DRAINAGE CALCULATIONS AND STORMWATER MANAGEMENT REPORT

For:

COMPREHENSIVE PERMIT PLAN
RIVER STONE
HINGHAM, MA

Located at:

VIKING LANE & WARD STREET
HINGHAM, MASSACHUSETTS

Submitted to:

TOWN OF HINGHAM

Prepared For:

RIVER STONE, LLC
293R WASHINGTON STREET
NORWELL, MASSACHUSETTS 02061

MEG
MCKENZIE
ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

June 8, 2026

COMMONWEALTH OF MASSACHUSETTS
BRADLEY C McKENZIE
CIVIL
No. 36917
REGISTERED PROFESSIONAL ENGINEER

TABLE OF CONTENTS

Comprehensive Permit Plan
River Stone
Viking Lane and Ward Street
Hingham, MA

Project Summary

The project proponent, River Stone, LLC, proposes to develop an approximate 6.67-acre parcel of land on Viking Lane and Ward Street in Hingham, Massachusetts. The proposed development will consist of thirty-two (32) residential units comprised of 2, 3, and 4-unit buildings and has been permitted as a Comprehensive Permit project under MGL Ch. 40B. The Hingham Zoning Board of Appeals issued a Comprehensive Permit approving the project on December 10, 2025.

The project is comprised of several parcels as shown on Assessors' Map 124, Lots 70-75 and Lot 26, consisting of approximately 6.67 acres off Viking Lane and Ward Street in Hingham, Massachusetts. The site is located within the Residence B Zoning District and is bounded by developed residential lots on Ward Street to the south, southwest, and northwest, Autumn Circle to the northeast, and to the north. The site is not located in the Aquifer Protection District. Refer to Figure 1 - USGS Locus Map for the location of the parcel.

The proposed development will involve the construction of approximately 1,112 linear feet of bituminous roadway, bituminous parking areas, and associated infrastructure. The project will access utility infrastructure located on Viking Lane and Ward Street, including water, electric, telephone, and cable television. A wastewater collection system will be constructed to convey sewage flows to an on-site shared septic soil absorption system. The stormwater management system will be designed to fully comply with all standards of the Department of Environment Protection's Stormwater Management Regulations. The design will utilize a portion of the existing closed drainage system on Viking Lane and consist of a series of subsurface infiltration facilities.

The existing and proposed site conditions are illustrated on the project site plans entitled "Comprehensive Permit Plans known as River Stone (Assessors' Map 124, Lots 70-75 and Lot 26), Viking Lane and Ward Street, Hingham, Massachusetts," prepared by McKenzie Engineering Group, Inc. (MEG) and dated October 7, 2015, with a latest revision date of June 8, 2026. The "Drainage Calculations and Stormwater Management Report" prepared by MEG dated June 8, 2026, contains stormwater peak rate of runoff calculations for the pre-development and post-development conditions and includes the sizing of the proposed drainage systems to demonstrate compliance with all Standards of the Mass. DEP Stormwater Management Standards.

Pre-Development Condition

The site is located within the Residence B Zoning District and is not located in the Aquifer Protection District. It is also not located within an Estimated Habitat of Rare Wetlands Wildlife, as determined by reference to the Massachusetts Division of Fisheries and Wildlife Natural Heritage and data provided by Mass GIS. Refer to Figure 3 – 2021 Natural Heritage and Endangered Species Program Map. The site is located within Zone X of the Flood Insurance Rate Map, as shown on the current FEMA Flood Insurance Rate Map Panel No. 25023CO083K with an effective date of July 3, 2024. Refer to Figure 2 – FEMA Flood Map.

The limit of bordering vegetated wetland and isolated vegetated wetland resource areas, and the approximate location of the intermittent stream on the site were delineated by Environmental Consulting and Restoration, LLC (ECR) in January 2026. The parcel is currently undeveloped and is mostly wooded with some grass areas, with the exception of the Viking Lane paved roadway and the stormwater management facility. The topography of the site ranges in elevation from approximately 54 ft. (NAVD 88) in the northeasterly portion of the site to an elevation of approximately 86 ft. along the southerly portion of the site. Portions of runoff emanating from the site flow in a southwesterly and northwesterly direction to the closed drainage system on Viking Lane, southeasterly and northeasterly to the existing stormwater management facility and existing wetlands, with a small portion flowing towards Ward Street to the south and abutting properties to the northwest.

The soil types as identified by the Soil Survey, Plymouth County, MA prepared by the NRCS Soil Conservation Service (NRCS) are classified Quonset sandy loam, 8 to 15 percent slopes; Warwick fine sandy loam, 0 to 8 percent slopes; Sudbury fine sandy loan, 3 to 8 percent slopes; and Freetown muck, 0 to 1 percent slopes soils. The soils fall into the following hydrological soil groups: Quonset – HSG A, Warwick – HSG A, Sudbury – HSG B, and Freetown - HSG D. Through an on-site soil evaluation, the site soils were determined to be consistent with the NRCS soil classifications. Refer to Figure 3 - Soil Map for the NRCS delineation of soil types.

In the pre-and post-development stormwater analysis, the watershed area analyzed was approximately 7.045 acres consisting of the subject parcel to be developed and offsite tributary areas and consists of five (5) sub-catchments. Refer to Pre-Development Watershed Delineation Plan WS-1 in Appendix A for a delineation of drainage subareas for the pre-development design condition.

The SCS Technical Release 20 (TR-20) and Technical Release 55 (TR-55) method-based program "HydroCAD" was employed to develop pre- and post-development peak flows. Drainage calculations were prepared for the pre-development condition for the 2, 10, 25, and 100-year, Type III storm events. Refer to Appendix A for computer results, soil characteristics, cover descriptions, and times of concentrations for all subareas.

Post-Development Condition

The proposed development will involve the construction of approximately 1,112 linear feet of bituminous roadway, bituminous parking areas, and associated infrastructure. The project will access utility infrastructure located on Viking Lane and Ward Street, including water, electric, telephone, and cable television. A wastewater collection system will be constructed to convey sewage flows to an on-site shared septic soil absorption system. The stormwater management system will be designed to fully comply with all standards of the Department of Environment Protection's Stormwater Management Regulations. The design will utilize a portion of the existing closed drainage system on Viking Lane and consist of a series of subsurface infiltration facilities.

In the post-development condition, stormwater analysis of watershed areas was conducted for the purpose of designing a drainage system to accommodate the buildings and associated bituminous roadway infrastructure. The objective in designing the proposed drainage facilities for the project was to maintain existing drainage patterns to the extent practicable and to ensure that post-development runoff rates are equal to or less than pre-development rates. Refer to Post-Development Watershed Delineation

Plan WS-2 in Appendix B for a delineation of post-development drainage subareas. The watershed area and design points for the post-development design conditions correspond to those analyzed for the pre-development design condition and are shown on Plan No. WS-2.

Drainage calculations were prepared by employing the SCS TR-20 Methods for the 2, 10, 25, and 100-year type III storm events. Refer to Appendix B for computer results. The subsurface infiltration chambers were designed to accommodate peak flows generated by all storms up to and including the 100-year storm event. Refer to the site plans for the drainage system design.

Proposed Stormwater Management System

The proposed design will require a new stormwater management system that complies with the Massachusetts DEP Stormwater Management Regulations (2008). Watershed areas were analyzed in the post-development condition to design stormwater management facilities that mitigate impacts from the property's redevelopment. The objective in designing the proposed drainage facilities for the Project is to maintain existing drainage patterns to the extent practicable and to ensure that post-development runoff rates are equal to or less than pre-development rates at all design points.

Refer to the Post-Development Watershed Plan WS-2 in Appendix B for a delineation of the drainage watershed for the post-development design condition.

