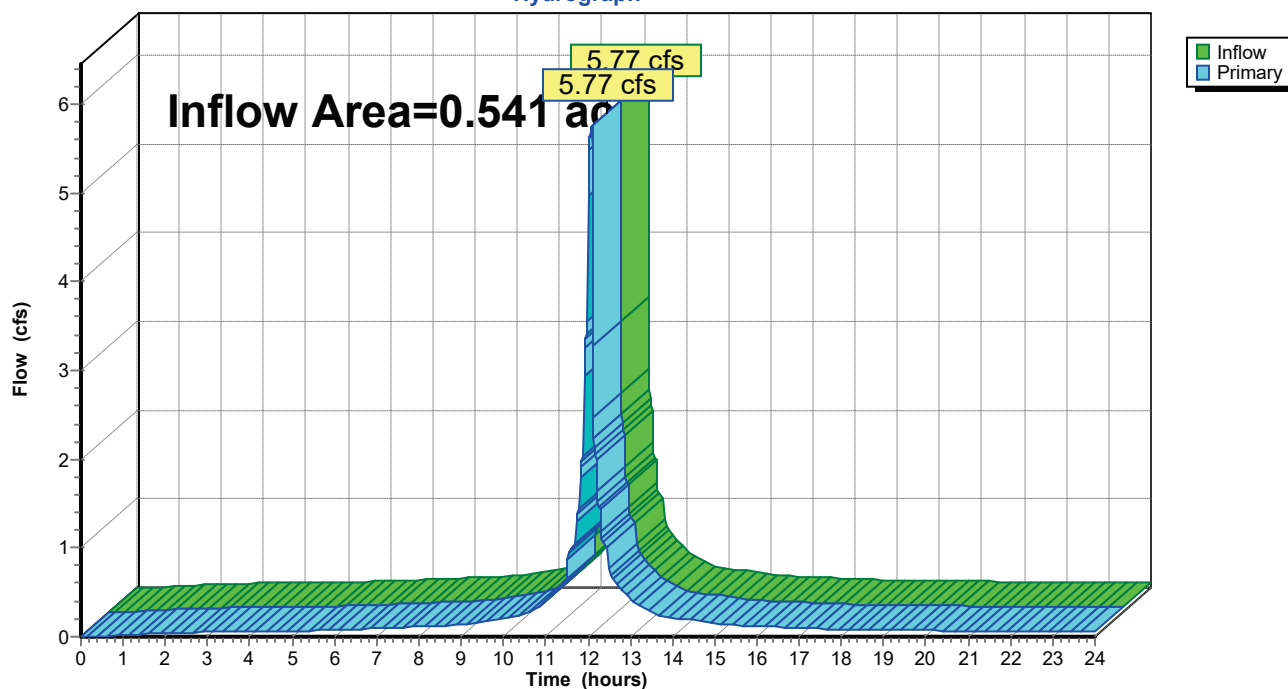
Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 8.77" for 100-YEAR - ADJUSTED event
Inflow = 5.77 cfs @ 12.10 hrs, Volume= 0.395 af
Primary = 5.77 cfs @ 12.10 hrs, Volume= 0.395 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2

Hydrograph



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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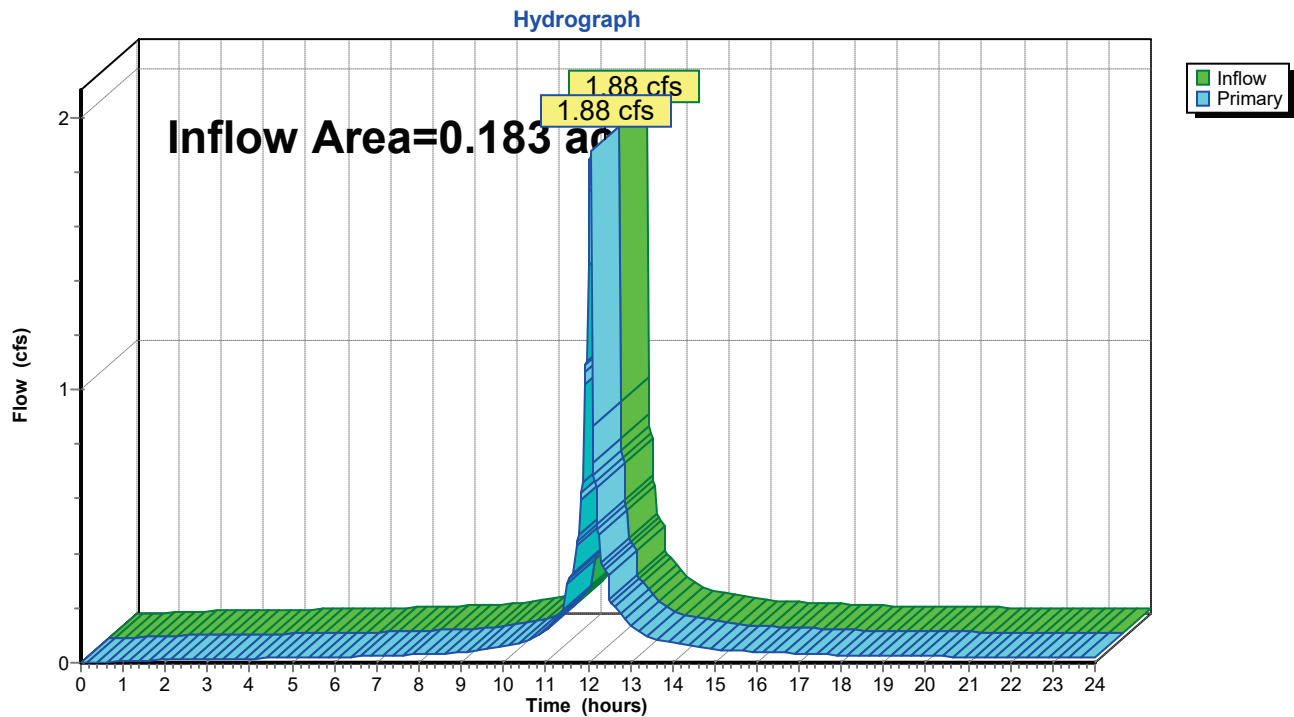
Page 31

Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 8.17" for 100-YEAR - ADJUSTED event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.125 af
Primary = 1.88 cfs @ 12.09 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3



Existing Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=9.23"

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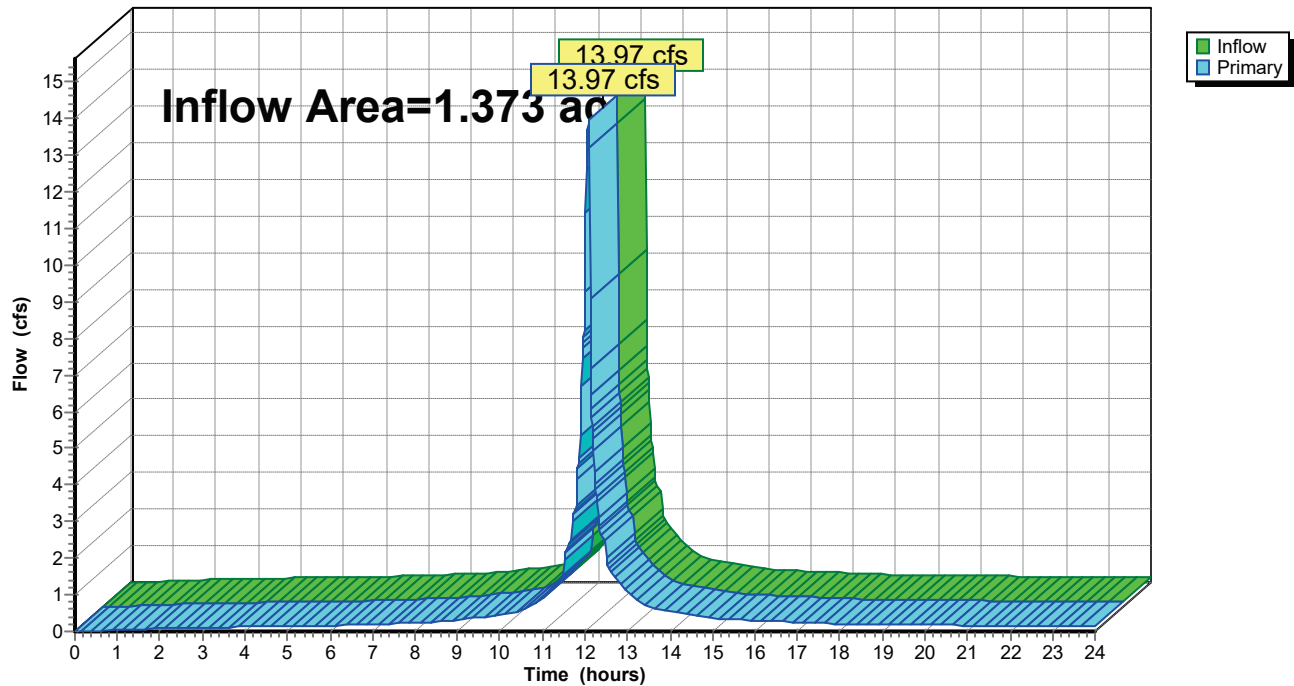
Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 8.30" for 100-YEAR - ADJUSTED event
Inflow = 13.97 cfs @ 12.10 hrs, Volume= 0.949 af
Primary = 13.97 cfs @ 12.10 hrs, Volume= 0.949 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

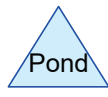
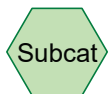
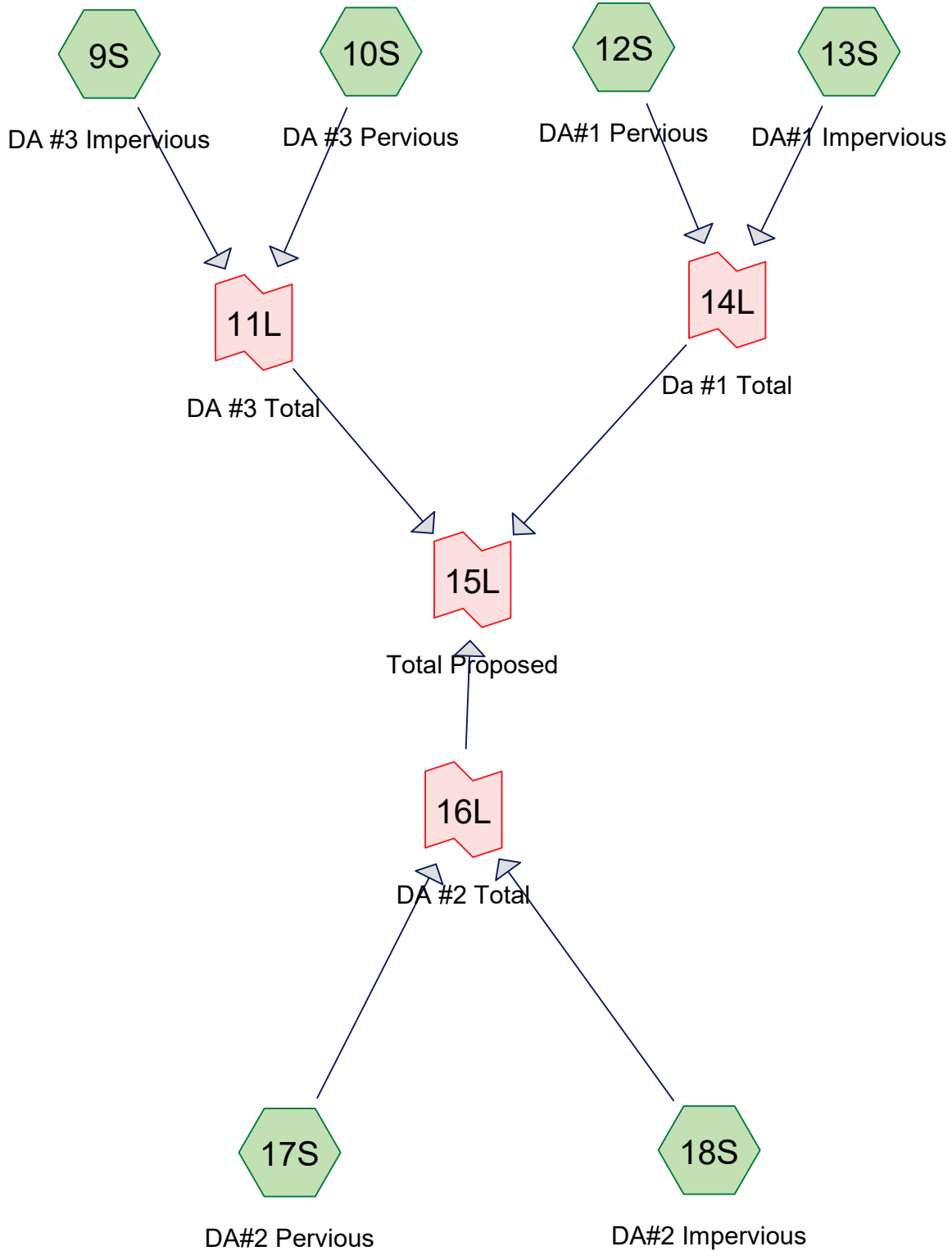
Link 10: TOTAL

Hydrograph



APPENDIX B

Post-Development Hydrographs Current Adjusted Precipitation Depths



Routing Diagram for Proposed Conditions

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Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 9S: DA #3 Impervious

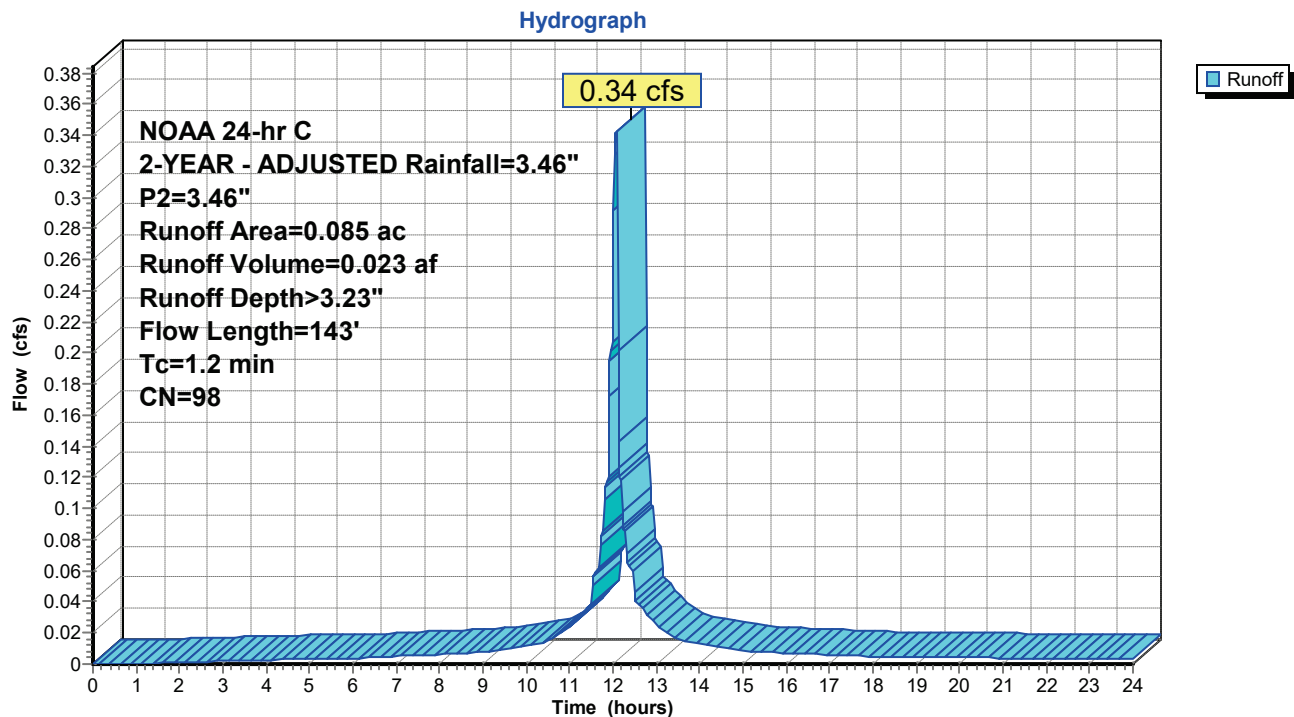
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.023 af, Depth> 3.23"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.085	98	Paved parking, HSG C
0.085		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	70	0.0500	1.92		Sheet Flow, Parking Segment 1
					Smooth surfaces n= 0.011 P2= 3.46"
0.6	73	0.0100	2.03		Shallow Concentrated Flow, Parking Segment 2
					Paved Kv= 20.3 fps
1.2	143	Total			

Subcatchment 9S: DA #3 Impervious



Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 10S: DA #3 Pervious

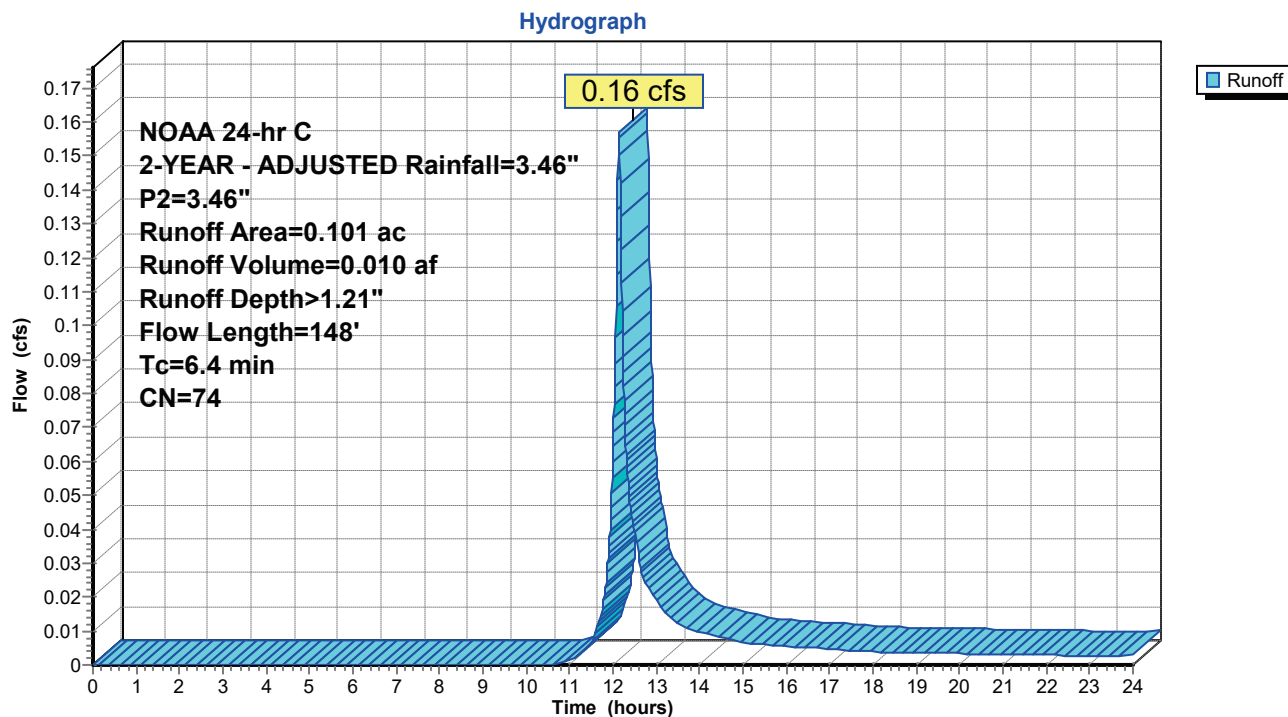
Runoff = 0.16 cfs @ 12.14 hrs, Volume= 0.010 af, Depth> 1.21"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.101	74	>75% Grass cover, Good, HSG C
0.101		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	28	0.0140	0.08		Sheet Flow, Lawn area Grass: Dense n= 0.240 P2= 3.46"
0.2	43	0.0500	4.54		Shallow Concentrated Flow, Parking Lot 1 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
0.2	21	0.0100	2.03		Shallow Concentrated Flow, Parking Third Segment Paved Kv= 20.3 fps
6.4	148	Total			

Subcatchment 10S: DA #3 Pervious



Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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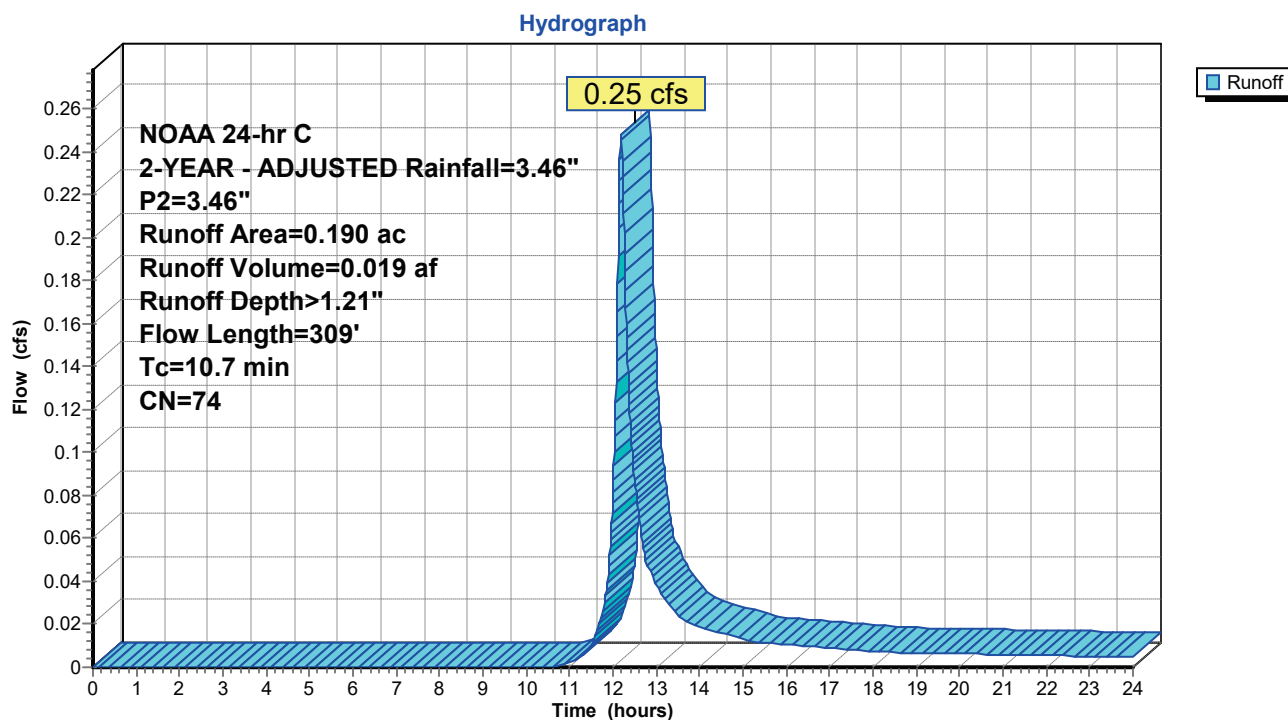
Summary for Subcatchment 12S: DA#1 Pervious

Runoff = 0.25 cfs @ 12.19 hrs, Volume= 0.019 af, Depth> 1.21"
Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.190	74	>75% Grass cover, Good, HSG C
0.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	64	0.0500	0.16		Sheet Flow, Segment 1 Grass: Dense n= 0.240 P2= 3.46"
3.1	25	0.0500	0.13		Sheet Flow, Segment 2 Grass: Dense n= 0.240 P2= 3.46"
0.3	93	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.2	22	0.0100	2.03		Shallow Concentrated Flow, Segment 4 Paved Kv= 20.3 fps
0.4	105	0.0100	4.91	3.86	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
10.7	309	Total			

Subcatchment 12S: DA#1 Pervious

Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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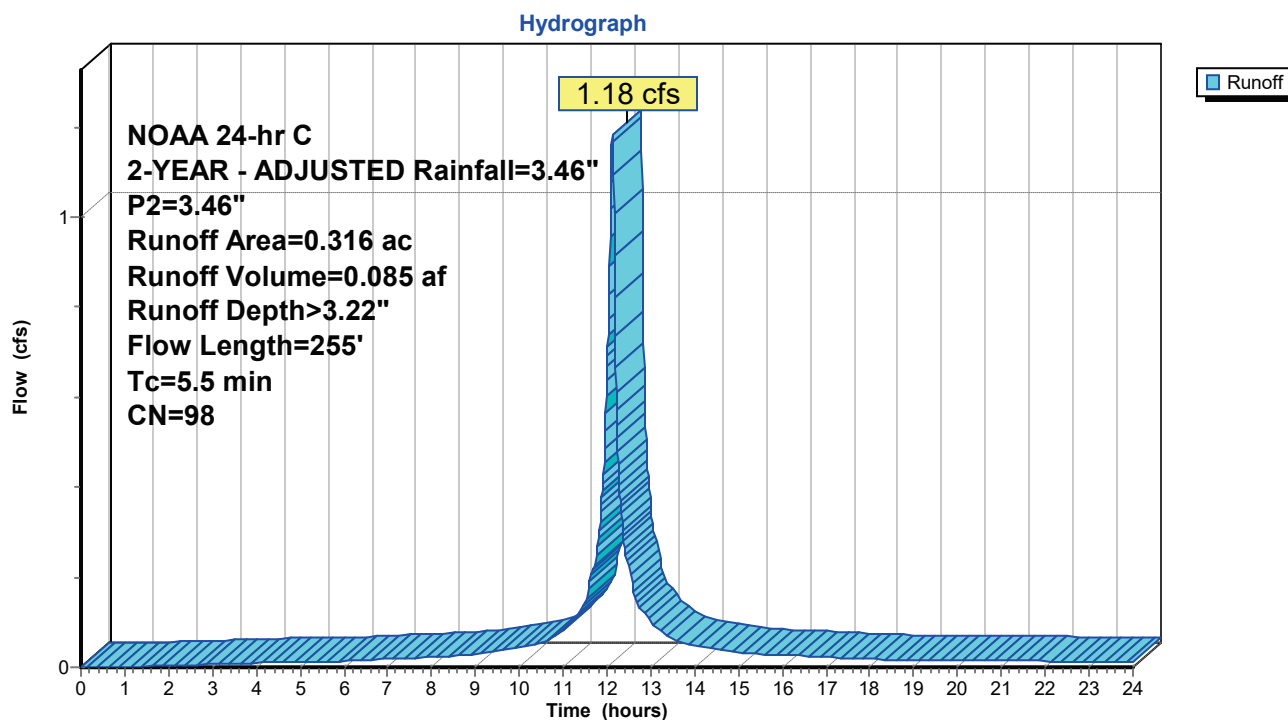
Summary for Subcatchment 13S: DA#1 Impervious

Runoff = 1.18 cfs @ 12.12 hrs, Volume= 0.085 af, Depth> 3.22"
Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.316	98	Paved parking, HSG C
0.316		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	28	0.0300	0.11		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.46"
0.4	44	0.0500	1.75		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.46"
0.2	60	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.5	61	0.0100	2.03		Shallow Concentrated Flow, Segment #4 Paved Kv= 20.3 fps
0.2	62	0.0100	4.91	3.86	Pipe Channel, Segment 5 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.5	255	Total			

Subcatchment 13S: DA#1 Impervious

Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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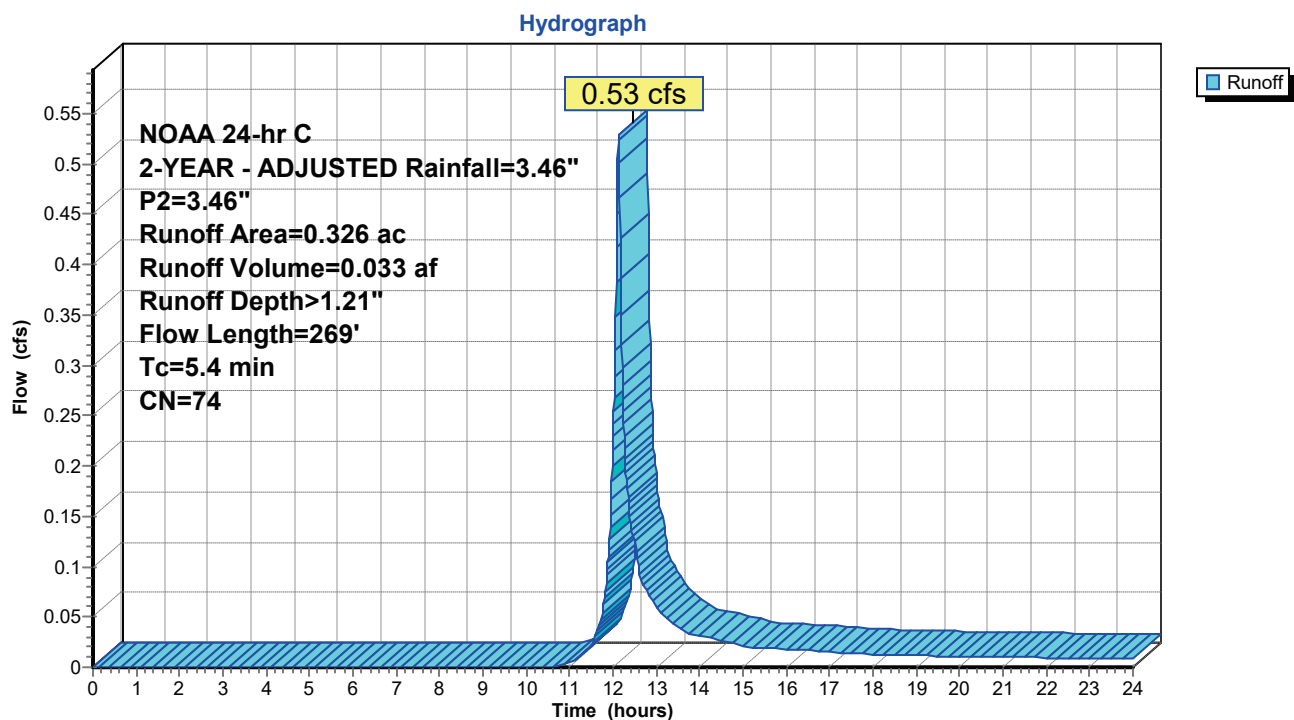
Summary for Subcatchment 17S: DA#2 Pervious

Runoff = 0.53 cfs @ 12.13 hrs, Volume= 0.033 af, Depth> 1.21"
Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.326	74	>75% Grass cover, Good, HSG C
0.326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	30	0.0400	0.13		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.46"
0.3	30	0.0500	1.62		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.46"
0.5	123	0.0500	4.54		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.5	56	0.0100	2.03		Shallow Concentrated Flow, Segment #5 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #6 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.4	269	Total			

Subcatchment 17S: DA#2 Pervious

Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 18S: DA#2 Impervious

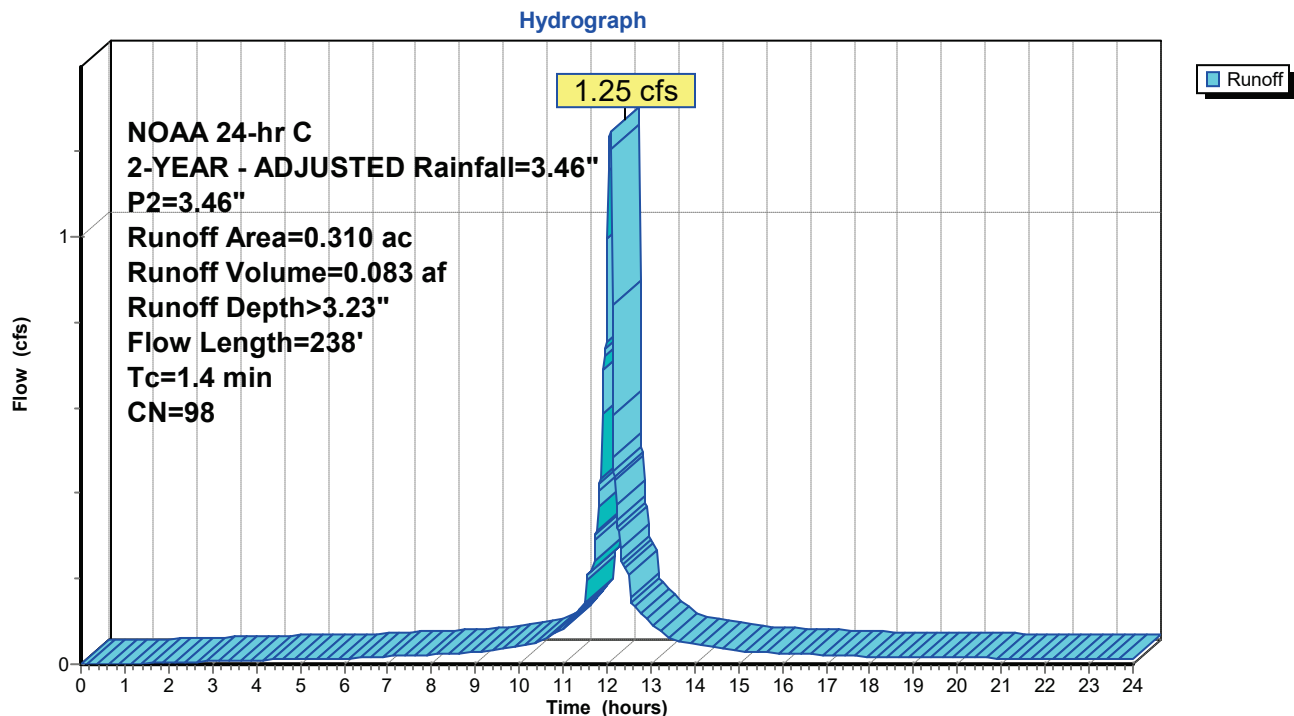
Runoff = 1.25 cfs @ 12.09 hrs, Volume= 0.083 af, Depth> 3.23"
Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG C
0.310		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	80	0.0500	1.97		Sheet Flow, Segment #1 Smooth surfaces n= 0.011 P2= 3.46"
0.3	72	0.0500	4.54		Shallow Concentrated Flow, Segment #2 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #4 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.4	238	Total			

Subcatchment 18S: DA#2 Impervious



Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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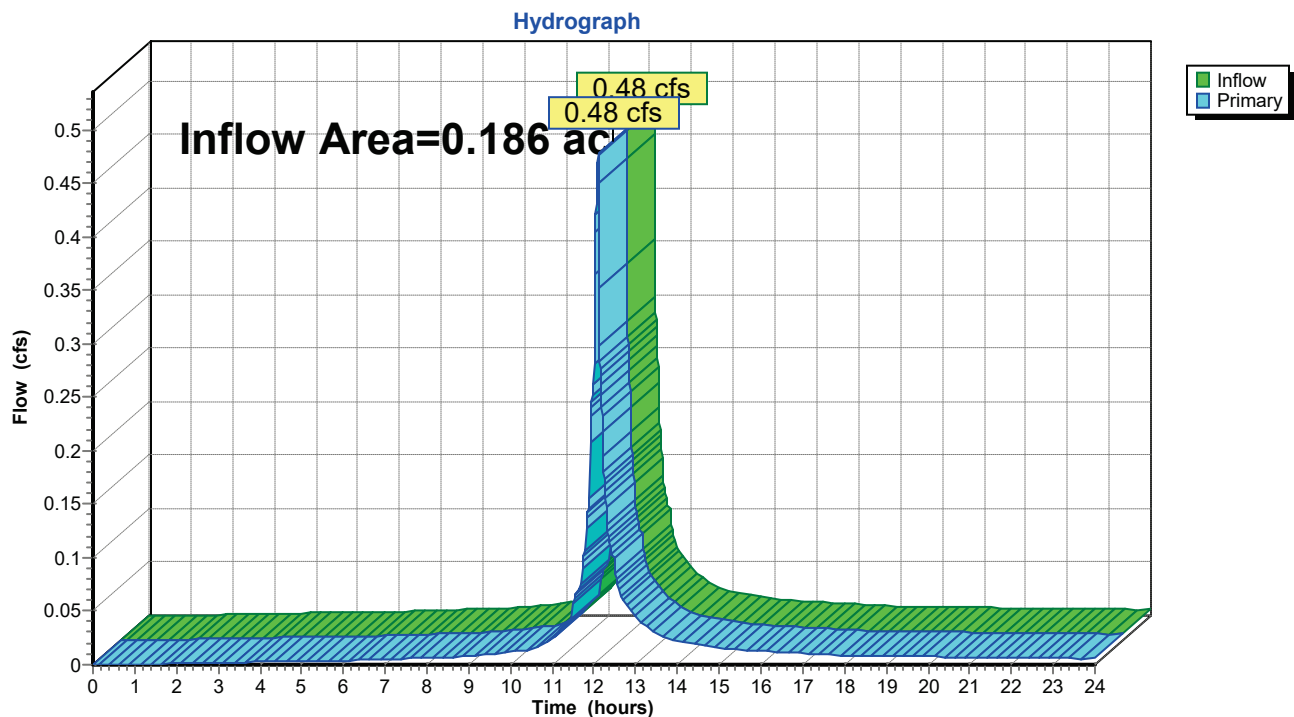
Page 8

Summary for Link 11L: DA #3 Total

Inflow Area = 0.186 ac, 45.70% Impervious, Inflow Depth > 2.13" for 2-YEAR - ADJUSTED event
Inflow = 0.48 cfs @ 12.10 hrs, Volume= 0.033 af
Primary = 0.48 cfs @ 12.10 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 11L: DA #3 Total



Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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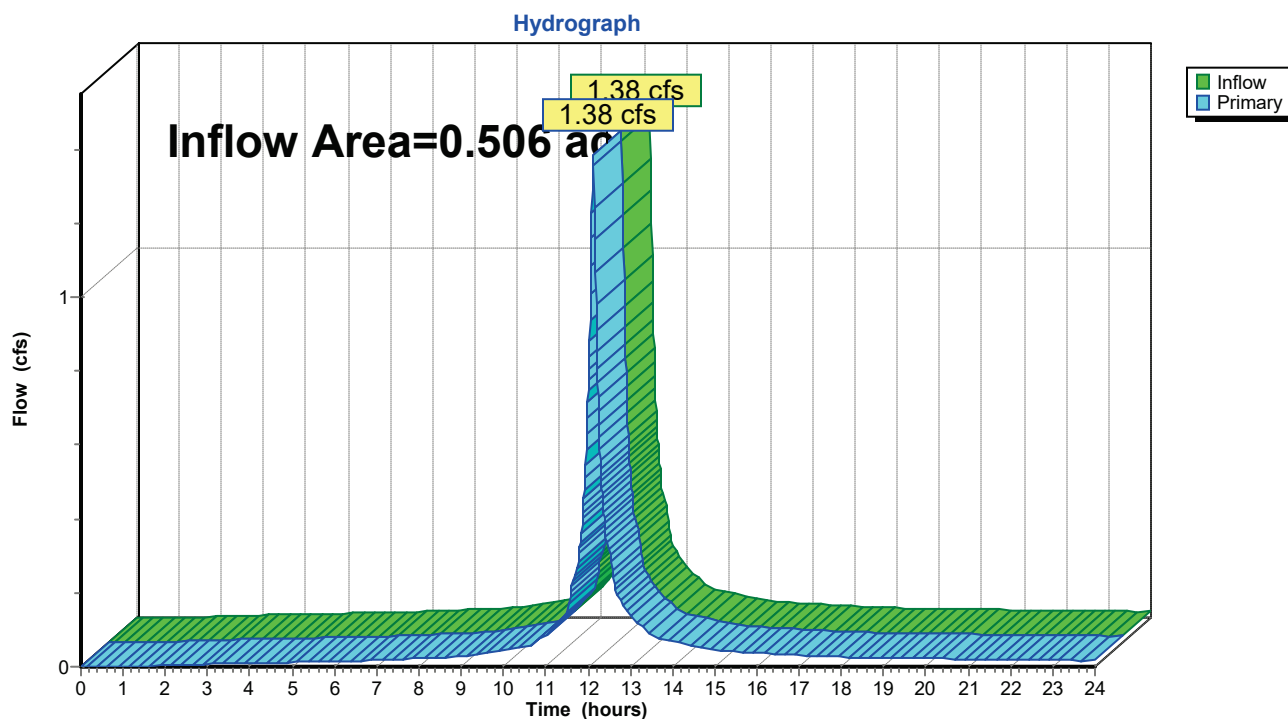
Page 9

Summary for Link 14L: Da #1 Total

Inflow Area = 0.506 ac, 62.45% Impervious, Inflow Depth > 2.47" for 2-YEAR - ADJUSTED event
Inflow = 1.38 cfs @ 12.13 hrs, Volume= 0.104 af
Primary = 1.38 cfs @ 12.13 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: Da #1 Total



Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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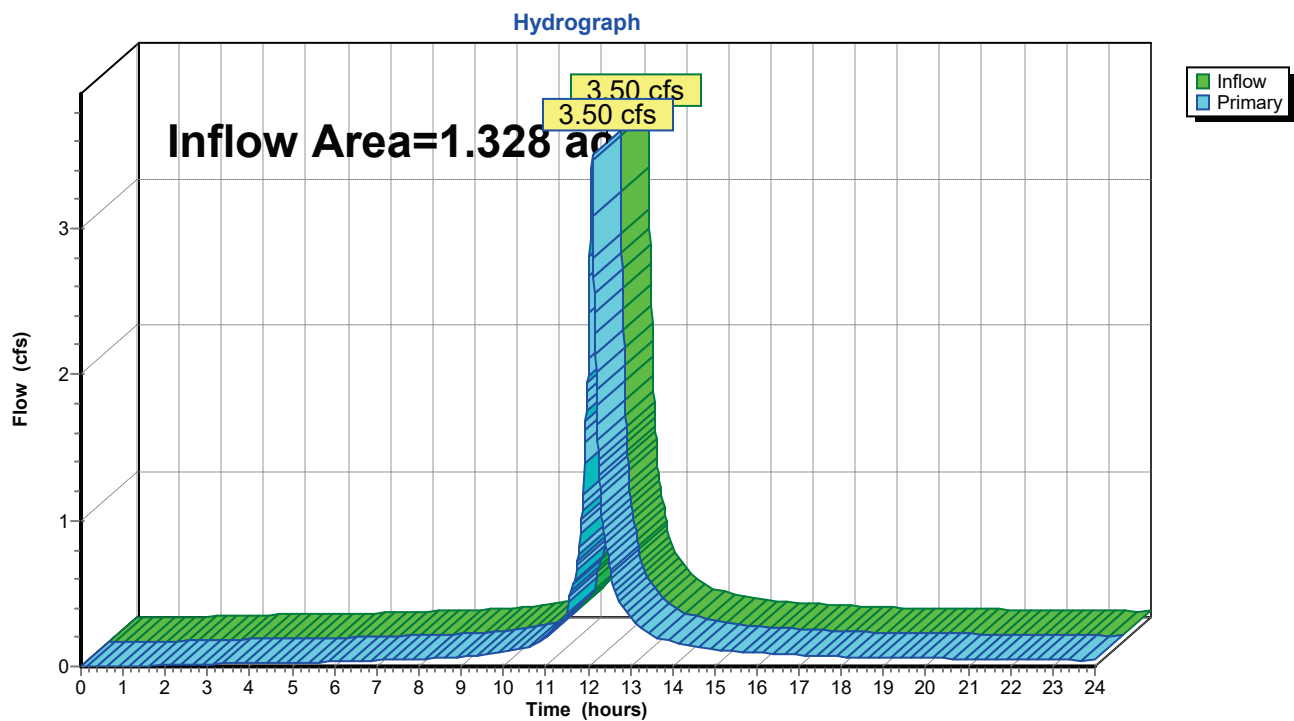
Page 10

Summary for Link 15L: Total Proposed

Inflow Area = 1.328 ac, 53.54% Impervious, Inflow Depth > 2.29" for 2-YEAR - ADJUSTED event
Inflow = 3.50 cfs @ 12.10 hrs, Volume= 0.253 af
Primary = 3.50 cfs @ 12.10 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 15L: Total Proposed



Proposed Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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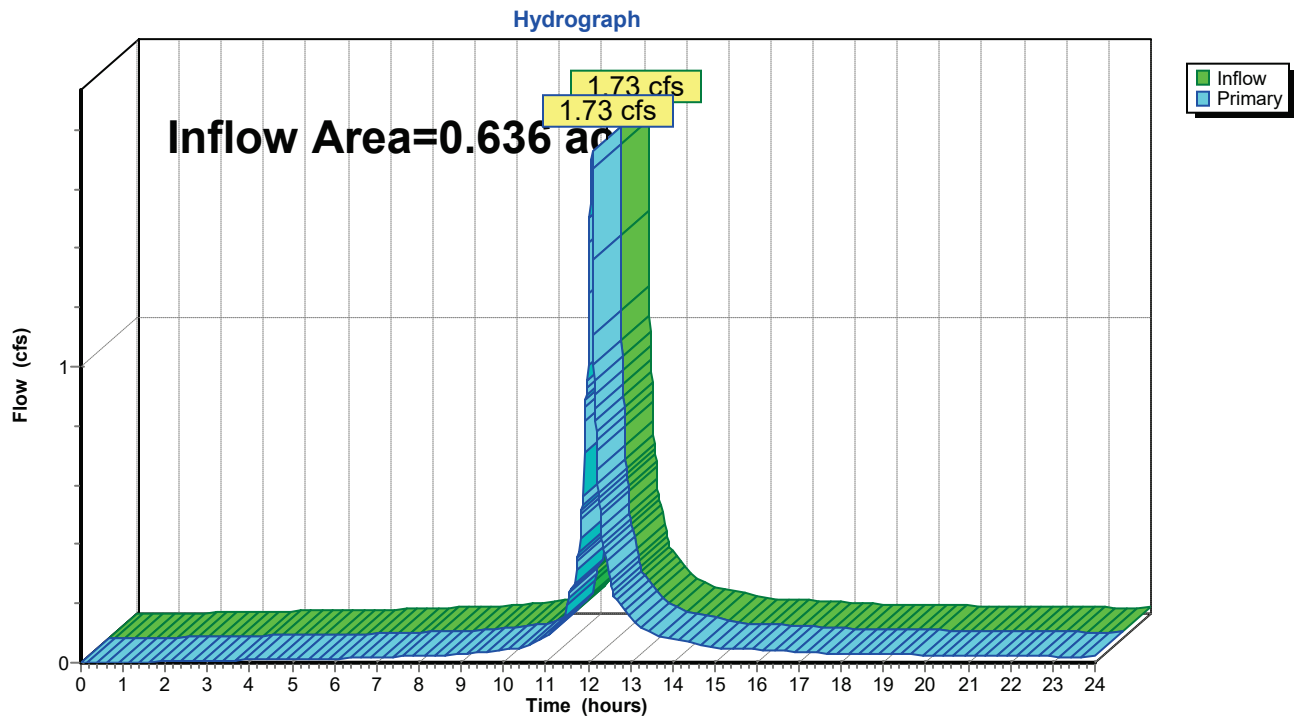
Page 11

Summary for Link 16L: DA #2 Total

Inflow Area = 0.636 ac, 48.74% Impervious, Inflow Depth > 2.19" for 2-YEAR - ADJUSTED event
Inflow = 1.73 cfs @ 12.10 hrs, Volume= 0.116 af
Primary = 1.73 cfs @ 12.10 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 16L: DA #2 Total



Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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Summary for Subcatchment 9S: DA #3 Impervious

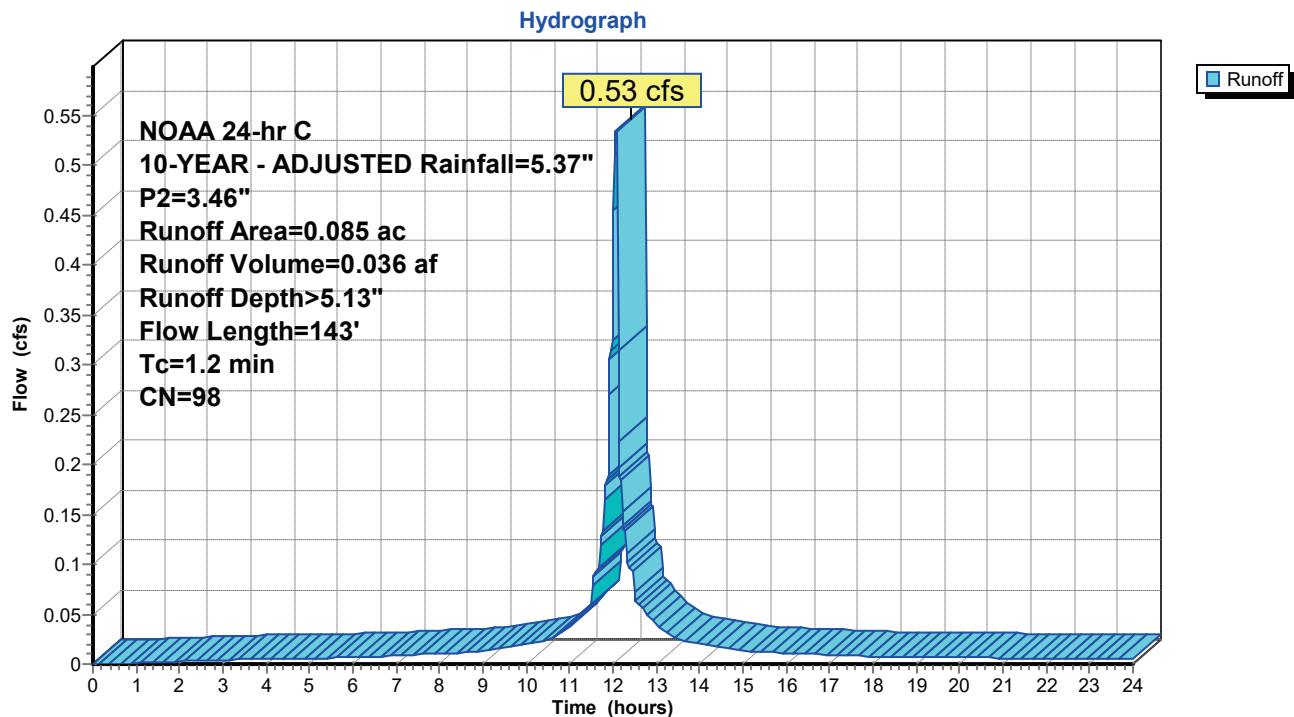
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.036 af, Depth> 5.13"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

Area (ac)	CN	Description
0.085	98	Paved parking, HSG C
0.085		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	70	0.0500	1.92		Sheet Flow, Parking Segment 1
					Smooth surfaces n= 0.011 P2= 3.46"
0.6	73	0.0100	2.03		Shallow Concentrated Flow, Parking Segment 2
					Paved Kv= 20.3 fps
1.2	143	Total			

Subcatchment 9S: DA #3 Impervious



Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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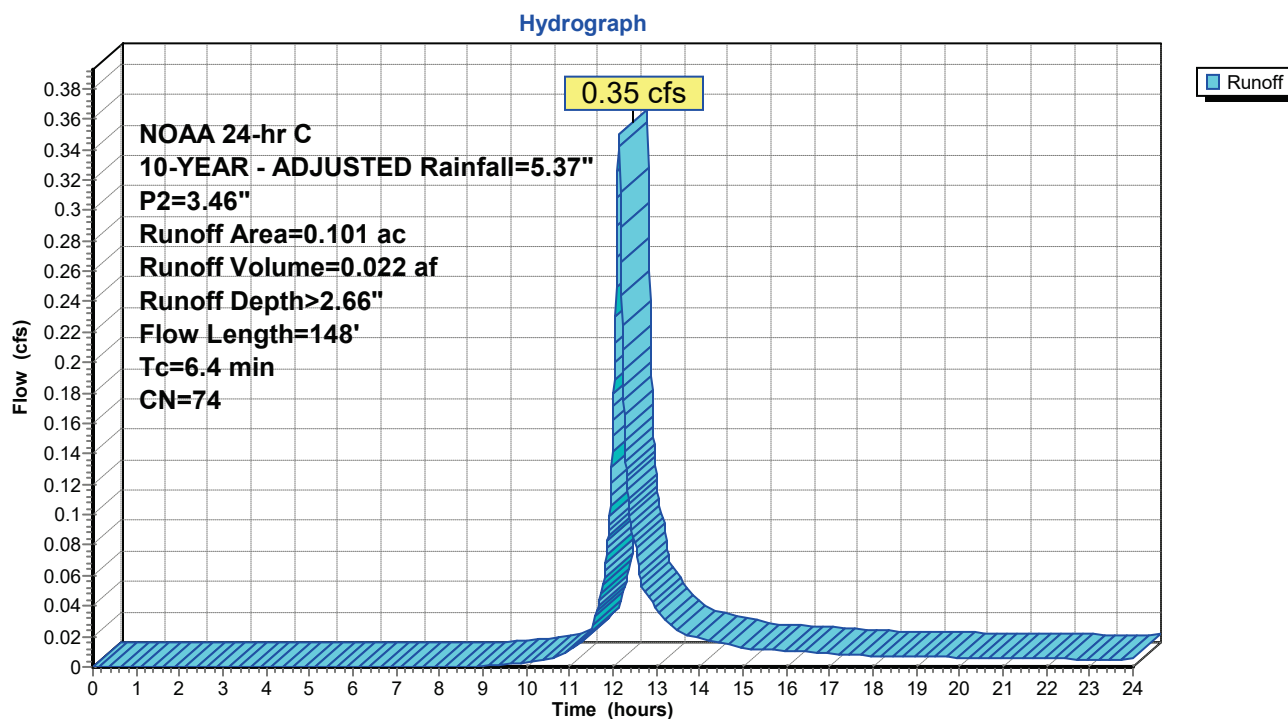
Summary for Subcatchment 10S: DA #3 Pervious

Runoff = 0.35 cfs @ 12.14 hrs, Volume= 0.022 af, Depth> 2.66"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

Area (ac)	CN	Description
0.101	74	>75% Grass cover, Good, HSG C
0.101		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	28	0.0140	0.08		Sheet Flow, Lawn area Grass: Dense n= 0.240 P2= 3.46"
0.2	43	0.0500	4.54		Shallow Concentrated Flow, Parking Lot 1 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
0.2	21	0.0100	2.03		Shallow Concentrated Flow, Parking Third Segment Paved Kv= 20.3 fps
6.4	148	Total			

