



February 2, 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**

**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 buildings, new parking area and the majority of the septic system area will be directed towards the proposed vegetated filter strip (>50lf) which will capture and pretreat the flows prior to discharging to a sediment forebay and then into the infiltration basin which is adjacent to the proposed parking area. The 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 basin 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 vegetated filter strip and stormwater management system. Clean runoff from the proposed building roofs (non-metal) will be directed into the infiltration basin via subsurface ADS pipes which will collect flow from the roof leaders.

### 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.

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	2P TRIB. TO S.E.	3P TRIB. TO S.W.
2YR	0.47	0.00	0.00	0.01	0.00	0.00
10YR	1.64	0.00	0.02	1.05	0.00	0.00
25YR	2.77	0.02	0.08	2.29	0.00	0.02
100YR	5.33	0.20	0.39	5.25	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 1/2 inch rule as the site is not within a critical area or a 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 2,544± 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 pocket wetland with the inclusion of the sediment forebay. 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.

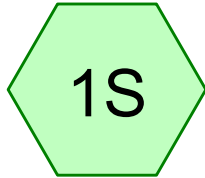
#### Standard 10 – Prohibition of Illicit Discharges

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

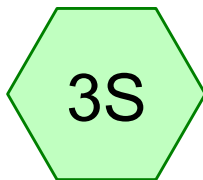
## **APPENDIX A**

### **Existing Conditions**

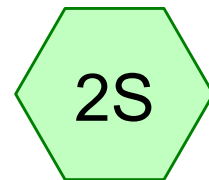
**2 (3.35"), 10 (4.95"), 25 (6.19") and 100 (8.68") year return storms**



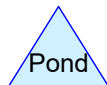
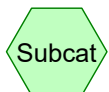
TRIB TO OLD  
WASHINGTON



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)
<b>105,870</b>	<b>53</b>	<b>TOTAL AREA</b>

**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"

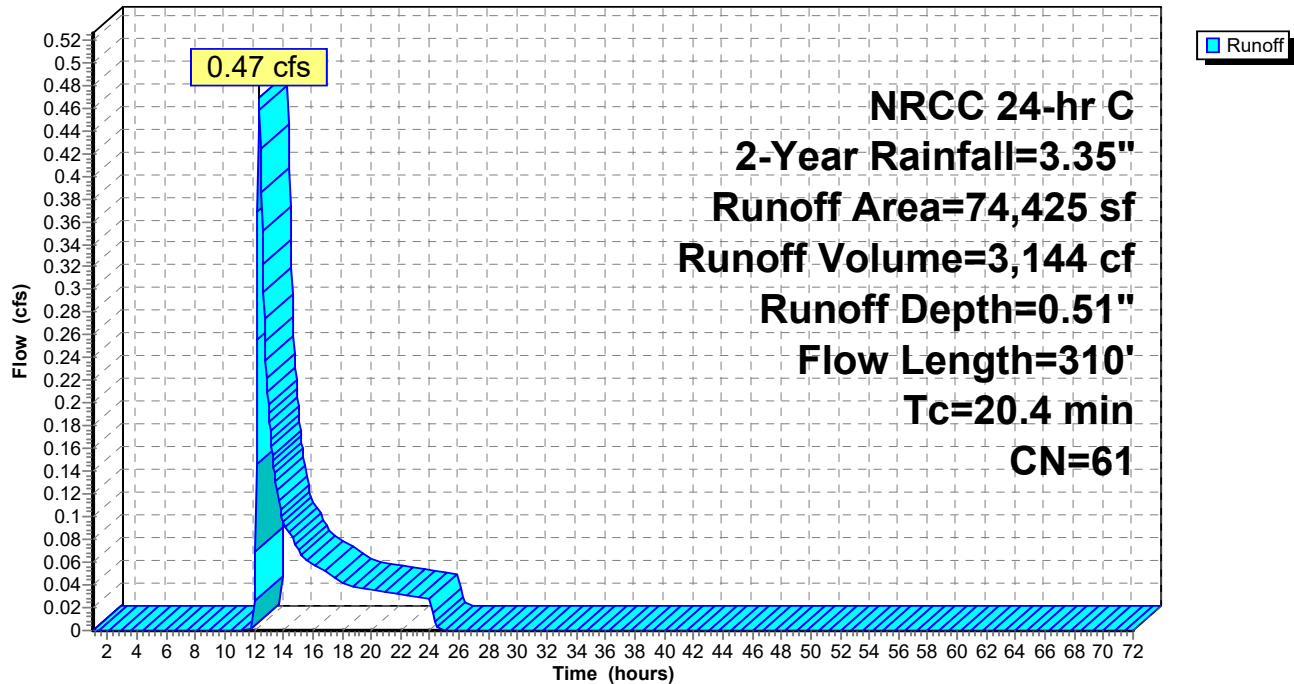
	Area (sf)	CN	Description
*	2,341	98	Paved parking & house/sheds
	4,603	96	Gravel surface, HSG A
	541	39	>75% Grass cover, Good, HSG A
	9,060	36	Woods, Fair, HSG A
	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	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		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		<b>Shallow Concentrated Flow,</b>
					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"

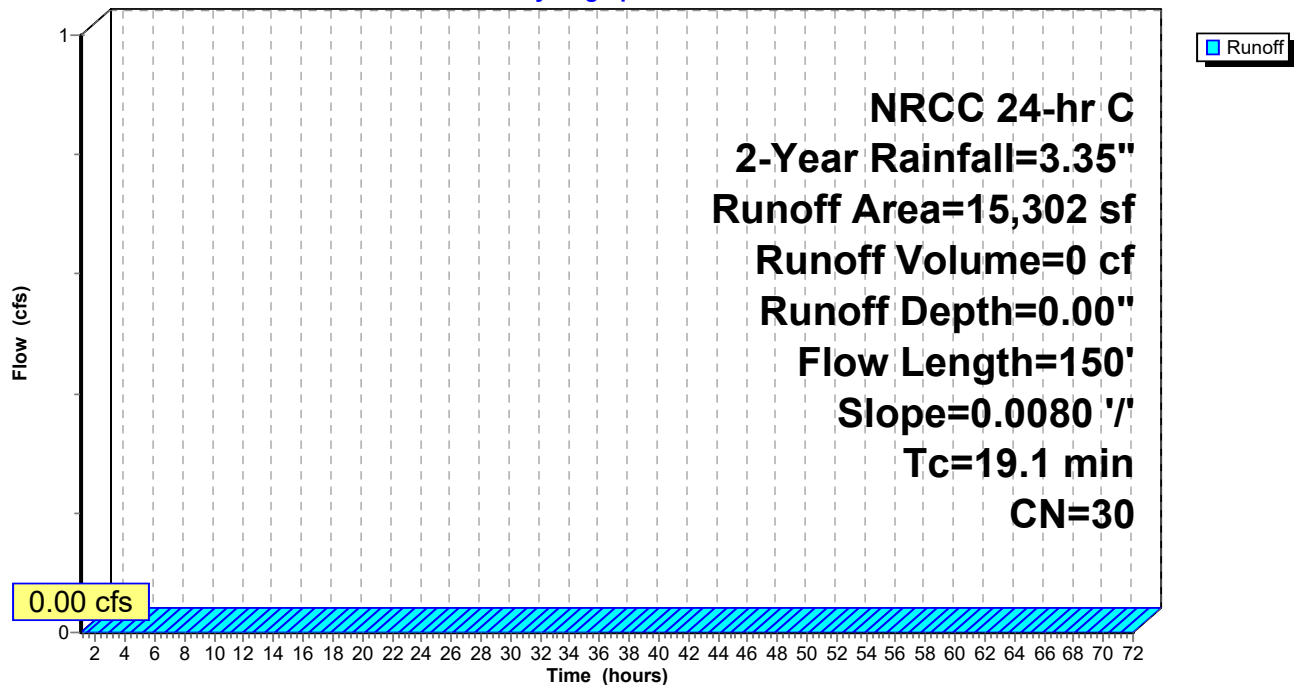
Area (sf)	CN	Description
15,302	30	Woods, Good, HSG A
15,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		<b>Shallow Concentrated Flow,</b>
					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"

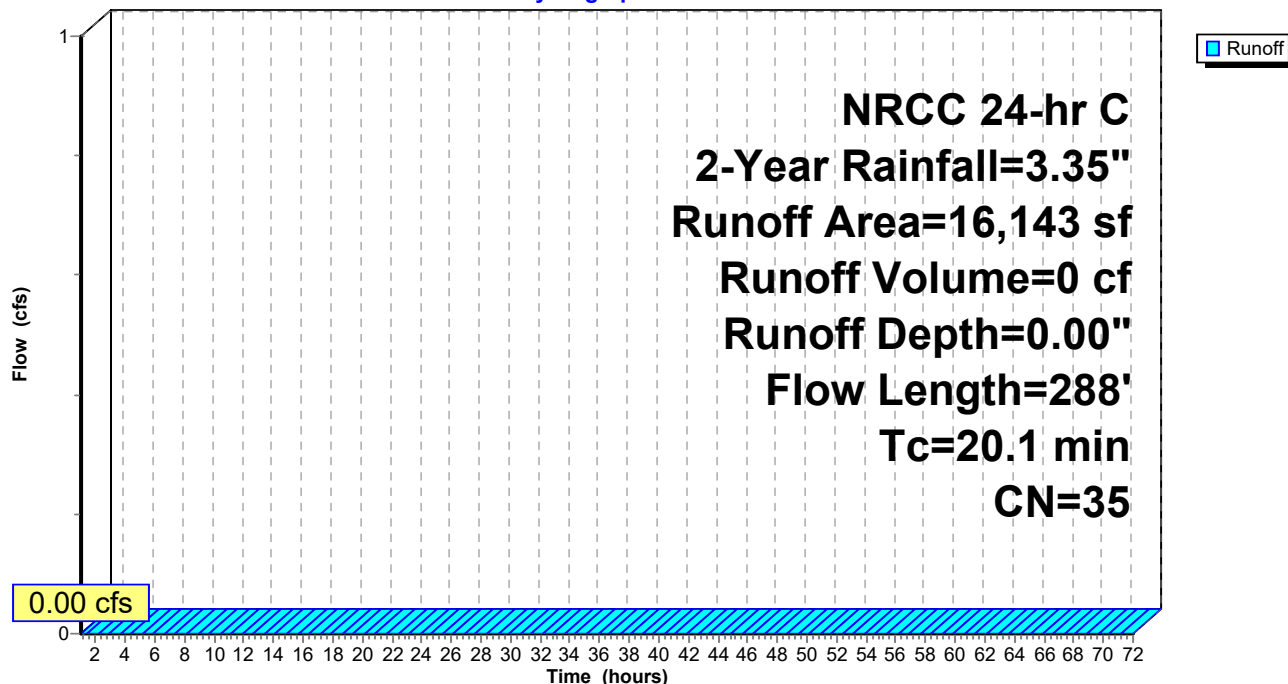
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		<b>Shallow Concentrated Flow,</b> 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

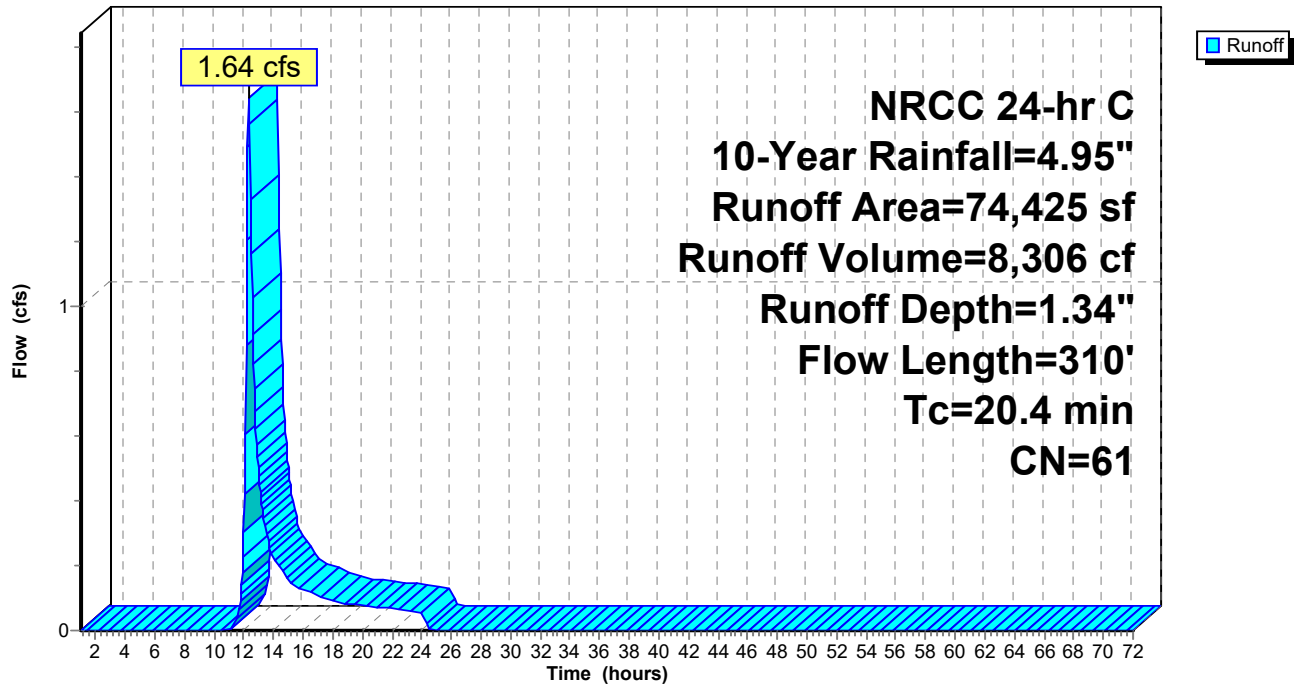
  

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
20.4	310	Total			



## Subcatchment 1S: TRIB TO OLD WASHINGTON

## Hydrograph



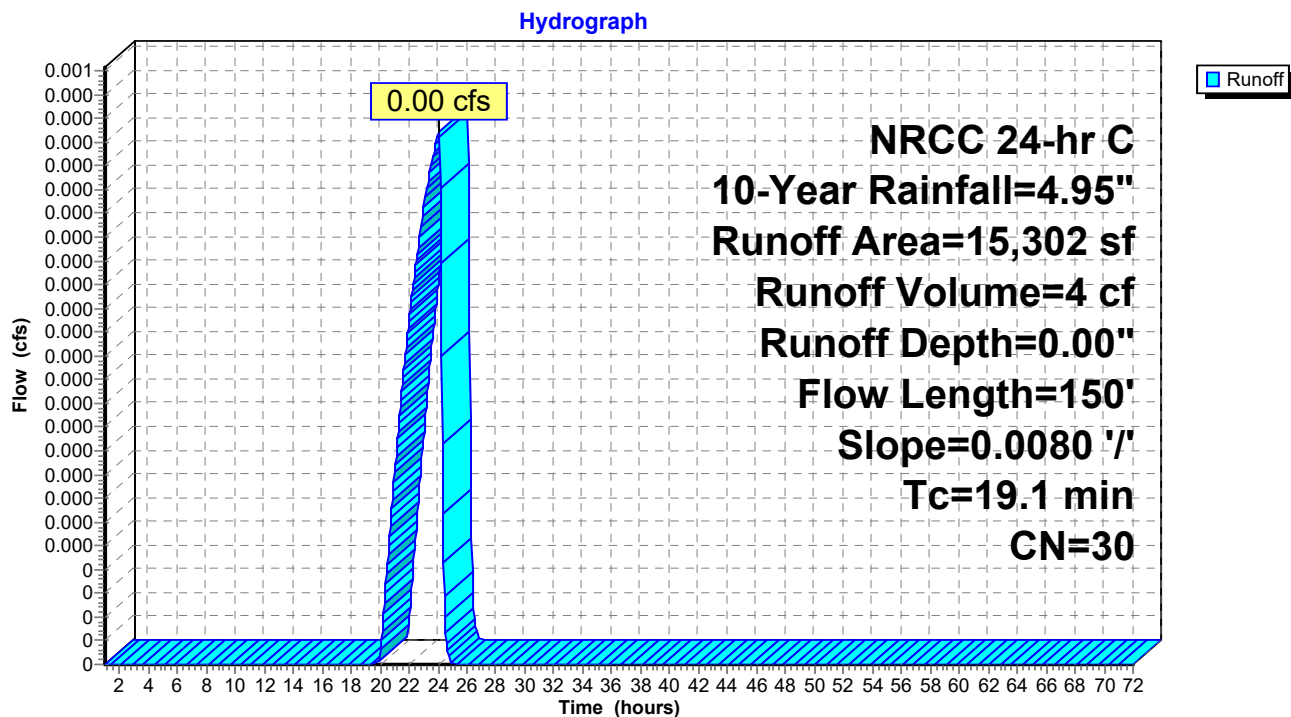
### Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		
					<b>Shallow Concentrated Flow,</b> 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"

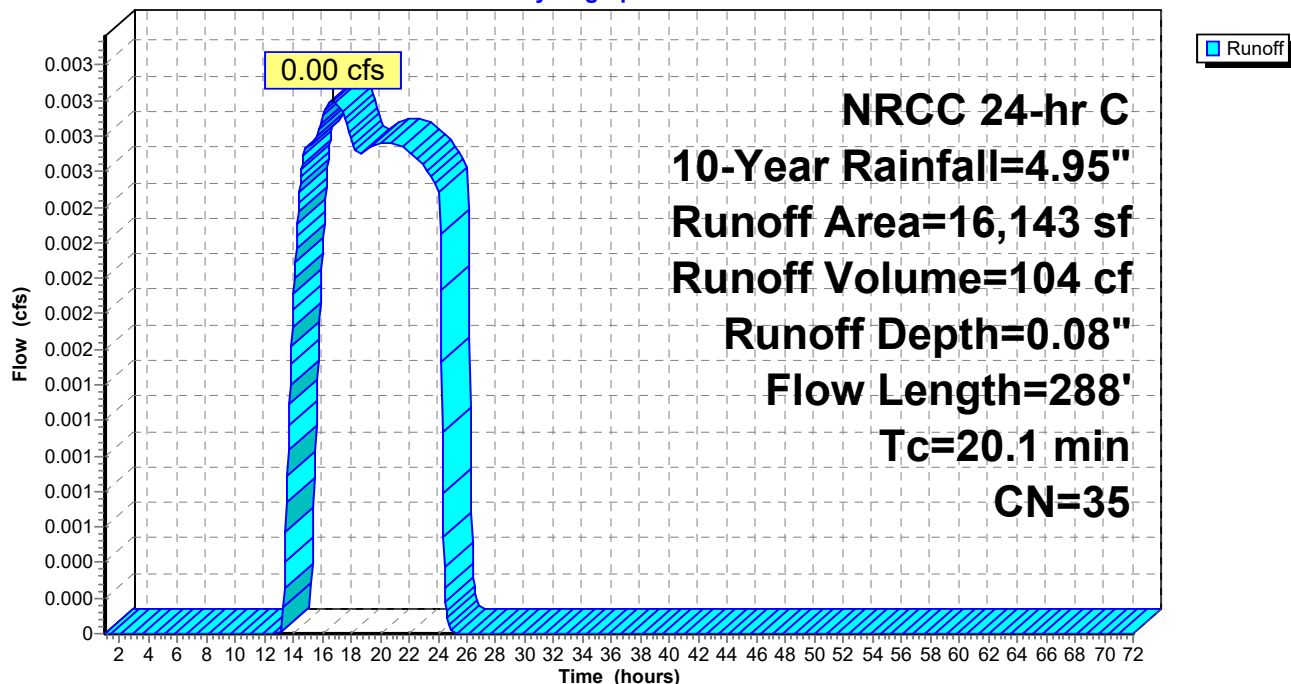
Area (sf)	CN	Description
12,796	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,143	35	Weighted Average
16,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		<b>Shallow Concentrated Flow,</b> 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 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"