Stormwater Best Management Practices (BMP's)

The stormwater management system was designed to be fully compliant with the DEP Stormwater Management Policy. The treatment stream shall consist of deep sump hooded catch basins, proprietary pre-treatment units (First Defense unit), a sediment forebay with an extended detention wetland basin, and subsurface infiltration chambers (IB-1) to achieve the required removal of at least 80% of the total suspended solids (TSS) and mitigate the anticipated pollutant loading.

The proposed treatment streams will renovate the stormwater and improve the water quality by promoting the settlement of sediments and pollutants before runoff is released into downgradient wetlands. Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Erosion and Siltation Control

Silt sock erosion control barriers will be installed as indicated on the plans before the commencement of any construction activity. The integrity of the silt sock erosion-control barrier will be maintained through periodic inspection and replacement as necessary. The silt sock erosion control barrier will remain in place until the first course of pavement has been placed, all side slopes have been loamed and seeded, and vegetation has been established. Riprap outlet protection is proposed for all drainage outlets to ensure minimal velocities are realized before flows are discharged into wetland areas. Operation and Maintenance Plans, including pollution prevention and erosion and sedimentation control measures, will be prepared in conjunction with the final construction plans, as required by the DEP Stormwater Management Regulations.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

The site development is designed so that new stormwater conveyances do not discharge untreated pavement runoff into, or cause erosion to, wetlands.

Standard 2 – Peak Rate Attenuation

In the pre-development and post-development stormwater analysis, the watershed area analyzed was approximately 7.76 acres, consisting of the subject parcel to be developed and off-site tributary areas. Refer to Existing Watershed Delineation Plan WS-1 for a delineation of drainage subareas for the pre-development design condition, and refer to Post-Development Watershed Delineation Plan WS-2 for a delineation of drainage subareas for the post-development design condition.

Drainage calculations were performed by employing SCS TR-20 methods for the 2, 10, 25, and 100-year Type III storm events. Refer to Appendix A and B for computer results. All drainage structures will be designed employing the Rational Method and the Mass. DPW Design Manual to accommodate peak flows generated by a minimum of a 25-year storm event or a 100-year storm event, where applicable. The stormwater management systems were designed to accommodate peak flows generated by a 100-year storm event.

The peak rates of runoff are as follows:

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	2 Year Storm **(3.40 Inches)**		10 Year Storm **(4.70 Inches)**		25 Year Storm **(5.60 Inches)**		100 Year Storm **(7.00 Inches)**	
	Exist. (CFS)	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
Design Point 1	*0.57*	0.26	*0.92*	0.44	*1.19*	0.57	*1.71*	1.55
Design Point 2	*0.00*	0.00	*0.00*	0.00	*0.00*	0.01	*0.01*	0.03
Design Point 3	*0.74*	0.57	*2.00*	1.38	*4.14*	3.35	*6.45*	6.26
Design Point 4	*0.00*	0.00	*0.00*	0.00	*0.02*	0.00	*0.09*	0.00
Design Point 5	*0.03*	0.00	*0.29*	0.00	*0.74*	0.01	*1.72*	0.03

A comparison of pre- and post-development peak runoff rates indicates that post-development peak runoff rates will be equal to or lower than pre-development rates for all storm events.

Pre-Development vs. Post-Development Volumes

Design Point	2 Year Storm **(3.40 Inches)**		10 Year Storm **(4.70 Inches)**		25 Year Storm **(5.60 Inches)**		100 Year Storm **(7.00 Inches)**	
	Exist. (ac-ft)	**Prop. (ac-ft)**	**Exist. (ac-ft)**	**Prop. (ac-ft)**	**Exist. (ac-ft)**	**Prop. (ac-ft)**	**Exist. (ac-ft)**	**Prop. (ac-ft)**
Design Point 1	*0.042*	0.019	*0.076*	0.031	*0.110*	0.051	*0.173*	0.102
Design Point 2	*0.000*	0.000	*0.000*	0.001	*0.001*	0.002	*0..007*	0.004
Design Point 3	*0.125*	0.079	*0.289*	0.184	*0.439*	0.354	*0.7069*	0.702
Design Point 4	*0.000*	0.000	*0.002*	0.000	*0.007*	0.000	*0.018*	0.001
Design Point 5	*0.016*	0.000	*0.051*	0.001	*0.088*	0.002	*0.160*	0.004

Standard 3 – Groundwater Recharge

Runoff will be infiltrated by three (3) subsurface infiltration system (IC-1), (IC-2) and (IC-3), which will meet the Stormwater Guidelines for infiltration:

- Infiltration structures will be a minimum of two feet above seasonal high groundwater.
- Utilize the "*Static*" method for sizing the storage volume, which takes into account the fact that stormwater is exfiltrating from the infiltration basin at the same time that the basin is filling.
- Hydraulic conductivity is based on test pits and values developed from Rawl, Brakensiek, and Saxon, 1982, Estimation of Soil Water Properties, *Transactions of the American Society of Agricultural Engineers*, vol.25, no.5.
- The infiltration component of the basins is not required to attenuate larger storm events.
- Refer to Appendix D for infiltration and drawdown calculations and Appendix F for soil testing support data.

Groundwater Recharge Volume

	Soil Type	**Target Depth Factor(F) (in)**	**Total Impervious Area (sf)**	**Required Recharge Volume (cf)[1]**	**Provided Recharge Volume (cf)[2]**
	A	0.60	100,603	5,030	
	B	0.35	26,206	764	
	D	0.10	348	3	
IC-1 (Subsurface Chambers)					636
IC-2 (Subsurface Chambers)					7,270
IC-3					3,506

(Subsurface Chambers)					
				5,797 (6,510) ADJ	**11,412**

1. Required Recharge Volume = Target Depth Factor x Impervious Area / (d+Kt) (Static Method – Refer to supplemental calculation in Appendix D)
2. Provided Recharge Volume = Volume Provided from Bottom of System to lowest outlet invert.

Per Standard 3, if stormwater runoff from less than 100% but greater than 65% of the site's impervious cover is directed to the BMP intended to infiltrate the Required Recharge Volume, the storage capacity of the infiltration BMP needs to be increased so that the BMP can capture more of the runoff from the impervious surfaces located within the contributing drainage area. The impervious cover directed towards the infiltration system is less than 100% but greater than 65% therefore, a capture area adjustment of 1.12 was made. Refer to Appendix D for Capture Area Adjustment calculations.

Standard 4 – Water Quality

The Long-Term Pollution Prevention Plan has been incorporated into the Post-Development Operation and Maintenance Plan. Refer to Appendix E for the BMP Operation and Maintenance Plans. The total required water quality treatment volume was calculated to be 9,398 cubic feet. The one-inch rule has been applied to the water quality volume. The water quality treatment volume will be provided within the stormwater management facilities as follows:

Water Quality Treatment Volume

	Required WQ Volume (cf)	Proposed WQ Volume (cf)	
IC-1		636	Subsurface infiltration system with pre-treatment
IC-2		7,270	Subsurface infiltration system with pre-treatment
IC-3		2,954	Subsurface infiltration system with pre-treatment
	10,596	**11,412**	

Proprietary treatment units – First Defense High-Capacity treatment units will pre-treat the required water quality volume. MassDEP has adopted a standard method to convert required water quality volume to a discharge rate for sizing flow based on manufactured proprietary stormwater treatment practices. The one-inch rule has been applied to the water quality flow rate calculations. Refer to Appendix D for supporting calculations

Pre-Treatment Water Quality Volume

FD Unit	Required WQ Flow Rate (cfs)	Proposed WQ Flow Rate (cfs)	
FD-1	0.119	1.2	First Defense Unit - FD-4HC
FD-2	0.504	1.2	First Defense Unit - FD-4HC
FD-3	1.939	3.8	First Defense Unit - FD-6HC
FD-4	0.499	1.2	First Defense Unit - FD-4HC
FD-5	0.316	1.2	First Defense Unit - FD-4HC

The stormwater management system was designed to be in full compliance with the DEP Stormwater Management Policy. A treatment stream consisting of street sweeping, deep sump catch basins with hooded outlets, proprietary First Defense separator units, a subsurface infiltration systems will be employed in the design of the drainage facilities for the project to achieve a weighted average removal of 80%. Refer to Appendix D for calculations.

