C&C DEVELOPMENT
STORMWATER NARRATIVE

March 7, 2025

REPORT FOR:
CITY OF LA CROSSE – ENGINEERING DEPARTMENT
Attn: Yuri Nasonovs

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ISG

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Introduction

This stormwater management report has been prepared to accompany the submitted plans and stormwater calculations for the C&C Development in La Crosse, WI. The project will consist of a new 12-unit townhome with parking and a 24-unit apartment building on a separate lot. Construction will include footings, erection of building, parking lots, site grading, stormwater management, sanitary and water services, concrete pavement, erosion control, and turf restoration. A project location map is provided in the submitted plan set.

Design Standards

Stormwater management plans and calculations have been prepared to meet the City of La Crosse Municipal Code of Ordinances and the Stormwater Management Requirements of NR 151. The disturbed area for the project is over one acre therefore it will require a Wisconsin DNR WPDES permit.

Table 1.1: Design Criteria

	Performance Standard	Requirements
Wisconsin Department of Natural Resources NR 151	Total Suspended Solids NR 151.122	Redevelopment – 40% TSS reduction from parking areas and roads.
	Peak Discharge NR 151.123	Exempt per NR 151.123(2)(b) – Redevelopment Site.
	Infiltration NR 151.124	Exempt per NR 151.124 (3)(b)3 – Redevelopment Site.
	Protective Areas NR 151.125	N/A – No protective areas within proposed site.
	Fueling & Vehicle Maintenance NR 151.126	N/A – No fueling or vehicle maintenance areas within proposed site.
	Location NR 151.127	BMP's will be located on site.
	Timing NR 151.128	BMP's will be installed prior to final stabilization.
City of La Crosse Municipal Code of Ordinances Section 105-61	Total Suspended Solids Sec. 105-61(b)(4)a.	Redevelopment – 40% TSS reduction from parking areas and roads.
	Peak Discharge Sec. 105-61(b)(4)b.	Maintain or reduce 2-yr and 10-yr 24-hour post construction peak runoff to predevelopment rates
	Safe Outlet Sec. 105-61(b)(4)c.	Safe passage of 100-year storm event
	Infiltration Sec. 105-61(b)(4)d.	Redevelopment site (exempt)
	Protective Areas Sec. 105-61(b)(4)e.	N/A – No protective areas within proposed site
	Fueling and vehicle maintenance Sec. 105-61(b)(4)f.	N/A – No fueling or vehicle maintenance areas within proposed site.
	Swale Treatment for Transportation Facilities Sec. 105-61(b)(4)f.	N/A

Existing Conditions

The existing site currently consists of a single-family homes and a garden. The site has been modeled as 2 drainage areas for the two separate proposed lots which convey water to the city street. Existing homes that have previously been demolished are included in the existing impervious area calculations. The existing drainage map and ground cover is provided in the attachments.

Proposed Conditions

The proposed site has been separated into 5 total drainage areas. The proposed site will consist of a new 12-unit townhome with parking and a 24-unit apartment building on a separate site.

The northern site fronting Division Street is comprised of three drainage areas. One will drain off site to the north and the other two will drain to a proposed filtration basin.

The southern site fronts 10th Street and consists of two proposed drainage areas. The majority of the site including the building roof will drain to a dry detention basin. The remainder of the site consisting of the perimeter around the building will drain to offsite to 10th similar to existing conditions.

A breakdown of the watersheds and land cover characteristics is provided on the proposed drainage map included in the stormwater calculations.

Stormwater Management Summary

Temporary erosion control measures will be implicated for the proposed project prior to the start of construction. Proposed erosion control measures include silt fence, stabilized construction exit, inlet protection, erosion control mat, and a concrete washout area. Locations of the proposed BMPs along with construction activity notes are provided on the erosion control sheets. Sediment and soil loss calculations are included in the attachments. Approximate construction sequencing for the project is listed below.

- Install temporary erosion control BMPs
- Stripping topsoil, soil corrections and rough grading
- Installation of underground utilities
- Subgrade preparation
- Construction of pavement
- Turf restoration
- Stabilization and establishment of turf

- Removal of temporary erosion control BMPs

Proposed stormwater management of the north site on Division will include a filtration basin with a layer of engineered soil to provide water quality along with peak flow reduction from the site. The south site on 10th Street will utilize a dry detention basin for peak flow reduction. Since the site only contains building roof area and sidewalk TSS reduction for a redevelopment site does not apply to the newly created impervious areas.

Calculation summary

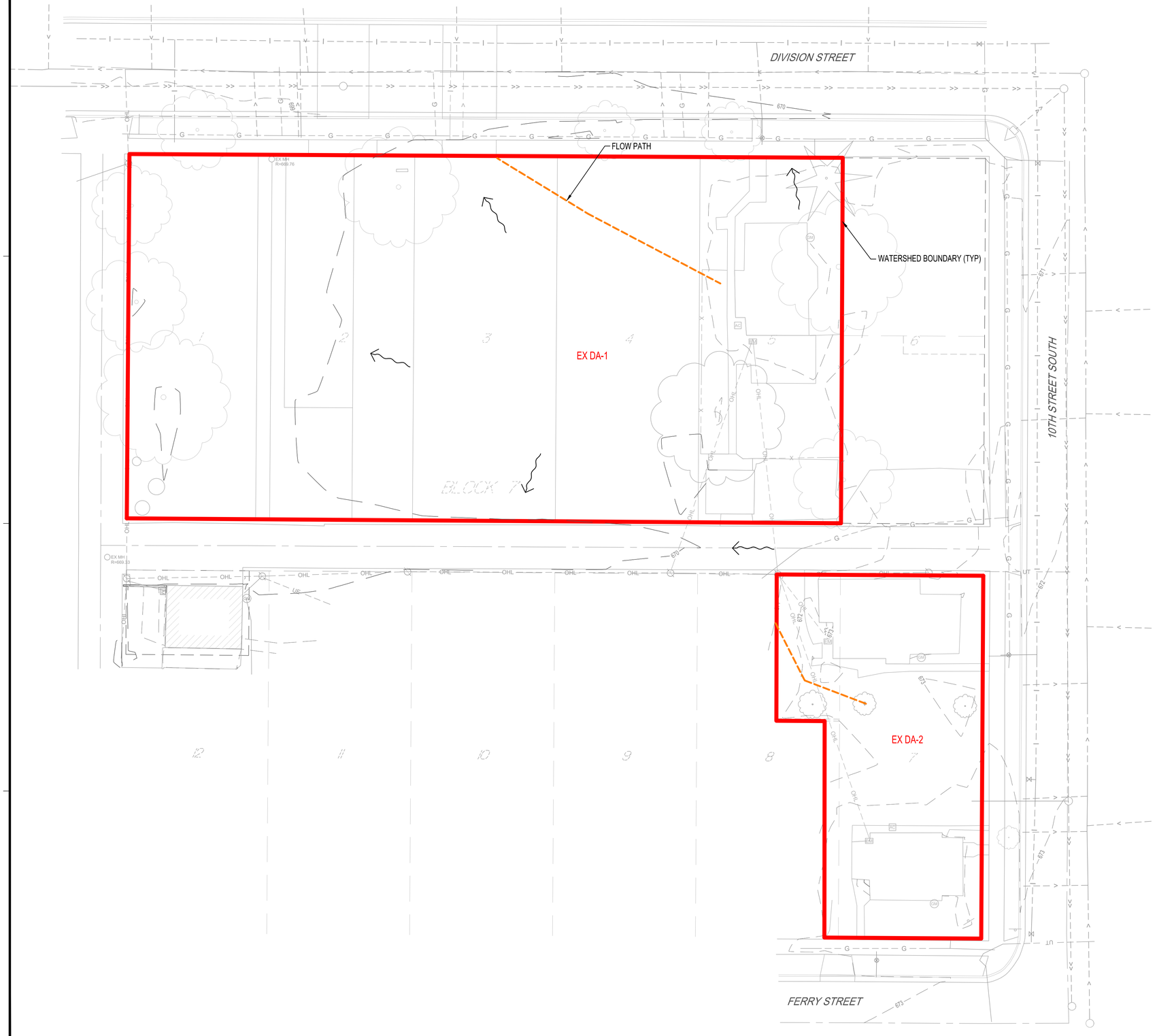
In conjunction with the plans for the project, calculations were performed for the existing and proposed drainage conditions. Water quantity calculations were completed using hydraulic models developed by utilizing the design data and the HydroCAD Version 10.20-5c computer modeling system. This was used to provide sizing and analysis for the proposed filtration basin and dry basin. Hydrographs for existing and proposed scenarios were generated and routed through these models using the Atlas-14 rainfall distribution. The proposed runoff from the analyzed events is provided in the table below. The HydroCAD calculations for the proposed conditions are included in the attachments.

Table 1.3: Site Runoff Calculations

Rainfall Event	Existing Conditions	Proposed Conditions
24-Hour Storm	Peak Flow (CFS)	Peak Flow (CFS)
2-year	1.48	1.41
10-year	*2.82*	2.29
100-year	*6.14*	7.66

The table above shows that the proposed 2 and 10-year peak runoff rates for the development are reduced compared to existing conditions, meeting the City requirements. Also, the 100-year event is contained without overtopping the proposed basins.

Water quality calculations have been completed by utilizing the design data and the WinSLAMM Version 10.5.0 computer modeling system. This was used to provide an analysis of the reduction in total suspended solids for the stormwater management system. Results show a total TSS removal of 83% from the impervious surfaces for the proposed site using suitable parameters for the project area when compared to no controls. The WinSLAMM model shows that the proposed conditions meet the City requirements to reduce total suspended solids for the redeveloped lot from the parking and road areas by 40% compared to no controls. The WinSLAMM model overview, inputs, and outputs can be found in the attachments.



Watershed	Surface Cover	Area (SF)	Area (AC)	Percent Impervious
EX DA-1	Impervious	*11115*	0.255	28%
	Pervious	28107	0.645	
	Total	***39222***	**0.900**	
EX DA-2	Impervious	*3467*	0.080	36%
	Pervious	6208	0.142	
	Total	***9675***	**0.222**	

TOTAL IMPERVIOUS	**0.335**
TOTAL PERVIOUS	**0.787**
TOTAL AREA	**1.122**

30%

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PROJECT

LA CROSSE WISCONSIN

REVISION SCHEDULE

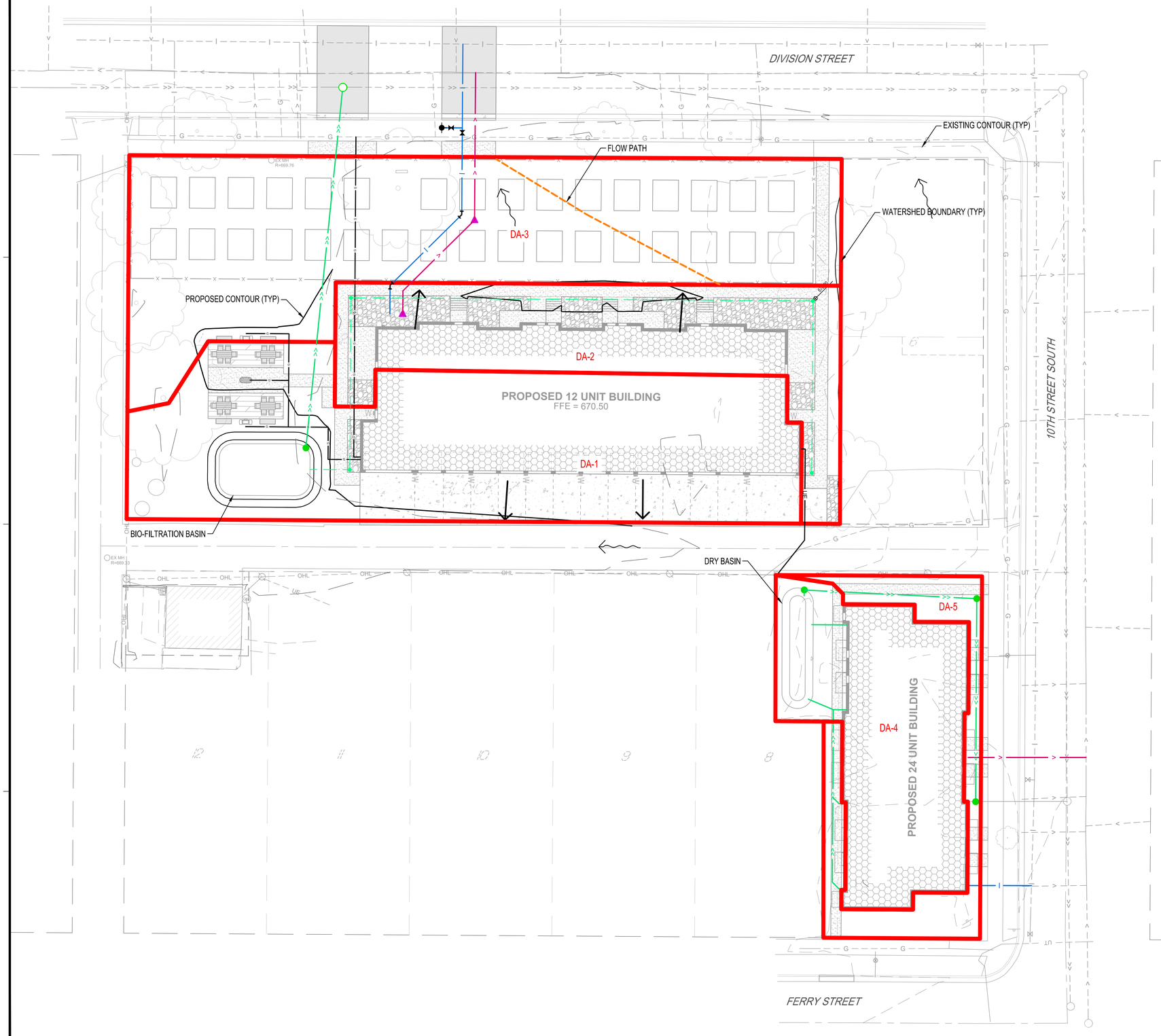
DATE	DESCRIPTION	BY

PROJECT NO.	24-31447
FILE NAME	31477 EXISTING CONDITIONS
DRAWN BY	SAK
DESIGNED BY	SAK
REVIEWED BY	KBR
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

EXISTING DRAINAGE MAP

SHEET



Watershed	Surface Cover	Area (SF)	Area (AC)	Percent Impervious
DA-1	Impervious	*11254*	0.258	74%
	Pervious	3943	0.091	
	Total	***15197***	**0.349**	
DA-2	Impervious	*5213*	0.120	66%
	Pervious	2756	0.063	
	Total	***7969***	**0.183**	
DA-3	Impervious	*250*	0.006	2%
	Pervious	15800	0.362	
	Total	***16050***	**0.368**	
DA-4	Impervious	*5593*	0.128	82%
	Pervious	1255	0.029	
	Total	***6848***	**0.157**	
DA-5	Impervious	*740*	0.017	26%
	Pervious	2087	0.048	
	Total	***2827***	**0.065**	

TOTAL IMPERVIOUS	**0.529**	47%
TOTAL PERVIOUS	**0.593**	
TOTAL AREA	**1.122**	

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PROJECT

LA CROSSE WISCONSIN

REVISION SCHEDULE

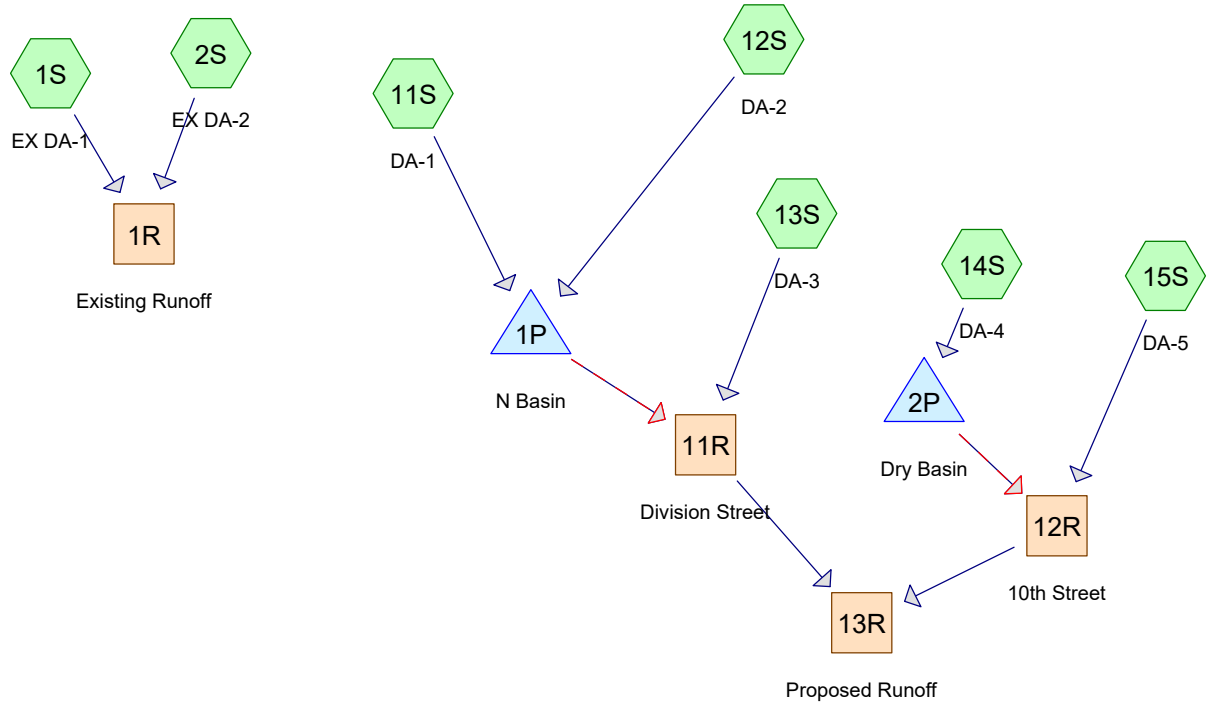
DATE	DESCRIPTION	BY

PROJECT NO.	24-31447
FILE NAME	31477 PROPOSED CONDITIONS
DRAWN BY	SAK
DESIGNED BY	SAK
REVIEWED BY	KBR
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

PROPOSED DRAINAGE MAP

SHEET



Subcat Reach Pond Link

Routing Diagram for 31447 HydroCAD
Prepared by I&S Group, Inc, Printed 3/7/2025
HydroCAD® 10.20-5c s/n 02403 © 2023 HydroCAD Software Solutions LLC

Project Notes

Defined 7 rainfall events from La Crosse WI IDF

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	MSE 24-hr	4	Default	24.00	1	3.01	2
2	10-yr	MSE 24-hr	4	Default	24.00	1	4.47	2
3	100-yr	MSE 24-hr	4	Default	24.00	1	7.58	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.380	69	50-75% Grass cover, Fair, HSG B (1S, 2S, 11S, 12S, 13S, 14S, 15S)
0.017	98	Paved parking, HSG B (15S)
0.512	98	Roofs, HSG B (11S, 12S, 13S, 14S)
0.335	98	Unconnected roofs, HSG B (1S, 2S)
2.244	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
2.244	HSG B	1S, 2S, 11S, 12S, 13S, 14S, 15S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.244		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.380	0.000	0.000	0.000	1.380	50-75% Grass cover, Fair	1S, 2S, 11S, 12S, 13S, 14S, 15S
0.000	0.017	0.000	0.000	0.000	0.017	Paved parking	15S
0.000	0.512	0.000	0.000	0.000	0.512	Roofs	11S, 12S, 13S, 14S
0.000	0.335	0.000	0.000	0.000	0.335	Unconnected roofs	1S, 2S
0.000	**2.244**	**0.000**	**0.000**	**0.000**	**2.244**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	665.00	664.33	135.0	0.0050	0.013	0.0	12.0	0.0	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: EX DA-1 Runoff Area=0.900 ac 28.33% Impervious Runoff Depth=1.27"
Flow Length=100' Slope=0.0110 '/' Tc=12.8 min UI Adjusted CN=WQ Runoff=1.23 cfs 0.095 af

Subcatchment2S: EX DA-2 Runoff Area=0.222 ac 36.04% Impervious Runoff Depth=1.43"
Flow Length=50' Slope=0.0400 '/' Tc=5.0 min CN=WQ Runoff=0.45 cfs 0.027 af

Subcatchment11S: DA-1 Runoff Area=0.349 ac 73.93% Impervious Runoff Depth=2.23"
Tc=5.0 min CN=WQ Runoff=1.09 cfs 0.065 af

Subcatchment12S: DA-2 Runoff Area=0.183 ac 65.57% Impervious Runoff Depth=2.05"
Tc=5.0 min CN=WQ Runoff=0.53 cfs 0.031 af

Subcatchment13S: DA-3 Runoff Area=0.368 ac 1.63% Impervious Runoff Depth=0.71"
Flow Length=100' Slope=0.0110 '/' Tc=12.8 min CN=WQ Runoff=0.28 cfs 0.022 af

Subcatchment14S: DA-4 Runoff Area=0.157 ac 81.53% Impervious Runoff Depth=2.39"
Tc=5.0 min CN=WQ Runoff=0.53 cfs 0.031 af