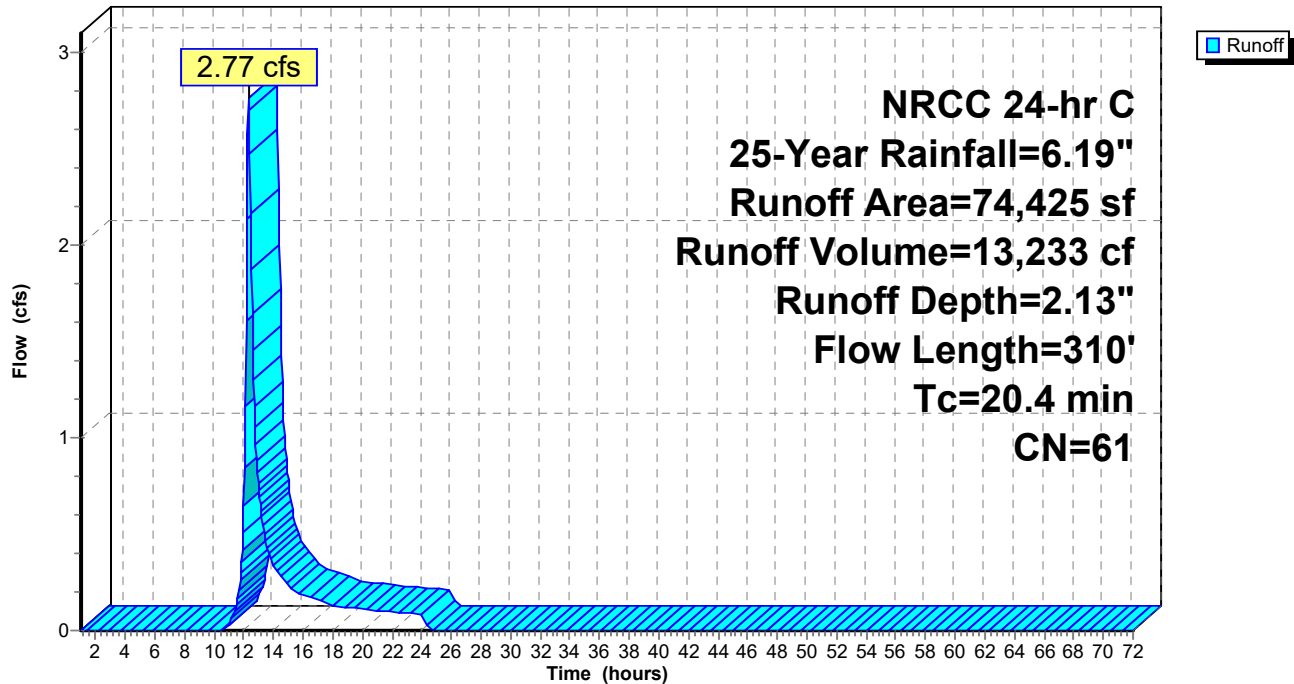
	Area (sf)	CN	Description
*	2,341	98	Paved parking & house/sheds
	4,603	96	Gravel surface, HSG A
	541	39	>75% Grass cover, Good, HSG A
	9,060	36	Woods, Fair, HSG A
	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
20.4	310	Total			

## Subcatchment 1S: TRIB TO OLD WASHINGTON

Hydrograph



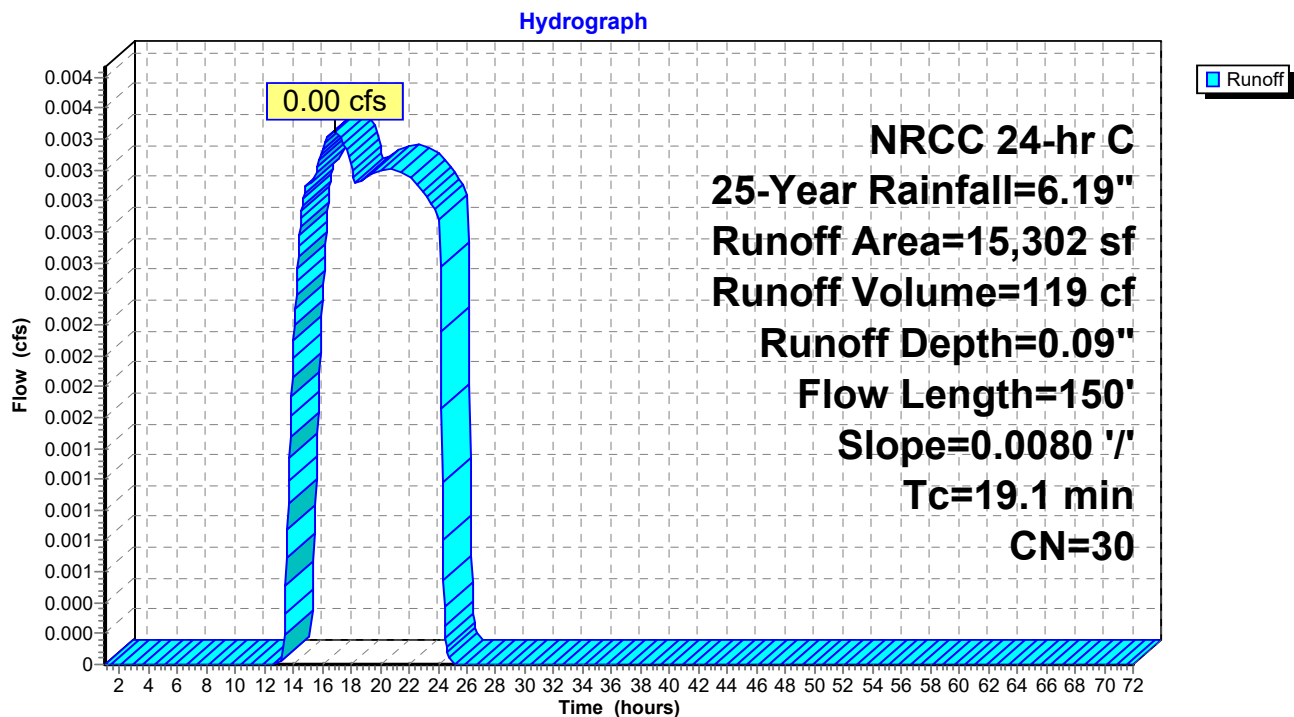
### Summary for Subcatchment 2S: TRIB TO SOUTH EAST OF SITE

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		
19.1	150	Total			

### Subcatchment 2S: TRIB TO SOUTH EAST OF SITE



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

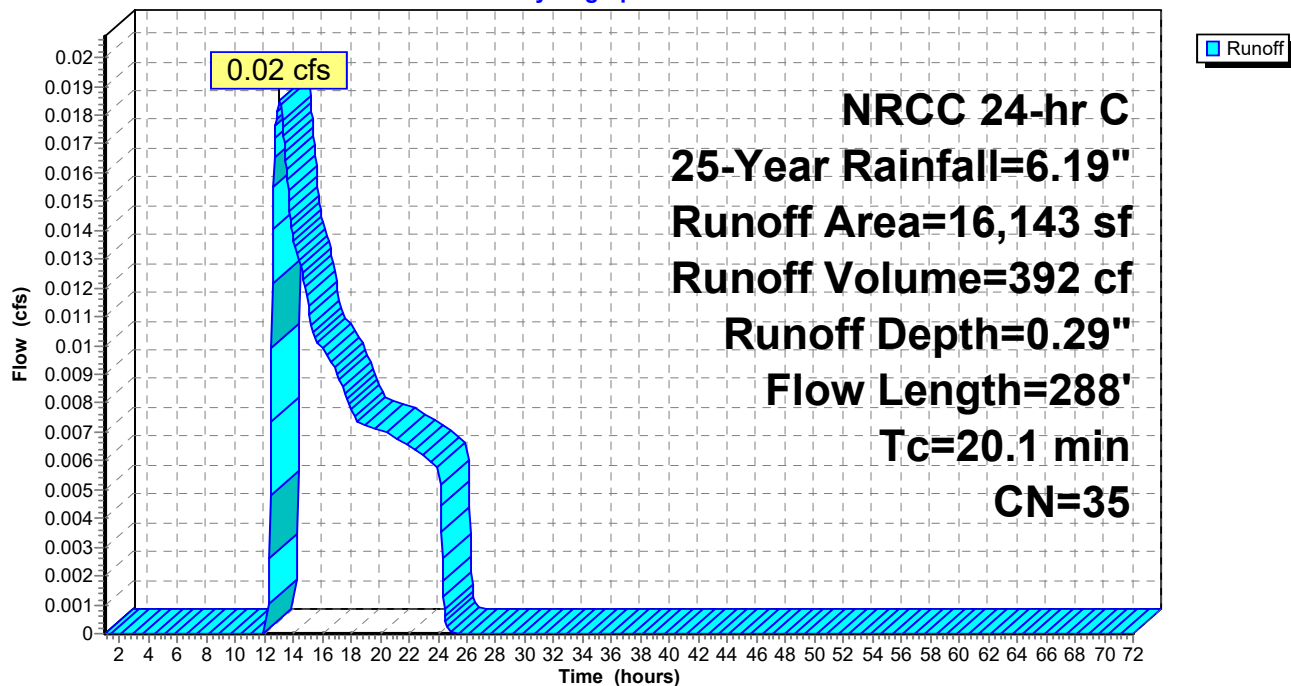
Runoff = 0.02 cfs @ 13.05 hrs, Volume= 392 cf, Depth= 0.29"

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

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

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		<b>Shallow Concentrated Flow,</b> 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"

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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"

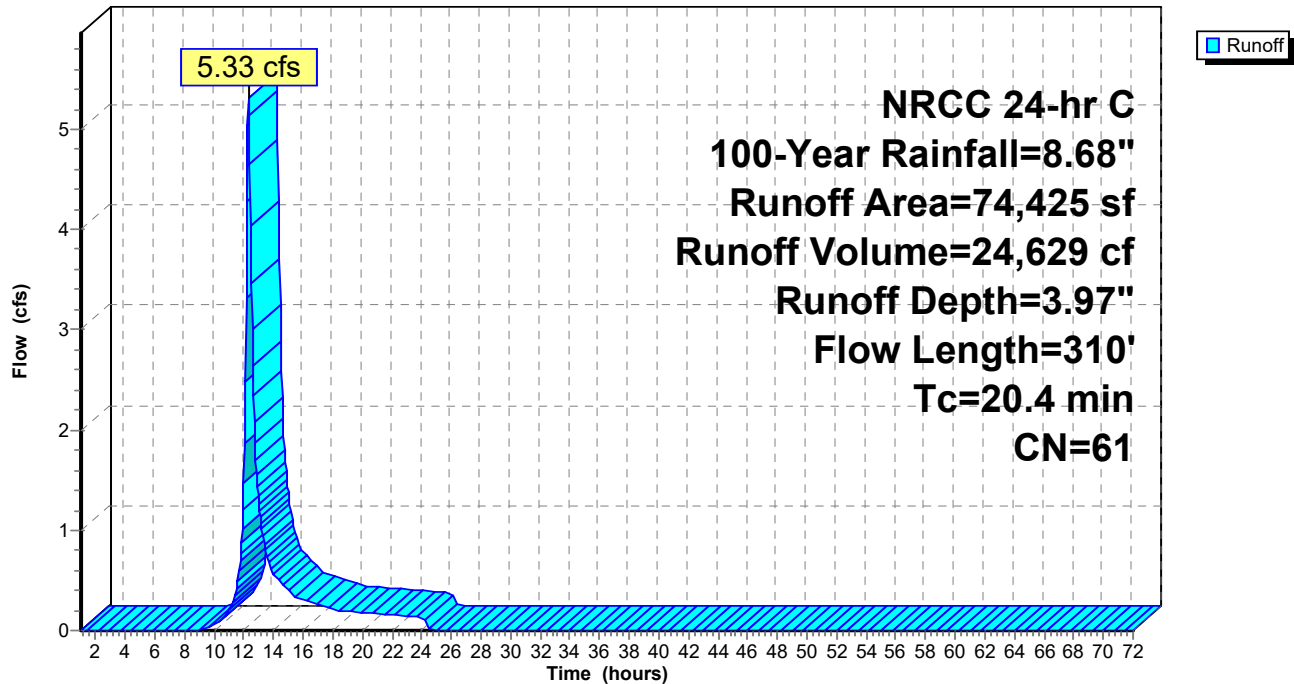
	Area (sf)	CN	Description
*	2,341	98	Paved parking & house/sheds
	4,603	96	Gravel surface, HSG A
	541	39	>75% Grass cover, Good, HSG A
	9,060	36	Woods, Fair, HSG A
	44,912	61	>75% Grass cover, Good, HSG B
	12,204	60	Woods, Fair, HSG B
	543	80	>75% Grass cover, Good, HSG D
	221	79	Woods, Fair, HSG D
	74,425	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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		<b>Shallow Concentrated Flow,</b> 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"

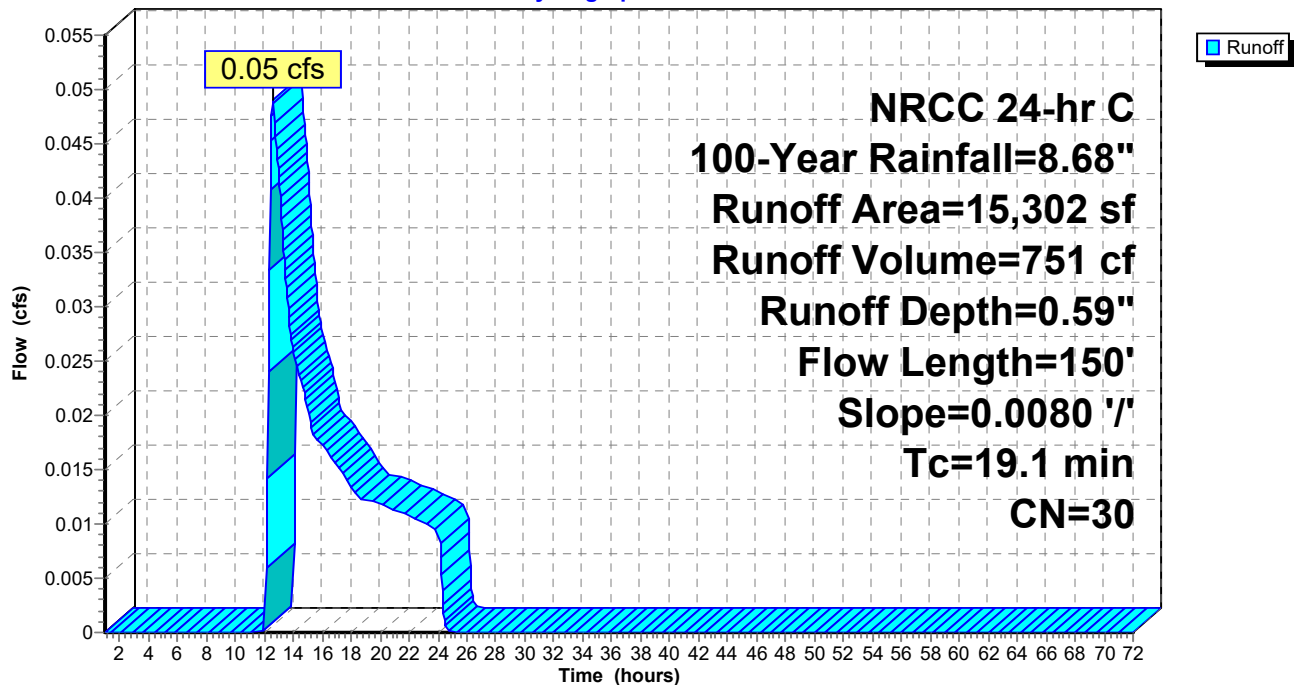
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		<b>Shallow Concentrated Flow,</b> 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"

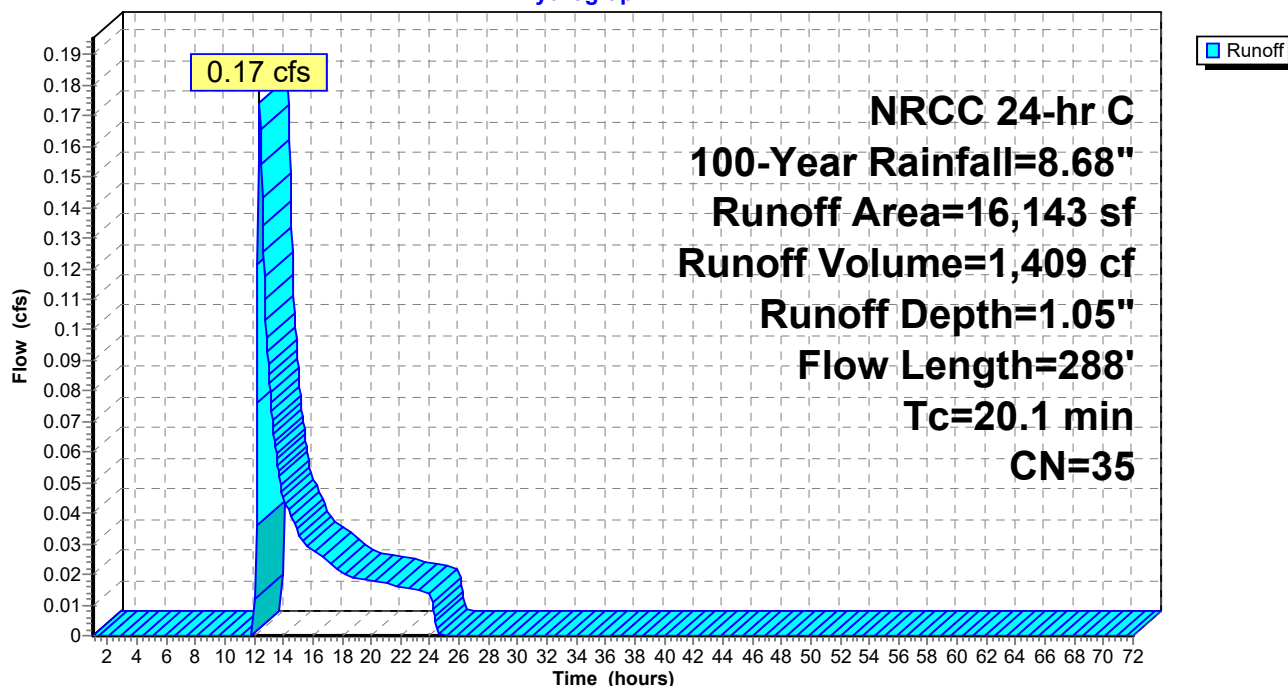
Area (sf)	CN	Description
12,796	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,143	35	Weighted Average
16,143		100.00% Pervious Area

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

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

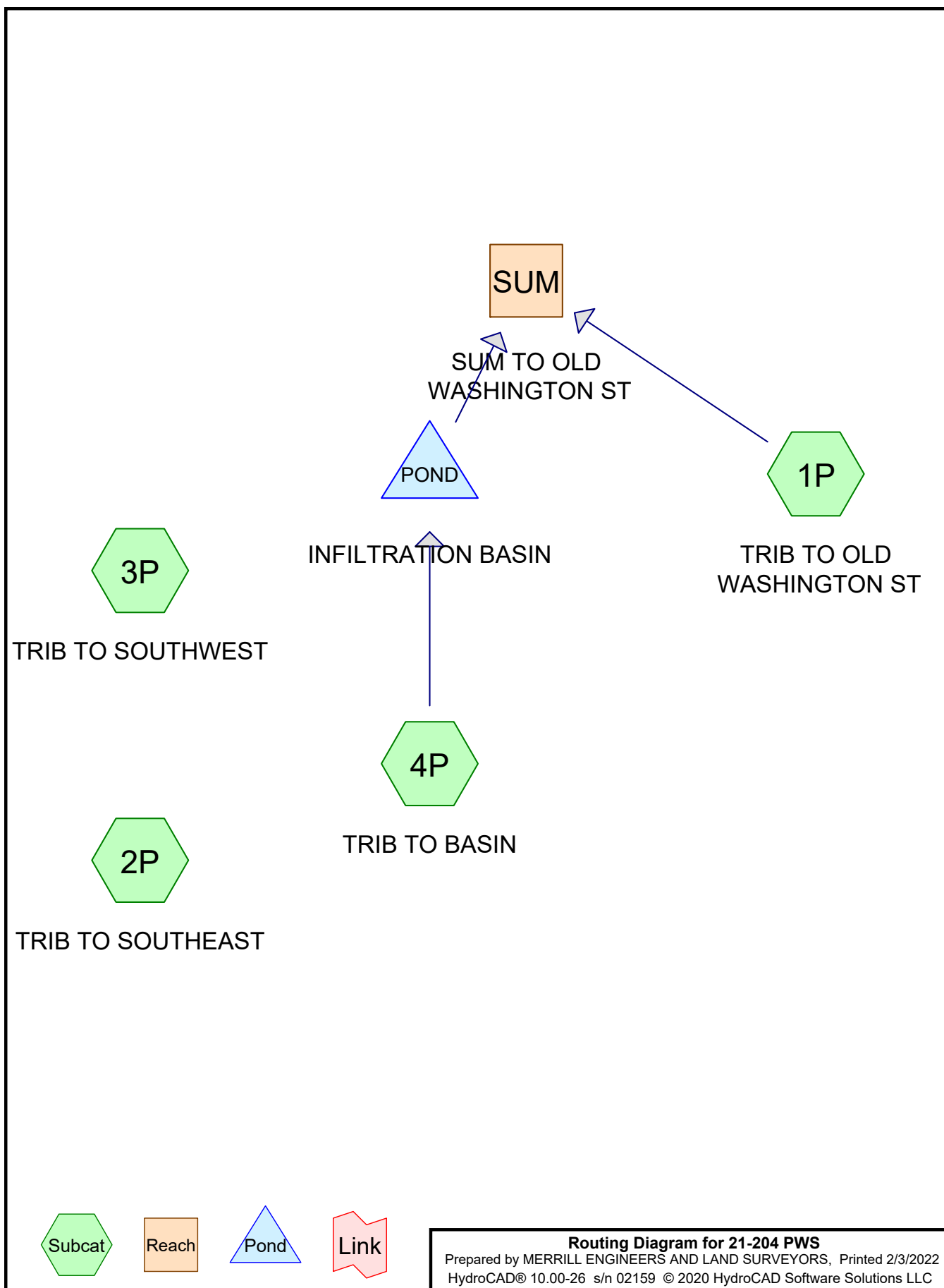
Hydrograph



## **APPENDIX B**

### **Proposed Conditions**

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



**21-204 PWS**

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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)
16,954	98	Paved parking, HSG B (4P)
35,262	30	Woods, Good, HSG A (1P, 2P, 3P)
27,384	55	Woods, Good, HSG B (1P, 3P, 4P)
<b>105,870</b>	<b>55</b>	<b>TOTAL AREA</b>