Subcatchment 10S: DA #3 Pervious

Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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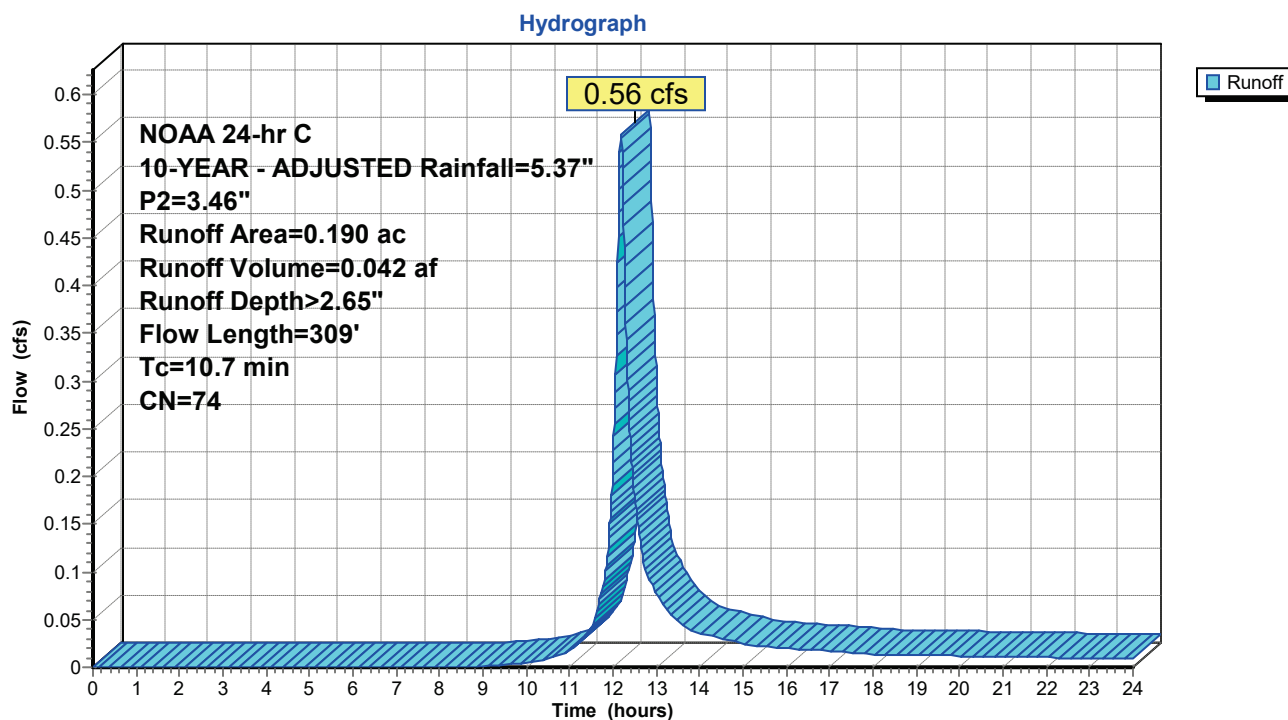
Summary for Subcatchment 12S: DA#1 Pervious

Runoff = 0.56 cfs @ 12.18 hrs, Volume= 0.042 af, Depth> 2.65"
Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

Area (ac)	CN	Description
0.190	74	>75% Grass cover, Good, HSG C
0.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	64	0.0500	0.16		Sheet Flow, Segment 1 Grass: Dense n= 0.240 P2= 3.46"
3.1	25	0.0500	0.13		Sheet Flow, Segment 2 Grass: Dense n= 0.240 P2= 3.46"
0.3	93	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.2	22	0.0100	2.03		Shallow Concentrated Flow, Segment 4 Paved Kv= 20.3 fps
0.4	105	0.0100	4.91	3.86	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
10.7	309	Total			

Subcatchment 12S: DA#1 Pervious

Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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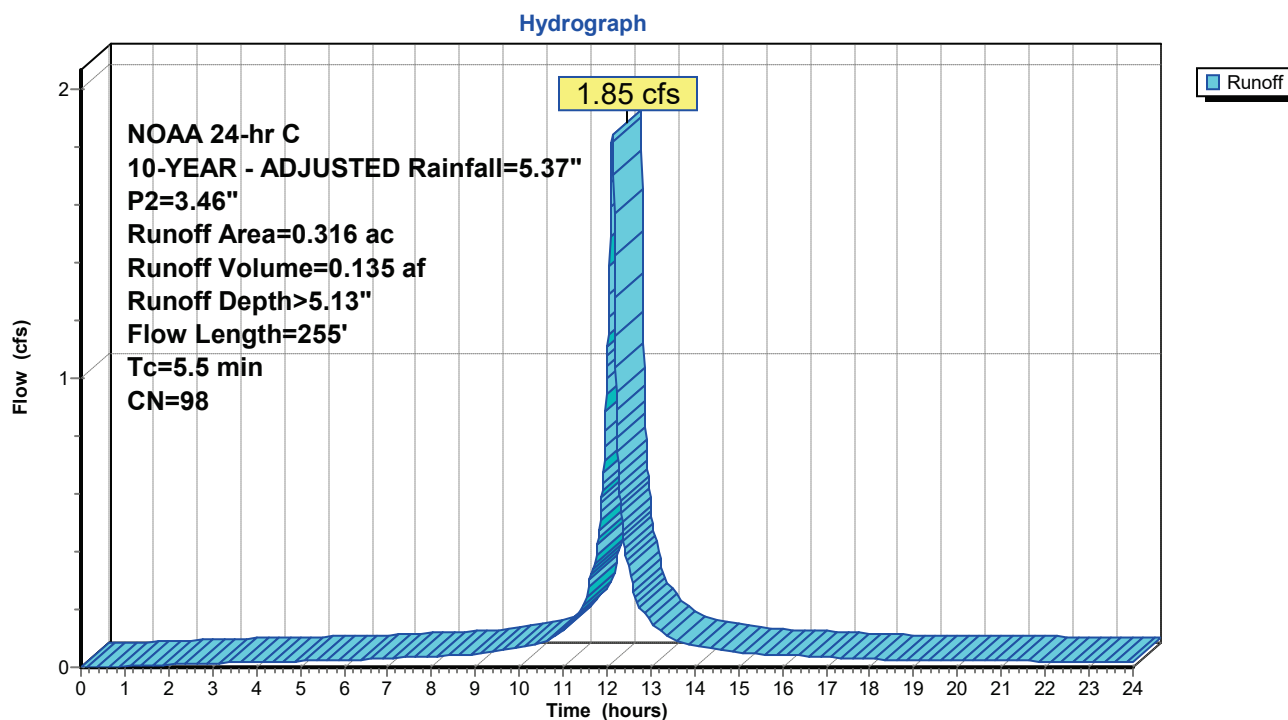
Summary for Subcatchment 13S: DA#1 Impervious

Runoff = 1.85 cfs @ 12.12 hrs, Volume= 0.135 af, Depth> 5.13"
Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

Area (ac)	CN	Description
0.316	98	Paved parking, HSG C
0.316		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	28	0.0300	0.11		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.46"
0.4	44	0.0500	1.75		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.46"
0.2	60	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.5	61	0.0100	2.03		Shallow Concentrated Flow, Segment #4 Paved Kv= 20.3 fps
0.2	62	0.0100	4.91	3.86	Pipe Channel, Segment 5 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.5	255	Total			

Subcatchment 13S: DA#1 Impervious

Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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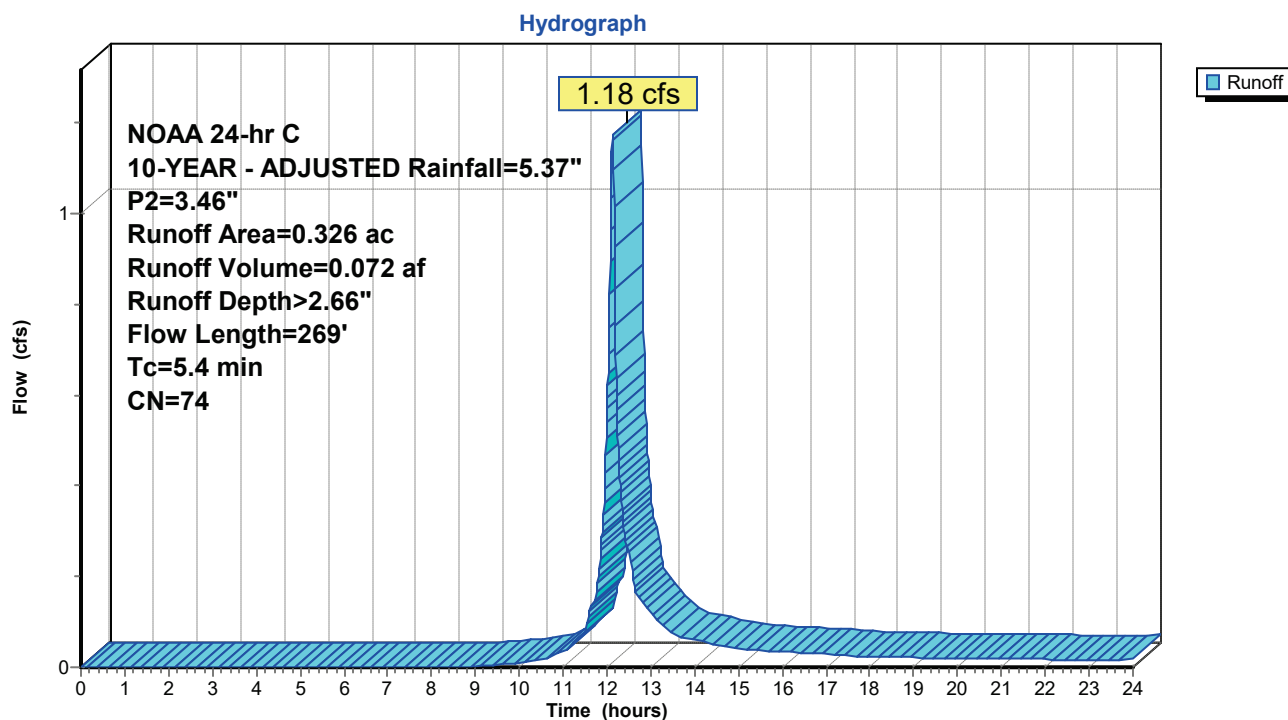
Summary for Subcatchment 17S: DA#2 Pervious

Runoff = 1.18 cfs @ 12.13 hrs, Volume= 0.072 af, Depth> 2.66"
 Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

Area (ac)	CN	Description
0.326	74	>75% Grass cover, Good, HSG C
0.326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	30	0.0400	0.13		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.46"
0.3	30	0.0500	1.62		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.46"
0.5	123	0.0500	4.54		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.5	56	0.0100	2.03		Shallow Concentrated Flow, Segment #5 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #6 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.4	269	Total			

Subcatchment 17S: DA#2 Pervious

Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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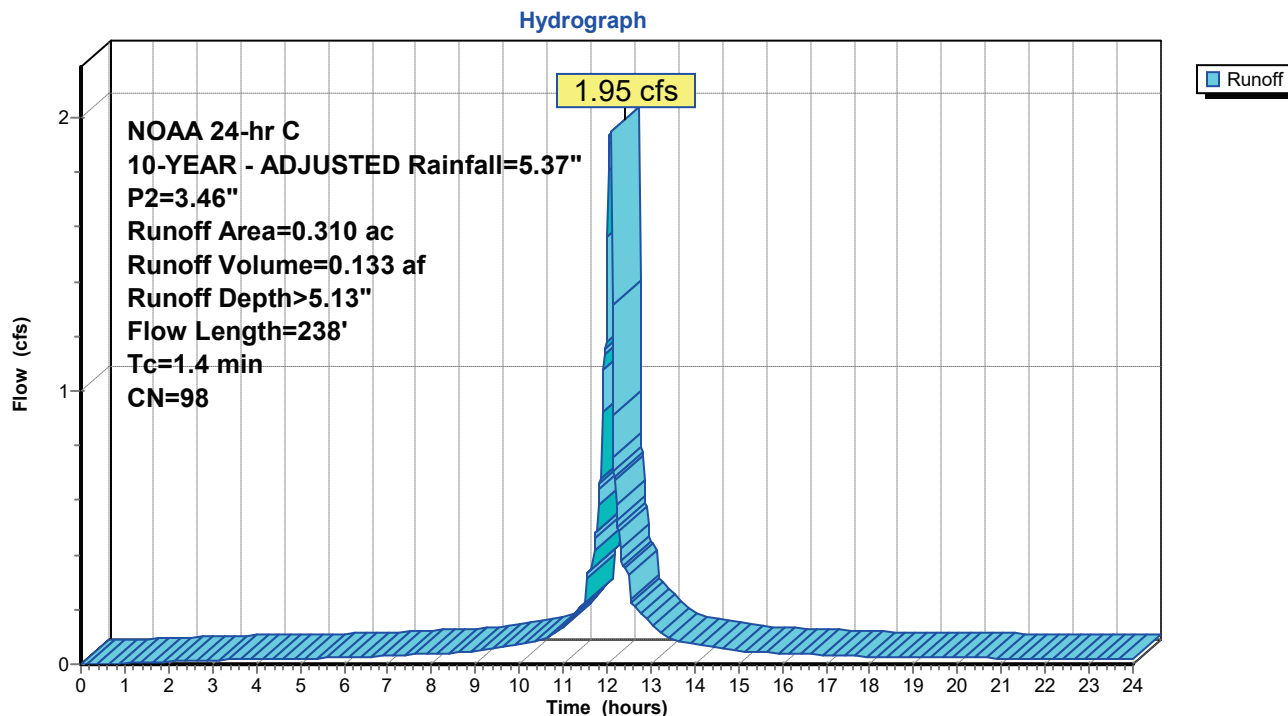
Summary for Subcatchment 18S: DA#2 Impervious

Runoff = 1.95 cfs @ 12.09 hrs, Volume= 0.133 af, Depth> 5.13"
Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG C
0.310		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	80	0.0500	1.97		Sheet Flow, Segment #1 Smooth surfaces n= 0.011 P2= 3.46"
0.3	72	0.0500	4.54		Shallow Concentrated Flow, Segment #2 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #4 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.4	238	Total			

Subcatchment 18S: DA#2 Impervious

Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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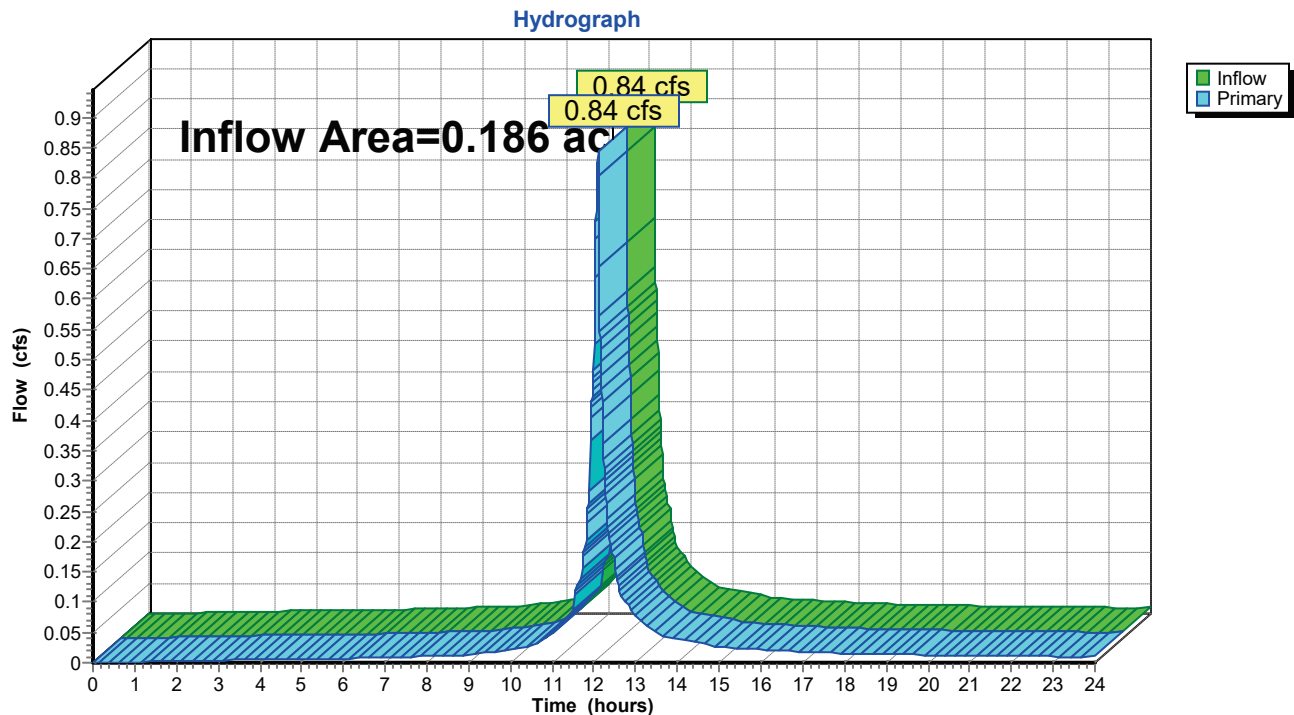
Page 18

Summary for Link 11L: DA #3 Total

Inflow Area = 0.186 ac, 45.70% Impervious, Inflow Depth > 3.79" for 10-YEAR - ADJUSTED event
Inflow = 0.84 cfs @ 12.10 hrs, Volume= 0.059 af
Primary = 0.84 cfs @ 12.10 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 11L: DA #3 Total



Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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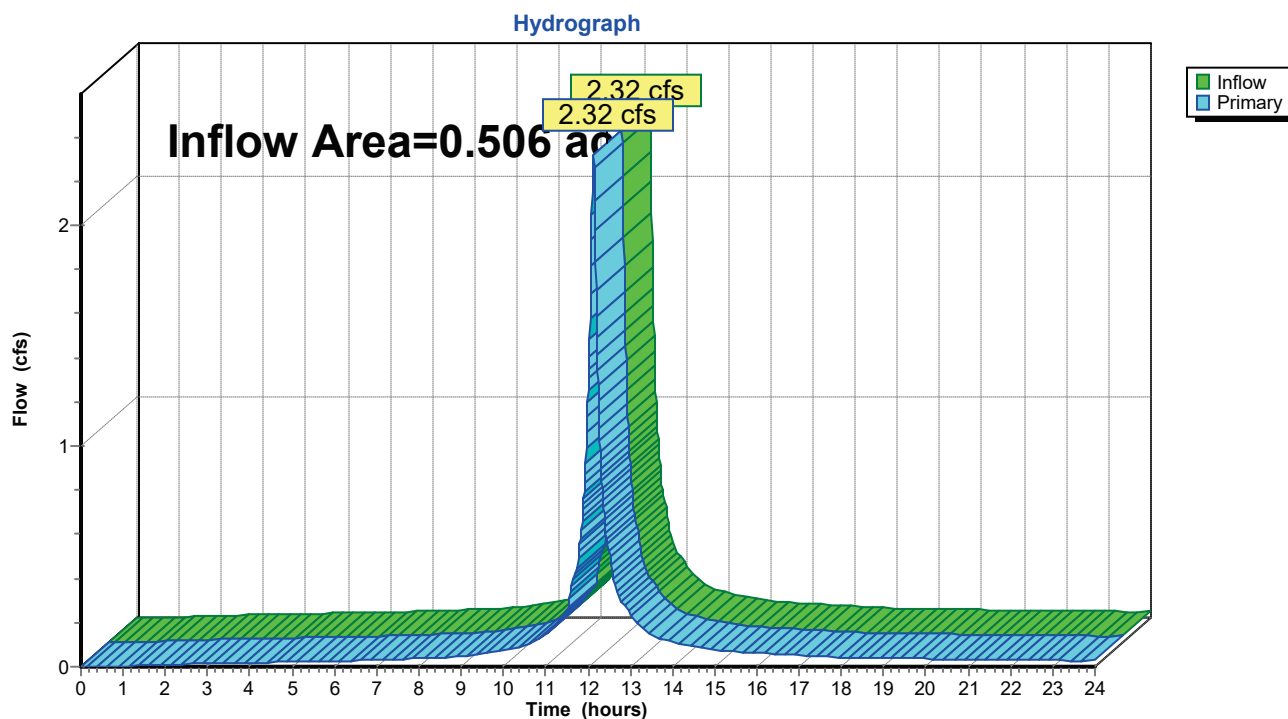
Page 19

Summary for Link 14L: Da #1 Total

Inflow Area = 0.506 ac, 62.45% Impervious, Inflow Depth > 4.20" for 10-YEAR - ADJUSTED event
Inflow = 2.32 cfs @ 12.13 hrs, Volume= 0.177 af
Primary = 2.32 cfs @ 12.13 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: Da #1 Total



Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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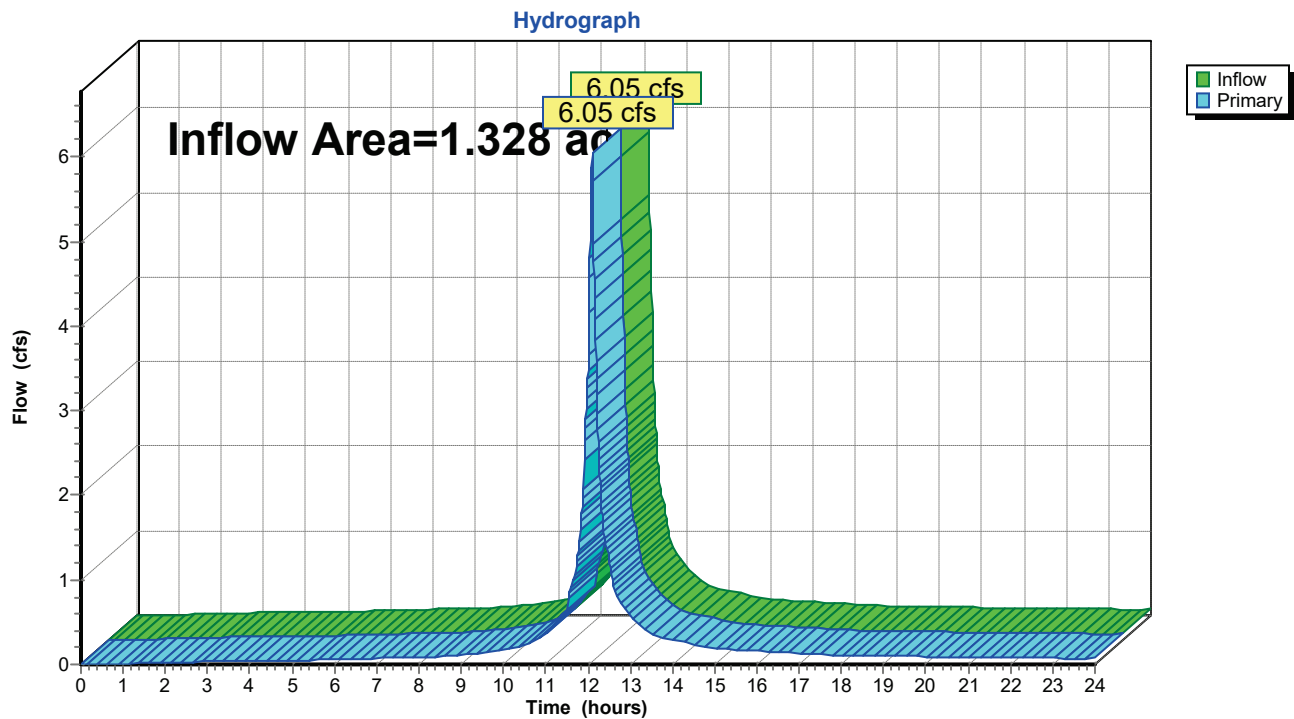
Page 20

Summary for Link 15L: Total Proposed

Inflow Area = 1.328 ac, 53.54% Impervious, Inflow Depth > 3.98" for 10-YEAR - ADJUSTED event
Inflow = 6.05 cfs @ 12.10 hrs, Volume= 0.441 af
Primary = 6.05 cfs @ 12.10 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 15L: Total Proposed



Proposed Conditions

NOAA 24-hr C 10-YEAR - ADJUSTED Rainfall=5.37", P2=3.46"

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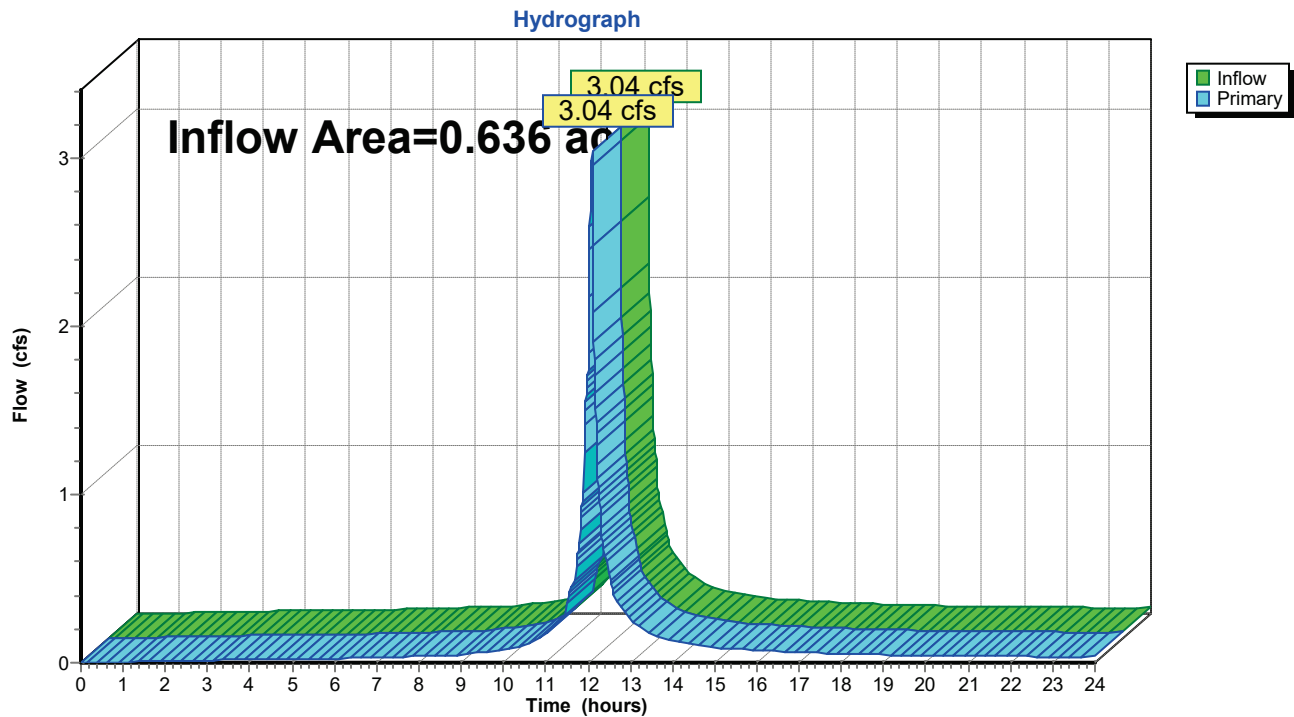
Page 21

Summary for Link 16L: DA #2 Total

Inflow Area = 0.636 ac, 48.74% Impervious, Inflow Depth > 3.86" for 10-YEAR - ADJUSTED event
Inflow = 3.04 cfs @ 12.10 hrs, Volume= 0.205 af
Primary = 3.04 cfs @ 12.10 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 16L: DA #2 Total



Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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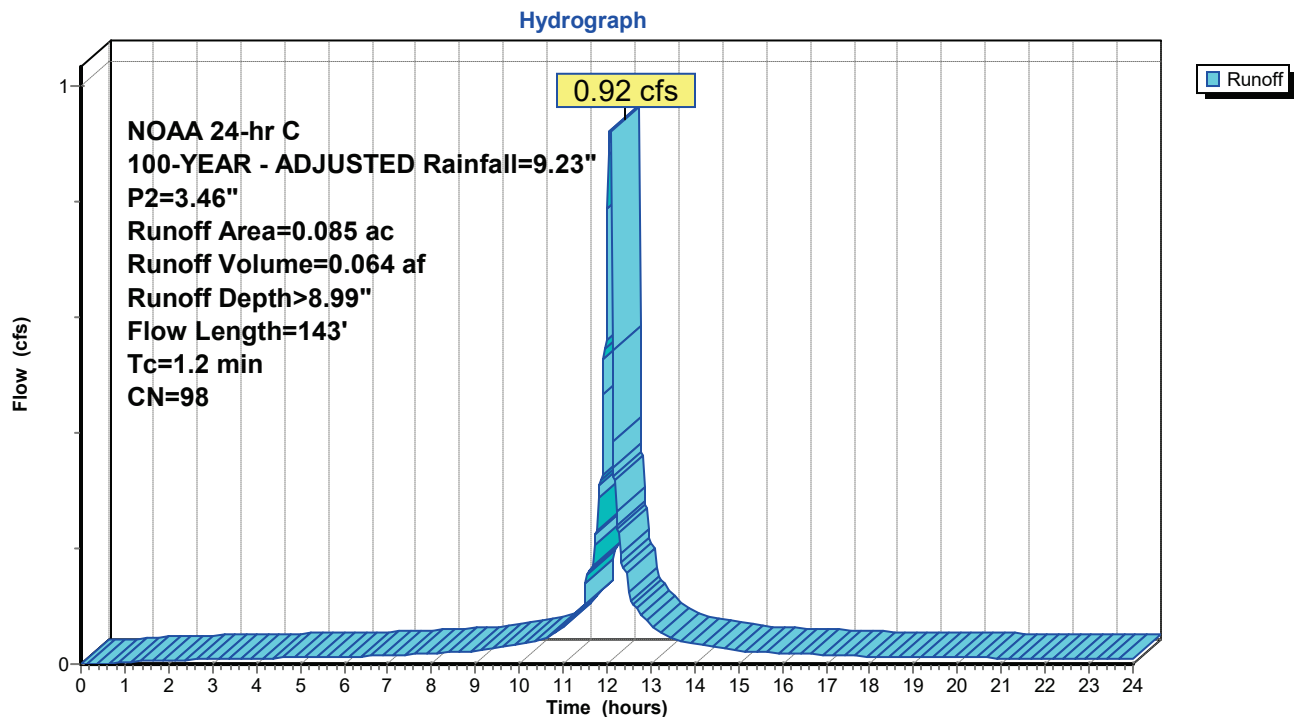
Summary for Subcatchment 9S: DA #3 Impervious

Runoff = 0.92 cfs @ 12.09 hrs, Volume= 0.064 af, Depth> 8.99"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

Area (ac)	CN	Description
0.085	98	Paved parking, HSG C
0.085		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	70	0.0500	1.92		Sheet Flow, Parking Segment 1 Smooth surfaces n= 0.011 P2= 3.46"
0.6	73	0.0100	2.03		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
1.2	143	Total			

Subcatchment 9S: DA #3 Impervious

Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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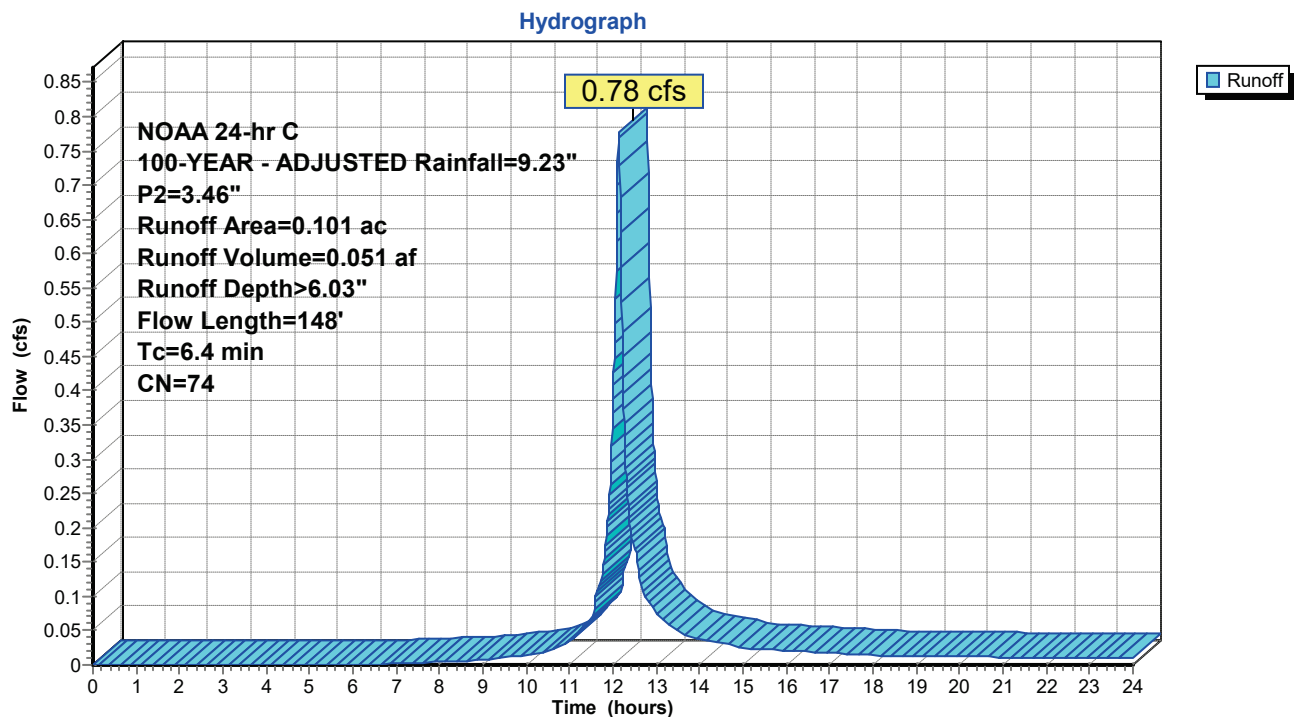
Summary for Subcatchment 10S: DA #3 Pervious

Runoff = 0.78 cfs @ 12.14 hrs, Volume= 0.051 af, Depth> 6.03"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

Area (ac)	CN	Description
0.101	74	>75% Grass cover, Good, HSG C
0.101		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	28	0.0140	0.08		Sheet Flow, Lawn area Grass: Dense n= 0.240 P2= 3.46"
0.2	43	0.0500	4.54		Shallow Concentrated Flow, Parking Lot 1 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
0.2	21	0.0100	2.03		Shallow Concentrated Flow, Parking Third Segment Paved Kv= 20.3 fps
6.4	148	Total			

Subcatchment 10S: DA #3 Pervious

Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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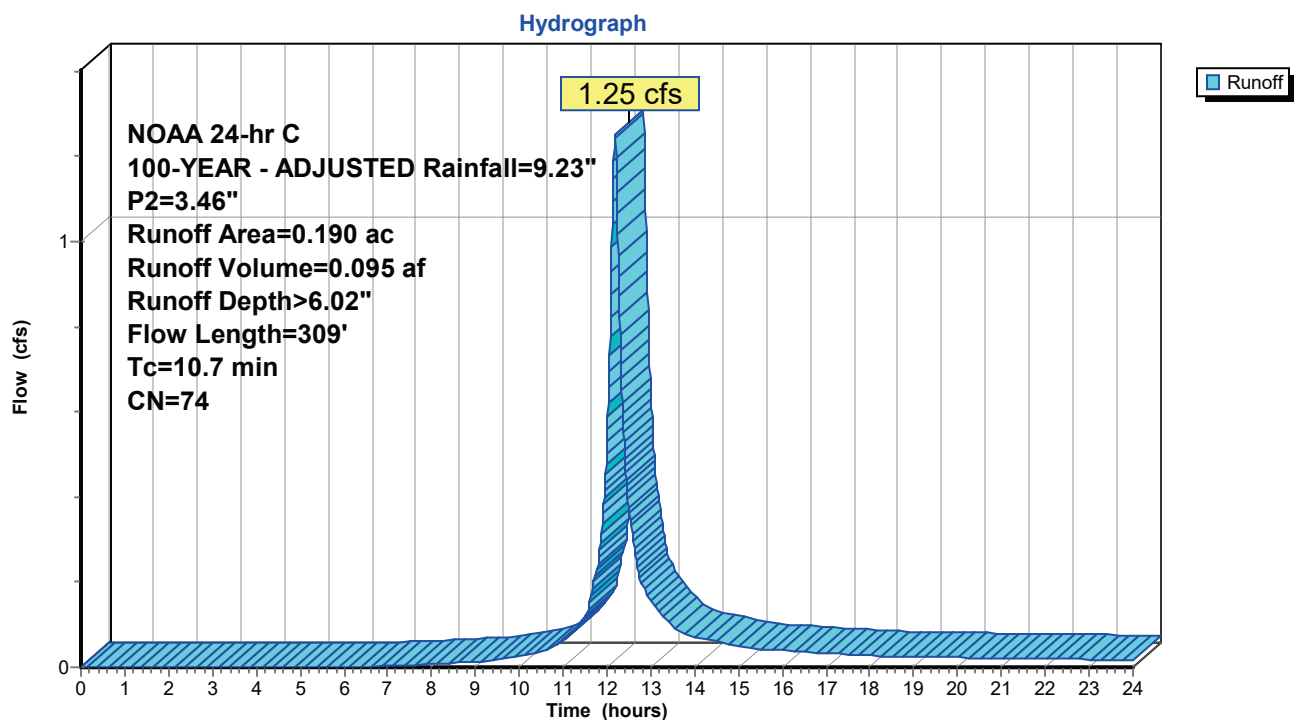
Summary for Subcatchment 12S: DA#1 Pervious

Runoff = 1.25 cfs @ 12.18 hrs, Volume= 0.095 af, Depth> 6.02"
Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

Area (ac)	CN	Description
0.190	74	>75% Grass cover, Good, HSG C
0.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	64	0.0500	0.16		Sheet Flow, Segment 1 Grass: Dense n= 0.240 P2= 3.46"
3.1	25	0.0500	0.13		Sheet Flow, Segment 2 Grass: Dense n= 0.240 P2= 3.46"
0.3	93	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.2	22	0.0100	2.03		Shallow Concentrated Flow, Segment 4 Paved Kv= 20.3 fps
0.4	105	0.0100	4.91	3.86	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
10.7	309	Total			

Subcatchment 12S: DA#1 Pervious

Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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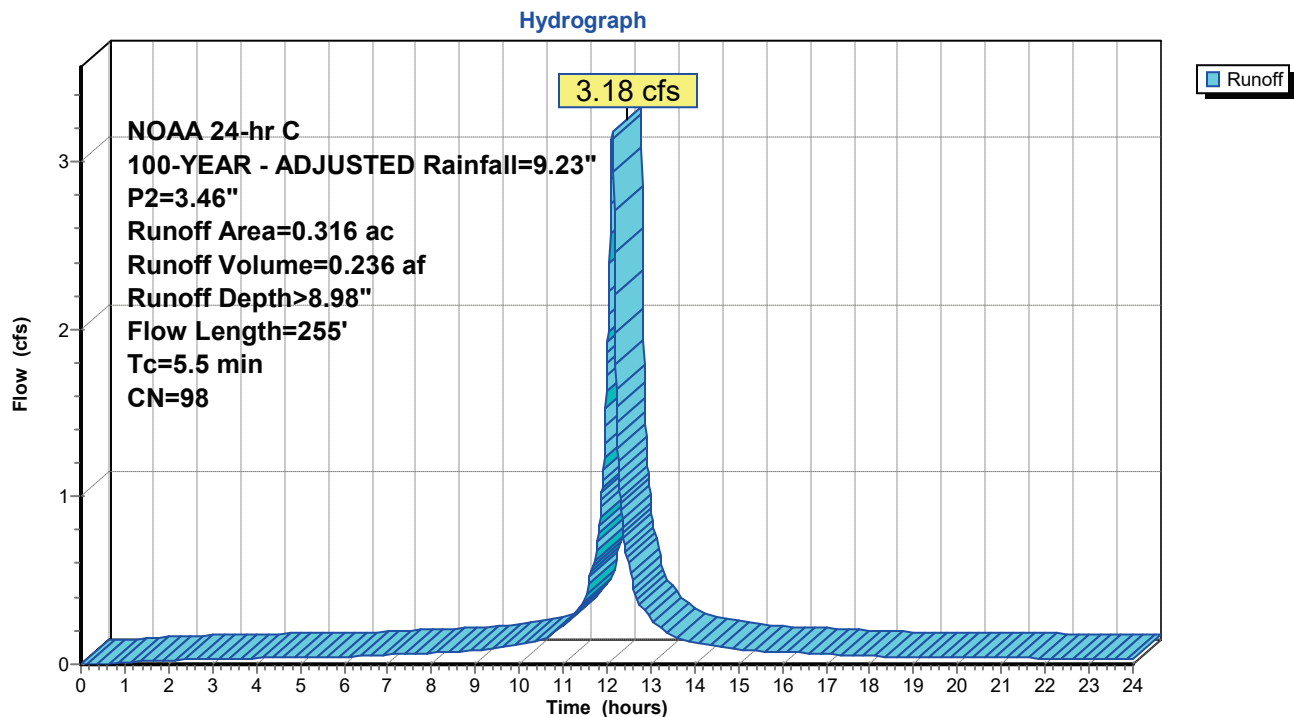
Summary for Subcatchment 13S: DA#1 Impervious

Runoff = 3.18 cfs @ 12.12 hrs, Volume= 0.236 af, Depth> 8.98"
Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

Area (ac)	CN	Description
0.316	98	Paved parking, HSG C
0.316		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	28	0.0300	0.11		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.46"
0.4	44	0.0500	1.75		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.46"
0.2	60	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.5	61	0.0100	2.03		Shallow Concentrated Flow, Segment #4 Paved Kv= 20.3 fps
0.2	62	0.0100	4.91	3.86	Pipe Channel, Segment 5 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.5	255	Total			

Subcatchment 13S: DA#1 Impervious

Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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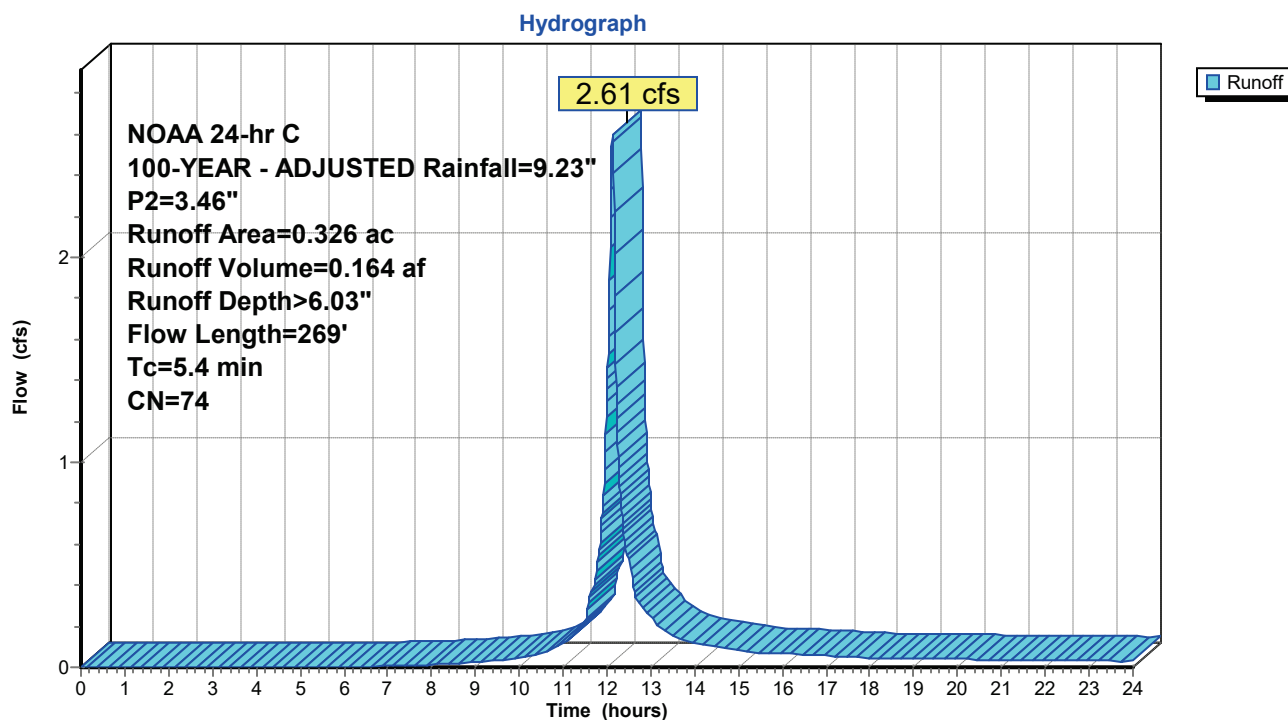
Summary for Subcatchment 17S: DA#2 Pervious

Runoff = 2.61 cfs @ 12.13 hrs, Volume= 0.164 af, Depth> 6.03"
Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

Area (ac)	CN	Description
0.326	74	>75% Grass cover, Good, HSG C
0.326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	30	0.0400	0.13		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 3.46"
0.3	30	0.0500	1.62		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 3.46"
0.5	123	0.0500	4.54		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.5	56	0.0100	2.03		Shallow Concentrated Flow, Segment #5 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #6 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.4	269	Total			

Subcatchment 17S: DA#2 Pervious

Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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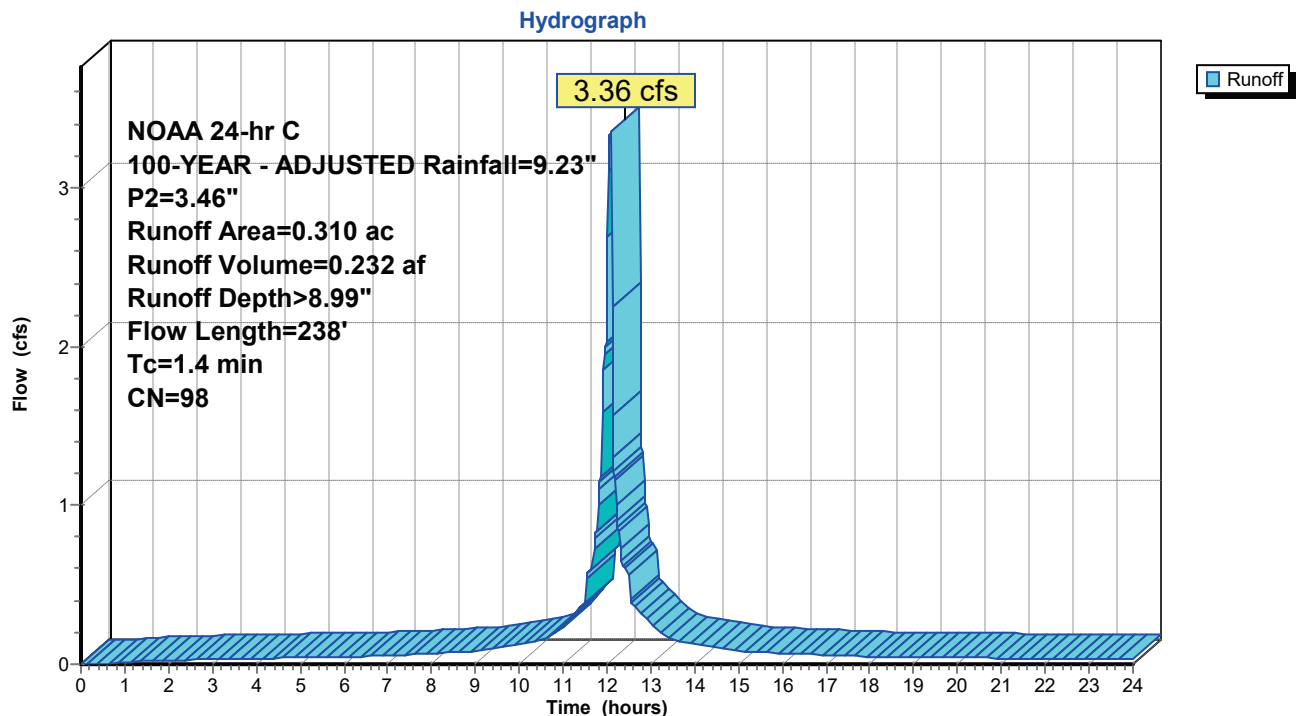
Summary for Subcatchment 18S: DA#2 Impervious

Runoff = 3.36 cfs @ 12.09 hrs, Volume= 0.232 af, Depth> 8.99"
Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG C
0.310		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	80	0.0500	1.97		Sheet Flow, Segment #1 Smooth surfaces n= 0.011 P2= 3.46"
0.3	72	0.0500	4.54		Shallow Concentrated Flow, Segment #2 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #4 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.4	238	Total			

Subcatchment 18S: DA#2 Impervious

Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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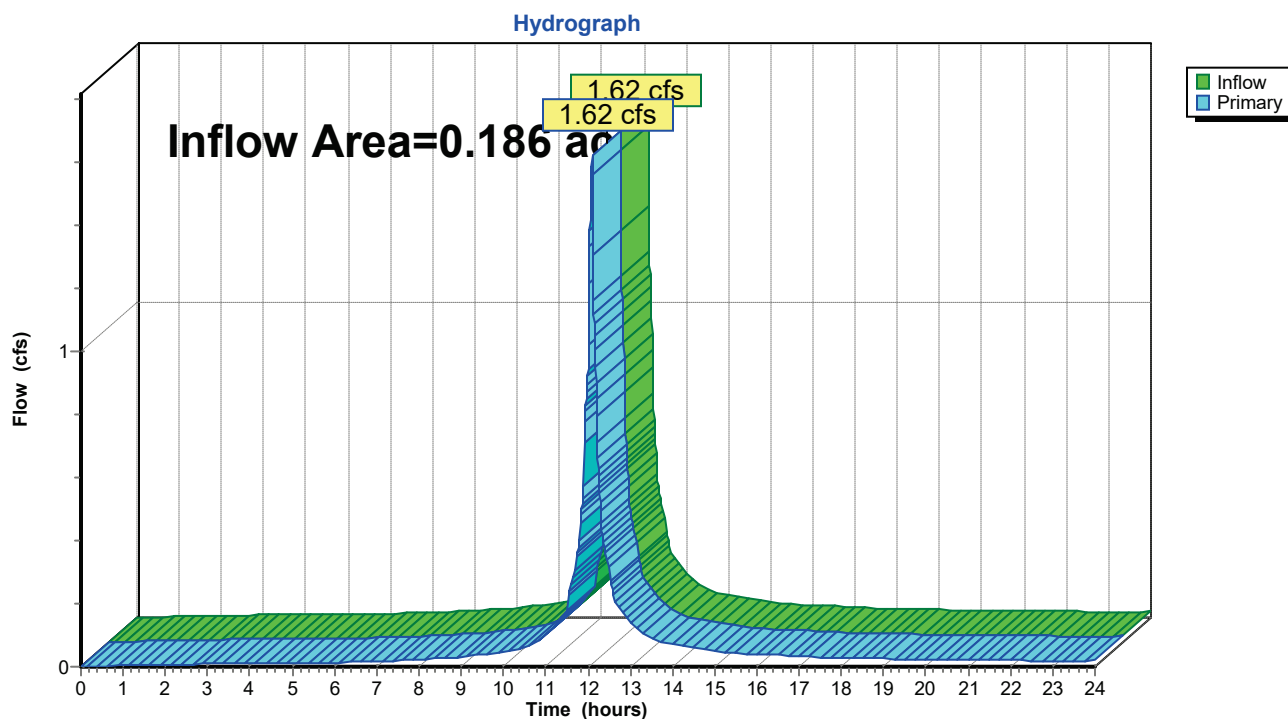
Page 28

Summary for Link 11L: DA #3 Total

Inflow Area = 0.186 ac, 45.70% Impervious, Inflow Depth > 7.38" for 100-YEAR - ADJUSTED event
Inflow = 1.62 cfs @ 12.10 hrs, Volume= 0.114 af
Primary = 1.62 cfs @ 12.10 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 11L: DA #3 Total



Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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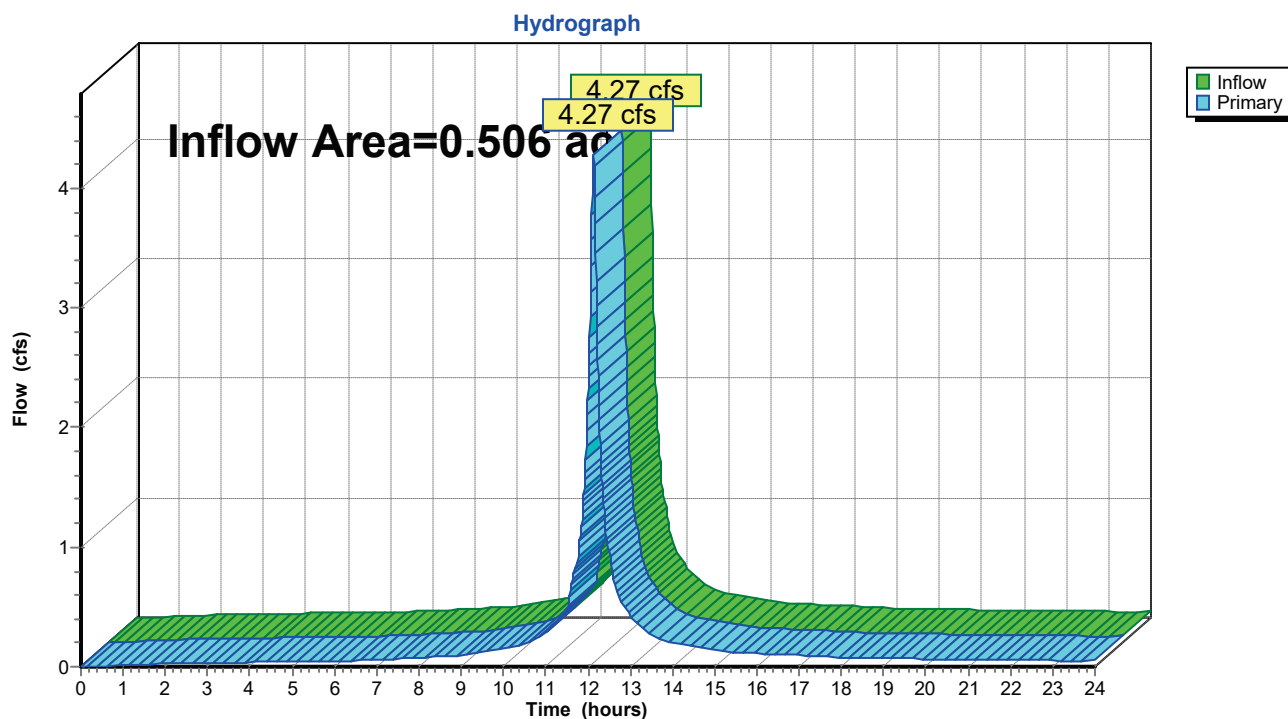
Page 29

Summary for Link 14L: Da #1 Total

Inflow Area = 0.506 ac, 62.45% Impervious, Inflow Depth > 7.87" for 100-YEAR - ADJUSTED event
Inflow = 4.27 cfs @ 12.13 hrs, Volume= 0.332 af
Primary = 4.27 cfs @ 12.13 hrs, Volume= 0.332 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: Da #1 Total



Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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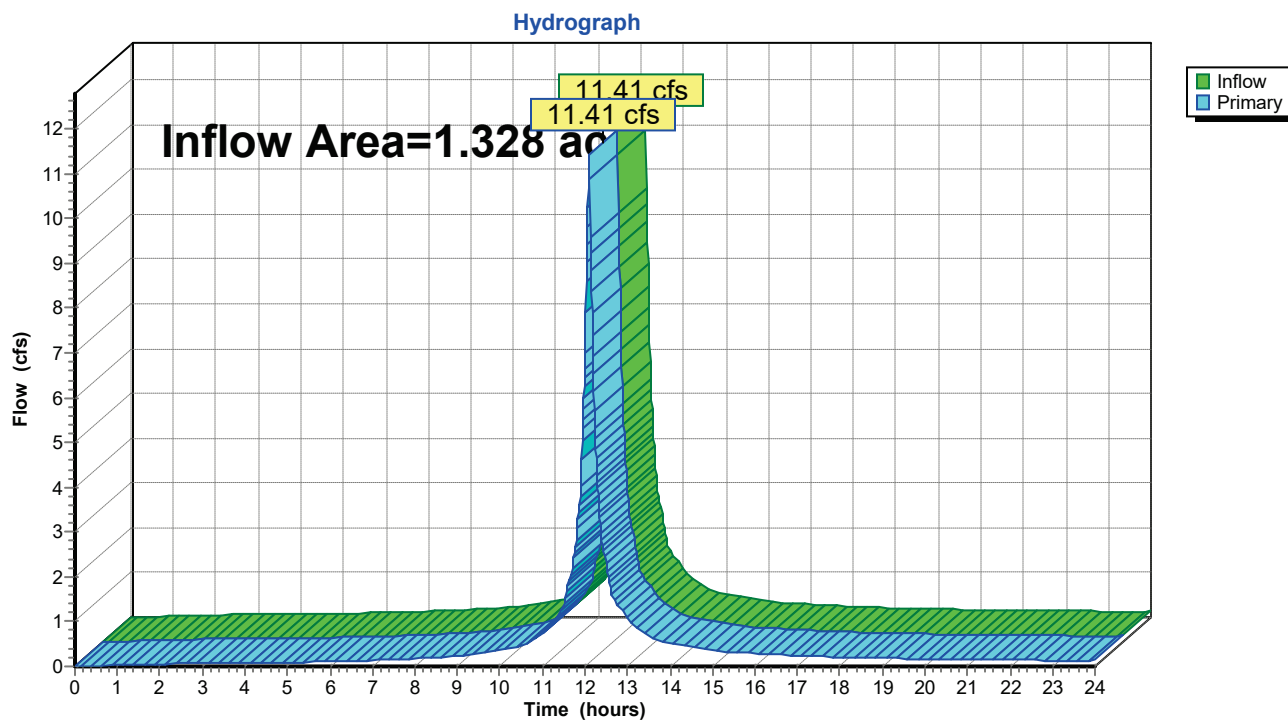
Page 30

Summary for Link 15L: Total Proposed

Inflow Area = 1.328 ac, 53.54% Impervious, Inflow Depth > 7.61" for 100-YEAR - ADJUSTED event
Inflow = 11.41 cfs @ 12.10 hrs, Volume= 0.842 af
Primary = 11.41 cfs @ 12.10 hrs, Volume= 0.842 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 15L: Total Proposed



Proposed Conditions

NOAA 24-hr C 100-YEAR - ADJUSTED Rainfall=9.23", P2=3.46"

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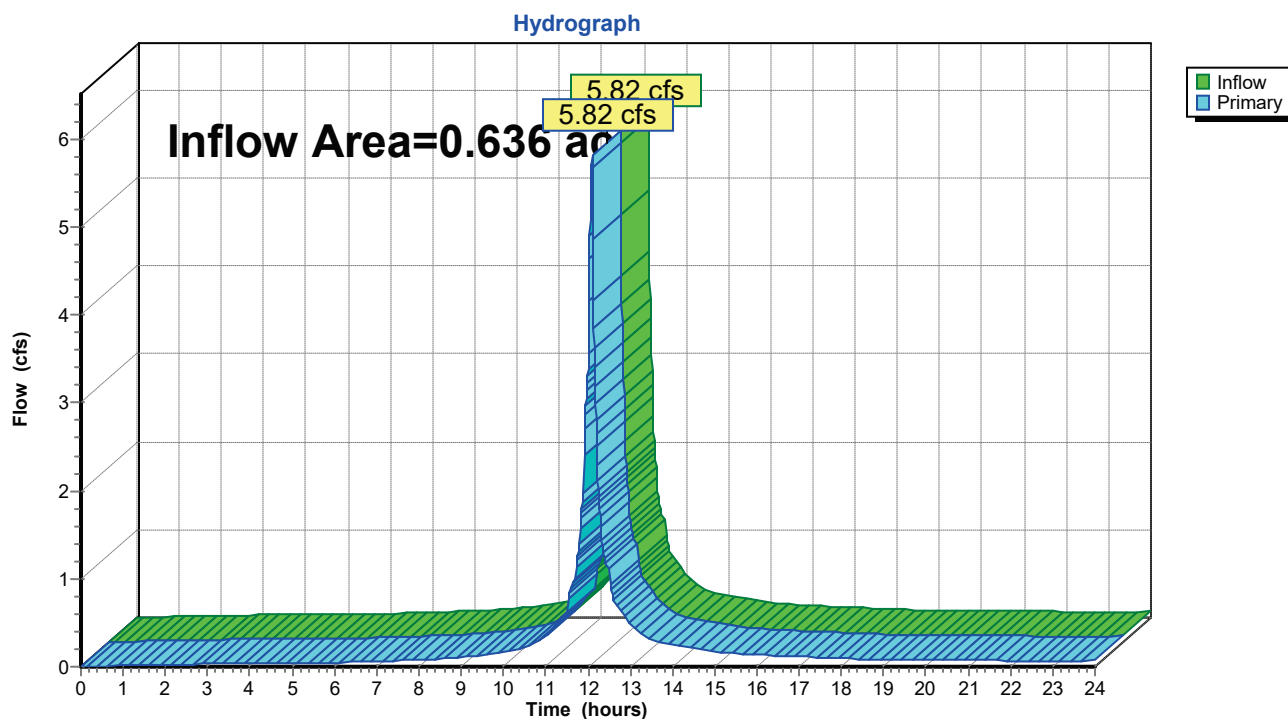
Page 31

Summary for Link 16L: DA #2 Total

Inflow Area = 0.636 ac, 48.74% Impervious, Inflow Depth > 7.47" for 100-YEAR - ADJUSTED event
Inflow = 5.82 cfs @ 12.10 hrs, Volume= 0.396 af
Primary = 5.82 cfs @ 12.10 hrs, Volume= 0.396 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

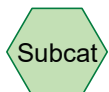
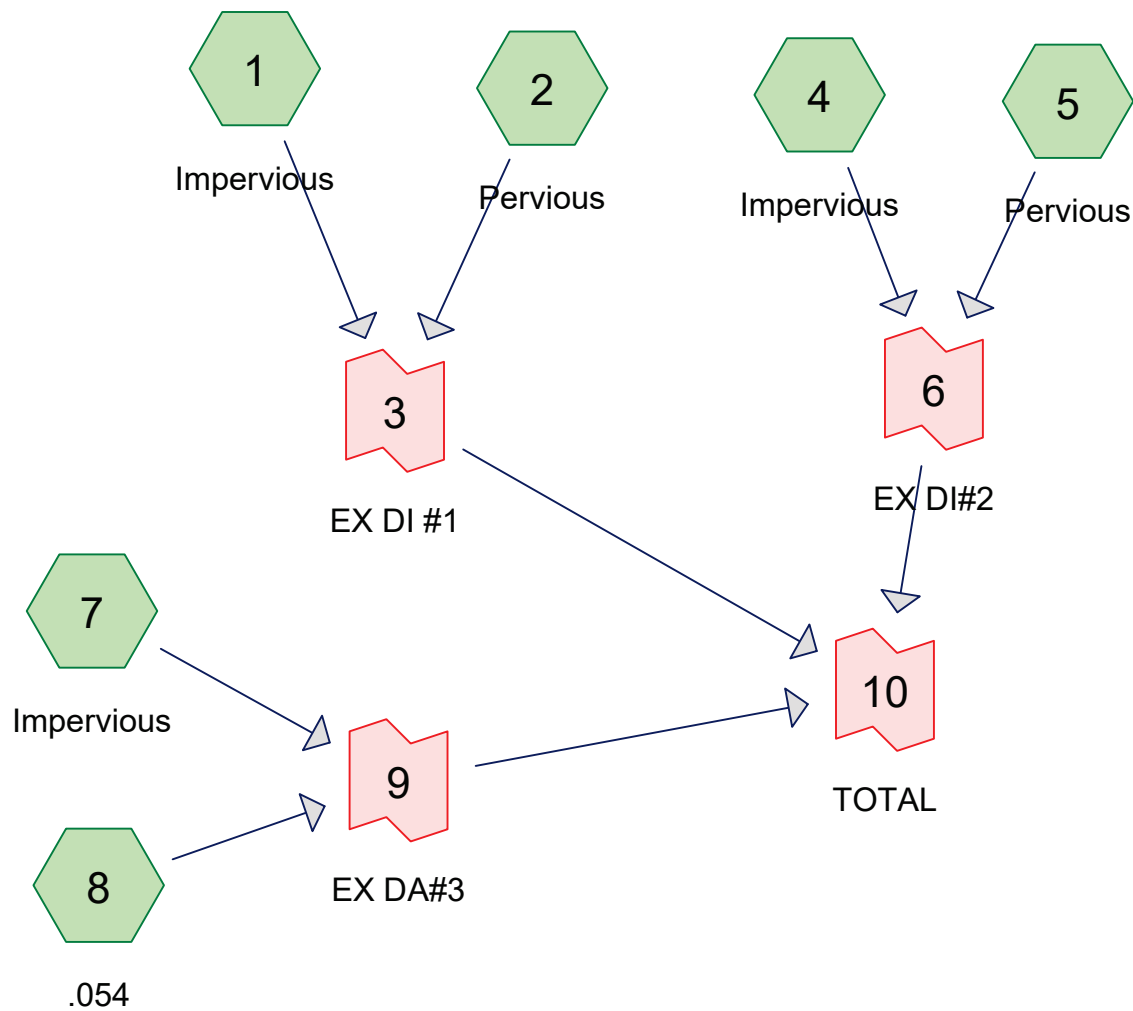
Link 16L: DA #2 Total



APPENDIX C

Pre-Development Hydrographs

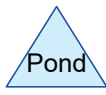
Future Adjusted Precipitation Depths



Subcat



Reach



Pond



Link

Routing Diagram for Existing Conditions

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Existing Conditions

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	(inches)
1	2-YEAR - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	3.46		3.46
2	2-YEAR - FUTURE ADJUSTED	NOAA 24-hr	C	Default	24.00	1	4.08		4.08
3	10-YEAR - FUTURE ADJUSTED	NOAA 24-hr	C	Default	24.00	1	6.36		6.36
4	100-YEAR - FUTURE ADJUSTED	NOAA 24-hr	C	Default	24.00	1	11.58		11.58

Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 1: Impervious

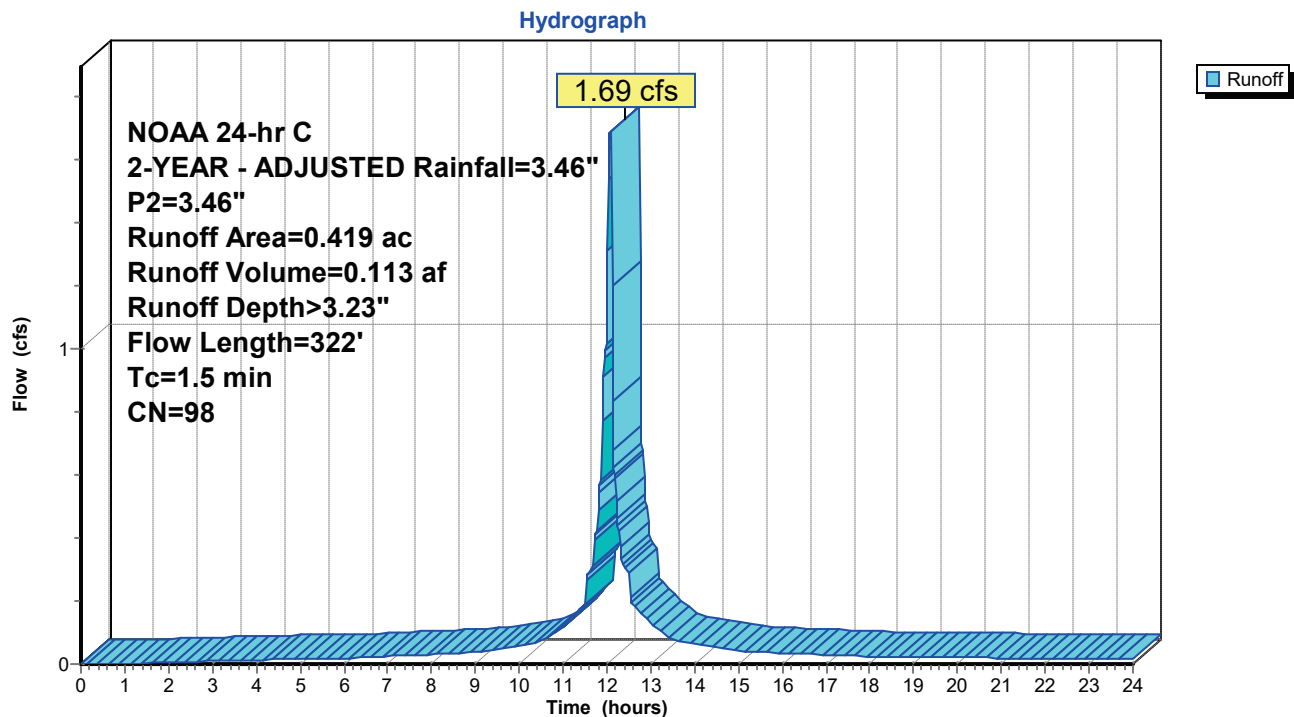
Runoff = 1.69 cfs @ 12.10 hrs, Volume= 0.113 af, Depth> 3.23"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0400	1.27		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.46"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.5	322	Total			

Subcatchment 1: Impervious



Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 2: Pervious

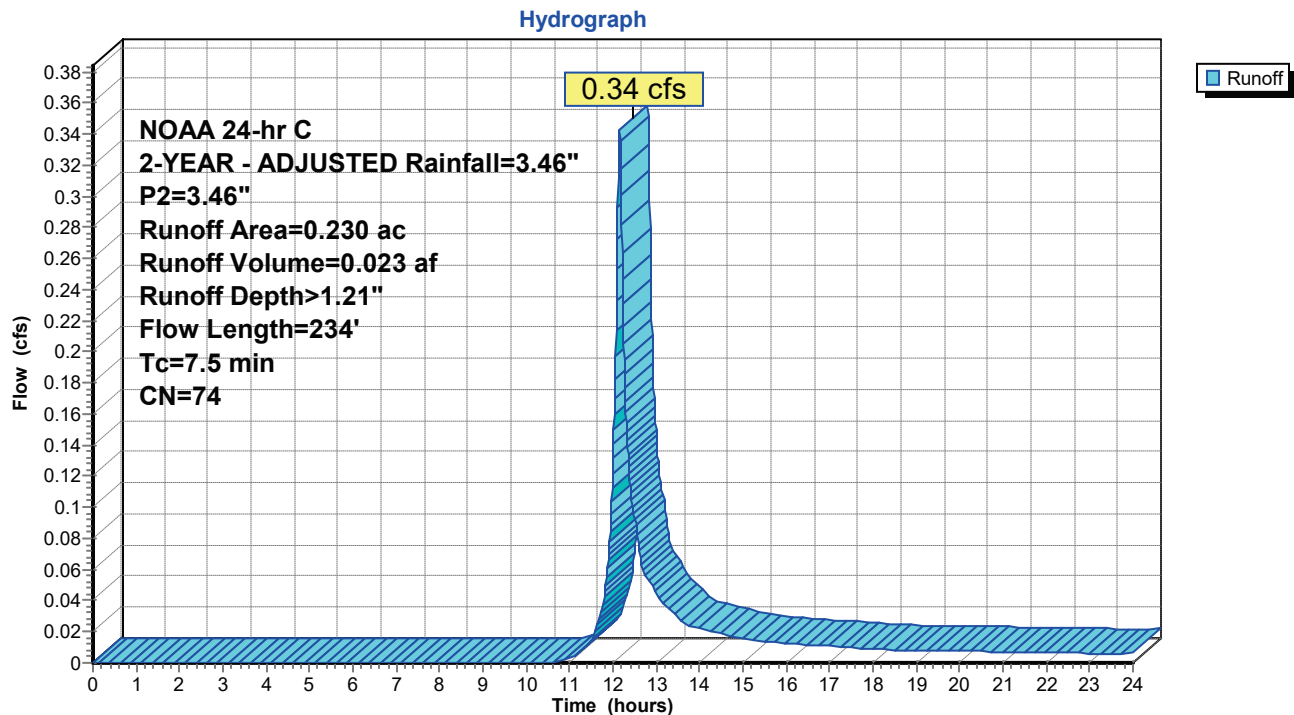
Runoff = 0.34 cfs @ 12.15 hrs, Volume= 0.023 af, Depth> 1.21"
Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	70	0.0600	0.18		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.46"
0.3	30	0.0390	1.47		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.46"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
7.5	234	Total			

Subcatchment 2: Pervious



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 4: Impervious

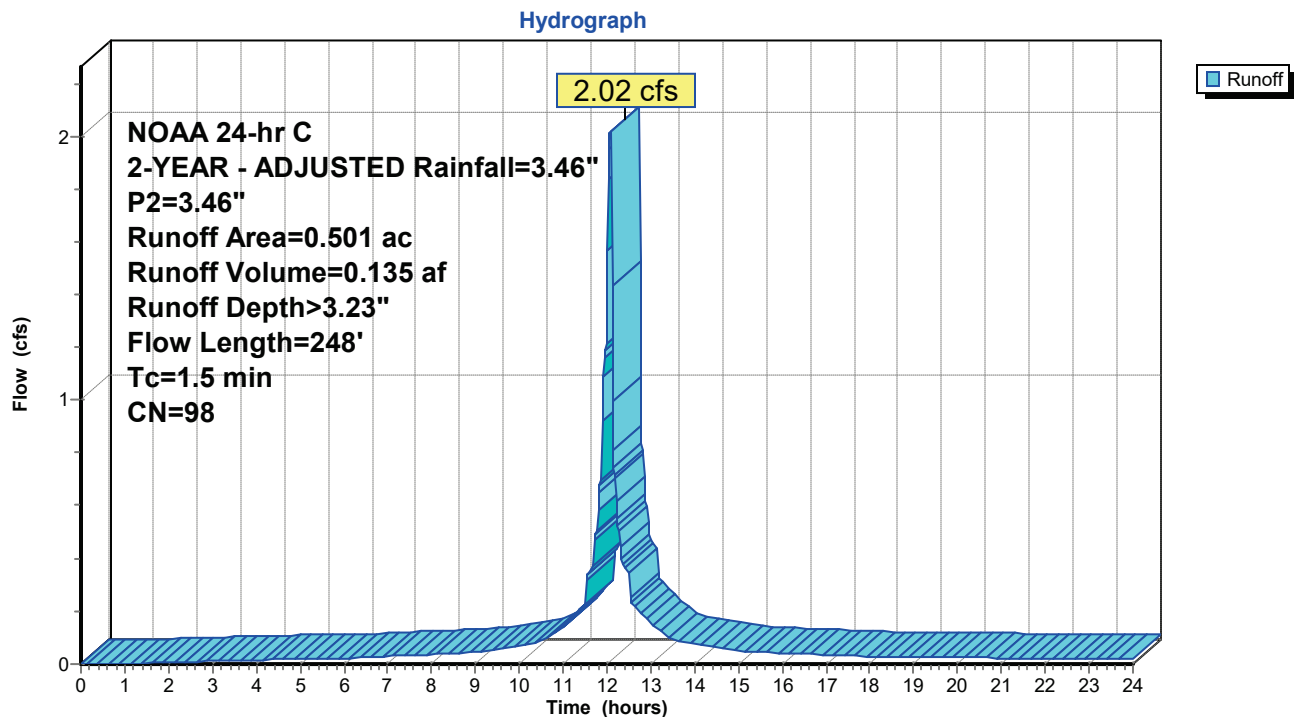
Runoff = 2.02 cfs @ 12.10 hrs, Volume= 0.135 af, Depth> 3.23"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0440	1.96		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.46"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
1.5	248	Total			

Subcatchment 4: Impervious



Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 5: Pervious

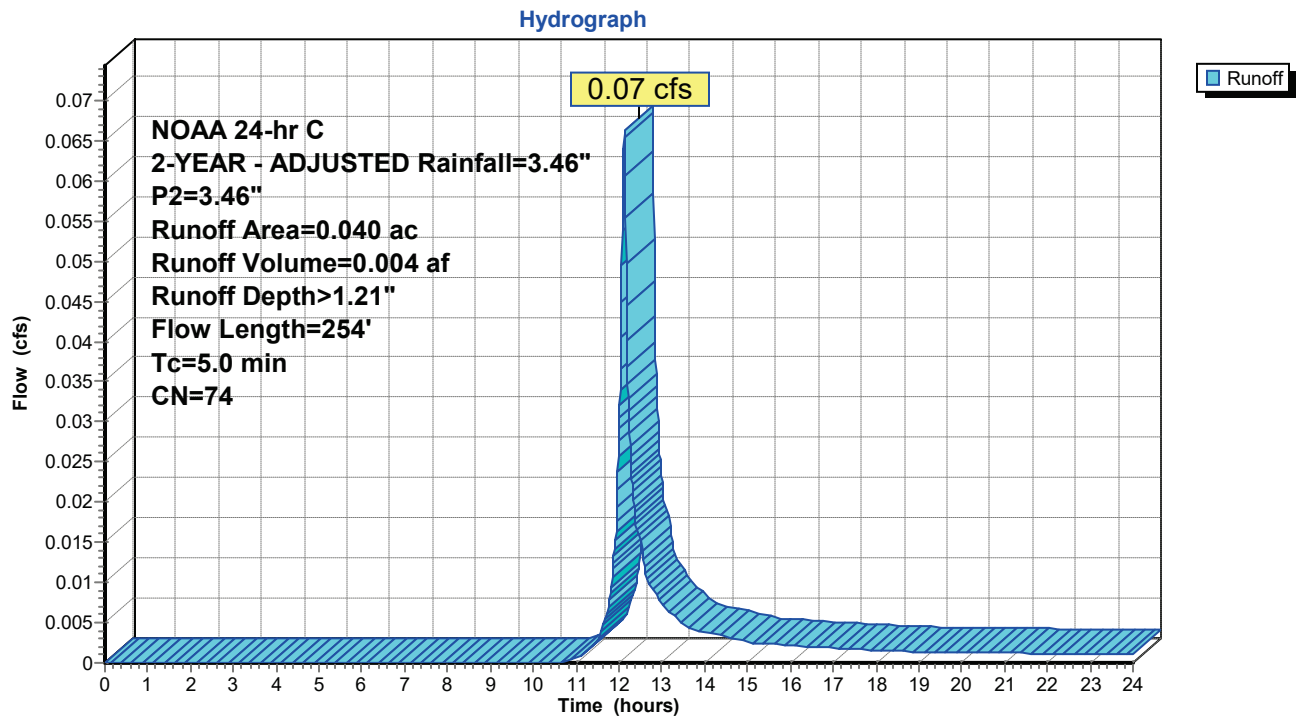
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 0.004 af, Depth> 1.21"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	28	0.0400	0.12		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.46"
0.6	72	0.0460	1.87		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.46"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
5.0	254	Total			

Subcatchment 5: Pervious



Existing Conditions

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NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 7: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

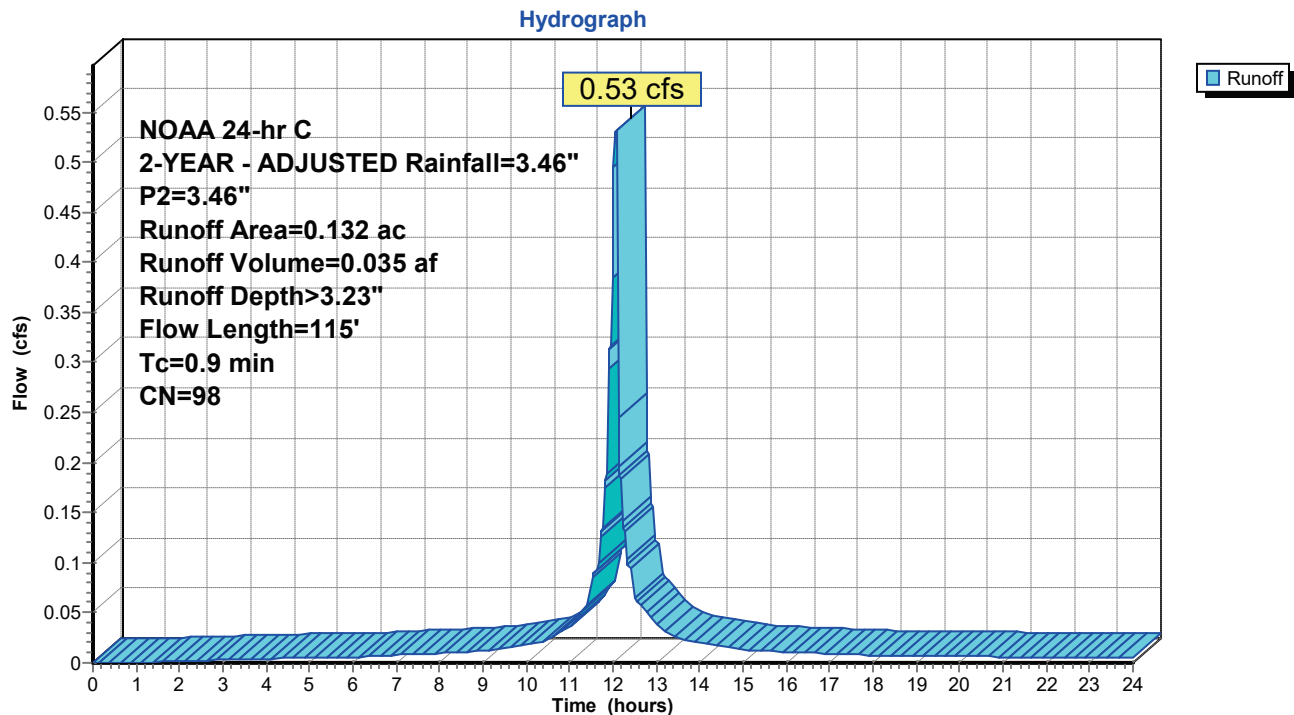
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.035 af, Depth> 3.23"
Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.73		Sheet Flow, B-C Smooth surfaces $n=0.011$ P2= 3.46"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved $K_v=20.3$ fps
0.9	115	Total			

Subcatchment 7: Impervious



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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Summary for Subcatchment 8: .054

Runoff = 0.09 cfs @ 12.11 hrs, Volume= 0.005 af, Depth> 1.21"
Routed to Link 9 : EX DA#3

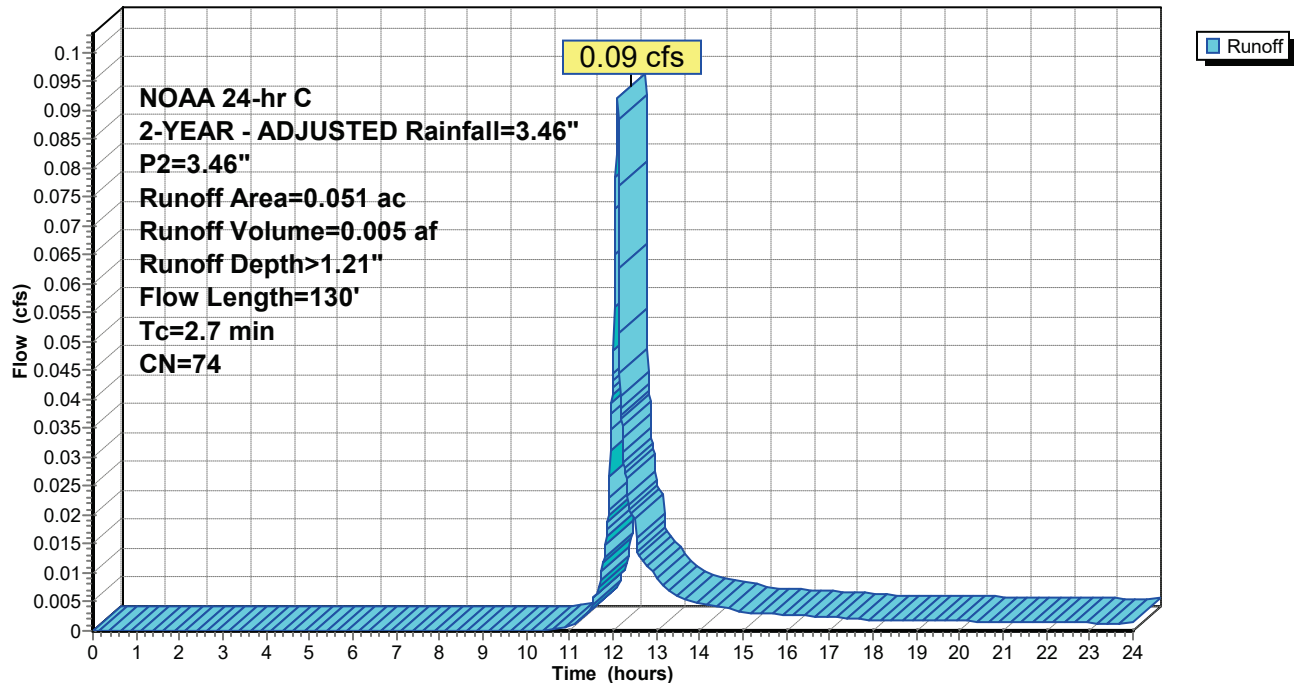
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	15	0.0850	0.15		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.46"
0.9	85	0.0300	1.63		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 3.46"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
2.7	130	Total			

Subcatchment 8: .054

Hydrograph



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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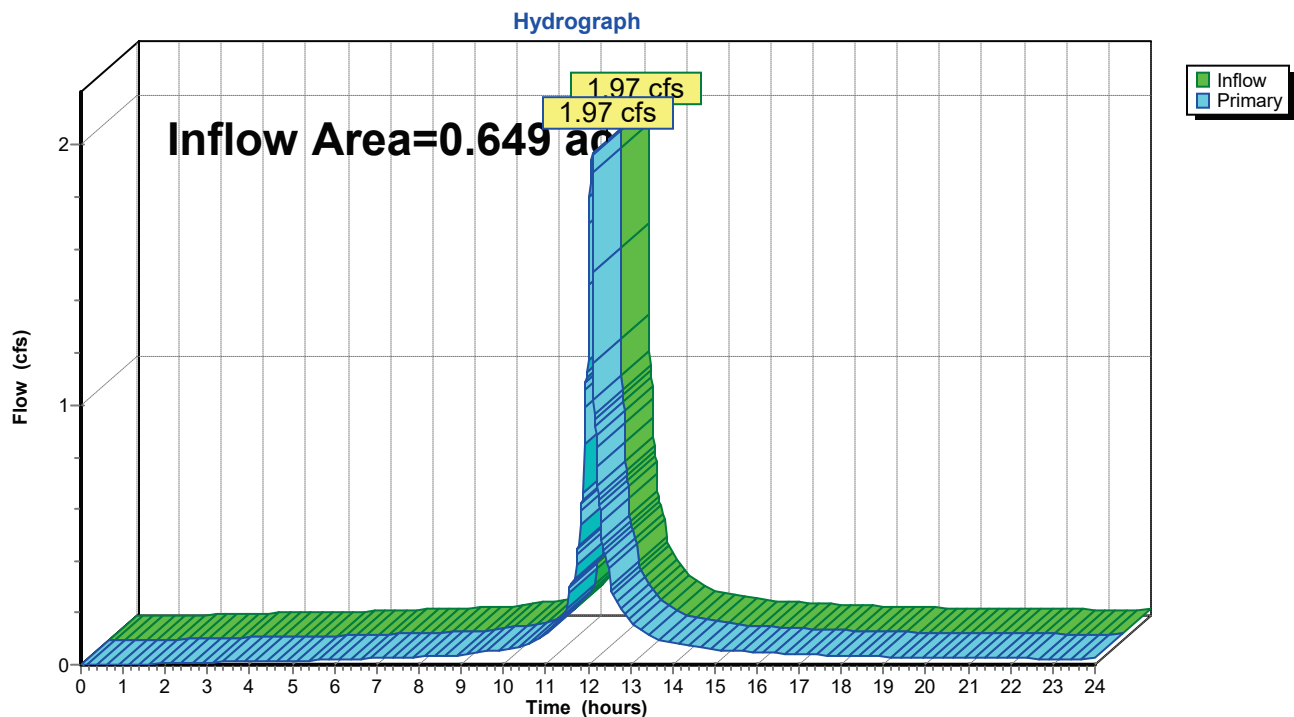
Page 9

Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 2.51" for 2-YEAR - ADJUSTED event
Inflow = 1.97 cfs @ 12.10 hrs, Volume= 0.136 af
Primary = 1.97 cfs @ 12.10 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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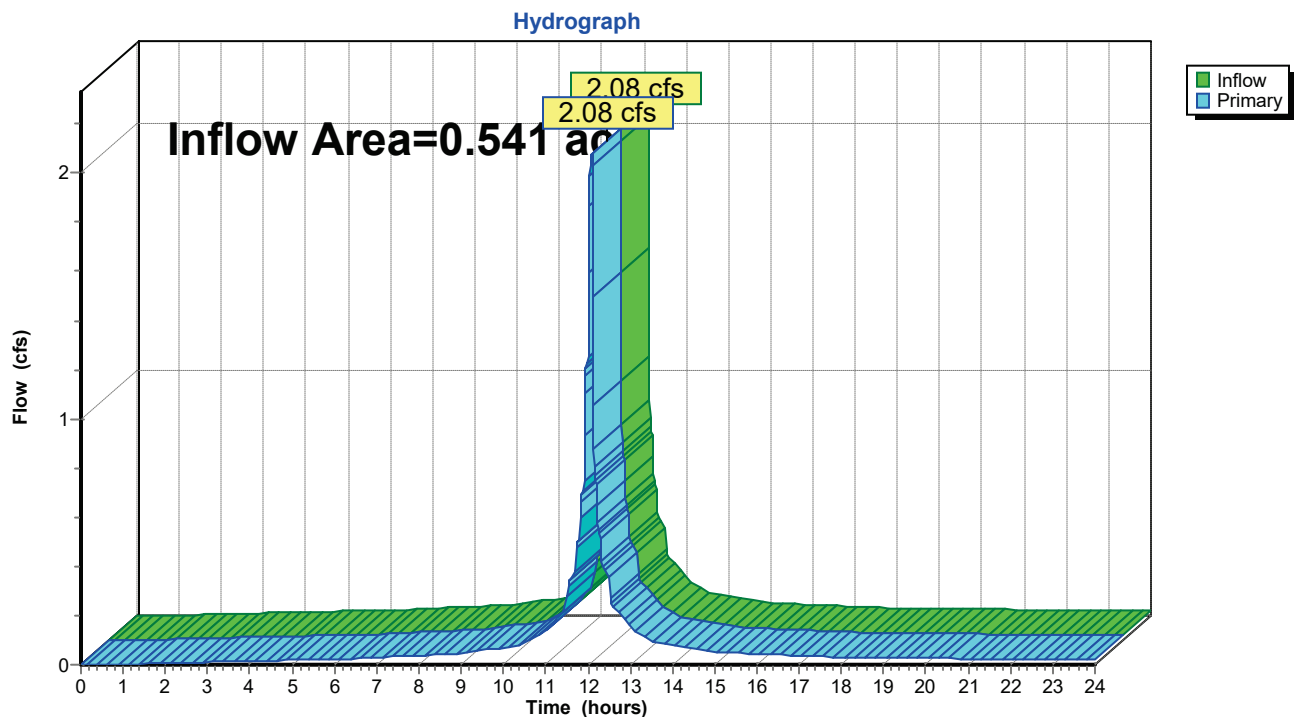
Page 10

Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 3.08" for 2-YEAR - ADJUSTED event
Inflow = 2.08 cfs @ 12.10 hrs, Volume= 0.139 af
Primary = 2.08 cfs @ 12.10 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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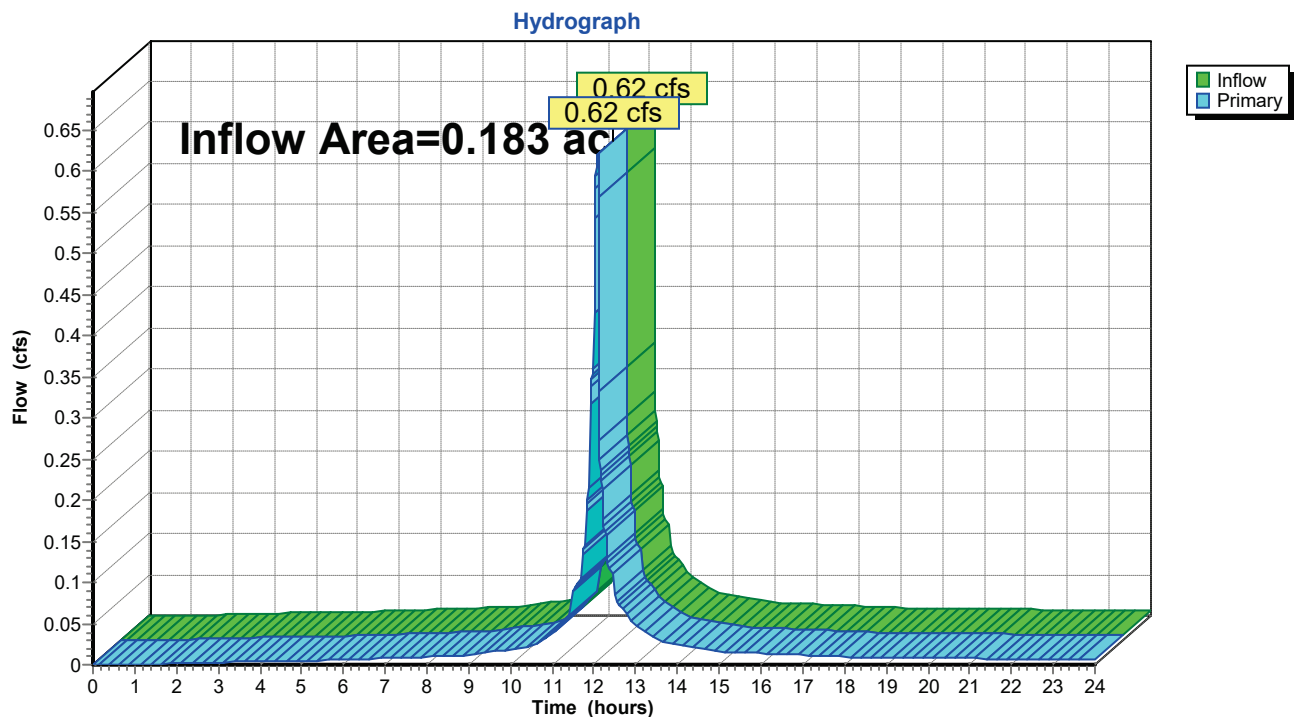
Page 11

Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 2.66" for 2-YEAR - ADJUSTED event
Inflow = 0.62 cfs @ 12.10 hrs, Volume= 0.041 af
Primary = 0.62 cfs @ 12.10 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3



Existing Conditions

NOAA 24-hr C 2-YEAR - ADJUSTED Rainfall=3.46", P2=3.46"

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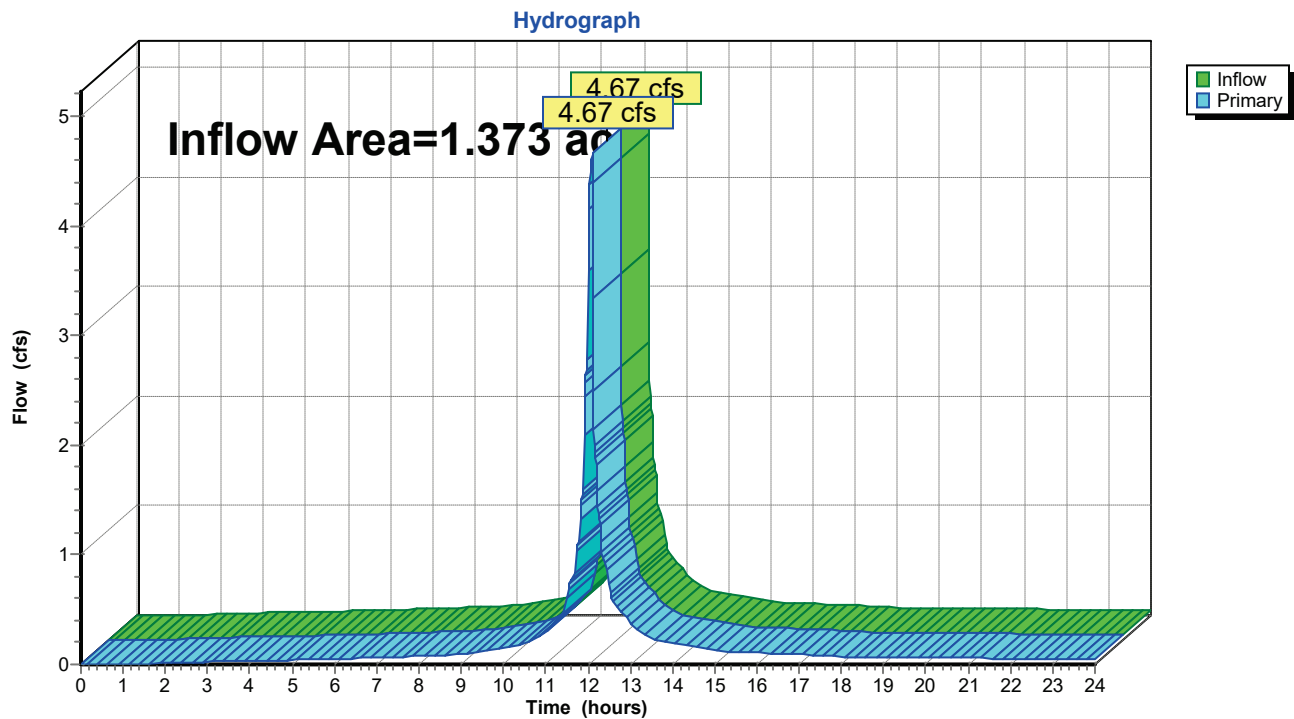
Page 12

Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 2.75" for 2-YEAR - ADJUSTED event
Inflow = 4.67 cfs @ 12.10 hrs, Volume= 0.315 af
Primary = 4.67 cfs @ 12.10 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 10: TOTAL



Summary for Subcatchment 1: Impervious

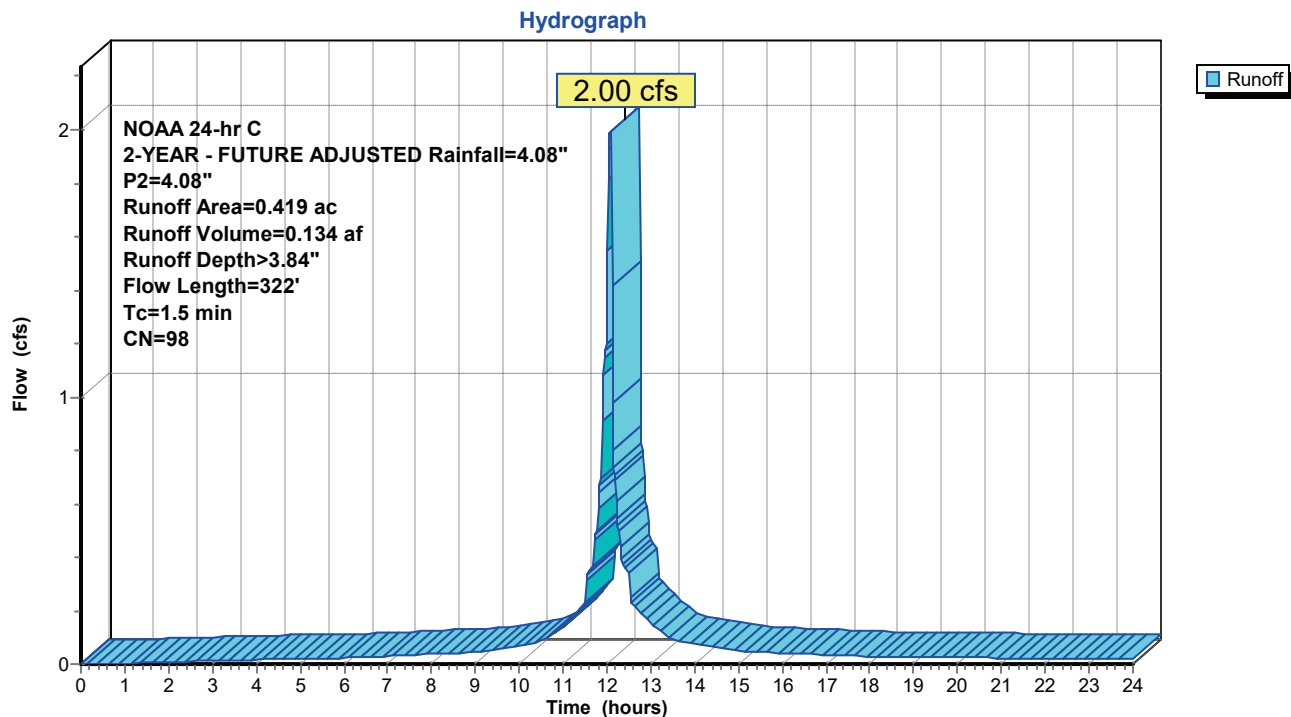
Runoff = 2.00 cfs @ 12.10 hrs, Volume= 0.134 af, Depth> 3.84"
 Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0400	1.38		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 4.08"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C
					Paved Kv= 20.3 fps
1.5	322	Total			

Subcatchment 1: Impervious



Summary for Subcatchment 2: Pervious

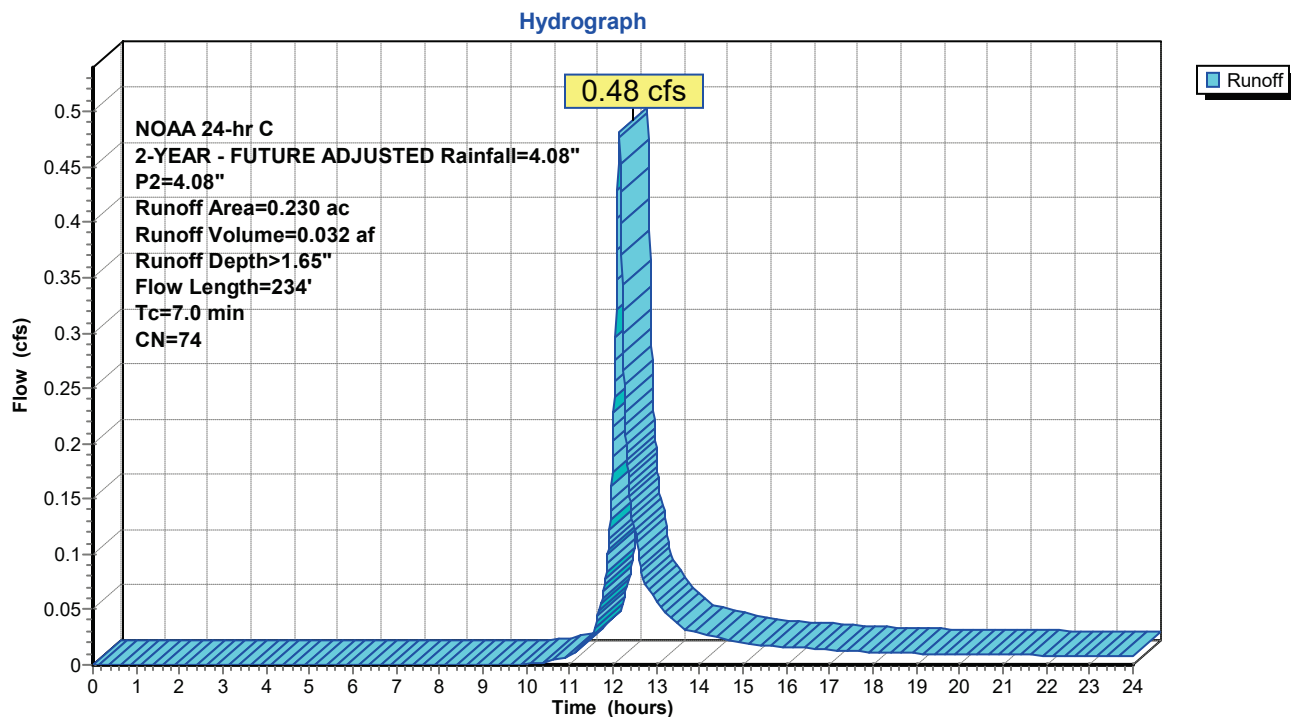
Runoff = 0.48 cfs @ 12.15 hrs, Volume= 0.032 af, Depth> 1.65"
 Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	70	0.0600	0.19		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 4.08"
0.3	30	0.0390	1.59		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 4.08"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
7.0	234	Total			

Subcatchment 2: Pervious



Summary for Subcatchment 4: Impervious

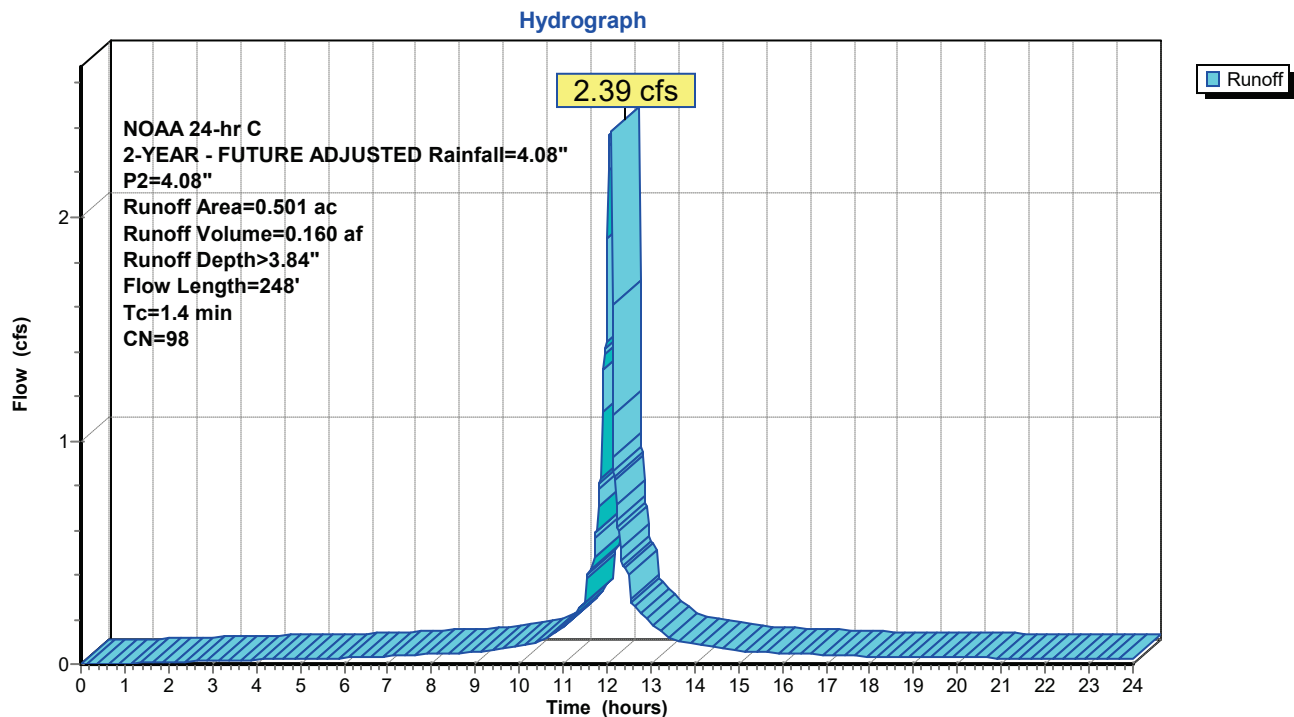
Runoff = 2.39 cfs @ 12.09 hrs, Volume= 0.160 af, Depth> 3.84"
 Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0440	2.13		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 4.08"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D
					Paved Kv= 20.3 fps
1.4	248	Total			

Subcatchment 4: Impervious



Summary for Subcatchment 5: Pervious

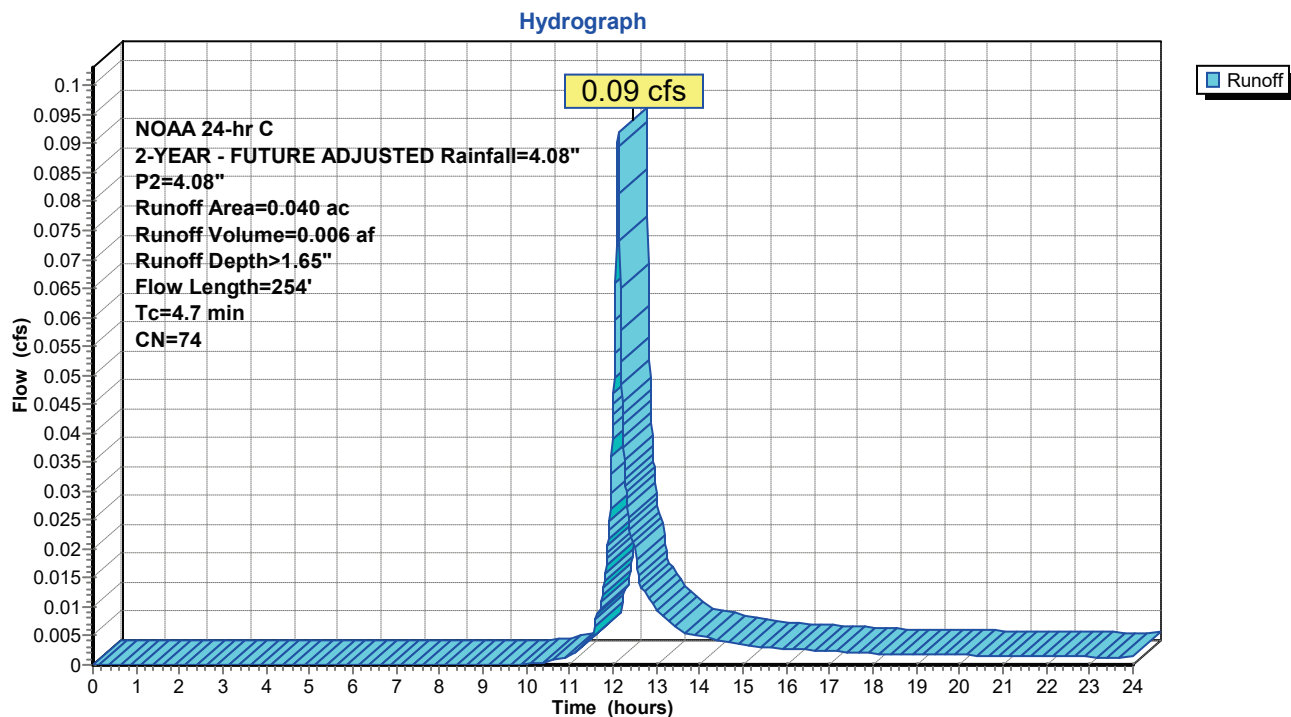
Runoff = 0.09 cfs @ 12.12 hrs, Volume= 0.006 af, Depth> 1.65"
 Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	28	0.0400	0.13		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 4.08"
0.6	72	0.0460	2.03		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 4.08"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
4.7	254	Total			

