Stantec

Memo

To:	City of Newton	From:	Karen Beighley Anna Jones Stantec
File:	Opus 2 Life Newton	Date:	May 17, 2022

Reference: 2Life Newton – Stormwater Management Memo

Introduction

2Life Communities proposes to develop a 4.6-acre site located at the intersection of Nahanton and Winchester Street. The site is adjacent to the existing Coleman House building, a senior housing facility. The proposed improvements include a new senior housing building, a connector building to the existing Coleman House, utilities, and associated site amenities.

The site drains to two design points, one in Nahanton Street and one in Winchester Street. In order to mitigate potential impacts to resource areas, stormwater management systems are proposed and have been designed in accordance with the City of Newton's Requirements for On-Site Drainage (Stormwater Management) and the Massachusetts Department of Environmental Protection's *Stormwater Management Standards*.

The following memo summarizes how the project plans to comply with applicable standards.

Stormwater Standards

Standard 1 – Untreated Discharge

Standard 1 states that "no new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth."

New stormwater outfalls are proposed to accommodate the proposed development. All runoff directed to these stormwater outfalls will be treated prior to discharging by a series of deep sump hooded catch basins, water quality units, and subsurface detention systems. Each new outfall will be constructed with rip-rap energy dissipation aprons to control exiting velocities and prevent erosion to existing design points. Sizing calculations for the rip-rap energy dissipation aprons will be provided in the Stormwater Management Reports prepared for each specific lot or development area.

Therefore, the Project will comply with Standard 1.

Standard 2 – Peak Rate Attenuation

Standard 2 states that "stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates."

The proposed stormwater management systems are designed to attenuate the 2-, 10-, and 100-year 24-hour storm events. In doing so, the post-development peak discharge rates do not exceed the allowable peak discharges rates established as part of the overall parcel (master plan) analysis. A table of peak flow rates as currently designed is included below for reference.

Design Point		2-Year Storm (3.30")	10-Year Storm (5.20")	50-Year Storm (7.46")	100-Year Storm (8.94")
DP1	Existing Rate (cfs)	5.36	10.03	12.93	18.91
	Proposed Rate (cfs)	**4.97**	**9.35**	**11.66**	**15.50**
DP2	Existing Rate (cfs)	3.91	7.18	9.21	13.37
	Proposed Rate (cfs)	**3.50**	**6.44**	**8.27**	**12.02**

Therefore, the Project will comply with Standard 2.

Standard 3

Standard 3 states that the "loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook."

The project site is located entirely within areas with shallow depth to ledge, and therefore recharge cannot be provided. Borings on site will be completed to confirm groundwater levels.

Standard 4 – Water Quality

Standard 4 states that "Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids."

Standard 4 is met when a project complies with all of the following criteria:

1. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained.
2. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
3. Pre-treatment is provided in accordance with the Massachusetts Stormwater Handbook

The Project will provide a minimum of 80% TSS removal through water quality units. The final design will comply with minimum requirements.

Standard 5 – Land Uses with Higher Potential Pollutant Loads (LUHPPL)

Standard 5 states that "for land uses with higher potential pollutant loads [LUHPPL], source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable."

The Project does not exceed requirements and therefore is not considered a LUHPPL.

Therefore, the Project complies with Standard 5.

Standard 6 – Critical Areas

Standard 6 states that “Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.”

Critical areas include any one of the following, as defined by the Massachusetts Department of Environmental Protection:

- Outstanding Resource Waters
- Special Resource Waters
- Zone I Recharge Areas
- Zone II Recharge Areas
- Interim Wellhead Protection Areas
- Zone A Recharge Areas
- Bathing Beaches
- Cold-water Fisheries
- Shellfish Growing Areas

The proposed stormwater management system does not discharge near or to any of the above listed critical areas.

Therefore, the Project complies with Standard 6.

Standard 7 – Redevelopment Projects

Standard 7 states that “a redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.”

The Project is not considered to be a redevelopment and therefore, the Project complies with Standard 7.

Standard 8 – Erosion and Sediment Control Plan

Standard 8 states that “a plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.”

Sedimentation and erosion controls will be implemented during the construction of all phases of the Project. Land disturbance will be evaluated on a parcel by parcel basis and a Stormwater Pollution Prevention Plan (SWPPP) will be prepared for each parcel that involves a land disturbance greater than one acre.

Therefore, the Project will comply with Standard 8.

Standard 9 – Operation and Maintenance Plan

Standard 9 states that “a long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.”

An operation and maintenance plan for all Stormwater BMP’s will be provided in the Stormwater Management Report submitted to the Conservation Commission.

Therefore the Project will comply with Standard 9.

Standard 10

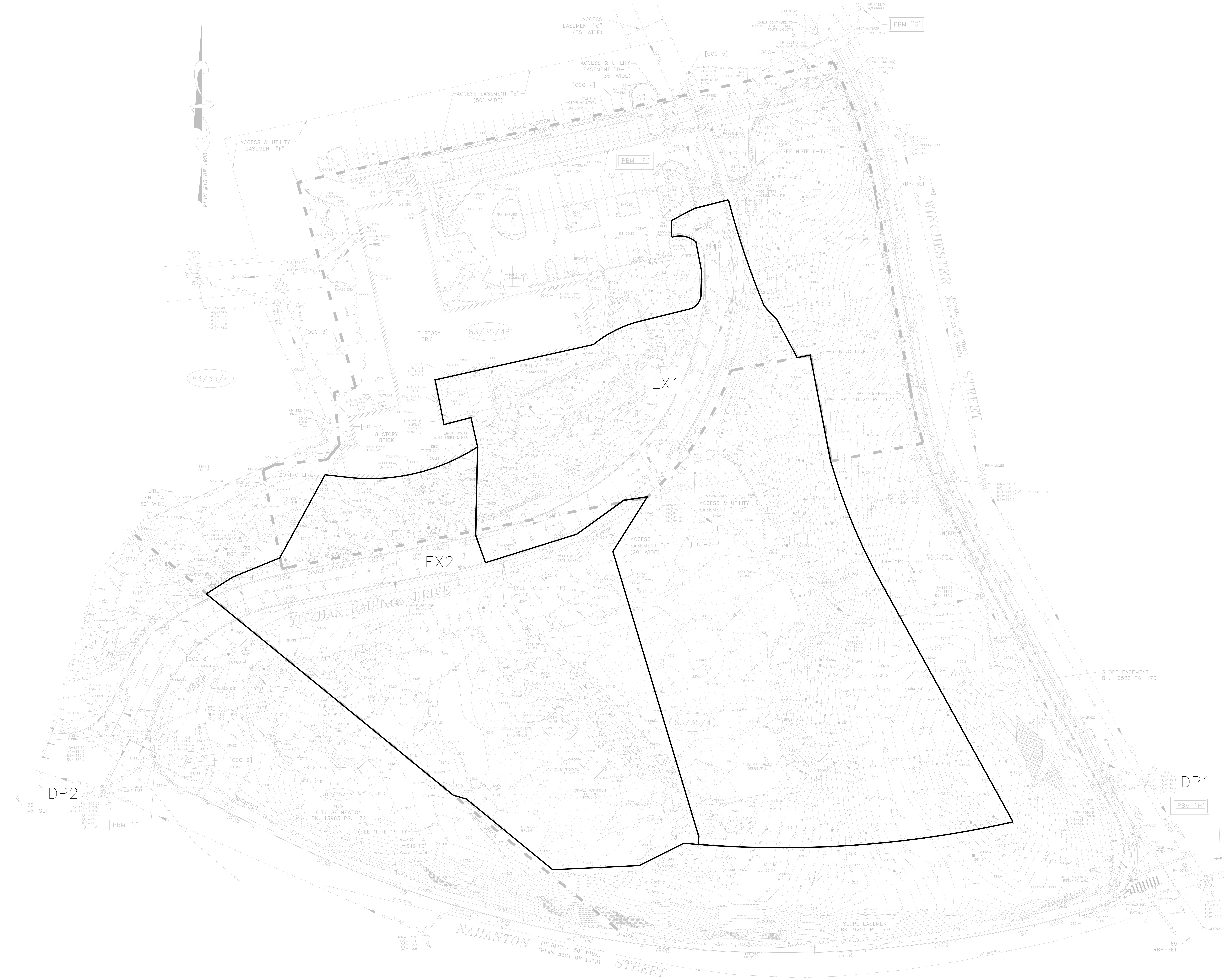
Standard 10 states that “all illicit discharges to the stormwater management system are prohibited.”

The Project will not allow illicit discharges to the stormwater management system. The final design will comply with the below Illicit Discharge Compliance Statement:

Illicit Discharge Compliance Statement

Per the requirements of Standard 10 of the Massachusetts Stormwater Management Standards, it shall be stated that no illicit discharges are proposed as part of the Vale project located in Woburn, Massachusetts, as described herein this stormwater report.

Therefore, the Project will comply with Standard 10.



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Structural:
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MEP consultant:
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PROJECT TITLE:

2LIFE - OPUS

677 WINCHESTER STREET
NEWTON, MA 02459

PROJECT No: 66571

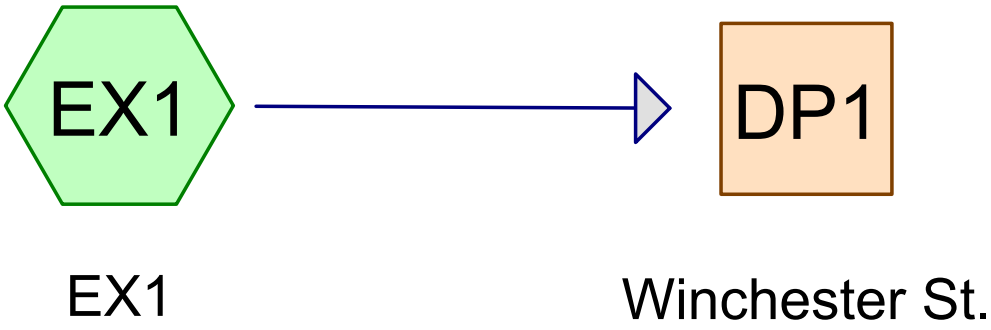
DRAWING TITLE:

EXISTING CONDITIONS WATERSHED MAP

SCALE:

SKC-100

ZONING REVIEW



EX1

Winchester St.

EX2

Nahanton St

Subcat Reach Pond Link

Routing Diagram for 20200317_Nahanton_Existing
Prepared by Stantec Consulting Ltd., Printed 5/6/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.786	96	Gravel surface, HSG D (EX1, EX2)
0.547	98	Paved parking, HSG D (EX1, EX2)
3.296	82	Woods/grass comb., Fair, HSG D (EX1, EX2)
4.628	**86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
4.628	HSG D	EX1, EX2
0.000	Other	
4.628		**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	0.000	0.000	0.786	0.000	0.786	Gravel surface	EX1, EX2
0.000	0.000	0.000	0.547	0.000	0.547	Paved parking	EX1, EX2
0.000	0.000	0.000	3.296	0.000	3.296	Woods/grass comb., Fair	EX1, EX2
0.000	**0.000**	**0.000**	**4.628**	**0.000**	**4.628**	**TOTAL AREA**	

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 Runoff Area=120,944 sf 10.82% Impervious Runoff Depth=1.92"
Flow Length=250' Tc=10.2 min CN=86 Runoff=5.43 cfs 0.445 af

Subcatchment EX2: EX2 Runoff Area=80,673 sf 13.31% Impervious Runoff Depth=2.00"
Flow Length=95' Tc=8.4 min CN=87 Runoff=4.00 cfs 0.309 af

Reach DP1: Winchester St. Inflow=5.43 cfs 0.445 af
Outflow=5.43 cfs 0.445 af

Reach DP2: Nahanton St Inflow=4.00 cfs 0.309 af
Outflow=4.00 cfs 0.309 af

Total Runoff Area = 4.628 ac Runoff Volume = 0.754 af Average Runoff Depth = 1.95"
88.18% Pervious = 4.081 ac 11.82% Impervious = 0.547 ac

Summary for Subcatchment EX1: EX1

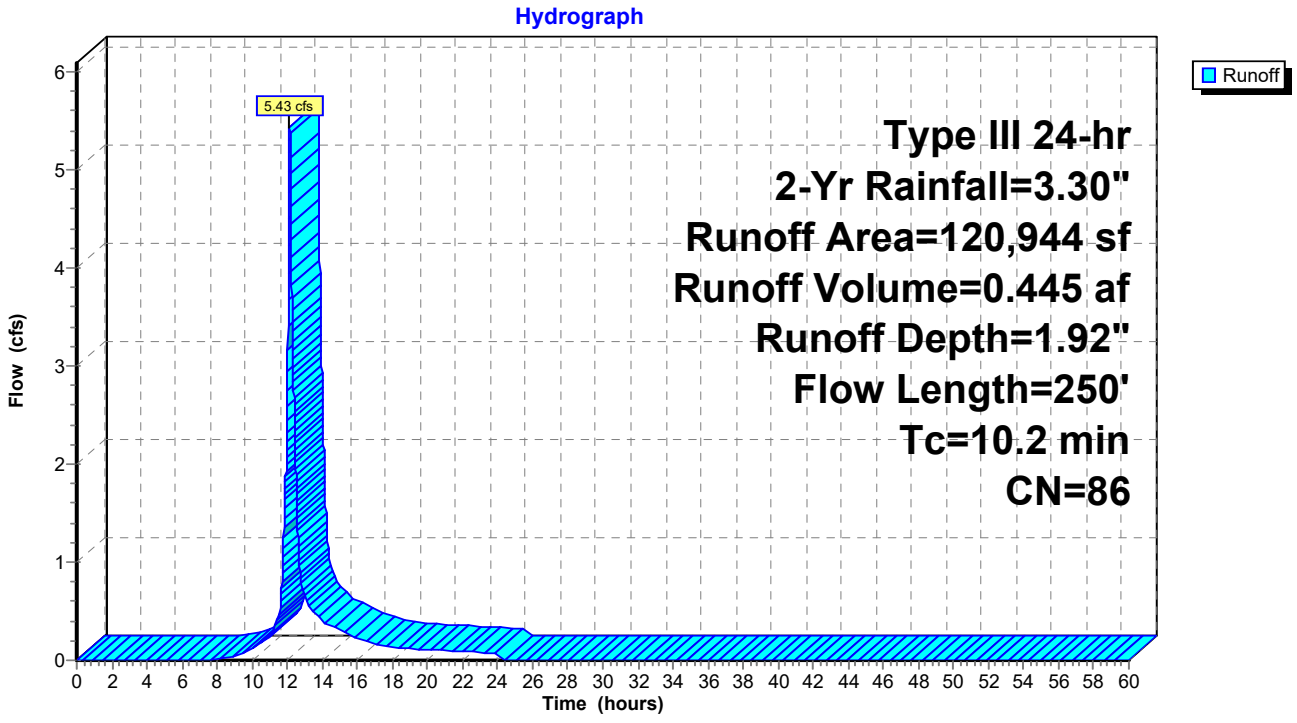
Runoff = 5.43 cfs @ 12.14 hrs, Volume= 0.445 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
13,091	98	Paved parking, HSG D
88,848	82	Woods/grass comb., Fair, HSG D
19,005	96	Gravel surface, HSG D
120,944	86	Weighted Average
107,853		89.18% Pervious Area
13,091		10.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0500	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	200	0.1400	1.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
10.2	250	Total			

Subcatchment EX1: EX1



Summary for Subcatchment EX2: EX2

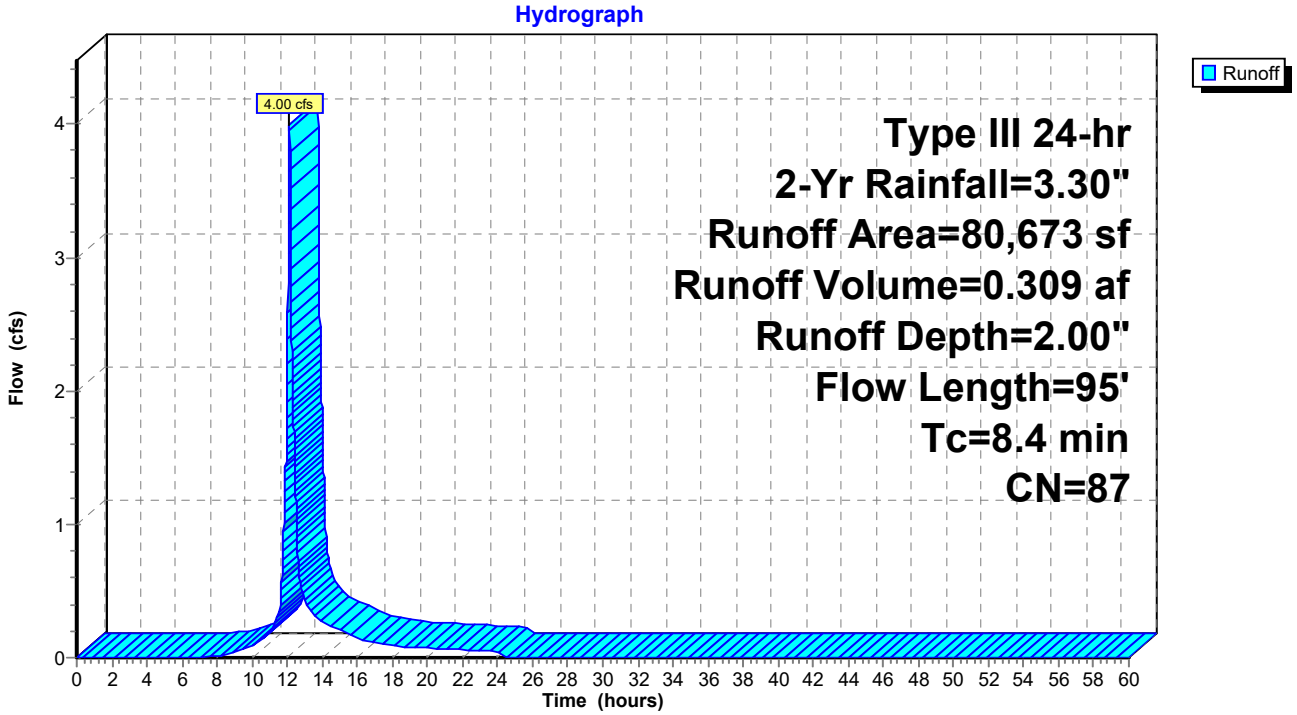
Runoff = 4.00 cfs @ 12.12 hrs, Volume= 0.309 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
10,741	98	Paved parking, HSG D
54,711	82	Woods/grass comb., Fair, HSG D
15,221	96	Gravel surface, HSG D
80,673	87	Weighted Average
69,932		86.69% Pervious Area
10,741		13.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2200	0.39		**Sheet Flow, sheet flow** Grass: Short n= 0.150 P2= 3.30"
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
6.0					**Direct Entry, to pavement**
8.4	95	Total			

Subcatchment EX2: EX2



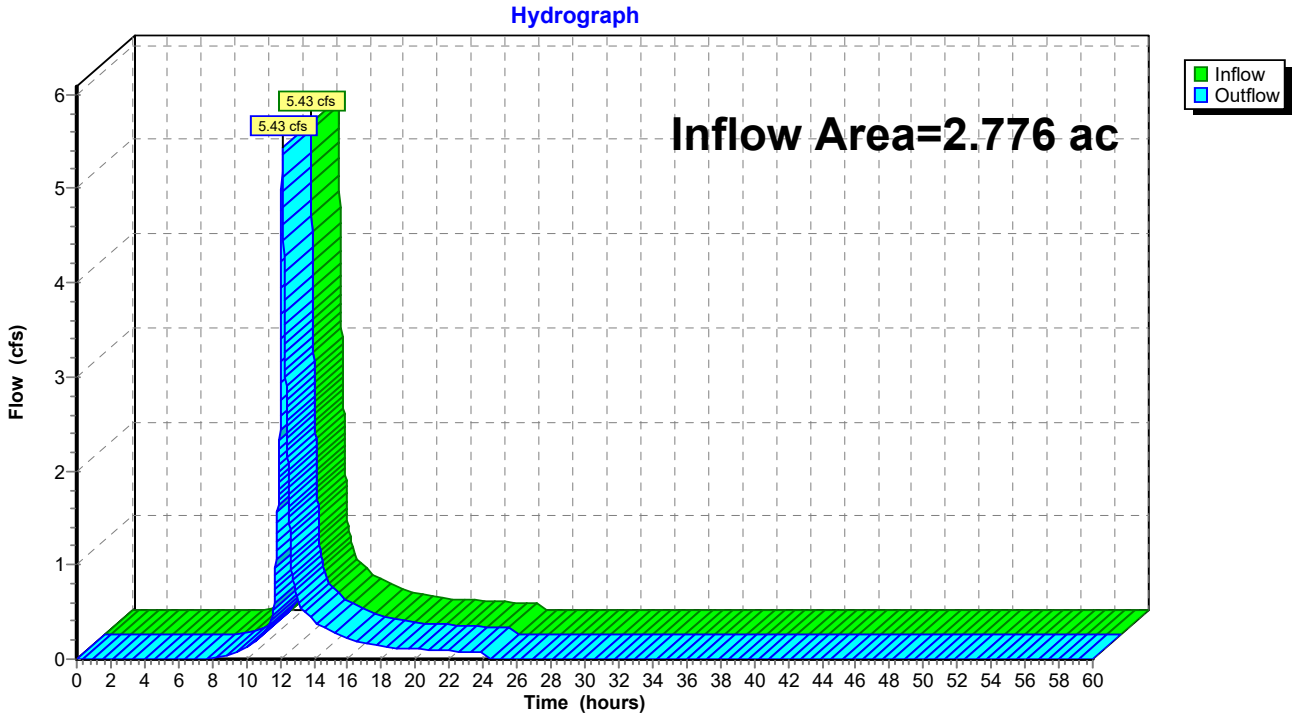
Summary for Reach DP1: Winchester St.

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

Inflow Area = 2.776 ac, 10.82% Impervious, Inflow Depth = 1.92" for 2-Yr event
Inflow = 5.43 cfs @ 12.14 hrs, Volume= 0.445 af
Outflow = 5.43 cfs @ 12.14 hrs, Volume= 0.445 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.



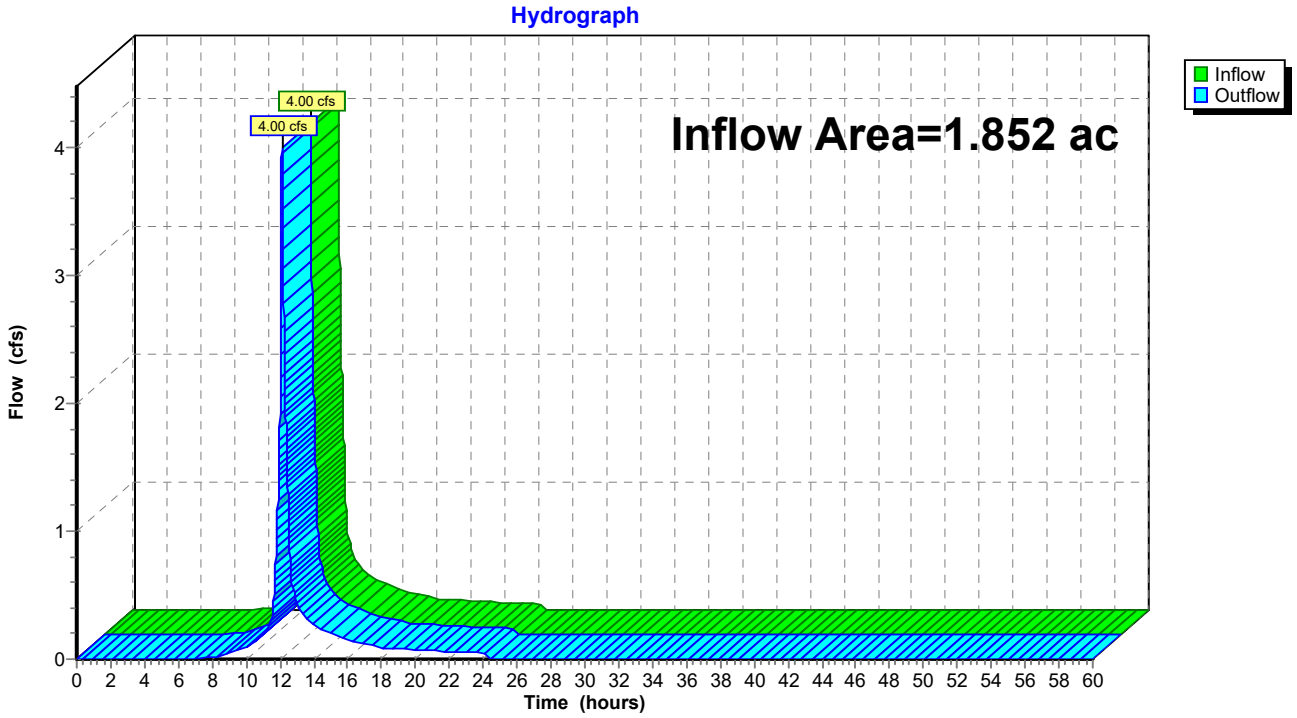
Summary for Reach DP2: Nahanton St

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

Inflow Area = 1.852 ac, 13.31% Impervious, Inflow Depth = 2.00" for 2-Yr event
Inflow = 4.00 cfs @ 12.12 hrs, Volume= 0.309 af
Outflow = 4.00 cfs @ 12.12 hrs, Volume= 0.309 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton St



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 Runoff Area=120,944 sf 10.82% Impervious Runoff Depth=3.64"
Flow Length=250' Tc=10.2 min CN=86 Runoff=10.16 cfs 0.843 af

Subcatchment EX2: EX2 Runoff Area=80,673 sf 13.31% Impervious Runoff Depth=3.75"
Flow Length=95' Tc=8.4 min CN=87 Runoff=7.35 cfs 0.578 af

Reach DP1: Winchester St. Inflow=10.16 cfs 0.843 af
Outflow=10.16 cfs 0.843 af

Reach DP2: Nahanton St Inflow=7.35 cfs 0.578 af
Outflow=7.35 cfs 0.578 af

Total Runoff Area = 4.628 ac Runoff Volume = 1.422 af Average Runoff Depth = 3.69"
88.18% Pervious = 4.081 ac 11.82% Impervious = 0.547 ac