Subcatchment15S: DA-5 Runoff Area=0.065 ac 26.15% Impervious Runoff Depth=1.23"
Tc=5.0 min CN=WQ Runoff=0.11 cfs 0.007 af

Reach 1R: Existing Runoff Inflow=1.48 cfs 0.122 af
Outflow=1.48 cfs 0.122 af

Reach 11R: Division Street Inflow=1.04 cfs 0.118 af
Outflow=1.04 cfs 0.118 af

Reach 12R: 10th Street Inflow=0.41 cfs 0.038 af
Outflow=0.41 cfs 0.038 af

Reach 13R: Proposed Runoff Inflow=1.41 cfs 0.156 af
Outflow=1.41 cfs 0.156 af

Pond 1P: N Basin Peak Elev=668.75' Storage=1,122 cf Inflow=1.62 cfs 0.096 af
Primary=0.76 cfs 0.096 af Secondary=0.00 cfs 0.000 af Outflow=0.76 cfs 0.096 af

Pond 2P: Dry Basin Peak Elev=670.34' Storage=146 cf Inflow=0.53 cfs 0.031 af
Primary=0.32 cfs 0.031 af Secondary=0.00 cfs 0.000 af Outflow=0.32 cfs 0.031 af

Total Runoff Area = 2.244 ac Runoff Volume = 0.278 af Average Runoff Depth = 1.48"
61.50% Pervious = 1.380 ac 38.50% Impervious = 0.864 ac

Summary for Subcatchment 1S: EX DA-1

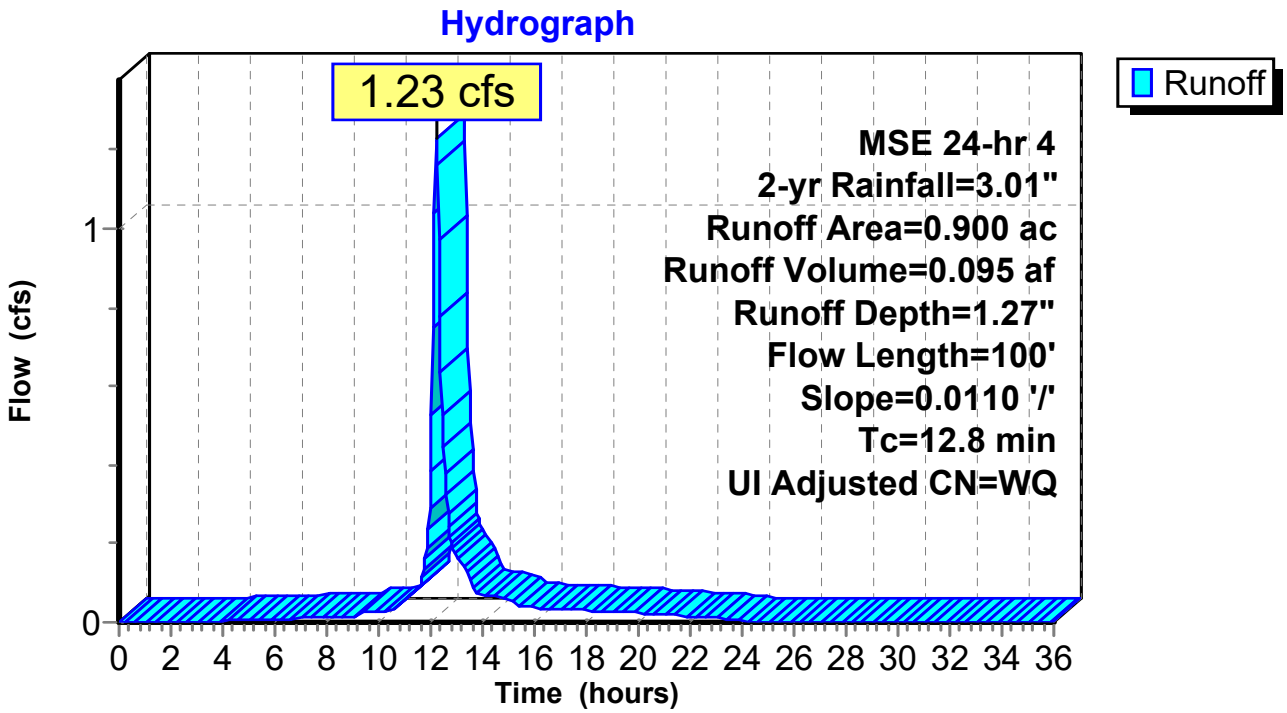
Runoff = 1.23 cfs @ 12.21 hrs, Volume= 0.095 af, Depth= 1.27"
Routed to Reach 1R : Existing Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Adj	Description
0.255	98	98	Unconnected roofs, HSG B
0.645	69	69	50-75% Grass cover, Fair, HSG B
0.900			Weighted Average
0.645			71.67% Pervious Area
0.255			28.33% Impervious Area
0.255			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0110	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"

Subcatchment 1S: EX DA-1



Summary for Subcatchment 2S: EX DA-2

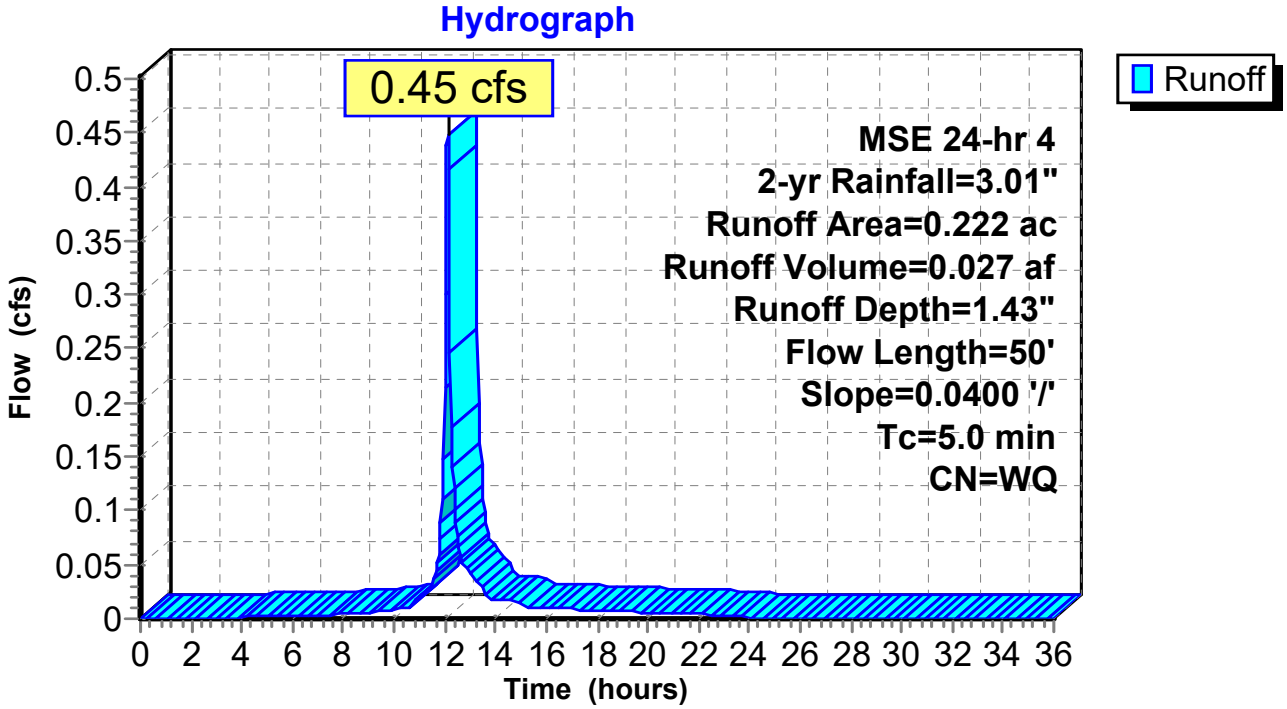
Runoff = 0.45 cfs @ 12.12 hrs, Volume= 0.027 af, Depth= 1.43"
Routed to Reach 1R : Existing Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.080	98	Unconnected roofs, HSG B
0.142	69	50-75% Grass cover, Fair, HSG B
0.222		Weighted Average
0.142		63.96% Pervious Area
0.080		36.04% Impervious Area
0.080		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
4.4	50	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2S: EX DA-2



Summary for Subcatchment 11S: DA-1

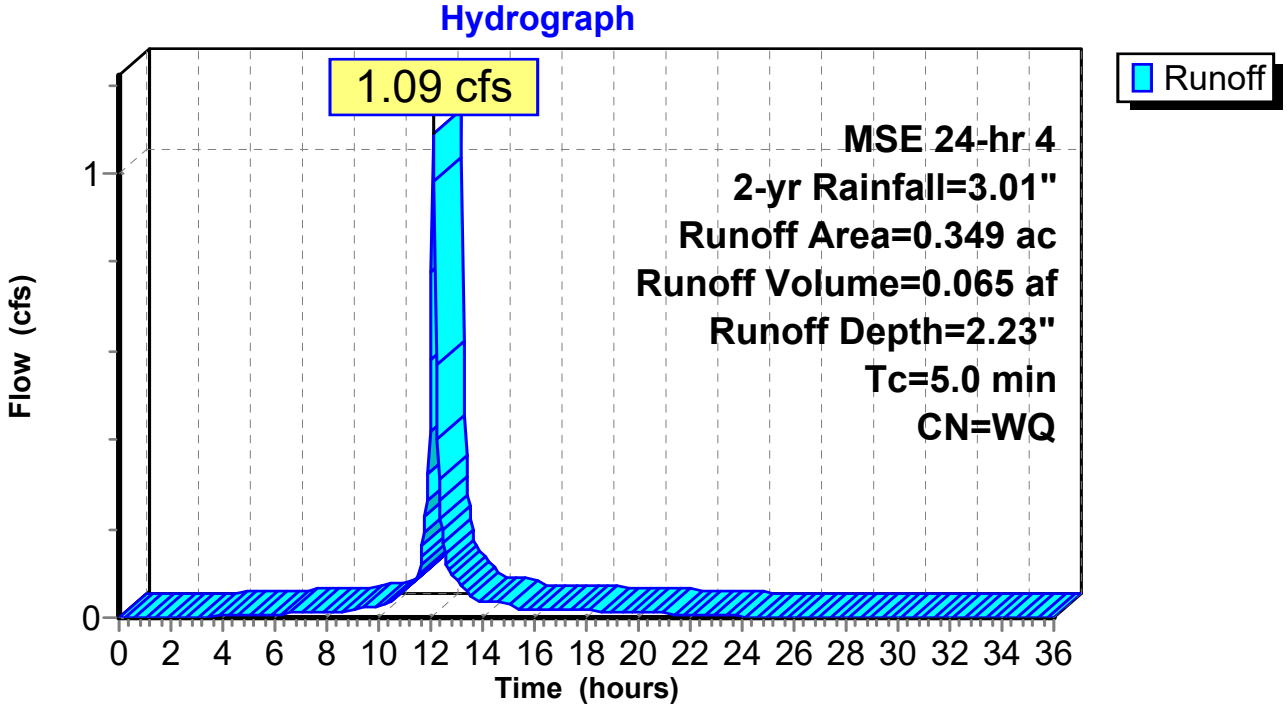
Runoff = 1.09 cfs @ 12.11 hrs, Volume= 0.065 af, Depth= 2.23"
Routed to Pond 1P : N Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.258	98	Roofs, HSG B
0.091	69	50-75% Grass cover, Fair, HSG B
0.349		Weighted Average
0.091		26.07% Pervious Area
0.258		73.93% Impervious Area

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

Subcatchment 11S: DA-1



Summary for Subcatchment 12S: DA-2

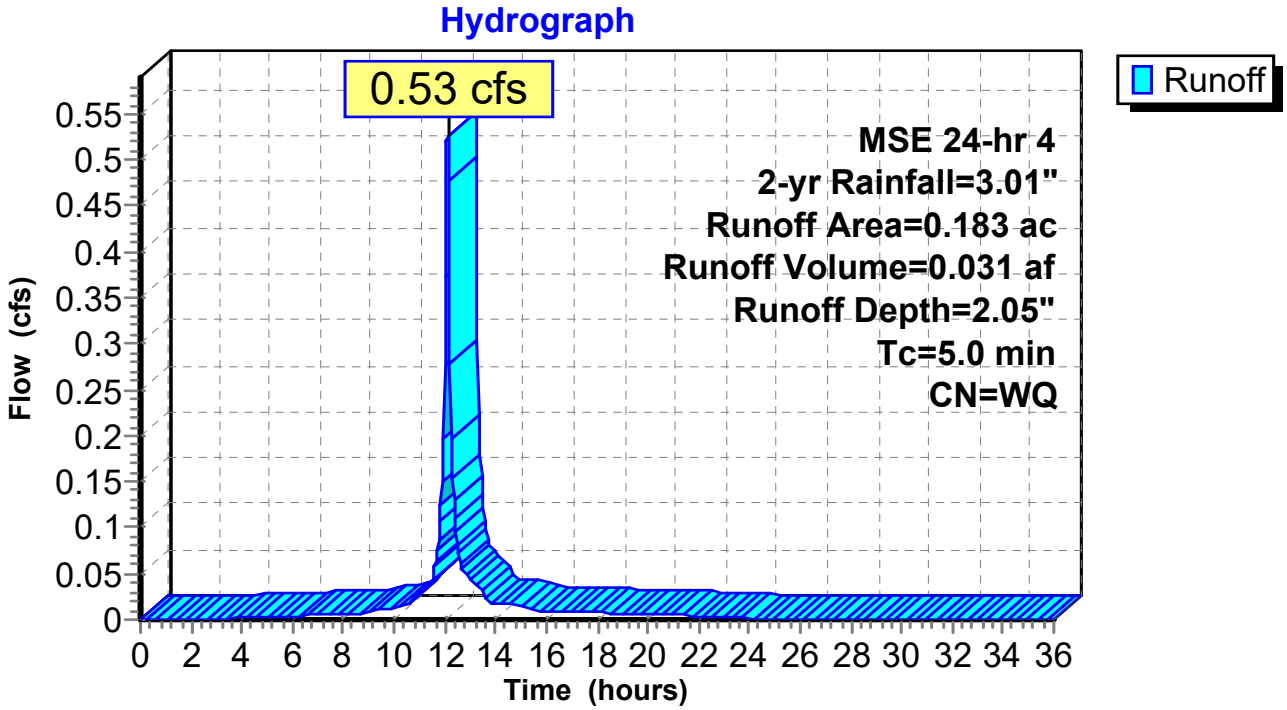
Runoff = 0.53 cfs @ 12.11 hrs, Volume= 0.031 af, Depth= 2.05"
Routed to Pond 1P : N Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.120	98	Roofs, HSG B
0.063	69	50-75% Grass cover, Fair, HSG B
0.183		Weighted Average
0.063		34.43% Pervious Area
0.120		65.57% Impervious Area

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

Subcatchment 12S: DA-2



Summary for Subcatchment 13S: DA-3

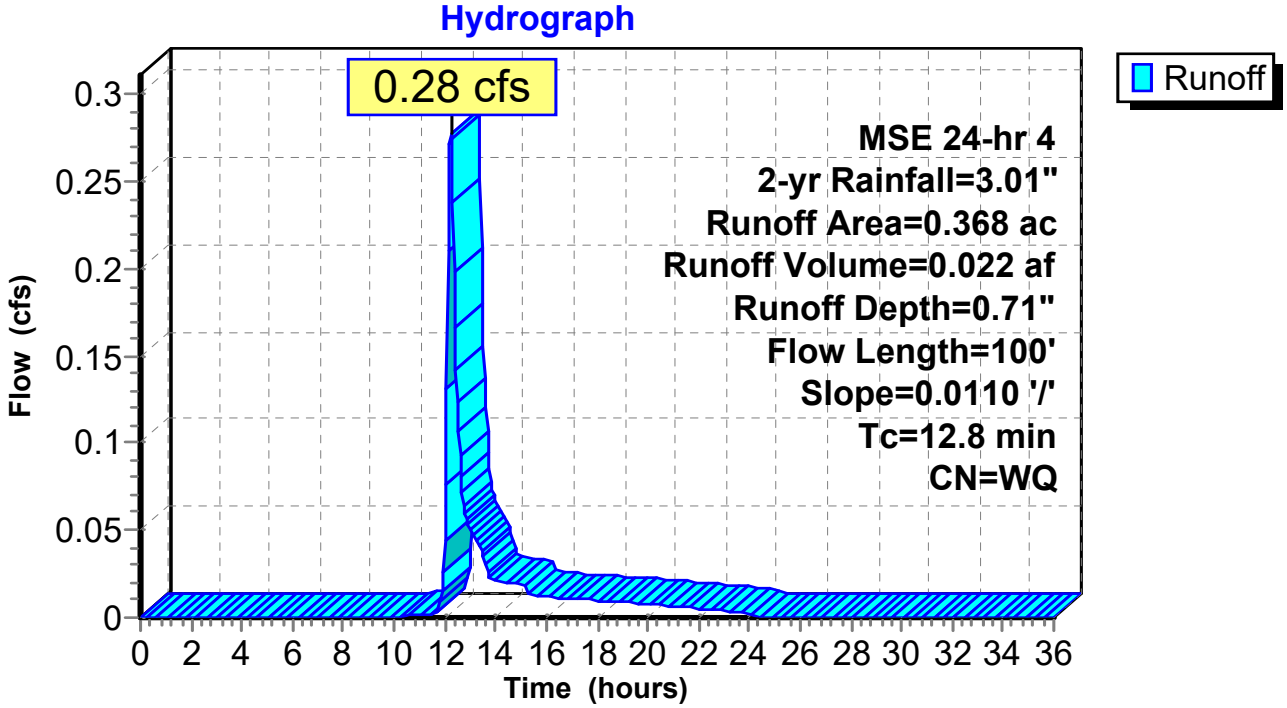
Runoff = 0.28 cfs @ 12.23 hrs, Volume= 0.022 af, Depth= 0.71"
Routed to Reach 11R : Division Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.006	98	Roofs, HSG B
0.362	69	50-75% Grass cover, Fair, HSG B
0.368		Weighted Average
0.362		98.37% Pervious Area
0.006		1.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0110	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"

Subcatchment 13S: DA-3



Summary for Subcatchment 14S: DA-4

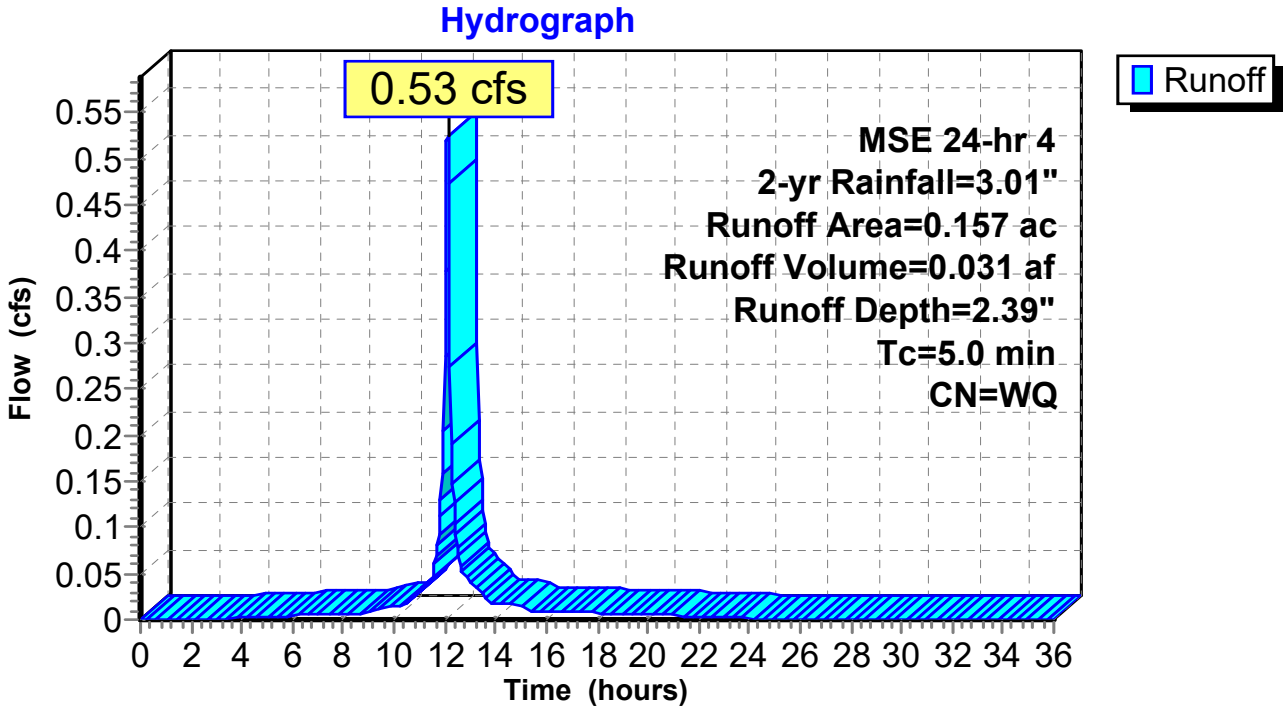
Runoff = 0.53 cfs @ 12.11 hrs, Volume= 0.031 af, Depth= 2.39"
Routed to Pond 2P : Dry Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.128	98	Roofs, HSG B
0.029	69	50-75% Grass cover, Fair, HSG B
0.157		Weighted Average
0.029		18.47% Pervious Area
0.128		81.53% Impervious Area