**21-204 PWS**

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

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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=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=45,176 sf 37.53% Impervious Runoff Depth=1.14"  
Flow Length=199' Tc=21.8 min CN=74 Runoff=0.86 cfs 4,282 cf

**Reach SUM: SUM TO OLD WASHINGTON ST**

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

**Pond POND: INFILTRATION BASIN**

Peak Elev=65.70' Storage=1,507 cf Inflow=0.86 cfs 4,282 cf  
Discarded=0.13 cfs 4,282 cf Primary=0.00 cfs 0 cf Outflow=0.13 cfs 4,282 cf

**Total Runoff Area = 105,870 sf Runoff Volume = 4,586 cf Average Runoff Depth = 0.52"**  
**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"

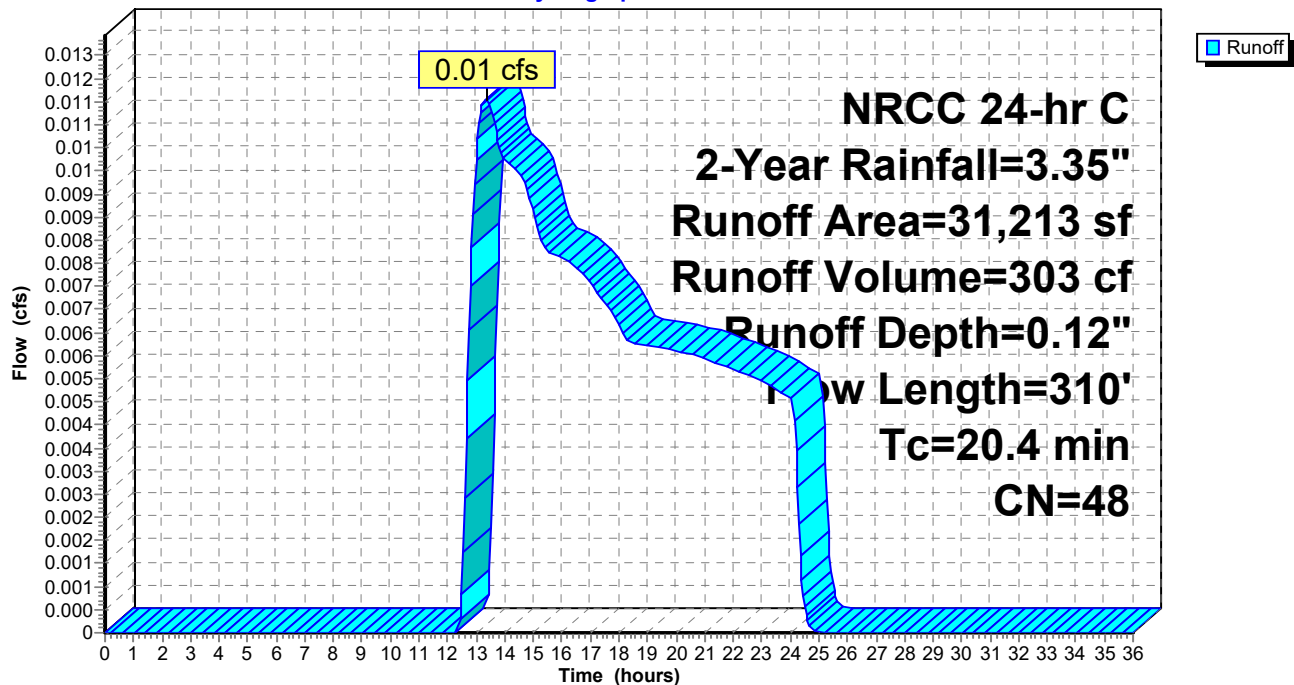
Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% Impervious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

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		<b>Shallow Concentrated Flow,</b>
					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"

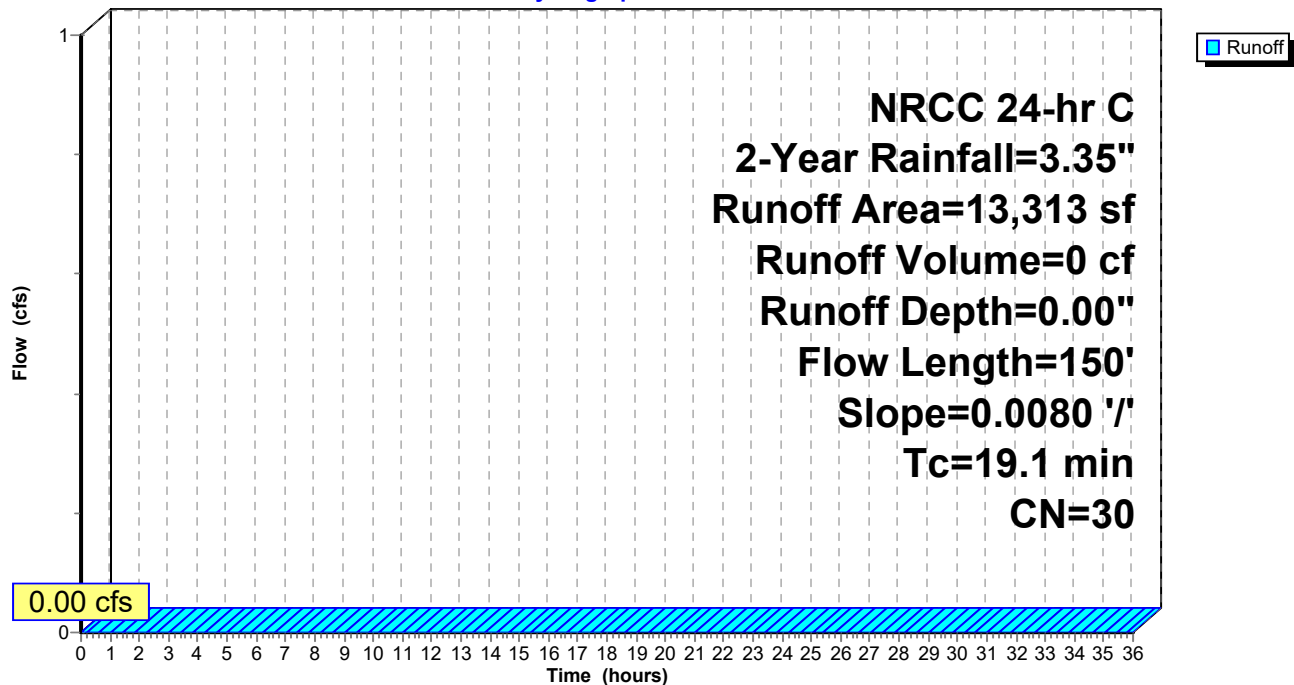
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

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		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		<b>Shallow Concentrated Flow,</b>
					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"

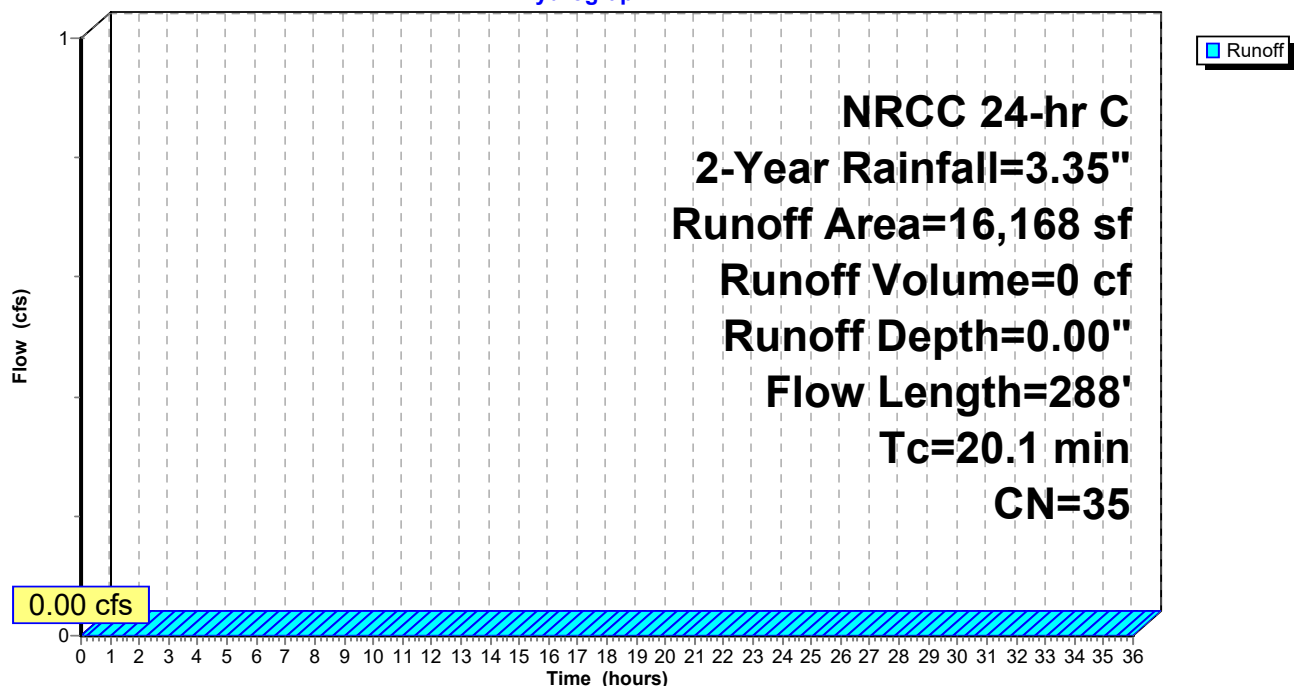
Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

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

**Subcatchment 3P: TRIB TO SOUTHWEST**

Hydrograph



**Summary for Subcatchment 4P: TRIB TO BASIN**

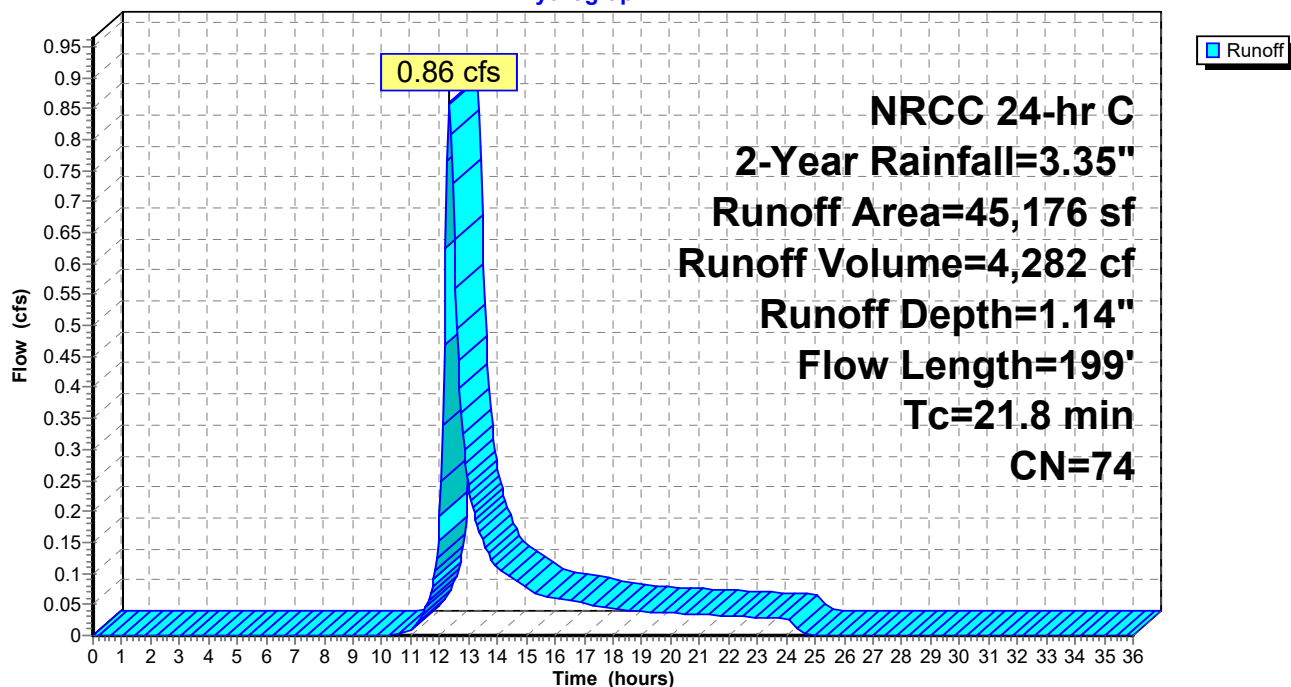
Runoff = 0.86 cfs @ 12.33 hrs, Volume= 4,282 cf, Depth= 1.14"

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
16,954	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
45,176	74	Weighted Average
28,222		62.47% Pervious Area
16,954		37.53% Impervious Area

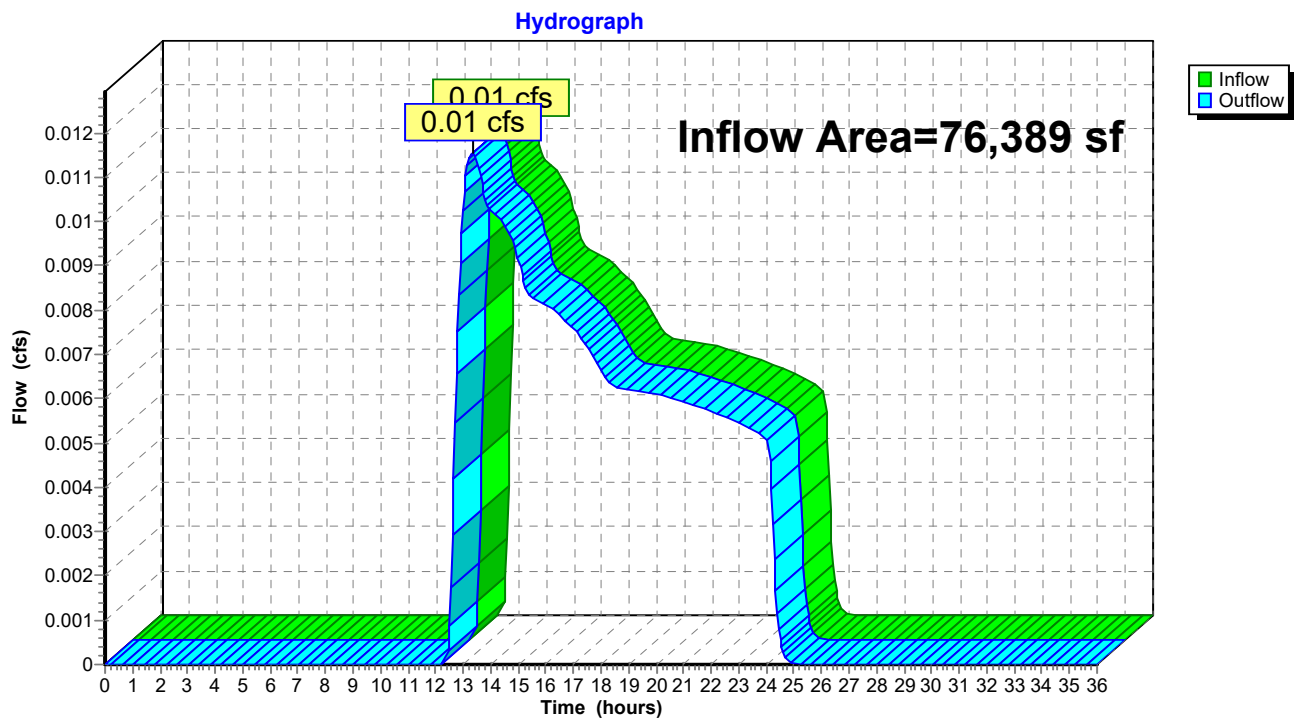
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		<b>Shallow Concentrated Flow,</b>
					Unpaved Kv= 16.1 fps
21.8	199	Total			

**Subcatchment 4P: TRIB TO BASIN****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 POND: INFILTRATION BASIN**

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 1.14" for 2-Year event  
 Inflow = 0.86 cfs @ 12.33 hrs, Volume= 4,282 cf  
 Outflow = 0.13 cfs @ 13.69 hrs, Volume= 4,282 cf, Atten= 85%, Lag= 81.5 min  
 Discarded = 0.13 cfs @ 13.69 hrs, Volume= 4,282 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= 65.70' @ 13.69 hrs Surf.Area= 2,331 sf Storage= 1,507 cf

Plug-Flow detention time= 106.1 min calculated for 4,276 cf (100% of inflow)

Center-of-Mass det. time= 105.8 min ( 992.4 - 886.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	6,687 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	1,926	10	10
66.00	2,501	2,214	2,223
67.00	3,125	2,813	5,036
67.50	3,477	1,651	6,687

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	65.75'	<b>2.0' long x 0.50' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	<b>8.0' long x 1.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 2.5' Crest Height

**Discarded OutFlow** Max=0.13 cfs @ 13.69 hrs HW=65.70' (Free Discharge)

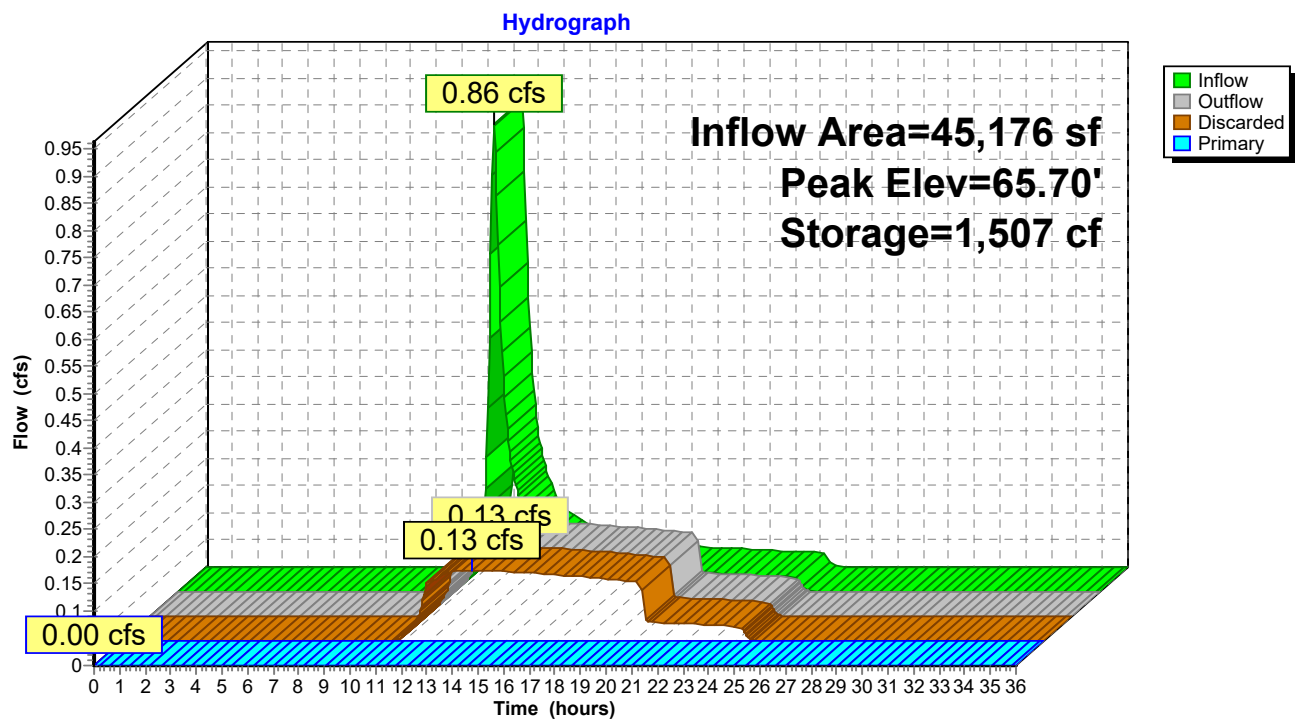
↑ **1=Exfiltration** (Exfiltration Controls 0.13 cfs)

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

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

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

## Pond POND: INFILTRATION BASIN





**21-204 PWS**

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 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=45,176 sf 37.53% Impervious Runoff Depth=2.32"  
Flow Length=199' Tc=21.8 min CN=74 Runoff=1.83 cfs 8,751 cf

**Reach SUM: SUM TO OLD WASHINGTON ST**

Inflow=1.05 cfs 4,146 cf  
Outflow=1.05 cfs 4,146 cf

**Pond POND: INFILTRATION BASIN**

Peak Elev=66.02' Storage=2,267 cf Inflow=1.83 cfs 8,751 cf  
Discarded=0.14 cfs 6,083 cf Primary=0.90 cfs 2,666 cf Outflow=1.04 cfs 8,749 cf