Summary for Subcatchment EX1: EX1

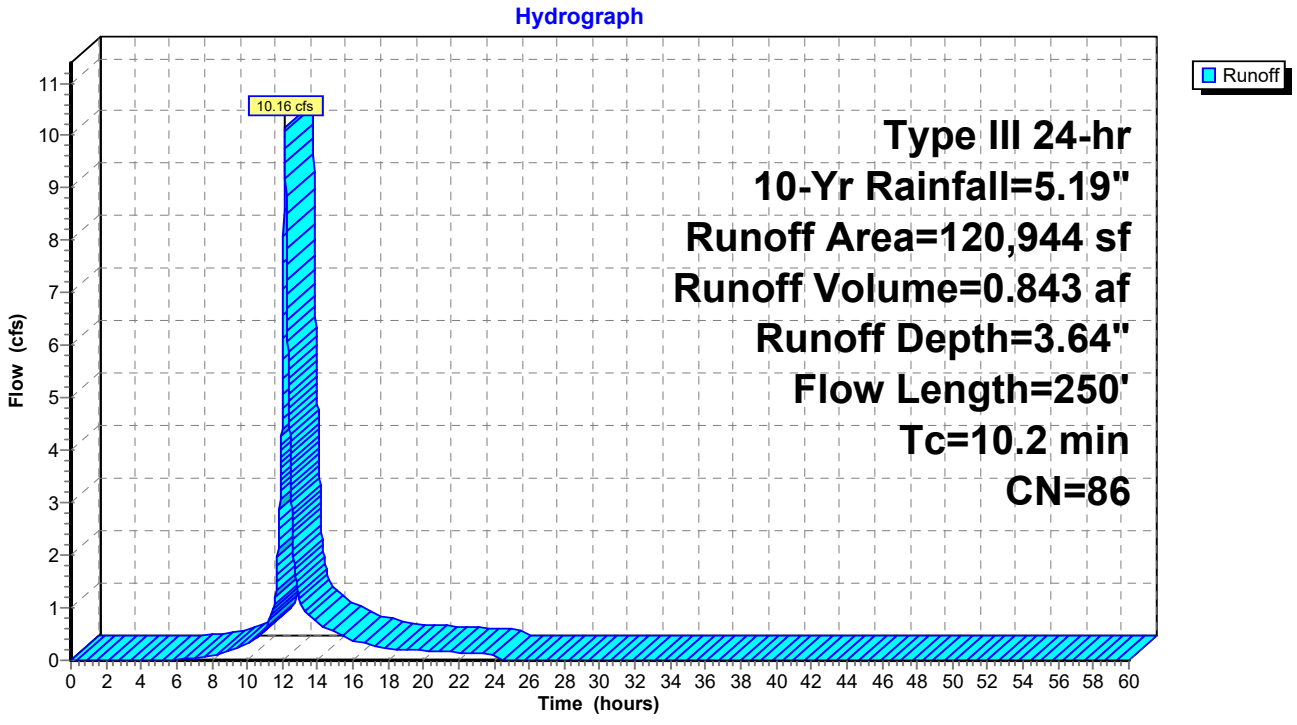
Runoff = 10.16 cfs @ 12.14 hrs, Volume= 0.843 af, Depth= 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
13,091	98	Paved parking, HSG D
88,848	82	Woods/grass comb., Fair, HSG D
19,005	96	Gravel surface, HSG D
120,944	86	Weighted Average
107,853		89.18% Pervious Area
13,091		10.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0500	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	200	0.1400	1.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
10.2	250	Total			

Subcatchment EX1: EX1



Summary for Subcatchment EX2: EX2

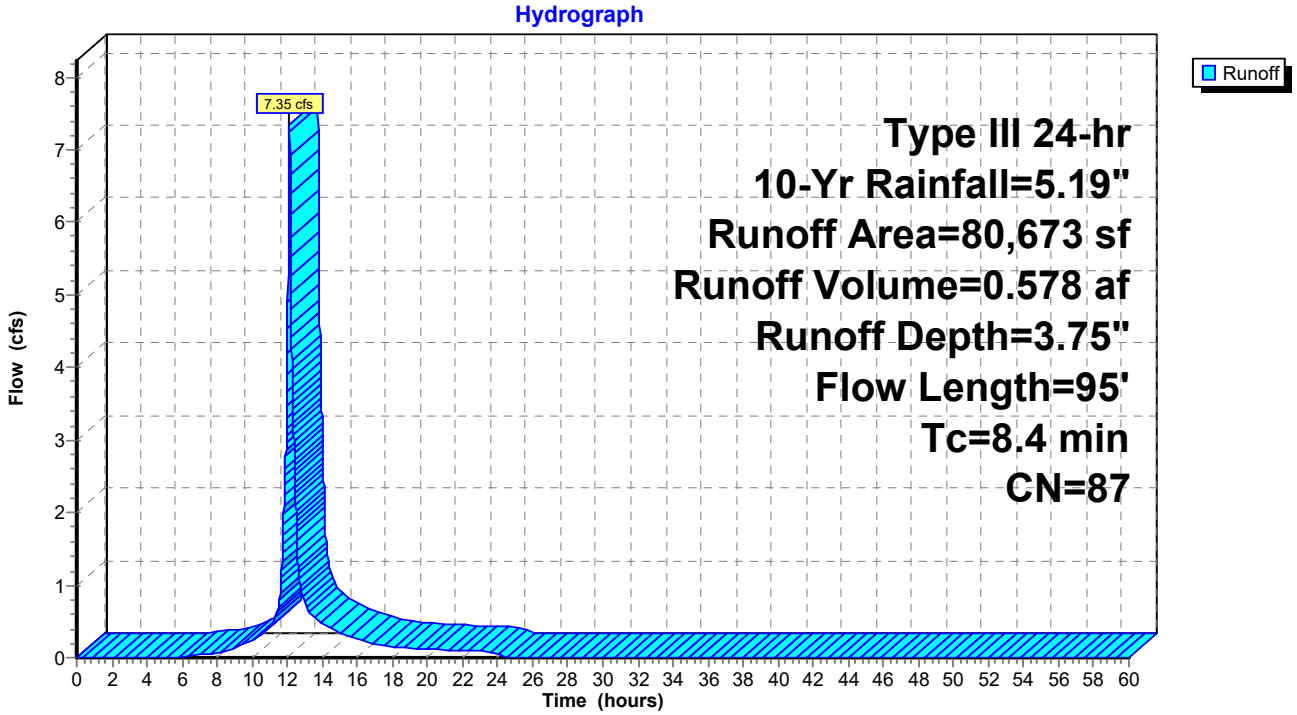
Runoff = 7.35 cfs @ 12.12 hrs, Volume= 0.578 af, Depth= 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
10,741	98	Paved parking, HSG D
54,711	82	Woods/grass comb., Fair, HSG D
15,221	96	Gravel surface, HSG D
80,673	87	Weighted Average
69,932		86.69% Pervious Area
10,741		13.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2200	0.39		**Sheet Flow, sheet flow** Grass: Short n= 0.150 P2= 3.30"
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
6.0					**Direct Entry, to pavement**
8.4	95	Total			

Subcatchment EX2: EX2



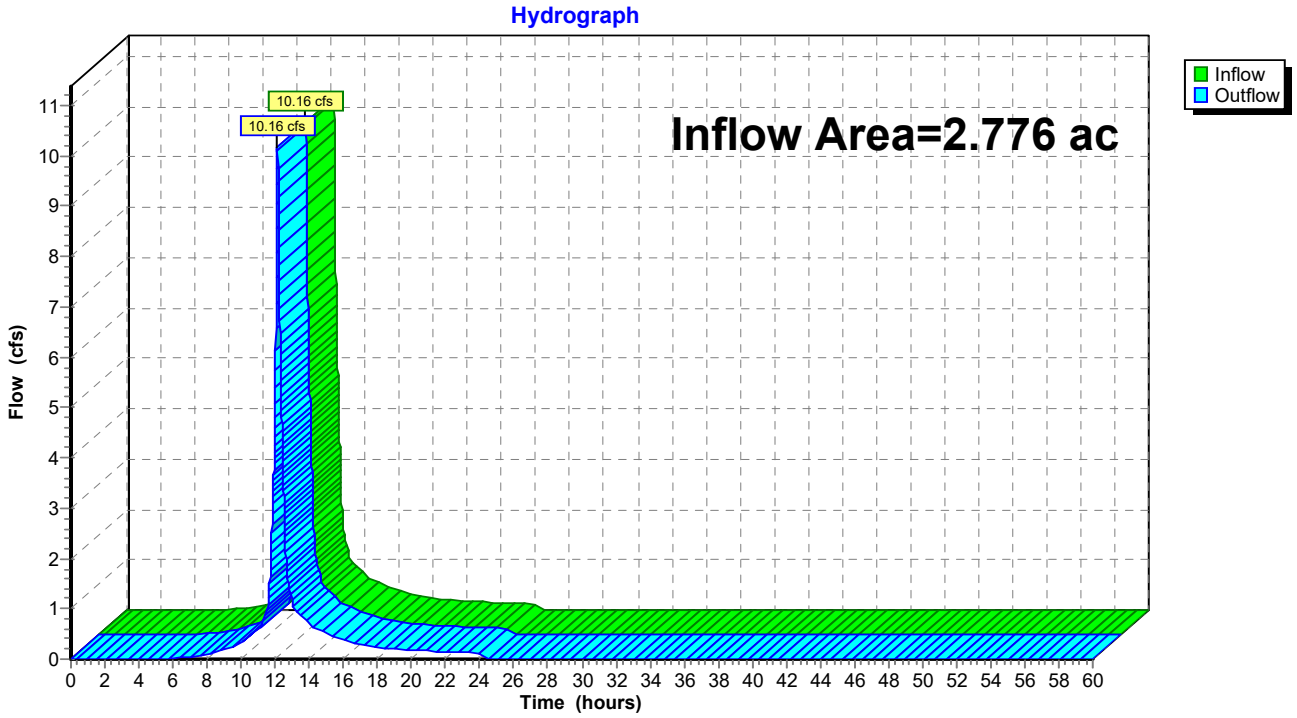
Summary for Reach DP1: Winchester St.

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

Inflow Area = 2.776 ac, 10.82% Impervious, Inflow Depth = 3.64" for 10-Yr event
Inflow = 10.16 cfs @ 12.14 hrs, Volume= 0.843 af
Outflow = 10.16 cfs @ 12.14 hrs, Volume= 0.843 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.



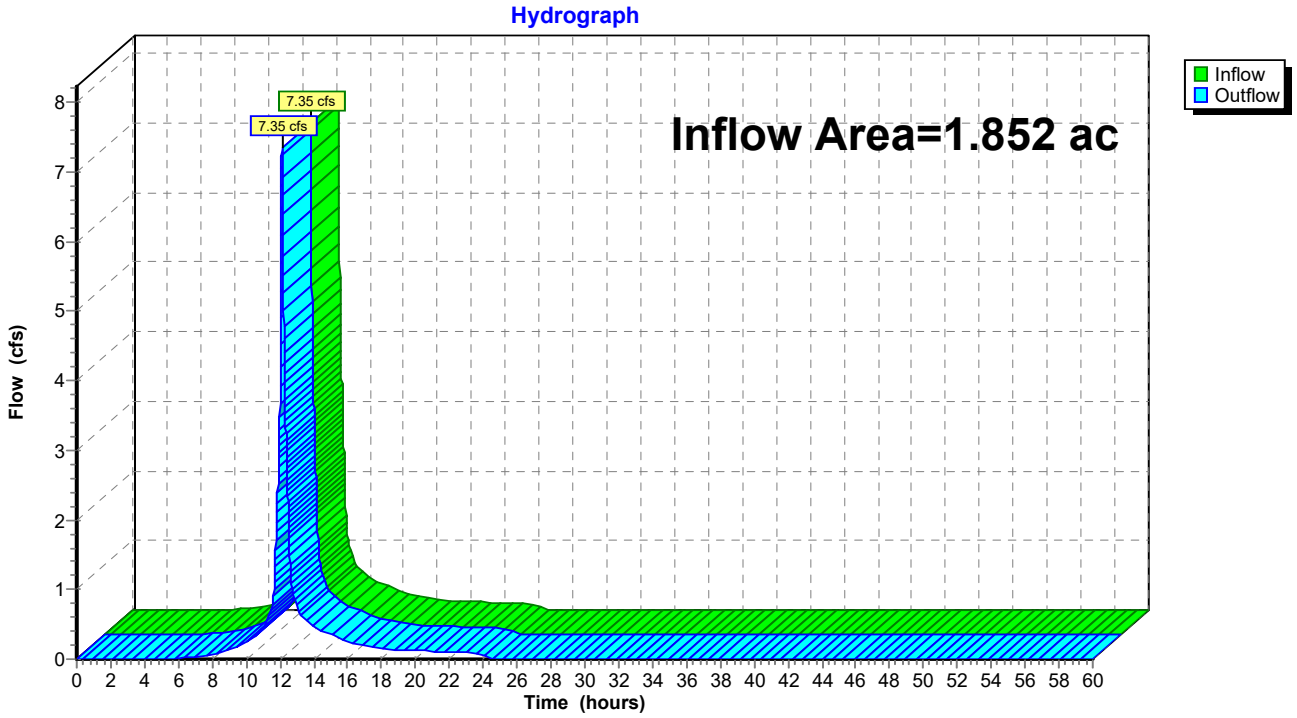
Summary for Reach DP2: Nahanton St

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

Inflow Area = 1.852 ac, 13.31% Impervious, Inflow Depth = 3.75" for 10-Yr event
Inflow = 7.35 cfs @ 12.12 hrs, Volume= 0.578 af
Outflow = 7.35 cfs @ 12.12 hrs, Volume= 0.578 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton St



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 Runoff Area=120,944 sf 10.82% Impervious Runoff Depth=4.75"
Flow Length=250' Tc=10.2 min CN=86 Runoff=13.11 cfs 1.100 af

Subcatchment EX2: EX2 Runoff Area=80,673 sf 13.31% Impervious Runoff Depth=4.86"
Flow Length=95' Tc=8.4 min CN=87 Runoff=9.42 cfs 0.750 af

Reach DP1: Winchester St. Inflow=13.11 cfs 1.100 af
Outflow=13.11 cfs 1.100 af

Reach DP2: Nahanton St Inflow=9.42 cfs 0.750 af
Outflow=9.42 cfs 0.750 af

Total Runoff Area = 4.628 ac Runoff Volume = 1.850 af Average Runoff Depth = 4.80"
88.18% Pervious = 4.081 ac 11.82% Impervious = 0.547 ac

Summary for Subcatchment EX1: EX1

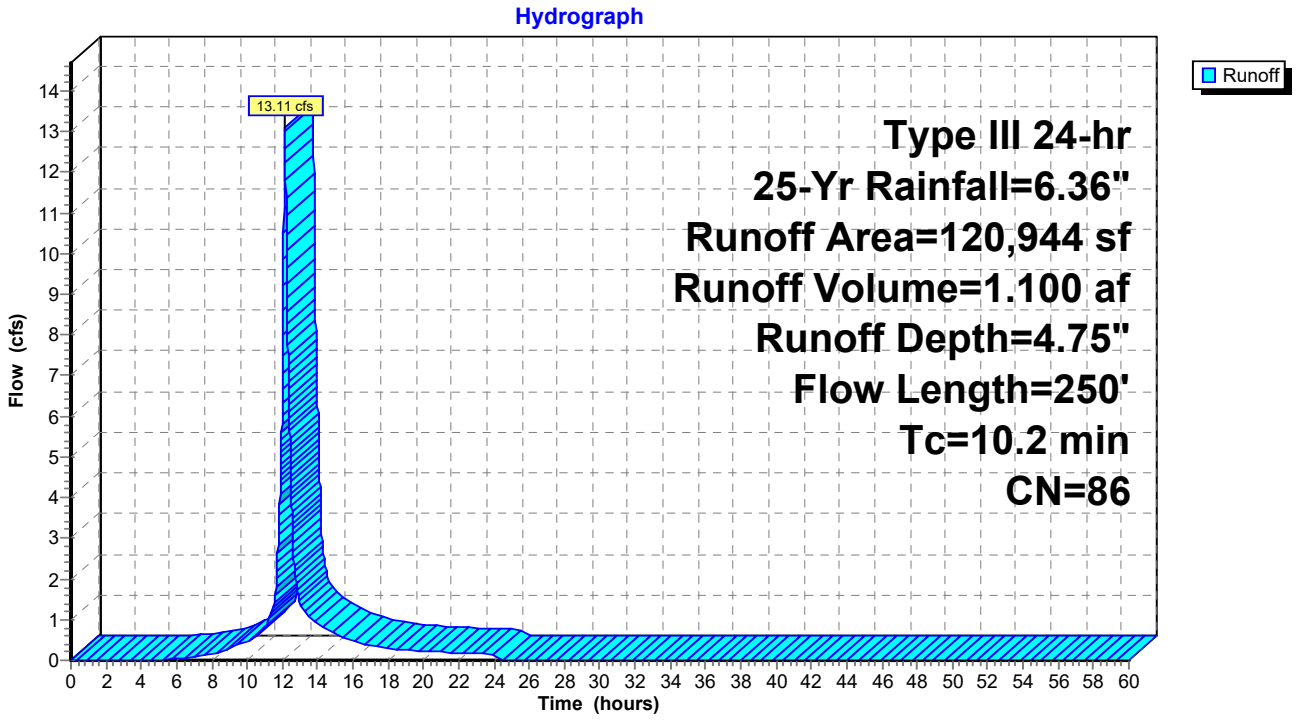
Runoff = 13.11 cfs @ 12.14 hrs, Volume= 1.100 af, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
13,091	98	Paved parking, HSG D
88,848	82	Woods/grass comb., Fair, HSG D
19,005	96	Gravel surface, HSG D
120,944	86	Weighted Average
107,853		89.18% Pervious Area
13,091		10.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0500	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	200	0.1400	1.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
10.2	250	Total			

Subcatchment EX1: EX1



Summary for Subcatchment EX2: EX2

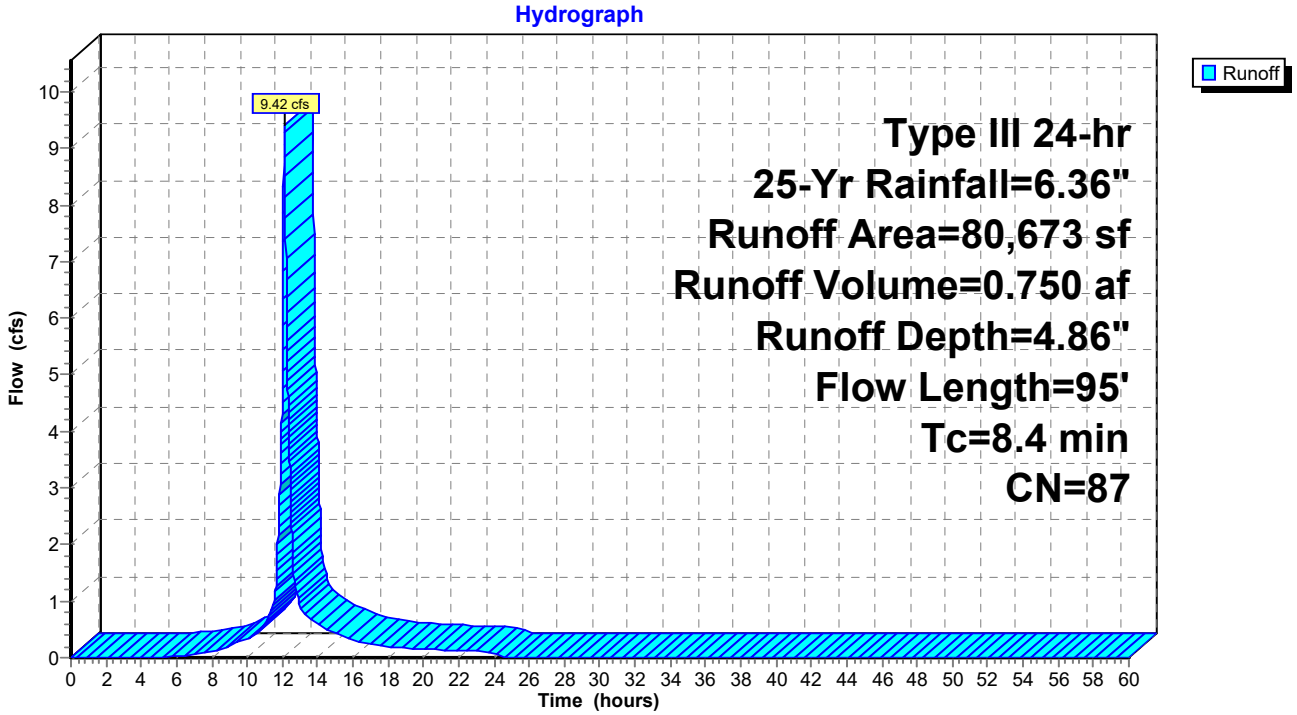
Runoff = 9.42 cfs @ 12.12 hrs, Volume= 0.750 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
10,741	98	Paved parking, HSG D
54,711	82	Woods/grass comb., Fair, HSG D
15,221	96	Gravel surface, HSG D
80,673	87	Weighted Average
69,932		86.69% Pervious Area
10,741		13.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2200	0.39		**Sheet Flow, sheet flow** Grass: Short n= 0.150 P2= 3.30"
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
6.0					**Direct Entry, to pavement**
8.4	95	Total			

Subcatchment EX2: EX2



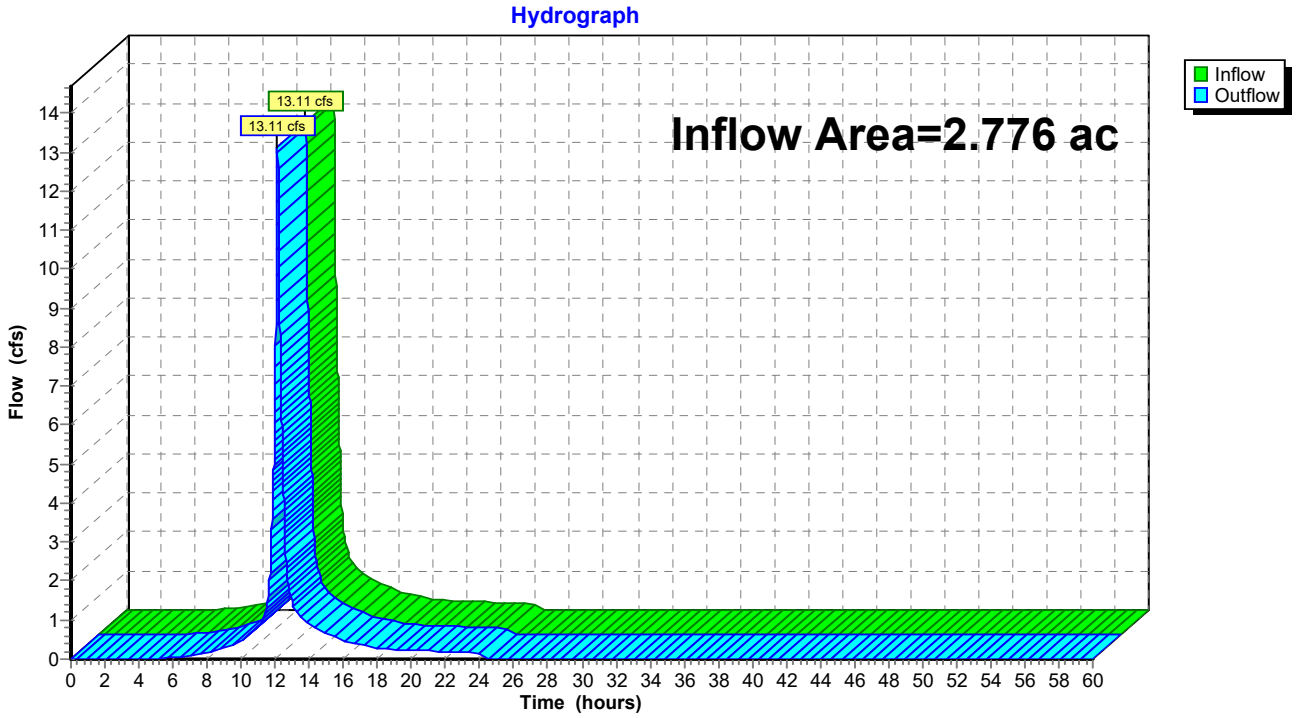
Summary for Reach DP1: Winchester St.

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

Inflow Area = 2.776 ac, 10.82% Impervious, Inflow Depth = 4.75" for 25-Yr event
Inflow = 13.11 cfs @ 12.14 hrs, Volume= 1.100 af
Outflow = 13.11 cfs @ 12.14 hrs, Volume= 1.100 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.