Subcatchment 5: Pervious



Summary for Subcatchment 7: Impervious

[49] Hint: Tc<2dt may require smaller dt

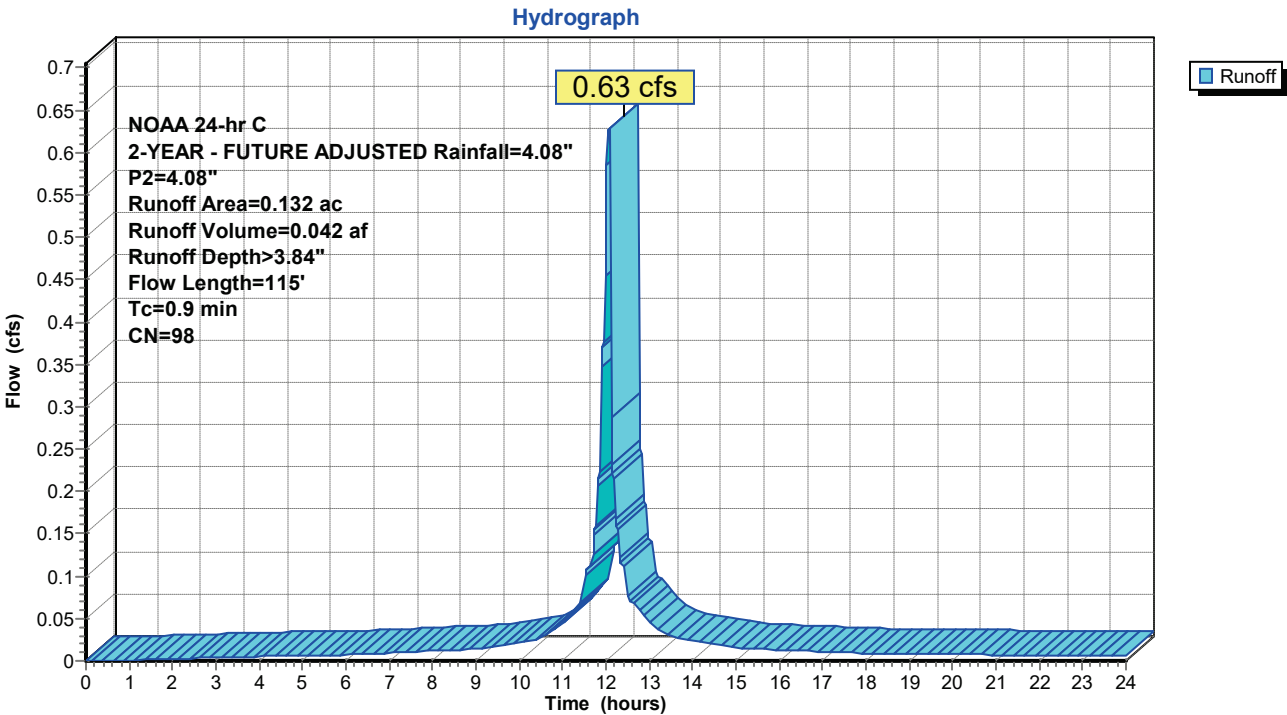
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 0.042 af, Depth> 3.84"
Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0350	1.88		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 4.08"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.9	115	Total			

Subcatchment 7: Impervious



Summary for Subcatchment 8: .054

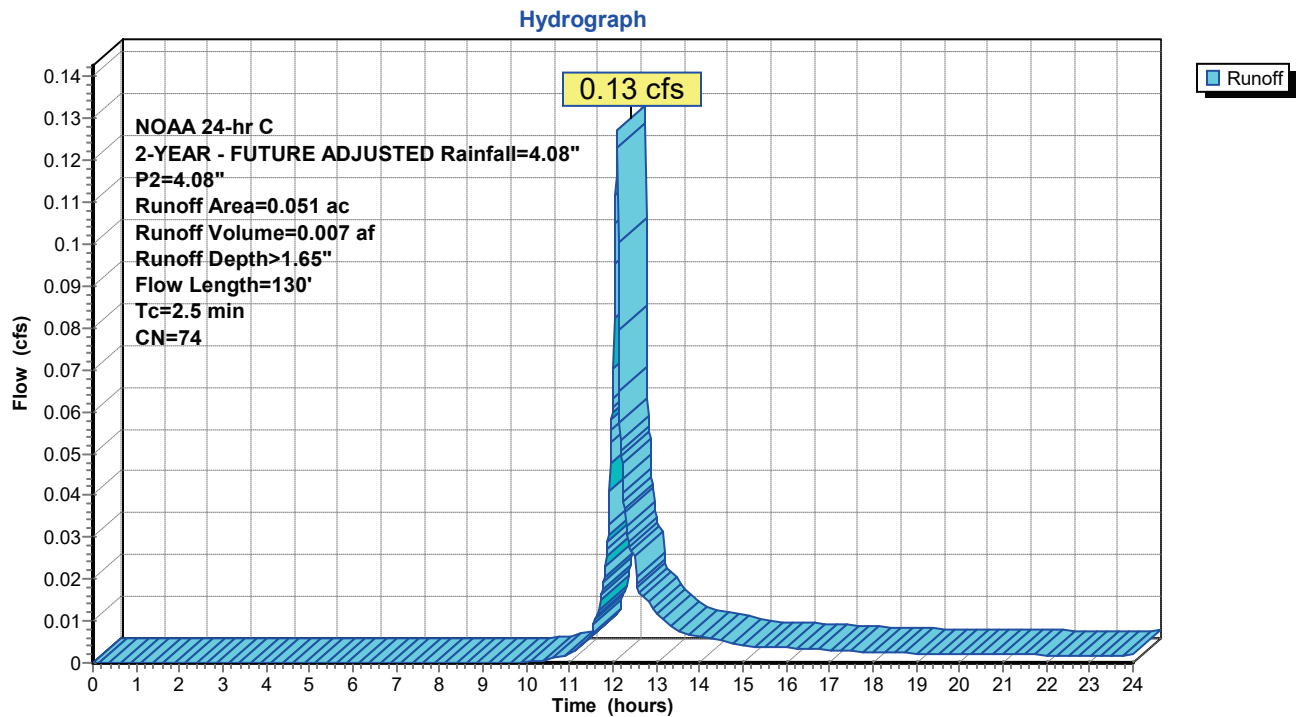
Runoff = 0.13 cfs @ 12.11 hrs, Volume= 0.007 af, Depth> 1.65"
 Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	15	0.0850	0.16		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 4.08"
0.8	85	0.0300	1.77		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 4.08"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
2.5	130	Total			

Subcatchment 8: .054

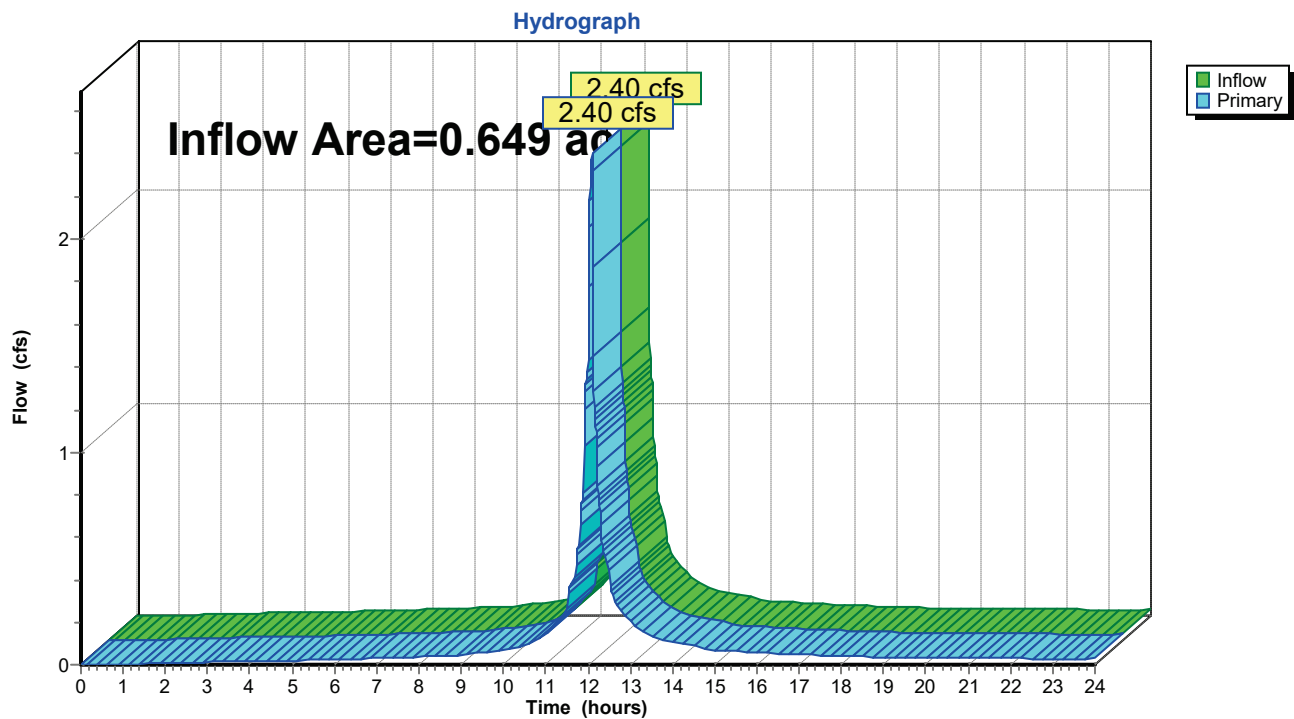


Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 3.07" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 2.40 cfs @ 12.10 hrs, Volume= 0.166 af
Primary = 2.40 cfs @ 12.10 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1

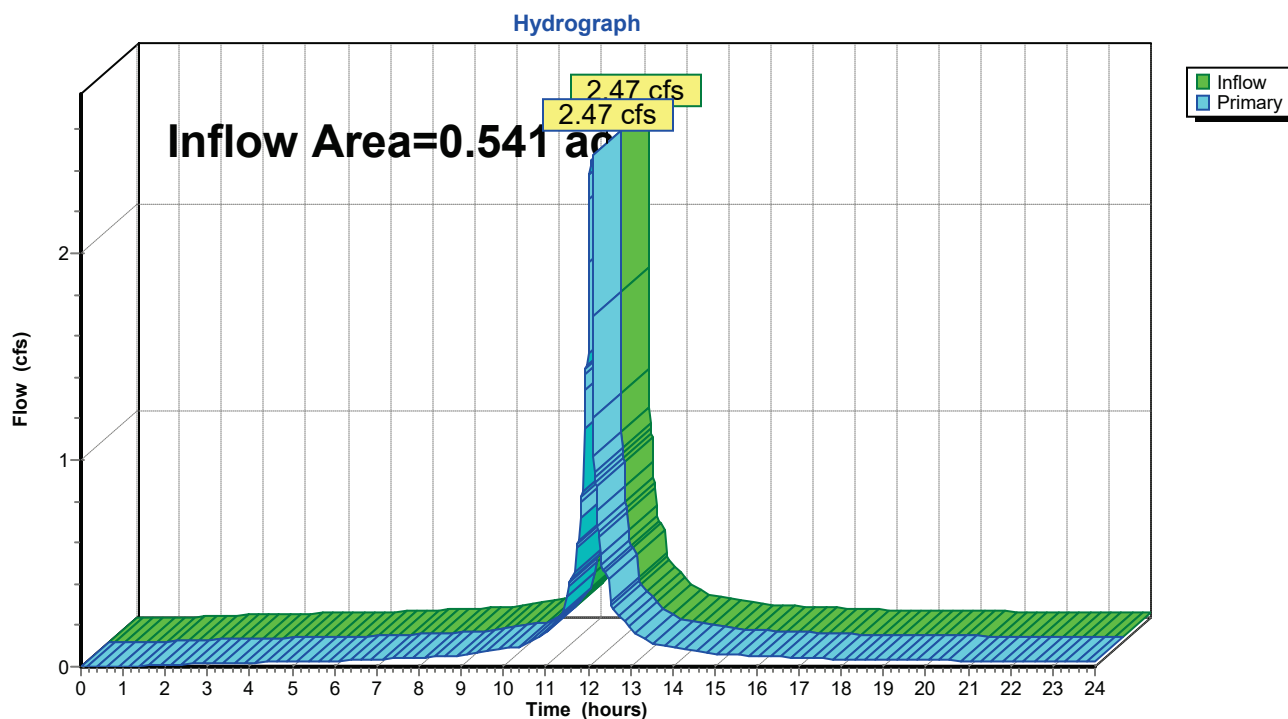


Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 3.68" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 2.47 cfs @ 12.10 hrs, Volume= 0.166 af
Primary = 2.47 cfs @ 12.10 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2

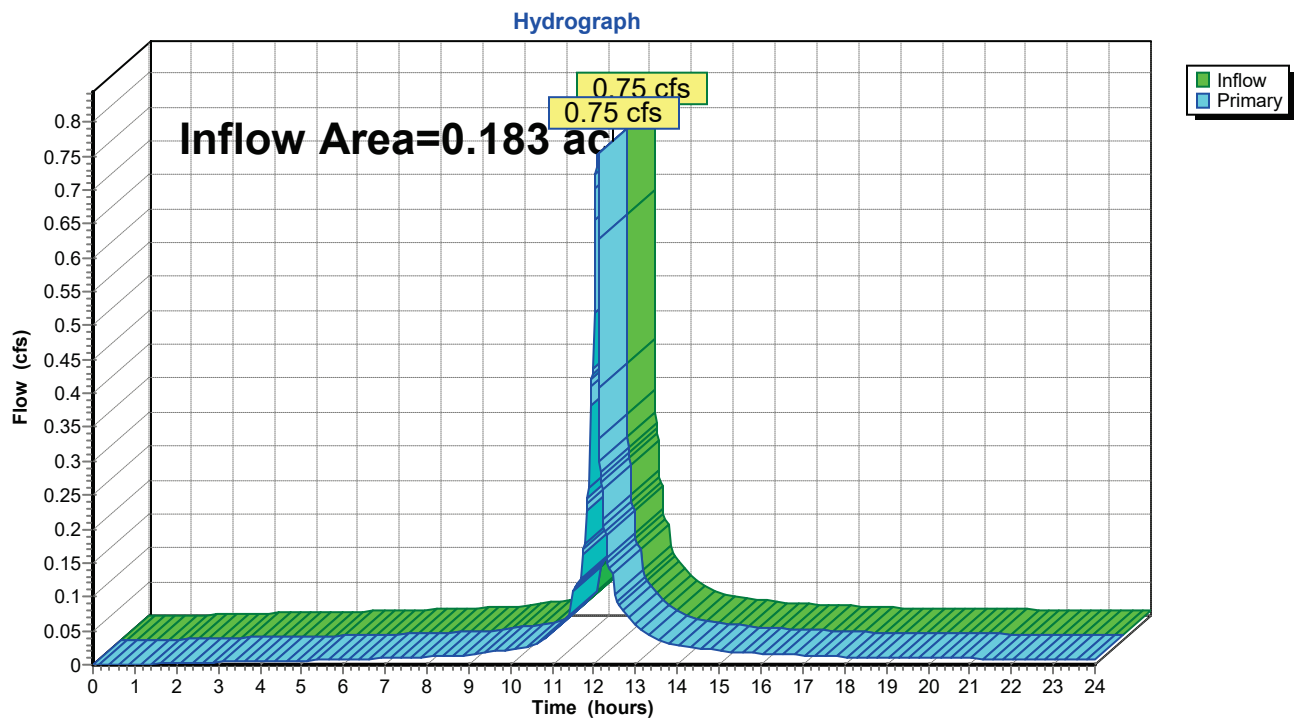


Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 3.23" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 0.75 cfs @ 12.10 hrs, Volume= 0.049 af
Primary = 0.75 cfs @ 12.10 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3

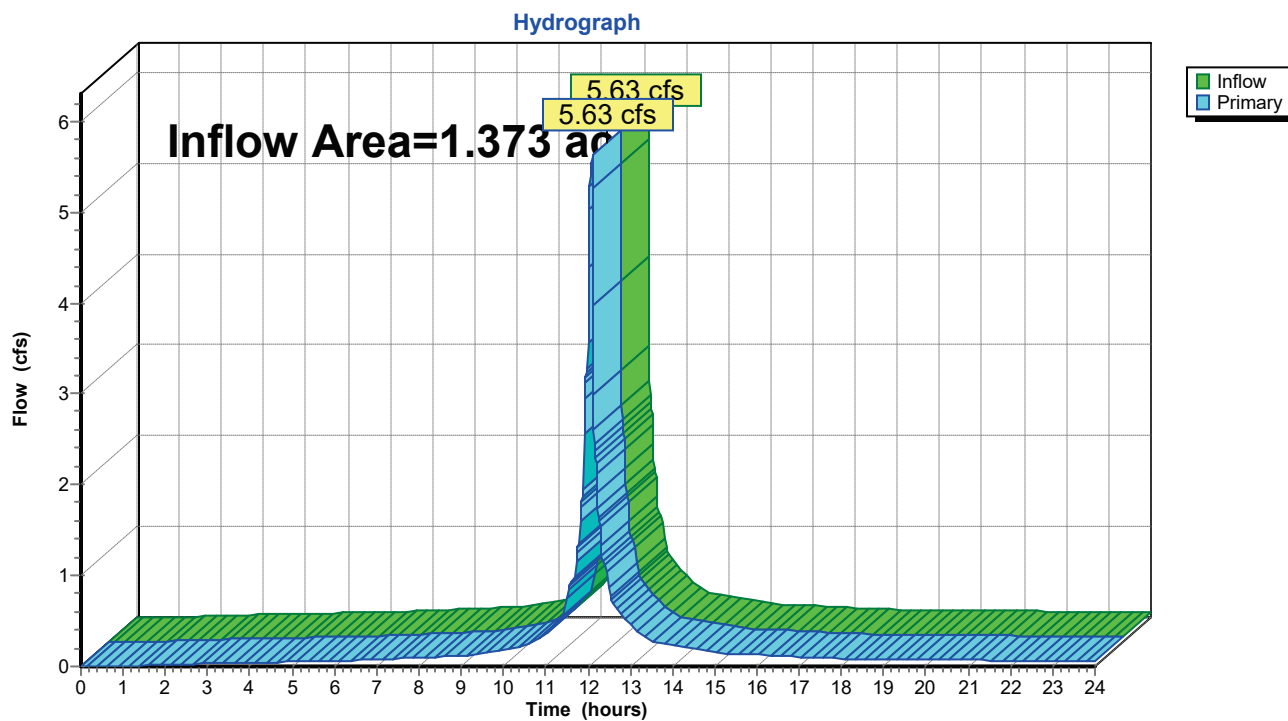


Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 3.33" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 5.63 cfs @ 12.10 hrs, Volume= 0.381 af
Primary = 5.63 cfs @ 12.10 hrs, Volume= 0.381 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 10: TOTAL



Summary for Subcatchment 1: Impervious

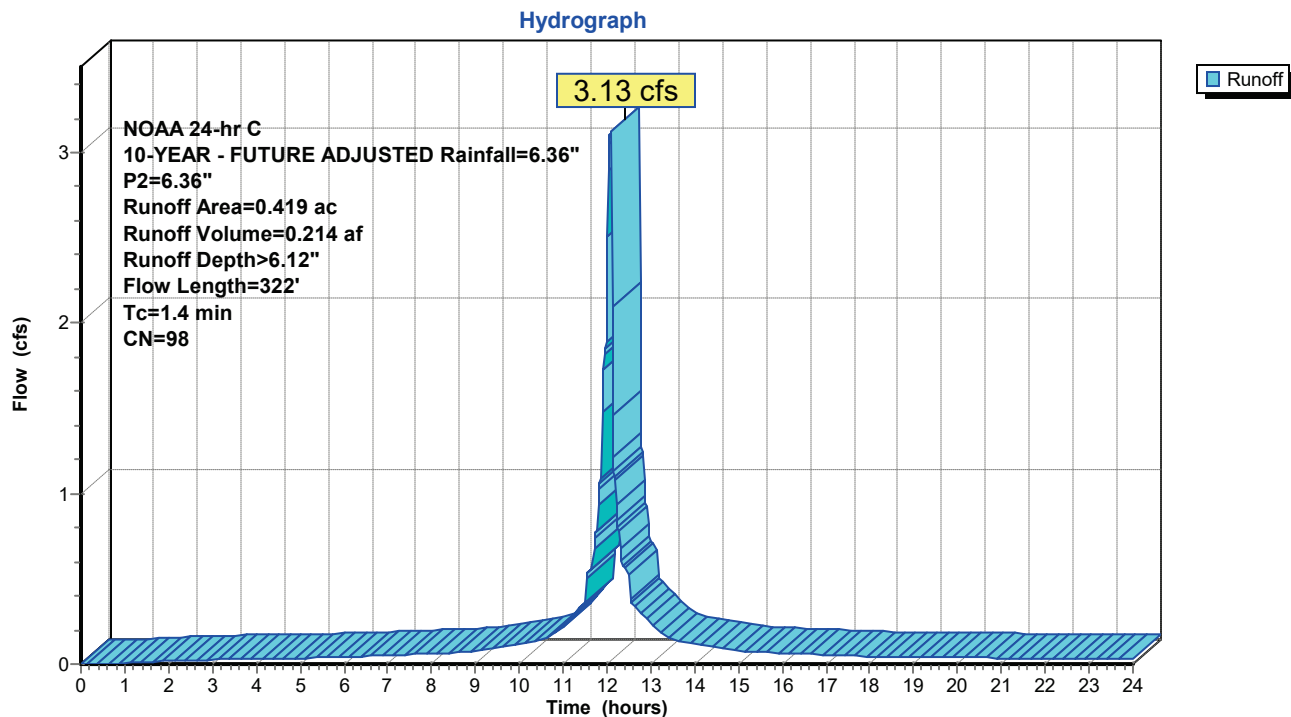
Runoff = 3.13 cfs @ 12.09 hrs, Volume= 0.214 af, Depth> 6.12"
 Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=6.36"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	14	0.0400	1.73		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 6.36"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C
					Paved Kv= 20.3 fps
1.4	322	Total			

Subcatchment 1: Impervious



Summary for Subcatchment 2: Pervious

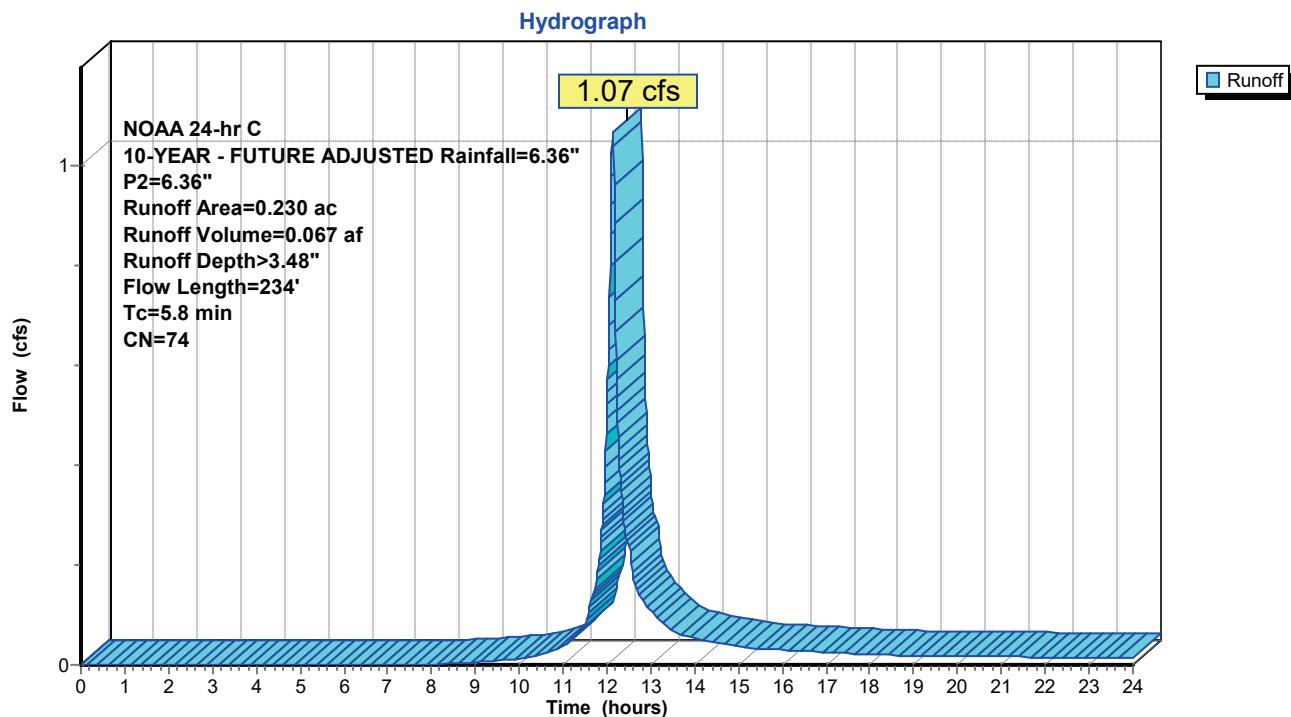
Runoff = 1.07 cfs @ 12.13 hrs, Volume= 0.067 af, Depth> 3.48"
 Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=6.36"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	70	0.0600	0.24		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 6.36"
0.3	30	0.0390	1.99		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 6.36"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
5.8	234	Total			

Subcatchment 2: Pervious



Summary for Subcatchment 4: Impervious

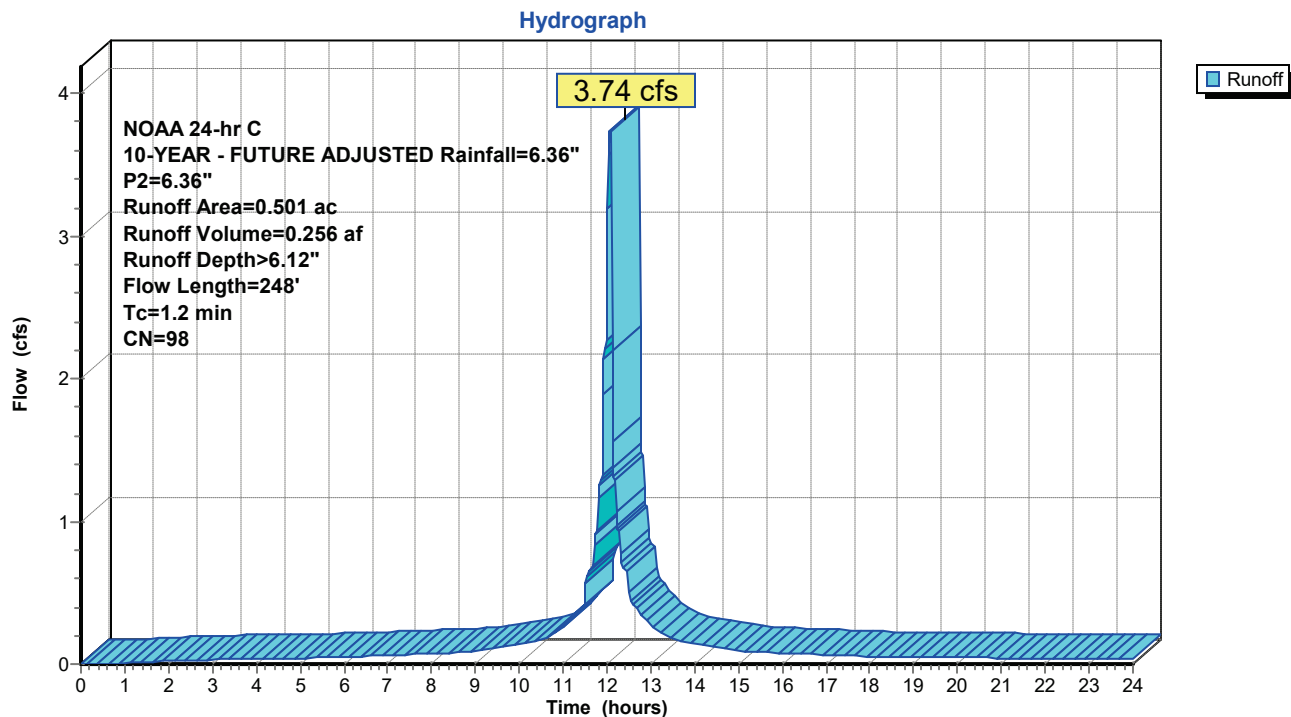
Runoff = 3.74 cfs @ 12.09 hrs, Volume= 0.256 af, Depth> 6.12"
 Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=6.36"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	100	0.0440	2.66		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 6.36"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D
					Paved Kv= 20.3 fps
1.2	248	Total			

Subcatchment 4: Impervious



Summary for Subcatchment 5: Pervious

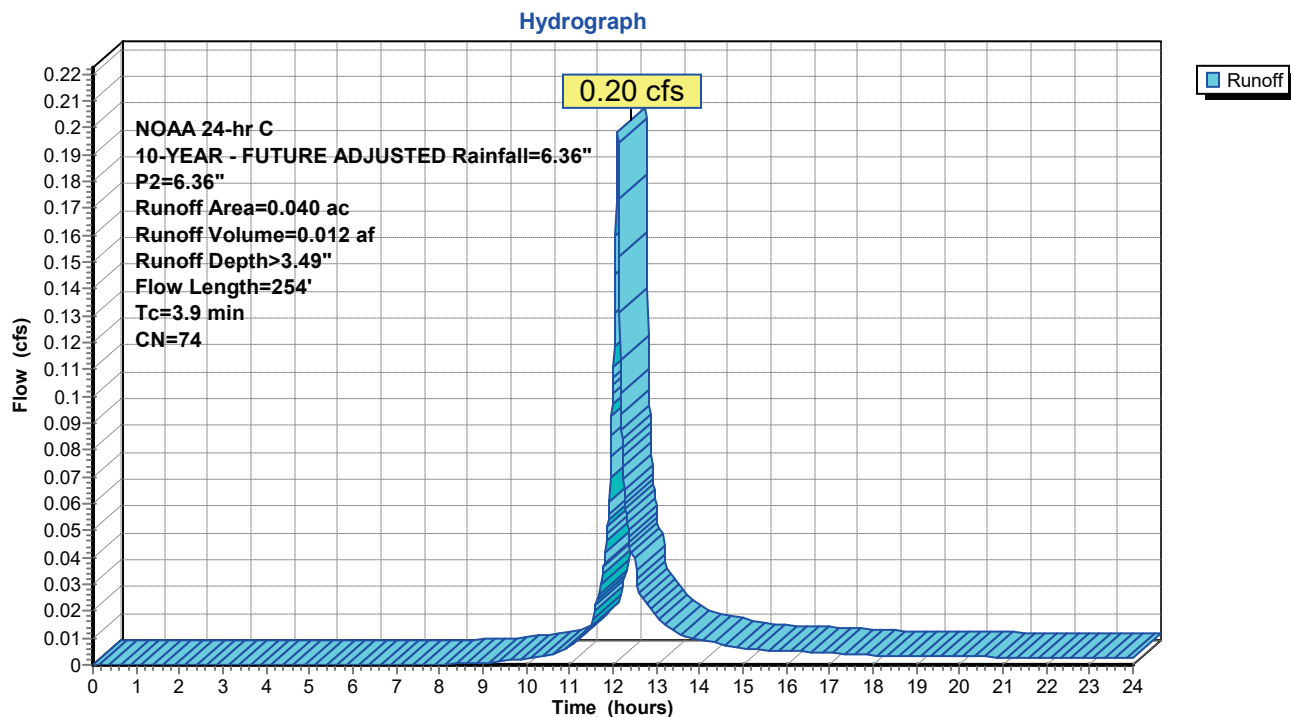
Runoff = 0.20 cfs @ 12.11 hrs, Volume= 0.012 af, Depth> 3.49"
 Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=6.36"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	28	0.0400	0.17		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 6.36"
0.5	72	0.0460	2.53		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 6.36"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
3.9	254	Total			

Subcatchment 5: Pervious



Summary for Subcatchment 7: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

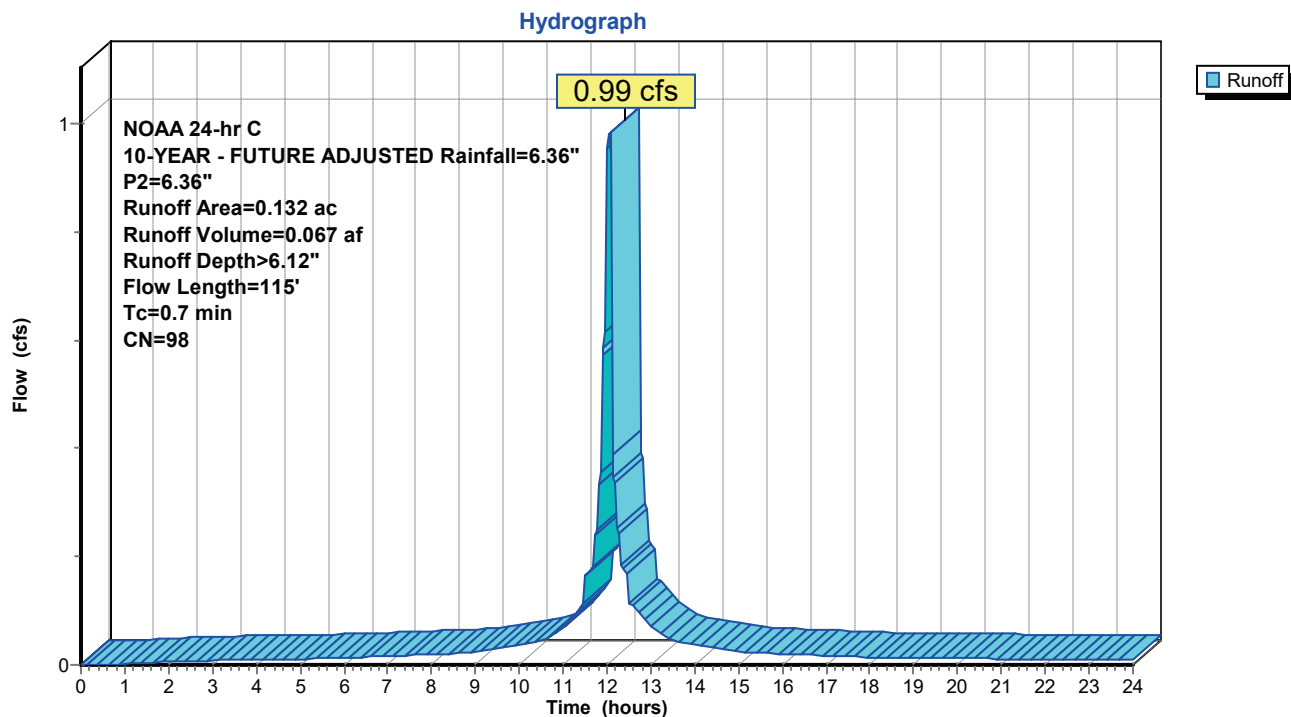
Runoff = 0.99 cfs @ 12.09 hrs, Volume= 0.067 af, Depth> 6.12"
 Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=6.36"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	85	0.0350	2.35		Sheet Flow, B-C
					Smooth surfaces $n=0.011$ P2= 6.36"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D
					Paved $K_v=20.3$ fps
0.7	115	Total			

Subcatchment 7: Impervious



Summary for Subcatchment 8: .054

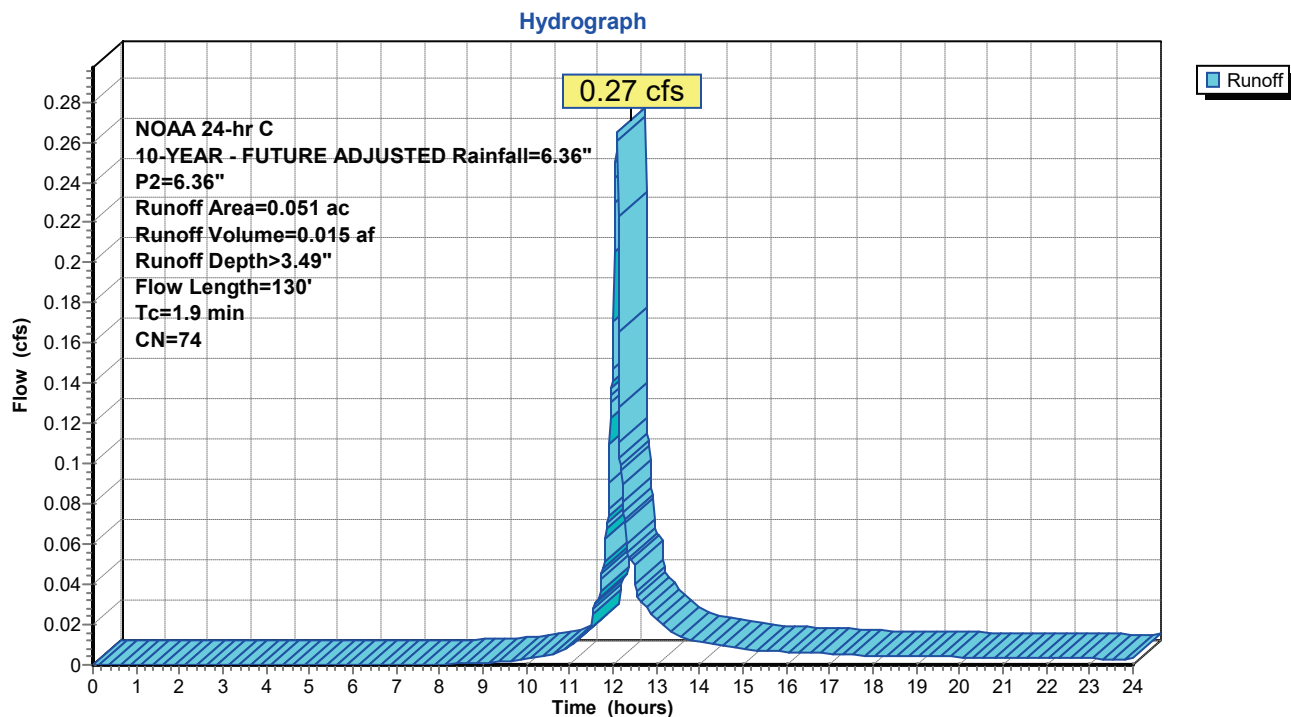
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 0.015 af, Depth> 3.49"
 Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=6.36"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	15	0.0850	0.20		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 6.36"
0.6	85	0.0300	2.21		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 6.36"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
1.9	130	Total			

Subcatchment 8: .054

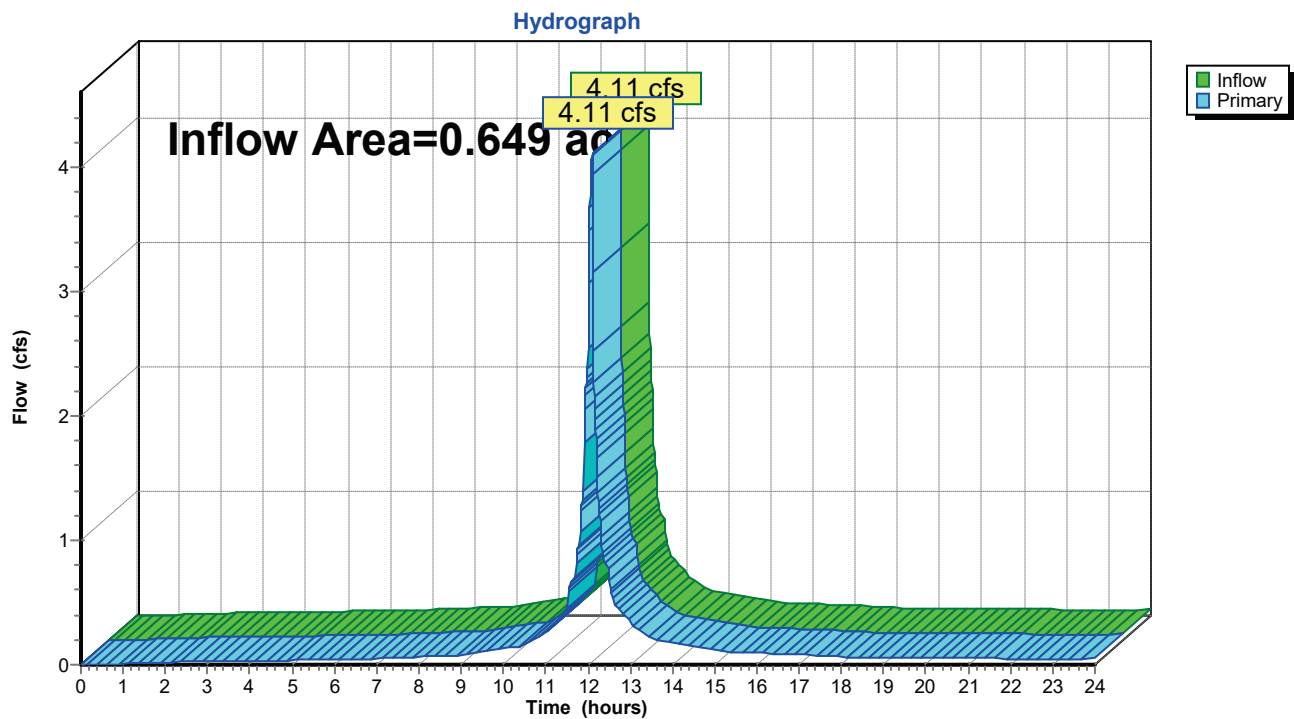


Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 5.19" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 4.11 cfs @ 12.10 hrs, Volume= 0.280 af
Primary = 4.11 cfs @ 12.10 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1

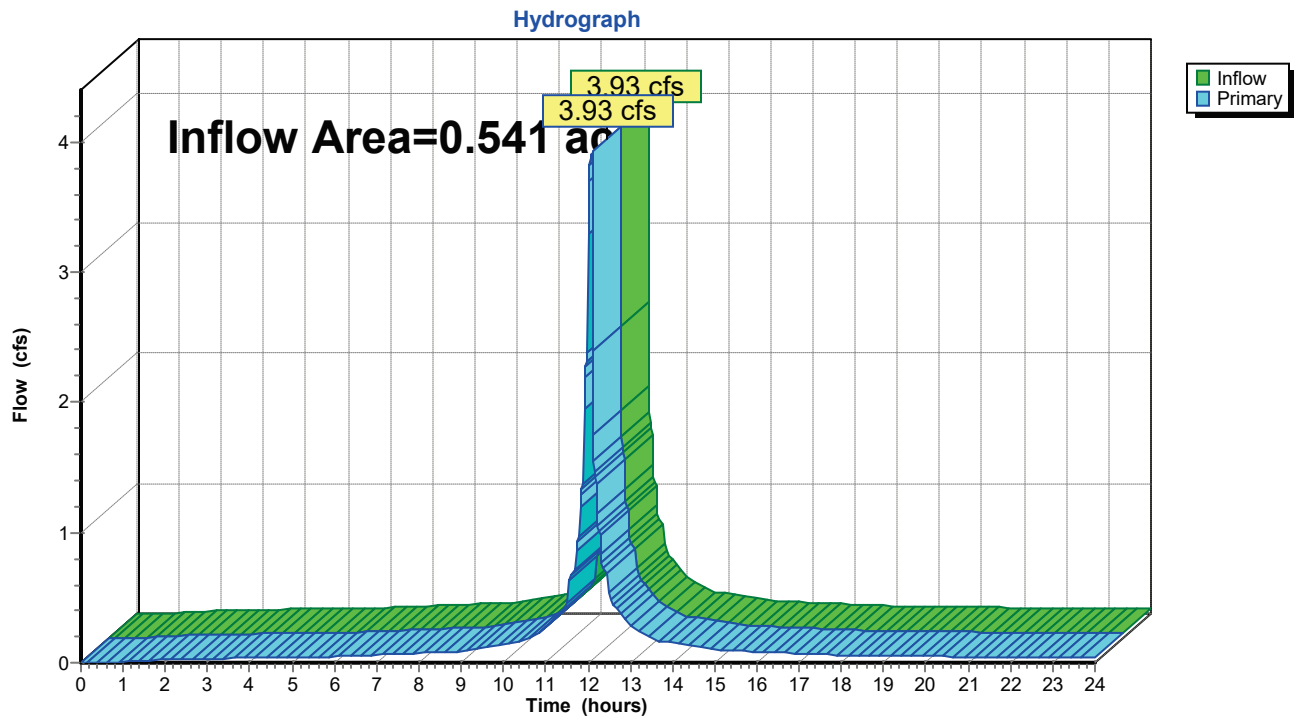


Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 5.93" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 3.93 cfs @ 12.10 hrs, Volume= 0.267 af
Primary = 3.93 cfs @ 12.10 hrs, Volume= 0.267 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2

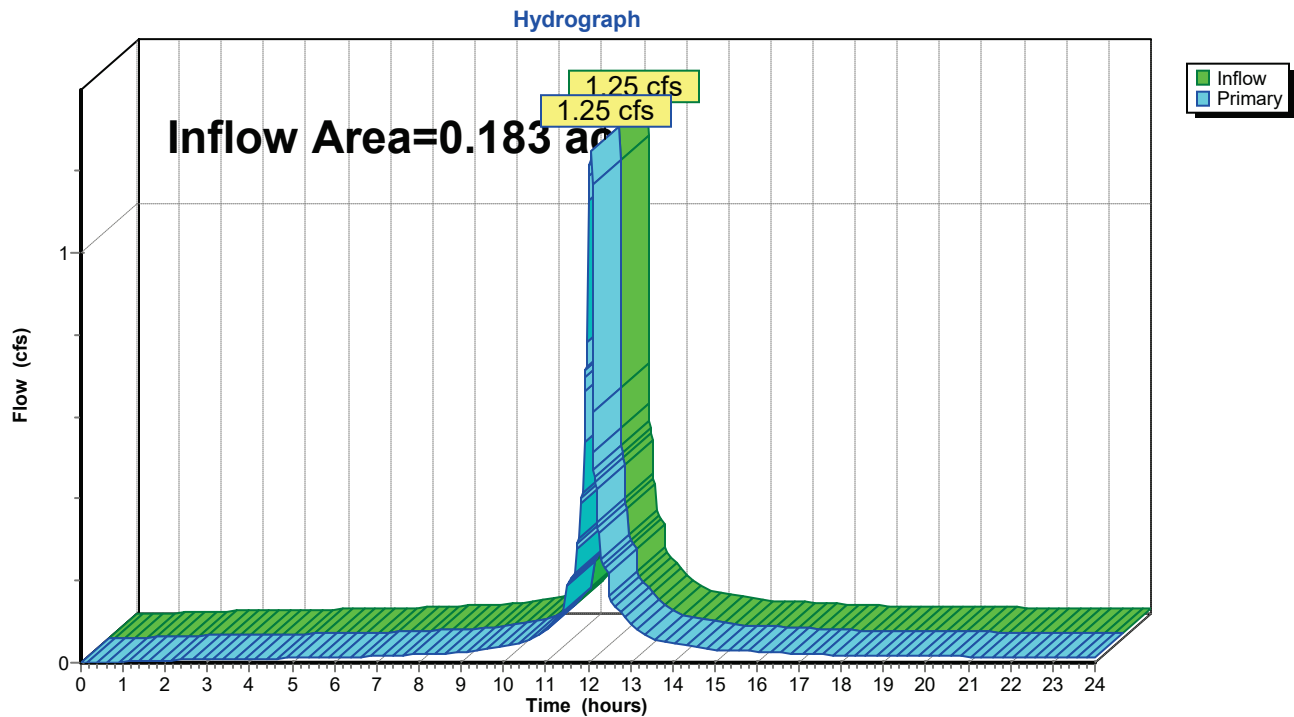


Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 5.39" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 1.25 cfs @ 12.09 hrs, Volume= 0.082 af
Primary = 1.25 cfs @ 12.09 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3

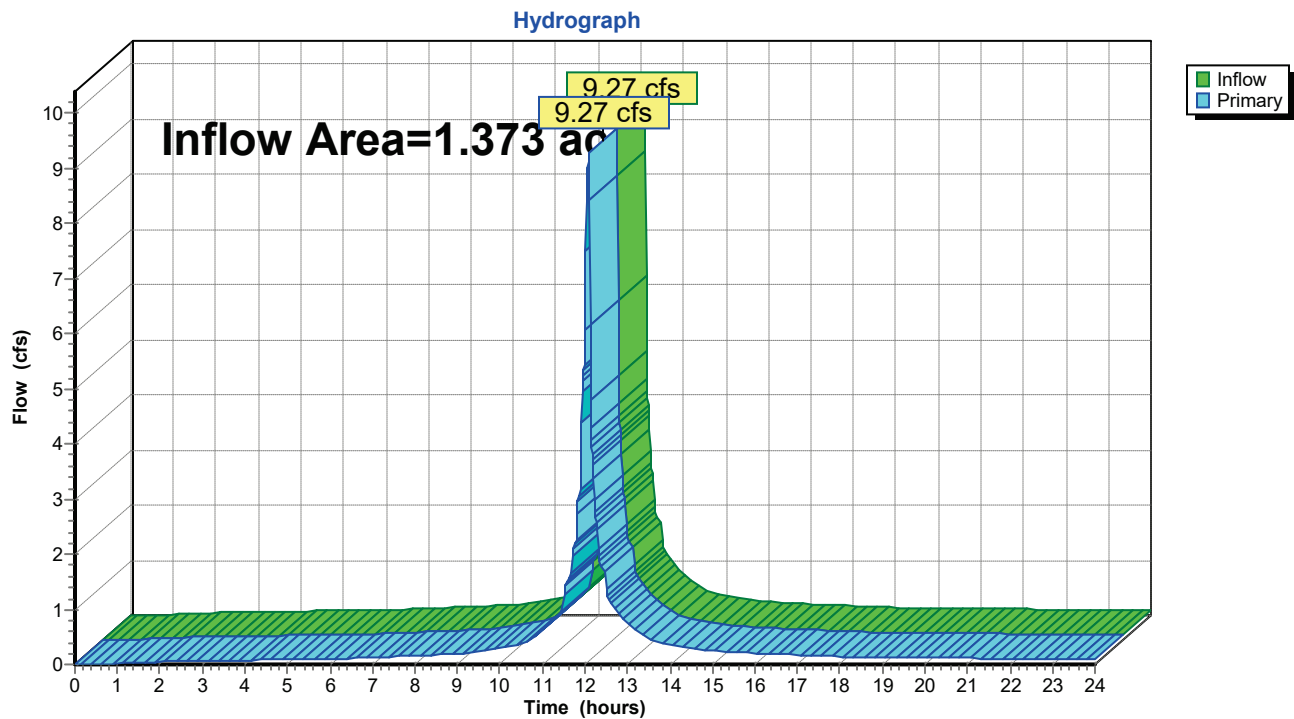


Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 5.50" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 9.27 cfs @ 12.10 hrs, Volume= 0.630 af
Primary = 9.27 cfs @ 12.10 hrs, Volume= 0.630 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 10: TOTAL



Summary for Subcatchment 1: Impervious

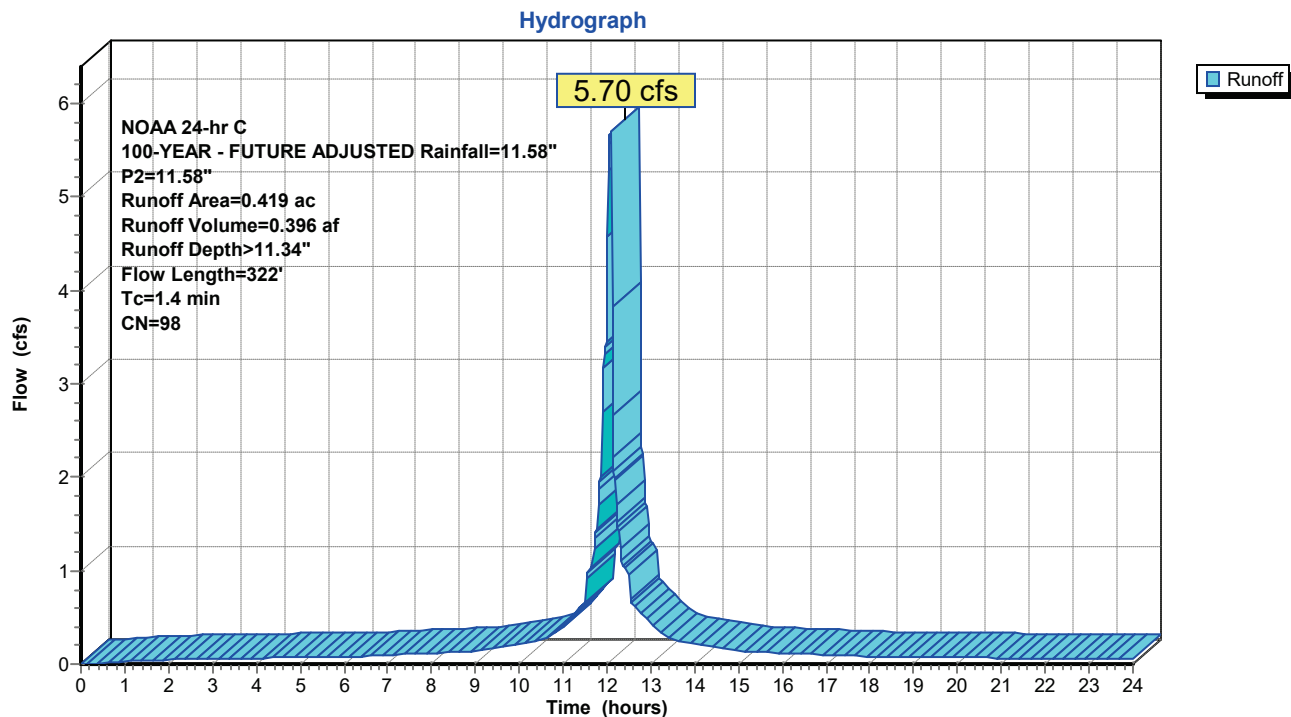
Runoff = 5.70 cfs @ 12.09 hrs, Volume= 0.396 af, Depth>11.34"
 Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=11.58"

Area (ac)	CN	Description
0.419	98	Paved parking, HSG C
0.419		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	14	0.0400	2.33		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 11.58"
1.3	308	0.0390	4.01		Shallow Concentrated Flow, B-C
					Paved Kv= 20.3 fps
1.4	322	Total			

