



February 2, 2022

Revised: March 21, 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: March 21, 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 existing catch basins located 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 2.41in/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>
1S	1P, 4P	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 and the majority of the septic system 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 be directed to a smaller Cultec® subsurface infiltration system via subsurface ADS pipes which will collect flow from the roof leaders. This subsurface infiltration system will discharge overflow from larger storm to the infiltration basin. The infiltration basin will capture and infiltrate the runoff from smaller, more frequent storm events (2-yr storms) entirely. During 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)			
	1S TRIB. TO OLD WASH- INGTON STREET	2S TRIB. TO S.E.	3S TRIB. TO S.W.	1P SUM TO OLD WASH- INGTON STREET	1P SUM TO OLD WASH-INGTON STREET – NO EXFILTRATION	2P TRIB. TO S.E.	3P TRIB. TO S.W.
2YR	0.47	0.00	0.00	0.01	0.08	0.00	0.00
10YR	1.64	0.00	0.02	0.47	0.99	0.00	0.00
25YR	2.77	0.02	0.08	1.64	2.28	0.00	0.02
100YR	5.33	0.20	0.39	4.72	5.01	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 503± cubic feet. The proposed infiltration basin will provide 2,544± 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.

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 719± cubic feet. The infiltration system provides 2,481± 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.

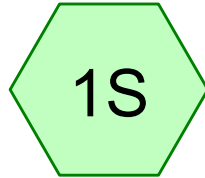
Standard 10 – Prohibition of Illicit Discharges

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

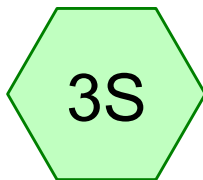
APPENDIX A

Existing Conditions

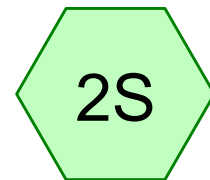
2 (3.35"), 10 (4.95"), 25 (6.19") and 100 (8.68") year return storms



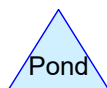
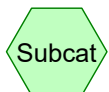
TRIB TO OLD
WASHINGTON



TRIB TO SOUTH WEST
OF SITE



TRIB TO SOUTH EAST
OF SITE



Routing Diagram for 21-204 EWS

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21-204 EWS

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Area Listing (selected nodes)

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

21-204 EWS

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

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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 1S: TRIB TO OLD WASHINGTON

Runoff Area=74,425 sf 3.15% Impervious Runoff Depth=0.51"
Flow Length=310' Tc=20.4 min CN=61 Runoff=0.47 cfs 3,144 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 = 3,144 cf Average Runoff Depth = 0.36"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

21-204 EWS

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

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Summary for Subcatchment 1S: TRIB TO OLD WASHINGTON

Runoff = 0.47 cfs @ 12.36 hrs, Volume= 3,144 cf, Depth= 0.51"

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

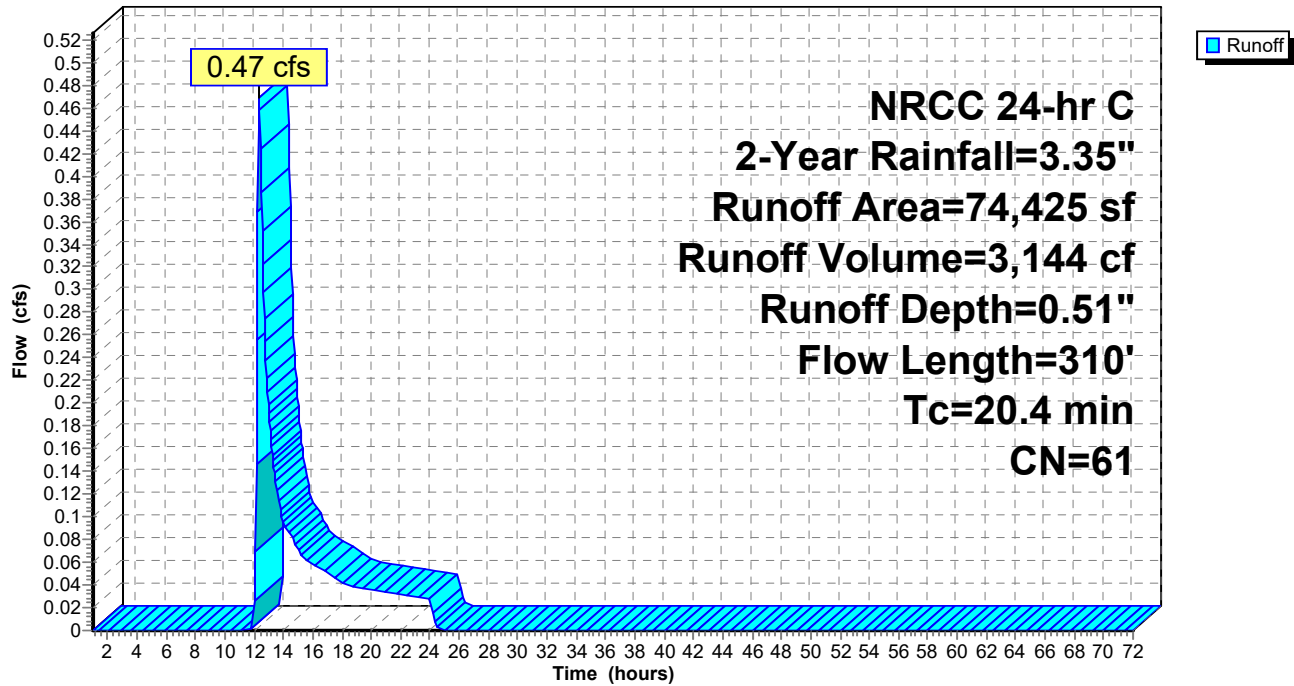
NRCC 24-hr C 2-Year Rainfall=3.35"

	Area (sf)	CN	Description
*	2,341	98	Paved parking & house/sheds
	4,603	96	Gravel surface, HSG A
	541	39	>75% Grass cover, Good, HSG A
	9,060	36	Woods, Fair, HSG A
	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	61	Weighted Average
	72,084		96.85% Pervious Area
	2,341		3.15% 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 1S: TRIB TO OLD WASHINGTON

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

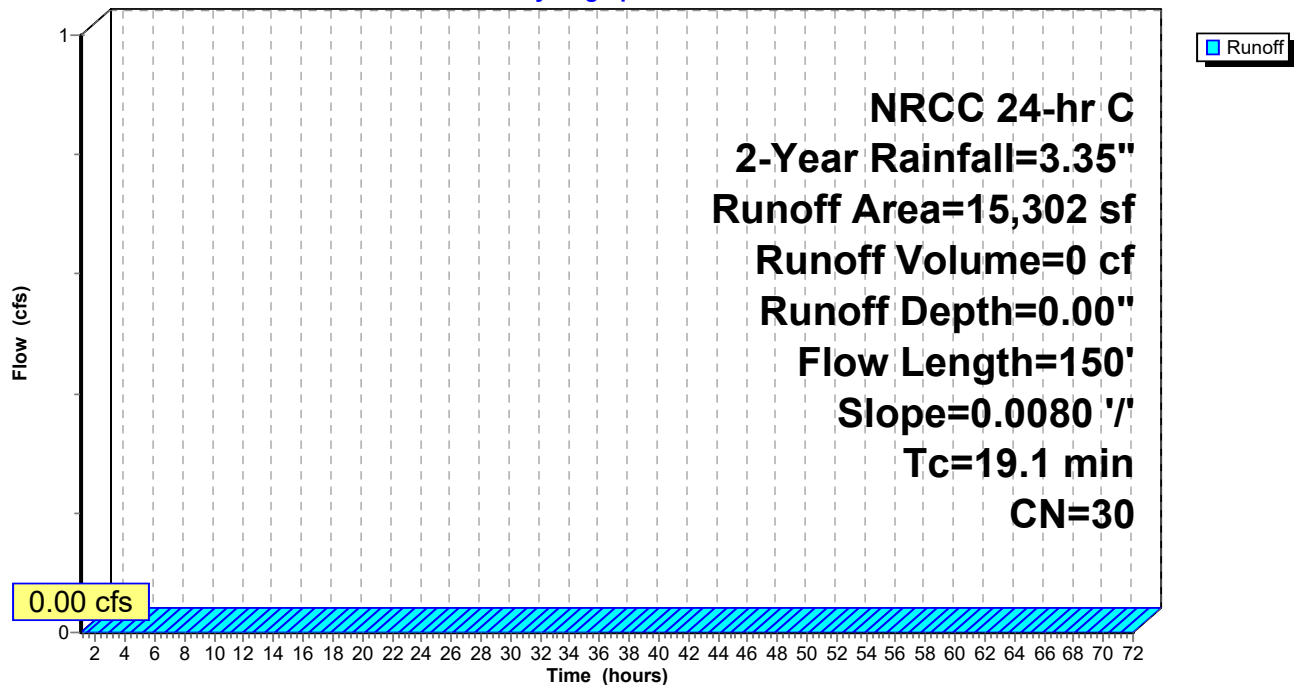
NRCC 24-hr C 2-Year Rainfall=3.35"

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

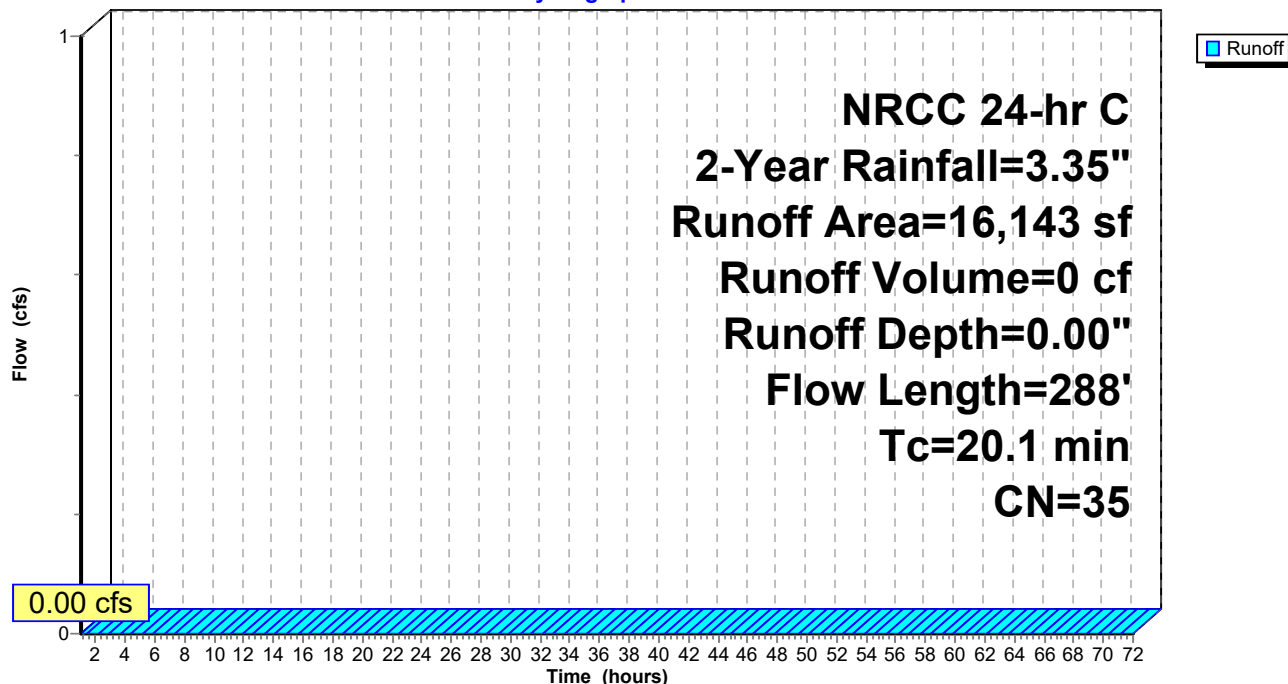
Runoff = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Depth= 0.00"

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**

21-204 EWS

NRCC 24-hr C 10-Year Rainfall=4.95"

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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 1S: TRIB TO OLD WASHINGTON

Runoff Area=74,425 sf 3.15% Impervious Runoff Depth=1.34"
Flow Length=310' Tc=20.4 min CN=61 Runoff=1.64 cfs 8,306 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 = 8,414 cf Average Runoff Depth = 0.95"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

21-204 EWS

NRCC 24-hr C 10-Year Rainfall=4.95"

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Summary for Subcatchment 1S: TRIB TO OLD WASHINGTON

Runoff = 1.64 cfs @ 12.32 hrs, Volume= 8,306 cf, Depth= 1.34"

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

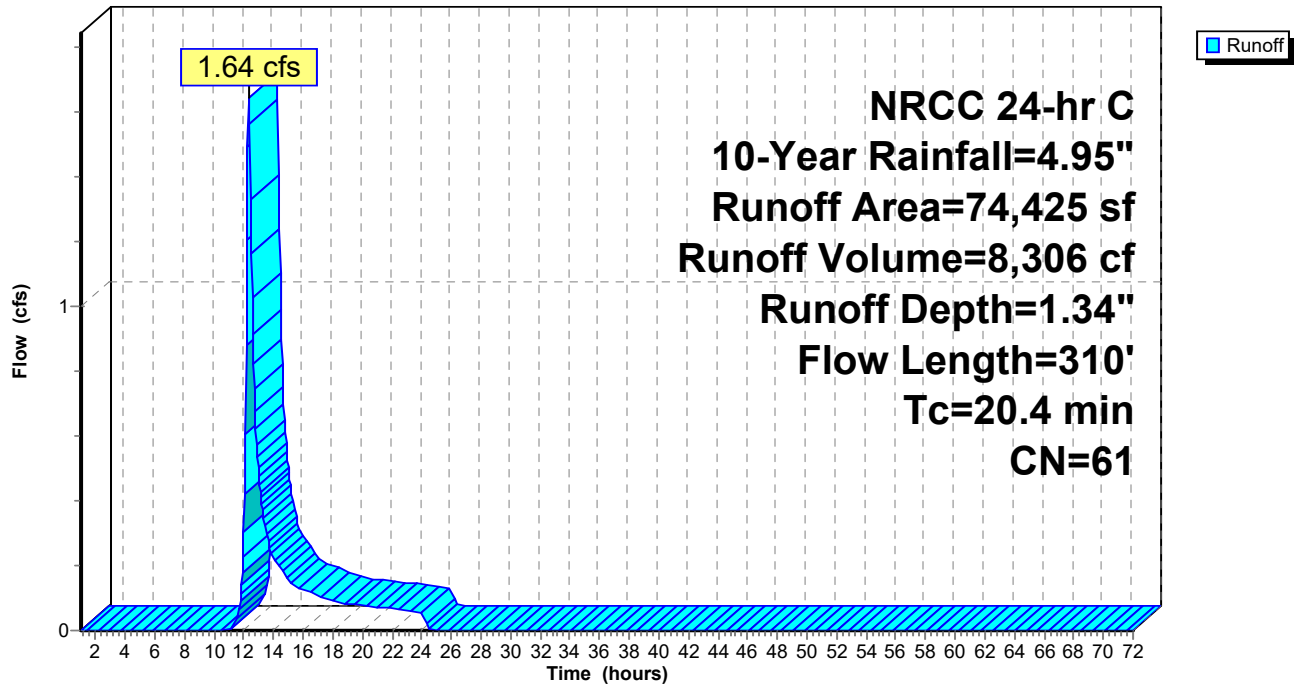
NRCC 24-hr C 10-Year Rainfall=4.95"

	Area (sf)	CN	Description
*	2,341	98	Paved parking & house/sheds
	4,603	96	Gravel surface, HSG A
	541	39	>75% Grass cover, Good, HSG A
	9,060	36	Woods, Fair, HSG A
	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	61	Weighted Average
	72,084		96.85% Pervious Area
	2,341		3.15% 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 1S: TRIB TO OLD WASHINGTON

Hydrograph



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

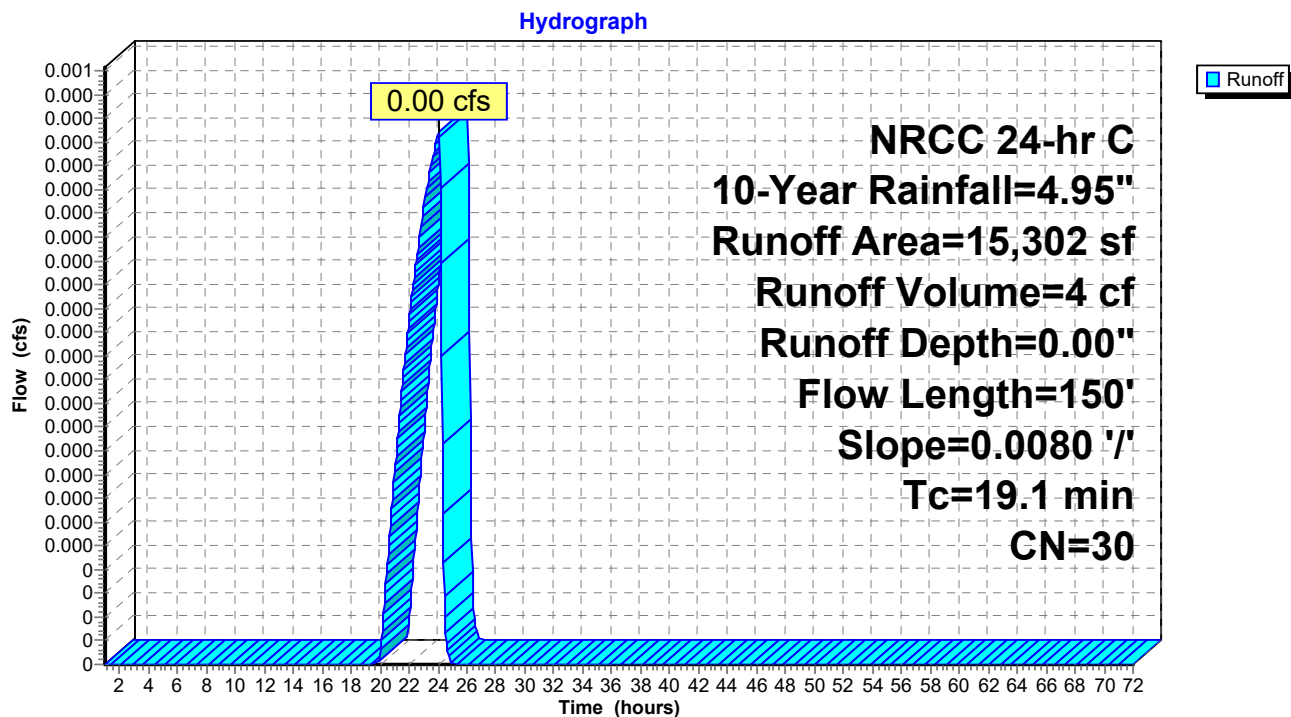
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 4 cf, Depth= 0.00"

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



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

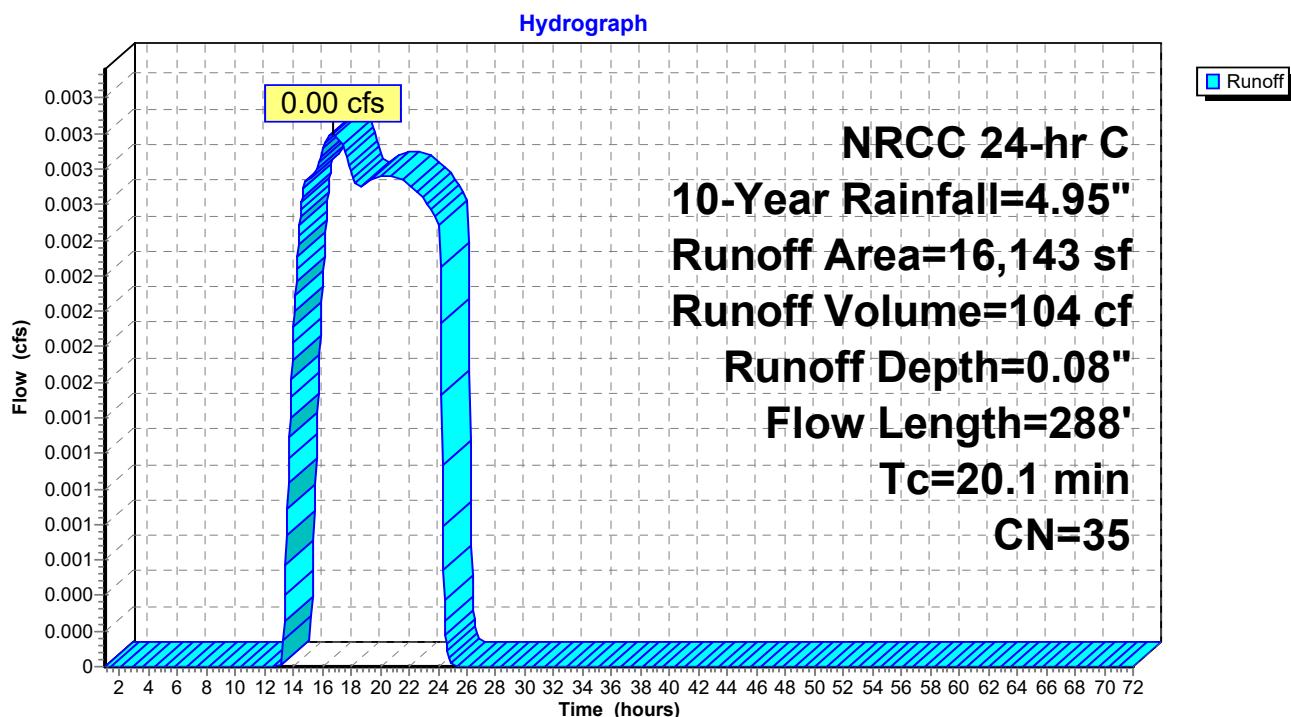
Runoff = 0.00 cfs @ 16.75 hrs, Volume= 104 cf, Depth= 0.08"

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
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



21-204 EWS

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

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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 1S: TRIB TO OLD WASHINGTON

Runoff Area=74,425 sf 3.15% Impervious Runoff Depth=2.13"
Flow Length=310' Tc=20.4 min CN=61 Runoff=2.77 cfs 13,233 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 = 13,744 cf Average Runoff Depth = 1.56"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

21-204 EWS

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

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Summary for Subcatchment 1S: TRIB TO OLD WASHINGTON

Runoff = 2.77 cfs @ 12.31 hrs, Volume= 13,233 cf, Depth= 2.13"

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

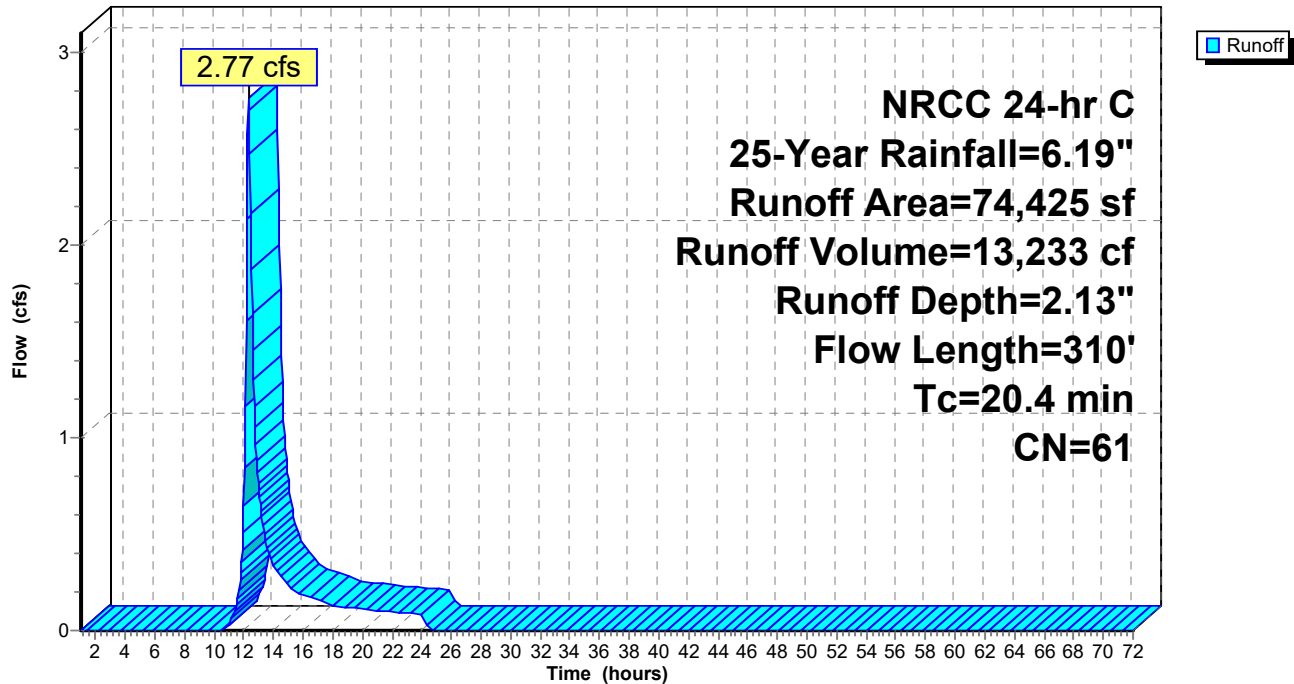
NRCC 24-hr C 25-Year Rainfall=6.19"

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	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	61	Weighted Average
	72,084		96.85% Pervious Area
	2,341		3.15% 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 1S: TRIB TO OLD WASHINGTON