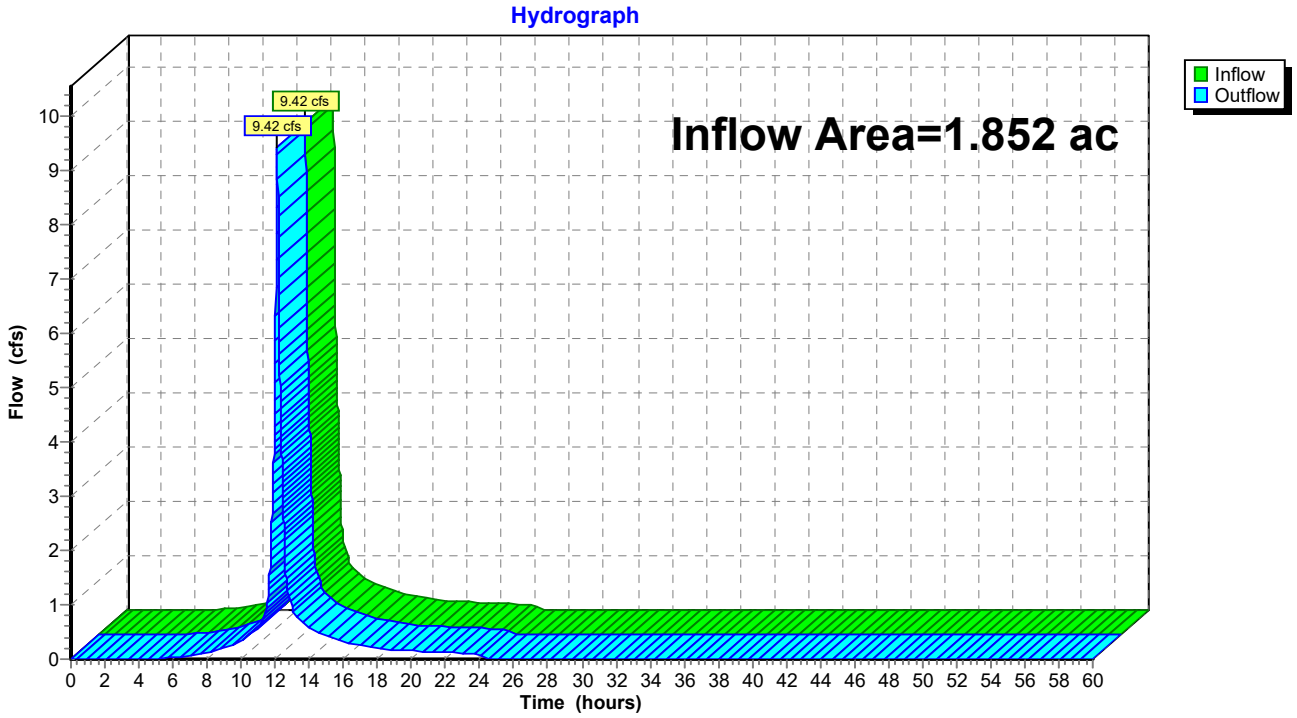
Summary for Reach DP2: Nahanton St

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

Inflow Area = 1.852 ac, 13.31% Impervious, Inflow Depth = 4.86" for 25-Yr event
Inflow = 9.42 cfs @ 12.12 hrs, Volume= 0.750 af
Outflow = 9.42 cfs @ 12.12 hrs, Volume= 0.750 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton St



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 Runoff Area=120,944 sf 10.82% Impervious Runoff Depth=7.09"
Flow Length=250' Tc=10.2 min CN=86 Runoff=19.17 cfs 1.640 af

Subcatchment EX2: EX2 Runoff Area=80,673 sf 13.31% Impervious Runoff Depth=7.21"
Flow Length=95' Tc=8.4 min CN=87 Runoff=13.69 cfs 1.113 af

Reach DP1: Winchester St. Inflow=19.17 cfs 1.640 af
Outflow=19.17 cfs 1.640 af

Reach DP2: Nahanton St Inflow=13.69 cfs 1.113 af
Outflow=13.69 cfs 1.113 af

Total Runoff Area = 4.628 ac Runoff Volume = 2.753 af Average Runoff Depth = 7.14"
88.18% Pervious = 4.081 ac 11.82% Impervious = 0.547 ac

Summary for Subcatchment EX1: EX1

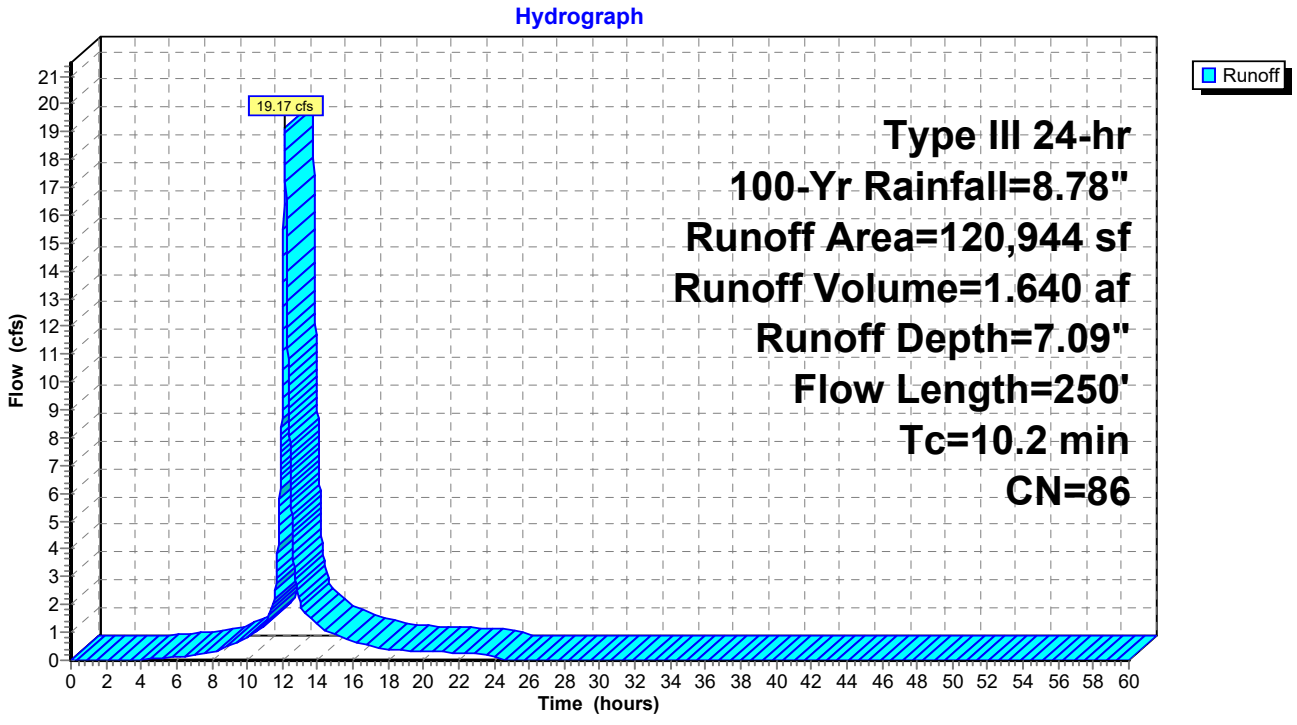
Runoff = 19.17 cfs @ 12.14 hrs, Volume= 1.640 af, Depth= 7.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
13,091	98	Paved parking, HSG D
88,848	82	Woods/grass comb., Fair, HSG D
19,005	96	Gravel surface, HSG D
120,944	86	Weighted Average
107,853		89.18% Pervious Area
13,091		10.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0500	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	200	0.1400	1.87		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
10.2	250	Total			

Subcatchment EX1: EX1



Summary for Subcatchment EX2: EX2

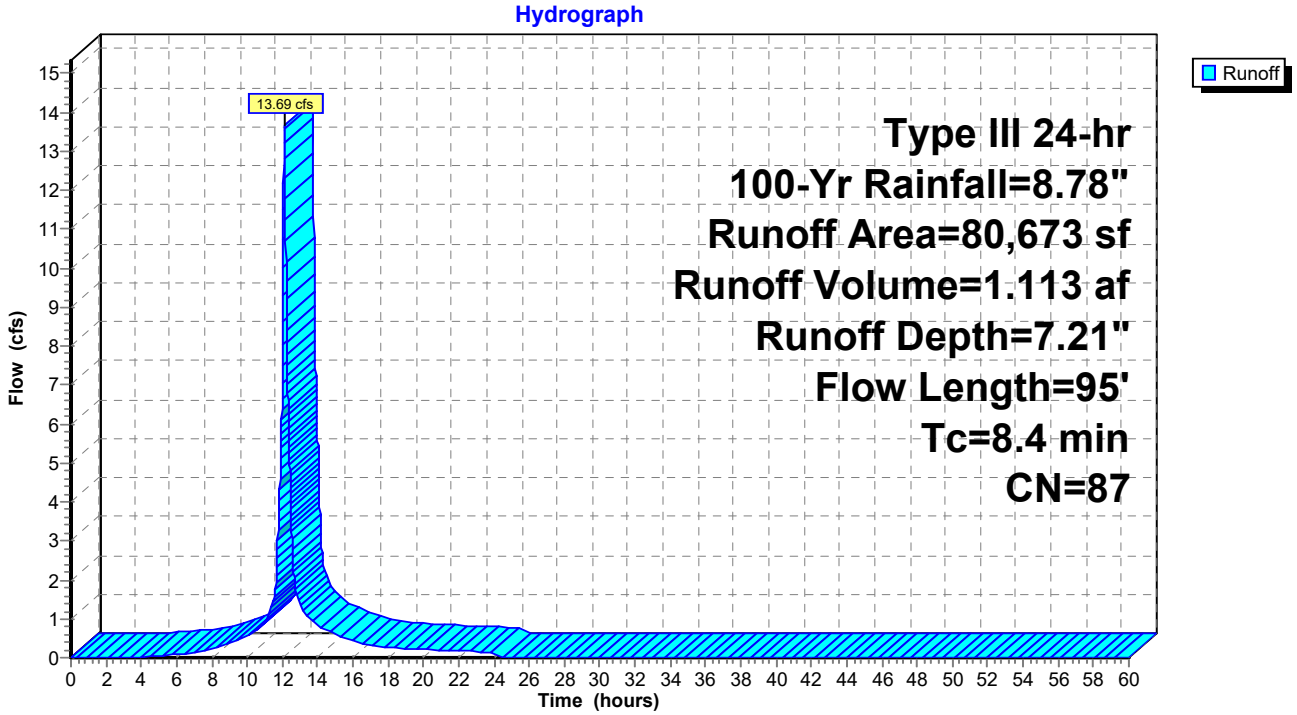
Runoff = 13.69 cfs @ 12.11 hrs, Volume= 1.113 af, Depth= 7.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
10,741	98	Paved parking, HSG D
54,711	82	Woods/grass comb., Fair, HSG D
15,221	96	Gravel surface, HSG D
80,673	87	Weighted Average
69,932		86.69% Pervious Area
10,741		13.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.2200	0.39		**Sheet Flow, sheet flow** Grass: Short n= 0.150 P2= 3.30"
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
6.0					**Direct Entry, to pavement**
8.4	95	Total			

Subcatchment EX2: EX2



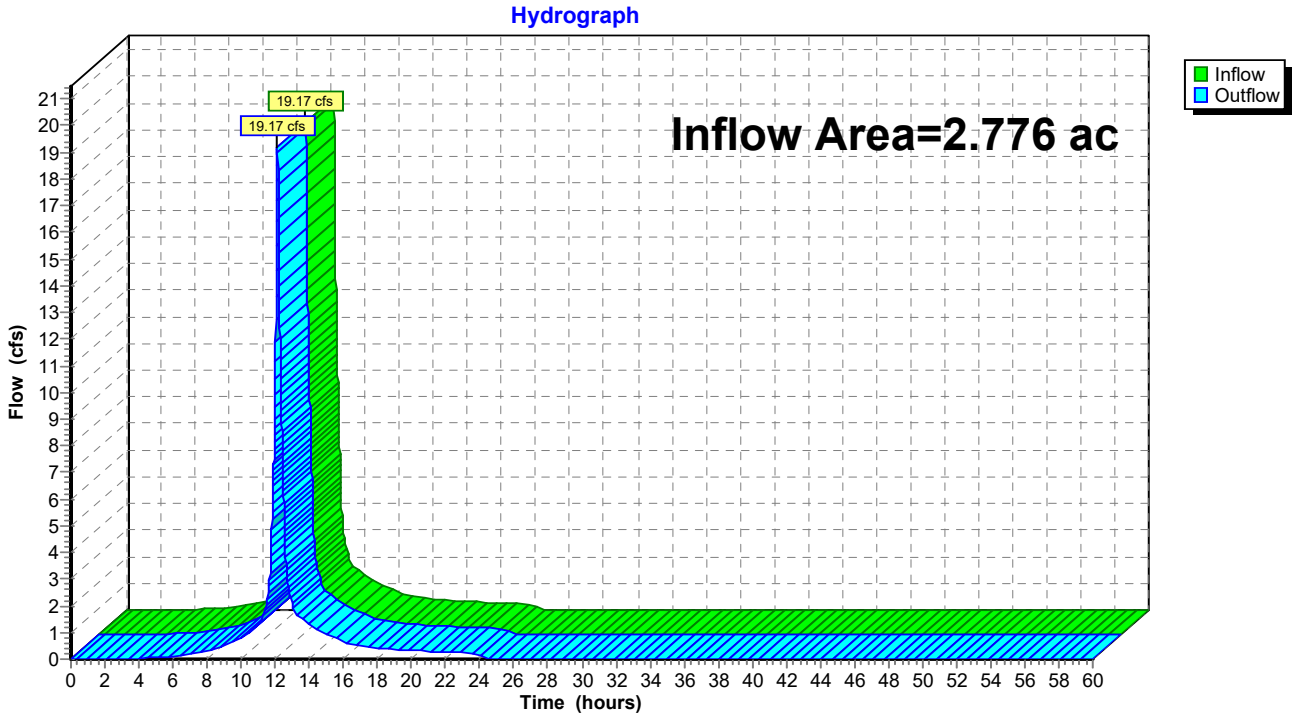
Summary for Reach DP1: Winchester St.

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

Inflow Area = 2.776 ac, 10.82% Impervious, Inflow Depth = 7.09" for 100-Yr event
Inflow = 19.17 cfs @ 12.14 hrs, Volume= 1.640 af
Outflow = 19.17 cfs @ 12.14 hrs, Volume= 1.640 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.



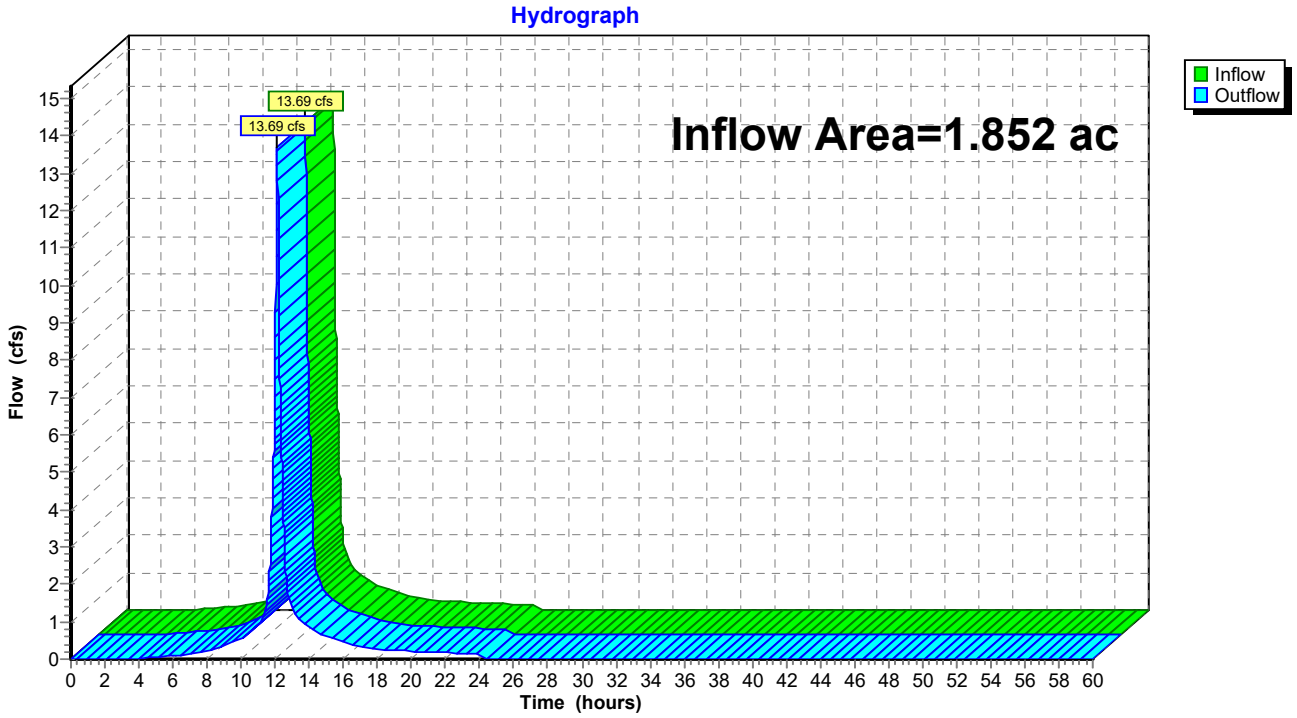
Summary for Reach DP2: Nahanton St

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

Inflow Area = 1.852 ac, 13.31% Impervious, Inflow Depth = 7.21" for 100-Yr event
Inflow = 13.69 cfs @ 12.11 hrs, Volume= 1.113 af
Outflow = 13.69 cfs @ 12.11 hrs, Volume= 1.113 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton St



NO.	DATE	REVISION
01	05/05/2021	SPECIAL PERMIT

SEAL

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PROJECT TITLE:

2LIFE - OPUS

677 WINCHESTER STREET
NEWTON, MA 02459

PROJECT No: 66571

DRAWING TITLE:

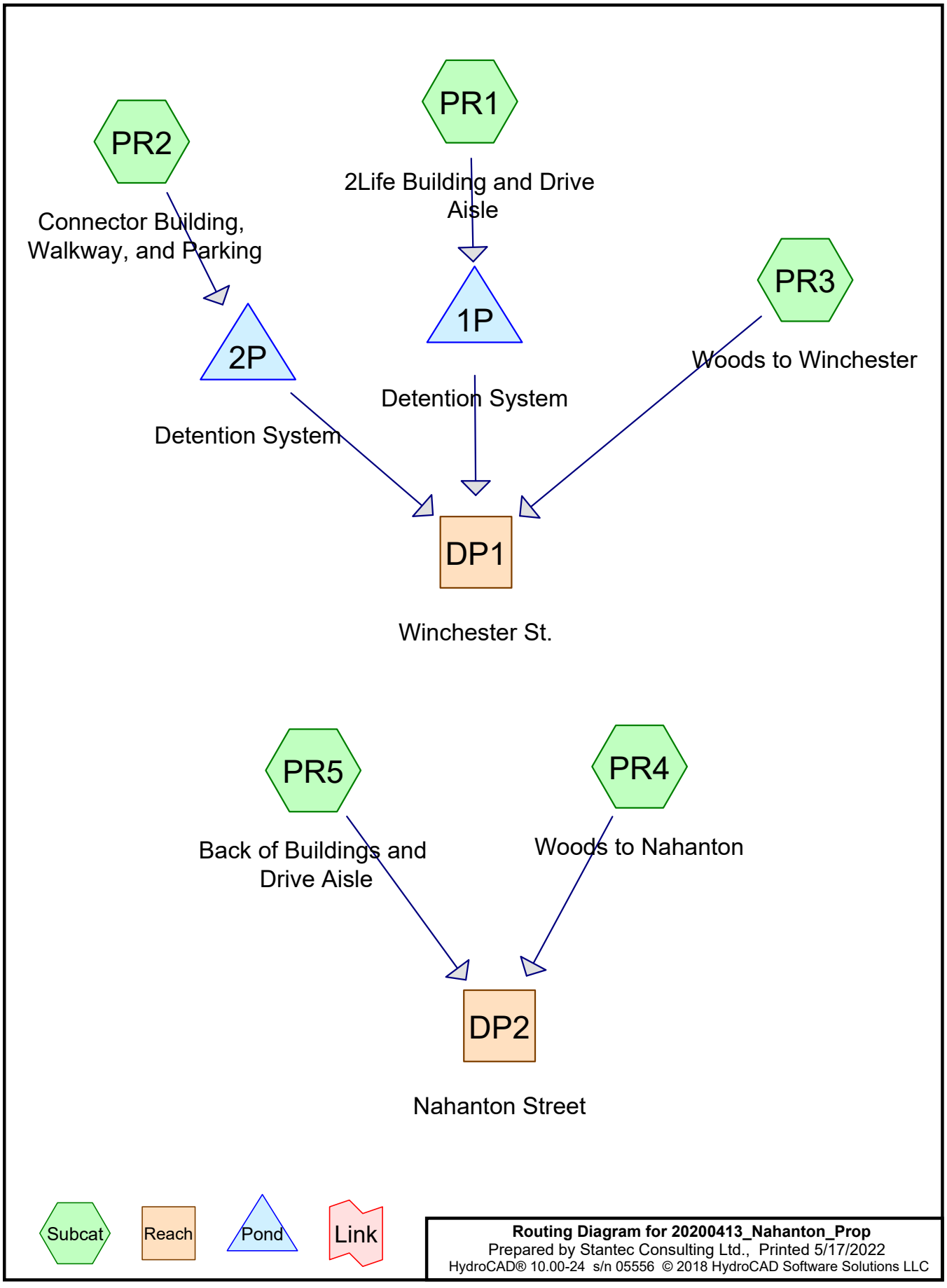
PROPOSED CONDITIONS WATERSHED MAP

SCALE:

SKC-200

ZONING REVIEW

3/03/2021



Routing Diagram for 20200413_Nahanton_Prop
Prepared by Stantec Consulting Ltd., Printed 5/17/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.234	80	>75% Grass cover, Good, HSG D (PR1, PR2, PR5)
2.851	98	Paved parking, HSG D (PR1, PR2, PR5)
0.543	82	Woods/grass comb., Fair, HSG D (PR3, PR4)
4.628	**91**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
4.628	HSG D	PR1, PR2, PR3, PR4, PR5
0.000	Other	
4.628		**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	0.000	0.000	1.234	0.000	1.234	>75% Grass cover, Good	PR1, PR2, PR5
0.000	0.000	0.000	2.851	0.000	2.851	Paved parking	PR1, PR2, PR5
0.000	0.000	0.000	0.543	0.000	0.543	Woods/grass comb., Fair	PR3, PR4
0.000	**0.000**	**0.000**	**4.628**	**0.000**	**4.628**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	129.25	129.00	12.0	0.0208	0.013	10.0	0.0	0.0
2	1P	131.20	131.00	2.0	0.1000	0.012	12.0	0.0	0.0
3	2P	146.25	146.00	20.0	0.0125	0.013	12.0	0.0	0.0

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR1: 2Life Building and Runoff Area=87,943 sf 81.37% Impervious Runoff Depth=2.74"
Tc=6.0 min CN=95 Runoff=6.13 cfs 0.461 af

Subcatchment PR2: Connector Building, Runoff Area=37,834 sf 79.66% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=94 Runoff=2.57 cfs 0.191 af

Subcatchment PR3: Woods to Winchester Runoff Area=10,203 sf 0.00% Impervious Runoff Depth=1.62"
Flow Length=165' Tc=7.4 min CN=82 Runoff=0.42 cfs 0.032 af

Subcatchment PR4: Woods to Nahanton Runoff Area=13,430 sf 0.00% Impervious Runoff Depth=1.62"
Tc=6.0 min CN=82 Runoff=0.58 cfs 0.042 af

Subcatchment PR5: Back of Buildings and Runoff Area=52,191 sf 43.11% Impervious Runoff Depth=2.09"
Tc=6.0 min CN=88 Runoff=2.92 cfs 0.208 af

Reach DP1: Winchester St. Inflow=4.97 cfs 0.659 af
Outflow=4.97 cfs 0.659 af

Reach DP2: Nahanton Street Inflow=3.50 cfs 0.250 af
Outflow=3.50 cfs 0.250 af

Pond 1P: Detention System Peak Elev=131.06' Storage=0.095 af Inflow=6.13 cfs 0.461 af
Outflow=3.10 cfs 0.450 af

Pond 2P: Detention System Peak Elev=146.97' Storage=0.052 af Inflow=2.57 cfs 0.191 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=1.58 cfs 0.178 af

Total Runoff Area = 4.628 ac Runoff Volume = 0.934 af Average Runoff Depth = 2.42"
38.39% Pervious = 1.777 ac 61.61% Impervious = 2.851 ac

Summary for Subcatchment PR1: 2Life Building and Drive Aisle

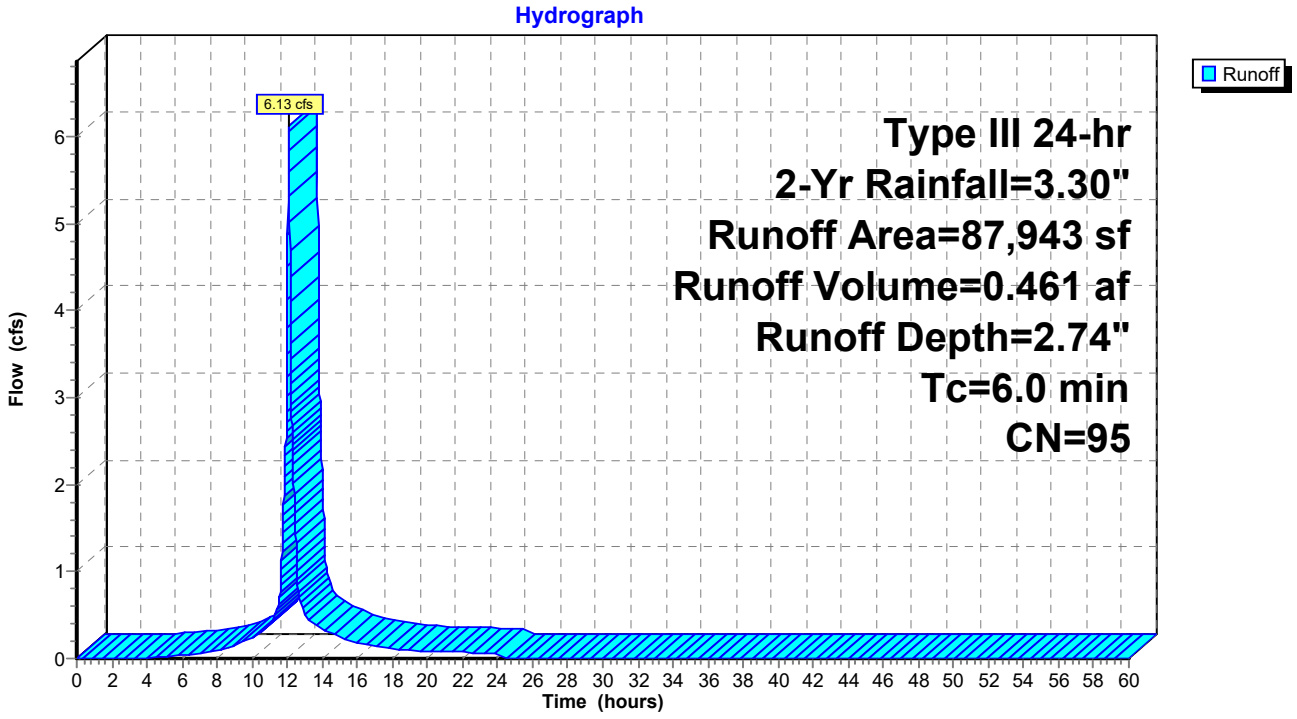
Runoff = 6.13 cfs @ 12.08 hrs, Volume= 0.461 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
71,557	98	Paved parking, HSG D
16,386	80	>75% Grass cover, Good, HSG D
87,943	95	Weighted Average
16,386		18.63% Pervious Area
71,557		81.37% Impervious Area