Subcatchment 1: Impervious



Summary for Subcatchment 2: Pervious

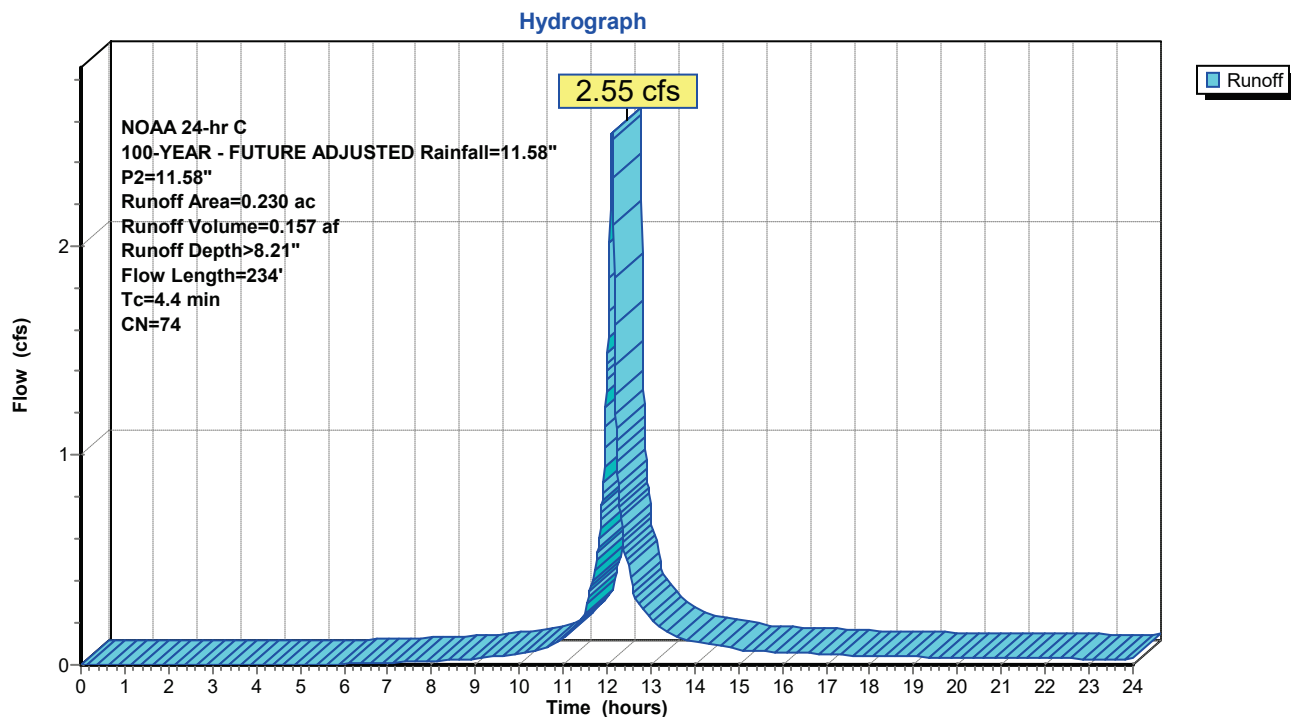
Runoff = 2.55 cfs @ 12.12 hrs, Volume= 0.157 af, Depth> 8.21"
 Routed to Link 3 : EX DI #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=11.58"

Area (ac)	CN	Description
0.230	74	>75% Grass cover, Good, HSG C
0.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	70	0.0600	0.32		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 11.58"
0.2	30	0.0390	2.69		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 11.58"
0.6	134	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
4.4	234	Total			

Subcatchment 2: Pervious



Summary for Subcatchment 4: Impervious

[49] Hint: Tc<2dt may require smaller dt

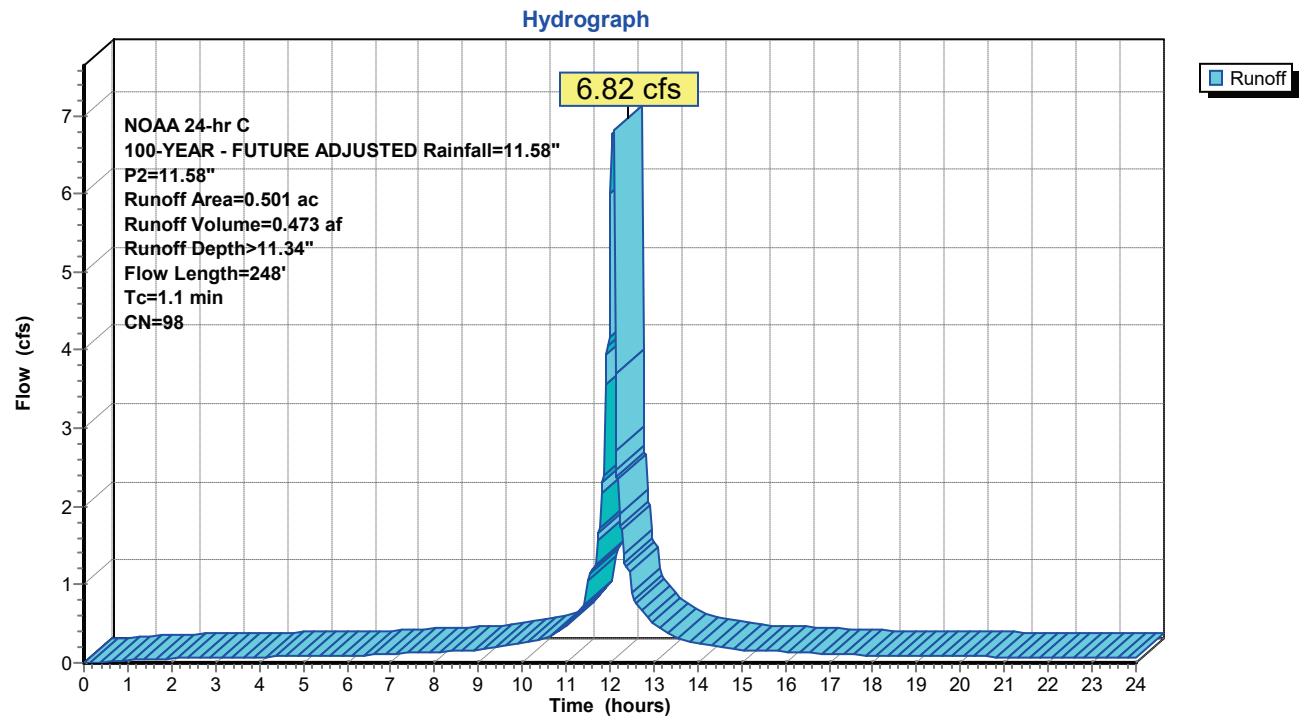
Runoff = 6.82 cfs @ 12.09 hrs, Volume= 0.473 af, Depth>11.34"
Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=11.58"

Area (ac)	CN	Description
0.501	98	Paved parking, HSG C
0.501		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.0440	3.59		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 11.58"
0.6	148	0.0390	4.01		Shallow Concentrated Flow, C-D
					Paved Kv= 20.3 fps
1.1	248	Total			

Subcatchment 4: Impervious



Summary for Subcatchment 5: Pervious

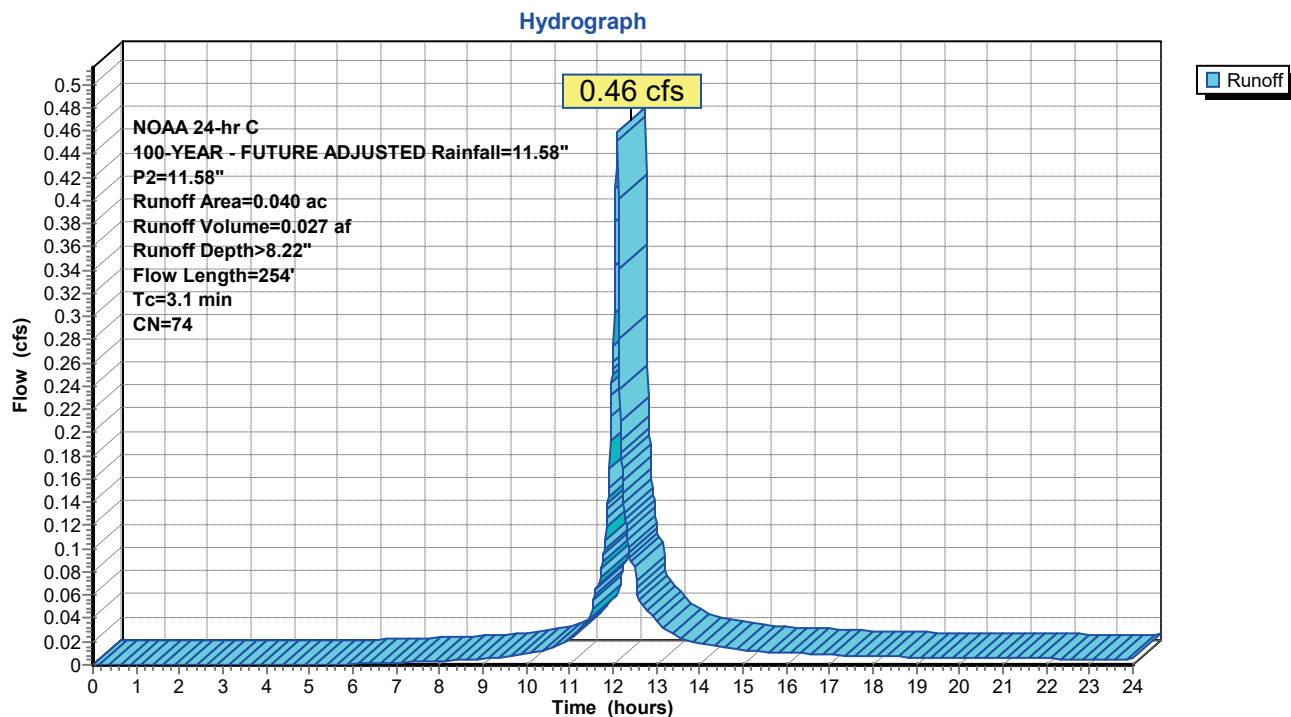
Runoff = 0.46 cfs @ 12.11 hrs, Volume= 0.027 af, Depth> 8.22"
 Routed to Link 6 : EX DI#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=11.58"

Area (ac)	CN	Description
0.040	74	>75% Grass cover, Good, HSG C
0.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	28	0.0400	0.23		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 11.58"
0.4	72	0.0460	3.42		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 11.58"
0.6	154	0.0390	4.01		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
3.1	254	Total			

Subcatchment 5: Pervious



Summary for Subcatchment 7: Impervious

[49] Hint: $T_c < 2dt$ may require smaller dt

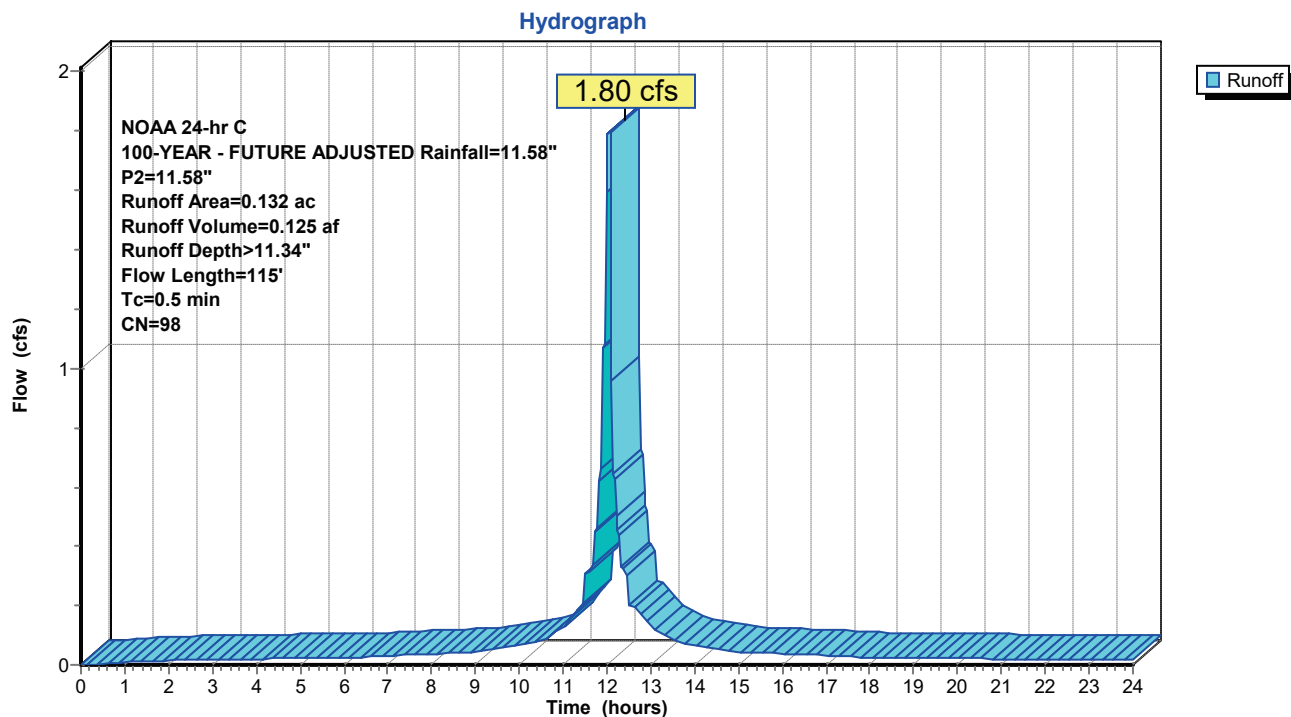
Runoff = 1.80 cfs @ 12.09 hrs, Volume= 0.125 af, Depth>11.34"
 Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.01$ hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=11.58"

Area (ac)	CN	Description
0.132	98	Paved parking, HSG C
0.132		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	85	0.0350	3.17		Sheet Flow, B-C
					Smooth surfaces $n=0.011$ P2= 11.58"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D
					Paved $K_v=20.3$ fps
0.5	115	Total			

Subcatchment 7: Impervious



Summary for Subcatchment 8: .054

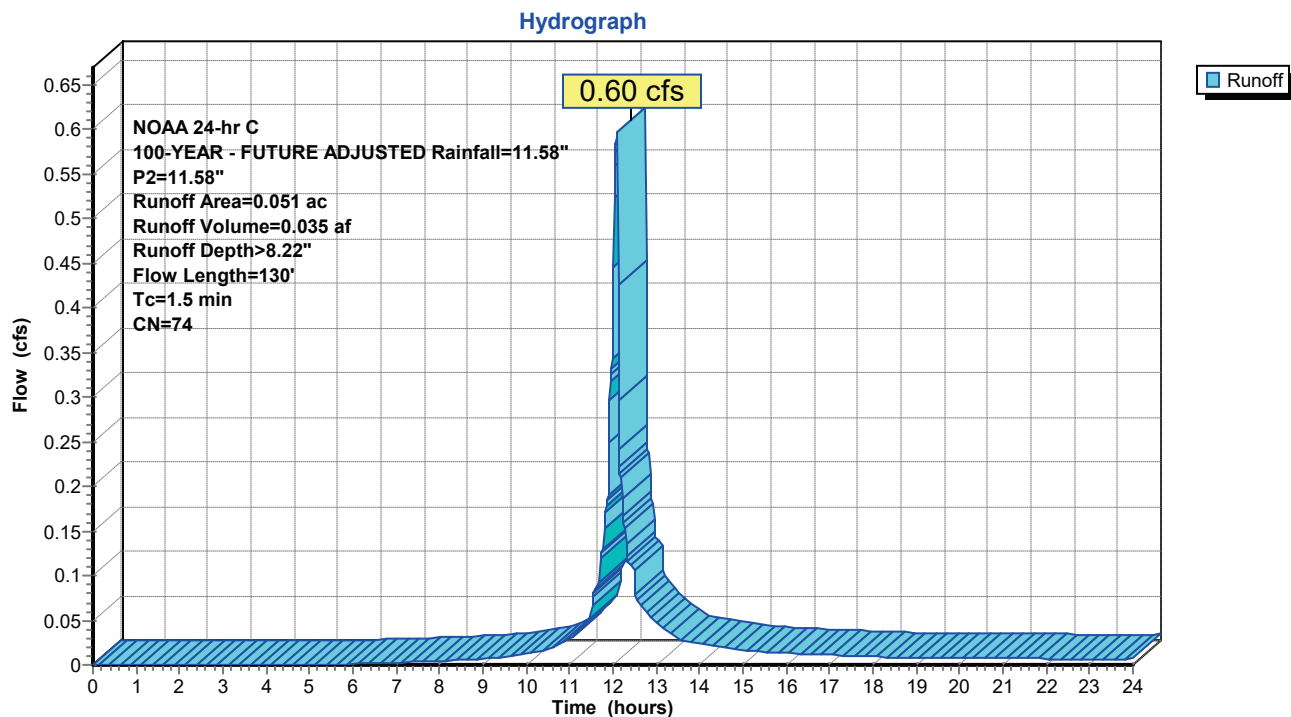
Runoff = 0.60 cfs @ 12.10 hrs, Volume= 0.035 af, Depth> 8.22"
 Routed to Link 9 : EX DA#3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=11.58"

Area (ac)	CN	Description
0.051	74	>75% Grass cover, Good, HSG C
0.051		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	15	0.0850	0.27		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 11.58"
0.5	85	0.0300	2.98		Sheet Flow, B-C Smooth surfaces n= 0.011 P2= 11.58"
0.1	30	0.0300	3.52		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
1.5	130	Total			

Subcatchment 8: .054

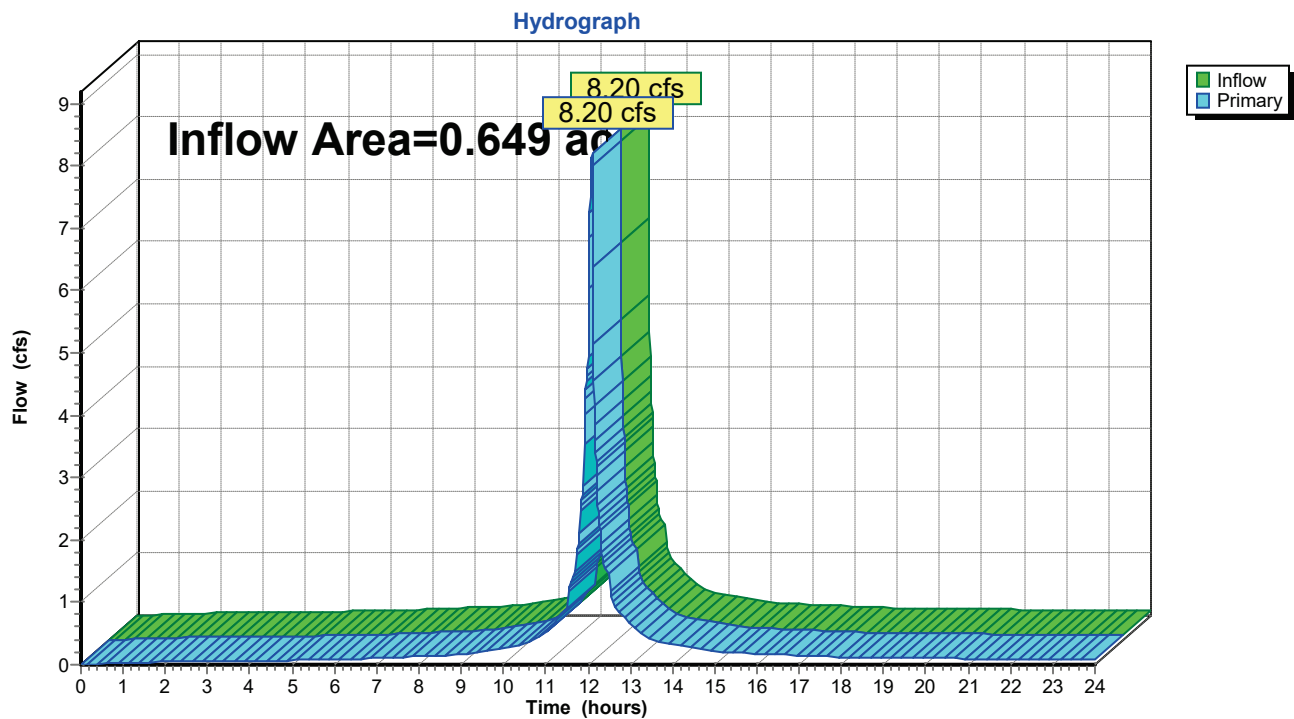


Summary for Link 3: EX DI #1

Inflow Area = 0.649 ac, 64.56% Impervious, Inflow Depth > 10.23" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 8.20 cfs @ 12.10 hrs, Volume= 0.553 af
Primary = 8.20 cfs @ 12.10 hrs, Volume= 0.553 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 3: EX DI #1

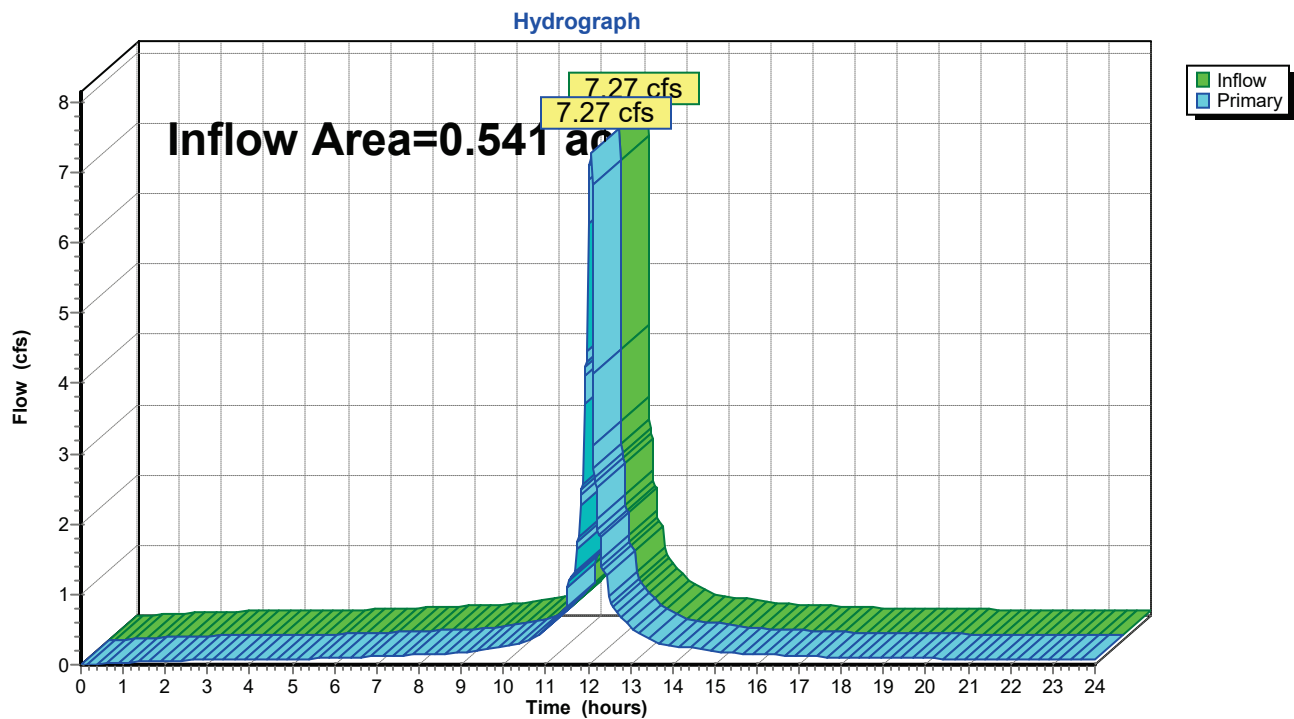


Summary for Link 6: EX DI#2

Inflow Area = 0.541 ac, 92.61% Impervious, Inflow Depth > 11.11" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 7.27 cfs @ 12.09 hrs, Volume= 0.501 af
Primary = 7.27 cfs @ 12.09 hrs, Volume= 0.501 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6: EX DI#2

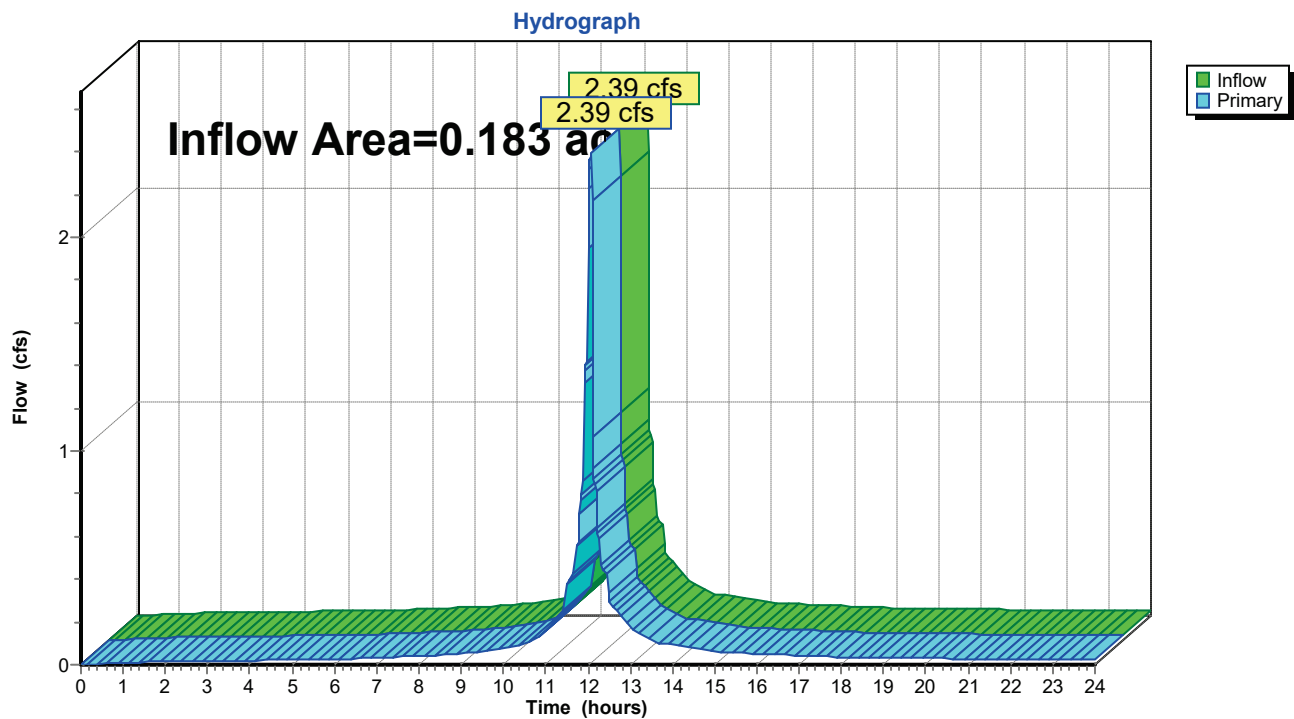


Summary for Link 9: EX DA#3

Inflow Area = 0.183 ac, 72.13% Impervious, Inflow Depth > 10.47" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 2.39 cfs @ 12.09 hrs, Volume= 0.160 af
Primary = 2.39 cfs @ 12.09 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min
Routed to Link 10 : TOTAL

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 9: EX DA#3

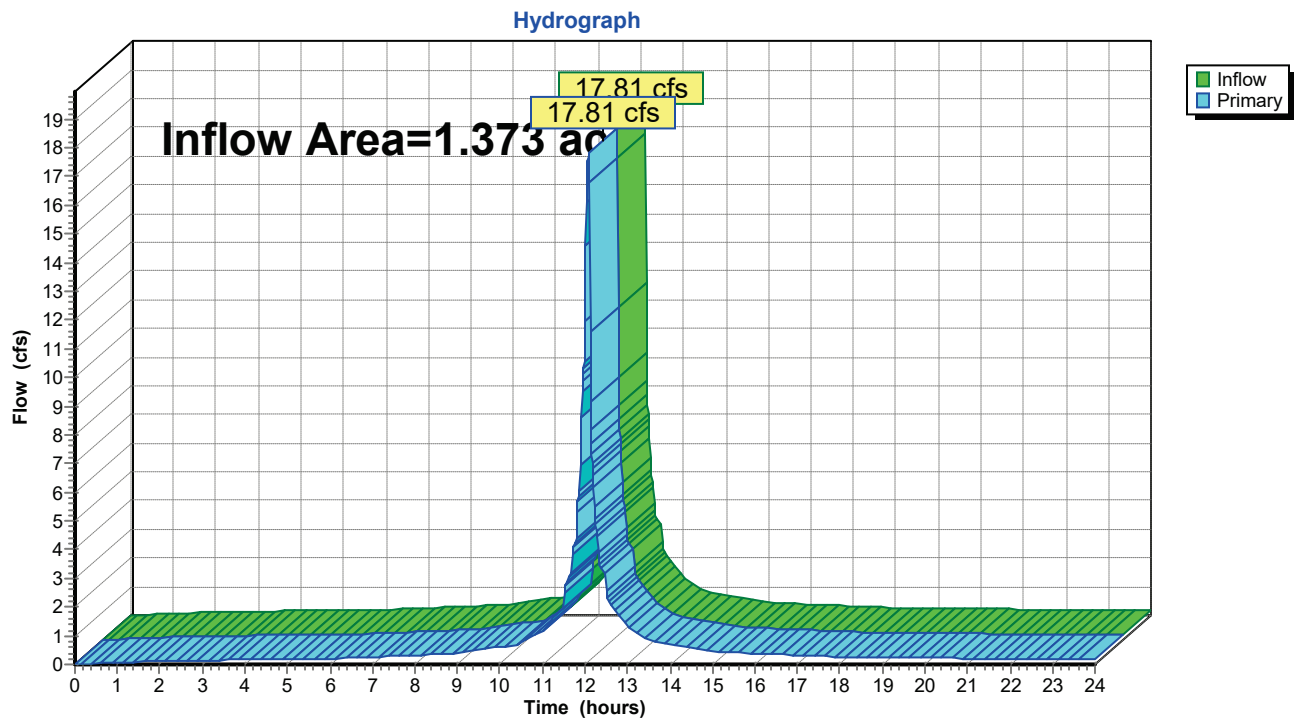


Summary for Link 10: TOTAL

Inflow Area = 1.373 ac, 76.62% Impervious, Inflow Depth > 10.61" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 17.81 cfs @ 12.10 hrs, Volume= 1.214 af
Primary = 17.81 cfs @ 12.10 hrs, Volume= 1.214 af, Atten= 0%, Lag= 0.0 min

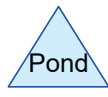
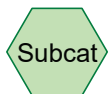
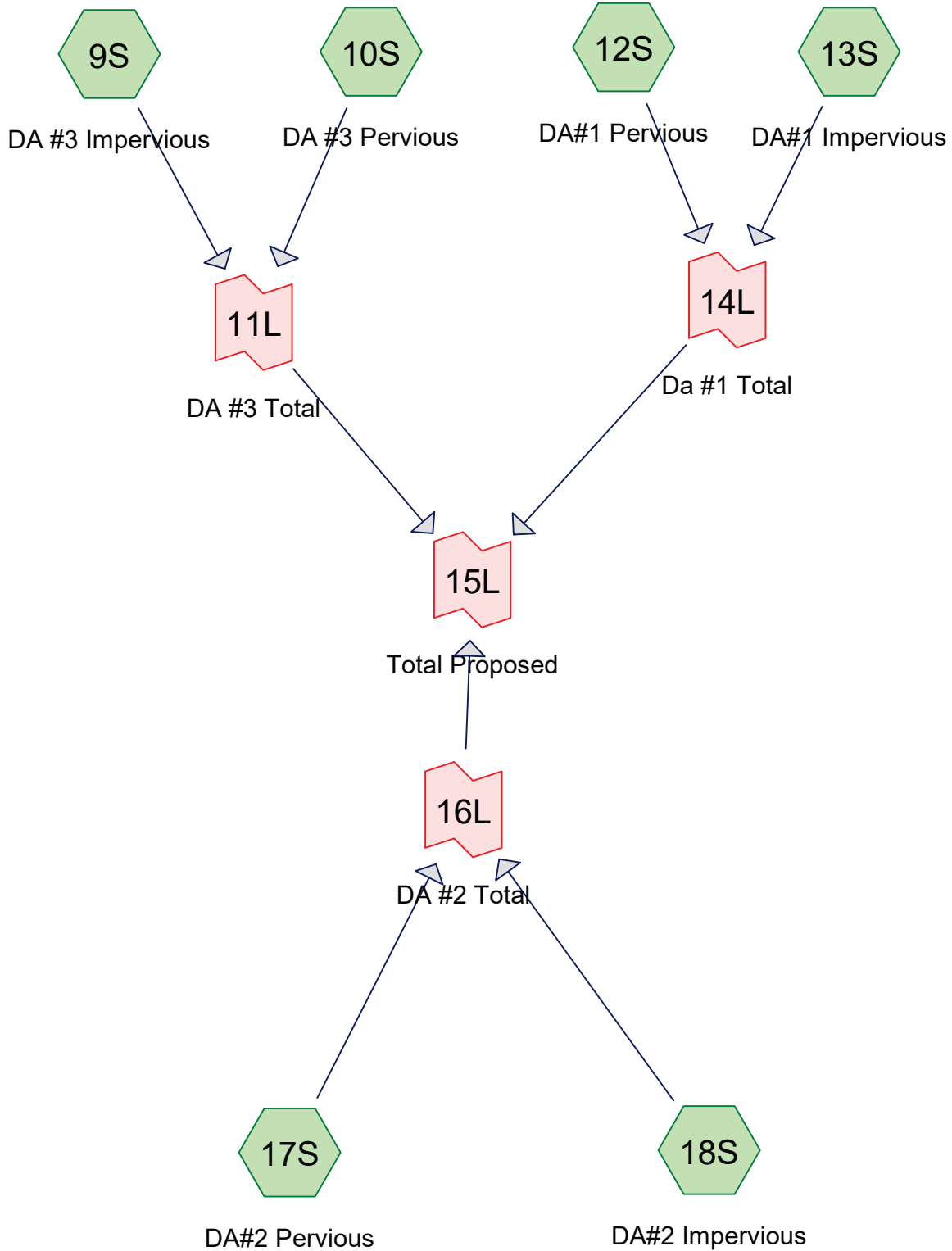
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 10: TOTAL



APPENDIX D

Post-Development Hydrographs Future Adjusted Precipitation Depths



Routing Diagram for Proposed Conditions

Prepared by Bright View Engineering, Printed 1/21/2026
HydroCAD® 10.20-8a s/n 13803 © 2025 HydroCAD Software Solutions LLC

Summary for Subcatchment 9S: DA #3 Impervious

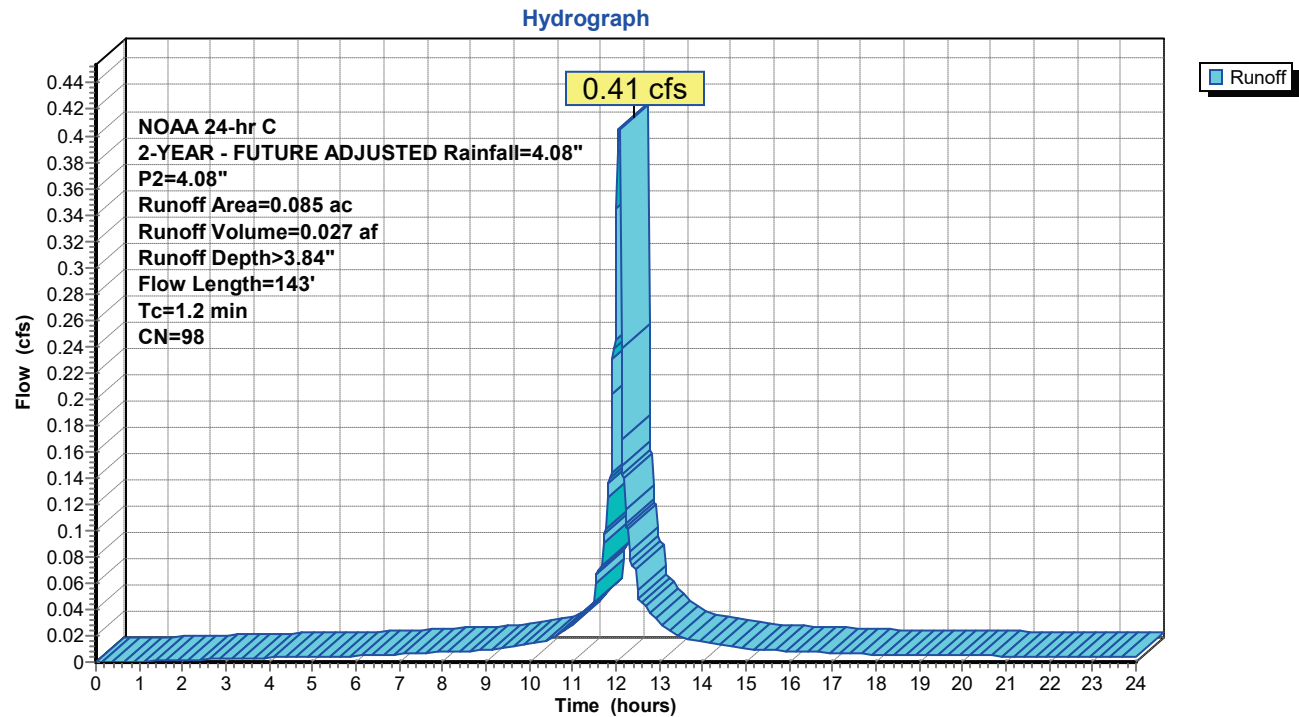
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 3.84"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.085	98	Paved parking, HSG C
0.085		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	70	0.0500	2.09		Sheet Flow, Parking Segment 1
					Smooth surfaces n= 0.011 P2= 4.08"
0.6	73	0.0100	2.03		Shallow Concentrated Flow, Parking Segment 2
					Paved Kv= 20.3 fps
1.2	143	Total			

Subcatchment 9S: DA #3 Impervious



Summary for Subcatchment 10S: DA #3 Pervious

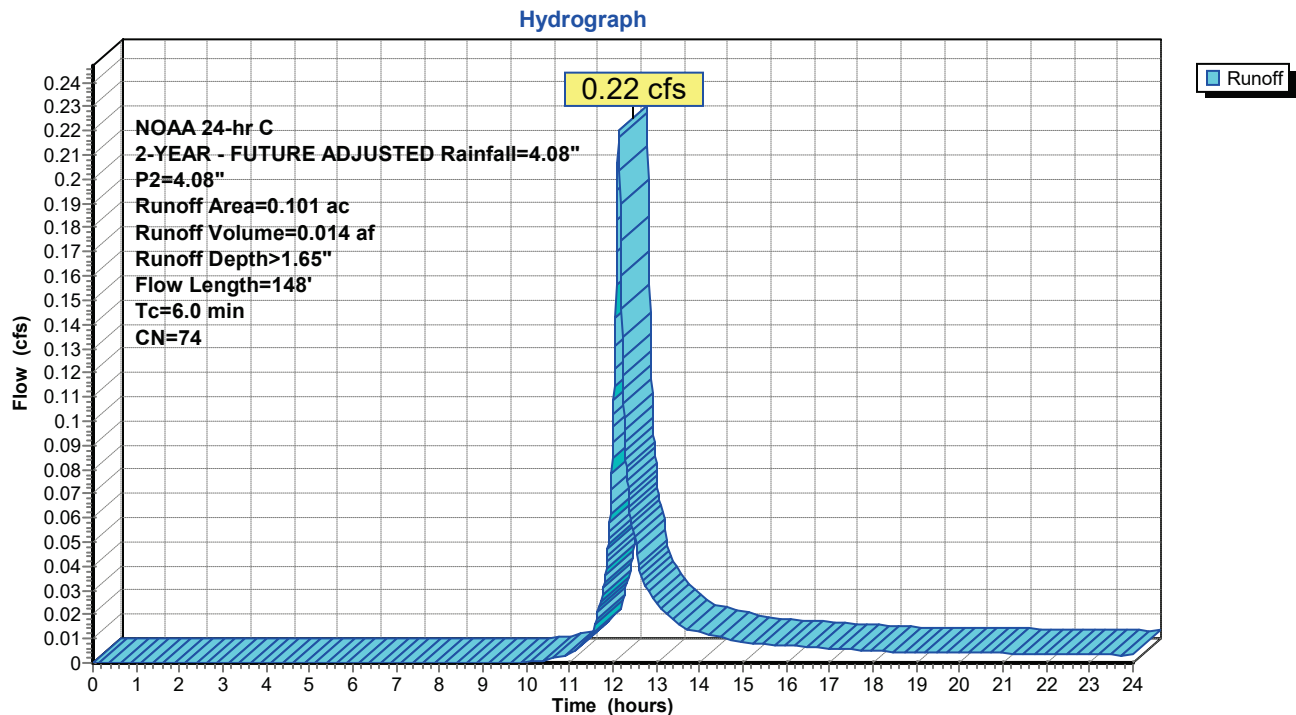
Runoff = 0.22 cfs @ 12.14 hrs, Volume= 0.014 af, Depth> 1.65"
 Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.101	74	>75% Grass cover, Good, HSG C
0.101		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	28	0.0140	0.09		Sheet Flow, Lawn area Grass: Dense n= 0.240 P2= 4.08"
0.2	43	0.0500	4.54		Shallow Concentrated Flow, Parking Lot 1 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
0.2	21	0.0100	2.03		Shallow Concentrated Flow, Parking Third Segment Paved Kv= 20.3 fps
6.0	148	Total			

Subcatchment 10S: DA #3 Pervious



Summary for Subcatchment 12S: DA#1 Pervious

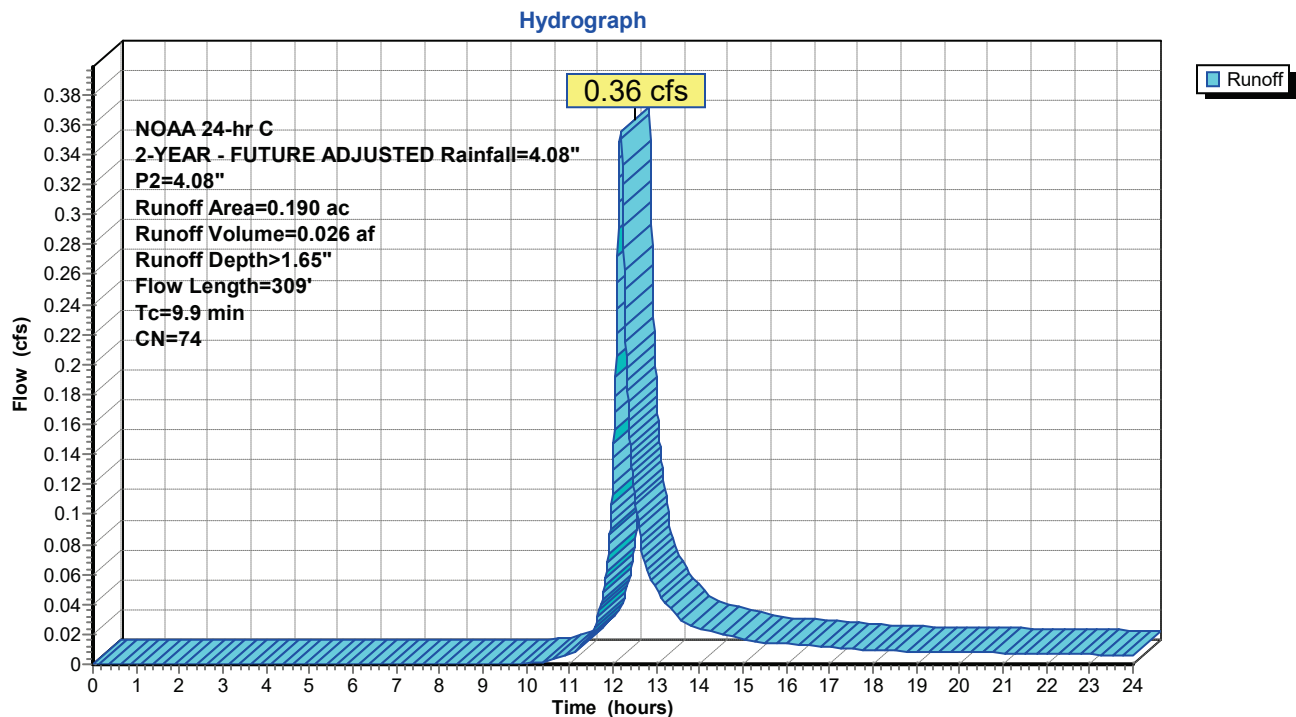
Runoff = 0.36 cfs @ 12.18 hrs, Volume= 0.026 af, Depth> 1.65"
 Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.190	74	>75% Grass cover, Good, HSG C
0.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	64	0.0500	0.17		Sheet Flow, Segment 1 Grass: Dense n= 0.240 P2= 4.08"
2.9	25	0.0500	0.14		Sheet Flow, Segment 2 Grass: Dense n= 0.240 P2= 4.08"
0.3	93	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.2	22	0.0100	2.03		Shallow Concentrated Flow, Segment 4 Paved Kv= 20.3 fps
0.4	105	0.0100	4.91	3.86	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
9.9	309	Total			

Subcatchment 12S: DA#1 Pervious



Summary for Subcatchment 13S: DA#1 Impervious

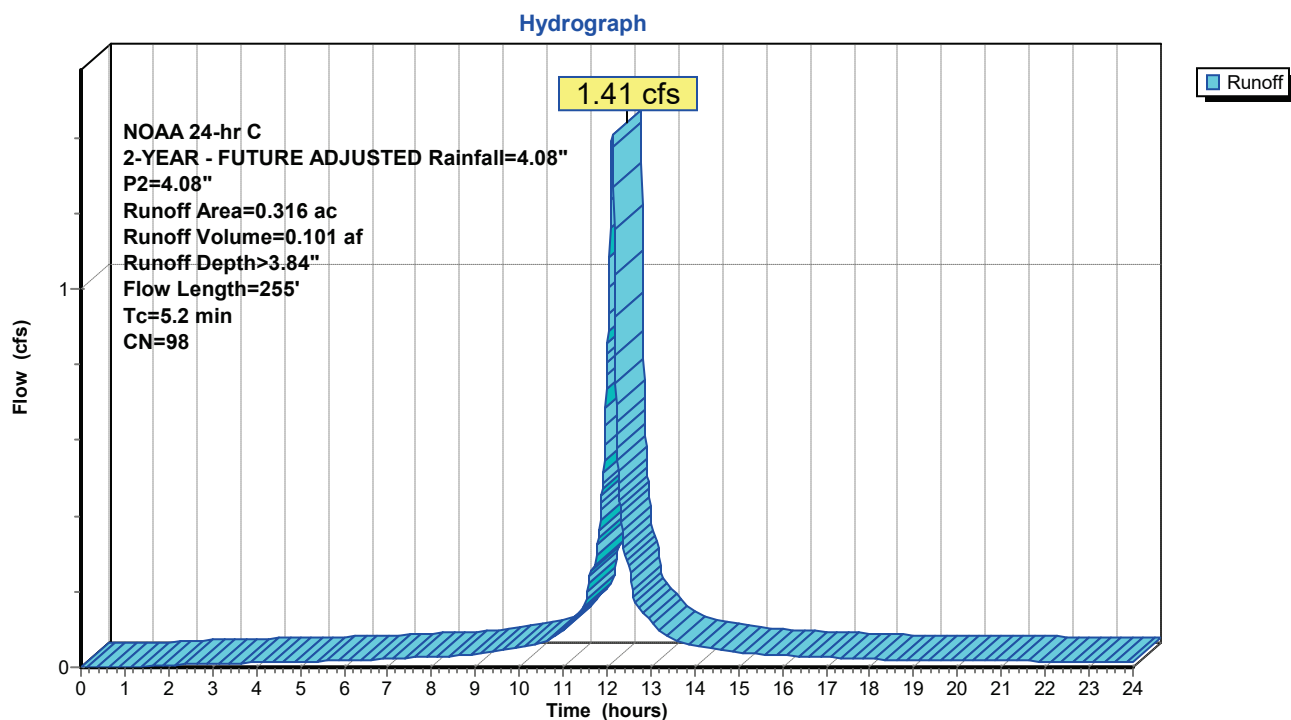
Runoff = 1.41 cfs @ 12.12 hrs, Volume= 0.101 af, Depth> 3.84"
 Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.316	98	Paved parking, HSG C
0.316		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	28	0.0300	0.12		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 4.08"
0.4	44	0.0500	1.90		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 4.08"
0.2	60	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.5	61	0.0100	2.03		Shallow Concentrated Flow, Segment #4 Paved Kv= 20.3 fps
0.2	62	0.0100	4.91	3.86	Pipe Channel, Segment 5 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.2	255	Total			

Subcatchment 13S: DA#1 Impervious



Summary for Subcatchment 17S: DA#2 Pervious

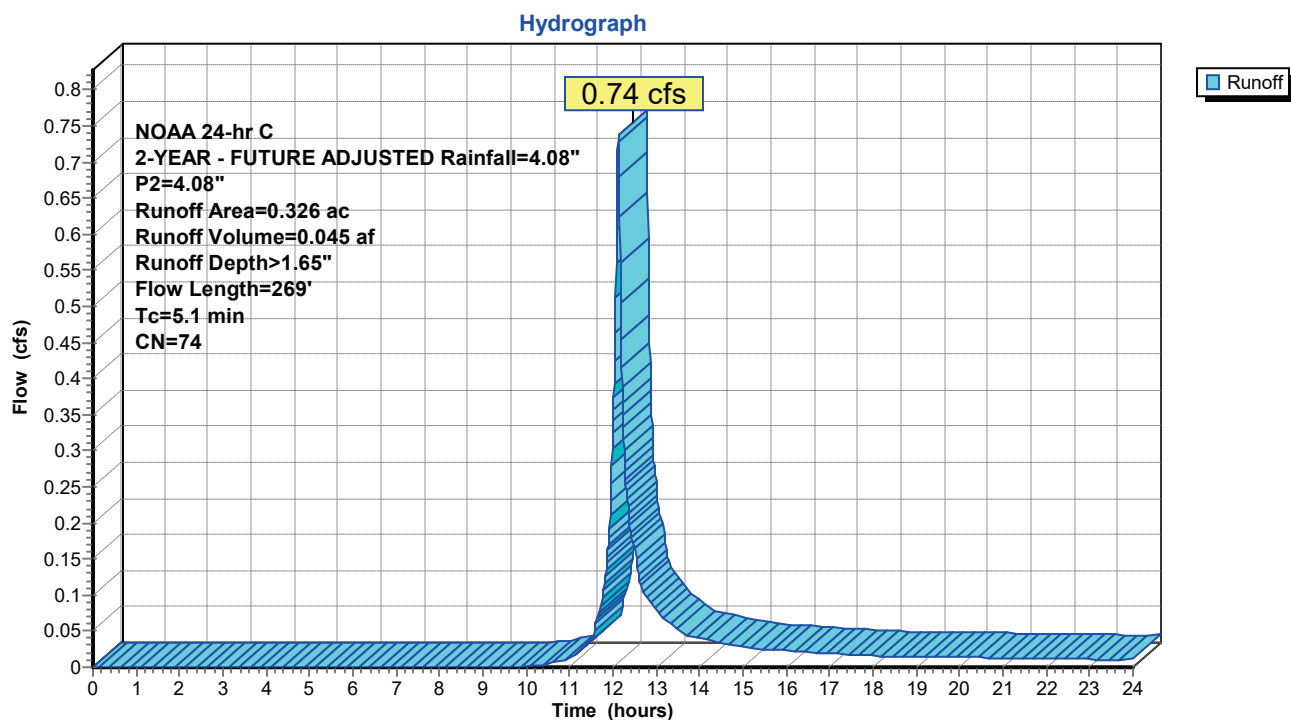
Runoff = 0.74 cfs @ 12.13 hrs, Volume= 0.045 af, Depth> 1.65"
 Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.326	74	>75% Grass cover, Good, HSG C
0.326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.0400	0.14		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 4.08"
0.3	30	0.0500	1.76		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 4.08"
0.5	123	0.0500	4.54		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.5	56	0.0100	2.03		Shallow Concentrated Flow, Segment #5 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #6 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.1	269	Total			

Subcatchment 17S: DA#2 Pervious



Summary for Subcatchment 18S: DA#2 Impervious

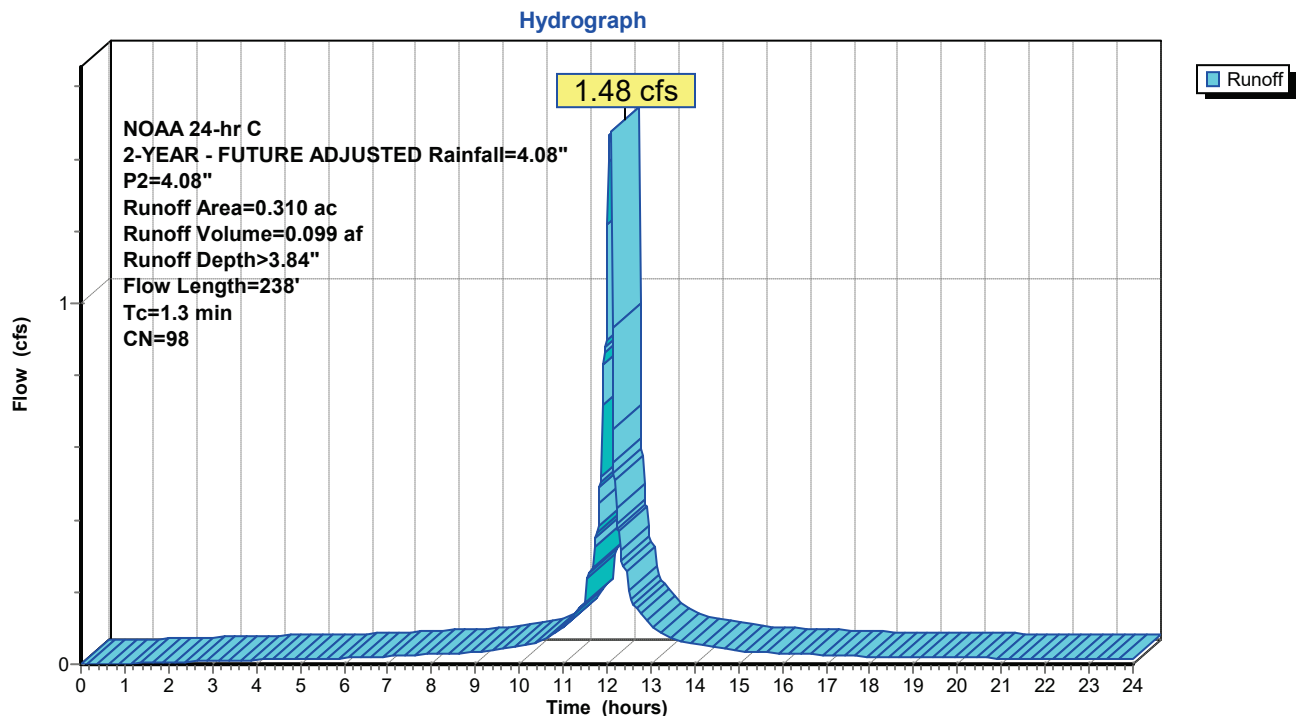
Runoff = 1.48 cfs @ 12.09 hrs, Volume= 0.099 af, Depth> 3.84"
 Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-YEAR - FUTURE ADJUSTED Rainfall=4.08", P2=4.08"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG C
0.310		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	80	0.0500	2.14		Sheet Flow, Segment #1 Smooth surfaces n= 0.011 P2= 4.08"
0.3	72	0.0500	4.54		Shallow Concentrated Flow, Segment #2 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #4 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.3	238	Total			