**Total Runoff Area = 105,870 sf Runoff Volume = 10,338 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"

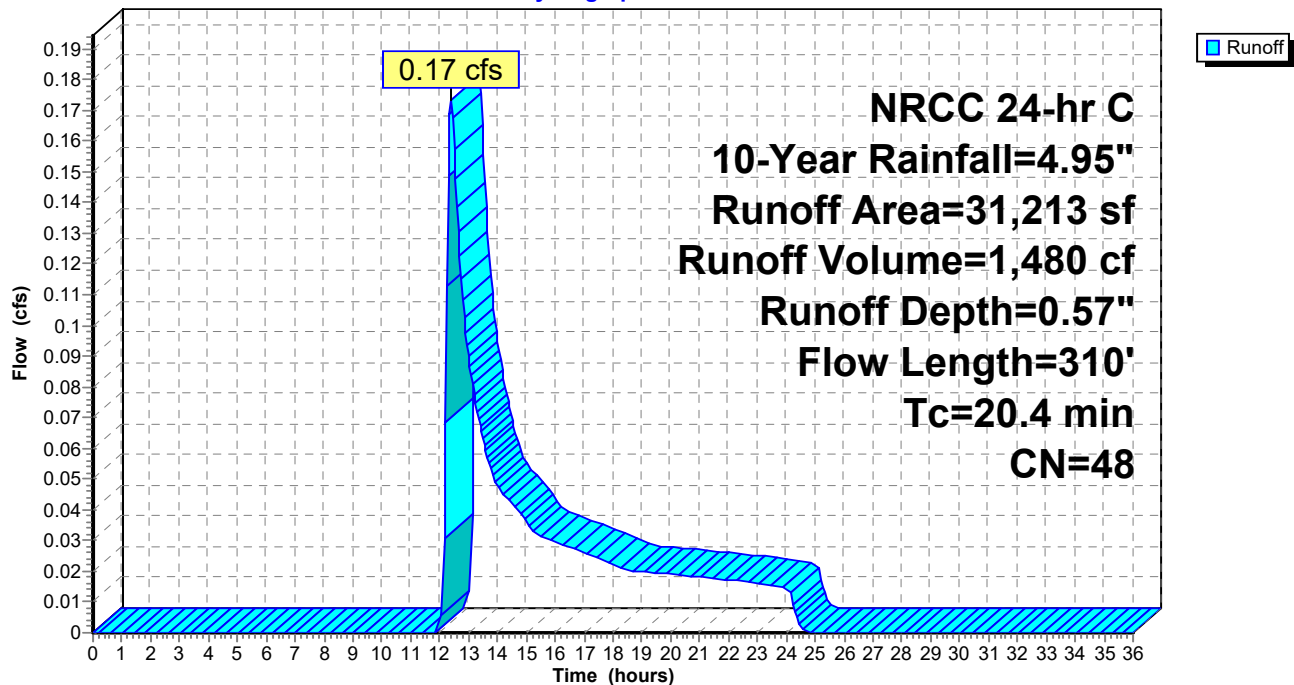
Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% Impervious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

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	50	0.0080	0.05		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.5	260	0.0120	1.76		<b>Shallow Concentrated Flow,</b> 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"

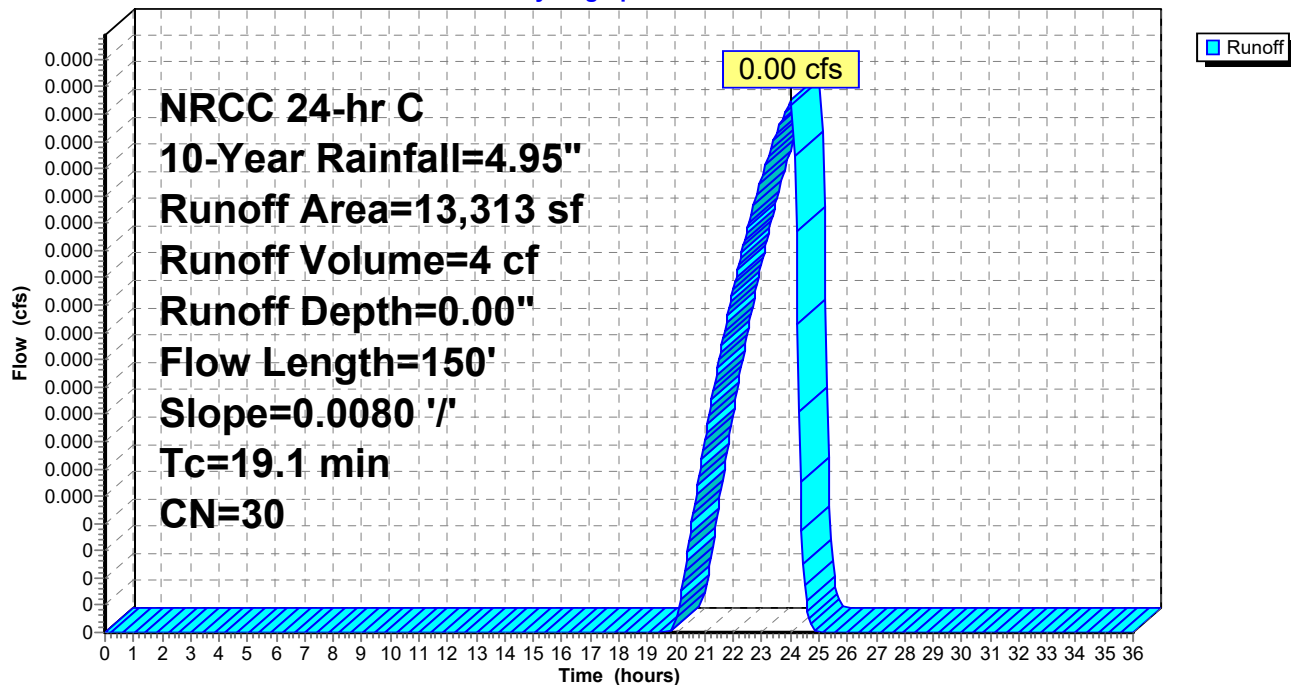
Area (sf)	CN	Description
13,313	30	Woods, Good, HSG A
13,313		100.00% Pervious Area

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

## Subcatchment 2P: TRIB TO SOUTHEAST

## Hydrograph



**Summary for Subcatchment 3P: TRIB TO SOUTHWEST**

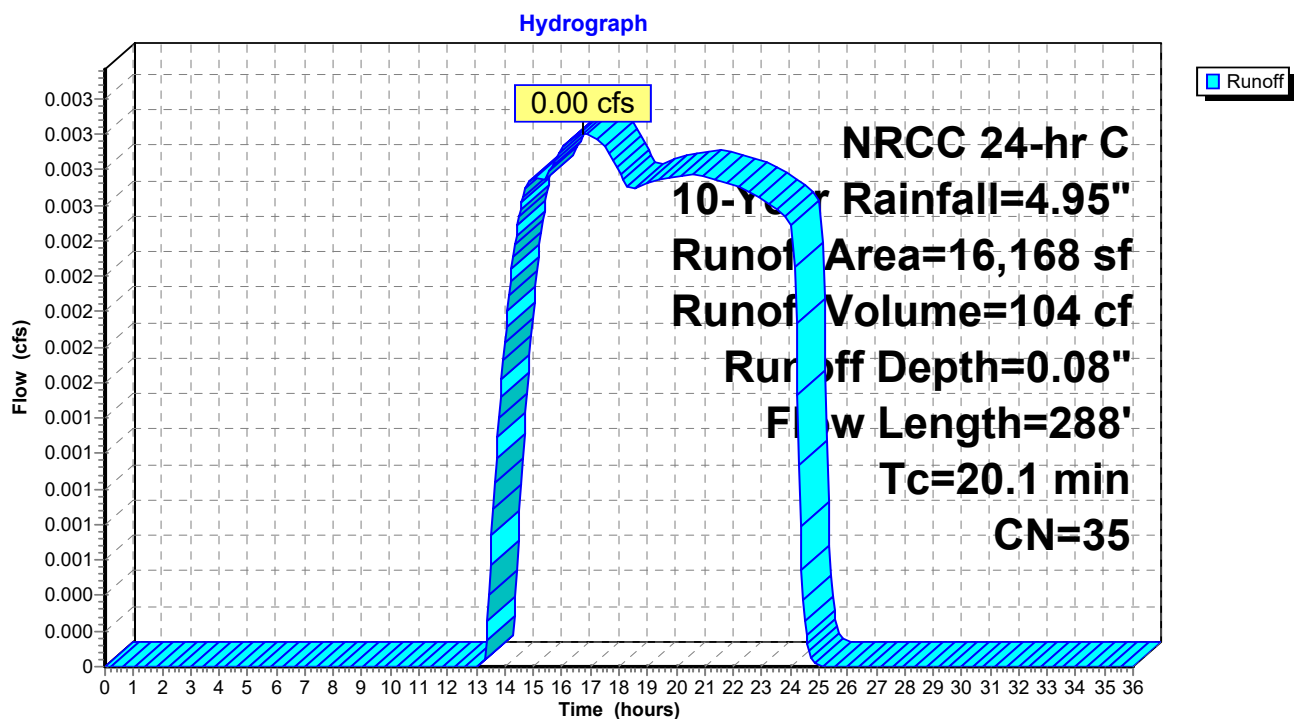
Runoff = 0.00 cfs @ 16.75 hrs, Volume= 104 cf, Depth= 0.08"

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
2.2	238	0.0120	1.76		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
20.1	288	Total			

**Subcatchment 3P: TRIB TO SOUTHWEST**

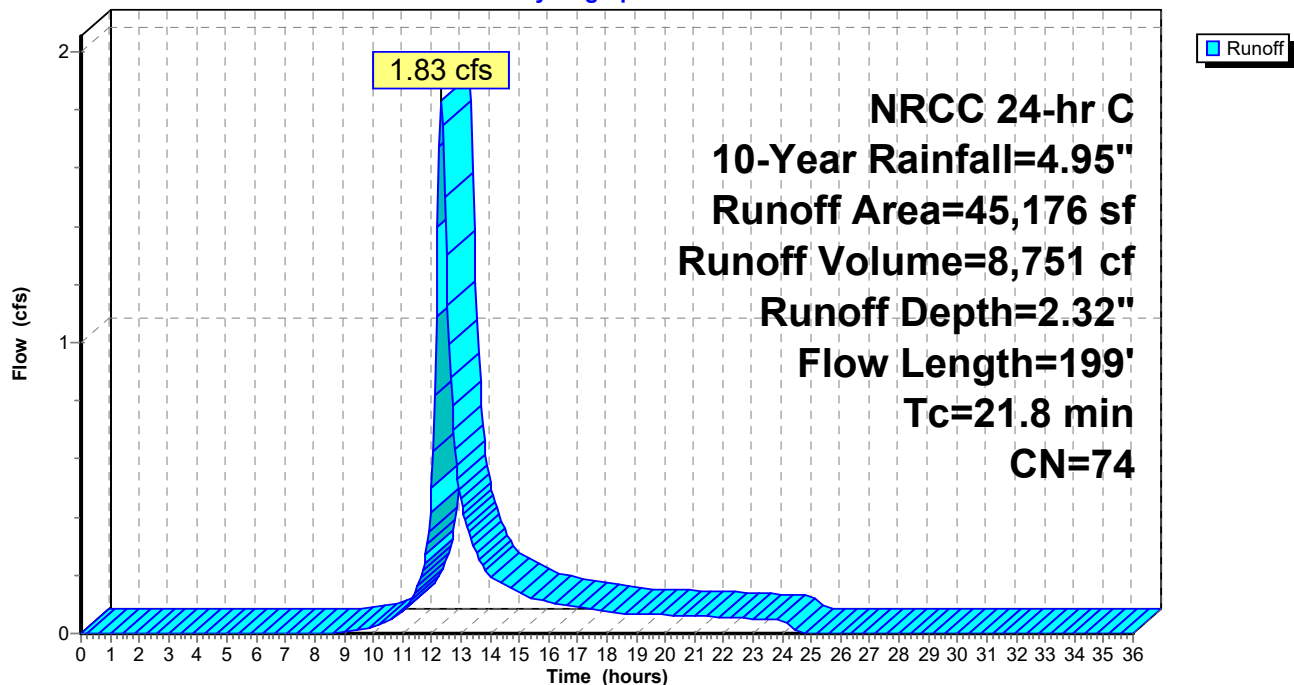
**Summary for Subcatchment 4P: TRIB TO BASIN**

Runoff = 1.83 cfs @ 12.32 hrs, Volume= 8,751 cf, Depth= 2.32"

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
16,954	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
45,176	74	Weighted Average
28,222		62.47% Pervious Area
16,954		37.53% Impervious Area

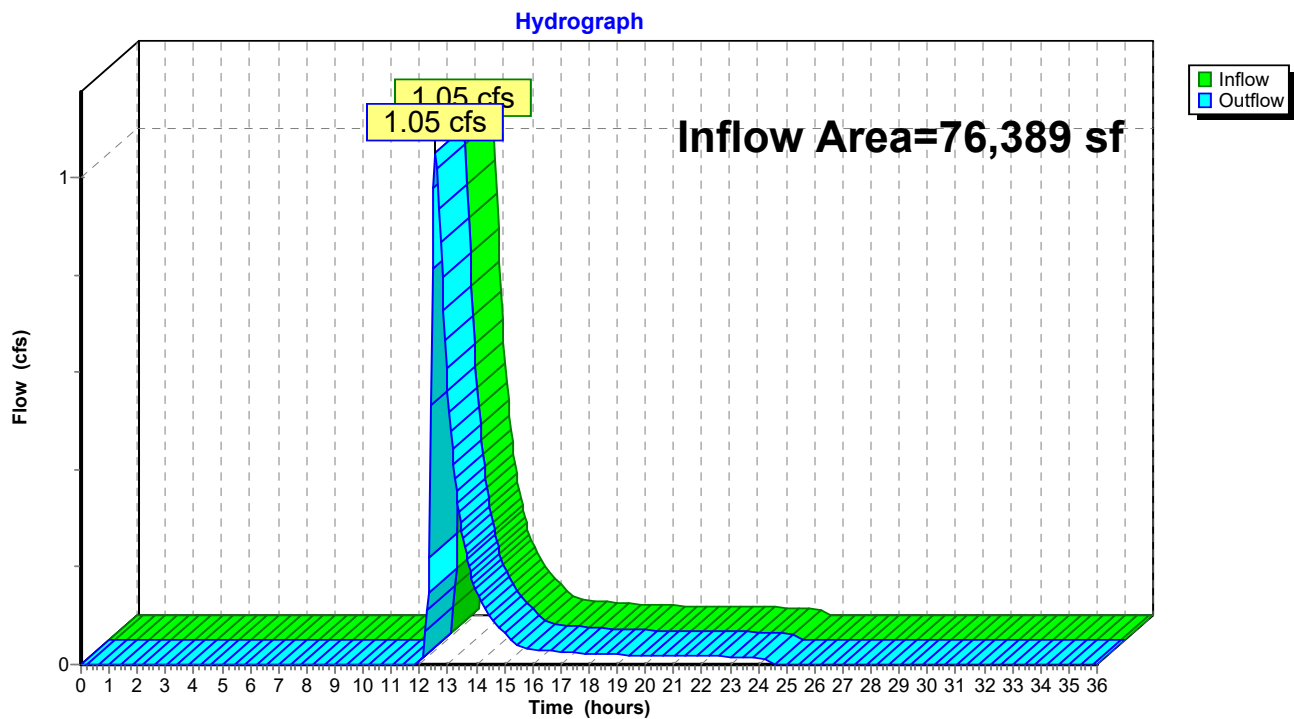
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		<b>Shallow Concentrated Flow,</b>
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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

**Summary for Reach SUM: SUM TO OLD WASHINGTON ST**

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 0.65" for 10-Year event  
Inflow = 1.05 cfs @ 12.57 hrs, Volume= 4,146 cf  
Outflow = 1.05 cfs @ 12.57 hrs, Volume= 4,146 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 POND: INFILTRATION BASIN**

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 2.32" for 10-Year event  
 Inflow = 1.83 cfs @ 12.32 hrs, Volume= 8,751 cf  
 Outflow = 1.04 cfs @ 12.58 hrs, Volume= 8,749 cf, Atten= 43%, Lag= 15.7 min  
 Discarded = 0.14 cfs @ 12.58 hrs, Volume= 6,083 cf  
 Primary = 0.90 cfs @ 12.58 hrs, Volume= 2,666 cf

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

Peak Elev= 66.02' @ 12.58 hrs Surf.Area= 2,512 sf Storage= 2,267 cf

Plug-Flow detention time= 97.7 min calculated for 8,737 cf (100% of inflow)

Center-of-Mass det. time= 97.4 min ( 960.7 - 863.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	6,687 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	1,926	10	10
66.00	2,501	2,214	2,223
67.00	3,125	2,813	5,036
67.50	3,477	1,651	6,687

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	65.75'	<b>2.0' long x 0.50' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	<b>8.0' long x 1.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 2.5' Crest Height

**Discarded OutFlow** Max=0.14 cfs @ 12.58 hrs HW=66.02' (Free Discharge)

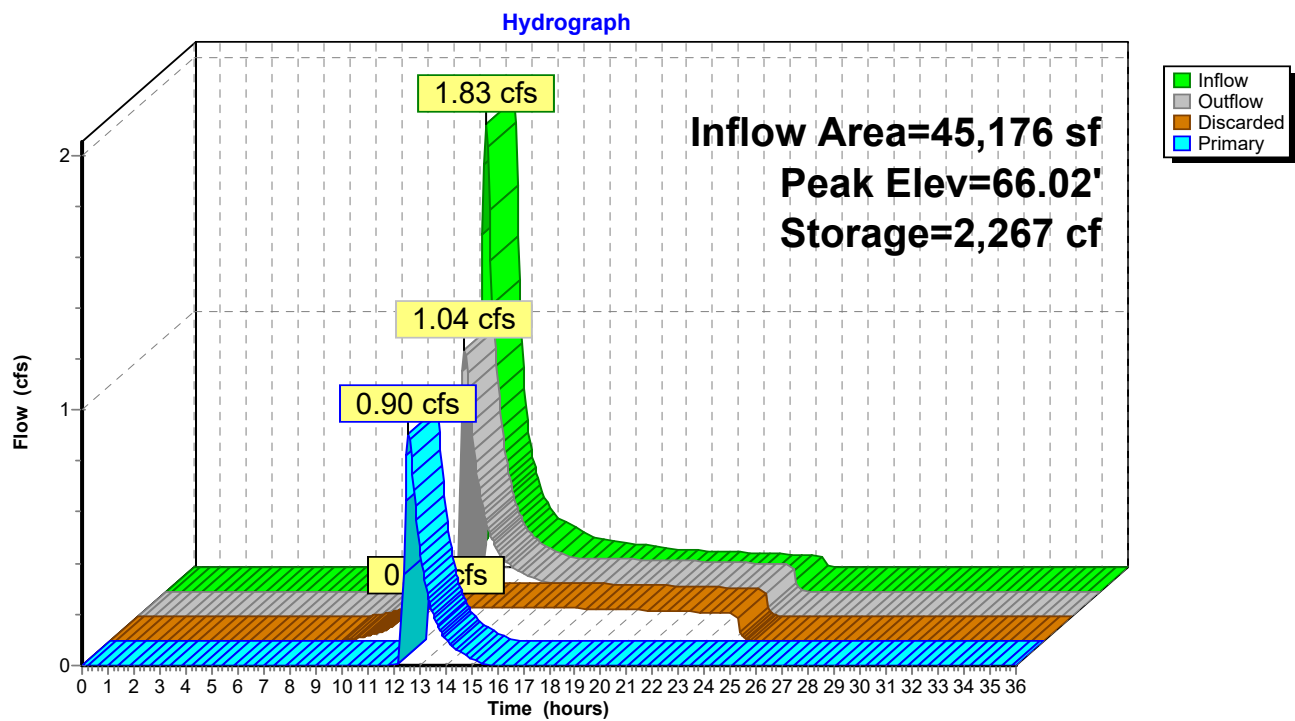
↑ **1=Exfiltration** (Exfiltration Controls 0.14 cfs)

**Primary OutFlow** Max=0.90 cfs @ 12.58 hrs HW=66.02' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 0.90 cfs @ 1.73 fps)

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

## Pond POND: INFILTRATION BASIN





**21-204 PWS**

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

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 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=45,176 sf 37.53% Impervious Runoff Depth=3.35"  
Flow Length=199' Tc=21.8 min CN=74 Runoff=2.65 cfs 12,594 cf

**Reach SUM: SUM TO OLD WASHINGTON ST**

Inflow=2.29 cfs 8,300 cf  
Outflow=2.29 cfs 8,300 cf

**Pond POND: INFILTRATION BASIN**

Peak Elev=66.19' Storage=2,705 cf Inflow=2.65 cfs 12,594 cf  
Discarded=0.15 cfs 7,126 cf Primary=1.89 cfs 5,466 cf Outflow=2.04 cfs 12,592 cf

**Total Runoff Area = 105,870 sf Runoff Volume = 15,924 cf Average Runoff Depth = 1.80"**  
**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"