The proposed treatment streams will renovate the stormwater and improve the water quality by promoting the settlement of sediments and pollutants before runoff is released into the downgradient wetland. Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

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

The proposed project is not a LUHPPL.

Not Applicable

Standard 6 – Critical Areas

The proposed project does not discharge to any critical areas.

Not Applicable.

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

The proposed project is not a redevelopment project.

Not Applicable.

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

The project will require an NPDES Construction General Permit; however, the Stormwater Pollution Prevention Plan (SWPPP) has not yet been submitted. The SWPPP will be submitted before any proposed construction. A Construction Phase BMP Operation and Maintenance Plan has been provided as a basis for the SWPPP during final design. Refer to Appendix E.

Standard 9 – Operation and Maintenance Plan

The Long-Term Operation and Maintenance Plan is provided in Appendix E.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on-site. An Illicit Discharge Compliance Statement will be submitted before any stormwater discharge to ensure compliance with best post-construction management practices. Measures to prevent illicit discharges will be included in the Long-Term Pollution Prevention Plan.

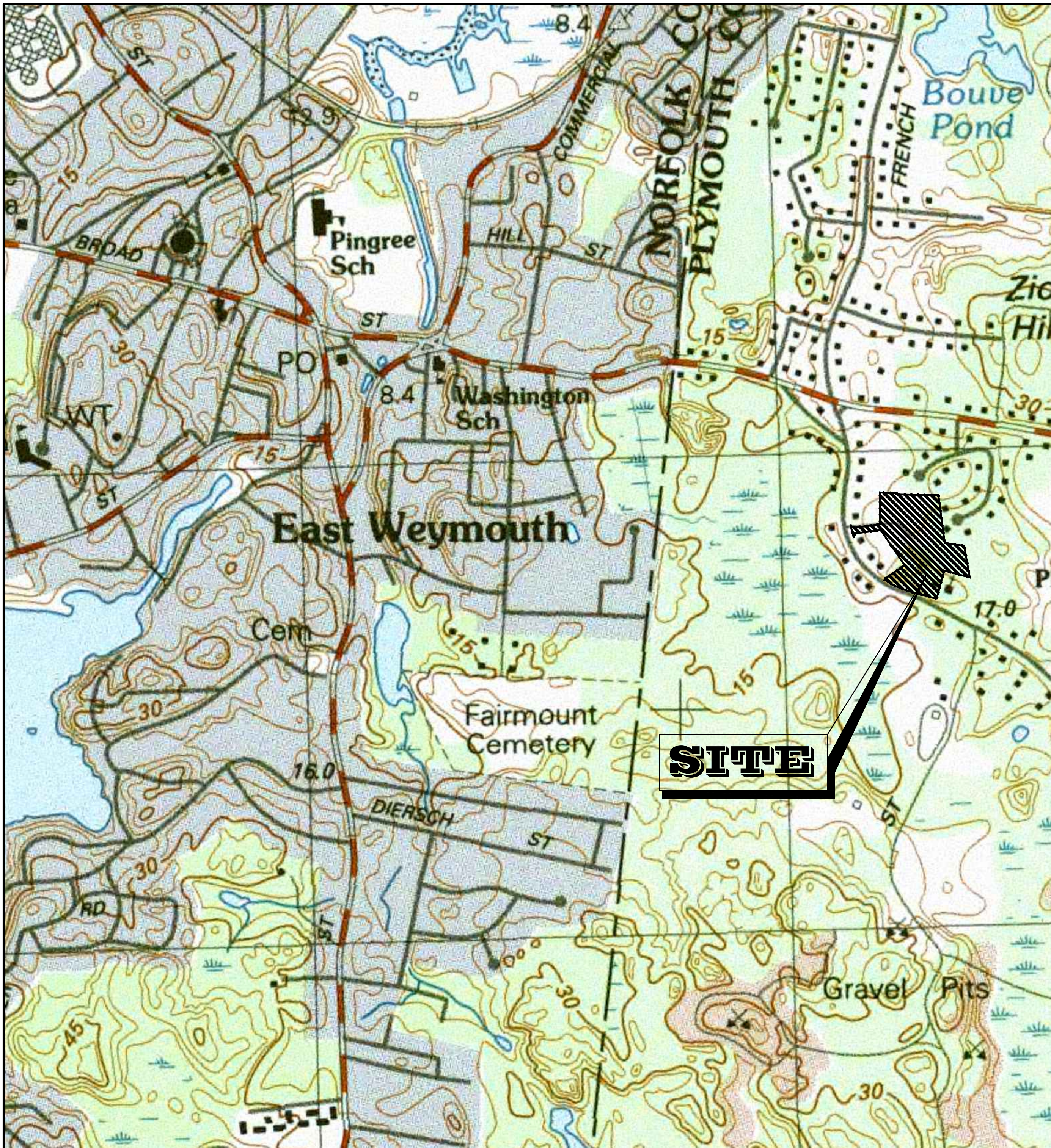


FIGURE - 1

0 1000' 2000' 2500'

U.S. GEOLOGICAL SURVEY
7.5 X 15 MINUTE SERIES

MCKENZIE ENGINEERING GROUP
150 LONGWATER DRIVE, SUITE 101
NORWELL, MASSACHUSETTS 02061
PHONE: (781) 792-3900
FACSIMILE: (781) 792-0333
WWW.MCKENG.COM

USGS LOCUS MAP

VIKING LANE & WARD STREET
MAP 124, LOTS 70-75 & LOT 26
HINGHAM, MASSACHUSETTS

FIGURE - 2

0 500' 1000' 1500'

COMMUNITY PANEL NO: 25023CO083K
EFFECTIVE DATE: JULY 3, 2024

MCKENZIE ENGINEERING GROUP

150 LONGWATER DRIVE, SUITE 101
NORWELL, MASSACHUSETTS 02061
PHONE: (781) 792-3900
FACSIMILE: (781) 792-0333
WWW.MCKENG.COM

FEMA FLOOD MAP

VIKING LANE & WARD STREET
MAP 124, LOTS 70-75 & LOT 26
HINGHAM, MASSACHUSETTS

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
52A	FREETOWN MUCK	D
260B	SUDBURY FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	B
262C	QUONSET SANDY LOAM, 8 TO 15 PERCENT SLOPES	A
266A	WARWICK FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES	A
266B	WARWICK FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	A

FIGURE - 3

0 200' 400' 500'

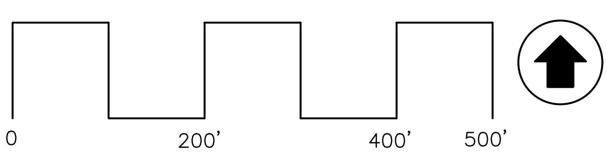
NRCS SOIL SURVEY
PLYMOUTH COUNTY

MCKENZIE ENGINEERING GROUP
150 LONGWATER DRIVE, SUITE 101
NORWELL, MASSACHUSETTS 02061
PHONE: (781) 792-3900
FACSIMILE: (781) 792-0333
WWW.MCKENG.COM

