



February 2, 2022

Revised: April 26, 2022

Stormwater Management Report

Submittal To:

Pembroke Planning Board

**Old Washington Place – 631 Washington Street
Multiunit Residential Development**

631 Washington Street
Definitive Site Plan
Multiunit Dwelling Development
Pembroke, Massachusetts
January 31, 2022
Revised: April 26, 2022

**STORMWATER MANAGEMENT REPORT AND HYDROLOGIC-HYDRAULIC
ANALYSIS**

Project Summary

The subject property is located between Old Washington Street and Washington Street, with frontage on both streets. Washington Street forms the easterly property line while Old Washington Street defines the westerly property line. The site is located within the Residential-Commercial District and consists of a total of 2.42± acres, all of which is upland. There are no wetland resource areas located on the property or within 200' of the parcel.

Currently the site is developed with a single-family dwelling that faces Washington Street (State Route 53). There is an existing driveway that runs through from Washington Street to Old Washington Street and all utilities enter the property from Old Washington Street. The proposed project will face Old Washington Street and have a 24' wide driveway that intersects with Old Washington Street and the existing driveway access to Washington Street will no longer be used. The proposed development will include the construction of 2 new Multiunit Residential Buildings with a total of 9 new residential units along with a parking area, landscaping, utility connections, a stormwater management system and associated site grading.

Methodology

Drainage computations were performed using the Natural Resources Conservation Services (NRCS) TR-20 method and HydroCAD[®] Drainage Calculation Software. Sketches of the existing and proposed watershed areas, HydroCAD[®] Report, and copies of the calculation sheets are included as appendices to this report.

Existing Conditions

From the existing conditions plan and site visits, the project area is very flat and slopes gently towards two existing catch basins located along Old Washington Street; a northerly catch basin in front of the property and a more southerly catch basin which is just to the south of the frontage along Old Washington Street. Currently there are no treatment devices on the site and stormwater from the existing dwelling's roof discharge from roof leaders, directly onto the ground.

Much of the existing cover in the project area, outside of the dwelling, would be classified as grass, woods, pavement or gravel driveway, in good condition with some spotty wooded areas with worn compacted paths running through them behind and around the existing dwelling that would be considered woods in fair condition. Soil

types were obtained from NRCS mapping and were found to be generally HSG A or B soils in the area where the redevelopment is proposed. Specifically, the soils are listed as map unit symbol 634B, Birchwood - Urban Land with a Hydrologic Soil Group Rating of HSG B Soils or 289B Hinckley soils which are listed as HSG A soils. In order to confirm the soil class and groundwater depth characteristics of these soils, test pits were performed by Merrill Engineers and Land Surveyors in July of 2021 and January of 2022. Based on soil textures encountered at the time of testing, the existing material was found to be predominantly loamy sand which would be consistent with the HSG A soils described in the NRCS mapping of the area. Based on this information an exfiltration rate of 2.41 in/hr was used in the stormwater calculations.

Ultimately, all of the runoff from the portion of the site where the proposed development will be constructed, is directed towards Old Washington Street so this was the area that is the focus of the analysis. Two smaller areas area directs runoff towards the southeast and southwest. One of the development goals was to provide a substantial buffer to the closest the residential abutters, and as a result, these tributary areas have been left substantially untouched.

Watershed Designation

<u>Existing</u>	<u>Proposed</u>	<u>Discharges to</u>
1A	1A,	Northerly CB Old Washington St
1B	1B, 4P, 11S	Southerly CB Old Washington St
2S	2P	Southeasterly Abutter
3S	3P	Westerly Abutter

Proposed Conditions/Stormwater Management

Under proposed conditions, stormwater runoff from the proposed parking area will be directed towards the proposed sediment forebays which will capture and pretreat the flows prior to discharging to the infiltration basin which is adjacent to the proposed parking area. Clean runoff from the roof areas will also be directed to the infiltration basin via subsurface ADS pipes which will collect flow from the roof leaders. The infiltration basin will capture and infiltrate the runoff from smaller, more frequent storm events (2-yr through 25-yr storms) entirely. Flows from the 100-yr storm event will be discharged over the 8-foot-wide weir with a calculated peak rate of 0.90±cfs so there will be little chance of scouring downstream. During these larger storms events, runoff will be detained and released towards the existing catch basins in Old Washington Street, as runoff from the property currently flows, at a reduced peak rate and volume from the existing conditions.

The paved parking area will be treated with cape cod berm or concrete curbing to ensure that runoff is contained in the parking areas and directed to the stormwater management system. A 4' wide break in the berm has been set at the low point of the driveway which will allow stormwater to flow from the pavement, over a stone diaphragm, into the sediment forebays and stormwater management system.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

No new stormwater conveyances will discharge untreated pavement runoff into, or cause erosion to downgradient areas. Under existing conditions, this entire project area flows towards the street drainage system in Old Washington Street. Refer to Appendix B for outlet velocities (<2 ft/sec).

Standard 2 – Peak Rate Attenuation

Peak rates of runoff were calculated using the TR-20 methodology developed by the NRCS (refer to Appendices). There will be an increase in runoff rates due to the additional impervious area proposed. This increase is attenuated by the proposed infiltration basin by providing infiltration, storage volume and discharge controls. These measures will both detain and infiltrate runoff, mitigating increased rates and volumes of runoff for the 2, 10, 25 and 100-year storms events.

In lieu of providing a mounding analysis, the infiltration systems have been analyzed without the exfiltration component. This will confirm that in the worst-case scenario, where the height of the groundwater mound exceeds the elevation of the bottom of the infiltration basin (which would impact the system's ability to use recharge to attenuate any stormwater), the peak rates are controlled and do not result in an increase over the pre-development conditions. If the pre-development peak rates of runoff are not exceeded without exfiltration component, the system/site design meet the requirements of Standard 2. An additional "No Exfiltration" Hydrocad Report has been included showing that the post-development peak rates of discharge are less than the pre-development conditions for that analysis as well.

The following is a summary of pre- and post-construction rates of runoff:

RETURN PERIOD	EXISTING CONDITIONS (CFS)				PROPOSED CONDITIONS (CFS)			
	1A TRIB. TO NORTH- ERLY CB	1B TRIB. TO SOUTH- ERLY CB	2S TRIB. TO S.E.	3S TRIB. TO S.W.	1A TRIB TO NORTH- ERLY CB	1B SUM TO SOUTH- ERLY CB	2P TRIB. TO S.E.	3P TRIB. TO S.W
2YR	0.49	0.03	0.00	0.00	0.14	0.00	0.00	0.00
10YR	1.43	0.22	0.00	0.00	0.51	0.08	0.00	0.00
25YR	2.30	0.46	0.00	0.02	0.88	0.25	0.00	0.02
100YR	4.25	1.05	0.05	0.17	1.71	0.82	0.04	0.17

Standard 3 – Groundwater Recharge

Runoff will be infiltrated by the infiltration basin which has been designed a minimum of two feet above seasonal high groundwater. The hydraulic conductivity was based on soil conditions found on the site via soil testing and DEP SMR Table 2.3.3 1982 Rawls Rates

- values developed from Rawls, Brakensiek and Saxton, 1982. The total required groundwater recharge volume was calculated to be $853\pm$ cubic feet. The proposed infiltration basin will provide $5,644\pm$ cubic feet of recharge below the outlet, which exceeds the requisite recharge volume for this project. Refer to Appendix B for infiltration system calculations and Appendix C for recharge volume calculations and soil testing results. Additionally, the groundwater elevation in testhole D-1 is at elevation =61.00 and the bottom of the basin has been designed at elevation=65.00, providing 4 feet of separation, eliminating the need for a groundwater mounding analysis.

Standard 4 – Water Quality

A Long-Term Source Control/Pollution Prevention Plan has been incorporated into the Operation and Maintenance Plan. Refer to Appendix E & F for BMP Operation and Maintenance Plans. The water quality volume was calculated using the 1-inch rule as the site is not within an area of rapid infiltration as defined by the Massachusetts Stormwater Handbook. The total required water quality treatment volume was calculated to be $1,421\pm$ cubic feet. The infiltration system provides $5,644\pm$ c.f. of water quality volume below the outlet. Refer to Appendix C for water quality calculations.

In accordance with the guidelines of the Stormwater Management Policy, the Total Suspended Solids (TSS) Removal was calculated to be 89% for the Infiltration Basin with the inclusion of the sediment forebay. The pretreatment requirement of 44% TSS removal prior to discharge to the infiltration basin has also been met through the use of the second sediment forebay. Runoff from the roof areas (non-metal) would be considered “clean” and would not require any pretreatment. TSS removal calculations are included in Appendix C.

Standard 5 – Land Use with Higher Potential Pollutants Loads (LUHPPL)

The proposed project is not considered a LUHPPL. Not Applicable.

Standard 6 – Critical Areas

The proposed project does not discharge to any critical areas. Not Applicable.

Standard 7 – Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable

The project site is currently developed, and the proposed project consists of razing several existing structures and constructing nine (9) new residential units in two buildings. Portions of the site could be considered redevelopment, but for the purpose of stormwater design, the project was considered new development and has been designed to be in compliance with the stormwater standards.

Standard 8 – Construction Period Pollutions Prevention and Erosion and Sedimentation Control

Silt socks will be placed at the limit of work as erosion control barriers prior to commencement of any construction activity. A Construction Operation and Maintenance Plan and Construction Pollution Prevention Plan have been provided. Refer to the construction detail plan for erosion control details and the BMP Operation and Maintenance Plans in Appendix E.

Standard 9 – Operation and Maintenance Plan

The Long-Term Source Control/Pollution Prevention Plan and Operation and Maintenance Plan is also provided within Appendix F.

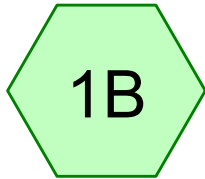
Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on site. Measures to prevent illicit discharges will be included in the Long-Term Source Control/Pollution Prevention Plan.

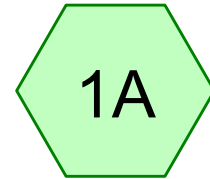
APPENDIX A

Existing Conditions

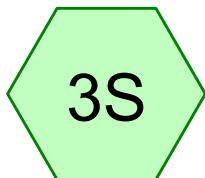
2 (3.35"), 10 (4.95"), 25 (6.19") and 100 (8.68") year return storms



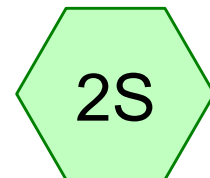
TRIB TO SOUTHERLY
CB



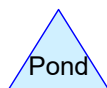
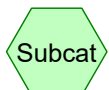
TRIB TO NORTHERLY
CB



TRIB TO SOUTH WEST
OF SITE



TRIB TO SOUTH EAST
OF SITE



Routing Diagram for 21-204 EWS_4-26-22

Prepared by MERRILL ENGINEERS AND LAND SURVEYORS, Printed 4/26/2022
HydroCAD® 10.00-26 s/n 02159 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
541	39	>75% Grass cover, Good, HSG A (1B)
44,912	61	>75% Grass cover, Good, HSG B (1A, 1B)
543	80	>75% Grass cover, Good, HSG D (1A, 1B)
4,603	96	Gravel surface, HSG A (1A)
2,341	98	Paved parking & house/sheds (1A, 1B)
9,060	36	Woods, Fair, HSG A (1A, 1B)
12,204	60	Woods, Fair, HSG B (1A, 1B)
221	79	Woods, Fair, HSG D (1A, 1B)
28,098	30	Woods, Good, HSG A (2S, 3S)
3,347	55	Woods, Good, HSG B (3S)
105,870	53	TOTAL AREA

Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 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 1A: TRIB TO NORTHERLY CB

Runoff Area=54,527 sf 3.84% Impervious Runoff Depth=0.63"
Flow Length=305' Tc=20.7 min CN=64 Runoff=0.49 cfs 2,866 cf

Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff Area=19,898 sf 1.25% Impervious Runoff Depth=0.24"
Flow Length=310' Tc=20.4 min CN=53 Runoff=0.03 cfs 395 cf

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff Area=16,143 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=288' Tc=20.1 min CN=35 Runoff=0.00 cfs 0 cf

Total Runoff Area = 105,870 sf Runoff Volume = 3,260 cf Average Runoff Depth = 0.37"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

Summary for Subcatchment 1A: TRIB TO NORTHERLY CB

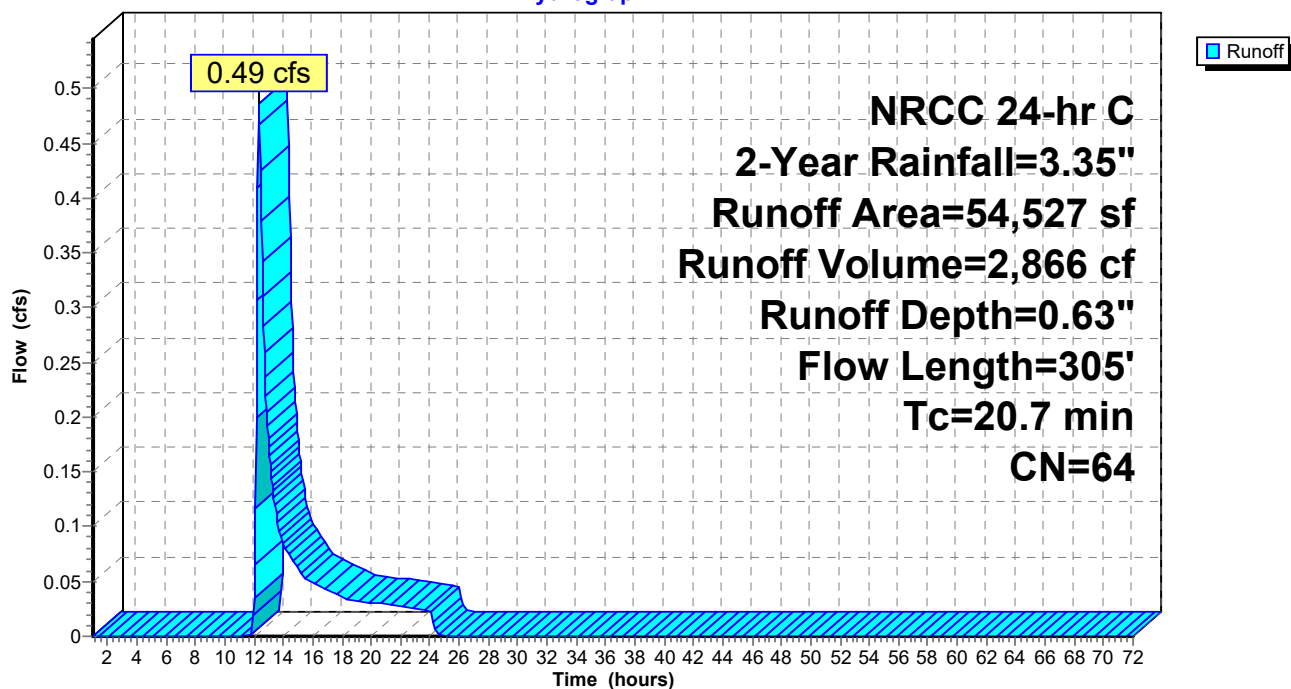
Runoff = 0.49 cfs @ 12.35 hrs, Volume= 2,866 cf, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
* 2,092	98	Paved parking & house/sheds
4,603	96	Gravel surface, HSG A
2,412	36	Woods, Fair, HSG A
37,572	61	>75% Grass cover, Good, HSG B
7,423	60	Woods, Fair, HSG B
286	80	>75% Grass cover, Good, HSG D
139	79	Woods, Fair, HSG D
54,527	64	Weighted Average
52,435		96.16% Pervious Area
2,092		3.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: TRIB TO NORTHERLY CB**Hydrograph**

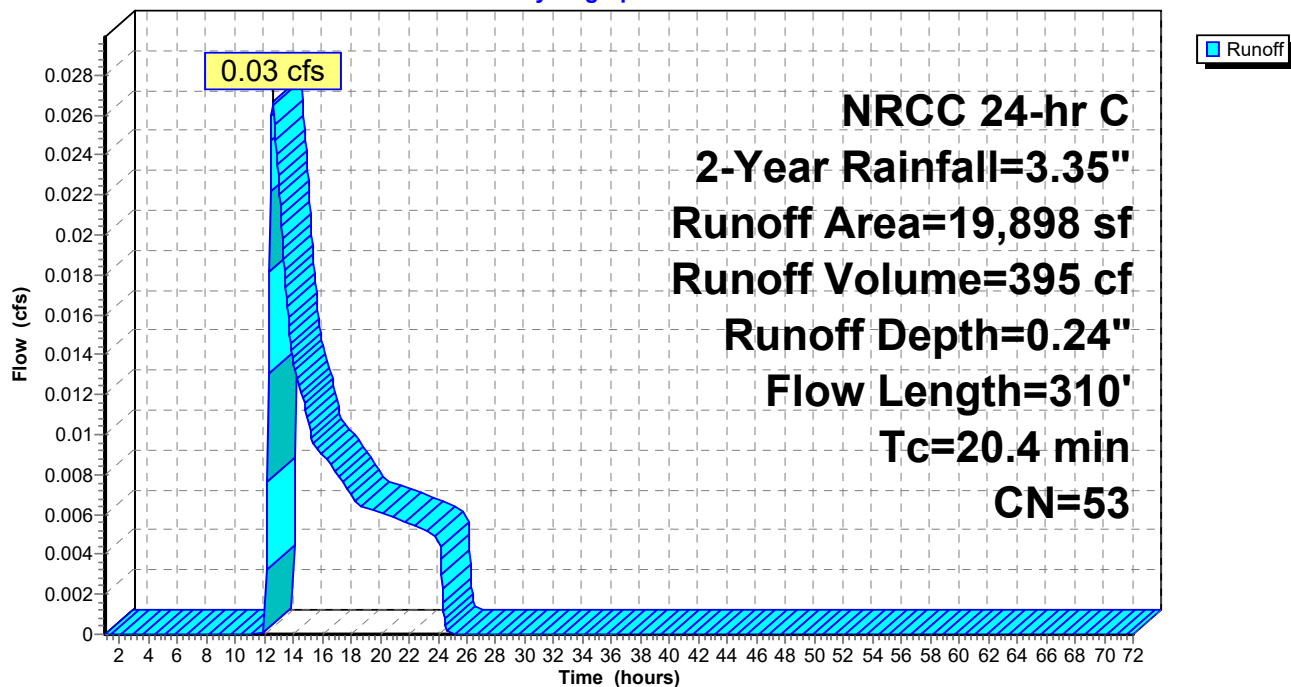
Summary for Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff = 0.03 cfs @ 12.60 hrs, Volume= 395 cf, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
* 249	98	Paved parking & house/sheds
541	39	>75% Grass cover, Good, HSG A
6,648	36	Woods, Fair, HSG A
7,340	61	>75% Grass cover, Good, HSG B
4,781	60	Woods, Fair, HSG B
257	80	>75% Grass cover, Good, HSG D
82	79	Woods, Fair, HSG D
19,898	53	Weighted Average
19,649		98.75% Pervious Area
249		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: TRIB TO SOUTHERLY CB**Hydrograph**

Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

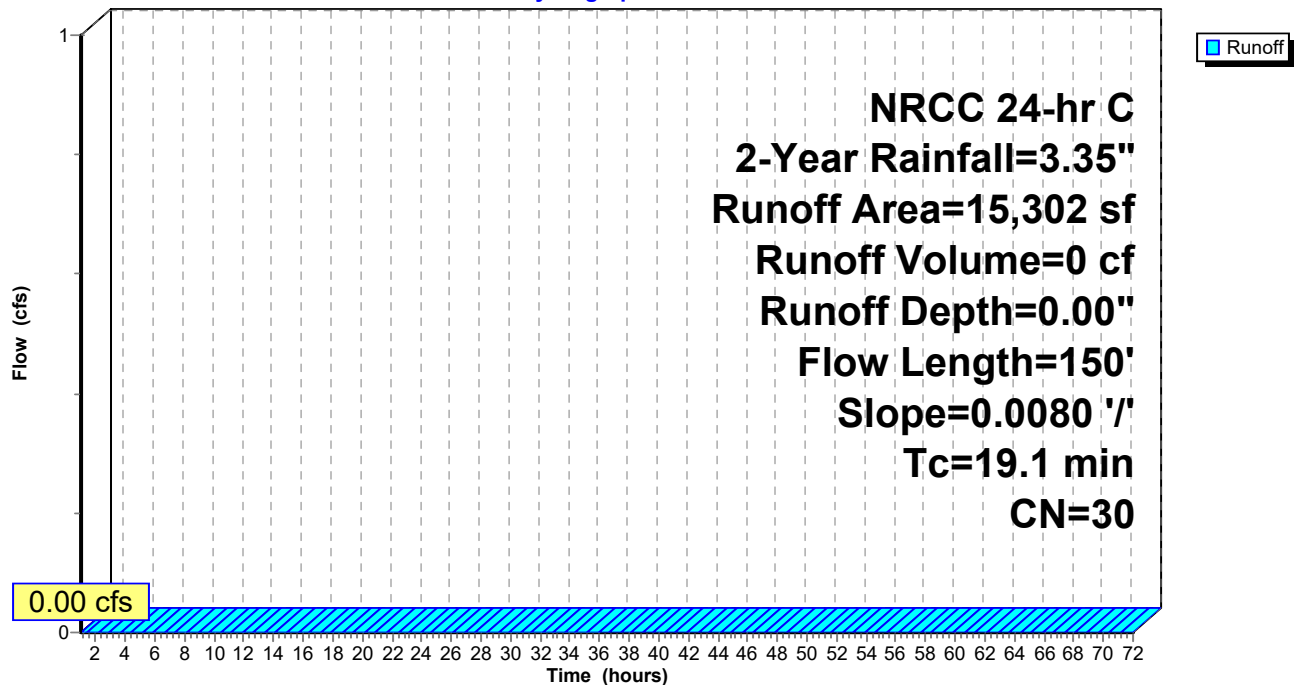
Runoff = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
15,302	30	Woods, Good, HSG A
15,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE**Hydrograph**

Summary for Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

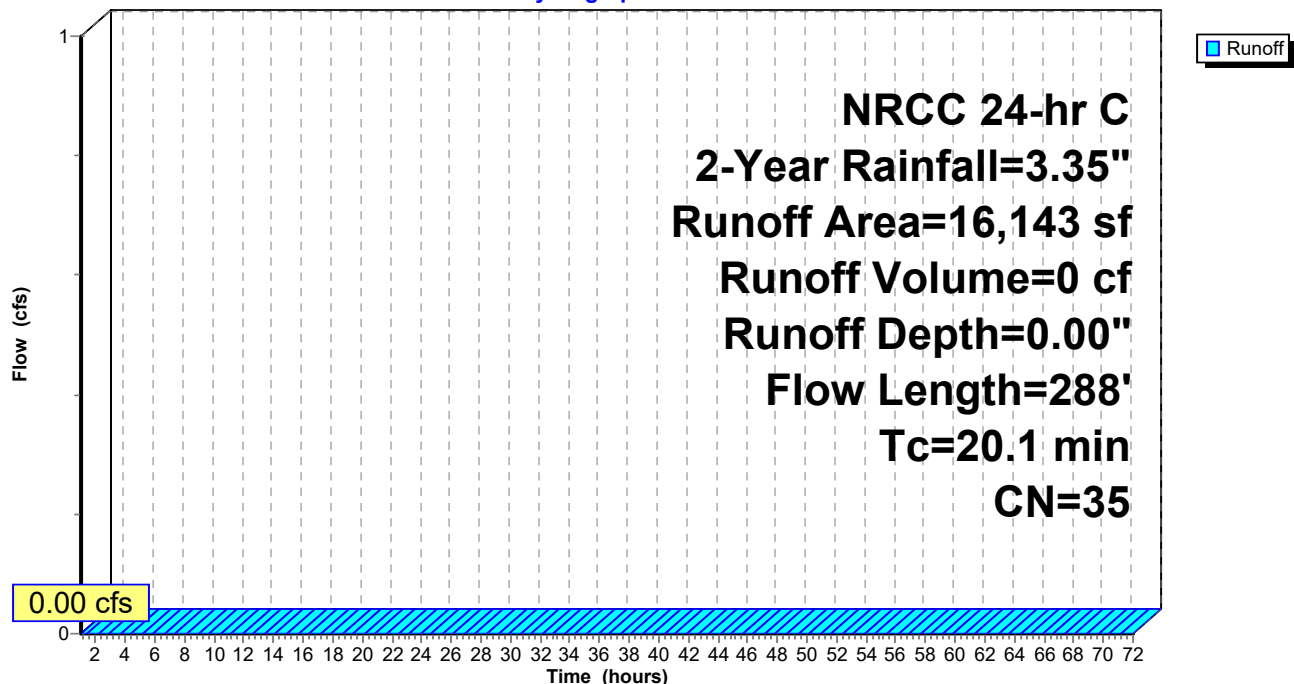
Runoff = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
12,796	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,143	35	Weighted Average
16,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE**Hydrograph**

Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 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 1A: TRIB TO NORTHERLY CB

Runoff Area=54,527 sf 3.84% Impervious Runoff Depth=1.55"
Flow Length=305' Tc=20.7 min CN=64 Runoff=1.43 cfs 7,035 cf

Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff Area=19,898 sf 1.25% Impervious Runoff Depth=0.84"
Flow Length=310' Tc=20.4 min CN=53 Runoff=0.22 cfs 1,389 cf