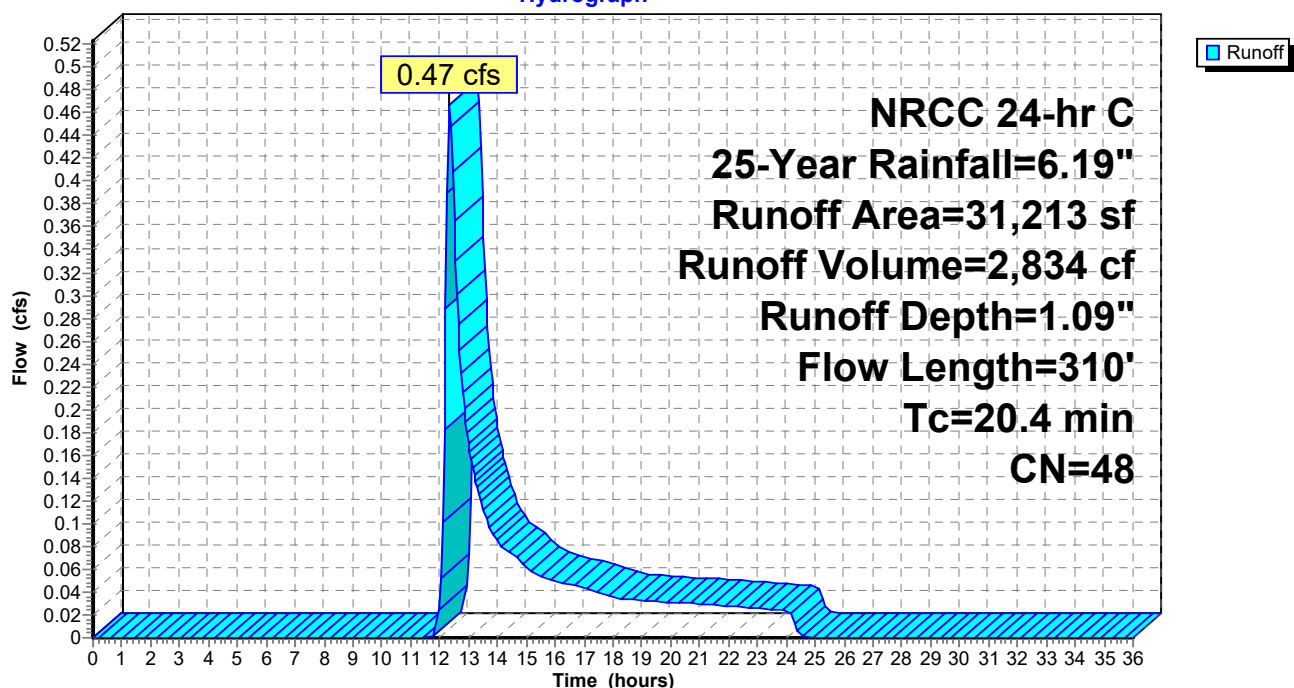
Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% Impervious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

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

**Subcatchment 1P: TRIB TO OLD WASHINGTON ST**

Hydrograph



**Summary for Subcatchment 2P: TRIB TO SOUTHEAST**

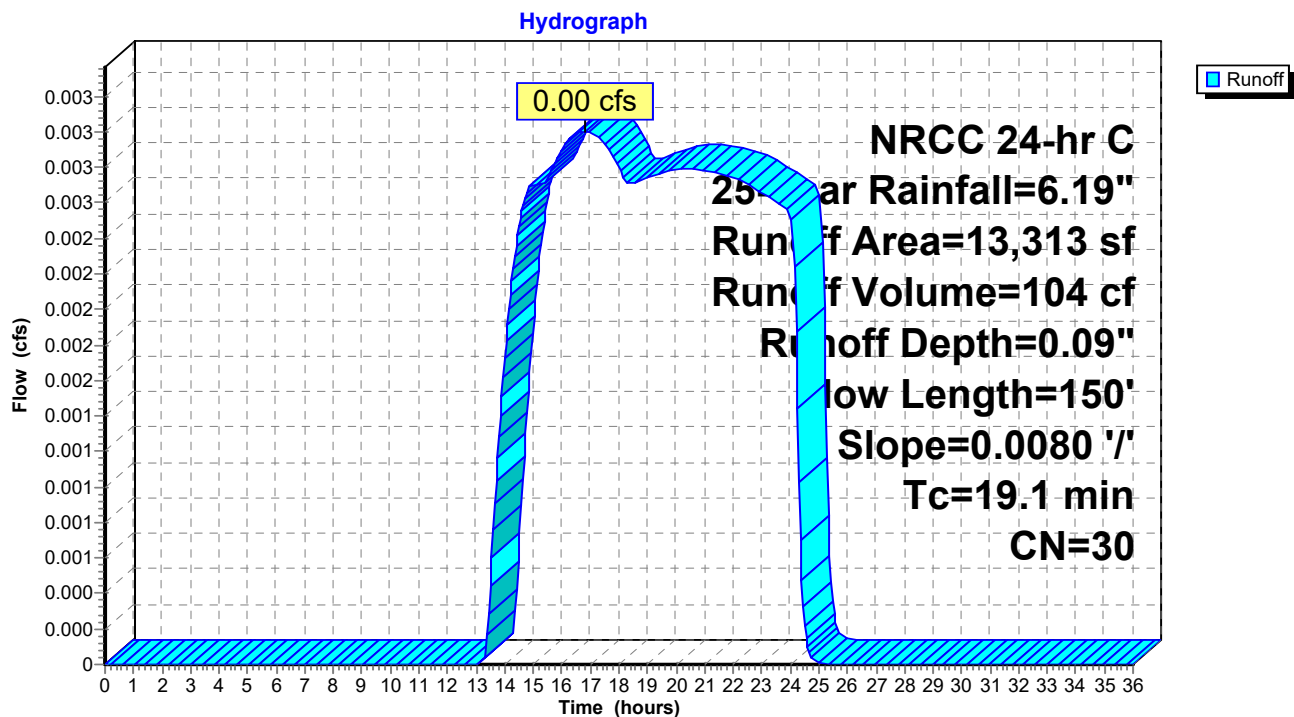
Runoff = 0.00 cfs @ 16.83 hrs, Volume= 104 cf, Depth= 0.09"

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		<b>Shallow Concentrated Flow,</b> 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"

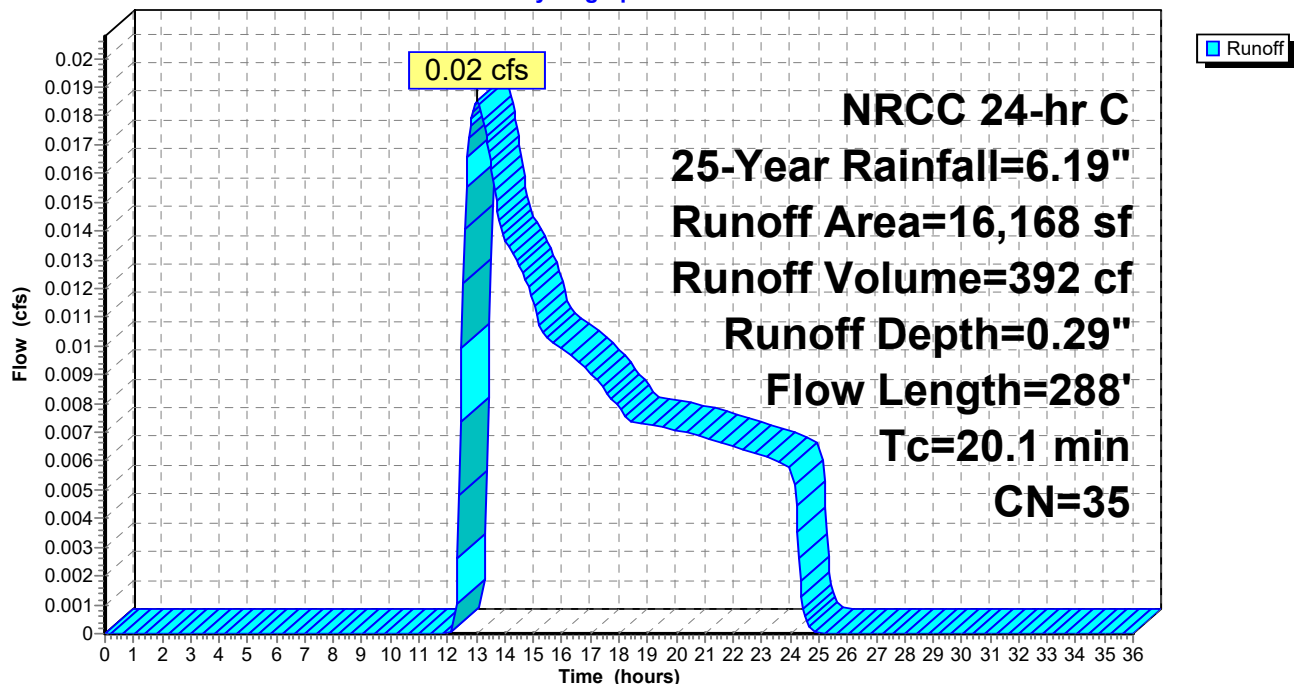
Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

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

**Subcatchment 3P: TRIB TO SOUTHWEST**

Hydrograph



**Summary for Subcatchment 4P: TRIB TO BASIN**

Runoff = 2.65 cfs @ 12.32 hrs, Volume= 12,594 cf, Depth= 3.35"

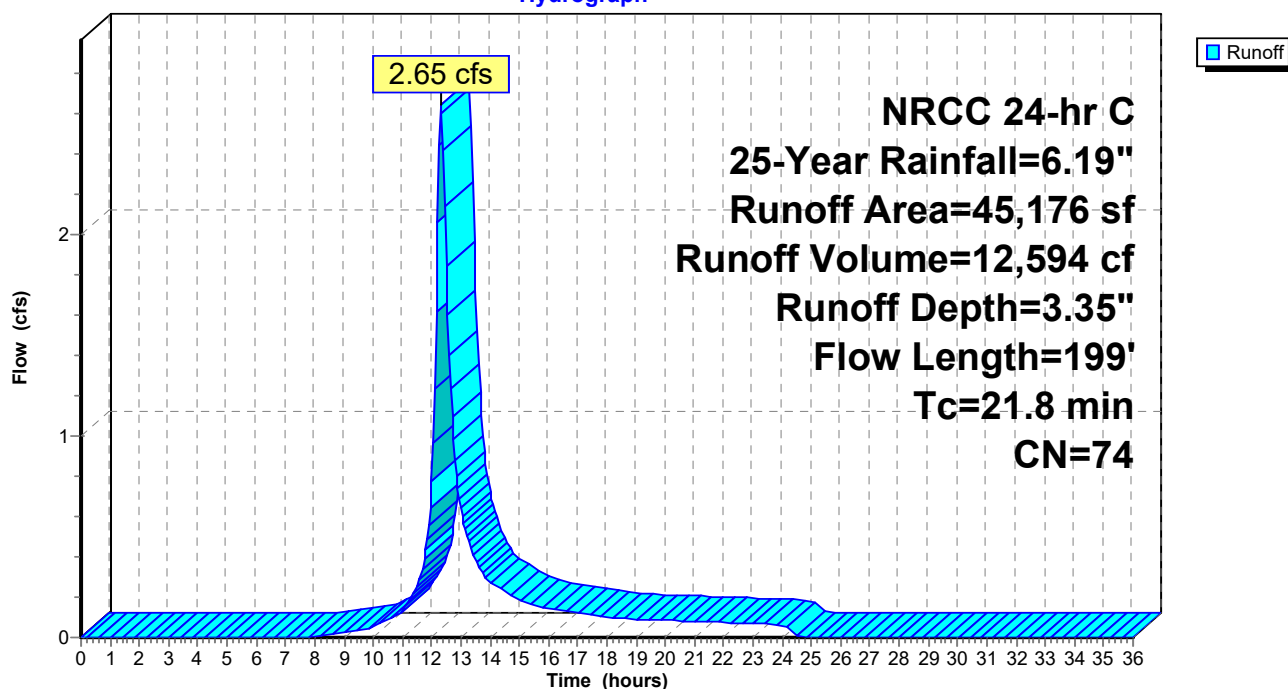
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C 25-Year Rainfall=6.19"

Area (sf)	CN	Description
16,954	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
45,176	74	Weighted Average
28,222		62.47% Pervious Area
16,954		37.53% Impervious Area

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

**Subcatchment 4P: TRIB TO BASIN**

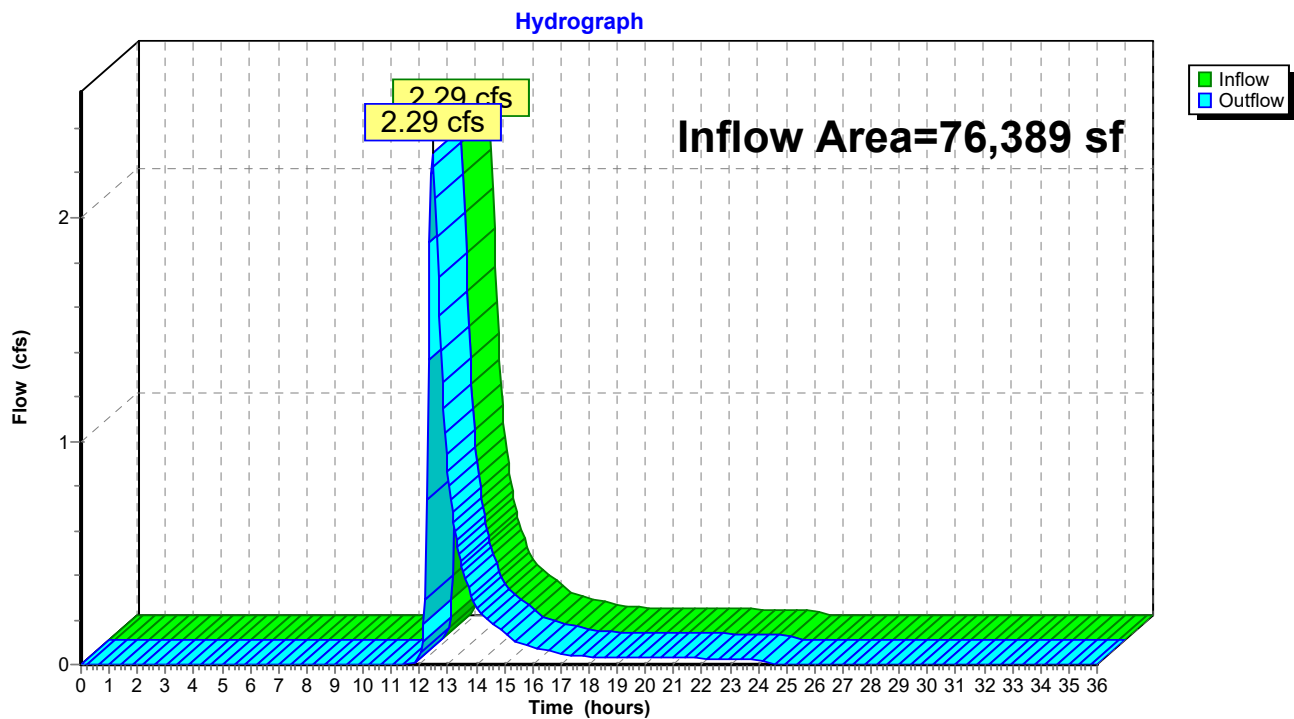
Hydrograph



**Summary for Reach SUM: SUM TO OLD WASHINGTON ST**

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 1.30" for 25-Year event  
Inflow = 2.29 cfs @ 12.46 hrs, Volume= 8,300 cf  
Outflow = 2.29 cfs @ 12.46 hrs, Volume= 8,300 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 POND: INFILTRATION BASIN**

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 3.35" for 25-Year event  
 Inflow = 2.65 cfs @ 12.32 hrs, Volume= 12,594 cf  
 Outflow = 2.04 cfs @ 12.47 hrs, Volume= 12,592 cf, Atten= 23%, Lag= 9.1 min  
 Discarded = 0.15 cfs @ 12.47 hrs, Volume= 7,126 cf  
 Primary = 1.89 cfs @ 12.47 hrs, Volume= 5,466 cf

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

Peak Elev= 66.19' @ 12.47 hrs Surf.Area= 2,618 sf Storage= 2,705 cf

Plug-Flow detention time= 87.4 min calculated for 12,575 cf (100% of inflow)

Center-of-Mass det. time= 87.3 min ( 939.0 - 851.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	6,687 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	1,926	10	10
66.00	2,501	2,214	2,223
67.00	3,125	2,813	5,036
67.50	3,477	1,651	6,687

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	65.75'	<b>2.0' long x 0.50' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	<b>8.0' long x 1.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 2.5' Crest Height

**Discarded OutFlow** Max=0.15 cfs @ 12.47 hrs HW=66.19' (Free Discharge)

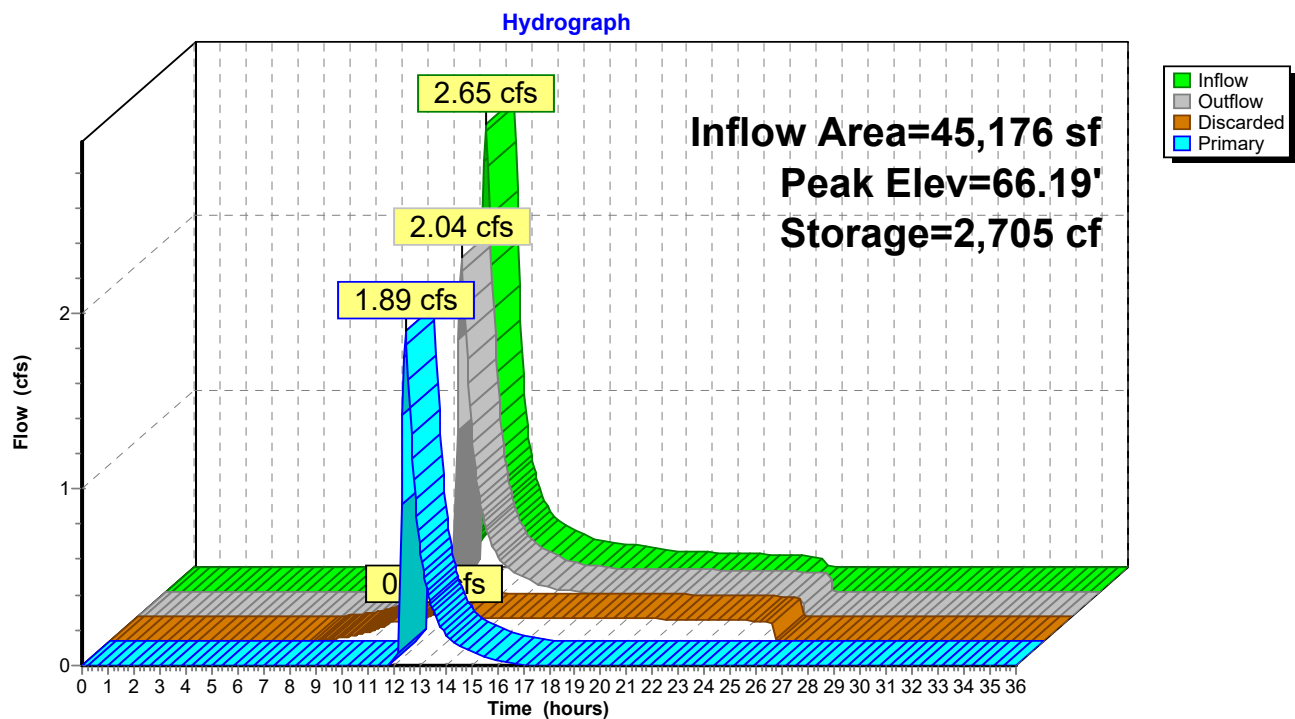
↑ **1=Exfiltration** (Exfiltration Controls 0.15 cfs)

**Primary OutFlow** Max=1.88 cfs @ 12.47 hrs HW=66.19' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 1.88 cfs @ 2.25 fps)

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

## Pond POND: INFILTRATION BASIN





**21-204 PWS**

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

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 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=45,176 sf 37.53% Impervious Runoff Depth=5.54"  
Flow Length=199' Tc=21.8 min CN=74 Runoff=4.37 cfs 20,849 cf

**Reach SUM: SUM TO OLD WASHINGTON ST**

Inflow=5.25 cfs 18,498 cf  
Outflow=5.25 cfs 18,498 cf

**Pond POND: INFILTRATION BASIN**

Peak Elev=66.37' Storage=3,188 cf Inflow=4.37 cfs 20,849 cf  
Discarded=0.15 cfs 8,713 cf Primary=4.02 cfs 12,137 cf Outflow=4.18 cfs 20,850 cf

**Total Runoff Area = 105,870 sf Runoff Volume = 29,275 cf Average Runoff Depth = 3.32"**  
**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"