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

Subcatchment 14S: DA-4



Summary for Subcatchment 15S: DA-5

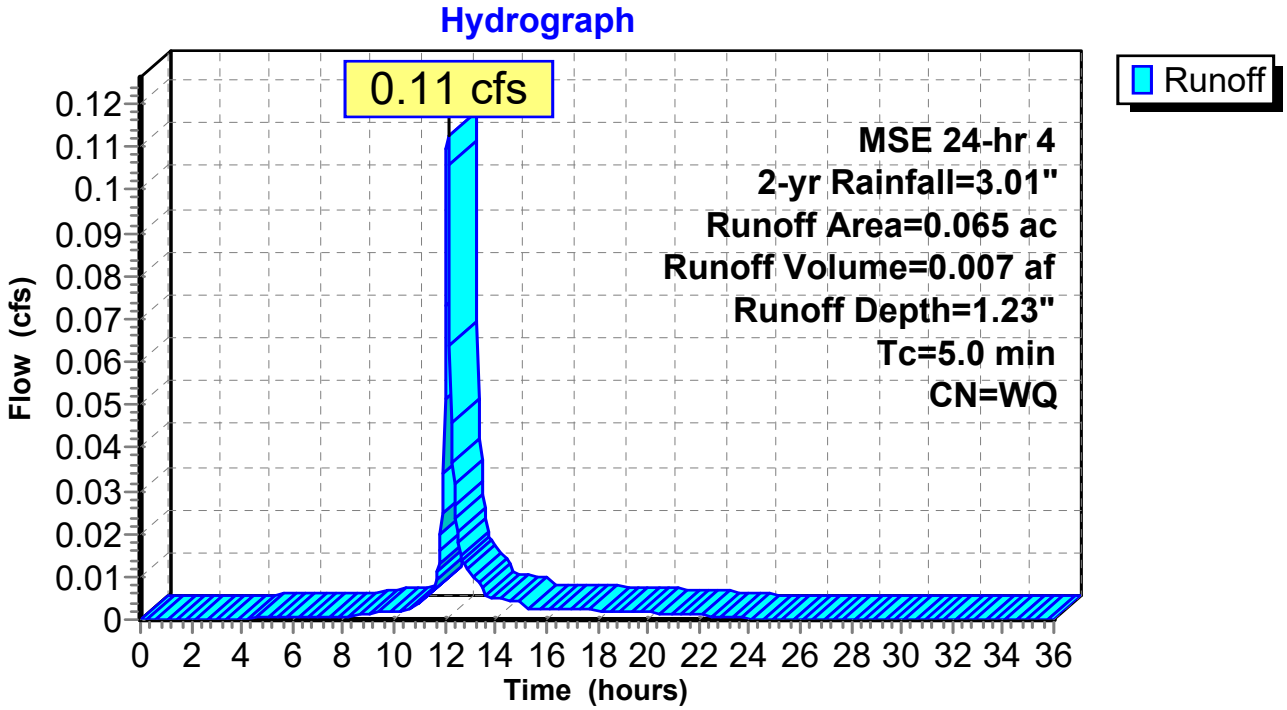
Runoff = 0.11 cfs @ 12.12 hrs, Volume= 0.007 af, Depth= 1.23"
Routed to Reach 12R : 10th Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.017	98	Paved parking, HSG B
0.048	69	50-75% Grass cover, Fair, HSG B
0.065		Weighted Average
0.048		73.85% Pervious Area
0.017		26.15% Impervious Area

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

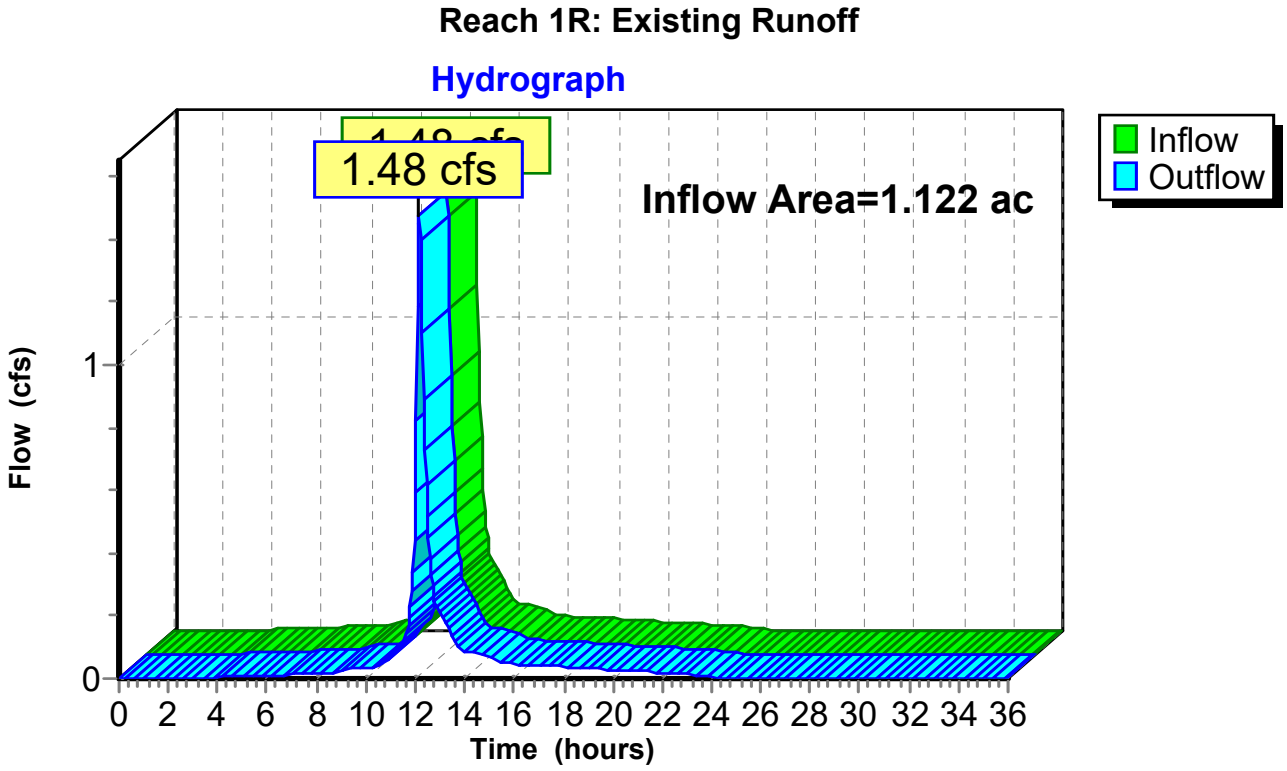
Subcatchment 15S: DA-5



Summary for Reach 1R: Existing Runoff

Inflow Area = 1.122 ac, 29.86% Impervious, Inflow Depth = 1.30" for 2-yr event
Inflow = 1.48 cfs @ 12.18 hrs, Volume= 0.122 af
Outflow = 1.48 cfs @ 12.18 hrs, Volume= 0.122 af, Atten= 0%, Lag= 0.0 min

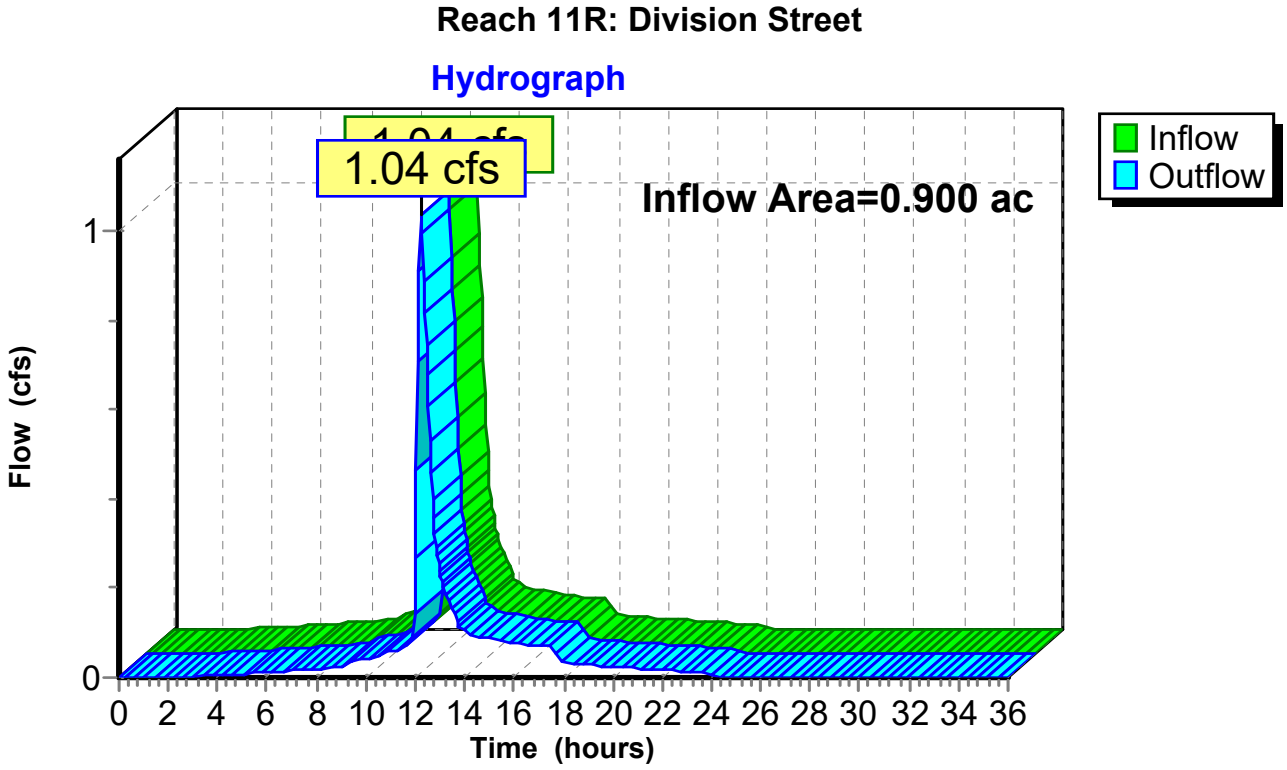
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 11R: Division Street

Inflow Area = 0.900 ac, 42.67% Impervious, Inflow Depth = 1.57" for 2-yr event
Inflow = 1.04 cfs @ 12.22 hrs, Volume= 0.118 af
Outflow = 1.04 cfs @ 12.22 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 13R : Proposed Runoff

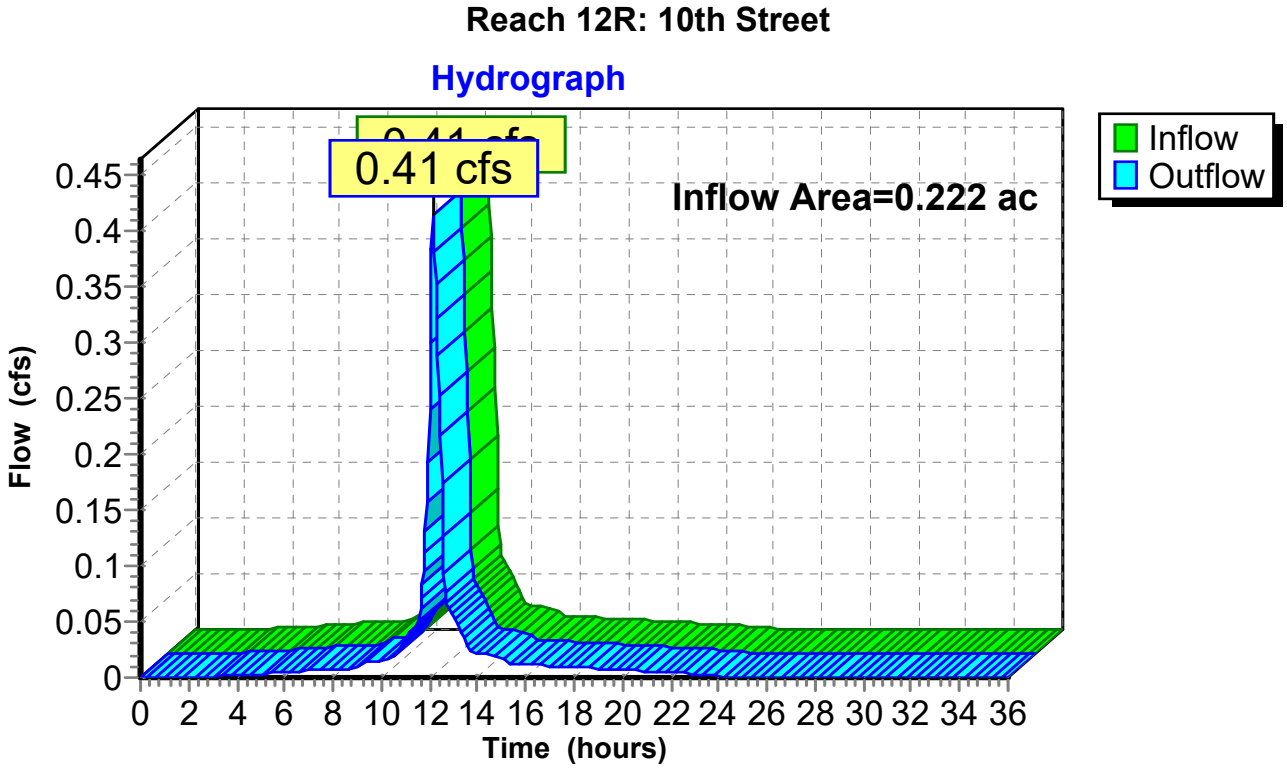
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 12R: 10th Street

Inflow Area = 0.222 ac, 65.32% Impervious, Inflow Depth = 2.05" for 2-yr event
Inflow = 0.41 cfs @ 12.15 hrs, Volume= 0.038 af
Outflow = 0.41 cfs @ 12.15 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 13R : Proposed Runoff

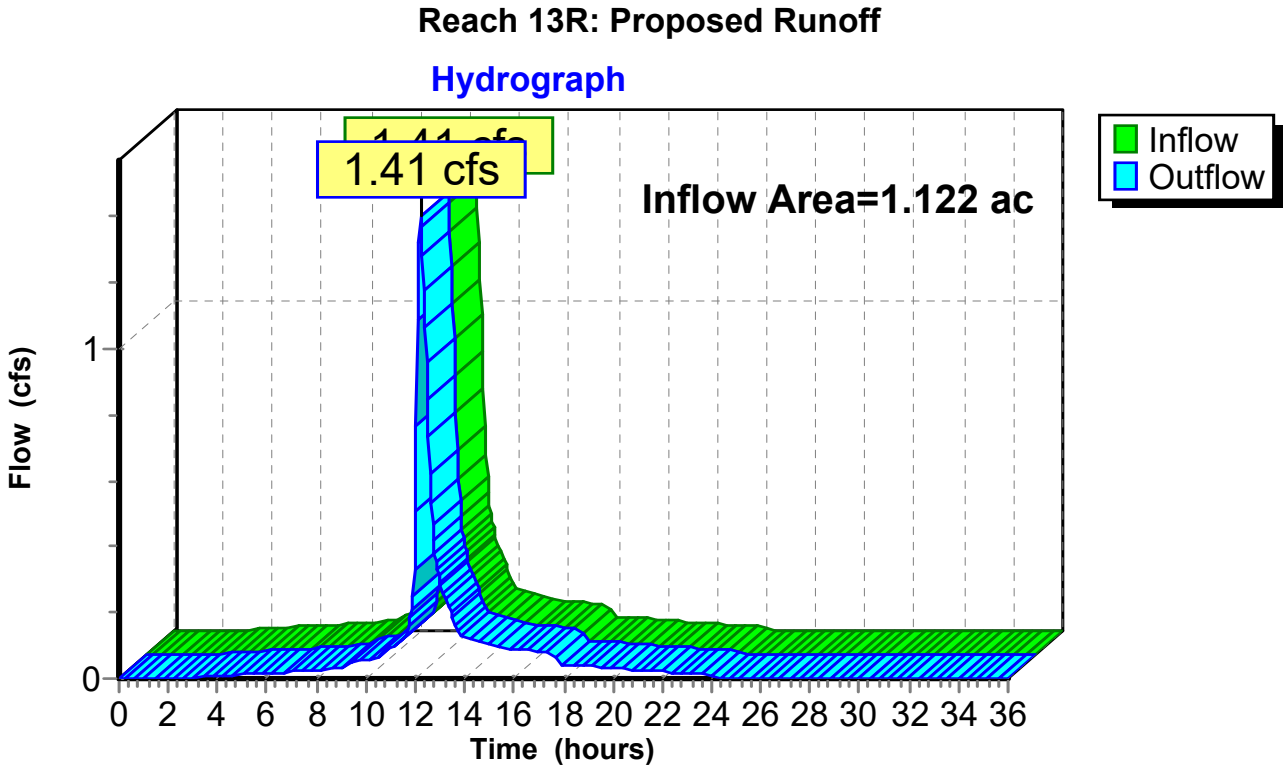
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 13R: Proposed Runoff

Inflow Area = 1.122 ac, 47.15% Impervious, Inflow Depth = 1.67" for 2-yr event
Inflow = 1.41 cfs @ 12.21 hrs, Volume= 0.156 af
Outflow = 1.41 cfs @ 12.21 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Pond 1P: N Basin

Inflow Area = 0.532 ac, 71.05% Impervious, Inflow Depth = 2.17" for 2-yr event
Inflow = 1.62 cfs @ 12.11 hrs, Volume= 0.096 af
Outflow = 0.76 cfs @ 12.22 hrs, Volume= 0.096 af, Atten= 53%, Lag= 6.5 min
Primary = 0.76 cfs @ 12.22 hrs, Volume= 0.096 af
Routed to Reach 11R : Division Street
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 11R : Division Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 668.75' @ 12.22 hrs Surf.Area= 1,116 sf Storage= 1,122 cf

Plug-Flow detention time= 34.1 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 34.1 min (797.9 - 763.8)

Volume	Invert	Avail.Storage	Storage Description
#1	667.50'	3,416 cf	**Basin (Prismatic)**Listed below (Recalc)

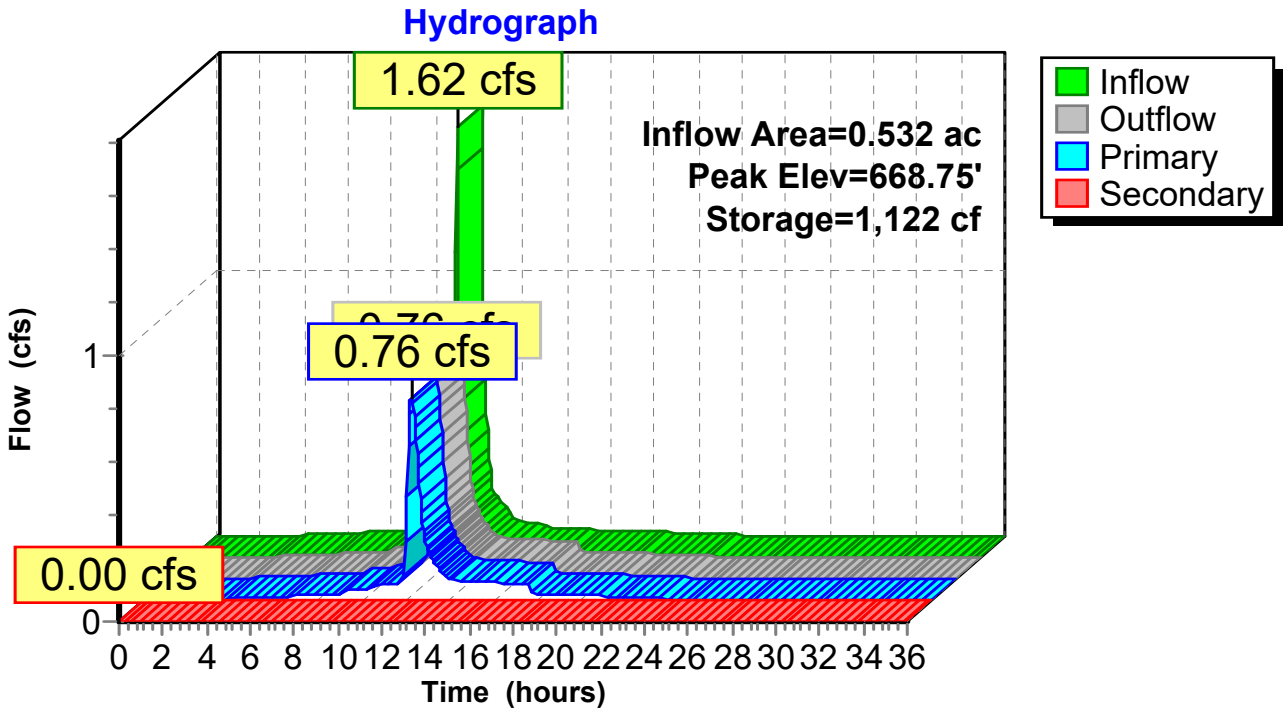
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
667.50	685	0	0
669.00	1,204	1,417	1,417
669.50	1,405	652	2,069
670.00	3,981	1,347	3,416