Hydrograph



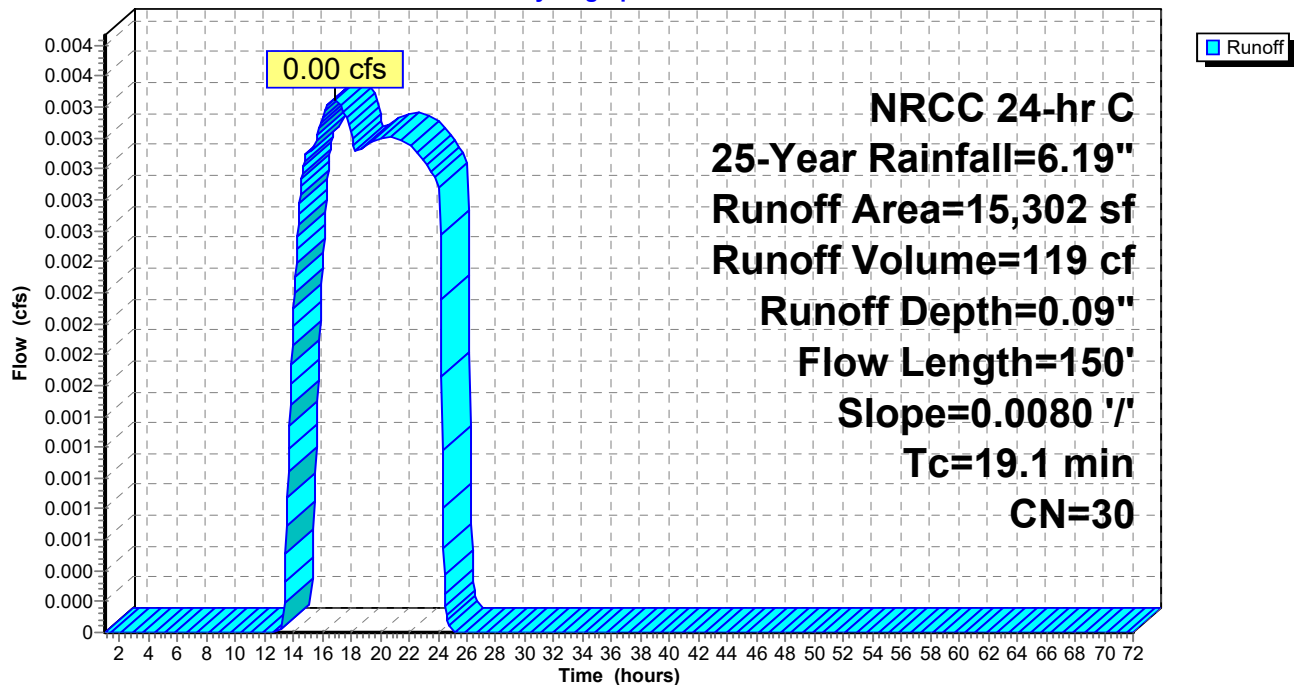
Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

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		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
19.1	150	Total			

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

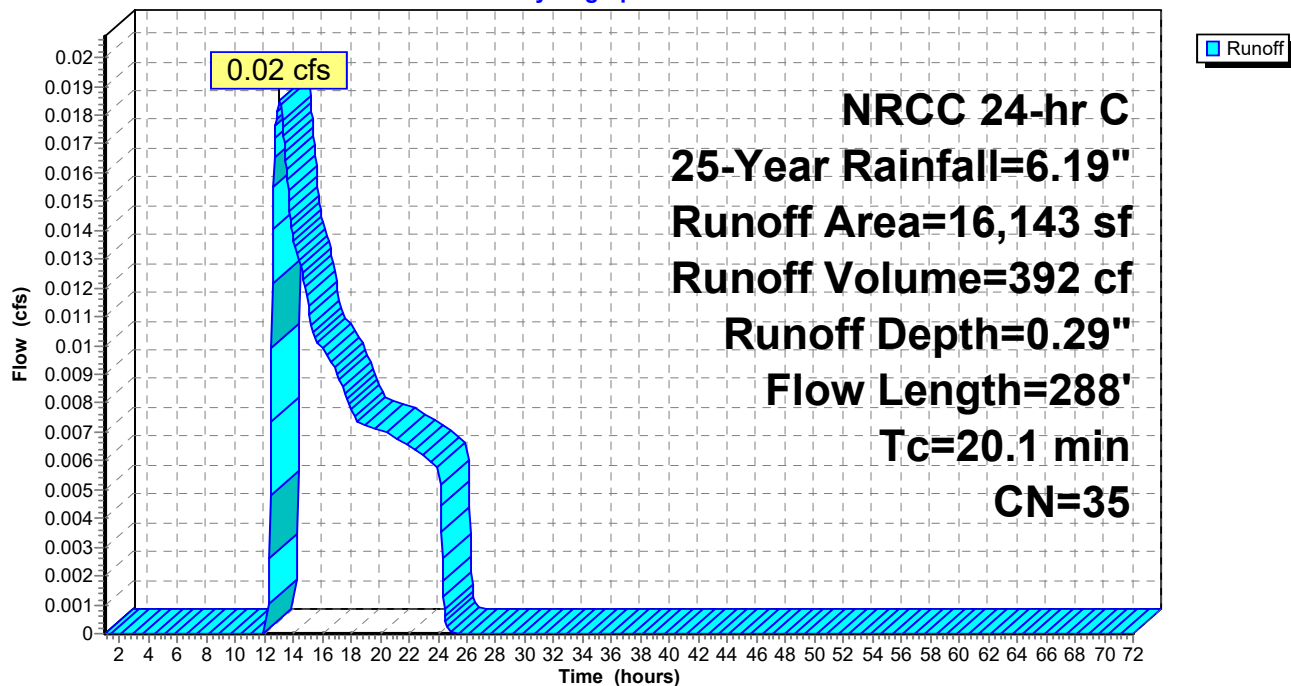
Summary for Subcatchment 3S: TRIB TO SOUTH WEST OF SITE

Runoff = 0.02 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**

21-204 EWS

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

Prepared by MERRILL ENGINEERS AND LAND SURVEYORS

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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 1S: TRIB TO OLD WASHINGTON

Runoff Area=74,425 sf 3.15% Impervious Runoff Depth=3.97"
Flow Length=310' Tc=20.4 min CN=61 Runoff=5.33 cfs 24,629 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 = 26,789 cf Average Runoff Depth = 3.04"
97.79% Pervious = 103,529 sf 2.21% Impervious = 2,341 sf

Summary for Subcatchment 1S: TRIB TO OLD WASHINGTON

Runoff = 5.33 cfs @ 12.31 hrs, Volume= 24,629 cf, Depth= 3.97"

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

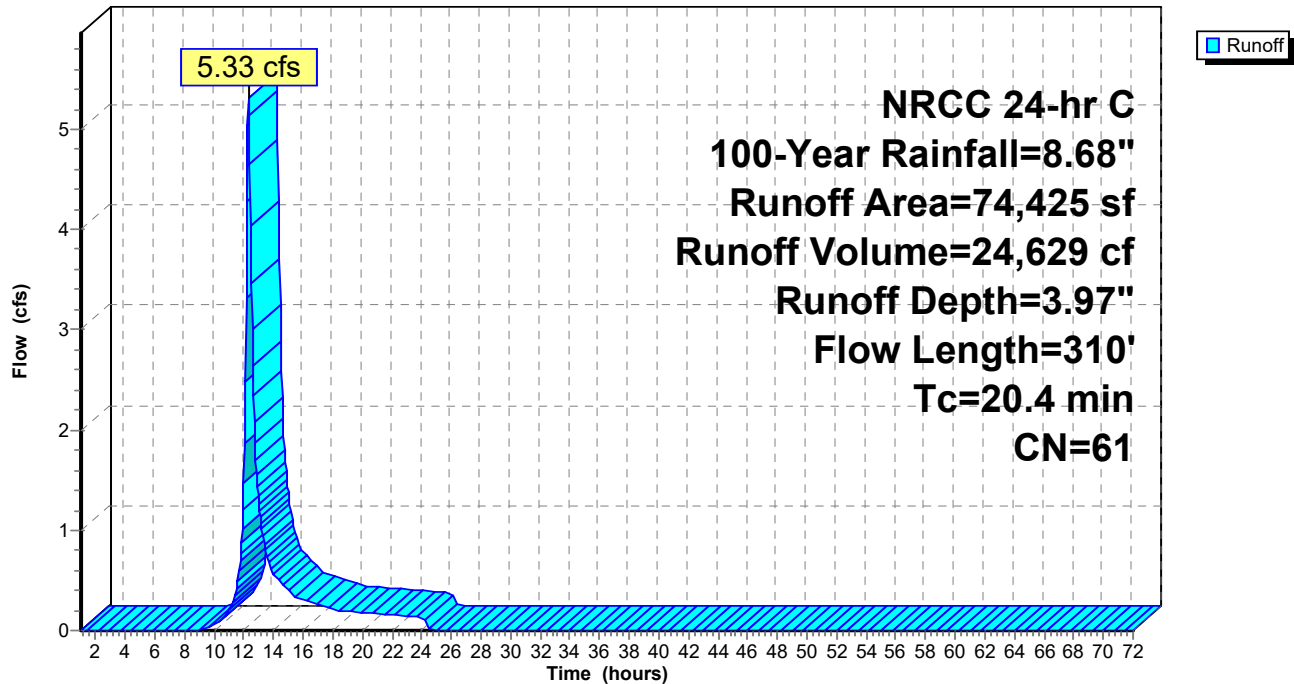
NRCC 24-hr C 100-Year Rainfall=8.68"

	Area (sf)	CN	Description
*	2,341	98	Paved parking & house/sheds
	4,603	96	Gravel surface, HSG A
	541	39	>75% Grass cover, Good, HSG A
	9,060	36	Woods, Fair, HSG A
	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	61	Weighted Average
	72,084		96.85% Pervious Area
	2,341		3.15% 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 1S: TRIB TO OLD WASHINGTON

Hydrograph



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

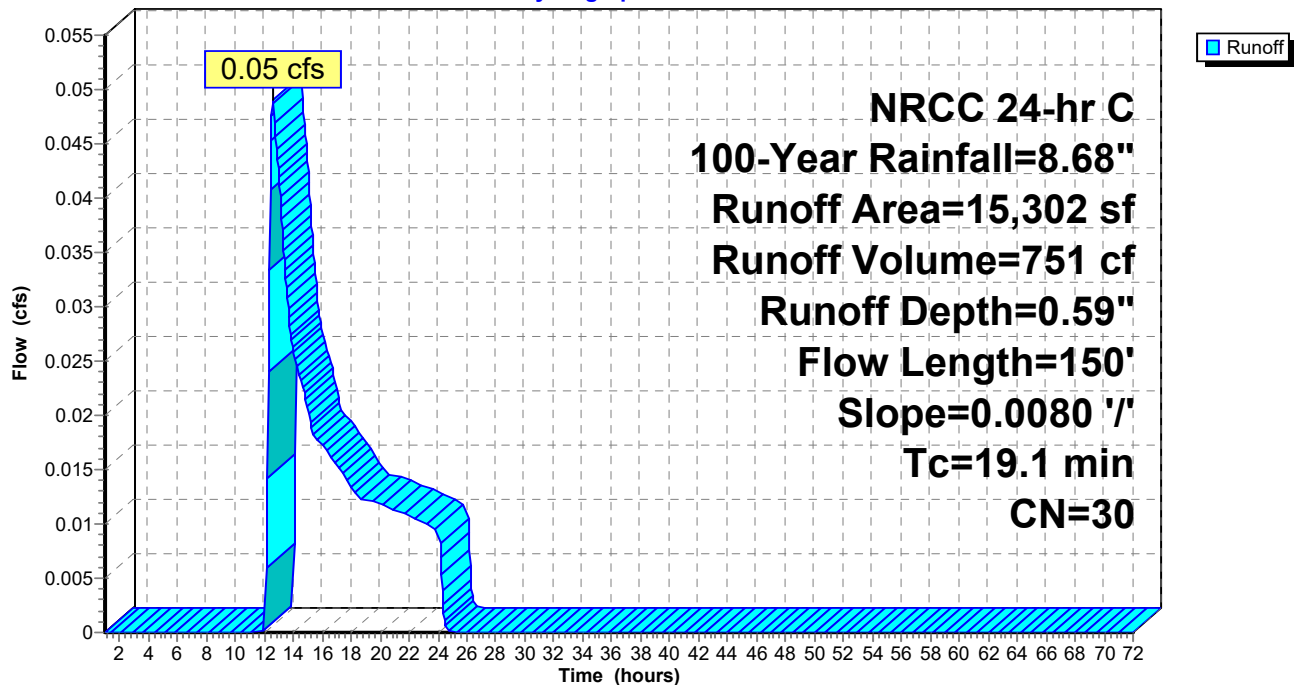
Runoff = 0.05 cfs @ 12.61 hrs, Volume= 751 cf, Depth= 0.59"

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"

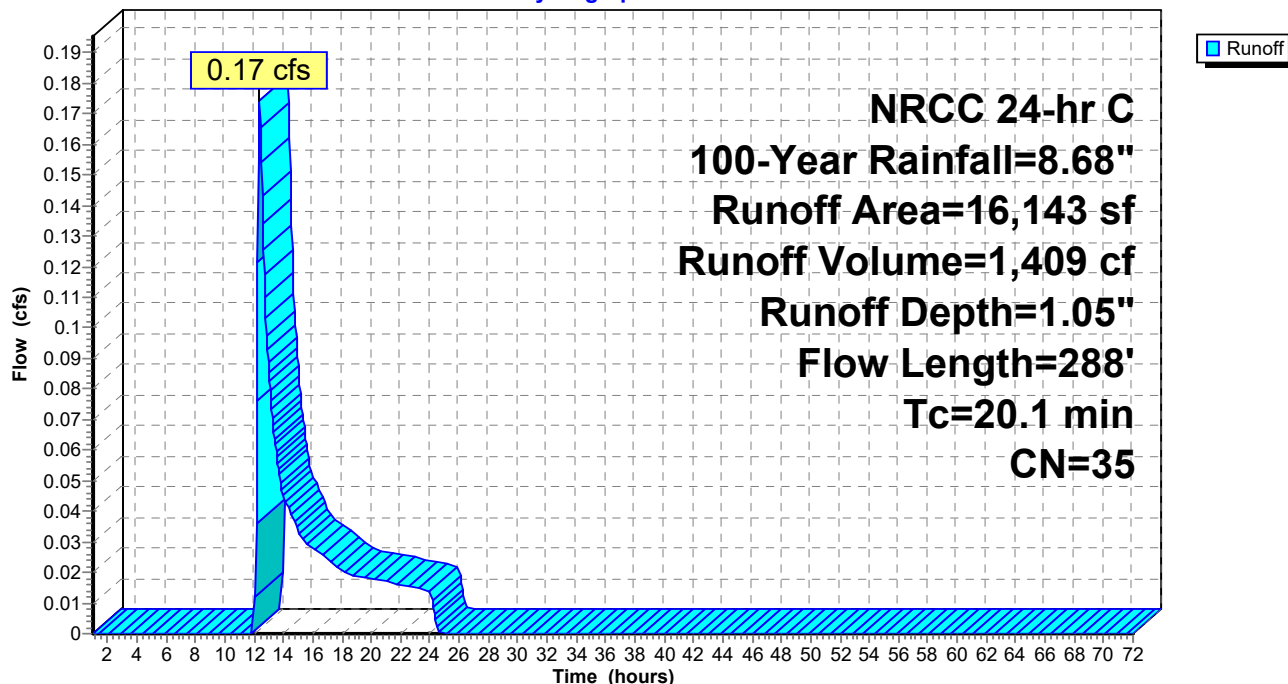
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.68"

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

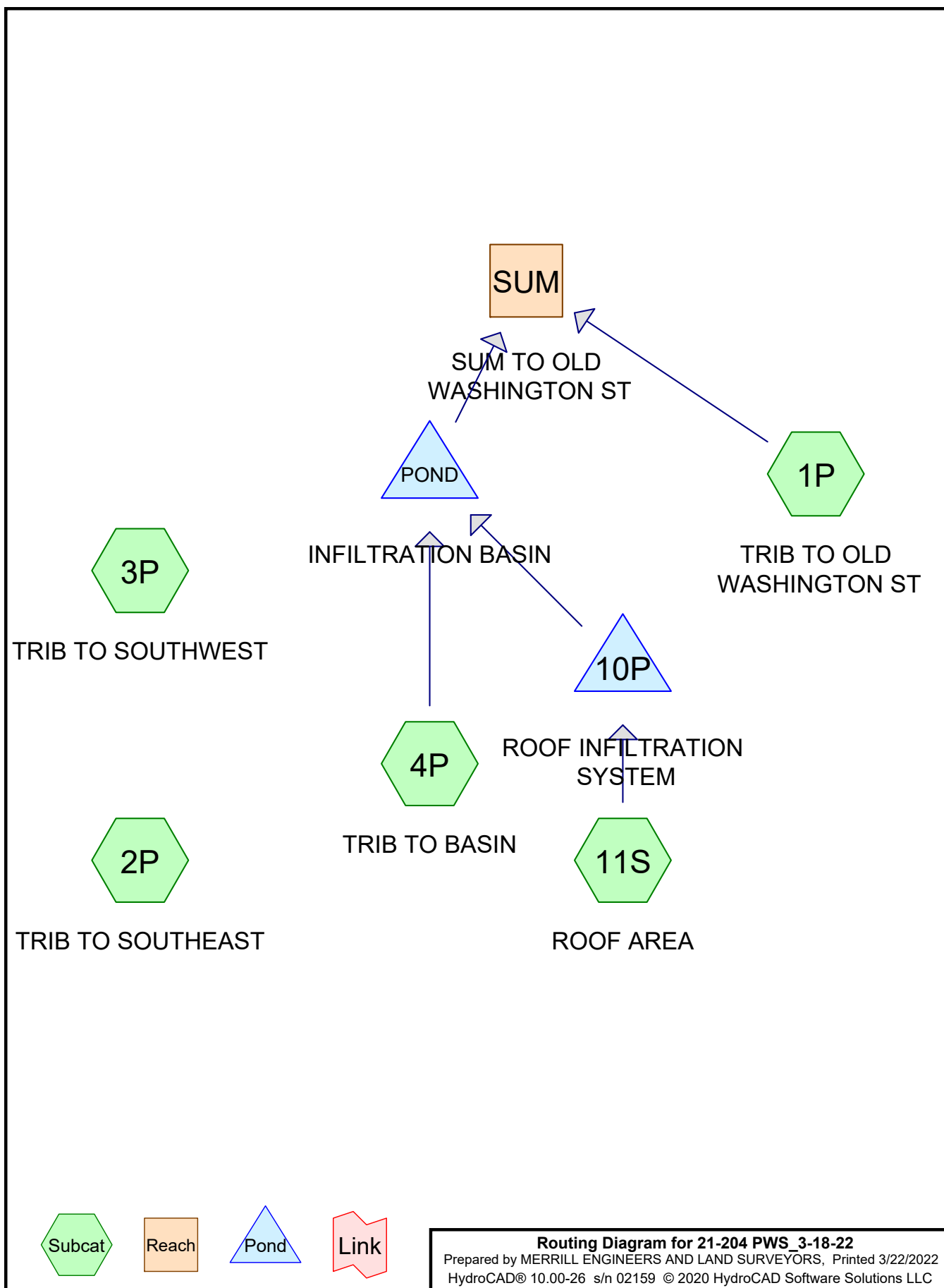
Hydrograph



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)
2,583	39	>75% Grass cover, Good, HSG A (1P)
22,448	61	>75% Grass cover, Good, HSG B (1P, 4P)
421	80	>75% Grass cover, Good, HSG D (1P)
818	98	Paved parking, HSG A (1P)
11,554	98	Paved parking, HSG B (4P)
5,400	98	Roofs, HSG A (11S)
35,262	30	Woods, Good, HSG A (1P, 2P, 3P)
27,384	55	Woods, Good, HSG B (1P, 3P, 4P)
105,870	55	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 1P: TRIB TO OLD WASHINGTON ST

Runoff Area=31,213 sf 2.62% Impervious Runoff Depth=0.12"
 Flow Length=310' Tc=20.4 min CN=48 Runoff=0.01 cfs 303 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=39,776 sf 29.05% Impervious Runoff Depth=0.92"
 Flow Length=199' Tc=21.8 min CN=70 Runoff=0.58 cfs 3,039 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 OLD WASHINGTON ST

Inflow=0.01 cfs 303 cf
 Outflow=0.01 cfs 303 cf

Pond 10P: ROOF INFILTRATION SYSTEM

Peak Elev=68.05' Storage=381 cf Inflow=0.41 cfs 1,403 cf
 Discarded=0.01 cfs 1,041 cf Primary=0.38 cfs 364 cf Outflow=0.40 cfs 1,405 cf

Pond POND: INFILTRATION BASIN

Peak Elev=65.19' Storage=1,252 cf Inflow=0.70 cfs 3,403 cf
 Discarded=0.11 cfs 3,404 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 3,404 cf

Total Runoff Area = 105,870 sf Runoff Volume = 4,744 cf Average Runoff Depth = 0.54"
83.21% Pervious = 88,098 sf 16.79% Impervious = 17,772 sf

Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

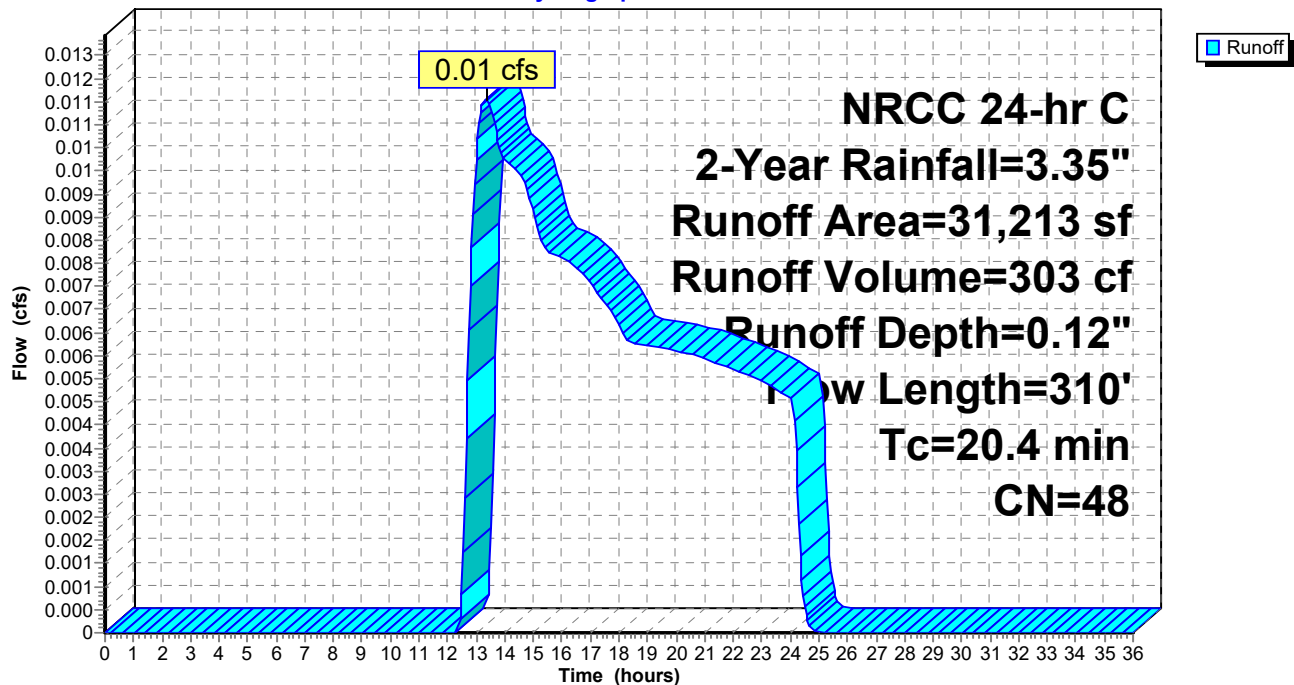
Runoff = 0.01 cfs @ 13.34 hrs, Volume= 303 cf, Depth= 0.12"

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
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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 1P: TRIB TO OLD WASHINGTON ST**Hydrograph**

