Merrill
Engineers and Land Surveyors

March 24, 2023
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Revised September 1, 2023

Stormwater Management Report

Submitted To: Town of Hingham

Bishops Lane, Hingham MA

(508) 746-6060 / 26 Union Street, Plymouth, MA 02360
merrillinc.com / (781) 826-9200 / 427 Columbia Road, Hanover, MA 02339

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Stormwater Management Report

Bishops Lane
Hingham, Massachusetts

September 2023

Project Description

The project proponent, Steven Young, proposes to develop an approximate 3.5-acre parcel of land at 16 and 0 Bishops Lane in Hingham, Massachusetts. The property has frontage on Bishops Lane and is shown as Map 70, Lots 20 and 22 on the Town of Hingham Assessor's Maps. The proposed development will consist of improvements to one (1) existing home, three (3) new single family homes, improvements/widening to approximately 300 feet of the existing Bishops Lane and the construction of approximately 470 feet of bituminous roadway with associated infrastructure. The site is primarily surrounded by developed residential zoned property on Bishops Lane, South Street and Del Prete Drive. Refer to the USGS Site Locus Map for the location of the parcel. This report contains calculations of stormwater runoff for pre- and post-development conditions and includes the sizing of the proposed drainage system and stormwater management facilities to support the development.

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

Existing Conditions

The site presently is comprised of a single family home located at 16 Bishops Lane with a bituminous concrete driveway, lawn area, detached garage, pool and pool house, several exposed ledge outcrops near the existing dwelling and forested areas in the southern portion of the property. The site is primarily wooded with topography consisting of moderate to steep slopes throughout with stormwater runoff from the property flowing overland in two general directions. The southern portion of the property flows in a northerly direction towards an offsite wetland area. The existing home generals flows towards Bishops Lane towards South Street. Currently there is no stormwater runoff controls and no stormwater attenuation occurs.

Soil types and information was obtained from Soils Conservation Service (SCS) Survey of Plymouth County, Massachusetts, NRCS mapping. The soils on site are classified as Chatfield-Rock outcrop-Canton complex very stony (15-35% slopes), Newfields fine sandy loam extremely stony (3-8% slopes) in the area of the proposed development. All soil types are identified as Hydrologic Soil Group (HSG) B soils. In order to confirm the soil class and groundwater depth characteristics of these soils, soil testing was performed during May 2019 within the approximate location of the proposed stormwater basin.

Drainage calculations were performed for the pre-development conditions for the 2, 10, 25, and 100-year Type III storm events. Refer to Section 3 of this report for HydroCad output results, soil characteristics, cover descriptions and time of concentrations for all subareas.

Proposed Conditions

Under the post development conditions, stormwater runoff from the proposed roadway and single family dwellings will be directed by closed drainage, gutters and roof leaders, and

surface flow to a stormwater infiltration basin located in the northern portion of the property. The objective in designing the proposed drainage system for the project was to maintain existing natural drainage patterns and to ensure that post-development rates of runoff are equal to or less than pre-development rates at all design points. Based on the soil conditions found on site, an exfiltration rate of 8.27 in/hr was used in the stormwater calculations for the infiltration basin. The increase in stormwater runoff from the roadway, roofs, walkways and driveways shall be treated and infiltrated. The majority of the runoff is directed toward the stormwater basin for treatment and attenuation.

There will be an increase in runoff rates due to the additional impervious area proposed on the site. 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, help mitigate increased rates and volumes of runoff for the 2, 10, 25, and 100-year storms events off site. The control structure for the infiltration basin will consist of an outlet structure with rectangular weir sized to attenuate the net increase in peak flows.

The drainage system was designed to fully comply with the Standards of the DEP Stormwater Management Regulations. A treatment stream consisting of deep dump catch basins with hoods, pretreatment unit (First Defense Unit), and an infiltration basin will ensure that 80% TSS (total suspended solids) removal is accomplished. The catch basin and pretreatment unit will provide the required 44% TSS prior to the infiltration component of the system. The proposed treatment stream will renovate the stormwater and improve he water quality by promoting the settlement of sediments and capture of pollutants before runoff is infiltrated into the ground or discharged off site.

Erosion and sedimentation controls will be placed at the limit of work prior to the commencement of any construction activity. The integrity of the erosion control barrier (silt sock) will be maintained by periodic inspections and replacement as necessary. The erosion control barrier will remain in place until the first course of pavement has been placed and all side slopes have been loamed and seeded and vegetation has been established.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

No new stormwater conveyances will discharge untreated impervious runoff into, or cause erosion to downgradient areas. An infiltration basin is proposed to capture and treat runoff from the roadway and new homes, which will improve the quality of stormwater discharge from the site.

Standard 2 – Peak Rate Attenuation

Peak rates of runoff were calculated using the TR-20 methodology developed by the NRCS computer-based program, HydroCAD (refer to Section 3). The increase in runoff is attenuated by the proposed infiltration basin. The stormwater basin system will both detain and infiltrate runoff, mitigating increased rates of runoff for the 2, 10, 25, and 100-year storms events.

No negative impact from the proposed development is anticipated on any existing drainage systems or toward any surrounding abutters to the site.

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

	PEAK RATES OF RUNOFF					
	Design Point 1 (Northern Property Line)		Design Point 2 (South Street)		Design Point 3 (Southern Property Line)	
	EXISTING (cfs)	PROPOSED (cfs)	EXISTING (cfs)	PROPOSED (cfs)	EXISTING (cfs)	PROPOSED (cfs)
2YR	0.64	0.30	1.00	0.63	0.19	0.09
10YR	2.73	0.88	2.14	1.26	0.64	0.45
25YR	4.81	2.66	3.10	1.78	1.06	0.81
100YR	9.78	9.14	5.12	2.86	2.03	1.65

	PEAK VOLUME OF RUNOFF					
	Design Point 1 (Northern Property Line)		Design Point 2 (South Street)		Design Point 3 (Southern Property Line)	
	EXISTING (AF)	PROPOSED (AF)	EXISTING (AF)	PROPOSED (AF)	EXISTING (AF)	PROPOSED (AF)
2YR	0.098	0.027	0.076	0.047	0.019	0.013
10YR	0.276	0.068	0.156	0.091	0.050	0.038
25YR	0.450	0.185	0.225	0.129	0.080	0.063
100YR	0.863	0.509	0.374	0.210	0.148	0.121

Standard 3 – Groundwater Recharge

Runoff will be infiltrated by the stormwater infiltration basin. The infiltration basin will be 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 for coarse sand soils with an exfiltration rate of 8.27 in/hr. The total required groundwater recharge volume for the entire site was calculated to be 1,258 cubic feet. The proposed subsurface infiltration facilities will provide 5,878 cubic feet of recharge below the minimum outlet elevation. Refer to Section 5 for recharge volume, drawdown 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. The water quality volume was calculated using the one-inch rule for the proposed impervious surface of 0.99 ac. The total required water quality treatment

volume was calculated to be 3,590 cubic feet. The proposed water quality treatment volume provided is 5,878 cubic feet through the pretreatment unit and the infiltration basin. Refer to Section 5 for water quality calculations for each treatment stream.

In accordance with the guidelines of the Stormwater Management Policy, the Total Suspended Solids (TSS) Removal was calculated to be 80% or greater for the new treatment trains which will handle the stormwater runoff from the proposed project area. The treatment trains consist of deep hooded catch basin to subsurface infiltration chamber system for the front yard area and a pretreatment stone diaphragm to the rain garden for the main driveway to achieve the required removal rate of 80% total suspended soils. TSS removal calculations are included in Section 5.

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

This project is not considered a redevelopment project. Not Applicable.

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 Plan.

Standard 9 – Operation and Maintenance Plan

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

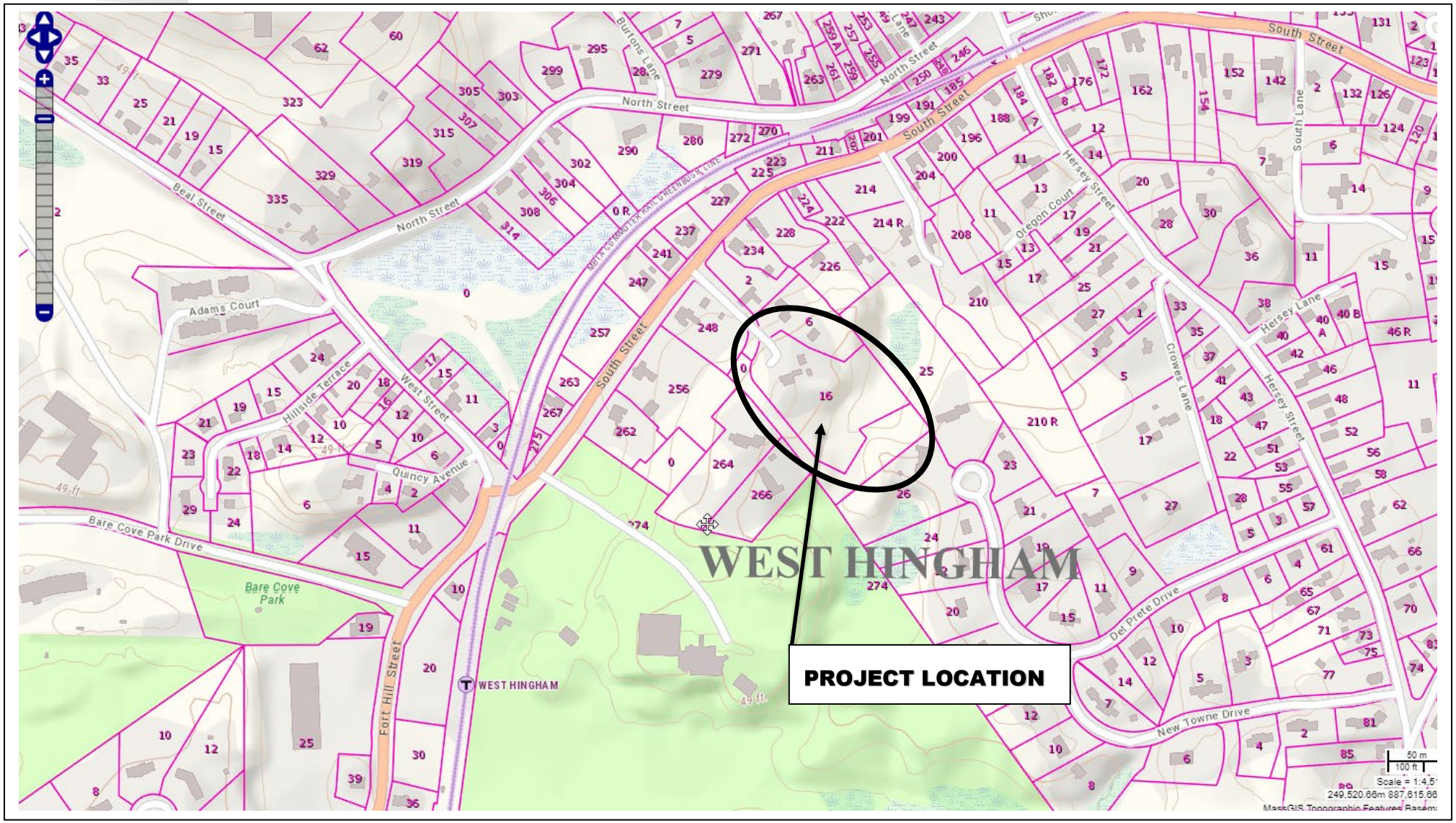
Standard 10 – Prohibition of Illicit Discharges

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

Figures

- USGS Map
- FEMA Flood Map
- NRCS Soil Survey Map

USGS Map



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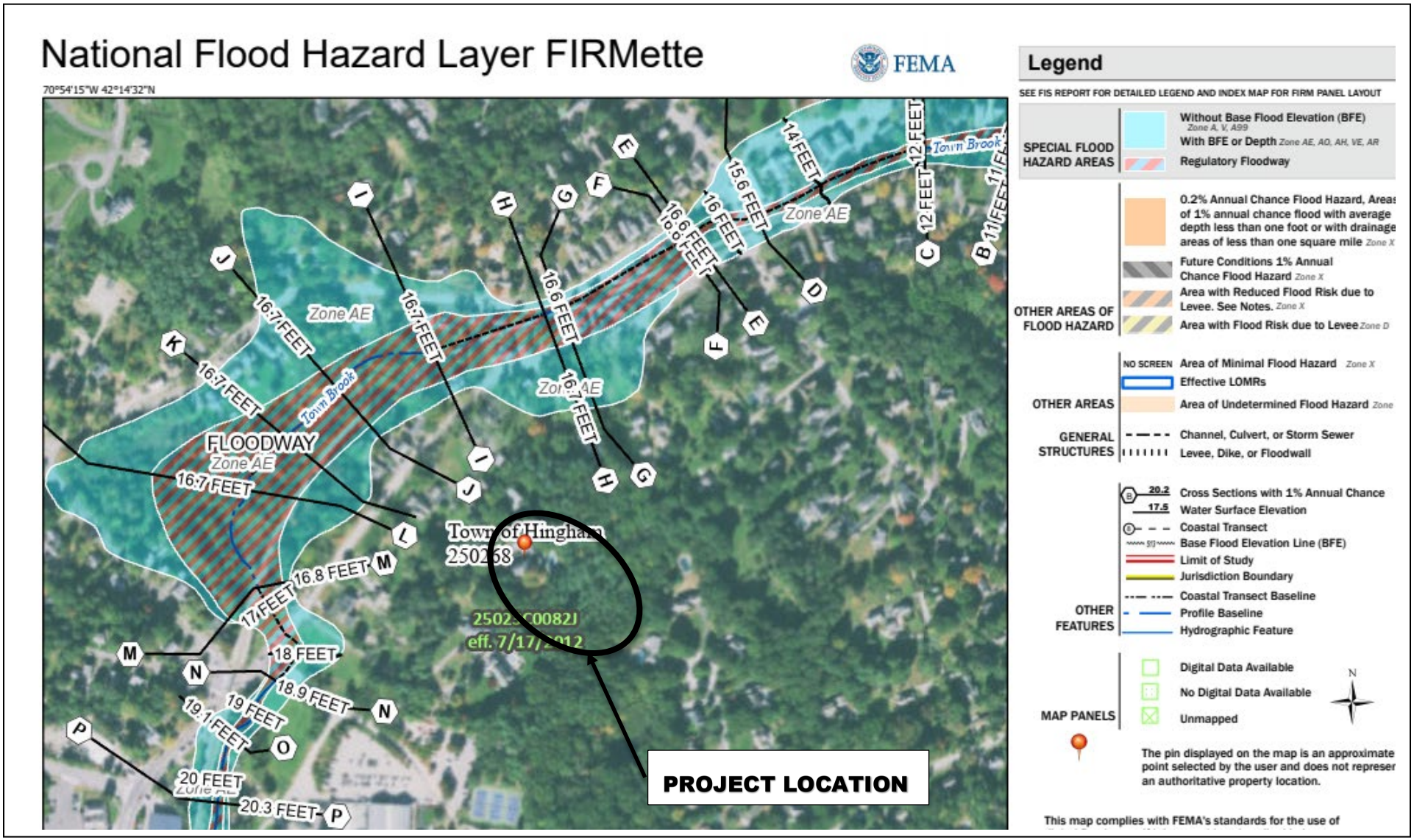
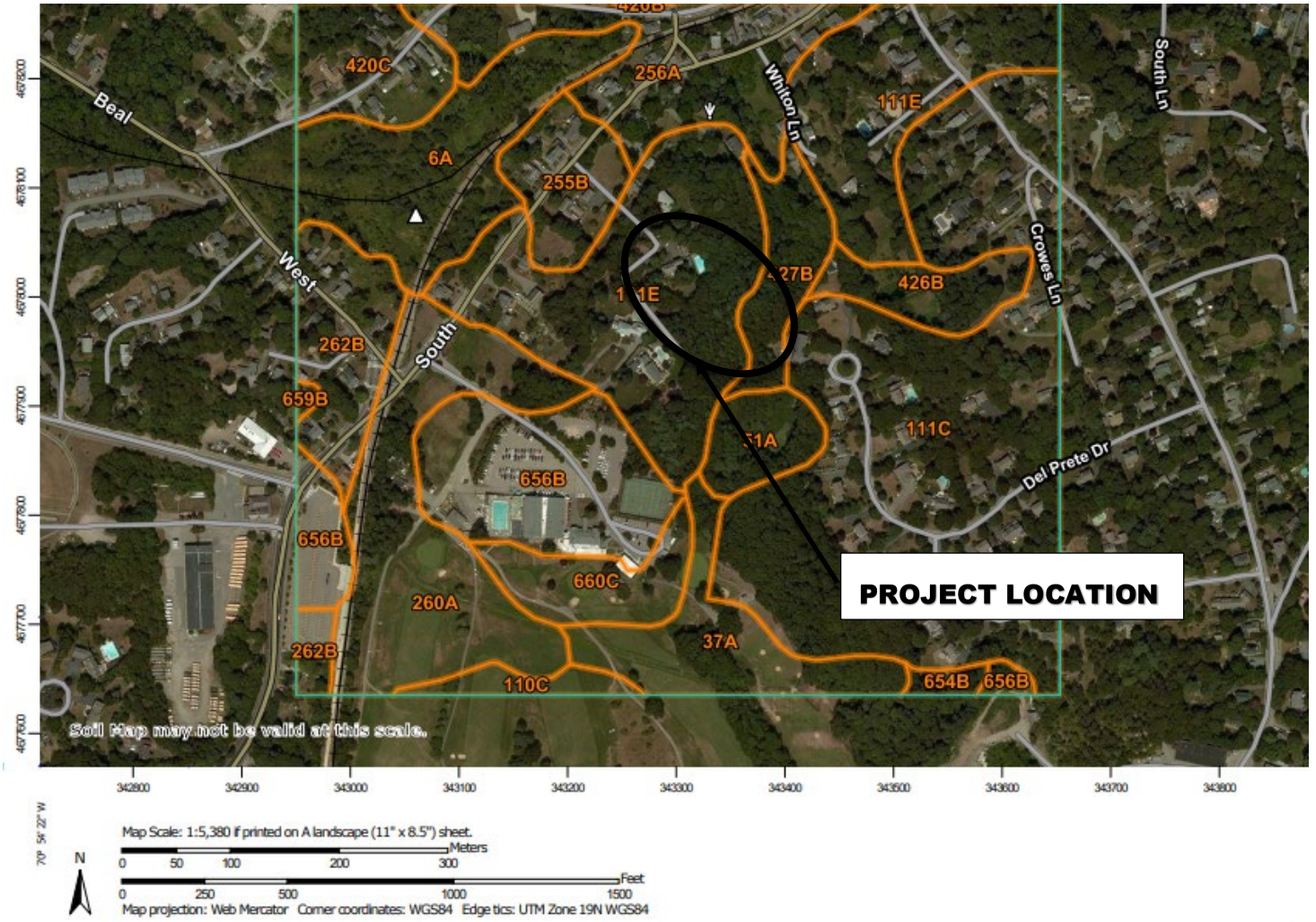
FEMA Flood Map



NRCS Soil Survey Map



Drainage Calculations

- Existing Conditions Model
- Proposed Conditions Model
- Supplemental Drainage Calculations
    - Groundwater Recharge Volume
    - Infiltration System Drawdown
    - Infiltration System Mounding Analysis
    - Water Quality Volume
    - TSS Removal Rate
    - Closed Drainage System Sizing
- Soil Testing Results

H:\17-360\Design\Cad\Existing Watersheds\17-360 EXWS.dwg 3/27/2023 6:46:26 PM

SCALE IN FEET
30 0 30 60 90

DEFINITIVE SUBDIVISION PLAN

#16 BISHOPS LANE
HINGHAM, MASSACHUSETTS

PREPARED FOR: YOUNG FAMILY TRUST
16 BISHOPS LANE
HINGHAM, MA 02043

MARCH 24, 2023

SCALE: AS NOTED

JOB No. 17-360

LATEST REVISION:

SHEET
EXISTING WATERSHED PLAN

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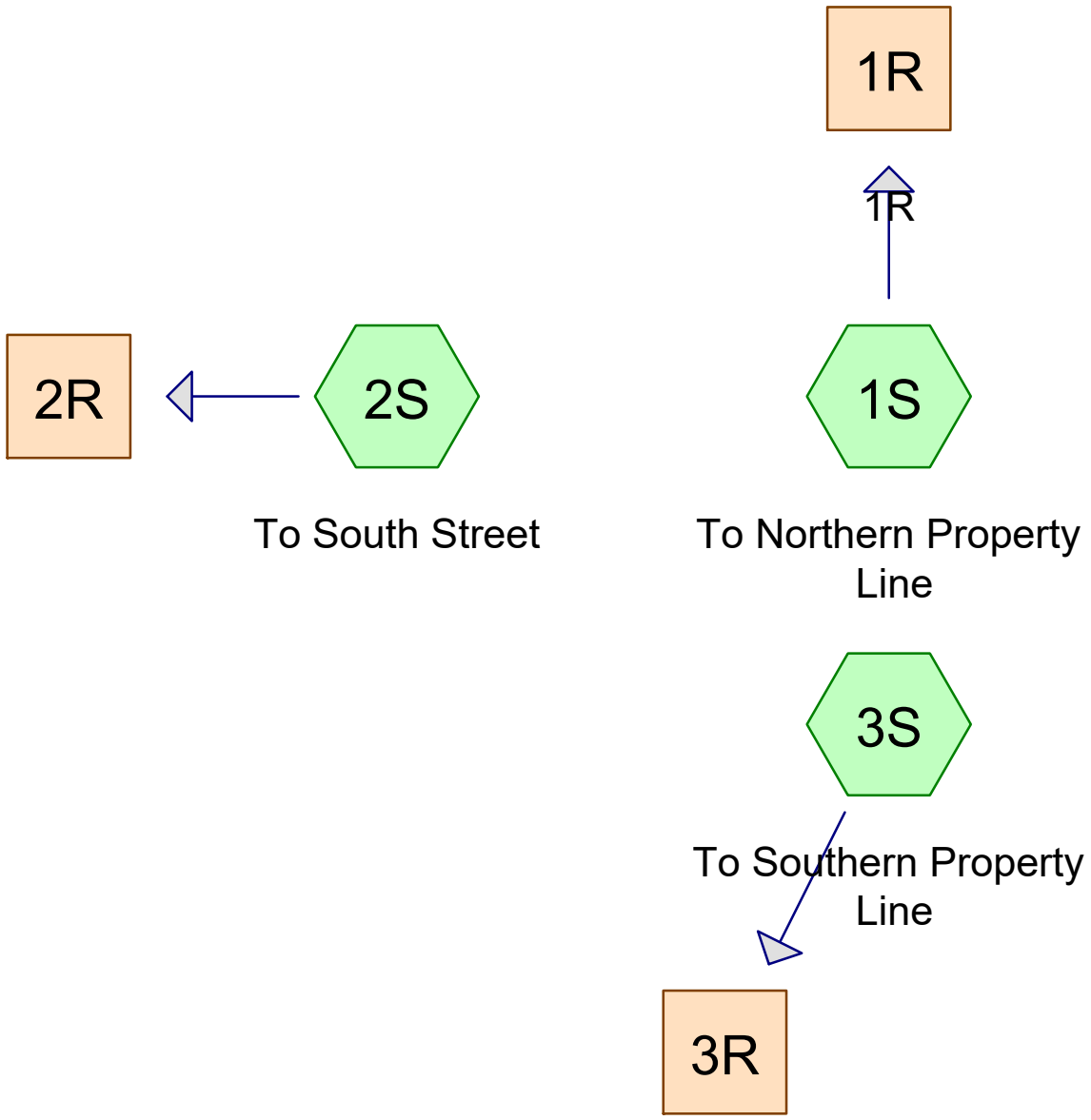
CHECKED BY: DK

REVISIONS



Subcat Reach Pond Link

Routing Diagram for 17-360 PRE
Prepared by Merrill Associates Inc, Printed 3/27/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.220	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S)
0.142	98	Ledge (1S, 2S, 3S)
0.185	98	Paved parking, HSG B (2S)
0.138	98	Paved parking/Conc Walks, HSG B (1S)
0.015	98	Roofs, HSG B (2S)
0.045	98	Unconnected pavement, HSG B (1S)
2.337	55	Woods, Good, HSG B (1S, 2S, 3S)
4.082	**62**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To Northern Property Runoff Area=122,882 sf 6.95% Impervious Runoff Depth=0.42"
Flow Length=354' Tc=11.9 min CN=59 Runoff=0.64 cfs 0.098 af

Subcatchment 2S: To South Street Runoff Area=35,746 sf 35.35% Impervious Runoff Depth=1.11"
Flow Length=397' Tc=6.0 min CN=74 Runoff=1.00 cfs 0.076 af

Subcatchment 3S: To Southern Property Runoff Area=19,195 sf 9.07% Impervious Runoff Depth=0.53"
Flow Length=136' Tc=6.0 min CN=62 Runoff=0.19 cfs 0.019 af

Reach 1R: 1R Inflow=0.64 cfs 0.098 af
Outflow=0.64 cfs 0.098 af

Reach 2R: Inflow=1.00 cfs 0.076 af
Outflow=1.00 cfs 0.076 af

Reach 3R: Inflow=0.19 cfs 0.019 af
Outflow=0.19 cfs 0.019 af

Total Runoff Area = 4.082 ac Runoff Volume = 0.193 af Average Runoff Depth = 0.57"
87.11% Pervious = 3.556 ac 12.89% Impervious = 0.526 ac

Summary for Subcatchment 1S: To Northern Property Line

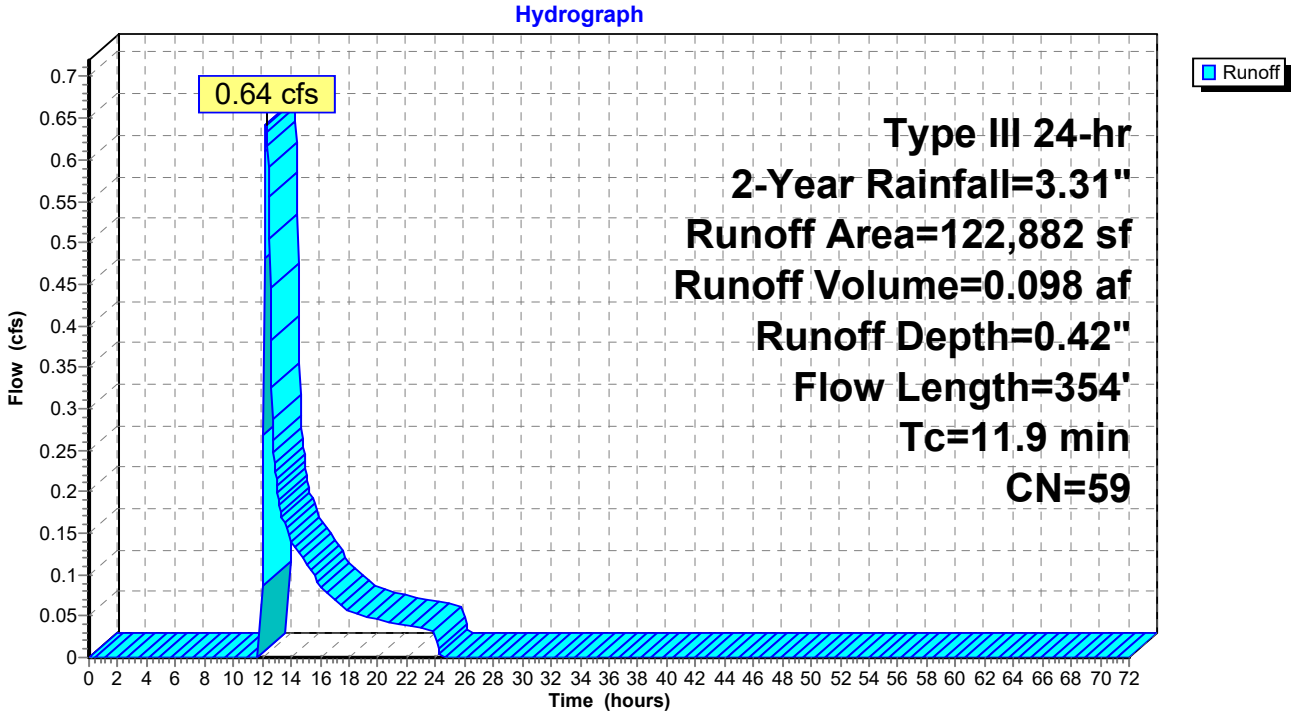
Runoff = 0.64 cfs @ 12.26 hrs, Volume= 0.098 af, Depth= 0.42"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	20,342	61	>75% Grass cover, Good, HSG B
	93,999	55	Woods, Good, HSG B
	1,970	98	Unconnected pavement, HSG B
*	6,021	98	Paved parking/Conc Walks, HSG B
*	550	98	Ledge
	122,882	59	Weighted Average
	114,341		93.05% Pervious Area
	8,541		6.95% Impervious Area
	1,970		23.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
1.6	304	0.0380	3.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.9	354	Total			

Subcatchment 1S: To Northern Property Line



Summary for Subcatchment 2S: To South Street

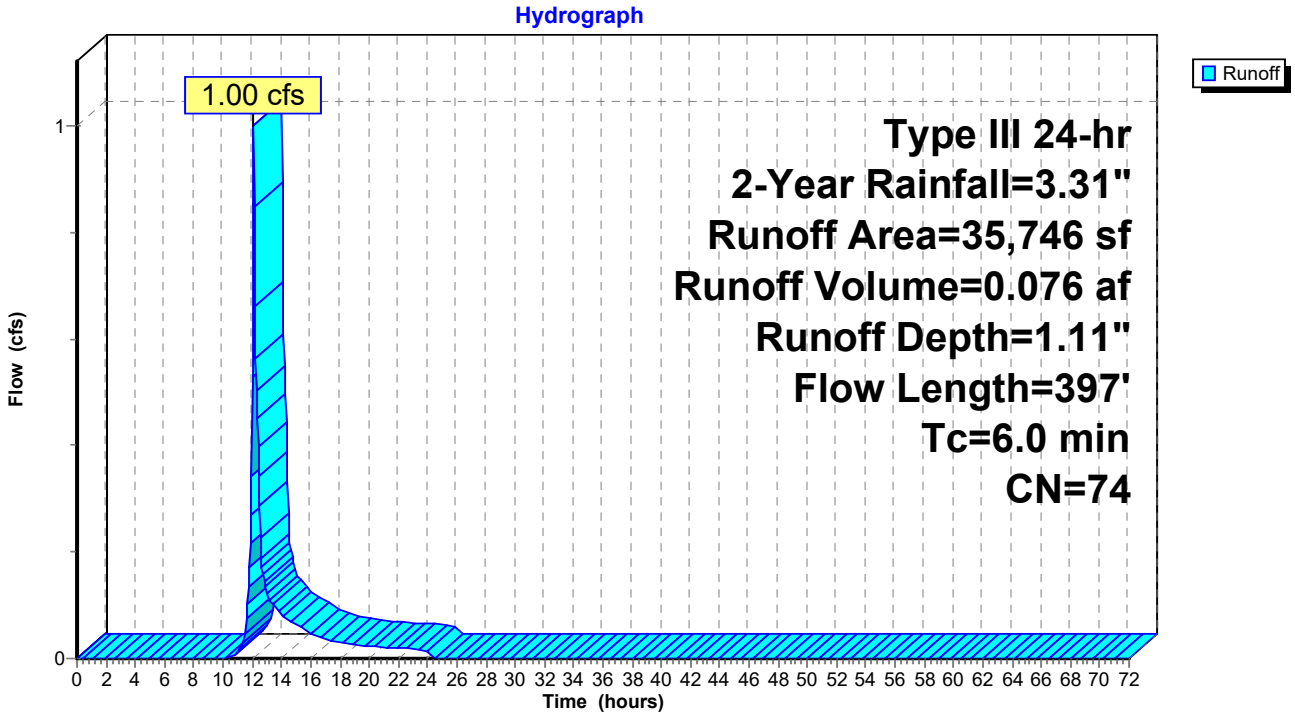
Runoff = 1.00 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 1.11"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	22,120	61	>75% Grass cover, Good, HSG B
	989	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
	8,065	98	Paved parking, HSG B
*	3,900	98	Ledge
	35,746	74	Weighted Average
	23,109		64.65% Pervious Area
	12,637		35.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	220	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	397	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

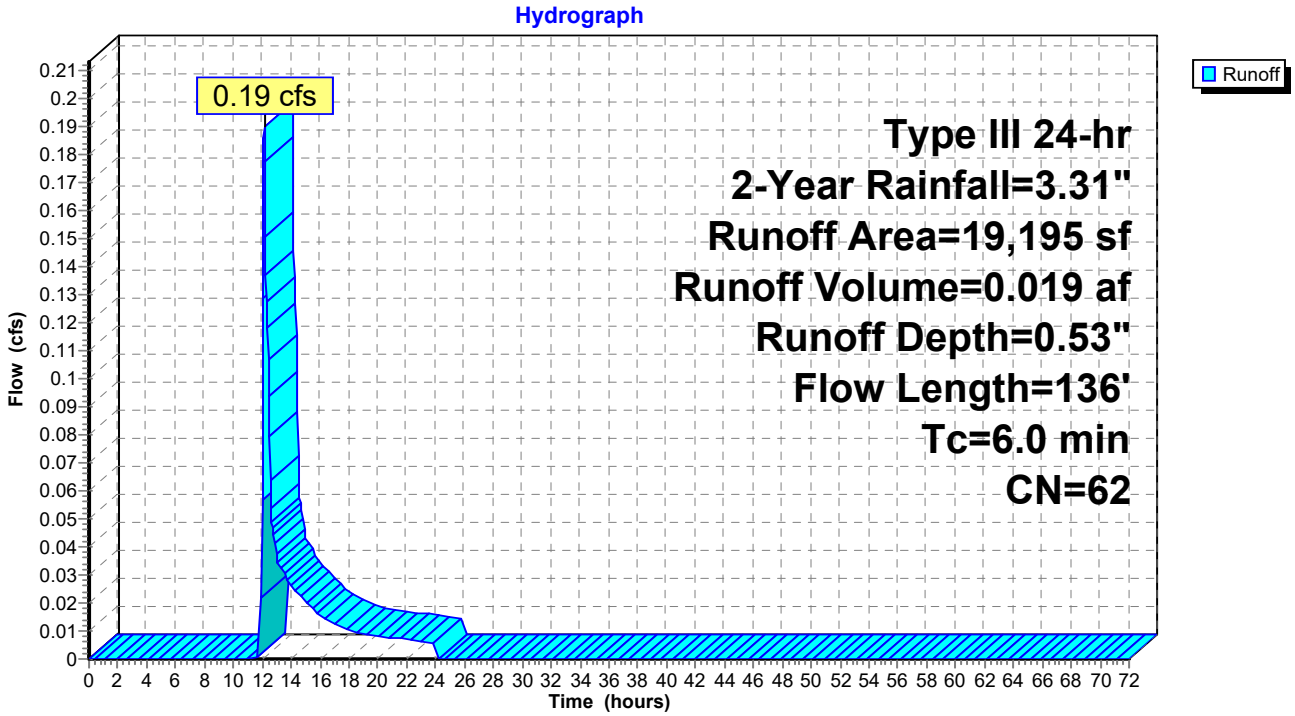
Runoff = 0.19 cfs @ 12.12 hrs, Volume= 0.019 af, Depth= 0.53"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	10,664	61	>75% Grass cover, Good, HSG B
	6,790	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	1,741	98	Ledge
	19,195	62	Weighted Average
	17,454		90.93% Pervious Area
	1,741		9.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0600	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0.4	86	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	136	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: To Southern Property Line

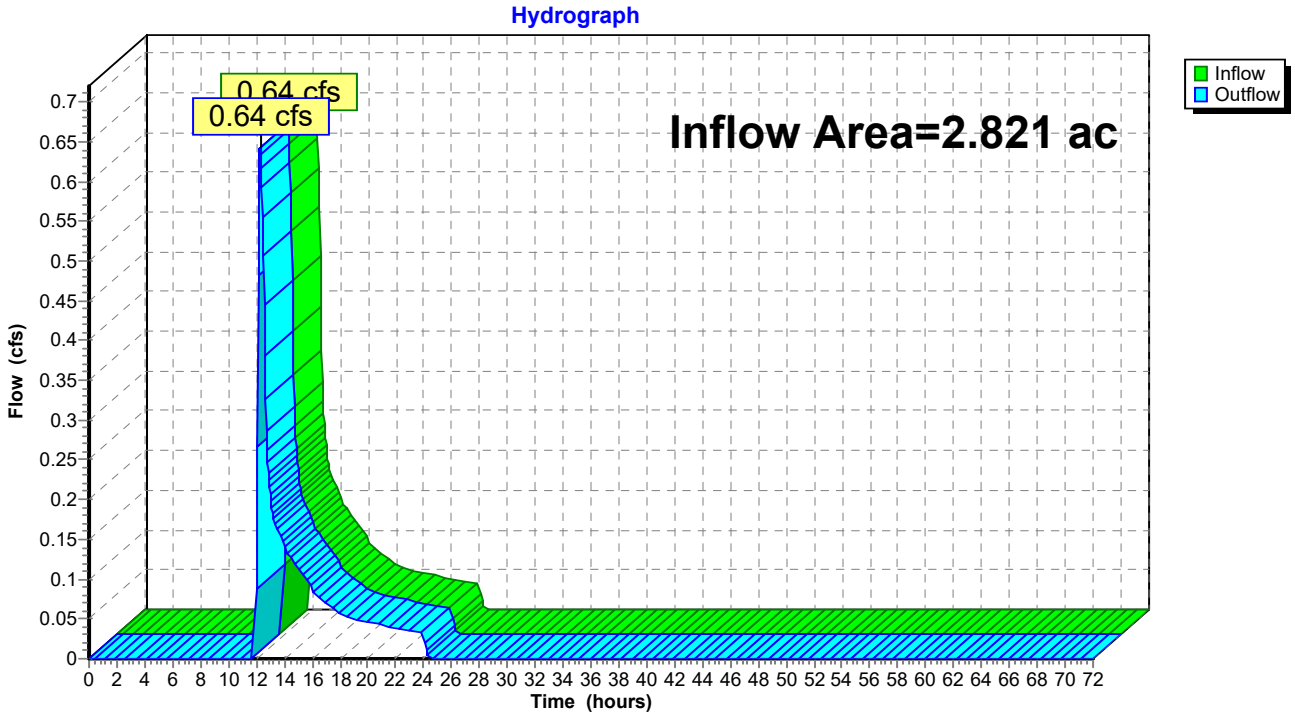


Summary for Reach 1R: 1R

Inflow Area = 2.821 ac, 6.95% Impervious, Inflow Depth = 0.42" for 2-Year event
Inflow = 0.64 cfs @ 12.26 hrs, Volume= 0.098 af
Outflow = 0.64 cfs @ 12.26 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

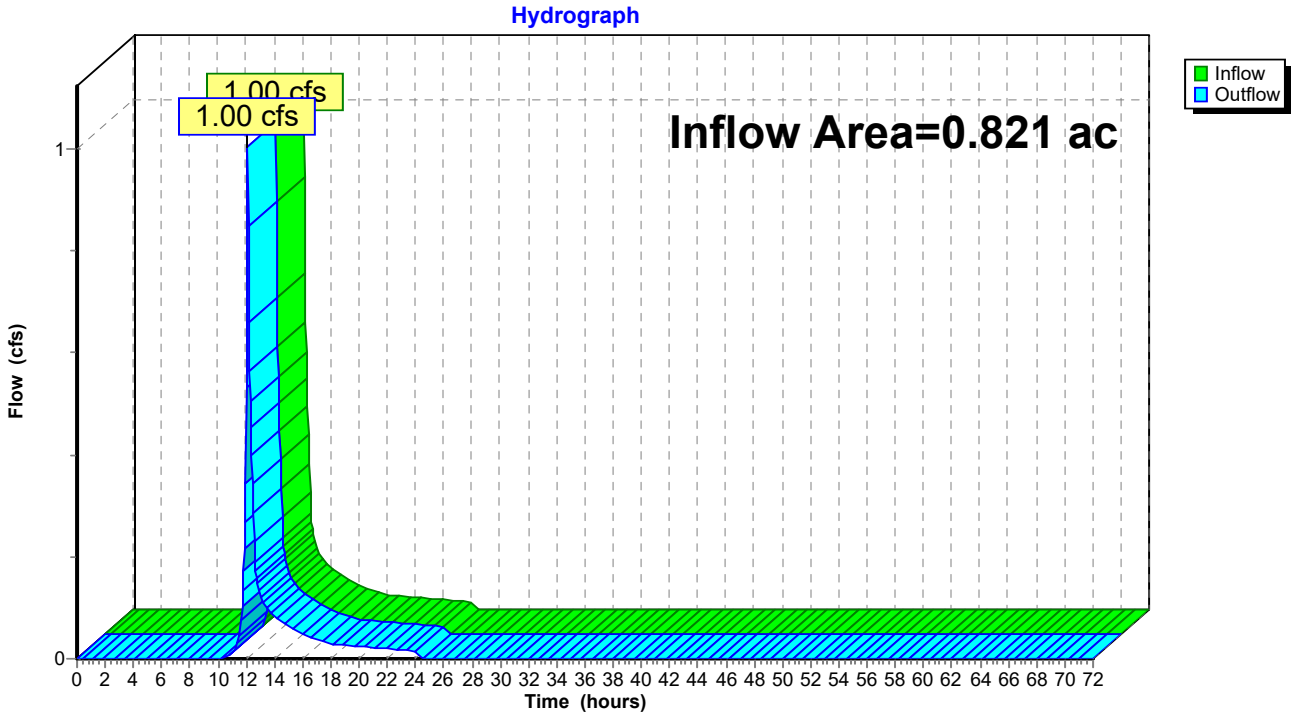


Summary for Reach 2R:

Inflow Area = 0.821 ac, 35.35% Impervious, Inflow Depth = 1.11" for 2-Year event
Inflow = 1.00 cfs @ 12.10 hrs, Volume= 0.076 af
Outflow = 1.00 cfs @ 12.10 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

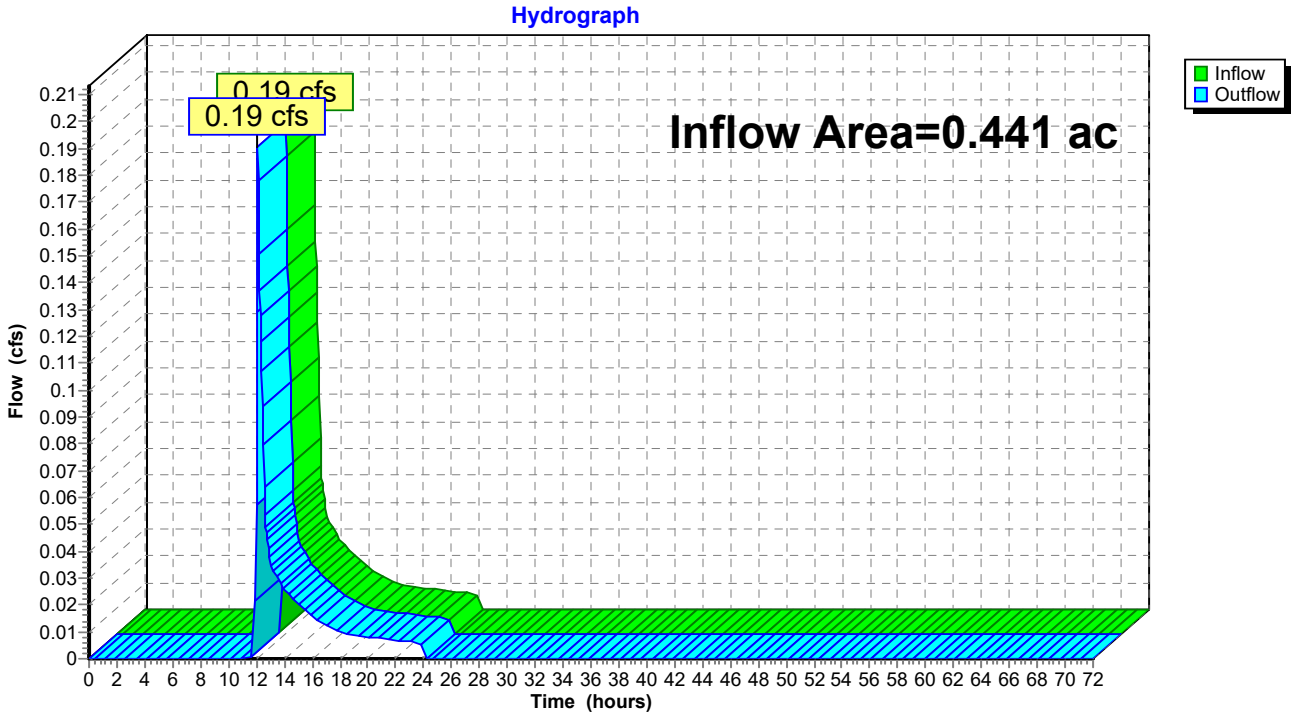


Summary for Reach 3R:

Inflow Area = 0.441 ac, 9.07% Impervious, Inflow Depth = 0.53" for 2-Year event
Inflow = 0.19 cfs @ 12.12 hrs, Volume= 0.019 af
Outflow = 0.19 cfs @ 12.12 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To Northern Property Runoff Area=122,882 sf 6.95% Impervious Runoff Depth=1.17"
Flow Length=354' Tc=11.9 min CN=59 Runoff=2.73 cfs 0.276 af

Subcatchment 2S: To South Street Runoff Area=35,746 sf 35.35% Impervious Runoff Depth=2.28"
Flow Length=397' Tc=6.0 min CN=74 Runoff=2.14 cfs 0.156 af

Subcatchment 3S: To Southern Property Runoff Area=19,195 sf 9.07% Impervious Runoff Depth=1.37"
Flow Length=136' Tc=6.0 min CN=62 Runoff=0.64 cfs 0.050 af

Reach 1R: 1R Inflow=2.73 cfs 0.276 af
Outflow=2.73 cfs 0.276 af

Reach 2R: Inflow=2.14 cfs 0.156 af
Outflow=2.14 cfs 0.156 af

Reach 3R: Inflow=0.64 cfs 0.050 af
Outflow=0.64 cfs 0.050 af

Total Runoff Area = 4.082 ac Runoff Volume = 0.482 af Average Runoff Depth = 1.42"
87.11% Pervious = 3.556 ac 12.89% Impervious = 0.526 ac

Summary for Subcatchment 1S: To Northern Property Line

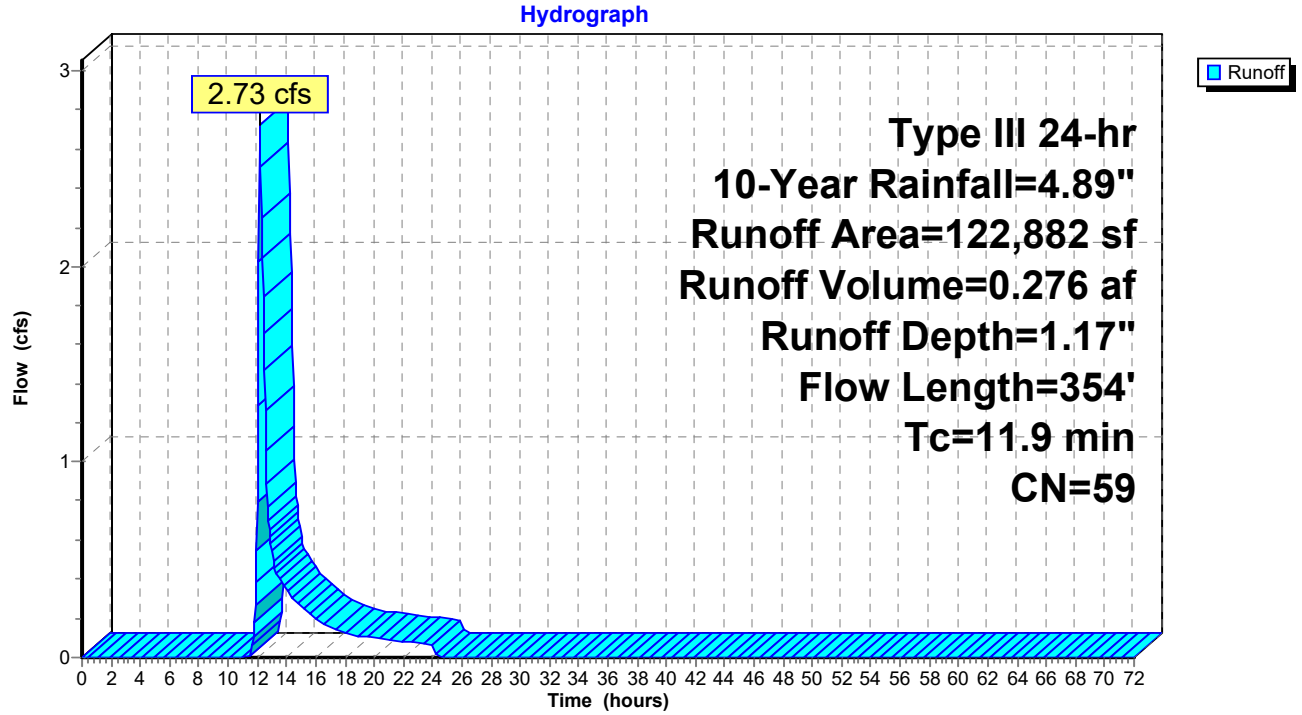
Runoff = 2.73 cfs @ 12.19 hrs, Volume= 0.276 af, Depth= 1.17"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	20,342	61	>75% Grass cover, Good, HSG B
	93,999	55	Woods, Good, HSG B
	1,970	98	Unconnected pavement, HSG B
*	6,021	98	Paved parking/Conc Walks, HSG B
*	550	98	Ledge
	122,882	59	Weighted Average
	114,341		93.05% Pervious Area
	8,541		6.95% Impervious Area
	1,970		23.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
1.6	304	0.0380	3.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.9	354	Total			

Subcatchment 1S: To Northern Property Line



Summary for Subcatchment 2S: To South Street

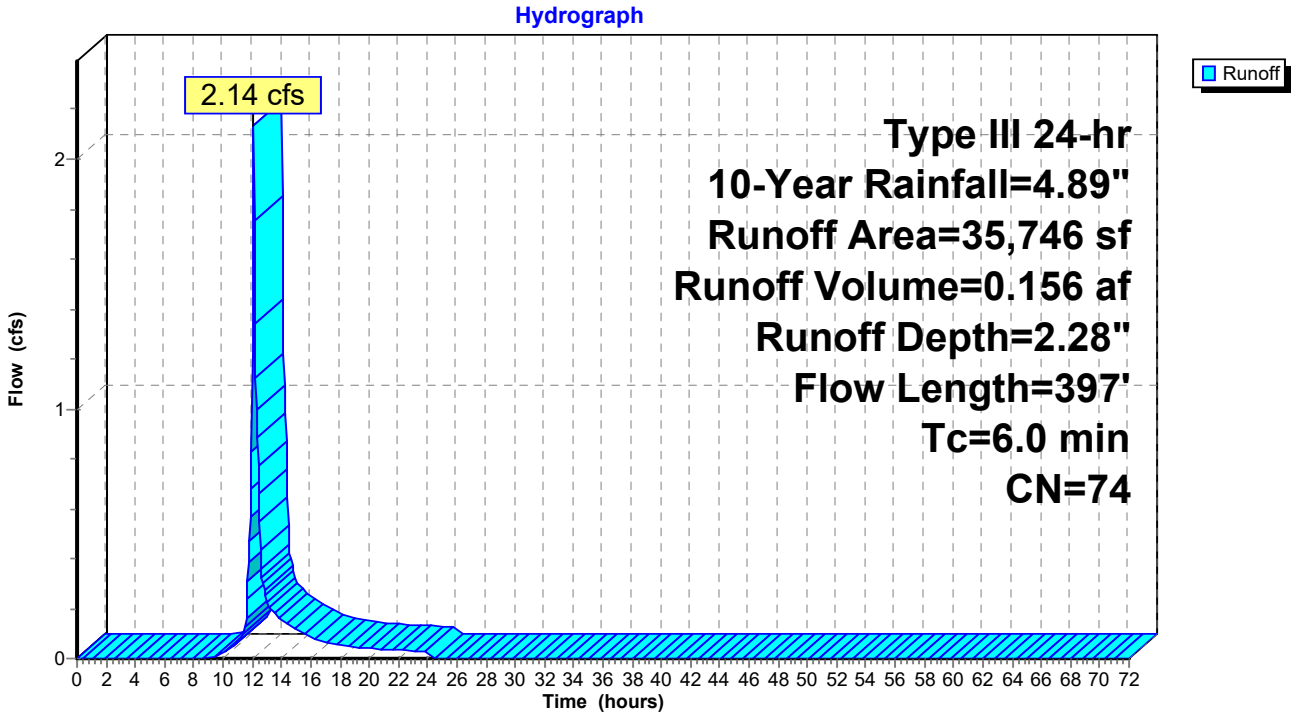
Runoff = 2.14 cfs @ 12.10 hrs, Volume= 0.156 af, Depth= 2.28"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	22,120	61	>75% Grass cover, Good, HSG B
	989	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
	8,065	98	Paved parking, HSG B
*	3,900	98	Ledge
	35,746	74	Weighted Average
	23,109		64.65% Pervious Area
	12,637		35.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	220	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	397	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

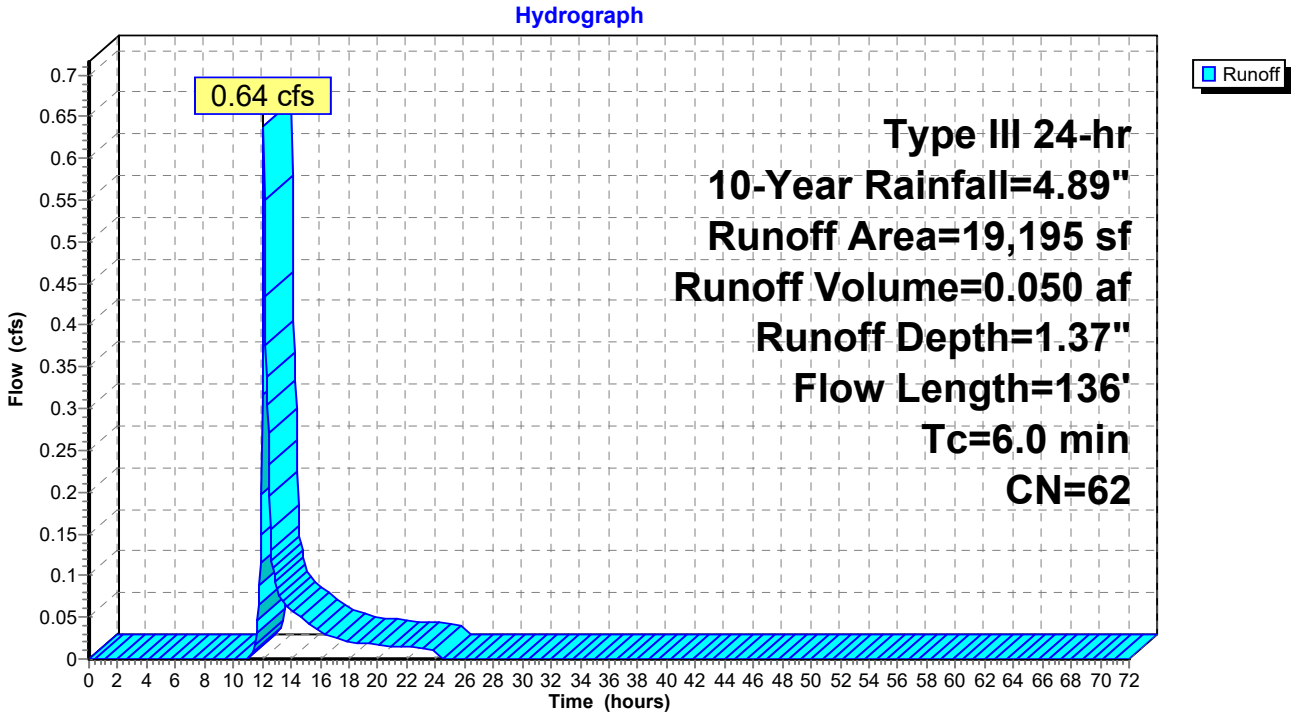
Runoff = 0.64 cfs @ 12.10 hrs, Volume= 0.050 af, Depth= 1.37"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	10,664	61	>75% Grass cover, Good, HSG B
	6,790	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	1,741	98	Ledge
	19,195	62	Weighted Average
	17,454		90.93% Pervious Area
	1,741		9.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0600	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0.4	86	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	136	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: To Southern Property Line

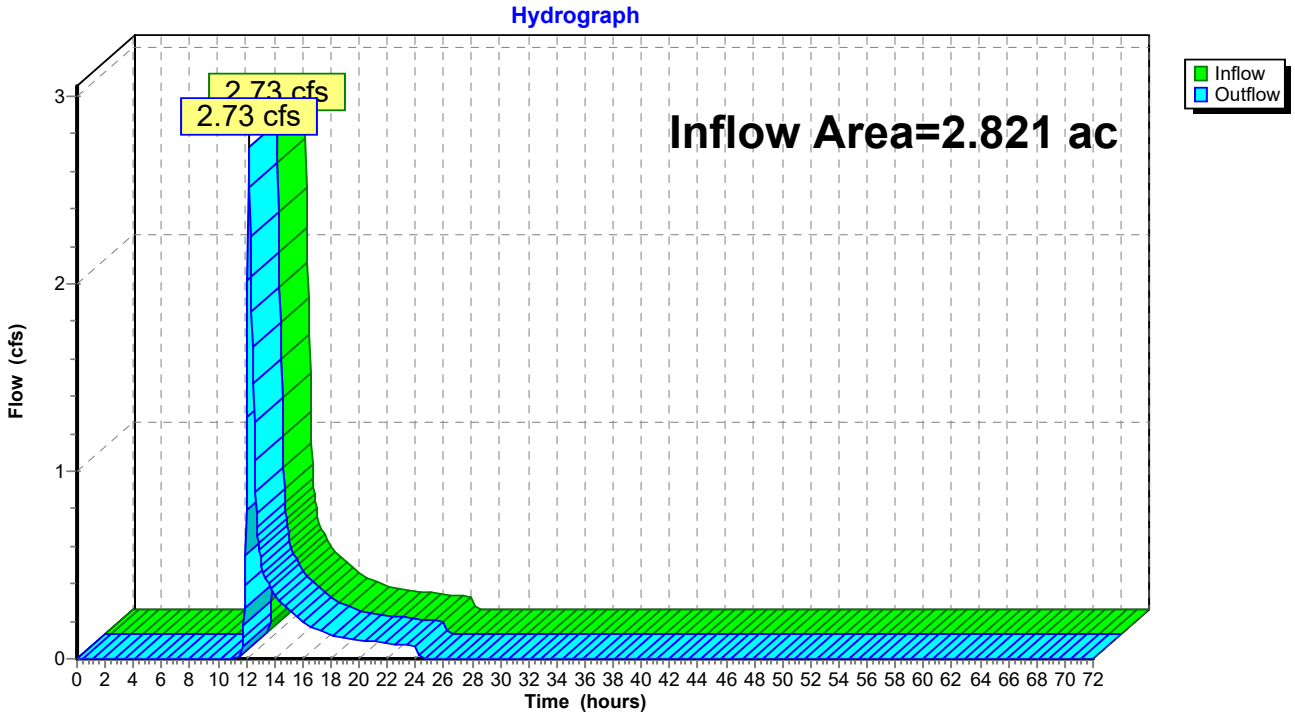


Summary for Reach 1R: 1R

Inflow Area = 2.821 ac, 6.95% Impervious, Inflow Depth = 1.17" for 10-Year event
Inflow = 2.73 cfs @ 12.19 hrs, Volume= 0.276 af
Outflow = 2.73 cfs @ 12.19 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

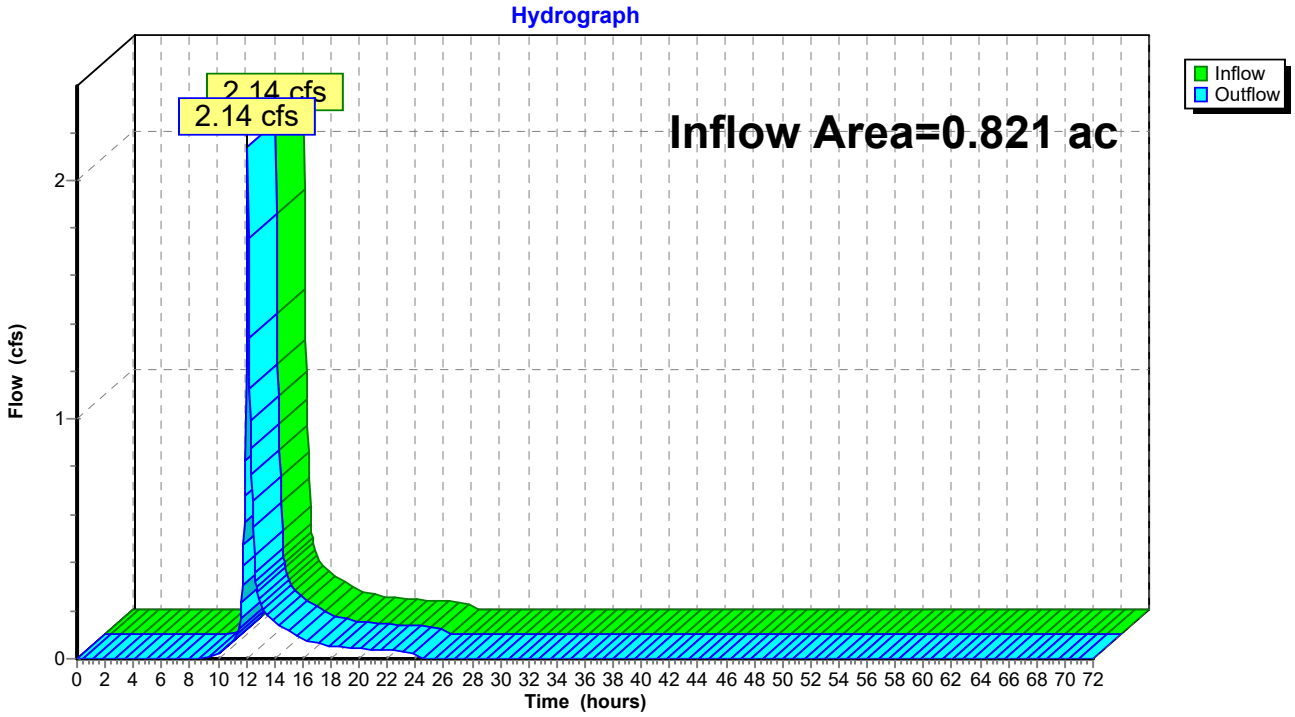


Summary for Reach 2R:

Inflow Area = 0.821 ac, 35.35% Impervious, Inflow Depth = 2.28" for 10-Year event
Inflow = 2.14 cfs @ 12.10 hrs, Volume= 0.156 af
Outflow = 2.14 cfs @ 12.10 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

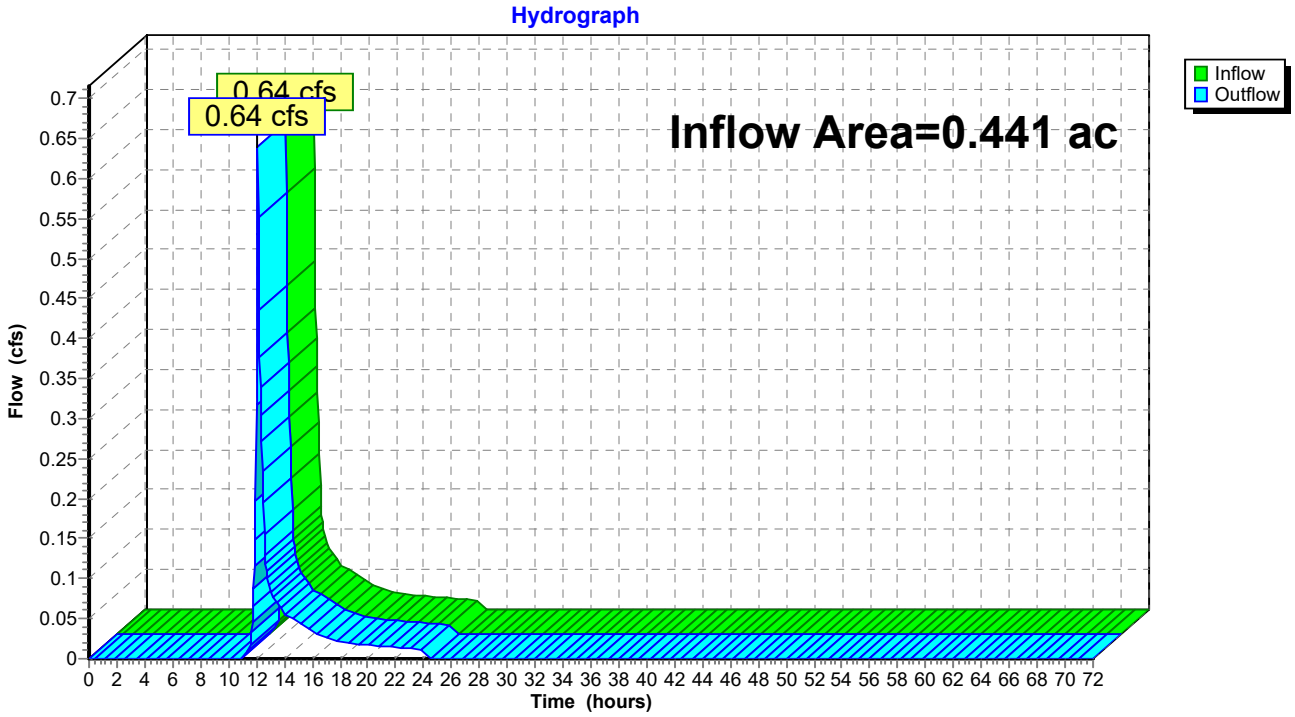


Summary for Reach 3R:

Inflow Area = 0.441 ac, 9.07% Impervious, Inflow Depth = 1.37" for 10-Year event
Inflow = 0.64 cfs @ 12.10 hrs, Volume= 0.050 af
Outflow = 0.64 cfs @ 12.10 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To Northern Property Runoff Area=122,882 sf 6.95% Impervious Runoff Depth=1.92"
Flow Length=354' Tc=11.9 min CN=59 Runoff=4.81 cfs 0.450 af

Subcatchment 2S: To South Street Runoff Area=35,746 sf 35.35% Impervious Runoff Depth=3.29"
Flow Length=397' Tc=6.0 min CN=74 Runoff=3.10 cfs 0.225 af

Subcatchment 3S: To Southern Property Runoff Area=19,195 sf 9.07% Impervious Runoff Depth=2.17"
Flow Length=136' Tc=6.0 min CN=62 Runoff=1.06 cfs 0.080 af

Reach 1R: 1R Inflow=4.81 cfs 0.450 af
Outflow=4.81 cfs 0.450 af

Reach 2R: Inflow=3.10 cfs 0.225 af
Outflow=3.10 cfs 0.225 af

Reach 3R: Inflow=1.06 cfs 0.080 af
Outflow=1.06 cfs 0.080 af

Total Runoff Area = 4.082 ac Runoff Volume = 0.755 af Average Runoff Depth = 2.22"
87.11% Pervious = 3.556 ac 12.89% Impervious = 0.526 ac

Summary for Subcatchment 1S: To Northern Property Line

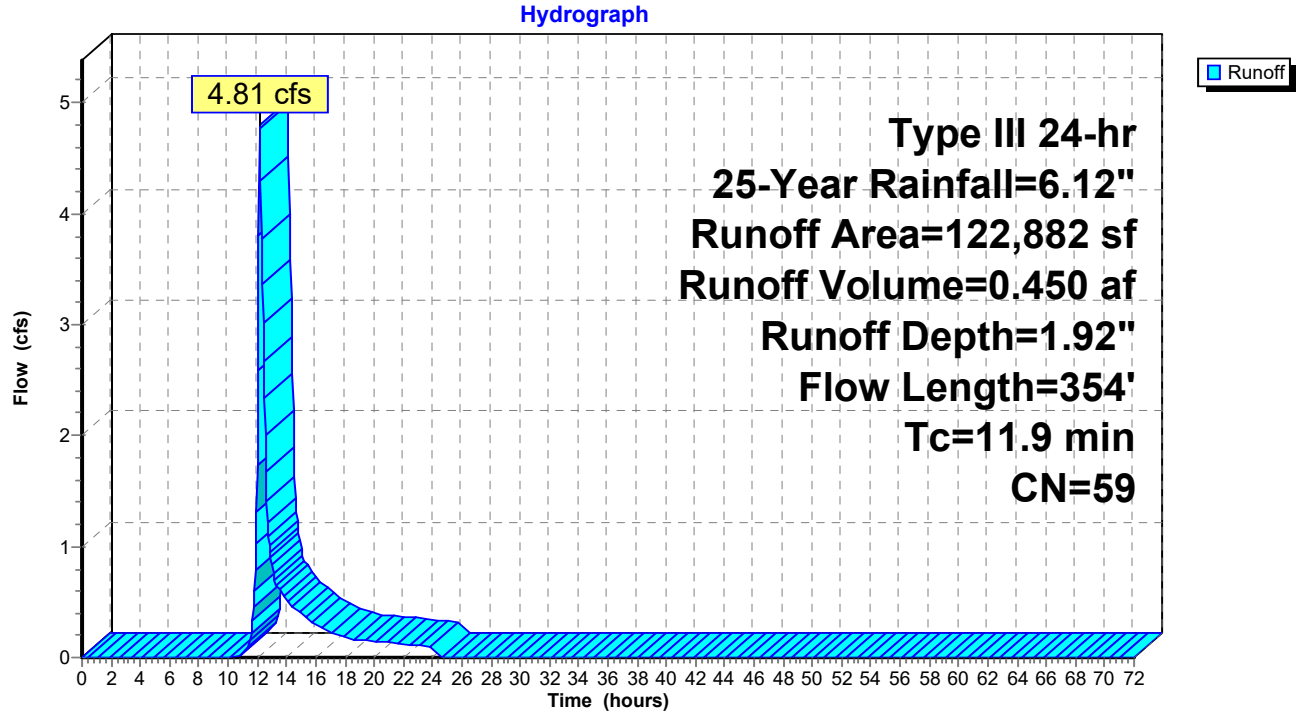
Runoff = 4.81 cfs @ 12.18 hrs, Volume= 0.450 af, Depth= 1.92"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	20,342	61	>75% Grass cover, Good, HSG B
	93,999	55	Woods, Good, HSG B
	1,970	98	Unconnected pavement, HSG B
*	6,021	98	Paved parking/Conc Walks, HSG B
*	550	98	Ledge
	122,882	59	Weighted Average
	114,341		93.05% Pervious Area
	8,541		6.95% Impervious Area
	1,970		23.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
1.6	304	0.0380	3.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.9	354	Total			

Subcatchment 1S: To Northern Property Line



Summary for Subcatchment 2S: To South Street

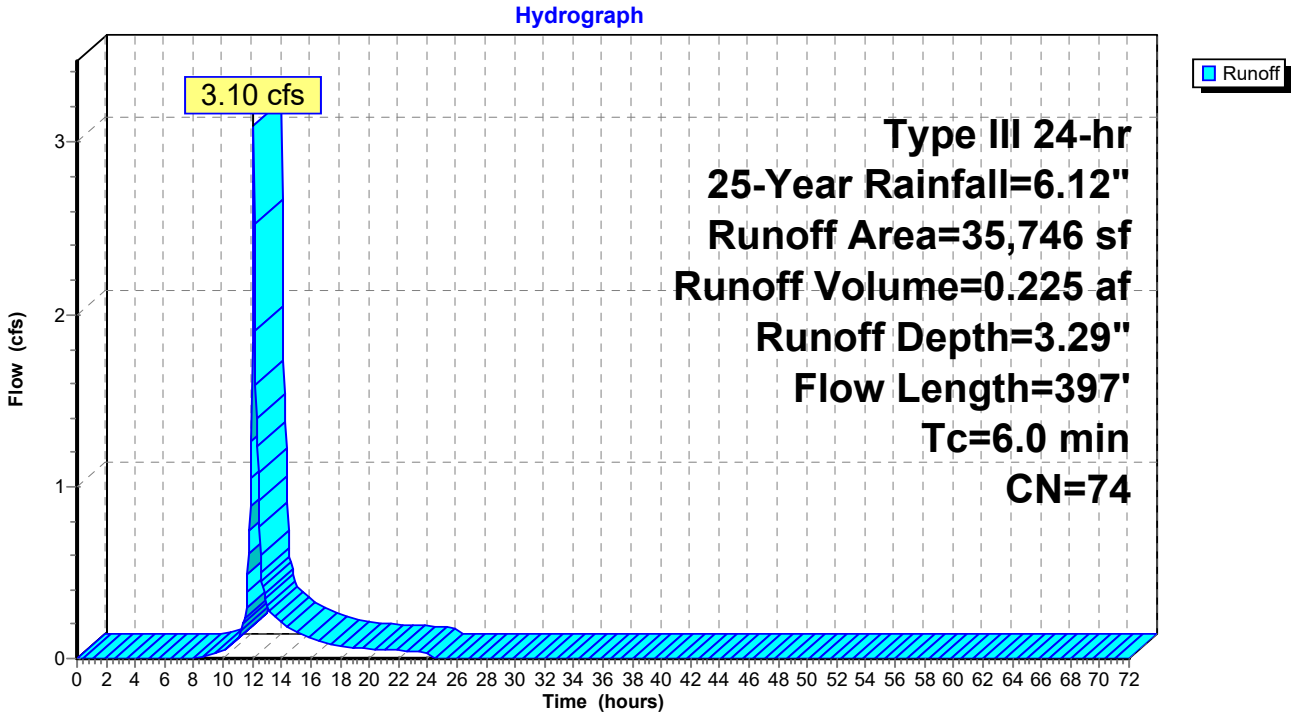
Runoff = 3.10 cfs @ 12.09 hrs, Volume= 0.225 af, Depth= 3.29"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	22,120	61	>75% Grass cover, Good, HSG B
	989	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
	8,065	98	Paved parking, HSG B
*	3,900	98	Ledge
	35,746	74	Weighted Average
	23,109		64.65% Pervious Area
	12,637		35.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	220	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	397	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

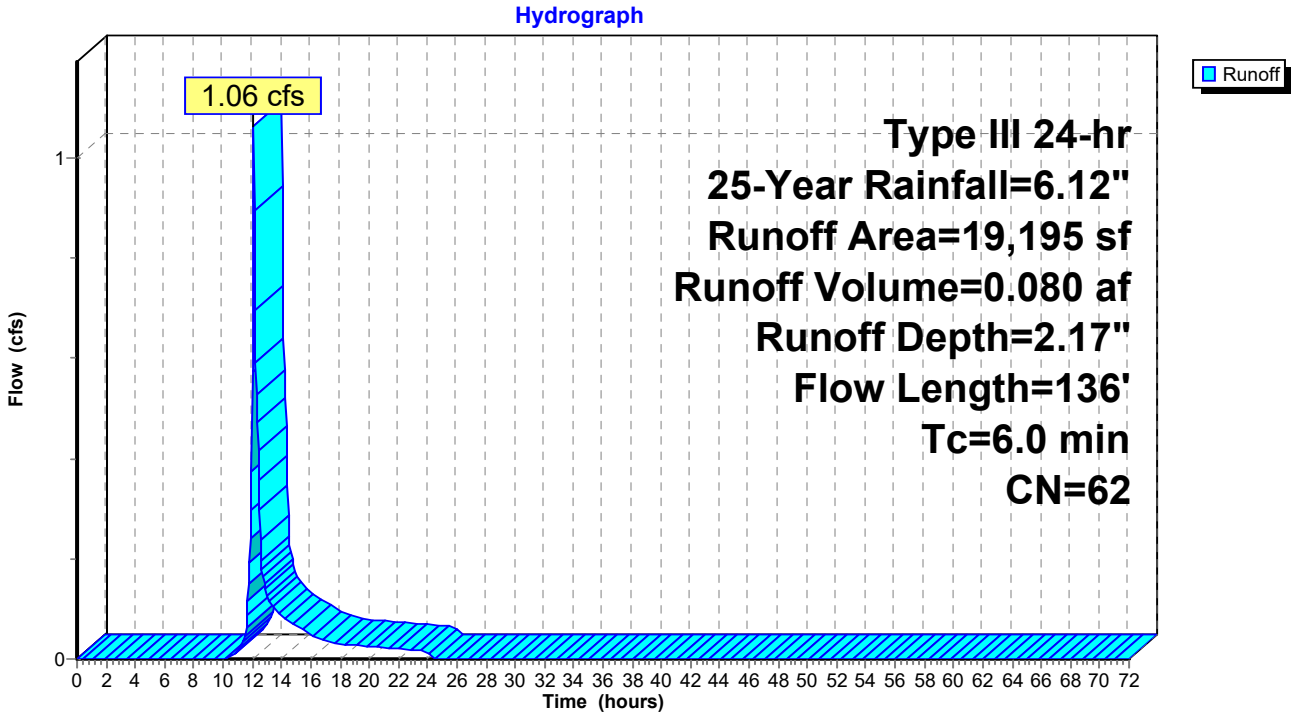
Runoff = 1.06 cfs @ 12.10 hrs, Volume= 0.080 af, Depth= 2.17"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	10,664	61	>75% Grass cover, Good, HSG B
	6,790	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	1,741	98	Ledge
	19,195	62	Weighted Average
	17,454		90.93% Pervious Area
	1,741		9.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0600	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0.4	86	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	136	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: To Southern Property Line

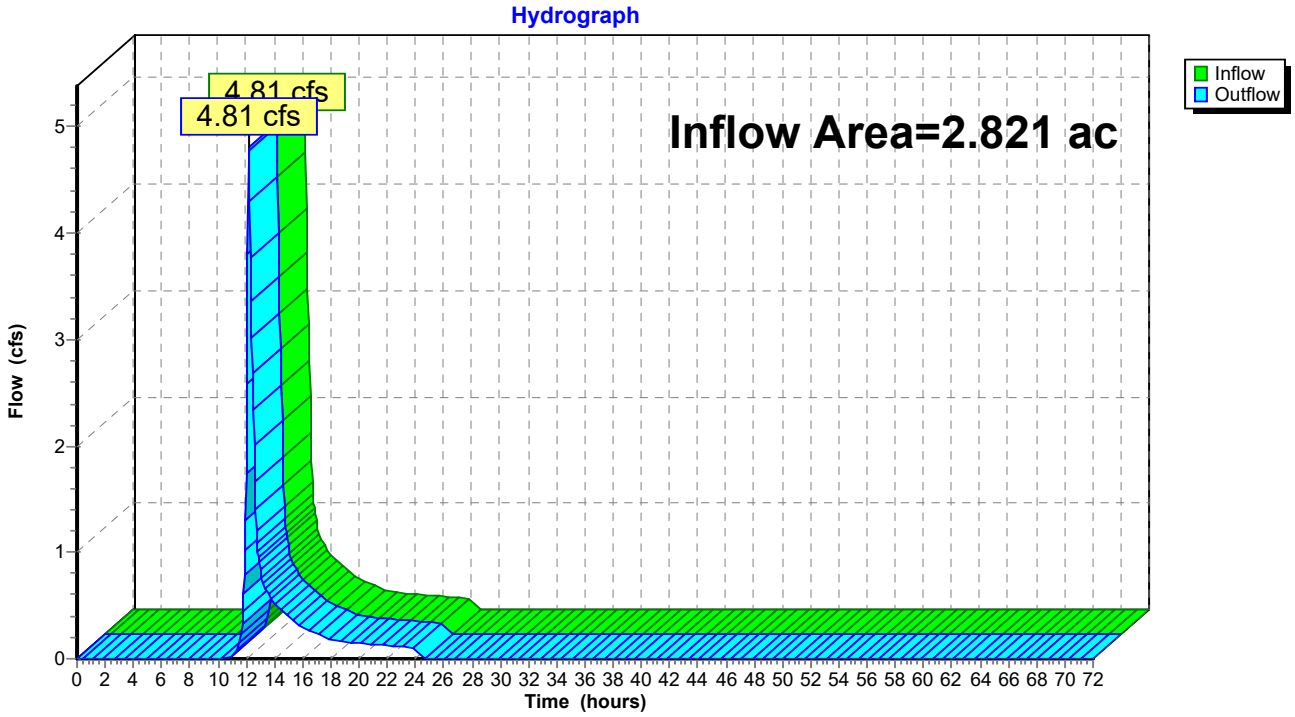


Summary for Reach 1R: 1R

Inflow Area = 2.821 ac, 6.95% Impervious, Inflow Depth = 1.92" for 25-Year event
Inflow = 4.81 cfs @ 12.18 hrs, Volume= 0.450 af
Outflow = 4.81 cfs @ 12.18 hrs, Volume= 0.450 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