Device	Routing	Invert	Outlet Devices
#1	Device 4	667.50'	**3.600 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Device 4	669.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Device 4	668.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	665.00'	**12.0" Round Culvert** L= 135.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 665.00' / 664.33' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	669.53'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.25 Width (feet) 0.00 10.00

Primary OutFlow Max=0.75 cfs @ 12.22 hrs HW=668.74' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.75 cfs of 4.86 cfs potential flow)
  ├─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.66 cfs @ 3.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=667.50' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 1P: N Basin



Summary for Pond 2P: Dry Basin

Inflow Area = 0.157 ac, 81.53% Impervious, Inflow Depth = 2.39" for 2-yr event
Inflow = 0.53 cfs @ 12.11 hrs, Volume= 0.031 af
Outflow = 0.32 cfs @ 12.20 hrs, Volume= 0.031 af, Atten= 40%, Lag= 5.0 min
Primary = 0.32 cfs @ 12.20 hrs, Volume= 0.031 af
Routed to Reach 12R : 10th Street
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 12R : 10th Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 670.34' @ 12.20 hrs Surf.Area= 341 sf Storage= 146 cf

Plug-Flow detention time= 3.5 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 3.5 min (763.2 - 759.7)

Volume	Invert	Avail.Storage	Storage Description
#1	669.60'	438 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

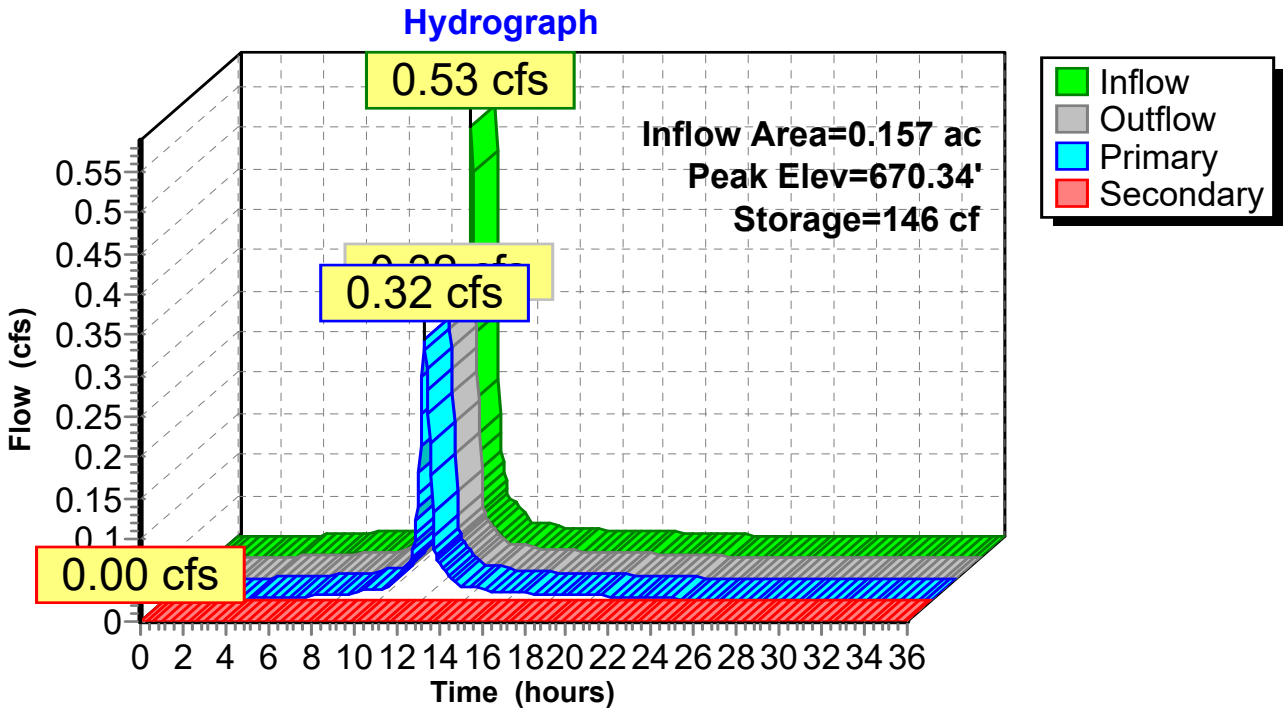
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.60	0	0	0
670.00	240	48	48
671.00	540	390	438

Device	Routing	Invert	Outlet Devices
#1	Primary	669.60'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	670.75'	**18.0" Horiz. Orifice/Grate** C= 0.600 in 18.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.32 cfs @ 12.20 hrs HW=670.34' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.32 cfs @ 3.63 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=669.60' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Dry Basin



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: EX DA-1 Runoff Area=0.900 ac 28.33% Impervious Runoff Depth=2.33"
Flow Length=100' Slope=0.0110 '/' Tc=12.8 min UI Adjusted CN=WQ Runoff=2.36 cfs 0.175 af

Subcatchment2S: EX DA-2 Runoff Area=0.222 ac 36.04% Impervious Runoff Depth=2.54"
Flow Length=50' Slope=0.0400 '/' Tc=5.0 min CN=WQ Runoff=0.82 cfs 0.047 af

Subcatchment11S: DA-1 Runoff Area=0.349 ac 73.93% Impervious Runoff Depth=3.54"
Tc=5.0 min CN=WQ Runoff=1.73 cfs 0.103 af

Subcatchment12S: DA-2 Runoff Area=0.183 ac 65.57% Impervious Runoff Depth=3.32"
Tc=5.0 min CN=WQ Runoff=0.85 cfs 0.051 af

Subcatchment13S: DA-3 Runoff Area=0.368 ac 1.63% Impervious Runoff Depth=1.62"
Flow Length=100' Slope=0.0110 '/' Tc=12.8 min CN=WQ Runoff=0.71 cfs 0.050 af

Subcatchment14S: DA-4 Runoff Area=0.157 ac 81.53% Impervious Runoff Depth=3.74"
Tc=5.0 min CN=WQ Runoff=0.82 cfs 0.049 af

Subcatchment15S: DA-5 Runoff Area=0.065 ac 26.15% Impervious Runoff Depth=2.28"
Tc=5.0 min CN=WQ Runoff=0.22 cfs 0.012 af

Reach 1R: Existing Runoff Inflow=2.82 cfs 0.222 af
Outflow=2.82 cfs 0.222 af

Reach 11R: Division Street Inflow=1.78 cfs 0.204 af
Outflow=1.78 cfs 0.204 af

Reach 12R: 10th Street Inflow=0.60 cfs 0.061 af
Outflow=0.60 cfs 0.061 af

Reach 13R: Proposed Runoff Inflow=2.29 cfs 0.265 af
Outflow=2.29 cfs 0.265 af

Pond 1P: N Basin Peak Elev=669.27' Storage=1,757 cf Inflow=2.58 cfs 0.154 af
Primary=1.06 cfs 0.154 af Secondary=0.00 cfs 0.000 af Outflow=1.06 cfs 0.154 af

Pond 2P: Dry Basin Peak Elev=670.72' Storage=297 cf Inflow=0.82 cfs 0.049 af
Primary=0.41 cfs 0.049 af Secondary=0.00 cfs 0.000 af Outflow=0.41 cfs 0.049 af

Total Runoff Area = 2.244 ac Runoff Volume = 0.487 af Average Runoff Depth = 2.60"
61.50% Pervious = 1.380 ac 38.50% Impervious = 0.864 ac

Summary for Subcatchment 1S: EX DA-1

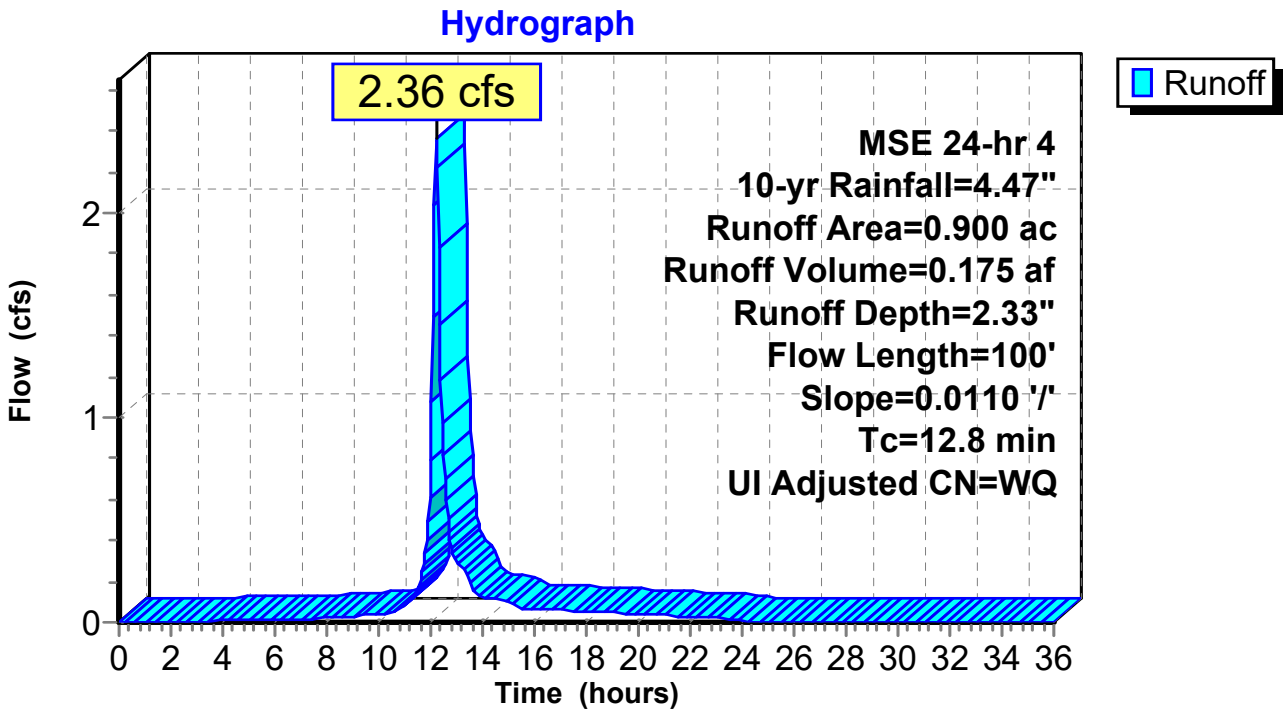
Runoff = 2.36 cfs @ 12.21 hrs, Volume= 0.175 af, Depth= 2.33"
Routed to Reach 1R : Existing Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Adj	Description
0.255	98	98	Unconnected roofs, HSG B
0.645	69	69	50-75% Grass cover, Fair, HSG B
0.900			Weighted Average
0.645			71.67% Pervious Area
0.255			28.33% Impervious Area
0.255			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0110	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"

Subcatchment 1S: EX DA-1



Summary for Subcatchment 2S: EX DA-2

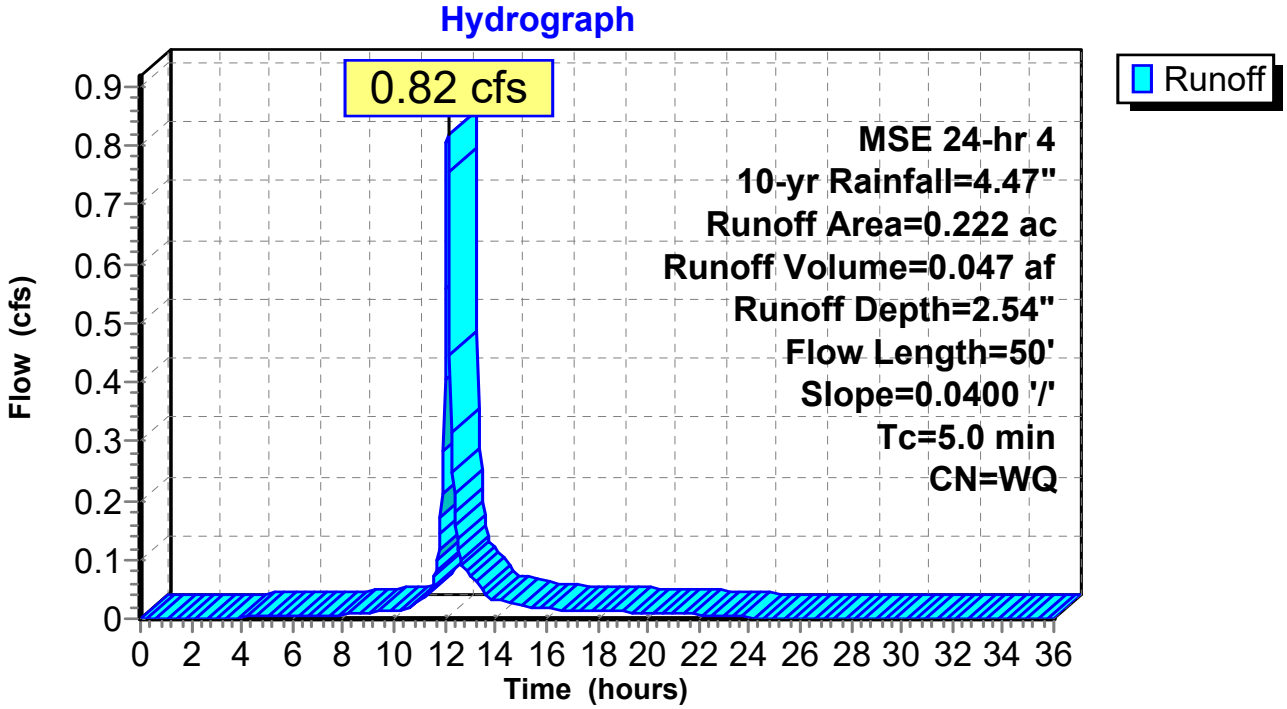
Runoff = 0.82 cfs @ 12.12 hrs, Volume= 0.047 af, Depth= 2.54"
Routed to Reach 1R : Existing Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Description
0.080	98	Unconnected roofs, HSG B
0.142	69	50-75% Grass cover, Fair, HSG B
0.222		Weighted Average
0.142		63.96% Pervious Area
0.080		36.04% Impervious Area
0.080		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
4.4	50	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2S: EX DA-2



Summary for Subcatchment 11S: DA-1

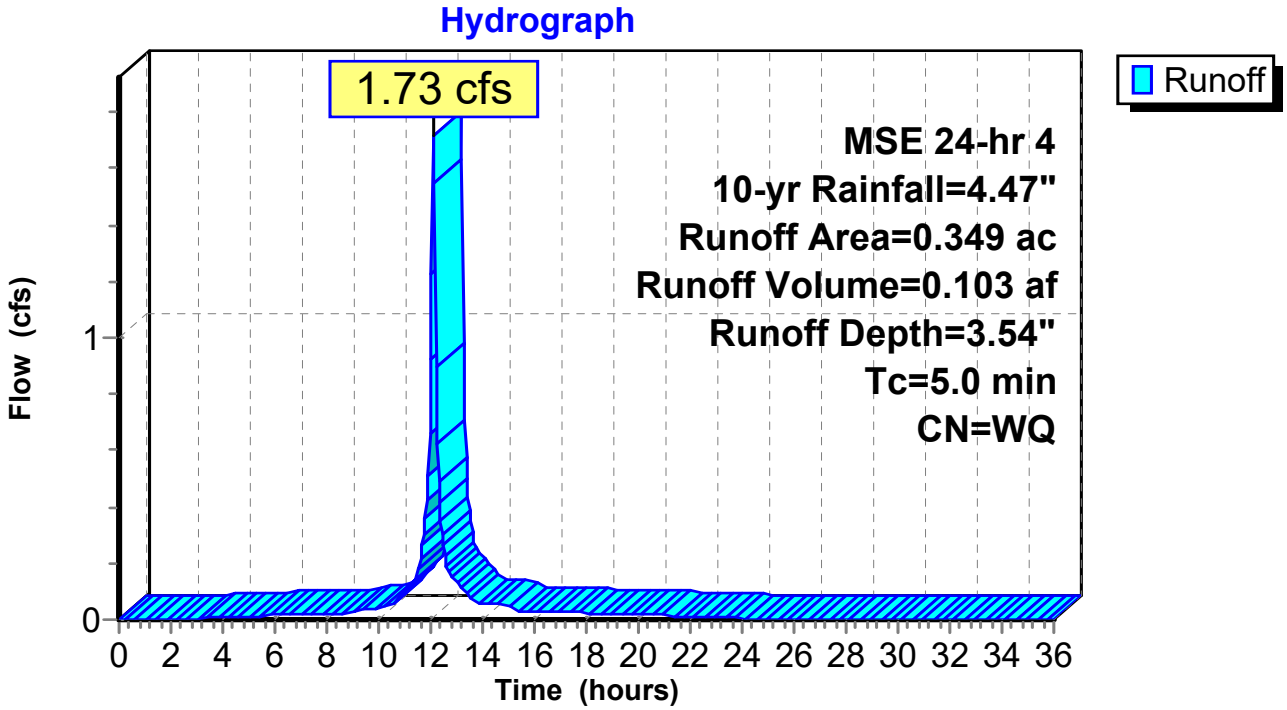
Runoff = 1.73 cfs @ 12.11 hrs, Volume= 0.103 af, Depth= 3.54"
Routed to Pond 1P : N Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Description
0.258	98	Roofs, HSG B
0.091	69	50-75% Grass cover, Fair, HSG B
0.349		Weighted Average
0.091		26.07% Pervious Area
0.258		73.93% Impervious Area

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

Subcatchment 11S: DA-1



Summary for Subcatchment 12S: DA-2

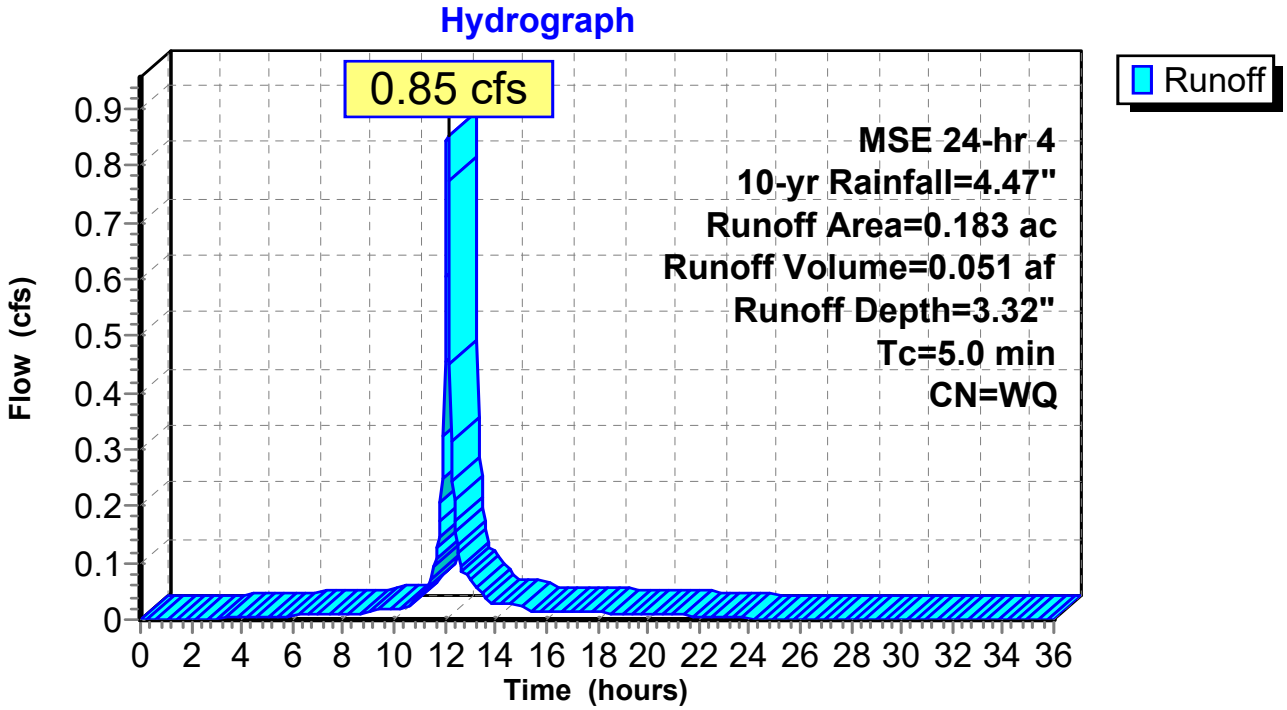
Runoff = 0.85 cfs @ 12.11 hrs, Volume= 0.051 af, Depth= 3.32"
Routed to Pond 1P : N Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Description
0.120	98	Roofs, HSG B
0.063	69	50-75% Grass cover, Fair, HSG B
0.183		Weighted Average
0.063		34.43% Pervious Area
0.120		65.57% Impervious Area