NRCS SOILS MAP

VIKING LANE & WARD STREET
MAP 124, LOTS 70-75 & LOT 26
HINGHAM, MASSACHUSETTS

FIGURE - 4



15TH EDITION MASSACHUSETTS
NATURAL HERITAGE ATLAS

MEG
MCKENZIE
ENGINEERING GROUP

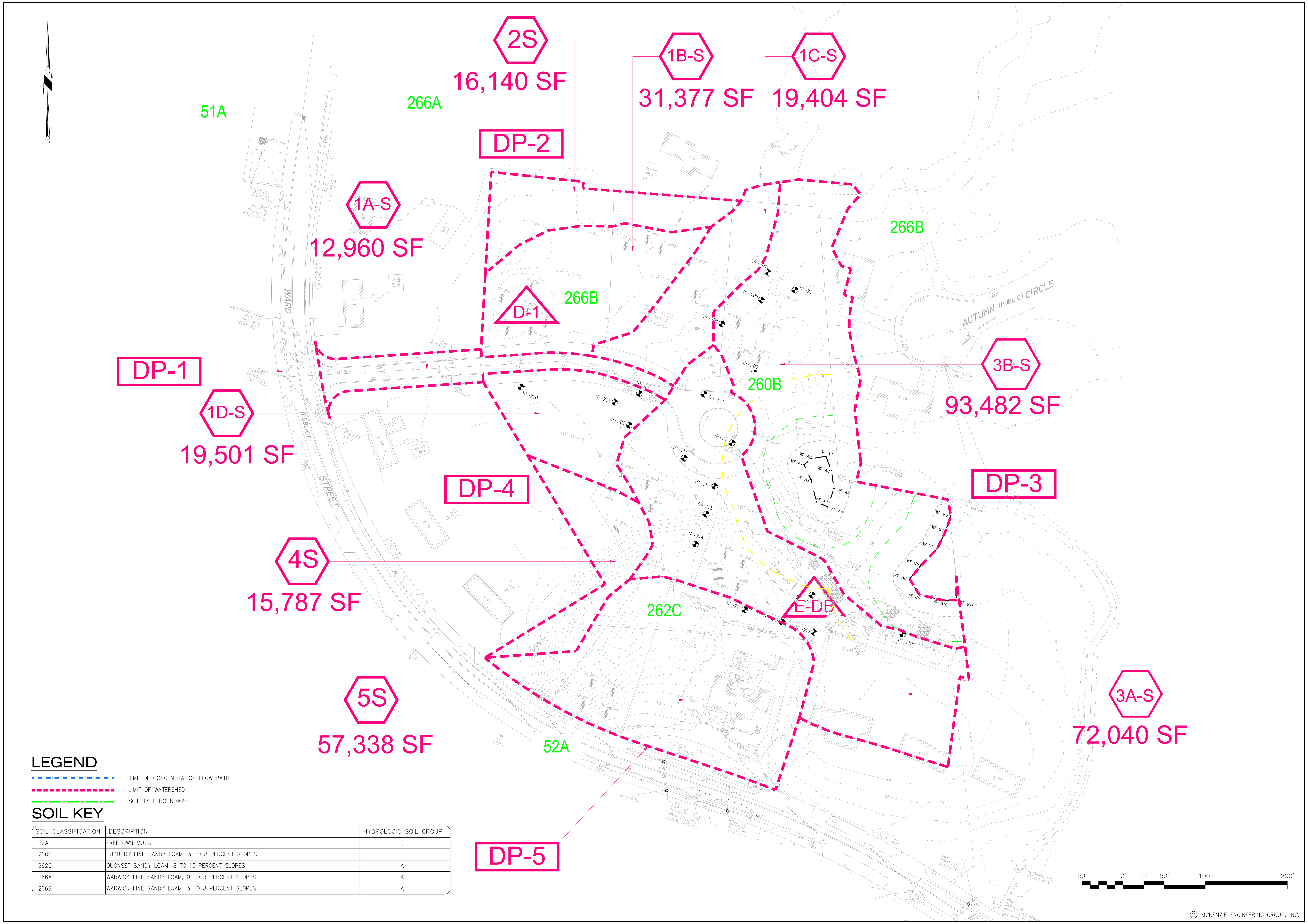
150 LONGWATER DRIVE, SUITE 101
NORWELL, MASSACHUSETTS 02061
PHONE: (781) 792-3900
FACSIMILE: (781) 792-0333
WWW.MCKENG.COM

NATURAL HERITAGE & ENDANGERED SPECIES MAP

VIKING LANE & WARD STREET
MAP 124, LOTS 70-75 & LOT 26
HINGHAM, MASSACHUSETTS

A P P E N D I X A

Pre-Development Design Condition



LEGEND

TIME OF CONCENTRATION FLOW PATH
LIMIT OF WATERSHED
SOIL TYPE BOUNDARY

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
52A	FREETOWN MUCK	D
260B	SUDBURY FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	B
262C	QUONSET SANDY LOAM, 8 TO 15 PERCENT SLOPES	A
266A	WARWICK FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES	A
266B	WARWICK FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	A

REV	DATE	DESCRIPTION	BY	APP
1	3/9/18	AREA 3A-S	SBS	BCM
2	4/25/18	AREAS 3B-S1, 3B-S2	SBS	BCM
3	6/8/26	C.C. NOI SUBMISSION	SBS	BCM

MCKENZIE ENGINEERING GROUP
Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061
Ph: 781-792-3900
www.mckeng.com

COMPREHENSIVE PERMIT PLAN

KNOWN AS
RIVER STONE
(ASSESSORS MAP 124, LOTS 70-75 & LOT 26)
VIKING LANE & WARD STREET
HINGHAM, MASSACHUSETTS

PROFESSIONAL ENGINEER:

APPLICANT:
RIVER STONE, LLC
293R WASHINGTON STREET
NORWELL, MASSACHUSETTS 02061

ZBA PERMIT PLAN

DRAWN BY:	SBS
DESIGNED BY:	SBS
CHECKED BY:	BCM
APPROVED BY:	BCM
DATE:	JANUARY 8, 2018
SCALE:	1"=50'
PROJECT NO.:	27-135

DWG. TITLE:
Pre-Dev. Watershed Plan

DWG. NO:
WS-1

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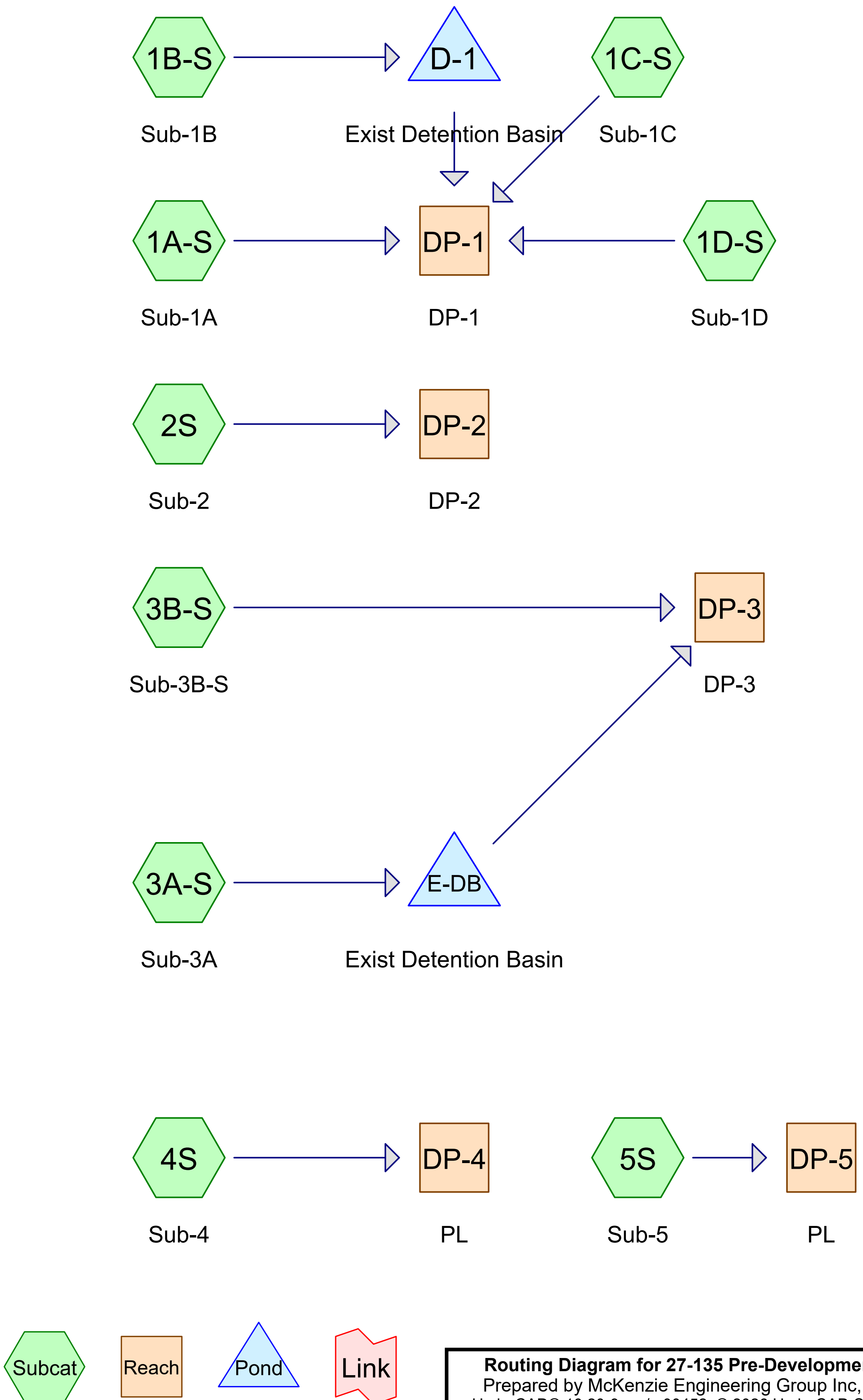


Routing Diagram for 27-135 Pre-Development Conditions (R9)
Prepared by McKenzie Engineering Group Inc, Printed 6/8/2026

Rainfall Events Listing

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	3.60	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.70	2
4	100-Year	Type III 24-hr		Default	24.00	1	7.10	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.258	49	50-75% Grass cover, Fair, HSG A (1B-S, 1C-S, 1D-S)
0.968	39	>75% Grass cover, Good, HSG A (1A-S, 1B-S, 1C-S, 1D-S, 3A-S, 3B-S, 5S)
0.122	39	>75% Grass cover, Good, HSG A - offsite (3A-S, 3B-S)
0.338	61	>75% Grass cover, Good, HSG B (3A-S, 3B-S)
0.022	61	>75% Grass cover, Good, HSG B - offsite (3B-S)
0.009	80	>75% Grass cover, Good, HSG D (5S)
0.062	98	Existing Detention Basin, HSG A (3A-S)
0.029	98	Existing Detention Basin, HSG B (3A-S)
0.004	98	Ledge, HSG A (5S)
0.005	98	Misc, HSG A (5S)
0.012	98	Patio, HSG A (5S)
0.122	98	Paved drive, HSG A (5S)
0.007	98	Paved drive, HSG A - offsite (3B-S)
0.007	98	Paved drive, HSG D (5S)
0.369	98	Paved parking, HSG A - offsite (3A-S)
0.259	98	Paved roads w/curbs & sewers, HSG A (1A-S, 3A-S)
0.075	98	Paved roads w/curbs & sewers, HSG B (3A-S)
0.025	98	Riprap, HSG A (3A-S, 3B-S)
0.024	98	Riprap, HSG B (3A-S, 3B-S)
0.049	98	Roofs, HSG A (5S)
0.032	98	Roofs, HSG A - offsite (3A-S)
0.018	98	Rubble Pile, HSG A (1D-S)
1.113	36	Woods, Fair, HSG A (4S, 5S)
2.058	30	Woods, Good, HSG A (1B-S, 1C-S, 1D-S, 2S, 3A-S, 3B-S)
0.158	30	Woods, Good, HSG A - offsite (1C-S, 3A-S, 3B-S)
1.574	55	Woods, Good, HSG B (1C-S, 3A-S, 3B-S)
0.040	55	Woods, Good, HSG B - offsite (3B-S)
7.760	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.642	HSG A	1A-S, 1B-S, 1C-S, 1D-S, 2S, 3A-S, 3B-S, 4S, 5S
2.102	HSG B	1C-S, 3A-S, 3B-S
0.000	HSG C	
0.016	HSG D	5S
0.000	Other	
7.760		**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
0.258	0.000	0.000	0.000	0.000	0.258	50-75% Grass cover, Fair	1B-S, 1C-S, 1D-S
1.090	0.360	0.000	0.009	0.000	1.459	>75% Grass cover, Good	1A-S, 1B-S, 1C-S, 1D-S, 3A-S, 3B-S, 5S
0.062	0.029	0.000	0.000	0.000	0.092	Existing Detention Basin	3A-S
0.004	0.000	0.000	0.000	0.000	0.004	Ledge	5S
0.005	0.000	0.000	0.000	0.000	0.005	Misc	5S
0.012	0.000	0.000	0.000	0.000	0.012	Patio	5S
0.129	0.000	0.000	0.007	0.000	0.136	Paved drive	3B-S, 5S
0.369	0.000	0.000	0.000	0.000	0.369	Paved parking	3A-S
0.259	0.075	0.000	0.000	0.000	0.334	Paved roads w/curbs & sewers	1A-S, 3A-S
0.025	0.024	0.000	0.000	0.000	0.049	Riprap	3A-S, 3B-S
0.081	0.000	0.000	0.000	0.000	0.081	Roofs	3A-S, 5S
0.018	0.000	0.000	0.000	0.000	0.018	Rubble Pile	1D-S

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.113	0.000	0.000	0.000	0.000	1.113	Woods, Fair	4S, 5S
2.216	1.614	0.000	0.000	0.000	3.830	Woods, Good	1B-S, 1C-S, 1D-S, 2S, 3A-S, 3B-S
5.642	**2.102**	**0.000**	**0.016**	**0.000**	**7.760**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	3A-S	0.00	0.00	157.0	0.0030	0.013	0.0	15.0	0.0	
2	E-DB	58.12	58.05	25.0	0.0028	0.013	0.0	12.0	0.0	

Time span=0.00-144.00 hrs, dt=0.01 hrs, 14401 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

Subcatchment1A-S: Sub-1A Runoff Area=12,960 sf 68.56% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=79 Runoff=0.57 cfs 0.041 af

Subcatchment1B-S: Sub-1B Runoff Area=31,377 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=212' Tc=9.6 min CN=35 Runoff=0.00 cfs 0.000 af

Subcatchment1C-S: Sub-1C Runoff Area=19,404 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=269' Tc=16.6 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment1D-S: Sub-1D Runoff Area=19,501 sf 3.95% Impervious Runoff Depth=0.02"
Flow Length=185' Tc=11.0 min CN=40 Runoff=0.00 cfs 0.001 af