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

Subcatchment PR1: 2Life Building and Drive Aisle



Summary for Subcatchment PR2: Connector Building, Walkway, and Parking

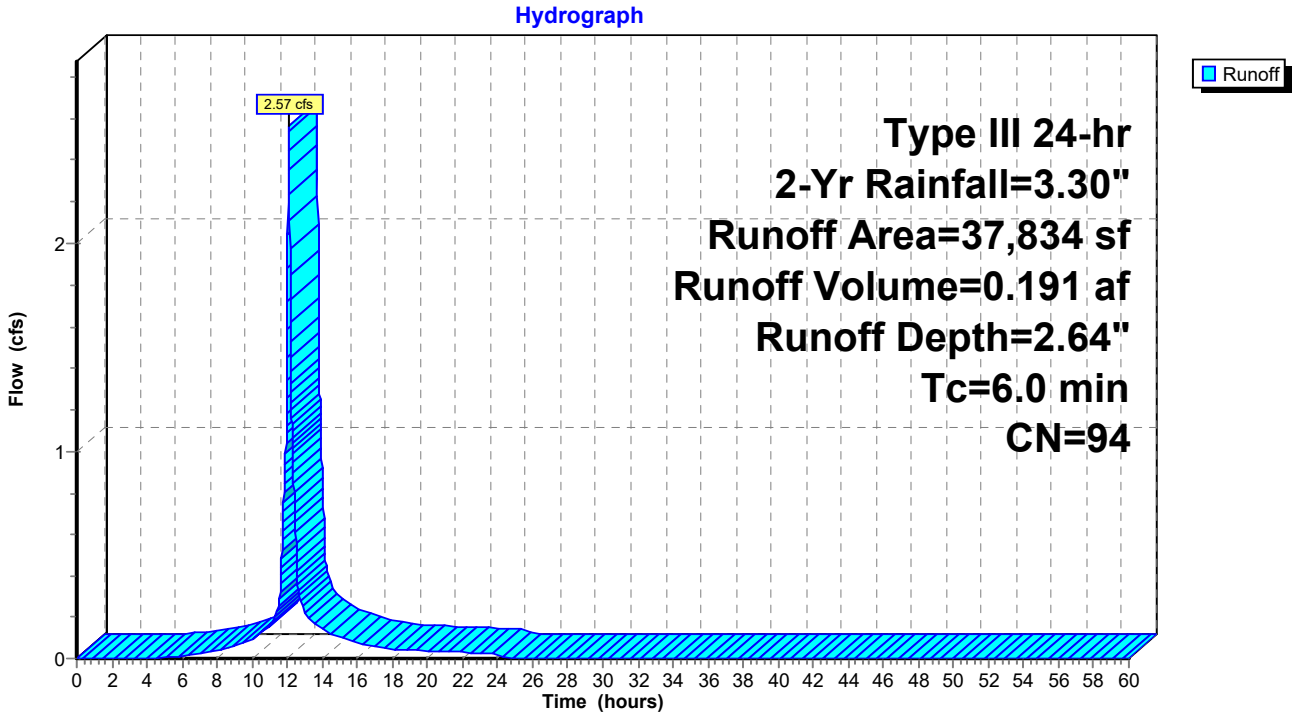
Runoff = 2.57 cfs @ 12.08 hrs, Volume= 0.191 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
30,140	98	Paved parking, HSG D
7,694	80	>75% Grass cover, Good, HSG D
37,834	94	Weighted Average
7,694		20.34% Pervious Area
30,140		79.66% Impervious Area

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

Subcatchment PR2: Connector Building, Walkway, and Parking



Summary for Subcatchment PR3: Woods to Winchester

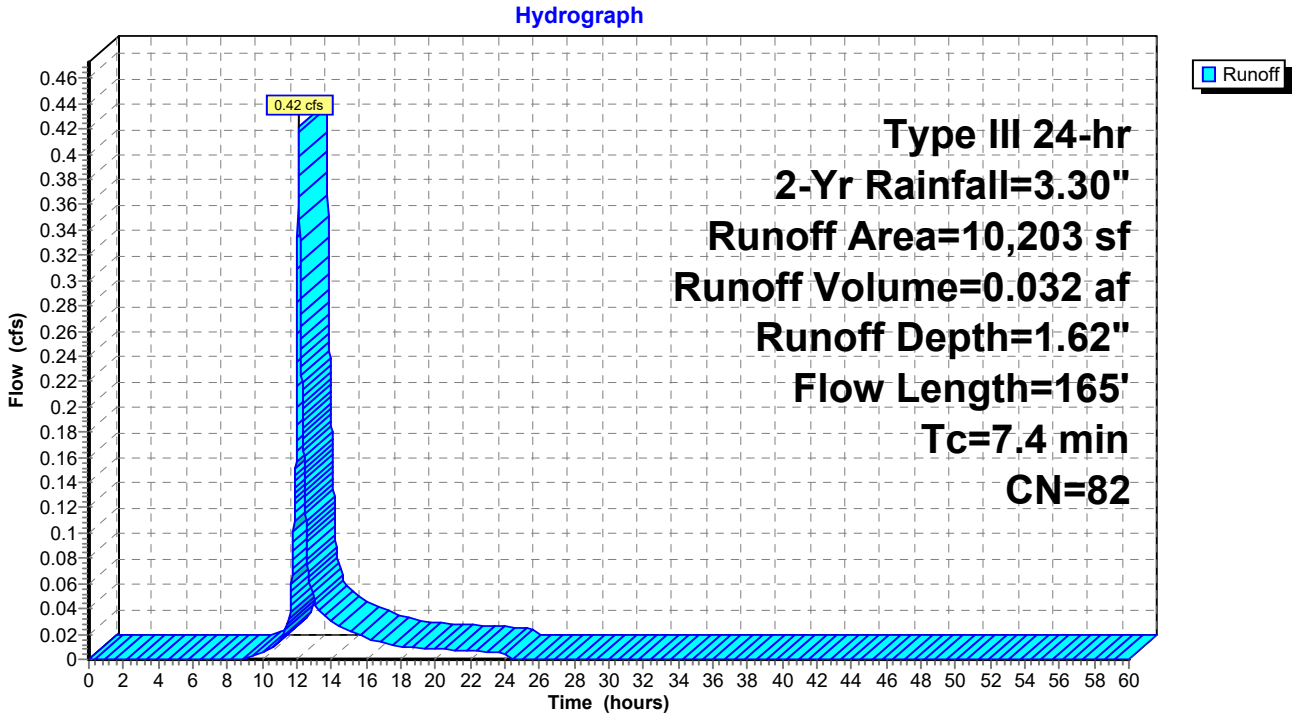
Runoff = 0.42 cfs @ 12.11 hrs, Volume= 0.032 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
10,203	82	Woods/grass comb., Fair, HSG D
10,203		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow, sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.0	115	0.1400	1.87		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
7.4	165	Total			

Subcatchment PR3: Woods to Winchester



Summary for Subcatchment PR4: Woods to Nahanton

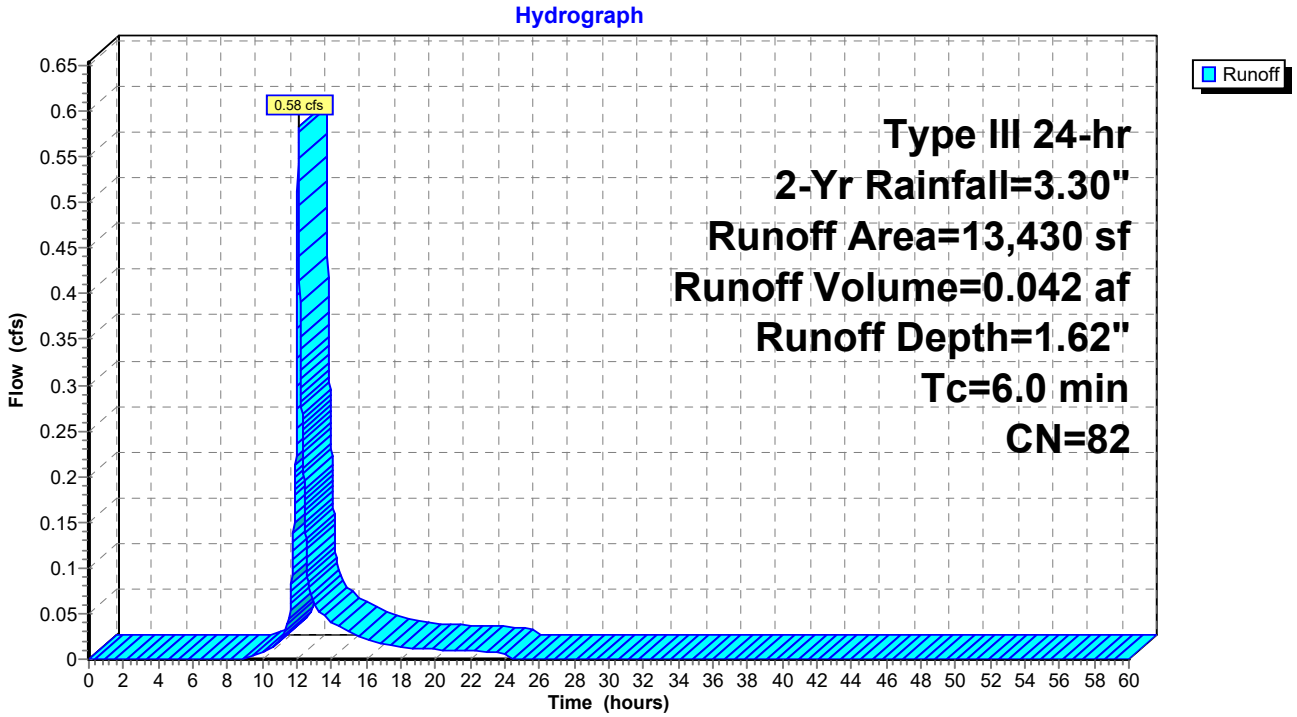
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.042 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
13,430	82	Woods/grass comb., Fair, HSG D
13,430		100.00% Pervious Area

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

Subcatchment PR4: Woods to Nahanton



Summary for Subcatchment PR5: Back of Buildings and Drive Aisle

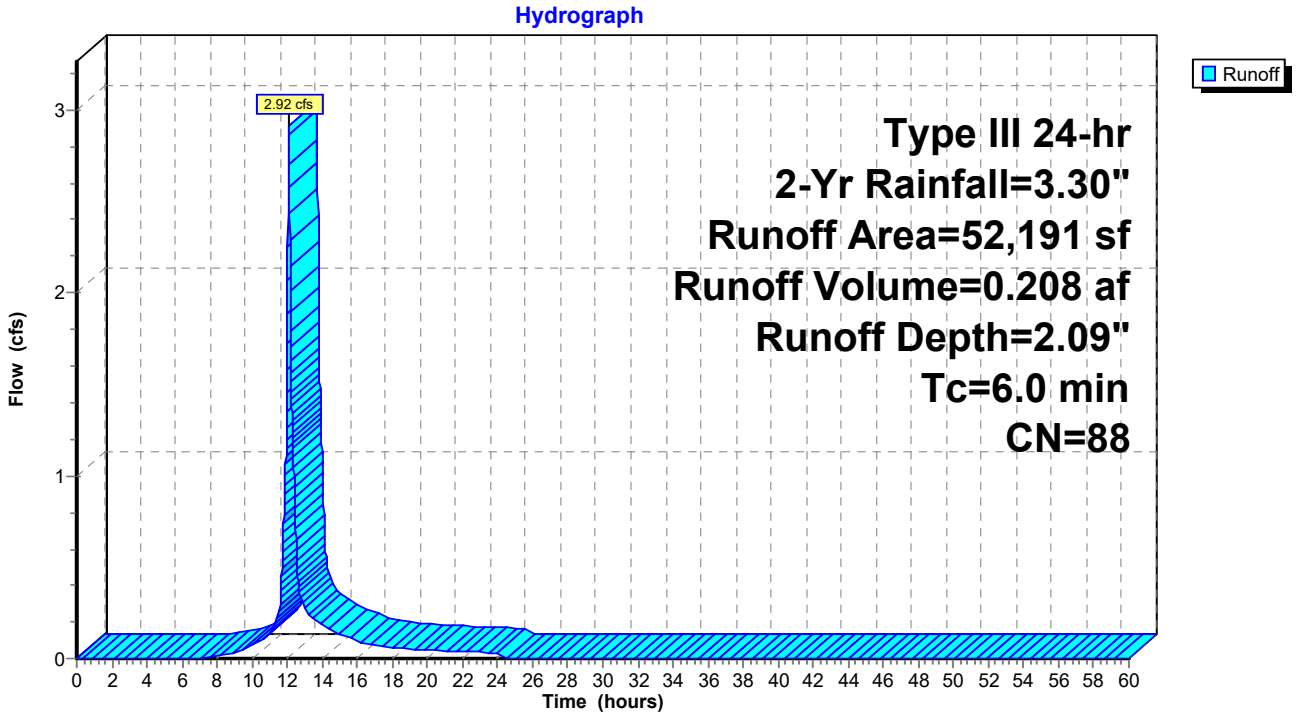
Runoff = 2.92 cfs @ 12.09 hrs, Volume= 0.208 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.30"

Area (sf)	CN	Description
22,500	98	Paved parking, HSG D
29,691	80	>75% Grass cover, Good, HSG D
52,191	88	Weighted Average
29,691		56.89% Pervious Area
22,500		43.11% Impervious Area

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

Subcatchment PR5: Back of Buildings and Drive Aisle

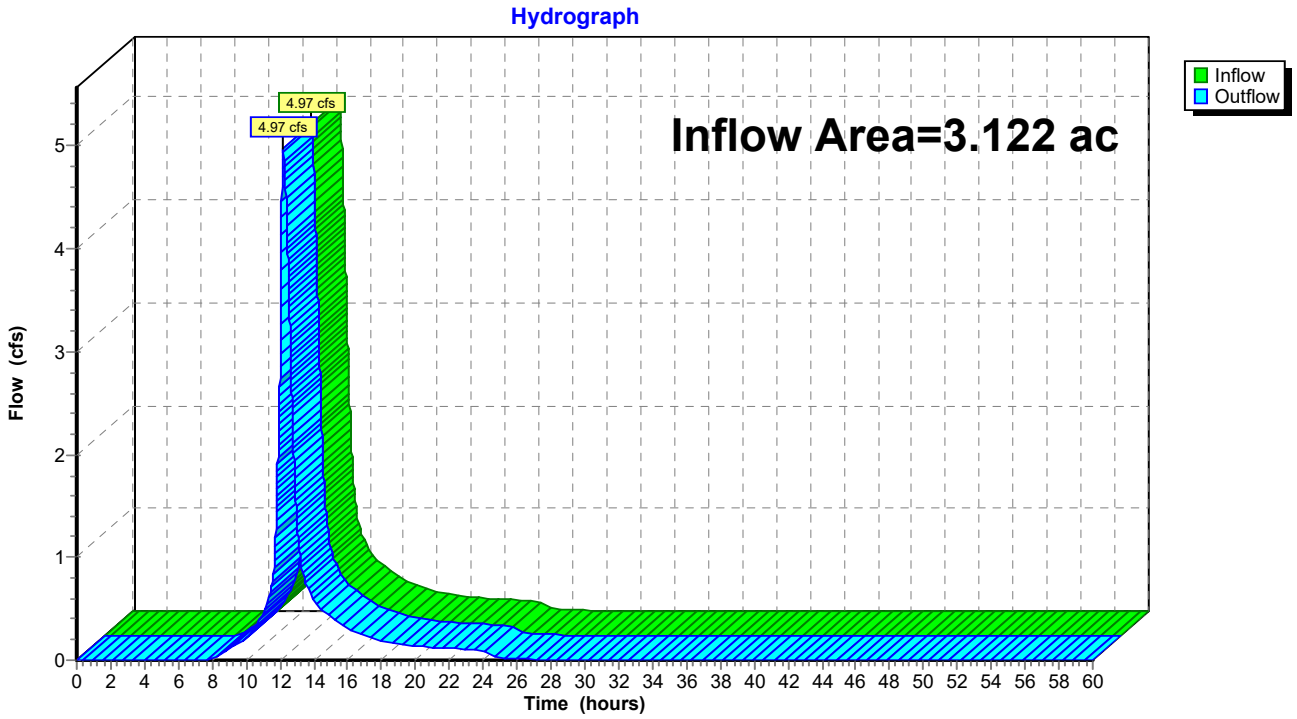


Summary for Reach DP1: Winchester St.

Inflow Area = 3.122 ac, 74.79% Impervious, Inflow Depth = 2.53" for 2-Yr event
Inflow = 4.97 cfs @ 12.18 hrs, Volume= 0.659 af
Outflow = 4.97 cfs @ 12.18 hrs, Volume= 0.659 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.

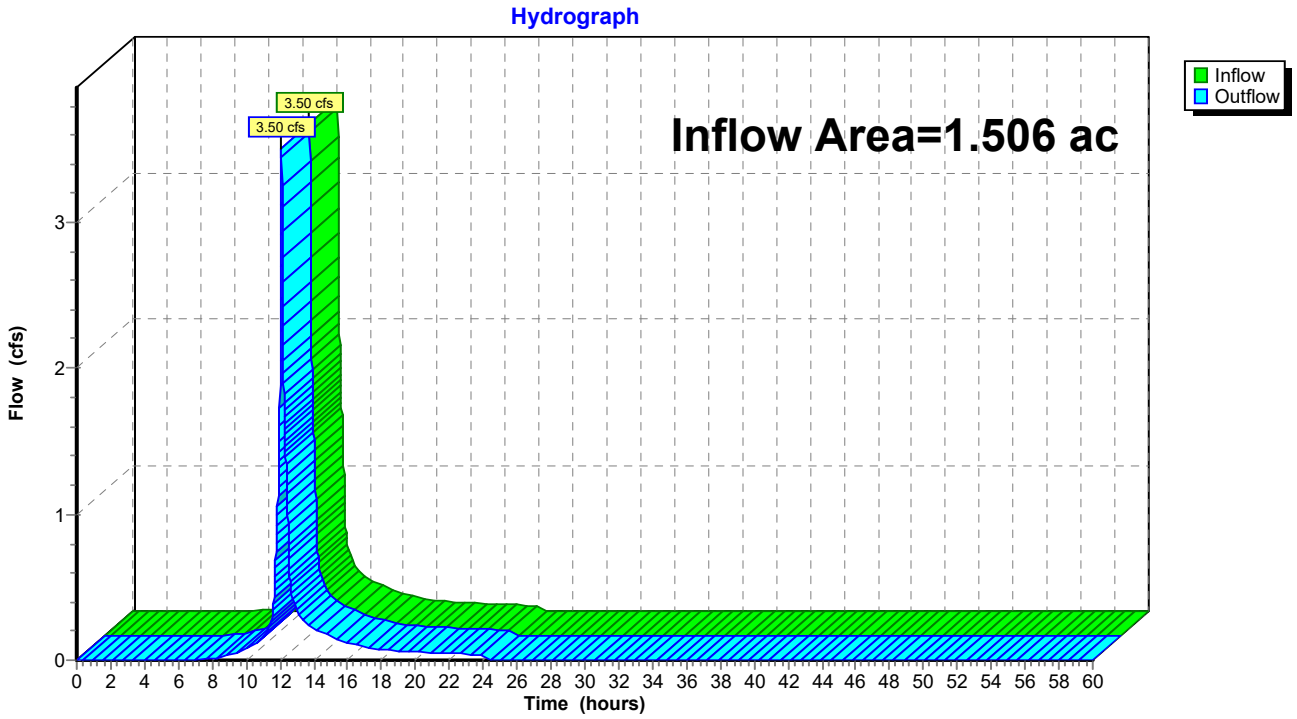


Summary for Reach DP2: Nahanton Street

Inflow Area = 1.506 ac, 34.29% Impervious, Inflow Depth = 1.99" for 2-Yr event
Inflow = 3.50 cfs @ 12.09 hrs, Volume= 0.250 af
Outflow = 3.50 cfs @ 12.09 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton Street



Summary for Pond 1P: Detention System

Inflow Area = 2.019 ac, 81.37% Impervious, Inflow Depth = 2.74" for 2-Yr event
Inflow = 6.13 cfs @ 12.08 hrs, Volume= 0.461 af
Outflow = 3.10 cfs @ 12.22 hrs, Volume= 0.450 af, Atten= 49%, Lag= 8.4 min
Primary = 3.10 cfs @ 12.22 hrs, Volume= 0.450 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 131.06' @ 12.22 hrs Surf.Area= 0.055 ac Storage= 0.095 af
Flood Elev= 133.00' Surf.Area= 0.055 ac Storage= 0.184 af

Plug-Flow detention time= 55.3 min calculated for 0.450 af (98% of inflow)
Center-of-Mass det. time= 39.9 min (819.9 - 780.0)

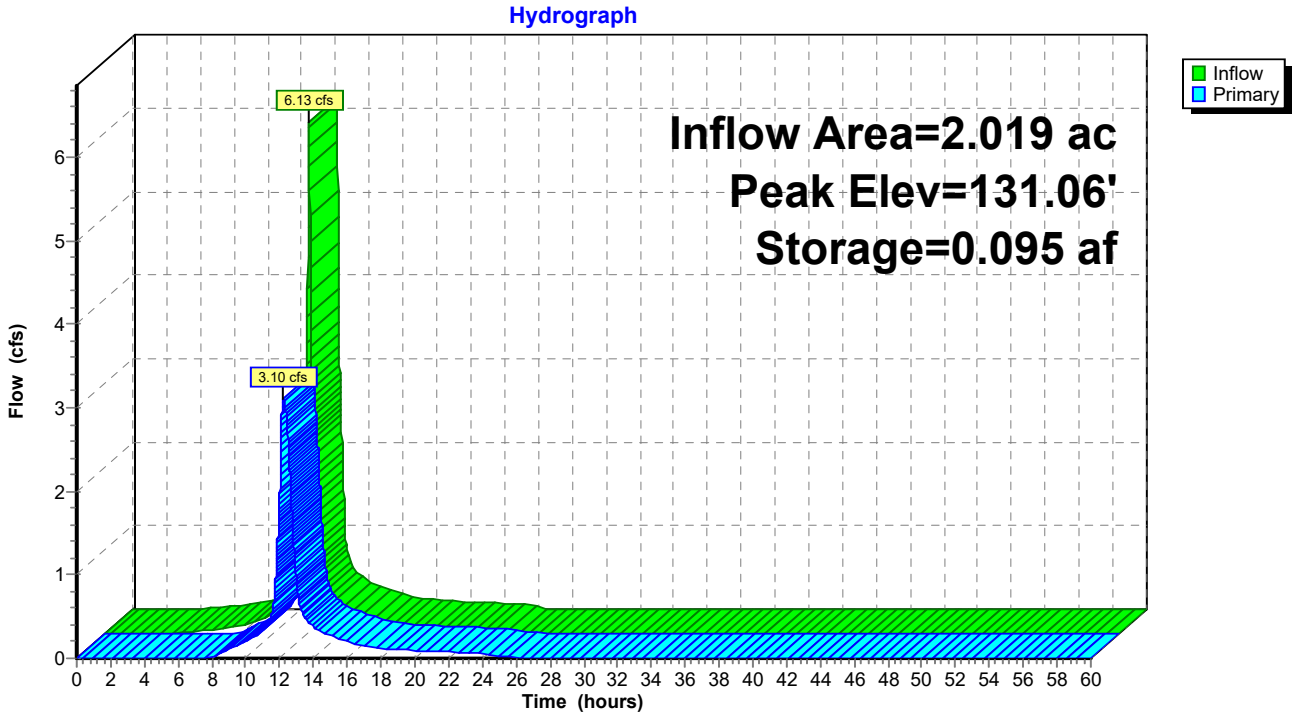
Volume	Invert	Avail.Storage	Storage Description
#1A	129.00'	0.000 af	**55.17'W x 43.19'L x 5.67'H Field A** 0.310 af Overall - 0.310 af Embedded = 0.000 af x 40.0% Voids
#2A	129.00'	0.231 af	**StormTrap ST1 SingleTrap 5-0** x 24 Inside #1 Inside= 82.7"W x 60.0"H => 29.76 sf x 14.06'L = 418.5 cf Outside= 82.7"W x 68.0"H => 39.08 sf x 14.06'L = 549.5 cf 24 Chambers in 8 Rows 55.17' x 42.19' Core + 0.00' x 0.50' Border = 55.17' x 43.19' System
		0.231 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	129.25'	**10.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 129.25' / 129.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	131.20'	**12.0" Round Culvert** L= 2.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 131.20' / 131.00' S= 0.1000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.10 cfs @ 12.22 hrs HW=131.06' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.10 cfs @ 5.68 fps)
└**2=Culvert** (Controls 0.00 cfs)

Pond 1P: Detention System



Summary for Pond 2P: Detention System

Inflow Area = 0.869 ac, 79.66% Impervious, Inflow Depth = 2.64" for 2-Yr event
Inflow = 2.57 cfs @ 12.08 hrs, Volume= 0.191 af
Outflow = 1.58 cfs @ 12.19 hrs, Volume= 0.178 af, Atten= 39%, Lag= 6.0 min
Primary = 1.58 cfs @ 12.19 hrs, Volume= 0.178 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 146.97' @ 12.19 hrs Surf.Area= 0.063 ac Storage= 0.052 af
Flood Elev= 140.00' Surf.Area= 0.000 ac Storage= 0.000 af

Plug-Flow detention time= 106.2 min calculated for 0.178 af (93% of inflow)
Center-of-Mass det. time= 69.3 min (855.4 - 786.1)