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

Subcatchment 12S: DA-2



Summary for Subcatchment 13S: DA-3

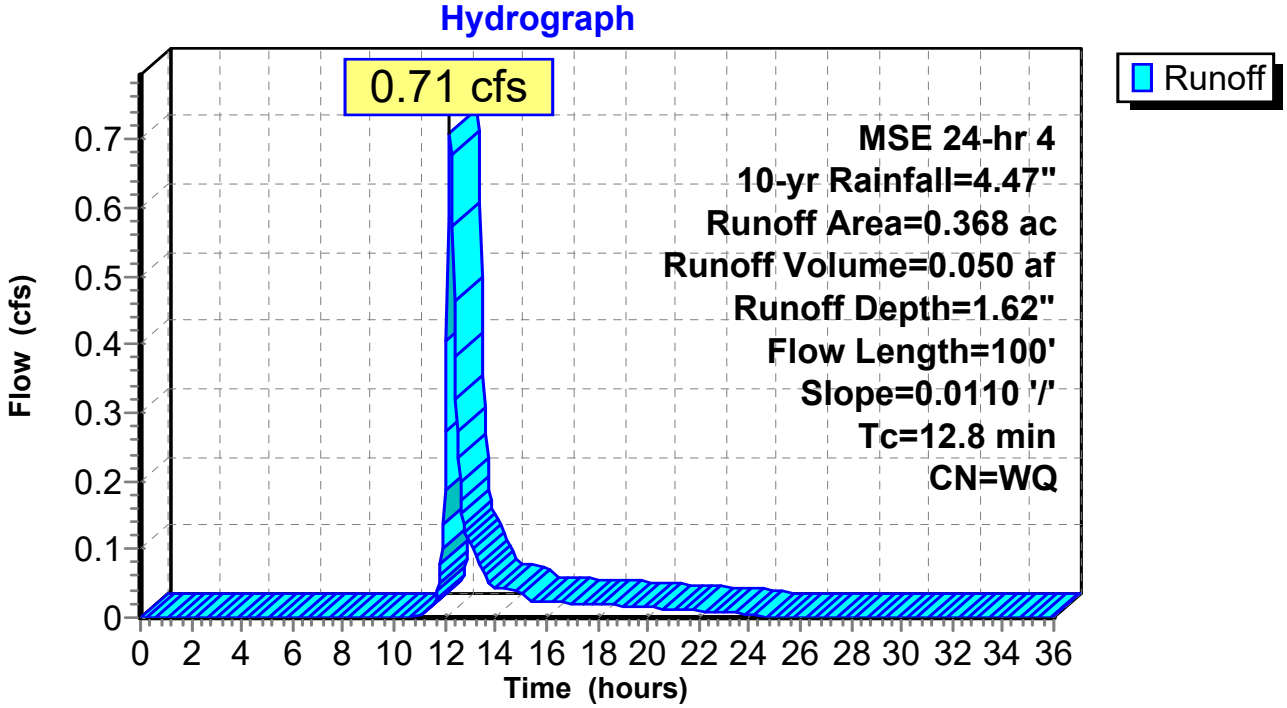
Runoff = 0.71 cfs @ 12.22 hrs, Volume= 0.050 af, Depth= 1.62"
Routed to Reach 11R : Division Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Description
0.006	98	Roofs, HSG B
0.362	69	50-75% Grass cover, Fair, HSG B
0.368		Weighted Average
0.362		98.37% Pervious Area
0.006		1.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0110	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"

Subcatchment 13S: DA-3



Summary for Subcatchment 14S: DA-4

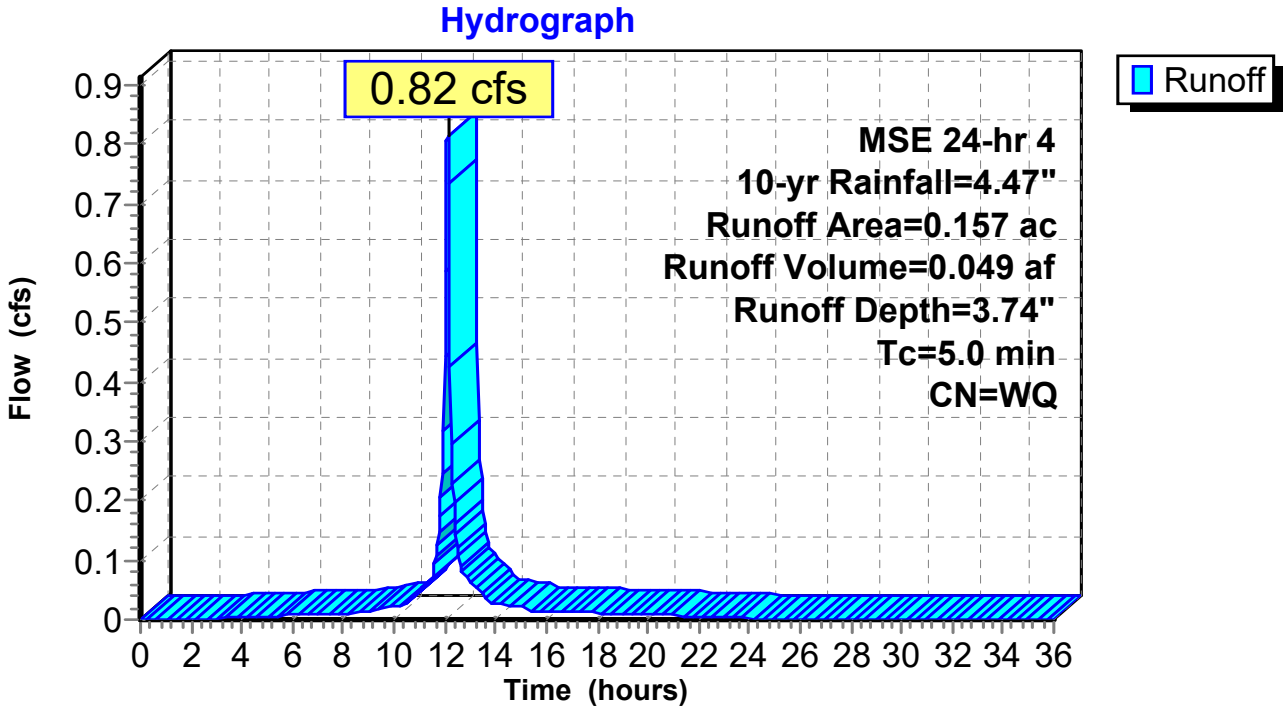
Runoff = 0.82 cfs @ 12.11 hrs, Volume= 0.049 af, Depth= 3.74"
Routed to Pond 2P : Dry Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Description
0.128	98	Roofs, HSG B
0.029	69	50-75% Grass cover, Fair, HSG B
0.157		Weighted Average
0.029		18.47% Pervious Area
0.128		81.53% Impervious Area

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

Subcatchment 14S: DA-4



Summary for Subcatchment 15S: DA-5

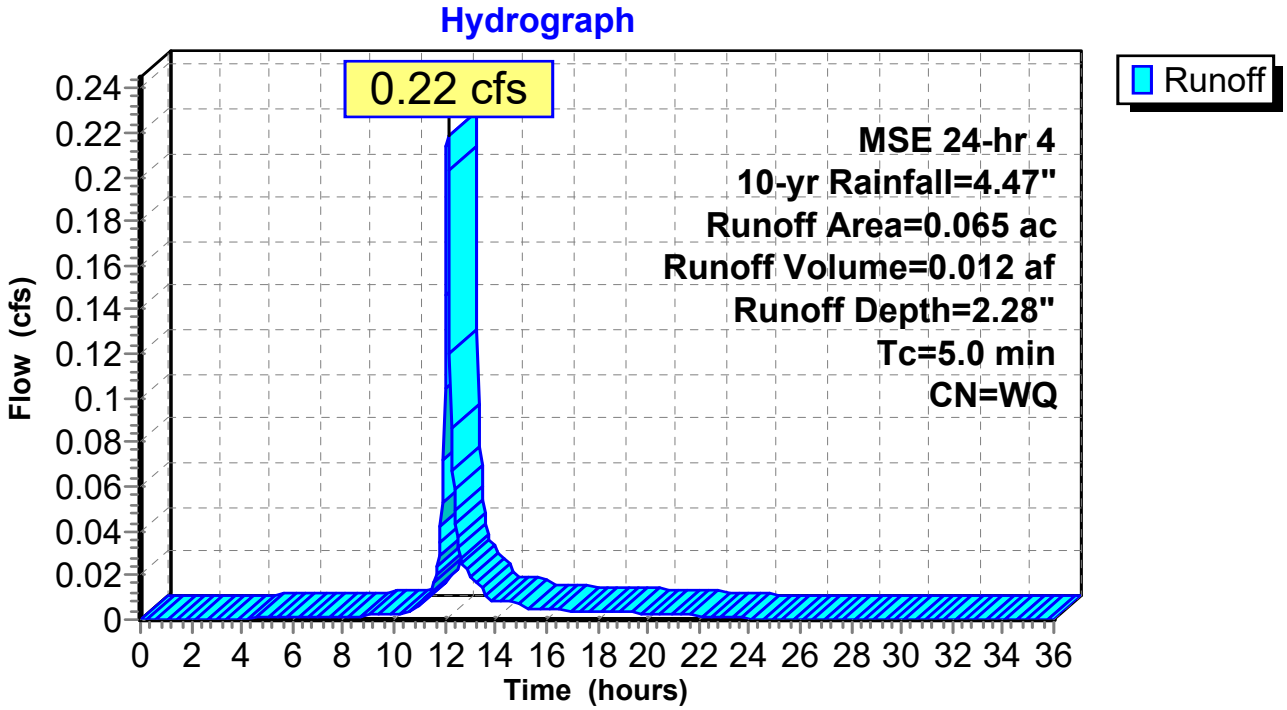
Runoff = 0.22 cfs @ 12.12 hrs, Volume= 0.012 af, Depth= 2.28"
Routed to Reach 12R : 10th Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr Rainfall=4.47"

Area (ac)	CN	Description
0.017	98	Paved parking, HSG B
0.048	69	50-75% Grass cover, Fair, HSG B
0.065		Weighted Average
0.048		73.85% Pervious Area
0.017		26.15% Impervious Area

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

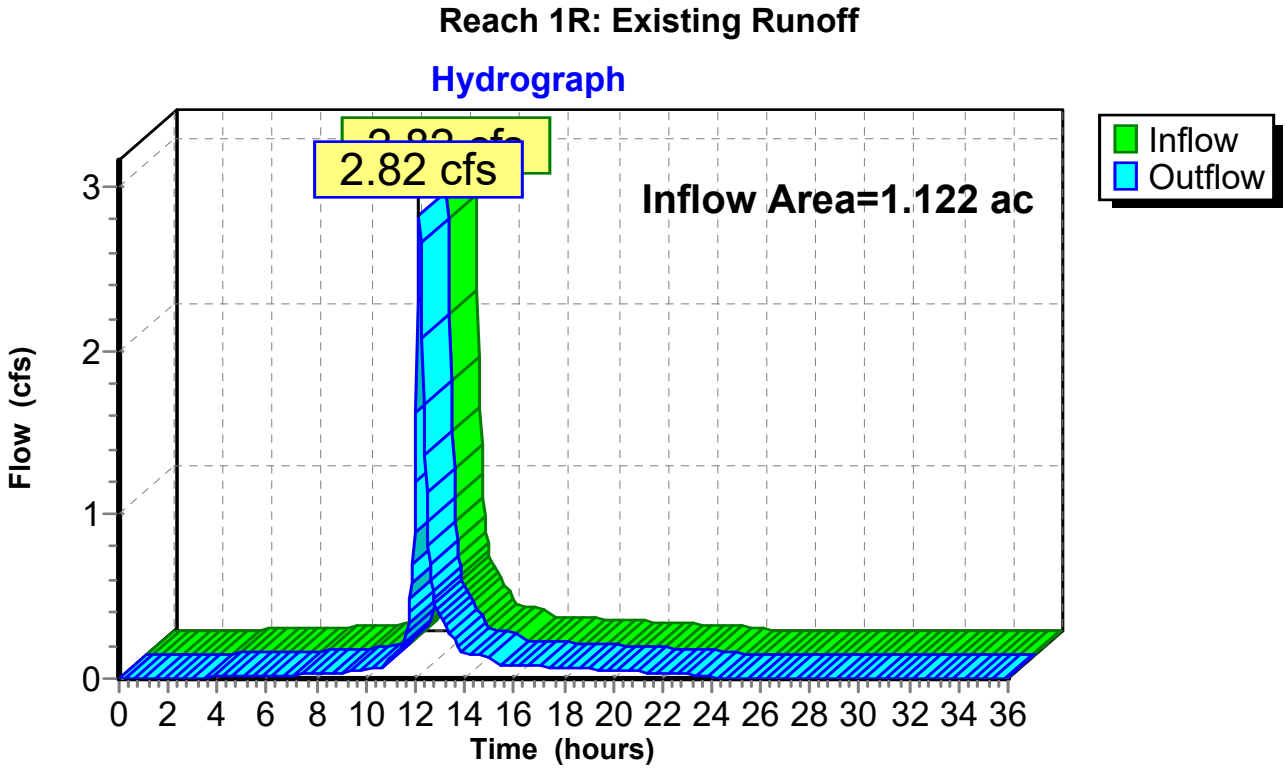
Subcatchment 15S: DA-5



Summary for Reach 1R: Existing Runoff

Inflow Area = 1.122 ac, 29.86% Impervious, Inflow Depth = 2.37" for 10-yr event
Inflow = 2.82 cfs @ 12.18 hrs, Volume= 0.222 af
Outflow = 2.82 cfs @ 12.18 hrs, Volume= 0.222 af, Atten= 0%, Lag= 0.0 min

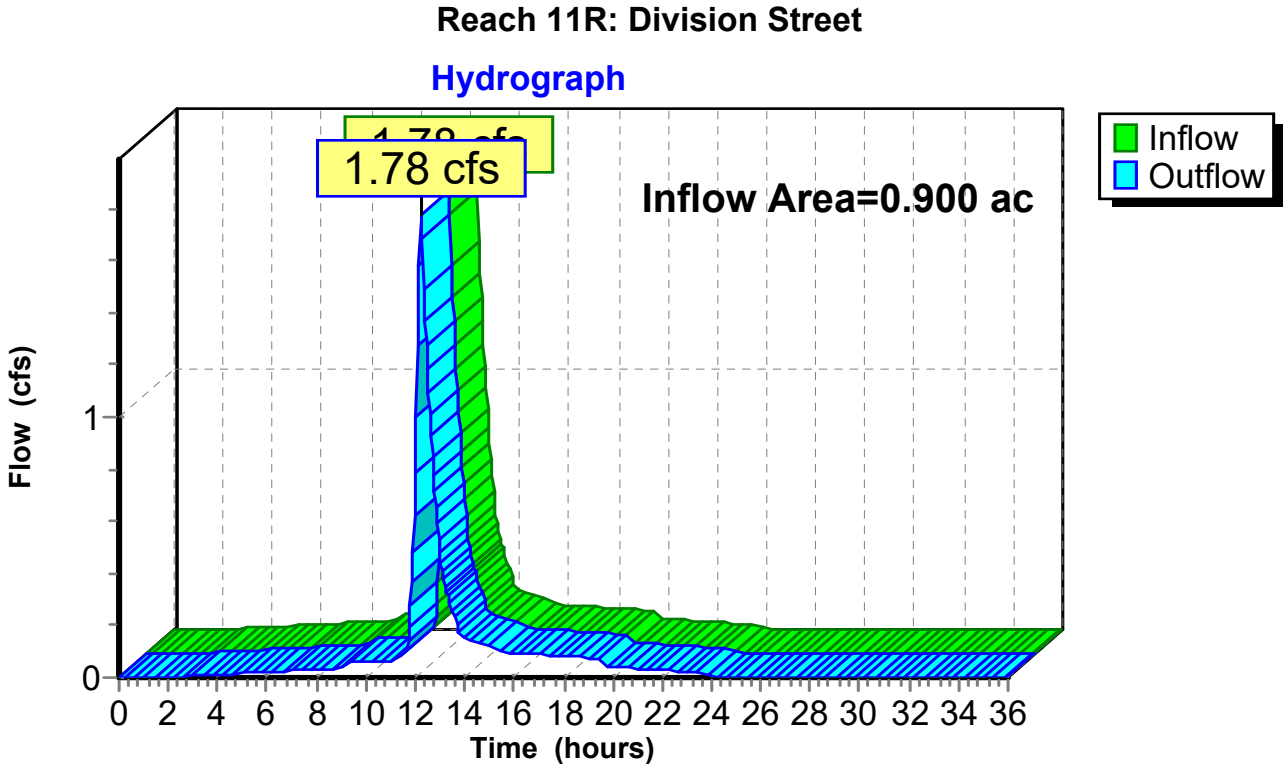
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 11R: Division Street

Inflow Area = 0.900 ac, 42.67% Impervious, Inflow Depth = 2.71" for 10-yr event
Inflow = 1.78 cfs @ 12.22 hrs, Volume= 0.204 af
Outflow = 1.78 cfs @ 12.22 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 13R : Proposed Runoff

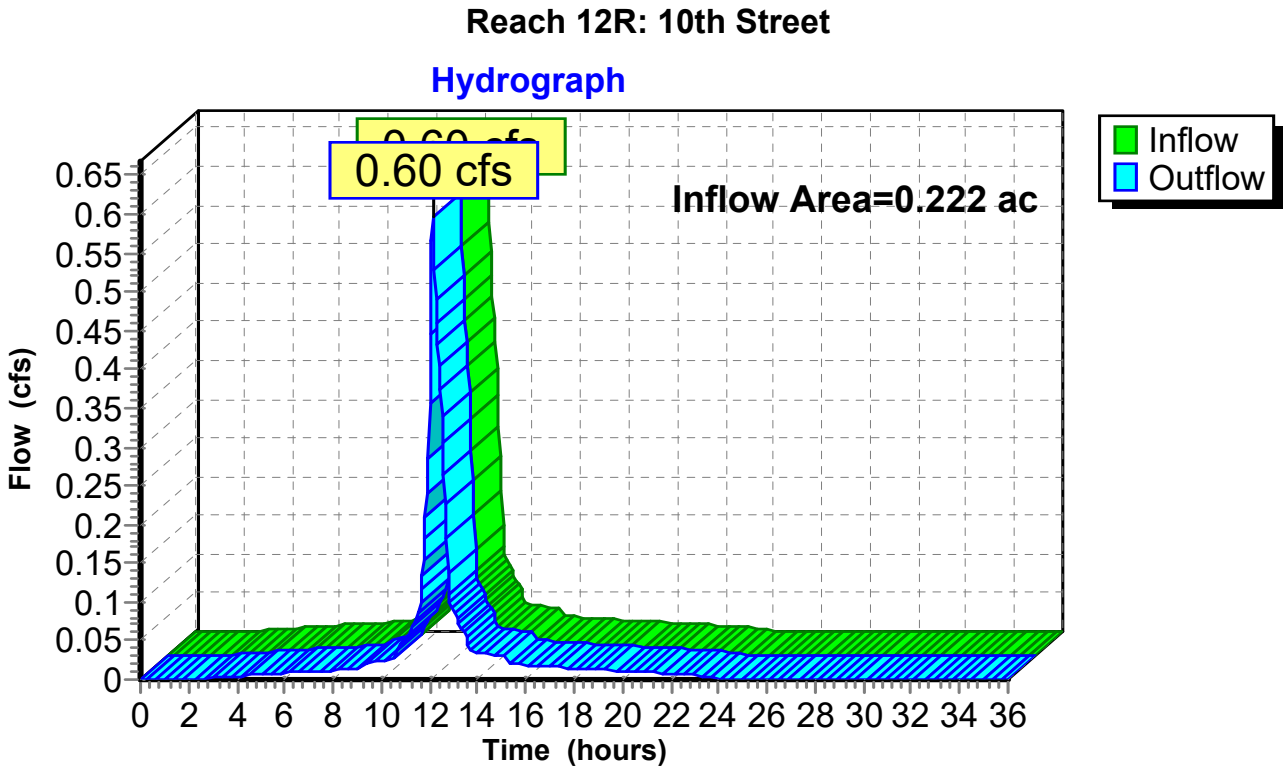
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 12R: 10th Street

Inflow Area = 0.222 ac, 65.32% Impervious, Inflow Depth = 3.31" for 10-yr event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 0.061 af
Outflow = 0.60 cfs @ 12.14 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 13R : Proposed Runoff