Summary for Subcatchment 2P: TRIB TO SOUTHEAST

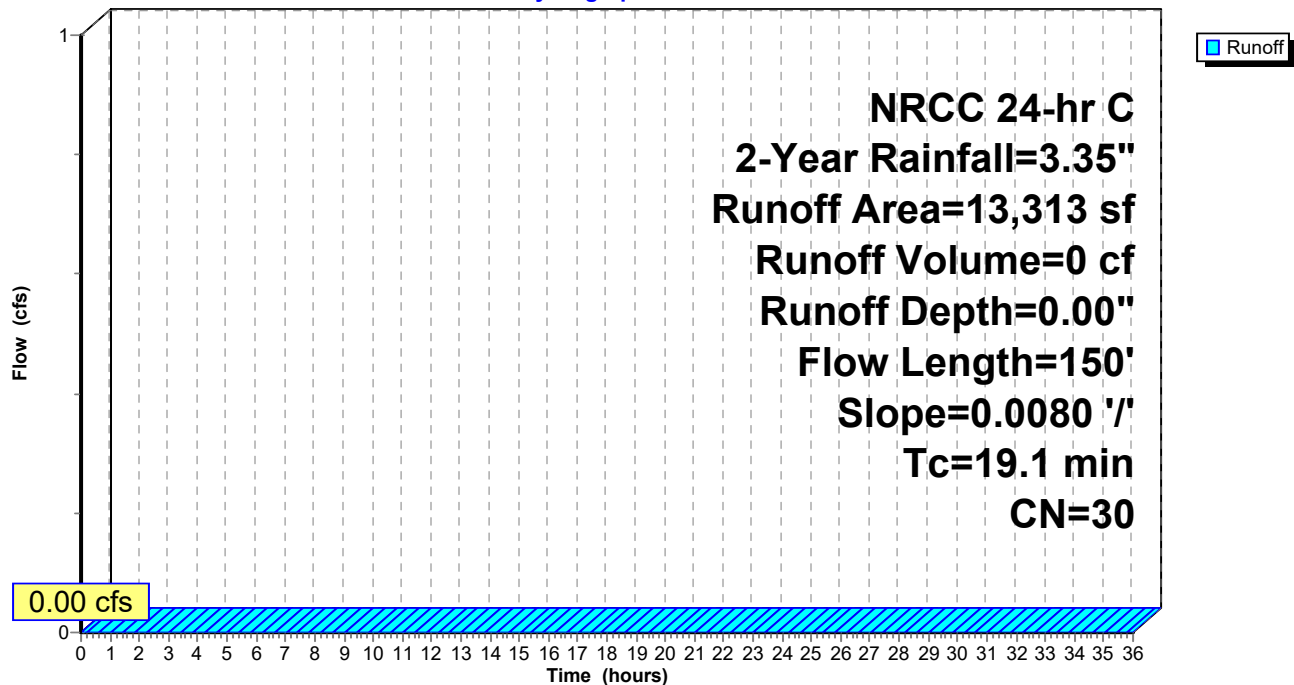
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

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

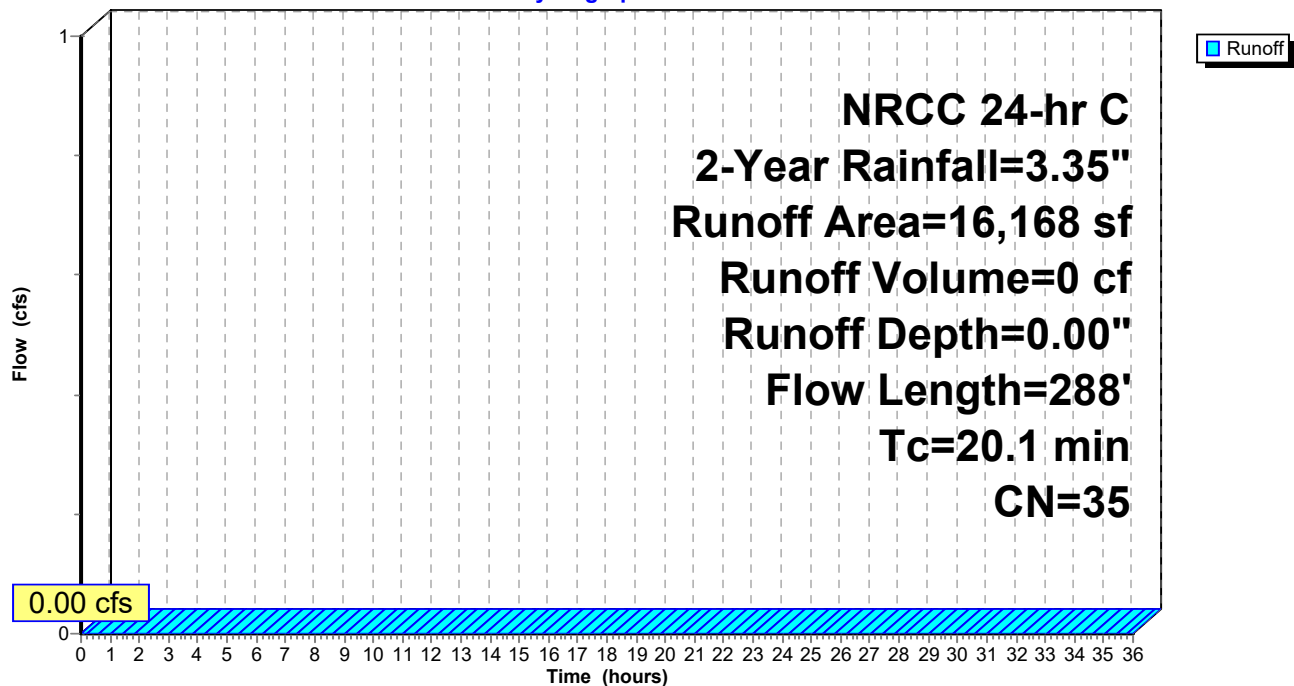
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

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**

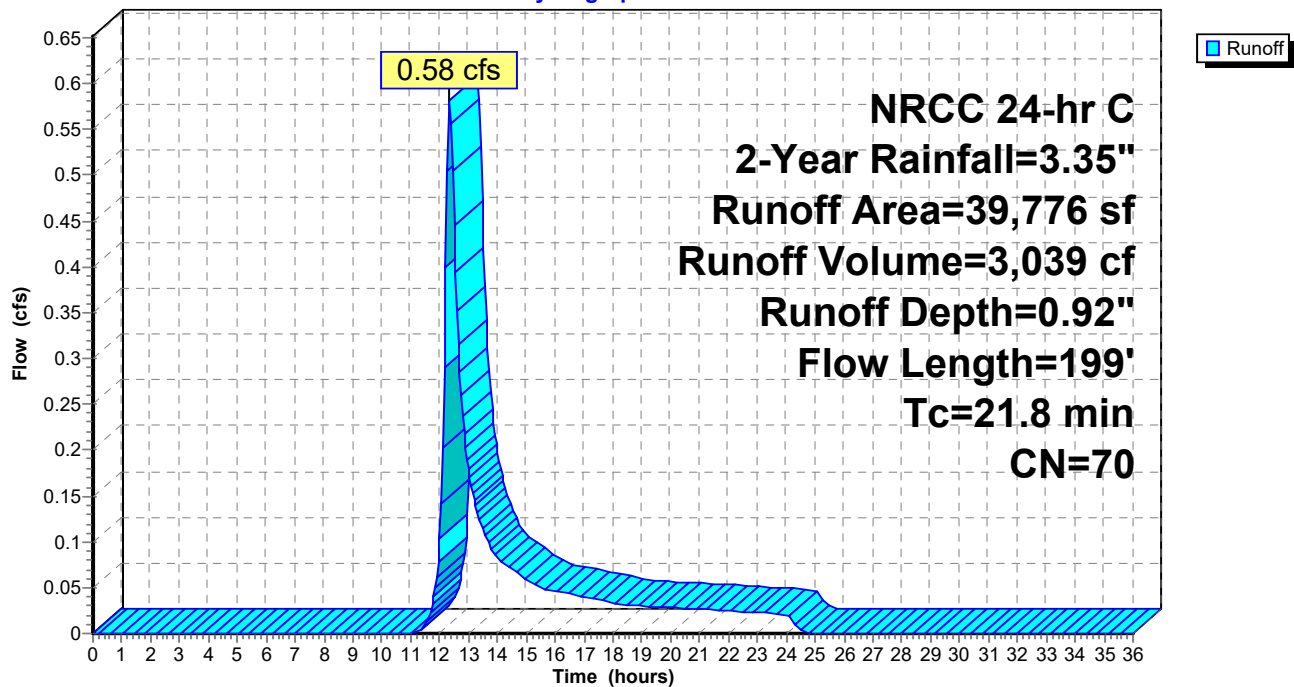
Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 0.58 cfs @ 12.34 hrs, Volume= 3,039 cf, Depth= 0.92"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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"

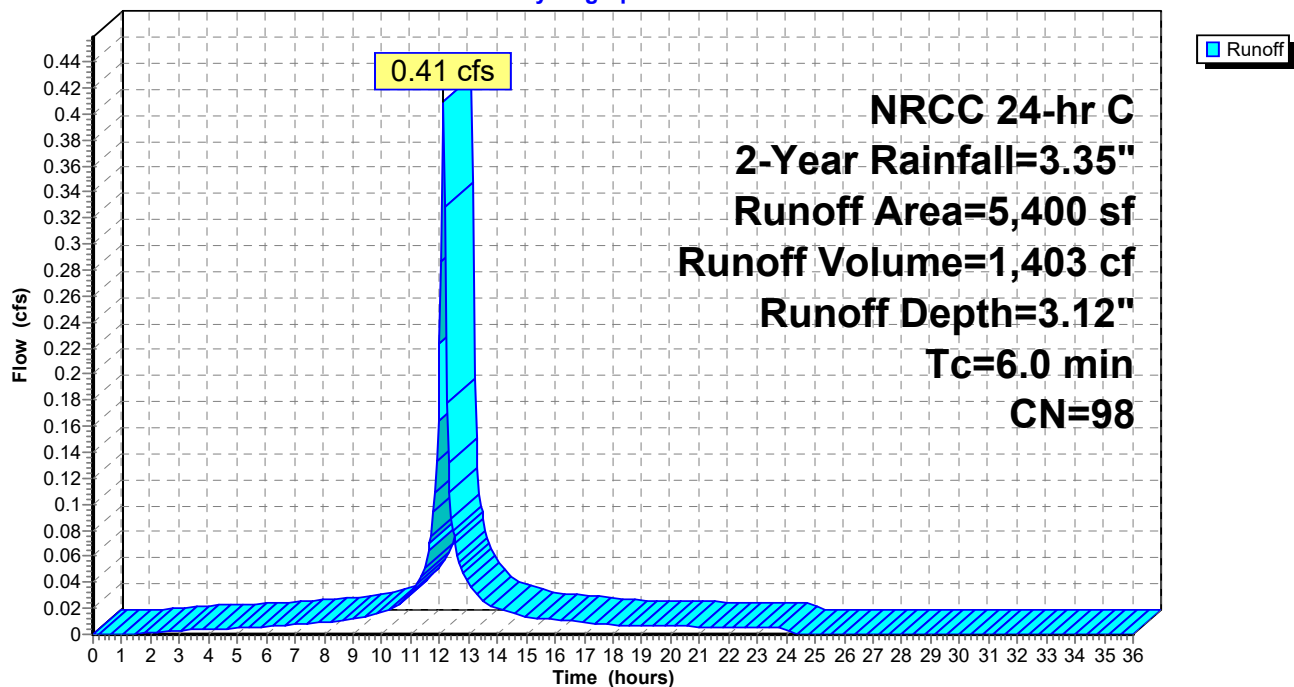
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.35"

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

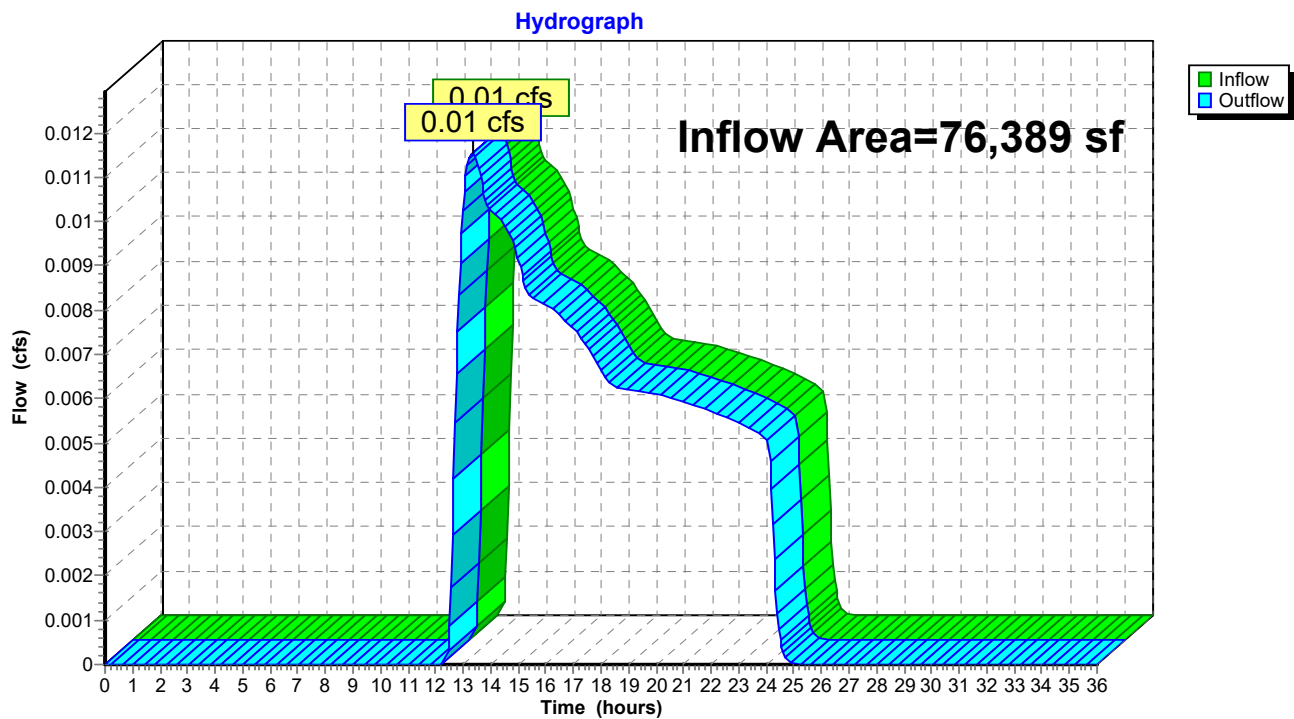
Hydrograph



Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 0.05" for 2-Year event
Inflow = 0.01 cfs @ 13.34 hrs, Volume= 303 cf
Outflow = 0.01 cfs @ 13.34 hrs, Volume= 303 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 OLD WASHINGTON ST

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 3.12" for 2-Year event
 Inflow = 0.41 cfs @ 12.13 hrs, Volume= 1,403 cf
 Outflow = 0.40 cfs @ 12.17 hrs, Volume= 1,405 cf, Atten= 3%, Lag= 2.4 min
 Discarded = 0.01 cfs @ 9.55 hrs, Volume= 1,041 cf
 Primary = 0.38 cfs @ 12.17 hrs, Volume= 364 cf

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

Peak Elev= 68.05' @ 12.17 hrs Surf.Area= 253 sf Storage= 381 cf

Plug-Flow detention time= 156.7 min calculated for 1,401 cf (100% of inflow)

Center-of-Mass det. time= 157.7 min (915.1 - 757.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height
#3	Primary	67.70'	12.0" Round Culvert L= 50.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 9.55 hrs HW=65.54' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.32 cfs @ 12.17 hrs HW=68.00' (Free Discharge)

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

↑ **3=Culvert** (Inlet Controls 0.32 cfs @ 1.64 fps)

Pond 10P: ROOF INFILTRATION SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-180 (Cultec Recharger® 180HD)

Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf

Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap

Row Length Adjustment= +1.00' x 3.44 sf x 3 rows

36.0" Wide + 3.0" Spacing = 39.0" C-C Row Spacing

3 Chambers/Row x 6.33' Long +1.00' Row Adjustment = 19.99' Row Length +12.0" End Stone x 2 = 21.99' Base Length

3 Rows x 36.0" Wide + 3.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.50' Base Width

6.0" Base + 20.5" Chamber Height + 6.0" Cover = 2.71' Field Height

9 Chambers x 21.8 cf +1.00' Row Adjustment x 3.44 sf x 3 Rows = 206.3 cf Chamber Storage

684.9 cf Field - 206.3 cf Chambers = 478.6 cf Stone x 40.0% Voids = 191.5 cf Stone Storage

Chamber Storage + Stone Storage = 397.7 cf = 0.009 af

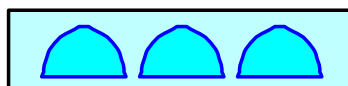
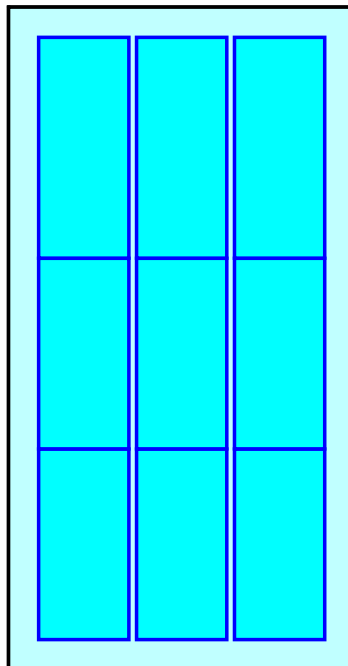
Overall Storage Efficiency = 58.1%

Overall System Size = 21.99' x 11.50' x 2.71'

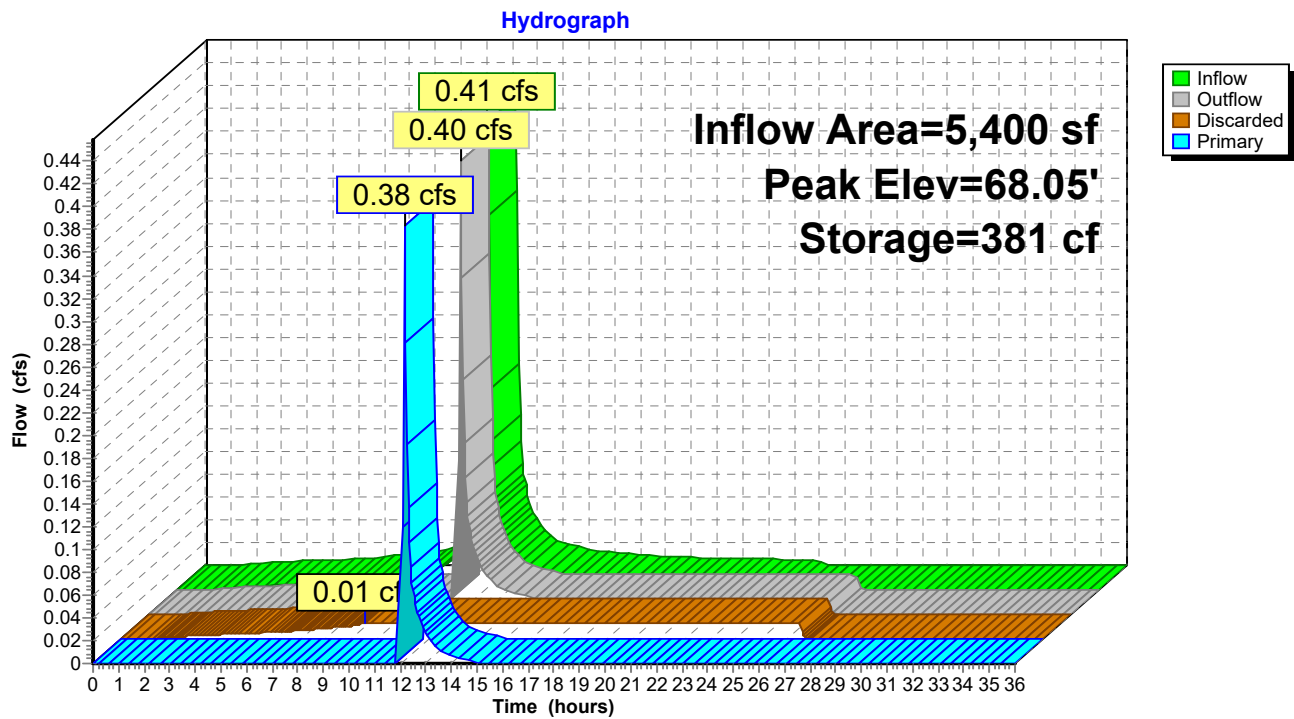
9 Chambers

25.4 cy Field

17.7 cy Stone



Pond 10P: ROOF INFILTRATION SYSTEM



Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 0.90" for 2-Year event
 Inflow = 0.70 cfs @ 12.29 hrs, Volume= 3,403 cf
 Outflow = 0.11 cfs @ 13.62 hrs, Volume= 3,404 cf, Atten= 84%, Lag= 79.6 min
 Discarded = 0.11 cfs @ 13.62 hrs, Volume= 3,404 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 / 3

Peak Elev= 65.19' @ 13.62 hrs Surf.Area= 2,035 sf Storage= 1,252 cf

Plug-Flow detention time= 102.4 min calculated for 3,399 cf (100% of inflow)

Center-of-Mass det. time= 102.3 min (987.6 - 885.3)

Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.49'	2.410 in/hr Exfiltration over Surface area
#2	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.11 cfs @ 13.62 hrs HW=65.19' (Free Discharge)

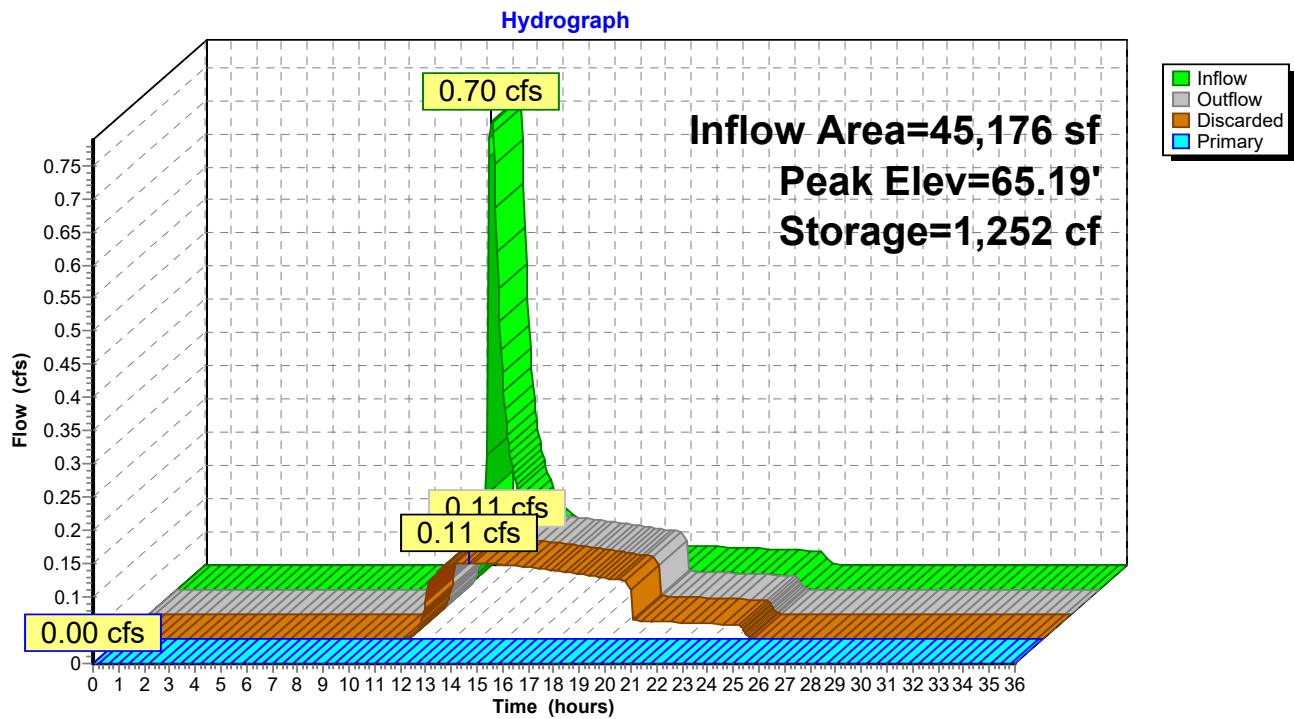
↑ **1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.49' (Free Discharge)

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

↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND: 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 1P: TRIB TO OLD WASHINGTON ST

Runoff Area=31,213 sf 2.62% Impervious Runoff Depth=0.57"
 Flow Length=310' Tc=20.4 min CN=48 Runoff=0.17 cfs 1,480 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=39,776 sf 29.05% Impervious Runoff Depth=2.00"
 Flow Length=199' Tc=21.8 min CN=70 Runoff=1.37 cfs 6,627 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 OLD WASHINGTON ST

Inflow=0.47 cfs 2,753 cf
 Outflow=0.47 cfs 2,753 cf

Pond 10P: ROOF INFILTRATION SYSTEM

Peak Elev=68.05' Storage=382 cf Inflow=0.61 cfs 2,121 cf
 Discarded=0.01 cfs 1,237 cf Primary=0.59 cfs 883 cf Outflow=0.60 cfs 2,120 cf

Pond POND: INFILTRATION BASIN

Peak Elev=65.90' Storage=2,833 cf Inflow=1.56 cfs 7,510 cf
 Discarded=0.14 cfs 6,237 cf Primary=0.37 cfs 1,273 cf Outflow=0.51 cfs 7,510 cf

Total Runoff Area = 105,870 sf Runoff Volume = 10,336 cf Average Runoff Depth = 1.17"
83.21% Pervious = 88,098 sf 16.79% Impervious = 17,772 sf

Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 0.17 cfs @ 12.40 hrs, Volume= 1,480 cf, Depth= 0.57"