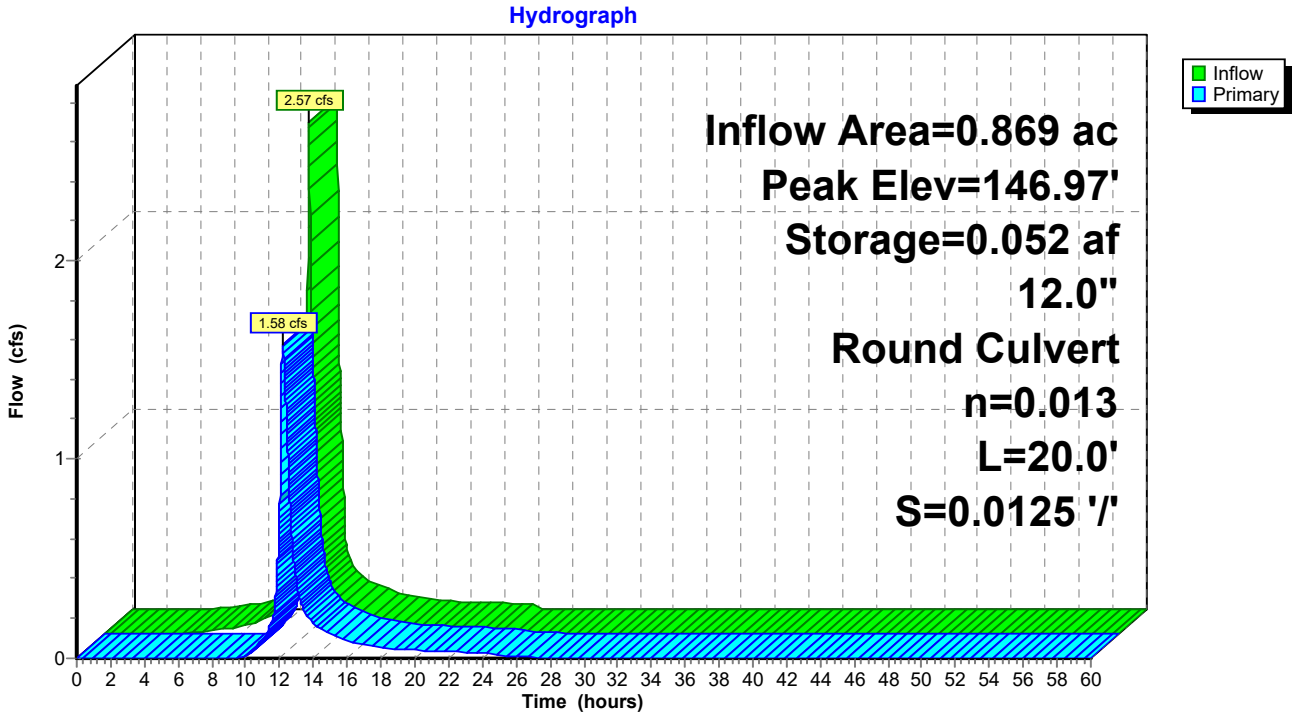
Volume	Invert	Avail.Storage	Storage Description
#1A	146.00'	0.000 af	**48.27'W x 57.25'L x 2.67'H Field A** 0.169 af Overall - 0.169 af Embedded = 0.000 af x 40.0% Voids
#2A	146.00'	0.107 af	**StormTrap ST1 SingleTrap 2-0** x 28 Inside #1 Inside= 82.7"W x 24.0"H => 11.84 sf x 14.06'L = 166.5 cf Outside= 82.7"W x 32.0"H => 18.39 sf x 14.06'L = 258.6 cf 28 Chambers in 7 Rows 48.27' x 56.25' Core + 0.00' x 0.50' Border = 48.27' x 57.25' System
		0.107 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	146.25'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.25' / 146.00' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.58 cfs @ 12.19 hrs HW=146.97' (Free Discharge)
1=Culvert (Barrel Controls 1.58 cfs @ 3.64 fps)

Pond 2P: Detention System



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR1: 2Life Building and Runoff Area=87,943 sf 81.37% Impervious Runoff Depth=4.61"
Tc=6.0 min CN=95 Runoff=9.99 cfs 0.775 af

Subcatchment PR2: Connector Building, Runoff Area=37,834 sf 79.66% Impervious Runoff Depth=4.50"
Tc=6.0 min CN=94 Runoff=4.25 cfs 0.325 af

Subcatchment PR3: Woods to Winchester Runoff Area=10,203 sf 0.00% Impervious Runoff Depth=3.25"
Flow Length=165' Tc=7.4 min CN=82 Runoff=0.85 cfs 0.063 af

Subcatchment PR4: Woods to Nahanton Runoff Area=13,430 sf 0.00% Impervious Runoff Depth=3.25"
Tc=6.0 min CN=82 Runoff=1.17 cfs 0.083 af

Subcatchment PR5: Back of Buildings and Runoff Area=52,191 sf 43.11% Impervious Runoff Depth=3.85"
Tc=6.0 min CN=88 Runoff=5.27 cfs 0.384 af

Reach DP1: Winchester St. Inflow=9.35 cfs 1.139 af
Outflow=9.35 cfs 1.139 af

Reach DP2: Nahanton Street Inflow=6.44 cfs 0.468 af
Outflow=6.44 cfs 0.468 af

Pond 1P: Detention System Peak Elev=132.10' Storage=0.143 af Inflow=9.99 cfs 0.775 af
Outflow=5.99 cfs 0.764 af

Pond 2P: Detention System Peak Elev=147.30' Storage=0.070 af Inflow=4.25 cfs 0.325 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=2.72 cfs 0.312 af

Total Runoff Area = 4.628 ac Runoff Volume = 1.632 af Average Runoff Depth = 4.23"
38.39% Pervious = 1.777 ac 61.61% Impervious = 2.851 ac

Summary for Subcatchment PR1: 2Life Building and Drive Aisle

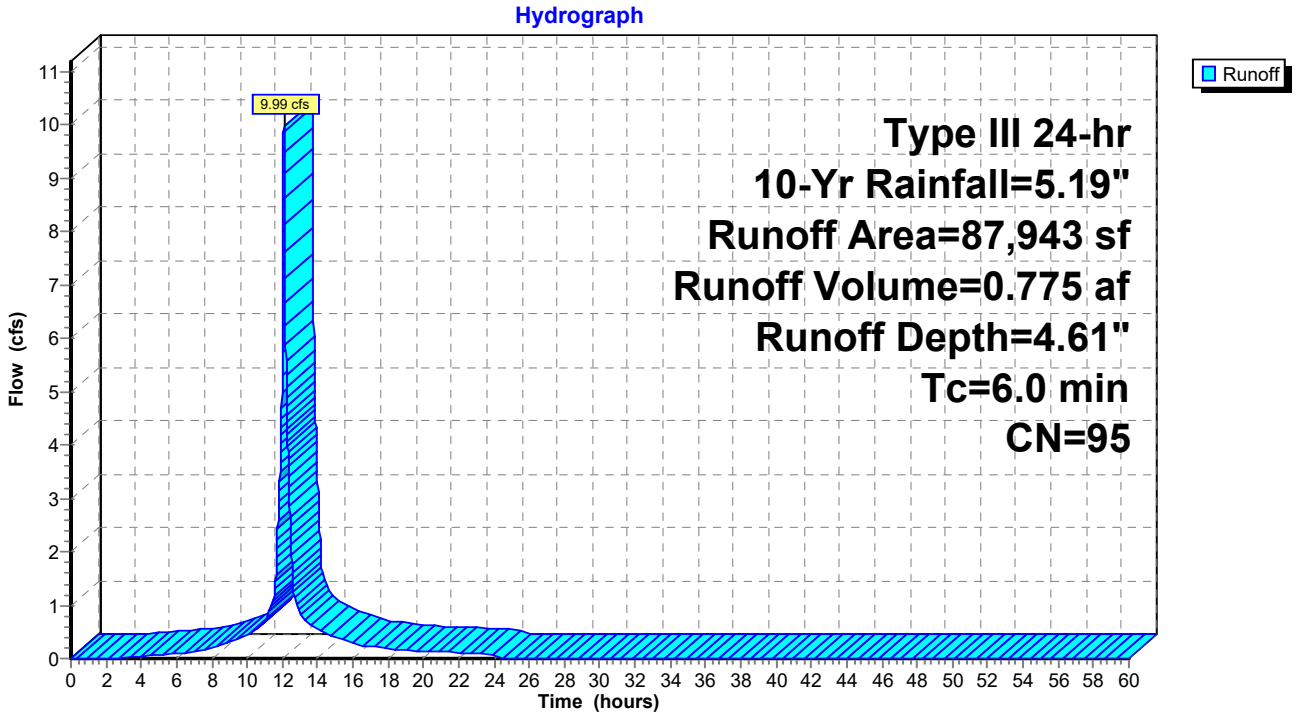
Runoff = 9.99 cfs @ 12.08 hrs, Volume= 0.775 af, Depth= 4.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
71,557	98	Paved parking, HSG D
16,386	80	>75% Grass cover, Good, HSG D
87,943	95	Weighted Average
16,386		18.63% Pervious Area
71,557		81.37% Impervious Area

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

Subcatchment PR1: 2Life Building and Drive Aisle



Summary for Subcatchment PR2: Connector Building, Walkway, and Parking

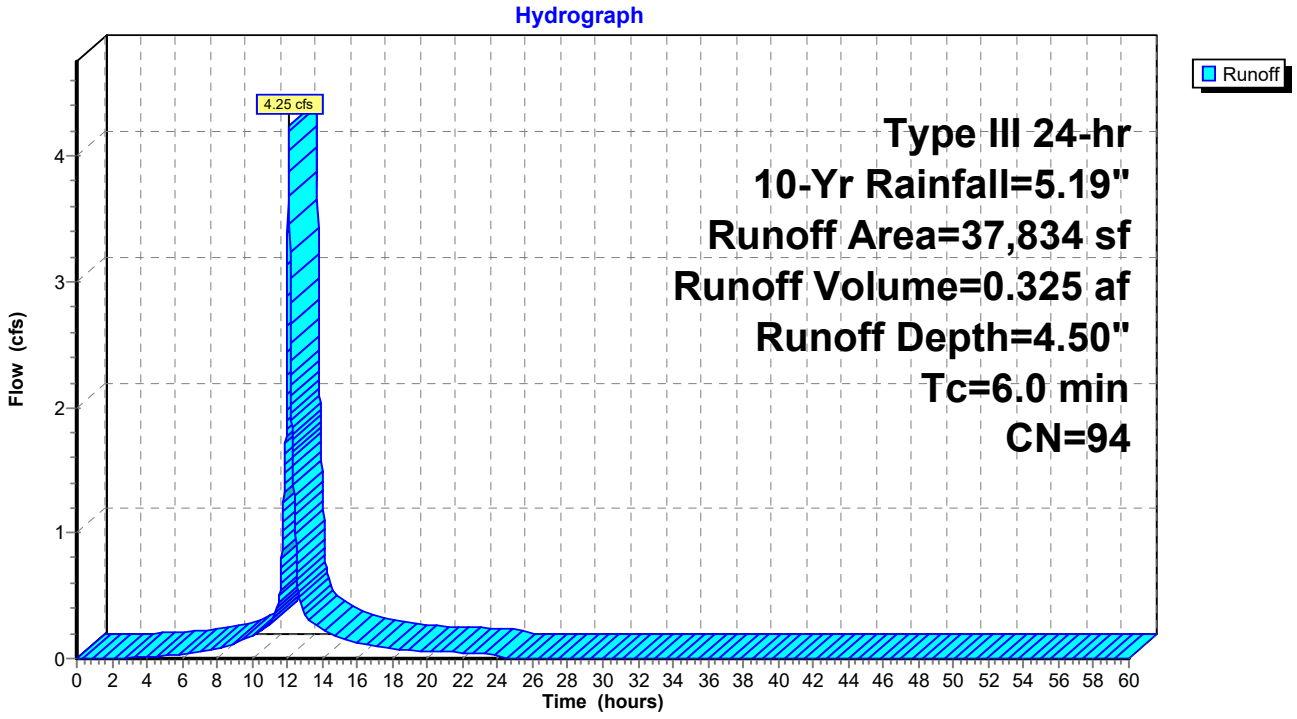
Runoff = 4.25 cfs @ 12.08 hrs, Volume= 0.325 af, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
30,140	98	Paved parking, HSG D
7,694	80	>75% Grass cover, Good, HSG D
37,834	94	Weighted Average
7,694		20.34% Pervious Area
30,140		79.66% Impervious Area

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

Subcatchment PR2: Connector Building, Walkway, and Parking



Summary for Subcatchment PR3: Woods to Winchester

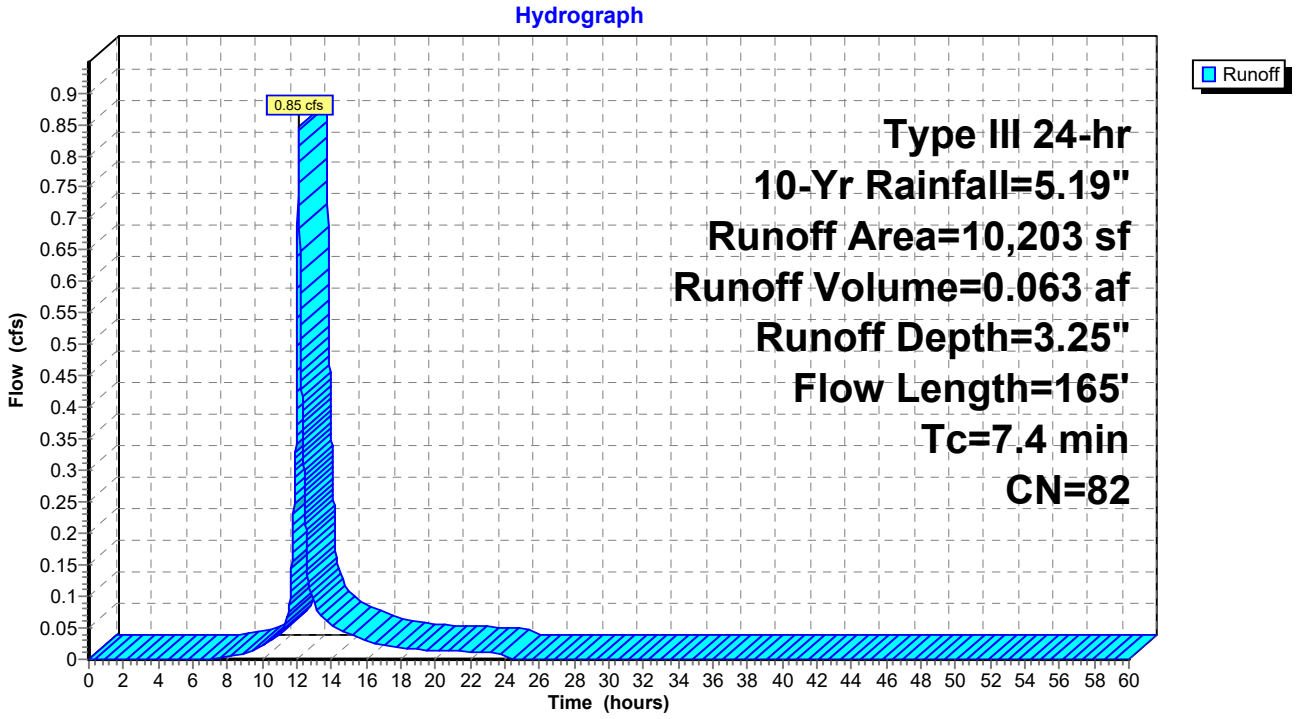
Runoff = 0.85 cfs @ 12.11 hrs, Volume= 0.063 af, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
10,203	82	Woods/grass comb., Fair, HSG D
10,203		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow, sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.0	115	0.1400	1.87		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
7.4	165	Total			

Subcatchment PR3: Woods to Winchester



Summary for Subcatchment PR4: Woods to Nahanton

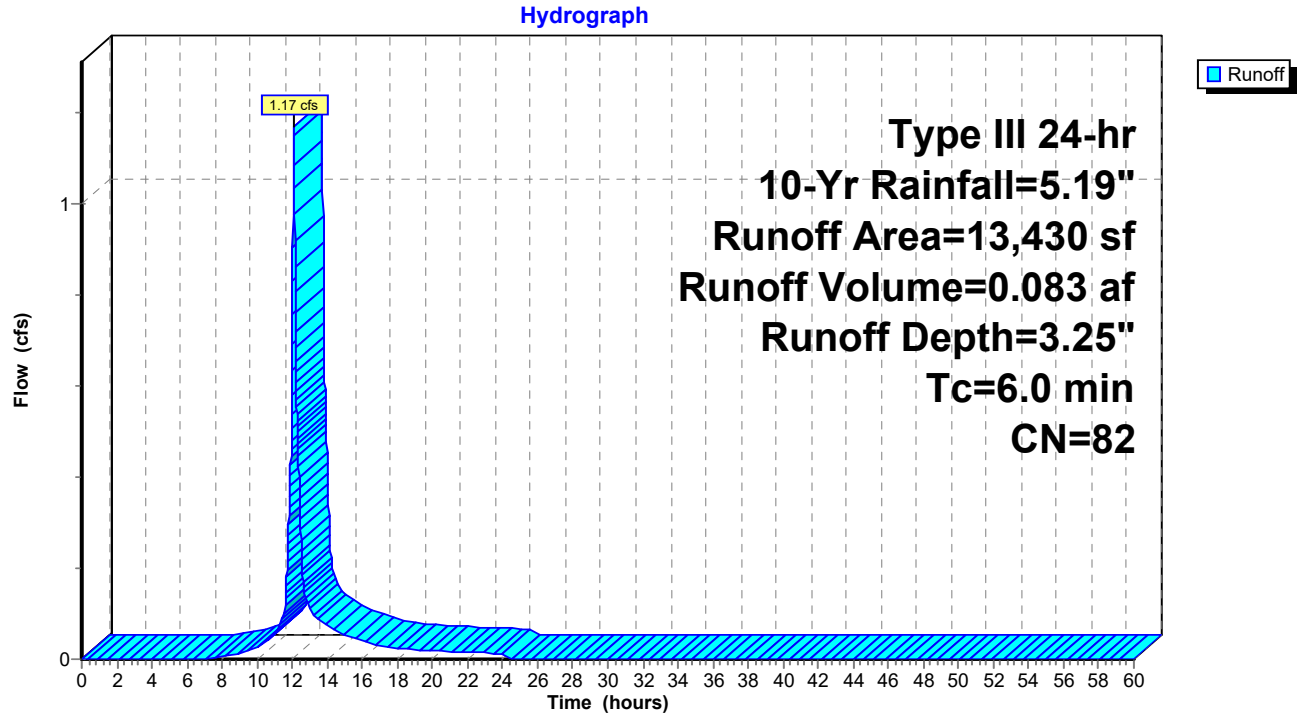
Runoff = 1.17 cfs @ 12.09 hrs, Volume= 0.083 af, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
13,430	82	Woods/grass comb., Fair, HSG D
13,430		100.00% Pervious Area

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

Subcatchment PR4: Woods to Nahanton



Summary for Subcatchment PR5: Back of Buildings and Drive Aisle

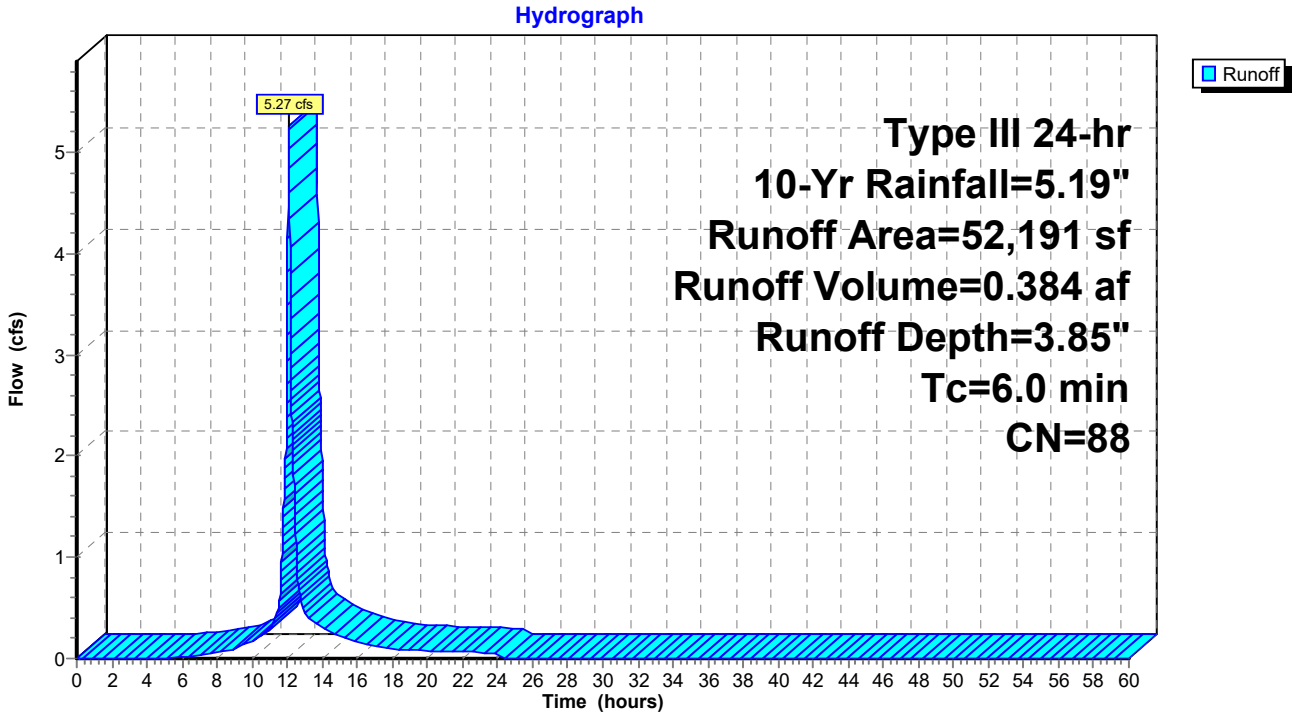
Runoff = 5.27 cfs @ 12.09 hrs, Volume= 0.384 af, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.19"

Area (sf)	CN	Description
22,500	98	Paved parking, HSG D
29,691	80	>75% Grass cover, Good, HSG D
52,191	88	Weighted Average
29,691		56.89% Pervious Area
22,500		43.11% Impervious Area

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

Subcatchment PR5: Back of Buildings and Drive Aisle

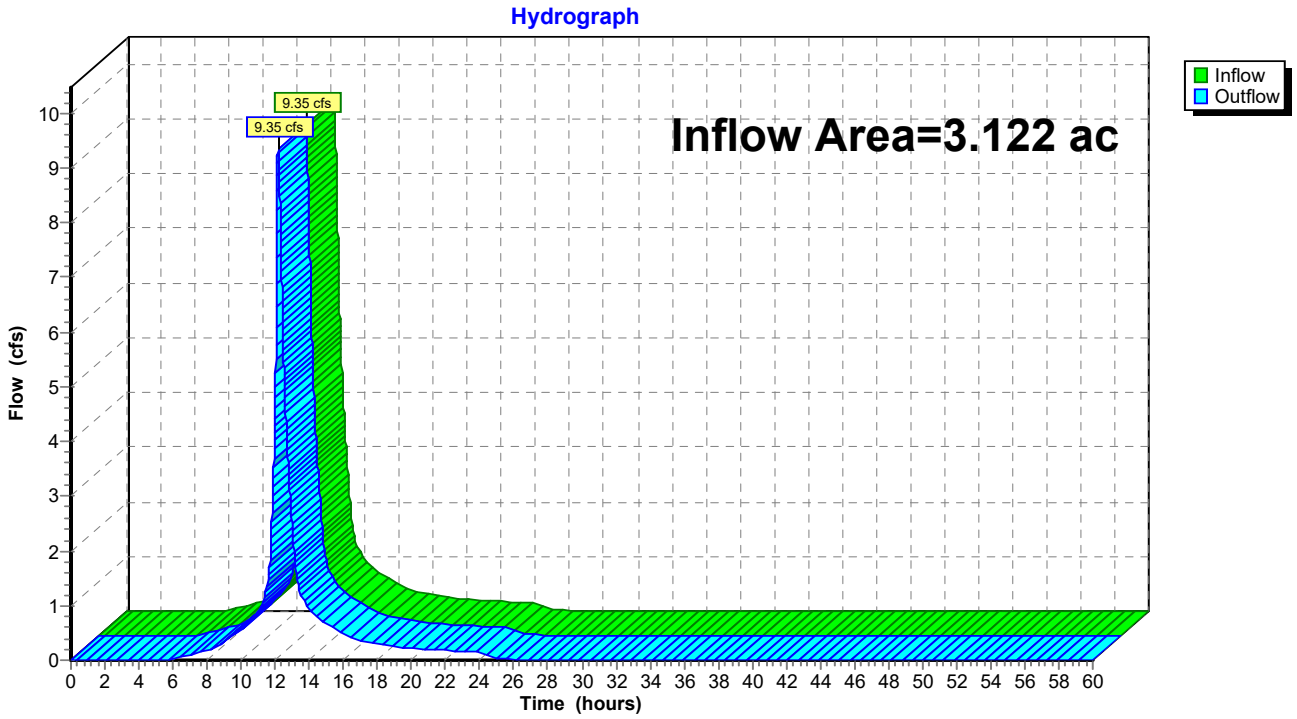


Summary for Reach DP1: Winchester St.

Inflow Area = 3.122 ac, 74.79% Impervious, Inflow Depth = 4.38" for 10-Yr event
Inflow = 9.35 cfs @ 12.17 hrs, Volume= 1.139 af
Outflow = 9.35 cfs @ 12.17 hrs, Volume= 1.139 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.