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

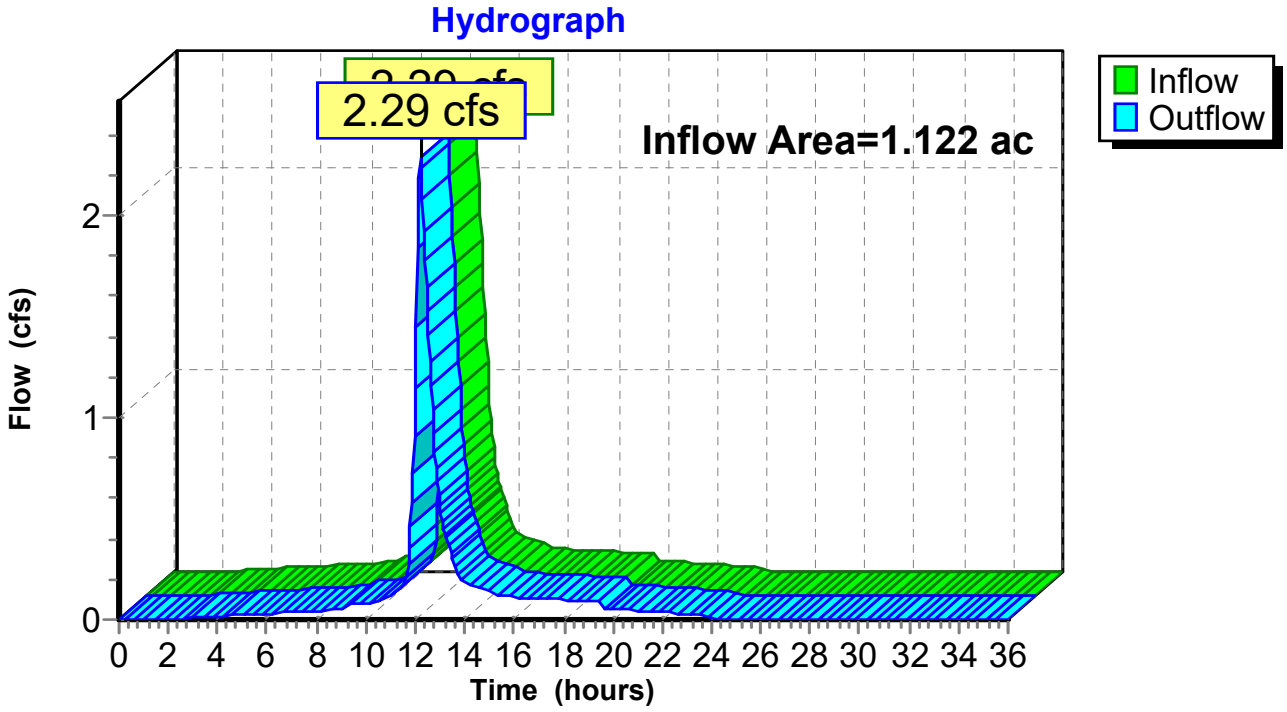


Summary for Reach 13R: Proposed Runoff

Inflow Area = 1.122 ac, 47.15% Impervious, Inflow Depth = 2.83" for 10-yr event
Inflow = 2.29 cfs @ 12.21 hrs, Volume= 0.265 af
Outflow = 2.29 cfs @ 12.21 hrs, Volume= 0.265 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 13R: Proposed Runoff



Summary for Pond 1P: N Basin

Inflow Area = 0.532 ac, 71.05% Impervious, Inflow Depth = 3.47" for 10-yr event
Inflow = 2.58 cfs @ 12.11 hrs, Volume= 0.154 af
Outflow = 1.06 cfs @ 12.24 hrs, Volume= 0.154 af, Atten= 59%, Lag= 7.6 min
Primary = 1.06 cfs @ 12.24 hrs, Volume= 0.154 af
Routed to Reach 11R : Division Street
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 11R : Division Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 669.27' @ 12.24 hrs Surf.Area= 1,313 sf Storage= 1,757 cf

Plug-Flow detention time= 33.7 min calculated for 0.153 af (100% of inflow)
Center-of-Mass det. time= 33.7 min (792.9 - 759.2)

Volume	Invert	Avail.Storage	Storage Description
#1	667.50'	3,416 cf	**Basin (Prismatic)**Listed below (Recalc)

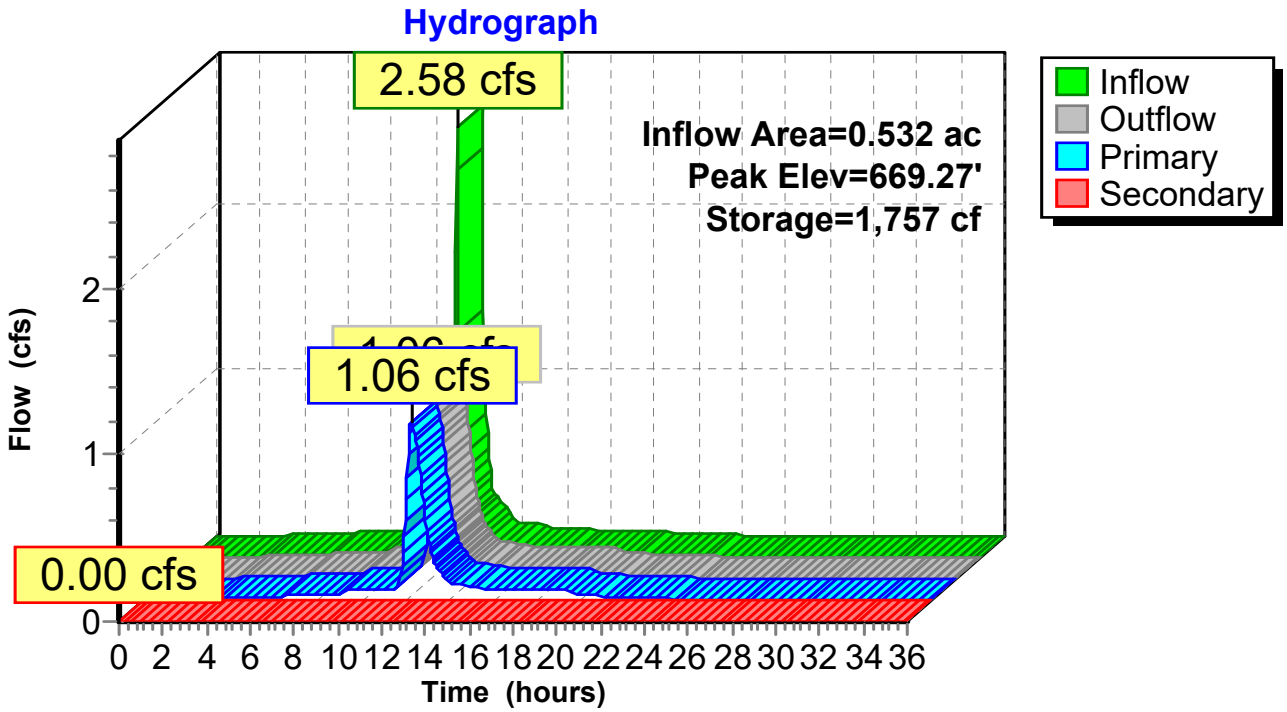
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
667.50	685	0	0
669.00	1,204	1,417	1,417
669.50	1,405	652	2,069
670.00	3,981	1,347	3,416

Device	Routing	Invert	Outlet Devices
#1	Device 4	667.50'	**3.600 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Device 4	669.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Device 4	668.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	665.00'	**12.0" Round Culvert** L= 135.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 665.00' / 664.33' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	669.53'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.25 Width (feet) 0.00 10.00

Primary OutFlow Max=1.06 cfs @ 12.24 hrs HW=669.27' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 1.06 cfs of 5.22 cfs potential flow)
  ├─**1=Exfiltration** (Exfiltration Controls 0.11 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.95 cfs @ 4.86 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=667.50' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 1P: N Basin



Summary for Pond 2P: Dry Basin

Inflow Area = 0.157 ac, 81.53% Impervious, Inflow Depth = 3.74" for 10-yr event
Inflow = 0.82 cfs @ 12.11 hrs, Volume= 0.049 af
Outflow = 0.41 cfs @ 12.21 hrs, Volume= 0.049 af, Atten= 50%, Lag= 6.1 min
Primary = 0.41 cfs @ 12.21 hrs, Volume= 0.049 af
Routed to Reach 12R : 10th Street
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 12R : 10th Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 670.72' @ 12.21 hrs Surf.Area= 455 sf Storage= 297 cf

Plug-Flow detention time= 4.9 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 4.9 min (759.2 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1	669.60'	438 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

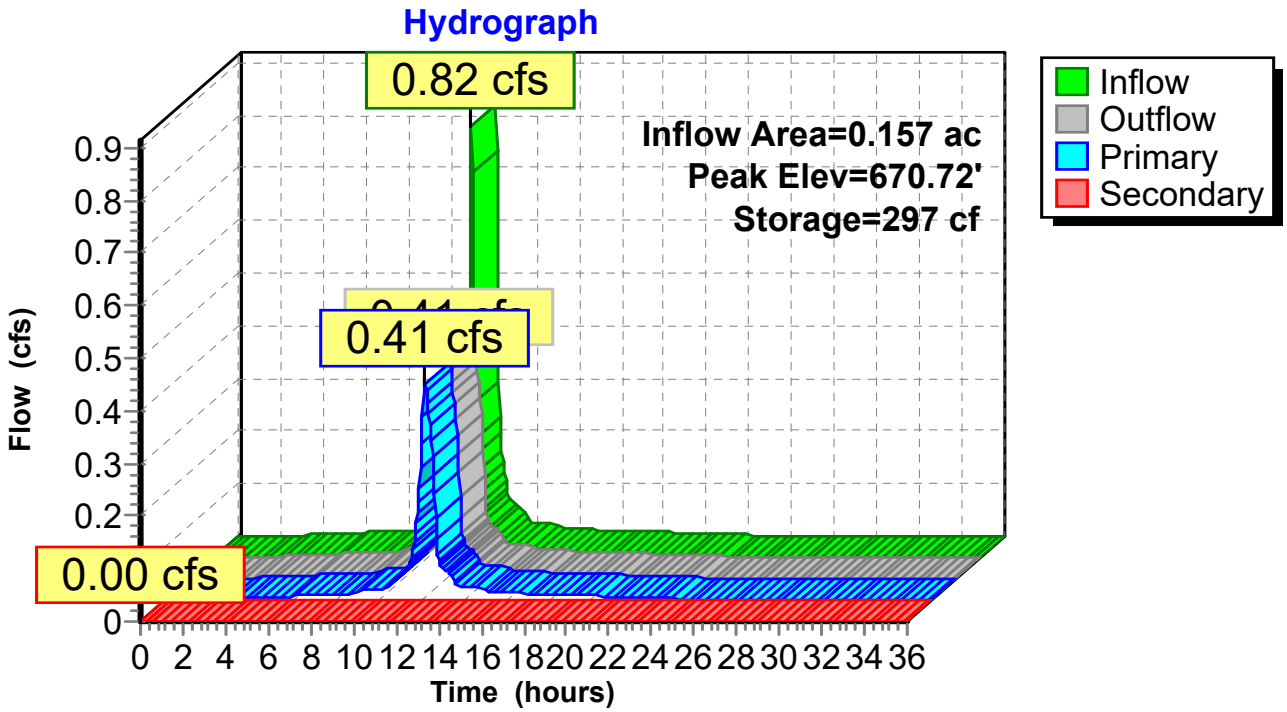
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.60	0	0	0
670.00	240	48	48
671.00	540	390	438

Device	Routing	Invert	Outlet Devices
#1	Primary	669.60'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	670.75'	**18.0" Horiz. Orifice/Grate** C= 0.600 in 18.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.41 cfs @ 12.21 hrs HW=670.71' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.41 cfs @ 4.67 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=669.60' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Dry Basin



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: EX DA-1 Runoff Area=0.900 ac 28.33% Impervious Runoff Depth=4.94"
Flow Length=100' Slope=0.0110 '/' Tc=12.8 min UI Adjusted CN=WQ Runoff=5.10 cfs 0.371 af

Subcatchment2S: EX DA-2 Runoff Area=0.222 ac 36.04% Impervious Runoff Depth=5.20"
Flow Length=50' Slope=0.0400 '/' Tc=5.0 min CN=WQ Runoff=1.70 cfs 0.096 af

Subcatchment11S: DA-1 Runoff Area=0.349 ac 73.93% Impervious Runoff Depth=6.47"
Tc=5.0 min CN=WQ Runoff=3.14 cfs 0.188 af

Subcatchment12S: DA-2 Runoff Area=0.183 ac 65.57% Impervious Runoff Depth=6.19"
Tc=5.0 min CN=WQ Runoff=1.59 cfs 0.094 af

Subcatchment13S: DA-3 Runoff Area=0.368 ac 1.63% Impervious Runoff Depth=4.05"
Flow Length=100' Slope=0.0110 '/' Tc=12.8 min CN=WQ Runoff=1.81 cfs 0.124 af

Subcatchment14S: DA-4 Runoff Area=0.157 ac 81.53% Impervious Runoff Depth=6.72"
Tc=5.0 min CN=WQ Runoff=1.45 cfs 0.088 af

Subcatchment15S: DA-5 Runoff Area=0.065 ac 26.15% Impervious Runoff Depth=4.87"
Tc=5.0 min CN=WQ Runoff=0.48 cfs 0.026 af

Reach 1R: Existing Runoff Inflow=6.14 cfs 0.467 af
Outflow=6.14 cfs 0.467 af

Reach 11R: Division Street Inflow=5.91 cfs 0.407 af
Outflow=5.91 cfs 0.407 af

Reach 12R: 10th Street Inflow=1.88 cfs 0.114 af
Outflow=1.88 cfs 0.114 af

Reach 13R: Proposed Runoff Inflow=7.66 cfs 0.521 af
Outflow=7.66 cfs 0.521 af

Pond 1P: N Basin Peak Elev=669.72' Storage=2,504 cf Inflow=4.73 cfs 0.282 af
Primary=3.47 cfs 0.276 af Secondary=0.80 cfs 0.006 af Outflow=4.27 cfs 0.282 af

Pond 2P: Dry Basin Peak Elev=670.91' Storage=390 cf Inflow=1.45 cfs 0.088 af
Primary=0.45 cfs 0.078 af Secondary=0.97 cfs 0.010 af Outflow=1.42 cfs 0.088 af

Total Runoff Area = 2.244 ac Runoff Volume = 0.988 af Average Runoff Depth = 5.28"
61.50% Pervious = 1.380 ac 38.50% Impervious = 0.864 ac

Summary for Subcatchment 1S: EX DA-1

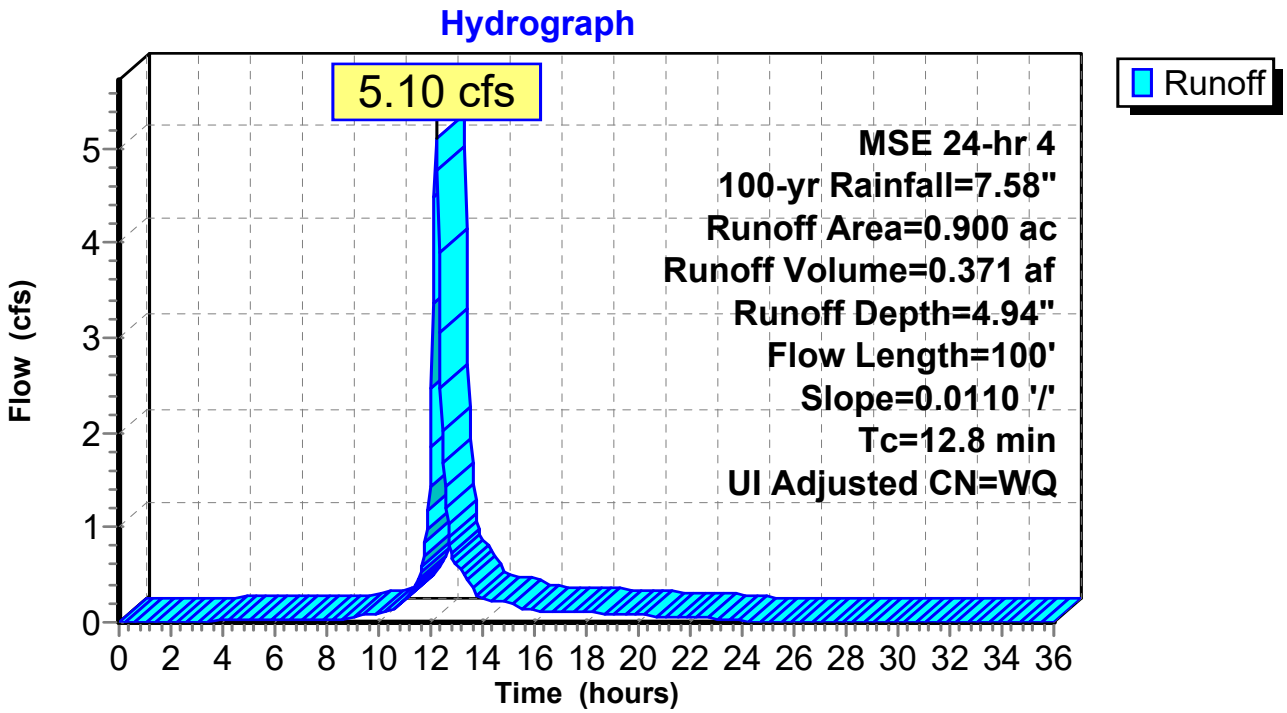
Runoff = 5.10 cfs @ 12.21 hrs, Volume= 0.371 af, Depth= 4.94"
Routed to Reach 1R : Existing Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Adj	Description
0.255	98	98	Unconnected roofs, HSG B
0.645	69	69	50-75% Grass cover, Fair, HSG B
0.900			Weighted Average
0.645			71.67% Pervious Area
0.255			28.33% Impervious Area
0.255			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0110	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"

Subcatchment 1S: EX DA-1



Summary for Subcatchment 2S: EX DA-2

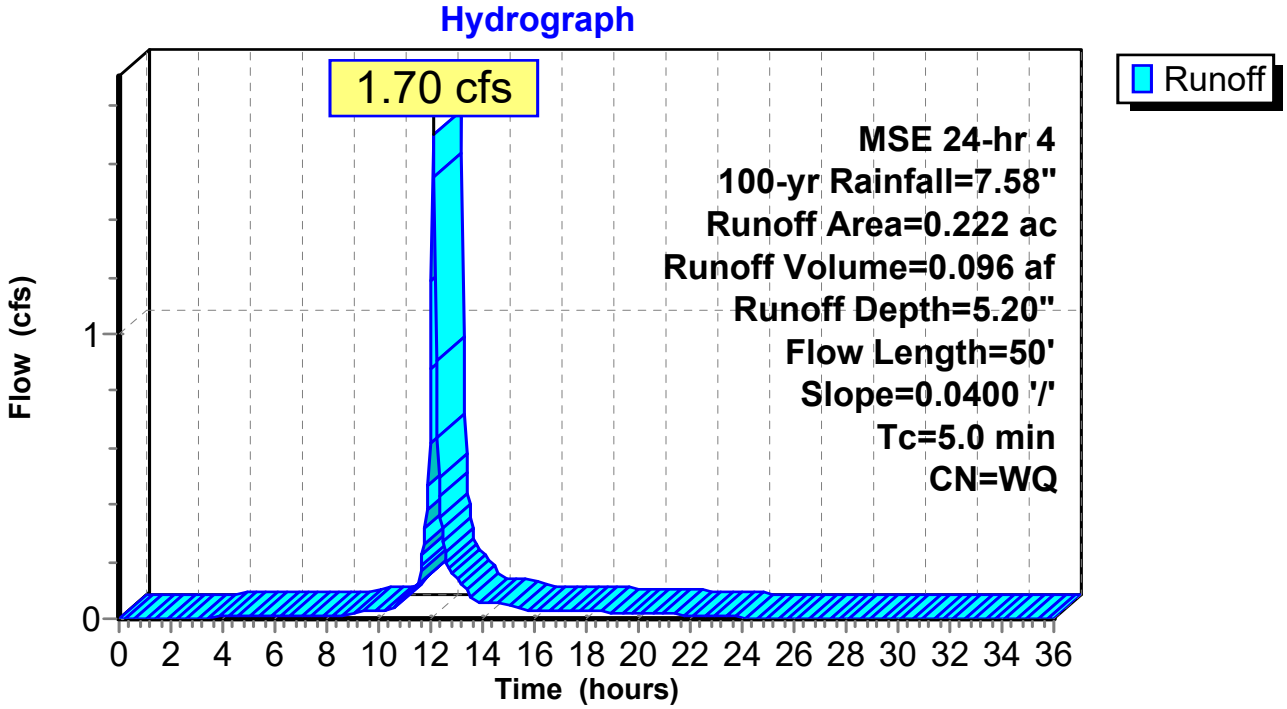
Runoff = 1.70 cfs @ 12.11 hrs, Volume= 0.096 af, Depth= 5.20"
Routed to Reach 1R : Existing Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.080	98	Unconnected roofs, HSG B
0.142	69	50-75% Grass cover, Fair, HSG B
0.222		Weighted Average
0.142		63.96% Pervious Area
0.080		36.04% Impervious Area
0.080		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
4.4	50	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 2S: EX DA-2