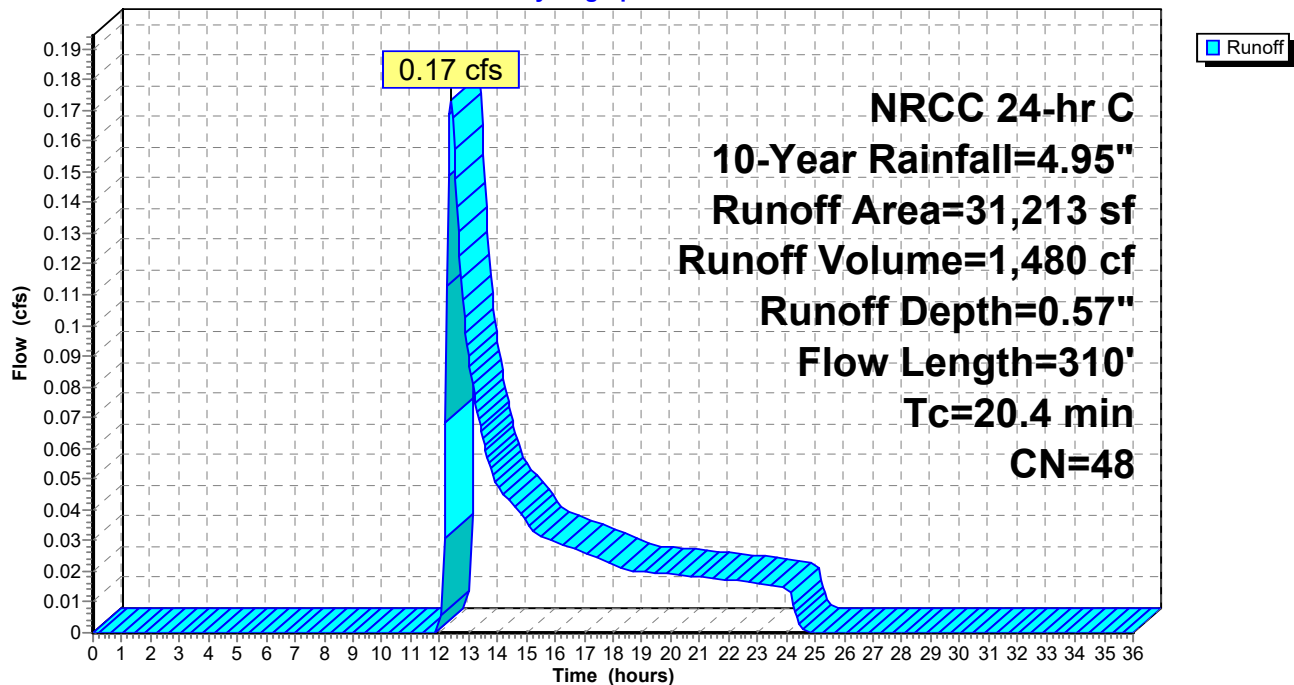
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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 1P: TRIB TO OLD WASHINGTON ST

Hydrograph



Summary for Subcatchment 2P: TRIB TO SOUTHEAST

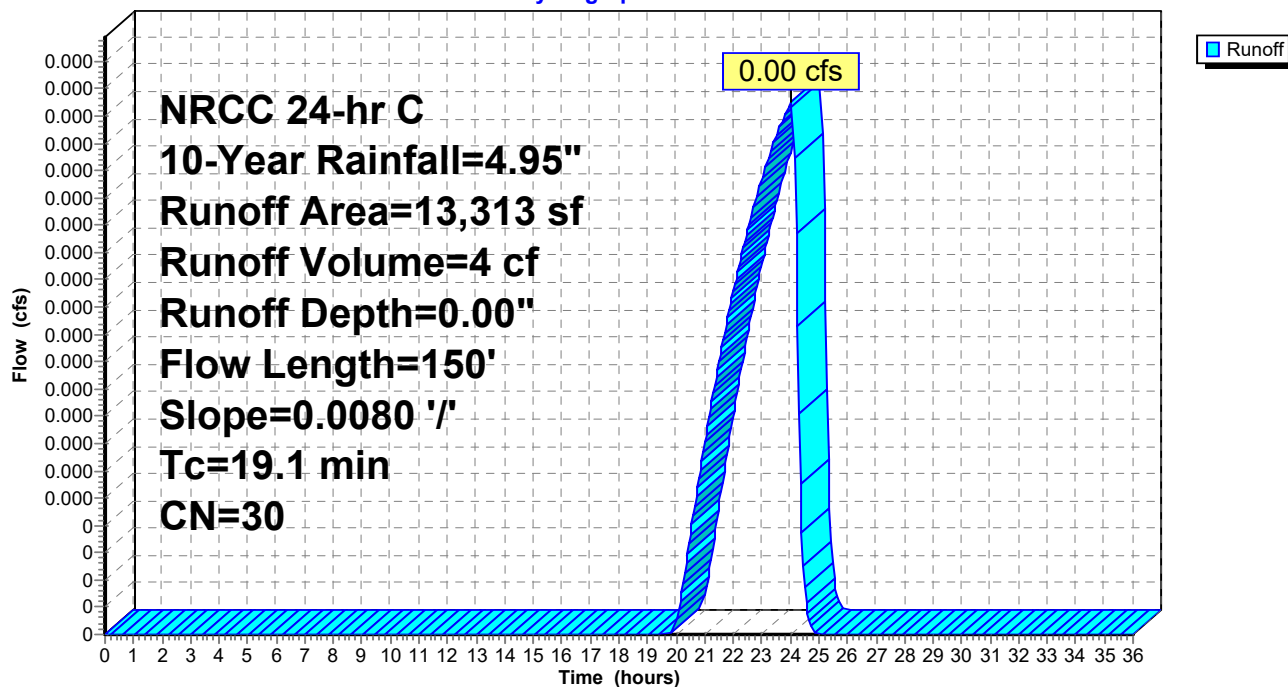
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 4 cf, Depth= 0.00"

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



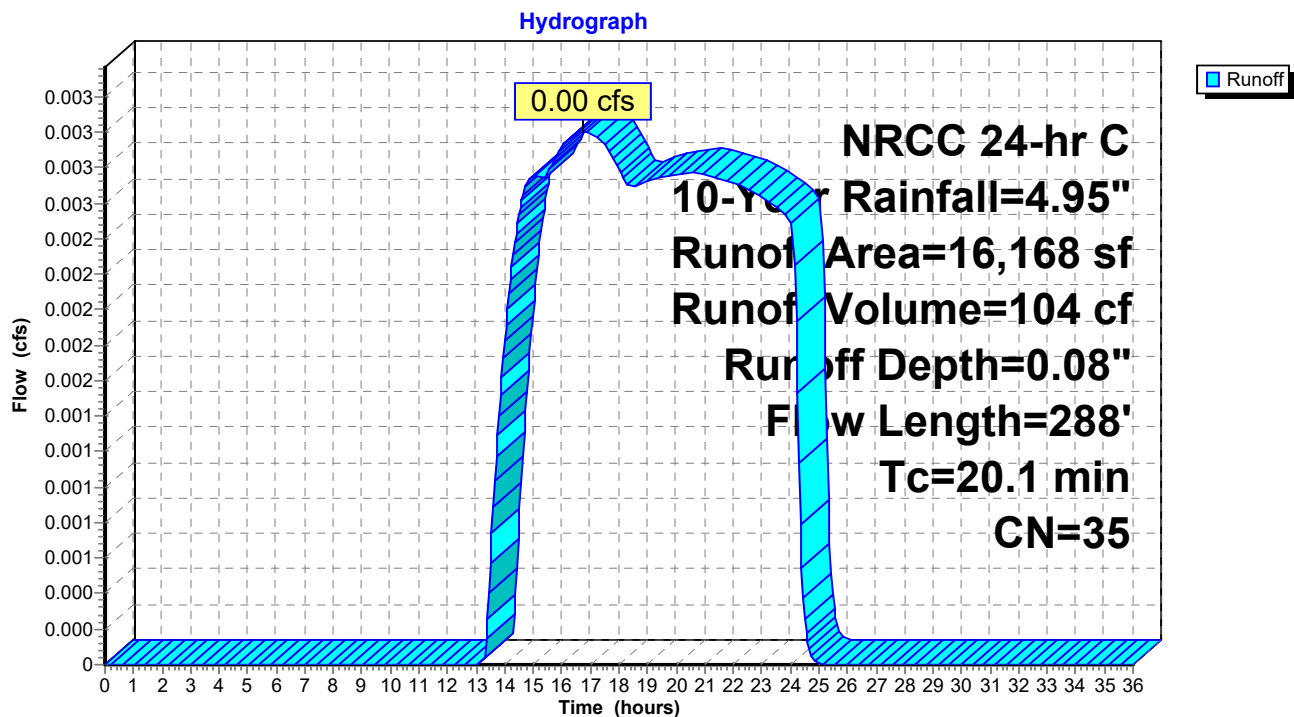
Summary for Subcatchment 3P: TRIB TO SOUTHWEST

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

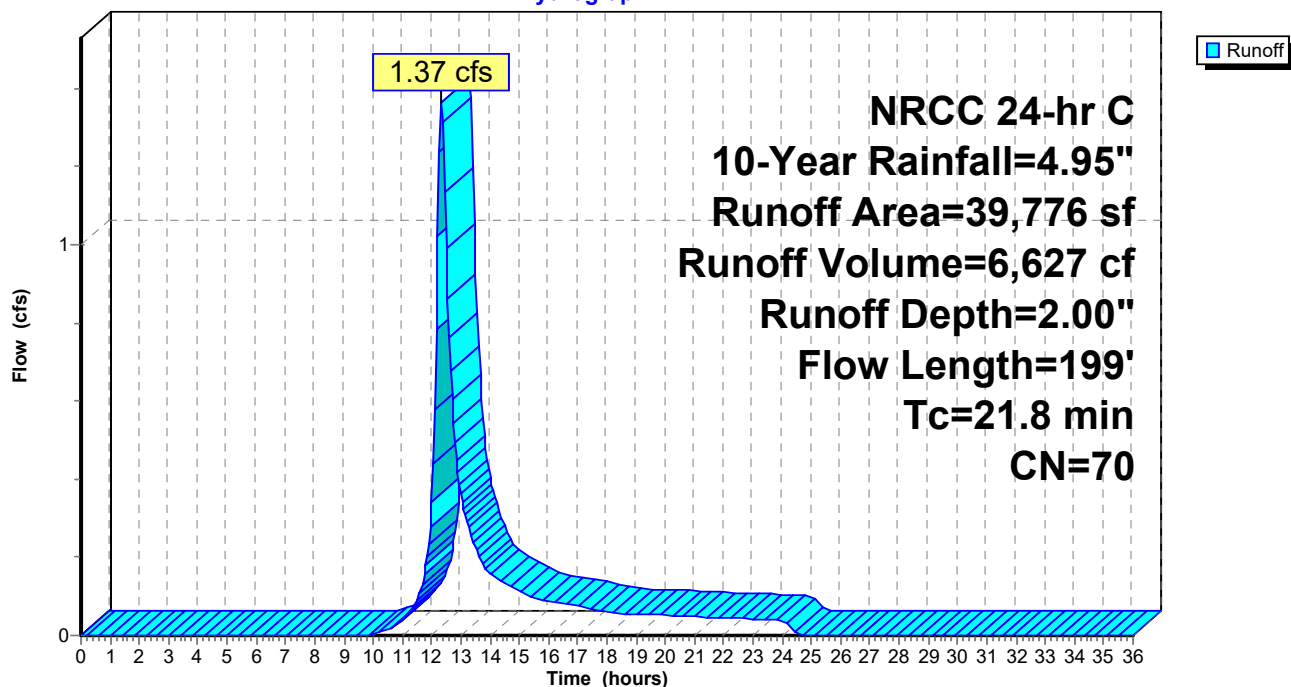
Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 1.37 cfs @ 12.33 hrs, Volume= 6,627 cf, Depth= 2.00"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

Subcatchment 4P: TRIB TO BASIN**Hydrograph**

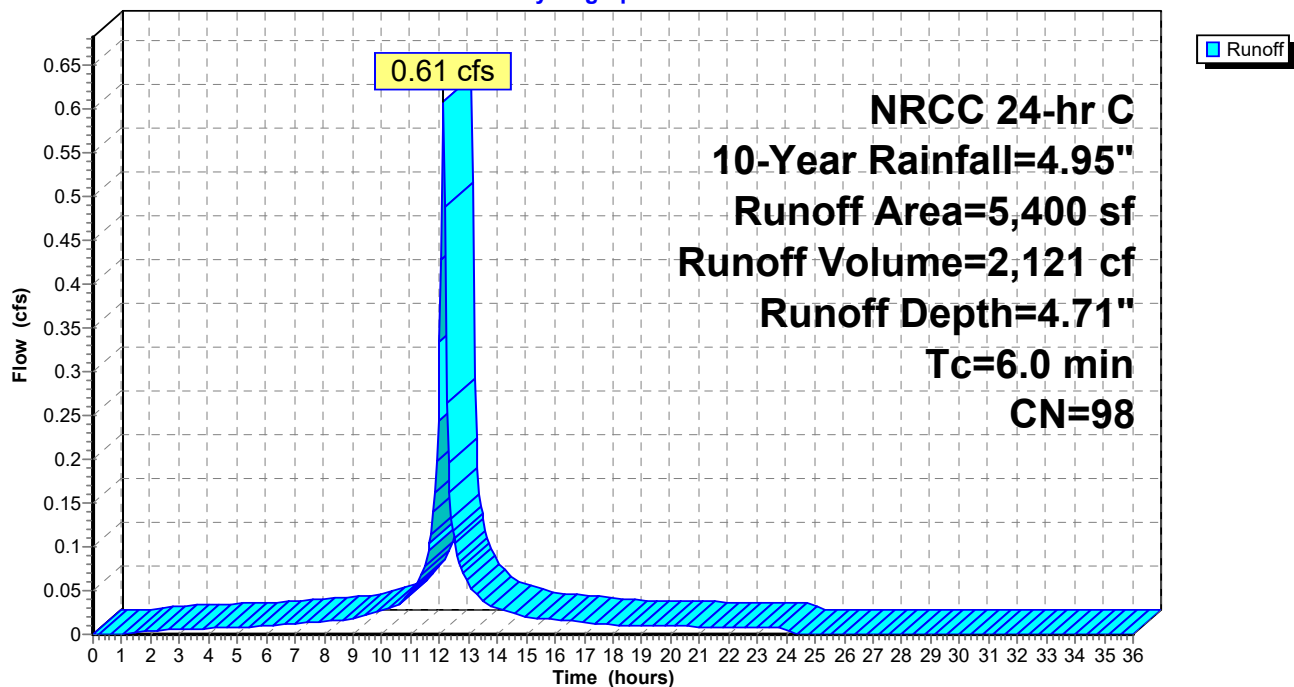
Summary for Subcatchment 11S: ROOF AREA

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

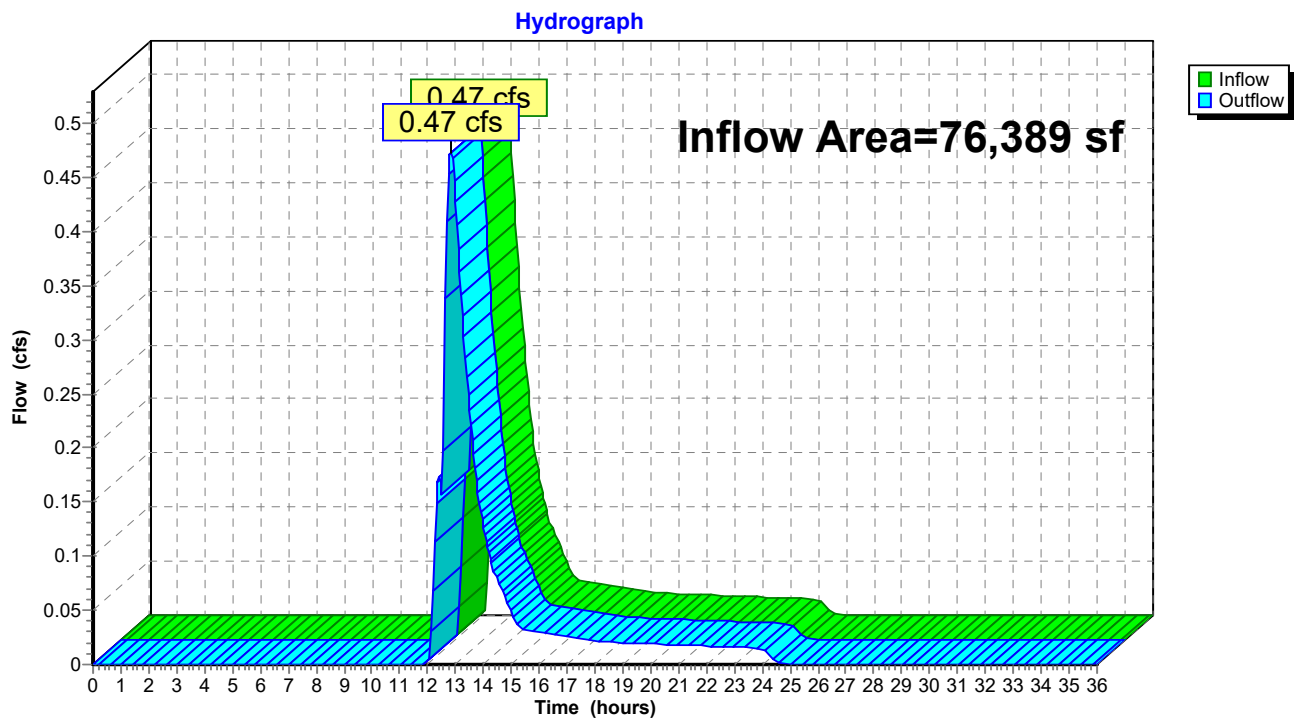
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment 11S: ROOF AREA**Hydrograph**

Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 0.43" for 10-Year event
Inflow = 0.47 cfs @ 12.83 hrs, Volume= 2,753 cf
Outflow = 0.47 cfs @ 12.83 hrs, Volume= 2,753 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 OLD WASHINGTON ST

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 4.71" for 10-Year event
 Inflow = 0.61 cfs @ 12.13 hrs, Volume= 2,121 cf
 Outflow = 0.60 cfs @ 12.13 hrs, Volume= 2,120 cf, Atten= 1%, Lag= 0.2 min
 Discarded = 0.01 cfs @ 7.75 hrs, Volume= 1,237 cf
 Primary = 0.59 cfs @ 12.13 hrs, Volume= 883 cf

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

Peak Elev= 68.05' @ 12.13 hrs Surf.Area= 253 sf Storage= 382 cf

Plug-Flow detention time= 134.3 min calculated for 2,120 cf (100% of inflow)

Center-of-Mass det. time= 133.9 min (883.4 - 749.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height
#3	Primary	67.70'	12.0" Round Culvert L= 50.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 7.75 hrs HW=65.54' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.56 cfs @ 12.13 hrs HW=68.05' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.70 fps)

↑ **3=Culvert** (Inlet Controls 0.43 cfs @ 1.77 fps)

Pond 10P: ROOF INFILTRATION SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-180 (Cultec Recharger® 180HD)

Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf

Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap

Row Length Adjustment= +1.00' x 3.44 sf x 3 rows

36.0" Wide + 3.0" Spacing = 39.0" C-C Row Spacing

3 Chambers/Row x 6.33' Long +1.00' Row Adjustment = 19.99' Row Length +12.0" End Stone x 2 = 21.99' Base Length

3 Rows x 36.0" Wide + 3.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.50' Base Width

6.0" Base + 20.5" Chamber Height + 6.0" Cover = 2.71' Field Height

9 Chambers x 21.8 cf +1.00' Row Adjustment x 3.44 sf x 3 Rows = 206.3 cf Chamber Storage

684.9 cf Field - 206.3 cf Chambers = 478.6 cf Stone x 40.0% Voids = 191.5 cf Stone Storage

Chamber Storage + Stone Storage = 397.7 cf = 0.009 af

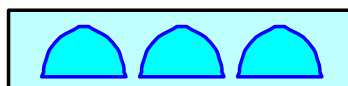
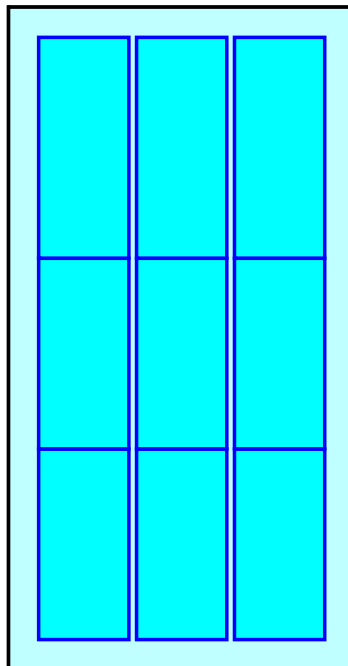
Overall Storage Efficiency = 58.1%

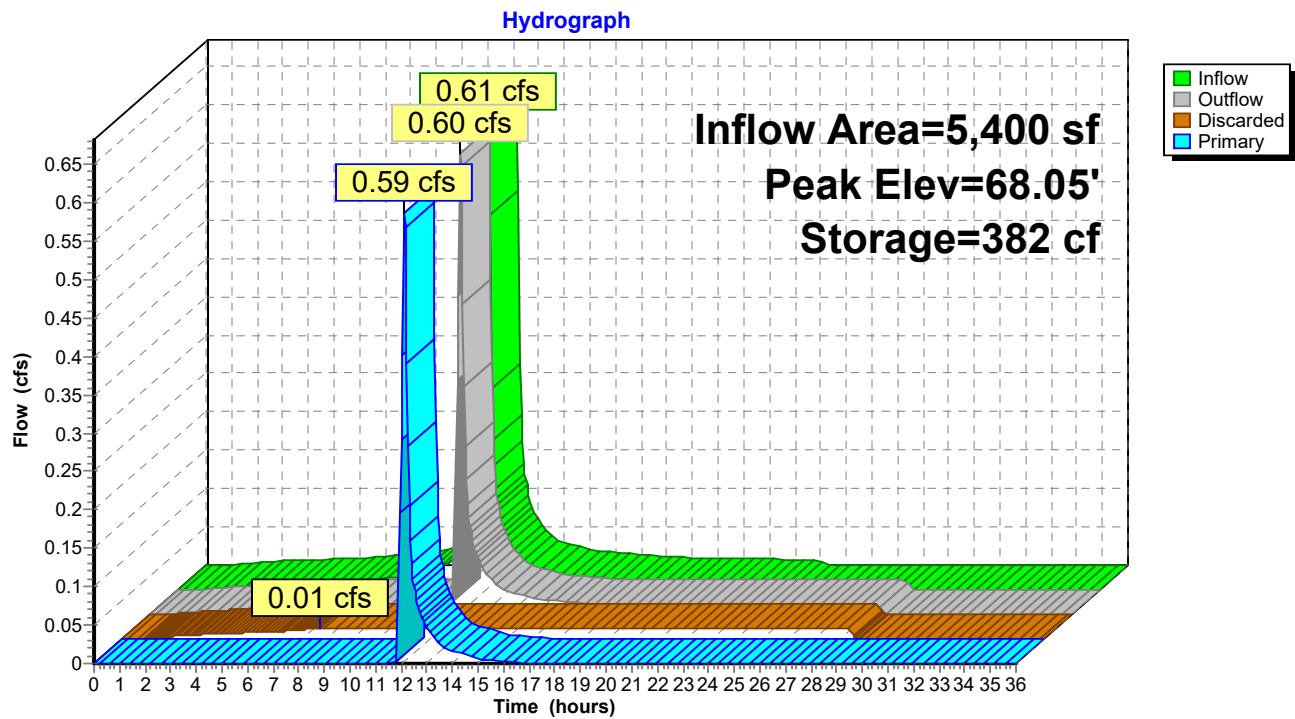
Overall System Size = 21.99' x 11.50' x 2.71'

9 Chambers

25.4 cy Field

17.7 cy Stone



Pond 10P: ROOF INFILTRATION SYSTEM

Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 1.99" for 10-Year event
 Inflow = 1.56 cfs @ 12.30 hrs, Volume= 7,510 cf
 Outflow = 0.51 cfs @ 12.85 hrs, Volume= 7,510 cf, Atten= 68%, Lag= 33.3 min
 Discarded = 0.14 cfs @ 12.85 hrs, Volume= 6,237 cf
 Primary = 0.37 cfs @ 12.85 hrs, Volume= 1,273 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 65.90' @ 12.85 hrs Surf.Area= 2,442 sf Storage= 2,833 cf

Plug-Flow detention time= 180.7 min calculated for 7,499 cf (100% of inflow)

Center-of-Mass det. time= 180.5 min (1,040.9 - 860.4)

Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.49'	2.410 in/hr Exfiltration over Surface area
#2	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.14 cfs @ 12.85 hrs HW=65.90' (Free Discharge)