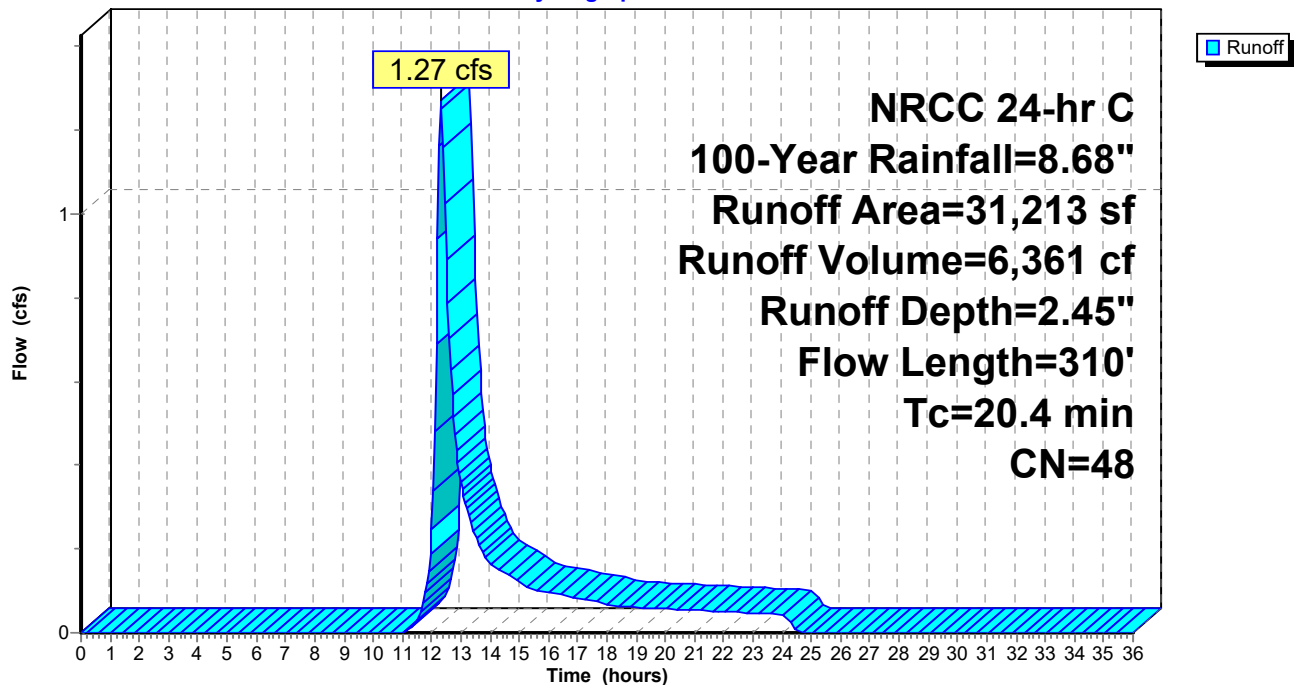
Area (sf)	CN	Description
818	98	Paved parking, HSG A
9,128	30	Woods, Good, HSG A
15,158	55	Woods, Good, HSG B
2,583	39	>75% Grass cover, Good, HSG A
3,105	61	>75% Grass cover, Good, HSG B
421	80	>75% Grass cover, Good, HSG D
31,213	48	Weighted Average
30,395		97.38% Pervious Area
818		2.62% Impervious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

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

**Subcatchment 1P: TRIB TO OLD WASHINGTON ST**

Hydrograph



**Summary for Subcatchment 2P: TRIB TO SOUTHEAST**

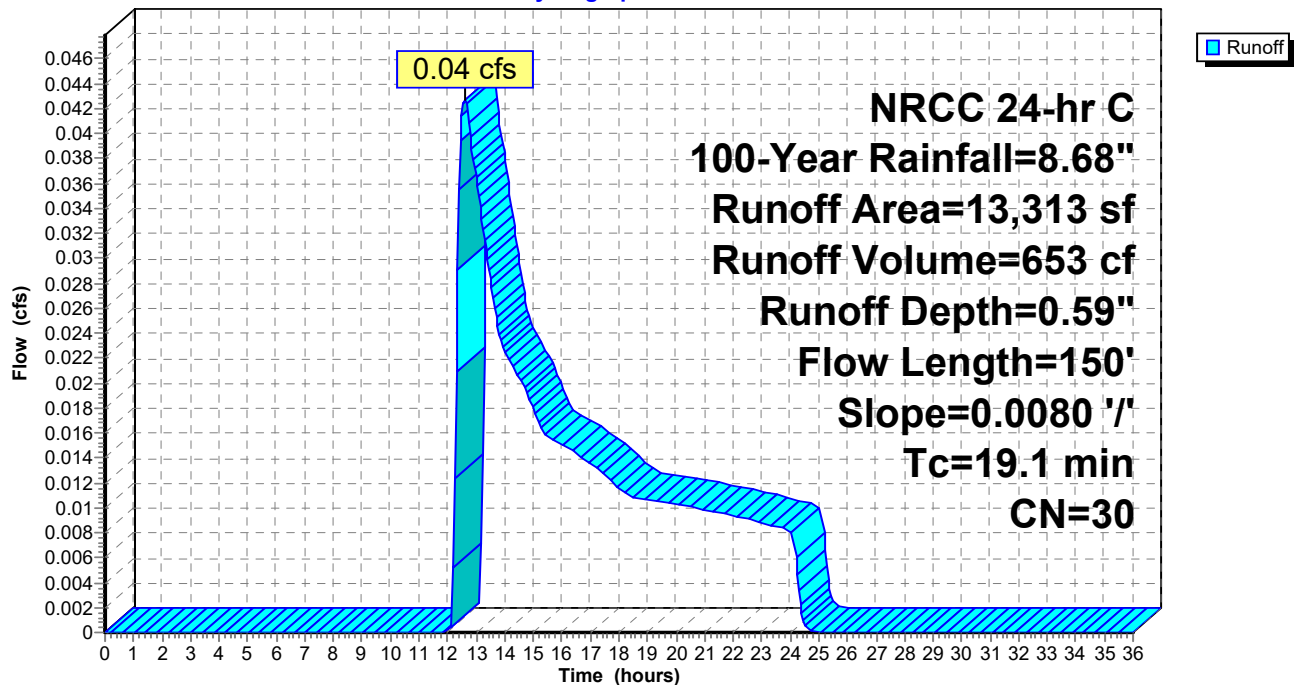
Runoff = 0.04 cfs @ 12.61 hrs, Volume= 653 cf, Depth= 0.59"

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		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.16"
1.2	100	0.0080	1.44		<b>Shallow Concentrated Flow,</b> 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"

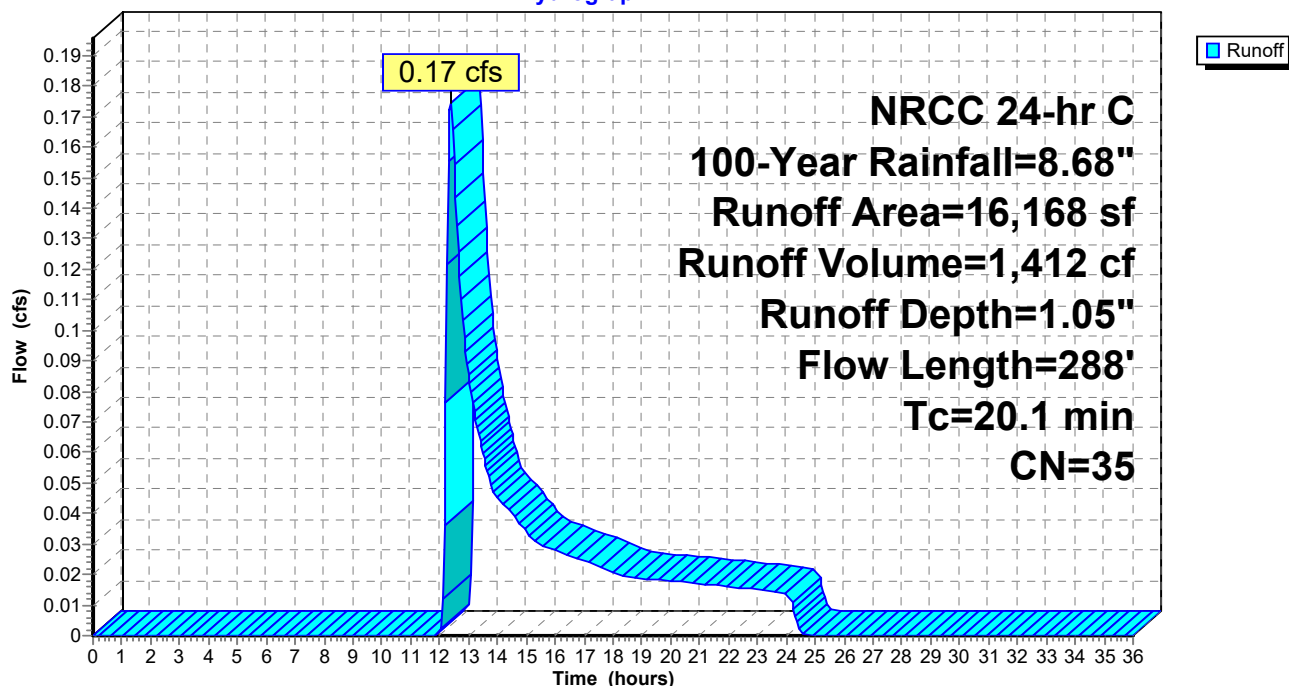
Area (sf)	CN	Description
12,821	30	Woods, Good, HSG A
3,347	55	Woods, Good, HSG B
16,168	35	Weighted Average
16,168		100.00% Pervious Area

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

**Subcatchment 3P: TRIB TO SOUTHWEST**

Hydrograph



**Summary for Subcatchment 4P: TRIB TO BASIN**

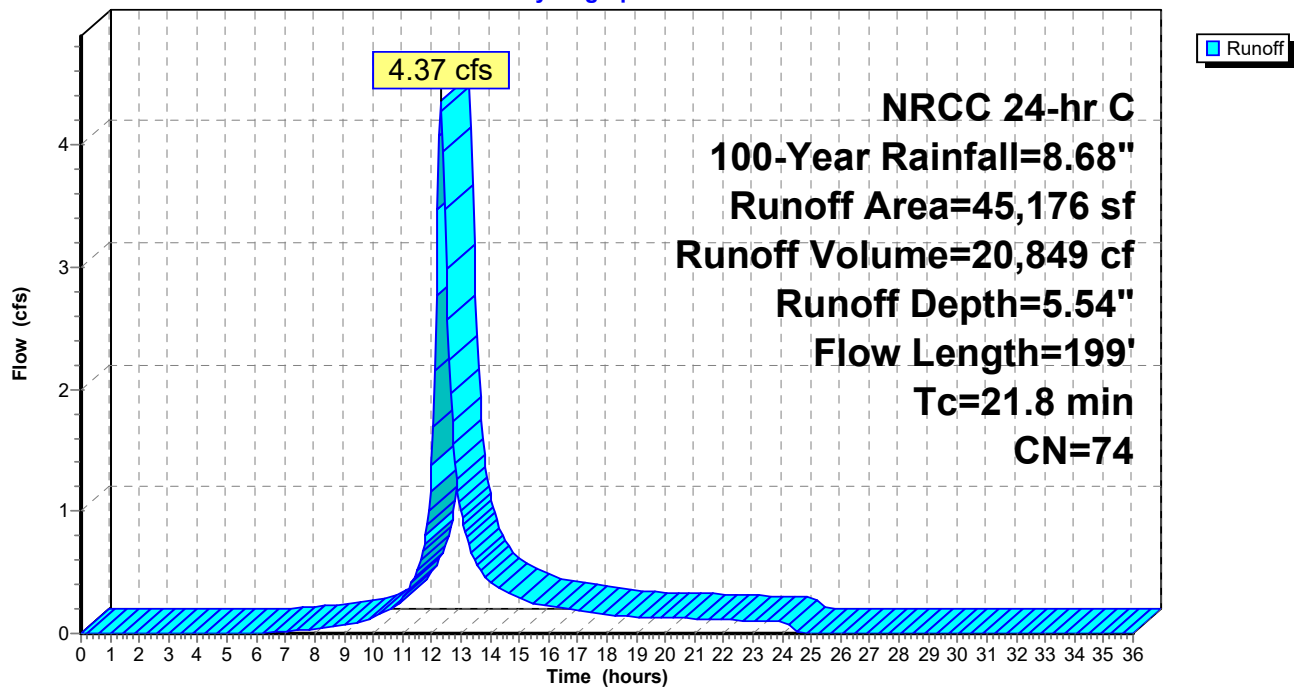
Runoff = 4.37 cfs @ 12.31 hrs, Volume= 20,849 cf, Depth= 5.54"

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
16,954	98	Paved parking, HSG B
8,879	55	Woods, Good, HSG B
19,343	61	>75% Grass cover, Good, HSG B
45,176	74	Weighted Average
28,222		62.47% Pervious Area
16,954		37.53% Impervious Area

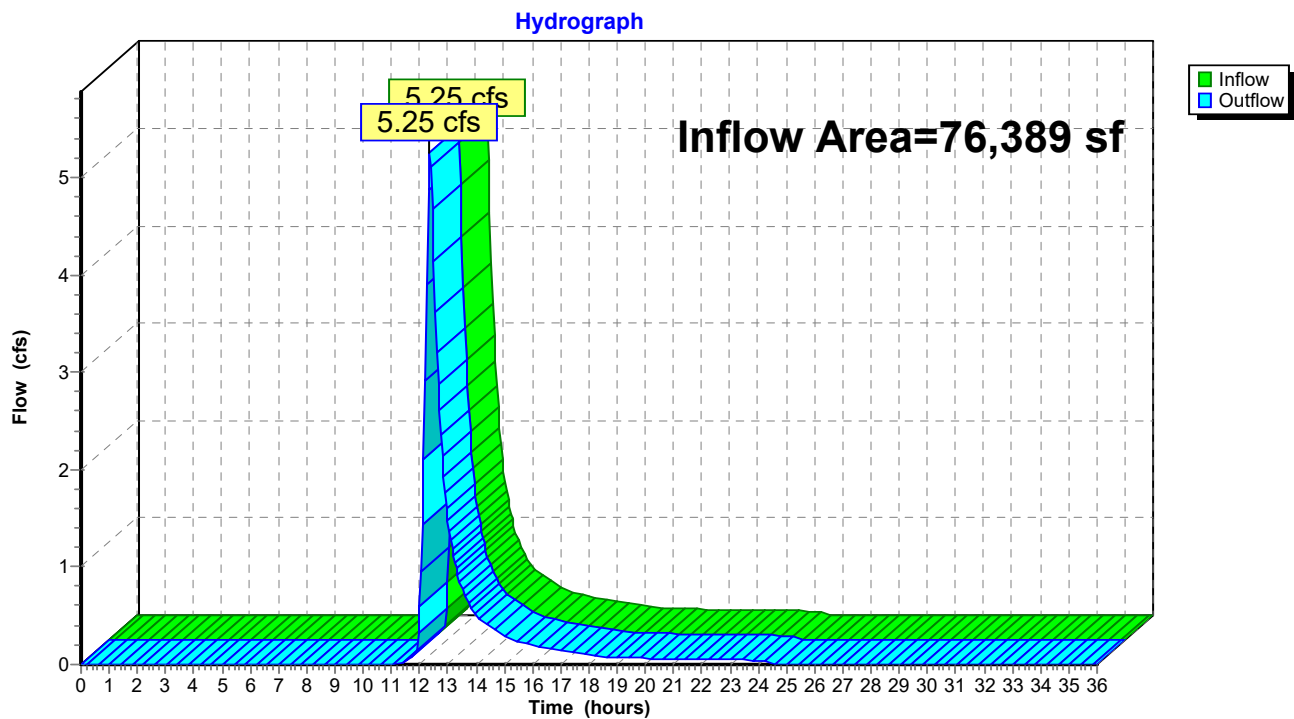
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0060	0.04		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.16"
1.7	149	0.0080	1.44		<b>Shallow Concentrated Flow,</b>
					Unpaved Kv= 16.1 fps
21.8	199	Total			

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

**Summary for Reach SUM: SUM TO OLD WASHINGTON ST**

Inflow Area = 76,389 sf, 23.27% Impervious, Inflow Depth = 2.91" for 100-Year event  
Inflow = 5.25 cfs @ 12.36 hrs, Volume= 18,498 cf  
Outflow = 5.25 cfs @ 12.36 hrs, Volume= 18,498 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 POND: INFILTRATION BASIN**

Inflow Area = 45,176 sf, 37.53% Impervious, Inflow Depth = 5.54" for 100-Year event  
 Inflow = 4.37 cfs @ 12.31 hrs, Volume= 20,849 cf  
 Outflow = 4.18 cfs @ 12.37 hrs, Volume= 20,850 cf, Atten= 4%, Lag= 3.4 min  
 Discarded = 0.15 cfs @ 12.37 hrs, Volume= 8,713 cf  
 Primary = 4.02 cfs @ 12.37 hrs, Volume= 12,137 cf

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

Peak Elev= 66.37' @ 12.37 hrs Surf.Area= 2,731 sf Storage= 3,188 cf

Plug-Flow detention time= 71.3 min calculated for 20,821 cf (100% of inflow)

Center-of-Mass det. time= 71.5 min ( 907.3 - 835.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	64.99'	6,687 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.99	0	0	0
65.00	1,926	10	10
66.00	2,501	2,214	2,223
67.00	3,125	2,813	5,036
67.50	3,477	1,651	6,687

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.99'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	65.75'	<b>2.0' long x 0.50' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 1.2' Crest Height
#3	Primary	66.25'	<b>8.0' long x 1.00' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 2.5' Crest Height

**Discarded OutFlow** Max=0.15 cfs @ 12.37 hrs HW=66.37' (Free Discharge)

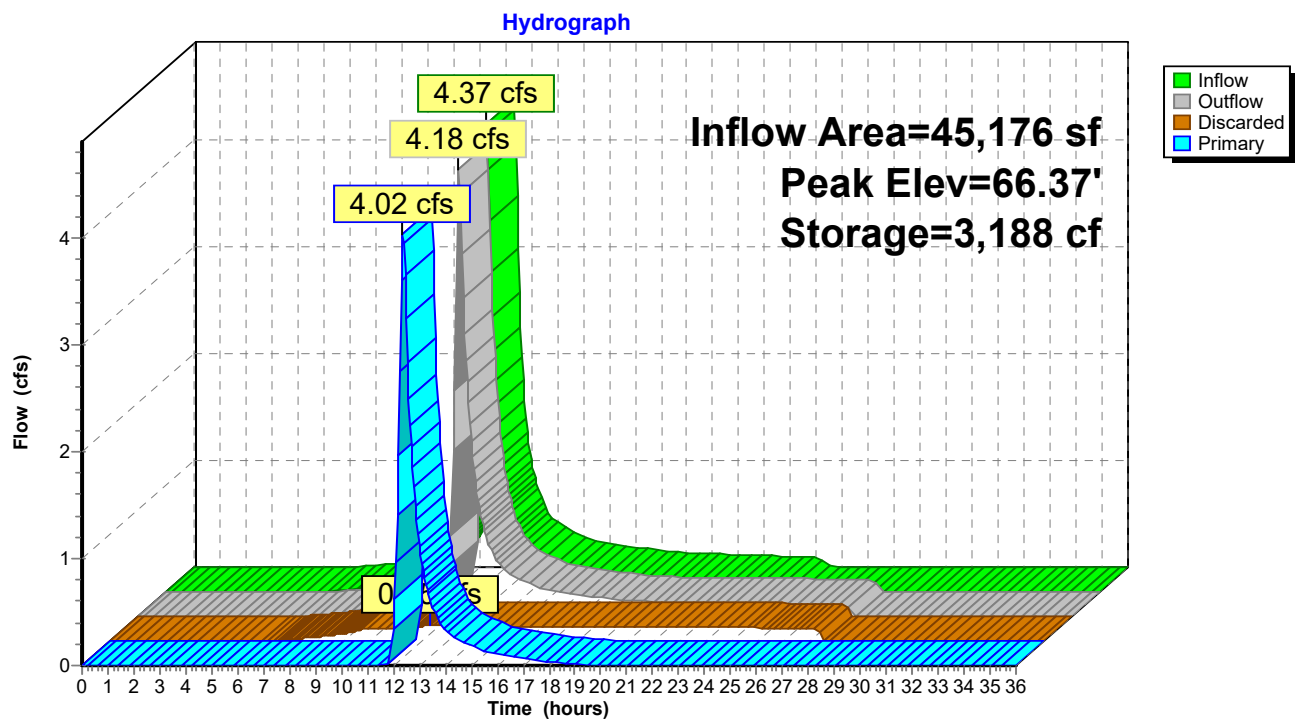
↑ **1=Exfiltration** (Exfiltration Controls 0.15 cfs)

**Primary OutFlow** Max=3.97 cfs @ 12.37 hrs HW=66.37' (Free Discharge)

↑ **2=Sharp-Crested Rectangular Weir** (Orifice Controls 2.93 cfs @ 3.09 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 1.04 cfs @ 1.12 fps)

## Pond POND: INFILTRATION BASIN





## **APPENDIX C**

### **Additional Calculations:**

- 1. Stormwater Management Form and Checklist**
- 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**
- 7. Soil Suitability Assessment**
- 8. Groundwater Mounding Calculation**



# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

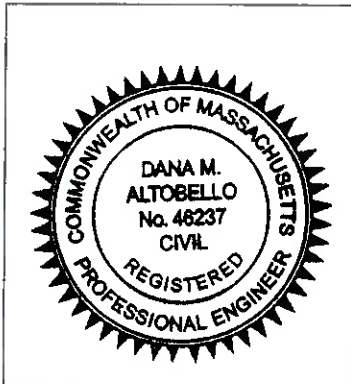
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

### Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



  
Signature and Date

2/2/22

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☐ New development
- ☐ Redevelopment
- ☒ Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): \_\_\_\_\_

### Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - ☐ Static
  - ☒ Simple Dynamic
  - ☐ Dynamic Field<sup>1</sup>
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
  - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
  - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

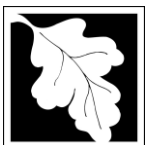
### Standard 3: Recharge (continued)

- ☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - ☐ is within the Zone II or Interim Wellhead Protection Area
    - ☐ is near or to other critical areas
    - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - ☐ involves runoff from land uses with higher potential pollutant loads.
  - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
  - ☒ The ½" or 1" Water Quality Volume or
  - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☒ Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☐ Limited Project
  - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - ☐ Bike Path and/or Foot Path
  - ☐ Redevelopment Project
  - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.





# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - ☒ Name of the stormwater management system owners;
  - ☒ Party responsible for operation and maintenance;
  - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
  - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
  - ☒ Description and delineation of public safety features;
  - ☒ Estimated operation and maintenance budget; and
  - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

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

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

Location: **631 Washington Street, Pembroke**

**Recharge Volumes (Standard #3)**

Total Area (Ac.)=	2.43	105,870 S.F.
Total Impervious Area A Soil (Ac.)=	0.00	
Total Impervious Area B Soil (Ac.)=	0.40	17,246
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	0.00	
Recharge Volume (B soil)	0.35	0.14	
Recharge Volume (C soil)	0.25	0.00	
		0.14	AC-IN
<b>Total Required Recharge Volume:</b>		0.01	AC-FT
		<b>503</b>	C.F.

**Recharge Volume provided by Stormwater Basin:**

<b>Volume Provided (below outlet):</b>	<b>2,544±</b>	C.F.
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**MERRILL ENGINEERS AND LAND SURVEYORS**  
427 COLUMBIA ROAD, HANOVER, MA. 02339  
TEL. (781) 826-9200

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

**WATER QUALITY VOLUME (STANDARD #4)**

Location: **631 Washington Street, Pembroke**

Total New Impervious Area

**Roadway/Driveways/Roofs** 17,246 S.F.

**Other** 0 S.F.

**Total Area:** 17,246 S.F.

Water Quality

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

Use: 0.5 inch x Imp. Area 719 cubic feet

(see attached)

Provided by Stormwater Basin (see calcs in Appendix B)

**2,544±**

c.f. (Below outlet)

**Sediment Forebay #1 Volume**

Required Volume = 400 CF/AC x Impervious Area

Impervious Area - Stormwater Basin: 17,246 SF

0.40 AC 7.48 Gal/CF

**Required Volume :** 158.37 CF = 1185 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

TSS Removal  
Calculation Worksheet

B	C	D	E	F
BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Vegetated Filter Strip >50 feet	0.45	1.00	0.45	0.55
Infiltration Basin	0.80	0.55	0.44	0.11
	0.00	0.11	0.00	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: 1/31/2022

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

**21-204 PWS**

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

Prepared by MERRILL ENGINEERS AND LAND SURVEYORS

Printed 2/3/2022

HydroCAD® 10.00-26 s/n 02159 © 2020 HydroCAD Software Solutions LLC

**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	64.99	0.00	0.00	0.00
1.00	0.00	0	64.99	0.00	0.00	0.00
2.00	0.00	0	64.99	0.00	0.00	0.00
3.00	0.00	0	64.99	0.00	0.00	0.00
4.00	0.00	0	64.99	0.00	0.00	0.00
5.00	0.00	0	64.99	0.00	0.00	0.00
6.00	0.00	0	64.99	0.00	0.00	0.00
7.00	0.02	1	64.99	0.01	0.01	0.00
8.00	0.04	3	64.99	0.04	0.04	0.00
9.00	0.07	6	65.00	0.07	0.07	0.00
10.00	0.14	27	65.01	0.11	0.11	0.00
11.00	0.28	326	65.16	0.11	0.11	0.00
12.00	<b>1.38</b>	<b>1,954</b>	<b>65.89</b>	<b>0.48</b>	<b>0.14</b>	<b>0.35</b>
13.00	<b>1.00</b>	<b>2,369</b>	<b>66.06</b>	<b>1.26</b>	<b>0.14</b>	<b>1.12</b>
14.00	0.42	1,944	65.89	0.47	0.14	0.33
15.00	0.29	1,834	65.84	0.32	0.13	0.18
16.00	0.22	1,763	65.81	0.24	0.13	0.10
17.00	0.19	1,726	65.80	0.20	0.13	0.07
18.00	0.16	1,686	65.78	0.17	0.13	0.04
19.00	0.14	1,649	65.76	0.14	0.13	0.01
20.00	0.13	1,624	65.75	0.13	0.13	0.00
21.00	0.12	1,596	65.74	0.13	0.13	0.00
22.00	0.11	1,540	65.72	0.13	0.13	0.00
23.00	0.10	1,457	65.68	0.13	0.13	0.00
24.00	0.09	1,348	65.63	0.13	0.13	0.00
25.00	0.00	1,007	65.48	0.12	0.12	0.00
26.00	0.00	576	65.28	0.12	0.12	0.00
27.00	0.00	169	65.08	0.11	0.11	0.00
28.00	0.00	0	64.99	0.00	0.00	0.00
29.00	0.00	0	64.99	0.00	0.00	0.00
30.00	0.00	0	64.99	0.00	0.00	0.00
31.00	0.00	0	64.99	0.00	0.00	0.00
32.00	0.00	0	64.99	0.00	0.00	0.00
33.00	0.00	0	64.99	0.00	0.00	0.00
34.00	0.00	0	64.99	0.00	0.00	0.00
35.00	0.00	0	64.99	0.00	0.00	0.00
36.00	0.00	0	64.99	0.00	0.00	0.00

DRAINED IN  
← 72 HRS

**STORMWATER MANAGEMENT**  
**BEST MANAGEMENT PRACTICES**  
**INSPECTION SCHEDULE AND EVALUATION CHECKLIST – CONSTRUCTION PHASE**

PROJECT LOCATION: 631 Washington St, Pembroke, MA

Latest Revision: \_\_\_\_\_

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Infiltration System
<b>Silt fence</b>	After every major storm event			Check sediment levels and remove when reaches ¼ to ½ the height of fence				
<b>Catch basins (Existing)</b>	Weekly or after major storm event.			Check silt sack sediment levels				
<b>Stockpiles</b>	After every major storm event			Ensure surrounding erosion control measure are intact				

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (March 1997) for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.

Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: \_\_\_\_\_

Stamp

H:\21-204\Documents\Drainage\21204 ISEC-CONST PHASE.doc

**STORMWATER MANAGEMENT**  
**BEST MANAGEMENT PRACTICES**  
**INSPECTION SCHEDULE AND EVALUATION CHECKLIST – POST CONSTRUCTION PHASE**

PROJECT LOCATION: 631 Washington St, Pembroke, MA

Latest Revision:

Stormwater Control Manager: \_\_\_\_\_

Stamp

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Detention System
<b>Vegetated Filter Strip &gt;50ft</b>	Quarterly			-Check for accumulated sand and silt and removes trash. -Remove accumulated sand/sediment at inlet so filter strip is 2" min below driveway to avoid ponding in driveway -Trim weeds/vegetation as necessary				
<b>Sediment Forebay</b>	Quarterly			-Sediment not to exceed 18" -Floating contaminants shall be removed by vacuum pump prior to sediment removal				
<b>Roof Drain Lines</b>	Once per Year (drain lines) Twice per year (culvert)			Check for accumulated sand and silt and clogged pipes				
<b>Infiltration Basin</b>	Twice a Year			Check for clogging, remove sediment buildup & trash, inspect inlet/outlet, signs of settlement and erosion/embankment leakage.				

**(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (March 2008) for recommendations regarding frequency for inspection and maintenance of specific BMPs.**

Project No. 21-204

Date: 1/21/22  
Revision: n/a

Commonwealth of Massachusetts  
Pembroke, Massachusetts

***Soil Suitability Assessment for On-site Sewage Disposal***

Performed By: <u>Dana M. Altobello, P.E.</u>	Test Dates: <u>1/21/22</u>
Performed By: <u>Joshua Green E.I.T.</u>	Test Dates: <u>7/7/21</u>
Witnessed By: _____	Testhole #: _____
Witnessed By: _____	Testhole #: _____

**FACILITY INFORMATION**

Site Location:

Builder's lot #: \_\_\_\_\_  
Street Address: 631 Washington Street  
Town, State, Zip: Pembroke, MA 02359  
Assessor's Map: Map E10, Lot 10

Owner/ Applicant Information:

Name: Bill Pappastratis  
Address: 633 Summer St  
Town, State, Zip: Marshfield, MA 02050  
Telephone no.: \_\_\_\_\_

**SITE INFORMATION**

Construction Type:

New Construction: ☒ Repair: ☐ Upgrade: ☐

Published Soil Survey Available: No: ☐ Yes: ☒

Year Published: 2022 Publication Scale: 1-963

a. Soil Map Unit: 289B Drainage Class: A  
b. Soil Map Unit: 634B Drainage Class: B/D

Soil Name: a. Hinckley GSL b. Birchwood Soil Limitations: Possible dense layers

Surficial Geologic Report Available: No: ☐ Yes: ☒

Year Published: 2018 Publication Scale: 1:24,000

Geological Material/map unit: Thin Till

Landform: Ground Moraine

Flood Insurance Rate Map: 255214 0015 E

Above 500 year flood boundary? No: ☐ Yes: ☐ Within a velocity zone? No: ☐ Yes: ☐

Within 500 year flood boundary? No: ☐ Yes: ☐ Within 100 year flood boundary? No: ☐ Yes: ☐

Wetland Area:

National Wetland Inventory Map: (map unit) n/a Name: \_\_\_\_\_

Wetlands Conservancy Program Map: (map unit) n/a Name: \_\_\_\_\_

Current Water Resource Conditions (USGS): (Month/year) July 1, 2021

Range: Above Normal: ☒ Normal: ☐ Below Normal: ☐

Other References Reviewed: None

Comments:



Project No.: 21-204

Date: 1/21/22  
Revised: n/a

**\*Deep Hole #**

Builder's lot #: 0  
Street Address: 631 Washington Street  
Town: Pembroke, MA 02359  
Assessor's Map: Map E10, Lot 10

**DETERMINATION OF HIGH GROUNDWATER ELEVATION**

Method Used:

- ☐ Depth observed standing in observation hole: A: \_\_\_\_\_ inches B: \_\_\_\_\_ inches
- ☐ Depth weeping from side of observation hole: A: \_\_\_\_\_ inches B: \_\_\_\_\_ inches
- ☒ Depth to soil mottles: see logs inches
- ☐ Ground water adjustment: \_\_\_\_\_ inches

Index Well Number: MA-D4W DUX Reading Date: 1/21/22 Index well level: 9.80

Adjustment factor: \_\_\_\_\_ Adjustment groundwater level: \_\_\_\_\_

**DEPTH OF PERVIOUS MATERIAL**

Depth of Naturally Occurring Pervious Material

Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes: ☒ No: ☐

If yes, at what depth was it observed? Upper Boundary (inches): see logs  
Lower Boundary (inches): see logs

**CERTIFICATION**

I certify that I have passed the soil evaluator examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator: \_\_\_\_\_ Date: \_\_\_\_\_  
Typed or Printed Name of Soil Evaluator: Dana M. Altobello, P.E.  
Date of Soil Evaluator Exam: November-02

Name of Board of Health Witness: Lisa Cullity  
Board of Health: Pembroke, MA 02359

\*If applicable, only deep hole with shallowest ESHGW listed.

**ON-SITE REVIEW**

DEEP HOLE #: 21-01 DATE: 7/7/21 TIME: 10:30 AM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-6	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
6-20	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
20-120	C	Loamy Sand	2.5Y 6/2	None Encountered	Massive, Friable 10% Gravel 2% Stone

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_

Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: \_\_\_\_\_

Estimated Depth to Seasonal High Ground Water : n/a

**PERCOLATION TEST**

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	<u>30-48"</u>	Depth of Perc:	_____
Start of Presoak:	<u>10:38 AM</u>	Start of Presoak:	_____
End of Presoak:	<u>10:53 AM</u>	End of Presoak:	_____
Time @ 12":	<u>10:53 AM</u>	Time @ 12":	_____
Time @ 9":	<u>11:20 AM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>27 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>11:52 AM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>32 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>11 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown  
Comments: C Layer was firm in place.

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 21-02 DATE: 7/7/21 TIME: 9:30 AM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-6	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
6-22	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
22-120	C	Loamy Sand	2.5Y 6/2	None Encountered	Massive, Friable 10% Gravel 2% Stone

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_  
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_  
Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: \_\_\_\_\_

Estimated Depth to Seasonal High Ground Water : n/a

**PERCOLATION TEST**

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	<u>28"-46"</u>	Depth of Perc:	_____
Start of Presoak:	<u>9:35 AM</u>	Start of Presoak:	_____
End of Presoak:	<u>9:50 AM</u>	End of Presoak:	_____
Time @ 12":	<u>9:50 AM</u>	Time @ 12":	_____
Time @ 9":	<u>10:36 AM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>46 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>11:42 AM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>66 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>22 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown  
Comments: 22-60 had fine material on one side of test pit, evidence of redox in fine material but not consistent throughout test pit.

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 21-03 DATE: 7/7/21 TIME: 12:20 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-7	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
7-28	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
28-76	C1	Loamy Sand	2.5Y 6/2		Massive, Friable 5% Gravel 5% Stone
76-114	C2	Loamy Sand	2.5Y 5/2	None Encountered	Massive, Friable 10% Gravel 10% Stone Boulders Present

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_  
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_  
Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: \_\_\_\_\_

Estimated Depth to Seasonal High Ground Water : n/a

**PERCOLATION TEST**

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	<u>48-66</u>	Depth of Perc:	_____
Start of Presoak:	<u>12:25 PM</u>	Start of Presoak:	_____
End of Presoak:	<u>12:40 PM</u>	End of Presoak:	_____
Time @ 12":	<u>12:40 PM</u>	Time @ 12":	_____
Time @ 9":	<u>1:09 PM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>29 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>1:44 PM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>35 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>6 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown  
Comments: \_\_\_\_\_

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 21-04 DATE: 7/7/21 TIME: 12:35 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-8	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
8-24	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
24-62	C1	Sandy Loam	2.5Y 6/2	58"	Massive, Friable 5% Gravel
62-120	C2	Loamy Sand	2.5Y 6/2		Massive, Friable 10% Gravel 10% Stone Boulders Present

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_

Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: 58"

Estimated Depth to Seasonal High Ground Water : 58"

**PERCOLATION TEST**

Percolation Hole #:	<u>Not Performed</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown

Comments: \_\_\_\_\_

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 21-05 DATE: 7/7/21 TIME: 12:40 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-5	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
5-18	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
18-72	C1	Sandy Loam	2.5Y 6/2	60"	Massive, Friable 5% Gravel
72-120	C2	Loamy Sand	2.5Y 6/2		Massive, Friable 5% Gravel

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_  
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_  
Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: 60"

Estimated Depth to Seasonal High Ground Water : 60"

**PERCOLATION TEST**

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	<u>26-44</u>	Depth of Perc:	_____
Start of Presoak:	<u>12:56 PM</u>	Start of Presoak:	_____
End of Presoak:	<u>1:11 PM</u>	End of Presoak:	_____
Time @ 12":	<u>1:11 PM</u>	Time @ 12":	_____
Time @ 9":	<u>1:34 PM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>23 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>2:06 PM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>32 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>12 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown  
Comments: \_\_\_\_\_

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 21-06 DATE: 7/7/21 TIME: 1:05 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-4	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
4-18	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
18-120	C1	Loamy Sand	2.5Y 6/2	60"	Massive, Friable 5% Gravel 5% Stone

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_

Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: 60"

Estimated Depth to Seasonal High Ground Water : 60"

**PERCOLATION TEST**

Percolation Hole #:	<u>Not Performed</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown

Comments: \_\_\_\_\_

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 21-07 DATE: 7/7/21 TIME: 1:45 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-8	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
8-18	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
18-36	C1	Sandy Loam	2.5Y 4/1		Massive, Friable 5% Gravel
36-132	C2	Loamy Sand	2.5Y 6/2	82"	Massive, Friable 5% Gravel 10% Stone Boulders Present

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_  
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_  
Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: 82"

Estimated Depth to Seasonal High Ground Water : 82"

**PERCOLATION TEST**

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	<u>55-73</u>	Depth of Perc:	_____
Start of Presoak:	<u>1:50 PM</u>	Start of Presoak:	_____
End of Presoak:	<u>2:05 PM</u>	End of Presoak:	_____
Time @ 12":	<u>2:05 PM</u>	Time @ 12":	_____
Time @ 9":	<u>4:28 AM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>23 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>2:59 PM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>31 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>11 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: Lisa Cullity Mach./Oper.: Alltown  
Comments: \_\_\_\_\_

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

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**ON-SITE REVIEW**

DEEP HOLE #: D1 DATE: 7/7/21 TIME: 2:20 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-6	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
6-26	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
26-144	C1	Loamy Sand	2.5Y 6/2	90"	Massive, Friable 5% Gravel 2% Stone

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_

Standing in Hole: 130" Weeping from Face: 120" Saturating the Face: \_\_\_\_\_ Mottling: 90"

Estimated Depth to Seasonal High Ground Water : 90"

**PERCOLATION TEST**

Percolation Hole #:	<u>Not Performed</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: \_\_\_\_\_ Mach./Oper.: Alltown

Comments: Gravel and Boulders at 130" where water was coming into the test pit.

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: D2 DATE: 7/7/21 TIME: 2:35 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-10	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
10-32	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
32-88	C1	Loamy Sand	2.5Y 6/2	75"	Massive, Friable 5% Gravel
88-144	C2	Sandy Loam	2.5Y 5/2		Massive, Friable 10% Gravel 5% Stone, Boulders Present

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_  
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_  
Standing in Hole: 136" Weeping from Face: 88" Saturating the Face: \_\_\_\_\_ Mottling: 75"

Estimated Depth to Seasonal High Ground Water : 75"

**PERCOLATION TEST**

Percolation Hole #:	<u>Not Performed</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	_____	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: \_\_\_\_\_ Mach./Oper.: Alltown  
Comments: Bands of sand present in C1 layer

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: D3 DATE: 7/7/21 TIME: 2:50 PM WEATHER: 80° Sunny  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 10+ ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-5	Ap	Loamy Sand	10 YR 3/2		Massive, Friable
5-26	Bw	Loamy Sand	10 YR 5/4		Massive, Friable
26-128	C1	Loamy Sand	2.5Y 6/2	55"	Massive, Friable 5% Gravel 5% Stone

PARENT MATERIAL: \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_  
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_  
Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: 55"

Estimated Depth to Seasonal High Ground Water : 55"

**PERCOLATION TEST**

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/	_____	Test Passed/ Failed/ Discon/	_____
Discon/ Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Joshua Green, E.I.T. Witnessed By: \_\_\_\_\_ Mach./Oper.: Alltown  
Comments: \_\_\_\_\_

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

**ON-SITE REVIEW**

DEEP HOLE #: 22-1D DATE: 1/21/22 TIME: 8:20 AM WEATHER: 15 deg F. Snow  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 2-Jan

VEGETATION: Grass, W. Pine LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 15 ft POSSIBLE WET AREA: 100 ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL: 100+ ft OTHER: \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0"-10"	Ap	Loamy Sand	10 YR 3/2		Loose
10"-28"	Bw	Loamy Sand	10 YR 5/4		Loose 5% Gravel
28"-58"	C1	Loamy Sand	2.5Y 6/2	MOTTILING @ 48"	Loose 20% Gravel, 5% Cobble
58"-68"	C2	Loamy Sand	10YR 4/4		FRA, 2% Gravel, 2% Cobble
68"-96"	C3	Loamy Sand	2.5Y 6/2		Loose, 30% Gravel, 10% cobble

**PARENT MATERIAL:** \_\_\_\_\_ Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: \_\_\_\_\_

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

**GROUNDWATER OBSERVED:** Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: \_\_\_\_\_

Standing in Hole: \_\_\_\_\_ Weeping from Face: \_\_\_\_\_ Saturating the Face: \_\_\_\_\_ Mottling: 48"

**Estimated Depth to Seasonal High Ground Water :** 48" from Mottling

**PERCOLATION TEST**

Percolation Hole #:	<u>N/A</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	<u>N/A</u>	End of Presoak:	_____
Time @ 12":	<u>N/A</u>	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/	_____	Test Passed/ Failed/ Discon/	_____
Discon/ Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Dana M. Altobello, P.E. Witnessed By: 0 Mach./Oper.: Joel w/ Alltown

Comments: \_\_\_\_\_

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*An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.*

**ON-SITE REVIEW**

DEEP HOLE #: 22-2D DATE: 1/21/22 TIME: 8:45 AM WEATHER: 15 deg. F Snow  
SITE ADDRESS or MAP/LOT #: 631 Washington Street Pembroke, MA 02359  
OWNER: Bill Papastratis JOB NO.: 21-204  
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: To be determined

LAND USE: Residential SURFACE STONES: Yes: ☒ No: ☐ SLOPE (%): 1-3%

VEGETATION: Grass LANDFORM: Ground Moraine

**DISTANCES FROM:**

OPEN WATER BODY: 100+ ft PROPERTY LINE: 75 ft POSSIBLE WET AREA: 100+ ft DRAINAGEWAY: 100+ ft

DRINKING WATER WELL:        ft OTHER:       

**DEEP OBSERVATION HOLE LOG**

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0"-14"	Ap	Sandy Loam	10YR 3/2		FRIA., 5% Gravel, 1% Cobble
14"-60"	C1	Sandy Loam	2.5Y 6/2	Mottling @ 42"	Firm, 2% Gravel, 5% Cobble
60"-92"	C2	Medium Sand	2.5Y 5/2		Loose, 25% Gravel, 5% Cobble

**PARENT MATERIAL:**        Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

**GROUNDWATER OBSERVED:** Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater:

Standing in Hole:        Weeping from Face:        Saturating the Face:        Mottling: 42"