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.00 cfs 4 cf

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff Area=16,143 sf 0.00% Impervious Runoff Depth=0.08"
Flow Length=288' Tc=20.1 min CN=35 Runoff=0.00 cfs 104 cf

Total Runoff Area = 105,870 sf Runoff Volume = 8,532 cf Average Runoff Depth = 0.97"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

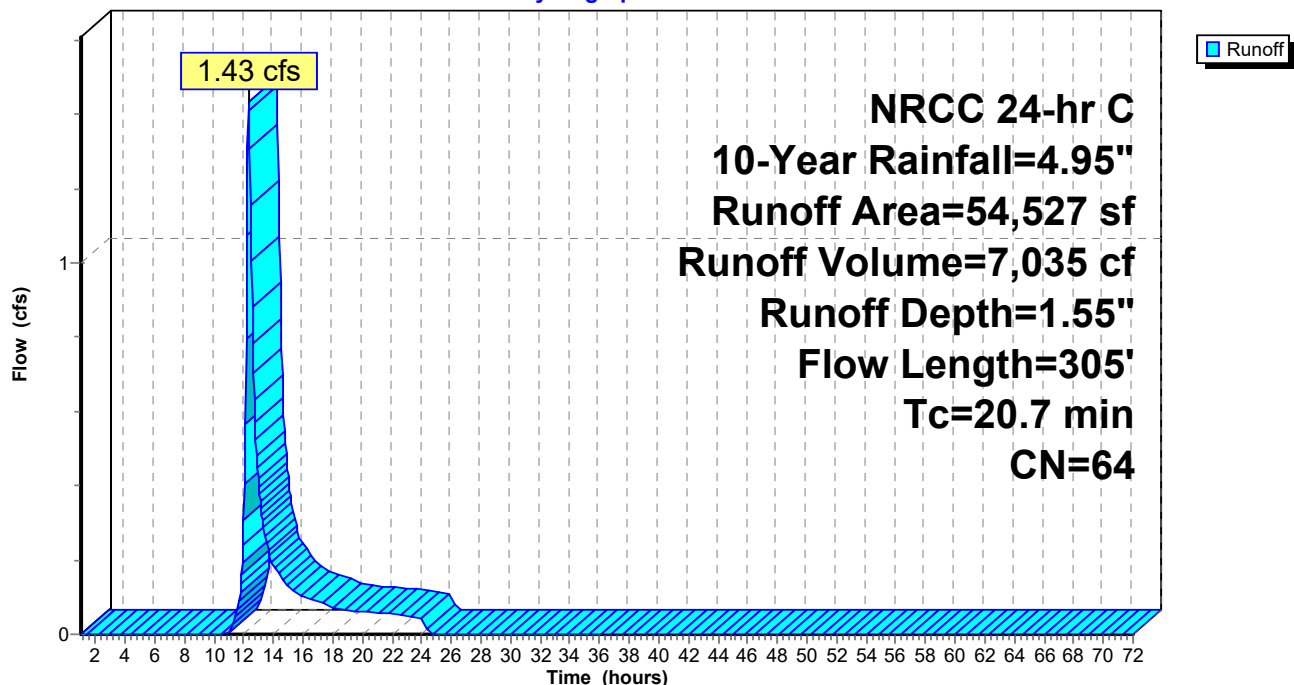
Summary for Subcatchment 1A: TRIB TO NORTHERLY CB

Runoff = 1.43 cfs @ 12.32 hrs, Volume= 7,035 cf, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
* 2,092	98	Paved parking & house/sheds
4,603	96	Gravel surface, HSG A
2,412	36	Woods, Fair, HSG A
37,572	61	>75% Grass cover, Good, HSG B
7,423	60	Woods, Fair, HSG B
286	80	>75% Grass cover, Good, HSG D
139	79	Woods, Fair, HSG D
54,527	64	Weighted Average
52,435		96.16% Pervious Area
2,092		3.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: TRIB TO NORTHERLY CB**Hydrograph**

Summary for Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff = 0.22 cfs @ 12.35 hrs, Volume= 1,389 cf, Depth= 0.84"

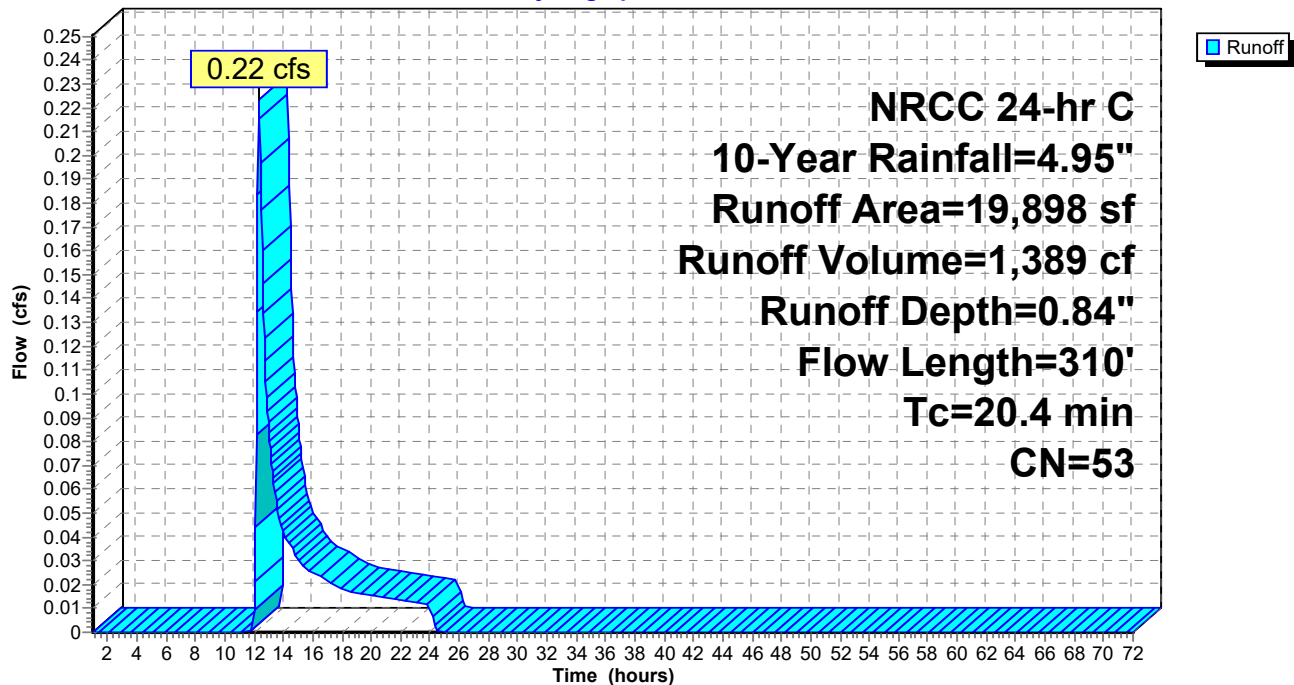
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
* 249	98	Paved parking & house/sheds
541	39	>75% Grass cover, Good, HSG A
6,648	36	Woods, Fair, HSG A
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: TRIB TO SOUTHERLY CB

Hydrograph



Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Runoff = 0.00 cfs @ 24.03 hrs, Volume= 4 cf, Depth= 0.00"

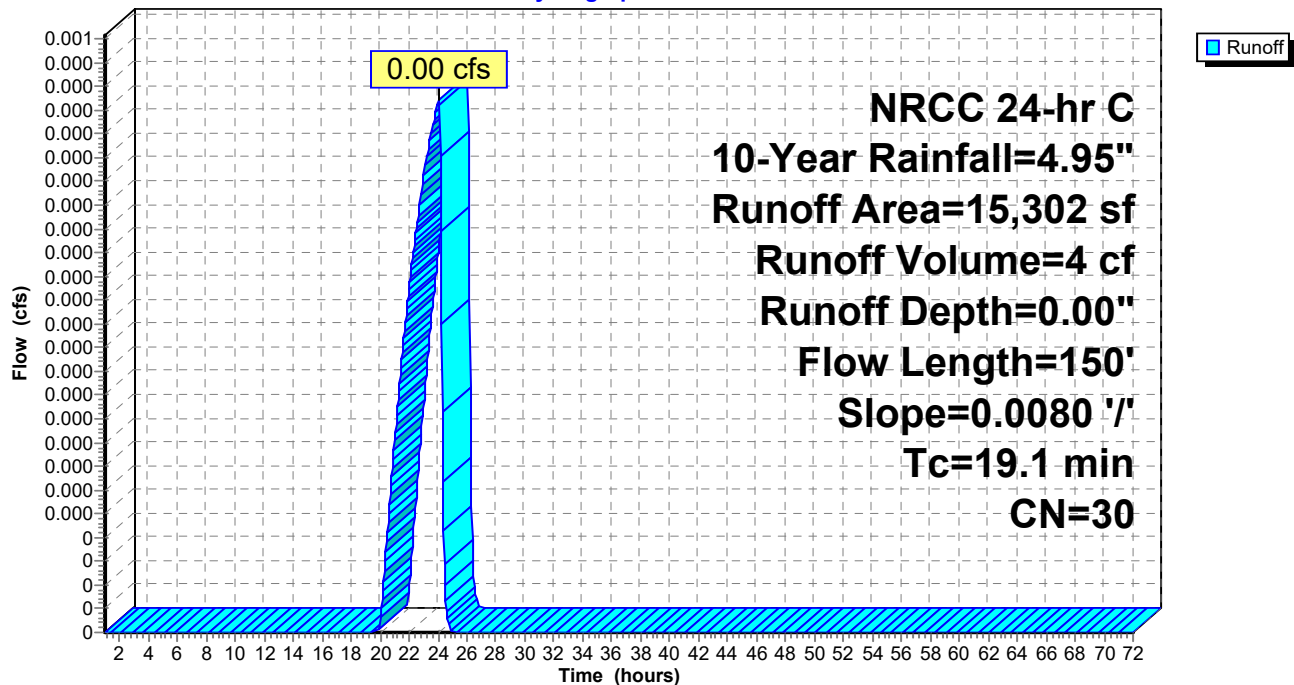
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
15,302	30	Woods, Good, HSG A
15,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Hydrograph



Summary for Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff = 0.00 cfs @ 16.75 hrs, Volume= 104 cf, Depth= 0.08"

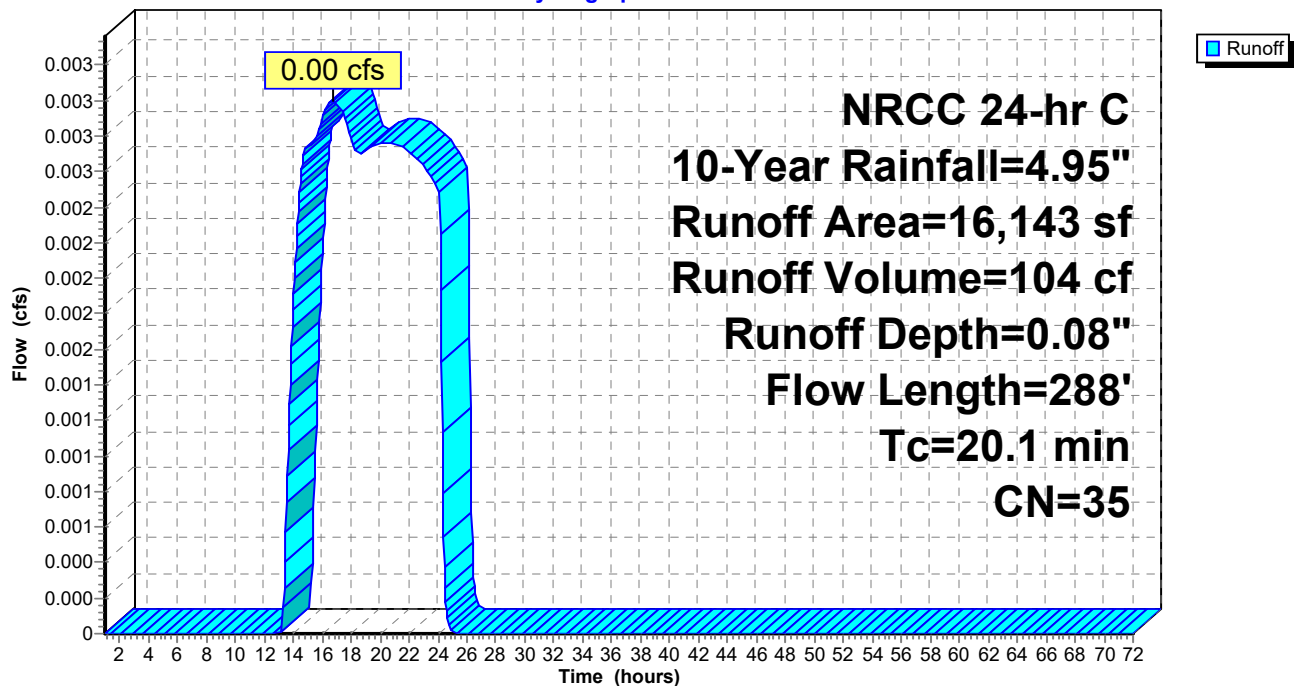
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)		CN	Description		
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16,143		35	Weighted Average		
16,143			100.00% Pervious Area		

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17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Hydrograph



Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 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 1A: TRIB TO NORTHERLY CB

Runoff Area=54,527 sf 3.84% Impervious Runoff Depth=2.40"
Flow Length=305' Tc=20.7 min CN=64 Runoff=2.30 cfs 10,905 cf

Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff Area=19,898 sf 1.25% Impervious Runoff Depth=1.47"
Flow Length=310' Tc=20.4 min CN=53 Runoff=0.46 cfs 2,435 cf

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.00 cfs 119 cf

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff Area=16,143 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=288' Tc=20.1 min CN=35 Runoff=0.02 cfs 392 cf

Total Runoff Area = 105,870 sf Runoff Volume = 13,850 cf Average Runoff Depth = 1.57"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

Summary for Subcatchment 1A: TRIB TO NORTHERLY CB

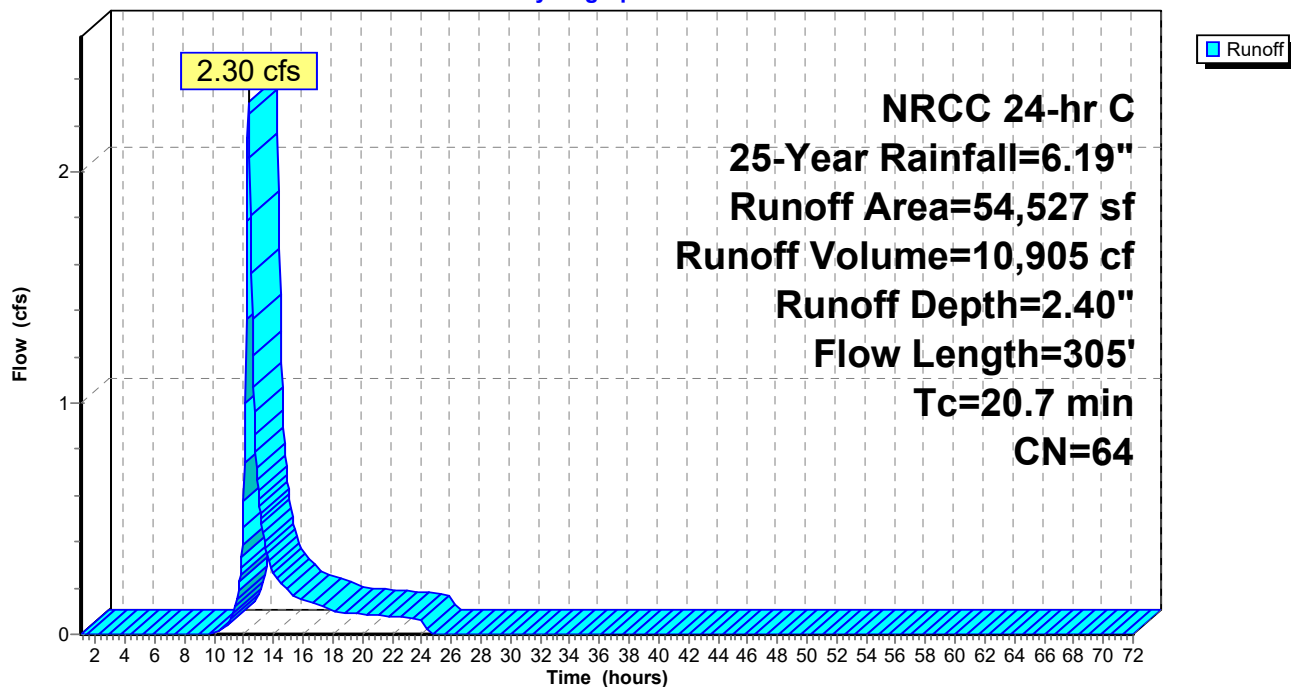
Runoff = 2.30 cfs @ 12.31 hrs, Volume= 10,905 cf, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
* 2,092	98	Paved parking & house/sheds
4,603	96	Gravel surface, HSG A
2,412	36	Woods, Fair, HSG A
37,572	61	>75% Grass cover, Good, HSG B
7,423	60	Woods, Fair, HSG B
286	80	>75% Grass cover, Good, HSG D
139	79	Woods, Fair, HSG D
54,527	64	Weighted Average
52,435		96.16% Pervious Area
2,092		3.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: TRIB TO NORTHERLY CB**Hydrograph**

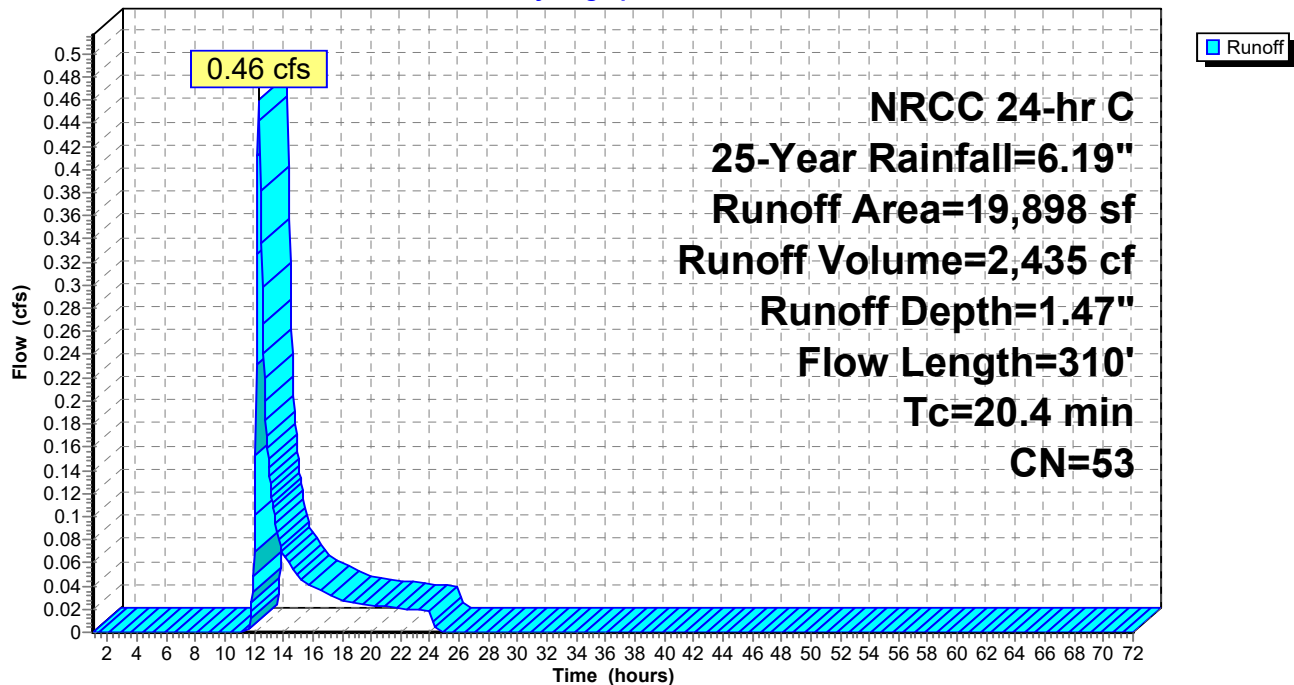
Summary for Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff = 0.46 cfs @ 12.33 hrs, Volume= 2,435 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
* 249	98	Paved parking & house/sheds
541	39	>75% Grass cover, Good, HSG A
6,648	36	Woods, Fair, HSG A
7,340	61	>75% Grass cover, Good, HSG B
4,781	60	Woods, Fair, HSG B
257	80	>75% Grass cover, Good, HSG D
82	79	Woods, Fair, HSG D
19,898	53	Weighted Average
19,649		98.75% Pervious Area
249		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: TRIB TO SOUTHERLY CB**Hydrograph**

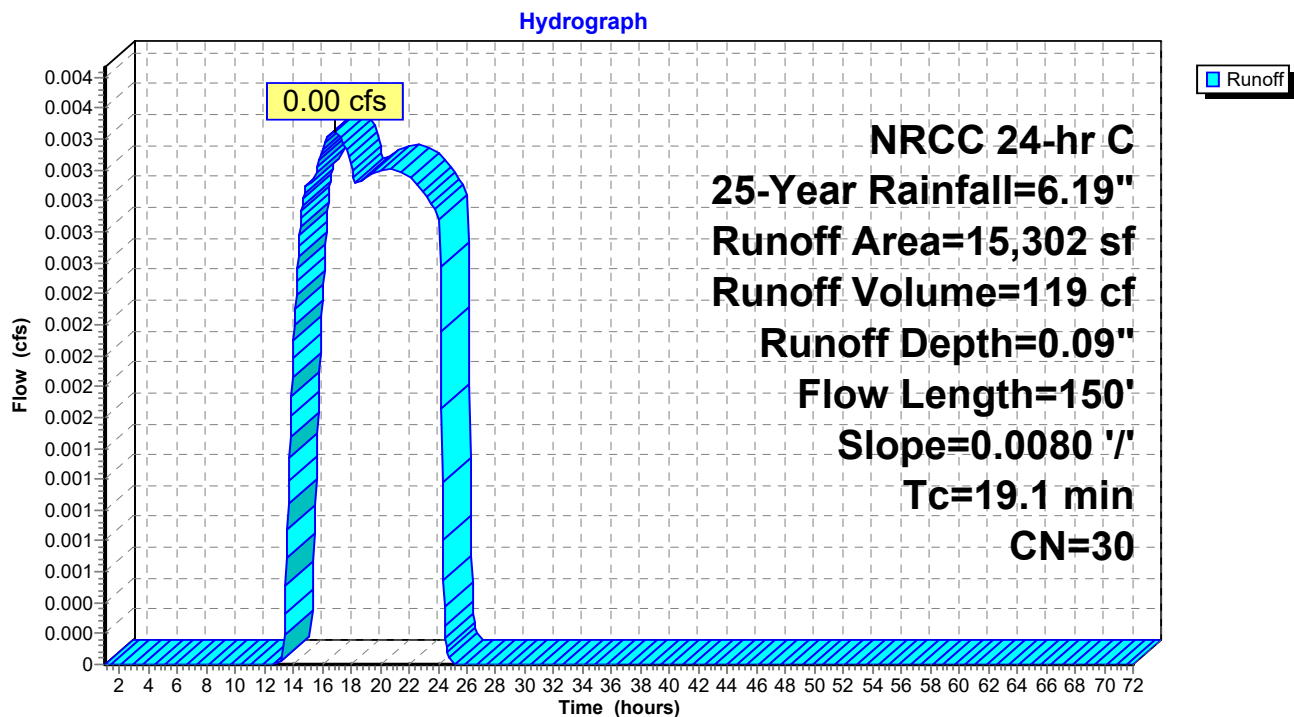
Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Runoff = 0.00 cfs @ 16.83 hrs, Volume= 119 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)		CN	Description		
15,302		30	Woods, Good, HSG A		
15,302		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		
19.1	150	Total			Shallow Concentrated Flow, Unpaved Kv= 16.1 fps