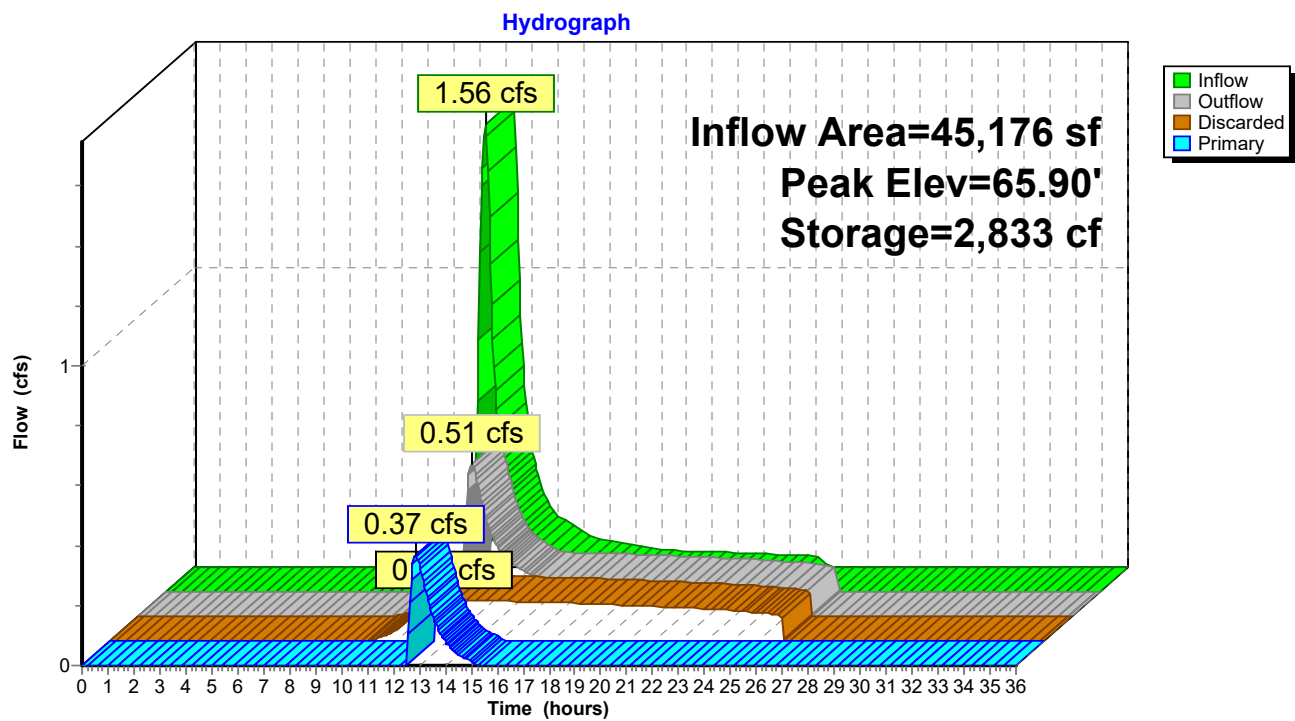
↑ **1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.37 cfs @ 12.85 hrs HW=65.90' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.37 cfs @ 1.27 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND: 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 1P: TRIB TO OLD WASHINGTON ST

Runoff Area=31,213 sf 2.62% Impervious Runoff Depth=1.09"
 Flow Length=310' Tc=20.4 min CN=48 Runoff=0.47 cfs 2,834 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=39,776 sf 29.05% Impervious Runoff Depth=2.96"
 Flow Length=199' Tc=21.8 min CN=70 Runoff=2.06 cfs 9,801 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 OLD WASHINGTON ST

Inflow=1.64 cfs 6,731 cf
 Outflow=1.64 cfs 6,731 cf

Pond 10P: ROOF INFILTRATION SYSTEM

Peak Elev=68.07' Storage=384 cf Inflow=0.76 cfs 2,678 cf
 Discarded=0.01 cfs 1,346 cf Primary=0.74 cfs 1,334 cf Outflow=0.75 cfs 2,680 cf

Pond POND: INFILTRATION BASIN

Peak Elev=66.09' Storage=3,314 cf Inflow=2.30 cfs 11,135 cf
 Discarded=0.14 cfs 7,235 cf Primary=1.29 cfs 3,897 cf Outflow=1.43 cfs 11,132 cf

Total Runoff Area = 105,870 sf Runoff Volume = 15,809 cf Average Runoff Depth = 1.79"
83.21% Pervious = 88,098 sf 16.79% Impervious = 17,772 sf

Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 0.47 cfs @ 12.35 hrs, Volume= 2,834 cf, Depth= 1.09"

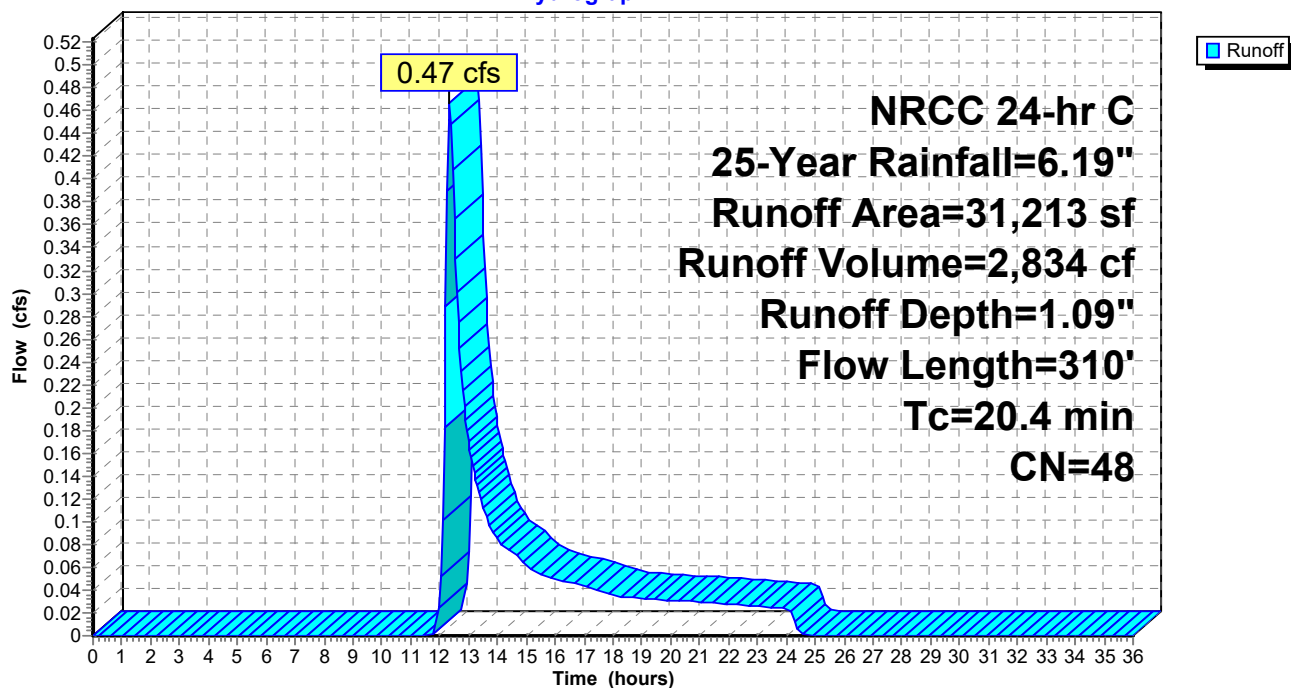
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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 1P: TRIB TO OLD WASHINGTON ST

Hydrograph



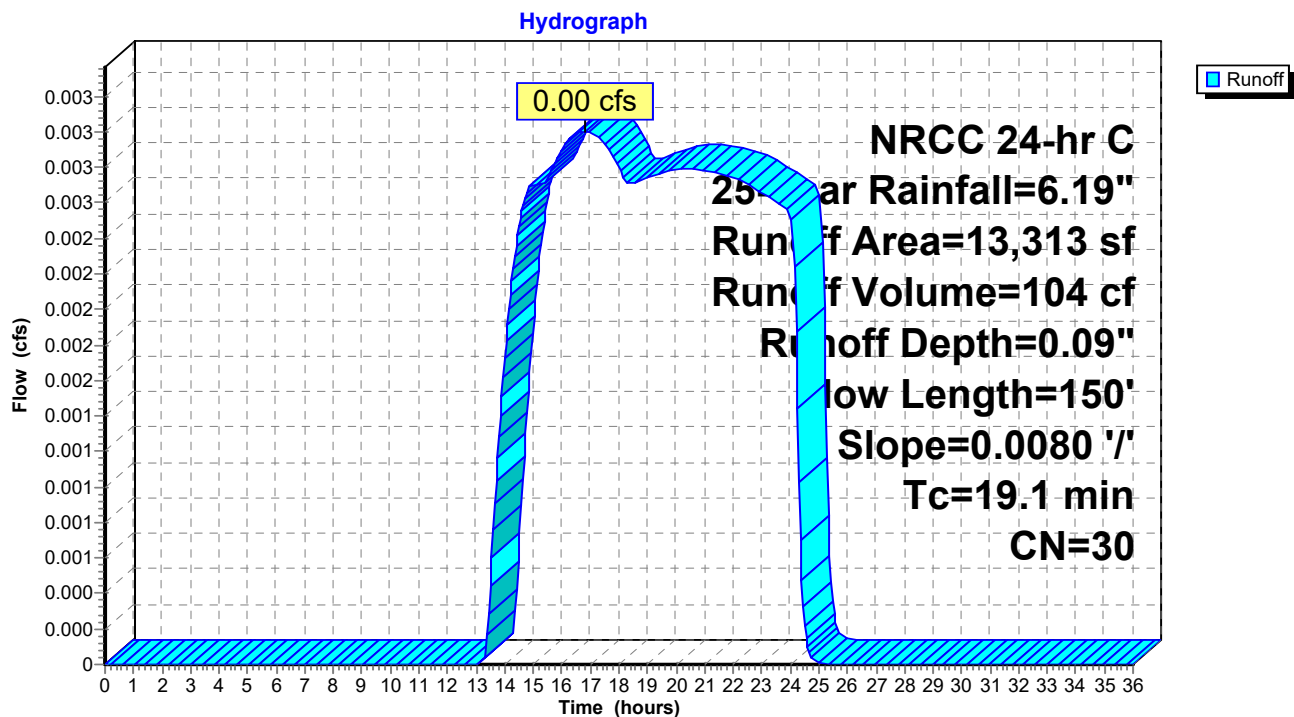
Summary for Subcatchment 2P: TRIB TO SOUTHEAST

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

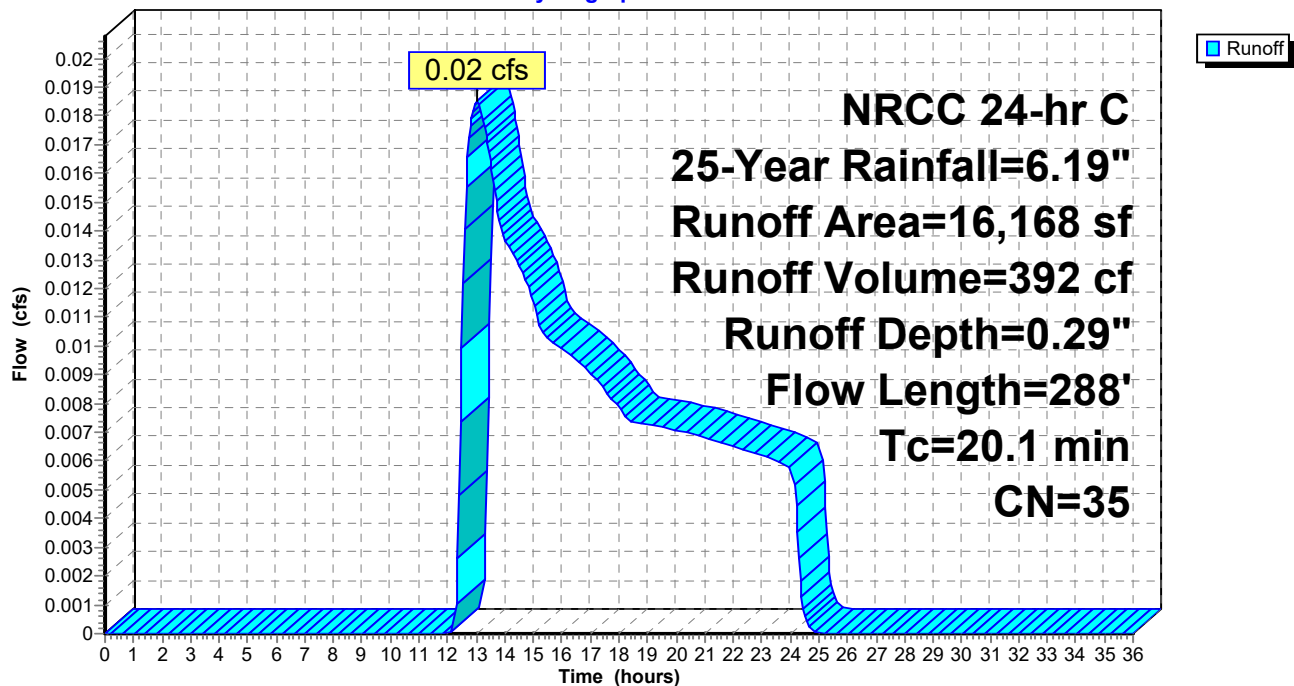
Summary for Subcatchment 3P: TRIB TO SOUTHWEST

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 = 2.06 cfs @ 12.32 hrs, Volume= 9,801 cf, Depth= 2.96"

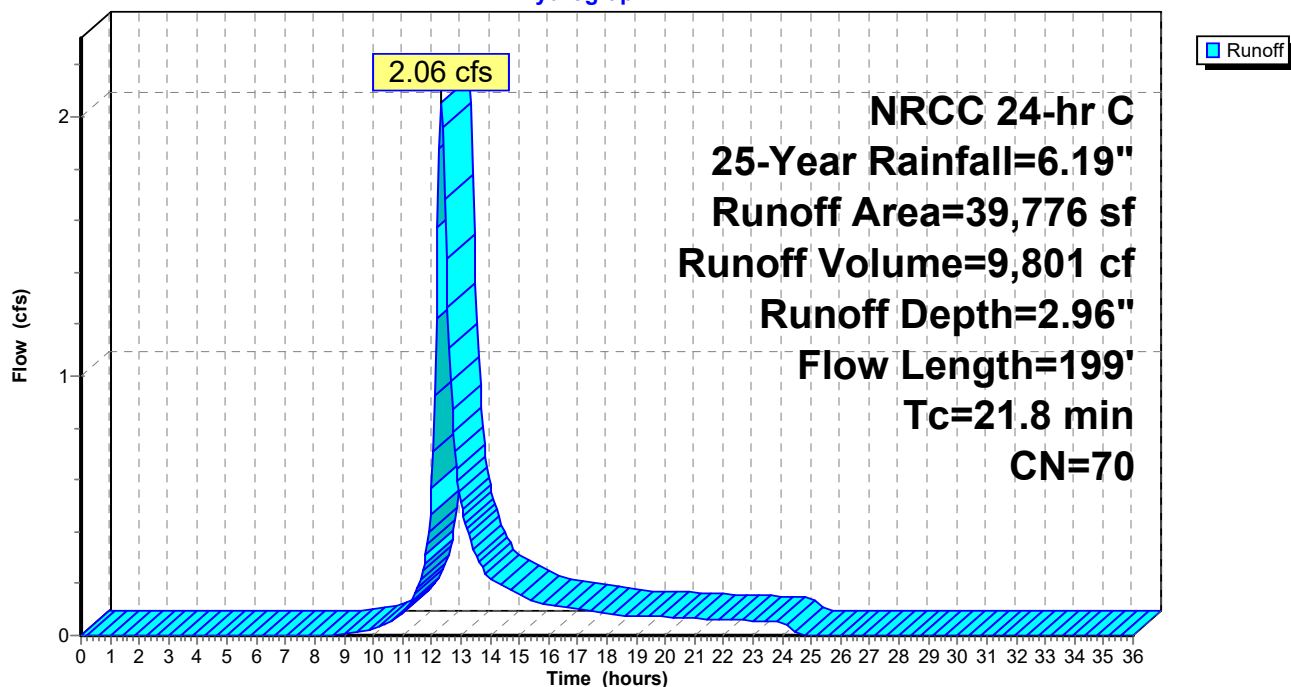
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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"

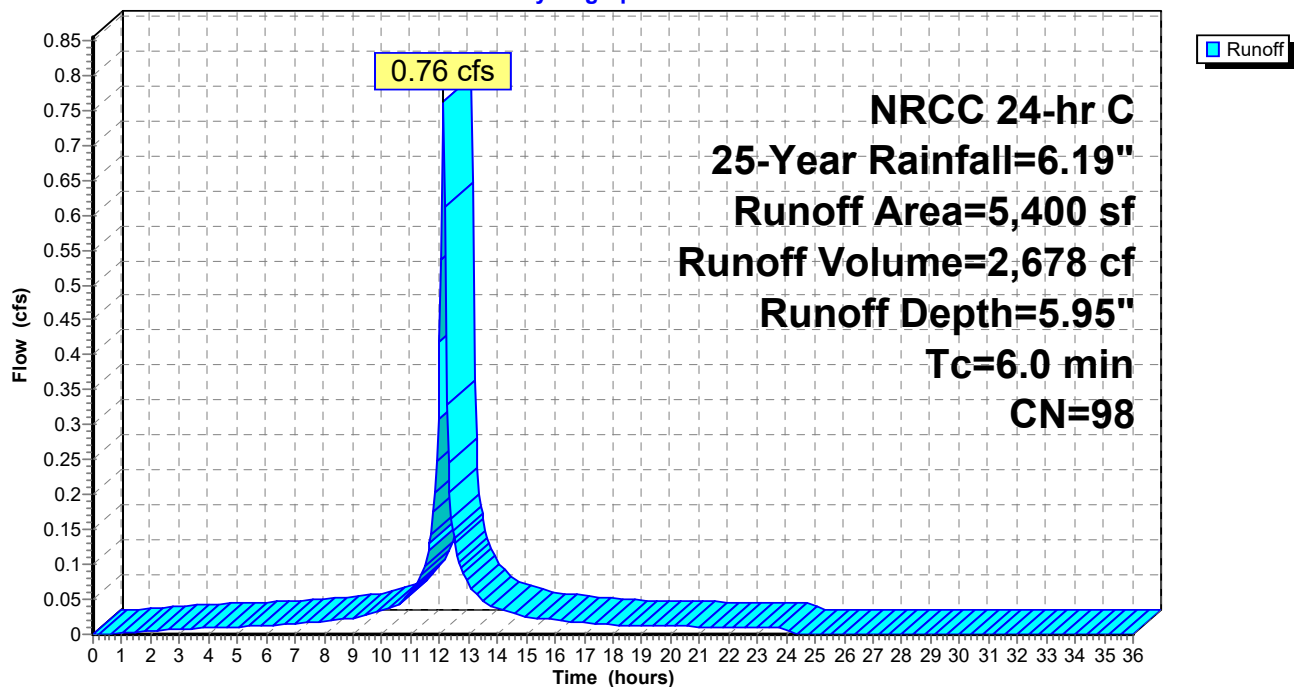
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 25-Year Rainfall=6.19"

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

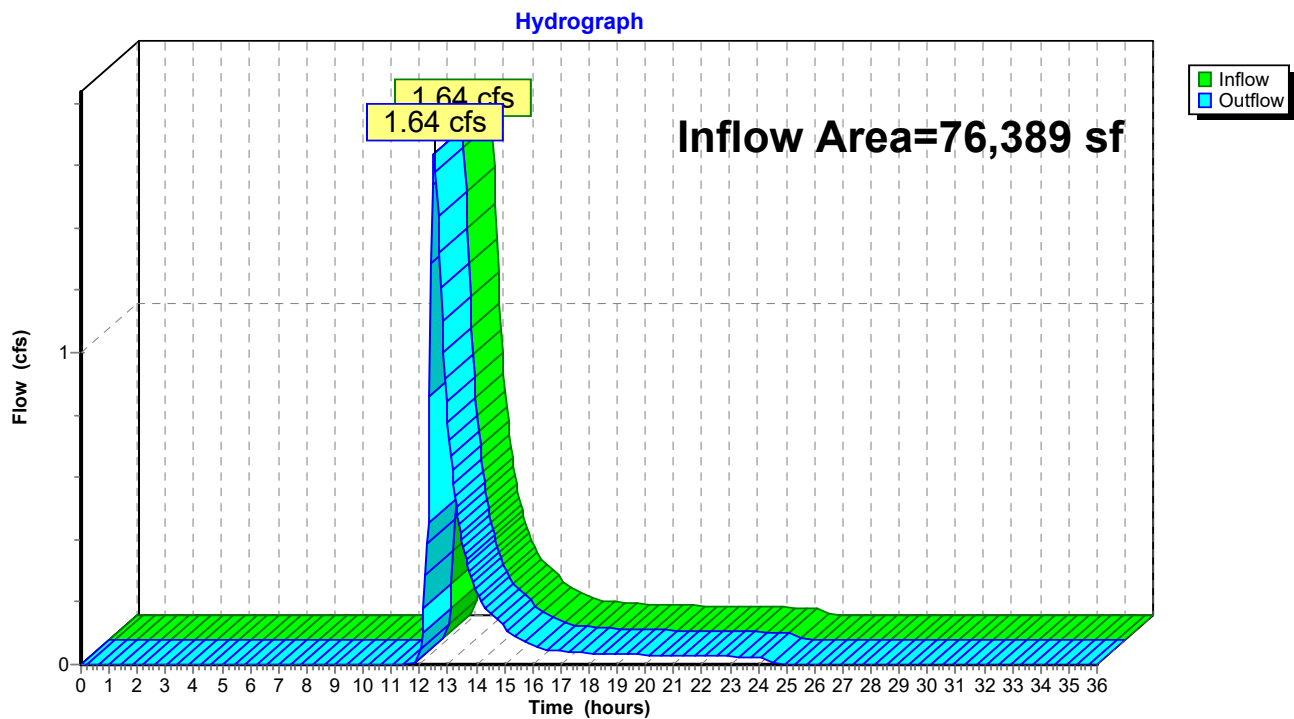
Hydrograph



Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 1.06" for 25-Year event
Inflow = 1.64 cfs @ 12.52 hrs, Volume= 6,731 cf
Outflow = 1.64 cfs @ 12.52 hrs, Volume= 6,731 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 OLD WASHINGTON ST

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 5.95" for 25-Year event
 Inflow = 0.76 cfs @ 12.13 hrs, Volume= 2,678 cf
 Outflow = 0.75 cfs @ 12.13 hrs, Volume= 2,680 cf, Atten= 1%, Lag= 0.1 min
 Discarded = 0.01 cfs @ 6.65 hrs, Volume= 1,346 cf
 Primary = 0.74 cfs @ 12.13 hrs, Volume= 1,334 cf

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

Peak Elev= 68.07' @ 12.13 hrs Surf.Area= 253 sf Storage= 384 cf

Plug-Flow detention time= 120.7 min calculated for 2,677 cf (100% of inflow)

Center-of-Mass det. time= 121.6 min (867.3 - 745.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height
#3	Primary	67.70'	12.0" Round Culvert L= 50.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 6.65 hrs HW=65.54' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.70 cfs @ 12.13 hrs HW=68.07' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.23 cfs @ 0.85 fps)

↑ **3=Culvert** (Inlet Controls 0.48 cfs @ 1.82 fps)

Pond 10P: ROOF INFILTRATION SYSTEM - Chamber Wizard Field A**Chamber Model = Cultec R-180 (Cultec Recharger® 180HD)**

Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf

Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap

Row Length Adjustment= +1.00' x 3.44 sf x 3 rows

36.0" Wide + 3.0" Spacing = 39.0" C-C Row Spacing

3 Chambers/Row x 6.33' Long +1.00' Row Adjustment = 19.99' Row Length +12.0" End Stone x 2 = 21.99' Base Length

3 Rows x 36.0" Wide + 3.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.50' Base Width

6.0" Base + 20.5" Chamber Height + 6.0" Cover = 2.71' Field Height

9 Chambers x 21.8 cf +1.00' Row Adjustment x 3.44 sf x 3 Rows = 206.3 cf Chamber Storage

684.9 cf Field - 206.3 cf Chambers = 478.6 cf Stone x 40.0% Voids = 191.5 cf Stone Storage

Chamber Storage + Stone Storage = 397.7 cf = 0.009 af

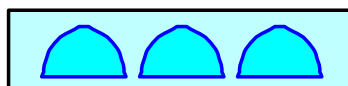
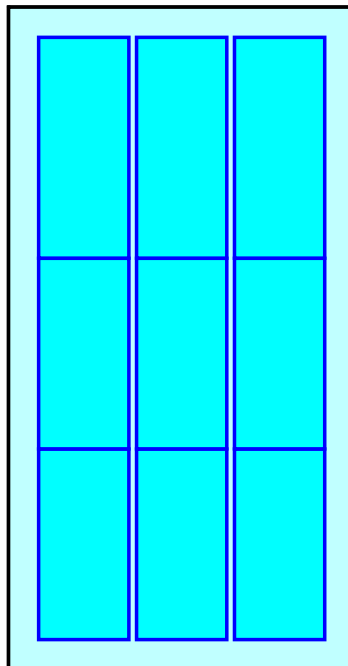
Overall Storage Efficiency = 58.1%

Overall System Size = 21.99' x 11.50' x 2.71'