Subcatchment 18S: DA#2 Impervious

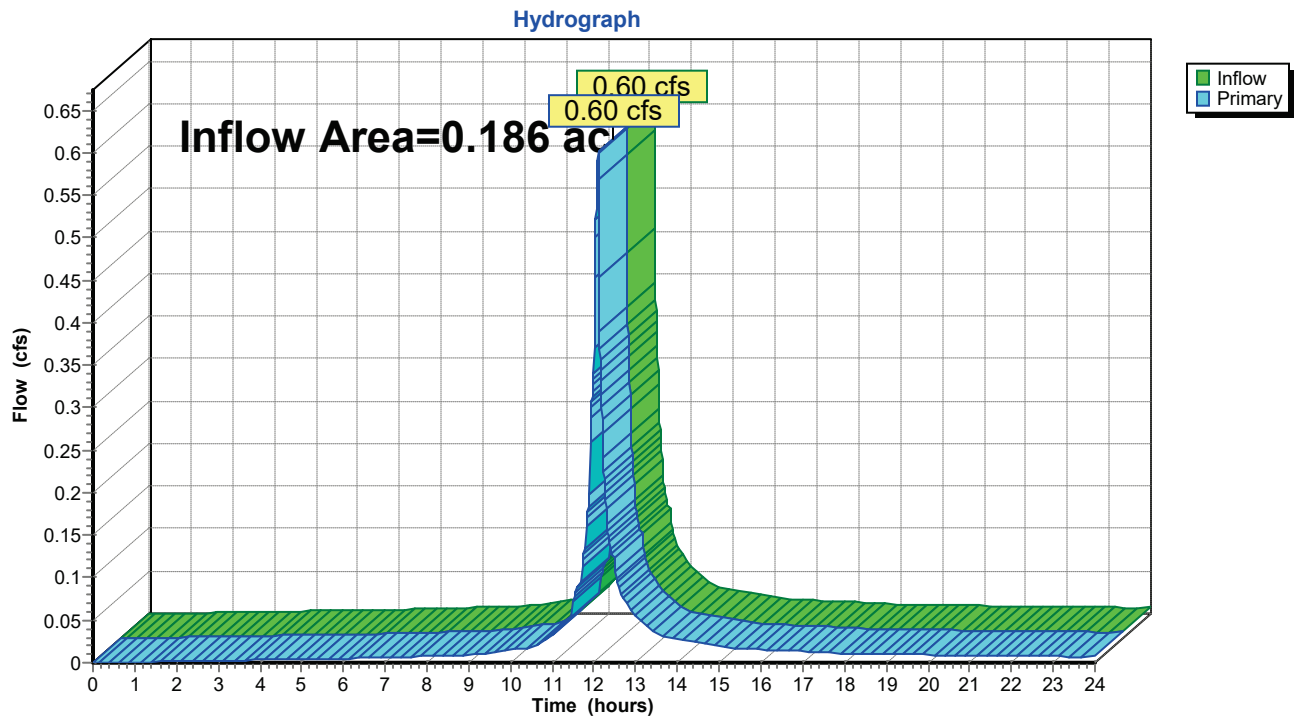


Summary for Link 11L: DA #3 Total

Inflow Area = 0.186 ac, 45.70% Impervious, Inflow Depth > 2.65" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 0.60 cfs @ 12.10 hrs, Volume= 0.041 af
Primary = 0.60 cfs @ 12.10 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 11L: DA #3 Total

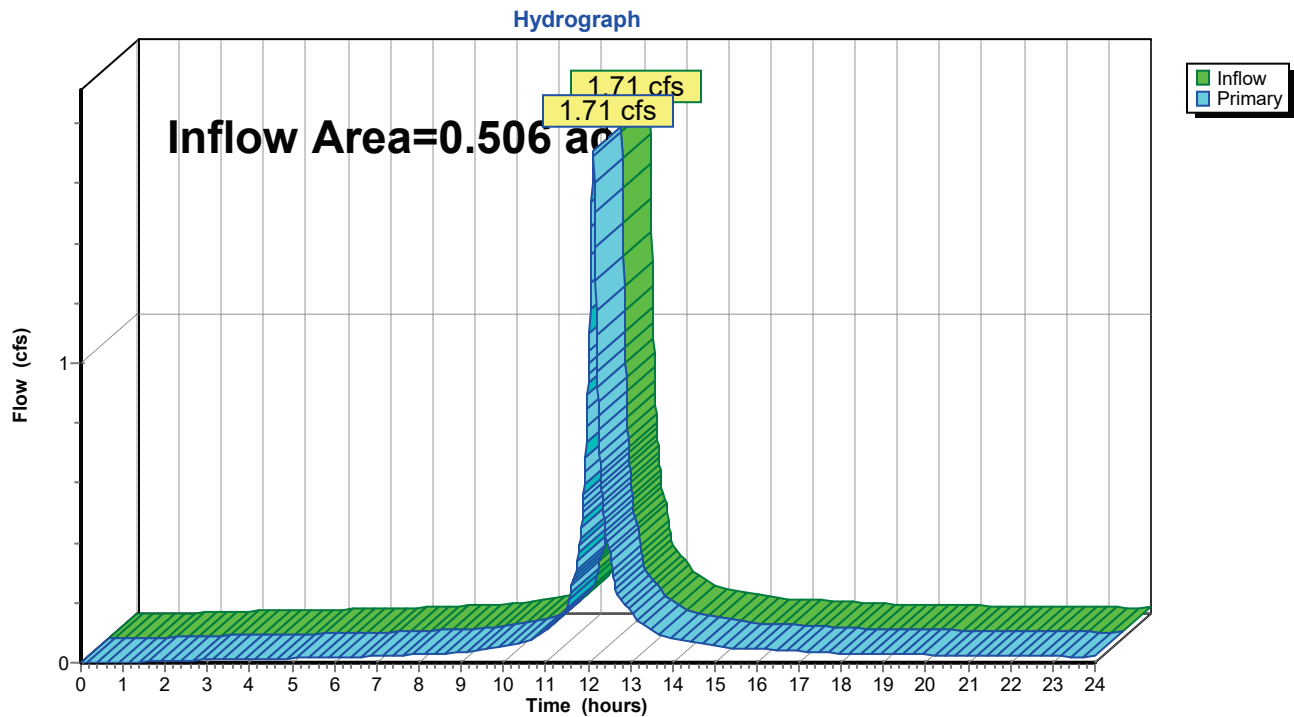


Summary for Link 14L: Da #1 Total

Inflow Area = 0.506 ac, 62.45% Impervious, Inflow Depth > 3.02" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 0.127 af
Primary = 1.71 cfs @ 12.13 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: Da #1 Total

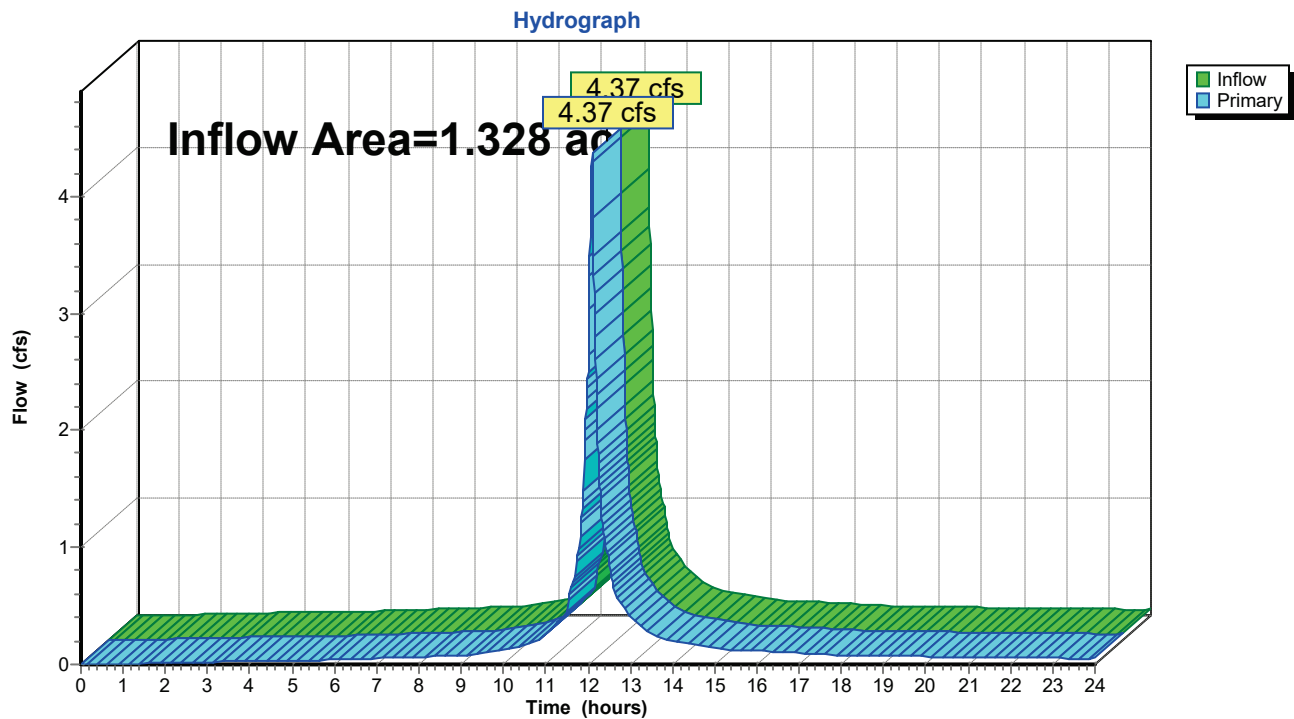


Summary for Link 15L: Total Proposed

Inflow Area = 1.328 ac, 53.54% Impervious, Inflow Depth > 2.82" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 4.37 cfs @ 12.10 hrs, Volume= 0.313 af
Primary = 4.37 cfs @ 12.10 hrs, Volume= 0.313 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 15L: Total Proposed

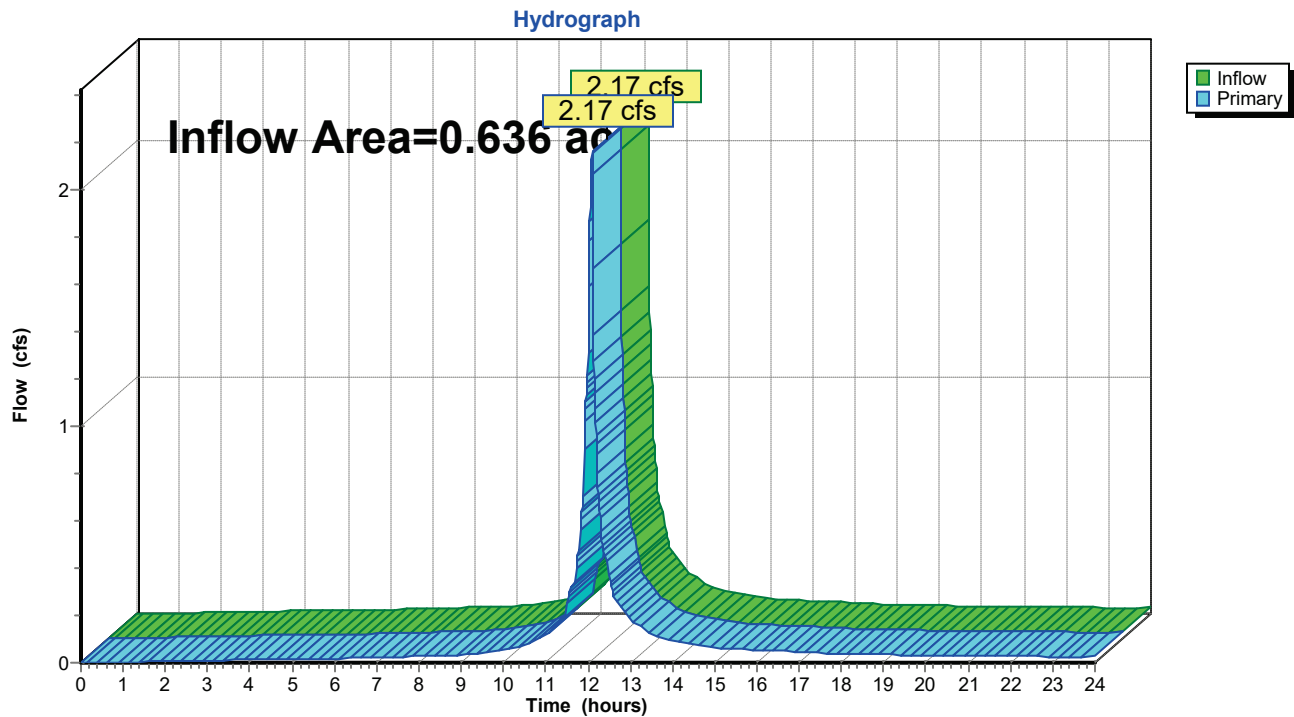


Summary for Link 16L: DA #2 Total

Inflow Area = 0.636 ac, 48.74% Impervious, Inflow Depth > 2.72" for 2-YEAR - FUTURE ADJUSTED event
Inflow = 2.17 cfs @ 12.10 hrs, Volume= 0.144 af
Primary = 2.17 cfs @ 12.10 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 16L: DA #2 Total



Summary for Subcatchment 9S: DA #3 Impervious

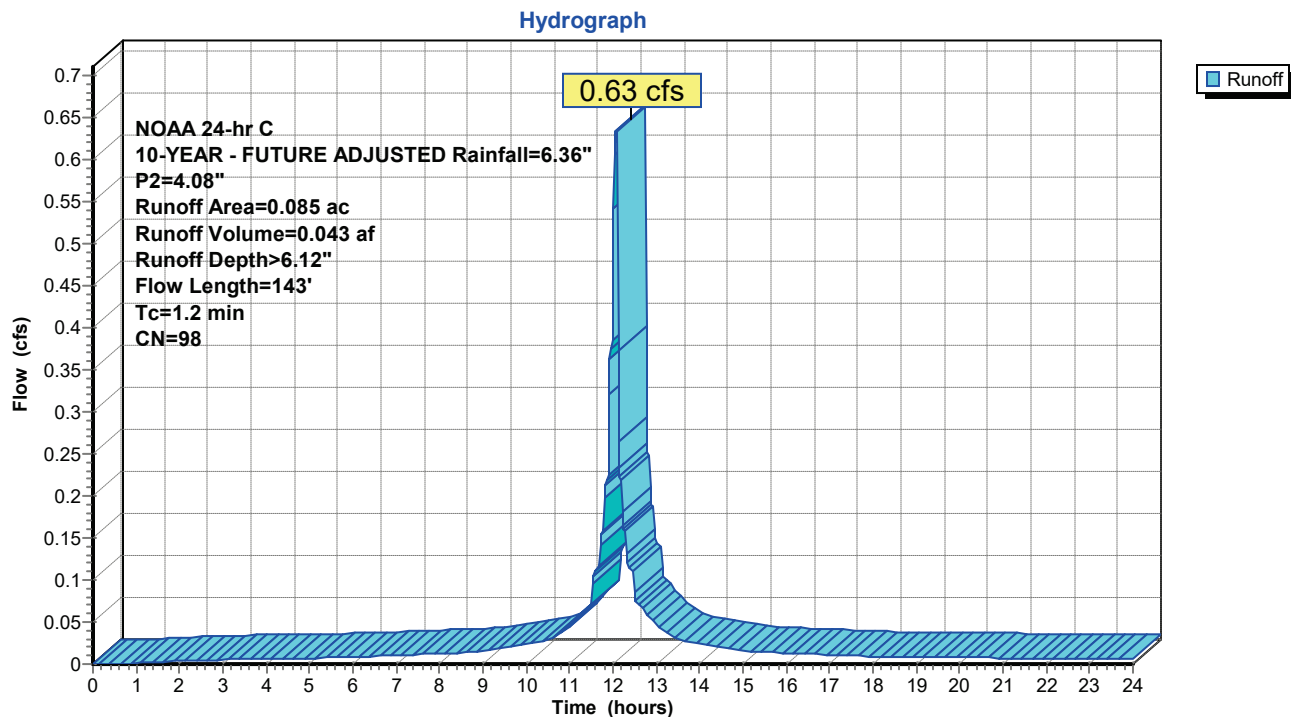
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 0.043 af, Depth> 6.12"
 Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=4.08"

Area (ac)	CN	Description
0.085	98	Paved parking, HSG C
0.085		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	70	0.0500	2.09		Sheet Flow, Parking Segment 1
					Smooth surfaces n= 0.011 P2= 4.08"
0.6	73	0.0100	2.03		Shallow Concentrated Flow, Parking Segment 2
					Paved Kv= 20.3 fps
1.2	143	Total			

Subcatchment 9S: DA #3 Impervious



Summary for Subcatchment 10S: DA #3 Pervious

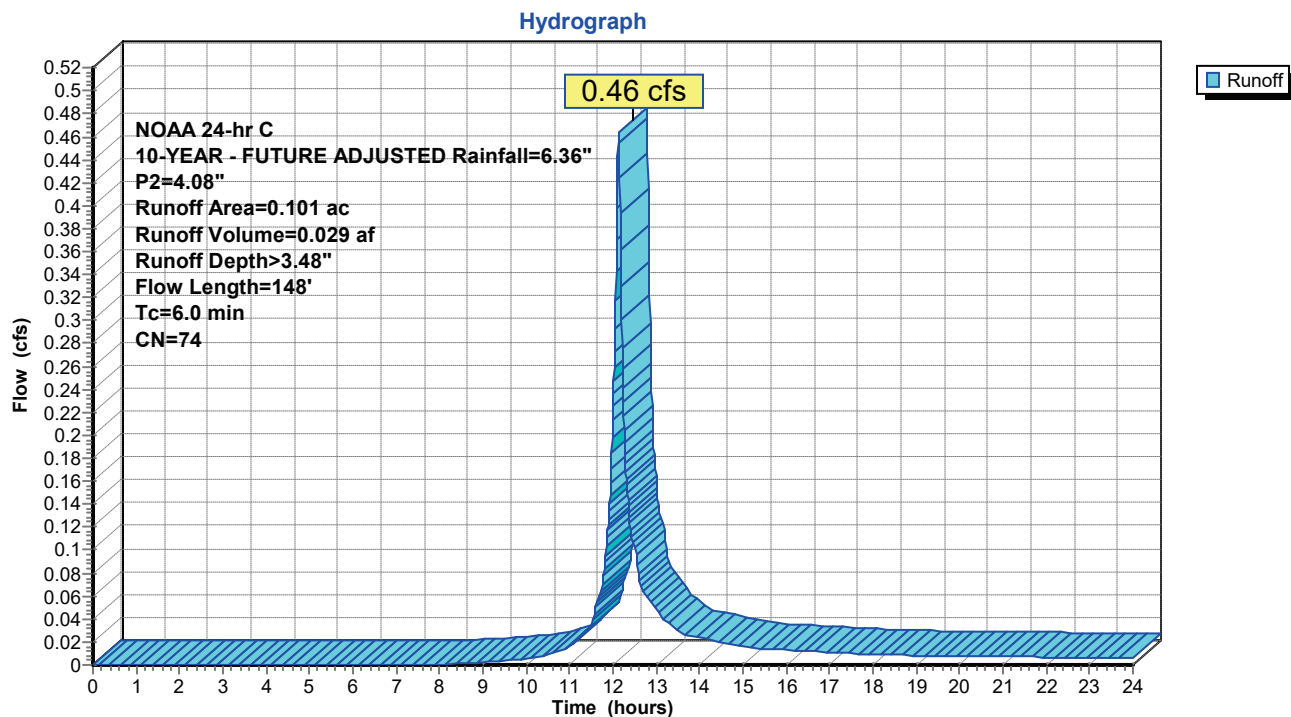
Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.029 af, Depth> 3.48"
 Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=4.08"

Area (ac)	CN	Description
0.101	74	>75% Grass cover, Good, HSG C
0.101		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	28	0.0140	0.09		Sheet Flow, Lawn area Grass: Dense n= 0.240 P2= 4.08"
0.2	43	0.0500	4.54		Shallow Concentrated Flow, Parking Lot 1 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
0.2	21	0.0100	2.03		Shallow Concentrated Flow, Parking Third Segment Paved Kv= 20.3 fps
6.0	148	Total			

Subcatchment 10S: DA #3 Pervious



Summary for Subcatchment 12S: DA#1 Pervious

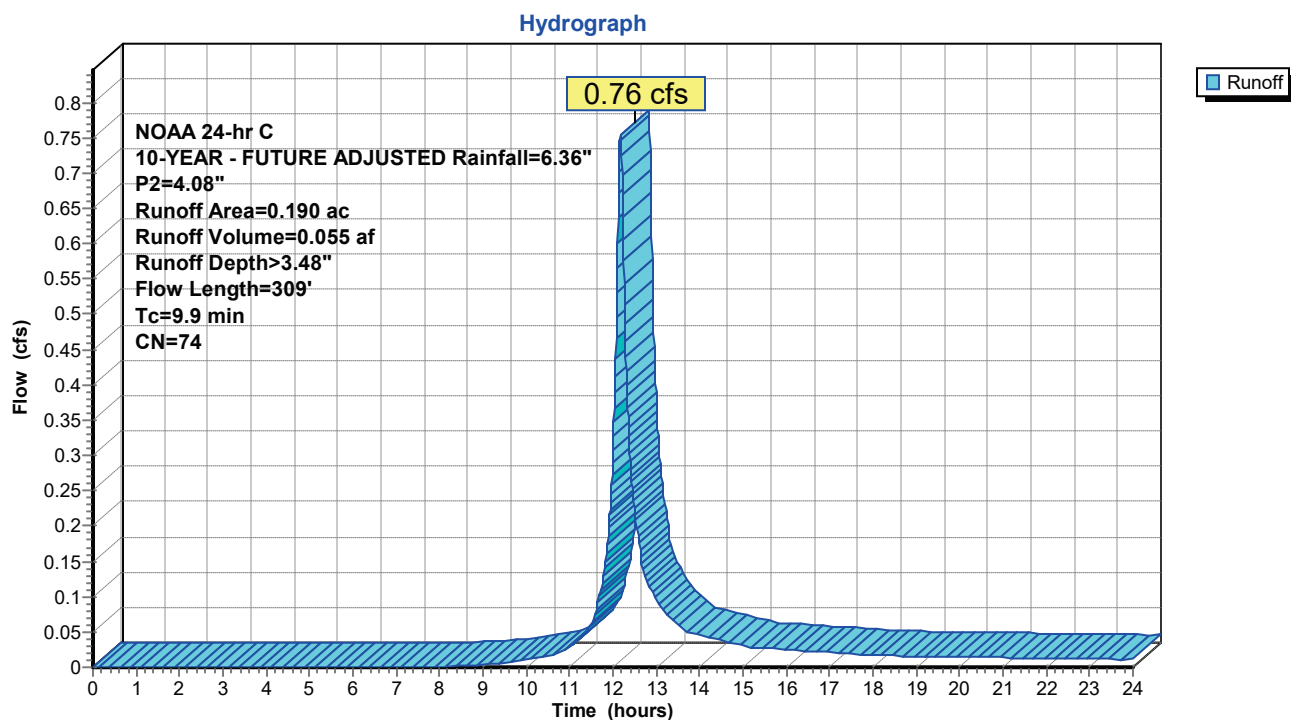
Runoff = 0.76 cfs @ 12.17 hrs, Volume= 0.055 af, Depth> 3.48"
 Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=4.08"

Area (ac)	CN	Description
0.190	74	>75% Grass cover, Good, HSG C
0.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	64	0.0500	0.17		Sheet Flow, Segment 1 Grass: Dense n= 0.240 P2= 4.08"
2.9	25	0.0500	0.14		Sheet Flow, Segment 2 Grass: Dense n= 0.240 P2= 4.08"
0.3	93	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.2	22	0.0100	2.03		Shallow Concentrated Flow, Segment 4 Paved Kv= 20.3 fps
0.4	105	0.0100	4.91	3.86	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
9.9	309	Total			

Subcatchment 12S: DA#1 Pervious



Summary for Subcatchment 13S: DA#1 Impervious

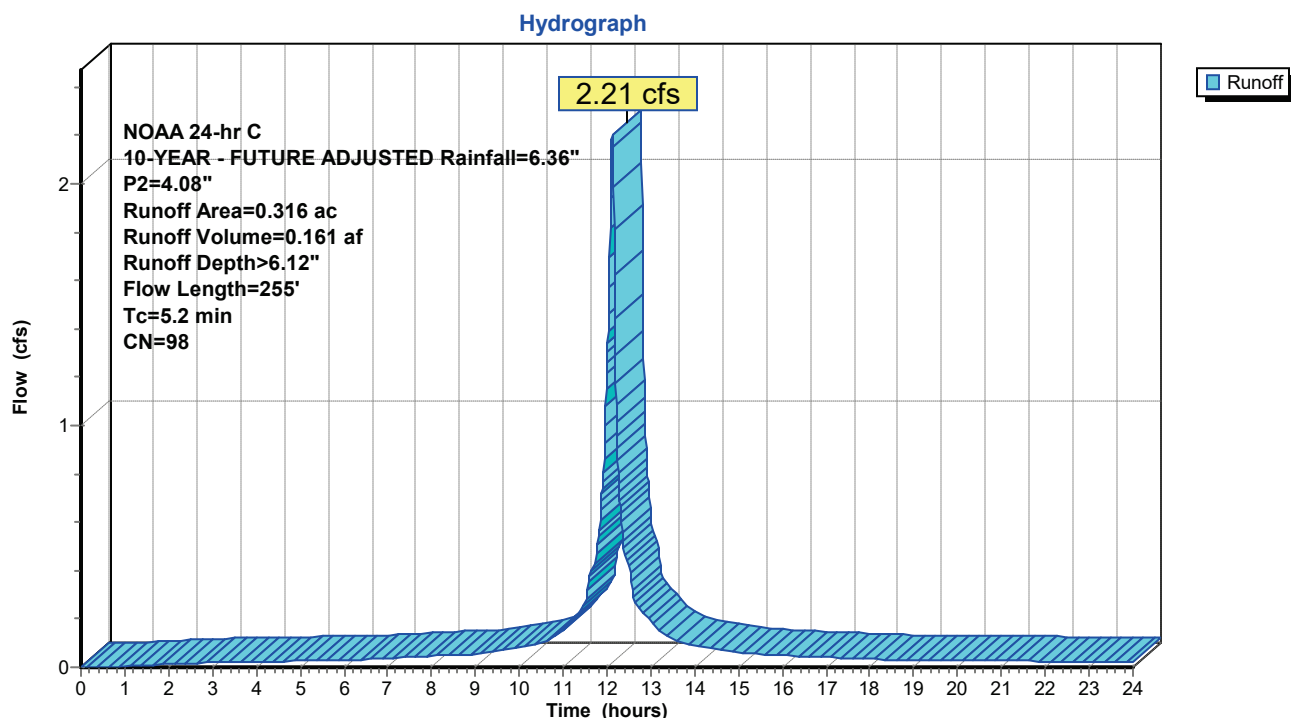
Runoff = 2.21 cfs @ 12.12 hrs, Volume= 0.161 af, Depth> 6.12"
 Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=4.08"

Area (ac)	CN	Description
0.316	98	Paved parking, HSG C
0.316		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	28	0.0300	0.12		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 4.08"
0.4	44	0.0500	1.90		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 4.08"
0.2	60	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.5	61	0.0100	2.03		Shallow Concentrated Flow, Segment #4 Paved Kv= 20.3 fps
0.2	62	0.0100	4.91	3.86	Pipe Channel, Segment 5 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.2	255	Total			

Subcatchment 13S: DA#1 Impervious



Summary for Subcatchment 17S: DA#2 Pervious

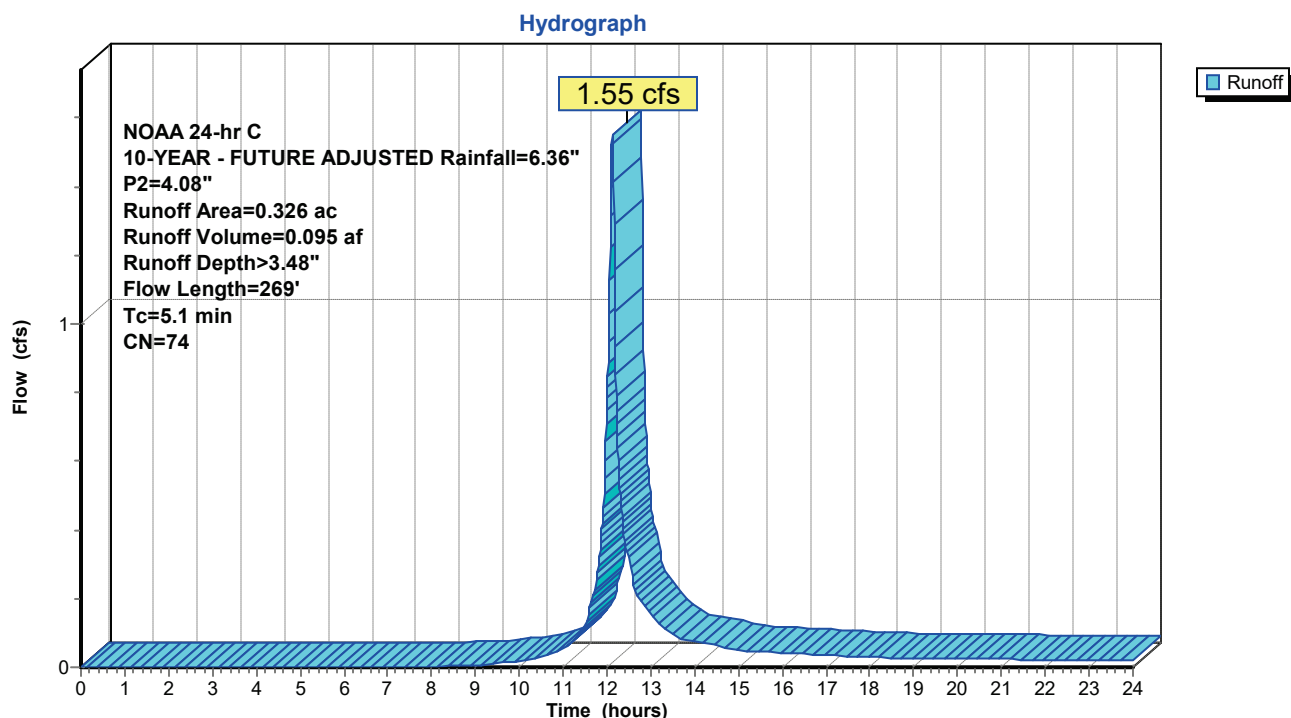
Runoff = 1.55 cfs @ 12.12 hrs, Volume= 0.095 af, Depth> 3.48"
 Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=4.08"

Area (ac)	CN	Description
0.326	74	>75% Grass cover, Good, HSG C
0.326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.0400	0.14		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 4.08"
0.3	30	0.0500	1.76		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 4.08"
0.5	123	0.0500	4.54		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.5	56	0.0100	2.03		Shallow Concentrated Flow, Segment #5 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #6 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.1	269	Total			

Subcatchment 17S: DA#2 Pervious



Summary for Subcatchment 18S: DA#2 Impervious

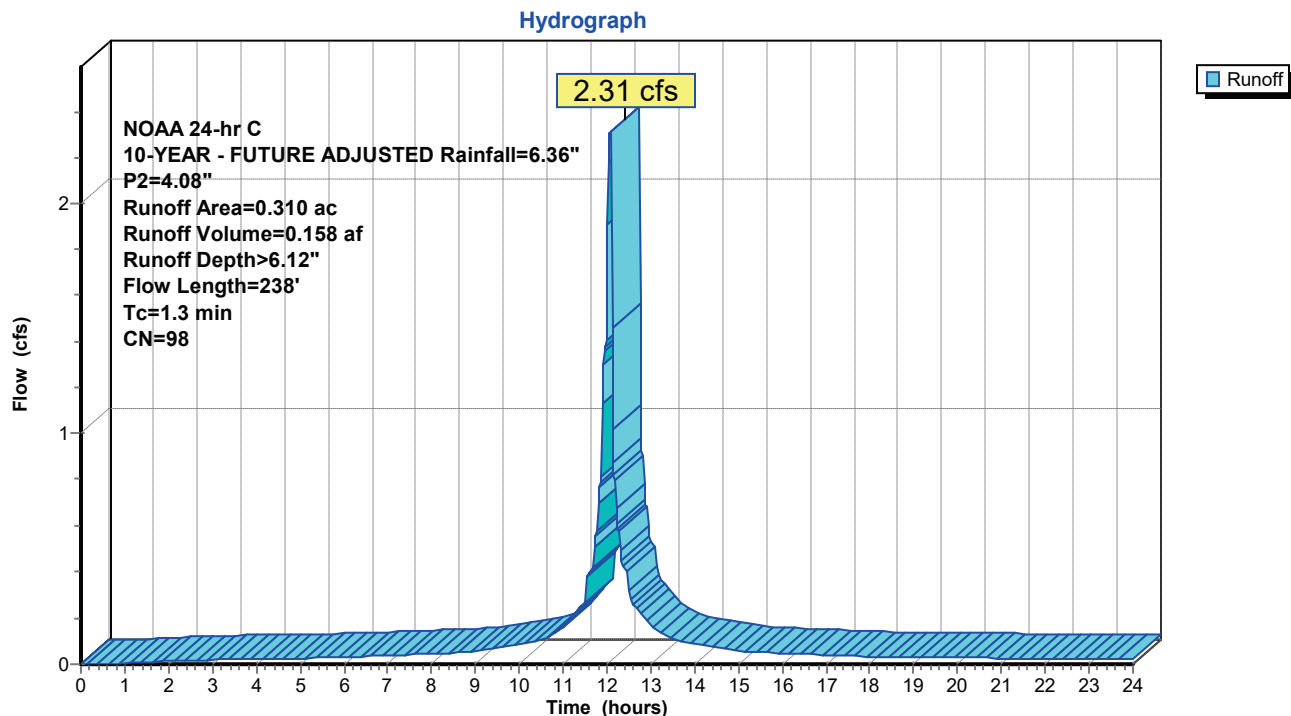
Runoff = 2.31 cfs @ 12.09 hrs, Volume= 0.158 af, Depth> 6.12"
 Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-YEAR - FUTURE ADJUSTED Rainfall=6.36", P2=4.08"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG C
0.310		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	80	0.0500	2.14		Sheet Flow, Segment #1 Smooth surfaces n= 0.011 P2= 4.08"
0.3	72	0.0500	4.54		Shallow Concentrated Flow, Segment #2 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #4 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.3	238	Total			

Subcatchment 18S: DA#2 Impervious

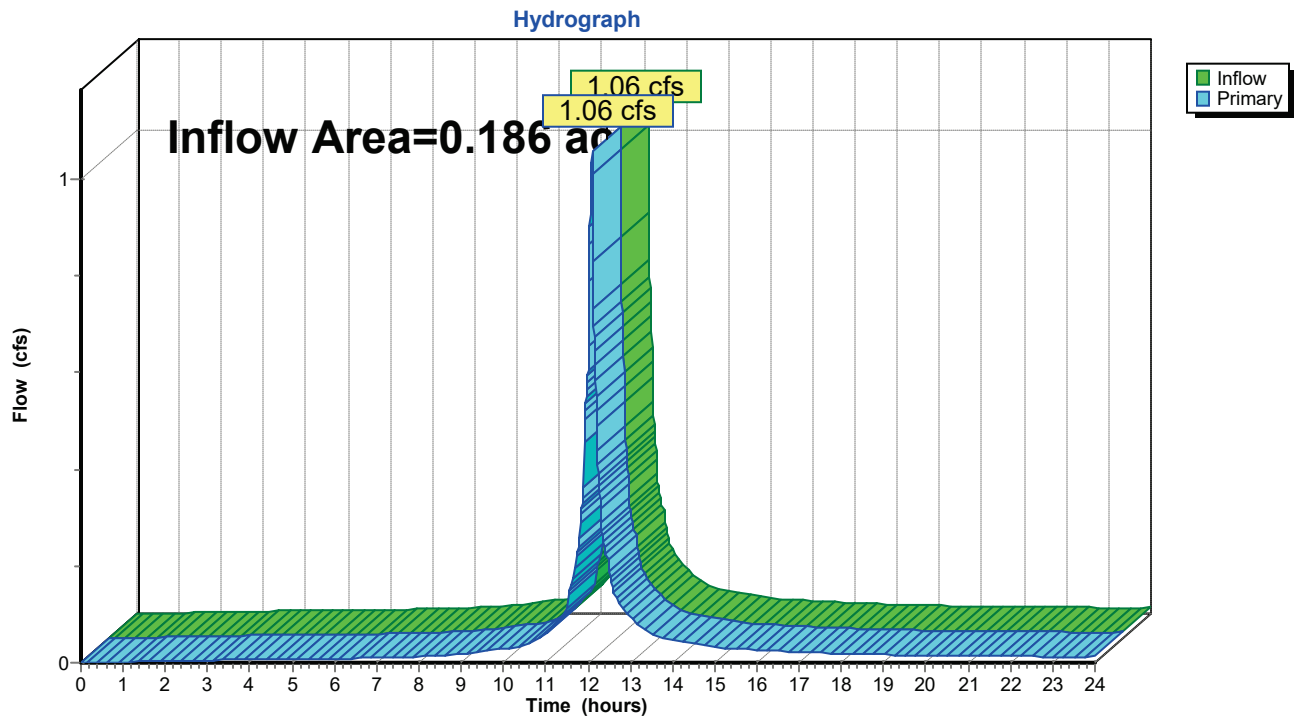


Summary for Link 11L: DA #3 Total

Inflow Area = 0.186 ac, 45.70% Impervious, Inflow Depth > 4.69" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 1.06 cfs @ 12.10 hrs, Volume= 0.073 af
Primary = 1.06 cfs @ 12.10 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 11L: DA #3 Total

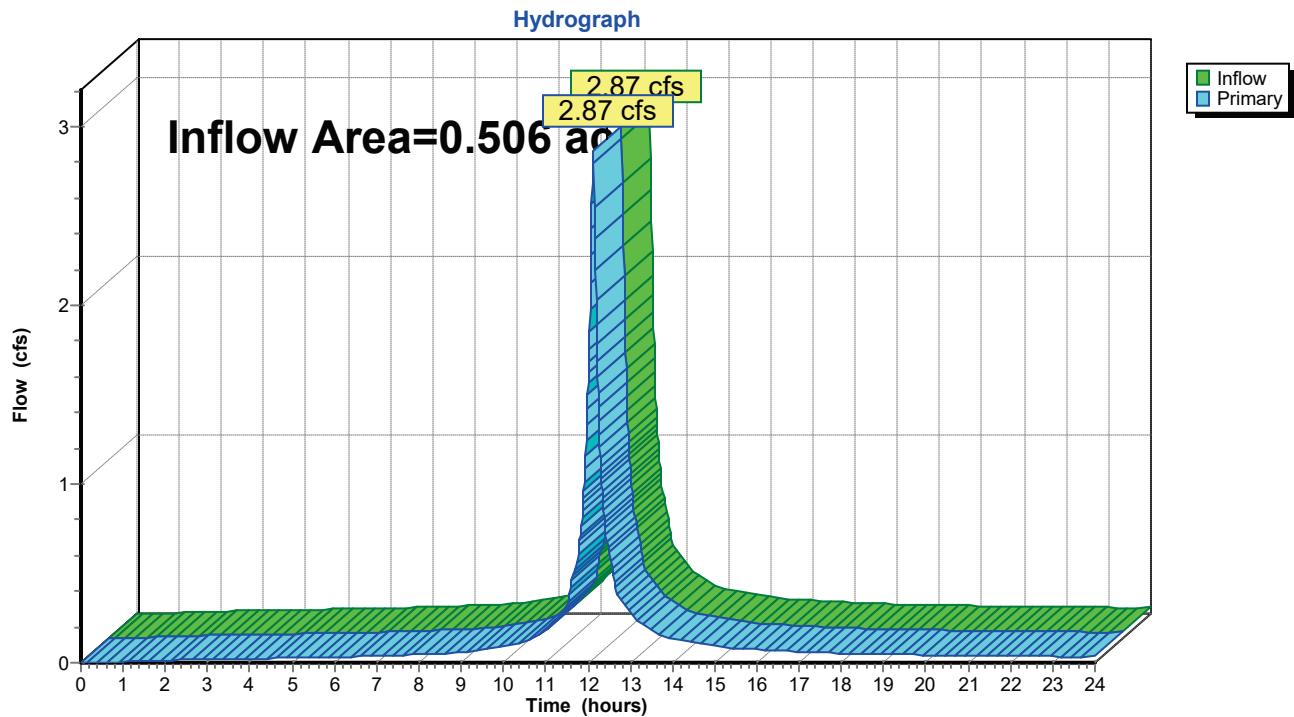


Summary for Link 14L: Da #1 Total

Inflow Area = 0.506 ac, 62.45% Impervious, Inflow Depth > 5.13" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 2.87 cfs @ 12.13 hrs, Volume= 0.216 af
Primary = 2.87 cfs @ 12.13 hrs, Volume= 0.216 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: Da #1 Total

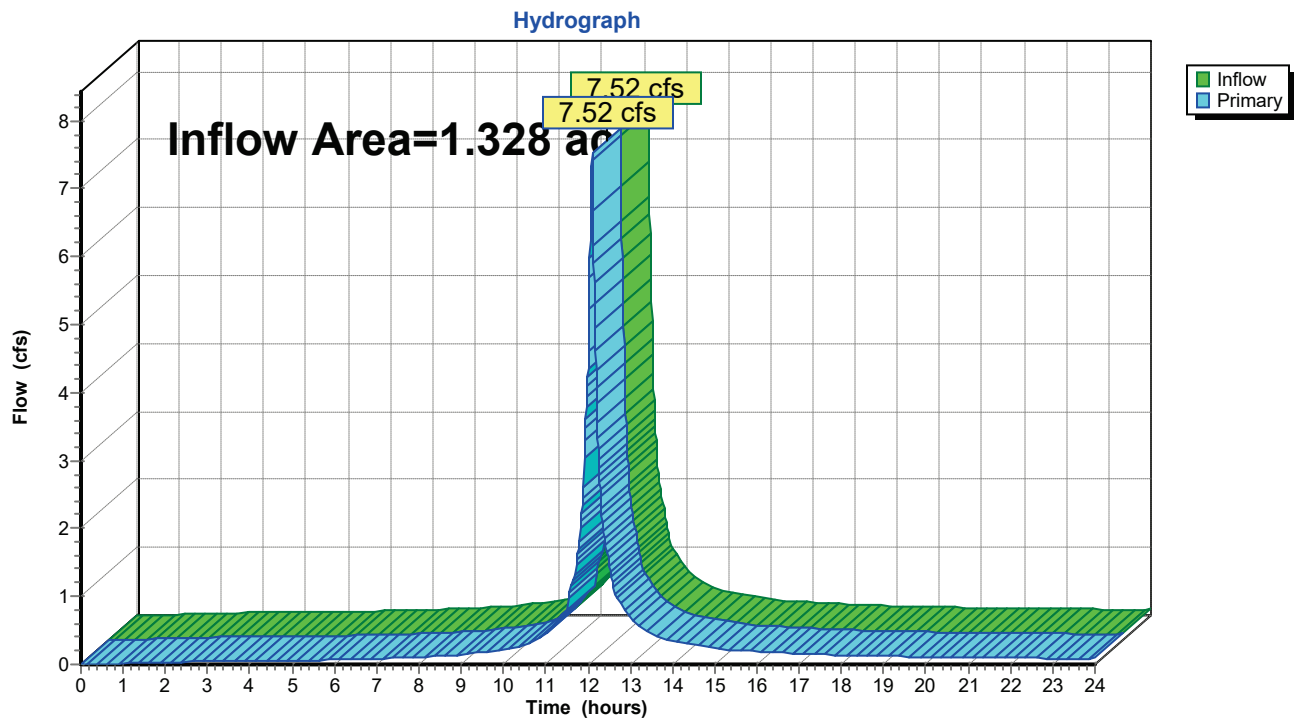


Summary for Link 15L: Total Proposed

Inflow Area = 1.328 ac, 53.54% Impervious, Inflow Depth > 4.89" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 7.52 cfs @ 12.10 hrs, Volume= 0.542 af
Primary = 7.52 cfs @ 12.10 hrs, Volume= 0.542 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 15L: Total Proposed

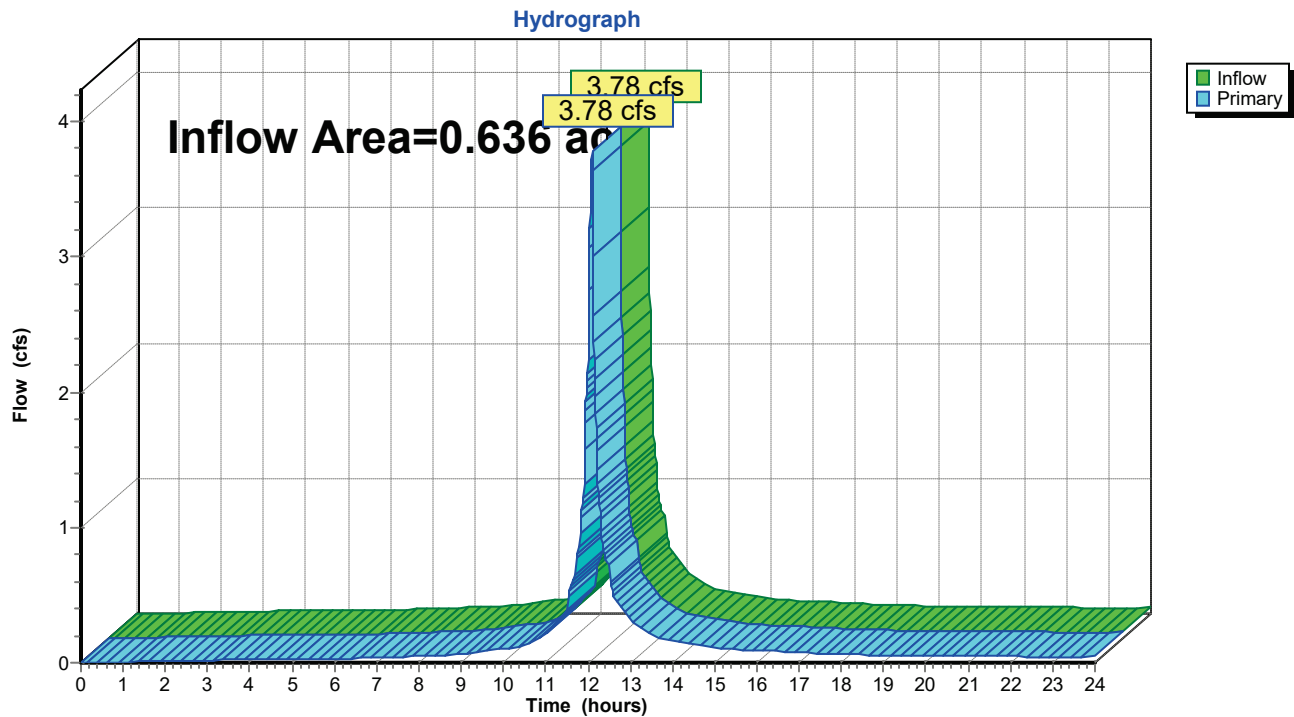


Summary for Link 16L: DA #2 Total

Inflow Area = 0.636 ac, 48.74% Impervious, Inflow Depth > 4.77" for 10-YEAR - FUTURE ADJUSTED even
Inflow = 3.78 cfs @ 12.10 hrs, Volume= 0.253 af
Primary = 3.78 cfs @ 12.10 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 16L: DA #2 Total



Summary for Subcatchment 9S: DA #3 Impervious

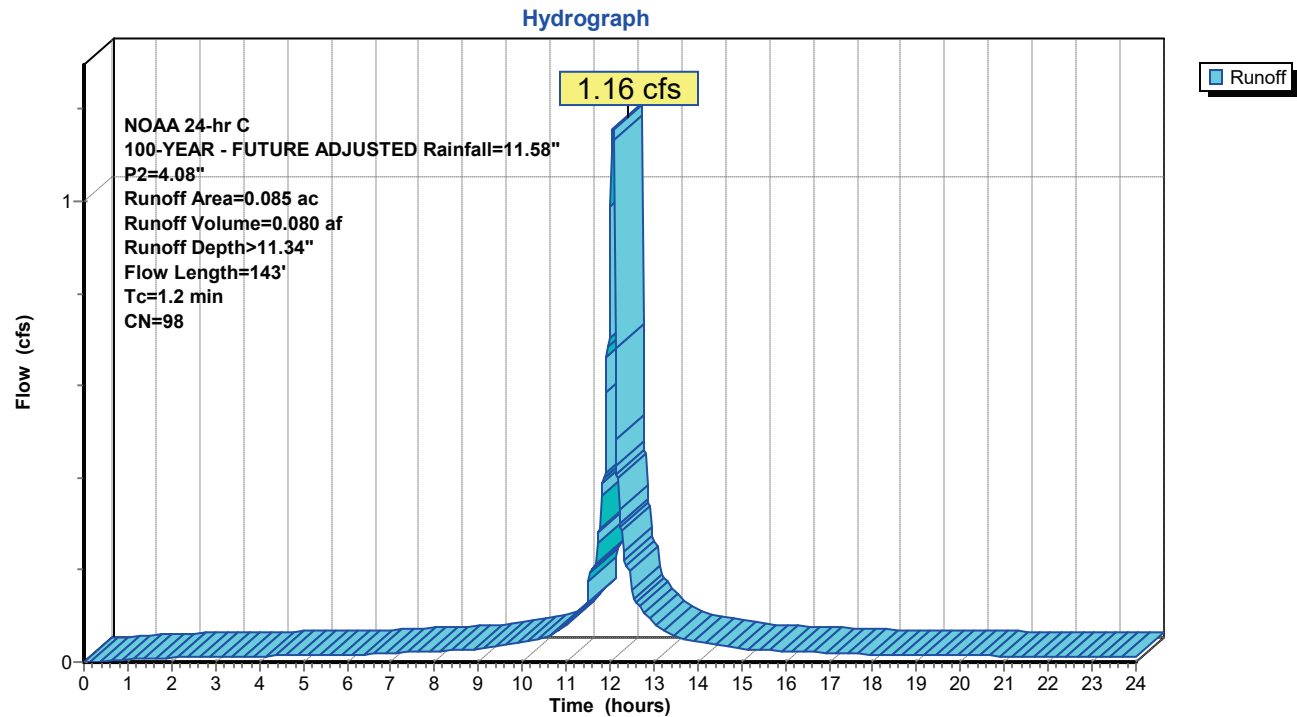
Runoff = 1.16 cfs @ 12.08 hrs, Volume= 0.080 af, Depth>11.34"
Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=4.08"

Area (ac)	CN	Description
0.085	98	Paved parking, HSG C
0.085		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	70	0.0500	2.09		Sheet Flow, Parking Segment 1
					Smooth surfaces n= 0.011 P2= 4.08"
0.6	73	0.0100	2.03		Shallow Concentrated Flow, Parking Segment 2
					Paved Kv= 20.3 fps
1.2	143	Total			

Subcatchment 9S: DA #3 Impervious



Summary for Subcatchment 10S: DA #3 Pervious

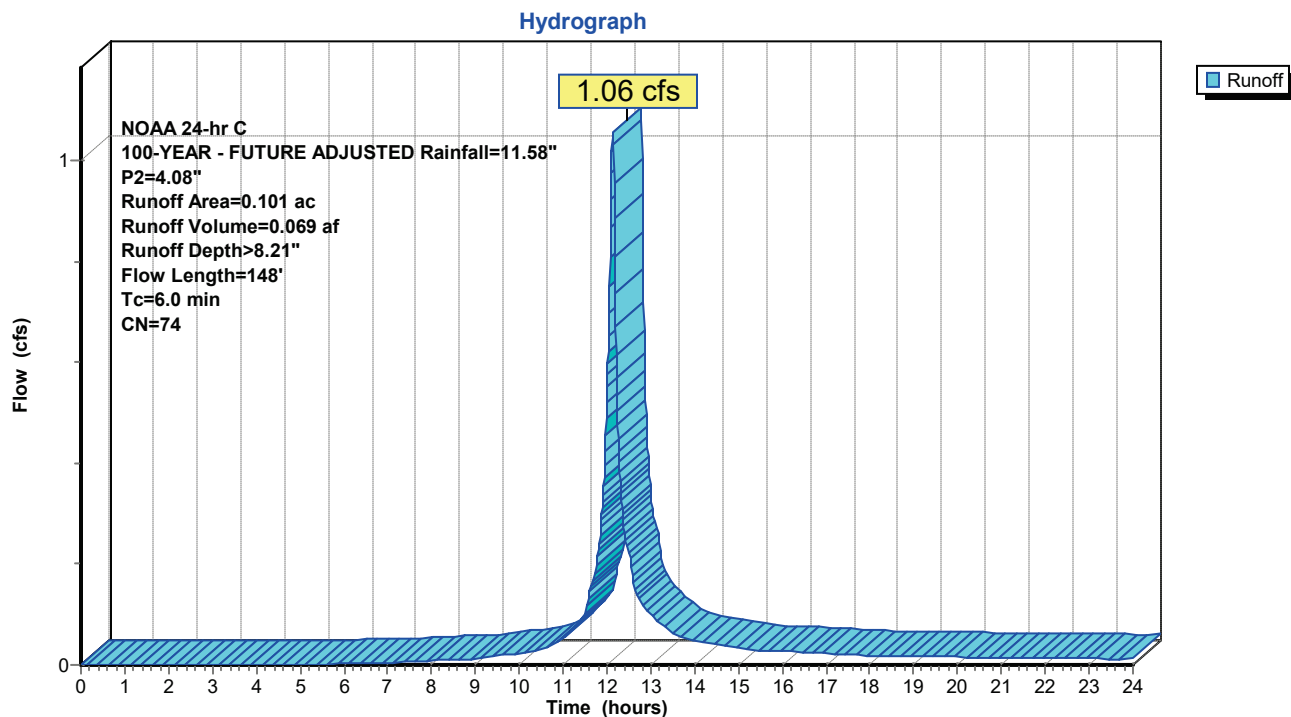
Runoff = 1.06 cfs @ 12.13 hrs, Volume= 0.069 af, Depth> 8.21"
 Routed to Link 11L : DA #3 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=4.08"

Area (ac)	CN	Description
0.101	74	>75% Grass cover, Good, HSG C
0.101		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	28	0.0140	0.09		Sheet Flow, Lawn area Grass: Dense n= 0.240 P2= 4.08"
0.2	43	0.0500	4.54		Shallow Concentrated Flow, Parking Lot 1 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Parking Segment 2 Paved Kv= 20.3 fps
0.2	21	0.0100	2.03		Shallow Concentrated Flow, Parking Third Segment Paved Kv= 20.3 fps
6.0	148	Total			