Subcatchment2S: Sub-2 Runoff Area=16,140 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=164' Tc=8.6 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment3A-S: Sub-3A Runoff Area=72,040 sf 40.04% Impervious Runoff Depth=0.66"
Flow Length=534' Tc=9.4 min CN=62 Runoff=0.87 cfs 0.091 af

Subcatchment3B-S: Sub-3B-S Runoff Area=93,482 sf 0.74% Impervious Runoff Depth=0.25"
Flow Length=345' Tc=8.5 min CN=51 Runoff=0.20 cfs 0.045 af

Subcatchment4S: Sub-4 Runoff Area=15,787 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment5S: Sub-5 Runoff Area=57,338 sf 15.24% Impervious Runoff Depth=0.14"
Flow Length=438' Tc=7.8 min CN=47 Runoff=0.03 cfs 0.016 af

Reach DP-1: DP-1 Inflow=0.57 cfs 0.042 af
Outflow=0.57 cfs 0.042 af

Reach DP-2: DP-2 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: DP-3 Inflow=0.74 cfs 0.125 af
Outflow=0.74 cfs 0.125 af

Reach DP-4: PL Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: PL Inflow=0.03 cfs 0.016 af
Outflow=0.03 cfs 0.016 af

Pond D-1: Exist Detention Basin Peak Elev=62.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond E-DB: Exist Detention Basin Peak Elev=58.87' Storage=741 cf Inflow=0.87 cfs 0.091 af
Outflow=0.54 cfs 0.080 af

Total Runoff Area = 7.760 ac Runoff Volume = 0.193 af Average Runoff Depth = 0.30"
85.82% Pervious = 6.660 ac 14.18% Impervious = 1.100 ac

Summary for Subcatchment 1A-S: Sub-1A

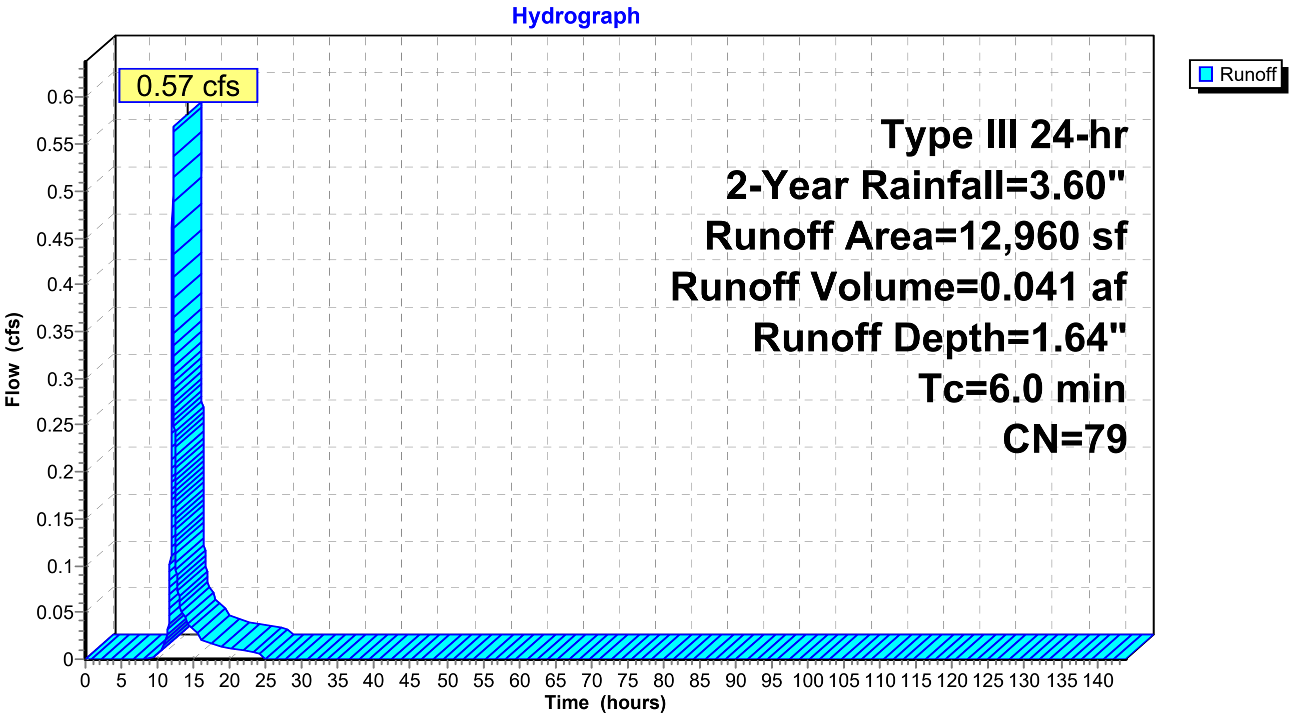
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 1.64"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
4,075	39	>75% Grass cover, Good, HSG A
8,885	98	Paved roads w/curbs & sewers, HSG A
12,960	79	Weighted Average
4,075		31.44% Pervious Area
8,885		68.56% Impervious Area

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

Subcatchment 1A-S: Sub-1A



Summary for Subcatchment 1B-S: Sub-1B

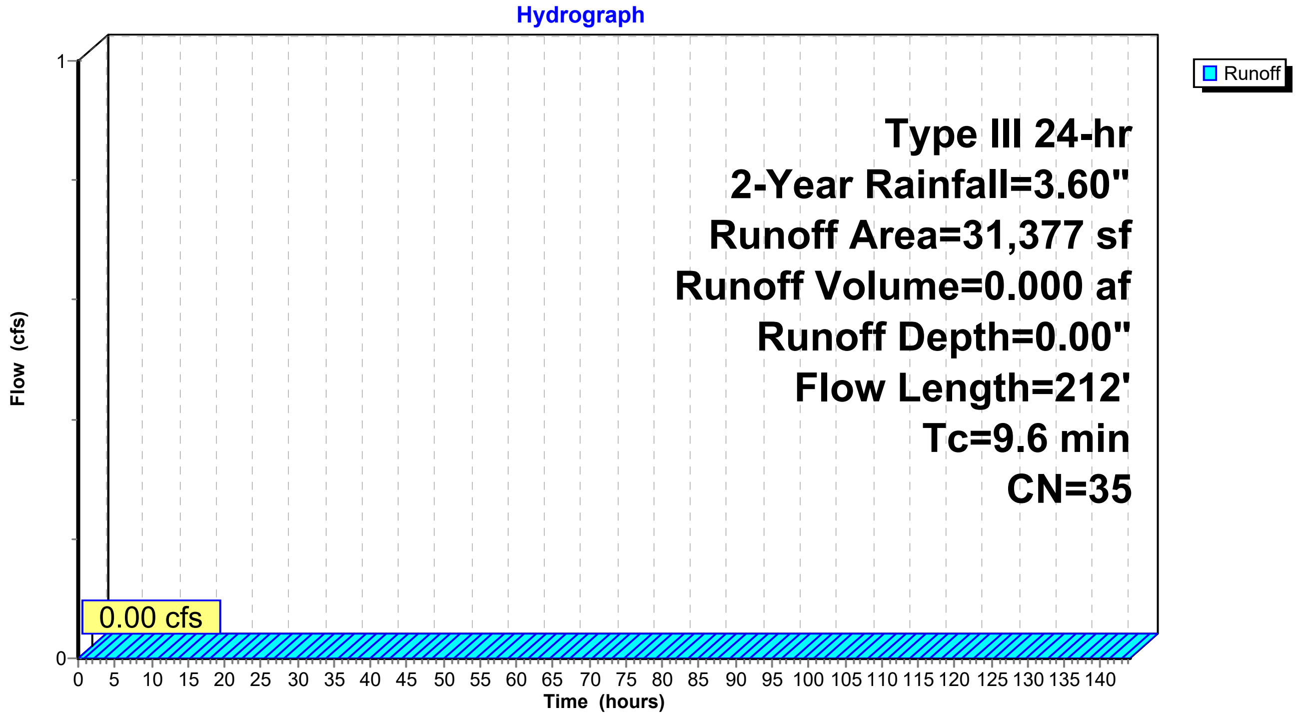
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond D-1 : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
22,072	30	Woods, Good, HSG A
1,755	39	>75% Grass cover, Good, HSG A
7,550	49	50-75% Grass cover, Fair, HSG A
31,377	35	Weighted Average
31,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	162	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	212	Total			