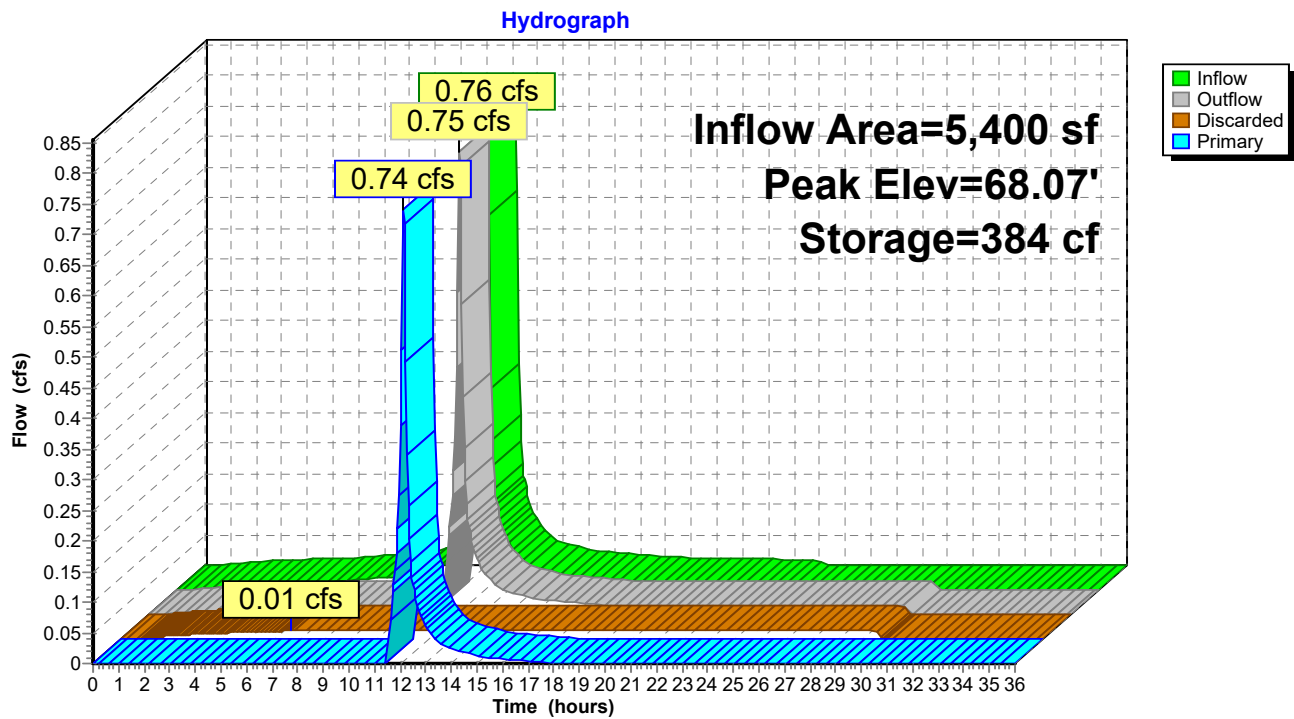
9 Chambers

25.4 cy Field

17.7 cy Stone



Pond 10P: ROOF INFILTRATION SYSTEM



Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 2.96" for 25-Year event
 Inflow = 2.30 cfs @ 12.30 hrs, Volume= 11,135 cf
 Outflow = 1.43 cfs @ 12.54 hrs, Volume= 11,132 cf, Atten= 38%, Lag= 14.3 min
 Discarded = 0.14 cfs @ 12.54 hrs, Volume= 7,235 cf
 Primary = 1.29 cfs @ 12.54 hrs, Volume= 3,897 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 66.09' @ 12.54 hrs Surf.Area= 2,557 sf Storage= 3,314 cf

Plug-Flow detention time= 151.2 min calculated for 11,132 cf (100% of inflow)

Center-of-Mass det. time= 151.1 min (1,000.2 - 849.2)

Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.49'	2.410 in/hr Exfiltration over Surface area
#2	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.14 cfs @ 12.54 hrs HW=66.09' (Free Discharge)

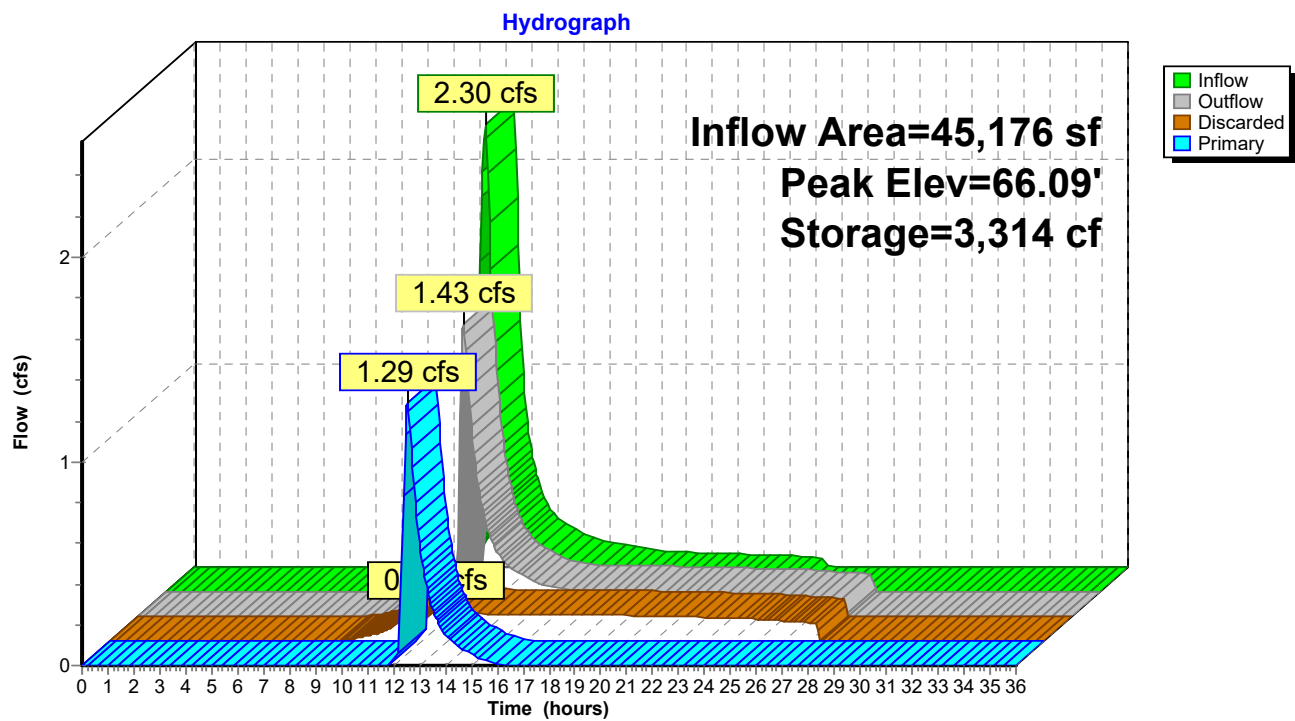
↑ **1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=1.29 cfs @ 12.54 hrs HW=66.09' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 1.29 cfs @ 1.97 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND: 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 1P: TRIB TO OLD WASHINGTON ST

Runoff Area=31,213 sf 2.62% Impervious Runoff Depth=2.45"
 Flow Length=310' Tc=20.4 min CN=48 Runoff=1.27 cfs 6,361 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=39,776 sf 29.05% Impervious Runoff Depth=5.05"
 Flow Length=199' Tc=21.8 min CN=70 Runoff=3.53 cfs 16,752 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 OLD WASHINGTON ST

Inflow=4.72 cfs 16,623 cf
 Outflow=4.72 cfs 16,623 cf

Pond 10P: ROOF INFILTRATION SYSTEM

Peak Elev=68.11' Storage=388 cf Inflow=1.07 cfs 3,798 cf
 Discarded=0.01 cfs 1,478 cf Primary=1.05 cfs 2,321 cf Outflow=1.06 cfs 3,799 cf

Pond POND: INFILTRATION BASIN

Peak Elev=66.34' Storage=3,970 cf Inflow=3.86 cfs 19,073 cf
 Discarded=0.15 cfs 8,810 cf Primary=3.49 cfs 10,262 cf Outflow=3.64 cfs 19,071 cf

Total Runoff Area = 105,870 sf Runoff Volume = 28,977 cf Average Runoff Depth = 3.28"
83.21% Pervious = 88,098 sf 16.79% Impervious = 17,772 sf

Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 1.27 cfs @ 12.32 hrs, Volume= 6,361 cf, Depth= 2.45"

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

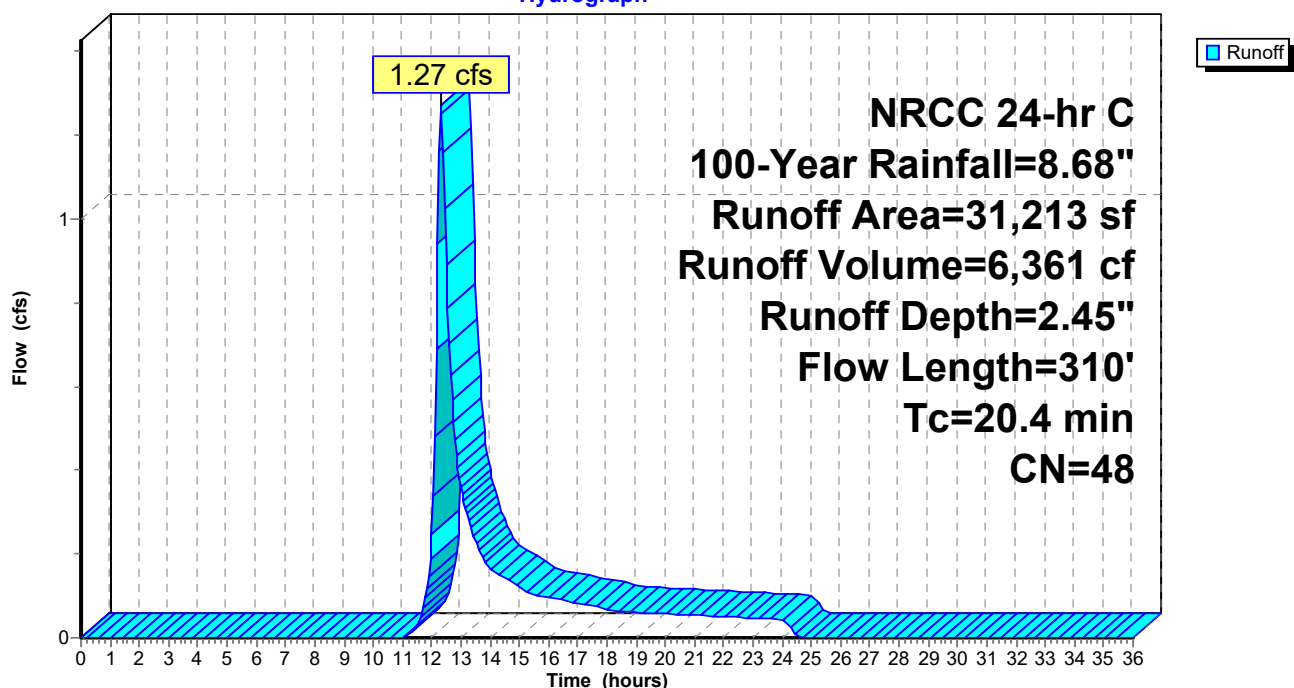
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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 1P: TRIB TO OLD WASHINGTON ST

Hydrograph



Summary for Subcatchment 2P: TRIB TO SOUTHEAST

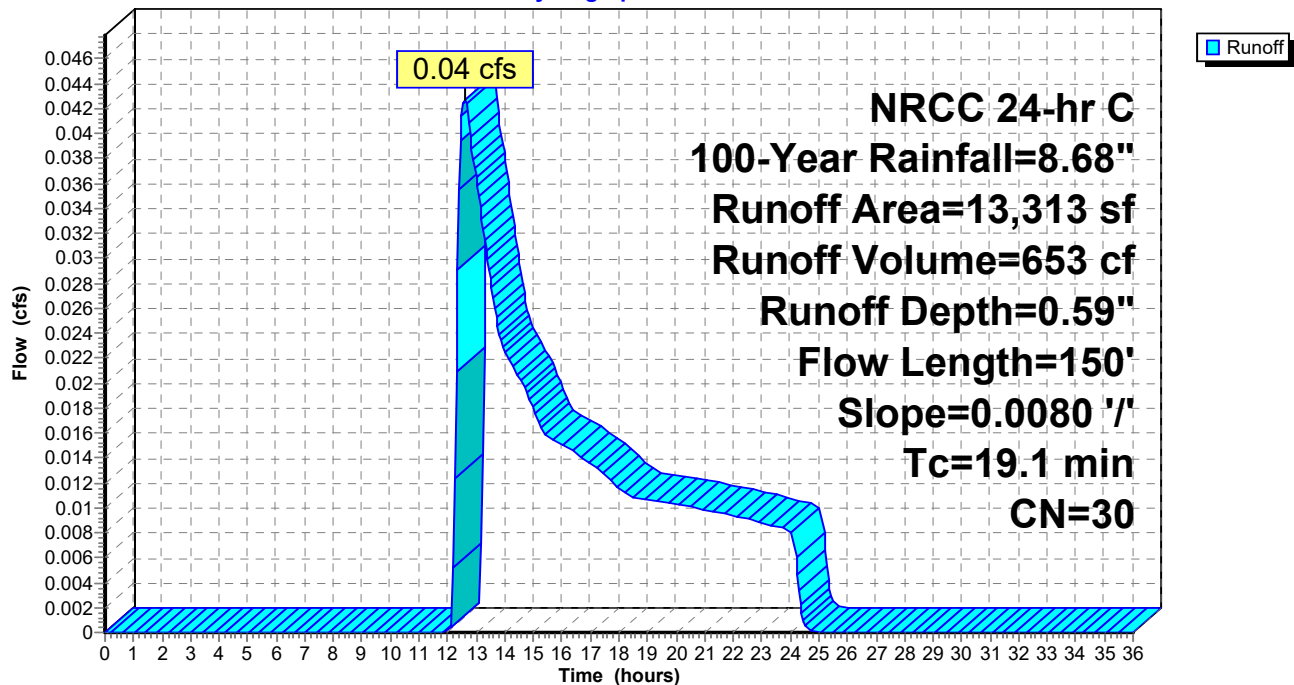
Runoff = 0.04 cfs @ 12.61 hrs, Volume= 653 cf, Depth= 0.59"

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**

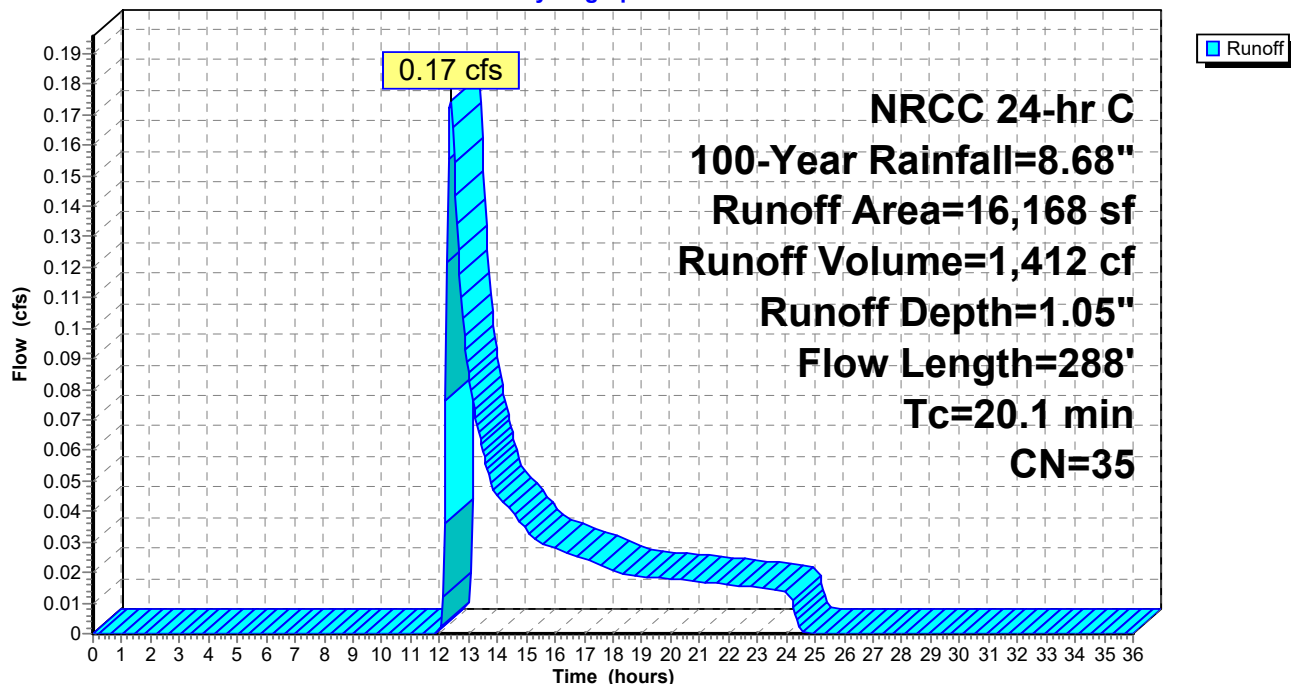
Summary for Subcatchment 3P: TRIB TO SOUTHWEST

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**

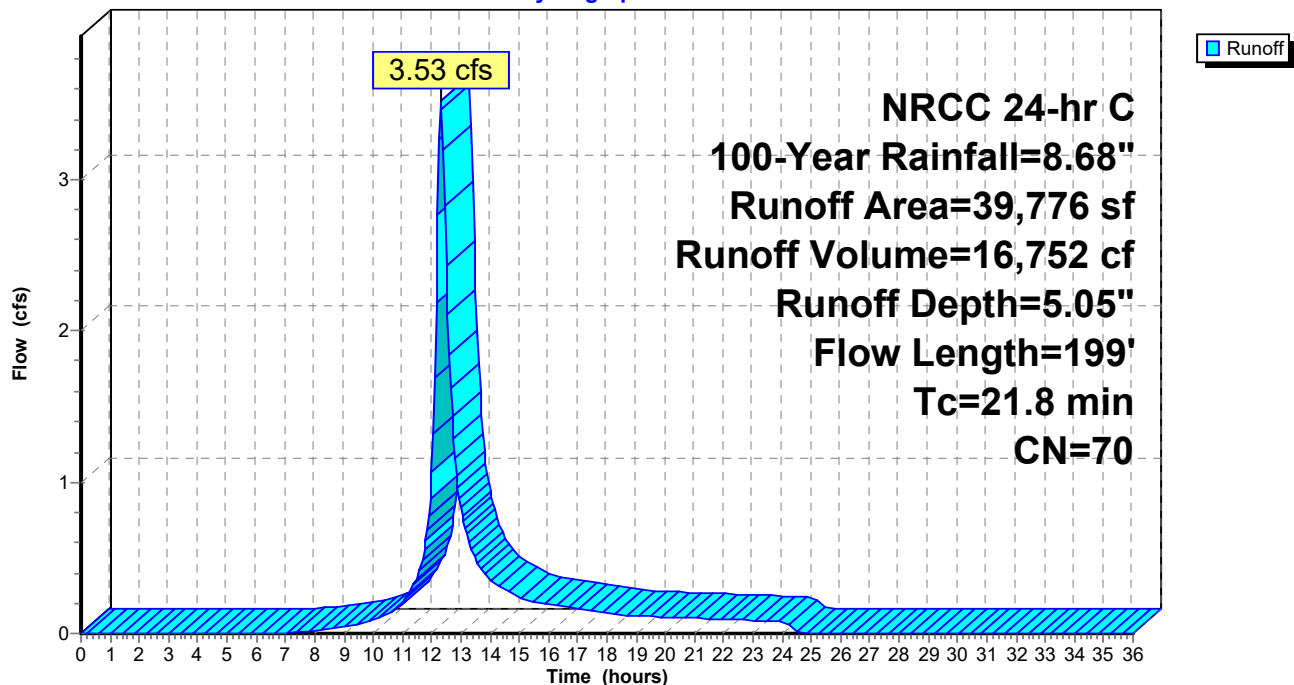
Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 3.53 cfs @ 12.32 hrs, Volume= 16,752 cf, Depth= 5.05"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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"

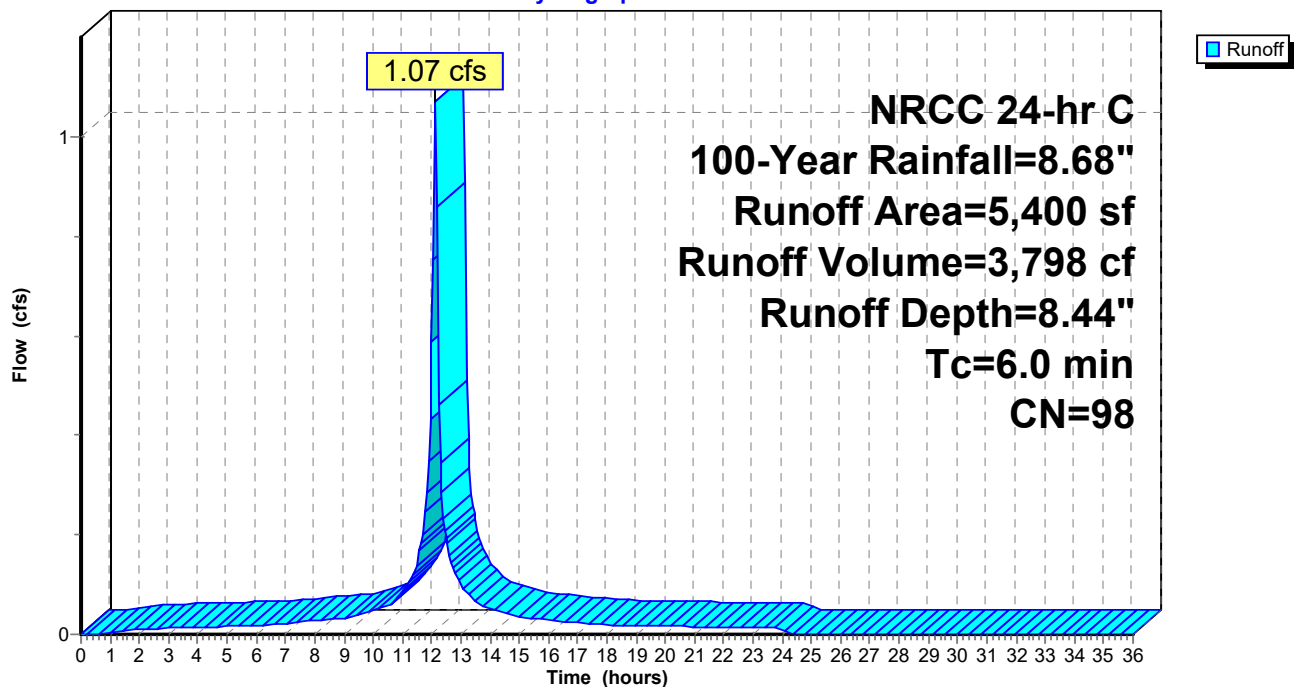
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=8.68"

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

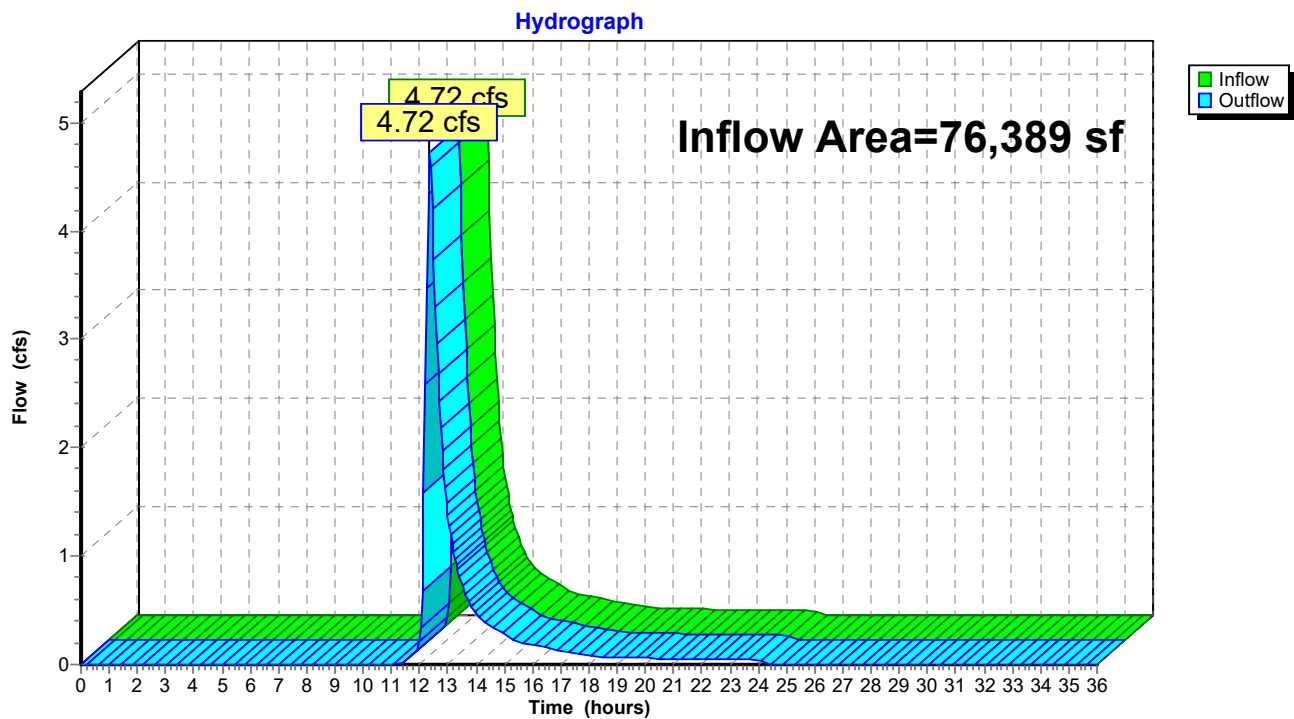
Hydrograph



Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 2.61" for 100-Year event
Inflow = 4.72 cfs @ 12.36 hrs, Volume= 16,623 cf
Outflow = 4.72 cfs @ 12.36 hrs, Volume= 16,623 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 OLD WASHINGTON ST

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 8.44" for 100-Year event
 Inflow = 1.07 cfs @ 12.13 hrs, Volume= 3,798 cf
 Outflow = 1.06 cfs @ 12.13 hrs, Volume= 3,799 cf, Atten= 1%, Lag= 0.1 min
 Discarded = 0.01 cfs @ 3.75 hrs, Volume= 1,478 cf
 Primary = 1.05 cfs @ 12.13 hrs, Volume= 2,321 cf