Subcatchment 10S: DA #3 Pervious



Summary for Subcatchment 12S: DA#1 Pervious

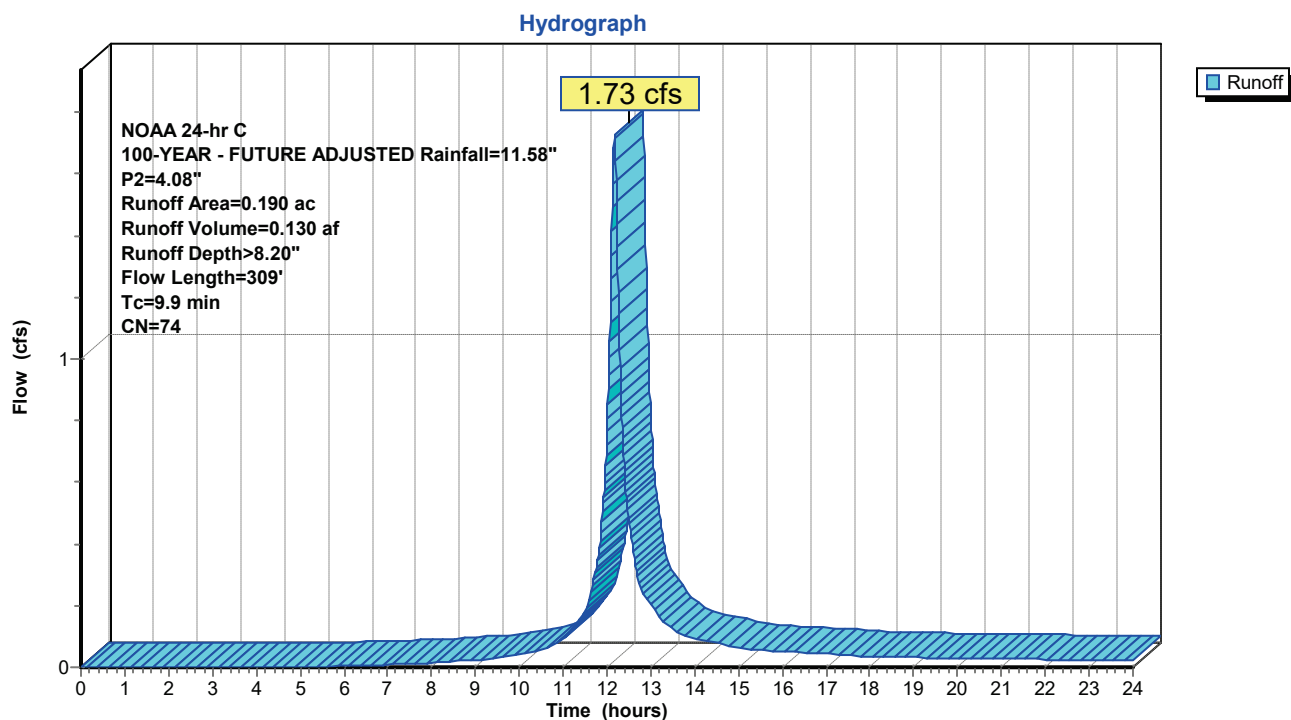
Runoff = 1.73 cfs @ 12.17 hrs, Volume= 0.130 af, Depth> 8.20"
 Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=4.08"

Area (ac)	CN	Description
0.190	74	>75% Grass cover, Good, HSG C
0.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	64	0.0500	0.17		Sheet Flow, Segment 1 Grass: Dense n= 0.240 P2= 4.08"
2.9	25	0.0500	0.14		Sheet Flow, Segment 2 Grass: Dense n= 0.240 P2= 4.08"
0.3	93	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.2	22	0.0100	2.03		Shallow Concentrated Flow, Segment 4 Paved Kv= 20.3 fps
0.4	105	0.0100	4.91	3.86	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
9.9	309	Total			

Subcatchment 12S: DA#1 Pervious



Summary for Subcatchment 13S: DA#1 Impervious

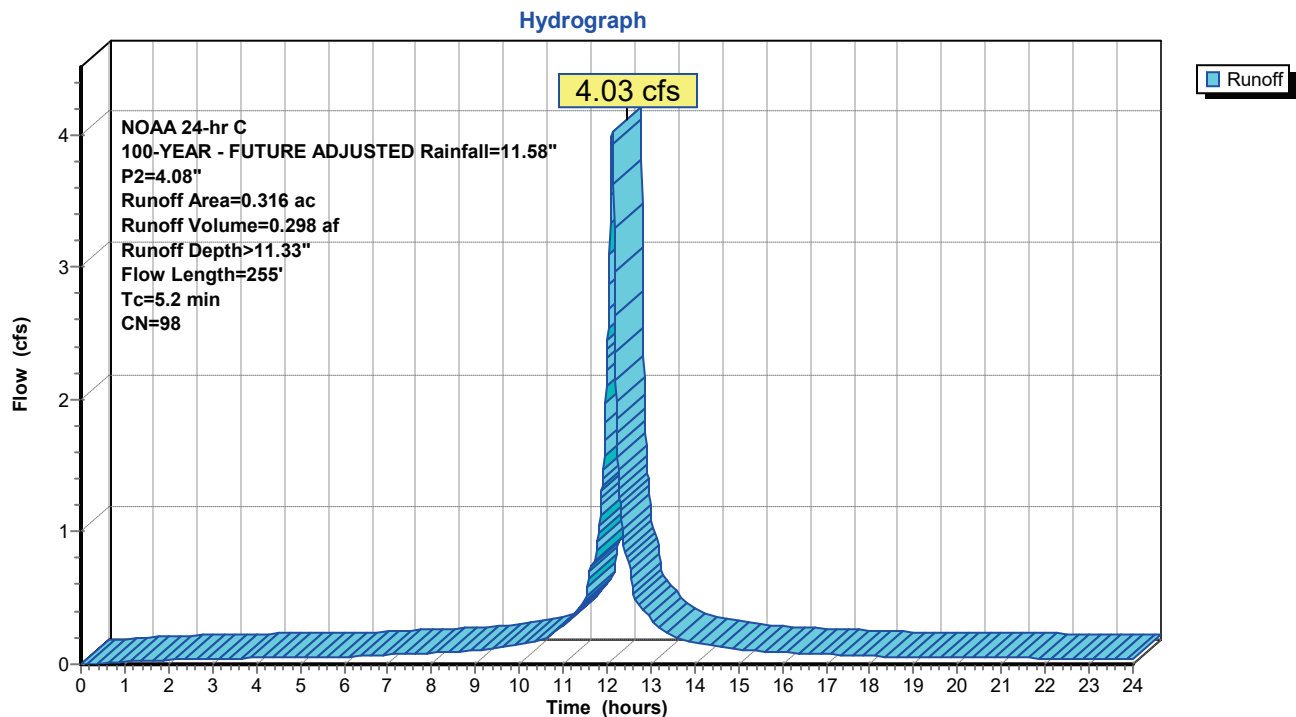
Runoff = 4.03 cfs @ 12.12 hrs, Volume= 0.298 af, Depth>11.33"
 Routed to Link 14L : Da #1 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=4.08"

Area (ac)	CN	Description
0.316	98	Paved parking, HSG C
0.316		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	28	0.0300	0.12		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 4.08"
0.4	44	0.0500	1.90		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 4.08"
0.2	60	0.0500	4.54		Shallow Concentrated Flow, Segment 3 Paved Kv= 20.3 fps
0.5	61	0.0100	2.03		Shallow Concentrated Flow, Segment #4 Paved Kv= 20.3 fps
0.2	62	0.0100	4.91	3.86	Pipe Channel, Segment 5 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.2	255	Total			

Subcatchment 13S: DA#1 Impervious



Summary for Subcatchment 17S: DA#2 Pervious

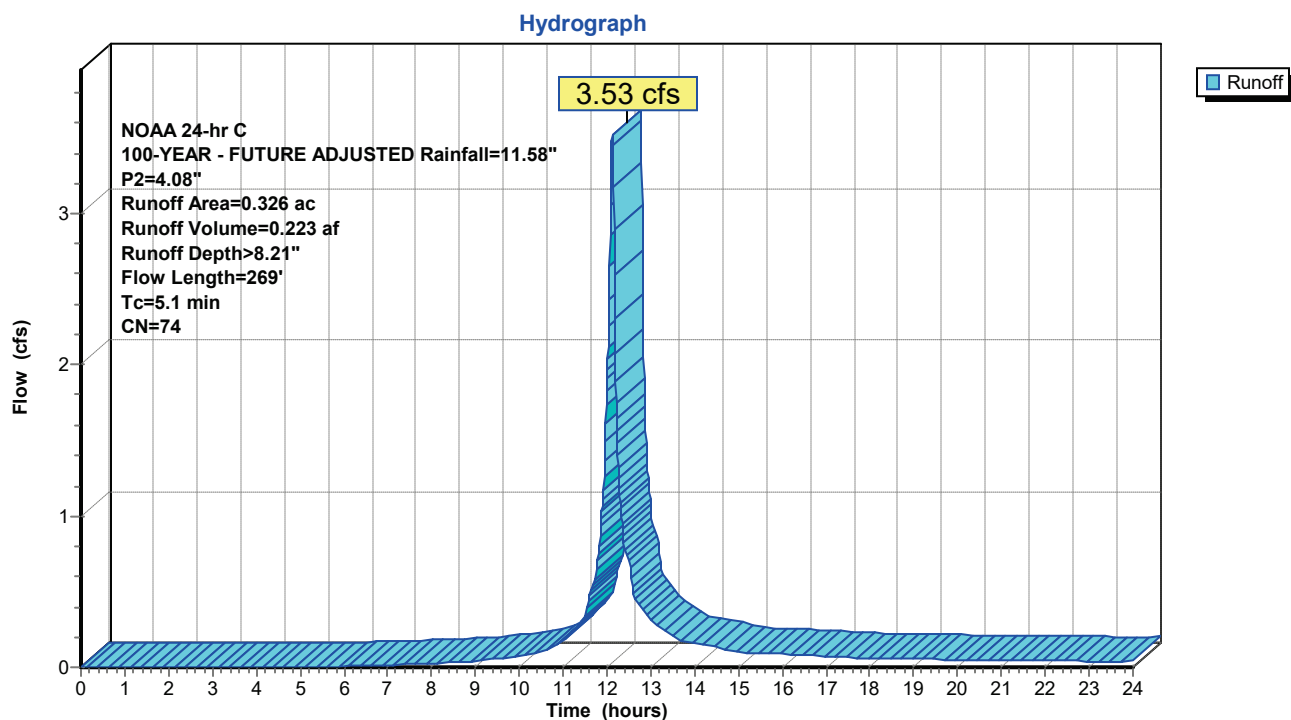
Runoff = 3.53 cfs @ 12.12 hrs, Volume= 0.223 af, Depth> 8.21"
 Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=4.08"

Area (ac)	CN	Description
0.326	74	>75% Grass cover, Good, HSG C
0.326		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	30	0.0400	0.14		Sheet Flow, Segment #1 Grass: Dense n= 0.240 P2= 4.08"
0.3	30	0.0500	1.76		Sheet Flow, Segment #2 Smooth surfaces n= 0.011 P2= 4.08"
0.5	123	0.0500	4.54		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.5	56	0.0100	2.03		Shallow Concentrated Flow, Segment #5 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #6 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
5.1	269	Total			

Subcatchment 17S: DA#2 Pervious



Summary for Subcatchment 18S: DA#2 Impervious

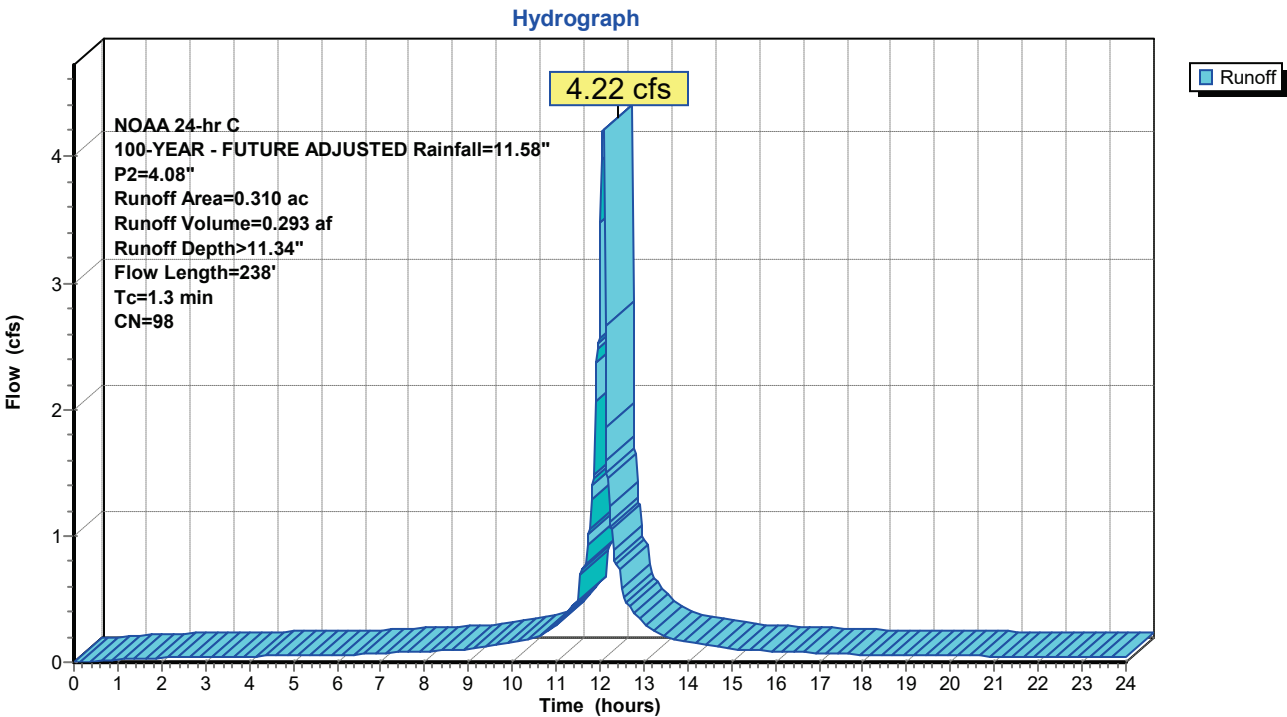
Runoff = 4.22 cfs @ 12.09 hrs, Volume= 0.293 af, Depth>11.34"
Routed to Link 16L : DA #2 Total

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-YEAR - FUTURE ADJUSTED Rainfall=11.58", P2=4.08"

Area (ac)	CN	Description			
0.310	98	Paved parking, HSG C			
0.310		100.00% Impervious Area			

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	80	0.0500	2.14		Sheet Flow, Segment #1 Smooth surfaces n= 0.011 P2= 4.08"
0.3	72	0.0500	4.54		Shallow Concentrated Flow, Segment #2 Paved Kv= 20.3 fps
0.3	56	0.0200	2.87		Shallow Concentrated Flow, Segment #3 Paved Kv= 20.3 fps
0.1	30	0.0100	4.91	3.86	Pipe Channel, Segment #4 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.3	238	Total			

Subcatchment 18S: DA#2 Impervious

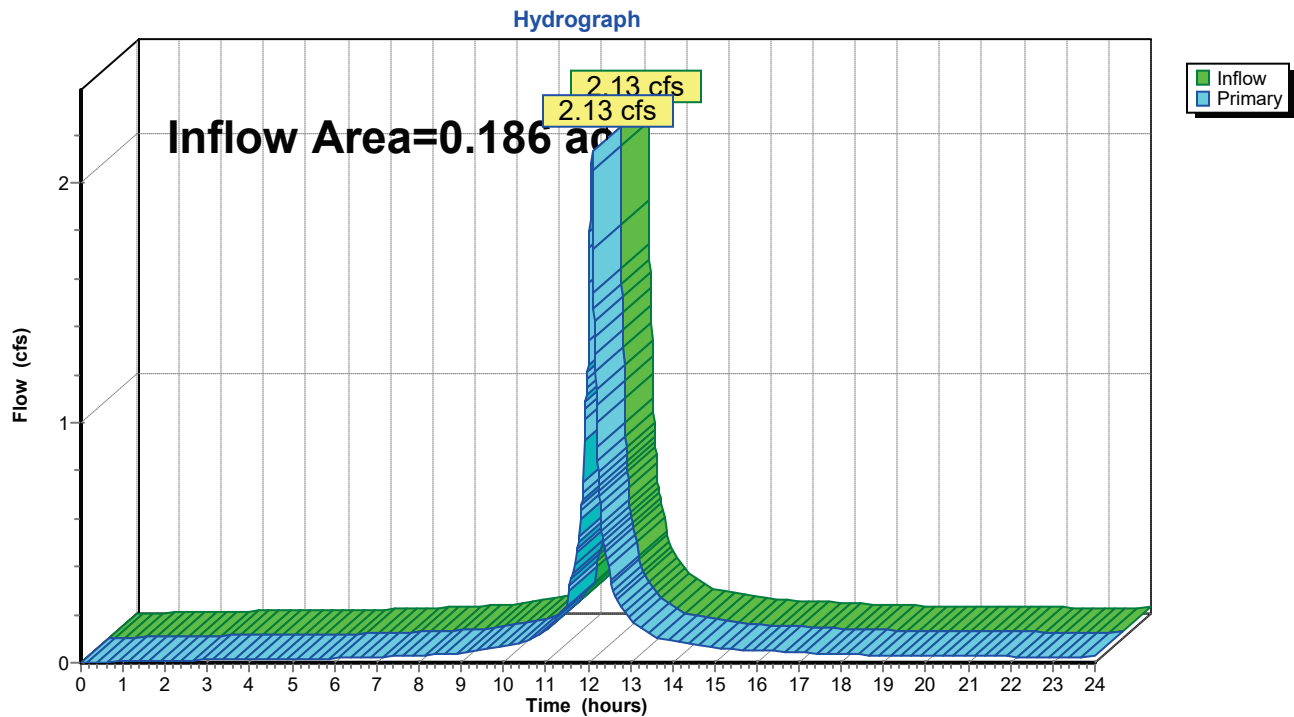


Summary for Link 11L: DA #3 Total

Inflow Area = 0.186 ac, 45.70% Impervious, Inflow Depth > 9.64" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 2.13 cfs @ 12.10 hrs, Volume= 0.149 af
Primary = 2.13 cfs @ 12.10 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 11L: DA #3 Total

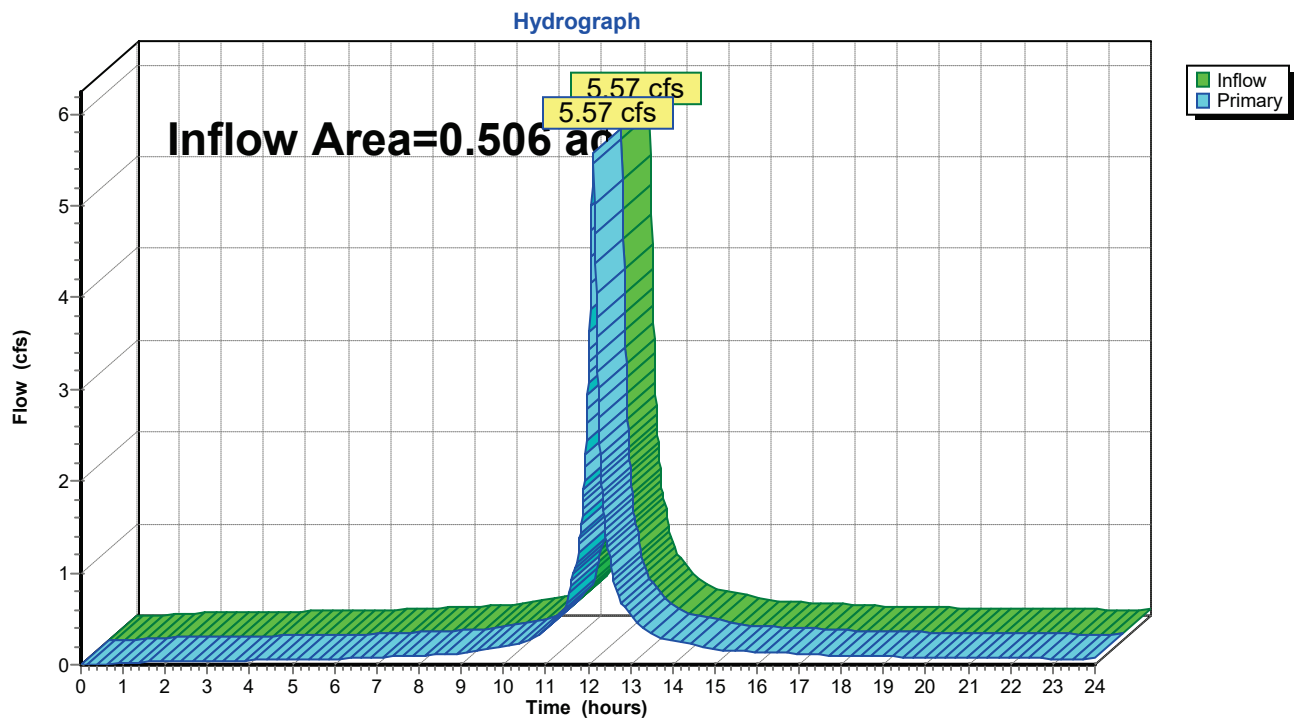


Summary for Link 14L: Da #1 Total

Inflow Area = 0.506 ac, 62.45% Impervious, Inflow Depth > 10.15" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 5.57 cfs @ 12.13 hrs, Volume= 0.428 af
Primary = 5.57 cfs @ 12.13 hrs, Volume= 0.428 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: Da #1 Total

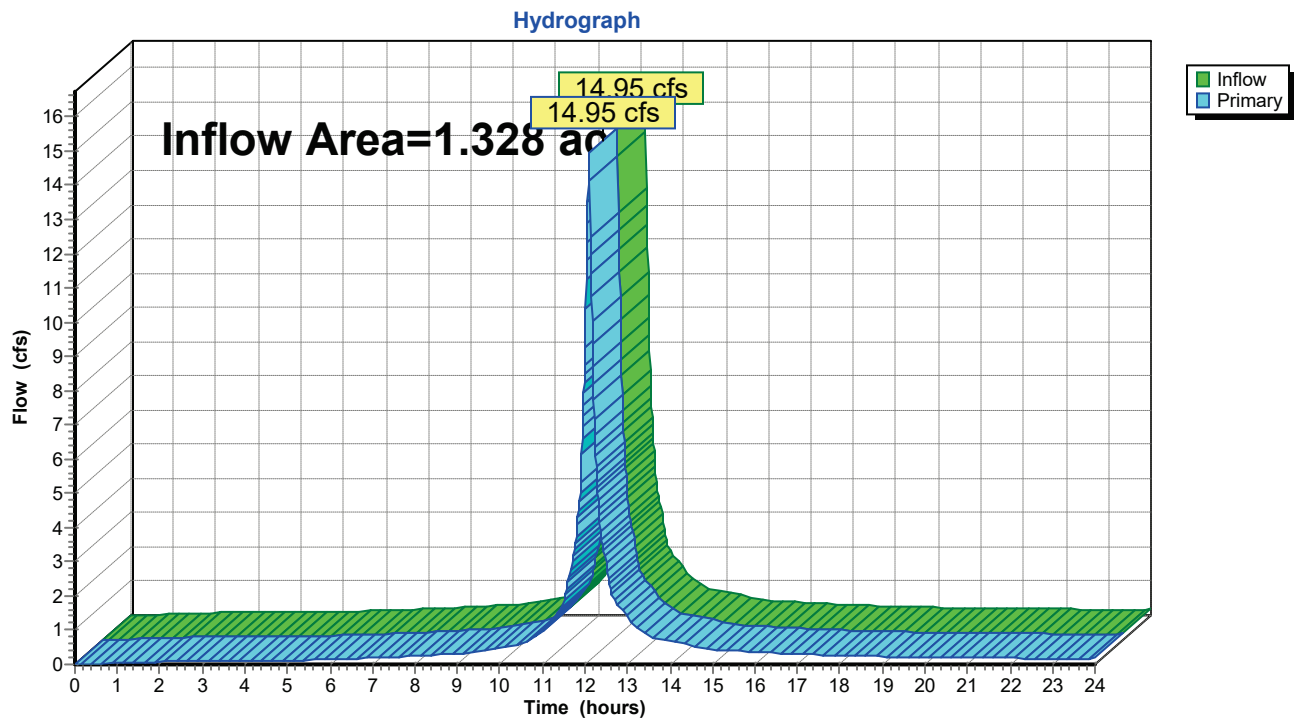


Summary for Link 15L: Total Proposed

Inflow Area = 1.328 ac, 53.54% Impervious, Inflow Depth > 9.88" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 14.95 cfs @ 12.10 hrs, Volume= 1.094 af
Primary = 14.95 cfs @ 12.10 hrs, Volume= 1.094 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 15L: Total Proposed

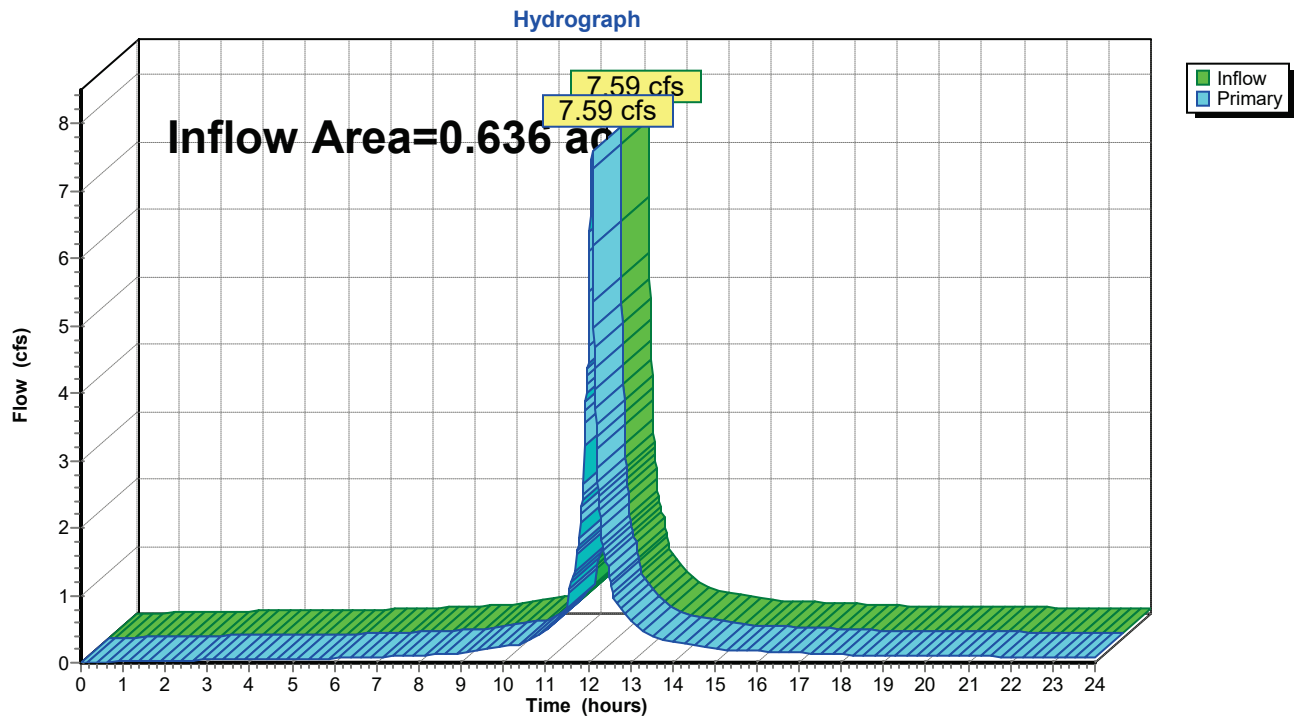


Summary for Link 16L: DA #2 Total

Inflow Area = 0.636 ac, 48.74% Impervious, Inflow Depth > 9.73" for 100-YEAR - FUTURE ADJUSTED event
Inflow = 7.59 cfs @ 12.10 hrs, Volume= 0.516 af
Primary = 7.59 cfs @ 12.10 hrs, Volume= 0.516 af, Atten= 0%, Lag= 0.0 min
Routed to Link 15L : Total Proposed

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

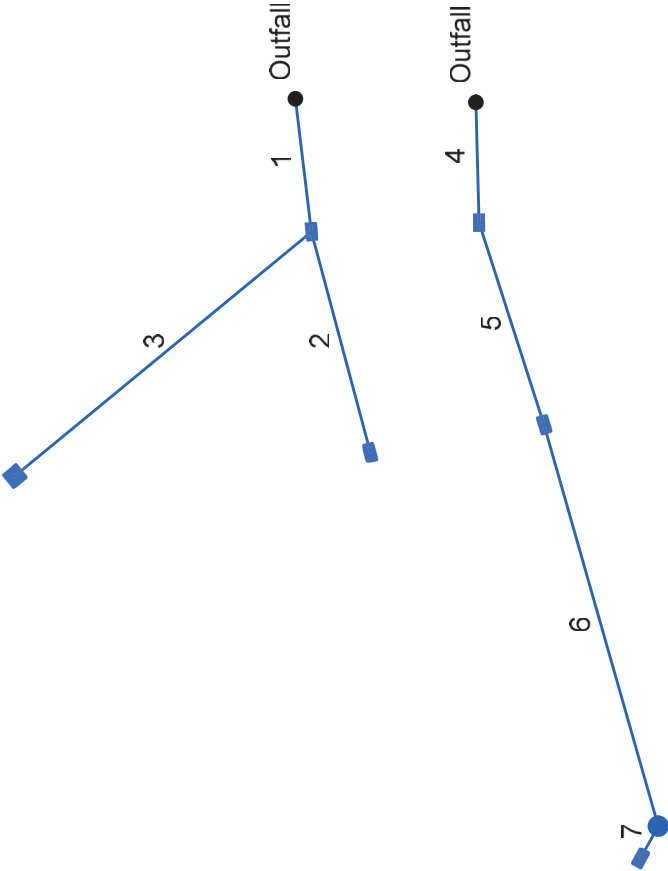
Link 16L: DA #2 Total



APPENDIX E

Conveyance Calculations

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



Project File: 2026-08-14-PIPE CALCS-250304.stm	Number of lines: 7	Date: 8/14/2026
Storm Sewers v2026.00		

Storm Sewer Tabulation

Station		Len (ft)	Dmg Area		Rnoff coeff (C)	Area x C		Tc		Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	28.929	0.29	0.63	0.82	0.24	0.53	6.0	7.2	6.5	3.43	4.24	5.58	12	1.21	375.67	376.02	376.35	376.81	0.00	379.12	EX1 -1-1
2	1	49.214	0.18	0.18	0.86	0.15	0.15	6.0	6.0	6.8	1.05	8.56	2.30	12	4.92	374.77	377.19	376.81	377.62	379.12	381.99	1-1 - 1-2
3	1	83.000	0.16	0.16	0.86	0.14	0.14	6.0	6.0	6.8	0.94	8.11	2.16	12	4.42	374.95	378.62	376.81	379.03	379.12	382.79	1-4 - 1-1
4	End	26.000	0.20	0.52	0.80	0.16	0.42	6.0	8.0	6.2	2.64	5.04	3.36	12	2.00	373.80	374.32	375.48	375.62	378.00	380.00	EX2 - 2-1
5	4	45.882	0.18	0.32	0.83	0.15	0.26	6.0	7.7	6.3	1.67	5.44	4.93	12	2.33	375.86	376.93	376.24	377.48	380.00	382.00	2-1 - 2-2
6	5	90.000	0.00	0.14	0.00	0.00	0.11	0.0	6.1	6.8	0.77	8.90	1.96	12	6.24	376.10	381.72	377.48	382.09	382.00	386.10	MH 1 - 2-2
7	6	8.000	0.14	0.14	0.81	0.11	0.11	6.0	6.0	6.8	0.77	6.17	2.96	12	3.00	381.72	381.96	382.09	382.33	386.10	386.04	2-3 - MH1
Project File: 2026-08-14-PIPE CALCS-250304.stm														Number of lines: 7		Run Date: 8/14/2026						

Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	12	3.43	375.67	376.35	0.68	0.57	6.01	0.41	376.76	0.000	28.929	376.02	376.81	0.79**	0.67	5.15	0.41	377.22	0.000	0.000	n/a	1.30	n/a
2	12	1.05	374.77	376.81	1.00	0.32	1.34	0.03	376.84	0.075	49.214	377.19	377.62 j	0.43**	0.32	3.25	0.16	377.79	0.501	0.288	n/a	1.00	n/a
3	12	0.94	374.95	376.81	1.00	0.30	1.19	0.02	376.83	0.059	83.000	378.62	379.03 j	0.41**	0.30	3.14	0.15	379.18	0.494	0.276	n/a	1.00	0.15
4	12	2.64	373.80	375.48	1.00	0.79	3.36	0.18	375.66	0.550	26.000	374.32	375.62	1.00	0.79	3.36	0.18	375.80	0.550	0.550	0.143	0.50	0.09
5	12	1.67	375.86	376.24	0.38*	0.27	6.08	0.22	376.46	0.000	45.882	376.93	377.48	0.55**	0.44	3.78	0.22	377.70	0.000	0.000	n/a	0.50	n/a
6	12	0.77	376.10	377.48	1.00	0.26	0.98	0.01	377.49	0.046	90.000	381.72	382.09 j	0.37**	0.26	2.95	0.14	382.22	0.570	0.308	n/a	0.75	n/a
7	12	0.77	381.72	382.09	0.37	0.26	2.97	0.14	382.22	0.000	8.000	381.96	382.33	0.37**	0.26	2.96	0.14	382.46	0.000	0.000	n/a	1.00	0.14
Project File: 2026-08-14-PIPE CALCS-250304.stm												Number of lines: 7								Run Date: 8/14/2026			
Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box																							

APPENDIX F

Water Quality Calculations

NJ Storm

Prepared by Contech Engineered Solutions
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NJ DEP 2-hr Custom Rainfall=1.25"

Printed 8/3/2026
Page 1

Summary for Subcatchment 1S: 1-1

Runoff = 0.91 cfs @ 1.03 hrs, Volume= 0.025 af, Depth= 1.03"

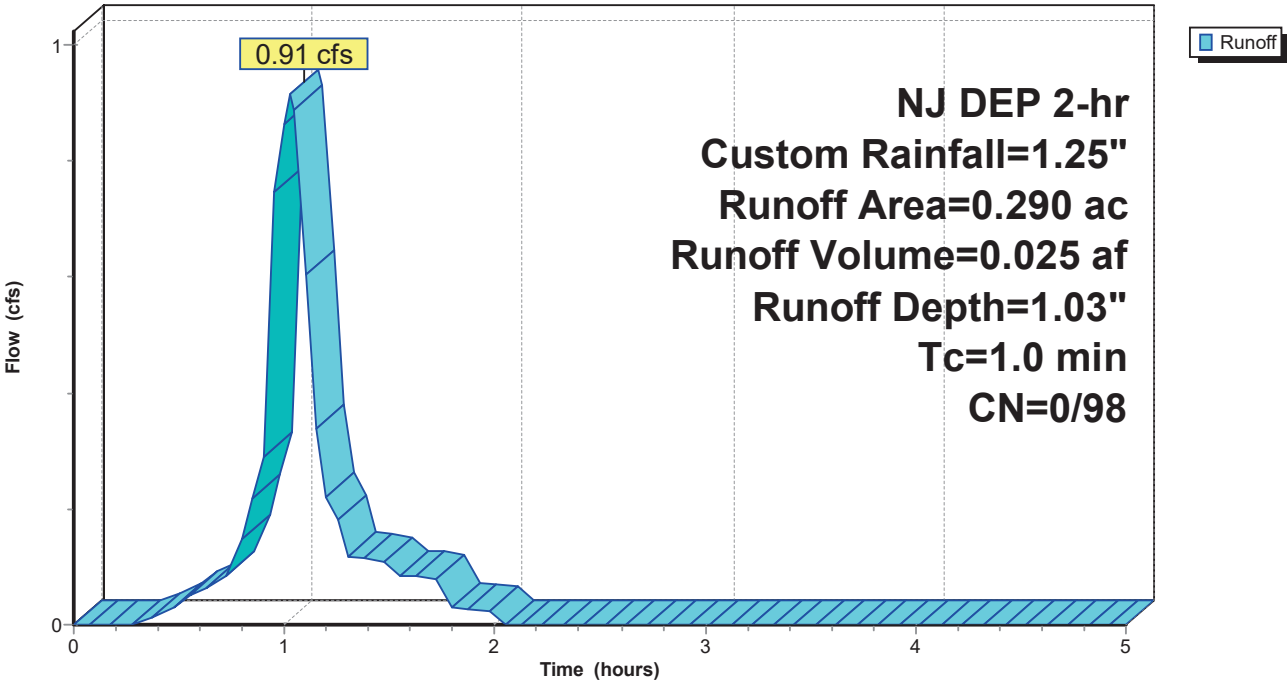
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Custom Rainfall=1.25"

Area (ac)	CN	Description
* 0.290	98	
0.290	98	100.00% Impervious Area

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

Subcatchment 1S: 1-1

Hydrograph



NJ Storm

Prepared by Contech Engineered Solutions

HydroCAD® 10.20-8a s/n 00447 © 2025 HydroCAD Software Solutions LLC

NJ DEP 2-hr Custom Rainfall=1.25"

Printed 8/3/2026

Page 2

Summary for Subcatchment 2S: 1-2 & 1-3

Runoff = 0.57 cfs @ 1.03 hrs, Volume= 0.016 af, Depth= 1.03"

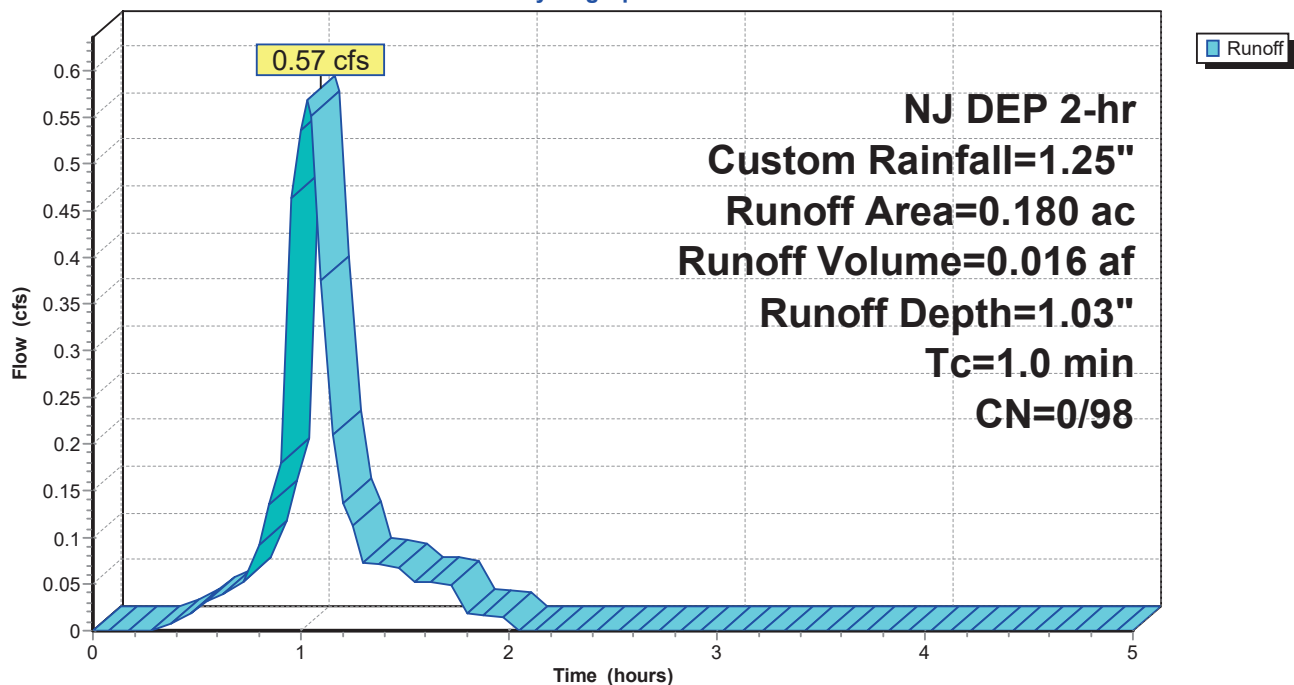
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Custom Rainfall=1.25"

Area (ac)	CN	Description
* 0.180	98	
0.180	98	100.00% Impervious Area

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

Subcatchment 2S: 1-2 & 1-3

Hydrograph



NJ Storm

Prepared by Contech Engineered Solutions

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NJ DEP 2-hr Custom Rainfall=1.25"

Printed 8/3/2026

Page 3

Summary for Subcatchment 4S: 1-4

Runoff = 0.50 cfs @ 1.03 hrs, Volume= 0.014 af, Depth= 1.03"

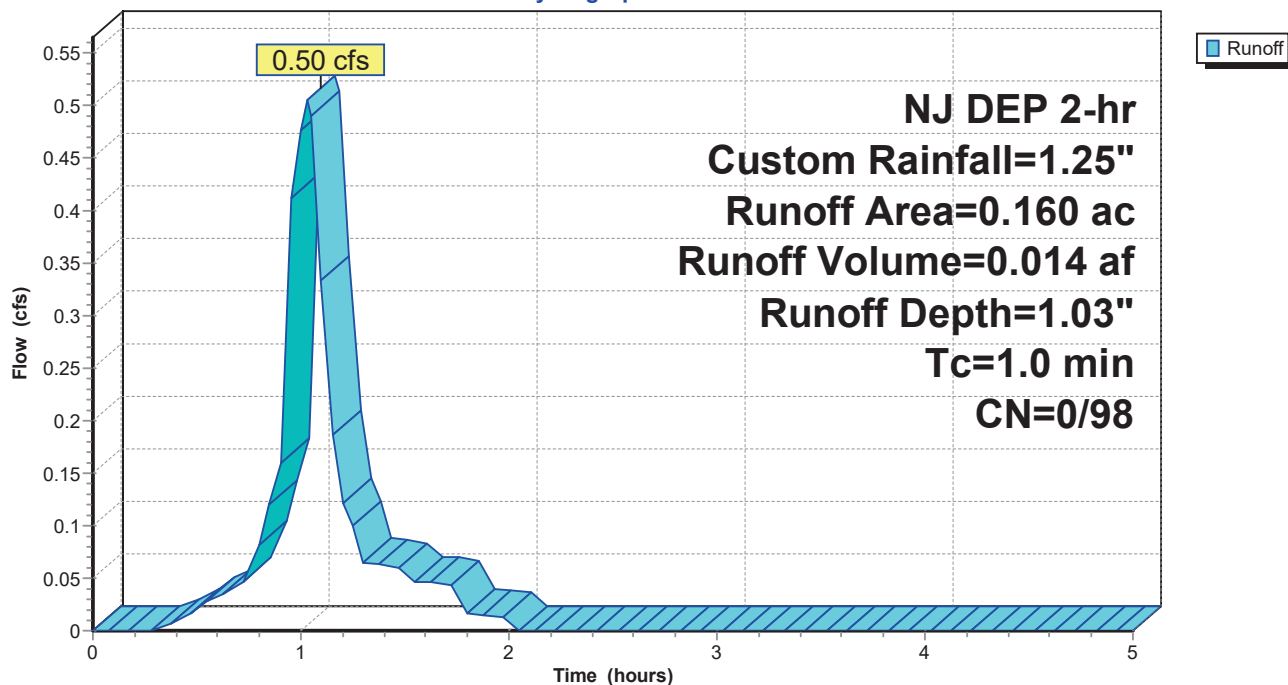
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Custom Rainfall=1.25"

Area (ac)	CN	Description
* 0.160	98	
0.160	98	100.00% Impervious Area

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

Subcatchment 4S: 1-4

Hydrograph



NJ Storm

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NJ DEP 2-hr Custom Rainfall=1.25"
Printed 8/3/2026
Page 4

Summary for Subcatchment 5S: 2-1

Runoff = 0.63 cfs @ 1.03 hrs, Volume= 0.017 af, Depth= 1.03"
Routed to nonexistent node 9P

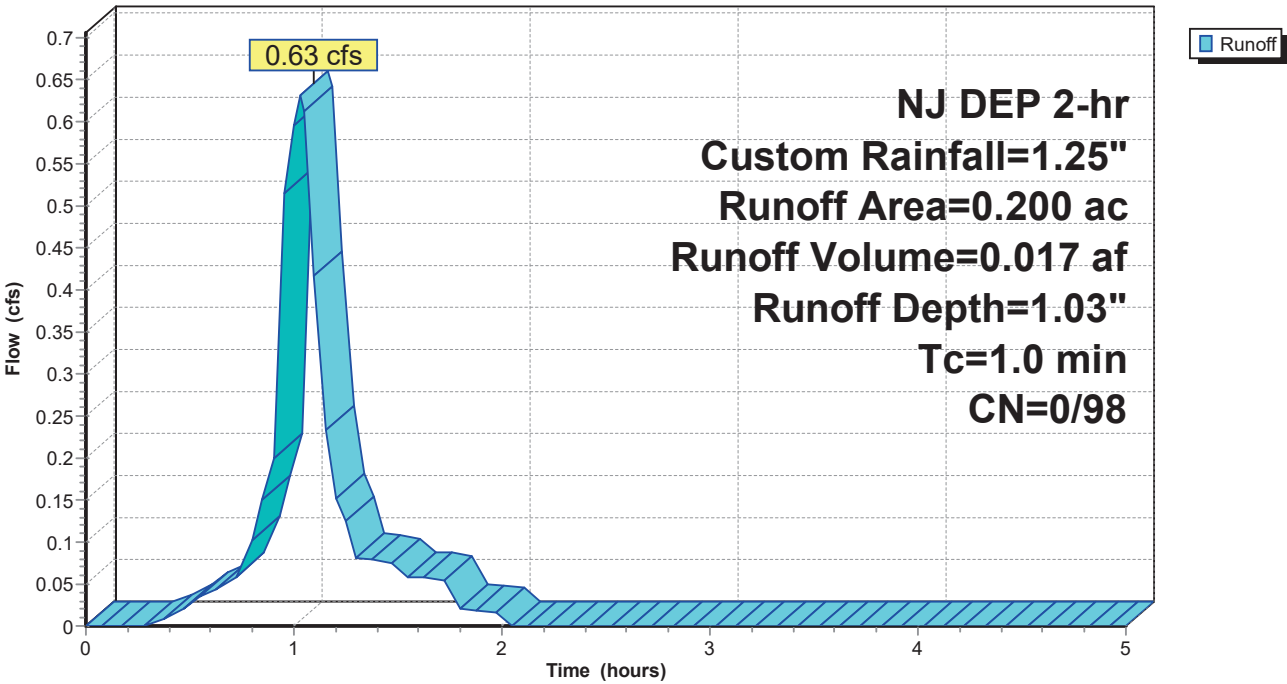
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Custom Rainfall=1.25"

Area (ac)	CN	Description
* 0.200	98	
0.200	98	100.00% Impervious Area

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

Subcatchment 5S: 2-1

Hydrograph



NJ Storm

Prepared by Contech Engineered Solutions

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NJ DEP 2-hr Custom Rainfall=1.25"

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Page 5

Summary for Subcatchment 6S: 2-2

Runoff = 0.57 cfs @ 1.03 hrs, Volume= 0.016 af, Depth= 1.03"
Routed to nonexistent node 9P

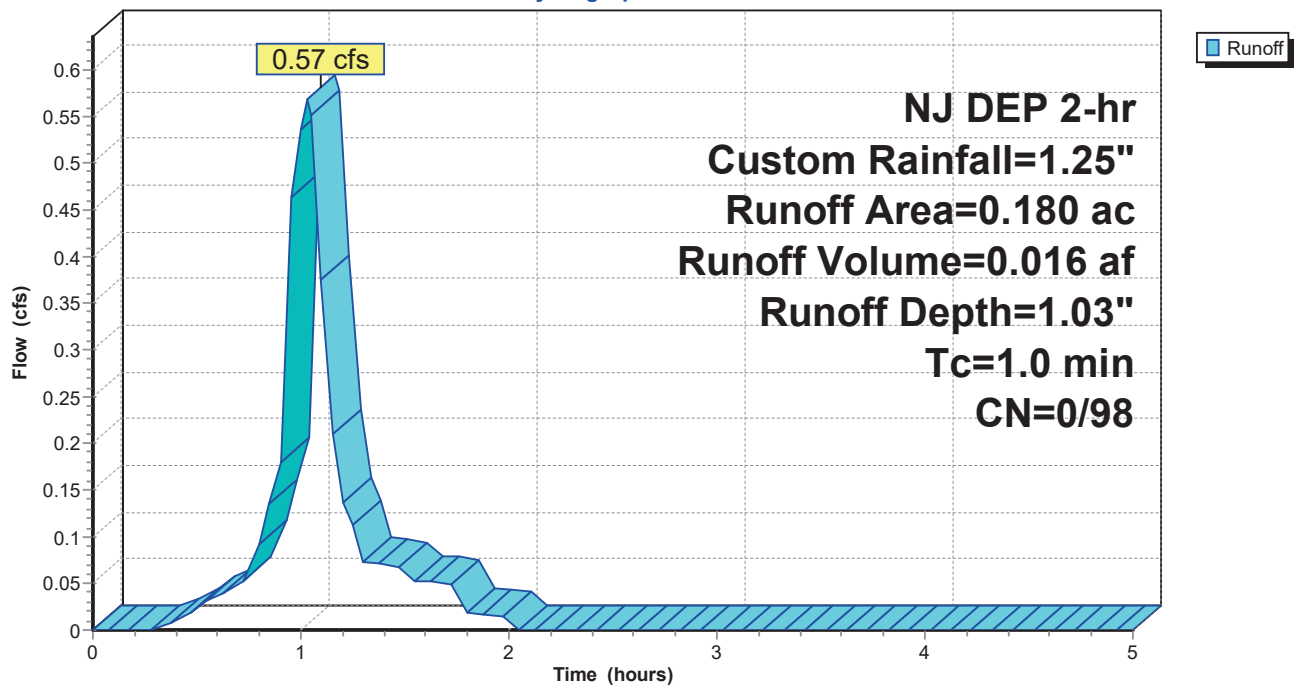
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Custom Rainfall=1.25"

Area (ac)	CN	Description
* 0.180	98	
0.180	98	100.00% Impervious Area

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

Subcatchment 6S: 2-2

Hydrograph



NJ Storm

Prepared by Contech Engineered Solutions

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NJ DEP 2-hr Custom Rainfall=1.25"

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Page 6

Summary for Subcatchment 7S: 2-3

Runoff = 0.44 cfs @ 1.03 hrs, Volume= 0.012 af, Depth= 1.03"
Routed to nonexistent node 9P

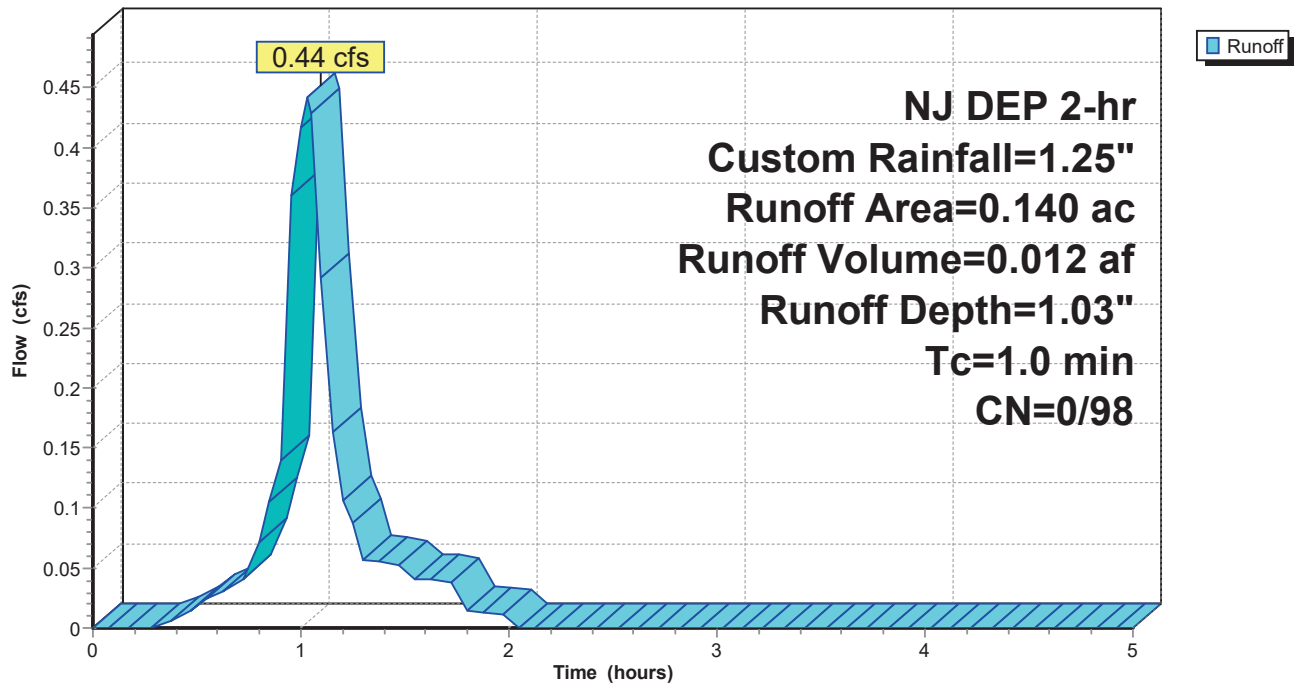
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Custom Rainfall=1.25"

Area (ac)	CN	Description
* 0.140	98	
0.140	98	100.00% Impervious Area

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

Subcatchment 7S: 2-3

Hydrograph





State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATERSHED PROTECTION AND RESTORATION

BUREAU OF NJPDES STORMWATER PERMITTING

P.O. Box 420 Mail Code 501-02A

Trenton, New Jersey 08625-0420

609-633-7021 / Fax: 609-777-0432

<https://dep.nj.gov/stormwater/>

MIKIE SHERILL
Governor

DALE G. CALDWELL
Lt. Governor

ED POTOSNAK
Acting Commissioner

February 6, 2026

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Rapterra System
Online Installation

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.2(f) and 5.2(j) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Rapterra System (Rapterra).

The project falls under the “Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology” dated August 4, 2021. The applicable protocol is the “New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device” dated January 14, 2022, updated April 25, 2023.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2026) for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the Rapterra by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.

2. The Rapterra stormwater treatment device shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.
3. This Rapterra stormwater treatment device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in Chapter 9.5 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at <https://dep.nj.gov/stormwater/>.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Rapterra. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at: <https://www.conteches.com/media/nj3lv4pd/rapterra-vault-om.pdf> for any changes to the maintenance requirements.
6. For an MTD to be considered "green infrastructure" in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) infiltrate into the subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil. Any configuration that uses a bio-filtration media and can be configured "above ground" and incorporate a tree box, planter box, or shrubs, etc., would meet the GI definition. Any MTD with bio-filtration media that would be placed "below ground" as a vault without any vegetation can be considered GI (for NJ purposes) only if the device infiltrates the entire Water Quality Design Storm into the subsoil. Further, the below ground device (vault) would need to meet the NJDEP Stormwater BMP Manual conditions of having the soil below the MTD meet the minimum tested infiltration rate of one inch per hour, have at least two feet of separation from the seasonal high water table, and infiltrate into the subsoil.
7. Sizing Requirements:

The example below demonstrates the sizing procedure for the Rapterra:

Example: A 0.25-acre impervious site with a slope of 5% is to be treated to 80% TSS removal using a Rapterra. The hydraulically most distant point to the inlet of the Rapterra is 110 feet. The site is located in an area for which the projected 2-year storm rainfall depth was calculated to be 3.84 inches.

The selection of the appropriate model of a Rapterra is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Rapterra in this example is 0.25 acres. Based upon the information in Table 1 below, one 6 X 4 Rapterra, whether used in the offline or inline configuration, would be able to treat the runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

CN = 98 (Curve Number for impervious)

Dimensionless Unit Hydrograph (DUH) = SCS Standard DUH (peak rate factor of 484)

Time of concentration = 0.8 minutes

Q = 0.77 cfs

Given the site runoff is 0.77 cfs and based on Table 1 below, one 6 X 6 Rapterra in the offline configuration with an MTFR of 0.780 cfs, or one 6 X 6 Rapterra in the online configuration with an MTFR of 0.771 cfs would be required to remove 80% of the TSS from the impervious area without exceeding the MTFR.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system model is noted below and on the following pages. Additional specifications regarding the Rapterra can be found in the Verification Appendix.