Subcatchment 1B-S: Sub-1B



Summary for Subcatchment 1C-S: Sub-1C

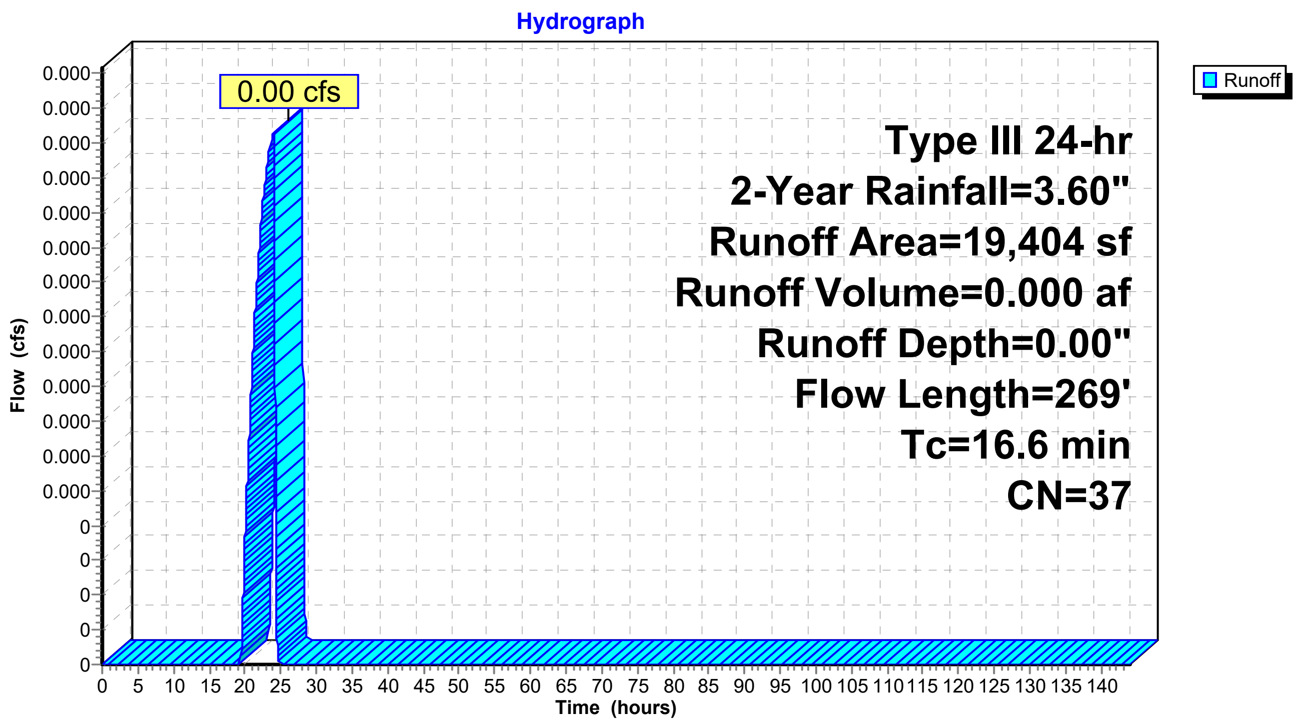
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
	12,129	30	Woods, Good, HSG A
	1,513	39	>75% Grass cover, Good, HSG A
	3,840	55	Woods, Good, HSG B
*	899	30	Woods, Good, HSG A - offsite
	1,023	49	50-75% Grass cover, Fair, HSG A
	19,404	37	Weighted Average
	19,404		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.3	219	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.6	269	Total			

Subcatchment 1C-S: Sub-1C



Summary for Subcatchment 1D-S: Sub-1D

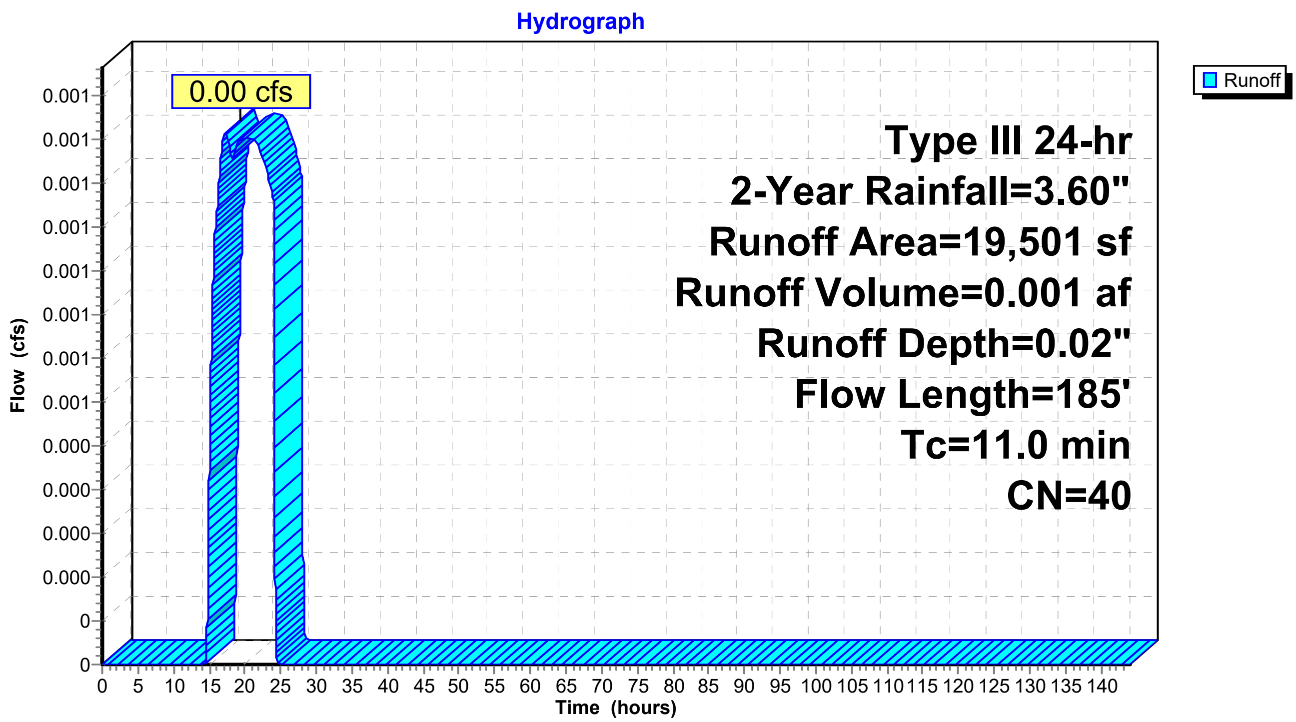
Runoff = 0.00 cfs @ 17.32 hrs, Volume= 0.001 af, Depth= 0.02"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
	10,890	39	>75% Grass cover, Good, HSG A
	2,684	49	50-75% Grass cover, Fair, HSG A
*	770	98	Rubble Pile, HSG A
	5,157	30	Woods, Good, HSG A
	19,501	40	Weighted Average
	18,731		96.05% Pervious Area
	770		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.1	135	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.0	185	Total			