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE



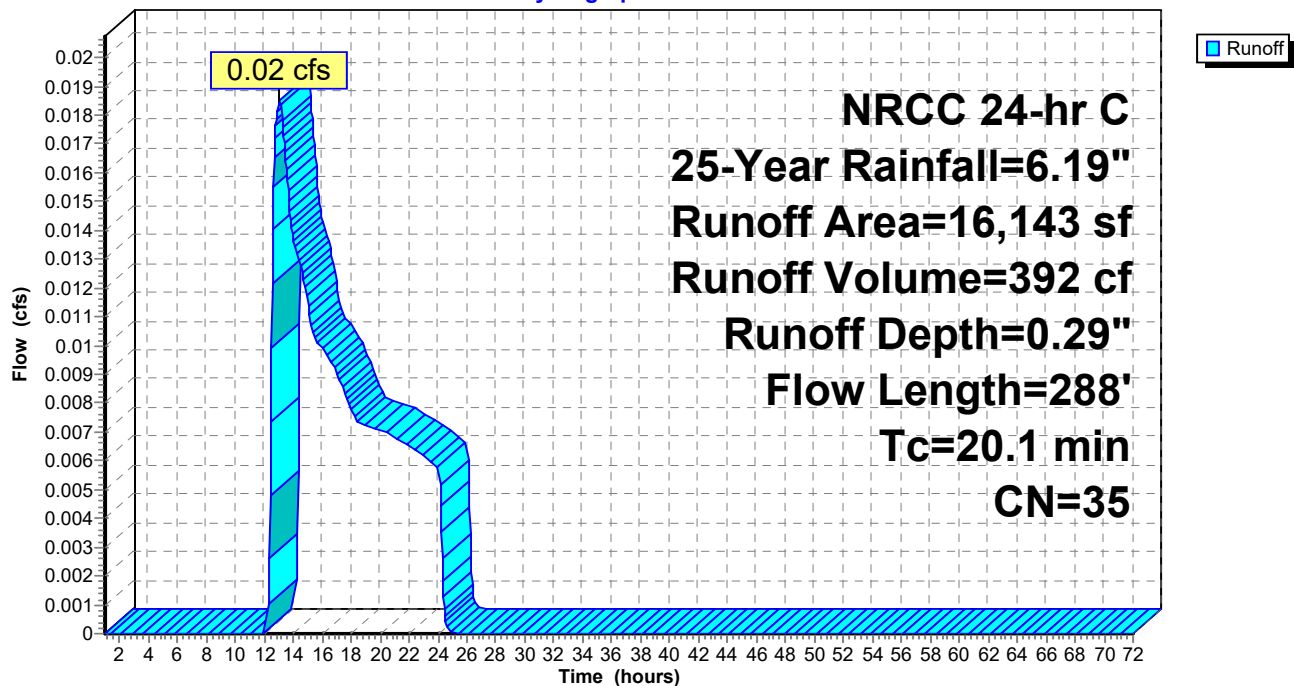
Summary for Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff = 0.02 cfs @ 13.05 hrs, Volume= 392 cf, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
12,796	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,143	35	Weighted Average
16,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE**Hydrograph**

Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 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 1A: TRIB TO NORTHERLY CB

Runoff Area=54,527 sf 3.84% Impervious Runoff Depth=4.33"
Flow Length=305' Tc=20.7 min CN=64 Runoff=4.25 cfs 19,678 cf

Subcatchment 1B: TRIB TO SOUTHERLY CB

Runoff Area=19,898 sf 1.25% Impervious Runoff Depth=3.02"
Flow Length=310' Tc=20.4 min CN=53 Runoff=1.05 cfs 5,014 cf

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=0.59"
Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.05 cfs 751 cf

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff Area=16,143 sf 0.00% Impervious Runoff Depth=1.05"
Flow Length=288' Tc=20.1 min CN=35 Runoff=0.17 cfs 1,409 cf

Total Runoff Area = 105,870 sf Runoff Volume = 26,852 cf Average Runoff Depth = 3.04"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

Summary for Subcatchment 1A: TRIB TO NORTHERLY CB

Runoff = 4.25 cfs @ 12.31 hrs, Volume= 19,678 cf, Depth= 4.33"

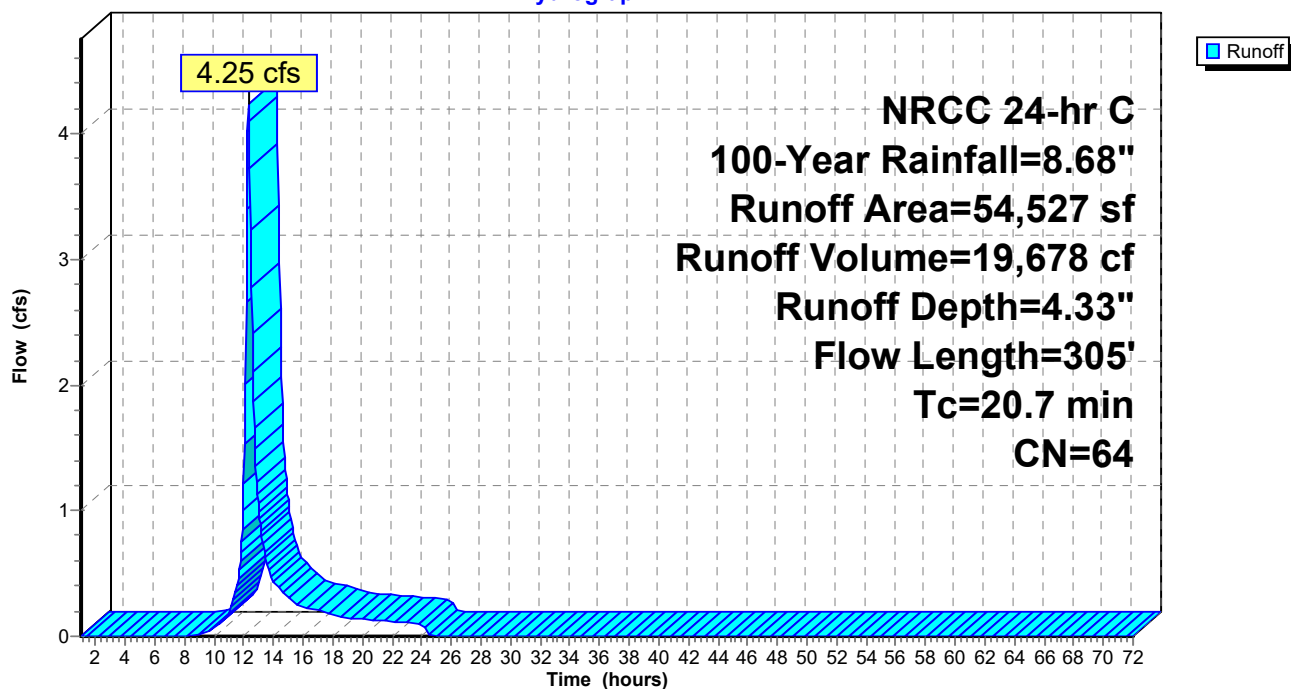
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
* 2,092	98	Paved parking & house/sheds
4,603	96	Gravel surface, HSG A
2,412	36	Woods, Fair, HSG A
37,572	61	>75% Grass cover, Good, HSG B
7,423	60	Woods, Fair, HSG B
286	80	>75% Grass cover, Good, HSG D
139	79	Woods, Fair, HSG D
54,527	64	Weighted Average
52,435		96.16% Pervious Area
2,092		3.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: TRIB TO NORTHERLY CB

Hydrograph



Summary for Subcatchment 1B: TRIB TO SOUTHERLY CB

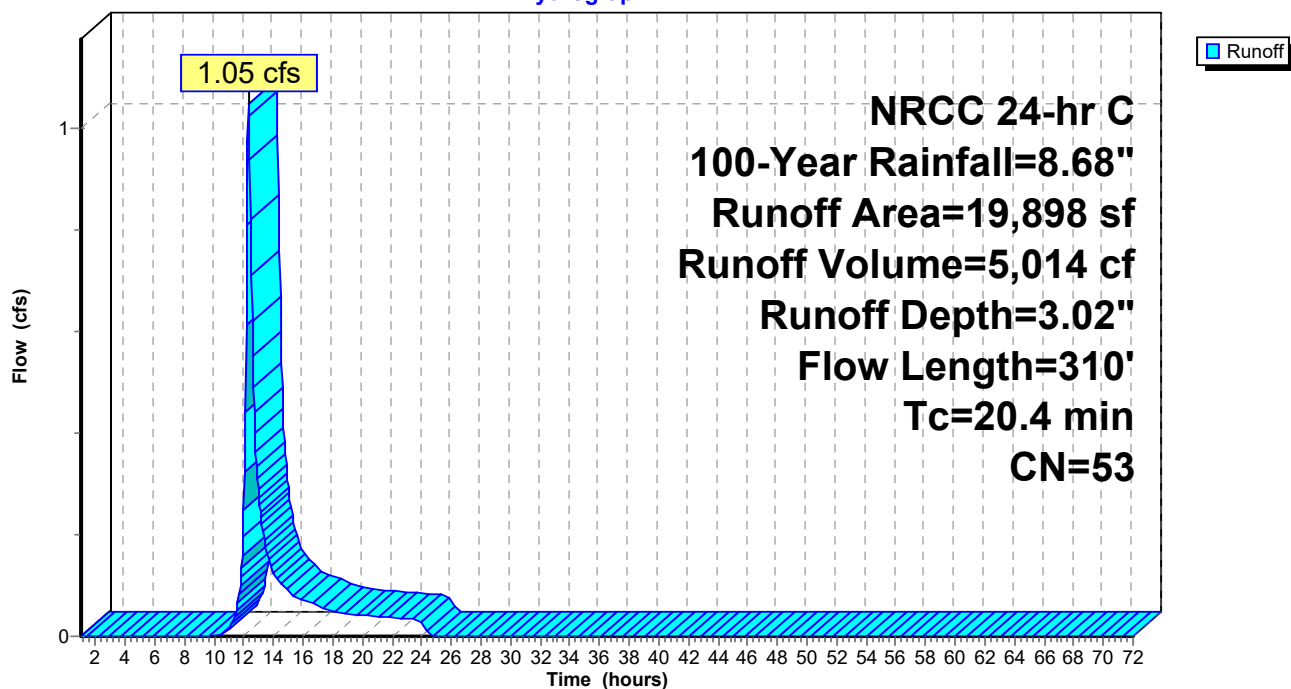
Runoff = 1.05 cfs @ 12.31 hrs, Volume= 5,014 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
* 249	98	Paved parking & house/sheds
541	39	>75% Grass cover, Good, HSG A
6,648	36	Woods, Fair, HSG A
7,340	61	>75% Grass cover, Good, HSG B
4,781	60	Woods, Fair, HSG B
257	80	>75% Grass cover, Good, HSG D
82	79	Woods, Fair, HSG D
19,898	53	Weighted Average
19,649		98.75% Pervious Area
249		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: TRIB TO SOUTHERLY CB**Hydrograph**

Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

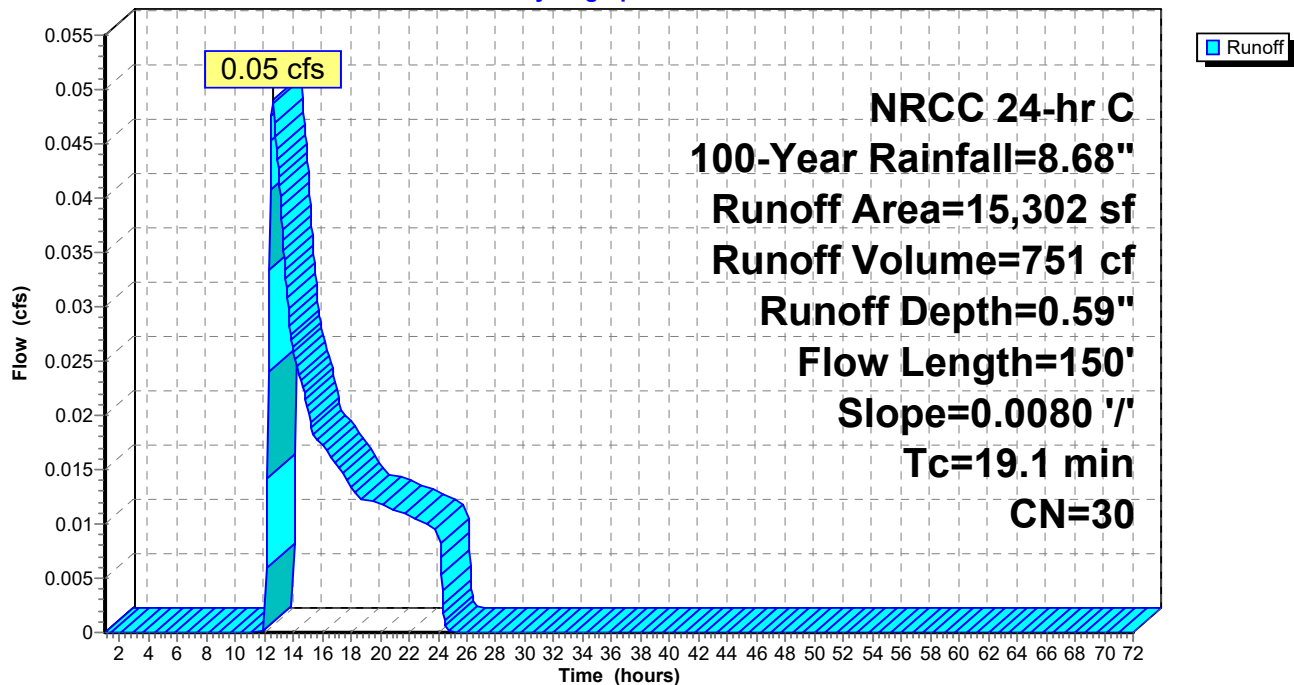
Runoff = 0.05 cfs @ 12.61 hrs, Volume= 751 cf, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
15,302	30	Woods, Good, HSG A
15,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2S: TRIB TO SOUTH EAST OF SITE**Hydrograph**

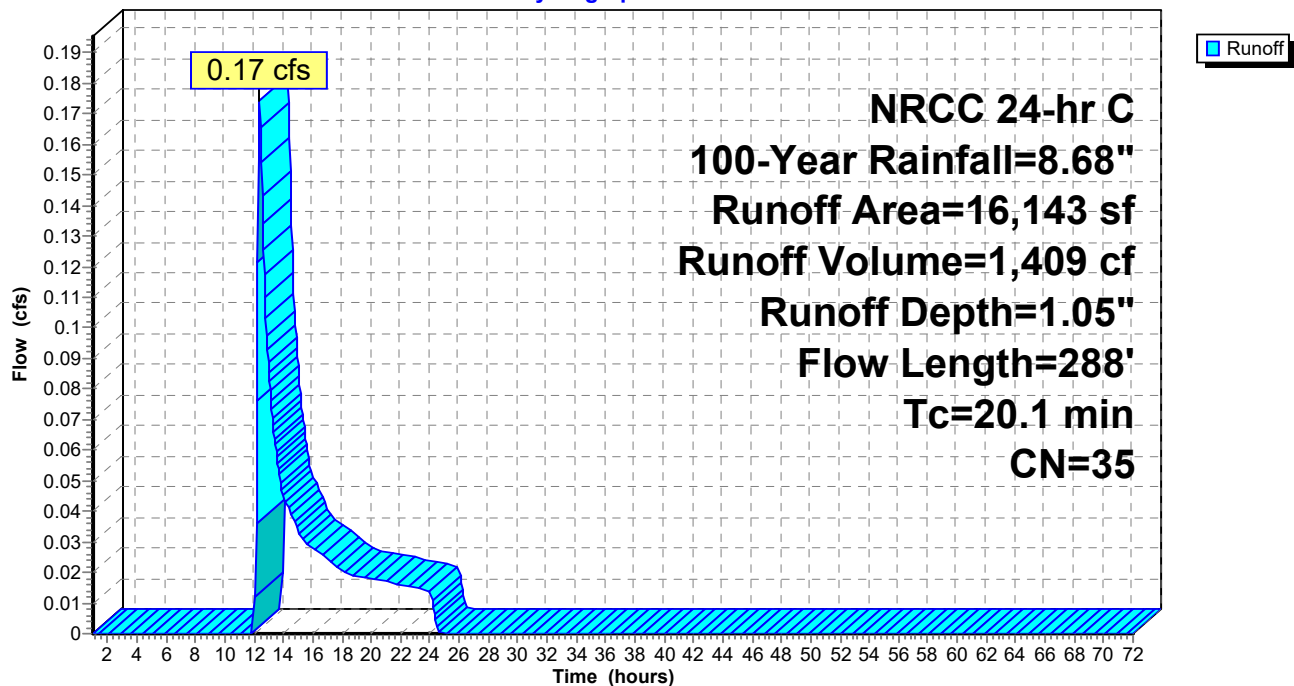
Summary for Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff = 0.17 cfs @ 12.38 hrs, Volume= 1,409 cf, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
12,796	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,143	35	Weighted Average
16,143		100.00% Pervious Area

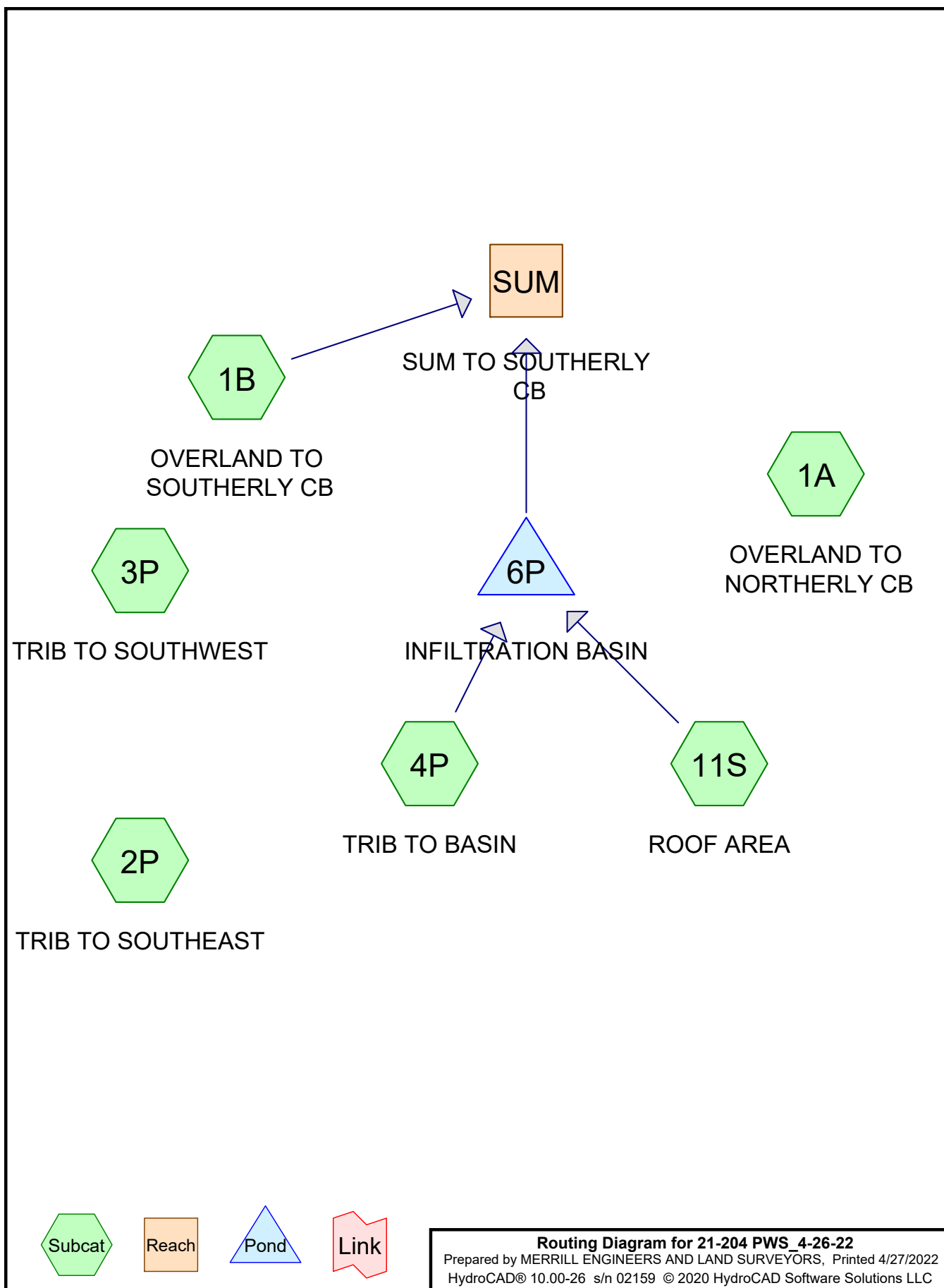
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3S: TRIB TO SOUTH WEST OF SITE**Hydrograph**

APPENDIX B

Proposed Conditions

2 (3.35”), 10 (4.95”), 25 (6.19”) and 100 (8.68”) year return storms



Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,911	39	>75% Grass cover, Good, HSG A (1A, 1B)
29,363	61	>75% Grass cover, Good, HSG B (1A, 1B, 4P)
251	80	>75% Grass cover, Good, HSG D (1B)
1,970	98	Paved parking, HSG A (1A, 1B)
11,654	98	Paved parking, HSG B (4P)
5,400	98	Roofs, HSG A (11S)
33,702	30	Woods, Good, HSG A (1B, 2P, 3P)
20,619	55	Woods, Good, HSG B (1A, 1B, 3P)
105,870	56	TOTAL AREA

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1A: OVERLAND TO NORTHERLY CB

Runoff Area=24,906 sf 4.63% Impervious Runoff Depth=0.47"
 Flow Length=305' Tc=20.7 min CN=60 Runoff=0.14 cfs 972 cf

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff Area=20,791 sf 3.93% Impervious Runoff Depth=0.08"
 Flow Length=310' Tc=20.4 min CN=46 Runoff=0.00 cfs 137 cf

Subcatchment 2P: TRIB TO SOUTHEAST

Runoff Area=13,313 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment 3P: TRIB TO SOUTHWEST

Runoff Area=16,168 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=288' Tc=20.1 min CN=35 Runoff=0.00 cfs 0 cf

Subcatchment 4P: TRIB TO BASIN

Runoff Area=25,292 sf 46.08% Impervious Runoff Depth=1.38"
 Tc=6.0 min CN=78 Runoff=0.98 cfs 2,918 cf

Subcatchment 11S: ROOF AREA

Runoff Area=5,400 sf 100.00% Impervious Runoff Depth=3.12"
 Tc=6.0 min CN=98 Runoff=0.41 cfs 1,403 cf

Reach SUM: SUM TO SOUTHERLY CB

Inflow=0.00 cfs 137 cf
 Outflow=0.00 cfs 137 cf

Pond 6P: INFILTRATION BASIN

Peak Elev=65.35' Storage=1,173 cf Inflow=1.39 cfs 4,320 cf
 Discarded=0.19 cfs 4,322 cf Primary=0.00 cfs 0 cf Outflow=0.19 cfs 4,322 cf

Total Runoff Area = 105,870 sf Runoff Volume = 5,429 cf Average Runoff Depth = 0.62"
82.03% Pervious = 86,846 sf 17.97% Impervious = 19,024 sf

Summary for Subcatchment 1A: OVERLAND TO NORTHERLY CB

Runoff = 0.14 cfs @ 12.37 hrs, Volume= 972 cf, Depth= 0.47"

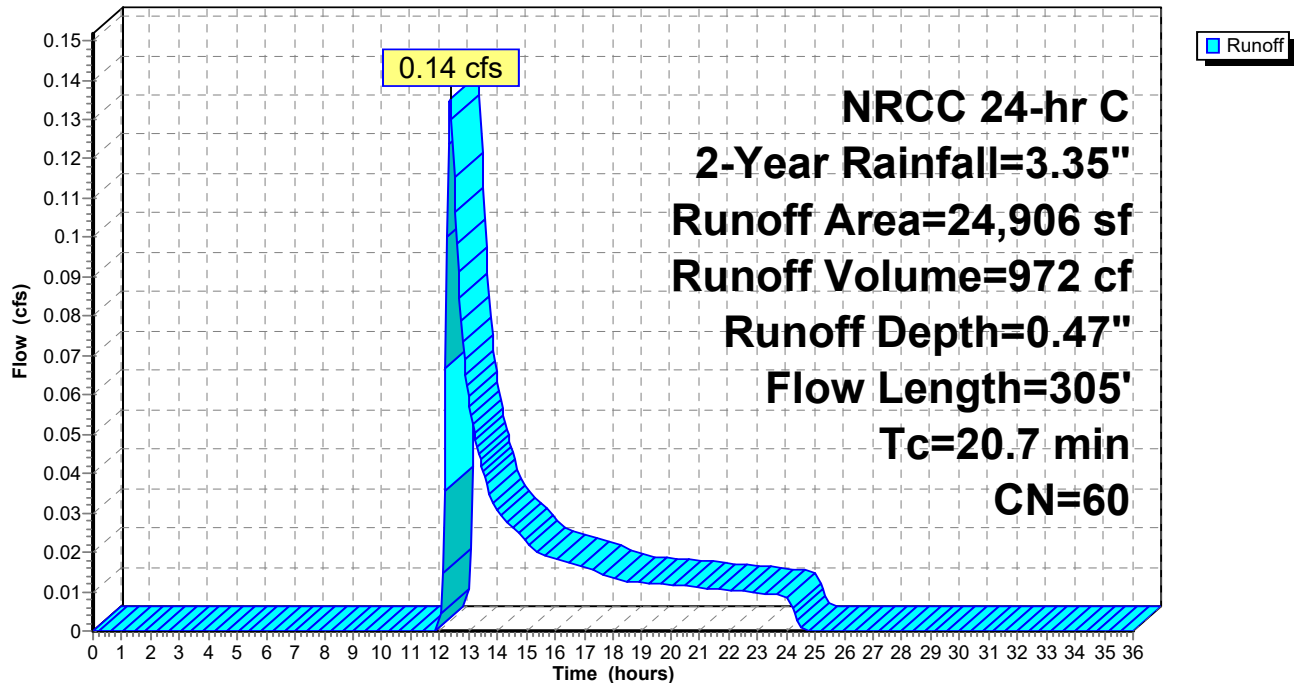
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
1,152	98	Paved parking, HSG A
9,348	55	Woods, Good, HSG B
14,078	61	>75% Grass cover, Good, HSG B
328	39	>75% Grass cover, Good, HSG A
24,906	60	Weighted Average
23,754		95.37% Pervious Area
1,152		4.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: OVERLAND TO NORTHERLY CB