Table 1: Rapterra Models and Associated MTFRs

Configuration	Media Bay Size	Effective Filtration Treatment Area (ft ²)	Maximum Treatment Flow Rate (cfs)	Maximum Inflow Drainage Area (acres)
Offline Configuration Rapterra and Rapterra Bioscape Vaults	36" Manhole	6.85	0.149	0.082
	48" Manhole	12.35	0.269	0.148
	4x4	15.79	0.344	0.189
	60" Manhole	19.42	0.423	0.233
	6x4 or 4x6	23.79	0.518	0.285
	72" Manhole	28.06	0.611	0.337
	8x4 or 4x8	31.79	0.693	0.381
	4.5x7.83 or 7.83x4.5	35.02	0.763	0.420
	6x6	35.79	0.780	0.429
	8x6 or 6x8	47.79	1.041	0.573
	10x6 or 6x10	59.62	1.299	0.715
	12x6 or 6x12	71.62	1.561	0.859
	13x7 or 7x13	90.62	1.975	1.087
	14x8	111.23	2.424	1.335
	16x8	127.33	2.775	1.528
	18x8	143.23	3.121	1.719
	20x8	159.23	3.470	1.911
	22x8	175.23	3.818	2.103

Configuration	Media Bay Size	Effective Filtration Treatment Area (ft ²)	Maximum Treatment Flow Rate (cfs)	Maximum Inflow Drainage Area (acres)
Inline Configuration Rapterra and Rapterra Bioscape Vaults	36" Manhole	6.85	0.149	0.082
	48" Manhole	12.35	0.269	0.148
	4x4	15.79	0.344	0.189
	60" Manhole	19.42	0.423	0.233
	6x4 or 4x6	23.79	0.518	0.285
	72" Manhole	28.06	0.611	0.337
	8x4 or 4x8	31.40	0.684	0.377
	4.5x7.83 or 7.83x4.5	34.64	0.755	0.416
	6x6	35.40	0.771	0.425
	8x6 or 6x8	47.40	1.033	0.569
	10x6 or 6x10	59.01	1.286	0.708
	12x6 or 6x12	71.01	1.547	0.852
	13x7 or 7x13	90.01	1.961	1.080
	14x8	110.38	2.405	1.325
	16x8	126.38	2.754	1.517
Peak Diversion Rapterra Vaults	4x4 (6x4 Vault)	15.79	0.344	0.189
	4x6 (8x4 Vault)	23.79	0.518	0.285
	6x4 (6x6 Vault)	23.79	0.518	0.285
	4.5x5.83 (7.83 x 4.5 Vault)	26.02	0.567	0.312
	6x6 (8x6 Vault)	35.79	0.780	0.429
	6x8 (10x6 Vault)	47.79	1.041	0.573
	6x10 (12x6 Vault)	59.62	1.299	0.715
	7x10 (13x7 Vault)	69.62	1.517	0.835
	8x10.5 (14x8 Vault)	83.62	1.822	1.003
	8x12.5 (16x8 Vault)	99.62	2.171	1.195
	8x14 (18x8 Vault)	111.23	2.424	1.335
	8x16 (20x8 Vault)	127.23	2.772	1.527
	8x18 (22x8 Vault)	143.23	3.121	1.719
	Custom and/or Rapterra Bioscape	Media Area in ft ² (MA)	0.02179 * MA	0.012 * MA

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Lisa Schaefer of my office at lisa.schaefer@dep.nj.gov.

Sincerely,

A handwritten signature in blue ink that reads "Gabriel Mahon". The signature is fluid and cursive, with the first name "Gabriel" and last name "Mahon" clearly distinguishable.

Gabriel Mahon, Chief
Bureau of NJPDES Stormwater Permitting
Division of Watershed Protection and Restoration
New Jersey Department of Environmental Protection

Attachment: Maintenance Plan

c: Richard Magee, NJCAT

Rapterra Vault Owner's Manual

(Precast Vault Configurations)



rapterra™

CONTECH®
ENGINEERED SOLUTIONS
A QUIKRETE® COMPANY

This Owner's Manual applies to all precast Rapterra configurations,
including Rapterra Bioscape Vault.



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Introduction

Thank you for your purchase of the Rapterra™ Bioretention System. Rapterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Rapterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Rapterra system.

Included with your purchase is Activation of the Rapterra system by the manufacturer and a final site assessment of unit condition (mulch replacement, debris removal, and pruning of vegetation, if applicable) scheduled between 6 and 12 months after activation, upon request.

Design and Installation

Each project presents different scopes for the use of Rapterra systems. Information and help may be provided to the design engineer during the planning process. Correct Rapterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Rapterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Rapterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices.
- Planting of the system's vegetation (provided by the purchaser) where applicable.
- Placement of pretreatment mulch layer using mulch acceptable for use in Rapterra systems.
- Placement of scour netting over the mulch layer.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation (where applicable), and use of pretreatment mulch acceptable for use in Rapterra systems. More information is available in the Rapterra Activation Package.

Minimum Requirements

The minimum requirements for Rapterra Activation can be found in Appendix 1 (page 12).

The Rapterra Activation Package is available on the Contech website (www.ContechES.com/Rapterra) and ensures that the proper conditions are met for Contech to perform the Activation service. If vegetation is specified or required, vegetation meeting Contech's requirements must be provided at time of Activation. If the site does not meet the conditions required for Activation, or acceptable vegetation is not provided by the purchaser at time of Activation, a charge of \$1,500 will be invoiced to the purchaser.



Rapterra Plant Selection Overview

A Plant List is available on the Contech website highlighting recommended plants for Rapterra systems in your area for systems specified with and/or requiring vegetation. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Rapterra system. Plants installed in the Rapterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Rapterra system.

More information is available in the Rapterra Activation Package.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Rapterra system's warranty and waive the manufacturer provided Activation and Final Site Assessment services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Rapterra system or runoff protection devices
- Removal of any Rapterra system components
- Failure to prevent construction related runoff from entering the Rapterra system
- Failure to properly store and protect any Rapterra components (including media and underdrain stone) that may be shipped separately from the vault

Final Site Assessment

With proper routine maintenance, the biofiltration media within the Rapterra system should last as long as traditional bioretention media. A final site assessment is included by the manufacturer, upon request, on all Rapterra systems between 6 and 12 months after activation. This includes a final assessment of unit condition, debris removal, mulch replacement, and pruning of vegetation, where applicable. More information is provided in the Operations and Maintenance Guidelines. Some Rapterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the final site assessment, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.



Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Rapterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Rapterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Rapterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; in regions with less rainfall often only (1) one visit per annum is sufficient. Varying land uses can affect maintenance frequency. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the maintenance provider of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology.



Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not included as part of the final site assessment. Should a major contamination event occur the Owner must block off the outlet pipe of the Rapterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Rapterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Identify the Rapterra system
2. Inspection of Rapterra and surrounding area
3. Removal of tree grate or access cover, scour protection netting, and erosion control stones
4. Removal of debris, trash and mulch
5. Mulch replacement
6. Plant health evaluation and pruning or replacement as necessary
7. Replace scour netting, erosion control stones, and tree grate
8. Clean area around Rapterra
9. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Rapterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft ²)	Volume at 6" (ft ³)	# of 2 ft ³ Mulch Bags
4	4	16	8	4
6	4	24	12	6
8	4	32	16	8
6	6	36	18	10
8	6	48	24	12
10	6	60	30	16
12	6	72	36	18
13	7	91	46	24

Other sizes not listed - 1 bag per 4 ft² of media.

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.



1. Identify the Rapterra System

To ensure correct maintenance guidelines, correctly identifying a Rapterra system from a Filterra system is critical. A Rapterra unit can be identified using either the nameplate or the protective scour netting that covers the mulch. If no nameplate or scour netting is present, STOP and contact Contech.

2. Inspection of Rapterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes no
Damage to Box Structure	yes no
Damage to Grate	yes no
Is Bypass Clear	yes no

If yes answered to any of these observations, record with close-up photograph (numbered).



3. Removal of tree grate or access cover, scour protection netting, and erosion control stones

- Remove cast iron grates or covers for access into Rapterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.
- Remove stakes that hold scour protection netting in place. Carefully remove scour netting that sits above the mulch layer. This netting will be reused.

Record on Maintenance Report the following:

Silt/Clay	yes no
Cups/ Bags	yes no
Leaves	yes no
Buckets Removed	_____



4. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Rapterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Rapterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____



5. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 6".
- Refer to Rapterra Mulch Specifications for information on acceptable sources.

6. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health, if applicable, and replace if necessary.

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy unhealthy
Damage to Plant	yes no
Plant Replaced	yes no

- Prune as necessary to encourage growth in the correct directions

7. Replace scour netting, erosion control stones, and tree grate

- Relay and re-anchor scour netting from before on top of mulch layer.
- Ensure correct repositioning of erosion control stones by the Rapterra inlet to allow for entry of trash during a storm event.
- Replace Rapterra grates or covers correctly using appropriate lifting or moving tools, taking care not to damage the plant, if applicable.

8. Clean area around Rapterra

- Clean area around unit and remove all refuse to be disposed of appropriately.

9. Complete paperwork

- Deliver Maintenance Report.
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.



Plant Care for Rapterra™ Systems w/ Vegetation Specified and/or Required

After Activation, the Contractor is responsible for proper care of the vegetation until the site is handed over to the Owner. After that, it is the Site Owner's responsibility to care for the vegetation. Contech recommends the following care for the plants:

1. To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
2. Plant staking may be required.
3. With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
4. Contech recommends irrigation of the Rapterra™ Vegetation. The following guidance will help to ensure the vegetation is properly irrigated.

Irrigation Recommendations:

- Each Rapterra™ system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Rapterra™ plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required.

*** Five gallons per square yard approximates 1 inch of water. Therefore for a 6' x 6 foot Rapterra™ approximately 20-60 gallons of applied water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate. Then calculate the time needed to irrigate the Rapterra™, For example if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6'x6' filter.*

Plant Replacement:

In some cases, plants will require replacement. Please follow the procedures below to ensure a properly functioning Rapterra™ system.

1. Remove the existing plant, and leave as much of the Rapterra™ media in place as possible.
2. Select a replacement per the Rapterra™ Activation Package.
3. Prior to removing the plant from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
4. Cut away any roots which are growing out of the container drain holes.
5. Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively, the pot can be cut away to minimize root ball disturbance.
6. Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
7. Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
8. All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
9. Reinstall or add mulch to a depth of 6" per Contech's mulch specifications for Rapterra™ systems.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Rapterra.	Inlet should be free of obstructions allowing free distributed flow of water into Rapterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation (where applicable)	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation (where applicable)	Plant growth excessive.	Plants should be appropriate to the species and location of Rapterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.

Rapterra Inspection & Maintenance Log

Rapterra System Size/Model: _____ Location: _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate (if applicable)	Vegetation Species (if applicable)	Issues with System	Comments
1/1/26	5 – 5 gal Buckets	6"	Lowe's Premium Brown Mulch	4'	Galaxy Magnolia	- Standing water in downstream structure	- Removed blockage in downstream structure

Appendix 1 – Rapterra™ Vault Activation Package

RAPTERRA™ VAULT ACTIVATION PACKAGE



The Rapterra system will be (or has been) delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Rapterra system.

Included with your purchase is Activation of the Rapterra system by the manufacturer as well as a 1-year warranty from delivery of the system and a Final Site Assessment (assessment of unit condition, mulch replacement, debris removal, and pruning of vegetation if applicable) scheduled between 6 months and 1 year after Activation, upon request.

Activation of the Rapterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices
- Planting of the system's vegetation (provided by the purchaser where specified and/or required)
- Placement of pretreatment mulch layer using mulch acceptable for use in Rapterra systems.
- Placement of scour netting over the mulch layer.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation (where applicable), and use of pretreatment mulch acceptable for use in Rapterra systems. The purchaser should request Activation from Contech after the site is stabilized, but prior to turning over the site to the owner. Please allow 1-2 weeks to schedule Activation.

The purchaser must ensure that the site is acceptable for Rapterra Activation. A checklist (included as page 3 of this document must be completed and submitted to the Contech Activation Coordinator. The minimum 4 requirements for Rapterra Activation are as follows:

1. If vegetation is specified and/or required, the purchaser must have sourced vegetation meeting the requirements outlined in "Plant Selection for Rapterra Systems" starting on page 4 of this document.



* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants (when specified and/or required) are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

Rapterra Activation Package | Page 1

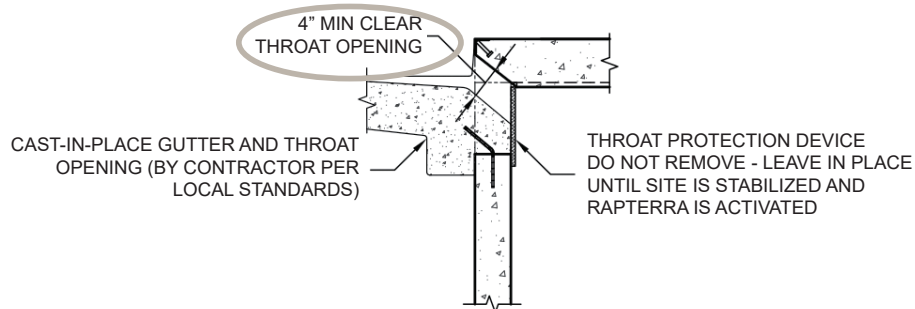
2. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



3. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Rapterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Rapterra system.



4. Where curb inlets are included as part of the Rapterra system, Rapterra throat opening should be at least 4" clear in order to ensure adequate capacity for inflow and debris.



* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants (when specified and/or required) are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

Rapterra Activation Package | Page 2

Rapterra™ Vault Activation Checklist



Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	Top Opening Type	Final Pavement Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height (where applicable)	Vegetation Sourced by Contractor (where applicable)
	☐ Tree Grate ☐ Full Grate (No tree opening) ☐ Bioscape Vault (Open Planter)	☐ Verified	☐ Verified	☐ Verified	☐ Verified	☐ Species on FT Plant List ☐ Container Grown (15 gal. max) ☐ 4' Tall Min. (Tree grate units only) _____ Qty provided
	☐ Tree Grate ☐ Full Grate (No tree opening) ☐ Bioscape Vault (Open Planter)	☐ Verified	☐ Verified	☐ Verified	☐ Verified	☐ Species on FT Plant List ☐ Container Grown (15 gal. max) ☐ 4' Tall Min. (Tree grate units only) _____ Qty provided
	☐ Tree Grate ☐ Full Grate (No tree opening) ☐ Bioscape Vault (Open Planter)	☐ Verified	☐ Verified	☐ Verified	☐ Verified	☐ Species on FT Plant List ☐ Container Grown (15 gal. max) ☐ 4' Tall Min. (Tree grate units only) _____ Qty provided
	☐ Tree Grate ☐ Full Grate (No tree opening) ☐ Bioscape Vault (Open Planter)	☐ Verified	☐ Verified	☐ Verified	☐ Verified	☐ Species on FT Plant List ☐ Container Grown (15 gal. max) ☐ 4' Tall Min. (Tree grate units only) _____ Qty provided

Attach additional sheets as necessary.

NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

Signature _____

Date _____

* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants (when specified and/or required) are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

Rapterra Activation Package | Page 3

Planting Selection for Rapterra™ Vault Systems Specifying and/or Requiring Plants

Vegetation is recommended in Rapterra for proper long-term performance. As indicated in the Activation Package, the Contractor is responsible for sourcing the proper vegetation prior to Activation. Contech or a Contech representative will install the vegetation during the Activation process.

Contractors should identify the Top Opening style for each Rapterra requiring Activation on the Activation Checklist. Contech offers three types, which are detailed on page 5 of this document:

- Vault with Tree Grate
- Vault with Full Grate
- Bioscape / Open Planter

Contractors must ensure the vegetation meets the following 4 requirements:

1. Select plant(s) as specified in the engineering plans and specifications AND that are listed on Contech's Configuration Specific Plant Lists**.
2. All plants MUST be container-grown in nursery containers no larger than 15 gallons. Crated and/or Ball/Burlap plants are NOT permitted.
3. For Vaults with Tree Grates, plant height must be 4' Minimum, from soil surface to top of plant.
4. Provide plant quantities per the following guidance:
 - Vault with Tree Grate – 1 per Tree Grate
 - Vault with Full Grate – 4-5 Small or Extra Small Grasses per Full Grate
 - Bioscape – Quantities should be selected based on plant palette options found starting on page 6 of this document.



If Contech or Contech's representative shows up for Activation and any of the 4 requirements above are not met, Activation cannot be performed and the Contractor will be billed a \$1,500 Unprepared Site fee*.

Some additional vegetation recommendations for the best possible Activation and Installation are as follows:

- Select plant(s) with full root development but not to the point where root bound.
- For Rapterra systems with a Tree Grate, select plants with taller trunks. Lower branches can be pruned away provided there are sufficient branches above the grate for tree or shrub development.
- For Rapterra systems with a Tree Grate, plant(s) should have a single trunk at installation.
- Plant species shall not have a mature height greater than 30 feet.

** In some cases, Contech may consider alternate plant species as approved by the Product Manager. Please list the plant name in the space below and submit this sheet to your Contech Activation Coordinator. If the plant species is approved, either the Product Manager or the Activation Coordinator will sign the form and return to you for inclusion with your Activation Checklist.

Requested Plant Species: _____ Approved: _____

Date: _____

* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants (when specified and/or required) are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

Rapterra™ Top Opening Examples

Rapterra™ Vault with Tree Grate

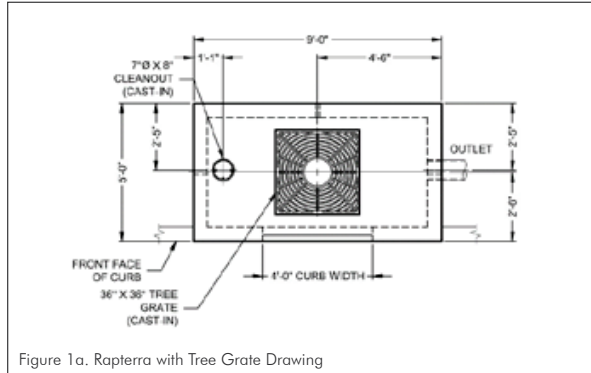


Figure 1a. Rapterra with Tree Grate Drawing



Figure 1b. Rapterra with Tree Grate Photo (not yet planted)

Rapterra™ Vault with Full Grate

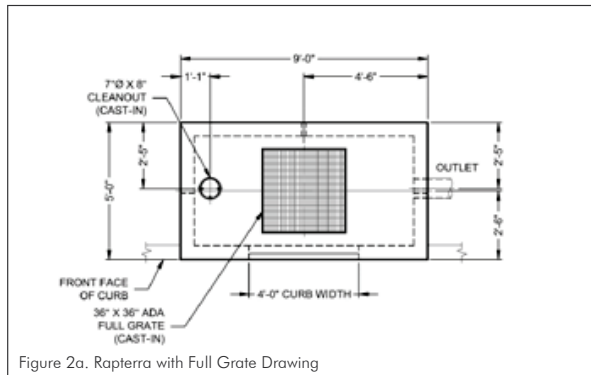


Figure 2a. Rapterra with Full Grate Drawing



Figure 2b. Rapterra with Full Grate Photo

Note: To meet NJDEP GI standards, solid grate option must include infiltration of the WQv.

Rapterra™ Bioscape Vault

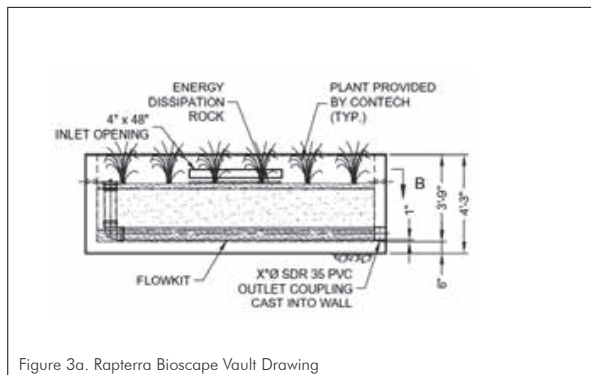


Figure 3a. Rapterra Bioscape Vault Drawing



Figure 3b. Rapterra Bioscape Vault Photo

* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants (when specified and/or required) are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

Rapterra™ Bioscape Vault Plant Palettes

KEY: (refer to plant lists for species sizing)

	A. EXTRA SMALL GRASS
	• Up to 2' mature spread
	• 1-2 gallon typical (1 gal. minimum)
	B. SMALL GRASS/SHRUB
	• 2'-4' mature spread
	• 1-7 gallon typical
	C. MEDIUM SHRUB
	• 4'-6' mature spread
	• 1-7 gallon typical
	D. LARGE SHRUB OR EXTRA LARGE SHRUB OR TREE
	• 6' mature spread and greater, 30' max. mature height
	• Up to 15 gallon maximum

NOTE: For larger vaults and in-ground Rapterra Bioscape systems, palettes can be scaled (i.e. Qty 6 of the 22x8 Palette can be used for a 1056 sf Rapterra Bioscape).

MIX & MATCH SUBSTITUTION OPTIONS:

1 Large Shrub or Extra Large Shrub or Tree

- 2 Medium Shrubs
- 4 Small Grass/Shrubs
- 12 Extra Small Grasses

1 Medium Shrub

- 2 Small Grass/Shrubs
- 6 Extra Small Grasses

1 Small Grass/Shrub

- 3 Extra Small Grasses

4x4 Media Bay



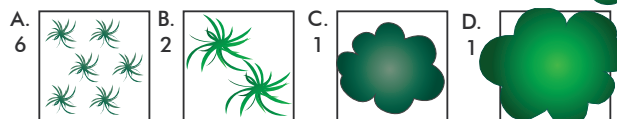
4x6/6x4 Media Bay



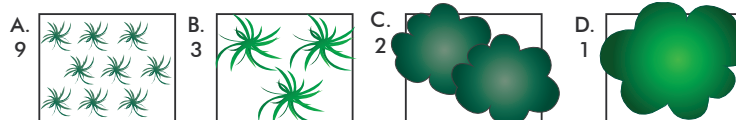
4x8/8x4 &
4.5x7.83/7.83x4.5
Media Bay



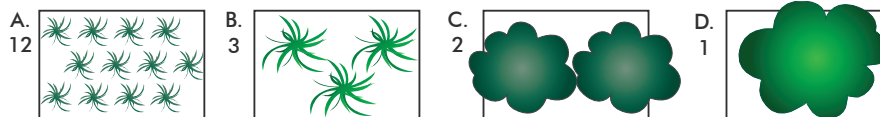
6x6 Media Bay



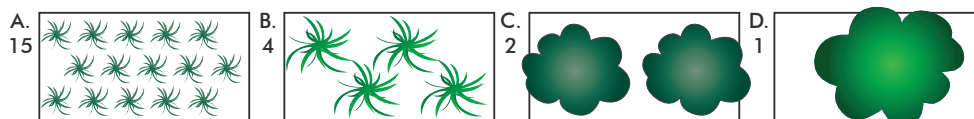
6x8/8x6 Media Bay



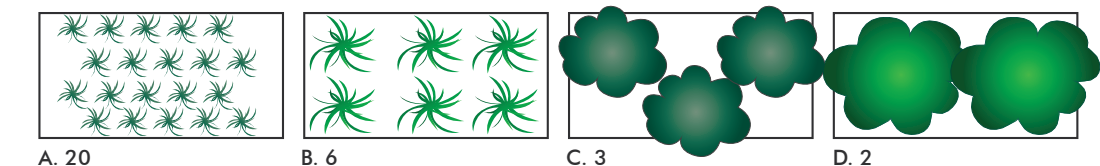
6x10/10x6 &
8x8 Media Bay



6x12/12x6 Media Bay

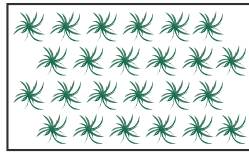


7x13/13x7/12x8 &
14x8 Media Bay

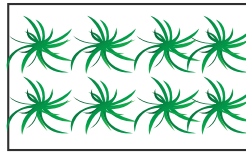


* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants (when specified and/or required) are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Rapterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

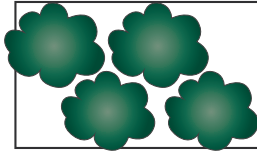
16x8 & 15x9
Media Bay



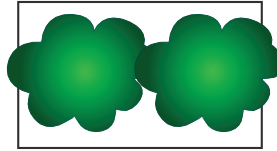
A. 24



B. 8

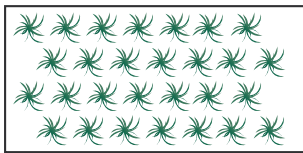


C. 4

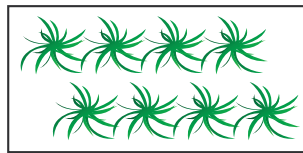


D. 2

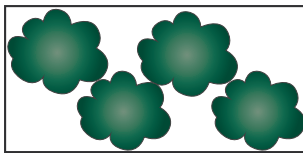
18x8 Media Bay



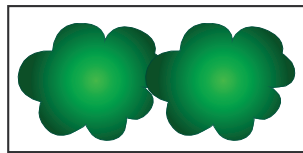
A. 28



B. 8

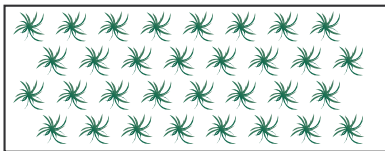


C. 4

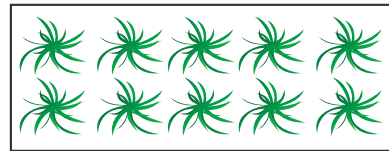


D. 2

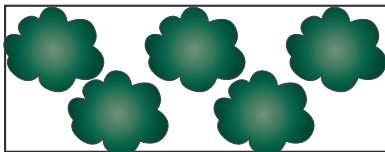
20x8 Media Bay



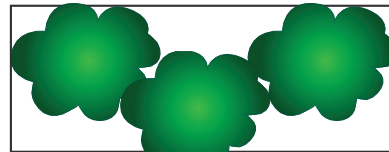
A. 32



B. 10

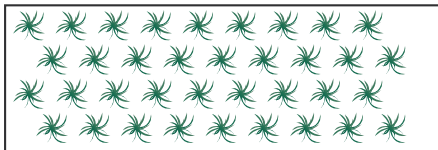


C. 5

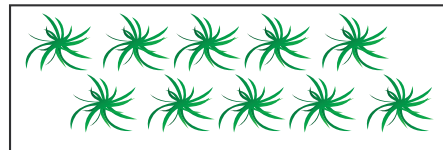


D. 3

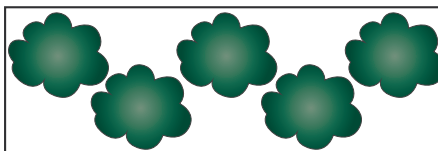
22x8 Media Bay



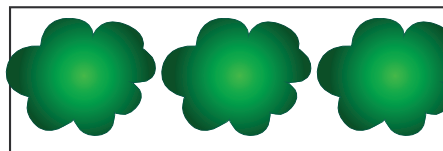
A. 36



B. 10



C. 5



D. 3

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Appendix 2 – Rapterra™ Tree Grate Opening Expansion Procedure

The standard grates used on all Rapterra configurations that employ Tree Grates are fabricated with a 6" opening that is designed with a breakaway section that can be removed, allowing the grate opening to be expanded to 12" as the tree matures and the trunk widens.

The following tools are required to expand the opening:

- Mini sledgehammer (3 lb. or greater)
- Safety Glasses / Goggles

The following guidelines should be followed to properly expand the tree opening from 6" to 12":



1. Remove the grate from the Rapterra frame, place it flat on a hard surface, and support the grate by stepping on the edge or using other weighted items such as a few mulch bags if this is being done during a Rapterra maintenance event. Put on safety glasses/goggles. Align the mini sledgehammer as shown in the figure to the left. The head of the sledgehammer should be aimed just inside the wide cast iron bar between the larger grate section and the breakaway section.



2. Repeatedly hit the grate at this spot with the mini sledgehammer.



3. After several hits, the breakaway section should snap cleanly off of the larger grate section. Reinstall the grate into the Rapterra grate frame. Recycle or dispose of the breakaway section per local guidelines.

[illegible]



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APPENDIX G

Supporting Documents



NOAA Atlas 14, Volume 2, Version 3
Location name: Township of Verona, New Jersey,
USA*

Latitude: 40.8309°, Longitude: -74.2464°

Elevation: 374 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.338 (0.308-0.371)	0.403 (0.368-0.442)	0.477 (0.435-0.523)	0.530 (0.482-0.580)	0.597 (0.542-0.654)	0.643 (0.581-0.705)	0.689 (0.619-0.754)	0.733 (0.655-0.803)	0.784 (0.694-0.861)	0.825 (0.725-0.909)
10-min	0.536 (0.490-0.589)	0.641 (0.586-0.704)	0.759 (0.692-0.833)	0.842 (0.766-0.923)	0.945 (0.857-1.04)	1.02 (0.918-1.11)	1.09 (0.976-1.19)	1.15 (1.02-1.26)	1.22 (1.08-1.34)	1.28 (1.12-1.41)
15-min	0.667 (0.609-0.733)	0.802 (0.733-0.880)	0.955 (0.871-1.05)	1.06 (0.964-1.16)	1.19 (1.08-1.30)	1.28 (1.16-1.40)	1.37 (1.23-1.50)	1.44 (1.29-1.58)	1.54 (1.36-1.69)	1.60 (1.40-1.76)
30-min	0.909 (0.830-0.998)	1.10 (1.01-1.21)	1.35 (1.23-1.48)	1.52 (1.39-1.67)	1.75 (1.59-1.92)	1.91 (1.72-2.09)	2.07 (1.86-2.27)	2.22 (1.98-2.43)	2.42 (2.14-2.65)	2.55 (2.24-2.81)
60-min	1.13 (1.03-1.24)	1.38 (1.26-1.51)	1.72 (1.57-1.89)	1.98 (1.80-2.17)	2.32 (2.10-2.54)	2.57 (2.32-2.82)	2.84 (2.55-3.10)	3.09 (2.76-3.39)	3.44 (3.04-3.78)	3.70 (3.25-4.07)
2-hr	1.38 (1.26-1.52)	1.69 (1.54-1.85)	2.13 (1.95-2.34)	2.49 (2.26-2.73)	2.97 (2.68-3.25)	3.37 (3.03-3.69)	3.78 (3.37-4.13)	4.20 (3.72-4.60)	4.80 (4.20-5.26)	5.28 (4.57-5.78)
3-hr	1.55 (1.42-1.70)	1.88 (1.72-2.07)	2.39 (2.18-2.62)	2.78 (2.54-3.05)	3.33 (3.02-3.64)	3.78 (3.40-4.13)	4.23 (3.79-4.62)	4.71 (4.18-5.15)	5.38 (4.72-5.88)	5.91 (5.13-6.47)
6-hr	2.00 (1.84-2.19)	2.43 (2.23-2.66)	3.08 (2.82-3.36)	3.60 (3.28-3.92)	4.35 (3.93-4.72)	4.97 (4.46-5.39)	5.63 (5.02-6.11)	6.34 (5.60-6.88)	7.36 (6.40-8.00)	8.21 (7.06-8.93)
12-hr	2.50 (2.28-2.75)	3.03 (2.77-3.34)	3.86 (3.52-4.24)	4.55 (4.13-4.99)	5.56 (5.00-6.08)	6.44 (5.74-7.01)	7.38 (6.51-8.03)	8.42 (7.34-9.17)	9.96 (8.52-10.8)	11.3 (9.49-12.3)
24-hr	2.83 (2.62-3.08)	3.43 (3.17-3.73)	4.39 (4.06-4.77)	5.21 (4.80-5.66)	6.45 (5.89-6.99)	7.52 (6.82-8.15)	8.71 (7.82-9.44)	10.0 (8.90-10.9)	12.0 (10.5-13.1)	13.7 (11.8-15.0)
2-day	3.35 (3.09-3.64)	4.05 (3.75-4.40)	5.17 (4.78-5.62)	6.10 (5.62-6.63)	7.47 (6.84-8.12)	8.64 (7.86-9.38)	9.91 (8.94-10.8)	11.3 (10.1-12.3)	13.4 (11.7-14.6)	15.1 (13.1-16.6)
3-day	3.52 (3.26-3.81)	4.26 (3.95-4.61)	5.41 (5.01-5.86)	6.36 (5.88-6.89)	7.75 (7.11-8.39)	8.92 (8.13-9.66)	10.2 (9.21-11.0)	11.6 (10.4-12.6)	13.6 (12.0-14.8)	15.3 (13.3-16.8)
4-day	3.69 (3.43-3.98)	4.46 (4.15-4.82)	5.65 (5.24-6.10)	6.62 (6.13-7.16)	8.02 (7.38-8.66)	9.20 (8.40-9.94)	10.5 (9.48-11.3)	11.8 (10.6-12.8)	13.8 (12.2-15.0)	15.4 (13.5-16.9)
7-day	4.36 (4.06-4.70)	5.24 (4.88-5.64)	6.51 (6.06-7.01)	7.56 (7.02-8.13)	9.06 (8.36-9.74)	10.3 (9.45-11.1)	11.6 (10.6-12.5)	13.0 (11.8-14.1)	15.1 (13.4-16.4)	16.8 (14.7-18.3)
10-day	5.01 (4.69-5.37)	5.98 (5.60-6.42)	7.32 (6.85-7.85)	8.42 (7.86-9.02)	9.97 (9.25-10.7)	11.2 (10.4-12.1)	12.6 (11.5-13.5)	14.0 (12.7-15.1)	16.0 (14.3-17.3)	17.6 (15.6-19.2)
20-day	6.77 (6.37-7.21)	8.04 (7.56-8.55)	9.59 (9.01-10.2)	10.8 (10.1-11.5)	12.5 (11.6-13.3)	13.8 (12.8-14.7)	15.1 (14.0-16.1)	16.4 (15.1-17.5)	18.1 (16.6-19.5)	19.5 (17.7-21.1)
30-day	8.44 (7.98-8.92)	9.96 (9.42-10.5)	11.6 (11.0-12.3)	12.9 (12.2-13.7)	14.6 (13.7-15.5)	15.9 (14.9-16.8)	17.1 (16.0-18.2)	18.3 (17.1-19.5)	19.9 (18.4-21.2)	21.0 (19.4-22.5)
45-day	10.7 (10.2-11.3)	12.6 (11.9-13.3)	14.5 (13.8-15.3)	16.0 (15.1-16.8)	17.9 (16.9-18.8)	19.3 (18.2-20.3)	20.6 (19.4-21.8)	21.9 (20.5-23.2)	23.5 (21.9-25.0)	24.7 (22.9-26.3)
60-day	12.8 (12.2-13.5)	15.1 (14.3-15.9)	17.2 (16.4-18.1)	18.8 (17.9-19.8)	20.8 (19.7-21.9)	22.3 (21.1-23.5)	23.6 (22.3-24.9)	24.9 (23.5-26.3)	26.5 (24.8-28.0)	27.6 (25.7-29.3)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

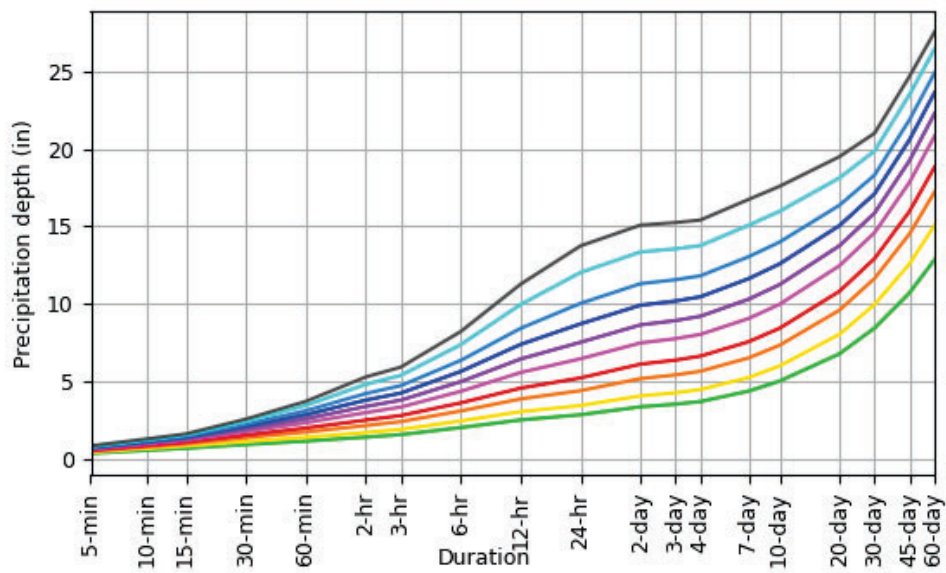
Please refer to NOAA Atlas 14 document for more information.

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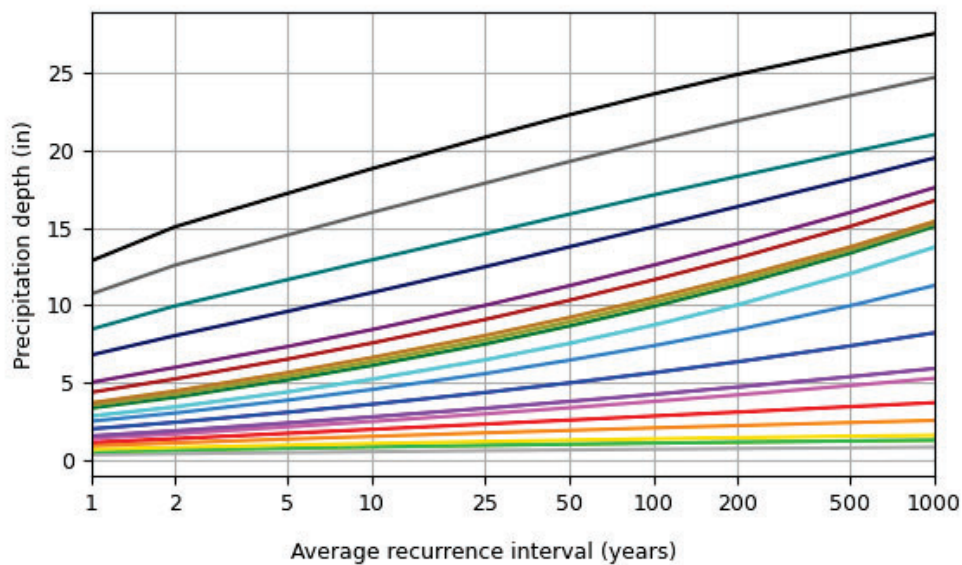
PF graphical

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

Latitude: 40.8309°, Longitude: -74.2464°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

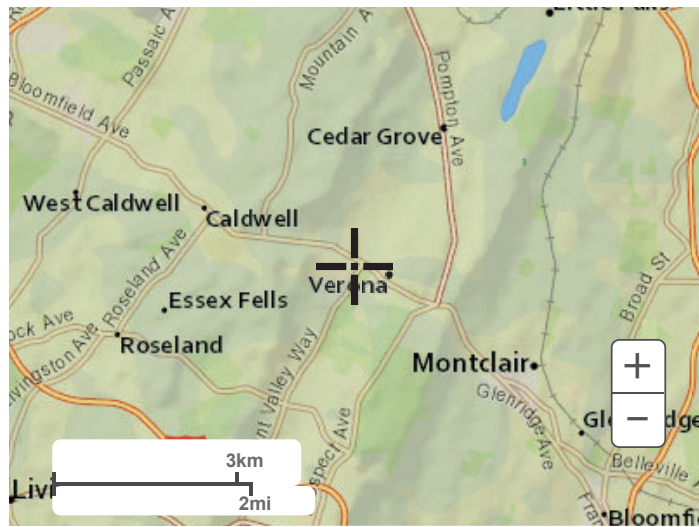


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

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Maps & aerials

Small scale terrain



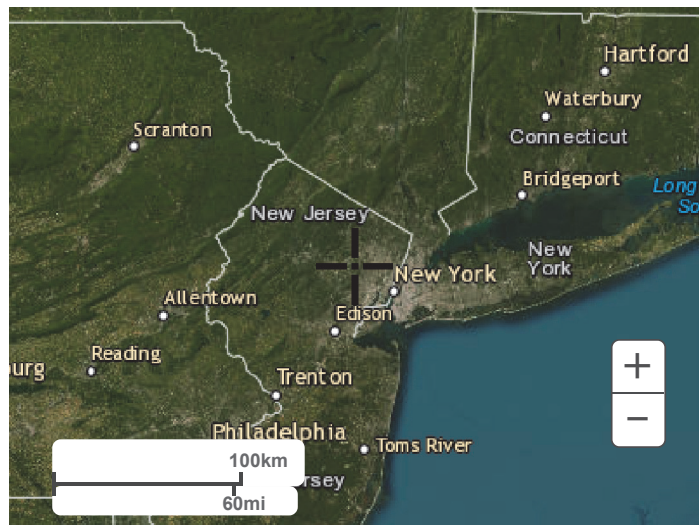
Large scale terrain



Large scale map



Large scale aerial



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Proposed Conditions

Prepared by Bright View Engineering

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Printed 1/19/2026

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	2-YEAR	NOAA 24-hr	C	Default	24.00	1	3.43	2	3.43
2	2-YEAR - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	3.46	2	3.46
3	2-YEAR - FUTURE ADJUSTED	NOAA 24-hr	C	Default	24.00	1	4.08	2	4.08
4	10-YEAR	NOAA 24-hr	C	Default	24.00	1	5.21	2	3.43
5	10-YEAR - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	5.37	2	3.46
6	10-YEAR - FUTURE ADJUSTED	NOAA 24-hr	C	Default	24.00	1	6.36	2	4.08
7	100-YEAR	NOAA 24-hr	C	Default	24.00	1	8.71	2	3.43
8	100-YEAR - ADJUSTED	NOAA 24-hr	C	Default	24.00	1	9.23	2	3.46
9	100-YEAR - FUTURE ADJUSTED	NOAA 24-hr	C	Default	24.00	1	11.58	2	4.08
10	NJ WQ Storm	NJ DEP 2-hr		Default	2.00	1	1.25	2	8.71
11	WORST CASE	NOAA 24-hr	C	Default	24.00	1	13.90	2	8.71



HYDROGRAPH COMPARISON

EVENT: 2 YEAR ADJUSTED

Time (hours)	Existing Rate (cfs)	Proposed Rate (cfs)	Change (cfs)*
0	0	0	0
0.5	0	0	0
1	0	0	0
1.5	0.01	0	0.01
2	0.01	0.01	0
2.5	0.02	0.01	0.01
3	0.02	0.02	0
3.5	0.03	0.02	0.01
4	0.03	0.02	0.01
4.5	0.04	0.02	0.02
5	0.04	0.03	0.01
5.5	0.04	0.03	0.01
6	0.05	0.03	0.02
6.5	0.05	0.04	0.01
7	0.06	0.04	0.02
7.5	0.07	0.05	0.02
8	0.08	0.05	0.03
8.5	0.09	0.06	0.03
9	0.09	0.06	0.03
9.5	0.12	0.08	0.04
10	0.15	0.1	0.05
10.5	0.18	0.12	0.06
11	0.28	0.2	0.08
11.5	0.48	0.35	0.13
12	2.74	1.99	0.75
12.5	0.87	0.76	0.11
13	0.39	0.35	0.04
13.5	0.25	0.22	0.03
14	0.19	0.17	0.02
14.5	0.16	0.14	0.02
15	0.13	0.11	0.02
15.5	0.12	0.1	0.02
16	0.11	0.09	0.02
16.5	0.1	0.09	0.01
17	0.09	0.08	0.01
17.5	0.08	0.07	0.01
18	0.07	0.06	0.01
18.5	0.07	0.06	0.01
19	0.07	0.06	0.01
19.5	0.06	0.06	0
20	0.06	0.06	0
20.5	0.06	0.05	0.01
21	0.06	0.05	0.01
21.5	0.06	0.05	0.01
22	0.05	0.05	0
22.5	0.05	0.05	0
23	0.05	0.04	0.01
23.5	0.05	0.04	0.01
24	0.06	0.05	0.01

* A negative value indicates an increase in runoff from existing to proposed

**HYDROGRAPH COMPARISON**

EVENT: 2 YEAR FUTURE

Time (hours)	Existing Rate (cfs)	Proposed Rate (cfs)	Change (cfs)*
0	0	0	0
0.5	0	0	0
1	0	0	0
1.5	0.01	0.01	0
2	0.02	0.01	0.01
2.5	0.03	0.02	0.01
3	0.03	0.02	0.01
3.5	0.04	0.02	0.02
4	0.04	0.03	0.01
4.5	0.05	0.03	0.02
5	0.05	0.03	0.02
5.5	0.05	0.04	0.01
6	0.06	0.04	0.02
6.5	0.07	0.04	0.03
7	0.08	0.05	0.03
7.5	0.08	0.06	0.02
8	0.09	0.06	0.03
8.5	0.1	0.07	0.03
9	0.11	0.08	0.03
9.5	0.14	0.1	0.04
10	0.18	0.12	0.06
10.5	0.21	0.15	0.06
11	0.35	0.25	0.1
11.5	0.59	0.44	0.15
12	3.31	2.5	0.81
12.5	1.04	0.92	0.12
13	0.47	0.42	0.05
13.5	0.29	0.27	0.02
14	0.23	0.21	0.02
14.5	0.19	0.17	0.02
15	0.15	0.14	0.01
15.5	0.14	0.12	0.02
16	0.13	0.11	0.02
16.5	0.12	0.11	0.01
17	0.11	0.1	0.01
17.5	0.1	0.09	0.01
18	0.09	0.08	0.01
18.5	0.08	0.07	0.01
19	0.08	0.07	0.01
19.5	0.08	0.07	0.01
20	0.07	0.07	0
20.5	0.07	0.07	0
21	0.07	0.06	0.01
21.5	0.07	0.06	0.01
22	0.06	0.06	0
22.5	0.06	0.06	0
23	0.06	0.05	0.01
23.5	0.06	0.05	0.01
24	0.07	0.06	0.01

* A negative value indicates an increase in runoff from existing to proposed

**HYDROGRAPH COMPARISON**

EVENT: 10 YEAR ADJUSTED

Time (hours)	Existing Rate (cfs)	Proposed Rate (cfs)	Change (cfs)*
0	0	0	0
0.5	0	0	0
1	0.01	0.01	0
1.5	0.02	0.01	0.01
2	0.03	0.02	0.01
2.5	0.04	0.03	0.01
3	0.05	0.03	0.02
3.5	0.06	0.04	0.02
4	0.06	0.04	0.02
4.5	0.07	0.05	0.02
5	0.07	0.05	0.02
5.5	0.08	0.05	0.03
6	0.08	0.05	0.03
6.5	0.09	0.06	0.03
7	0.1	0.07	0.03
7.5	0.12	0.08	0.04
8	0.13	0.09	0.04
8.5	0.14	0.09	0.05
9	0.15	0.11	0.04
9.5	0.2	0.14	0.06
10	0.25	0.18	0.07
10.5	0.3	0.22	0.08
11	0.48	0.36	0.12
11.5	0.81	0.63	0.18
12	4.52	3.48	1.04
12.5	1.4	1.3	0.1
13	0.63	0.59	0.04
13.5	0.4	0.37	0.03
14	0.31	0.29	0.02
14.5	0.26	0.24	0.02
15	0.21	0.19	0.02
15.5	0.19	0.17	0.02
16	0.17	0.16	0.01
16.5	0.16	0.15	0.01
17	0.14	0.13	0.01
17.5	0.13	0.12	0.01
18	0.12	0.11	0.01
18.5	0.11	0.1	0.01
19	0.11	0.1	0.01
19.5	0.1	0.1	0
20	0.1	0.09	0.01
20.5	0.1	0.09	0.01
21	0.09	0.09	0
21.5	0.09	0.08	0.01
22	0.09	0.08	0.01
22.5	0.08	0.08	0
23	0.08	0.07	0.01
23.5	0.08	0.07	0.01
24	0.09	0.08	0.01

* A negative value indicates an increase in runoff from existing to proposed

**HYDROGRAPH COMPARISON**

EVENT: 10 YEAR FUTURE

Time (hours)	Existing Rate (cfs)	Proposed Rate (cfs)	Change (cfs)*
0	0	0	0
0.5	0	0	0
1	0.02	0.01	0.01
1.5	0.03	0.02	0.01
2	0.05	0.03	0.02
2.5	0.06	0.04	0.02
3	0.06	0.04	0.02
3.5	0.07	0.05	0.02
4	0.08	0.05	0.03
4.5	0.08	0.06	0.02
5	0.09	0.06	0.03
5.5	0.09	0.06	0.03
6	0.1	0.07	0.03
6.5	0.11	0.08	0.03
7	0.13	0.09	0.04
7.5	0.14	0.09	0.05
8	0.16	0.11	0.05
8.5	0.17	0.12	0.05
9	0.19	0.14	0.05
9.5	0.24	0.18	0.06
10	0.3	0.23	0.07
10.5	0.36	0.28	0.08
11	0.58	0.45	0.13
11.5	0.98	0.79	0.19
12	5.47	4.35	1.12
12.5	1.68	1.57	0.11
13	0.76	0.71	0.05
13.5	0.47	0.45	0.02
14	0.37	0.35	0.02
14.5	0.31	0.29	0.02
15	0.25	0.23	0.02
15.5	0.22	0.21	0.01
16	0.21	0.19	0.02
16.5	0.19	0.18	0.01
17	0.17	0.16	0.01
17.5	0.16	0.15	0.01
18	0.14	0.13	0.01
18.5	0.13	0.12	0.01
19	0.13	0.12	0.01
19.5	0.12	0.12	0
20	0.12	0.11	0.01
20.5	0.12	0.11	0.01
21	0.11	0.1	0.01
21.5	0.11	0.1	0.01
22	0.1	0.1	0
22.5	0.1	0.09	0.01
23	0.1	0.09	0.01
23.5	0.09	0.09	0
24	0.11	0.1	0.01

* A negative value indicates an increase in runoff from existing to proposed

**HYDROGRAPH COMPARISON**

EVENT: 100 YEAR ADJUSTED

Time (hours)	Existing Rate (cfs)	Proposed Rate (cfs)	Change (cfs)*
0	0	0	0
0.5	0.01	0	0.01
1	0.04	0.03	0.01
1.5	0.07	0.04	0.03
2	0.08	0.06	0.02
2.5	0.1	0.06	0.04
3	0.11	0.07	0.04
3.5	0.12	0.08	0.04
4	0.12	0.08	0.04
4.5	0.13	0.09	0.04
5	0.14	0.09	0.05
5.5	0.14	0.1	0.04
6	0.15	0.1	0.05
6.5	0.17	0.12	0.05
7	0.2	0.14	0.06
7.5	0.22	0.16	0.06
8	0.24	0.18	0.06
8.5	0.27	0.2	0.07
9	0.29	0.23	0.06
9.5	0.38	0.29	0.09
10	0.46	0.37	0.09
10.5	0.56	0.45	0.11
11	0.89	0.73	0.16
11.5	1.5	1.27	0.23
12	8.28	6.65	1.63
12.5	2.5	2.42	0.08
13	1.12	1.09	0.03
13.5	0.7	0.68	0.02
14	0.55	0.53	0.02
14.5	0.46	0.44	0.02
15	0.37	0.35	0.02
15.5	0.33	0.31	0.02
16	0.3	0.29	0.01
16.5	0.28	0.27	0.01
17	0.26	0.24	0.02
17.5	0.23	0.22	0.01
18	0.21	0.2	0.01
18.5	0.2	0.19	0.01
19	0.19	0.18	0.01
19.5	0.18	0.17	0.01
20	0.18	0.17	0.01
20.5	0.17	0.16	0.01
21	0.17	0.16	0.01
21.5	0.16	0.15	0.01
22	0.15	0.14	0.01
22.5	0.15	0.14	0.01
23	0.14	0.13	0.01
23.5	0.13	0.13	0
24	0.16	0.14	0.02

* A negative value indicates an increase in runoff from existing to proposed

**HYDROGRAPH COMPARISON**

EVENT: 100 YEAR FUTURE

Time (hours)	Existing Rate (cfs)	Proposed Rate (cfs)	Change (cfs)*
0	0	0	0
0.5	0.02	0.01	0.01
1	0.07	0.04	0.03
1.5	0.1	0.06	0.04
2	0.11	0.08	0.03
2.5	0.13	0.09	0.04
3	0.14	0.09	0.05
3.5	0.15	0.1	0.05
4	0.16	0.11	0.05
4.5	0.17	0.11	0.06
5	0.18	0.12	0.06
5.5	0.19	0.13	0.06
6	0.2	0.14	0.06
6.5	0.23	0.16	0.07
7	0.26	0.19	0.07
7.5	0.29	0.22	0.07
8	0.32	0.25	0.07
8.5	0.35	0.28	0.07
9	0.38	0.31	0.07
9.5	0.49	0.4	0.09
10	0.6	0.5	0.1
10.5	0.72	0.61	0.11
11	1.15	0.98	0.17
11.5	1.93	1.68	0.25
12	10.61	8.76	1.85
12.5	3.16	3.08	0.08
13	1.41	1.38	0.03
13.5	0.89	0.86	0.03
14	0.7	0.67	0.03
14.5	0.58	0.56	0.02
15	0.46	0.45	0.01
15.5	0.42	0.4	0.02
16	0.38	0.37	0.01
16.5	0.35	0.34	0.01
17	0.32	0.31	0.01
17.5	0.29	0.28	0.01
18	0.26	0.25	0.01
18.5	0.25	0.24	0.01
19	0.24	0.23	0.01
19.5	0.23	0.22	0.01
20	0.22	0.21	0.01
20.5	0.22	0.21	0.01
21	0.21	0.2	0.01
21.5	0.2	0.19	0.01
22	0.19	0.18	0.01
22.5	0.18	0.18	0
23	0.18	0.17	0.01
23.5	0.17	0.16	0.01
24	0.2	0.18	0.02

* A negative value indicates an increase in runoff from existing to proposed

APPENDIX H
MAPS



Map Scale: 1:1,760 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 20, Sep 3, 2024

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

Date(s) aerial images were photographed: Oct 10, 2022—Oct 16, 2022

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

MAP LEGEND

Area of Interest (AOI)		Area of Interest (AOI)
Soils		Soil Map Unit Polygons
		Soil Map Unit Lines
		Soil Map Unit Points
Special Point Features		
		Blowout
		Borrow Pit
		Clay Spot
		Closed Depression
		Gravel Pit
		Gravelly Spot
		Landfill
		Lava Flow
		Marsh or swamp
		Mine or Quarry
		Miscellaneous Water
		Perennial Water
		Rock Outcrop
		Saline Spot
		Sandy Spot
		Severely Eroded Spot
		Sinkhole
		Slide or Slip
		Sodic Spot
Water Features		
		Streams and Canals
Transportation		
		Rails
		Interstate Highways
		US Routes
		Major Roads
		Local Roads
Background		
		Aerial Photography
		Special Line Features
		Other
		Wet Spot
		Very Stony Spot
		Stony Spot
		Spill Area

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BouB	Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes	0.0	0.6%
PecuuB	Peckmantown - Urban land, Peckmantown substratum complex, 0 to 8 percent slopes	5.8	99.4%
Totals for Area of Interest		5.9	100.0%

PLANS ARE FINAL FOR SANITARY SEWER AND WATER MAIN DESIGN