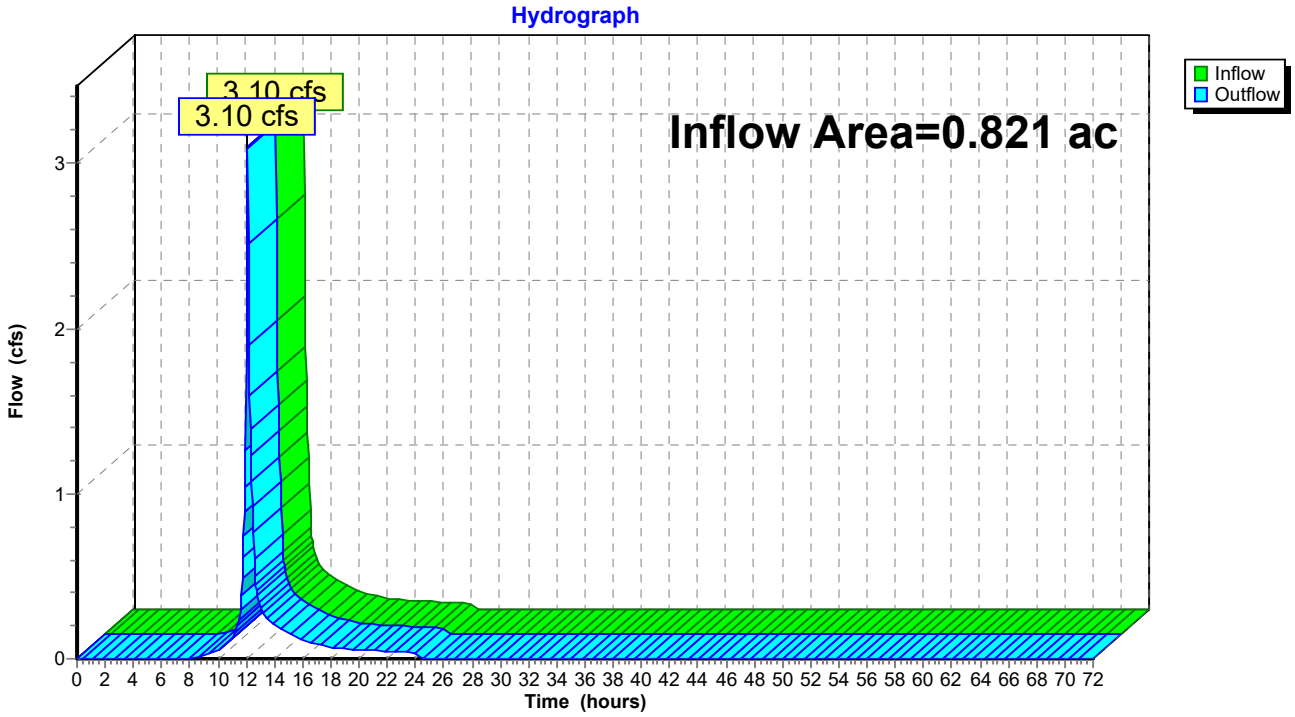


Summary for Reach 2R:

Inflow Area = 0.821 ac, 35.35% Impervious, Inflow Depth = 3.29" for 25-Year event
Inflow = 3.10 cfs @ 12.09 hrs, Volume= 0.225 af
Outflow = 3.10 cfs @ 12.09 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

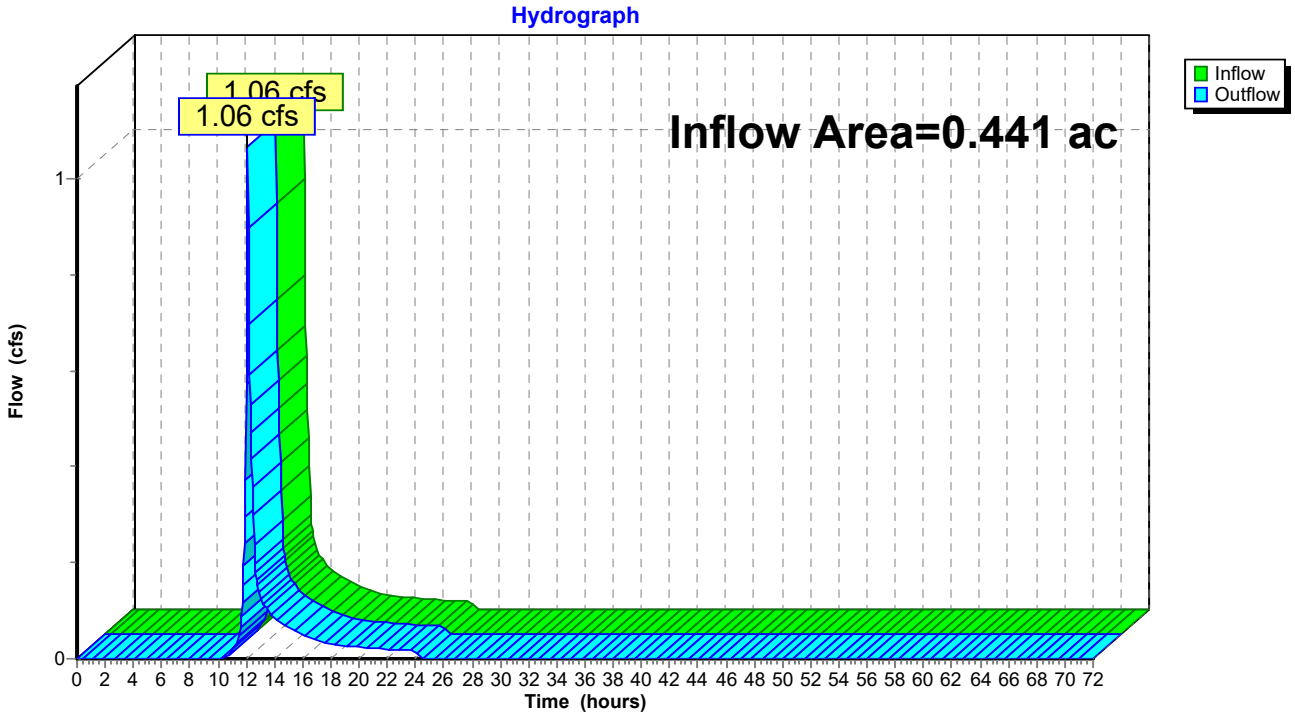


Summary for Reach 3R:

Inflow Area = 0.441 ac, 9.07% Impervious, Inflow Depth = 2.17" for 25-Year event
Inflow = 1.06 cfs @ 12.10 hrs, Volume= 0.080 af
Outflow = 1.06 cfs @ 12.10 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To Northern Property Runoff Area=122,882 sf 6.95% Impervious Runoff Depth=3.67"
Flow Length=354' Tc=11.9 min CN=59 Runoff=9.78 cfs 0.863 af

Subcatchment 2S: To South Street Runoff Area=35,746 sf 35.35% Impervious Runoff Depth=5.47"
Flow Length=397' Tc=6.0 min CN=74 Runoff=5.12 cfs 0.374 af

Subcatchment 3S: To Southern Property Runoff Area=19,195 sf 9.07% Impervious Runoff Depth=4.03"
Flow Length=136' Tc=6.0 min CN=62 Runoff=2.03 cfs 0.148 af

Reach 1R: 1R Inflow=9.78 cfs 0.863 af
Outflow=9.78 cfs 0.863 af

Reach 2R: Inflow=5.12 cfs 0.374 af
Outflow=5.12 cfs 0.374 af

Reach 3R: Inflow=2.03 cfs 0.148 af
Outflow=2.03 cfs 0.148 af

Total Runoff Area = 4.082 ac Runoff Volume = 1.385 af Average Runoff Depth = 4.07"
87.11% Pervious = 3.556 ac 12.89% Impervious = 0.526 ac

Summary for Subcatchment 1S: To Northern Property Line

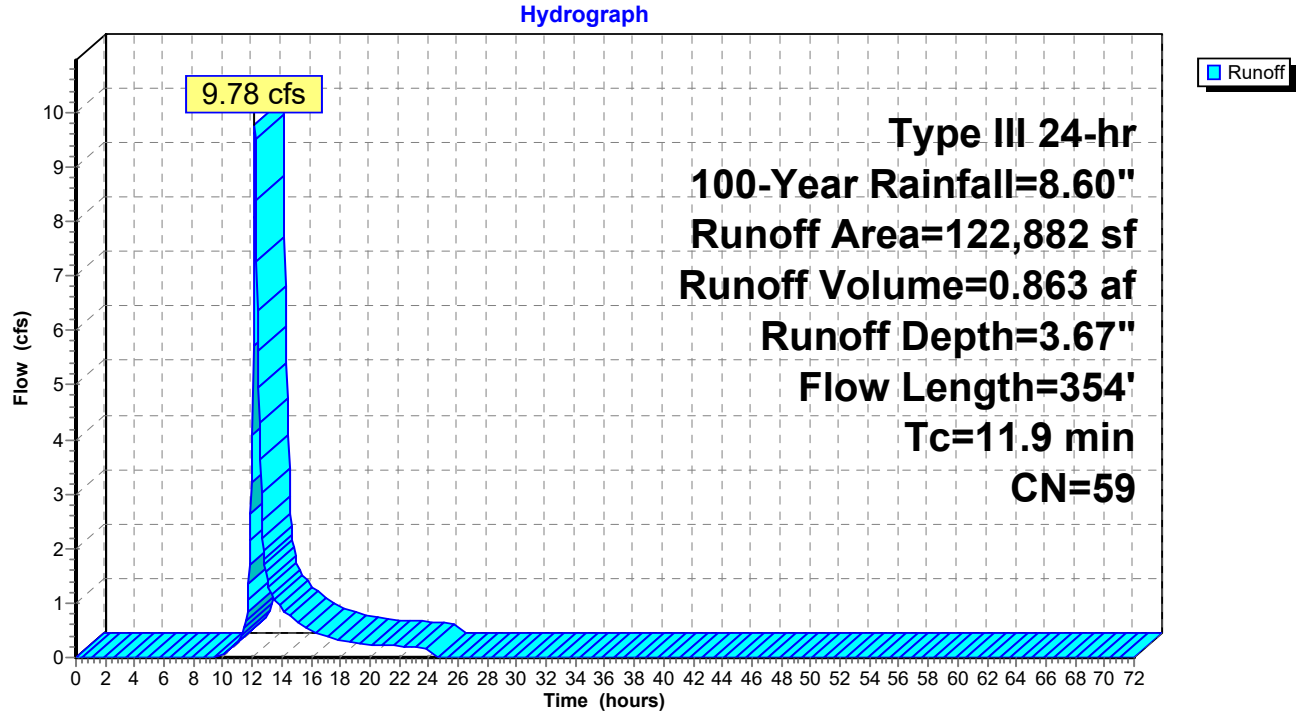
Runoff = 9.78 cfs @ 12.17 hrs, Volume= 0.863 af, Depth= 3.67"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	20,342	61	>75% Grass cover, Good, HSG B
	93,999	55	Woods, Good, HSG B
	1,970	98	Unconnected pavement, HSG B
*	6,021	98	Paved parking/Conc Walks, HSG B
*	550	98	Ledge
	122,882	59	Weighted Average
	114,341		93.05% Pervious Area
	8,541		6.95% Impervious Area
	1,970		23.07% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
1.6	304	0.0380	3.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.9	354	Total			

Subcatchment 1S: To Northern Property Line



Summary for Subcatchment 2S: To South Street

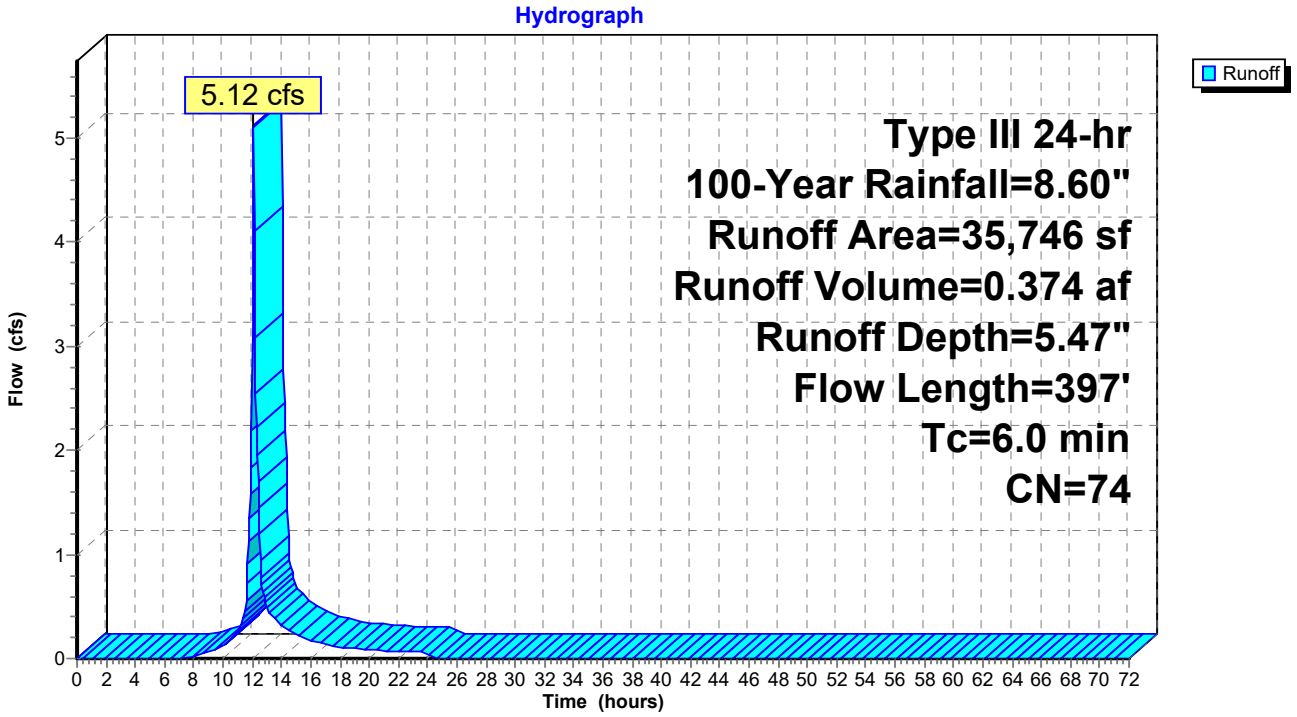
Runoff = 5.12 cfs @ 12.09 hrs, Volume= 0.374 af, Depth= 5.47"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	22,120	61	>75% Grass cover, Good, HSG B
	989	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
	8,065	98	Paved parking, HSG B
*	3,900	98	Ledge
	35,746	74	Weighted Average
	23,109		64.65% Pervious Area
	12,637		35.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	220	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	397	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

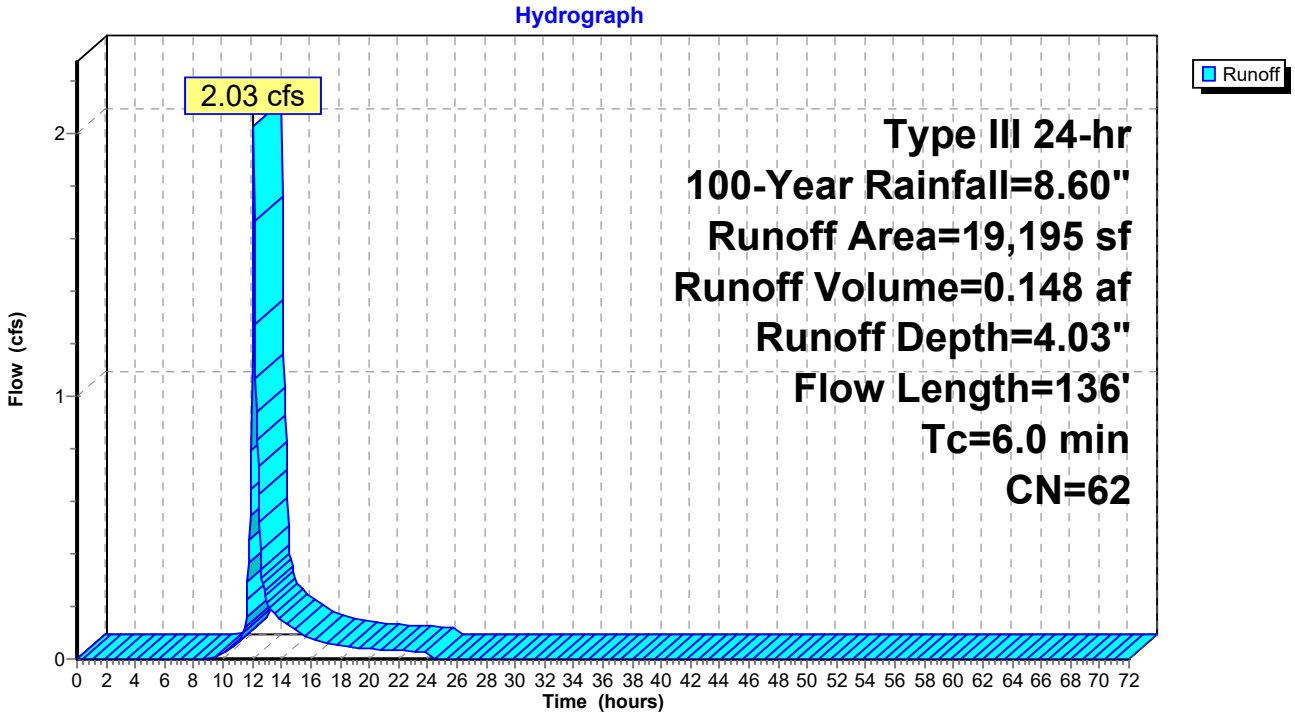
Runoff = 2.03 cfs @ 12.09 hrs, Volume= 0.148 af, Depth= 4.03"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	10,664	61	>75% Grass cover, Good, HSG B
	6,790	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	1,741	98	Ledge
	19,195	62	Weighted Average
	17,454		90.93% Pervious Area
	1,741		9.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.0600	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.31"
0.4	86	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.6	136	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S: To Southern Property Line

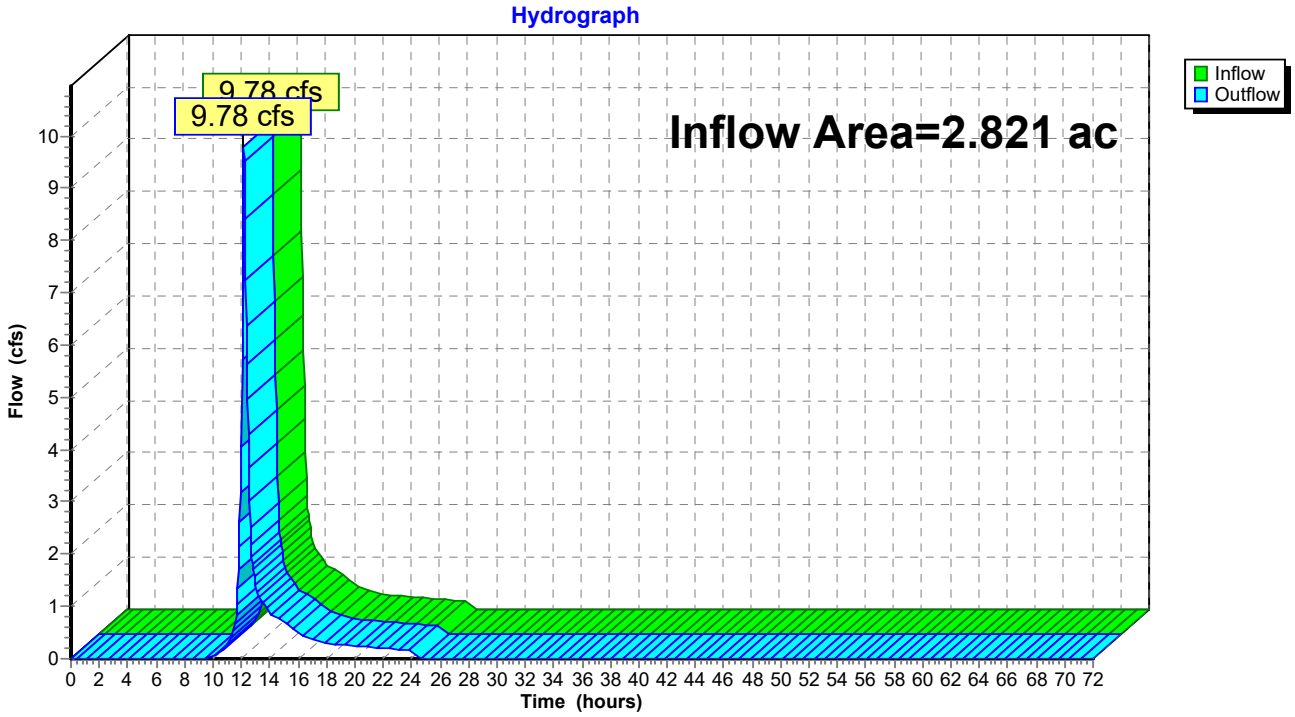


Summary for Reach 1R: 1R

Inflow Area = 2.821 ac, 6.95% Impervious, Inflow Depth = 3.67" for 100-Year event
Inflow = 9.78 cfs @ 12.17 hrs, Volume= 0.863 af
Outflow = 9.78 cfs @ 12.17 hrs, Volume= 0.863 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

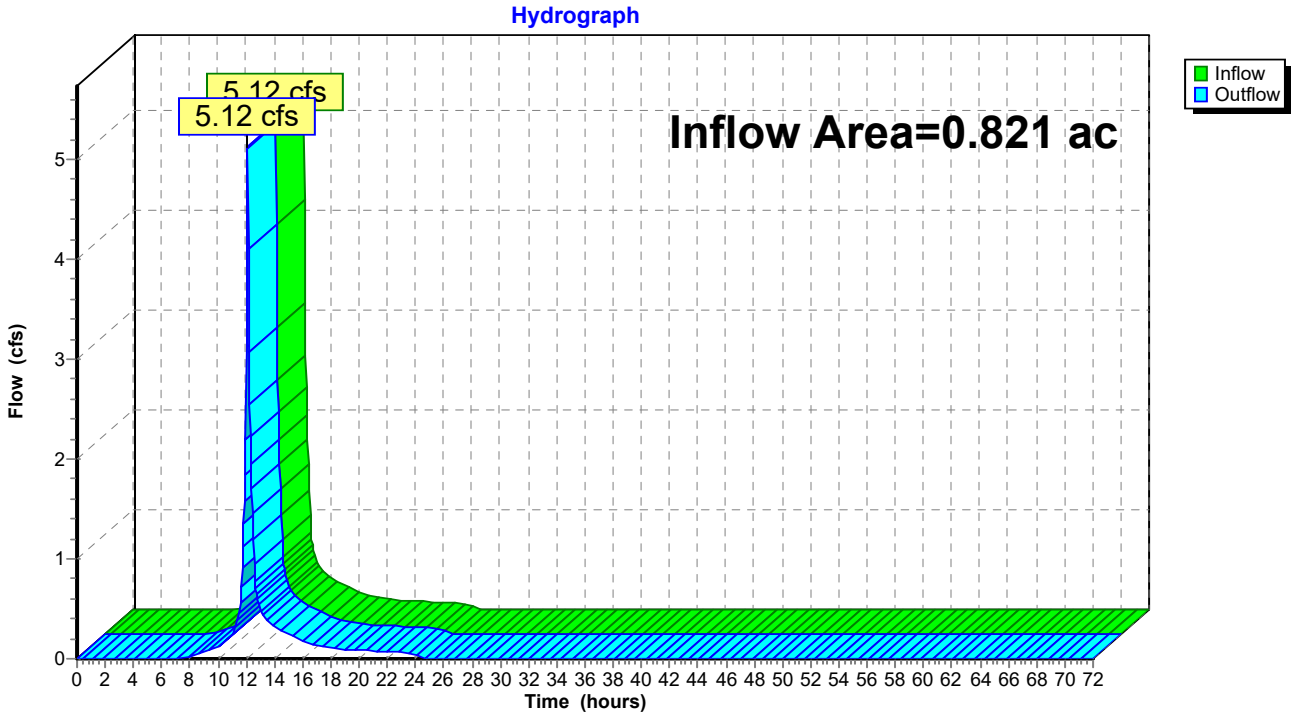


Summary for Reach 2R:

Inflow Area = 0.821 ac, 35.35% Impervious, Inflow Depth = 5.47" for 100-Year event
Inflow = 5.12 cfs @ 12.09 hrs, Volume= 0.374 af
Outflow = 5.12 cfs @ 12.09 hrs, Volume= 0.374 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

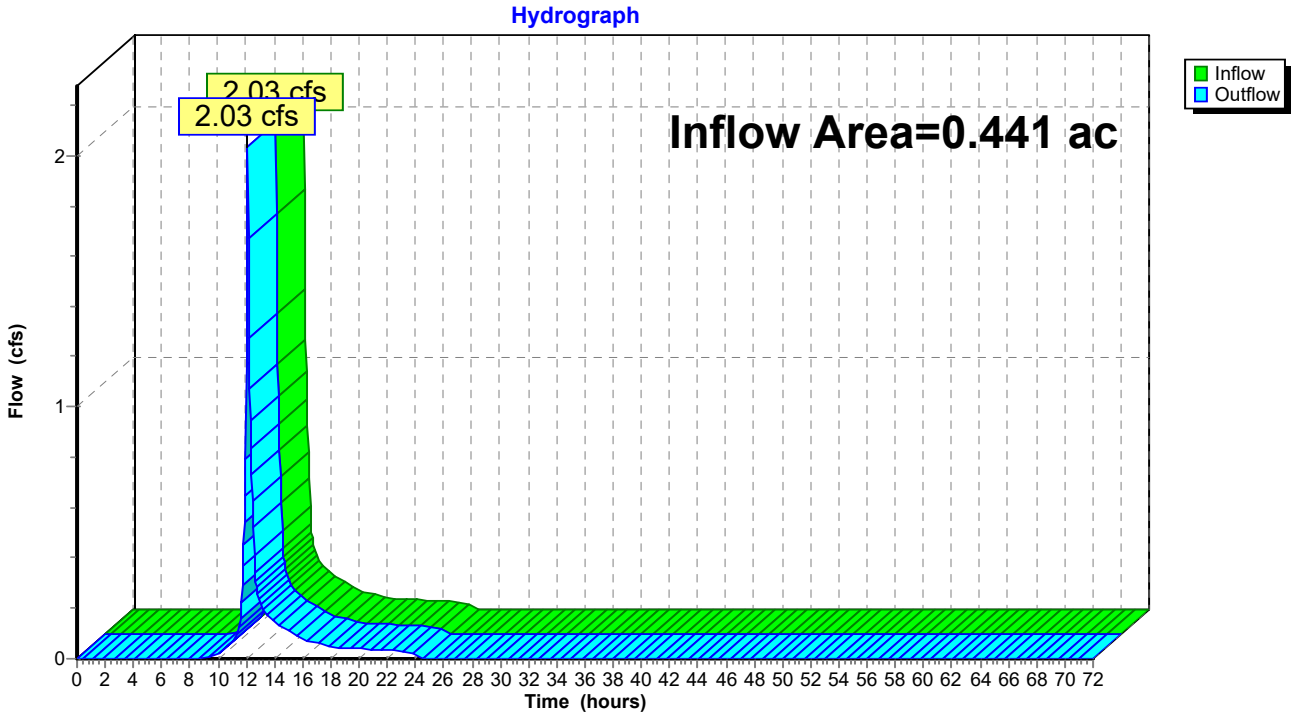


Summary for Reach 3R:

Inflow Area = 0.441 ac, 9.07% Impervious, Inflow Depth = 4.03" for 100-Year event
Inflow = 2.03 cfs @ 12.09 hrs, Volume= 0.148 af
Outflow = 2.03 cfs @ 12.09 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



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SCALE IN FEET
30 0 30 60 90

DP3

DP2

DP1

1S

2S

1cS

1bS

1aS

BISHOPS LANE ~ PRIVATE ~

~ PUBLIC – VARIABLE WIDTH ~ SOUTH STREET

100' WETLAND BUFFER

50' WETLAND BUFFER

Edge of Cohasset Hills

ASSESSORS MAP 70 LOT 98
#26 DEL PRETE DRIVE
N/F PRIYA C. HOWELL &
PETER E. HOWELL
DEED BOOK 41161 PAGE 80

ASSESSORS MAP 70 LOT 97
#25 DEL PRETE DRIVE
N/F DAVID J. GRIFFIN &
KATHY M. GRIFFIN
DEED BOOK 13366 PAGE 311

ASSESSORS MAP 70 LOT 14
#27 SOUTH STREET
C/O SOUTH SHORE COUNTRY CLUB
N/F TOWN OF HINGHAM
DEED BOOK 8357 PAGE 277

ASSESSORS MAP 70 LOT 114
#266 SOUTH STREET
N/F BARRY J. INVERNIZZI &
HEIDI D. INVERNIZZI
DEED BOOK 10434 PAGE 212

ASSESSORS MAP 70 LOT 113
#264 SOUTH STREET
N/F BRENDAN CLANCY CALEAY &
AMANDA BROWN CALEAY
DEED BOOK 47595 PAGE 43

ASSESSORS MAP 70 LOT 17
#256 SOUTH STREET
N/F MATTHEW O'HARA &
JENNIFER O'HARA
DEED BOOK 46937 PAGE 298

ASSESSORS MAP 70 LOT 18
#248 SOUTH STREET
N/F CHARLES W. WHITLOCK &
SHARON A. CLARK
DEED BOOK 41840 PAGE 47

ASSESSORS MAP 70 LOT 24
#2 BISHOPS LANE
N/F DANIEL P. FICKES &
KARA K. FICKES
DEED BOOK 41954 PAGE 64

ASSESSORS MAP 70 LOT 23
#6 BISHOPS LANE
N/F KEVIN M. FLAHERTY
& DEBRA A. LEBLANC-FLAHERTY
DEED BOOK 8102 PAGE 129

BENCHMARK SPINDLE
EL=21.61

BENCHMARK
SPIKE SET
EL=21.61

WF1 WF2 WF3 WF4 WF5 WF6 WF7 WF8
WETLAND UPLAND

DEFINITIVE SUBDIVISION PLAN

#16 BISHOPS LANE
HINGHAM, MASSACHUSETTS

PREPARED FOR: YOUNG FAMILY TRUST
16 BISHOPS LANE
HINGHAM, MA 02043

MARCH 24, 2023

SCALE: AS NOTED

JOB No. 17-360

LATEST REVISION:

PROPOSED
WATERSHED PLAN

SHEET

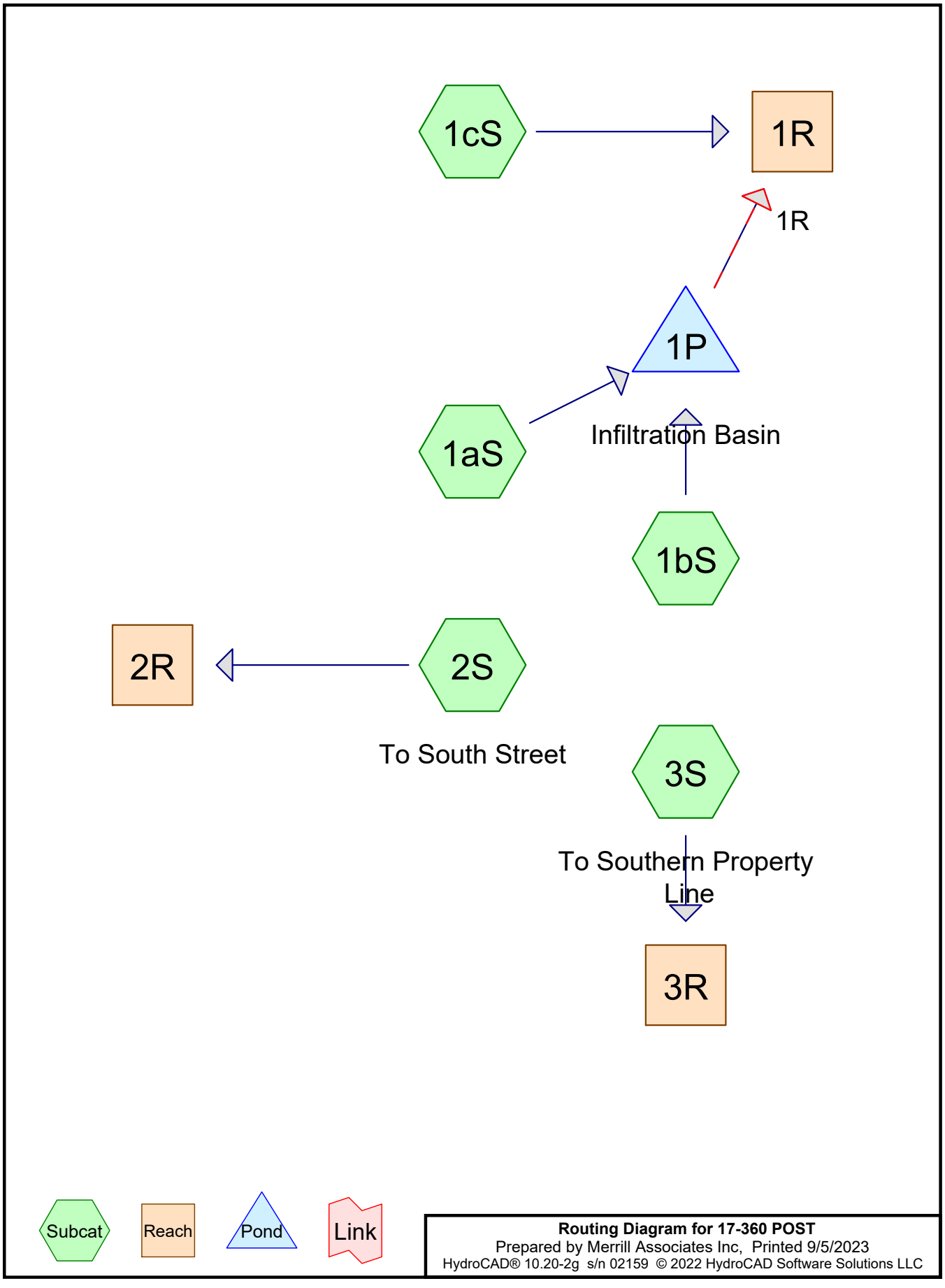
Merrill
Engineers and Land Surveyors
427 COLUMBIA ROAD, HANOVER, MA 02339 / T: (781) 826-9200
26 UNION STREET, PLYMOUTH MA 02360 / T: (508) 746-6060
WWW.MERRILLINC.COM

DRAWN BY: JG

DESIGNED BY: DK

CHECKED BY: DK

REVISIONS



Routing Diagram for 17-360 POST
Prepared by Merrill Associates Inc, Printed 9/5/2023

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.31	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.89	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.12	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.60	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.323	61	>75% Grass cover, Good, HSG B (1aS, 1bS, 1cS, 2S, 3S)
0.129	98	Ledge (1aS, 1bS, 2S, 3S)
0.753	98	Paved parking/Conc Walks, HSG B (1aS, 1bS, 1cS, 2S)
0.149	98	Roofs, HSG B (1aS, 1bS, 1cS)
0.088	98	Sidewalk (1bS, 2S)
0.640	55	Woods, Good, HSG B (1bS, 1cS, 2S, 3S)
4.082	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.865	HSG B	1aS, 1bS, 1cS, 2S, 3S
0.000	HSG C	
0.000	HSG D	
0.217	Other	1aS, 1bS, 2S, 3S
4.082		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	2.323	0.000	0.000	0.000	2.323	>75% Grass cover, Good	1aS, 1bS, 1cS, 2S, 3S
0.000	0.000	0.000	0.000	0.129	0.129	Ledge	1aS, 1bS, 2S, 3S
0.000	0.753	0.000	0.000	0.000	0.753	Paved parking/Conc Walks	1aS, 1bS, 1cS, 2S
0.000	0.149	0.000	0.000	0.000	0.149	Roofs	1aS, 1bS, 1cS
0.000	0.000	0.000	0.000	0.088	0.088	Sidewalk	1bS, 2S
0.000	0.640	0.000	0.000	0.000	0.640	Woods, Good	1bS, 1cS, 2S, 3S
0.000	**3.865**	**0.000**	**0.000**	**0.217**	**4.082**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1aS: Runoff Area=22,412 sf 51.24% Impervious Runoff Depth=1.49"
Flow Length=258' Tc=6.0 min CN=80 Runoff=0.87 cfs 0.064 af

Subcatchment 1bS: Runoff Area=95,283 sf 26.72% Impervious Runoff Depth=0.89"
Flow Length=255' Tc=6.0 min CN=70 Runoff=2.05 cfs 0.163 af

Subcatchment 1cS: Runoff Area=23,419 sf 13.96% Impervious Runoff Depth=0.61"
Flow Length=143' Tc=6.0 min CN=64 Runoff=0.30 cfs 0.027 af

Subcatchment 2S: To South Street Runoff Area=18,852 sf 43.78% Impervious Runoff Depth=1.29"
Tc=6.0 min CN=77 Runoff=0.63 cfs 0.047 af

Subcatchment 3S: To Southern Property Runoff Area=17,840 sf 1.46% Impervious Runoff Depth=0.38"
Tc=6.0 min CN=58 Runoff=0.09 cfs 0.013 af

Reach 1R: 1R Inflow=0.30 cfs 0.027 af
Outflow=0.30 cfs 0.027 af

Reach 2R: Inflow=0.63 cfs 0.047 af
Outflow=0.63 cfs 0.047 af

Reach 3R: Inflow=0.09 cfs 0.013 af
Outflow=0.09 cfs 0.013 af

Pond 1P: Infiltration Basin Peak Elev=26.52' Storage=1,881 cf Inflow=2.92 cfs 0.227 af
Discarded=0.89 cfs 0.227 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.89 cfs 0.227 af

Total Runoff Area = 4.082 ac Runoff Volume = 0.313 af Average Runoff Depth = 0.92"
72.60% Pervious = 2.963 ac 27.40% Impervious = 1.119 ac

Summary for Subcatchment 1aS:

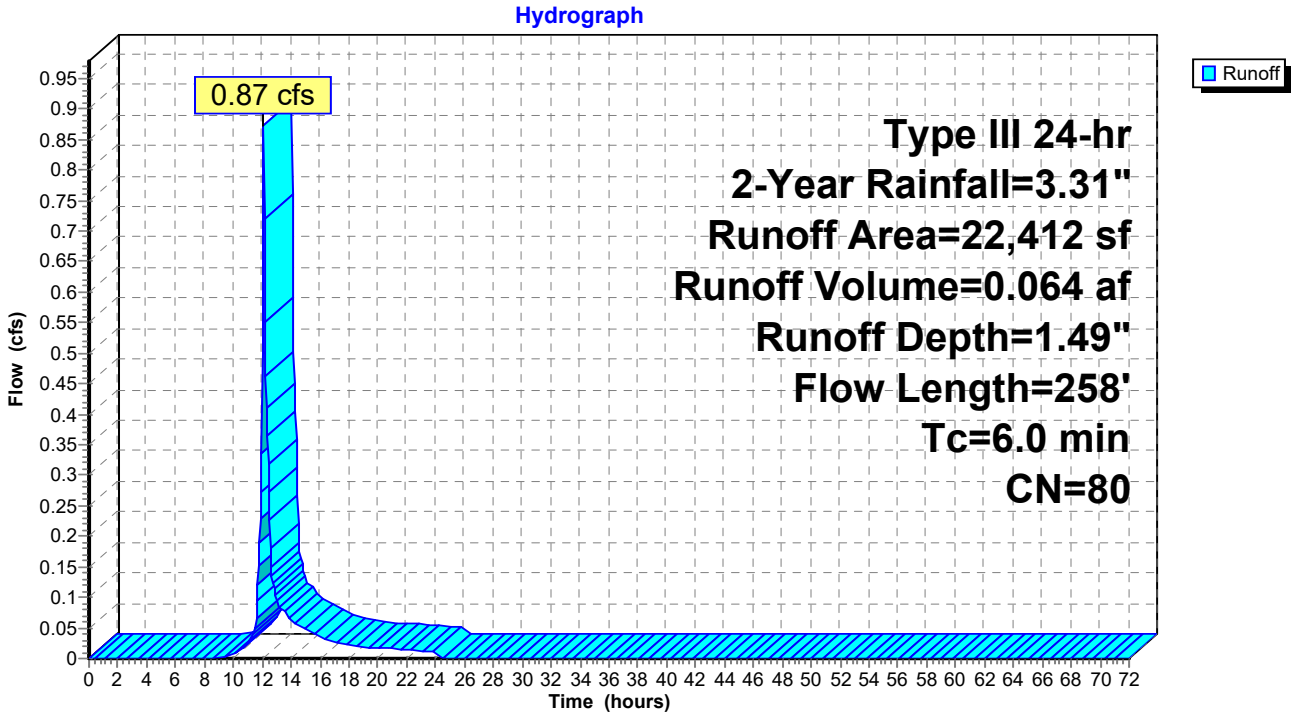
Runoff = 0.87 cfs @ 12.10 hrs, Volume= 0.064 af, Depth= 1.49"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	10,928	61	>75% Grass cover, Good, HSG B
	0	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
*	7,750	98	Paved parking/Conc Walks, HSG B
*	3,062	98	Ledge
	22,412	80	Weighted Average
	10,928		48.76% Pervious Area
	11,484		51.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	65	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	16	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.9	258	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1aS:



Summary for Subcatchment 1bS:

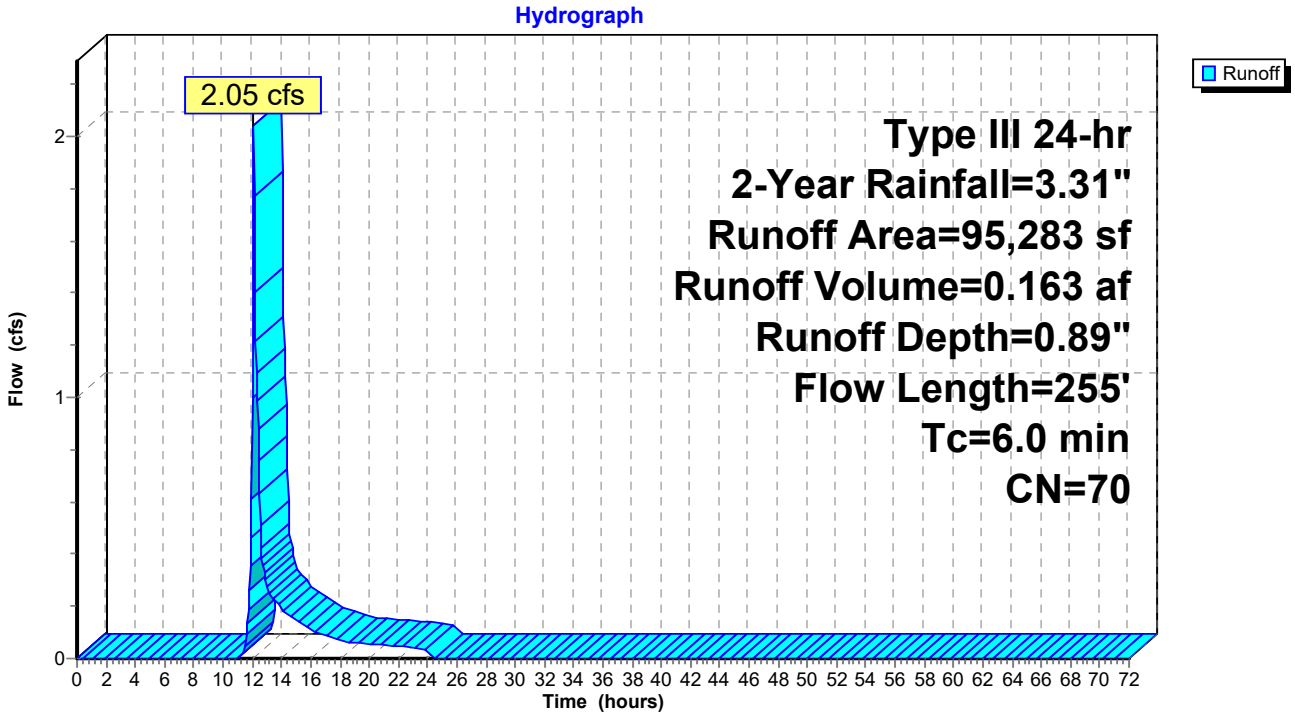
Runoff = 2.05 cfs @ 12.10 hrs, Volume= 0.163 af, Depth= 0.89"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	63,069	61	>75% Grass cover, Good, HSG B
	6,756	55	Woods, Good, HSG B
	4,124	98	Roofs, HSG B
*	17,346	98	Paved parking/Conc Walks, HSG B
*	1,433	98	Ledge
*	2,555	98	Sidewalk
	95,283	70	Weighted Average
	69,825		73.28% Pervious Area
	25,458		26.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.7	85	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	55	0.1820	6.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	65	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	255	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1bS:



Summary for Subcatchment 1cS:

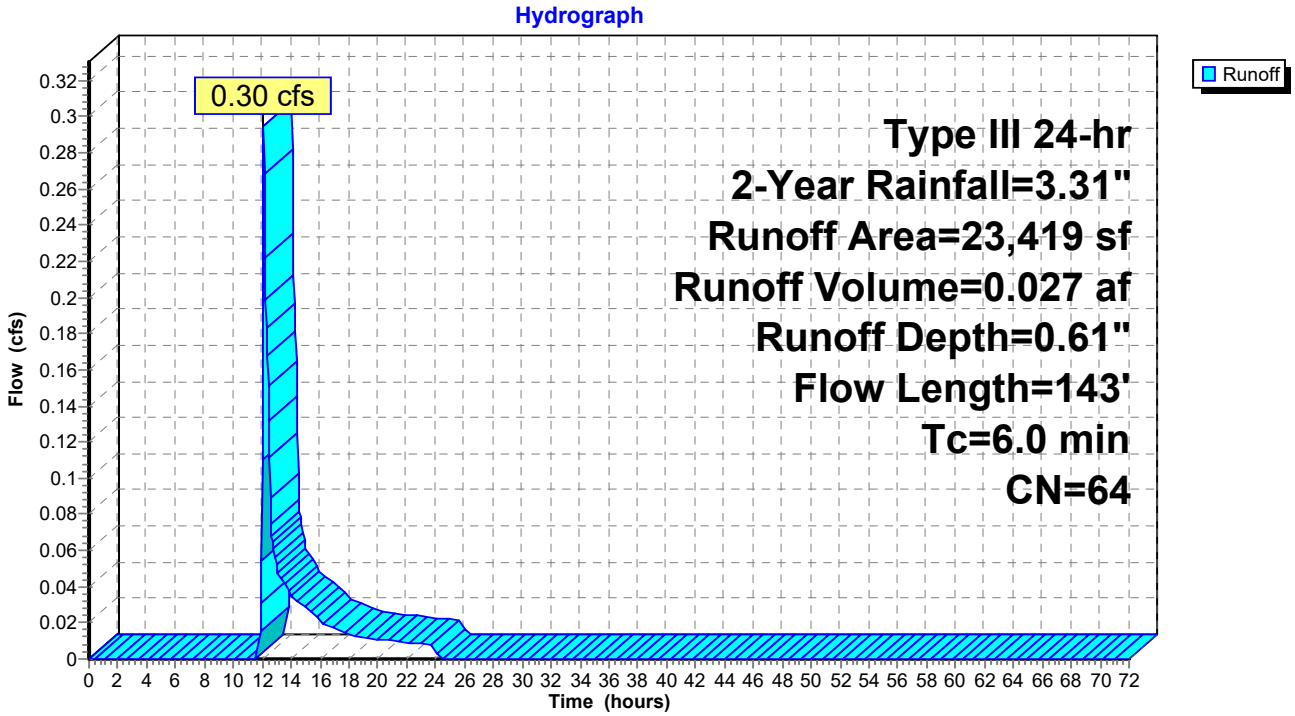
Runoff = 0.30 cfs @ 12.11 hrs, Volume= 0.027 af, Depth= 0.61"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	9,992	61	>75% Grass cover, Good, HSG B
	10,157	55	Woods, Good, HSG B
	1,696	98	Roofs, HSG B
*	1,574	98	Paved parking/Conc Walks, HSG B
*	0	98	Ledge
	23,419	64	Weighted Average
	20,149		86.04% Pervious Area
	3,270		13.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
0.3	93	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.9	143	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1cS:



Summary for Subcatchment 2S: To South Street

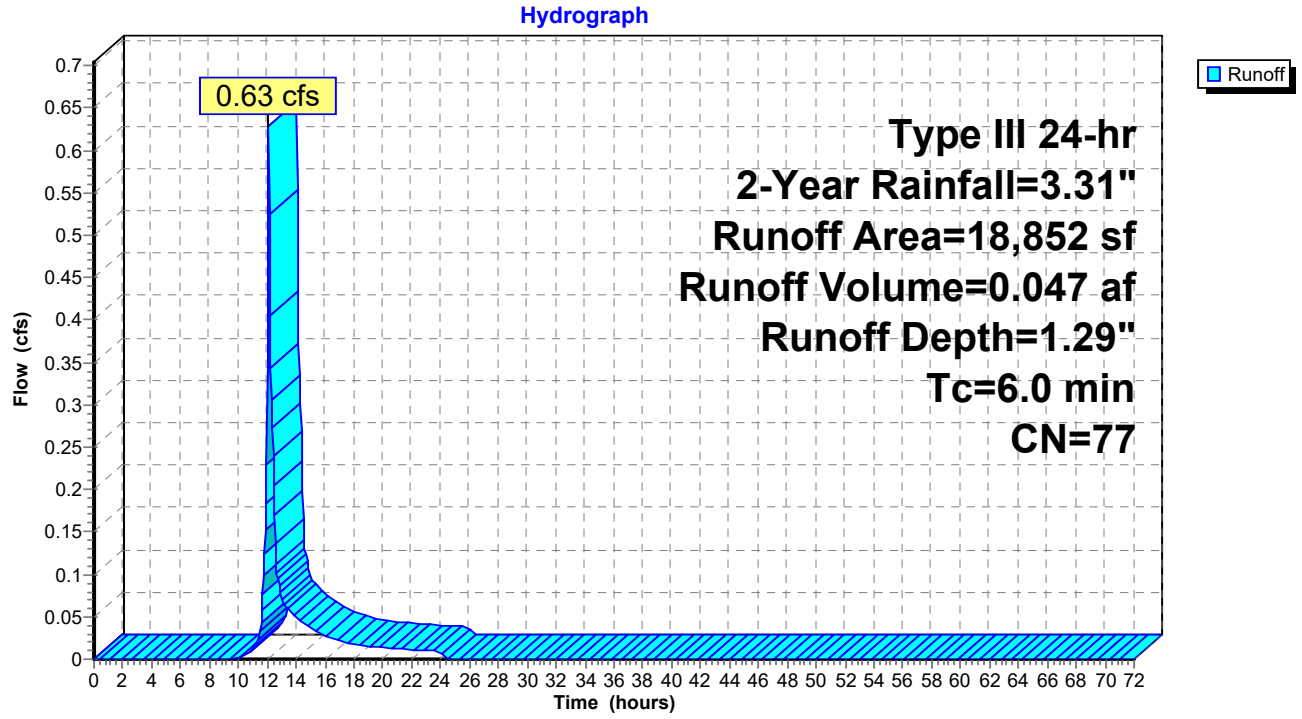
Runoff = 0.63 cfs @ 12.10 hrs, Volume= 0.047 af, Depth= 1.29"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	10,416	61	>75% Grass cover, Good, HSG B
	182	55	Woods, Good, HSG B
	0	98	Roofs, HSG B
*	6,111	98	Paved parking/Conc Walks, HSG B
*	858	98	Ledge
*	1,285	98	Sidewalk
	18,852	77	Weighted Average
	10,598		56.22% Pervious Area
	8,254		43.78% Impervious Area

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

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

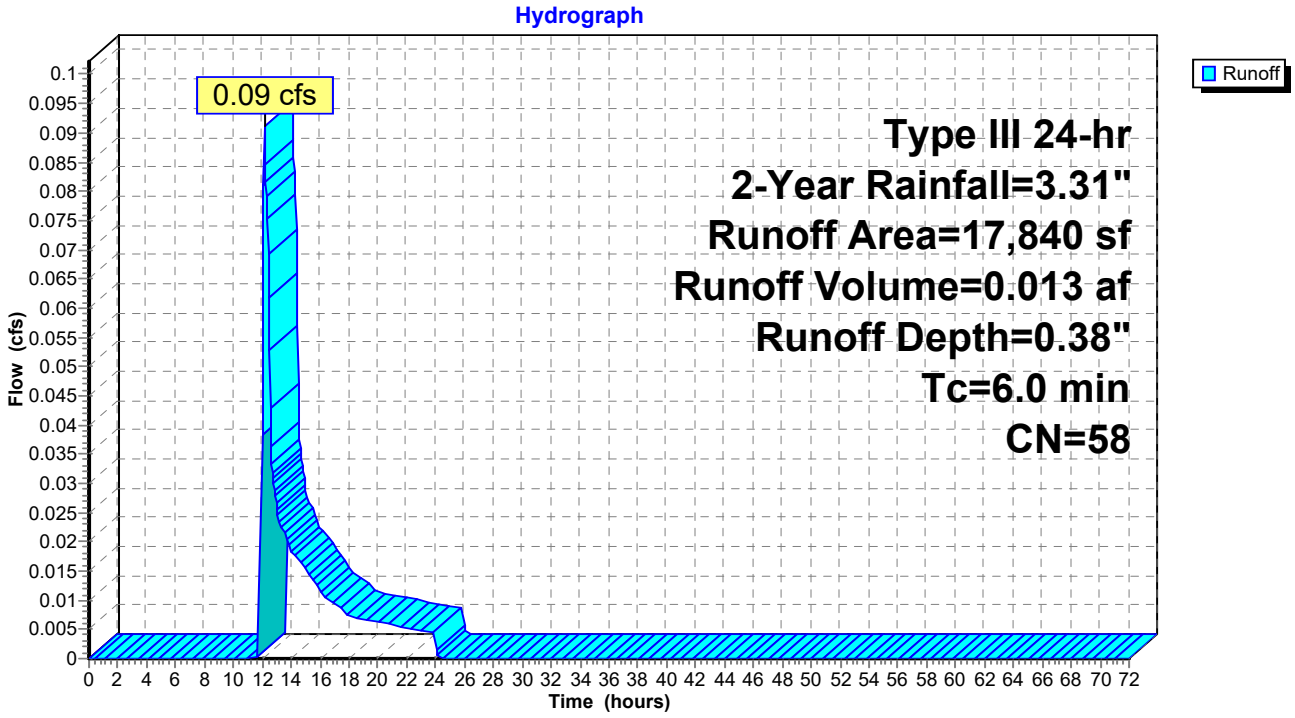
Runoff = 0.09 cfs @ 12.16 hrs, Volume= 0.013 af, Depth= 0.38"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
	6,785	61	>75% Grass cover, Good, HSG B
	10,794	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	261	98	Ledge
	17,840	58	Weighted Average
	17,579		98.54% Pervious Area
	261		1.46% Impervious Area

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

Subcatchment 3S: To Southern Property Line

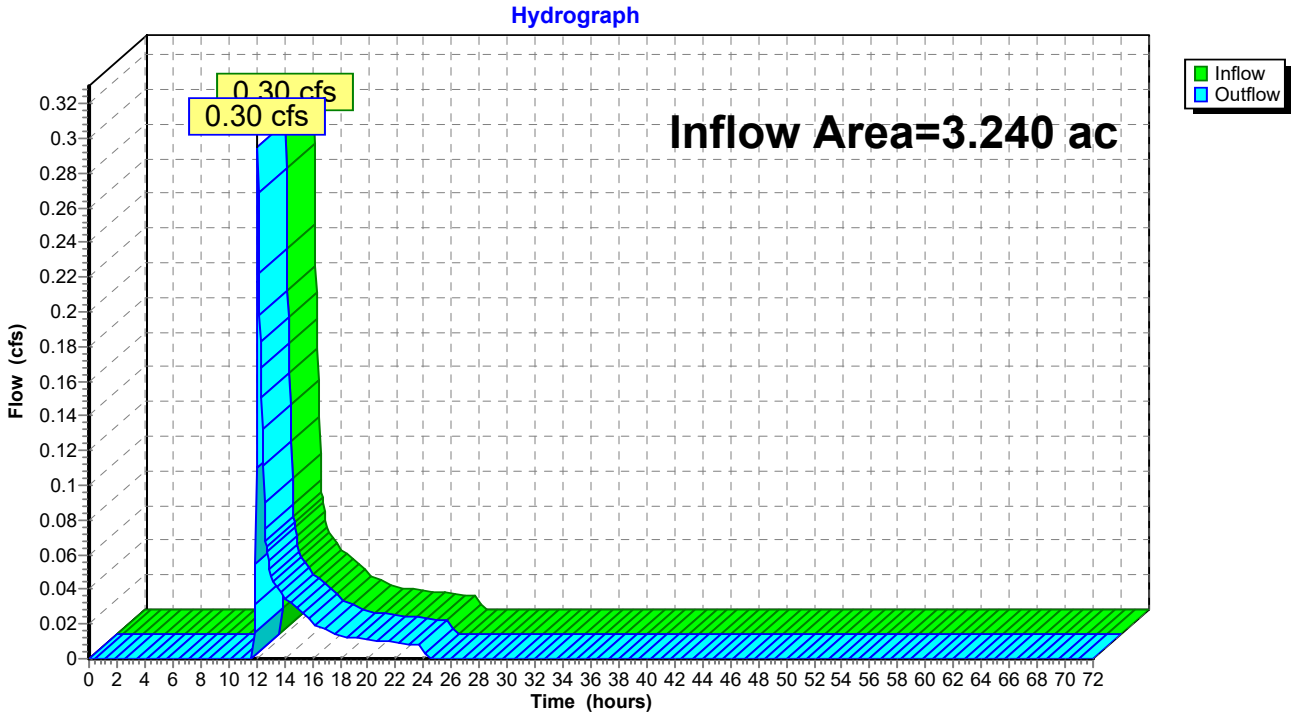


Summary for Reach 1R: 1R

Inflow Area = 3.240 ac, 28.50% Impervious, Inflow Depth = 0.10" for 2-Year event
Inflow = 0.30 cfs @ 12.11 hrs, Volume= 0.027 af
Outflow = 0.30 cfs @ 12.11 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

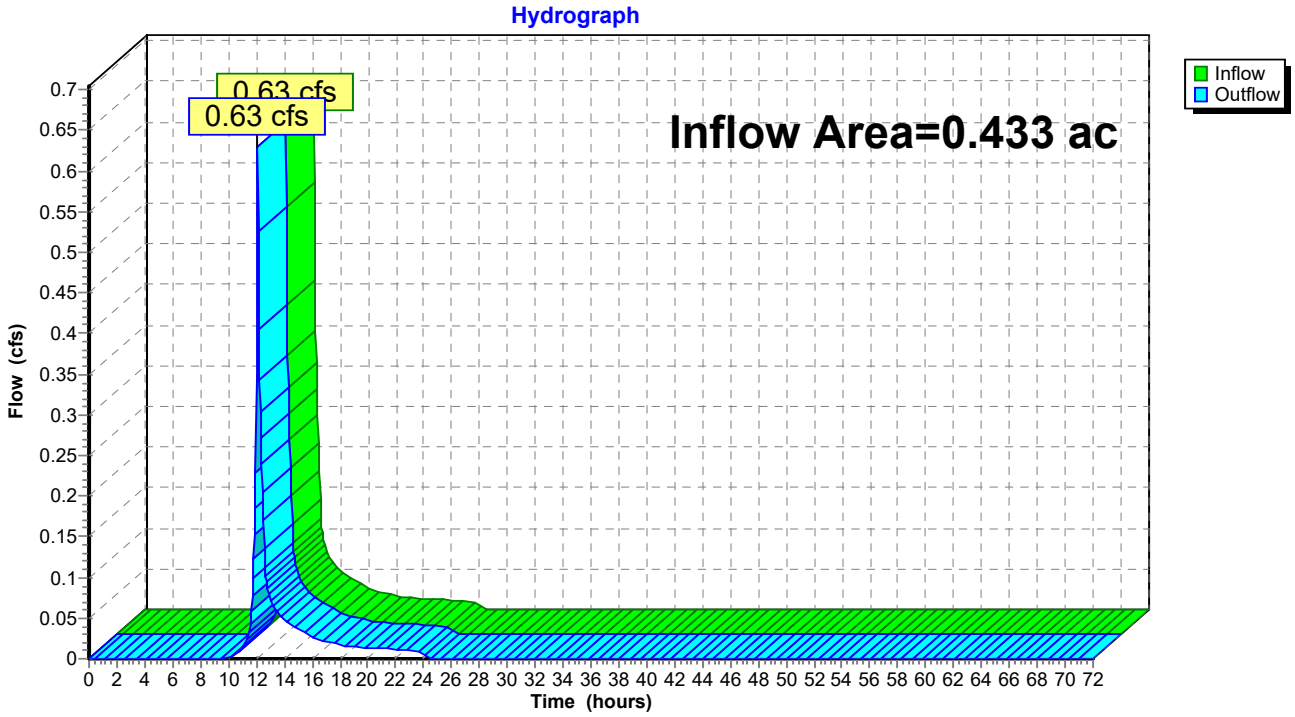


Summary for Reach 2R:

Inflow Area = 0.433 ac, 43.78% Impervious, Inflow Depth = 1.29" for 2-Year event
Inflow = 0.63 cfs @ 12.10 hrs, Volume= 0.047 af
Outflow = 0.63 cfs @ 12.10 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

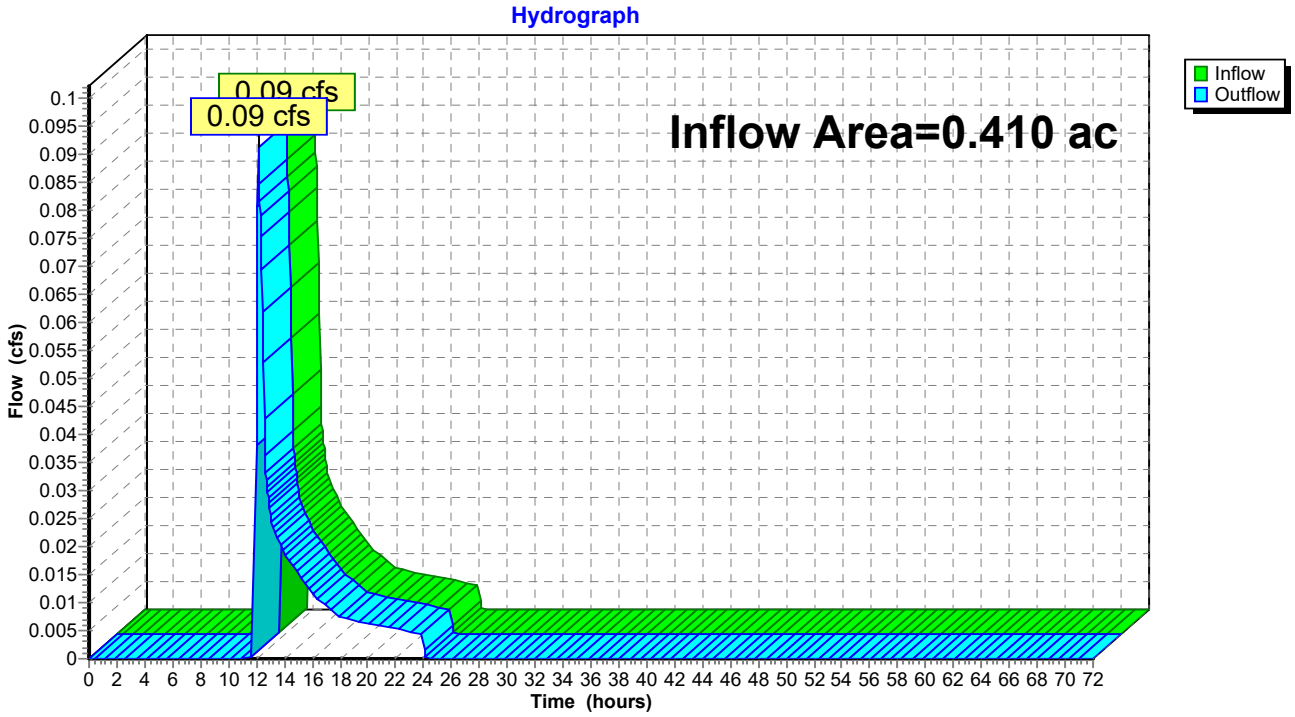


Summary for Reach 3R:

Inflow Area = 0.410 ac, 1.46% Impervious, Inflow Depth = 0.38" for 2-Year event
Inflow = 0.09 cfs @ 12.16 hrs, Volume= 0.013 af
Outflow = 0.09 cfs @ 12.16 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2.702 ac, 31.39% Impervious, Inflow Depth = 1.01" for 2-Year event
Inflow = 2.92 cfs @ 12.10 hrs, Volume= 0.227 af
Outflow = 0.89 cfs @ 12.49 hrs, Volume= 0.227 af, Atten= 70%, Lag= 23.4 min
Discarded = 0.89 cfs @ 12.49 hrs, Volume= 0.227 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : 1R
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 26.52' @ 12.49 hrs Surf.Area= 3,889 sf Storage= 1,881 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.6 min (876.8 - 864.2)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	19,116 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	3,308	0	0	3,308
27.00	4,460	3,870	3,870	4,481
28.00	5,752	5,092	8,962	5,797
29.00	7,110	6,419	15,381	7,185
29.50	7,835	3,735	19,116	7,926

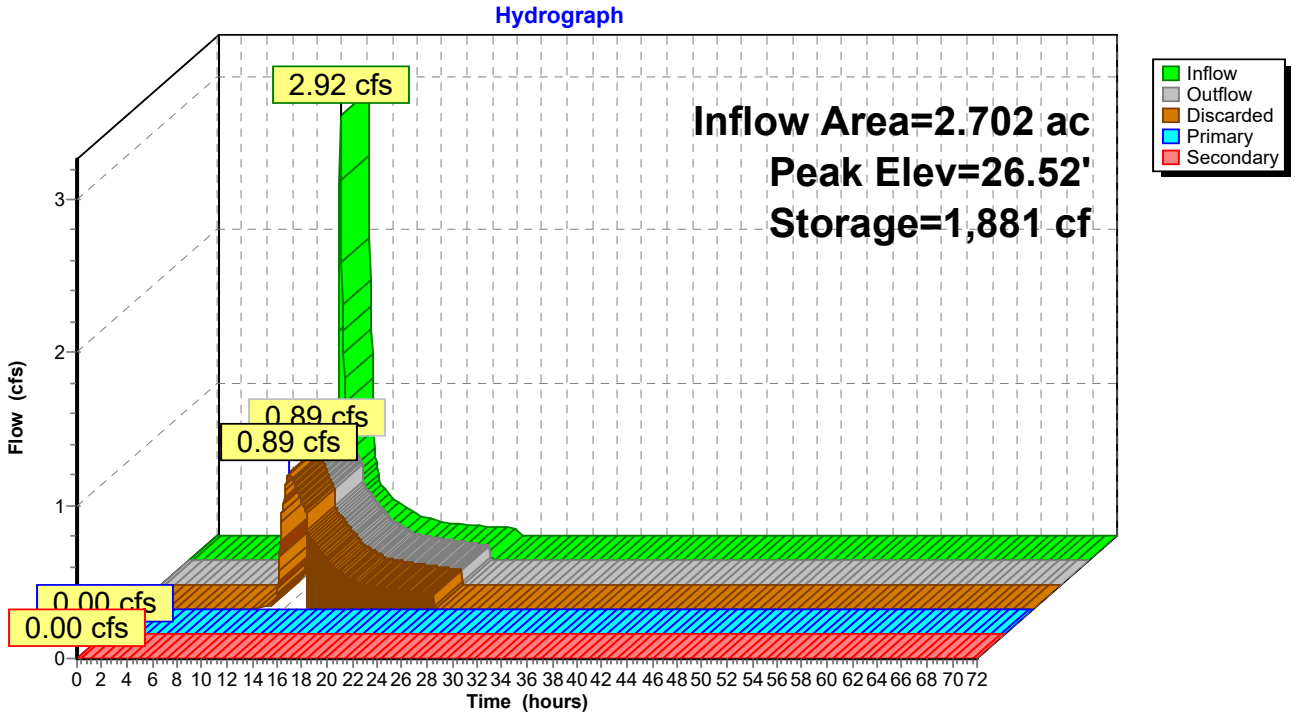
Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 23.50'
#2	Secondary	28.50'	**12.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	25.90'	**18.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.90' / 25.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#4	Device 3	27.40'	**2.4' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.89 cfs @ 12.49 hrs HW=26.52' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.89 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' TW=0.00' (Dynamic Tailwater)
↑—**3=Culvert** (Passes 0.00 cfs of 0.05 cfs potential flow)
↑—**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1aS: Runoff Area=22,412 sf 51.24% Impervious Runoff Depth=2.80"
Flow Length=258' Tc=6.0 min CN=80 Runoff=1.65 cfs 0.120 af

Subcatchment 1bS: Runoff Area=95,283 sf 26.72% Impervious Runoff Depth=1.96"
Flow Length=255' Tc=6.0 min CN=70 Runoff=4.83 cfs 0.356 af

Subcatchment 1cS: Runoff Area=23,419 sf 13.96% Impervious Runoff Depth=1.51"
Flow Length=143' Tc=6.0 min CN=64 Runoff=0.88 cfs 0.068 af

Subcatchment 2S: To South Street Runoff Area=18,852 sf 43.78% Impervious Runoff Depth=2.53"
Tc=6.0 min CN=77 Runoff=1.26 cfs 0.091 af

Subcatchment 3S: To Southern Property Runoff Area=17,840 sf 1.46% Impervious Runoff Depth=1.11"
Tc=6.0 min CN=58 Runoff=0.45 cfs 0.038 af

Reach 1R: 1R Inflow=0.88 cfs 0.068 af
Outflow=0.88 cfs 0.068 af

Reach 2R: Inflow=1.26 cfs 0.091 af
Outflow=1.26 cfs 0.091 af

Reach 3R: Inflow=0.45 cfs 0.038 af
Outflow=0.45 cfs 0.038 af

Pond 1P: Infiltration Basin Peak Elev=27.43' Storage=5,919 cf Inflow=6.48 cfs 0.476 af
Discarded=1.40 cfs 0.476 af Primary=0.05 cfs 0.001 af Secondary=0.00 cfs 0.000 af Outflow=1.45 cfs 0.477 af

Total Runoff Area = 4.082 ac Runoff Volume = 0.673 af Average Runoff Depth = 1.98"
72.60% Pervious = 2.963 ac 27.40% Impervious = 1.119 ac

Summary for Subcatchment 1aS:

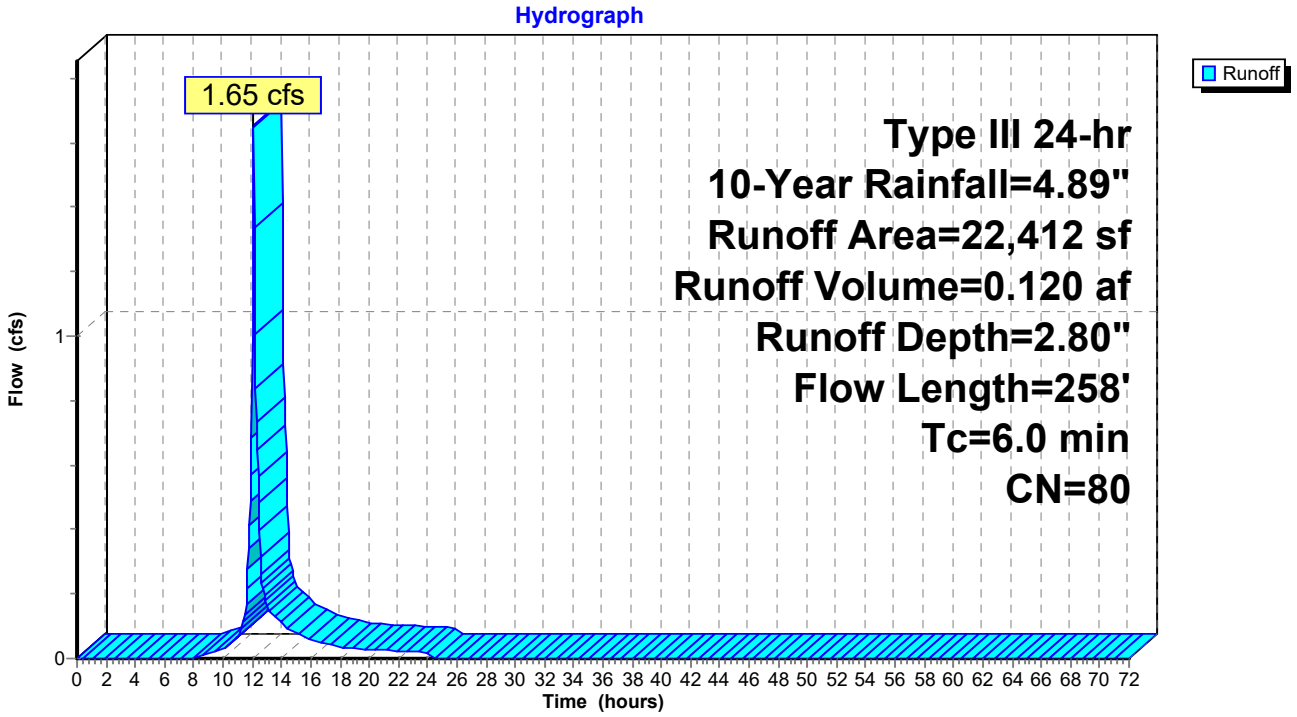
Runoff = 1.65 cfs @ 12.09 hrs, Volume= 0.120 af, Depth= 2.80"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	10,928	61	>75% Grass cover, Good, HSG B
	0	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
*	7,750	98	Paved parking/Conc Walks, HSG B
*	3,062	98	Ledge
	22,412	80	Weighted Average
	10,928		48.76% Pervious Area
	11,484		51.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	65	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	16	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.9	258	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1aS:



Summary for Subcatchment 1bS:

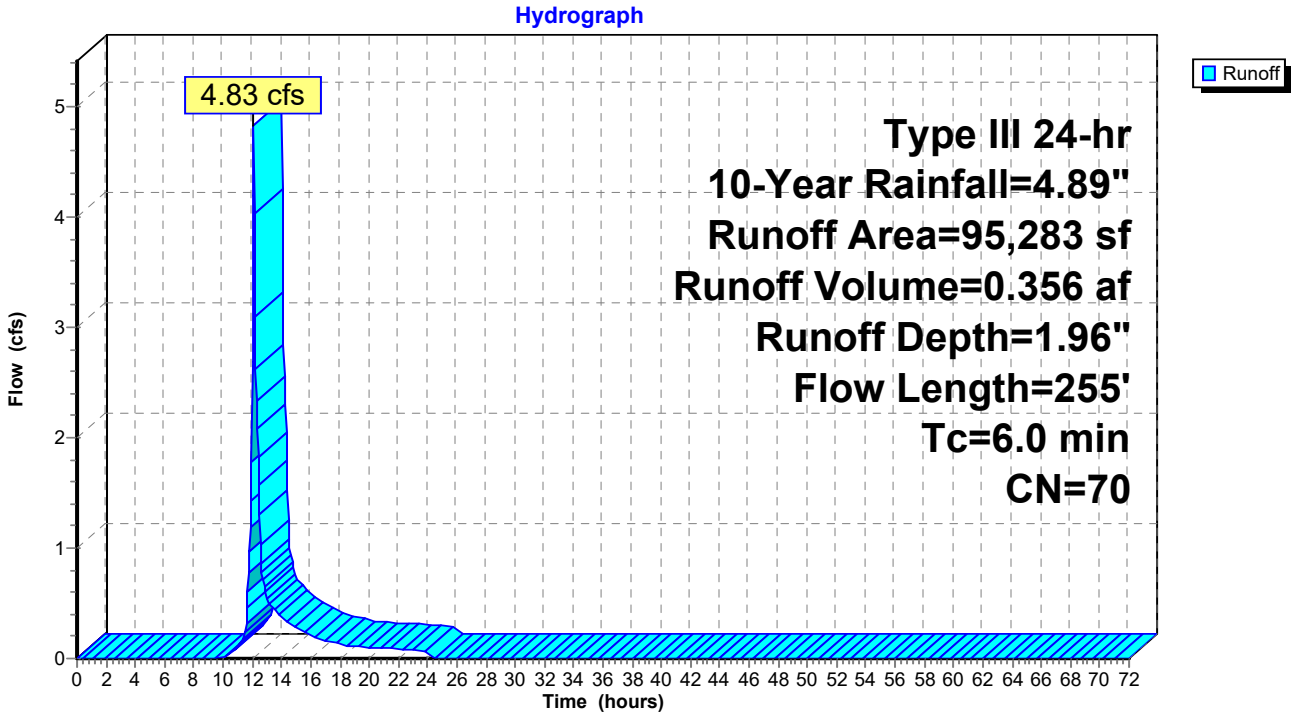
Runoff = 4.83 cfs @ 12.10 hrs, Volume= 0.356 af, Depth= 1.96"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	63,069	61	>75% Grass cover, Good, HSG B
	6,756	55	Woods, Good, HSG B
	4,124	98	Roofs, HSG B
*	17,346	98	Paved parking/Conc Walks, HSG B
*	1,433	98	Ledge
*	2,555	98	Sidewalk
	95,283	70	Weighted Average
	69,825		73.28% Pervious Area
	25,458		26.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.7	85	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	55	0.1820	6.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	65	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	255	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1bS:



Summary for Subcatchment 1cS:

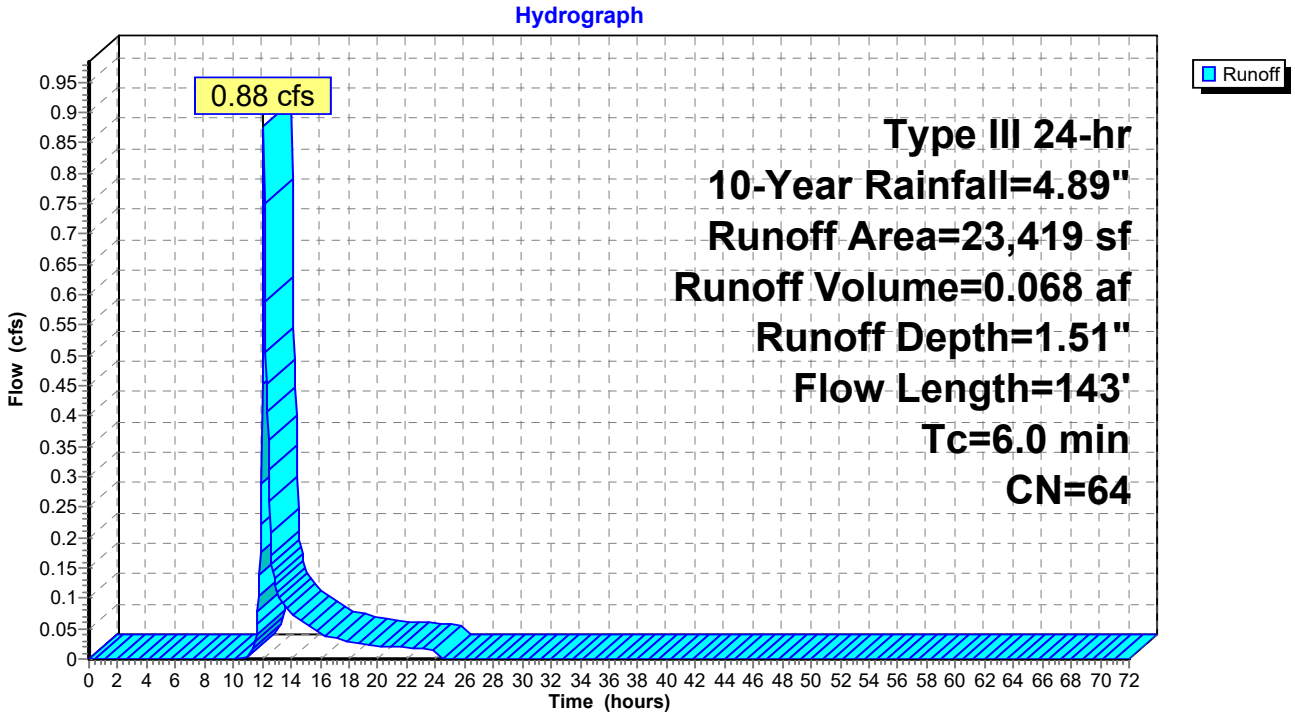
Runoff = 0.88 cfs @ 12.10 hrs, Volume= 0.068 af, Depth= 1.51"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	9,992	61	>75% Grass cover, Good, HSG B
	10,157	55	Woods, Good, HSG B
	1,696	98	Roofs, HSG B
*	1,574	98	Paved parking/Conc Walks, HSG B
*	0	98	Ledge
	23,419	64	Weighted Average
	20,149		86.04% Pervious Area
	3,270		13.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
0.3	93	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.9	143	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1cS:



Summary for Subcatchment 2S: To South Street

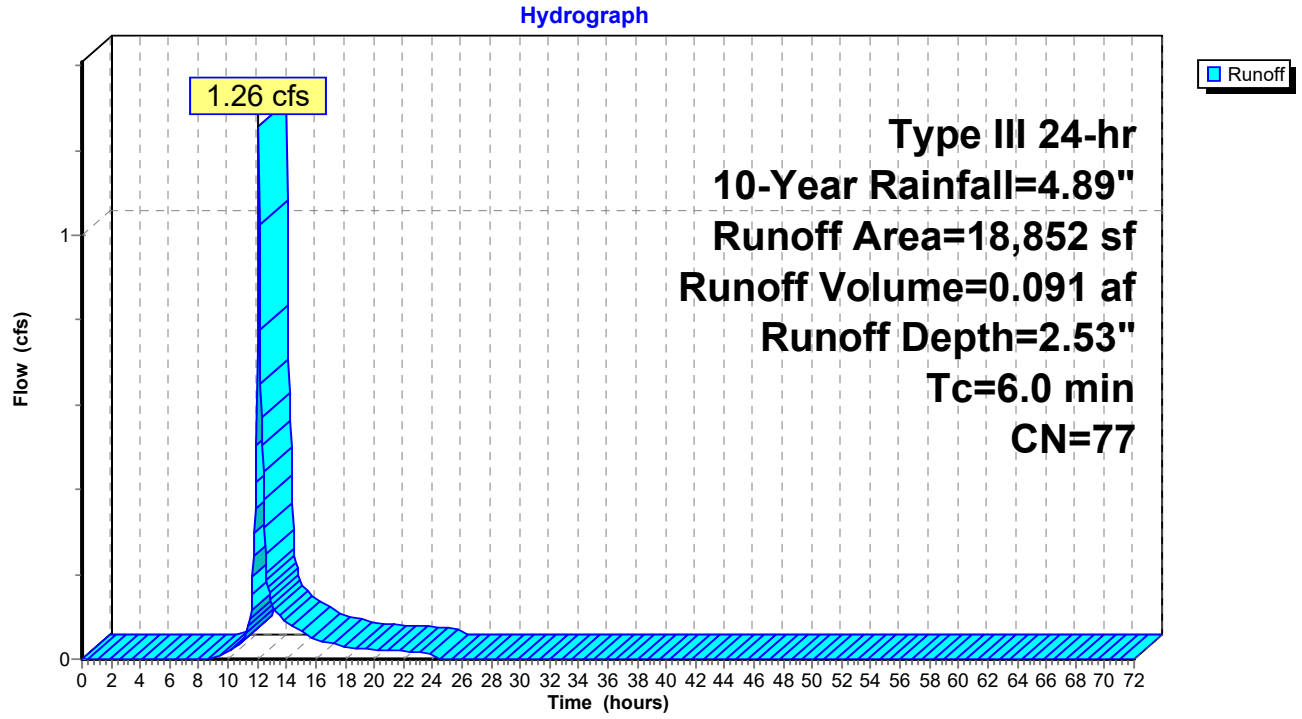
Runoff = 1.26 cfs @ 12.09 hrs, Volume= 0.091 af, Depth= 2.53"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	10,416	61	>75% Grass cover, Good, HSG B
	182	55	Woods, Good, HSG B
	0	98	Roofs, HSG B
*	6,111	98	Paved parking/Conc Walks, HSG B
*	858	98	Ledge
*	1,285	98	Sidewalk
	18,852	77	Weighted Average
	10,598		56.22% Pervious Area
	8,254		43.78% Impervious Area

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

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

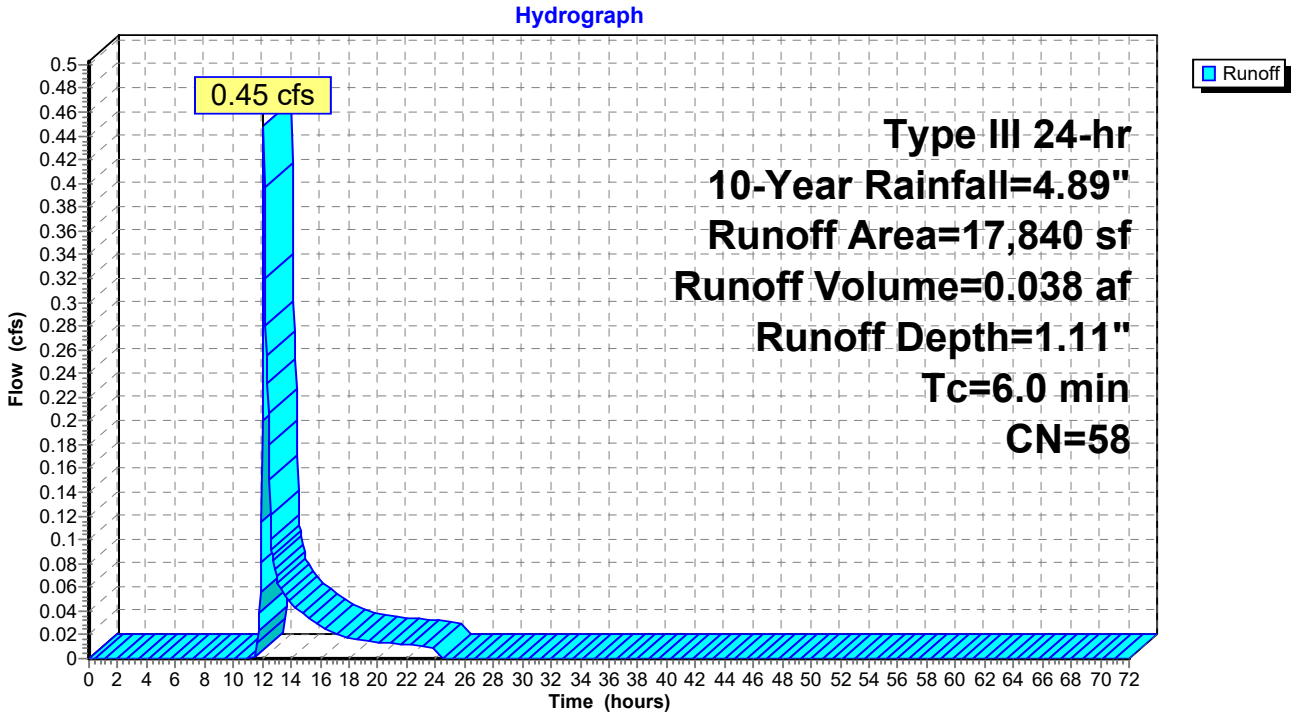
Runoff = 0.45 cfs @ 12.11 hrs, Volume= 0.038 af, Depth= 1.11"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.89"

	Area (sf)	CN	Description
	6,785	61	>75% Grass cover, Good, HSG B
	10,794	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	261	98	Ledge
	17,840	58	Weighted Average
	17,579		98.54% Pervious Area
	261		1.46% Impervious Area

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

Subcatchment 3S: To Southern Property Line

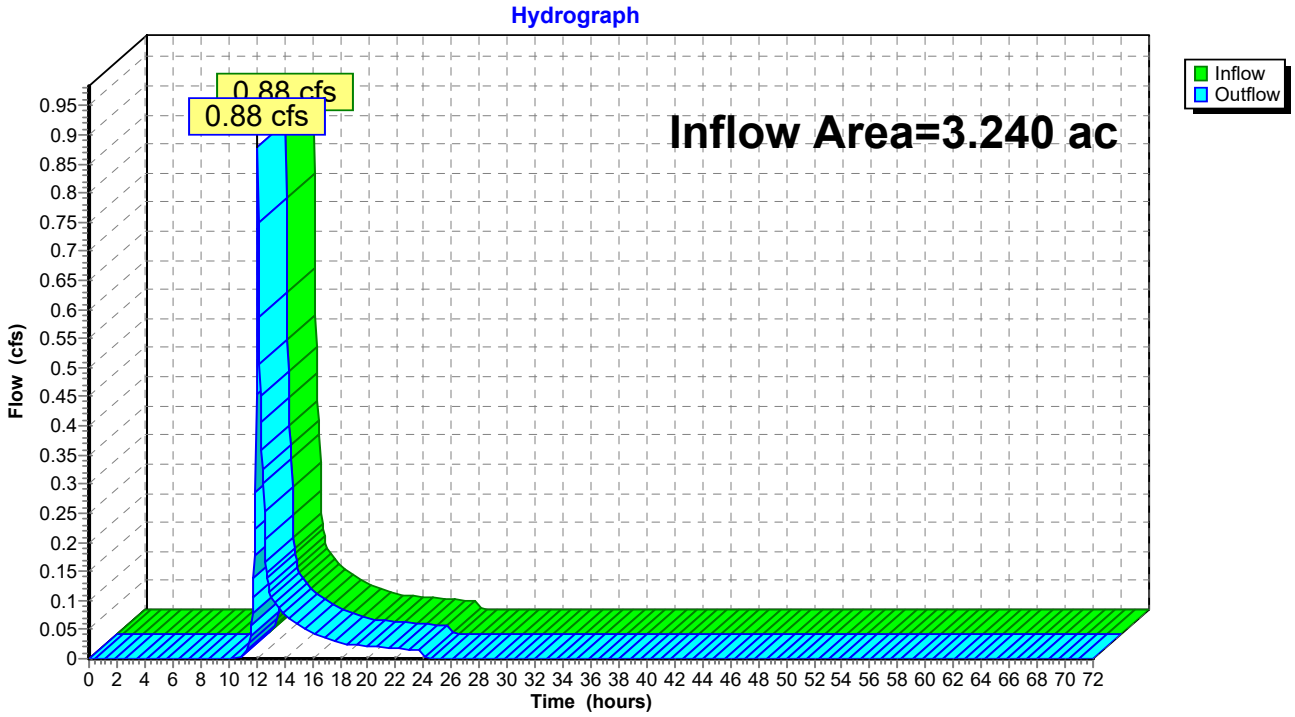


Summary for Reach 1R: 1R

Inflow Area = 3.240 ac, 28.50% Impervious, Inflow Depth = 0.25" for 10-Year event
Inflow = 0.88 cfs @ 12.10 hrs, Volume= 0.068 af
Outflow = 0.88 cfs @ 12.10 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

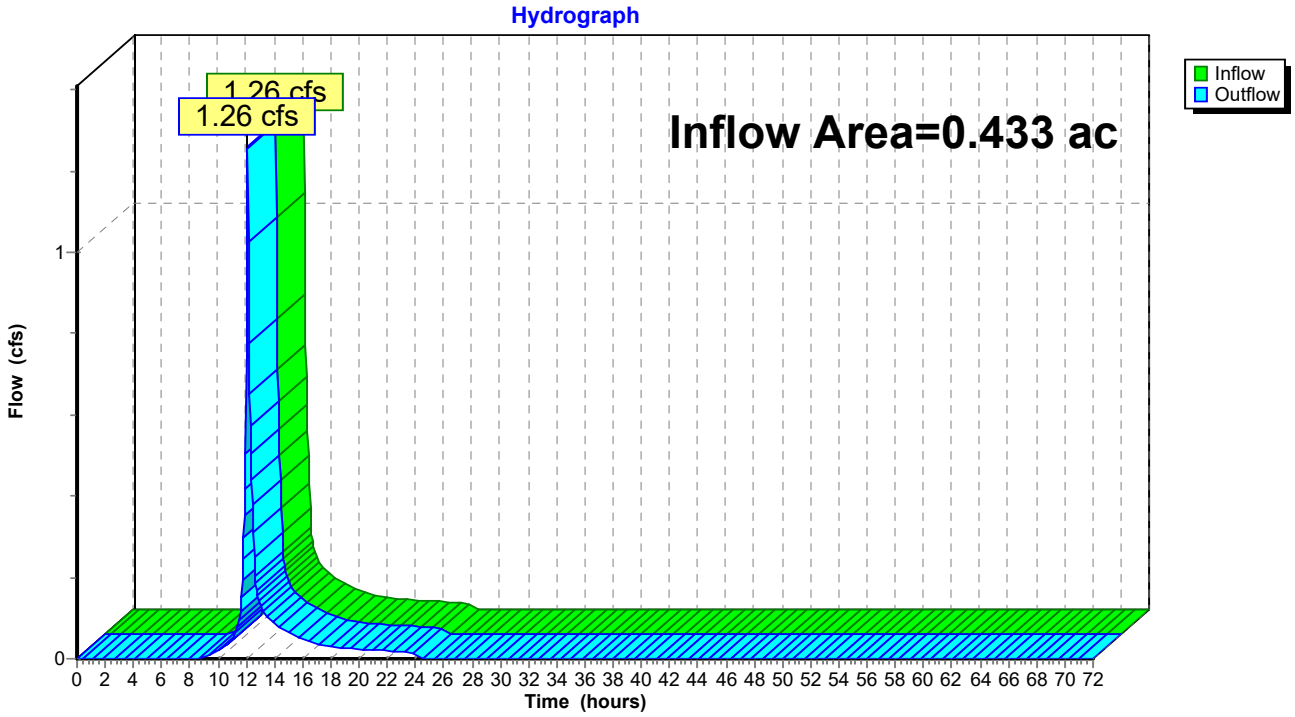


Summary for Reach 2R:

Inflow Area = 0.433 ac, 43.78% Impervious, Inflow Depth = 2.53" for 10-Year event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 0.091 af
Outflow = 1.26 cfs @ 12.09 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

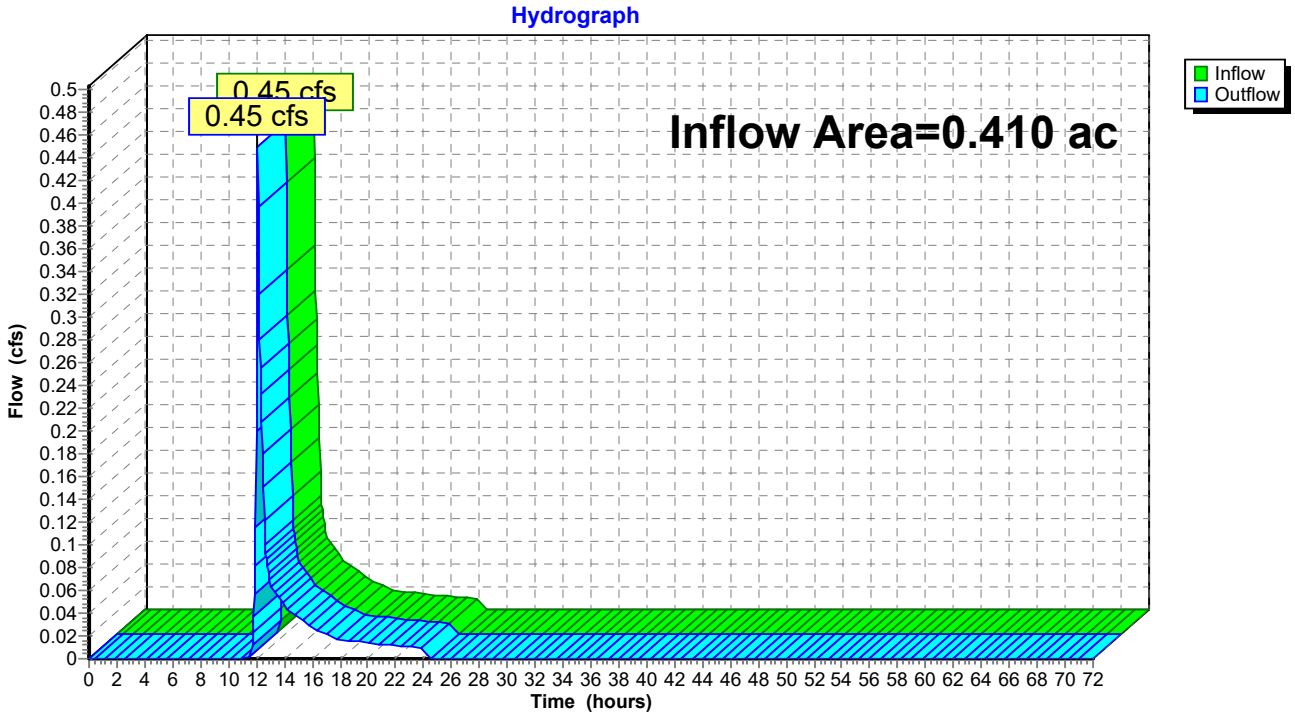


Summary for Reach 3R:

Inflow Area = 0.410 ac, 1.46% Impervious, Inflow Depth = 1.11" for 10-Year event
Inflow = 0.45 cfs @ 12.11 hrs, Volume= 0.038 af
Outflow = 0.45 cfs @ 12.11 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2.702 ac, 31.39% Impervious, Inflow Depth = 2.12" for 10-Year event
Inflow = 6.48 cfs @ 12.10 hrs, Volume= 0.476 af
Outflow = 1.45 cfs @ 12.54 hrs, Volume= 0.477 af, Atten= 78%, Lag= 26.6 min
Discarded = 1.40 cfs @ 12.54 hrs, Volume= 0.476 af
Primary = 0.05 cfs @ 12.54 hrs, Volume= 0.001 af
Routed to Reach 1R : 1R
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 27.43' @ 12.54 hrs Surf.Area= 5,000 sf Storage= 5,919 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 34.5 min (876.8 - 842.3)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	19,116 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	3,308	0	0	3,308
27.00	4,460	3,870	3,870	4,481
28.00	5,752	5,092	8,962	5,797
29.00	7,110	6,419	15,381	7,185
29.50	7,835	3,735	19,116	7,926

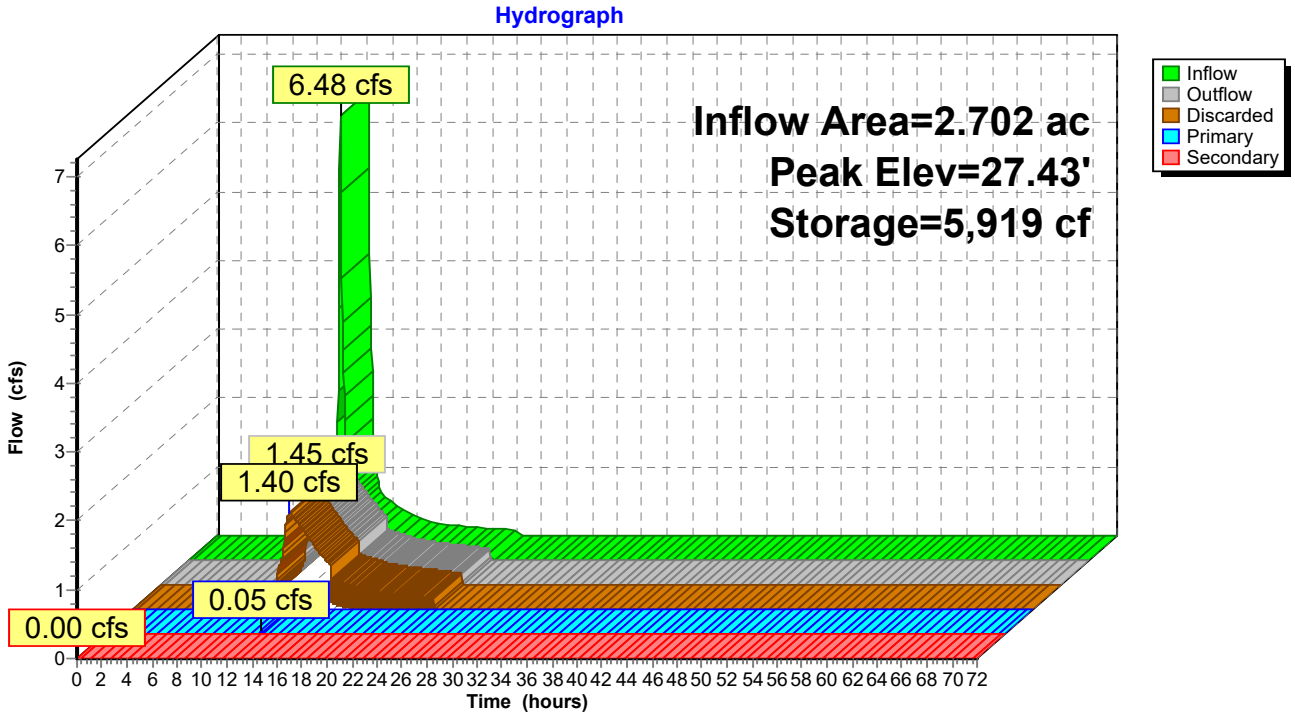
Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 23.50'
#2	Secondary	28.50'	**12.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	25.90'	**18.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.90' / 25.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#4	Device 3	27.40'	**2.4' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=1.40 cfs @ 12.54 hrs HW=27.43' (Free Discharge)
↑—**1=Exfiltration** (Controls 1.40 cfs)

Primary OutFlow Max=0.05 cfs @ 12.54 hrs HW=27.43' TW=0.00' (Dynamic Tailwater)
↑—**3=Culvert** (Passes 0.05 cfs of 7.53 cfs potential flow)
↑—**4=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.05 cfs @ 0.59 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1aS: Runoff Area=22,412 sf 51.24% Impervious Runoff Depth=3.89"
Flow Length=258' Tc=6.0 min CN=80 Runoff=2.29 cfs 0.167 af

Subcatchment 1bS: Runoff Area=95,283 sf 26.72% Impervious Runoff Depth=2.90"
Flow Length=255' Tc=6.0 min CN=70 Runoff=7.27 cfs 0.529 af

Subcatchment 1cS: Runoff Area=23,419 sf 13.96% Impervious Runoff Depth=2.35"
Flow Length=143' Tc=6.0 min CN=64 Runoff=1.42 cfs 0.105 af

Subcatchment 2S: To South Street Runoff Area=18,852 sf 43.78% Impervious Runoff Depth=3.58"
Tc=6.0 min CN=77 Runoff=1.78 cfs 0.129 af

Subcatchment 3S: To Southern Property Runoff Area=17,840 sf 1.46% Impervious Runoff Depth=1.83"
Tc=6.0 min CN=58 Runoff=0.81 cfs 0.063 af

Reach 1R: 1R Inflow=2.66 cfs 0.185 af
Outflow=2.66 cfs 0.185 af

Reach 2R: Inflow=1.78 cfs 0.129 af
Outflow=1.78 cfs 0.129 af

Reach 3R: Inflow=0.81 cfs 0.063 af
Outflow=0.81 cfs 0.063 af

Pond 1P: Infiltration Basin Peak Elev=27.81' Storage=7,888 cf Inflow=9.55 cfs 0.696 af
Discarded=1.64 cfs 0.616 af Primary=2.06 cfs 0.080 af Secondary=0.00 cfs 0.000 af Outflow=3.69 cfs 0.696 af

Total Runoff Area = 4.082 ac Runoff Volume = 0.993 af Average Runoff Depth = 2.92"
72.60% Pervious = 2.963 ac 27.40% Impervious = 1.119 ac

Summary for Subcatchment 1aS:

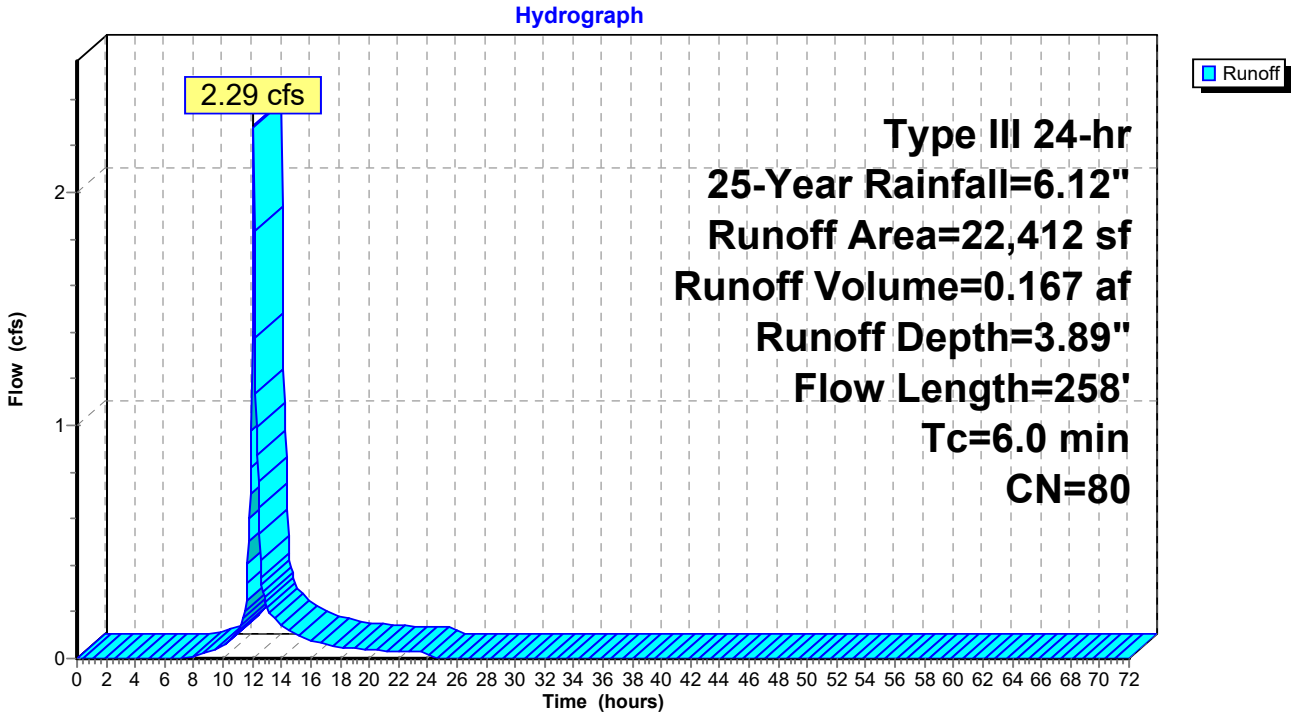
Runoff = 2.29 cfs @ 12.09 hrs, Volume= 0.167 af, Depth= 3.89"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	10,928	61	>75% Grass cover, Good, HSG B
	0	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
*	7,750	98	Paved parking/Conc Walks, HSG B
*	3,062	98	Ledge
	22,412	80	Weighted Average
	10,928		48.76% Pervious Area
	11,484		51.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	65	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	16	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.9	258	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1aS:



Summary for Subcatchment 1bS:

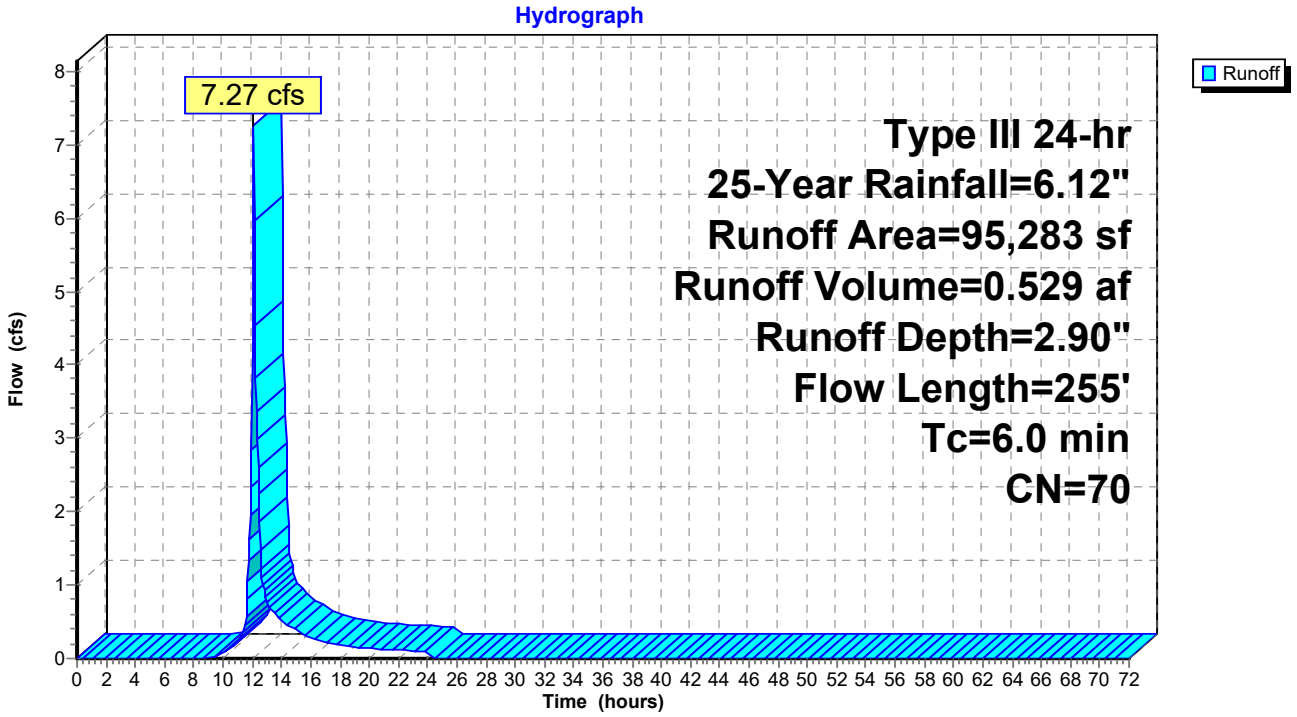
Runoff = 7.27 cfs @ 12.09 hrs, Volume= 0.529 af, Depth= 2.90"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	63,069	61	>75% Grass cover, Good, HSG B
	6,756	55	Woods, Good, HSG B
	4,124	98	Roofs, HSG B
*	17,346	98	Paved parking/Conc Walks, HSG B
*	1,433	98	Ledge
*	2,555	98	Sidewalk
	95,283	70	Weighted Average
	69,825		73.28% Pervious Area
	25,458		26.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.7	85	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	55	0.1820	6.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	65	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	255	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1bS:



Summary for Subcatchment 1cS:

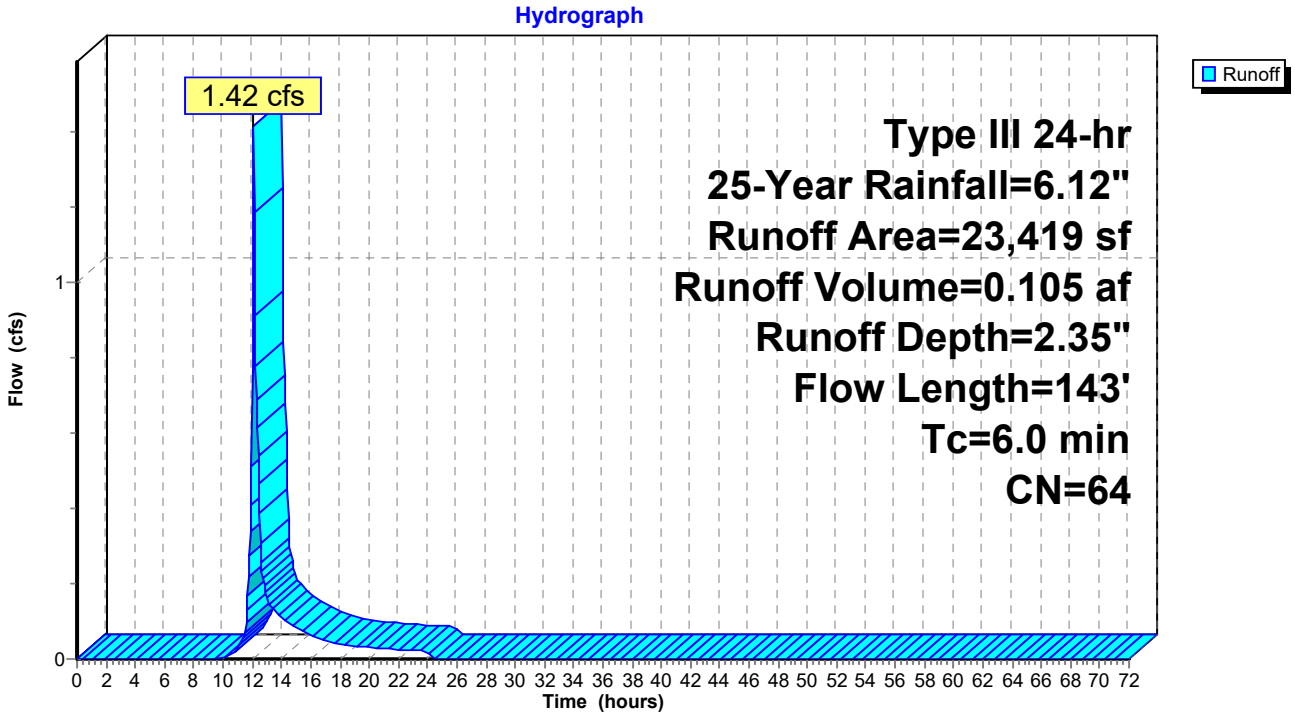
Runoff = 1.42 cfs @ 12.10 hrs, Volume= 0.105 af, Depth= 2.35"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	9,992	61	>75% Grass cover, Good, HSG B
	10,157	55	Woods, Good, HSG B
	1,696	98	Roofs, HSG B
*	1,574	98	Paved parking/Conc Walks, HSG B
*	0	98	Ledge
	23,419	64	Weighted Average
	20,149		86.04% Pervious Area
	3,270		13.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
0.3	93	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.9	143	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1cS:



Summary for Subcatchment 2S: To South Street

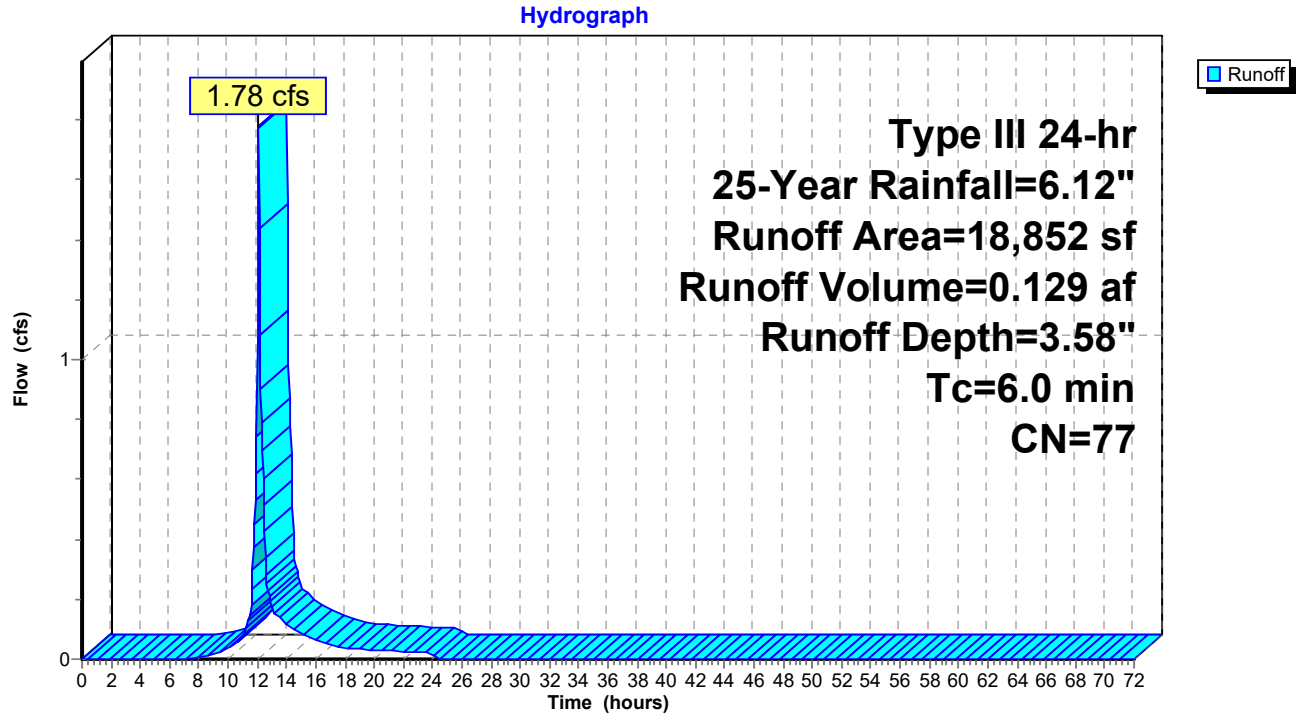
Runoff = 1.78 cfs @ 12.09 hrs, Volume= 0.129 af, Depth= 3.58"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	10,416	61	>75% Grass cover, Good, HSG B
	182	55	Woods, Good, HSG B
	0	98	Roofs, HSG B
*	6,111	98	Paved parking/Conc Walks, HSG B
*	858	98	Ledge
*	1,285	98	Sidewalk
	18,852	77	Weighted Average
	10,598		56.22% Pervious Area
	8,254		43.78% Impervious Area

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

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

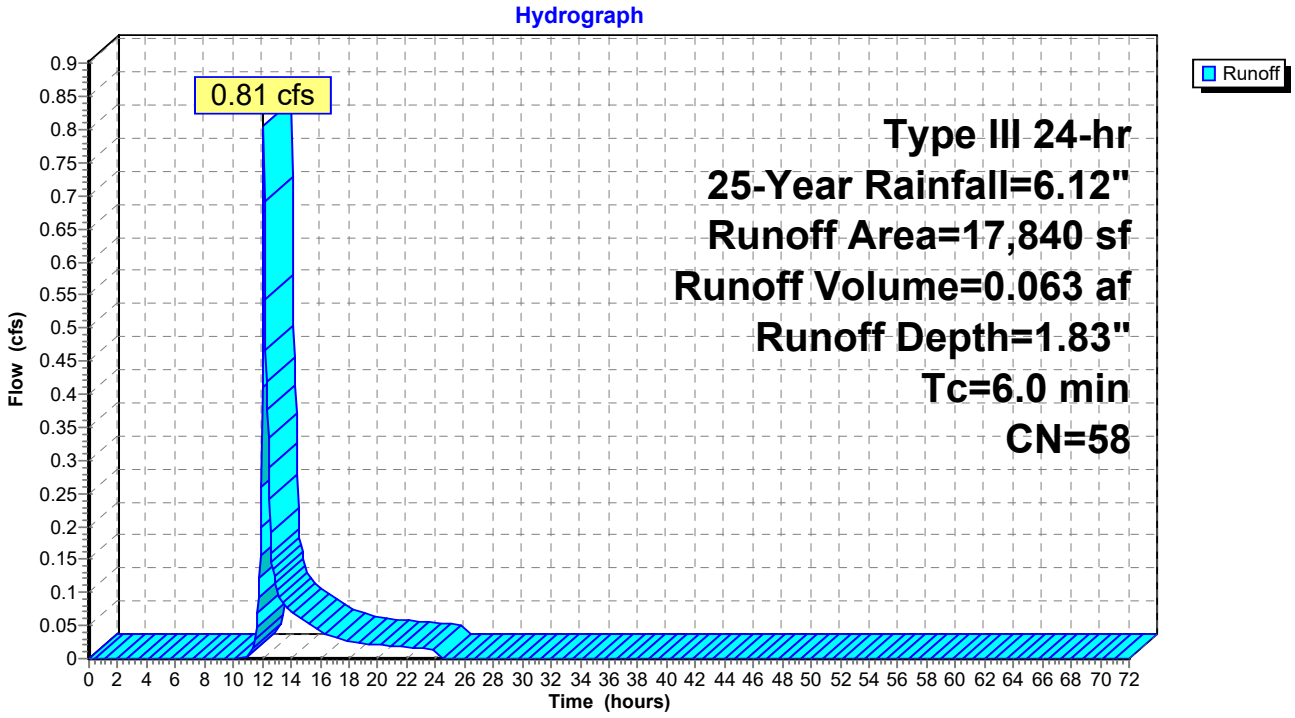
Runoff = 0.81 cfs @ 12.10 hrs, Volume= 0.063 af, Depth= 1.83"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.12"

	Area (sf)	CN	Description
	6,785	61	>75% Grass cover, Good, HSG B
	10,794	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	261	98	Ledge
	17,840	58	Weighted Average
	17,579		98.54% Pervious Area
	261		1.46% Impervious Area