Hydrograph



Summary for Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff = 0.00 cfs @ 14.58 hrs, Volume= 137 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

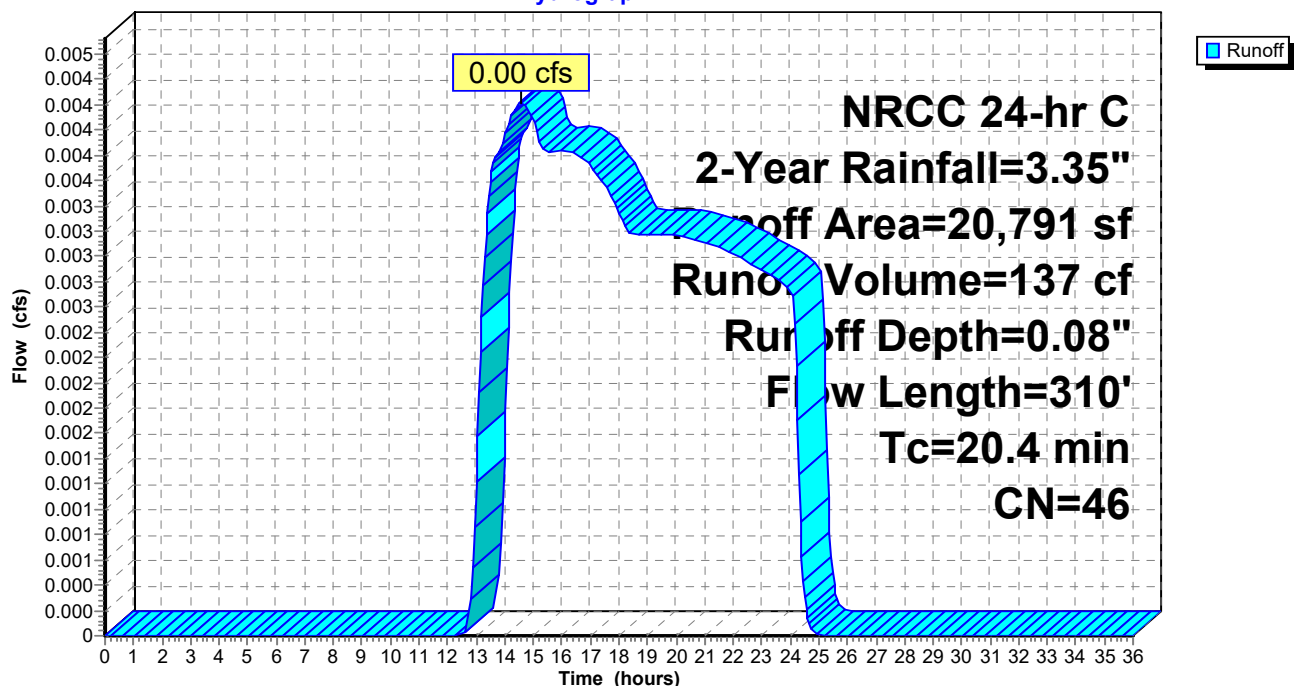
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
7,568	30	Woods, Good, HSG A
7,924	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
1,647	61	>75% Grass cover, Good, HSG B
251	80	>75% Grass cover, Good, HSG D
20,791	46	Weighted Average
19,973		96.07% Pervious Area
818		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Hydrograph



Summary for Subcatchment 2P: TRIB TO SOUTHEAST

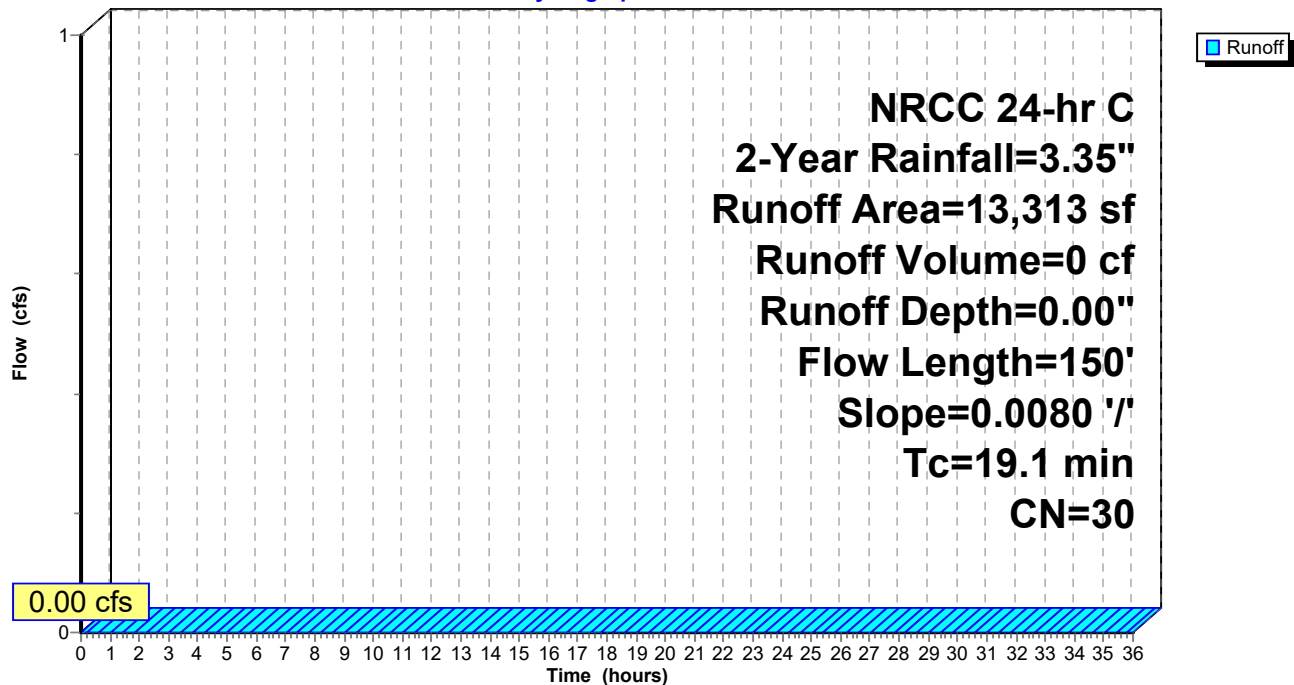
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
13,313	30	Woods, Good, HSG A
13,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2P: TRIB TO SOUTHEAST**Hydrograph**

Summary for Subcatchment 3P: TRIB TO SOUTHWEST

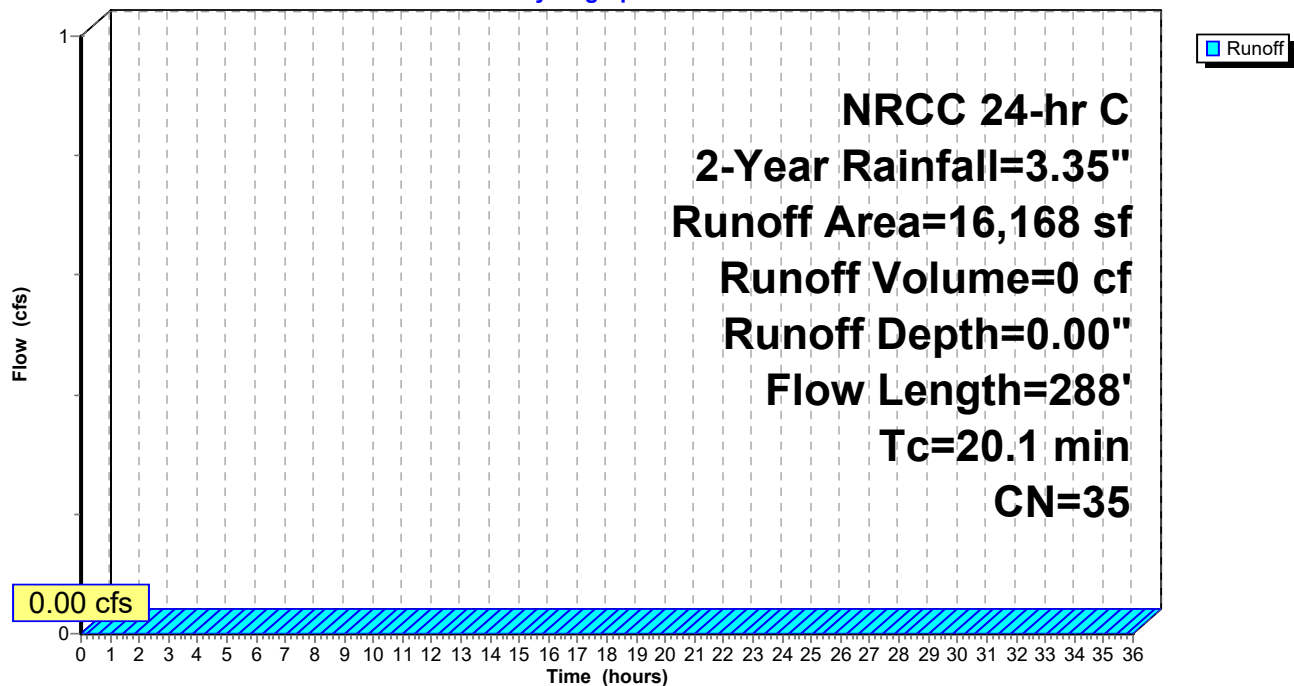
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3P: TRIB TO SOUTHWEST**Hydrograph**

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 0.98 cfs @ 12.13 hrs, Volume= 2,918 cf, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

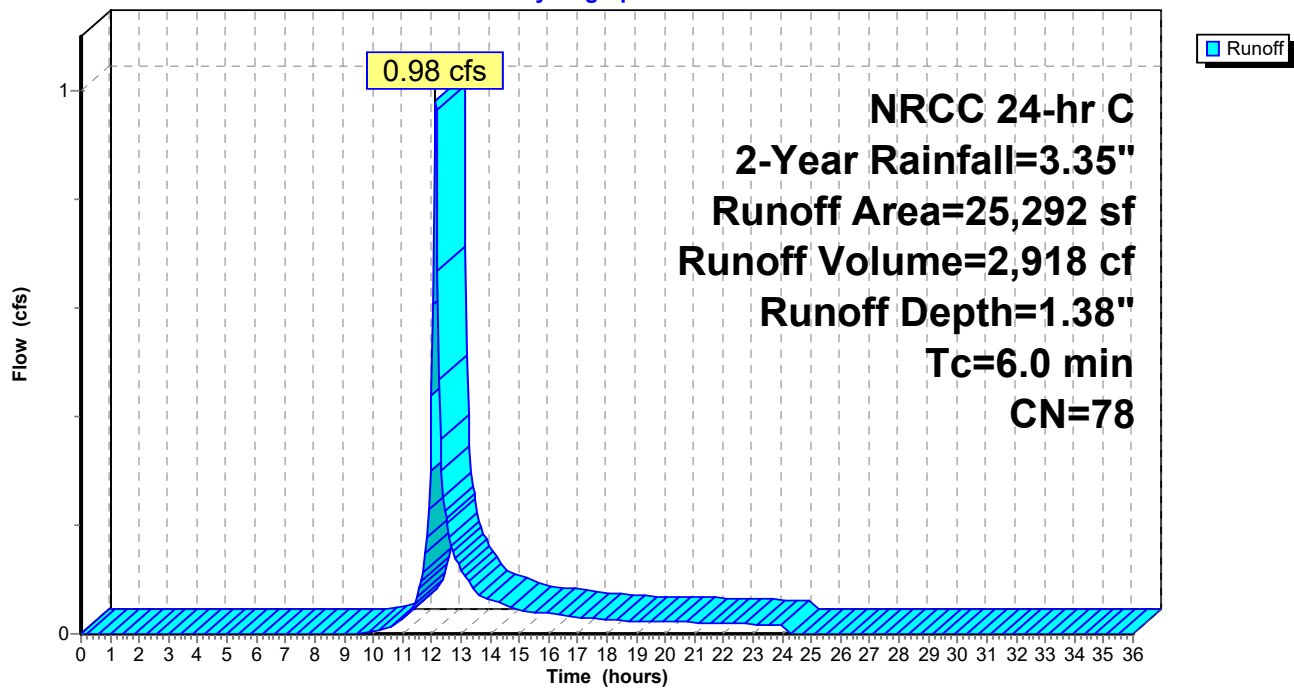
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
11,654	98	Paved parking, HSG B
13,638	61	>75% Grass cover, Good, HSG B
25,292	78	Weighted Average
13,638		53.92% Pervious Area
11,654		46.08% Impervious Area

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

Subcatchment 4P: TRIB TO BASIN

Hydrograph



Summary for Subcatchment 11S: ROOF AREA

Runoff = 0.41 cfs @ 12.13 hrs, Volume= 1,403 cf, Depth= 3.12"

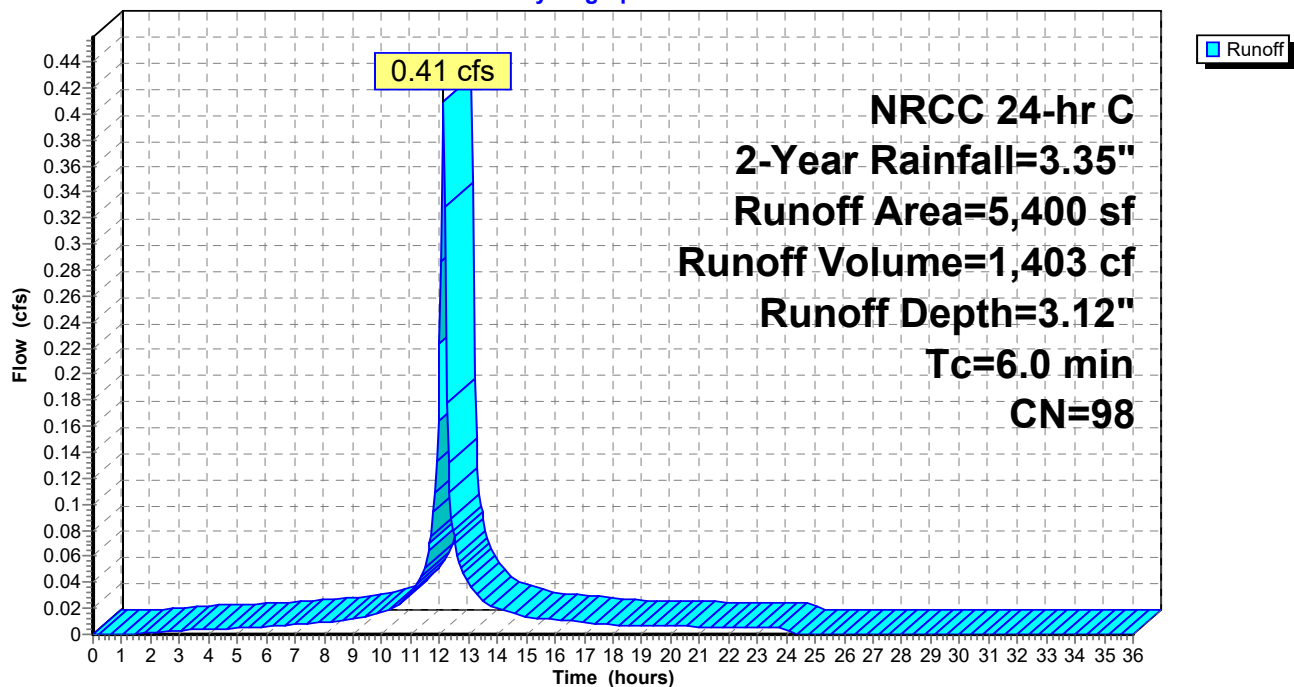
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
5,400	98	Roofs, HSG A
5,400		100.00% Impervious Area

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

Subcatchment 11S: ROOF AREA

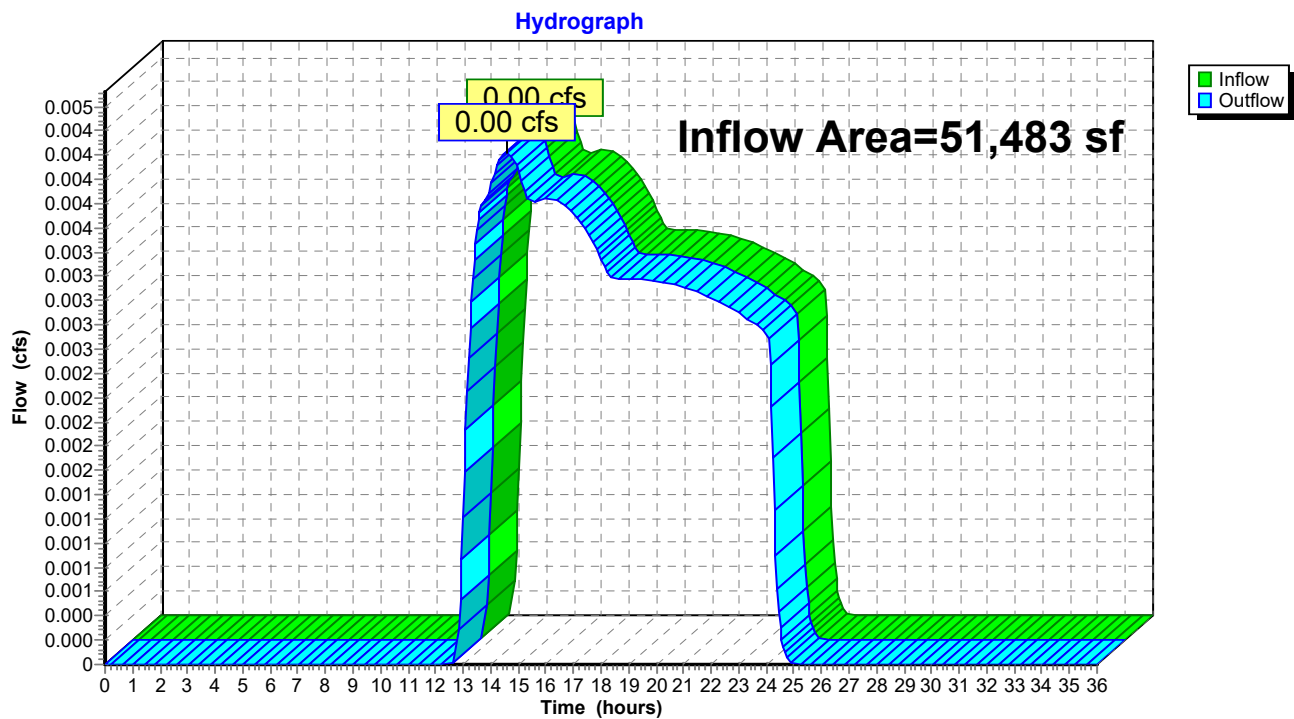
Hydrograph



Summary for Reach SUM: SUM TO SOUTHERLY CB

Inflow Area = 51,483 sf, 34.71% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.00 cfs @ 14.58 hrs, Volume= 137 cf
Outflow = 0.00 cfs @ 14.58 hrs, Volume= 137 cf, Atten= 0%, Lag= 0.0 min

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

Reach SUM: SUM TO SOUTHERLY CB

Summary for Pond 6P: INFILTRATION BASIN

Inflow Area = 30,692 sf, 55.56% Impervious, Inflow Depth = 1.69" for 2-Year event
 Inflow = 1.39 cfs @ 12.13 hrs, Volume= 4,320 cf
 Outflow = 0.19 cfs @ 12.79 hrs, Volume= 4,322 cf, Atten= 86%, Lag= 39.6 min
 Discarded = 0.19 cfs @ 12.79 hrs, Volume= 4,322 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 65.35' @ 12.79 hrs Surf.Area= 3,419 sf Storage= 1,173 cf

Plug-Flow detention time= 41.6 min calculated for 4,316 cf (100% of inflow)

Center-of-Mass det. time= 41.8 min (867.3 - 825.5)

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	7,954 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	3,125	16	16
66.00	3,955	3,540	3,556
67.00	4,841	4,398	7,954

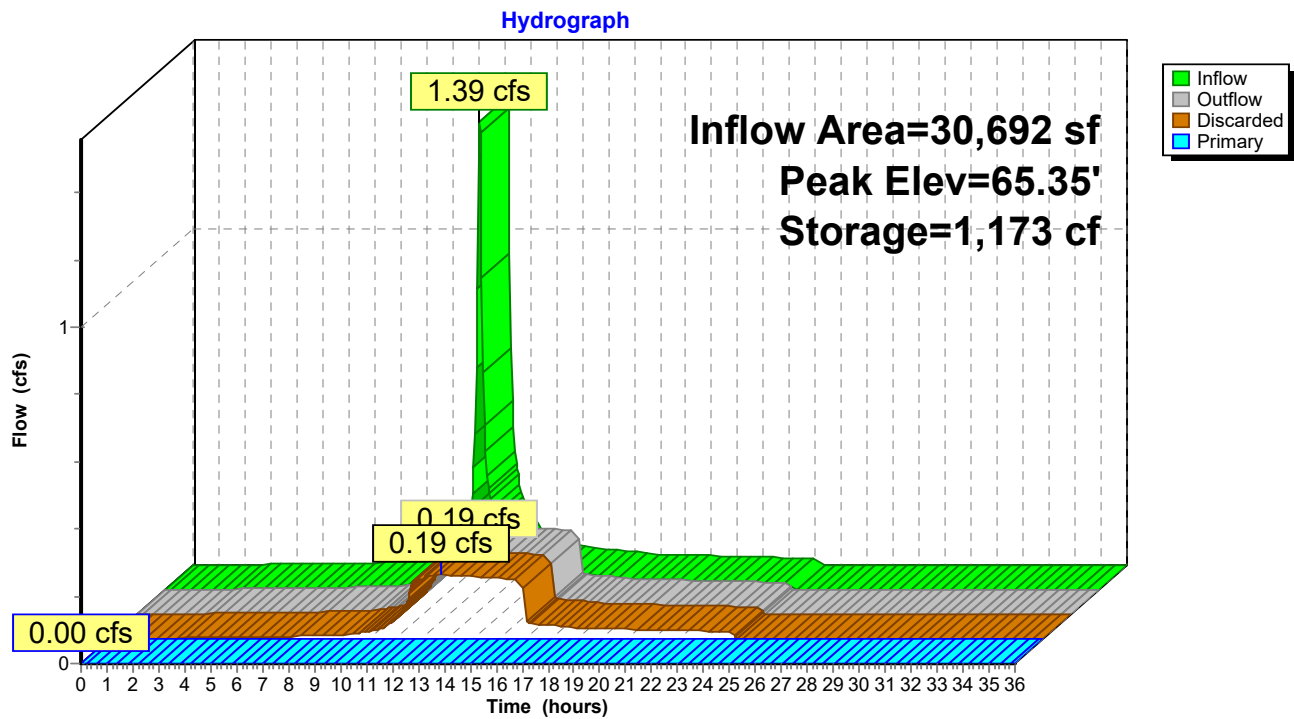
Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	2.410 in/hr Exfiltration over Surface area
#2	Primary	66.70'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.19 cfs @ 12.79 hrs HW=65.35' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.99' (Free Discharge)

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

Pond 6P: INFILTRATION BASIN

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1A: OVERLAND TO NORTHERLY CB

Runoff Area=24,906 sf 4.63% Impervious Runoff Depth=1.27"
 Flow Length=305' Tc=20.7 min CN=60 Runoff=0.51 cfs 2,640 cf

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff Area=20,791 sf 3.93% Impervious Runoff Depth=0.47"
 Flow Length=310' Tc=20.4 min CN=46 Runoff=0.08 cfs 818 cf

Subcatchment 2P: TRIB TO SOUTHEAST

Runoff Area=13,313 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.00 cfs 4 cf

Subcatchment 3P: TRIB TO SOUTHWEST

Runoff Area=16,168 sf 0.00% Impervious Runoff Depth=0.08"
 Flow Length=288' Tc=20.1 min CN=35 Runoff=0.00 cfs 104 cf

Subcatchment 4P: TRIB TO BASIN

Runoff Area=25,292 sf 46.08% Impervious Runoff Depth=2.67"
 Tc=6.0 min CN=78 Runoff=1.90 cfs 5,626 cf

Subcatchment 11S: ROOF AREA

Runoff Area=5,400 sf 100.00% Impervious Runoff Depth=4.71"
 Tc=6.0 min CN=98 Runoff=0.61 cfs 2,121 cf

Reach SUM: SUM TO SOUTHERLY CB

Inflow=0.08 cfs 818 cf
 Outflow=0.08 cfs 818 cf

Pond 6P: INFILTRATION BASIN

Peak Elev=65.82' Storage=2,851 cf Inflow=2.51 cfs 7,747 cf
 Discarded=0.21 cfs 7,750 cf Primary=0.00 cfs 0 cf Outflow=0.21 cfs 7,750 cf

Total Runoff Area = 105,870 sf Runoff Volume = 11,313 cf Average Runoff Depth = 1.28"
82.03% Pervious = 86,846 sf 17.97% Impervious = 19,024 sf

Summary for Subcatchment 1A: OVERLAND TO NORTHERLY CB

Runoff = 0.51 cfs @ 12.33 hrs, Volume= 2,640 cf, Depth= 1.27"