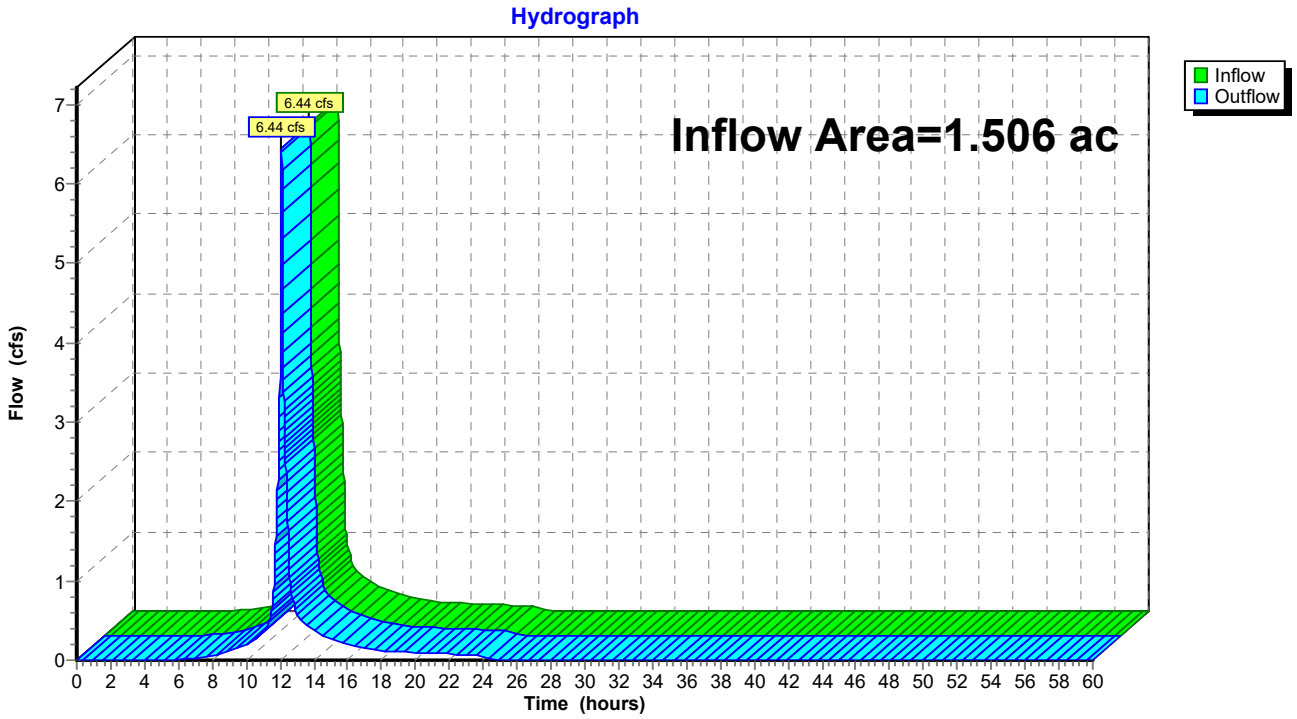


Summary for Reach DP2: Nahanton Street

Inflow Area = 1.506 ac, 34.29% Impervious, Inflow Depth = 3.73" for 10-Yr event
Inflow = 6.44 cfs @ 12.09 hrs, Volume= 0.468 af
Outflow = 6.44 cfs @ 12.09 hrs, Volume= 0.468 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton Street



Summary for Pond 1P: Detention System

Inflow Area = 2.019 ac, 81.37% Impervious, Inflow Depth = 4.61" for 10-Yr event
Inflow = 9.99 cfs @ 12.08 hrs, Volume= 0.775 af
Outflow = 5.99 cfs @ 12.19 hrs, Volume= 0.764 af, Atten= 40%, Lag= 6.2 min
Primary = 5.99 cfs @ 12.19 hrs, Volume= 0.764 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 132.10' @ 12.19 hrs Surf.Area= 0.055 ac Storage= 0.143 af
Flood Elev= 133.00' Surf.Area= 0.055 ac Storage= 0.184 af

Plug-Flow detention time= 42.4 min calculated for 0.764 af (98% of inflow)
Center-of-Mass det. time= 33.0 min (800.2 - 767.3)

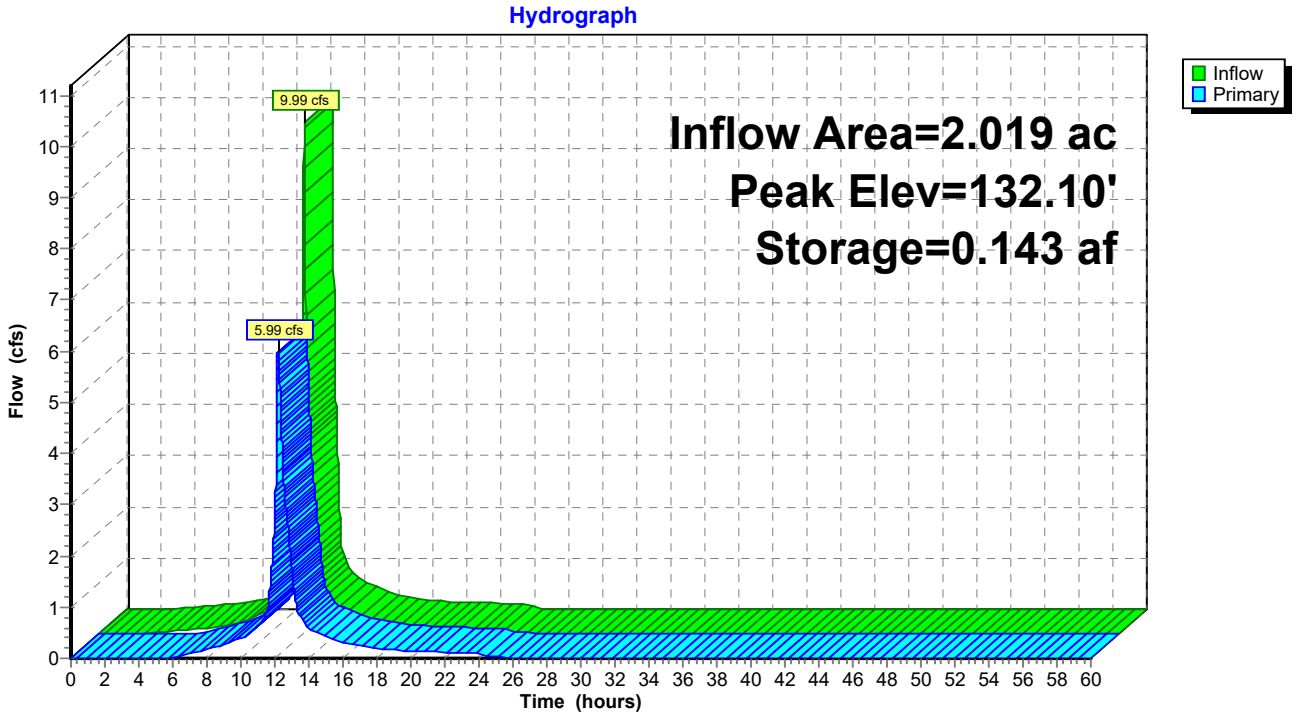
Volume	Invert	Avail.Storage	Storage Description
#1A	129.00'	0.000 af	**55.17'W x 43.19'L x 5.67'H Field A** 0.310 af Overall - 0.310 af Embedded = 0.000 af x 40.0% Voids
#2A	129.00'	0.231 af	**StormTrap ST1 SingleTrap 5-0** x 24 Inside #1 Inside= 82.7"W x 60.0"H => 29.76 sf x 14.06'L = 418.5 cf Outside= 82.7"W x 68.0"H => 39.08 sf x 14.06'L = 549.5 cf 24 Chambers in 8 Rows 55.17' x 42.19' Core + 0.00' x 0.50' Border = 55.17' x 43.19' System
		0.231 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	129.25'	**10.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 129.25' / 129.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	131.20'	**12.0" Round Culvert** L= 2.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 131.20' / 131.00' S= 0.1000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.99 cfs @ 12.19 hrs HW=132.10' (Free Discharge)
1=Culvert (Inlet Controls 4.09 cfs @ 7.51 fps)
2=Culvert (Inlet Controls 1.89 cfs @ 2.55 fps)

Pond 1P: Detention System



Summary for Pond 2P: Detention System

Inflow Area = 0.869 ac, 79.66% Impervious, Inflow Depth = 4.50" for 10-Yr event
Inflow = 4.25 cfs @ 12.08 hrs, Volume= 0.325 af
Outflow = 2.72 cfs @ 12.18 hrs, Volume= 0.312 af, Atten= 36%, Lag= 5.6 min
Primary = 2.72 cfs @ 12.18 hrs, Volume= 0.312 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 147.30' @ 12.18 hrs Surf.Area= 0.063 ac Storage= 0.070 af
Flood Elev= 140.00' Surf.Area= 0.000 ac Storage= 0.000 af

Plug-Flow detention time= 78.2 min calculated for 0.312 af (96% of inflow)
Center-of-Mass det. time= 54.4 min (826.8 - 772.4)

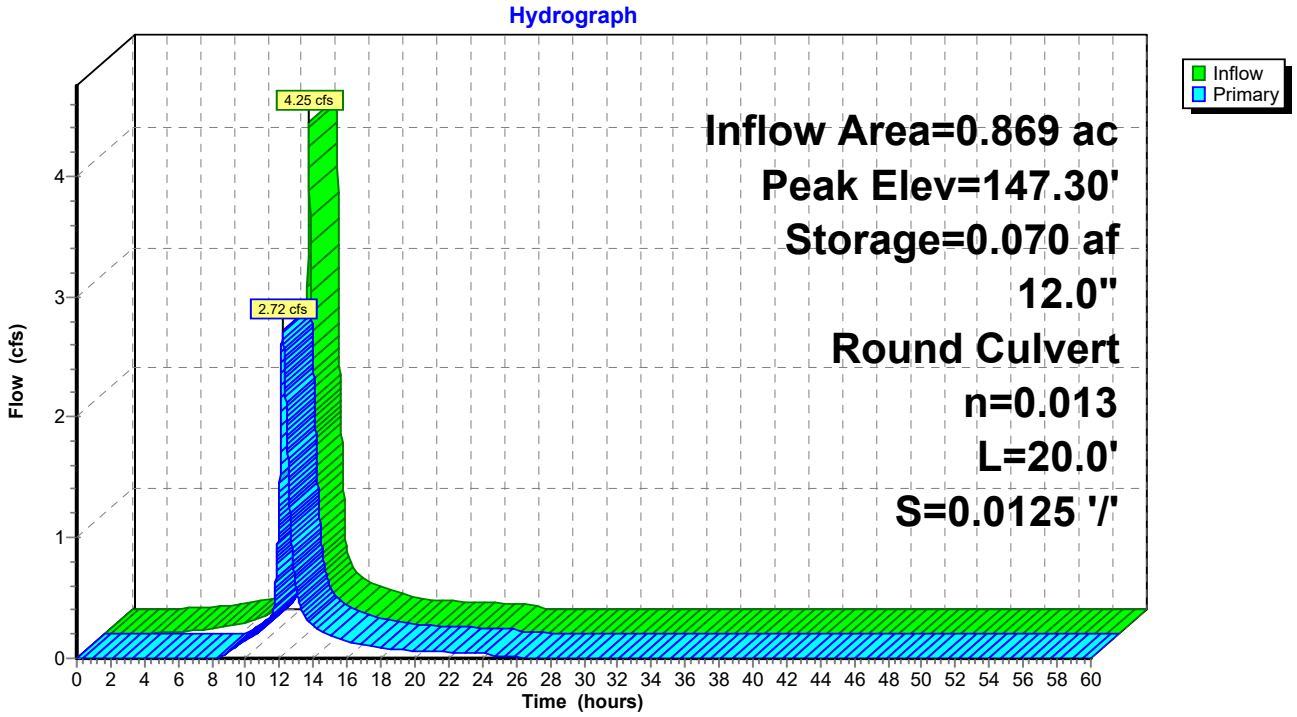
Volume	Invert	Avail.Storage	Storage Description
#1A	146.00'	0.000 af	**48.27'W x 57.25'L x 2.67'H Field A** 0.169 af Overall - 0.169 af Embedded = 0.000 af x 40.0% Voids
#2A	146.00'	0.107 af	**StormTrap ST1 SingleTrap 2-0** x 28 Inside #1 Inside= 82.7"W x 24.0"H => 11.84 sf x 14.06'L = 166.5 cf Outside= 82.7"W x 32.0"H => 18.39 sf x 14.06'L = 258.6 cf 28 Chambers in 7 Rows 48.27' x 56.25' Core + 0.00' x 0.50' Border = 48.27' x 57.25' System
		0.107 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	146.25'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.25' / 146.00' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.72 cfs @ 12.18 hrs HW=147.30' (Free Discharge)
1=Culvert (Barrel Controls 2.72 cfs @ 4.08 fps)

Pond 2P: Detention System



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR1: 2Life Building and Runoff Area=87,943 sf 81.37% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=95 Runoff=12.36 cfs 0.971 af

Subcatchment PR2: Connector Building, Runoff Area=37,834 sf 79.66% Impervious Runoff Depth=5.65"
Tc=6.0 min CN=94 Runoff=5.27 cfs 0.409 af

Subcatchment PR3: Woods to Winchester Runoff Area=10,203 sf 0.00% Impervious Runoff Depth=4.32"
Flow Length=165' Tc=7.4 min CN=82 Runoff=1.12 cfs 0.084 af

Subcatchment PR4: Woods to Nahanton Runoff Area=13,430 sf 0.00% Impervious Runoff Depth=4.32"
Tc=6.0 min CN=82 Runoff=1.54 cfs 0.111 af

Subcatchment PR5: Back of Buildings and Runoff Area=52,191 sf 43.11% Impervious Runoff Depth=4.97"
Tc=6.0 min CN=88 Runoff=6.72 cfs 0.497 af

Reach DP1: Winchester St. Inflow=11.66 cfs 1.439 af
Outflow=11.66 cfs 1.439 af

Reach DP2: Nahanton Street Inflow=8.27 cfs 0.608 af
Outflow=8.27 cfs 0.608 af

Pond 1P: Detention System Peak Elev=132.68' Storage=0.170 af Inflow=12.36 cfs 0.971 af
Outflow=7.51 cfs 0.959 af

Pond 2P: Detention System Peak Elev=147.51' Storage=0.081 af Inflow=5.27 cfs 0.409 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=3.27 cfs 0.396 af

Total Runoff Area = 4.628 ac Runoff Volume = 2.072 af Average Runoff Depth = 5.37"
38.39% Pervious = 1.777 ac 61.61% Impervious = 2.851 ac

Summary for Subcatchment PR1: 2Life Building and Drive Aisle

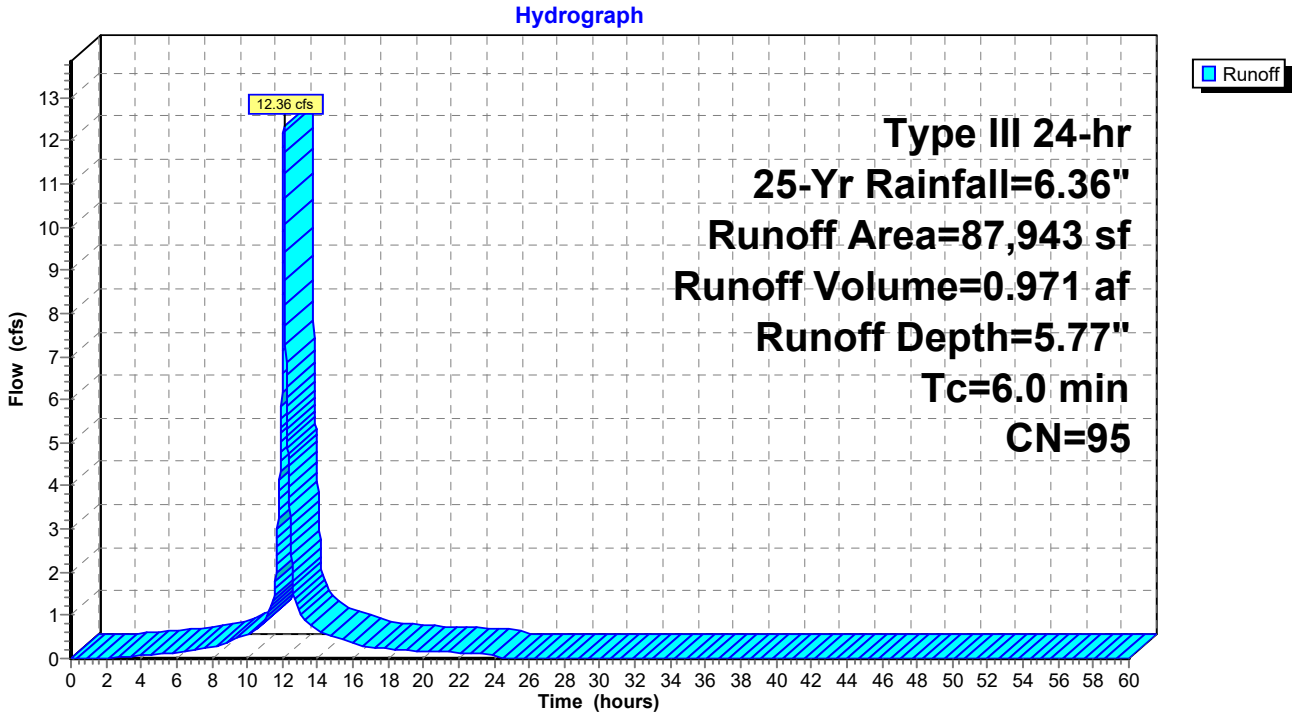
Runoff = 12.36 cfs @ 12.08 hrs, Volume= 0.971 af, Depth= 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
71,557	98	Paved parking, HSG D
16,386	80	>75% Grass cover, Good, HSG D
87,943	95	Weighted Average
16,386		18.63% Pervious Area
71,557		81.37% Impervious Area

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

Subcatchment PR1: 2Life Building and Drive Aisle



Summary for Subcatchment PR2: Connector Building, Walkway, and Parking

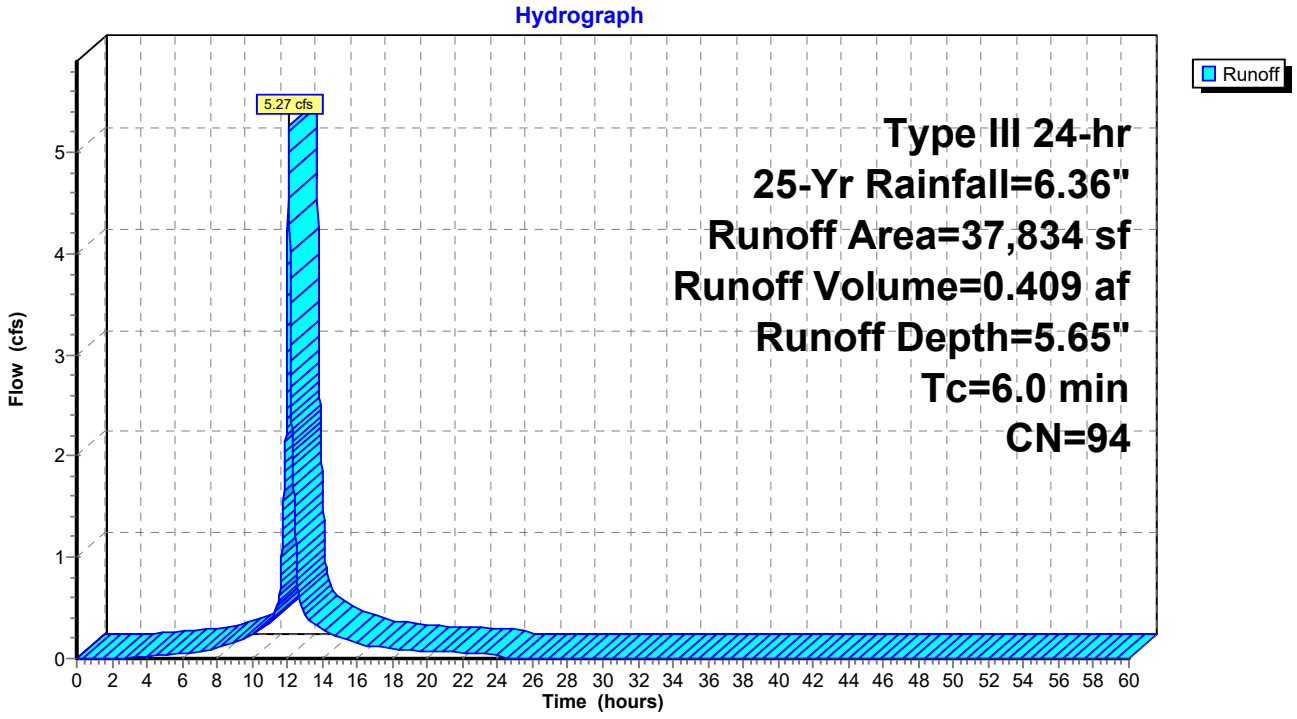
Runoff = 5.27 cfs @ 12.08 hrs, Volume= 0.409 af, Depth= 5.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
30,140	98	Paved parking, HSG D
7,694	80	>75% Grass cover, Good, HSG D
37,834	94	Weighted Average
7,694		20.34% Pervious Area
30,140		79.66% Impervious Area

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

Subcatchment PR2: Connector Building, Walkway, and Parking



Summary for Subcatchment PR3: Woods to Winchester

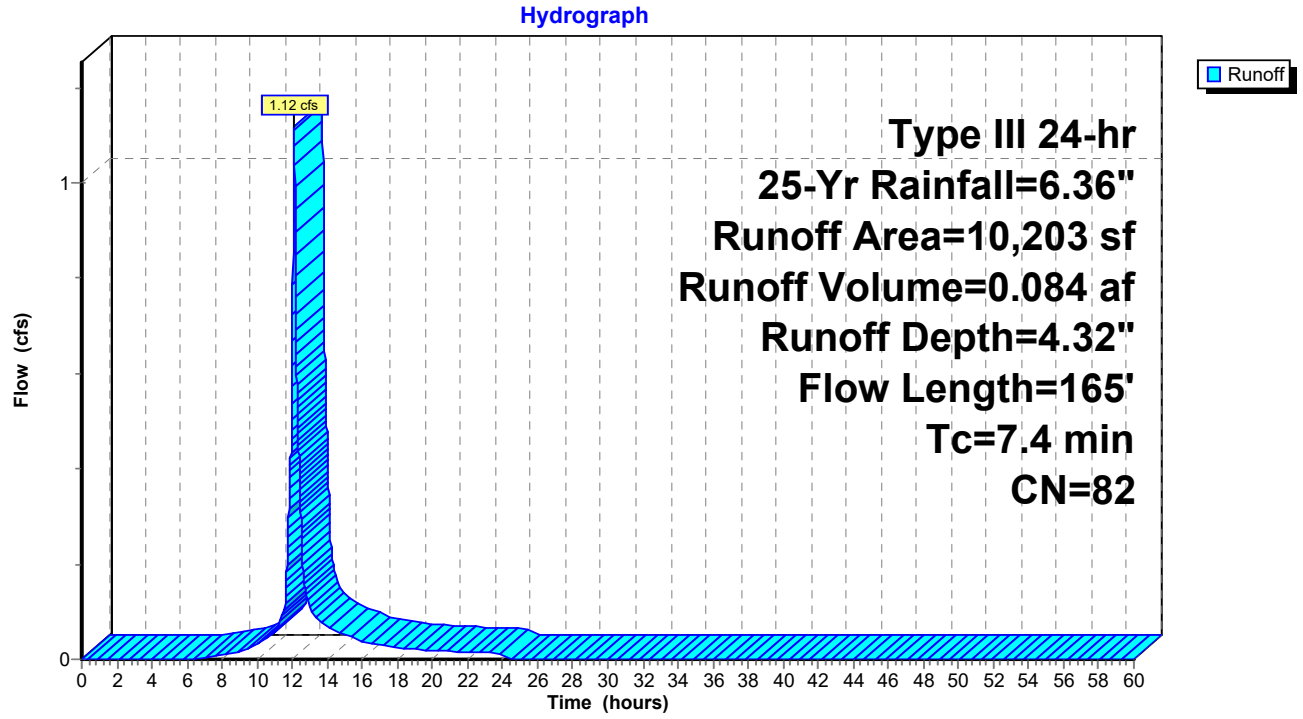
Runoff = 1.12 cfs @ 12.10 hrs, Volume= 0.084 af, Depth= 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
10,203	82	Woods/grass comb., Fair, HSG D
10,203		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow, sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.0	115	0.1400	1.87		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
7.4	165	Total			

Subcatchment PR3: Woods to Winchester



Summary for Subcatchment PR4: Woods to Nahanton

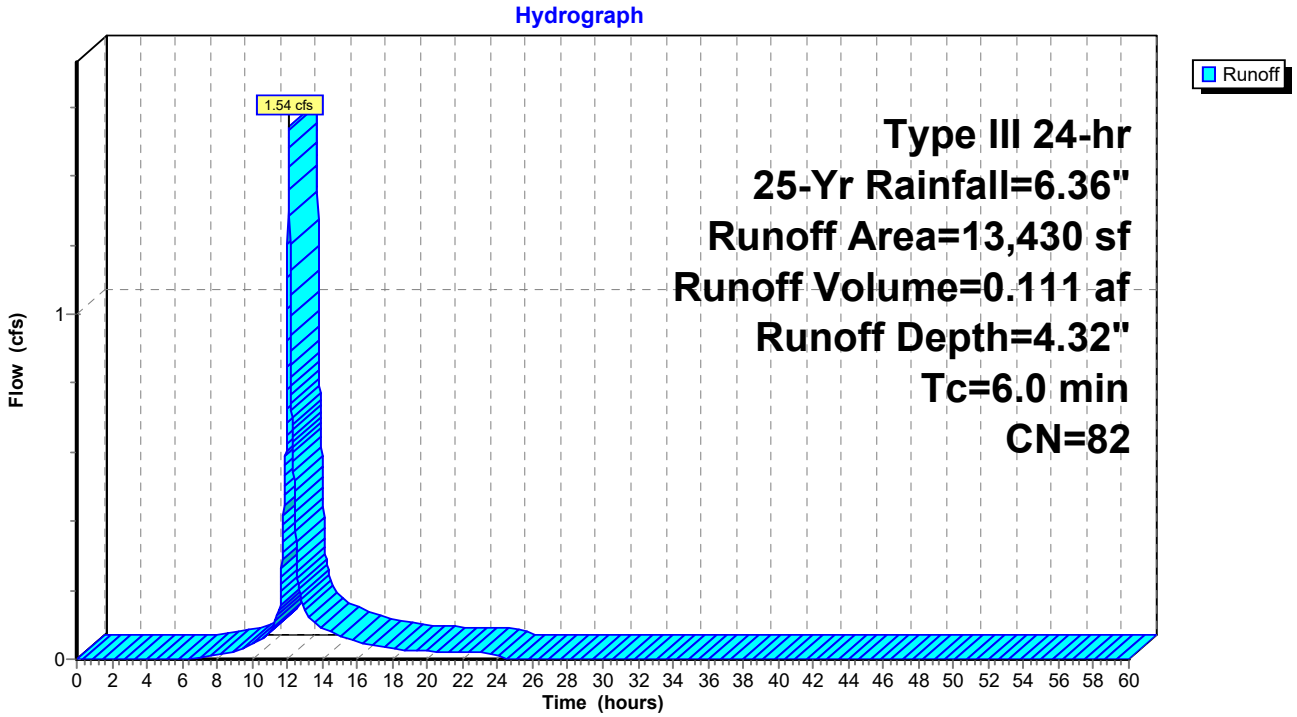
Runoff = 1.54 cfs @ 12.09 hrs, Volume= 0.111 af, Depth= 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
13,430	82	Woods/grass comb., Fair, HSG D
13,430		100.00% Pervious Area