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

Peak Elev= 68.11' @ 12.13 hrs Surf.Area= 253 sf Storage= 388 cf

Plug-Flow detention time= 101.7 min calculated for 3,793 cf (100% of inflow)

Center-of-Mass det. time= 102.2 min (843.2 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height
#3	Primary	67.70'	12.0" Round Culvert L= 50.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 3.75 hrs HW=65.54' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.00 cfs @ 12.13 hrs HW=68.10' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 1.06 fps)

↑ **3=Culvert** (Inlet Controls 0.57 cfs @ 1.91 fps)

Pond 10P: ROOF INFILTRATION SYSTEM - Chamber Wizard Field A

Chamber Model = Cultec R-180 (Cultec Recharger® 180HD)

Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf

Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap

Row Length Adjustment= +1.00' x 3.44 sf x 3 rows

36.0" Wide + 3.0" Spacing = 39.0" C-C Row Spacing

3 Chambers/Row x 6.33' Long +1.00' Row Adjustment = 19.99' Row Length +12.0" End Stone x 2 = 21.99' Base Length

3 Rows x 36.0" Wide + 3.0" Spacing x 2 + 12.0" Side Stone x 2 = 11.50' Base Width

6.0" Base + 20.5" Chamber Height + 6.0" Cover = 2.71' Field Height

9 Chambers x 21.8 cf +1.00' Row Adjustment x 3.44 sf x 3 Rows = 206.3 cf Chamber Storage

684.9 cf Field - 206.3 cf Chambers = 478.6 cf Stone x 40.0% Voids = 191.5 cf Stone Storage

Chamber Storage + Stone Storage = 397.7 cf = 0.009 af

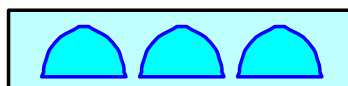
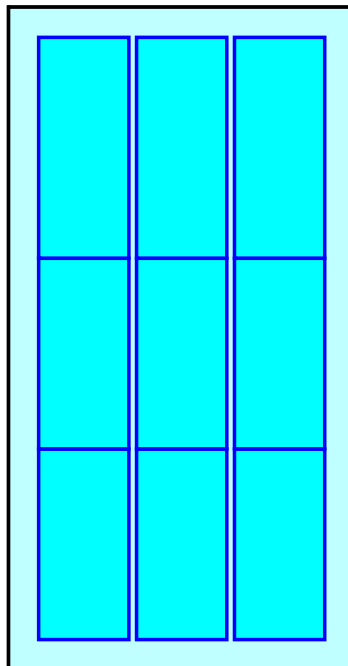
Overall Storage Efficiency = 58.1%

Overall System Size = 21.99' x 11.50' x 2.71'

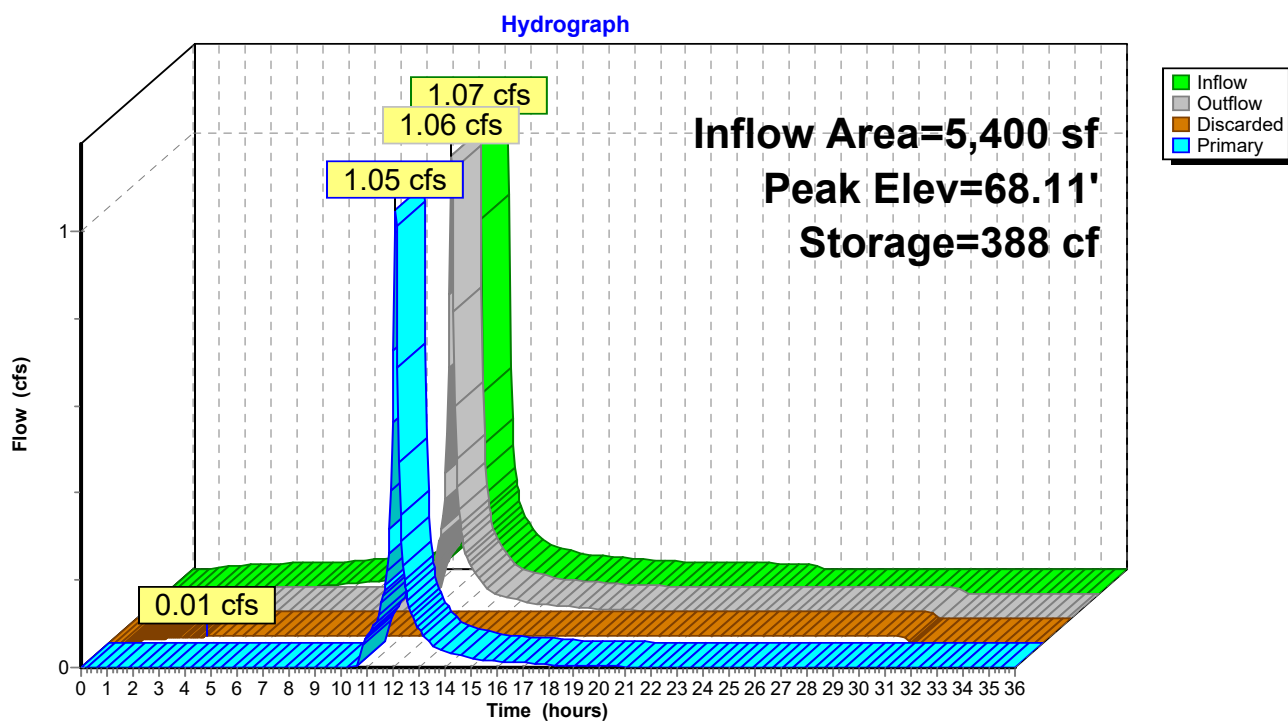
9 Chambers

25.4 cy Field

17.7 cy Stone



Pond 10P: ROOF INFILTRATION SYSTEM



Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 5.07" for 100-Year event
 Inflow = 3.86 cfs @ 12.30 hrs, Volume= 19,073 cf
 Outflow = 3.64 cfs @ 12.37 hrs, Volume= 19,071 cf, Atten= 6%, Lag= 4.2 min
 Discarded = 0.15 cfs @ 12.37 hrs, Volume= 8,810 cf
 Primary = 3.49 cfs @ 12.37 hrs, Volume= 10,262 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 66.34' @ 12.37 hrs Surf.Area= 2,712 sf Storage= 3,970 cf

Plug-Flow detention time= 115.5 min calculated for 19,071 cf (100% of inflow)

Center-of-Mass det. time= 115.4 min (950.1 - 834.6)

Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.49'	2.410 in/hr Exfiltration over Surface area
#2	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Discarded OutFlow Max=0.15 cfs @ 12.37 hrs HW=66.34' (Free Discharge)

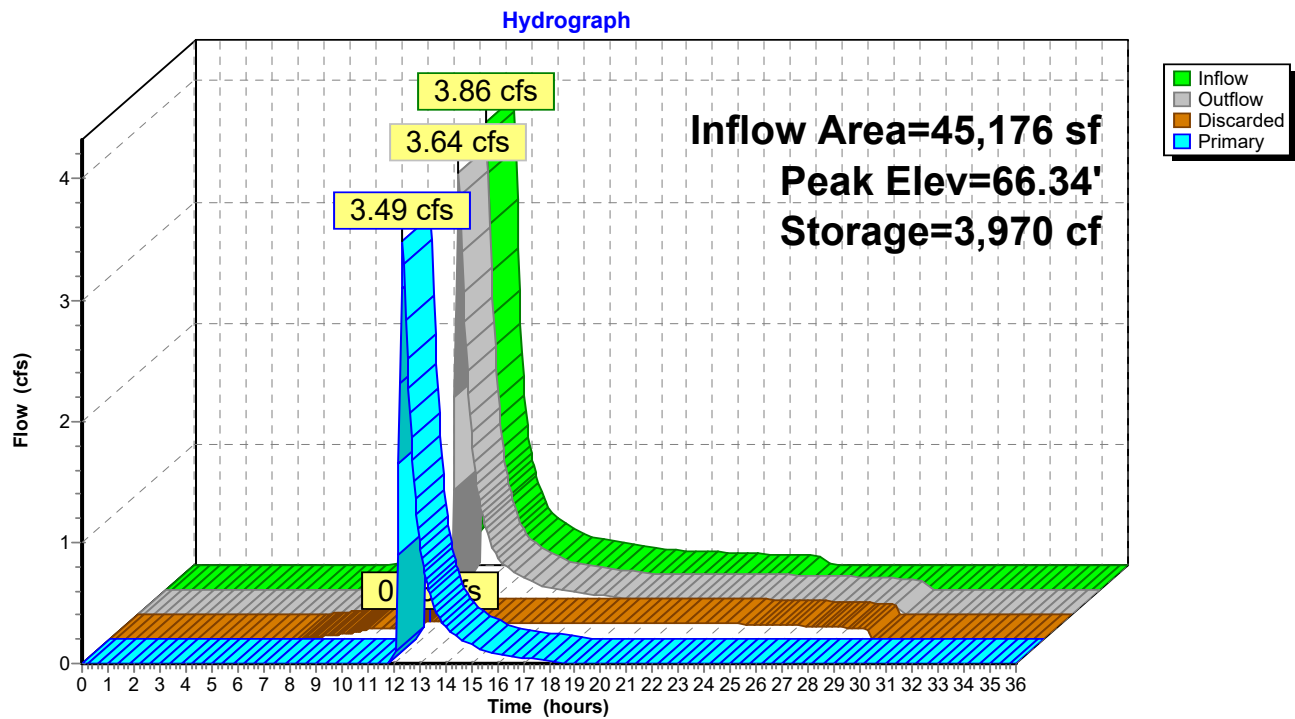
↑ **1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=3.44 cfs @ 12.37 hrs HW=66.34' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Orifice Controls 2.78 cfs @ 2.93 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.65 cfs @ 0.96 fps)

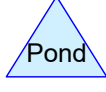
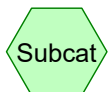
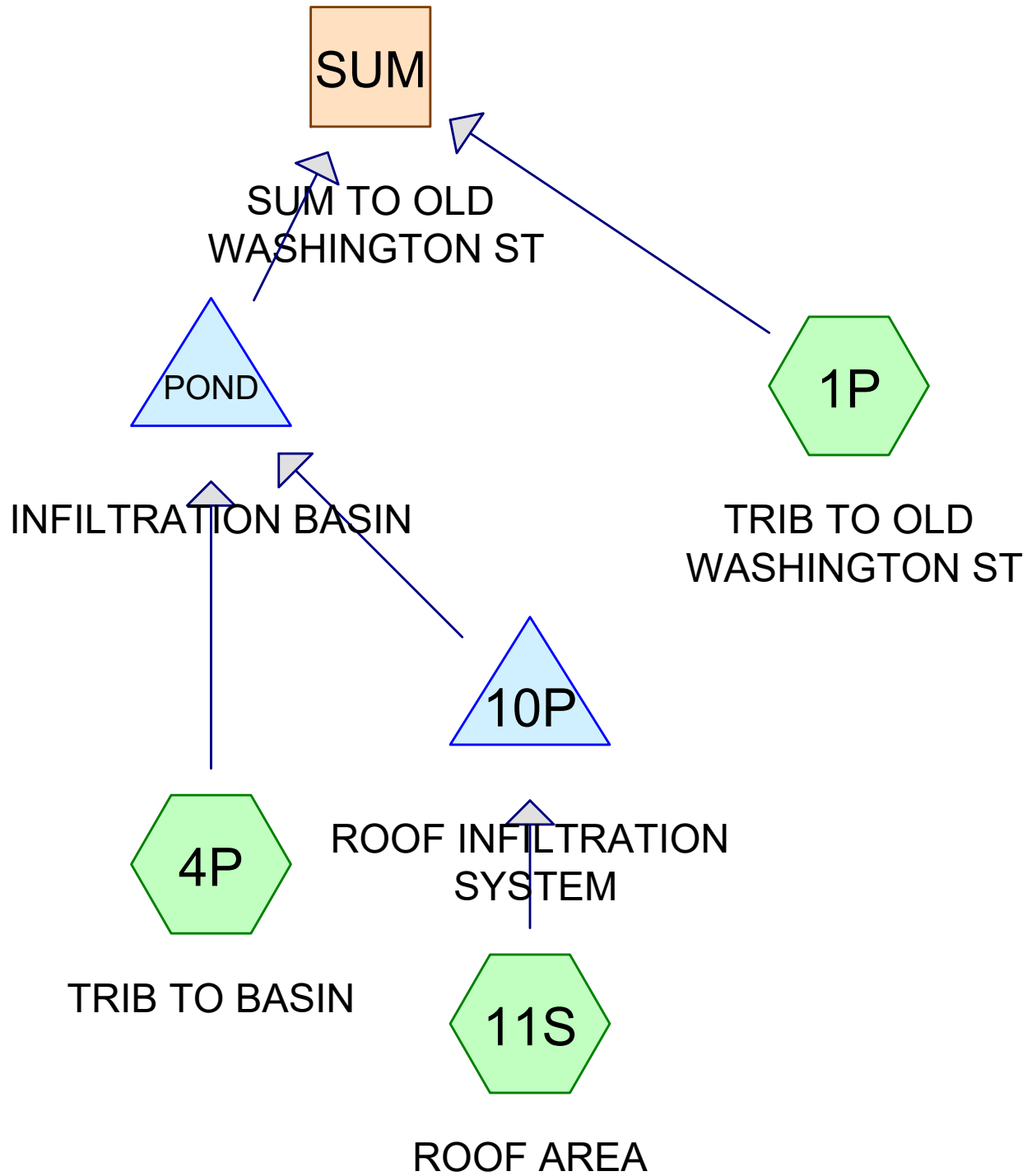
Pond POND: INFILTRATION BASIN



APPENDIX B-2

Proposed Conditions NO EXFILTRATION

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



21-204 PWS_3-18-22_NO EXFILTRATION

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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,583	39	>75% Grass cover, Good, HSG A (1P)
22,448	61	>75% Grass cover, Good, HSG B (1P, 4P)
421	80	>75% Grass cover, Good, HSG D (1P)
818	98	Paved parking, HSG A (1P)
11,554	98	Paved parking, HSG B (4P)
5,400	98	Roofs, HSG A (11S)
9,128	30	Woods, Good, HSG A (1P)
24,037	55	Woods, Good, HSG B (1P, 4P)
76,389	63	TOTAL AREA

21-204 PWS_3-18-22_NO EXFILTRATION

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

Prepared by MERRILL ENGINEERS AND LAND SURVEYORS

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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 1P: TRIB TO OLD WASHINGTON STRunoff Area=31,213 sf 2.62% Impervious Runoff Depth=0.12"
Flow Length=310' Tc=20.4 min CN=48 Runoff=0.01 cfs 303 cf**Subcatchment 4P: TRIB TO BASIN**Runoff Area=39,776 sf 29.05% Impervious Runoff Depth=0.92"
Flow Length=199' Tc=21.8 min CN=70 Runoff=0.58 cfs 3,039 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 OLD WASHINGTON ST**Inflow=0.08 cfs 1,919 cf
Outflow=0.08 cfs 1,919 cf**Pond 10P: ROOF INFILTRATION SYSTEM**Peak Elev=68.02' Storage=379 cf Inflow=0.41 cfs 1,403 cf
Outflow=0.40 cfs 1,057 cf**Pond POND: INFILTRATION BASIN**Peak Elev=65.80' Storage=2,599 cf Inflow=0.72 cfs 4,096 cf
Outflow=0.08 cfs 1,615 cf**Total Runoff Area = 76,389 sf Runoff Volume = 4,744 cf Average Runoff Depth = 0.75"**
76.73% Pervious = 58,617 sf 23.27% Impervious = 17,772 sf

21-204 PWS_3-18-22_NO EXFILTRATION

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

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Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 0.01 cfs @ 13.34 hrs, Volume= 303 cf, Depth= 0.12"

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
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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			

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 0.58 cfs @ 12.34 hrs, Volume= 3,039 cf, Depth= 0.92"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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

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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,

Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 0.30" for 2-Year event
 Inflow = 0.08 cfs @ 14.90 hrs, Volume= 1,919 cf
 Outflow = 0.08 cfs @ 14.90 hrs, Volume= 1,919 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 3.12" for 2-Year event
 Inflow = 0.41 cfs @ 12.13 hrs, Volume= 1,403 cf
 Outflow = 0.40 cfs @ 12.13 hrs, Volume= 1,057 cf, Atten= 2%, Lag= 0.4 min
 Primary = 0.40 cfs @ 12.13 hrs, Volume= 1,057 cf

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

Peak Elev= 68.02' @ 12.13 hrs Surf.Area= 253 sf Storage= 379 cf

Plug-Flow detention time= 174.8 min calculated for 1,056 cf (75% of inflow)

Center-of-Mass det. time= 82.3 min (839.7 - 757.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height

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

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#2 Primary 67.70' **12.0" Round Culvert** L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900
 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.13 hrs HW=68.02' (Free Discharge)


1=Sharp-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.40 fps)

2=Culvert (Inlet Controls 0.36 cfs @ 1.69 fps)

Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 1.09" for 2-Year event
 Inflow = 0.72 cfs @ 12.29 hrs, Volume= 4,096 cf
 Outflow = 0.08 cfs @ 14.92 hrs, Volume= 1,615 cf, Atten= 90%, Lag= 157.7 min
 Primary = 0.08 cfs @ 14.92 hrs, Volume= 1,615 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 65.80' @ 14.92 hrs Surf.Area= 2,386 sf Storage= 2,599 cf

Plug-Flow detention time= 382.0 min calculated for 1,615 cf (39% of inflow)
 Center-of-Mass det. time= 231.5 min (1,116.6 - 885.1)

Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#2	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Primary OutFlow Max=0.07 cfs @ 14.92 hrs HW=65.80' (Free Discharge)


1=Sharp-Crested Rectangular Weir (Weir Controls 0.07 cfs @ 0.73 fps)

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

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NRCC 24-hr C 10-Year Rainfall=4.95"

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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 1P: TRIB TO OLD WASHINGTON STRunoff Area=31,213 sf 2.62% Impervious Runoff Depth=0.57"
Flow Length=310' Tc=20.4 min CN=48 Runoff=0.17 cfs 1,480 cf**Subcatchment 4P: TRIB TO BASIN**Runoff Area=39,776 sf 29.05% Impervious Runoff Depth=2.00"
Flow Length=199' Tc=21.8 min CN=70 Runoff=1.37 cfs 6,627 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 OLD WASHINGTON ST**Inflow=0.99 cfs 7,400 cf
Outflow=0.99 cfs 7,400 cf**Pond 10P: ROOF INFILTRATION SYSTEM**Peak Elev=68.05' Storage=382 cf Inflow=0.61 cfs 2,121 cf
Outflow=0.60 cfs 1,774 cf**Pond POND: INFILTRATION BASIN**Peak Elev=66.01' Storage=3,107 cf Inflow=1.57 cfs 8,401 cf
Outflow=0.86 cfs 5,920 cf**Total Runoff Area = 76,389 sf Runoff Volume = 10,228 cf Average Runoff Depth = 1.61"**
76.73% Pervious = 58,617 sf 23.27% Impervious = 17,772 sf

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NRCC 24-hr C 10-Year Rainfall=4.95"

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Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 0.17 cfs @ 12.40 hrs, Volume= 1,480 cf, Depth= 0.57"

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
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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			

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 1.37 cfs @ 12.33 hrs, Volume= 6,627 cf, Depth= 2.00"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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NRCC 24-hr C 10-Year Rainfall=4.95"

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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,

Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 1.16" for 10-Year event
 Inflow = 0.99 cfs @ 12.59 hrs, Volume= 7,400 cf
 Outflow = 0.99 cfs @ 12.59 hrs, Volume= 7,400 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 4.71" for 10-Year event
 Inflow = 0.61 cfs @ 12.13 hrs, Volume= 2,121 cf
 Outflow = 0.60 cfs @ 12.13 hrs, Volume= 1,774 cf, Atten= 1%, Lag= 0.2 min
 Primary = 0.60 cfs @ 12.13 hrs, Volume= 1,774 cf

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

Peak Elev= 68.05' @ 12.13 hrs Surf.Area= 253 sf Storage= 382 cf

Plug-Flow detention time= 142.3 min calculated for 1,771 cf (84% of inflow)

Center-of-Mass det. time= 68.0 min (817.5 - 749.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height

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NRCC 24-hr C 10-Year Rainfall=4.95"

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#2 Primary 67.70' **12.0" Round Culvert** L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900
 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.57 cfs @ 12.13 hrs HW=68.05' (Free Discharge)

1=Sharp-Crested Rectangular Weir (Weir Controls 0.14 cfs @ 0.72 fps)


2=Culvert (Inlet Controls 0.43 cfs @ 1.77 fps)
Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 2.23" for 10-Year event

Inflow = 1.57 cfs @ 12.30 hrs, Volume= 8,401 cf

Outflow = 0.86 cfs @ 12.61 hrs, Volume= 5,920 cf, Atten= 46%, Lag= 18.3 min

Primary = 0.86 cfs @ 12.61 hrs, Volume= 5,920 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 66.01' @ 12.61 hrs Surf.Area= 2,506 sf Storage= 3,107 cf

Plug-Flow detention time= 190.3 min calculated for 5,920 cf (70% of inflow)

Center-of-Mass det. time= 82.3 min (944.8 - 862.5)


Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#2	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Primary OutFlow Max=0.85 cfs @ 12.61 hrs HW=66.01' (Free Discharge)

1=Sharp-Crested Rectangular Weir (Weir Controls 0.85 cfs @ 1.70 fps)


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

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

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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 1P: TRIB TO OLD WASHINGTON STRunoff Area=31,213 sf 2.62% Impervious Runoff Depth=1.09"
Flow Length=310' Tc=20.4 min CN=48 Runoff=0.47 cfs 2,834 cf**Subcatchment 4P: TRIB TO BASIN**Runoff Area=39,776 sf 29.05% Impervious Runoff Depth=2.96"
Flow Length=199' Tc=21.8 min CN=70 Runoff=2.06 cfs 9,801 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 OLD WASHINGTON ST**Inflow=2.28 cfs 12,486 cf
Outflow=2.28 cfs 12,486 cf**Pond 10P: ROOF INFILTRATION SYSTEM**Peak Elev=68.07' Storage=384 cf Inflow=0.76 cfs 2,678 cf
Outflow=0.75 cfs 2,334 cf**Pond POND: INFILTRATION BASIN**Peak Elev=66.18' Storage=3,555 cf Inflow=2.31 cfs 12,134 cf
Outflow=1.86 cfs 9,652 cf**Total Runoff Area = 76,389 sf Runoff Volume = 15,313 cf Average Runoff Depth = 2.41"**
76.73% Pervious = 58,617 sf 23.27% Impervious = 17,772 sf

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

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Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 0.47 cfs @ 12.35 hrs, Volume= 2,834 cf, Depth= 1.09"

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
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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			

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 2.06 cfs @ 12.32 hrs, Volume= 9,801 cf, Depth= 2.96"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
21.8	199	Total			

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

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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,

Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 1.96" for 25-Year event
 Inflow = 2.28 cfs @ 12.43 hrs, Volume= 12,486 cf
 Outflow = 2.28 cfs @ 12.43 hrs, Volume= 12,486 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 5.95" for 25-Year event
 Inflow = 0.76 cfs @ 12.13 hrs, Volume= 2,678 cf
 Outflow = 0.75 cfs @ 12.13 hrs, Volume= 2,334 cf, Atten= 1%, Lag= 0.1 min
 Primary = 0.75 cfs @ 12.13 hrs, Volume= 2,334 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 68.07' @ 12.13 hrs Surf.Area= 253 sf Storage= 384 cf

Plug-Flow detention time= 124.9 min calculated for 2,334 cf (87% of inflow)
 Center-of-Mass det. time= 60.2 min (805.9 - 745.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height

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

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#2 Primary 67.70' **12.0" Round Culvert** L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900
 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.72 cfs @ 12.13 hrs HW=68.07' (Free Discharge)

1=Sharp-Crested Rectangular Weir (Weir Controls 0.24 cfs @ 0.86 fps)


2=Culvert (Inlet Controls 0.48 cfs @ 1.83 fps)
Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 3.22" for 25-Year event
 Inflow = 2.31 cfs @ 12.30 hrs, Volume= 12,134 cf
 Outflow = 1.86 cfs @ 12.45 hrs, Volume= 9,652 cf, Atten= 19%, Lag= 8.8 min
 Primary = 1.86 cfs @ 12.45 hrs, Volume= 9,652 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 66.18' @ 12.45 hrs Surf.Area= 2,615 sf Storage= 3,555 cf

Plug-Flow detention time= 143.4 min calculated for 9,638 cf (79% of inflow)

Center-of-Mass det. time= 58.1 min (909.2 - 851.2)


Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#2	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Primary OutFlow Max=1.86 cfs @ 12.45 hrs HW=66.18' (Free Discharge)

1=Sharp-Crested Rectangular Weir (Weir Controls 1.86 cfs @ 2.24 fps)


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

21-204 PWS_3-18-22_NO EXFILTRATION

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

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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 1P: TRIB TO OLD WASHINGTON ST

Runoff Area=31,213 sf 2.62% Impervious Runoff Depth=2.45"
Flow Length=310' Tc=20.4 min CN=48 Runoff=1.27 cfs 6,361 cf

Subcatchment 4P: TRIB TO BASIN

Runoff Area=39,776 sf 29.05% Impervious Runoff Depth=5.05"
Flow Length=199' Tc=21.8 min CN=70 Runoff=3.53 cfs 16,752 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 OLD WASHINGTON ST