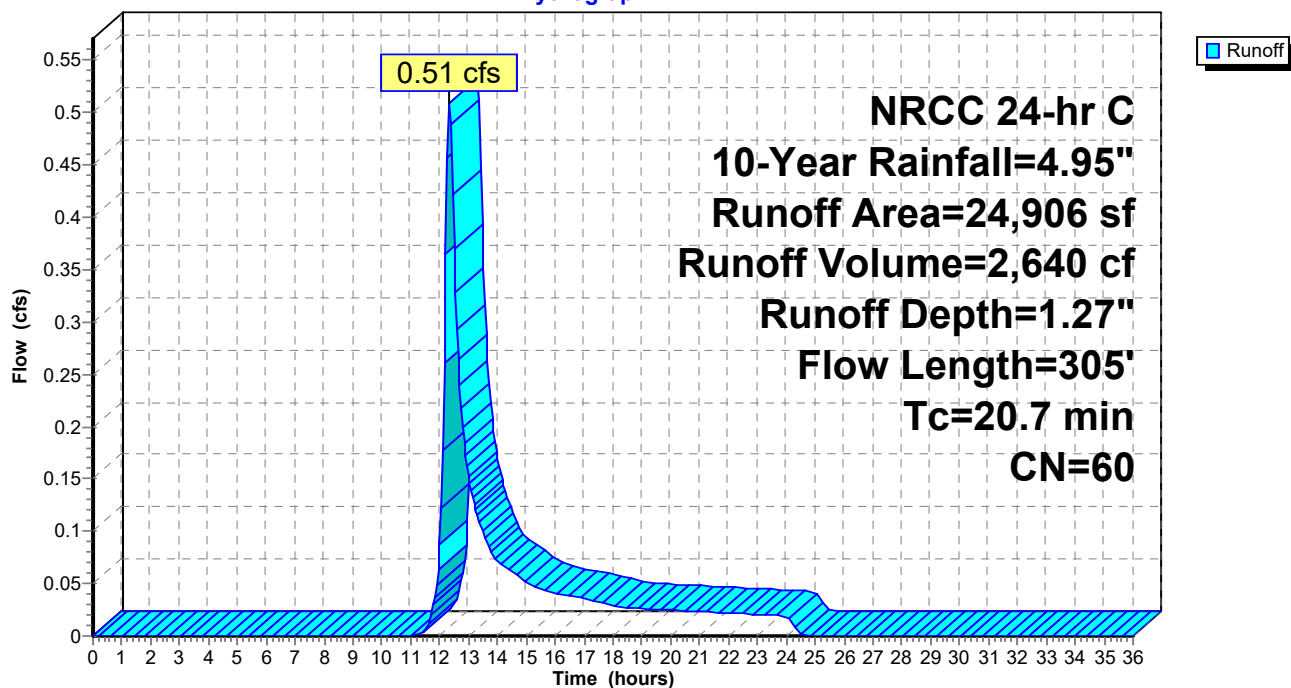
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
1,152	98	Paved parking, HSG A
9,348	55	Woods, Good, HSG B
14,078	61	>75% Grass cover, Good, HSG B
328	39	>75% Grass cover, Good, HSG A
24,906	60	Weighted Average
23,754		95.37% Pervious Area
1,152		4.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: OVERLAND TO NORTHERLY CB

Hydrograph



Summary for Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff = 0.08 cfs @ 12.43 hrs, Volume= 818 cf, Depth= 0.47"

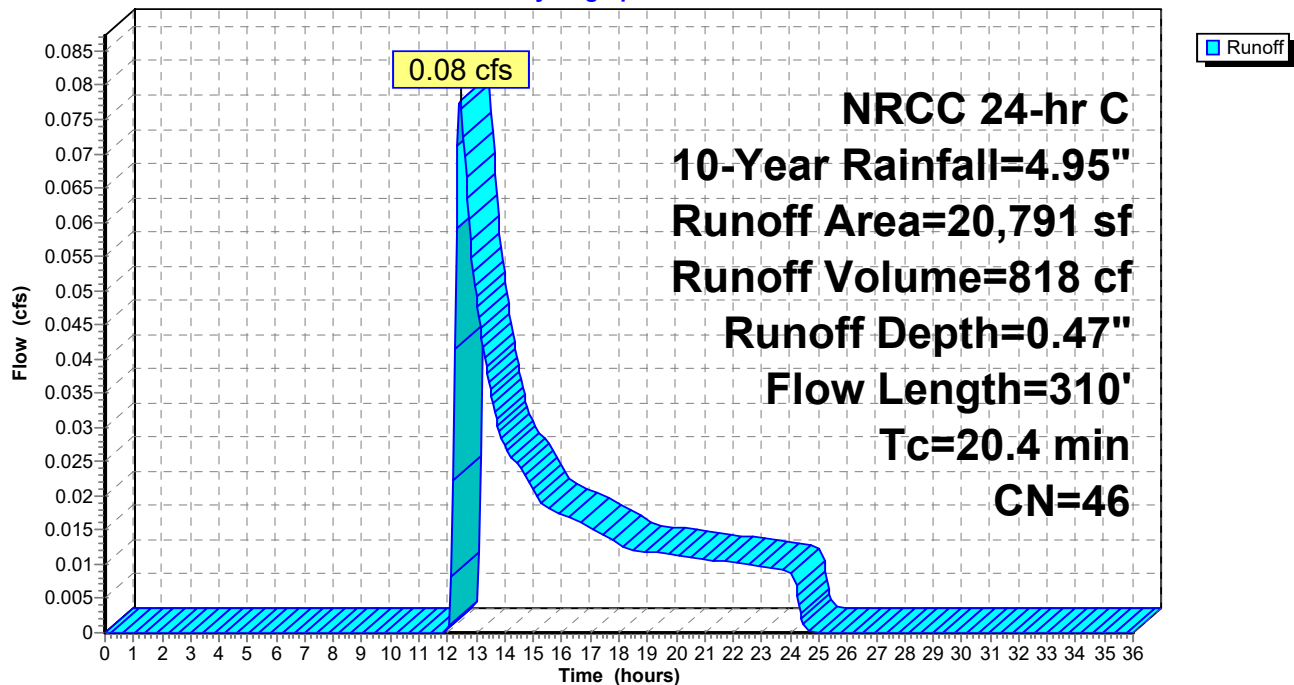
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
7,568	30	Woods, Good, HSG A
7,924	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
1,647	61	>75% Grass cover, Good, HSG B
251	80	>75% Grass cover, Good, HSG D
20,791	46	Weighted Average
19,973		96.07% Pervious Area
818		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Hydrograph



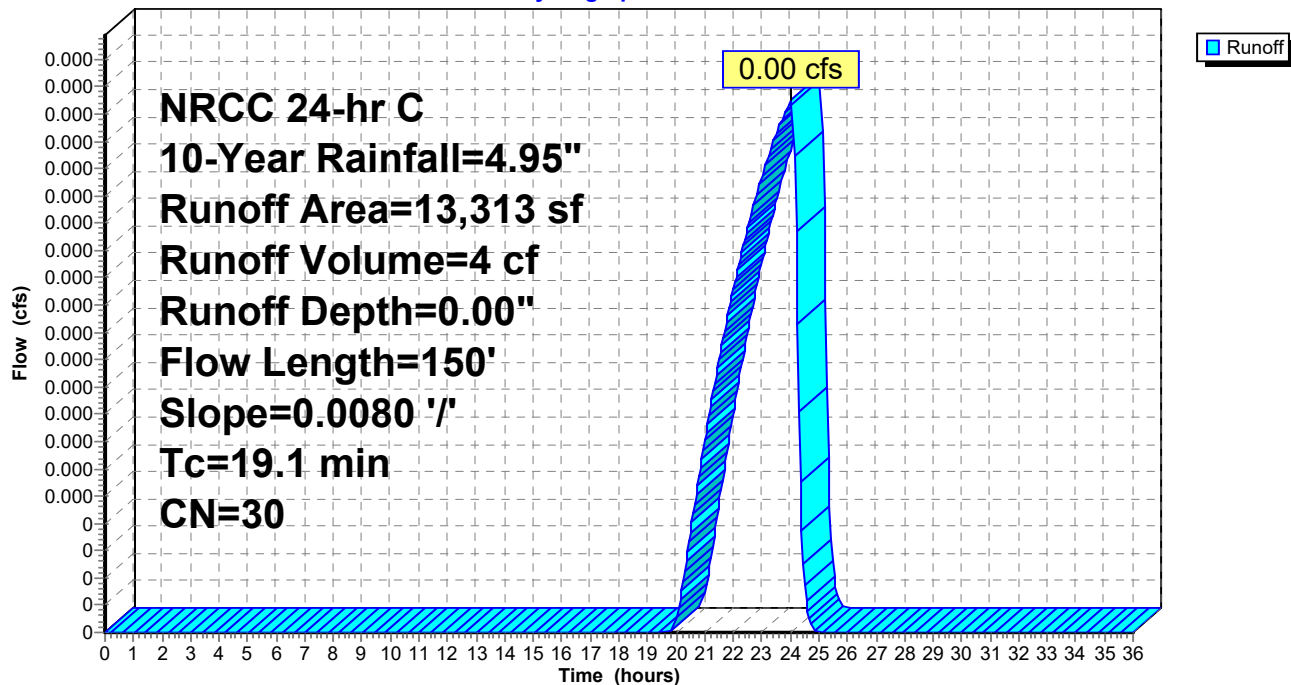
Summary for Subcatchment 2P: TRIB TO SOUTHEAST

Runoff = 0.00 cfs @ 24.03 hrs, Volume= 4 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
13,313	30	Woods, Good, HSG A
13,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2P: TRIB TO SOUTHEAST**Hydrograph**

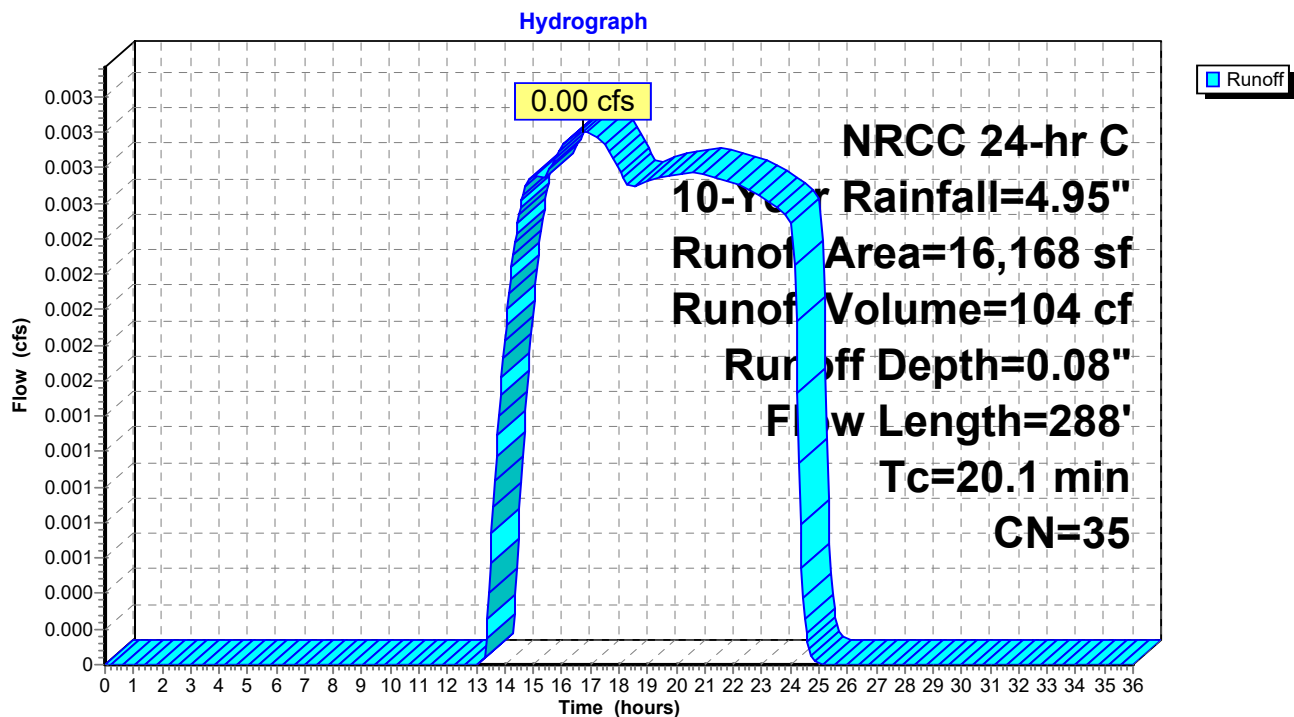
Summary for Subcatchment 3P: TRIB TO SOUTHWEST

Runoff = 0.00 cfs @ 16.75 hrs, Volume= 104 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3P: TRIB TO SOUTHWEST

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 1.90 cfs @ 12.13 hrs, Volume= 5,626 cf, Depth= 2.67"

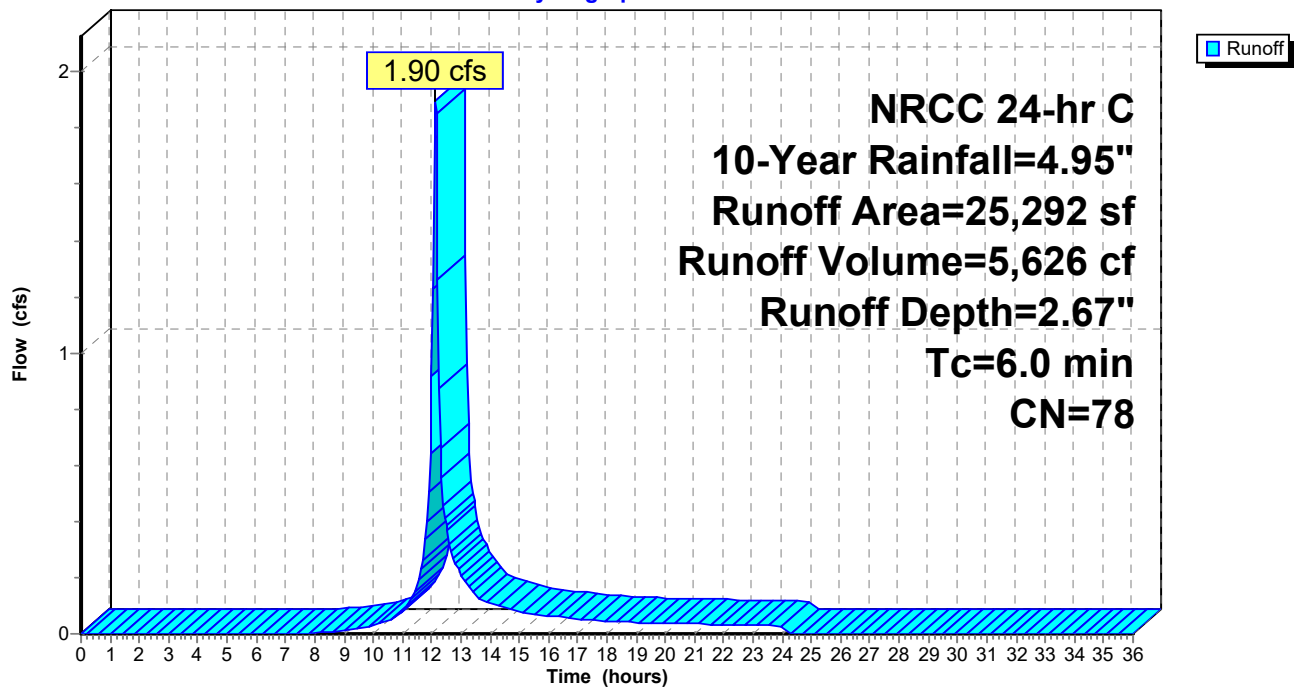
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
11,654	98	Paved parking, HSG B
13,638	61	>75% Grass cover, Good, HSG B
25,292	78	Weighted Average
13,638		53.92% Pervious Area
11,654		46.08% Impervious Area

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

Subcatchment 4P: TRIB TO BASIN

Hydrograph



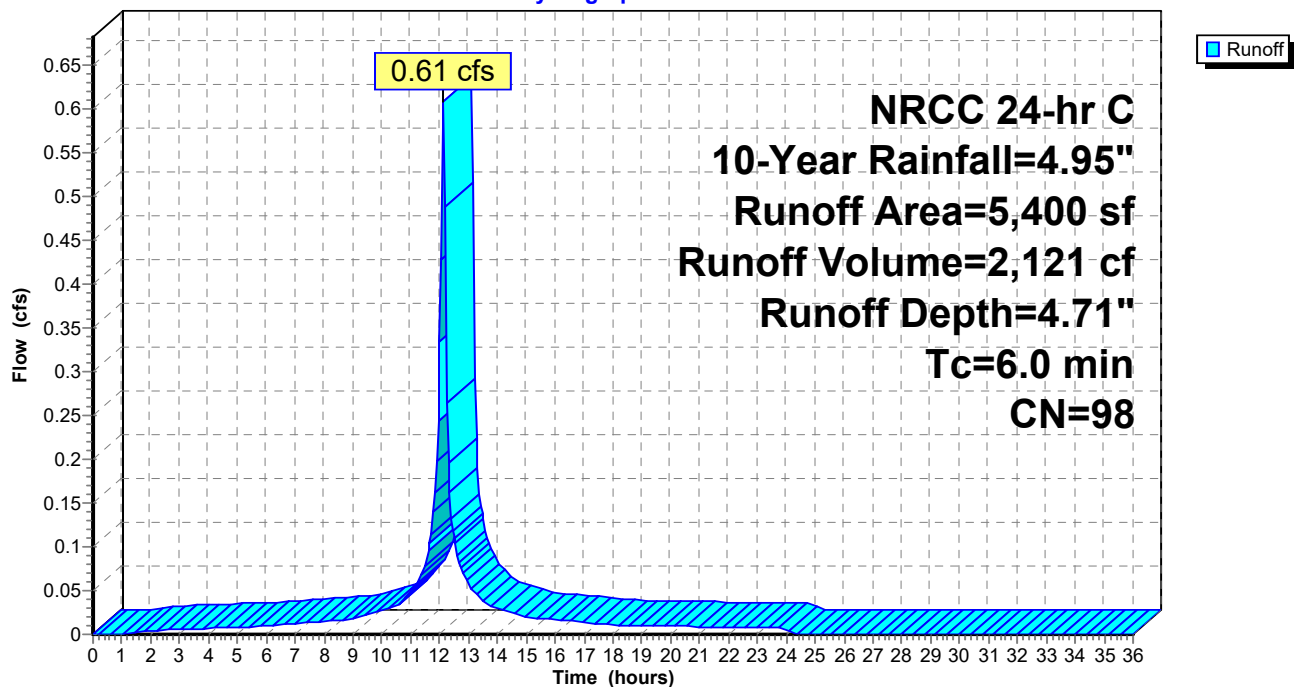
Summary for Subcatchment 11S: ROOF AREA

Runoff = 0.61 cfs @ 12.13 hrs, Volume= 2,121 cf, Depth= 4.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
5,400	98	Roofs, HSG A
5,400		100.00% Impervious Area

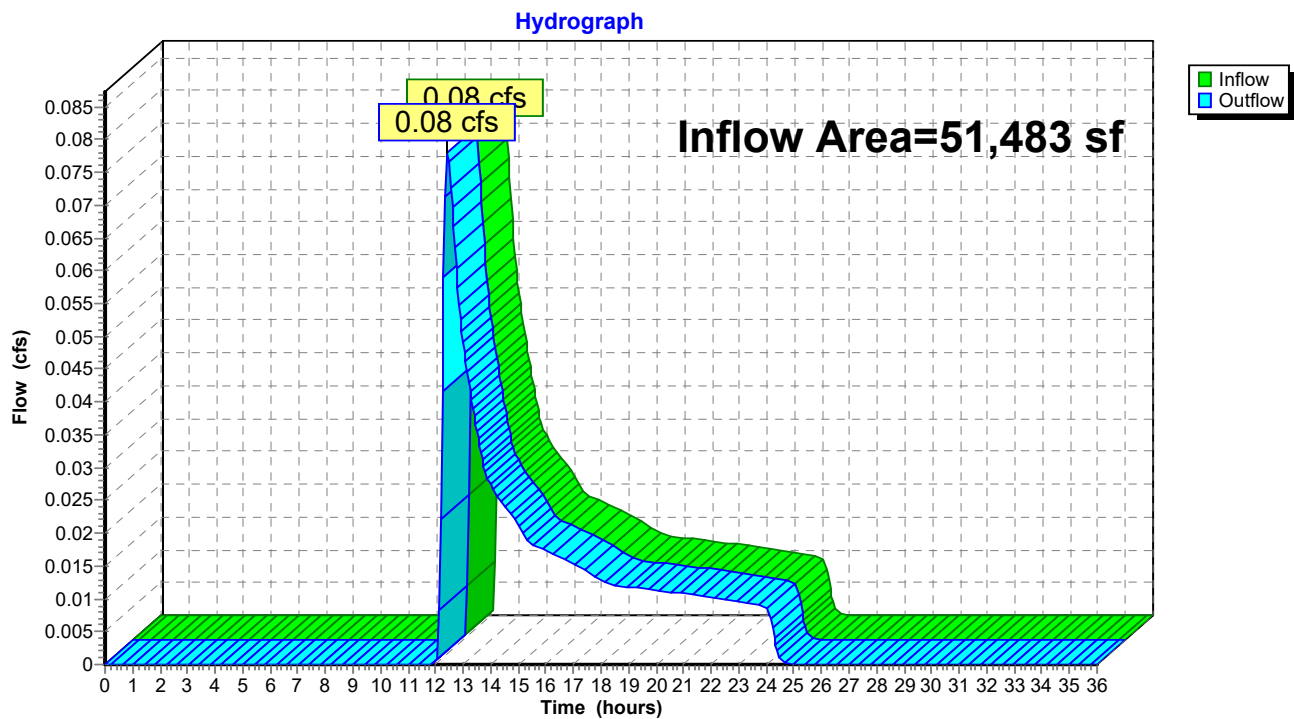
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment 11S: ROOF AREA**Hydrograph**

Summary for Reach SUM: SUM TO SOUTHERLY CB

Inflow Area = 51,483 sf, 34.71% Impervious, Inflow Depth = 0.19" for 10-Year event
Inflow = 0.08 cfs @ 12.43 hrs, Volume= 818 cf
Outflow = 0.08 cfs @ 12.43 hrs, Volume= 818 cf, Atten= 0%, Lag= 0.0 min

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

Reach SUM: SUM TO SOUTHERLY CB

Summary for Pond 6P: INFILTRATION BASIN

Inflow Area = 30,692 sf, 55.56% Impervious, Inflow Depth = 3.03" for 10-Year event
 Inflow = 2.51 cfs @ 12.13 hrs, Volume= 7,747 cf
 Outflow = 0.21 cfs @ 13.28 hrs, Volume= 7,750 cf, Atten= 92%, Lag= 68.9 min
 Discarded = 0.21 cfs @ 13.28 hrs, Volume= 7,750 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 65.82' @ 13.28 hrs Surf.Area= 3,804 sf Storage= 2,851 cf

Plug-Flow detention time= 110.7 min calculated for 7,739 cf (100% of inflow)

Center-of-Mass det. time= 110.7 min (924.0 - 813.2)

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	7,954 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	3,125	16	16
66.00	3,955	3,540	3,556
67.00	4,841	4,398	7,954

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	2.410 in/hr Exfiltration over Surface area
#2	Primary	66.70'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

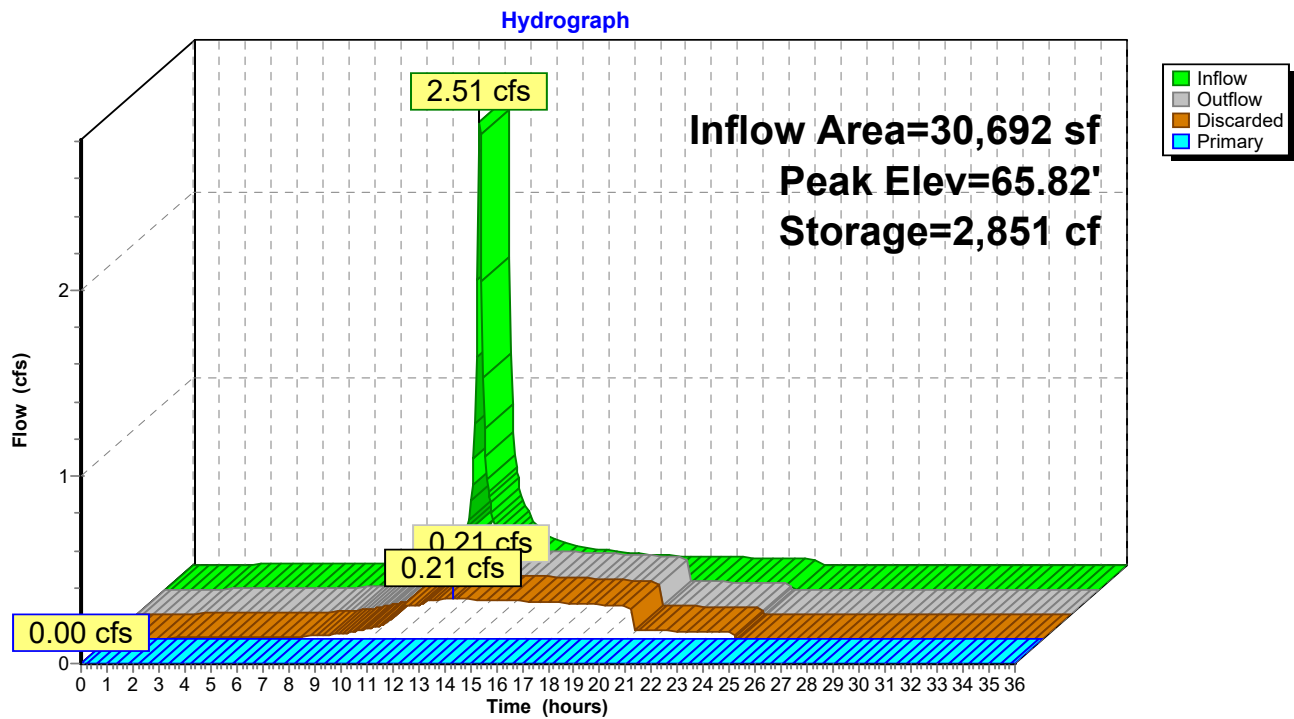
Discarded OutFlow Max=0.21 cfs @ 13.28 hrs HW=65.82' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.99' (Free Discharge)