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

Subcatchment PR4: Woods to Nahanton



Summary for Subcatchment PR5: Back of Buildings and Drive Aisle

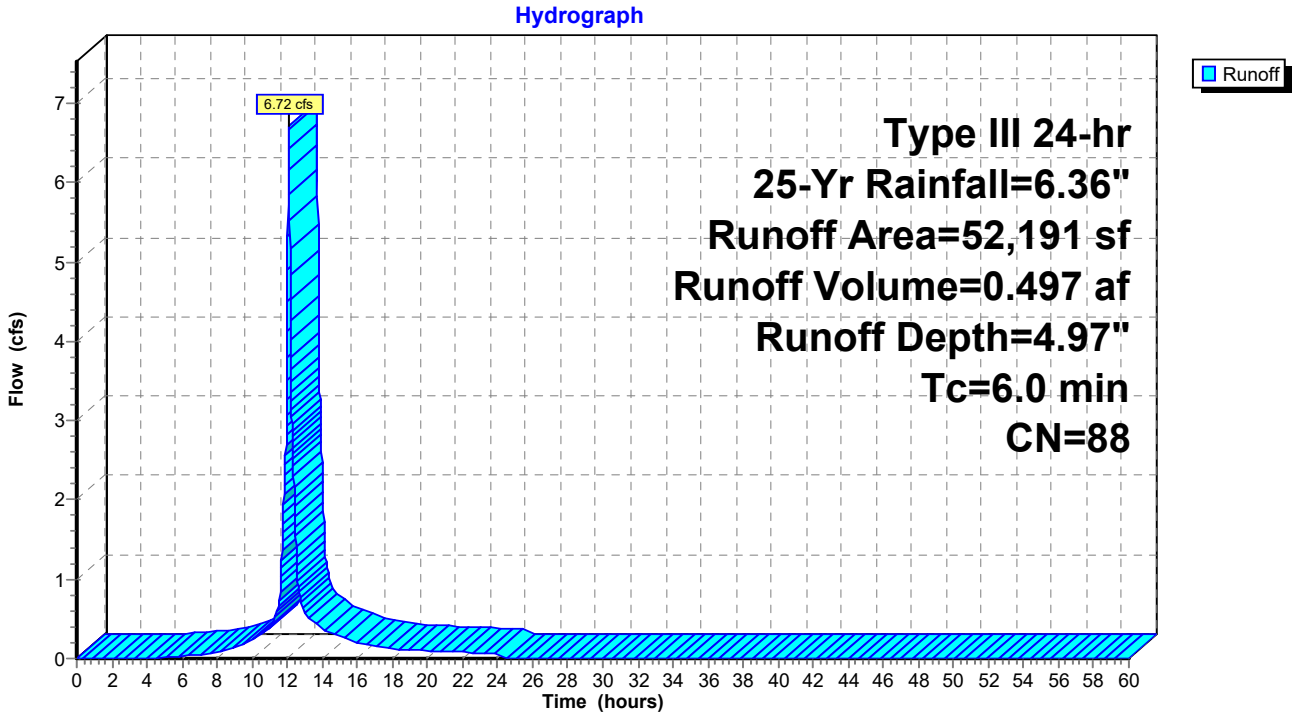
Runoff = 6.72 cfs @ 12.08 hrs, Volume= 0.497 af, Depth= 4.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.36"

Area (sf)	CN	Description
22,500	98	Paved parking, HSG D
29,691	80	>75% Grass cover, Good, HSG D
52,191	88	Weighted Average
29,691		56.89% Pervious Area
22,500		43.11% Impervious Area

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

Subcatchment PR5: Back of Buildings and Drive Aisle

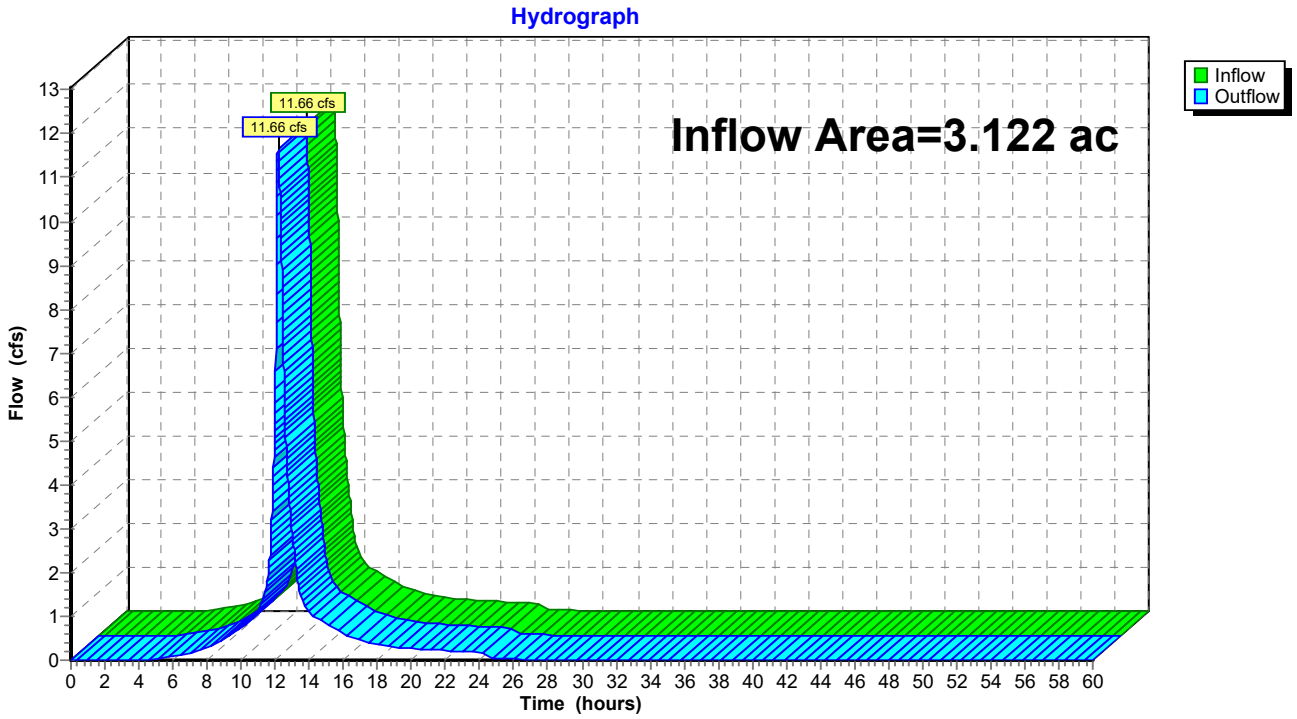


Summary for Reach DP1: Winchester St.

Inflow Area = 3.122 ac, 74.79% Impervious, Inflow Depth = 5.53" for 25-Yr event
Inflow = 11.66 cfs @ 12.17 hrs, Volume= 1.439 af
Outflow = 11.66 cfs @ 12.17 hrs, Volume= 1.439 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.

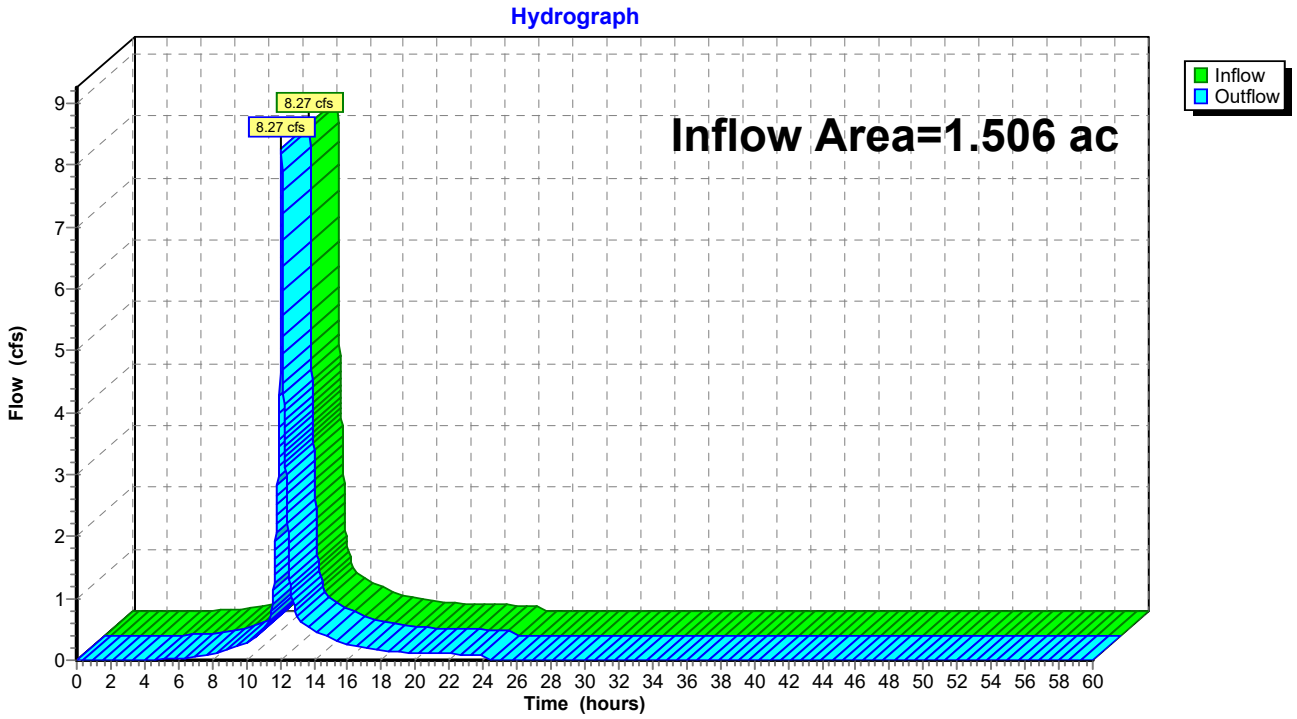


Summary for Reach DP2: Nahanton Street

Inflow Area = 1.506 ac, 34.29% Impervious, Inflow Depth = 4.84" for 25-Yr event
Inflow = 8.27 cfs @ 12.09 hrs, Volume= 0.608 af
Outflow = 8.27 cfs @ 12.09 hrs, Volume= 0.608 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton Street



Summary for Pond 1P: Detention System

Inflow Area = 2.019 ac, 81.37% Impervious, Inflow Depth = 5.77" for 25-Yr event
Inflow = 12.36 cfs @ 12.08 hrs, Volume= 0.971 af
Outflow = 7.51 cfs @ 12.18 hrs, Volume= 0.959 af, Atten= 39%, Lag= 6.0 min
Primary = 7.51 cfs @ 12.18 hrs, Volume= 0.959 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 132.68' @ 12.18 hrs Surf.Area= 0.055 ac Storage= 0.170 af
Flood Elev= 133.00' Surf.Area= 0.055 ac Storage= 0.184 af

Plug-Flow detention time= 38.0 min calculated for 0.959 af (99% of inflow)
Center-of-Mass det. time= 30.1 min (792.4 - 762.2)

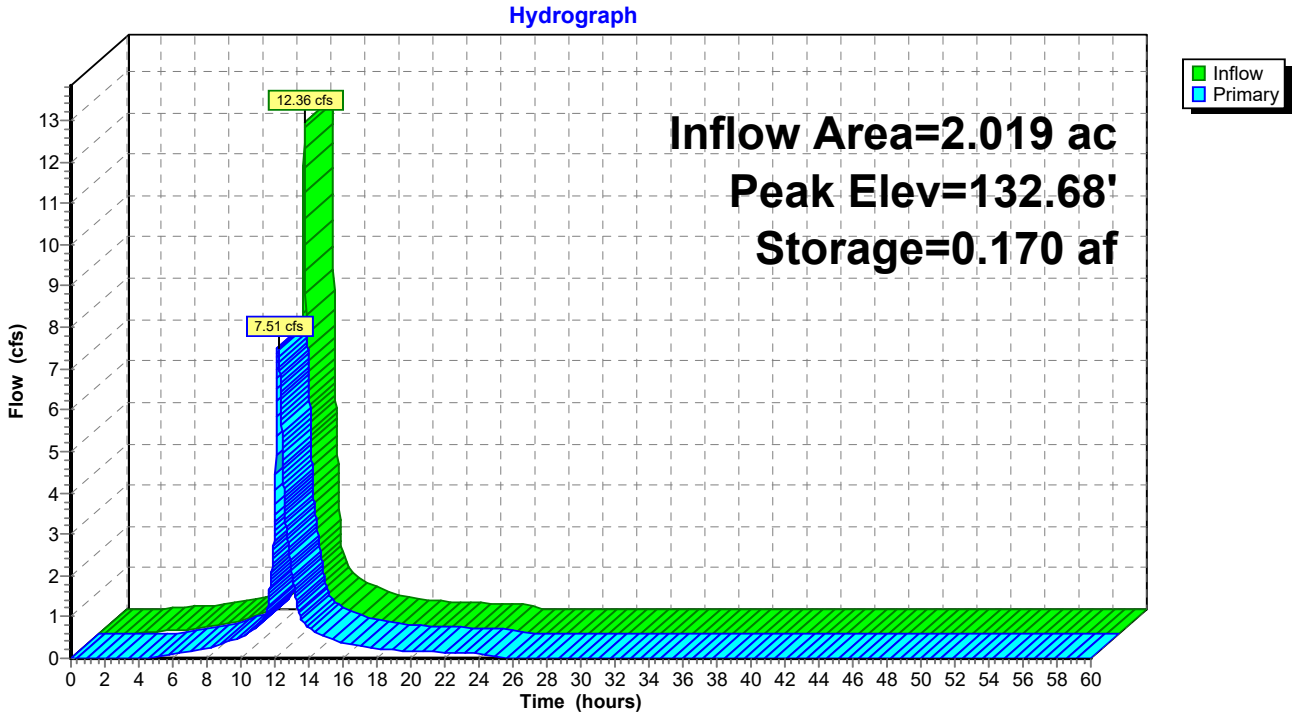
Volume	Invert	Avail.Storage	Storage Description
#1A	129.00'	0.000 af	**55.17'W x 43.19'L x 5.67'H Field A** 0.310 af Overall - 0.310 af Embedded = 0.000 af x 40.0% Voids
#2A	129.00'	0.231 af	**StormTrap ST1 SingleTrap 5-0** x 24 Inside #1 Inside= 82.7"W x 60.0"H => 29.76 sf x 14.06'L = 418.5 cf Outside= 82.7"W x 68.0"H => 39.08 sf x 14.06'L = 549.5 cf 24 Chambers in 8 Rows 55.17' x 42.19' Core + 0.00' x 0.50' Border = 55.17' x 43.19' System
		0.231 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	129.25'	**10.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 129.25' / 129.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	131.20'	**12.0" Round Culvert** L= 2.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 131.20' / 131.00' S= 0.1000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.51 cfs @ 12.18 hrs HW=132.68' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.56 cfs @ 8.36 fps)
└**2=Culvert** (Inlet Controls 2.95 cfs @ 3.76 fps)

Pond 1P: Detention System



Summary for Pond 2P: Detention System

Inflow Area = 0.869 ac, 79.66% Impervious, Inflow Depth = 5.65" for 25-Yr event
Inflow = 5.27 cfs @ 12.08 hrs, Volume= 0.409 af
Outflow = 3.27 cfs @ 12.18 hrs, Volume= 0.396 af, Atten= 38%, Lag= 5.9 min
Primary = 3.27 cfs @ 12.18 hrs, Volume= 0.396 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 147.51' @ 12.18 hrs Surf.Area= 0.063 ac Storage= 0.081 af
Flood Elev= 140.00' Surf.Area= 0.000 ac Storage= 0.000 af

Plug-Flow detention time= 68.7 min calculated for 0.396 af (97% of inflow)
Center-of-Mass det. time= 49.1 min (816.1 - 767.0)

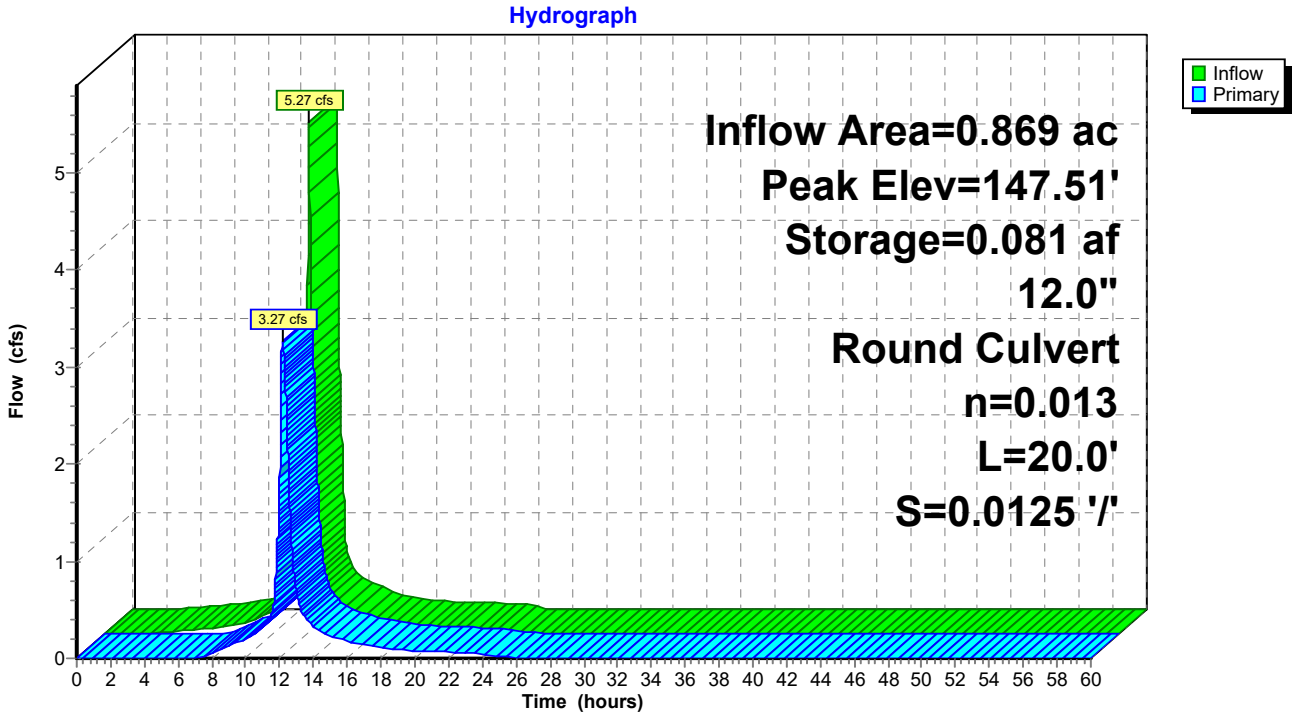
Volume	Invert	Avail.Storage	Storage Description
#1A	146.00'	0.000 af	**48.27'W x 57.25'L x 2.67'H Field A** 0.169 af Overall - 0.169 af Embedded = 0.000 af x 40.0% Voids
#2A	146.00'	0.107 af	**StormTrap ST1 SingleTrap 2-0** x 28 Inside #1 Inside= 82.7"W x 24.0"H => 11.84 sf x 14.06'L = 166.5 cf Outside= 82.7"W x 32.0"H => 18.39 sf x 14.06'L = 258.6 cf 28 Chambers in 7 Rows 48.27' x 56.25' Core + 0.00' x 0.50' Border = 48.27' x 57.25' System
		0.107 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	146.25'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.25' / 146.00' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.27 cfs @ 12.18 hrs HW=147.51' (Free Discharge)
1=Culvert (Barrel Controls 3.27 cfs @ 4.25 fps)

Pond 2P: Detention System



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR1: 2Life Building and Runoff Area=87,943 sf 81.37% Impervious Runoff Depth=8.18"
Tc=6.0 min CN=95 Runoff=17.23 cfs 1.376 af

Subcatchment PR2: Connector Building, Runoff Area=37,834 sf 79.66% Impervious Runoff Depth=8.06"
Tc=6.0 min CN=94 Runoff=7.38 cfs 0.583 af

Subcatchment PR3: Woods to Winchester Runoff Area=10,203 sf 0.00% Impervious Runoff Depth=6.60"
Flow Length=165' Tc=7.4 min CN=82 Runoff=1.68 cfs 0.129 af

Subcatchment PR4: Woods to Nahanton Runoff Area=13,430 sf 0.00% Impervious Runoff Depth=6.60"
Tc=6.0 min CN=82 Runoff=2.32 cfs 0.170 af

Subcatchment PR5: Back of Buildings and Runoff Area=52,191 sf 43.11% Impervious Runoff Depth=7.33"
Tc=6.0 min CN=88 Runoff=9.70 cfs 0.732 af

Reach DP1: Winchester St. Inflow=15.50 cfs 2.063 af
Outflow=15.50 cfs 2.063 af

Reach DP2: Nahanton Street Inflow=12.02 cfs 0.902 af
Outflow=12.02 cfs 0.902 af

Pond 1P: Detention System Peak Elev=133.99' Storage=0.230 af Inflow=17.23 cfs 1.376 af
Outflow=9.98 cfs 1.364 af

Pond 2P: Detention System Peak Elev=148.06' Storage=0.107 af Inflow=7.38 cfs 0.583 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=4.32 cfs 0.570 af

Total Runoff Area = 4.628 ac Runoff Volume = 2.990 af Average Runoff Depth = 7.75"
38.39% Pervious = 1.777 ac 61.61% Impervious = 2.851 ac

Summary for Subcatchment PR1: 2Life Building and Drive Aisle

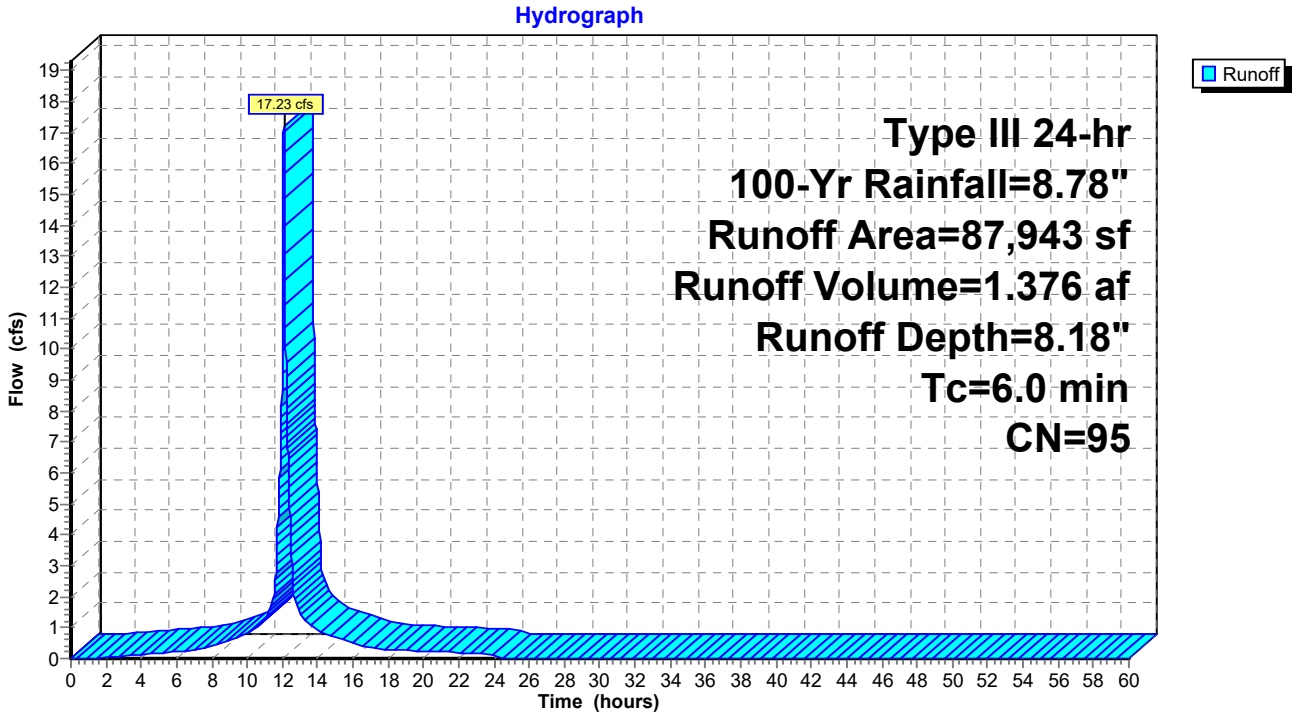
Runoff = 17.23 cfs @ 12.08 hrs, Volume= 1.376 af, Depth= 8.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
71,557	98	Paved parking, HSG D
16,386	80	>75% Grass cover, Good, HSG D
87,943	95	Weighted Average
16,386		18.63% Pervious Area
71,557		81.37% Impervious Area