**Estimated Depth to Seasonal High Ground Water :** 42" From Mottling

**PERCOLATION TEST**

Percolation Hole #:	<u>N/A</u>	Percolation Hole #:	<u>      </u>
Test Date:	<u>      </u>	Test Date:	<u>      </u>
Depth of Perc:	<u>      </u>	Depth of Perc:	<u>      </u>
Start of Presoak:	<u>      </u>	Start of Presoak:	<u>      </u>
End of Presoak:	<u>N/A</u>	End of Presoak:	<u>      </u>
Time @ 12":	<u>N/A</u>	Time @ 12":	<u>      </u>
Time @ 9":	<u>      </u>	Time @ 9":	<u>      </u>
Time Elapse:(12"-9")	<u>      </u>	Time Elapse:(12"-9")	<u>      </u>
Time AT 6":	<u>      </u>	Time AT 6":	<u>      </u>
Time Elapse: (9"-6"):	<u>      </u>	Time Elapse: (9"-6"):	<u>      </u>
Rate: (min/in.):	<u>      </u>	Rate: (min/in.):	<u>      </u>
Test Passed/ Failed/	<u>      </u>	Test Passed/ Failed/ Discon/	<u>      </u>
Discon/ Add. Test Req'd:	<u>      </u>	Add. Testing Req'd:	<u>      </u>

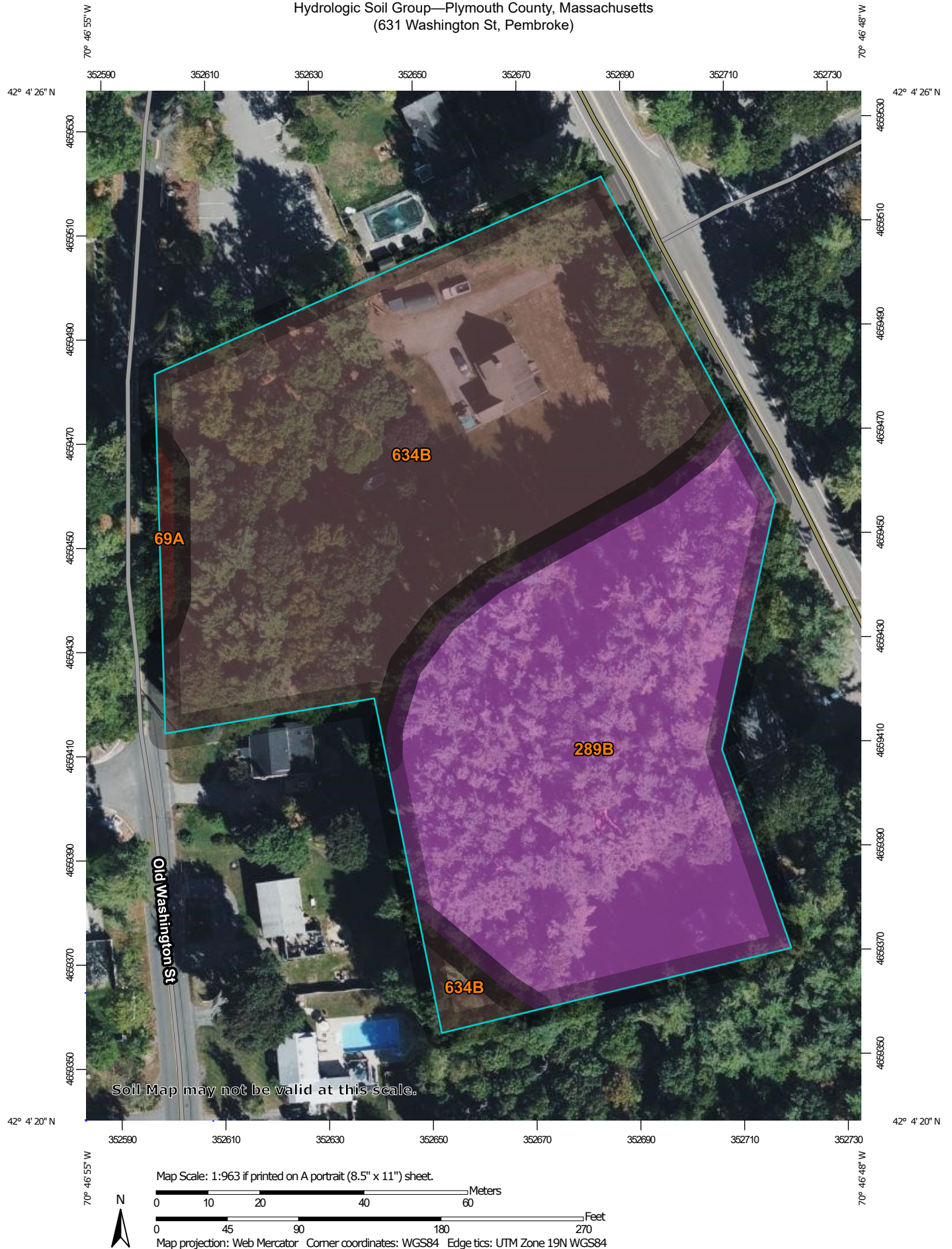
Performed By: Dana M. Altobello, P.E. Witnessed By: 0 Mach./Oper.: Joel w/ Alltown

Comments:       

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Hydrologic Soil Group—Plymouth County, Massachusetts  
(631 Washington St, Pembroke)



## MAP LEGEND

### Area of Interest (AOI)









 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Lines


 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Points






 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available


### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

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

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

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Plymouth County, Massachusetts  
Survey Area Data: Version 13, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 9, 2020

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



## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
69A	Mattapoisett loamy sand, 0 to 3 percent slopes, extremely stony	D	0.0	0.7%
289B	Hinckley gravelly sandy loam, 3 to 8 percent slopes, bouldery	A	1.4	44.3%
634B	Birchwood - Urban land complex, 0 to 8 percent slopes	B/D	1.8	55.0%
<b>Totals for Area of Interest</b>			<b>3.2</b>	<b>100.0%</b>



## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate ( $R$ ), specific yield ( $S_y$ ), horizontal hydraulic conductivity ( $K_h$ ), basin dimensions ( $x$ ,  $y$ ), duration of infiltration period ( $t$ ), and the initial thickness of the saturated zone ( $h_i(0)$ ), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length ( $x = y$ ). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify  $x$  as the short dimension and  $y$  as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify  $y$  as the short dimension,  $x$  as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. **The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed** otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

Input Values		use consistent units (e.g. feet & days <b>or</b> inches & hours)
2.5816	$R$	Recharge (infiltration) rate (feet/day)
0.270	$S_y$	Specific yield, $S_y$ (dimensionless, between 0 and 1)
1.82	$K$	Horizontal hydraulic conductivity, $K_h$ (feet/day)*
37.500	$x$	1/2 length of basin ( $x$ direction, in feet)
22.500	$y$	1/2 width of basin ( $y$ direction, in feet)
1.000	$t$	duration of infiltration period (days)
507.000	$h_i(0)$	initial thickness of saturated zone (feet)

#### Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

509.191	$h(\max)$	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.191	$\Delta h(\max)$	maximum groundwater mounding (beneath center of basin at end of infiltration period)

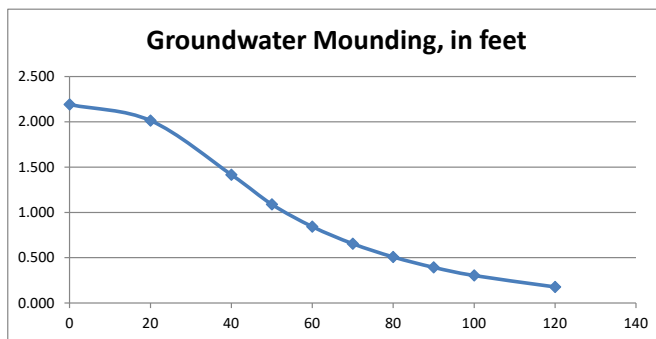
Ground-water Mounding, in feet

Distance from center of basin in  $x$  direction, in feet

2.191	0
2.014	20
1.416	40
1.089	50
0.843	60
0.655	70
0.508	80
0.393	90
0.303	100
0.177	120



Re-Calculate Now



#### Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

**MERRILL ENGINEERS & LAND SURVEYORS**  
REGISTERED PROFESSIONAL ENGINEERS  
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: 1/24/2022  
REV'D:

**Hantush (1967) Groundwater Mounding Calculator Data**

Location: **631 Washington St, Pembroke**

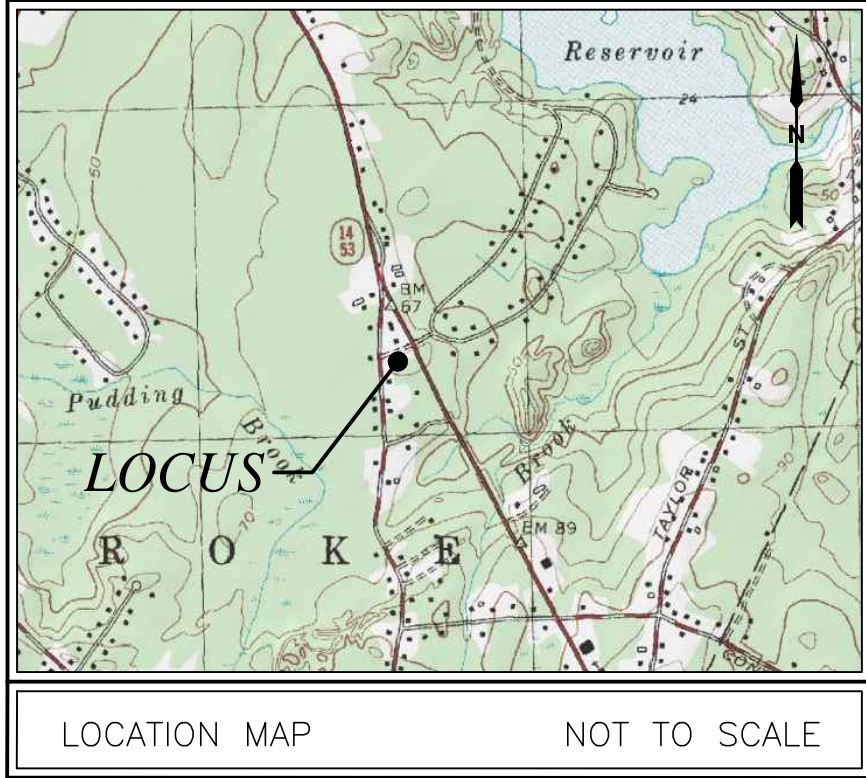
**Infiltration System:**

1 Perc Rate P.R.):	12 MPI
2 Hydraulic Conductivity (K)	
Rate (ft/day): ((60mph/P.R.)x(24hr/1 day))/(12in./ft)	10 ft/day
K=R/6.03)^1.18=	1.8165 ft/day
3 Specific Yield: Gravelly Sand =	0.27
4 T= (per Brett Rowe & Kermit Studley, MA DEP):	1 days
5 Initial Sat'd Thickness (h <sub>i</sub> ): (assumed from nearby irrigation well)	507 ft
6 Length of basin:	75 ft
7 Width of basin:	45 ft
8 Recharge Rate:	
A=L x W =	3375 sf
Q= (DDF)	
Flow	8,713 C.F. per day (Hydrocad)
Recharge Rate:	2.58163 ft/day

## **APPENDIX D**

### **Existing and Proposed Watersheds Plan (Insert)**





## PRE-DEVELOPMENT WATERSHEDS

### SUBCATCHMENT 1E - TRIB. TO OLD WASHINGTON ST

DESCRIPTION	AREA (S.F.)
IMPERVIOUS AREA	2,341 S.F.
GRAVEL	4,603 S.F.
GRASS HSG A	541 S.F.
WOODS HSG A	9,060 S.F.
GRASS HSG B	44,912 S.F.
WOODS HSG B	12,204 S.F.
GRASS HSG D	543 S.F.
WOODS HSG D	221 S.F.
SUBTOTAL	74,425 S.F.

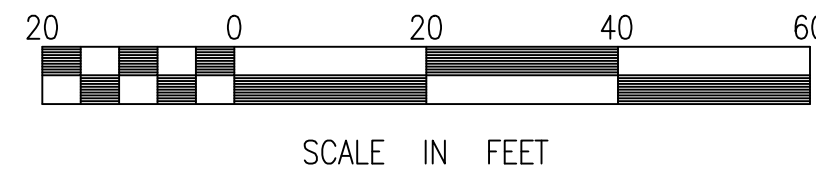
### SUBCATCHMENT 2E - TRIB. TO SOUTH EAST SIDE

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

### SUBCATCHMENT 3E - TRIB. TO SOUTH WEST SIDE

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

TOTAL AREA: 105,870 S.F.



## REVISIONS

DRAWN BY: PAL

DESIGNED BY: ---

CHECKED BY: DA

**Merrill**  
Engineers and Land Surveyors  
427 COLUMBIA ROAD, HANOVER, MA 02339 / T: (781) 826-9200  
26 UNION STREET, PLYMOUTH MA 02560 / T: (508) 746-6060  
WWW.MERRILLINC.COM

## EXISTING WATERSHED

#631 WASHINGTON STREET  
PEMBROKE, MASSACHUSETTS

OWNER/APPLICANT  
BILL PAPASTRAIS  
633 SUMMER STREET  
MARSHFIELD, MA 02050

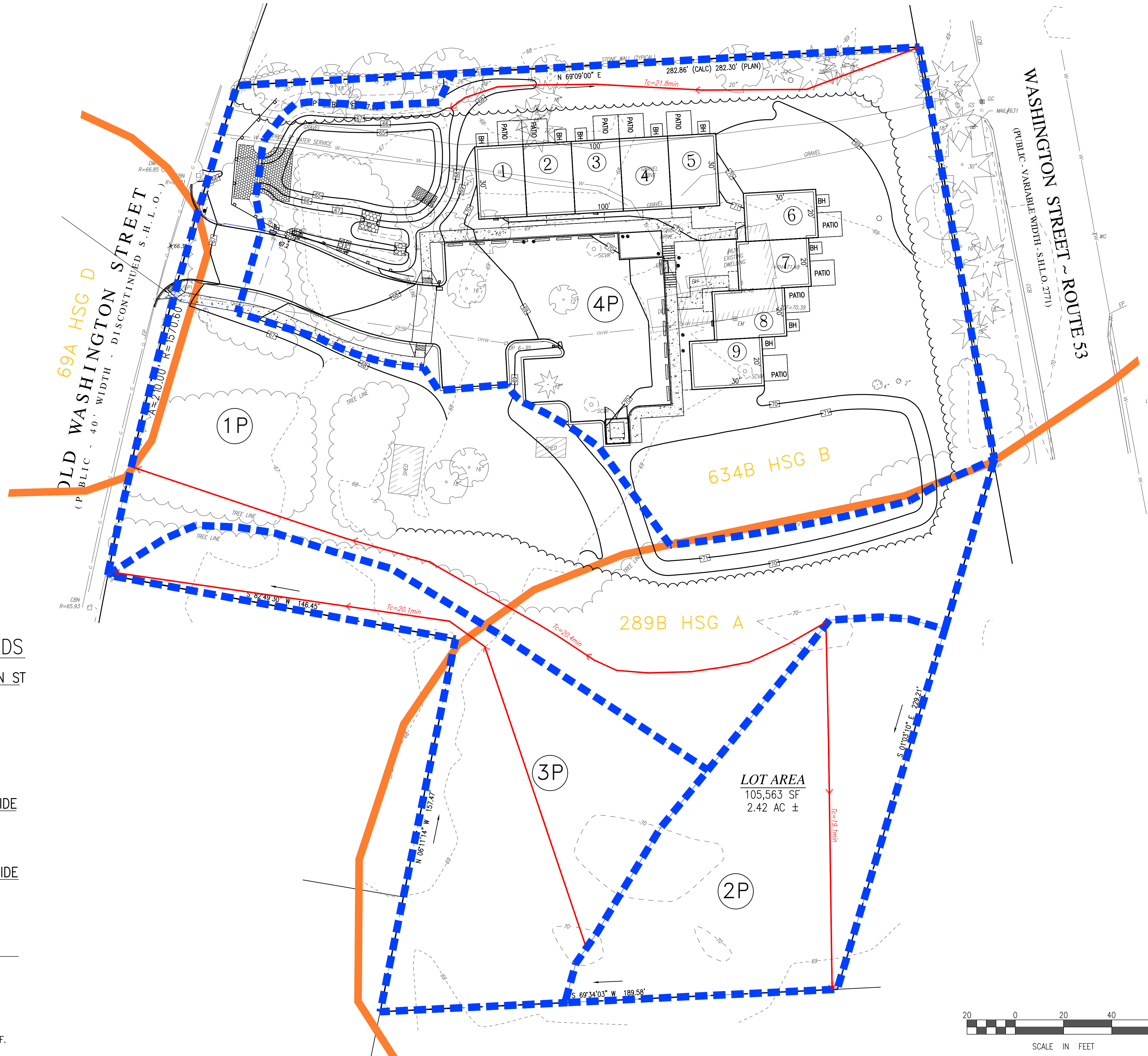
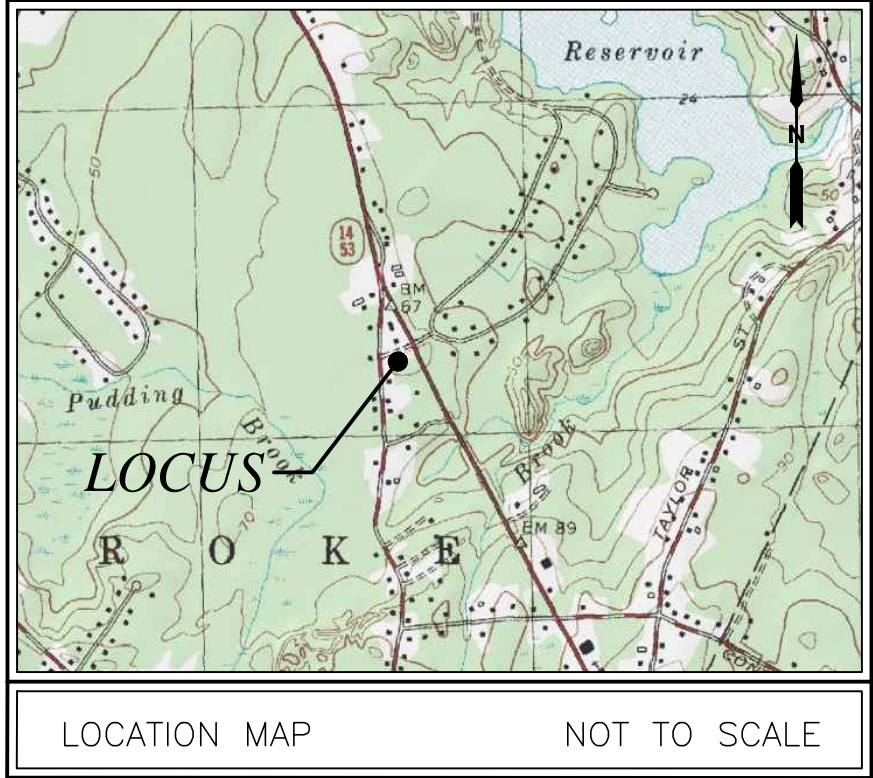
FEBRUARY 2, 2022

SCALE: 1" = 20'

JOB NO. 21-204

LATEST REVISION:





## POST-DEVELOPMENT WATERSHEDS

### SUBCATCHMENT 1P – TRIB. TO OLD WASHINGTON ST

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS AREA	818±	S.F.
WOODS HSG A	9,128±	S.F.
GRASS HSG A	2,583±	S.F.
WOODS HSG B	15,158±	S.F.
GRASS HSG B	3,105±	S.F.
GRASS HSG D	421±	S.F.
SUBTOTAL	31,213±	S.F.

### SUBCATCHMENT 2P – TRIB. TO SOUTH EAST SIDE

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

### SUBCATCHMENT 3P – TRIB. TO SOUTH WEST SIDE

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

### SUBCATCHMENT 4P – TRIB. TO BASIN

DESCRIPTION	AREA (S.F.)	
IMPERVIOUS AREA	16,954±	S.F.
WOODS HSG B	8,879±	S.F.
GRASS HSG B	19,343±	S.F.
SUBTOTAL	45,176±	S.F.

TOTAL AREA: 105,870 S.F.

## REVISIONS

DRAWN BY: PAL

DESIGNED BY: ---

CHECKED BY: DA

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

## PROPOSED WATERSHED

#631 WASHINGTON STREET  
PEMBROKE, MASSACHUSETTS

OWNER/APPLICANT  
BILL PAPAPRATIS  
633 SUMMER STREET  
MARSHFIELD, MA 02050

FEBRUARY 2, 2022

SCALE: 1" = 20'

JOB NO. 21-204

LATEST REVISION:



## **APPENDIX E**

### **Operations and Maintenance Plan**

## **OPERATION AND MAINTENANCE PLAN**

PROPOSED DRAINAGE SYSTEM – DURING CONSTRUCTION  
February 2, 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 14 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 – DURING CONSTRUCTION  
February 2, 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 1<sup>st</sup>, before sediment from winter sanding operations is washed into the drainage system and in the fall after November 1<sup>st</sup>. Disposal of the

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

### **Silt Trap Erosion Control Pad and Vegetated Filter Strip**

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.

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.

### **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 1<sup>st</sup>, 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.

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