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

Pond 6P: INFILTRATION BASIN



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1A: OVERLAND TO NORTHERLY CB

Runoff Area=24,906 sf 4.63% Impervious Runoff Depth=2.05"
 Flow Length=305' Tc=20.7 min CN=60 Runoff=0.88 cfs 4,248 cf

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff Area=20,791 sf 3.93% Impervious Runoff Depth=0.95"
 Flow Length=310' Tc=20.4 min CN=46 Runoff=0.25 cfs 1,642 cf

Subcatchment 2P: TRIB TO SOUTHEAST

Runoff Area=13,313 sf 0.00% Impervious Runoff Depth=0.09"
 Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.00 cfs 104 cf

Subcatchment 3P: TRIB TO SOUTHWEST

Runoff Area=16,168 sf 0.00% Impervious Runoff Depth=0.29"
 Flow Length=288' Tc=20.1 min CN=35 Runoff=0.02 cfs 392 cf

Subcatchment 4P: TRIB TO BASIN

Runoff Area=25,292 sf 46.08% Impervious Runoff Depth=3.75"
 Tc=6.0 min CN=78 Runoff=2.64 cfs 7,898 cf

Subcatchment 11S: ROOF AREA

Runoff Area=5,400 sf 100.00% Impervious Runoff Depth=5.95"
 Tc=6.0 min CN=98 Runoff=0.76 cfs 2,678 cf

Reach SUM: SUM TO SOUTHERLY CB

Inflow=0.25 cfs 1,642 cf
 Outflow=0.25 cfs 1,642 cf

Pond 6P: INFILTRATION BASIN

Peak Elev=66.21' Storage=4,395 cf Inflow=3.40 cfs 10,576 cf
 Discarded=0.23 cfs 10,574 cf Primary=0.00 cfs 0 cf Outflow=0.23 cfs 10,574 cf

Total Runoff Area = 105,870 sf Runoff Volume = 16,962 cf Average Runoff Depth = 1.92"
82.03% Pervious = 86,846 sf 17.97% Impervious = 19,024 sf

Summary for Subcatchment 1A: OVERLAND TO NORTHERLY CB

Runoff = 0.88 cfs @ 12.32 hrs, Volume= 4,248 cf, Depth= 2.05"

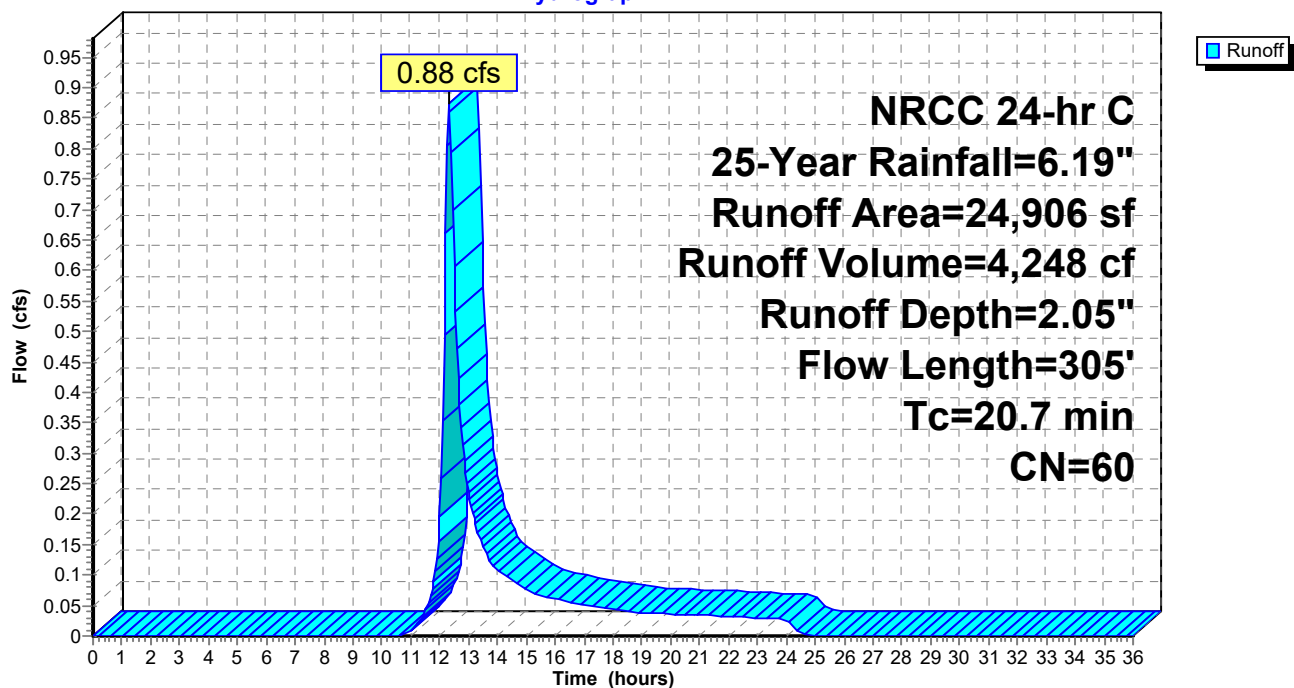
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
1,152	98	Paved parking, HSG A
9,348	55	Woods, Good, HSG B
14,078	61	>75% Grass cover, Good, HSG B
328	39	>75% Grass cover, Good, HSG A
24,906	60	Weighted Average
23,754		95.37% Pervious Area
1,152		4.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: OVERLAND TO NORTHERLY CB

Hydrograph



Summary for Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff = 0.25 cfs @ 12.36 hrs, Volume= 1,642 cf, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

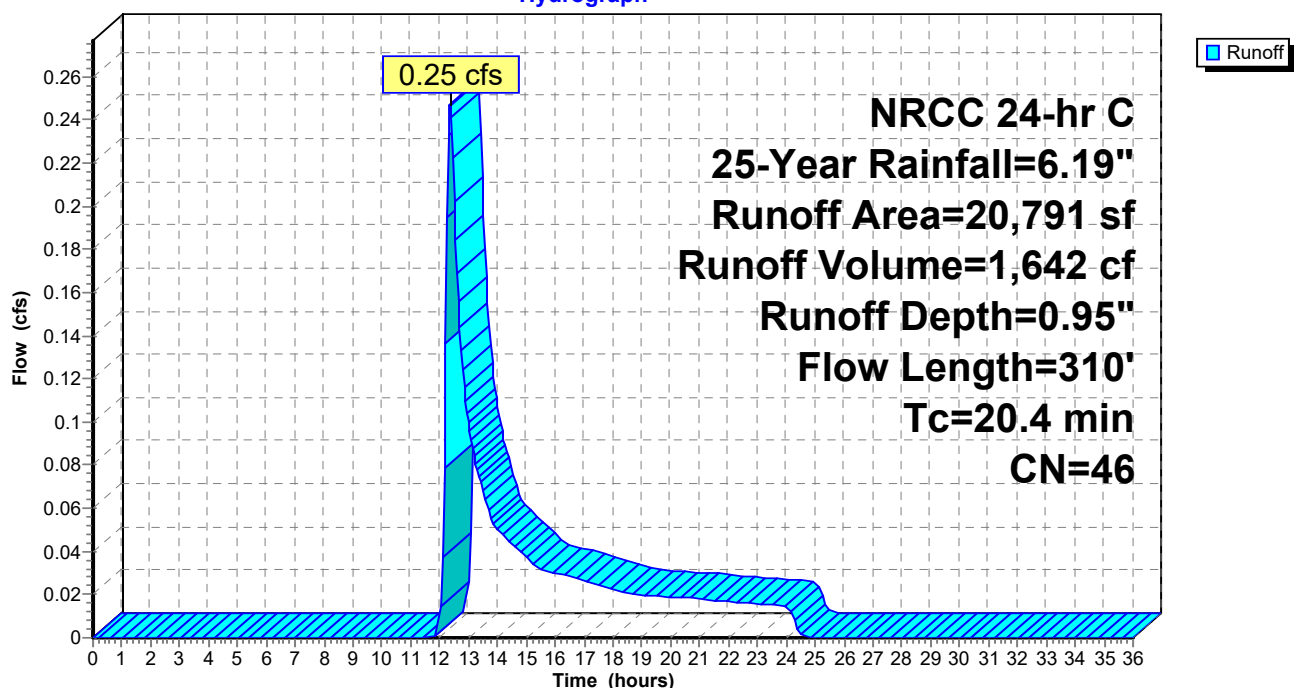
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
7,568	30	Woods, Good, HSG A
7,924	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
1,647	61	>75% Grass cover, Good, HSG B
251	80	>75% Grass cover, Good, HSG D
20,791	46	Weighted Average
19,973		96.07% Pervious Area
818		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Hydrograph



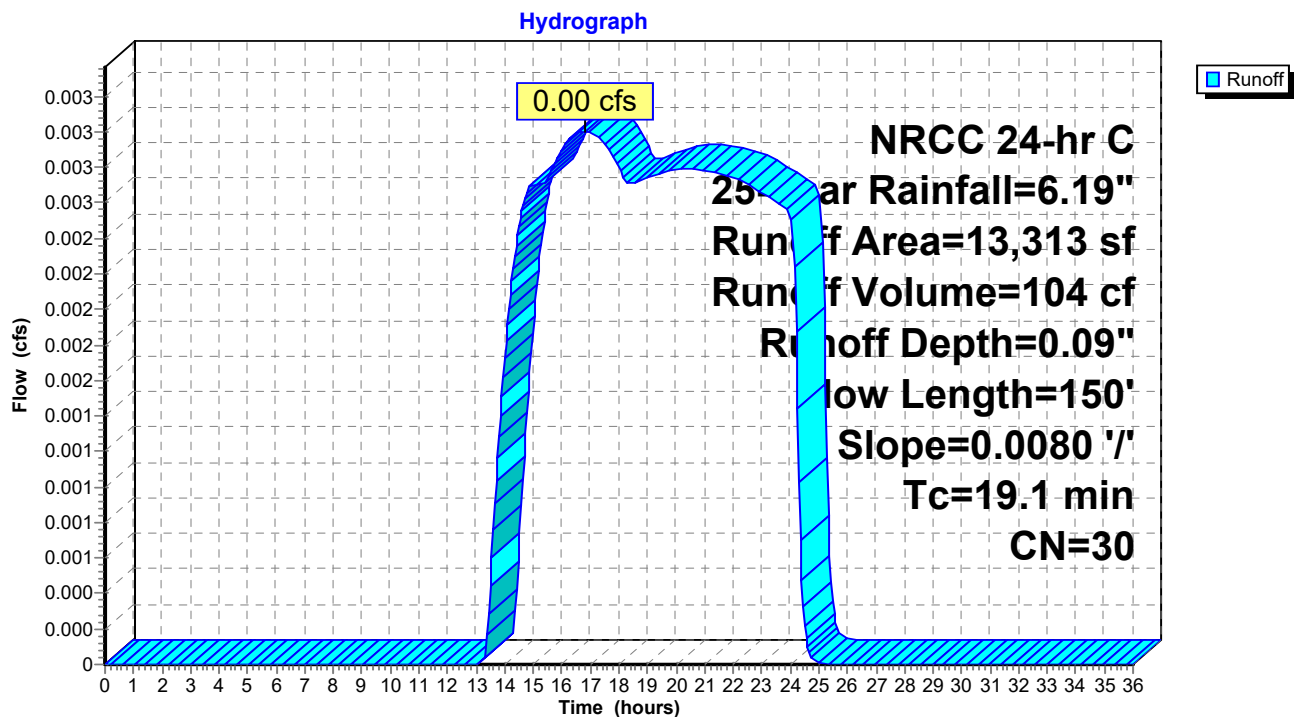
Summary for Subcatchment 2P: TRIB TO SOUTHEAST

Runoff = 0.00 cfs @ 16.83 hrs, Volume= 104 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
13,313	30	Woods, Good, HSG A
13,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2P: TRIB TO SOUTHEAST

Summary for Subcatchment 3P: TRIB TO SOUTHWEST

Runoff = 0.02 cfs @ 13.05 hrs, Volume= 392 cf, Depth= 0.29"

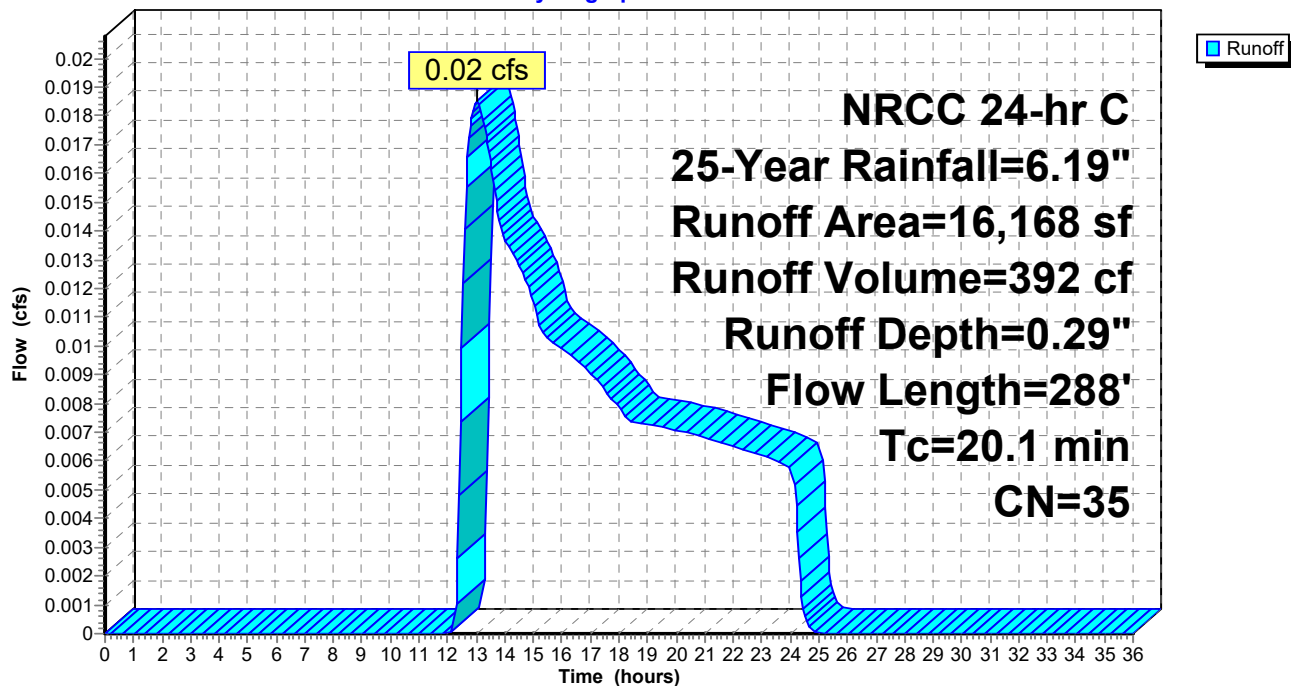
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3P: TRIB TO SOUTHWEST

Hydrograph



Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 2.64 cfs @ 12.13 hrs, Volume= 7,898 cf, Depth= 3.75"

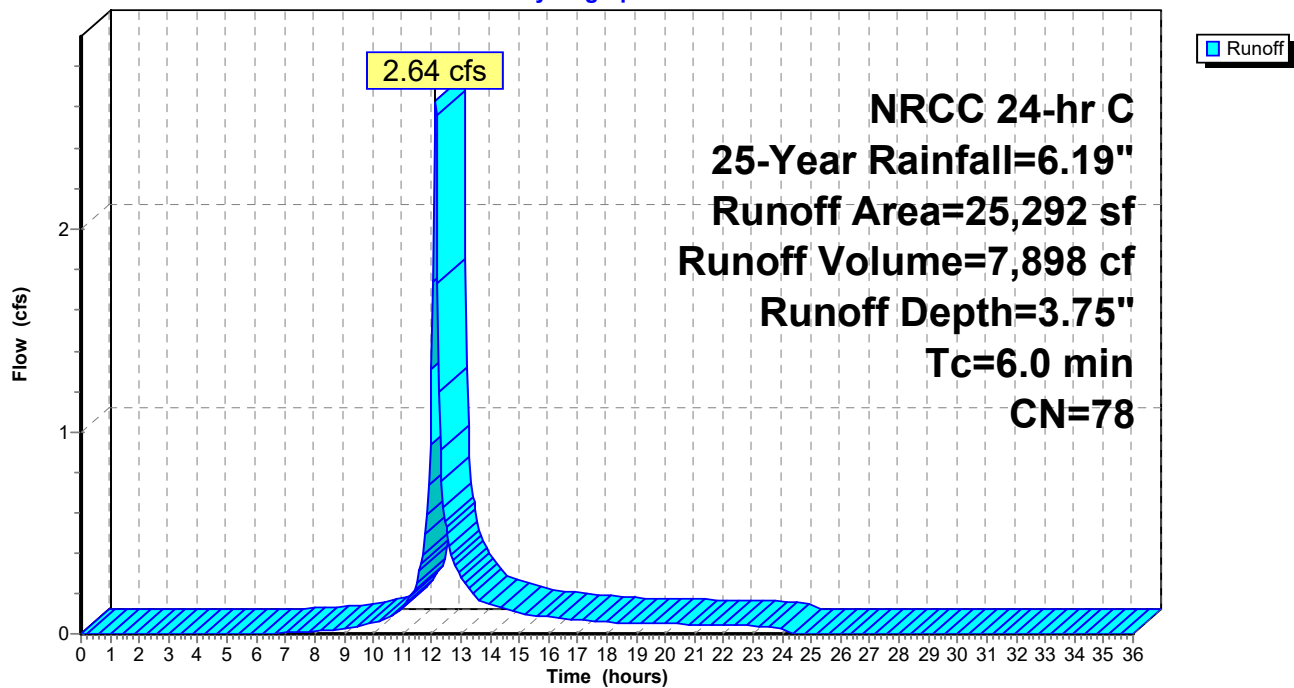
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
11,654	98	Paved parking, HSG B
13,638	61	>75% Grass cover, Good, HSG B
25,292	78	Weighted Average
13,638		53.92% Pervious Area
11,654		46.08% Impervious Area

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

Subcatchment 4P: TRIB TO BASIN

Hydrograph



Summary for Subcatchment 11S: ROOF AREA

Runoff = 0.76 cfs @ 12.13 hrs, Volume= 2,678 cf, Depth= 5.95"

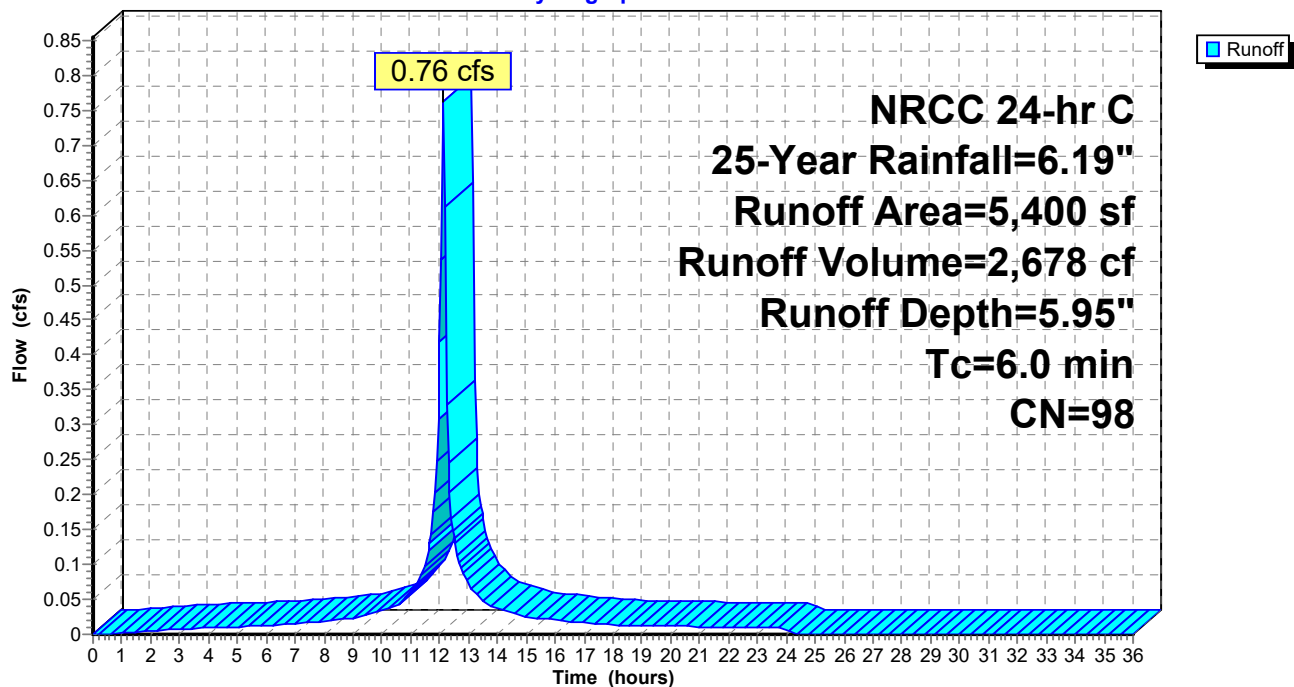
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
5,400	98	Roofs, HSG A
5,400		100.00% Impervious Area

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

Subcatchment 11S: ROOF AREA

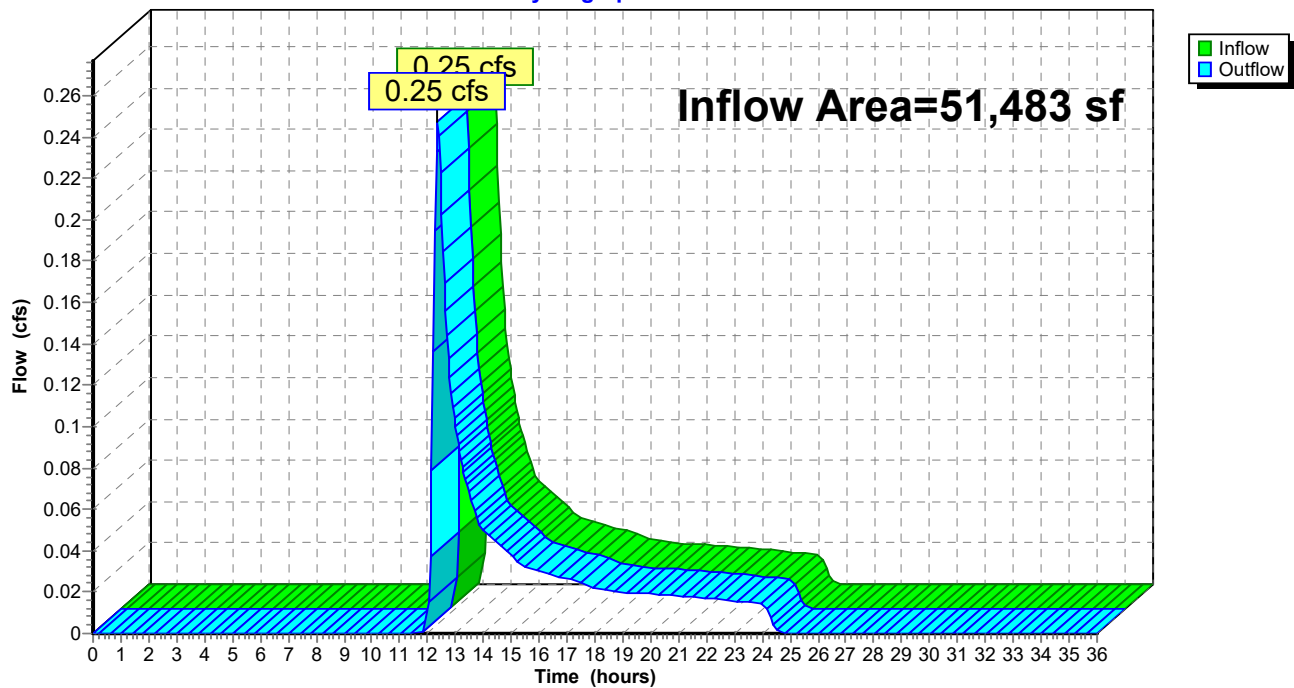
Hydrograph



Summary for Reach SUM: SUM TO SOUTHERLY CB

Inflow Area = 51,483 sf, 34.71% Impervious, Inflow Depth = 0.38" for 25-Year event
Inflow = 0.25 cfs @ 12.36 hrs, Volume= 1,642 cf
Outflow = 0.25 cfs @ 12.36 hrs, Volume= 1,642 cf, Atten= 0%, Lag= 0.0 min