Summary for Subcatchment 11S: DA-1

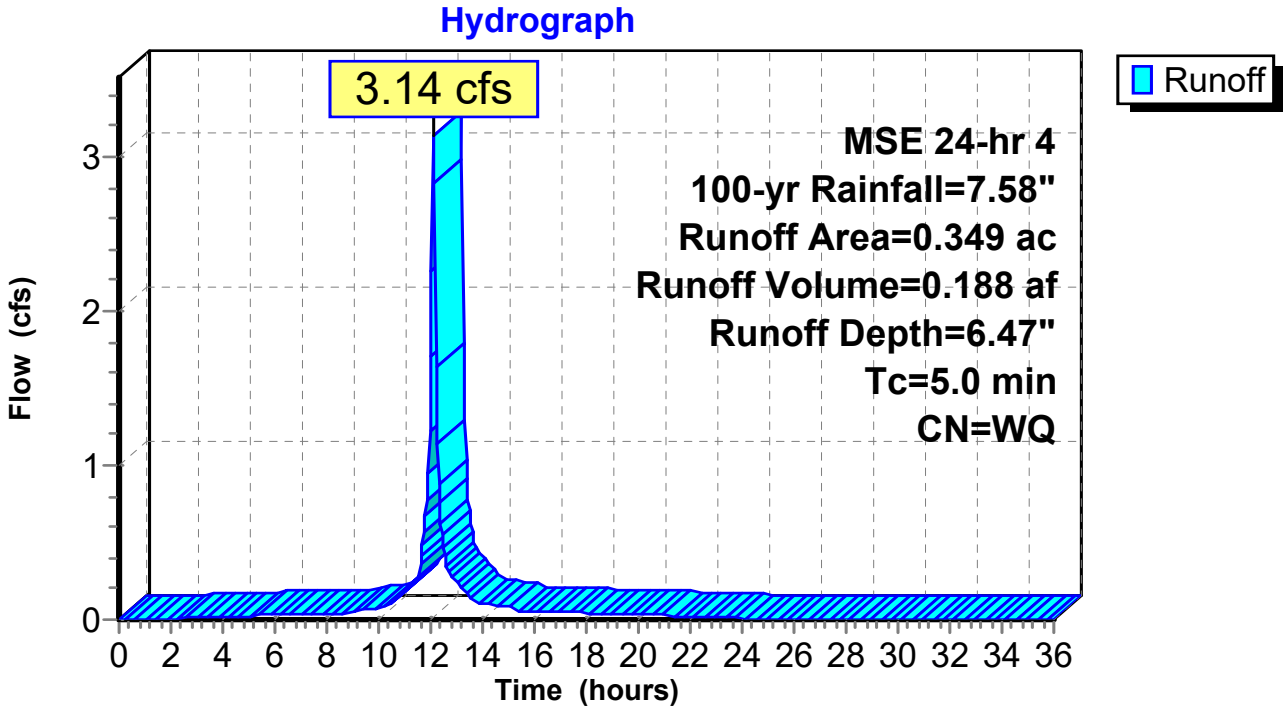
Runoff = 3.14 cfs @ 12.11 hrs, Volume= 0.188 af, Depth= 6.47"
Routed to Pond 1P : N Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.258	98	Roofs, HSG B
0.091	69	50-75% Grass cover, Fair, HSG B
0.349		Weighted Average
0.091		26.07% Pervious Area
0.258		73.93% Impervious Area

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

Subcatchment 11S: DA-1



Summary for Subcatchment 12S: DA-2

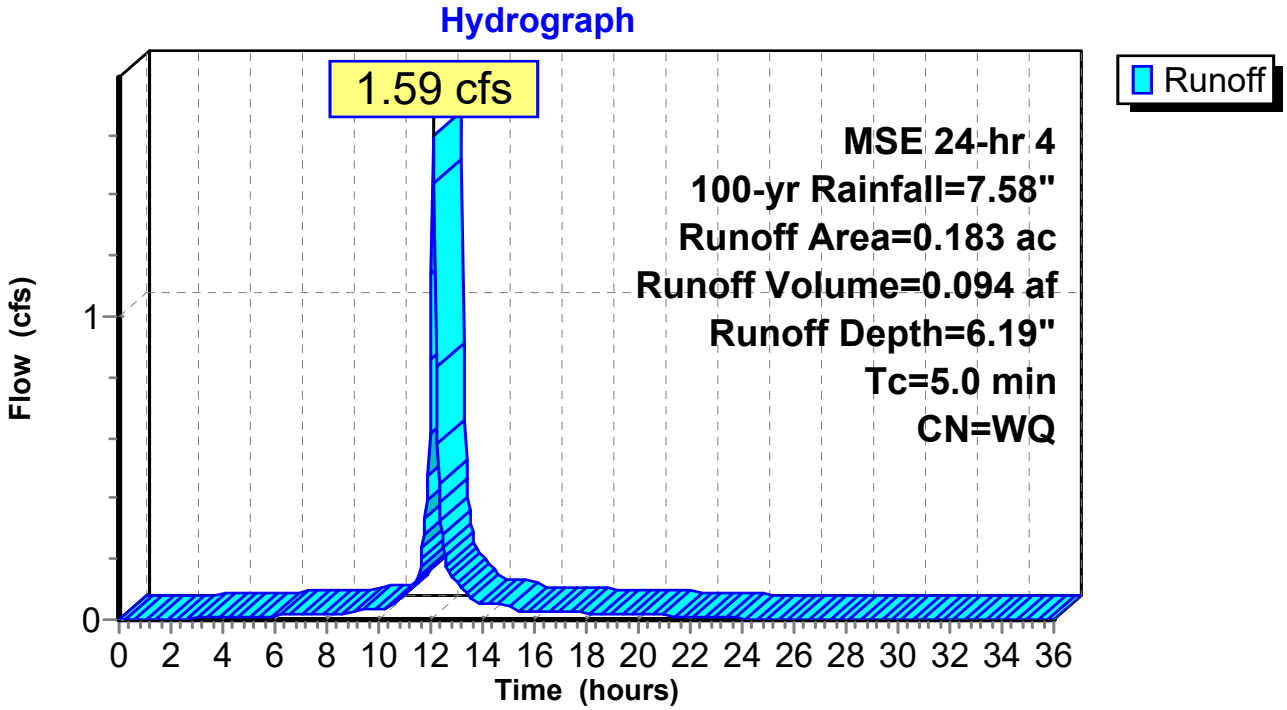
Runoff = 1.59 cfs @ 12.11 hrs, Volume= 0.094 af, Depth= 6.19"
Routed to Pond 1P : N Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.120	98	Roofs, HSG B
0.063	69	50-75% Grass cover, Fair, HSG B
0.183		Weighted Average
0.063		34.43% Pervious Area
0.120		65.57% Impervious Area

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

Subcatchment 12S: DA-2



Summary for Subcatchment 13S: DA-3

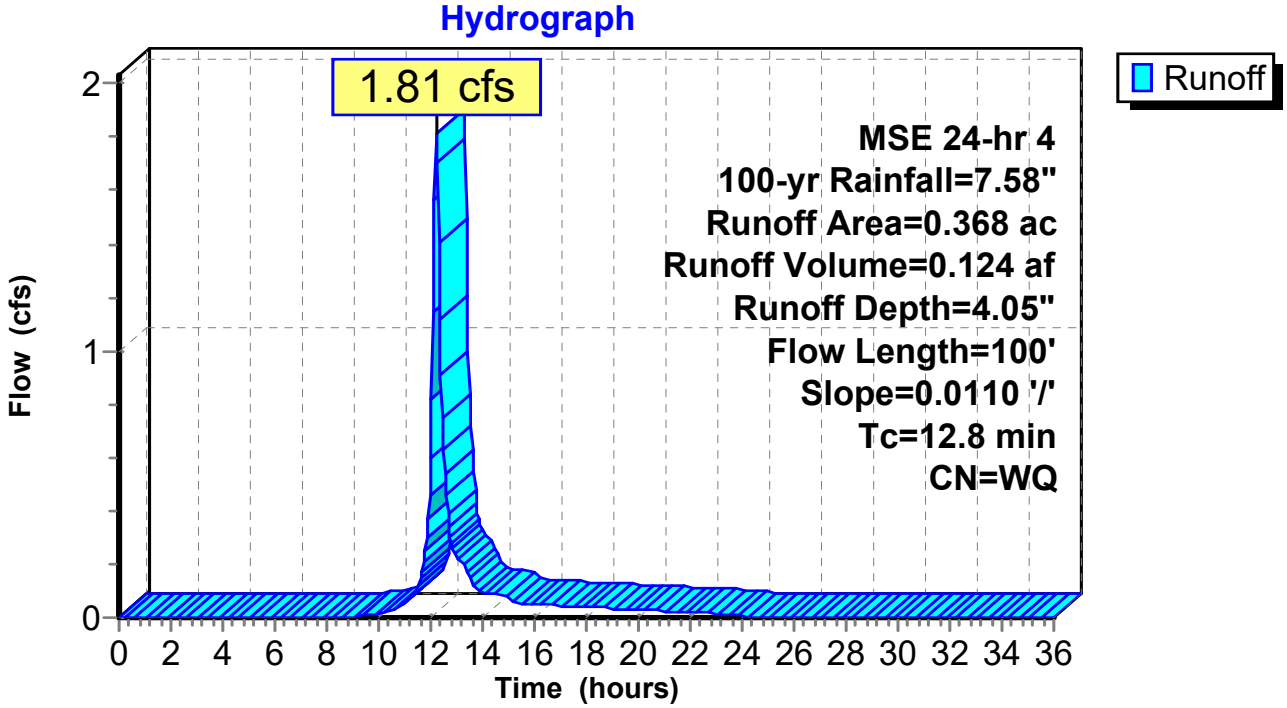
Runoff = 1.81 cfs @ 12.21 hrs, Volume= 0.124 af, Depth= 4.05"
Routed to Reach 11R : Division Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.006	98	Roofs, HSG B
0.362	69	50-75% Grass cover, Fair, HSG B
0.368		Weighted Average
0.362		98.37% Pervious Area
0.006		1.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0110	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"

Subcatchment 13S: DA-3



Summary for Subcatchment 14S: DA-4

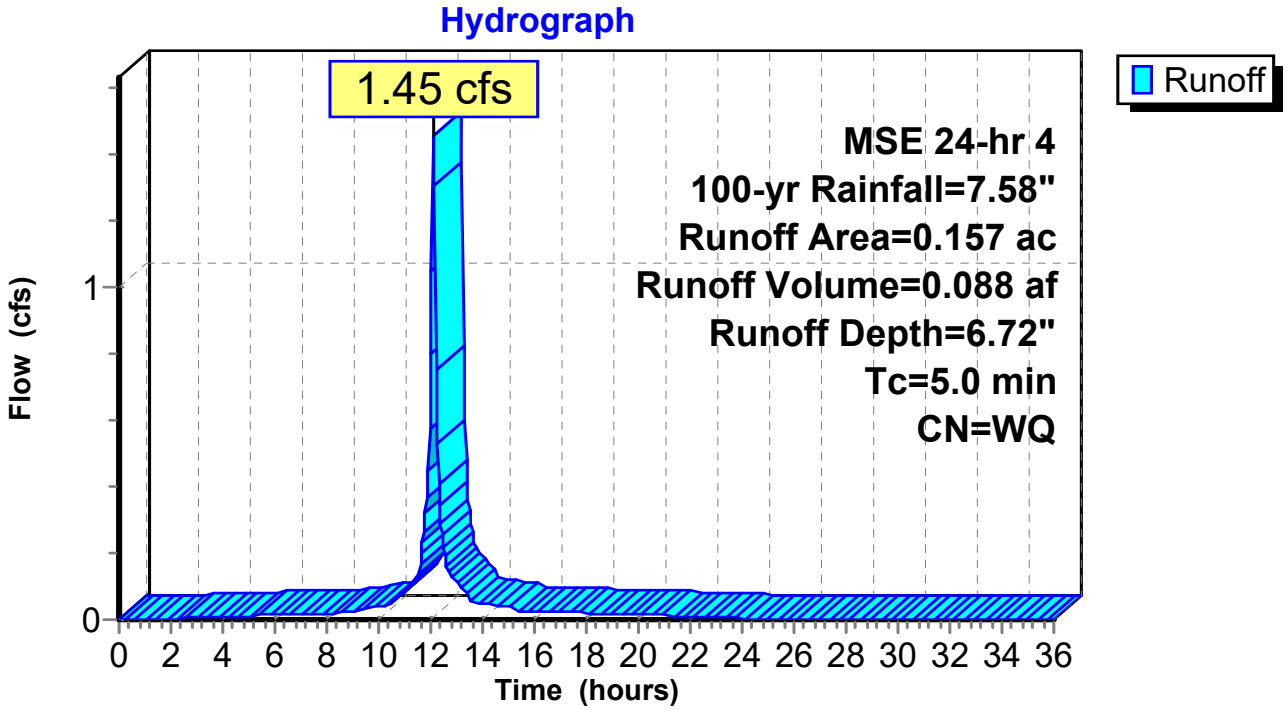
Runoff = 1.45 cfs @ 12.11 hrs, Volume= 0.088 af, Depth= 6.72"
Routed to Pond 2P : Dry Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.128	98	Roofs, HSG B
0.029	69	50-75% Grass cover, Fair, HSG B
0.157		Weighted Average
0.029		18.47% Pervious Area
0.128		81.53% Impervious Area

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

Subcatchment 14S: DA-4



Summary for Subcatchment 15S: DA-5

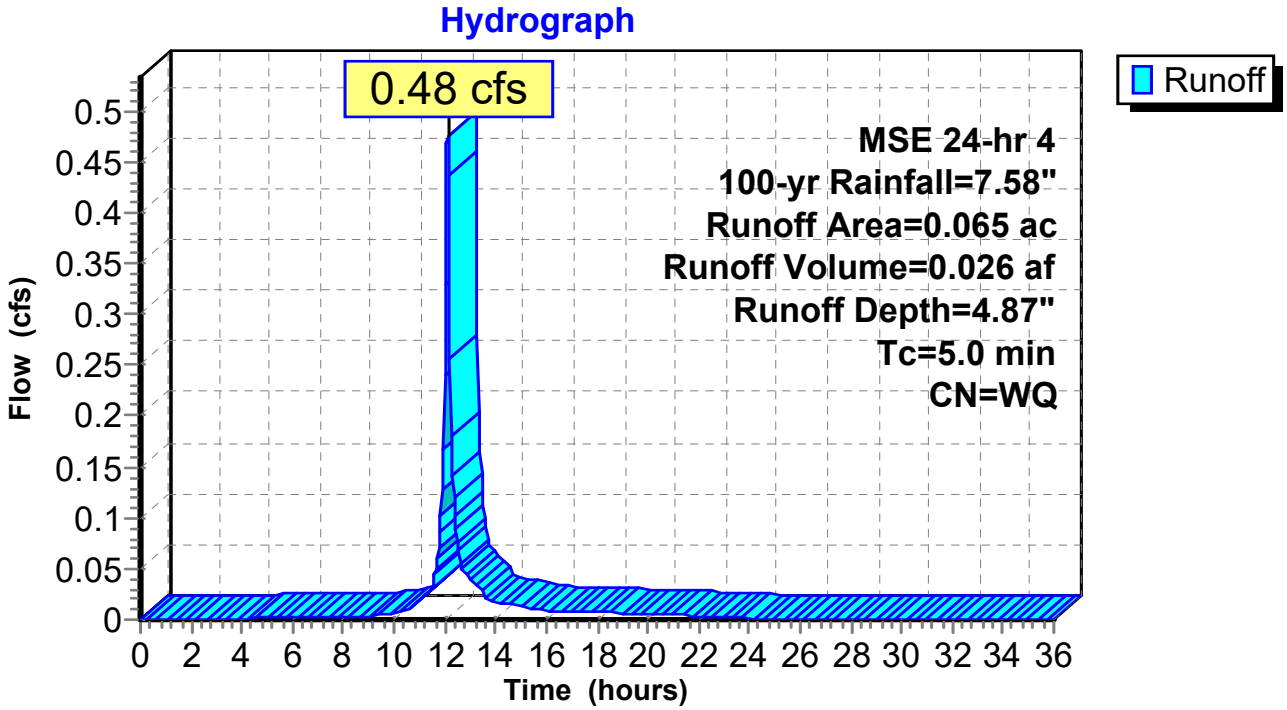
Runoff = 0.48 cfs @ 12.12 hrs, Volume= 0.026 af, Depth= 4.87"
Routed to Reach 12R : 10th Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.017	98	Paved parking, HSG B
0.048	69	50-75% Grass cover, Fair, HSG B
0.065		Weighted Average
0.048		73.85% Pervious Area
0.017		26.15% Impervious Area

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

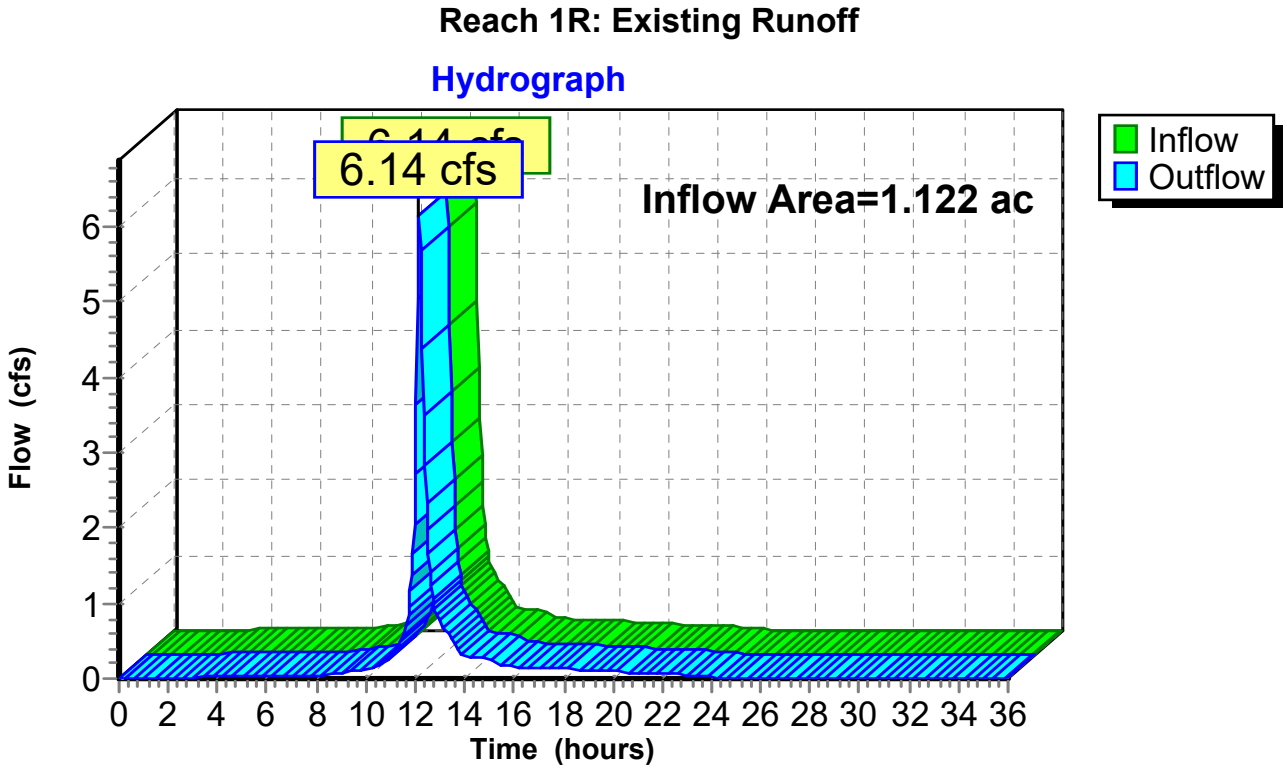
Subcatchment 15S: DA-5



Summary for Reach 1R: Existing Runoff

Inflow Area = 1.122 ac, 29.86% Impervious, Inflow Depth = 4.99" for 100-yr event
Inflow = 6.14 cfs @ 12.17 hrs, Volume= 0.467 af
Outflow = 6.14 cfs @ 12.17 hrs, Volume= 0.467 af, Atten= 0%, Lag= 0.0 min