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

Subcatchment PR1: 2Life Building and Drive Aisle



Summary for Subcatchment PR2: Connector Building, Walkway, and Parking

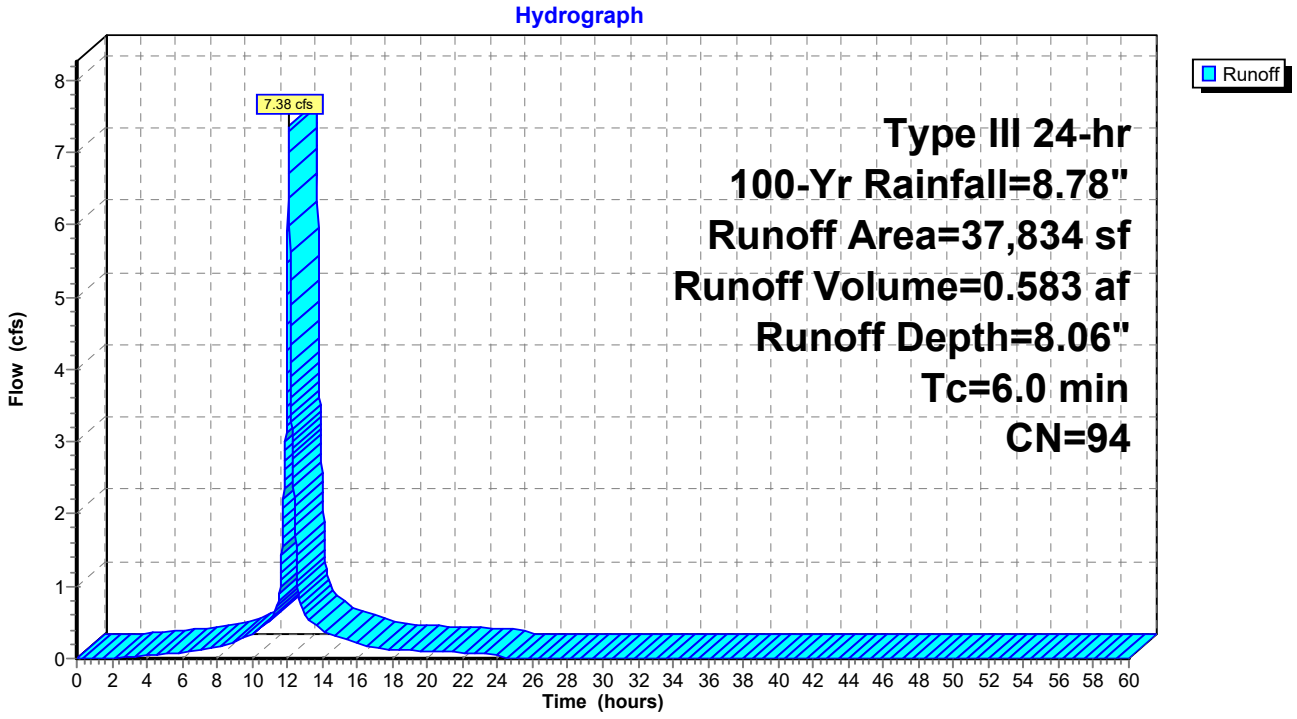
Runoff = 7.38 cfs @ 12.08 hrs, Volume= 0.583 af, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
30,140	98	Paved parking, HSG D
7,694	80	>75% Grass cover, Good, HSG D
37,834	94	Weighted Average
7,694		20.34% Pervious Area
30,140		79.66% Impervious Area

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

Subcatchment PR2: Connector Building, Walkway, and Parking



Summary for Subcatchment PR3: Woods to Winchester

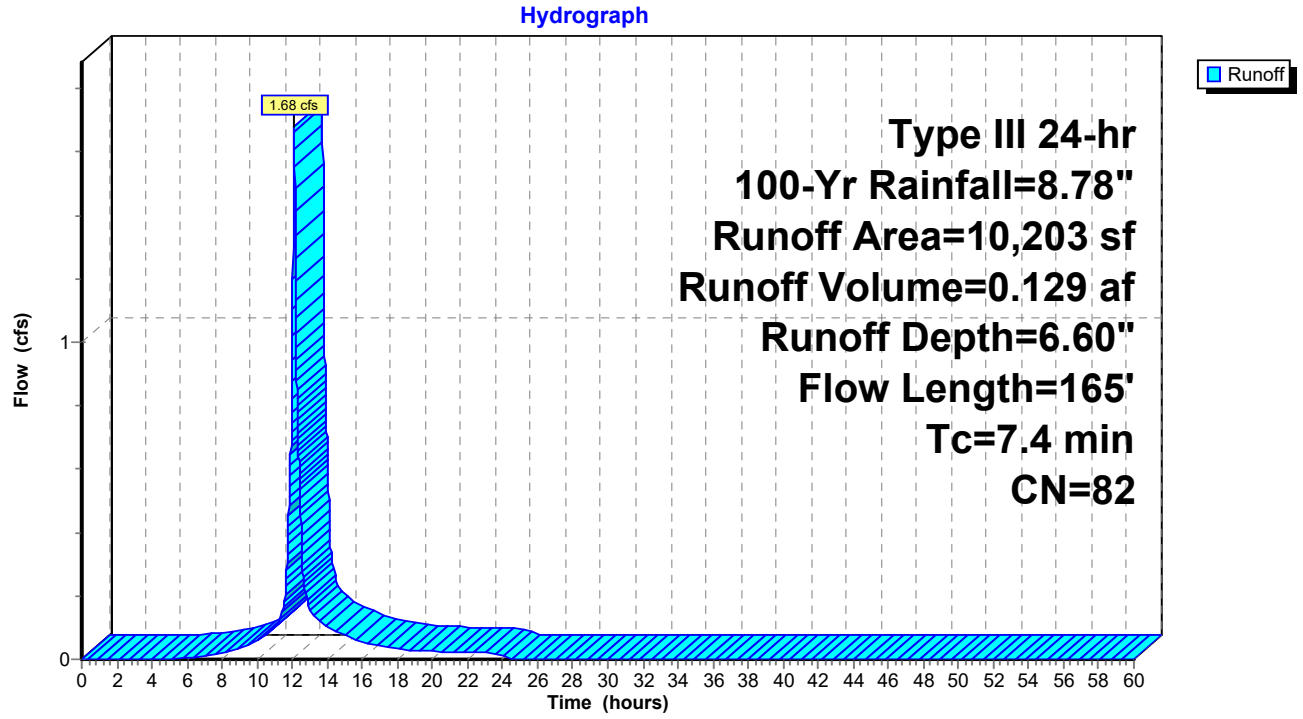
Runoff = 1.68 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 6.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
10,203	82	Woods/grass comb., Fair, HSG D
10,203		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow, sheet flow** Woods: Light underbrush n= 0.400 P2= 3.30"
1.0	115	0.1400	1.87		**Shallow Concentrated Flow, shallow** Woodland Kv= 5.0 fps
7.4	165	Total			

Subcatchment PR3: Woods to Winchester



Summary for Subcatchment PR4: Woods to Nahanton

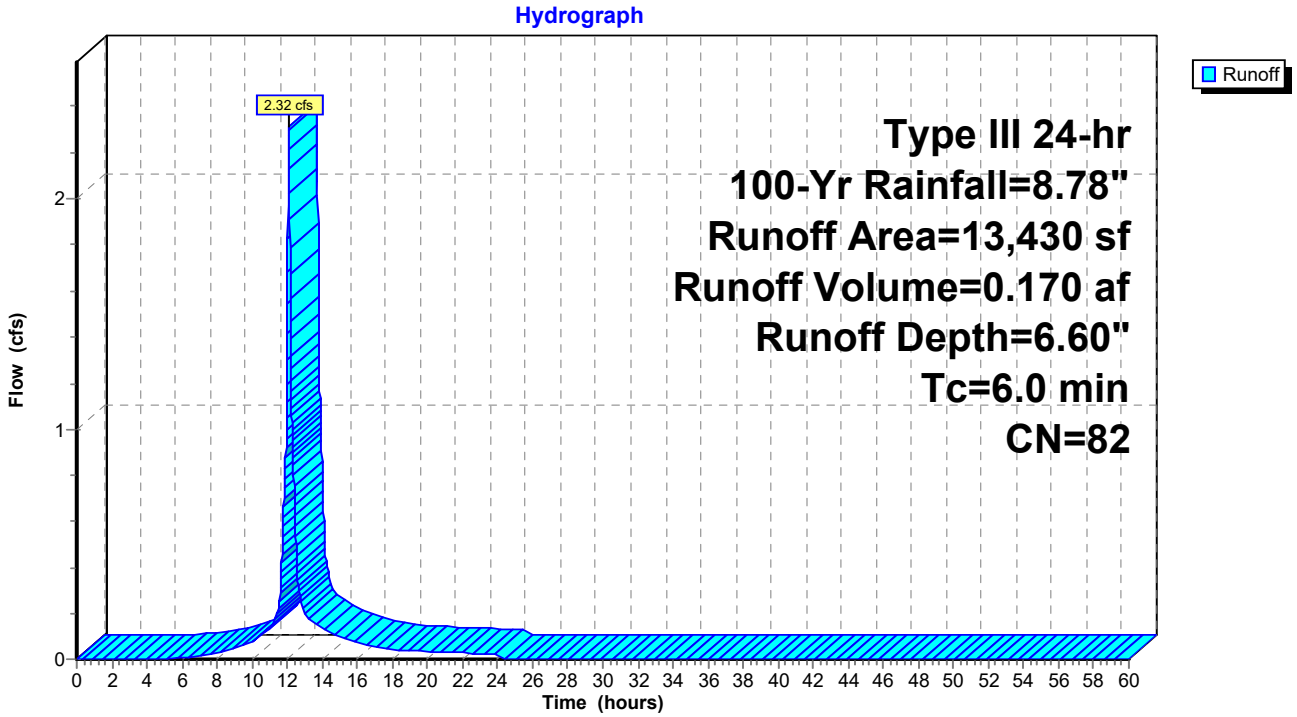
Runoff = 2.32 cfs @ 12.09 hrs, Volume= 0.170 af, Depth= 6.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
13,430	82	Woods/grass comb., Fair, HSG D
13,430		100.00% Pervious Area

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

Subcatchment PR4: Woods to Nahanton



Summary for Subcatchment PR5: Back of Buildings and Drive Aisle

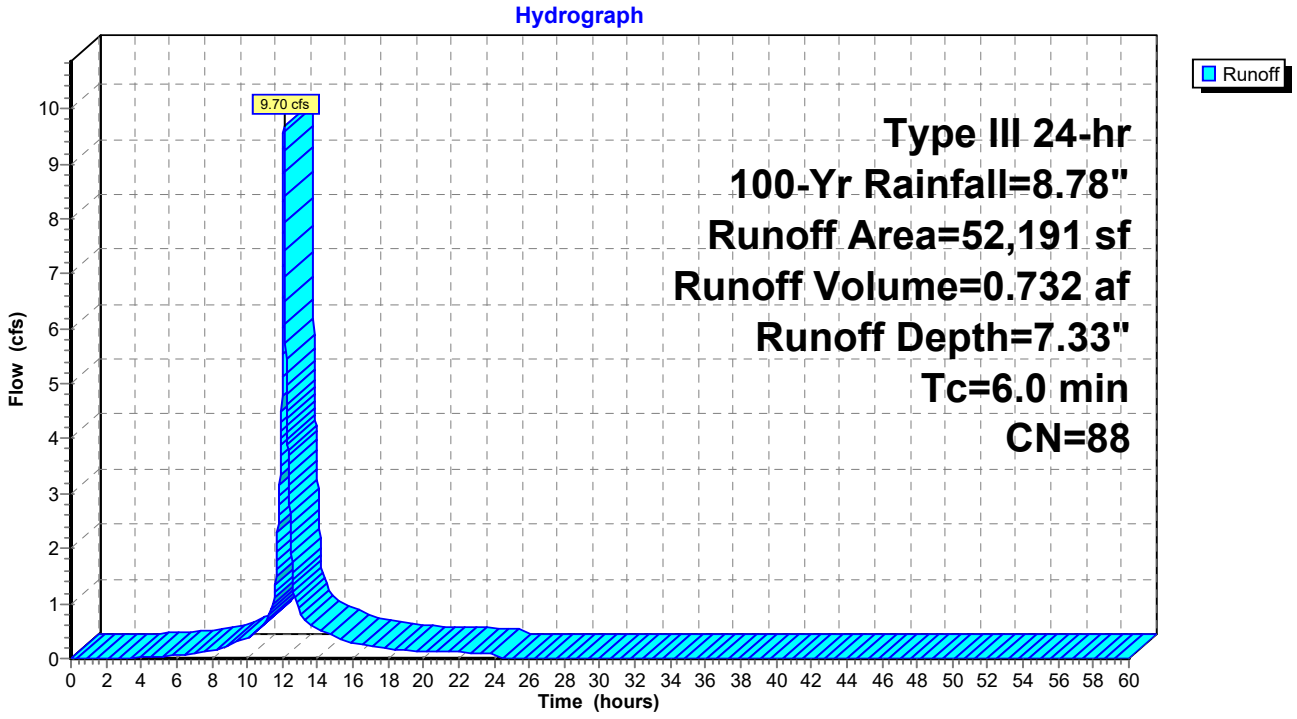
Runoff = 9.70 cfs @ 12.08 hrs, Volume= 0.732 af, Depth= 7.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.78"

Area (sf)	CN	Description
22,500	98	Paved parking, HSG D
29,691	80	>75% Grass cover, Good, HSG D
52,191	88	Weighted Average
29,691		56.89% Pervious Area
22,500		43.11% Impervious Area

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

Subcatchment PR5: Back of Buildings and Drive Aisle

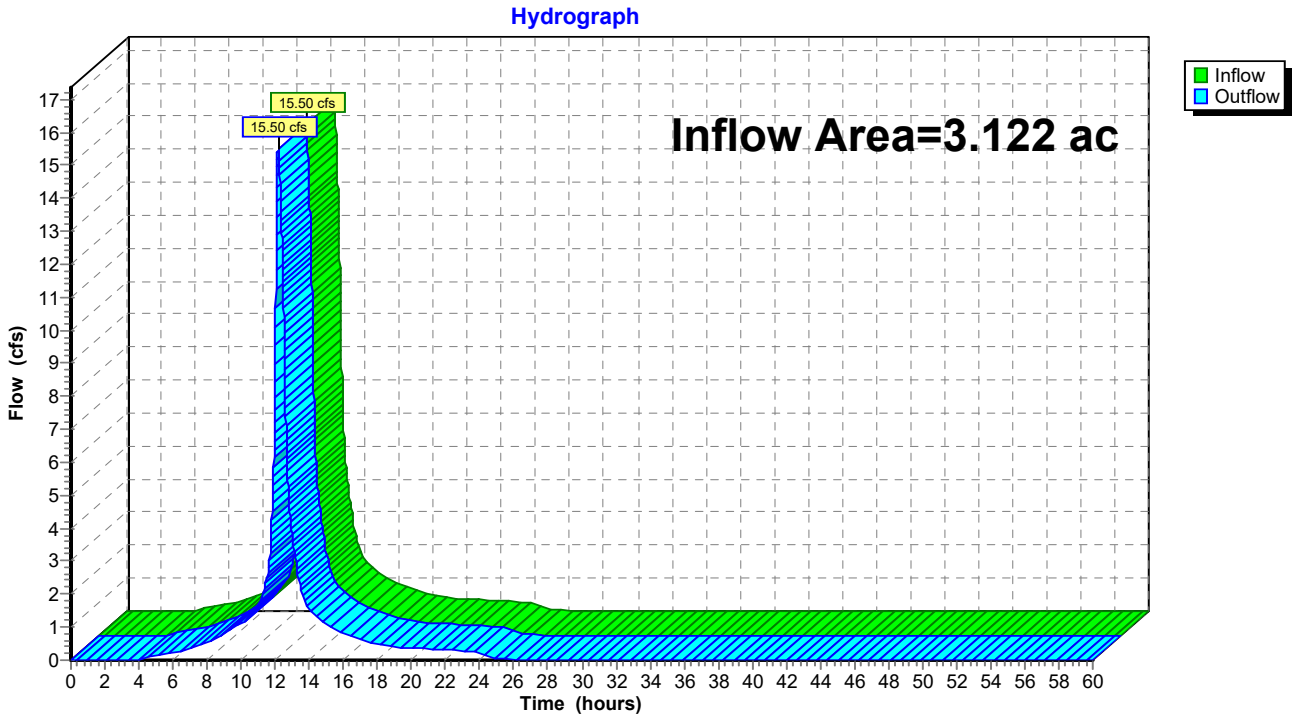


Summary for Reach DP1: Winchester St.

Inflow Area = 3.122 ac, 74.79% Impervious, Inflow Depth = 7.93" for 100-Yr event
Inflow = 15.50 cfs @ 12.19 hrs, Volume= 2.063 af
Outflow = 15.50 cfs @ 12.19 hrs, Volume= 2.063 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP1: Winchester St.

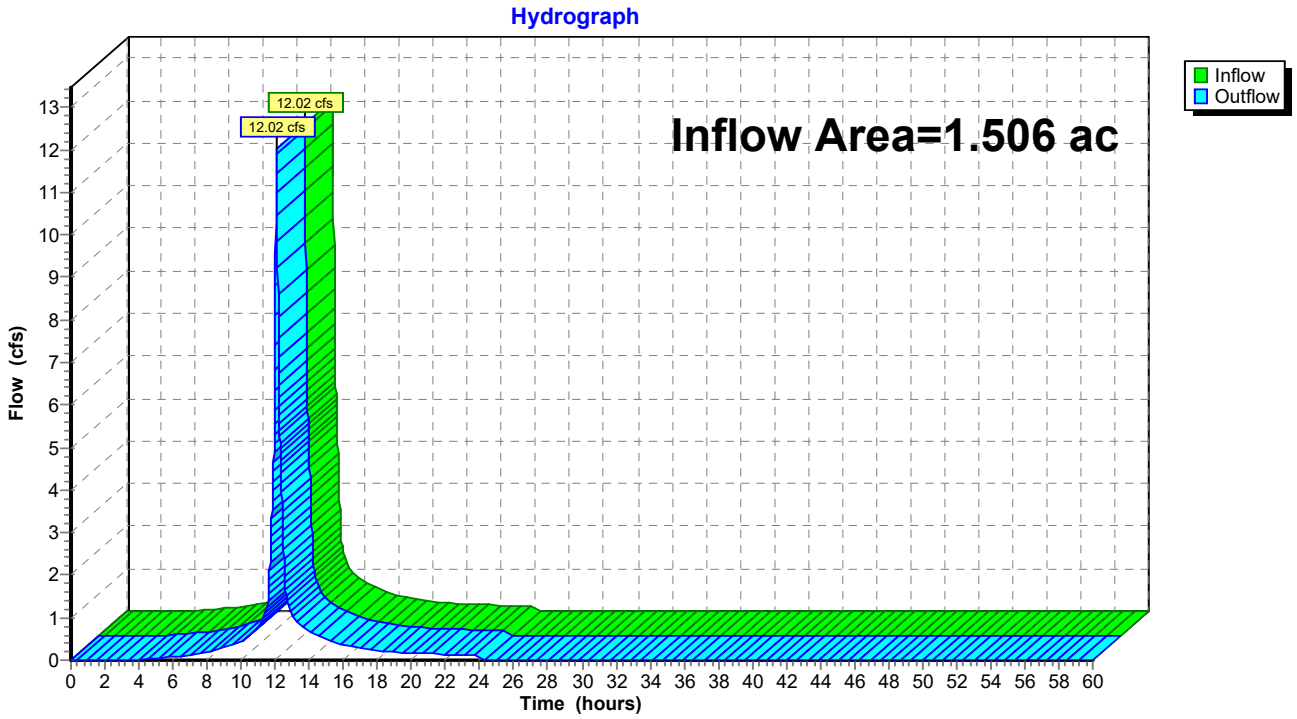


Summary for Reach DP2: Nahanton Street

Inflow Area = 1.506 ac, 34.29% Impervious, Inflow Depth = 7.18" for 100-Yr event
Inflow = 12.02 cfs @ 12.08 hrs, Volume= 0.902 af
Outflow = 12.02 cfs @ 12.08 hrs, Volume= 0.902 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Reach DP2: Nahanton Street



Summary for Pond 1P: Detention System

Inflow Area = 2.019 ac, 81.37% Impervious, Inflow Depth = 8.18" for 100-Yr event
Inflow = 17.23 cfs @ 12.08 hrs, Volume= 1.376 af
Outflow = 9.98 cfs @ 12.19 hrs, Volume= 1.364 af, Atten= 42%, Lag= 6.5 min
Primary = 9.98 cfs @ 12.19 hrs, Volume= 1.364 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 133.99' @ 12.19 hrs Surf.Area= 0.055 ac Storage= 0.230 af
Flood Elev= 133.00' Surf.Area= 0.055 ac Storage= 0.184 af

Plug-Flow detention time= 32.0 min calculated for 1.364 af (99% of inflow)
Center-of-Mass det. time= 26.5 min (781.6 - 755.1)

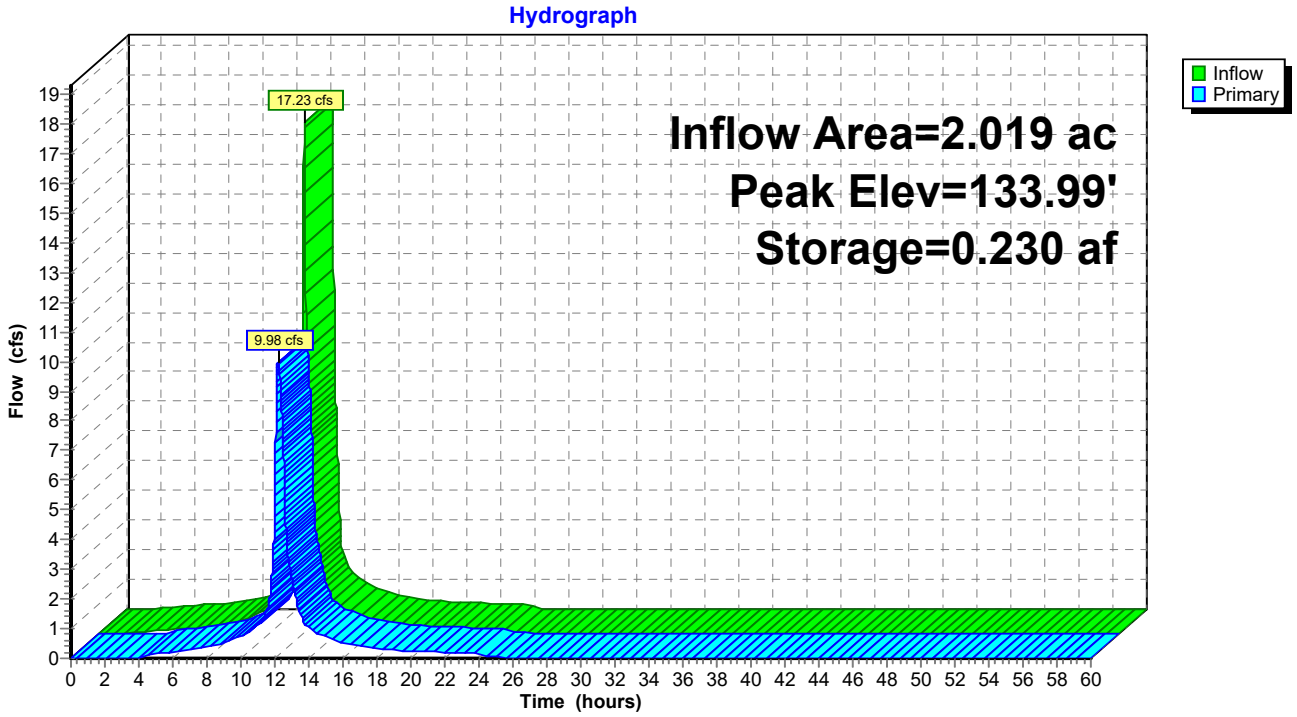
Volume	Invert	Avail.Storage	Storage Description
#1A	129.00'	0.000 af	**55.17'W x 43.19'L x 5.67'H Field A** 0.310 af Overall - 0.310 af Embedded = 0.000 af x 40.0% Voids
#2A	129.00'	0.231 af	**StormTrap ST1 SingleTrap 5-0** x 24 Inside #1 Inside= 82.7"W x 60.0"H => 29.76 sf x 14.06'L = 418.5 cf Outside= 82.7"W x 68.0"H => 39.08 sf x 14.06'L = 549.5 cf 24 Chambers in 8 Rows 55.17' x 42.19' Core + 0.00' x 0.50' Border = 55.17' x 43.19' System
		0.231 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	129.25'	**10.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 129.25' / 129.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Primary	131.20'	**12.0" Round Culvert** L= 2.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 131.20' / 131.00' S= 0.1000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=9.98 cfs @ 12.19 hrs HW=133.99' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.46 cfs @ 10.01 fps)
└**2=Culvert** (Inlet Controls 4.52 cfs @ 5.75 fps)

Pond 1P: Detention System



Summary for Pond 2P: Detention System

Inflow Area = 0.869 ac, 79.66% Impervious, Inflow Depth = 8.06" for 100-Yr event
Inflow = 7.38 cfs @ 12.08 hrs, Volume= 0.583 af
Outflow = 4.32 cfs @ 12.19 hrs, Volume= 0.570 af, Atten= 41%, Lag= 6.4 min
Primary = 4.32 cfs @ 12.19 hrs, Volume= 0.570 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 148.06' @ 12.19 hrs Surf.Area= 0.063 ac Storage= 0.107 af
Flood Elev= 140.00' Surf.Area= 0.000 ac Storage= 0.000 af

Plug-Flow detention time= 56.4 min calculated for 0.570 af (98% of inflow)
Center-of-Mass det. time= 42.1 min (801.4 - 759.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	146.00'	0.000 af	**48.27'W x 57.25'L x 2.67'H Field A** 0.169 af Overall - 0.169 af Embedded = 0.000 af x 40.0% Voids
#2A	146.00'	0.107 af	**StormTrap ST1 SingleTrap 2-0** x 28 Inside #1 Inside= 82.7"W x 24.0"H => 11.84 sf x 14.06'L = 166.5 cf Outside= 82.7"W x 32.0"H => 18.39 sf x 14.06'L = 258.6 cf 28 Chambers in 7 Rows 48.27' x 56.25' Core + 0.00' x 0.50' Border = 48.27' x 57.25' System
		0.107 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	146.25'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.25' / 146.00' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.32 cfs @ 12.19 hrs HW=148.05' (Free Discharge)
1=Culvert (Inlet Controls 4.32 cfs @ 5.50 fps)

Pond 2P: Detention System