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

Reach SUM: SUM TO SOUTHERLY CB**Hydrograph**

Summary for Pond 6P: INFILTRATION BASIN

Inflow Area = 30,692 sf, 55.56% Impervious, Inflow Depth = 4.14" for 25-Year event
 Inflow = 3.40 cfs @ 12.13 hrs, Volume= 10,576 cf
 Outflow = 0.23 cfs @ 13.52 hrs, Volume= 10,574 cf, Atten= 93%, Lag= 83.2 min
 Discarded = 0.23 cfs @ 13.52 hrs, Volume= 10,574 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 66.21' @ 13.52 hrs Surf.Area= 4,139 sf Storage= 4,395 cf

Plug-Flow detention time= 172.6 min calculated for 10,574 cf (100% of inflow)

Center-of-Mass det. time= 172.4 min (978.5 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	7,954 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	3,125	16	16
66.00	3,955	3,540	3,556
67.00	4,841	4,398	7,954

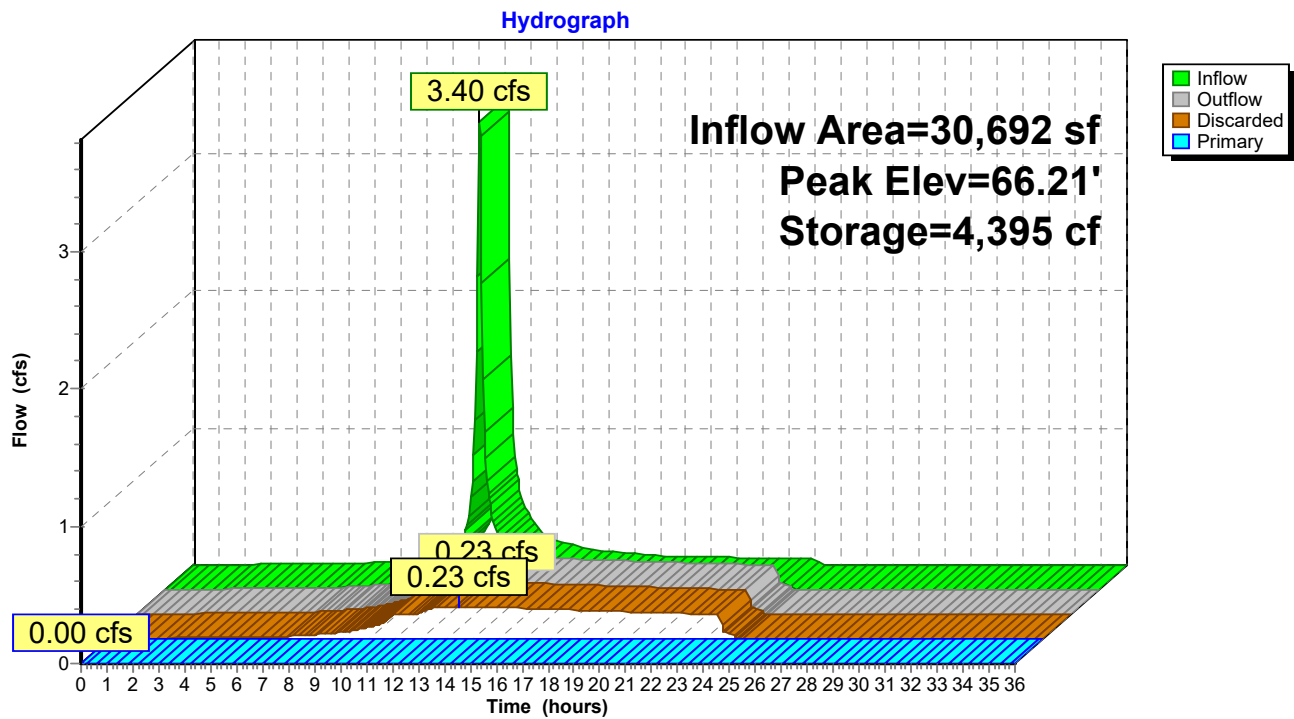
Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	2.410 in/hr Exfiltration over Surface area
#2	Primary	66.70'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.23 cfs @ 13.52 hrs HW=66.21' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.99' (Free Discharge)

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

Pond 6P: INFILTRATION BASIN

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1A: OVERLAND TO NORTHERLY CB

Runoff Area=24,906 sf 4.63% Impervious Runoff Depth=3.85"
 Flow Length=305' Tc=20.7 min CN=60 Runoff=1.71 cfs 7,994 cf

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff Area=20,791 sf 3.93% Impervious Runoff Depth=2.22"
 Flow Length=310' Tc=20.4 min CN=46 Runoff=0.75 cfs 3,844 cf

Subcatchment 2P: TRIB TO SOUTHEAST

Runoff Area=13,313 sf 0.00% Impervious Runoff Depth=0.59"
 Flow Length=150' Slope=0.0080 '/' Tc=19.1 min CN=30 Runoff=0.04 cfs 653 cf

Subcatchment 3P: TRIB TO SOUTHWEST

Runoff Area=16,168 sf 0.00% Impervious Runoff Depth=1.05"
 Flow Length=288' Tc=20.1 min CN=35 Runoff=0.17 cfs 1,412 cf

Subcatchment 4P: TRIB TO BASIN

Runoff Area=25,292 sf 46.08% Impervious Runoff Depth=6.02"
 Tc=6.0 min CN=78 Runoff=4.16 cfs 12,694 cf

Subcatchment 11S: ROOF AREA

Runoff Area=5,400 sf 100.00% Impervious Runoff Depth=8.44"
 Tc=6.0 min CN=98 Runoff=1.07 cfs 3,798 cf

Reach SUM: SUM TO SOUTHERLY CB

Inflow=0.82 cfs 5,178 cf
 Outflow=0.82 cfs 5,178 cf

Pond 6P: INFILTRATION BASIN

Peak Elev=66.77' Storage=6,841 cf Inflow=5.23 cfs 16,492 cf
 Discarded=0.26 cfs 15,161 cf Primary=0.44 cfs 1,334 cf Outflow=0.70 cfs 16,495 cf

Total Runoff Area = 105,870 sf Runoff Volume = 30,395 cf Average Runoff Depth = 3.45"
82.03% Pervious = 86,846 sf 17.97% Impervious = 19,024 sf

Summary for Subcatchment 1A: OVERLAND TO NORTHERLY CB

Runoff = 1.71 cfs @ 12.31 hrs, Volume= 7,994 cf, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

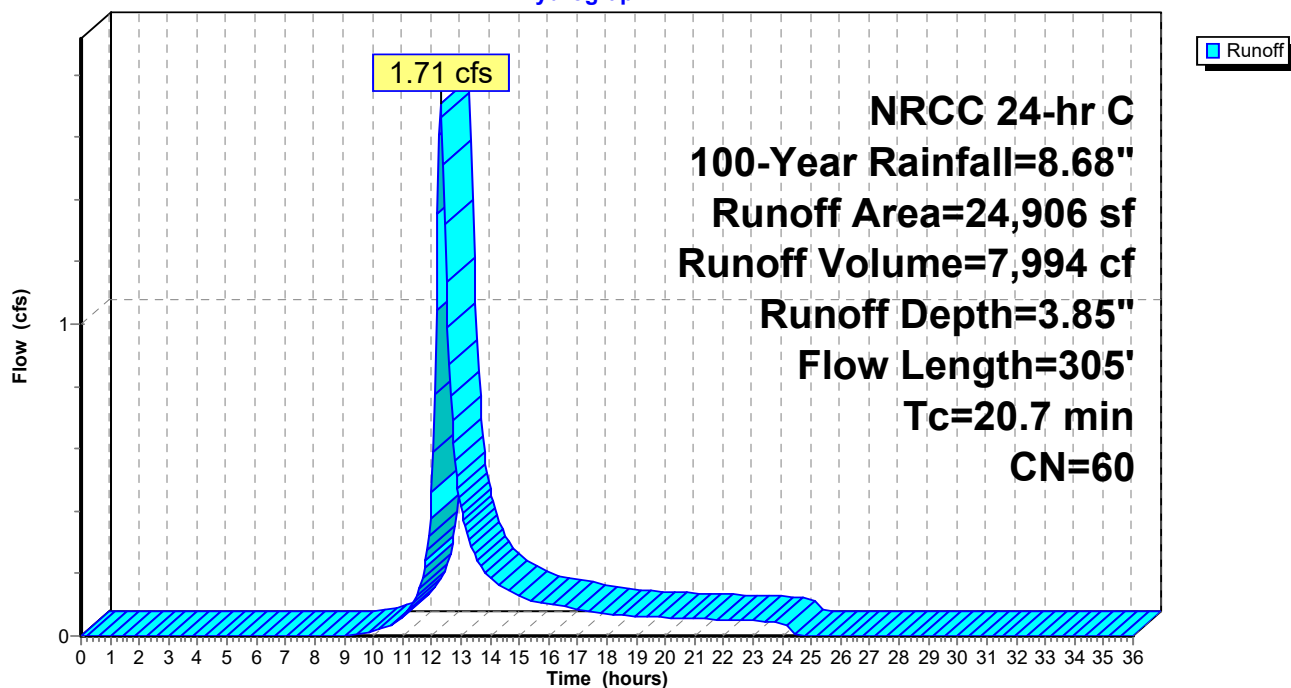
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
1,152	98	Paved parking, HSG A
9,348	55	Woods, Good, HSG B
14,078	61	>75% Grass cover, Good, HSG B
328	39	>75% Grass cover, Good, HSG A
24,906	60	Weighted Average
23,754		95.37% Pervious Area
1,152		4.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.8	255	0.0090	1.53		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.7	305	Total			

Subcatchment 1A: OVERLAND TO NORTHERLY CB

Hydrograph



Summary for Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Runoff = 0.75 cfs @ 12.32 hrs, Volume= 3,844 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

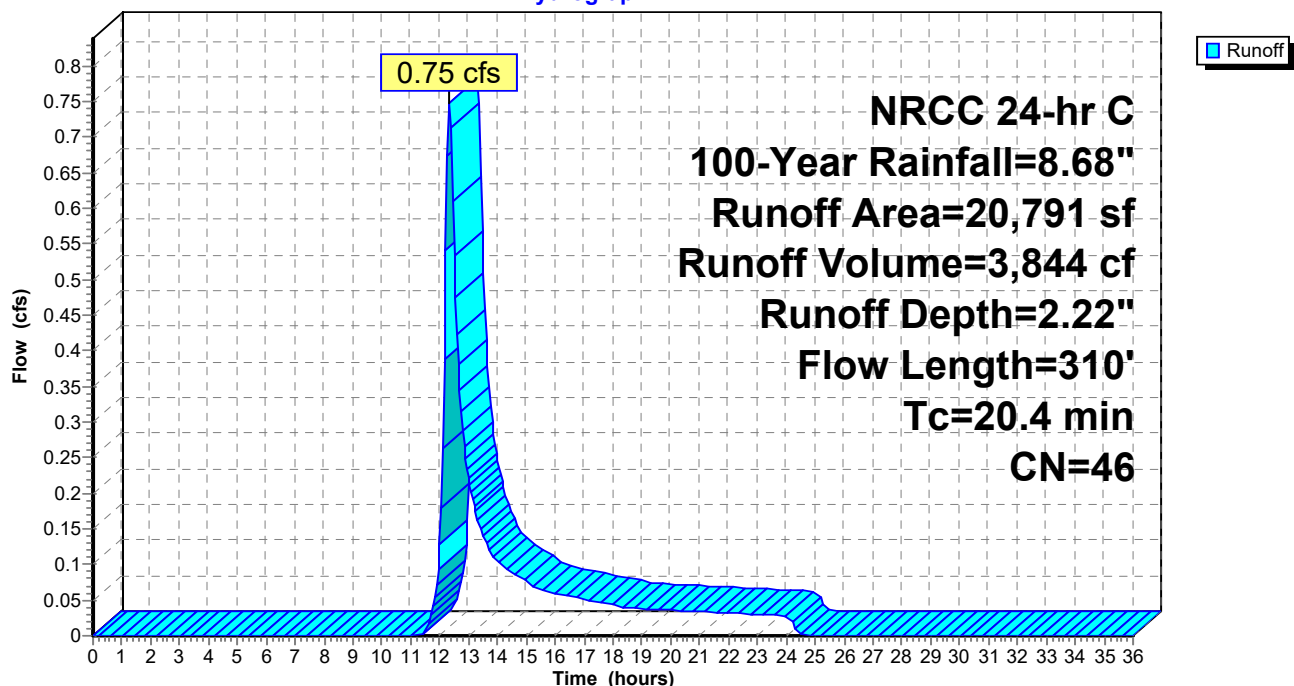
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
7,568	30	Woods, Good, HSG A
7,924	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
1,647	61	>75% Grass cover, Good, HSG B
251	80	>75% Grass cover, Good, HSG D
20,791	46	Weighted Average
19,973		96.07% Pervious Area
818		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
20.4	310	Total			

Subcatchment 1B: OVERLAND TO SOUTHERLY CB

Hydrograph



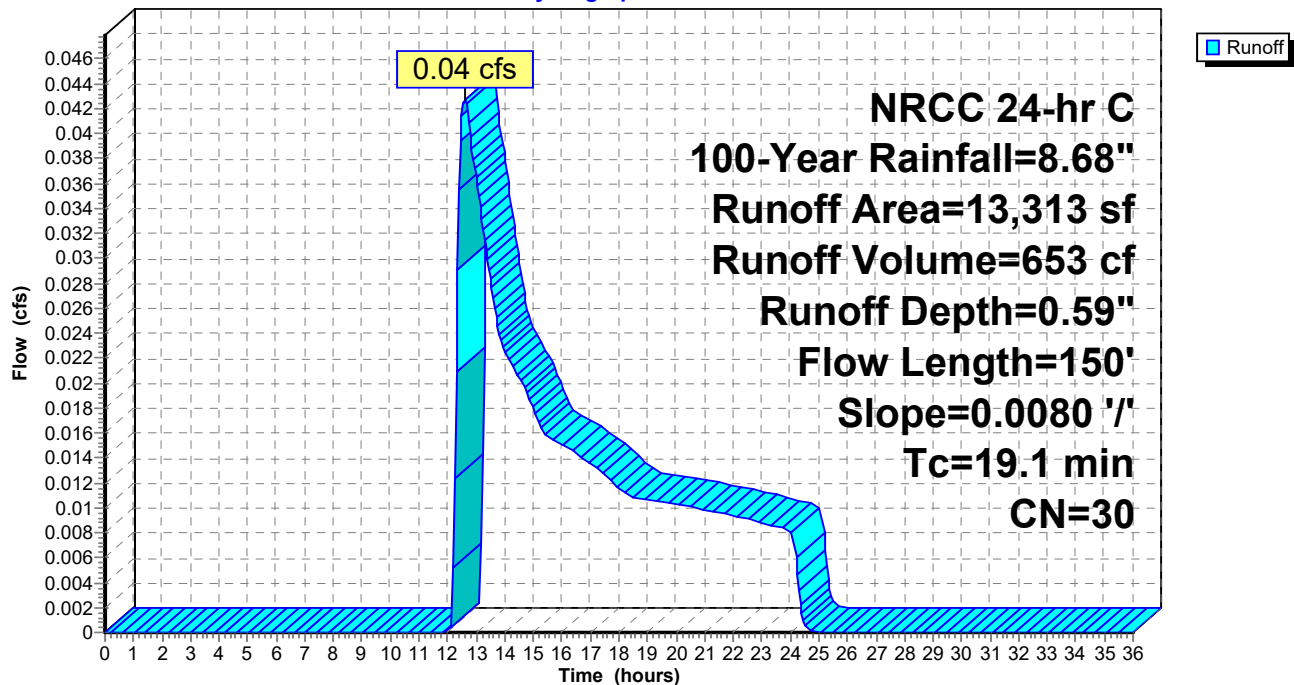
Summary for Subcatchment 2P: TRIB TO SOUTHEAST

Runoff = 0.04 cfs @ 12.61 hrs, Volume= 653 cf, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
13,313	30	Woods, Good, HSG A
13,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
19.1	150	Total			

Subcatchment 2P: TRIB TO SOUTHEAST**Hydrograph**

Summary for Subcatchment 3P: TRIB TO SOUTHWEST

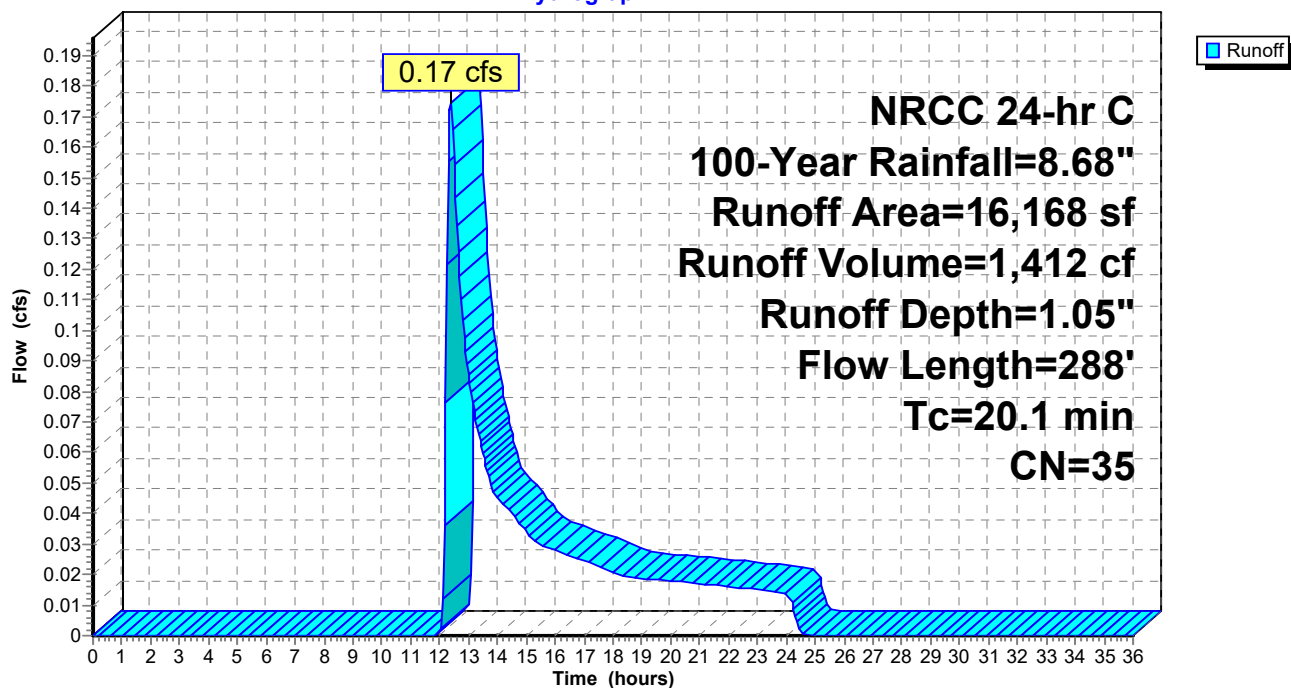
Runoff = 0.17 cfs @ 12.38 hrs, Volume= 1,412 cf, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
20.1	288	Total			

Subcatchment 3P: TRIB TO SOUTHWEST**Hydrograph**

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 4.16 cfs @ 12.13 hrs, Volume= 12,694 cf, Depth= 6.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

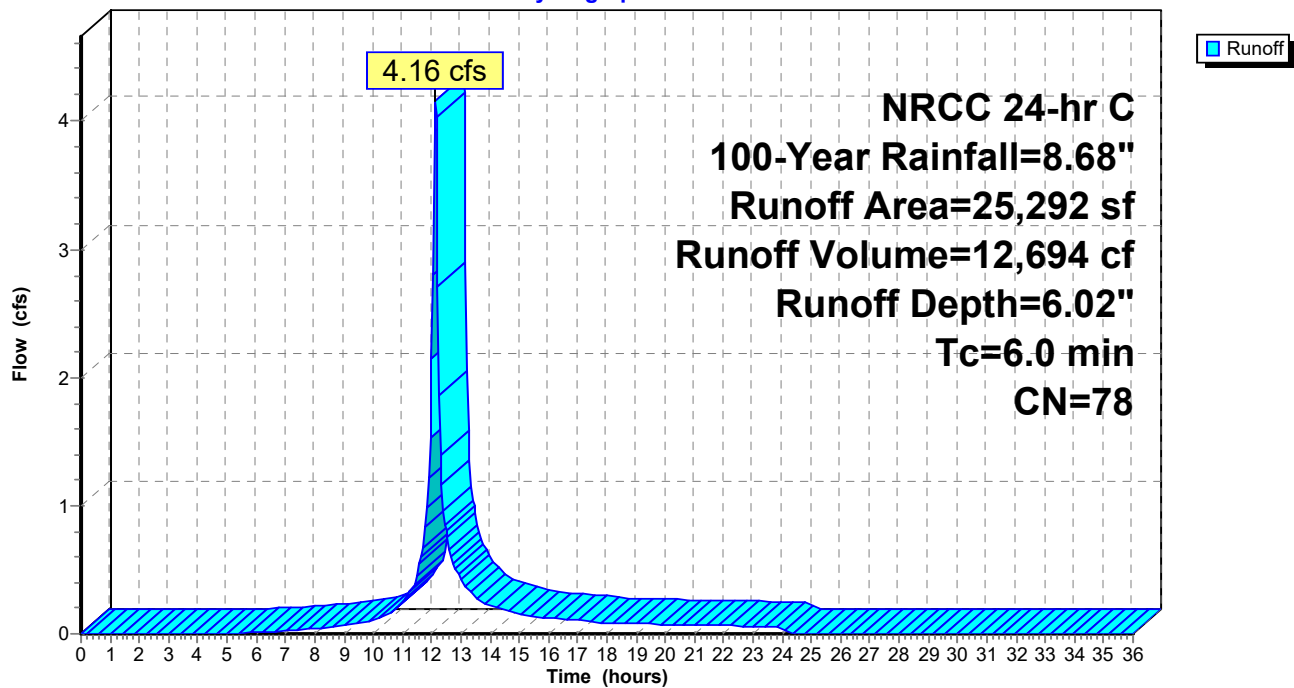
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
11,654	98	Paved parking, HSG B
13,638	61	>75% Grass cover, Good, HSG B
25,292	78	Weighted Average
13,638		53.92% Pervious Area
11,654		46.08% Impervious Area

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

Subcatchment 4P: TRIB TO BASIN

Hydrograph



Summary for Subcatchment 11S: ROOF AREA

Runoff = 1.07 cfs @ 12.13 hrs, Volume= 3,798 cf, Depth= 8.44"

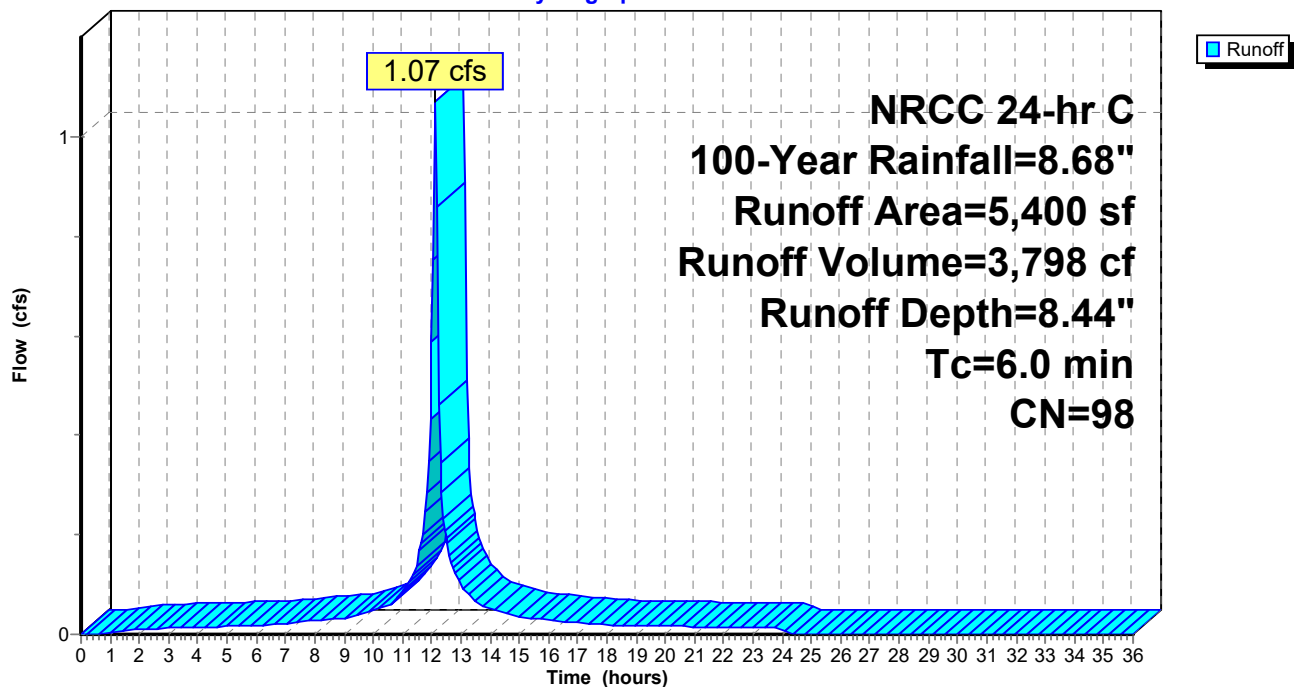
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
5,400	98	Roofs, HSG A
5,400		100.00% Impervious Area