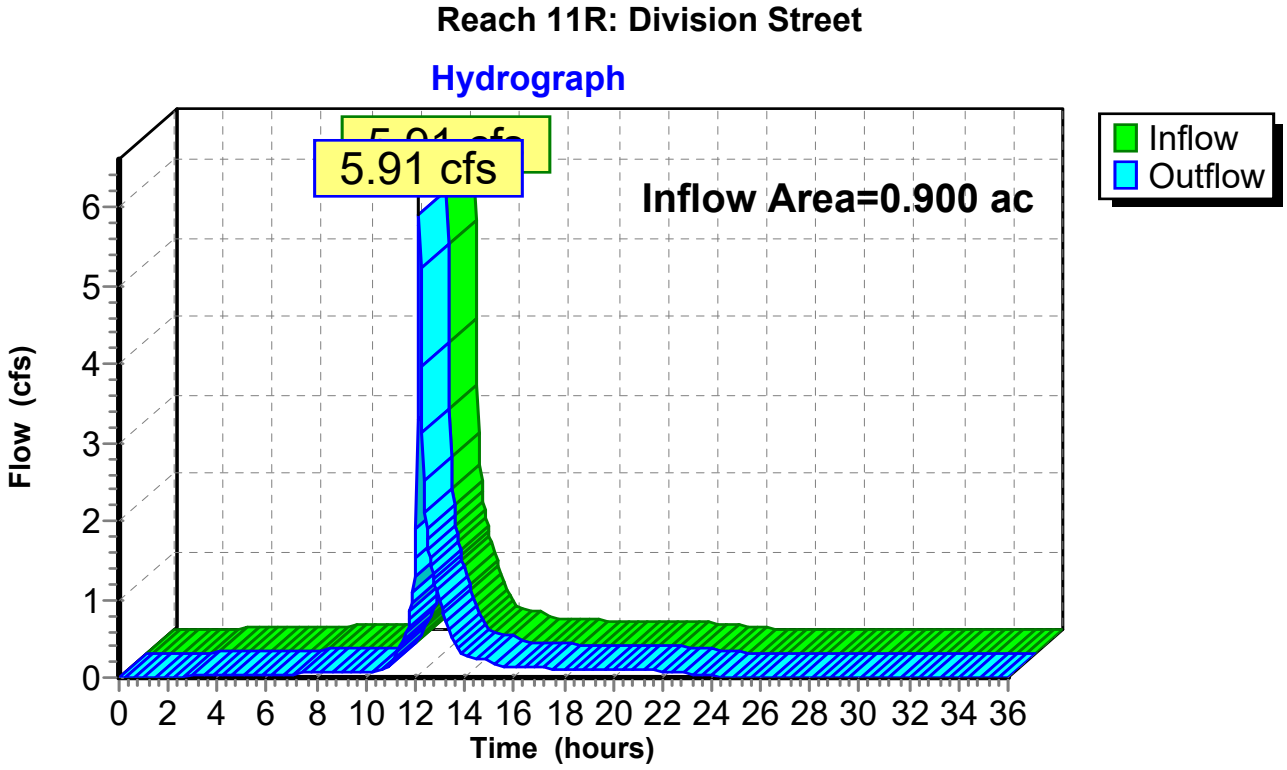
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 11R: Division Street

Inflow Area = 0.900 ac, 42.67% Impervious, Inflow Depth = 5.42" for 100-yr event
Inflow = 5.91 cfs @ 12.17 hrs, Volume= 0.407 af
Outflow = 5.91 cfs @ 12.17 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 13R : Proposed Runoff

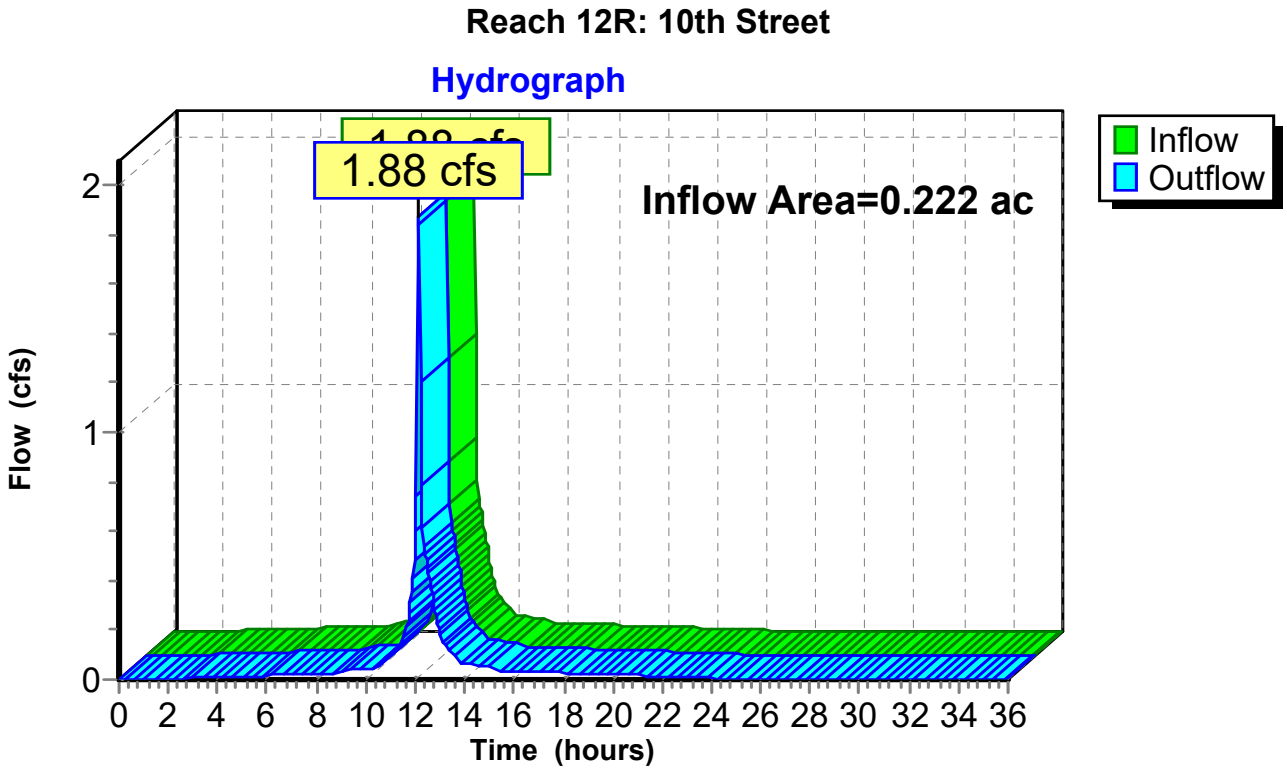
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 12R: 10th Street

Inflow Area = 0.222 ac, 65.32% Impervious, Inflow Depth = 6.18" for 100-yr event
Inflow = 1.88 cfs @ 12.13 hrs, Volume= 0.114 af
Outflow = 1.88 cfs @ 12.13 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 13R : Proposed Runoff

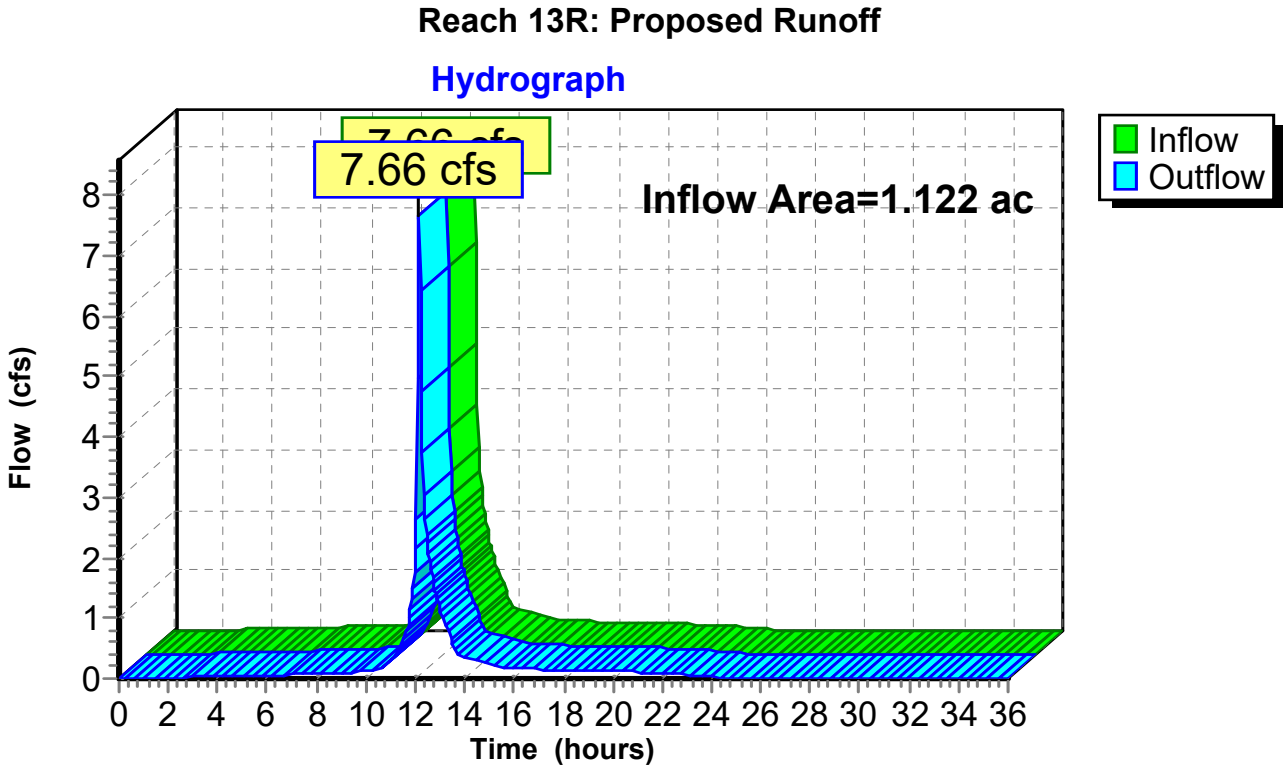
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Reach 13R: Proposed Runoff

Inflow Area = 1.122 ac, 47.15% Impervious, Inflow Depth = 5.57" for 100-yr event
Inflow = 7.66 cfs @ 12.16 hrs, Volume= 0.521 af
Outflow = 7.66 cfs @ 12.16 hrs, Volume= 0.521 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs



Summary for Pond 1P: N Basin

Inflow Area = 0.532 ac, 71.05% Impervious, Inflow Depth = 6.37" for 100-yr event
Inflow = 4.73 cfs @ 12.11 hrs, Volume= 0.282 af
Outflow = 4.27 cfs @ 12.16 hrs, Volume= 0.282 af, Atten= 10%, Lag= 2.9 min
Primary = 3.47 cfs @ 12.16 hrs, Volume= 0.276 af
Routed to Reach 11R : Division Street
Secondary = 0.80 cfs @ 12.16 hrs, Volume= 0.006 af
Routed to Reach 11R : Division Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 669.72' @ 12.16 hrs Surf.Area= 2,540 sf Storage= 2,504 cf

Plug-Flow detention time= 33.2 min calculated for 0.282 af (100% of inflow)
Center-of-Mass det. time= 33.1 min (786.8 - 753.6)

Volume	Invert	Avail.Storage	Storage Description
#1	667.50'	3,416 cf	**Basin (Prismatic)**Listed below (Recalc)

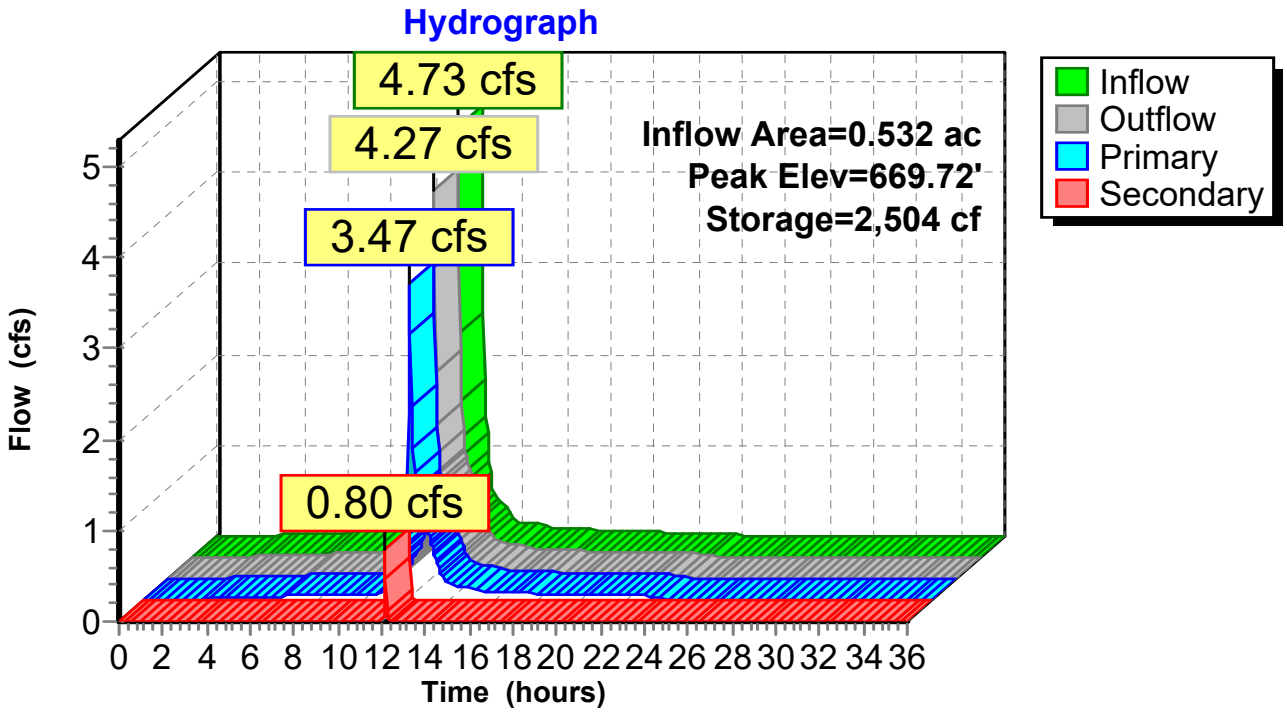
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
667.50	685	0	0
669.00	1,204	1,417	1,417
669.50	1,405	652	2,069
670.00	3,981	1,347	3,416

Device	Routing	Invert	Outlet Devices
#1	Device 4	667.50'	**3.600 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Device 4	669.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Device 4	668.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	665.00'	**12.0" Round Culvert** L= 135.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 665.00' / 664.33' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	669.53'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.25 Width (feet) 0.00 10.00

Primary OutFlow Max=3.30 cfs @ 12.16 hrs HW=669.71' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 3.30 cfs of 5.51 cfs potential flow)
  ├─**1=Exfiltration** (Exfiltration Controls 0.21 cfs)
  ├─**2=Orifice/Grate** (Weir Controls 1.95 cfs @ 1.49 fps)
  └─**3=Orifice/Grate** (Orifice Controls 1.14 cfs @ 5.81 fps)

Secondary OutFlow Max=0.72 cfs @ 12.16 hrs HW=669.71' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Weir Controls 0.72 cfs @ 1.11 fps)

Pond 1P: N Basin



Summary for Pond 2P: Dry Basin

Inflow Area = 0.157 ac, 81.53% Impervious, Inflow Depth = 6.72" for 100-yr event
Inflow = 1.45 cfs @ 12.11 hrs, Volume= 0.088 af
Outflow = 1.42 cfs @ 12.14 hrs, Volume= 0.088 af, Atten= 2%, Lag= 1.6 min
Primary = 0.45 cfs @ 12.14 hrs, Volume= 0.078 af
Routed to Reach 12R : 10th Street
Secondary = 0.97 cfs @ 12.14 hrs, Volume= 0.010 af
Routed to Reach 12R : 10th Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 670.91' @ 12.14 hrs Surf.Area= 513 sf Storage= 390 cf

Plug-Flow detention time= 4.9 min calculated for 0.088 af (100% of inflow)
Center-of-Mass det. time= 4.9 min (753.1 - 748.3)

Volume	Invert	Avail.Storage	Storage Description
#1	669.60'	438 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

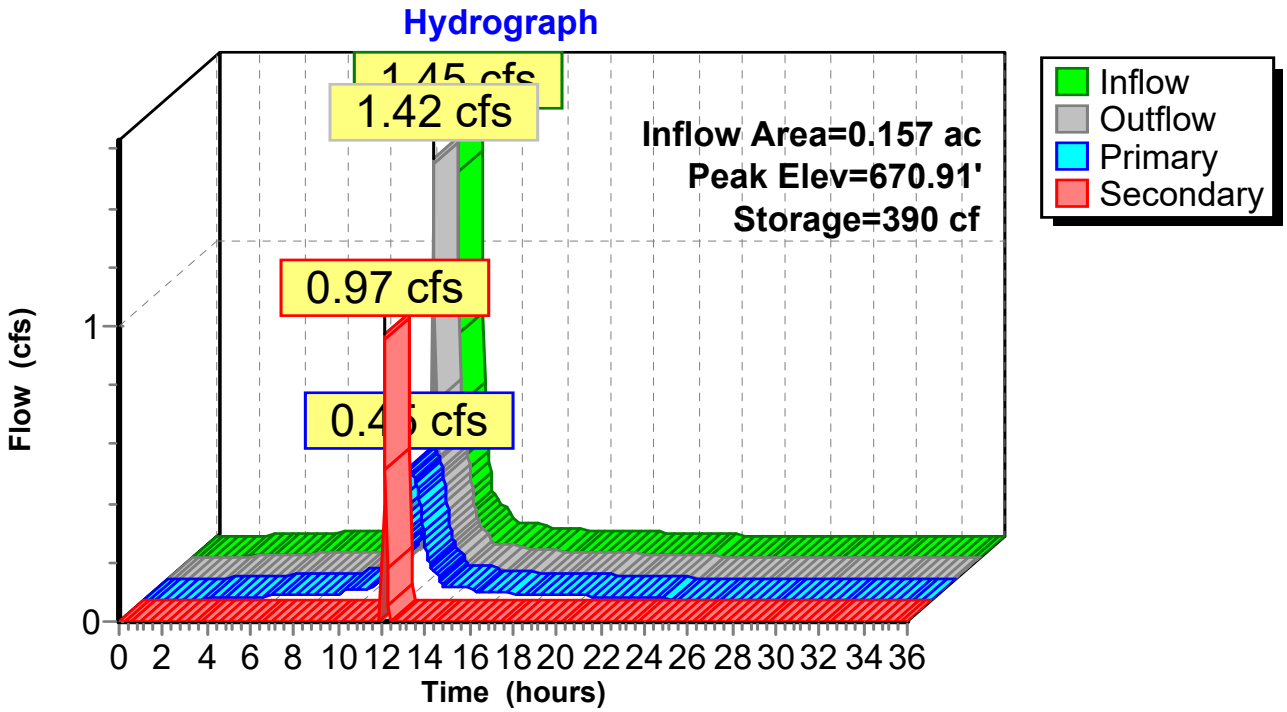
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
669.60	0	0	0
670.00	240	48	48
671.00	540	390	438

Device	Routing	Invert	Outlet Devices
#1	Primary	669.60'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	670.75'	**18.0" Horiz. Orifice/Grate** C= 0.600 in 18.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.45 cfs @ 12.14 hrs HW=670.90' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.13 fps)

Secondary OutFlow Max=0.92 cfs @ 12.14 hrs HW=670.90' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Weir Controls 0.92 cfs @ 1.28 fps)

Pond 2P: Dry Basin



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Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Minneapolis MN 1959.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/02/59 Study period ending date: 12/28/59
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 09-05-2024 Time: 15:58:00
Site information:

LU# 1 - Residential: DA-1 Total area (ac): 0.349
13 - Paved Parking 1: 0.258 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
51 - Small Landscaped Areas 1: 0.091 ac. Moderately Compacted Sandy PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM F

LU# 2 - Residential: DA-2 Total area (ac): 0.183
1 - Roofs 1: 0.120 ac. Pitched Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
52 - Small Landscaped Areas 2: 0.063 ac. Moderately Compacted Sandy PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM F

Control Practice 1: Biofilter CP# 1 (DS) - DS Biofilters # 1
1. Top area (square feet) = 1405
2. Bottom aea (square feet) = 685
3. Depth (ft): 5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.5
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 0.01
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 1
10. Porosity of rock filled volume = 0.33
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 2
13. Engineered soil porosity = 0.27
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

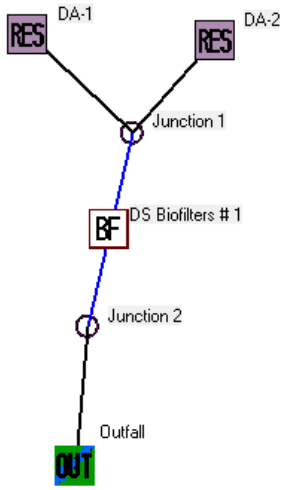
Soil Data	Soil Type Fraction in Eng. Soil
User-Defined Media Type	1.000
Sand	0.700
Compost	0.300

Saturation water content (Porosity) = 0
Field capacity (fraction) = 0
Permanent Wilting Point (fraction) = 0
Infiltration rate (in/hr) = 3.6

Biofilter Outlet/Discharge Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 5
2. Weir crest width (ft): 5
3. Height of datum to bottom of weir opening: 4.75

Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 2
2. Stand pipe height above datum (ft): 3.5

Outlet type: Drain Tile/Underdrain
1. Underdrain outlet diameter (ft): 0.33
2. Invert elevation above datum (ft): 0.5
3. Number of underdrain outlets: 1



SLAMM for Windows Version 10.5.0
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Data file name: S:\Projects\31000 PROJ\31400-31499\31447 10th and Division Development-La Crosse WI\31447 Practice Groups\31447 Civil-Survey\Civil Calcs\Storm
WinSLAMM Version 10.5.0
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Minneapolis MN 1959.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
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Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/02/59 Study period ending date: 12/28/59
Start of Winter Season: 12/02 End of Winter Season: 03/12
Model Run Start Date: 01/02/59 Model Run End Date: 12/28/59
Date of run: 09-05-2024 Time of run: 15:57:10
Total Area Modeled (acres): 0.532
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	32449	-	122.5	248.2	-
Outfall Total with Controls:	17007	47.59%	37.99	40.34	83.75%
Annualized Total After Outfall Controls:	17243			40.90	

Biofilter # 1 is expected to clog in 6.1 years.. Percent Solids Reduction due to Engineered Media = 80