Inflow=5.01 cfs 24,088 cf
Outflow=5.01 cfs 24,088 cf

Pond 10P: ROOF INFILTRATION SYSTEM

Peak Elev=68.11' Storage=388 cf Inflow=1.07 cfs 3,798 cf
Outflow=1.06 cfs 3,453 cf

Pond POND: INFILTRATION BASIN

Peak Elev=66.35' Storage=4,013 cf Inflow=3.87 cfs 20,205 cf
Outflow=3.76 cfs 17,727 cf

Total Runoff Area = 76,389 sf Runoff Volume = 26,912 cf Average Runoff Depth = 4.23"
76.73% Pervious = 58,617 sf 23.27% Impervious = 17,772 sf

21-204 PWS_3-18-22_NO EXFILTRATION

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

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Summary for Subcatchment 1P: TRIB TO OLD WASHINGTON ST

Runoff = 1.27 cfs @ 12.32 hrs, Volume= 6,361 cf, Depth= 2.45"

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
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% 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			

Summary for Subcatchment 4P: TRIB TO BASIN

Runoff = 3.53 cfs @ 12.32 hrs, Volume= 16,752 cf, Depth= 5.05"

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
11,554	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
39,776	70	Weighted Average
28,222		70.95% Pervious Area
11,554		29.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
21.8	199	Total			

21-204 PWS_3-18-22_NO EXFILTRATION

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

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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,

Summary for Reach SUM: SUM TO OLD WASHINGTON ST

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 3.78" for 100-Year event
 Inflow = 5.01 cfs @ 12.34 hrs, Volume= 24,088 cf
 Outflow = 5.01 cfs @ 12.34 hrs, Volume= 24,088 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 10P: ROOF INFILTRATION SYSTEM

Inflow Area = 5,400 sf, 100.00% Impervious, Inflow Depth = 8.44" for 100-Year event
 Inflow = 1.07 cfs @ 12.13 hrs, Volume= 3,798 cf
 Outflow = 1.06 cfs @ 12.13 hrs, Volume= 3,453 cf, Atten= 1%, Lag= 0.1 min
 Primary = 1.06 cfs @ 12.13 hrs, Volume= 3,453 cf

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

Peak Elev= 68.11' @ 12.13 hrs Surf.Area= 253 sf Storage= 388 cf

Plug-Flow detention time= 98.8 min calculated for 3,448 cf (91% of inflow)

Center-of-Mass det. time= 48.9 min (789.9 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	65.50'	191 cf	11.50'W x 21.99'L x 2.71'H Field A 685 cf Overall - 206 cf Embedded = 479 cf x 40.0% Voids
#2A	66.00'	206 cf	Cultec R-180 x 9 Inside #1 Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 3 rows
		398 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	68.00'	4.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.7' Crest Height

21-204 PWS_3-18-22_NO EXFILTRATION

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

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#2 Primary 67.70' **12.0" Round Culvert** L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
 Inlet / Outlet Invert= 67.70' / 67.40' S= 0.0060 '/' Cc= 0.900
 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.01 cfs @ 12.13 hrs HW=68.10' (Free Discharge)

 1=Sharp-Crested Rectangular Weir (Weir Controls 0.44 cfs @ 1.07 fps)

2=Culvert (Inlet Controls 0.57 cfs @ 1.91 fps)

Summary for Pond POND: INFILTRATION BASIN

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 5.37" for 100-Year event
 Inflow = 3.87 cfs @ 12.30 hrs, Volume= 20,205 cf
 Outflow = 3.76 cfs @ 12.35 hrs, Volume= 17,727 cf, Atten= 3%, Lag= 2.9 min
 Primary = 3.76 cfs @ 12.35 hrs, Volume= 17,727 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 66.35' @ 12.35 hrs Surf.Area= 2,722 sf Storage= 4,013 cf

Plug-Flow detention time= 101.5 min calculated for 17,702 cf (88% of inflow)

Center-of-Mass det. time= 42.0 min (877.5 - 835.5)

Volume	Invert	Avail.Storage	Storage Description
#1	64.49'	7,551 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.49	0	0	0
64.50	1,541	8	8
65.00	1,926	867	874
66.00	2,501	2,214	3,088
67.00	3,125	2,813	5,901
67.50	3,477	1,651	7,551

Device	Routing	Invert	Outlet Devices
#1	Primary	65.75'	2.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.2' Crest Height
#2	Primary	66.25'	8.0' long x 1.00' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) 2.5' Crest Height

Primary OutFlow Max=3.75 cfs @ 12.35 hrs HW=66.35' (Free Discharge)

 1=Sharp-Crested Rectangular Weir (Orifice Controls 2.87 cfs @ 3.03 fps)

2=Sharp-Crested Rectangular Weir (Weir Controls 0.88 cfs @ 1.06 fps)

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. Inspection Schedule and Evaluation Checklists for Construction Phase and Post Development (*See Previous submittal*)**
- 7. Soil Suitability Assessment (*See Previous submittal*)**

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 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

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	16,954
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	
		0.23	AC-IN
Total Required Recharge Volume:		0.02	AC-FT
		848	C.F.

Recharge Volume provided by Stormwater Basin:

Volume Provided (below outlet):	2,481±	C.F.
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JOB 21-204
SHEET NO. 1 of 1
CALCULATED BY DA
CHECKED BY PGP
DATE: 1/27/2022
REV'D:

WATER QUALITY VOLUME (STANDARD #4)

Location: **631 Washington Street, Pembroke**

Total New Impervious Area

Roadway/Driveways/Roofs	16,954 S.F.
Other	0 S.F.
Total Area:	16,954 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 1,413 cubic feet
(see attached)

Provided by Stormwater Basin (see calcs in Appendix B)

2,481± c.f. (Below outlet)

Sediment Forebay #1 & #2 Volume

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

Impervious Area - Stormwater Basin: 16,954 SF
0.39 AC = 7.48 Gal/CF
Required Volume : 155.68 CF = **1165** Gal

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

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: 631 Washington Street, Pembroke - Pretreatment

TSS Removal
Calculation Worksheet

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Sediment Forebay	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56
	0.00	0.56	0.00	0.56

Total TSS Removal =

44%

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Project: 21-204
Prepared By: DA
Date: 3/20/2022

*Equals remaining load from previous BMP (E)
which enters the BMP

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: 631 Washington Street, Pembroke

TSS Removal
Calculation Worksheet

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Sediment Forebay	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal =

89%

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Project: 21-204
Prepared By: DA
Date: 3/20/2022

*Equals remaining load from previous BMP (E)
which enters the BMP

Hydrograph for Pond POND: INFILTRATION BASIN

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	64.49	0.00	0.00	0.00
1.00	0.00	0	64.49	0.00	0.00	0.00
2.00	0.00	0	64.49	0.00	0.00	0.00
3.00	0.00	0	64.49	0.00	0.00	0.00
4.00	0.00	0	64.49	0.00	0.00	0.00
5.00	0.00	0	64.49	0.00	0.00	0.00
6.00	0.00	0	64.49	0.00	0.00	0.00
7.00	0.00	0	64.49	0.00	0.00	0.00
8.00	0.02	1	64.49	0.02	0.02	0.00
9.00	0.04	4	64.49	0.04	0.04	0.00
10.00	0.09	8	64.50	0.09	0.09	0.00
11.00	0.27	178	64.61	0.09	0.09	0.00
12.00	1.64	2,001	65.54	0.12	0.12	0.00
13.00	0.92	3,186	66.04	1.16	0.14	1.02
14.00	0.38	2,787	65.88	0.44	0.14	0.30
15.00	0.26	2,678	65.83	0.29	0.13	0.16
16.00	0.20	2,607	65.80	0.22	0.13	0.08
17.00	0.17	2,569	65.79	0.18	0.13	0.05
18.00	0.13	2,523	65.77	0.15	0.13	0.02
19.00	0.12	2,477	65.75	0.13	0.13	0.00
20.00	0.11	2,420	65.72	0.13	0.13	0.00
21.00	0.10	2,338	65.69	0.13	0.13	0.00
22.00	0.09	2,230	65.64	0.13	0.13	0.00
23.00	0.09	2,099	65.58	0.13	0.13	0.00
24.00	0.08	1,948	65.52	0.12	0.12	0.00
25.00	0.00	1,605	65.36	0.12	0.12	0.00
26.00	0.00	1,188	65.16	0.11	0.11	0.00
27.00	0.00	795	64.96	0.11	0.11	0.00
28.00	0.00	430	64.76	0.10	0.10	0.00
29.00	0.00	96	64.56	0.09	0.09	0.00
30.00	0.00	0	64.49	0.00	0.00	0.00
31.00	0.00	0	64.49	0.00	0.00	0.00
32.00	0.00	0	64.49	0.00	0.00	0.00
33.00	0.00	0	64.49	0.00	0.00	0.00
34.00	0.00	0	64.49	0.00	0.00	0.00
35.00	0.00	0	64.49	0.00	0.00	0.00
36.00	0.00	0	64.49	0.00	0.00	0.00

Hydrograph for Pond 10P: ROOF INFILTRATION SYSTEM

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	64.50	0.00	0.00	0.00
1.00	0.00	1	64.51	0.00	0.00	0.00
2.00	0.01	3	64.53	0.01	0.01	0.00
3.00	0.01	4	64.54	0.01	0.01	0.00
4.00	0.01	5	64.55	0.01	0.01	0.00
5.00	0.02	10	64.60	0.01	0.01	0.00
6.00	0.02	21	64.71	0.01	0.01	0.00
7.00	0.02	43	64.93	0.01	0.01	0.00
8.00	0.03	83	65.16	0.01	0.01	0.00
9.00	0.03	140	65.45	0.01	0.01	0.00
10.00	0.05	234	65.95	0.01	0.01	0.00
11.00	0.09	398	67.63	0.08	0.01	0.07
12.00	0.59	398	67.90	0.58	0.01	0.57
13.00	0.10	398	67.65	0.10	0.01	0.08
14.00	0.05	398	67.59	0.05	0.01	0.03
15.00	0.04	398	67.57	0.03	0.01	0.02
16.00	0.03	398	67.55	0.03	0.01	0.01
17.00	0.02	398	67.53	0.02	0.01	0.01
18.00	0.02	398	67.52	0.02	0.01	0.00
19.00	0.02	398	67.21	0.01	0.01	0.00
20.00	0.02	398	67.21	0.01	0.01	0.00
21.00	0.02	398	67.21	0.01	0.01	0.00
22.00	0.01	398	67.21	0.01	0.01	0.00
23.00	0.01	397	67.20	0.01	0.01	0.00
24.00	0.01	391	67.15	0.01	0.01	0.00
25.00	0.00	345	66.68	0.01	0.01	0.00
26.00	0.00	294	66.31	0.01	0.01	0.00
27.00	0.00	243	66.00	0.01	0.01	0.00
28.00	0.00	192	65.73	0.01	0.01	0.00
29.00	0.00	142	65.46	0.01	0.01	0.00
30.00	0.00	91	65.20	0.01	0.01	0.00
31.00	0.00	40	64.90	0.01	0.01	0.00
32.00	0.00	0	64.50	0.00	0.00	0.00
33.00	0.00	0	64.50	0.00	0.00	0.00
34.00	0.00	0	64.50	0.00	0.00	0.00
35.00	0.00	0	64.50	0.00	0.00	0.00
36.00	0.00	0	64.50	0.00	0.00	0.00

Operation and Maintenance Log

Project Name: **Old Washington Place**

Project Location: **631 Washington Street, Pembroke, Massachusetts 02359**

Inspection Log: *(attach additional pages as necessary)*

No.	Date	Name of Inspector	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
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17			
18			
19			
20			

APPENDIX E

Operations and Maintenance Plan

OPERATION AND MAINTENANCE PLAN

PROPOSED DRAINAGE SYSTEM – DURING CONSTRUCTION

February 2, 2022

Revised: March 22, 2022

**631 Washington Street
Pembroke, MA 02339**

Owner: NIKE Construction Service, LLC
633 Summer Street
Marshfield, MA 02050

Party Responsible for Operation and Maintenance:
NIKE Construction Service, LLC
633 Summer Street
Marshfield, MA 02050

Source of Funding:
Operation and Maintenance of this stormwater management system will be the responsibility of the property owner to include its successor and/or assigns, as the same may appear on record with the appropriate register of deeds.

During Construction:
Construction activities shall follow the Construction Sequence shown on the approved plan. During periods of active construction, the stormwater management system shall be inspected on a weekly basis and within 24 hours of a storm event of greater than 1/2". Maintenance tasks shall be performed monthly or after significant rainfall events of 1" of rain or greater. During construction, silt laden runoff shall be prevented from entering the existing street drainage system(s) and off-site properties.

All erosion and sedimentation control measures shall be in place prior to the commencement of any site work or earthwork operations, shall be maintained during construction, and shall remain in place until all site work is complete and ground cover is established. All erosion and sedimentation control measures shall be constructed in accordance with the Massachusetts erosion and sediment control guidelines for urban and suburban areas dated March 1997 and all municipal regulations. The location of erosion control measures shall be field verified during site preparation operation by the design engineer. The contractor shall keep on site at all time additional erosion control measures for installation at the direction of the engineer or town officials to mitigate any emergency

conditions. The contractor shall anticipate and modify erosion control measures based on past and current weather conditions, season and expected future construction activities.

Sediment at the silt sock erosion control barriers shall be removed once the volume reaches $\frac{1}{4}$ to $\frac{1}{2}$ the height of the silt sock and shall be maintained throughout the project. Disposal of sediment shall be the responsibility of the contractor in accordance with applicable local, state, and federal guidelines and regulations.

The stabilized construction entrance shall be placed at the project street entrance and shall consist of $\frac{3}{4}$ " to 1 $\frac{1}{2}$ " stone and be constructed as shown on the approved plans. The stabilized construction entrance shall be maintained in a condition that will prevent tracking or flowing of sediment outside the construction area. All sediment dropped, washed or tracked onto the public right-of-way must be removed immediately. Dust shall be controlled on site.

During dewatering operations, all water pumped shall be directed to a "dirt bag" pumped sediment removal system (or approved equal) as manufactured by ACF Environmental. The unit shall be placed on a crushed stone blanket. Disposal of such "dirt bag" shall occur when the device is full and can no longer effectively filter sediment or allow water to pass at a reasonable flow rate. Disposal of this unit shall be the responsibility of the contractor in accordance with applicable local, state, and federal guidelines and regulations.

All stockpiles shall be surrounded by erosion controls. The tops of stockpiles shall be covered in such a manner so that stormwater does not infiltrate the materials and thereby render the same unsuitable for fill use. All areas disturbed by construction and not to be paved or otherwise treated as noted on the plan shall be treated with 6" loam, seeded with and straw mulched for erosion control. Where construction activities have permanently ceased or have temporarily been suspended for more than seven days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within three days.

Earthwork activity on the site shall be done in a manner such that runoff is directed to the line of erosion control measures. Disturbed areas remaining idle for more than 10 days shall be stabilized.

The stormwater infiltration basin and pocket wetland basin shall be inspected after every major storm event during construction and cleaned to ensure proper function. The pre-treatment structures

shall be inspected after every major storm event during construction and cleaned when sediment exceeds 6" of depth.

Once each structure is in place, it shall be maintained in accordance with the procedures described in the post-construction Operations and Maintenance Plan.

Inspections

The owner shall be responsible to secure the services of a Professional Engineer or similar professional (inspector) on an on-going basis. The inspector shall review the project with respect to the following:

- Proper installation and performance of the Stormwater Management System.
- Review of the controls to determine any damaged or ineffective controls.
- Corrective actions.

The inspector shall prepare and submit a report documenting the findings and should request the required maintenance or repair for the pollution prevention controls when the inspector finds that it is necessary for the control to be effective. The inspector shall notify the Owner to make the changes.

APPENDIX F

Long Term Pollution Prevention Plan

LONG TERM SOURCE CONTROL/POLLUTION PREVENTION PLAN AND OPERATION AND MAINTENANCE PLAN

PROPOSED DRAINAGE SYSTEM – POST CONSTRUCTION

February 2, 2022

Revised: March 21, 2022

**631 Washington Street
Pembroke, MA 02339**

Owner: NIKE Construction Service, LLC
633 Summer Street
Marshfield, MA 02050

Party Responsible for Operation and Maintenance:
NIKE Construction Service, LLC
633 Summer Street
Marshfield, MA 02050

Note: Inspection records shall be maintained for a period of three years, on an ongoing basis.

Source of Funding:

Operation and Maintenance of this stormwater management system will be the responsibility of the property owner to include its successor and/or assigns, as the same may appear on record with the appropriate register of deeds.

1.0 Vehicle Washing Controls

There will be no vehicle washing operations on the site

2.0 Requirements for Routine Inspections and Maintenance of Stormwater Best Management Practices

Note: The Town shall be notified immediately if a change in ownership or maintenance responsibility occurs at the site.

Street Sweeping

Streets and parking areas shall be swept at least twice per year. Sweeping shall be completed during the early spring, no later than May 1st, before sediment from winter sanding operations is washed into the drainage system and in the fall after November 1st. Disposal of the

accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.

Silt Trap Erosion Control Pad

After construction, when all slopes have been stabilized, sediment and debris should be removed four times per year and be the responsibility of the owner. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state and federal guidelines and regulations.

Sediment Forebay

Inspect sediment forebays monthly and clean them out at least four times per year. Stabilize the floor and sidewalls of the sediment forebay before making it operational, otherwise the practice will discharge excess amounts of suspended sediments. When mowing the grass, keep the grass height no greater than 6". Check for signs of rilling and gullyng and repair as needed. After removing the sediment, replace any vegetation damaged during the clean-out by either reseeding or sodding. When reseeding, incorporate practices such as hydroseeding with a tackifier, blanket, or similar practice to ensure that no scour occurs in the forebay, while the seeds germinate and develop roots.

Stormwater Infiltration Basin

After construction, the stormwater infiltration basin shall be inspected for proper function after every major storm event until the site is completely developed and stabilized. After the site has been stabilized the stormwater infiltration system shall be inspected at least twice per year or if lack of performance is observed and perform necessary corrective measures to maintain infiltration capacity; as required by the Stormwater Management Policy. Inspections shall include checking the water level in the system after a major storm event, and performing necessary corrective action if water is observed 72 hours following the storm.

Sediment shall be removed from the bottom of the basin if the basin is observed to be holding water after 72 hours following a substantial storm event. Procedure for removal shall follow the Basin Repair and Renovation Plan below. Disposal of the accumulated sediment must be in accordance with applicable local, state and federal guidelines and regulations.

Inspections shall be performed by qualified professionals of the basin bottoms and outlet control structure. The embankments should also be inspected for signs of settlement, significant erosion, animal burrows,

growth of woody vegetation, and other conditions that could affect embankment integrity. Repairs should be made immediately based on these inspections.

The bottoms and sides of the stormwater basin should be mowed, limed, aerated, and overseeded along with the regular maintenance of other loamed & seeded areas on the project site. Liming shall be limited to once per year.

Basin Repair and Renovation Plan

In the event that the time for the stormwater basin to drain exceeds 72 hours, the basin shall be renovated. The following procedure shall be followed:

1. The Planning Board shall be notified of the status of the drainage facility.
2. An evaluation and determination for the slow drain time shall be performed by a Professional Engineer. The following shall be considered:
 - a. Higher sediment loading than anticipated
 - b. Extreme hydrologic events
 - c. Poor installation (i.e., excessive compaction of soils and low spots)
 - d. Poor maintenance.
3. In the case of higher than anticipated sediment loading, the schedule for maintenance shall be increased from the recommended yearly cleaning to bi-annual. For all other failures, the repair and renovation shall be made in accordance with the original approved Plan and the inspection shall remain the same as specified in the Operation and Maintenance Plan.
4. Prior to construction, the contractor shall secure all necessary State, Municipal and other utility permits and verify the existing locations of the utilities with the utility companies.
5. The contractor shall notify "Digsafe" (1.888.344.7233) at least four days prior to construction.
6. The work shall be performed in accordance with the specifications of the appropriate department. The contractor shall notify the Planning Board at least four days prior to construction.

7. Install erosion control barriers along limit of construction and at the following locations:
 - a. At the interface between the silt trap-erosion control pad and the bottom of the basin.
 - b. At the interface between the bottom of the basin and the outlet control structure.
8. A Professional Engineer shall develop a plan for handling stormwater during repair and renovation.
 - a. The plan shall include the use of temporary basins, swales with check dams, additional water quality controls prior to discharge, etc.
 - b. The plan should be based on the specific circumstances of where and how the basin failed
9. The repair and renovation shall proceed as follows:
 - a. Construction shall not take place until the floor of the basin is thoroughly dry.
 - b. Prior to tilling, grass clippings and accumulated organic matter should be removed to prevent the formation of an impervious organic mat. Trash and debris should also be removed at this time.
 - c. Light equipment which will not compact the underlying soils should be used to remove the top layer and replace with loam as required. The remaining soils should be deeply tilled and re-vegetated as soon as possible.
10. The basin to be inspected weekly and after every storm event and maintained until grass has stabilized disturbed areas.
11. At the completion of all construction, the contractor is to remove the erosion control barrier and re-establish flows to the drainage basin.

Basin Bi-Annual Maintenance Plan

Maintenance of the infiltration basin shall be performed at least twice per year and include:

1. Mow the basin area, side slopes and bottom area.
2. Remove grass clippings and accumulated organic matter to prevent organic mat from forming

3. Remove trash and debris, and use deep tilling to break up clogged surfaces followed by immediate re-vegetation.

3.0 Snow Disposal and Plowing Plans

1. Site Selection

Snow disposal is to be located adjacent to or on pervious surfaces. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris which can be removed in the springtime.

2. Site Preparation and Maintenance

It is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- Some form of a barrier should be placed securely on any down gradient side of the snow disposal site, to prevent snow from migrating beyond the designated disposal area, or over property lines.
- Debris should be cleared from the site prior to using the site for snow disposal.
- Debris should be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.

Any snow that cannot be properly disposed of as outlined above, shall be removed from the site and disposed of in accordance with State, Federal, and Local Regulations.

4.0 Provisions for Solid Waste Management

Waste disposal dumpsters and trailers will be used for the disposal of construction debris, which will be removed from site according to state, local and federal guidelines. Construction debris will include pavement, utility, earth and building materials, which cannot be reused. The dumpsters will be located on-site, covered, and placed well away from the wetland resource areas and catch basins as possible. All machinery will be operated and maintained so as to limit impacts to drainage systems by avoiding leakage of fuel. If stockpiles of debris materials are necessary, perimeter controls or plastic sheeting/covering will be used if deemed necessary during regular site inspections. A concrete washout area will be established as necessary and utilized.

Portable sanitary units will be placed on-site during construction and will be serviced regularly. They will be placed over 100 feet from resource areas wherever possible.

5.0 Spill Prevention

The Owner shall be aware of, educate occupants of, and enforce the following spill prevention measures:

Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container
- Manufacturer's recommendations for proper use and disposal will be followed

Hazardous Products

These practices are used to reduce the risks associated with hazardous materials.

- Exterior storage of deicing chemicals, fertilizers, herbicides, pesticides, or other hazardous materials shall be prohibited.
- Products will be kept in original containers unless they are not resalable.
- Original labels and material safety data will be retained; they contain important product information.

- If surplus product must be disposed of, manufacturers or local State recommended methods for proper disposal will be followed.

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

If used, fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed; exterior storage shall be prohibited. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturers' instructions or State and local regulations.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate State or local government agency, protective clothing, regardless of the size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what cause it, and the cleanup measures will also be included.

6.0 **Solid Waste**

Solid Waste shall be picked up by a private firm, and solid waste disposed of in accordance with State, Federal, and Local regulations.

7.0 **Street Sweeping**

The parking area shall be swept at least four times per year. Sweeping shall be completed during the early spring, no later than May 1st, before sediment from winter sanding operations is washed into the drainage system. Disposal of the accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.

8. **Illicit Discharge Statement**

To the best of our knowledge, there are no current illicit discharges present on the site. No new illicit discharges from the site are proposed.

The site operator is specifically notified that Illicit Discharges are prohibited. Below is a list of those non-stormwater discharges allowed by MassDEP.



Dana M. Altobello, P.E.

Allowable Non-Stormwater Discharges

The following non-storm water discharges are authorized provided it has been determined by the permittee that they are not significant contributors of pollutants to the MS4. If these discharges are identified as significant contributors to the MS4, they must be addressed in the Illicit Discharge Detection and Elimination minimum control measure described in Parts II, III, IV and V.

1. water line flushing,
2. landscape irrigation,
3. diverted stream flows,
4. rising ground waters,
5. uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. uncontaminated pumped ground water,
7. discharge from potable water sources,
8. foundation drains,
9. air conditioning condensation,
10. irrigation water, springs,
11. water from crawl space pumps,
12. footing drains,
13. lawn watering,
14. flows from riparian habitats and wetlands,
15. dechlorinated swimming pool discharges,
16. street wash water, and
17. Residential building wash waters, without detergents.

Discharges or flows from firefighting activities occur during emergency situations. The permittee is not expected to evaluate firefighting discharges with regard to pollutant contributions. Therefore, these discharges are authorized as allowable non-storm water discharges, unless identified, by EPA, as significant sources of pollutants to Waters of the U.S..

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

Maintenance Cost

The maintenance cost shall include BMP inspections, maintenance of subsurface drainage infiltration chambers, cleaning sediment forebays, outlet control structures, street sweeping and minor maintenance repairs. The anticipated maintenance cost \$1,000 per year.