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

Subcatchment 11S: ROOF AREA

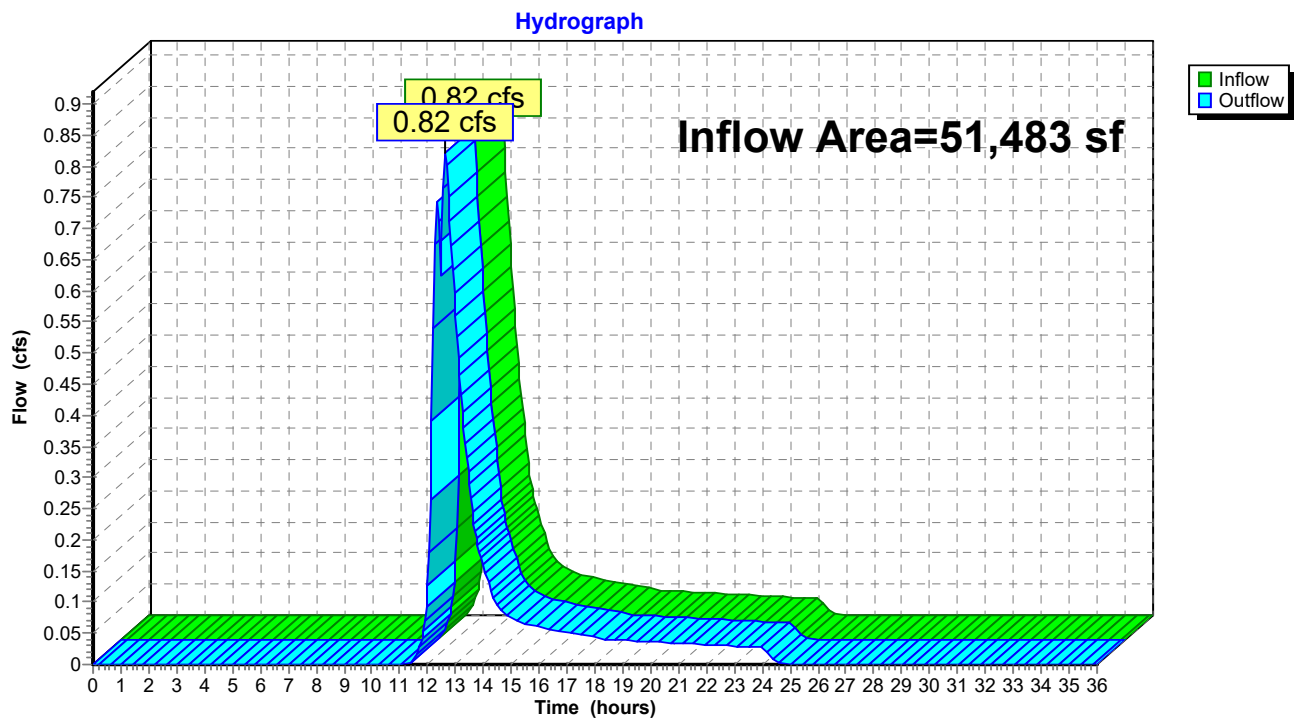
Hydrograph



Summary for Reach SUM: SUM TO SOUTHERLY CB

Inflow Area = 51,483 sf, 34.71% Impervious, Inflow Depth = 1.21" for 100-Year event
Inflow = 0.82 cfs @ 12.62 hrs, Volume= 5,178 cf
Outflow = 0.82 cfs @ 12.62 hrs, Volume= 5,178 cf, Atten= 0%, Lag= 0.0 min

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

Reach SUM: SUM TO SOUTHERLY CB

Summary for Pond 6P: INFILTRATION BASIN

Inflow Area = 30,692 sf, 55.56% Impervious, Inflow Depth = 6.45" for 100-Year event
 Inflow = 5.23 cfs @ 12.13 hrs, Volume= 16,492 cf
 Outflow = 0.70 cfs @ 12.71 hrs, Volume= 16,495 cf, Atten= 87%, Lag= 34.6 min
 Discarded = 0.26 cfs @ 12.71 hrs, Volume= 15,161 cf
 Primary = 0.44 cfs @ 12.71 hrs, Volume= 1,334 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 66.77' @ 12.71 hrs Surf.Area= 4,633 sf Storage= 6,841 cf

Plug-Flow detention time= 234.7 min calculated for 16,472 cf (100% of inflow)

Center-of-Mass det. time= 234.8 min (1,030.1 - 795.3)

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	7,954 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	3,125	16	16
66.00	3,955	3,540	3,556
67.00	4,841	4,398	7,954

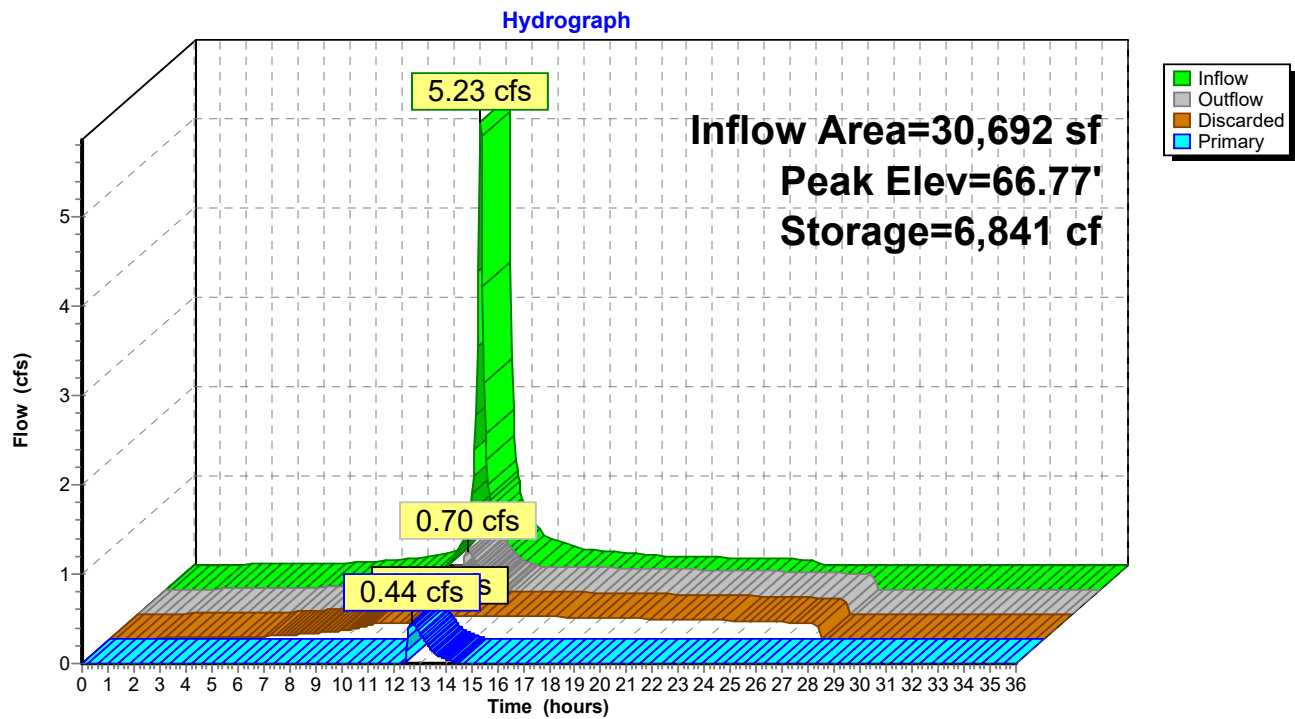
Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	2.410 in/hr Exfiltration over Surface area
#2	Primary	66.70'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.26 cfs @ 12.71 hrs HW=66.76' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.43 cfs @ 12.71 hrs HW=66.76' (Free Discharge)

↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 0.84 fps)

Pond 6P: INFILTRATION BASIN

APPENDIX C

Additional Calculations:

- 1. Stormwater Management Form and Checklist (*See Previous submittal*)**
- 2. Recharge Volumes Calculation (Standard #3)**
- 3. Water Quality Volume (Standard #4)**
- 4. TSS Removal Calculations (Standard #4)**
- 5. Calculation showing Infiltration System Drains in 72hrs**
- 6. Operations and Maintenance Log**
- 7. Inspection Schedule and Evaluation Checklists for Construction Phase and Post Development (*See Previous submittal*)**
- 8. Soil Suitability Assessment (*See Previous submittal*)**

MERRILL ENGINEERS AND LAND SURVEYORS
 427 COLUMBIA ROAD, HANOVER, MA. 02339
 TEL. (781) 826-9200

JOB 21-204
 SHEET NO. 1 of 1
 CALCULATED BY DA
 CHECKED BY PGP
 DATE: 1/27/2022
 REV'D: 4/26/2022

Location: **631 Washington Street, Pembroke**

Recharge Volumes (Standard #3)

Total Area (Ac.)=	2.43	105,870 S.F.
Total Impervious Area A Soil (Ac.)=	0.39	17,054 S.F.
Total Impervious Area B Soil (Ac.)=	0.00	
Total Impervious Area C Soil (Ac.)=	0.00	

	Vol. To Recharge (inches per Imp. Acre)	Volume (Imp. Area x inches per Acre)
Recharge Volume (A soil)	0.6	0.23
Recharge Volume (B soil)	0.35	0.00
Recharge Volume (C soil)	0.25	0.00

Total Required Recharge Volume:	0.23	AC-IN
	0.02	AC-FT
	853	C.F.

Recharge Volume provided by Stormwater Basin:

Volume Provided (below outlet):	5,644±	C.F.
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MERRILL ENGINEERS AND LAND SURVEYORS
 427 COLUMBIA ROAD, HANOVER, MA. 02339
 TEL. (781) 826-9200

JOB 21-204
 SHEET NO. 1 of 1
 CALCULATED BY DA
 CHECKED BY PGP
 DATE: 1/27/2022
 REV'D: 3/21/2022

WATER QUALITY VOLUME (STANDARD #4)

Location: **631 Washington Street, Pembroke**

Total New Impervious Area

Roadway/Driveways/Roofs	17,054 S.F.
Other	0 S.F.
Total Area:	17,054 S.F.

Water Quality

Volume using: 0.5 or 1.0 inch x Imp. Area (per S.W. Mgmt Policy)

Use: 1 inch x Imp. Area 1,421 cubic feet
 (see attached)

Provided by Stormwater Basin (see calcs in Appendix B)

5,644± c.f. (Below outlet)

Sediment Forebay #1 & #2 Volume

Required Volume = 400 CF/AC x Impervious Area
~~2,401±~~

Impervious Area - Stormwater Basin: 17,054 SF

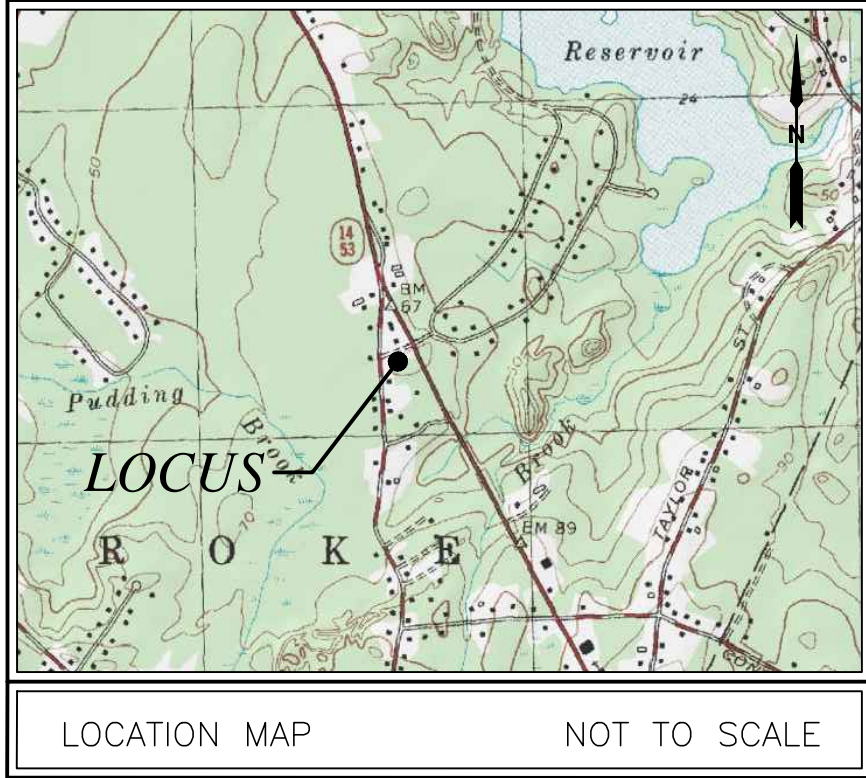
0.39 AC 7.48 Gal/CF

Required Volume : 156.60 CF = 1171 Gal

Volume Provided 168± C.F. (Sediment Forebay)

APPENDIX D

Existing and Proposed Watersheds Plan (Insert)



PRE-DEVELOPMENT WATERSHEDS

SUBCATCHMENT 1A – TRIB. TO NORTHERLY CATCH BASIN

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS AREA	2,092	S.F.
GRAVEL	4,603	S.F.
WOODS HSG A	2,412	S.F.
GRASS HSG B	37,572	S.F.
WOODS HSG B	7,423	S.F.
GRASS HSG D	286	S.F.
WOODS HSG D	139	S.F.
SUBTOTAL	54,527	S.F.

SUBCATCHMENT 1B – TRIB. TO SOUTHERLY CATCH BASIN

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS AREA	249	S.F.
GRASS HSG A	541	S.F.
WOODS HSG A	6,648	S.F.
GRASS HSG B	7,340	S.F.
WOODS HSG B	4,781	S.F.
GRASS HSG D	257	S.F.
WOODS HSG D	82	S.F.
SUBTOTAL	19,898	S.F.

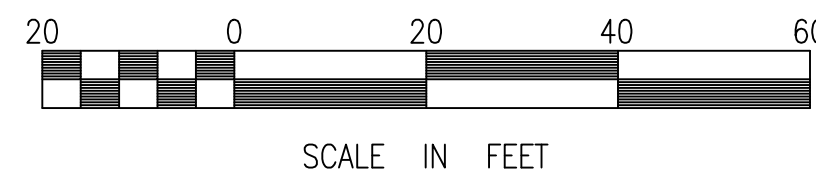
SUBCATCHMENT 2E – TRIB. TO SOUTH EAST SIDE

DESCRIPTION	AREA (S.F.)	
WOODS HSG A	15,302	S.F.
SUBTOTAL	15,302	S.F.

SUBCATCHMENT 3E – TRIB. TO SOUTH WEST SIDE

DESCRIPTION	AREA (S.F.)	
WOODS HSG A	12,796	S.F.
WOODS HSG B	3,347	S.F.
SUBTOTAL	16,143	S.F.

TOTAL AREA: 105,870 S.F.



REVISIONS

- 3/22/22 PB PEER REVIEW COMMENTS
- 4/26/22 MOVE BASIN

DRAWN BY: PAL

DESIGNED BY:

CHECKED BY: DA

Merrill
Engineers and Land Surveyors
427 COLUMBIA ROAD, HANOVER, MA 02339 / T: (781) 826-9200
26 UNION STREET, PLYMOUTH MA 02360 / T: (508) 746-6060
WWW.MERRILLINC.COM

DEFINITIVE SITE PLAN

631 WASHINGTON STREET
ASSESSORS MAP E10 LOT 10
PEMBROKE, MASSACHUSETTS

OWNER/APPLICANT BILL PAPASTRAITIS
633 SUMMER STREET
MARSHFIELD, MA 02050
(781)248-0277

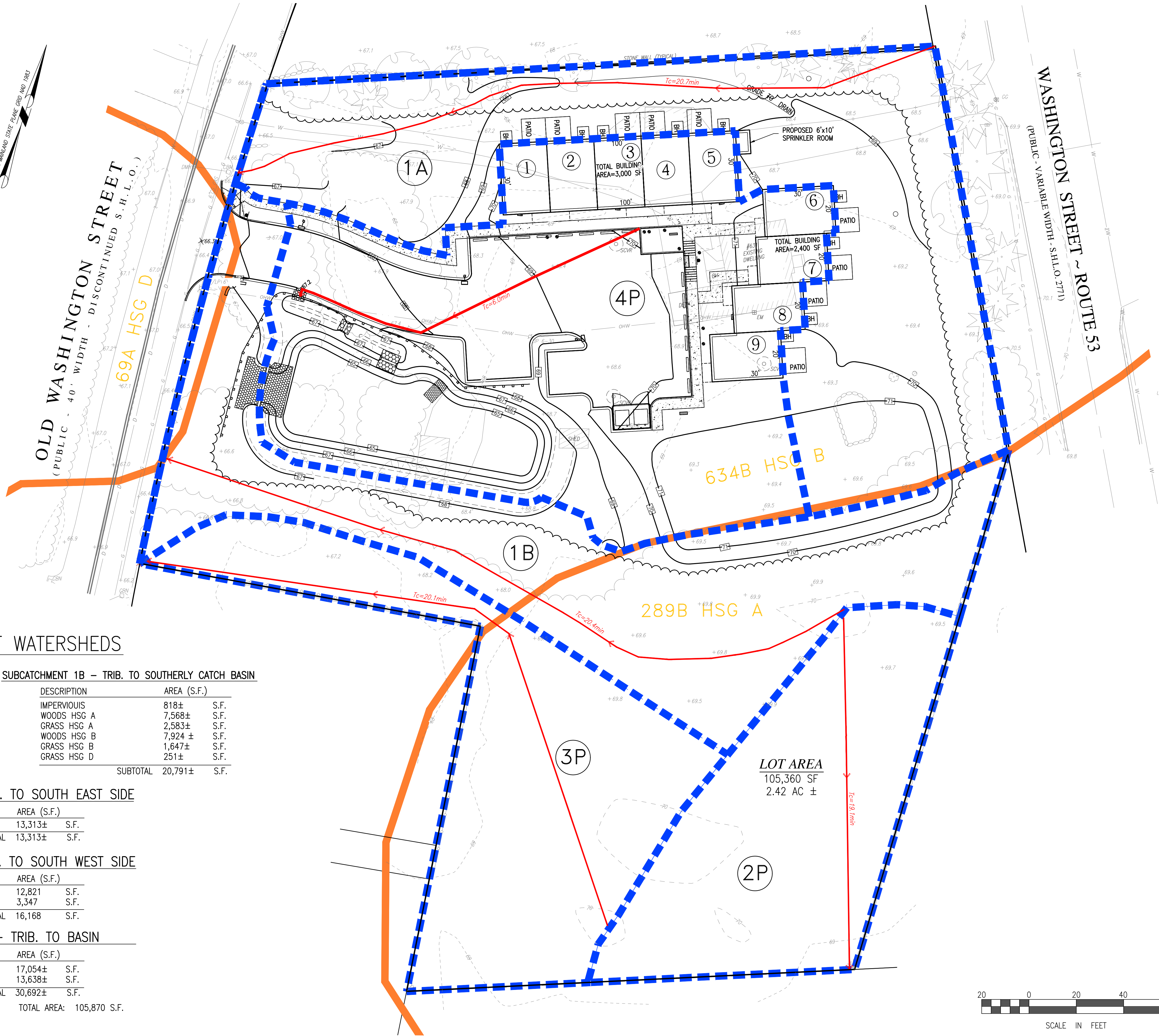
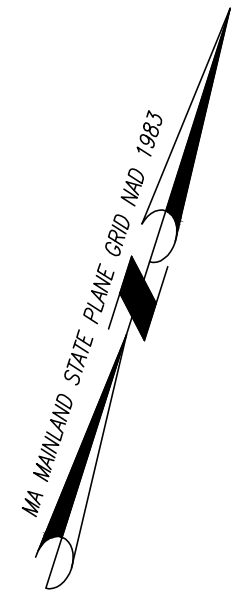
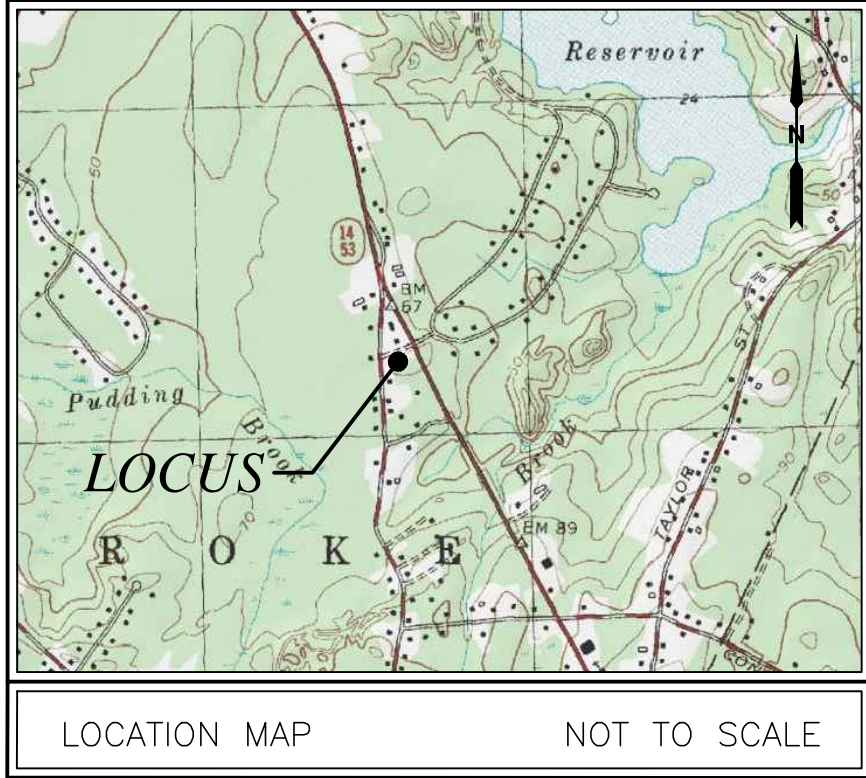
FEBRUARY 2, 2022

SCALE: AS NOTED

JOB NO. 21-204

LATEST REVISION:
APRIL 26, 2022

PERMIT SET
NOT FOR
CONSTRUCTION
SHEET 1 OF 2



POST-DEVELOPMENT WATERSHEDS

SUBCATCHMENT 1A – TRIB. TO NORTHERLY CATCH BASIN

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS AREA	1,152±	S.F.
WOODS HSG B	9,348±	S.F.
GRASS HSG A	328±	S.F.
GRASS HSG B	14,078±	S.F.
SUBTOTAL	24,906±	S.F.

SUBCATCHMENT 1B – TRIB. TO SOUTHERLY CATCH BASIN

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS	818±	S.F.
WOODS HSG A	7,568±	S.F.
GRASS HSG A	2,583±	S.F.
WOODS HSG B	7,924 ±	S.F.
GRASS HSG B	1,647±	S.F.
GRASS HSG D	251±	S.F.
SUBTOTAL	20,791±	S.F.

SUBCATCHMENT 2P – TRIB. TO SOUTH EAST SIDE

DESCRIPTION	AREA (S.F.)	
WOODS HSG A	13,313±	S.F.
SUBTOTAL	13,313±	S.F.

SUBCATCHMENT 3P – TRIB. TO SOUTH WEST SIDE

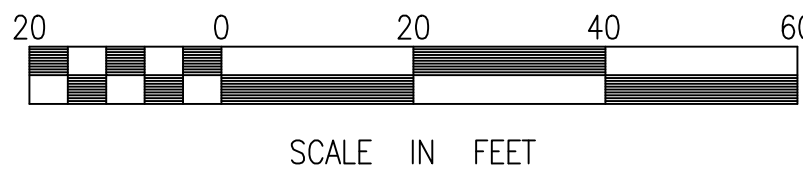
DESCRIPTION	AREA (S.F.)	
WOODS HSG A	12,821	S.F.
WOODS HSG B	3,347	S.F.
SUBTOTAL	16,168	S.F.

SUBCATCHMENT 4P – TRIB. TO BASIN

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS AREA	17,054±	S.F.
GRASS HSG B	13,638±	S.F.
SUBTOTAL	30,692±	S.F.

TOTAL AREA: 105,870 S.F.

LOT AREA
105,360 SF
2.42 AC ±



REVISIONS		
2.	4/26/22	MOVE BASIN
1.	3/22/22	PB. PEER REVIEW COMMENTS

DRAWN BY: PAL

DESIGNED BY:

CHECKED BY: DA

Merrill
Engineers and Land Surveyors
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DEFINITIVE SITE PLAN
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FEBRUARY 2, 2022
SCALE: AS NOTED
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LATEST REVISION: APRIL 26, 2022

PERMIT SET
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CONSTRUCTION
SHEET 2 OF 2