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

Subcatchment 3S: To Southern Property Line

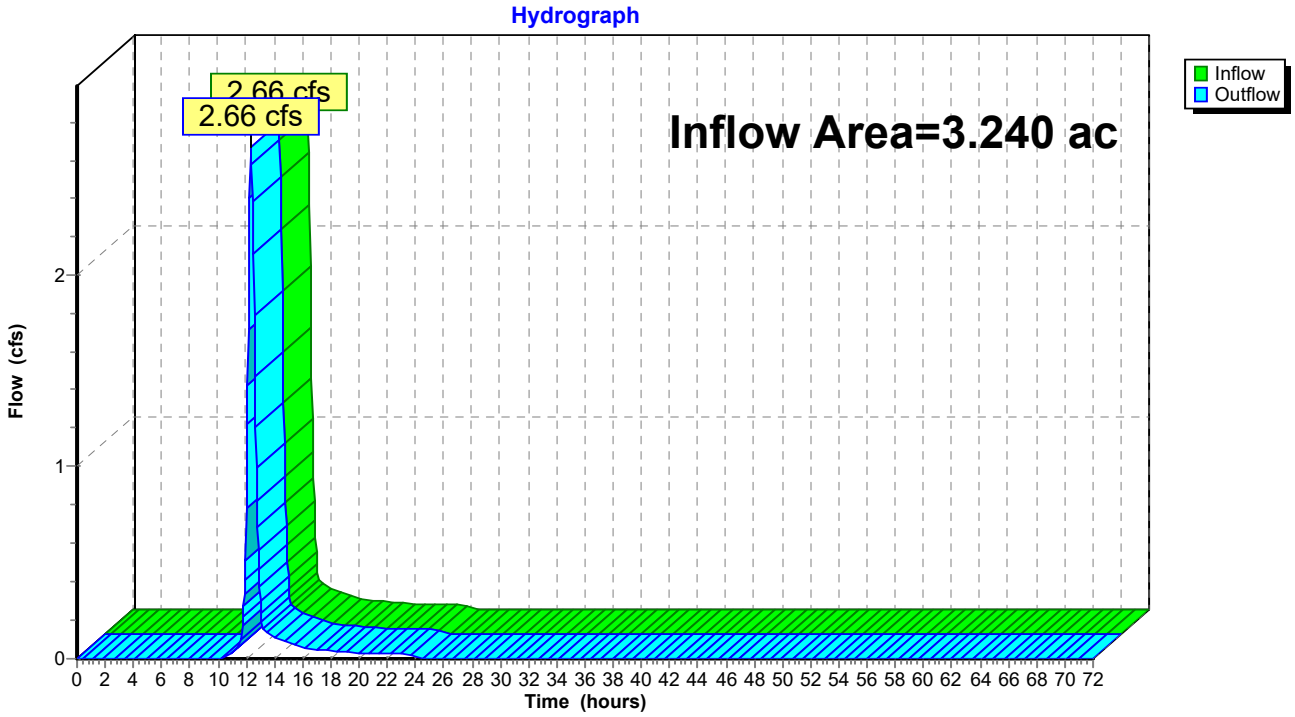


Summary for Reach 1R: 1R

Inflow Area = 3.240 ac, 28.50% Impervious, Inflow Depth = 0.68" for 25-Year event
Inflow = 2.66 cfs @ 12.34 hrs, Volume= 0.185 af
Outflow = 2.66 cfs @ 12.34 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

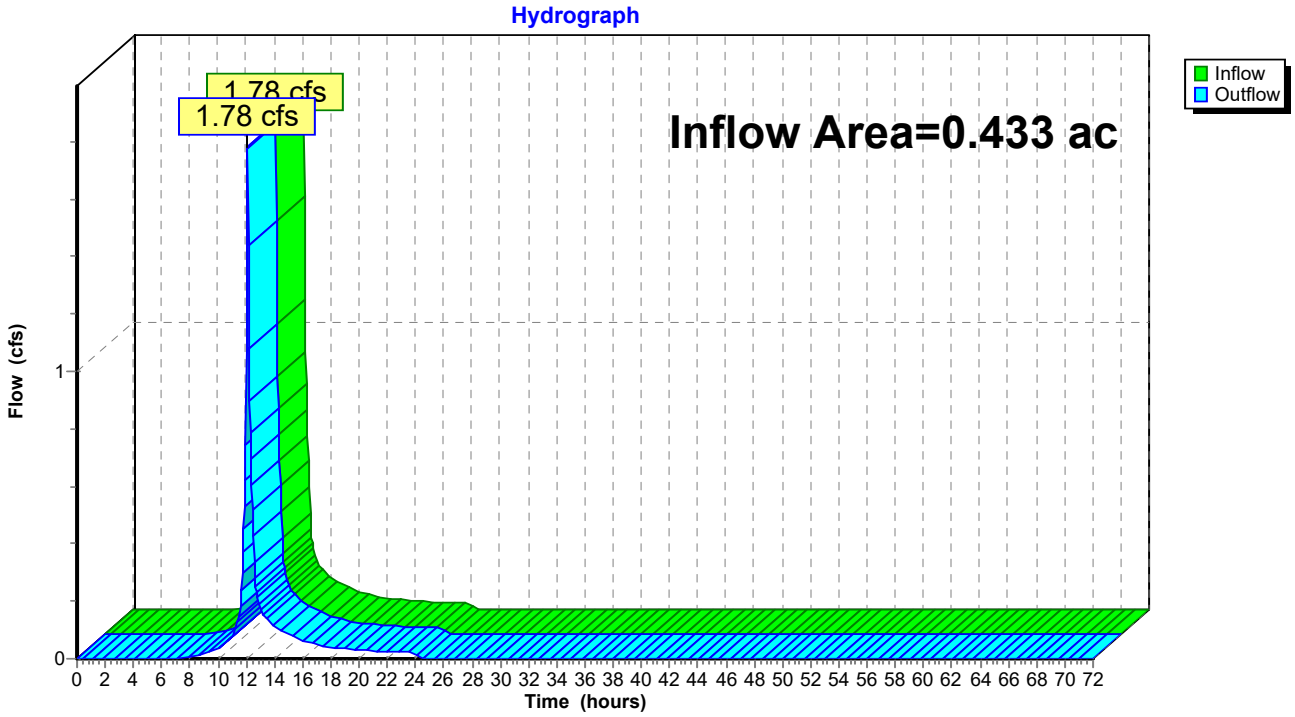


Summary for Reach 2R:

Inflow Area = 0.433 ac, 43.78% Impervious, Inflow Depth = 3.58" for 25-Year event
Inflow = 1.78 cfs @ 12.09 hrs, Volume= 0.129 af
Outflow = 1.78 cfs @ 12.09 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

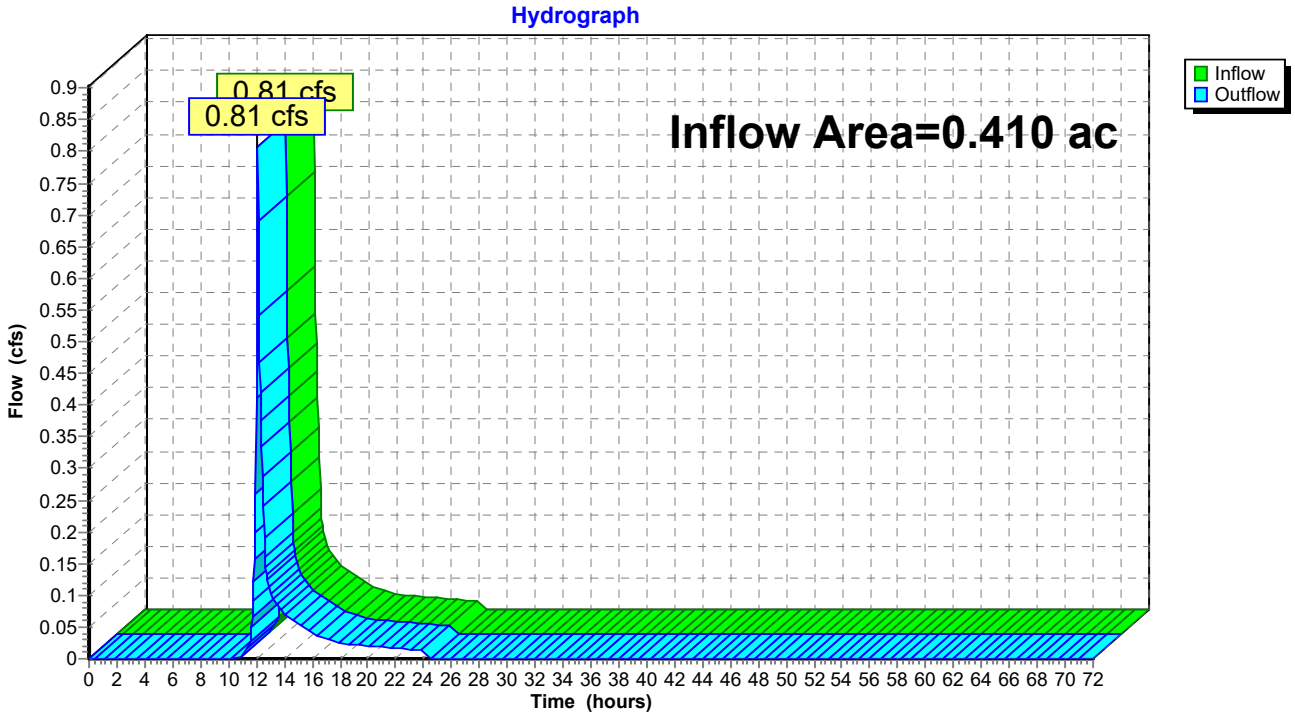


Summary for Reach 3R:

Inflow Area = 0.410 ac, 1.46% Impervious, Inflow Depth = 1.83" for 25-Year event
Inflow = 0.81 cfs @ 12.10 hrs, Volume= 0.063 af
Outflow = 0.81 cfs @ 12.10 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2.702 ac, 31.39% Impervious, Inflow Depth = 3.09" for 25-Year event
Inflow = 9.55 cfs @ 12.09 hrs, Volume= 0.696 af
Outflow = 3.69 cfs @ 12.37 hrs, Volume= 0.696 af, Atten= 61%, Lag= 16.6 min
Discarded = 1.64 cfs @ 12.37 hrs, Volume= 0.616 af
Primary = 2.06 cfs @ 12.37 hrs, Volume= 0.080 af
Routed to Reach 1R : 1R
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 27.81' @ 12.37 hrs Surf.Area= 5,492 sf Storage= 7,888 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 34.6 min (866.1 - 831.5)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	19,116 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	3,308	0	0	3,308
27.00	4,460	3,870	3,870	4,481
28.00	5,752	5,092	8,962	5,797
29.00	7,110	6,419	15,381	7,185
29.50	7,835	3,735	19,116	7,926

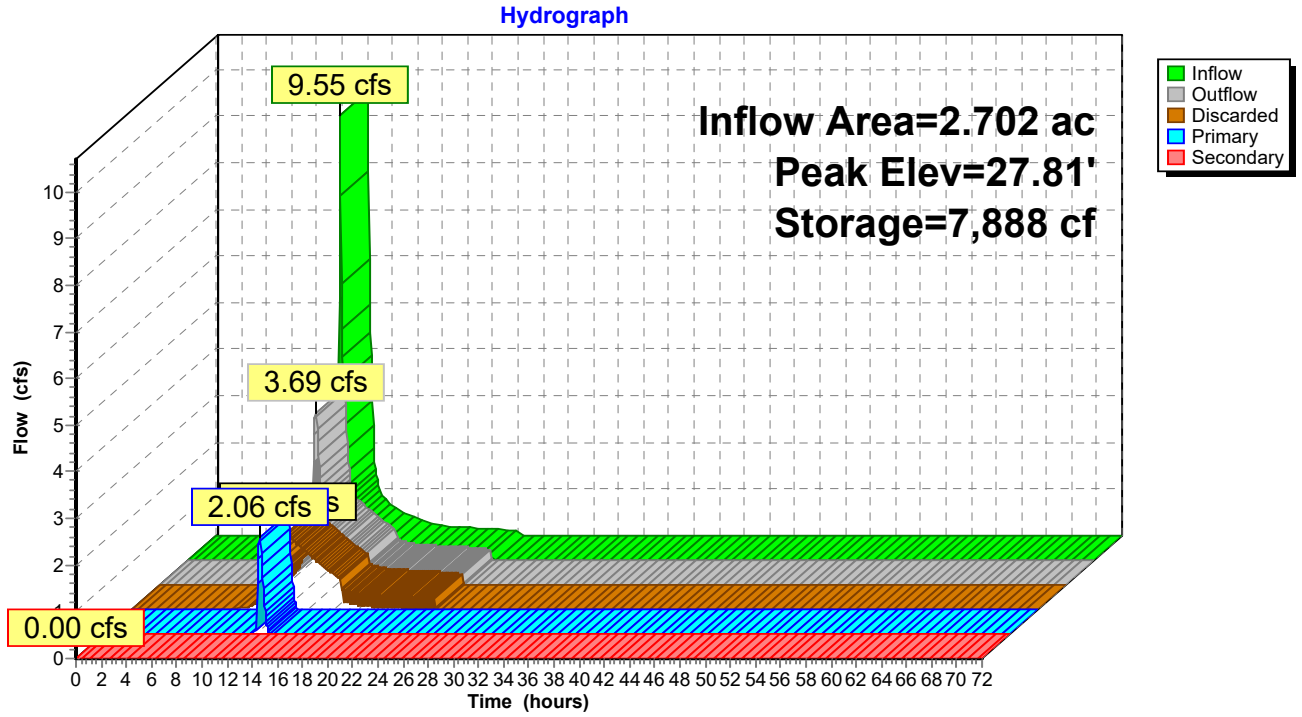
Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 23.50'
#2	Secondary	28.50'	**12.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	25.90'	**18.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.90' / 25.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#4	Device 3	27.40'	**2.4' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=1.63 cfs @ 12.37 hrs HW=27.81' (Free Discharge)
↑—**1=Exfiltration** (Controls 1.63 cfs)

Primary OutFlow Max=2.04 cfs @ 12.37 hrs HW=27.81' TW=0.00' (Dynamic Tailwater)
↑—**3=Culvert** (Passes 2.04 cfs of 9.15 cfs potential flow)
↑—**4=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.04 cfs @ 2.09 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1aS: Runoff Area=22,412 sf 51.24% Impervious Runoff Depth=6.19"
Flow Length=258' Tc=6.0 min CN=80 Runoff=3.58 cfs 0.265 af

Subcatchment 1bS: Runoff Area=95,283 sf 26.72% Impervious Runoff Depth=4.98"
Flow Length=255' Tc=6.0 min CN=70 Runoff=12.52 cfs 0.909 af

Subcatchment 1cS: Runoff Area=23,419 sf 13.96% Impervious Runoff Depth=4.27"
Flow Length=143' Tc=6.0 min CN=64 Runoff=2.63 cfs 0.191 af

Subcatchment 2S: To South Street Runoff Area=18,852 sf 43.78% Impervious Runoff Depth=5.83"
Tc=6.0 min CN=77 Runoff=2.86 cfs 0.210 af

Subcatchment 3S: To Southern Property Runoff Area=17,840 sf 1.46% Impervious Runoff Depth=3.55"
Tc=6.0 min CN=58 Runoff=1.65 cfs 0.121 af

Reach 1R: 1R Inflow=9.14 cfs 0.509 af
Outflow=9.14 cfs 0.509 af

Reach 2R: Inflow=2.86 cfs 0.210 af
Outflow=2.86 cfs 0.210 af

Reach 3R: Inflow=1.65 cfs 0.121 af
Outflow=1.65 cfs 0.121 af

Pond 1P: Infiltration Basin Peak Elev=28.37' Storage=11,195 cf Inflow=16.10 cfs 1.174 af
Discarded=2.00 cfs 0.857 af Primary=7.54 cfs 0.318 af Secondary=0.00 cfs 0.000 af Outflow=9.54 cfs 1.174 af

Total Runoff Area = 4.082 ac Runoff Volume = 1.696 af Average Runoff Depth = 4.99"
72.60% Pervious = 2.963 ac 27.40% Impervious = 1.119 ac

Summary for Subcatchment 1aS:

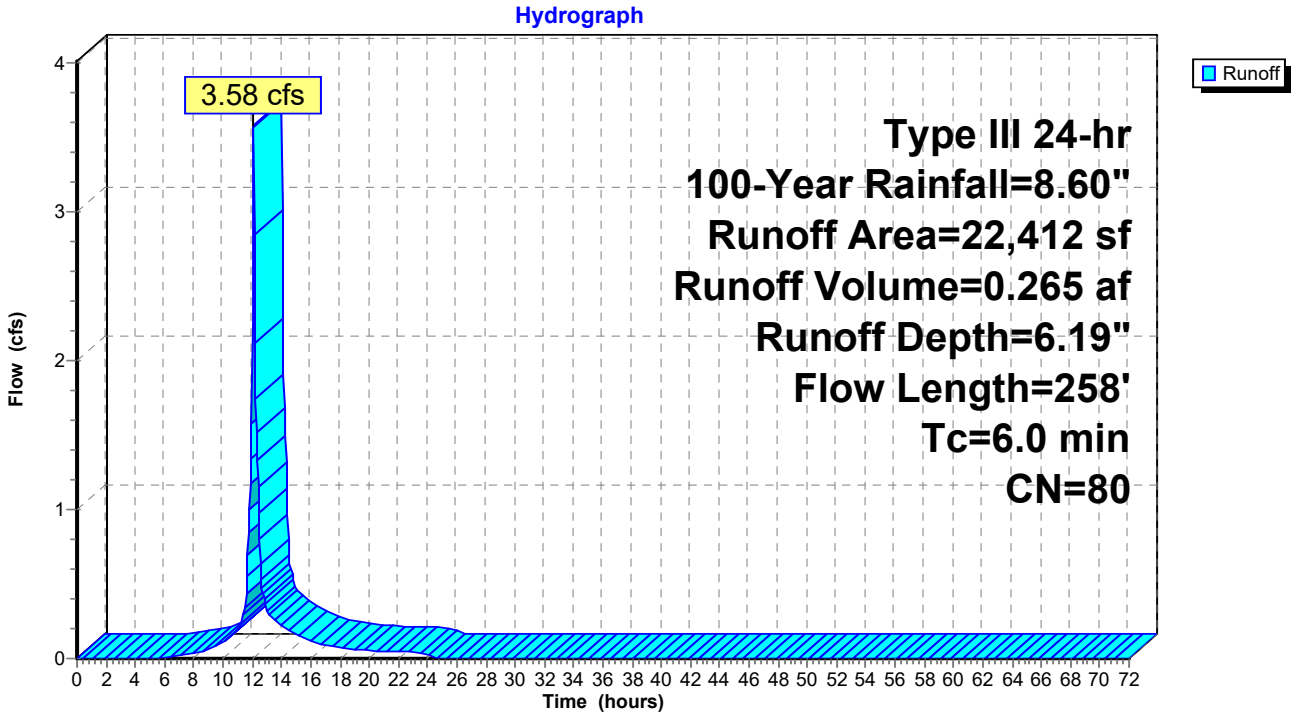
Runoff = 3.58 cfs @ 12.09 hrs, Volume= 0.265 af, Depth= 6.19"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	10,928	61	>75% Grass cover, Good, HSG B
	0	55	Woods, Good, HSG B
	672	98	Roofs, HSG B
*	7,750	98	Paved parking/Conc Walks, HSG B
*	3,062	98	Ledge
	22,412	80	Weighted Average
	10,928		48.76% Pervious Area
	11,484		51.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0780	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.1	38	0.1970	7.15		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	13	0.1540	7.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	76	0.1450	6.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	65	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	16	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.9	258	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1aS:



Summary for Subcatchment 1bS:

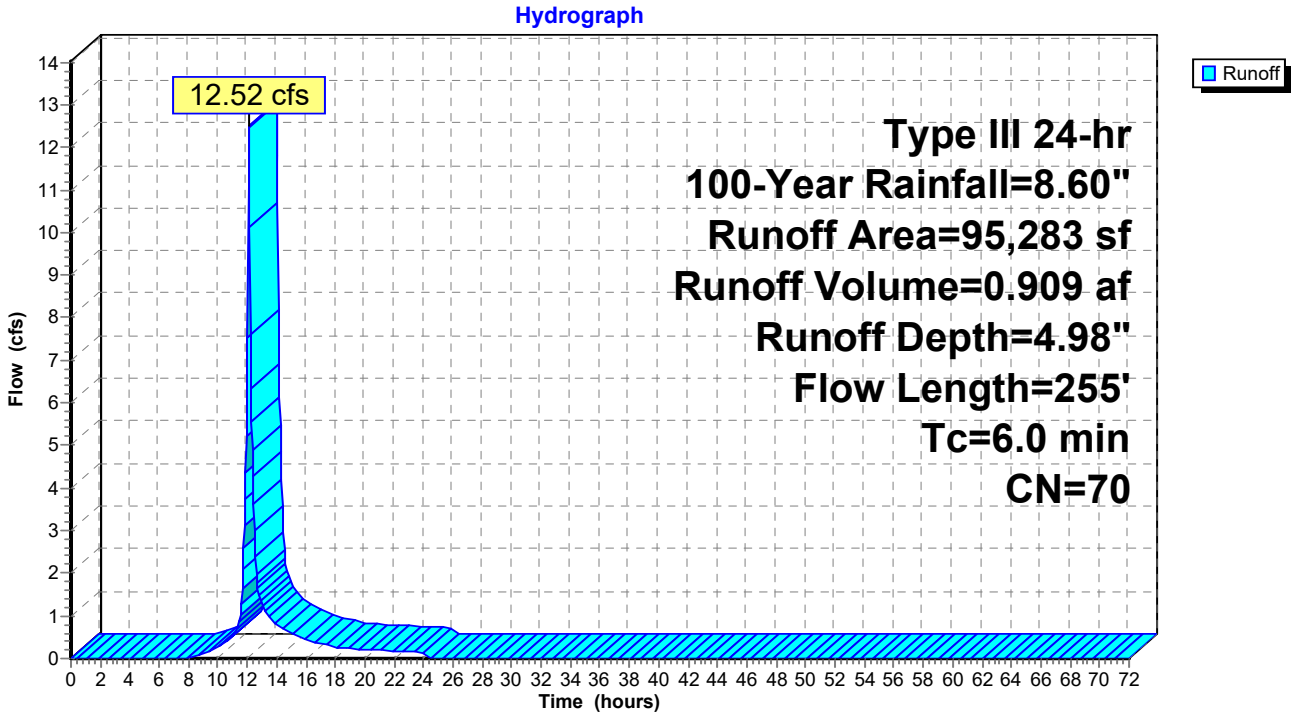
Runoff = 12.52 cfs @ 12.09 hrs, Volume= 0.909 af, Depth= 4.98"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	63,069	61	>75% Grass cover, Good, HSG B
	6,756	55	Woods, Good, HSG B
	4,124	98	Roofs, HSG B
*	17,346	98	Paved parking/Conc Walks, HSG B
*	1,433	98	Ledge
*	2,555	98	Sidewalk
	95,283	70	Weighted Average
	69,825		73.28% Pervious Area
	25,458		26.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0700	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
0.7	85	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	55	0.1820	6.87		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	65	0.0310	2.83		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	255	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1bS:



Summary for Subcatchment 1cS:

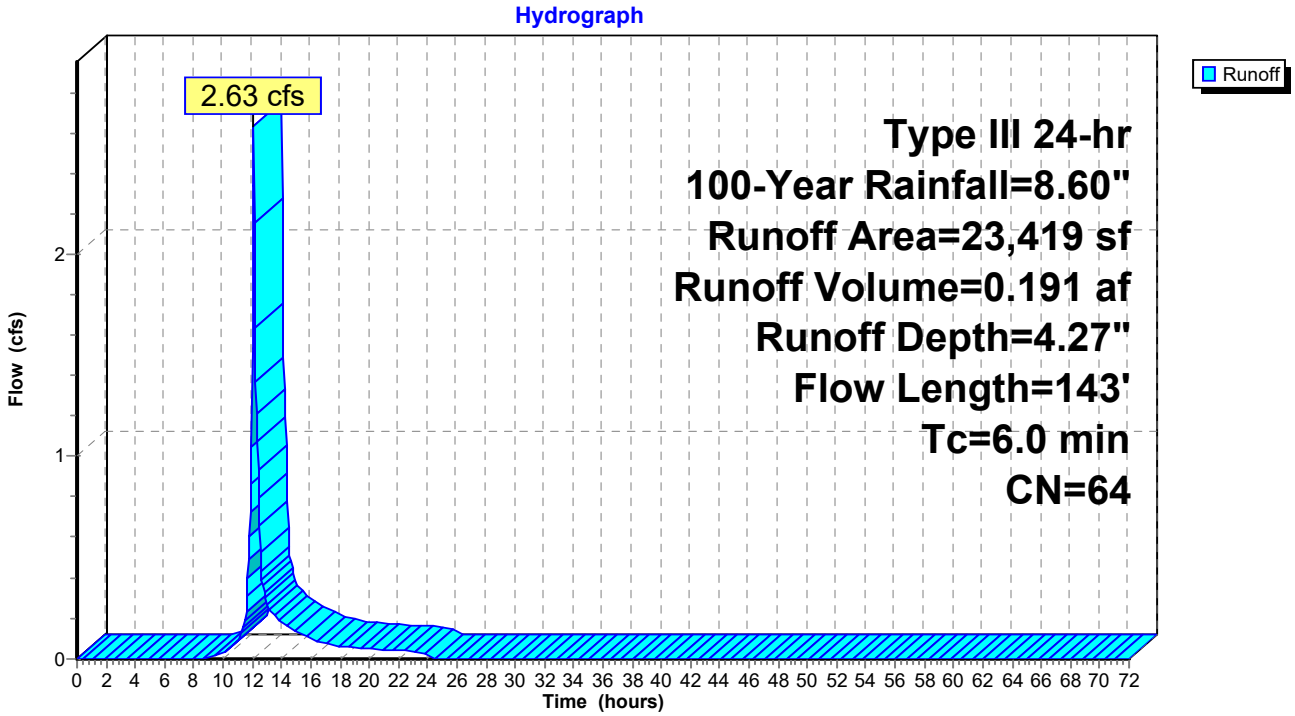
Runoff = 2.63 cfs @ 12.09 hrs, Volume= 0.191 af, Depth= 4.27"
Routed to Reach 1R : 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	9,992	61	>75% Grass cover, Good, HSG B
	10,157	55	Woods, Good, HSG B
	1,696	98	Roofs, HSG B
*	1,574	98	Paved parking/Conc Walks, HSG B
*	0	98	Ledge
	23,419	64	Weighted Average
	20,149		86.04% Pervious Area
	3,270		13.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.31"
0.3	93	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.9	143	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1cS:



Summary for Subcatchment 2S: To South Street

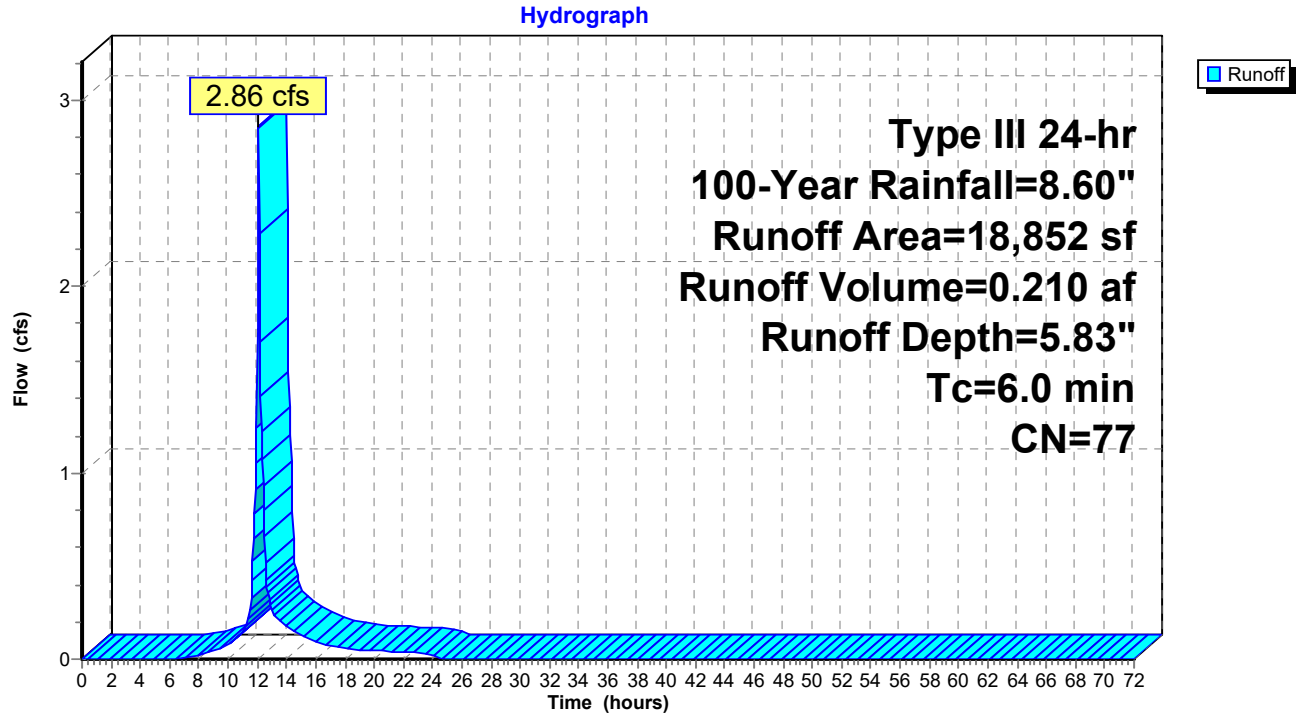
Runoff = 2.86 cfs @ 12.09 hrs, Volume= 0.210 af, Depth= 5.83"
Routed to Reach 2R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	10,416	61	>75% Grass cover, Good, HSG B
	182	55	Woods, Good, HSG B
	0	98	Roofs, HSG B
*	6,111	98	Paved parking/Conc Walks, HSG B
*	858	98	Ledge
*	1,285	98	Sidewalk
	18,852	77	Weighted Average
	10,598		56.22% Pervious Area
	8,254		43.78% Impervious Area

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

Subcatchment 2S: To South Street



Summary for Subcatchment 3S: To Southern Property Line

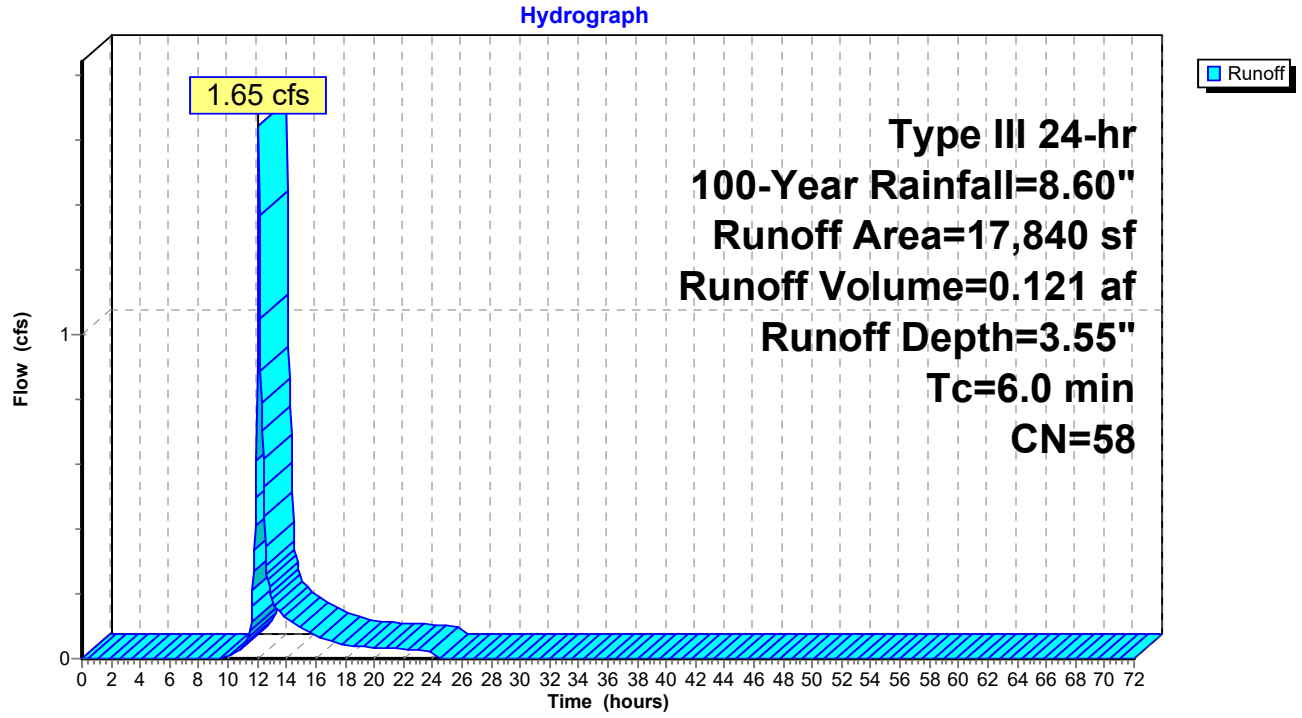
Runoff = 1.65 cfs @ 12.10 hrs, Volume= 0.121 af, Depth= 3.55"
Routed to Reach 3R :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

	Area (sf)	CN	Description
	6,785	61	>75% Grass cover, Good, HSG B
	10,794	55	Woods, Good, HSG B
	0	98	Unconnected pavement, HSG B
*	0	98	Paved parking/Conc Walks, HSG B
*	261	98	Ledge
	17,840	58	Weighted Average
	17,579		98.54% Pervious Area
	261		1.46% Impervious Area

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

Subcatchment 3S: To Southern Property Line

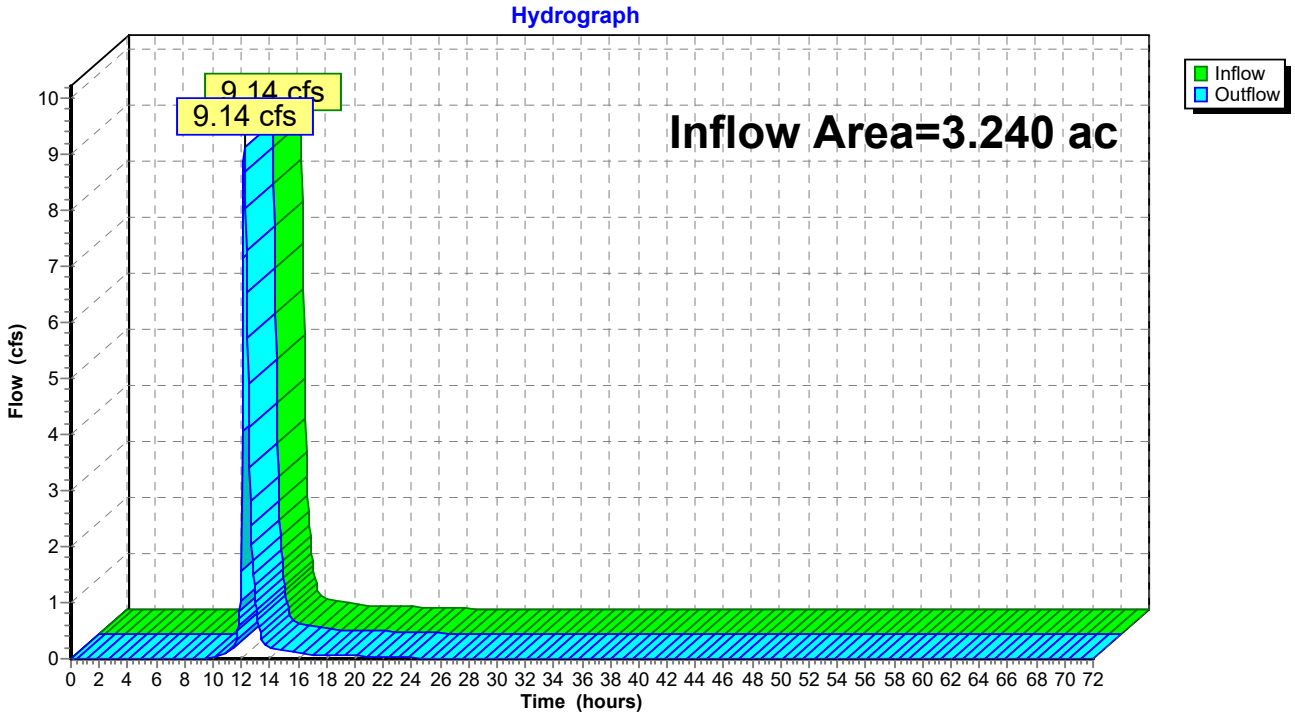


Summary for Reach 1R: 1R

Inflow Area = 3.240 ac, 28.50% Impervious, Inflow Depth = 1.88" for 100-Year event
Inflow = 9.14 cfs @ 12.19 hrs, Volume= 0.509 af
Outflow = 9.14 cfs @ 12.19 hrs, Volume= 0.509 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: 1R

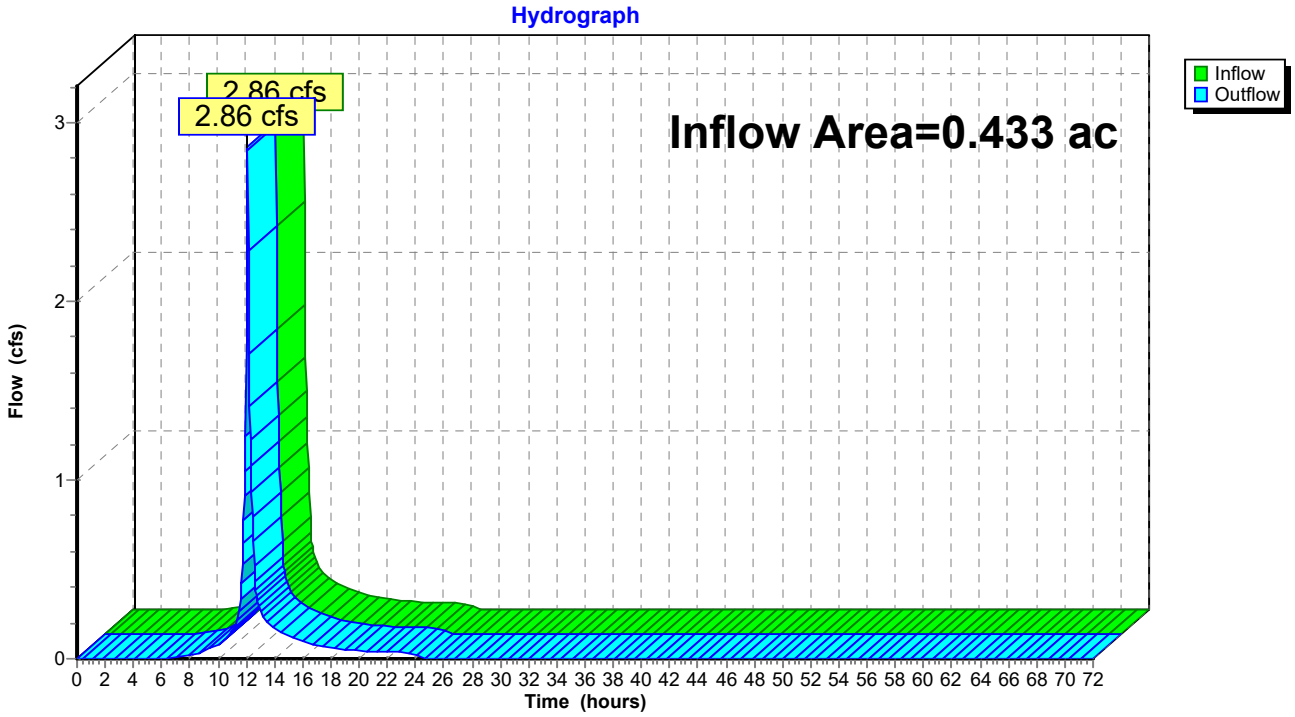


Summary for Reach 2R:

Inflow Area = 0.433 ac, 43.78% Impervious, Inflow Depth = 5.83" for 100-Year event
Inflow = 2.86 cfs @ 12.09 hrs, Volume= 0.210 af
Outflow = 2.86 cfs @ 12.09 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R:

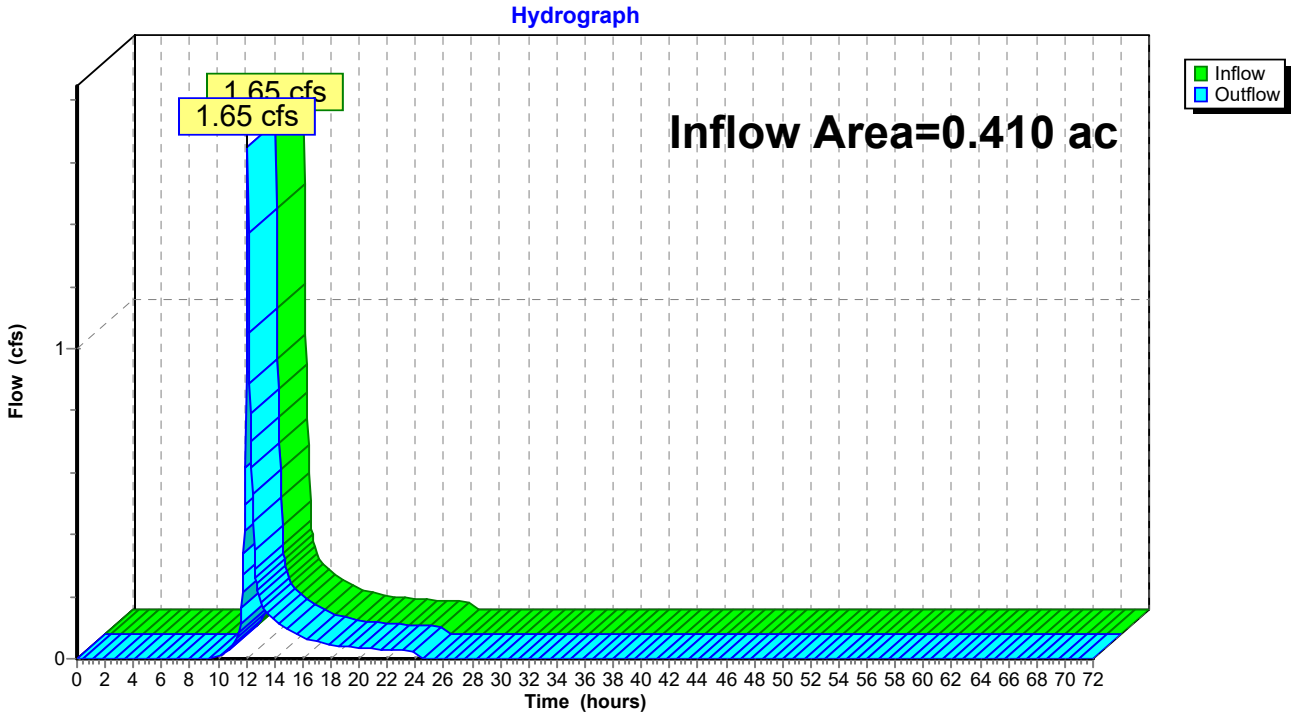


Summary for Reach 3R:

Inflow Area = 0.410 ac, 1.46% Impervious, Inflow Depth = 3.55" for 100-Year event
Inflow = 1.65 cfs @ 12.10 hrs, Volume= 0.121 af
Outflow = 1.65 cfs @ 12.10 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 3R:



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2.702 ac, 31.39% Impervious, Inflow Depth = 5.21" for 100-Year event
Inflow = 16.10 cfs @ 12.09 hrs, Volume= 1.174 af
Outflow = 9.54 cfs @ 12.22 hrs, Volume= 1.174 af, Atten= 41%, Lag= 7.5 min
Discarded = 2.00 cfs @ 12.22 hrs, Volume= 0.857 af
Primary = 7.54 cfs @ 12.22 hrs, Volume= 0.318 af
Routed to Reach 1R : 1R
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 28.37' @ 12.22 hrs Surf.Area= 6,241 sf Storage= 11,195 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 31.7 min (848.5 - 816.8)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	19,116 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	3,308	0	0	3,308
27.00	4,460	3,870	3,870	4,481
28.00	5,752	5,092	8,962	5,797
29.00	7,110	6,419	15,381	7,185
29.50	7,835	3,735	19,116	7,926

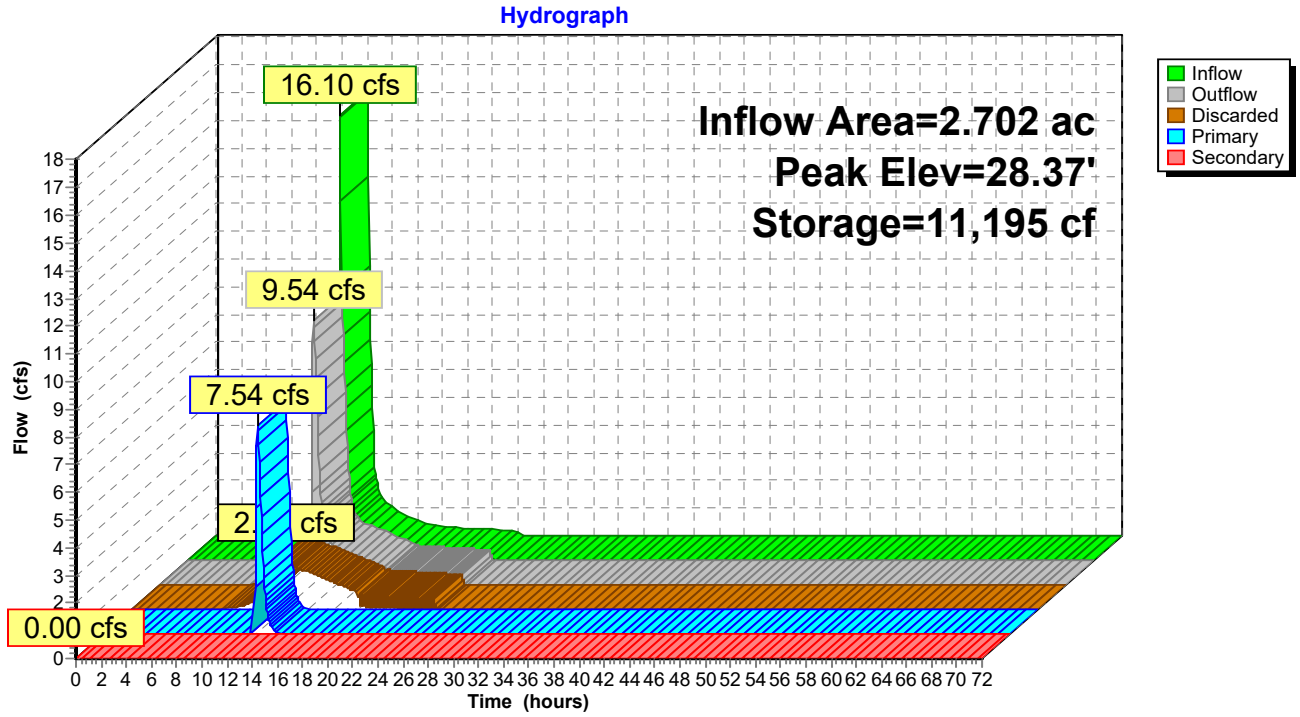
Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 23.50'
#2	Secondary	28.50'	**12.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	25.90'	**18.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 25.90' / 25.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#4	Device 3	27.40'	**2.4' long x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=2.00 cfs @ 12.22 hrs HW=28.36' (Free Discharge)
└**1=Exfiltration** (Controls 2.00 cfs)

Primary OutFlow Max=7.44 cfs @ 12.22 hrs HW=28.36' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Passes 7.44 cfs of 11.14 cfs potential flow)
└**4=Sharp-Crested Vee/Trap Weir** (Weir Controls 7.44 cfs @ 3.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin



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427 COLUMBIA ROAD, HANOVER, MA. 02339
TEL. (781) 826-9200

JOB	17-360		
SHEET N0.	1	of	1
CALCULATED BY	JG		
CHECKED BY	DK		3/24/2023

Outlet Protection - Standard 1

Location: **Bishops Lane, Hingham MA**

Reference: ASCE No 77 Design & Construction of Urban Stormwater Management Systems; Chapter 9, Section C - RipRap Protection at Outlets

Median Stone Diameter (d_{50}) = $0.0125(Q)^{4/3}/TW(D)$ For Y = D/2 : depth of scour hole below invert

Trap Size (3:1 side slopes) = Width = 2D+3Y
Length = 3D+3Y

Infiltration Basin Outlet:

Outlet Pipe (D) = 15" HDPE 1.25 ft
Q_{25} = 18.64 cfs
TW < 0.5 D 0.625 ft

Y = 0.63 ft

d_{50}= 0.78 ft

USE: 10" Median Dia Stone Size

Trap Size: 4.38 ft Width
5.63 ft Length

USE: 4.50 ft W x 5.75 ft L

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JOB	17-360		
SHEET N0.	1	of	2
CALCULATED BY	JG		
CHECKED BY	DK		9/1/2023

GROUNDWATER RECHARGE VOLUMES (STANDARD #3)

Location: **Bishops Lane, Hingham MA**

Total Area (Ac.)=	0.99	(Total impervious watershed area)
Total Impervious Area A Soil (Ac.)=	0.00	
Total Impervious Area B Soil (Ac.)=	0.99	Roadway, drives, walks & roofs
Total Impervious Area C Soil (Ac.)=	0.00	
Total Impervious Area D Soil (Ac.)=	0.00	

	Vol. To Recharge (inches per Imp. Acre)	Volume (Imp. Area x inches per Acre)
Recharge Volume (A soil)	0.60	0.00
Recharge Volume (B soil)	0.35	0.35
Recharge Volume (C soil)	0.25	0.00
Recharge Volume (D soil)	0.10	0.00

Total Required Recharge Volume:	0.35	AC-IN
	0.029	AC-FT
	1258	C.F.

Recharge volume provided within Infiltration Facilities (basin)	**5,878**	C.F.

(Rv will be total storage volume below lowest outlet elevation)

Groundwater Recharge Volume Calculation Per Infiltration System:

Infiltration Basin (Pond 1P)

Total Impervious Area A Soil (SF.)=	0	
Total Impervious Area B Soil (SF.)=	35717	Roofs, Drives, Road and Sidewalk
Total Impervious Area C Soil (SF.)=	0	
Total Impervious Area D Soil (SF.)=	0	

	Vol. To Recharge (inches per Imp. SF)	Volume (Imp. Area x inches per SF)	
Recharge Volume (A soil)	0.60	0	SF-IN
Recharge Volume (B soil)	0.35	12501	
Recharge Volume (C soil)	0.25	0	
Recharge Volume (D soil)	0.10	0	

Required Recharge Volume:	**1042**	C.F.
Proposed Recharge Volume:	**5,878**	C.F.

Drawdown Calculations for Infiltration Systems:

Drawdown Time = Rv/(k)(basin bottom area)

where Rv will be total storage volume below lowest outlet elevation

Open Infiltration Basin			2.52	< 72 hrs.
(Pond 8P)	Rv =	5878	cf	
	k=	8.27	in/hr (convert to ft)	
	Bot. Area=	3383	sf	

Minimum Bottom Area Calculation

A = Rv / (D+kT)

Rv = Required Recharge Volume

k = Saturated hydraulic conductivity rate

D = Depth of facility (ft)

T = Allowable drawdown during peak, Use 2 hrs

Open Infiltration Basin	Rv =	1042	cf	
(Pond 8P)	D =	2.5		
	k=	8.27	in/hr (convert to ft)	
	T =	2		
	A (Min. Bottom Area) =	269	sf	
	Proposed Bottom Area =	3383	sf	Ok

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JOB 17-360
SHEET N0. 1 of 1
CALCULATED BY JG
CHECKED BY DK 9/1/2023

WATER QUALITY VOLUME (STANDARD #4)

Location: **Bishops Lane, Hingham MA**

Infiltration Basin System

First Defense Unit (FD1) (9P):

Proprietary Treatment Unit: Q=(qu)(A)(WQV)

qu for Tc of 6 min.	774	(csm/in)		
Impervious Area: AC*0.0015625mi^2/AC	0.0012	mi^2	0.76	AC
WQV Treated:	1.00	in		
Q (Peak flow rate for 1" WQV):	**0.92**	cfs		
Proposed FD-4HC Max. Treated Flow Rate:	**1.5**	cfs		

Max flow rate = 18 cfs

Volume using: 0.5 or 1.0 inch x Imp. Area (per S.W. Mgmt Policy)
1 inch x Imp. Area **2,764** CF (min)

WQ Treatment within FD Unit =
Recharge volume provided by Infiltration System = **5,878**

Total Walter Quality Volume Provided = **5,878** CF (Proposed)

Water Quality Volume - Total Site Improvements

Total Impervious Area:

Proposed Roof	0.15	
Proposed Pavement/Sidewalk	0.84	
Total Area:	0.99	AC

Water Quality
Volume using: 0.5 or 1.0 inch x Imp. Area (per S.W. Mgmt Policy)
1 inch x Imp. Area **3,590** CF (min)

Total Walter Quality Volume Provided = **5,878** CF (min)

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 (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(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)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
1.7400	***R***	**Recharge (infiltration) rate (feet/day)**
0.320	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
16.54	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
55.000	**x**	**1/2 length of basin (x direction, in feet)**
14.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
23.500	**hi(0)**	**initial thickness of saturated zone (feet)**
25.401	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.901	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Conversion Table

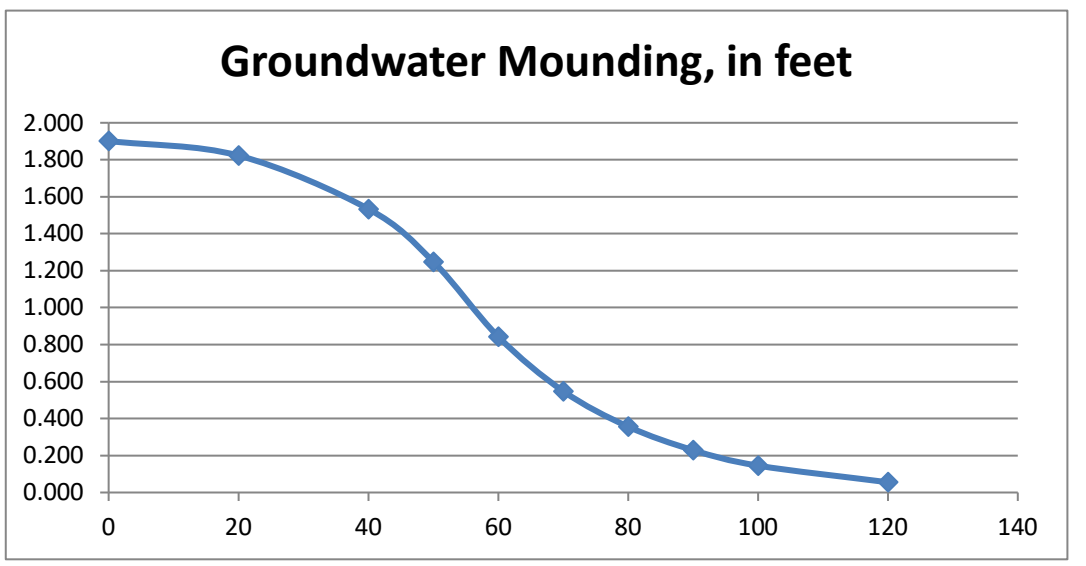
inch/hour	feet/day
0.67	1.33
2.00	4.00

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).

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.901	0
1.823	20
1.534	40
1.249	50
0.843	60
0.548	70
0.356	80
0.229	90
0.145	100
0.055	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 ASSOCIATES INC.
REGISTERED PROFESSIONAL ENGINEERS
427 COLUMBIA ROAD, HANOVER, MA. 02339
TEL. (781) 826-9200

JOB 17-360
SHEET N0. 1 of 1
CALCULATED BY JG
CHECKED BY DK
DATE: 3/24/2023
REV'D:

Hantush (1967) Groundwater Mounding Calculator Data

Location: **16 Bishops Lane, Hingham**

Infiltration System:

1	Soil Texture Class - Coarse Sand		
2	Hydraulic Conductivity (K)		
	Rate (ft/day): Rawls Table	**16.54**	ft/day
3	Specific Yield: Gravelly Sand =	**0.32**	
4	T= (per Brett Rowe & Kermit Studley, MA DEP):	**1**	days
5	Initial Sat'd Thickness (h_i): (assumed from nearby well)	**26.5**	ft
6	Length of basin:	**110**	ft
7	Width of basin:	**29**	ft
8	Recharge Rate:		
	A=L x W =	**3383**	sf
	Flow	**5,878**	C.F. per day (Hydrocad)
	Recharge Rate:	**1.74**	ft/day

Stage-Area-Storage for Pond 1P: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
26.00	3,383	3,383	0
26.10	3,493	3,495	344
26.20	3,604	3,608	699
26.30	3,718	3,724	1,065
26.40	3,833	3,841	1,442
26.50	3,950	3,960	1,831
26.60	4,068	4,080	2,232
26.70	4,188	4,203	2,645
26.80	4,311	4,327	3,070
26.90	4,434	4,453	3,507
27.00	4,560	4,581	3,957
27.10	4,681	4,704	4,419
27.20	4,803	4,828	4,893
27.30	4,926	4,954	5,379
27.40	5,052	5,082	5,878
27.50	5,178	5,211	6,390
27.60	5,307	5,342	6,914
27.70	5,437	5,475	7,451
27.80	5,568	5,609	8,001
27.90	5,701	5,745	8,565
28.00	5,836	5,882	9,142
28.10	5,967	6,016	9,732
28.20	6,099	6,151	10,335
28.30	6,233	6,288	10,952
28.40	6,368	6,426	11,582
28.50	6,505	6,565	12,225
28.60	6,643	6,706	12,883
28.70	6,783	6,849	13,554
28.80	6,924	6,993	14,239
28.90	7,066	7,139	14,939
29.00	7,210	7,286	15,653
29.10	7,352	7,431	16,381
29.20	7,496	7,578	17,123
29.30	7,641	7,726	17,880
29.40	7,787	7,876	18,651
29.50	**7,935**	**8,027**	**19,437**

First Defense® High Capacity

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Applications

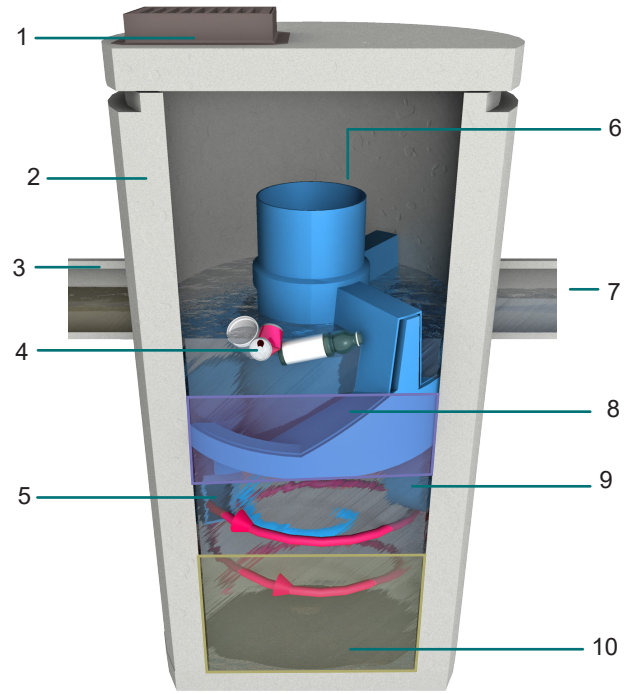
- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 450% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

Verified by NJCAT and NJDEP

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at peak flows.



Components

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

How it Works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

First Defense® High Capacity

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

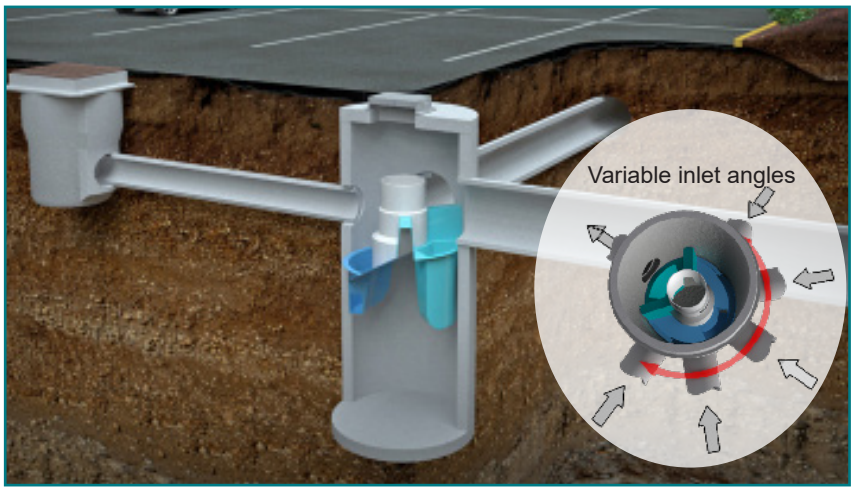


Fig 2. Works with multiple inlet pipes and grates

Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

Sizing Calculator for Engineers

This simple online tool will recommend the best separatror, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Fig 3. Maintenance is done with a vactor truck

Table 1. First Defense® High Capacity Design Criteria.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 30.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 53.2	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC*	5 / 1.5	2.34 / 66.2	2.94 / 83.2	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 119.8	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

***Coming soon**
[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Stormwater Solutions
hydro-int.com/firstdefensehc

Center for Environmental Systems
Stevens Institute of Technology
One Castle Point
Hoboken, NJ 07030-0000

January 9, 2016

Titus Magnanao
NJDEP
Division of Water Quality
Bureau of Non-Point Pollution Control
401-02B
PO Box 420
Trenton, NJ 08625-0420

Dear Mr. Magnanao,

Based on my review, evaluation and assessment of the testing conducted on the First Defense® HC (FDHC) Stormwater Treatment Device by Hydro International and observed by FB Environmental Associates, the test protocol requirements contained in the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" (NJDEP HDS Protocol) were met or exceeded. Specifically:

Test Sediment Feed

The mean PSD of Hydro Internationals test sediments comply with the PSD criteria established by the NJDEP HDS protocol. The Hydro International removal efficiency test sediment PSD analysis was plotted against the NJDEP removal efficiency test PSD specification. The test sediment was shown to be slightly finer than the sediment blend specified by the protocol. The Hydro International scour test sediment PSD analysis was plotted against the NJDEP removal efficiency test PSD specification and shown to be much finer than specified by the protocol.

Removal Efficiency Testing

In accordance with the NJDEP HDS Protocol, removal efficiency testing was executed on the 4-ft. laboratory unit in order to establish the ability of the FDHC to remove the specified test sediment at 25%, 50%, 75%, 100% and 125% of the target MTFR. Prior to the start of testing Hydro International reviewed existing data and decided to utilize a target MTFR of 675 gpm (1.50 cfs). This target was chosen based on the ultimate goal of demonstrating greater than 50% annualized weighted solids removal as defined in the NJDEP HDS Protocol. The flow rates, feed rates and influent concentration all met the NJDEP HDS test protocol's coefficient of variance requirements and the background concentration for all five test runs never exceeded 20 mg/L.

Scour Testing

In order to demonstrate the ability of the FDHC to be used as an online treatment device scour testing was conducted at greater than 200% of MTFR in accordance with the NJDEP HDS Protocol. The average flow rate during the online scour test was 3.24 cfs, which represents 216% of the MTFR (MTFR = 1.50 cfs). Background concentrations were 2 mg/L throughout the scour testing, which complies with the 20 mg/L maximum background concentration specified by the test protocol. Unadjusted effluent concentrations ranged from 2 mg/L to 4 mg/L with a mean of 2.1 mg/L. When adjusted for background concentrations, the effluent concentrations range from 0 to 2 mg/L with a mean of 0.1 mg/L. These results confirm that the 4-ft. FDHC did not scour at 216% MTFR and meets the criteria for online use.

Maintenance Frequency

The predicted maintenance frequency for all models is 44 months.

Sincerely,

Richard S. Magee, Sc.D., P.E., BCEE

Stormwater Solutions

Hydro International

Turning Water Around...®

December 21, 2015

Dr. Richard Magee, Sc.D., P.E., BCEE
Technical Director
New Jersey Corporation for Advanced Technology
c/o Center for Environmental Systems
Stevens Institute of Technology
One Castle Point on Hudson
Hoboken, NJ 07030

Re: Verification of First Defense® HC to NJDEP HDS Laboratory Testing Protocol

Dear Dr. Magee:

Hydro International's First Defense® HC (FDHC) vortex separator for stormwater treatment recently underwent verification testing according to the NJDEP HDS Laboratory Testing Protocol. As required by the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology", this letter serves as Hydro International's statement that all procedures and requirements identified in the aforementioned protocol and process document were met or exceeded. The 4-ft FDHC removal efficiency and scour tests conducted at Hydro International's laboratory facility in Portland, Maine were done so under the direct supervision of FB Environmental Associates. All water quality samples were analyzed by the independent analytical lab, Maine Environmental Laboratory. The removal efficiency particle size distribution was analyzed by the independent analytical laboratory, GeoTesting Express. The scour test particle size distribution was analyzed at Hydro International's facility under the supervision of FB Environmental Associates. Additionally, the preparation of the verification report and the documentation contained therein fulfill the submission requirements of the process document and protocol.

If you have any questions or comments regarding the verification of the FDHC, please do not hesitate to contact us.

Sincerely,

Lisa Lemont, CPSWQ
Business Development Manager

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Statement of Third Party Observer

STATEMENT OF THIRD PARTY OBSERVER

To: Lisa Lemont, Hydro International, Portland, Maine

From: Forrest Bell, FB Environmental Associates

Subject: Third Party Review under *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP, January 25 2013)[1]

Date: December 31, 2015

cc: Andrew Anastasio, Hydro International; Jeremy Fink, Hydro International
Margaret Burns, FB Environmental Associates

Statement of Third Party Observer

FB Environmental has served as the third-party observer for tests performed by Hydro International in October through December 2015. The tests assessed the First Defense HC Stormwater Treatment Device as a 50% Total Suspended Solids (TSS) removal device under the New Jersey Department of Environmental Protection certification. Tests were performed by Hydro International staff at their laboratory located at 94 Hutchinson Drive in Portland, Maine, to meet the standards described in *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP, January 25 2013)[1]. On May 10, 2014, we also submitted a statement of qualifications, as required by NJCAT MTD process.

A member of our staff verified compliance with the laboratory test protocol above, and our staff member was physically present to observe the full duration of all laboratory testing. We have also reviewed the data, calculations, and conclusions associated with the removal efficiency testing in the *Verification Testing Report for the First Defense® HC Stormwater Treatment Device* by Hydro International, dated December 29, 2015, and state that they conform to what we saw during our supervision as third-party observer.

Forrest Bell — December 31, 2015

Signed: Date:

[1] Available at http://www.nj.gov/dep/stormwater/treatment.html

Statement of Disclosure

STATEMENT OF DISCLOSURE – THIRD PARTY OBSERVER

To: Lisa Lemont, Hydro International, Portland, Maine

From: Forrest Bell, FB Environmental Associates

Subject: Third Party Observer Statement of Disclosure under *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP, January 25 2013)[1]

Date: December 31, 2015

cc: Andrew Anastasio, Hydro International
Margaret Burns, FB Environmental Associates

Statement of Disclosure – Third Party Observer

FB Environmental has no financial conflict of interest regarding the test results of the stormwater device testing outlined in the *Verification Testing Report for the First Defense ® HC Stormwater Treatment Device* by Hydro International, dated December 29, 2015.

Disclosure Record

FB Environmental has provided the service of third party observer for tests performed by Hydro International in October through December of 2015. The tests assessed the First Defense HC Stormwater Treatment Device as a 50% Total Suspended Solids (TSS) removal device under the New Jersey Department of Environmental Protection certification as outlined in the *Verification Testing Report for the First Defense ® HC Stormwater Treatment Device* by Hydro International, dated December 29, 2015. Beyond this, FB Environmental and Hydro International have no relationships that would constitute a conflict of interest, as outlined in *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP 2013). For example, we have no ownership stake, do not receive commissions, do not have licensing agreements, and do not receive funds or grants beyond those associated with the testing program.

Fort Bell — December 31, 2015

Signed: Date:

[1] Available at http://www.nj.gov/dep/stormwater/treatment.html

1 of 1

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: Bishops Lane, Hingham MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.00**	**0.75**	**0.00**	**0.75**
Infiltration Basin	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

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

Project: 17-360
Prepared By: DWK
Date: 3/24/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

TSS Removal Calculation Worksheet

Closed Drainage System

Location: Bishops Lane, Hingham MA

Proj. No.: 17-360
7/14/2023
Computed by: DWK

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Deep sump & hooded Catch Basin	25	1.00	0.25	0.75
First Defense Unit	50	0.75	0.38	0.38
Infiltration Basin	80	0.38	0.30	0.08

Total TSS Removal= **93%**

> 44% Treatment prior to Infiltration Basin

Notes:

*Starting TSS Load for first BMP= 1.00. TSS load for subsequent BMP's is equal to the Remaining Load (E) from the previous BMP.

Storm Drainage Computations

Name: Bishops Lane
Hingham, MA

Client: Steven Young

Proj. No.: **17-360**
Date: 3/24/2023 REV 9/1/23

Computed by: **JG**

Checked by: **DK**

Design Parameters:
7 **Year Storm** Boston, MA

k_e= **0.5**

DESCRIPTION	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE						
	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft
	CB1	DMH 1	0.07	0.55	0.04	0.04	0.13	6.0	7.0	0.3	2.5	0.011	12	0.0135	4.9	6.2	20	0.27	35.23	32.03	31.76	32.0	3.3
	CB2	DMH1	0.12	0.65	0.08	0.08	0.15	6.0	7.0	0.6	3.0	0.011	12	0.0100	4.2	5.4	27	0.27	35.23	32.03	31.76	31.9	3.3
	DMH1	DMH2	---	---	---	0.12	0.50	6.1	7.0	0.8	2.7	0.011	12	0.0050	3.0	3.8	80	0.40	37.58	31.76	31.36	31.7	5.9
Double Grate	CB3	DMH 2	0.06	0.74	0.05	0.05	0.06	6.0	7.0	0.3	2.7	0.011	12	0.0160	5.3	6.8	9	0.14	42.92	38.72	38.57	38.6	4.3
	CB4	DMH2	0.26	0.57	0.15	0.15	0.07	6.0	7.0	1.0	3.7	0.011	12	0.0100	4.2	5.4	15	0.15	42.92	38.72	38.57	38.6	4.4
	DMH2	DMH3	---	---	---	0.31	0.44	6.6	6.8	2.1	3.6	0.011	12	0.0050	3.0	3.8	94	0.47	43.94	31.36	30.89	31.2	12.7
	DMH3	DMH4	---	---	---	0.31	0.78	7.1	6.7	2.1	3.5	0.011	12	0.0050	3.0	3.8	164	0.82	49.05	30.89	30.07	30.7	18.3
	DMH4	DMH5	---	---	---	0.31	0.58	7.8	6.5	2.0	3.5	0.011	12	0.0050	3.0	3.8	121	0.61	47.21	30.07	29.46	29.9	17.3
	CB3	DMH5	0.48	0.68	0.33	0.33	0.14	6.0	7.0	2.3	6.5	0.011	12	0.0250	6.7	8.5	54	1.35	40.75	36.55	35.20	36.0	4.7
	DMH5	DMH6	---	---	---	0.64	0.25	6.1	7.0	4.5	6.5	0.011	15	0.0163	9.7	7.9	96	1.56	41.00	29.21	27.65	28.7	12.3
	DMH6	FES1	---	---	---	0.64	0.15	6.4	6.9	4.4	4.3	0.011	15	0.0050	5.4	4.4	40	0.20	31.50	27.65	27.45	27.4	4.1

Merrill Engineers- Land Surveyors
427 Columbia Rd., Hanover, MA. 02339
781-826-9200
26 Union St., Plymouth, MA. 02360
508-746-6060

FORMS 11 AND 12
SOIL EVALUATOR FORM

ON-SITE REVIEW

DEEP HOLE #: 19-01 DATE: 5/2/19 TIME: 11:00 AM WEATHER: Cloudy
SITE ADDRESS or MAP/LOT #: 16 Bishops Lane Hingham, MA
OWNER: Young Realty Trust JOB NO.: 17-360
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Residential SURFACE STONES: Yes: [X] No: [ ] SLOPE (%): 5-15%

VEGETATION: Woods LANDFORM: Ridges, Hills

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >100 ft
DRINKING WATER WELL: >150 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
0-12"	A	Loamy Sand	10 YR 2/2		Granular, Friable
12"-24"	B	Loamy Sand	10 YR 5/6		Massive, Friable
24"-48"	C	Coarse Sand	2.5 Y 6/3	Weeping @36"	Single Grain, Loose, Coarse.

PARENT MATERIAL: Coarse-loamy melt-out till Unsuitable Material Present? Yes: [ ] No: [X] If Yes:
Disturbed Soil: [ ] Fill Mat'l: [ ] Impervious Layer(s): [ ] Weathered/Fractured Rock: [ ] Bedrock: [ ]

GROUNDWATER OBSERVED: Yes: [X] 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 : 36"

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/ Discon/ Add. Test Req'd:			Test Passed/ Failed/ Discon/ Add. Testing Req'd:		

Performed By: David Newhall Witnessed By: Drainage Mach./Oper.: Meridian Construction
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 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.

Plymouth County, Massachusetts

111E—Chatfield-Rock outcrop-Canton complex, 15 to 35 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w82t
Elevation: 0 to 180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Chatfield, very stony, and similar soils: 40 percent
Rock outcrop: 25 percent
Canton, very stony, and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Canton, Very Stony

Setting

Landform: Ridges, hills, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Hollis, very stony

Percent of map unit: 10 percent
Landform: Ridges, hills
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Side slope, nose slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Newfields, very stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills, moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 10, Oct 6, 2017

Plymouth County, Massachusetts

427B—Newfields fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: bcxt
Elevation: 10 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Newfields, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newfields, Extremely Stony

Setting

Landform: Hills, moraines, till plains
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly supraglacial meltout till

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 3 inches: fine sandy loam
Bs - 3 to 4 inches: fine sandy loam
Bw1 - 4 to 16 inches: fine sandy loam
Bw2 - 16 to 28 inches: gravelly fine sandy loam
2C - 28 to 63 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 15 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Barnstable, very stony

Percent of map unit: 8 percent
Landform: Moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Norwell, extremely stony

Percent of map unit: 7 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scituate, very stony

Percent of map unit: 5 percent
Landform: Drumlins, ridges
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 10, Oct 6, 2017

Merrill Engineers- Land Surveyors
427 Columbia Rd., Hanover, MA. 02339
781-826-9200
26 Union St., Plymouth, MA. 02360
508-746-6060

Project No. 17-360

Date: 7/28/2023
Revision:

Commonwealth of Massachusetts
Hingham , Massachusetts

Soil Suitability Assessment for On-site Sewage Disposal

Performed By:	Paul Louderback SE# 14618	Test Dates:	7/28/2023
Performed By:		Test Dates:	
Witnessed By:	NA - For Drainage	Testhole #:	23-01
Witnessed By:		Testhole #:	

FACILITY INFORMATION

Site Location:		Owner/ Applicant Information:	
Builder's lot #:		Name:	Steven and Caroline Young
Street Address:	16 Bishops Lane	Address:	16 Bishops Lane
Town, State, Zip:	Hingham, MA 02043	Town, State, Zip:	Hingham, MA 02043
Assessor's Map:	70-22	Telephone no.:	

SITE INFORMATION

Construction Type:

New Construction: [ ] Repair: [ ] Upgrade: [ ] Drainage: [X]

Published Soil Survey Available: No: [ ] Yes: [X]

Year Published: 2023 Publication Scale: 1:12,000 a. Soil Map Unit: **427B** Drainage Class: **HSG B**
b. Soil Map Unit: Drainage Class:

Soil Name: a. Newfields Fine Sandy Loam Soil Limitations: None

Surficial Geologic Report Available: No: [ ] Yes: [X]

Year Published: 2018 Publication Scale: 1:250,000

Geological Material/map unit: Course Deposits: consists of gravel deposits, sand and gravel deposits, & sand

Landform: Morains, till plains

Flood Insurance Rate Map:

Above 500 year flood boundary? No: [ ] Yes: [X] Within a velocity zone? No: [X] Yes: [ ]

Within 500 year flood boundary? No: [X] Yes: [ ] Within 100 year flood boundary? No: [X] 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-2023

Range: Above Normal: [ ] Normal: [X] Below Normal: [ ]

Other References Reviewed: From MA-D4W 79R Duxbury well
Comments:

Merrill Engineers Land Surveyors
427 Columbia Rd., Hanover, MA. 02339
26 Union St., Plymouth, MA. 02360

Project No.: 17-360

Date: 7/28/23
Revised:

***Deep Hole #** 23-01

Builder's lot #:
Street Address: 16 Bishops Lane
Town: Hingham, MA 02043
Assessor's Map: 70-22

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: _____ inches
- ☐ Ground water adjustment: _____ feet

Index Well Number: _____ Reading Date: _____ Index well level: _____

Adjustment factor: None 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 Environtmental Protection and that the above analysis was performed by me conistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator: _____ Date: July 18, 2023
Typed or Printed Name of Soil Evaluator: Paul Louderback SE# 14618
Date of Soil Evaluator Exam: 5/17/2022

Name of Board of Health Witness: NA - For Drainage
Board of Health: _____

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

Merrill Engineers- Land Surveyors
427 Columbia Rd., Hanover, MA. 02339
781-826-9200
26 Union St., Plymouth, MA. 02360
508-746-6060

FORMS 11 AND 12
SOIL EVALUATOR FORM

ON-SITE REVIEW

DEEP HOLE #: 23-01 DATE: 7/28/2023 TIME: 9:00 WEATHER: Sunny 85°
SITE ADDRESS or MAP/LOT #: 16 Bishops Lane, Hingham Hingham, MA 02043
OWNER: Young Family Trust (Steve Young) JOB NO.: 17-360
LOCATION (Identify on Plan): See Attached Plan GROUND ELEVATION AT SURFACE OF HOLE: 26±

LAND USE: Residential SURFACE STONES: Yes: [ ] No: [X] SLOPE (%): 3-5%

VEGETATION: Heavily wooded empty lot LANDFORM: Moraine/ till plain

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
0-12	A	Loamy Sand	10Yr 2/2	-	Massive Friable
12-24	Bw	Loamy Sand	10Yr 5/6	-	Massive Friable
24-120	C	Corse Sand	2.5 Y 6/3	-	20% gravel & stones (dense in place, loose in hand)
					Single grain, loose

PARENT MATERIAL: Course loamy deposits over gravel/sand deposits Unsuitable Material Present? Yes: [ ] No: [X] If Yes:
Disturbed Soil: [ ] Fill Mat'l: [ ] Impervious Layer(s): [ ] Weathered/Fractured Rock: [ ] Bedrock: [ ]

GROUNDWATER OBSERVED: Yes: [X] No: [ ] If Yes: What is the depth of Groundwater:
Standing in Hole: 109" Weeping from Face: 105" Saturating the Face: - Mottling: none observed
Estimated Depth to Seasonal High Ground Water :

PERCOLATION TEST

Percolation Hole #:	N/A		Percolation Hole #:		
Test Date:	for drainage		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: Paul Louderback Witnessed By: N/A - for drainage Mach./Oper.: Meridian - Brendan Smith
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 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.

Operation and Maintenance Plans

- Construction Operation and Maintenance Plan & Pollution Prevention Plan
- Long Term Source Control / Pollution Prevention Plan & Operation and Maintenance Plan

Merrill
Engineers and Land Surveyors

March 24, 2023

Construction Phase Operation & Maintenance Plan

Definitive Subdivision
Bishops Lane, Hingham MA

Table of Contents

CONSTRUCTION PHASE
OPERATION AND MAINTENANCE PLAN

Dated: March 24, 2024

Bishops Lane
Definitive Subdivision
Hingham, MA

The structural and stabilization practices utilized on site correspond with plans entitled "Bishops Lane, Definitive Subdivision, Hingham, Massachusetts", dated March 24, 2023 as revised hereinafter referred to as the Site Plans.

Responsible Party for Operation and Maintenance Contact Information:

Steve Young
16 Bishops Lane
Hingham MA 02043
P: 617-645-0374

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.

Project Description:

The project proponent, Steven Young, proposes to develop an approximate 3.5-acre parcel of land at 16 and 0 Bishops Lane in Hingham, Massachusetts. The property has frontage on Bishops Lane and is shown as Map 70, Lots 20 and 22 on the Town of Hingham Assessor's Maps. The proposed development will consist of improvements to one (1) existing home, three (3) new single family homes, improvements/widening to approximately 300 feet of the existing Bishops Lane and the construction of approximately 470 feet of bituminous roadway with associated infrastructure. The site is primarily surrounded by developed residential zoned property on Bishops Lane, South Street and Del Prete Drive. Refer to the USGS Site Locus Map for the location of the parcel. This report contains calculations of stormwater runoff for pre- and post-development conditions and includes the sizing of the proposed drainage system and stormwater management facilities to support the development.

Pre-Development Condition

The site presently is comprised of a single family home located at 16 Bishops Lane with a bituminous concrete driveway, lawn area, detached garage, pool and pool house, several exposed ledge outcrops near the existing dwelling and forested areas in the southern portion of the property. The site is primarily wooded with topography consisting of moderate to steep slopes throughout with stormwater runoff from the property flowing

overland in two general directions. The southern portion of the property flows in a northerly direction towards an offsite wetland area. The existing home generals flows towards Bishops Lane towards South Street. Currently there is no stormwater runoff controls and no stormwater attenuation occurs.

Soils

Soil types and information was obtained from Soils Conservation Service (SCS) Survey of Plymouth County, Massachusetts, NRCS mapping. The soils on site are classified as Chatfield-Rock outcrop-Canton complex very stony (15-35% slopes), Newfields fine sandy loam extremely stony (3-8% slopes) in the area of the proposed development. All soil types are identified as Hydrologic Soil Group (HSG) B soils. In order to confirm the soil class and groundwater depth characteristics of these soils, soil testing was performed during May 2019 within the approximate location of the proposed stormwater basin.

Post-Development Condition

Under the post development conditions, stormwater runoff from the proposed roadway and single family dwellings will be directed by closed drainage, gutters and roof leaders, and surface flow to a stormwater infiltration basin located in the northern portion of the property. The objective in designing the proposed drainage system for the project was to maintain existing natural drainage patterns and to ensure that post-development rates of runoff are equal to or less than pre-development rates at all design points. Based on the soil conditions found on site, an exfiltration rate of 8.27 in/hr was used in the stormwater calculations for the infiltration basin. The increase in stormwater runoff from the roadway, roofs, walkways and driveways shall be treated and infiltrated. The majority of the runoff is directed toward the stormwater basin for treatment and attenuation.
The stormwater management systems were designed to be in compliance with the DEP Stormwater Management Regulations (SMR).

Erosion and Sedimentation Control Best Management Practices:

Structural Practices:

1) **Silt Sock Erosion Control Barrier** – A silt sock barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sock barrier should be installed as shown on the Site Plan and Construction Detail Plan.

   Silt Sock Installation Requirements

   a) Locate the silt sock where identified on the plans.

   b) The silt sock line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the silt sack should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

   c) The silt sock shall be staked every 8 linear feet with 1-inch by 1-inch stakes.

   d) Sediment silt sock should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through

one growing season. Retained sediment must be removed and properly disposed of, or mulched and seeded.

Silt Sock Inspection/Maintenance

a) Silt sock should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the stakes are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the silt sock. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all silt sock materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform with the existing topography and vegetated.

2) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the proposed roadway entrance off Bishops Lane. The construction entrance will keep mud and sediment from being tracked off the construction site onto surrounding streets by vehicles leaving the site. The stabilized construction entrance will be installed prior to any major soil disturbance on site. The construction entrance will be graded to contain stormwater runoff from the entrance to prevent sediment from washing onto the adjacent ground surface. The stabilized construction entrance shall be constructed as shown on the Site Plans.

Construction Entrance Installation Requirements

a) Grade foundation of construction entrance with slightly concave shape to contain runoff within the entrance to prevent sediment from washing onto the adjacent ground surface.

b) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

c) Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater.

d) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

e) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the

vehicle enters the road or street. The wash area shall be located at the stabilized construction entrance.

f) Water employed in the washing process shall be directed to the temporary sedimentation basin/dewatering area as shown on the plans prior to discharge. Sediment should be prevented from entering any watercourses.

Construction Entrance Maintenance

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Bishops Lane and South Street. This may require periodic topdressing with additional stone

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the temporary sedimentation basin/dewatering area should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available. Any water pumped from the temporary sedimentation basin shall be directed into a sediment dirt bag or equivalent inlet protection prior to discharge. Discharge should not be across the disturbed construction site but rather to undisturbed areas.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) Broken road pavement on Bishops Lane and South Street shall be repaired immediately.

h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed and only following approval by the Engineering Department or their representative. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

3) **Temporary Sediment Basin** – Temporary sediment basins shall be constructed in locations as determined by the Site Contractor as necessary. The temporary sediment basins will handle storm water, filtering out sediment until the permanent stormwater drainage system is functioning properly. The temporary sediment basins will be lined with sediment erosion barrier controls.

Sediment Basin Design/Installation Requirements

a) Divert runoff from undisturbed areas away from basins.

b) The sediment basins should have a minimum volume based on ½ inch of storage for each acre of drainage area.

c) The length-to-width ratio should be 2:1 or greater; divert inflow to upper end of basin to avoid short-circuiting flow. Length is defined as the average distance from the inlet to the outlet of the trap.

d) Utilize side slopes of 3:1.

e) The sediment basins should be located as close to the sediment source as site conditions permit considering soils, pool area, dam length, and spillway conditions.

f) Line bottom with gravel and stabilize as soon as possible.

Sediment Basin and Swale Inspection/Maintenance

a) The sediment basins should be readily accessible for maintenance and sediment removal. The sediment basins should remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place.

b) Inspect the sediment basins after each significant rainfall.

c) Remove and properly dispose of sediment when it accumulates to one-half design volume (level marked by reference stake). The effectiveness of a sediment pond is based less on its size than on regular sediment removal.

d) Check embankment and outlet for erosion damage.

e) Check embankment for: settlement, seepage, or slumping along the toe. Repair immediately. Remove trash and other debris from principal spillway and pool area.

f) Clean or replace gravel when sediment pool does not drain properly.

4) **Inlet Protection** – Inlet Protection will be utilized around the existing catch basin grates as determined by the Site Contractor as necessary. The inlet protection will prevent any sediment from entering the street(s) and or site's closed drainage system. Siltsack or equivalent will be utilized for the inlet protection. Siltsack is manufactured by ACF Environmental. The telephone number is 1-800-437-6746. Regular flow siltsack will be utilized, and if it does not allow enough storm water flow, hi-flow siltsack will be utilized.

Silt Sack (or equivalent) Inlet Protection Maintenance Requirements

a) The silt sack trapping device and the catch basin should be inspected after every rain storm and repairs made as necessary.

b) Sediment should be removed from the silt sack after the sediment has reached a maximum depth of one-half the depth of the trap.

c) Sediment should be disposed of in a suitable area and protected from erosion by either structural or vegetative means. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

d) The silt sack must be replaced if it is ripped or torn in any way.

e) Temporary traps should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

1) **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stock piles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

Temporary Seeding Planting Procedures

a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

c) The seedbed should be firm with a fairly fine surface. Perform all cultural operations across or at right angles to the slope. A minimum of 2 to 4-inches of tilled topsoil is required. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content.

d) Apply uniformly 2 tons of ground limestone per acre (100 lbs. Per 1,000 sq.ft.) or according to soil test. Apply uniformly 10-10-10 analysis fertilizer at the rate of 400 lbs. per acre (14 lbs. per 1,000 sq.ft.) or as indicated by soil test. Forty

percent of the nitrogen should be in organic form. Work in lime and fertilizer to a depth of 4-inches using any suitable equipment.

e) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

f) Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

g) Use effective mulch, such as clean grain straw; tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Maintenance

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to a heavy rainfall, defined as a 2-year storm event (i.e., 3.35 inches of rainfall within a twenty-four hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open

			polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Maintenance

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting. The preferred mulching material is straw.

Mulch (Straw) Installation

a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq.ft. is 90-100 lbs. (2-3 bales) and the application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

Mulch Maintenance

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Straw or grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) **Land Grading** – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

Land Grading Stabilization Maintenance

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed. Organic fertilizer shall be utilized in areas within the 100-foot buffer zone to a wetland resource area.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially along vehicle circulation paths. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of dust control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Soil Stockpiling:

Topsoil and subsoil from the roadway grading will be stockpiled in locations shown on the plans.

Stockpile Material Construction Procedure

1) Topsoil and subsoil that are stripped will be stockpiled for later distribution on disturbed areas.
2) The stockpiles will be located as shown on the plans. These locations will allow them to not interfere with work on the site.
3) Seed the stockpiles with a temporary erosion control mix if the stockpile is to remain undisturbed for more than 30 days. The stockpiles must be stable and the side slopes should not exceed 2:1.
4) Sediment erosion control measures should be placed surrounding each stockpile.
5) As needed, the stockpiled topsoil and subsoil are redistributed throughout the site.

Pollution Prevention:

Spill Prevention and Response:

The site supervisor or their representative shall be present on the job site at all times during the course of work and shall be present during the delivery, removal of any liquid/chemical materials to or from the job site. They will also be present during any refueling practices. All subcontractors will be notified of their responsibilities in writing. In the event a spill occurs, the site supervisor shall be notified immediately.
The site supervisor shall have in place a spill prevention plan and resources to contain and clean up any potential spills in a timely manner. Refer to the attached Spill Containment & Management Plan, including Spill Report, Emergency Response Equipment Inventory, and Emergency Notification and phone numbers.

Fueling and Maintenance of Equipment or Vehicles:

The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. This document shall include language that shall permit the maintenance of vehicles only in designated locations on the job site. The site supervisor shall document receipt of these instructions by obtaining the signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities.

Several types of vehicles and equipment will be used on-site throughout the project, including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, and forklifts. Vehicles requiring refueling or lubrication shall be brought to a designated portion of the site away from environmentally sensitive areas (such as storm drains, steep slopes, etc.) or shall utilize temporary drip protection measures at the location of fueling. The operator shall take precautions to ensure that drips, spills or seeps do not enter the ground. The use of absorbent towels beneath the

fuel tank is recommended. Absorbent, spill cleanup materials and spill kits should be kept on site. Refueling or maintenance of equipment in locations other than those designated for such activity shall be performed under the supervision of the site supervisor or his/her designee. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

1. Fueling operations shall take place in designated area(s) as shown on site maps. Provide temporary drip protection during fueling operations which take place outside of designated area(s). Materials necessary to address a spill shall be made readily available in a location known to the site supervisor or his/her designee.
2. Fueling operation procedures shall be in effect throughout the project duration.

Maintenance Requirements -

1. Vehicles and equipment will be inspected on each day of use. Leaks will be repaired immediately, or the problem vehicle or equipment will be removed from the project site.
2. All emergency response equipment listed in the Emergency Response Equipment Inventory shall be made readily available and kept in a designated location known to the site supervisor or his/her designee. All such materials shall be replenished as necessary to the listed amounts.

Washing of Equipment and Vehicles:

The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. The site supervisor shall document receipt of these instructions by obtaining the signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities. This document shall include language that shall not permit vehicle washing on the job site. Concrete trucks shall be exempt from this rule. Concrete truck cleaning shall be confined within the work area and conducted in a manner to prevent water drainage beyond the specified area of work.

Concrete truck washout shall be conducted in designated areas only and shall not be discharged in areas which would allow wash water to leave the site or enter protected areas.

Maintenance Requirements -

1. The site supervisor shall maintain a log of individuals receiving these instructions.

Storage, Handling, and Disposal of Construction Products, Materials, and Wastes:

Building products stored on site shall be kept in designated materials storage areas as shown on the site map(s). Storage areas shall properly contain materials and prevent materials or their containers/wrappers from being strewn about the site. Any leaking containers shall be removed and properly disposed of immediately. Weather sensitive materials shall be safely stored in closed temporary containers as necessary.

1. Place all materials being stored for future use in designated storage areas.
2. Place all weather sensitive materials in closed temporary containers as necessary. Care should be taken to store materials in accordance with manufacturer's

recommendations and to avoid storing combinations of materials which may cause a noxious, volatile or otherwise dangerous condition.

3. All non-hazardous solid waste shall be disposed of in a trash receptacle (dumpster) which shall be removed and disposed of at an approved land fill.

Maintenance Requirements -

1. The site supervisor shall inspect the designated storage areas weekly and after storm events as well as any portions of the site under construction to ensure that all materials are properly stored. The storage areas will be kept clean, well-organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.

Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

The use of pesticides and herbicides is not currently anticipated for this site. Fertilizers and landscape materials will be used to stabilize slopes and other disturbed areas.

1. Store all fertilizers and landscape materials in designated secure locations. Store all weather sensitive materials in closed containers in accordance with manufacturer's recommendations.

Maintenance Requirements

1. The site supervisor shall inspect the designated storage areas weekly as well as any portions of the site under construction to ensure that all materials are properly stored. Storage issues shall be immediately addressed.

Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

Storage of diesel fuel, oil hydraulic fluids and other petroleum products/chemicals shall be in a secure area protected from the outside elements.

Refueling and maintenance for vehicles or equipment shall occur either within the designated area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

Refueling or maintenance of equipment in locations other than those designated for such activity shall be performed under the supervision of the site supervisor or his/her designee and shall employ drip pans or other suitable means of preventing fuel, hydraulic fluid, etc. from spilling or being otherwise carried offsite or into protected areas.

Hazardous or Toxic Waste

(Note: Examples include paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds, acids.)

Hazardous or toxic waste associated with paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds, acids shall be stored in sealed containers to prevent leakage and corrosion, and which are labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) and all other applicable federal, state and local requirements.

Hazardous or toxic waste shall be collected in approved containers and disposed of in accordance with municipal, state and federal regulations.

Hazardous and toxic waste shall not be disposed of in solid waste containers intended for non-hazardous construction debris.

Maintenance Requirements

1. The site supervisor shall inspect all portions of the project under construction weekly and after storm events to ensure that all hazardous or toxic materials are stored and disposed of in accordance with the practices detailed above and shall immediately correct any improper storage or disposal practices.

Construction and Domestic Waste:

(Note: Examples include packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, and other trash or building materials.)

All construction and domestic waste shall be collected and disposed of into dumpsters. Dumpsters will be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site will be deposited in the dumpster. No construction materials will be buried on-site. Any overflow from containers/dumpsters shall be cleaned up immediately. All personnel will be instructed regarding the correct disposal of trash and construction debris. Notices that state these practices will be posted in the job site trailer and the individual who manages day-to-day operations will be responsible for seeing that these practices are followed.

Recyclable waste material shall be stored in an appropriate container or in a designated location on site until it can be removed.

1. Dumpsters and recyclable waste material containers shall be located as needed throughout the site.

Maintenance Requirements

1. The site supervisor shall inspect all dumpsters and containers to confirm that construction and domestic waste is properly contained and shall also ascertain that waste is being picked up in a timely manner to ensure that no receptacles are overflowing. Pick-up schedules shall be modified, or the number of receptacles shall be increased as needed.

Sanitary Waste

Sanitary facilities (portable toilets) will be provided at the site throughout the construction phase. The portable toilets will be located away from a concentrated flow paths or traffic flow.

Sanitary facilities will be brought to the site at the start of construction.

Maintenance Requirements

1. If necessary, the site supervisor shall execute a contract with a vendor to supply and maintain portable toilets throughout the site for the project duration. The portable toilets shall be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks will be removed from the site and replaced

with new portable toilets. The site supervisor shall determine if a sufficient number of toilets are present to meet staffing levels and shall ensure that the toilets are regularly and properly maintained.

Washing of Applicators and Containers used for Paint, Concrete or Other Materials

Concrete washout shall be restricted to designated areas only. Paints, form release oils, curing compounds, etc. shall be recycled and/or disposed of utilizing appropriate containers in accordance with manufacturer's recommendations and EPA guidelines.

1. Direct all wash water into a leak-proof container or leak-proof pit at the appropriate designated location. The washout location shall be designated before concrete pours commence. The container or pit must be designed so that no overflow can occur due to inadequate sizing or precipitation. Concrete trucks shall wash out only at washout pit or container such as a portable roll-off washout pit.
2. Signs will be posted marking the location of the washout area to ensure that the concrete and other equipment operators use the proper facility. Concrete pours or other material application will not be conducted during or before an anticipated storm event.
3. Provide suitable containers for recycling or disposal for cleanup of paints, form release oils, curing compounds, etc.

Maintenance Requirements

1. The site supervisor shall inspect concrete washout pits (or other acceptable facility) daily to ensure that they are properly maintained. Washout pits shall be cleaned out when the area is filled to 75% of holding capacity. If necessary, wash water in a washout pit shall be vacuumed off and the hardened concrete broken up and recycled. Wash water and broken up concrete shall be properly disposed of at a suitable facility. If necessary, the washout pit shall be repaired and relined with plastic prior to continued use.
2. Containers for waste paint, form release oil, curing compounds, etc. shall be sealed and removed from the site and properly disposed of at a suitable facility. Empty containers shall replace those being removed for disposal.

Fertilizers

Fertilizers shall be used only as necessary to establish vegetative stabilized slopes and disturbed areas. Apply at recommended rates. Use only slow-release fertilizers to minimize discharge of nitrogen or phosphorous.

1. Store all fertilizers in designated locations. Store all weather sensitive materials in closed containers in accordance with manufacturer's recommendations.
2. To prevent accidental release of fertilizers, the site supervisor shall attempt to coordinate delivery of fertilizers to coincide with application and reduce the need to warehouse large quantities on-site.

3. Avoid applying before heavy rains that could cause excess nutrients to be discharged.
4. Never apply to frozen ground or apply to stormwater conveyance channels with flowing water.
5. Follow all other federal, state, and local requirements regarding fertilizer applications.

Maintenance Requirements

1. Site supervisor shall make regular inspections to ensure that fertilizer is being applied at proper rates and that all perimeter controls are in place and properly maintained to control runoff which may contain fertilizer.

Inspection and Corrective Action:

Operator personnel must inspect the construction site at least once every 7 calendar days and within 24 hours of a storm event of ½-inch or greater. The owner shall be responsible to secure the services of a design professional or similar "qualified person" (inspector) on an on-going basis throughout all phases of the project. The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure or ineffective controls since it was installed or performed.
- What corrective actions should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Best Management Practices Inspection Schedule and Evaluation Checklist – Construction Phase, as attached or provided in the Site's Stormwater Pollution Prevention Plan, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes.

It is essential that the inspector document the inspection of the pollution prevention measures. These records will be used to request maintenance and repair and to prove that the inspection and maintenance were performed.

Spill Containment and Management Plan

March 24, 2023

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name) _____

_____

Facility Manager (phone) _____

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 741-1430
Board of Health Phone:	(781) 741-1466
Conservation Commission Phone:	(781) 741-1445

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time_____ AM / PM

Exact location (Transformer #)_____

Type of equipment_____Make_____Size_____

S / N_____Weather Conditions_____

On or near water ☐ Yes If yes, name of body of water_____
☐ No

Type of chemical / oil spilled_____

Amount of chemical / oil spilled_____

Cause of spill_____

_____

_____

Measures taken to contain or clean up spill_____

_____

_____

Amount of chemical / oil recovered_____Method_____

Material collected as a result of clean up

_____drums containing_____

_____drums containing_____

_____drums containing_____

Location and method of debris disposal_____

_____

Name and address of any person, firm, or corporation suffering damages_____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring____

_____

Spill reported to General Office by_____Time_____AM / PM

Spill reported to DEP / National Response Center by_____

DEP Date____/_____/_____ Time_____ AM / PM Inspector_____

NRC Date____/_____/_____ Time_____ AM / PM Inspector_____

Additional comments_____

_____

_____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	1 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	3
--	18” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   NAME: _____ BEEPER: _____
   PHONE: _____ CELL PHONE: _____

   ALTERNATE:
   NAME: _____ BEEPER: N/A _____
   PHONE: _____ CEL PHONE: _____

2. FIRE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 741-1416

3. POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 749-1212

4. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (888) 340-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

5. NATIONAL RESPONSE CENTER
   PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   EMERGENCY: (617) 223-7265
   BUSINESS: (617) 860-4300

6. DEPARTMENT OF PUBLIC WORKS
   CONTACT:
   PHONE: (781) 741-1430

7. CONSERVATION COMMISSION
   CONTACT: Sylvia Schuler, Administrative Assistant
   PHONE: (781) 741-1445

8. BOARD OF HEALTH
   CONTACT: Susan Sarni, Executive Health Officer
   PHONE: (781) 741-1466

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

PROJECT LOCATION: **Bishops Lane, Hingham, 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 System
Silt Sock Erosion Control Barrier	Weekly or after every major storm event – minimum weekly			Check sediment levels and remove when reaches ¼ to ½ the height of sock				
Stabilized Construction Entrance	Weekly or after every major storm event – minimum weekly			Check sediment levels in stone				
Temporary Sedimentation Basin	Weekly or after every major storm event – minimum weekly			Check sediment levels				
Catch Basin & Pre-treatment Structure (Inlet Protection)	Weekly or after every major storm event – minimum weekly			Check silt sack for sediment levels, tears or any damage				
Stockpiles	Weekly or after every major storm event – minimum weekly			Ensure surrounding erosion control measure are intact				
Temp/Prop Seeding for Stabilization	Weekly or after every major storm event – minimum weekly							
Geotextiles/ Mulching & Netting	Weekly or after every major storm event – minimum weekly							

Dust Control	Weekly							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (2008) 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**

Merrill
Engineers and Land Surveyors

March 24, 2023

Long-Term Pollution Prevention Plan Operation & Maintenance Plan

Definitive Subdivision
Bishops Lane Hingham MA

Table of Contents

LONG TERM POLLUTION PREVENTION PLAN / OPERATION AND MAINTENANCE PLAN

Date: March 24, 2023
Revised Date: July 14, 2023

Bishops Lane
Definitive Subdivision
Hingham, MA

Responsible Party for Operation and Maintenance Contact Information:

Steve Young
16 Bishops Lane
Hingham MA 02043
P: 617-645-0374

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

General Conditions

1. The BMP's will be owned and maintained by the property owner.
2. All Stormwater BMP's shall be operated and maintained in accordance with the design plans and the following Long-Term Operations and Maintenance Plan.
3. The Responsible Party shall:
    a. Maintain an Operation and Maintenance Log (see Attachment A). The Log shall include all BMP inspections, repairs, replacement activities and disposal activities (disposal material and disposal location shall be included in the Log);
    b. Retain inspection and maintenance logs for a period of three years, on an ongoing basis;
    c. Make the logs available to the Town upon request;
    d. Allow members and agents of the Hingham DPW to enter the premises and ensure that the Responsible Party has complied with the Operation and Maintenance Plan requirements for each BMP.
4. An inspection and maintenance schedule should be adhered to at a minimum for the first year of service of all BMP's referenced in this document. After the first year of service, a more accurate inspection/maintenance schedule should be determined based on the level of service for this site.

Operation and Maintenance

1.0 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.

Drain lines

After construction, the drainlines shall be inspected after every major storm for the first few months to ensure proper functions. Presence of accumulated sand and silt would indicate more frequent maintenance of the pre-treatment devices is required. Thereafter, the drainlines shall be inspected at least once per year.

Deep sump and hooded Catch Basins

Catch basin grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of properly. Deep sump catch basins shall be inspected and cleaned bi-annually of all accumulated sediments. Catch basins with hoods shall be inspected annually to check oil build-up and outlet obstructions. Material shall be removed from catch basins and disposed of in accordance with all applicable regulations.

Pre-treatment Structures – First Defense FD-4HC

The proprietary pretreatment unit shall be inspected and maintained from the surface, without entry into the unit quaterly and following heavy rain events defined as a storm event exceeding one inch of rainfall within a twenty-four hour period to verify that the inlet opening is not clogged by debris.

During the first year of installation, perform inspection regularly, so an accurate maintenance schedule can be established. Perform oil and floatables removal once per year and immediately in the event of a spill. Oil shall be removed by using a small portable pump and disposed of properly. Perform sediment removal once per year or as needed and following a spill event. Sediment shall be removed from the unit using a vacuum truck. The requirements for the disposal from the unit should be in compliance with all local, state and federal regulations.

Please refer to the attached manufacturer's maintenance manual for additional detail on proper inspection and maintenance of the First Defense unit.

Stormwater Basin

After construction, the stormwater 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 bottom 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 bottom and sides of the stormwater basins 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 Conservation Commission 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.

Outlet Protection

All outfall protection structures shall be inspected quarterly and following major storm events defined as a storm event exceeding one inch of rainfall within a twenty-four hour period to check for signs for erosion. Any necessary repairs shall be performed promptly and cleaned to remove accumulated sediment as necessary. Material removed shall be disposed of in accordance with all applicable local, state, and federal regulations. Rip-Rap overflow structure shall be weeded and cleaned on a quarterly basis to ensure that water overflowing the spillway will not become obstructed by debris.

Roadway Pavement Maintenance

Vacuum sweepers shall sweep the roadway and parking area periodically during dry weather to remove excess sediments to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping should be conducted four times per year and will be the responsibility of the property owner.

Salt used for de-icing on the roadway during winter months should be limited as much as possible as this will reduce the need for removal and treatment.

Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

2.0 Inspections

The responsible party shall secure the services of a Licensed 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 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.

If hydrocarbons or any petroleum products are detected in any stormwater structure during an inspection, immediate measures shall be taken to remove and dispose of the material in accordance with all applicable regulations. The inspector shall notify the Owner to make the changes.

The owner shall be responsible for retaining the inspection and maintenance records for a period of three years, on an ongoing basis.

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

Pollution Prevention Plan

Good Housekeeping

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.
- Resident education outreach, including promoting recycling through the Town of Hingham Transfer Station.

1.0 Storage and Disposal of Household Waste and Toxics

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the Town of Hingham.

MADEP has prepared several materials for residents on how to properly use and dispose of household hazardous materials:

http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:

DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
.....nickel cadmium batteries
.....(no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and
Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish
removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners

stains
Arts and crafts chemicals
Charcoal lighter fluid
Shoe polish
Windshield wiper fluid

2.0 Vehicle Washing

This management measure involves educating the general public on the water quality impacts of the outdoor washing of automobiles and how to avoid allowing polluted runoff to enter the storm drain system. Outdoor car washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions in many watersheds, as the detergent-rich water used to wash the grime off our cars flows down the street and into the storm drain. The following management practices will be encouraged:

- Washing cars on gravel, grass, or other permeable surfaces.
- Blocking off the storm drain during car washing and redirecting wash water onto grass or landscaping to provide filtration.
- Using hoses with nozzles that automatically turn off when left unattended.
- Using only biodegradable soaps.
- Minimize the amounts of soap and water used. Wash cars less frequently.
- Promote use of commercial car wash services.

3.0 Landscape Maintenance

This management measure seeks to control the storm water impacts of landscaping and
lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.

- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).
- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the Town of Hingham.
- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

4. Integrated Pest Management (IPM)

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chlorpyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden.

The following IPM practices will be encouraged:

- Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.
- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.

5. Pet Waste Management

Pet waste management involves using a combination of pet waste collection programs, pet awareness and education, to alert residents to the proper disposal techniques for pet droppings. The following management practices will be encouraged:

- Raise awareness of residents that are also pet owners that they are encouraged to pick up after their pets and dispose of the waste either in the trash, including on their own lawns and walking trails.
- Provide signage along walking trails.

6. Proper Management of Deicing Chemicals and Snow

The following deicing chemicals and snow storage practices will be encouraged:

- Select effective snow disposal sites adjacent to or on pervious surfaces in upland areas away from water resources and wells. At these locations, the

snow meltwater can filter in to the soil, leaving behind sand and debris, which can be removed in the springtime.

- No roadway deicing materials shall be stockpiled on site unless all storage areas are protected from exposure to rain, snow, snowmelt and runoff.
- Avoid dumping snow into any waterbody, including wetlands, cranberry bogs, detention/infiltration basins, and grassed swales/channels.
- Avoid disposing of snow on top of storm drain catch basins.

7. Illicit Discharge Statement

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria or other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

Allowable Non-Stormwater Discharges

The following non-stormwater 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. discharges or flows from fire fighting activities occur during emergency situations. The permittee is not expected to evaluate fire fighting 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..

Spill Containment and Management Plan

March 24, 2023

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name) _____

_____

Facility Manager (phone) _____

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 741-1430
Board of Health Phone:	(781) 741-1466
Conservation Commission Phone:	(781) 741-1445

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time_____ AM / PM

Exact location (Transformer #)_____

Type of equipment_____Make_____Size_____

S / N_____Weather Conditions_____

On or near water ☐ Yes If yes, name of body of water_____
☐ No

Type of chemical / oil spilled_____

Amount of chemical / oil spilled_____

Cause of spill_____

_____

_____

Measures taken to contain or clean up spill_____

_____

_____

Amount of chemical / oil recovered_____Method_____

Material collected as a result of clean up

_____drums containing_____

_____drums containing_____

_____drums containing_____

Location and method of debris disposal_____

_____

Name and address of any person, firm, or corporation suffering damages_____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring____

_____

Spill reported to General Office by_____Time_____AM / PM

Spill reported to DEP / National Response Center by_____

DEP Date____/_____/_____ Time_____ AM / PM Inspector_____

NRC Date____/_____/_____ Time_____ AM / PM Inspector_____

Additional comments_____

_____

_____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	1 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	3
--	18” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   NAME: _____ BEEPER: _____
   PHONE: _____ CELL PHONE: _____

   ALTERNATE:
   NAME: _____ BEEPER: N/A _____
   PHONE: _____ CEL PHONE: _____

2. FIRE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 741-1416

3. POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 749-1212

4. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (888) 340-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

5. NATIONAL RESPONSE CENTER
   PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   EMERGENCY: (617) 223-7265
   BUSINESS: (617) 860-4300

6. DEPARTMENT OF PUBLIC WORKS
   CONTACT:
   PHONE: (781) 741-1430

7. CONSERVATION COMMISSION
   CONTACT: Sylvia Schuler, Administrative Assistant
   PHONE: (781) 741-1445

8. BOARD OF HEALTH
   CONTACT: Susan Sarni, Executive Health Officer
   PHONE: (781) 741-1466

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

PROJECT LOCATION: **Bishops Lane, Hingham, MA** Latest Revision:_____

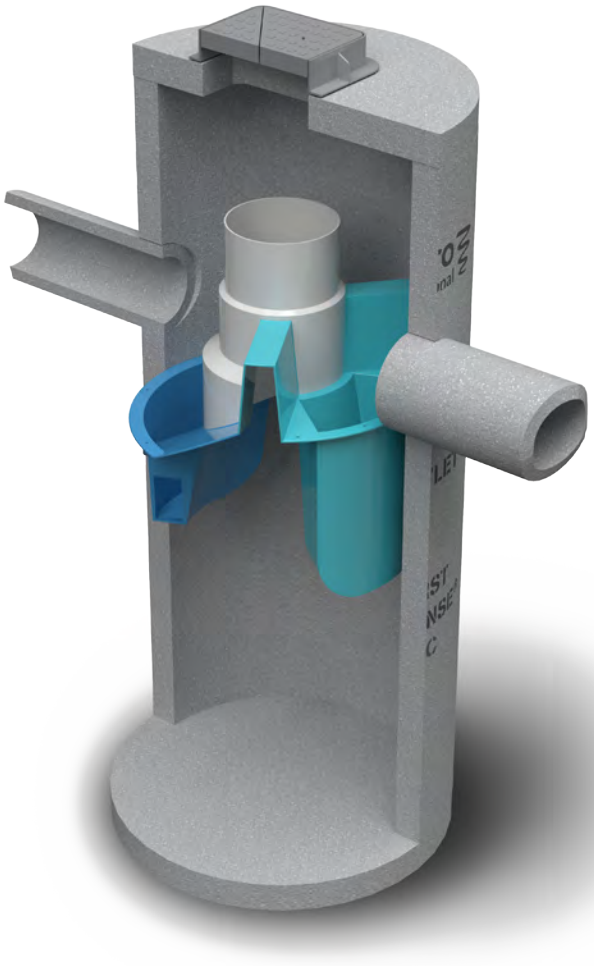
Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/ Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Detention System
Drain Lines	Yearly			-Sediment build-up -Trash and debris				
Deep Sump Hooded Catch Basins	Quarterly			-Sediment level exceeds 8” -Trach and debris - Floatable oils or hydrocarbon - Grate or outlet blockage				
Pre-Treatment Structure (First Defense Unit)	Quarterly			-Sediment not to exceed 18” -Floating contaminates shall be removed by vacuum pump prior to sediment removal -Outlet blockages				
Stormwater Basin	Twice a Year			-Sediment build-up -Trash and debris -Standing water greater than 72 hours				
Subsurface Infiltration Chamber Systems – for roof	Twice a Year			-Sediment buildup -Standing water greater than 48 hours				
Roadway Pavement Maintenance	Quarterly							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (2008) 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**

Hydro International



Operation and Maintenance Manual

First Defense® and First Defense® High Capacity

Vortex Separator for Stormwater Treatment

Table of Contents

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

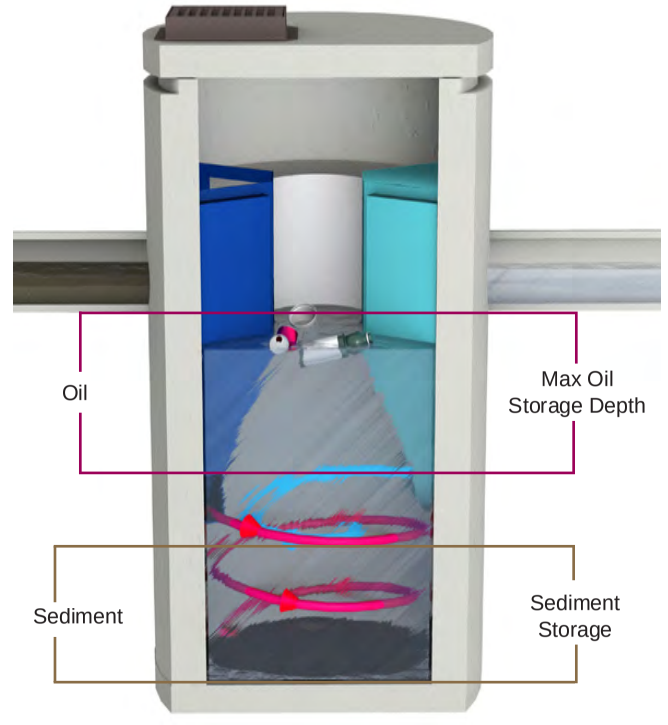


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

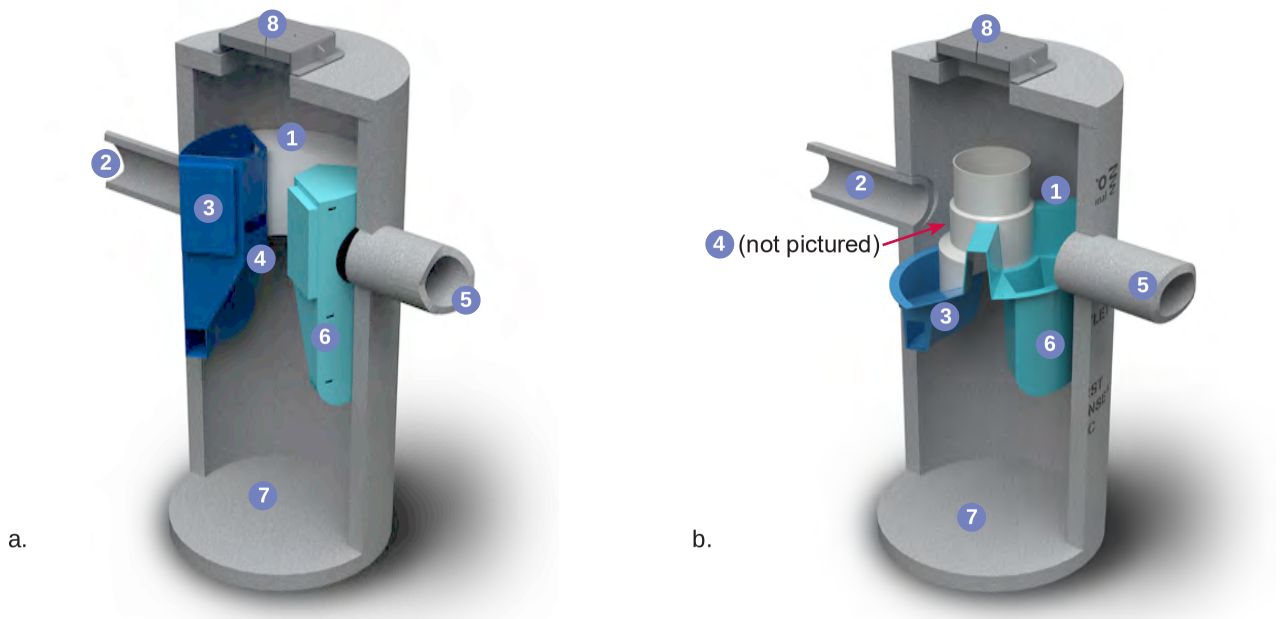


Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates NJDEP Certified	Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Chamber Depth
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.85 / 24.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.75 / 1.14
FD-4HC	4 / 1.2	1.50 / 42.4	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	5.00 / 1.52
FD-5HC	5 / 1.5	2.35 / 66.2	20 / 566	24 / 609	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.25 / 1.60
FD-6HC	6 / 1.8	3.38 / 95.7	32 / 906	30 / 750	496 / 1878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	6.25 / 1.90
FD-7HC	7 / 2.1	4.60 / 130.2	40 / 1133	42 / 1067	750 / 2839	2.1 / 1.9	3.0 - 5.5 / 0.9 - 1.7	7.25 / 2.20
FD-8HC	8 / 2.4	6.00 / 169.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	8.00 / 2.43

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

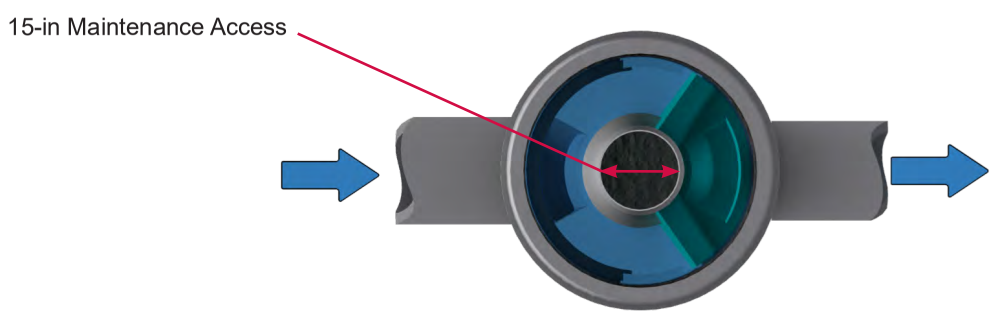


Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)

- Crow bar or other tool to remove grate or lid

- Pole with skimmer or net (if only floatables are being removed)

- Sediment probe (such as a Sludge Judge®)

- Vactor truck (flexible hose recommended)

- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): **FD-3HC** **FD-4** **FD-4HC** **FD-5HC** **FD-6** **FD-6HC** **FD-7HC** **FD-8HC**

INLET (CIRCLE ALL THAT APPLY): **GRATED INLET (CATCH BASIN)** **INLET PIPE (FLOW THROUGH)**

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

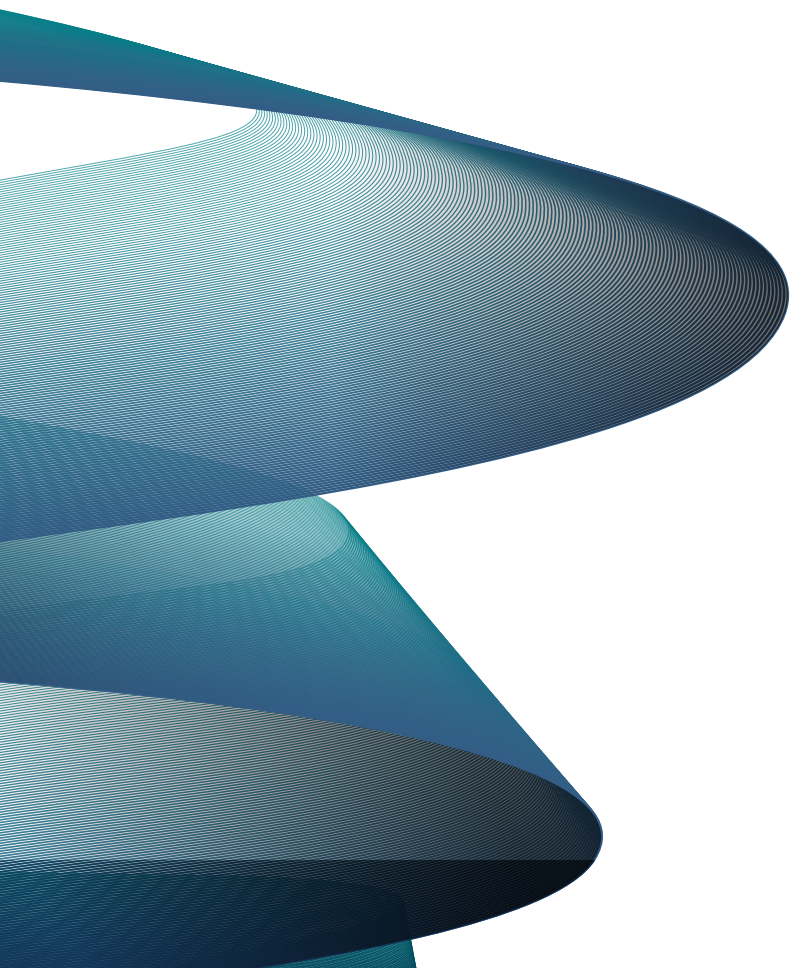
First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Notes

Hydro International®



Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

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Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

FDHC_O+M_H_1703

Site Plan – Attached

(508) 746-6060 / 26 Union Street, Plymouth, MA 02360
merrillinc.com / (781) 826-9200 / 427 Columbia Road, Hanover, MA 02339