Subcatchment 1D-S: Sub-1D



Summary for Subcatchment 2S: Sub-2

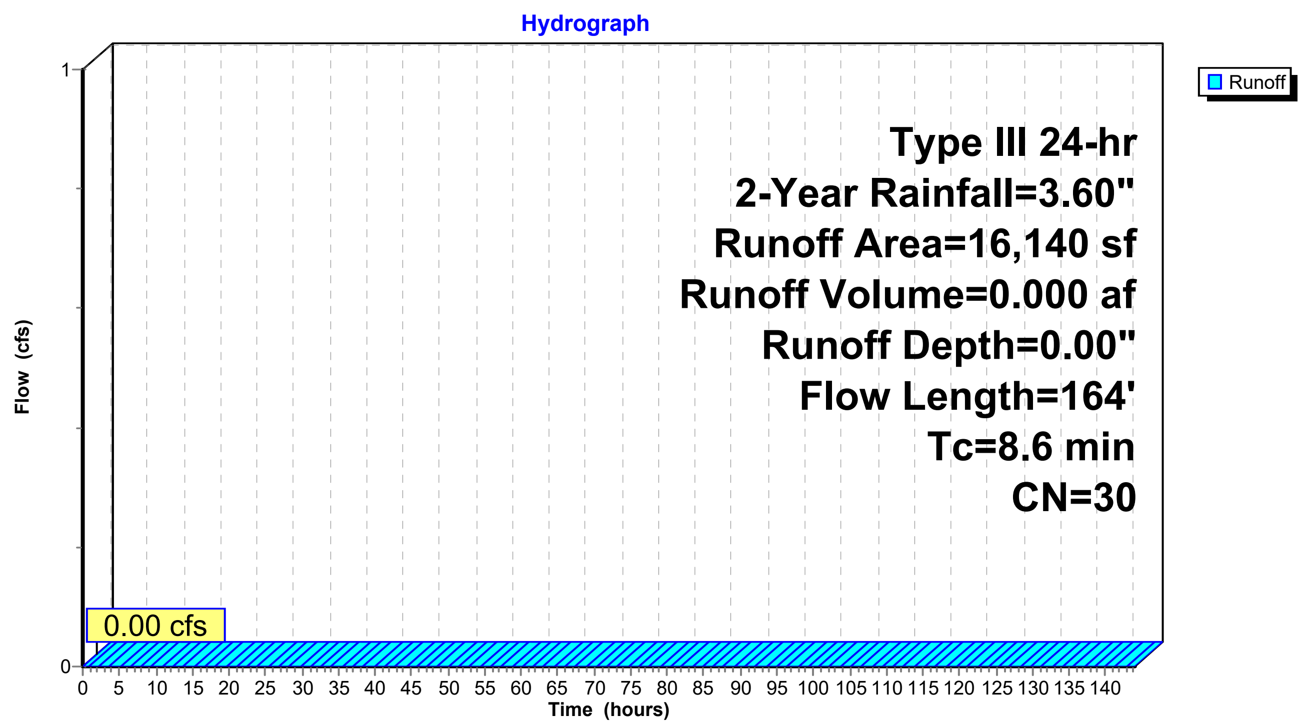
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
16,140	30	Woods, Good, HSG A
16,140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.9	114	0.0383	0.98		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.6	164	Total			

Subcatchment 2S: Sub-2



Summary for Subcatchment 3A-S: Sub-3A

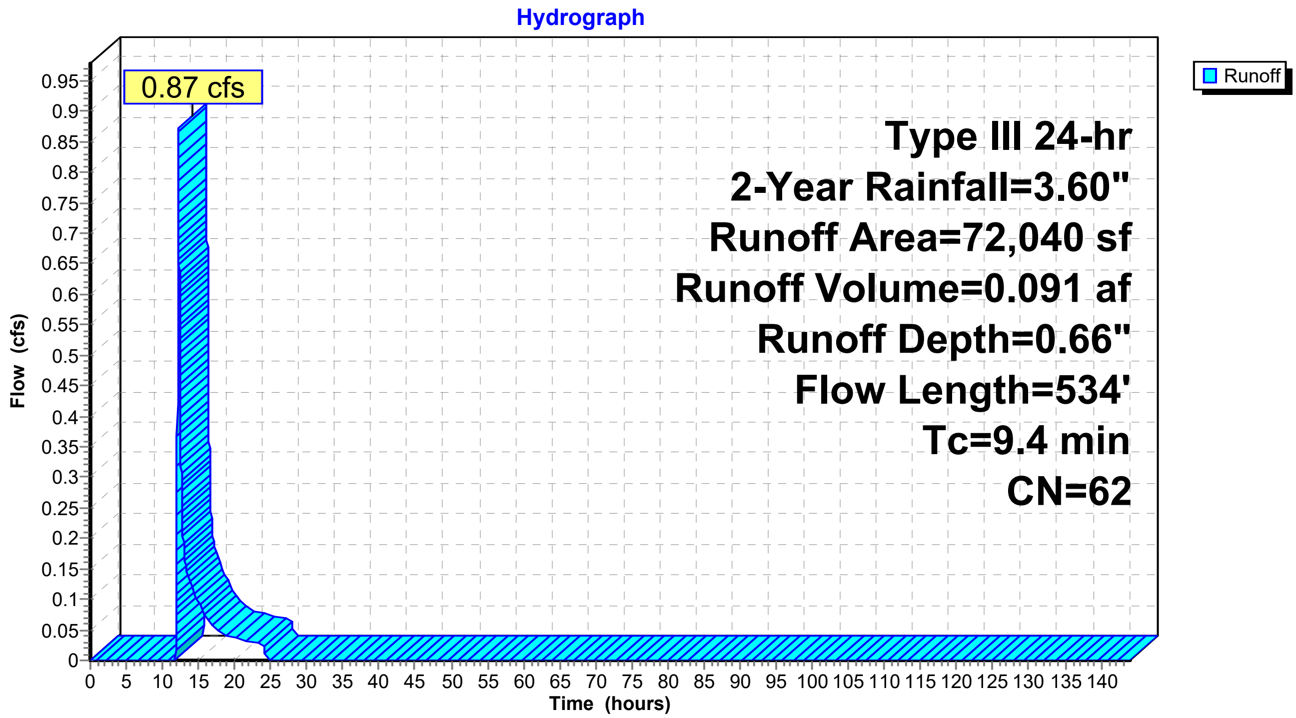
Runoff = 0.87 cfs @ 12.16 hrs, Volume= 0.091 af, Depth= 0.66"
Routed to Pond E-DB : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	1,384	98	Roofs, HSG A - offsite
*	16,069	98	Paved parking, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
*	1,189	39	>75% Grass cover, Good, HSG A - offsite
	24,471	30	Woods, Good, HSG A
	6,630	39	>75% Grass cover, Good, HSG A
	2,407	98	Paved roads w/curbs & sewers, HSG A
*	2,712	98	Existing Detention Basin, HSG A
*	810	98	Riprap, HSG A
	3,247	98	Paved roads w/curbs & sewers, HSG B
	2,784	55	Woods, Good, HSG B
*	938	98	Riprap, HSG B
	6,442	61	>75% Grass cover, Good, HSG B
*	1,275	98	Existing Detention Basin, HSG B
	72,040	62	Weighted Average
	43,198		59.96% Pervious Area
	28,842		40.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0160	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.60"
1.8	225	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	102	0.0090	1.93		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	157	0.0030	2.88	3.54	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
9.4	534	Total			

Subcatchment 3A-S: Sub-3A



Summary for Subcatchment 3B-S: Sub-3B-S

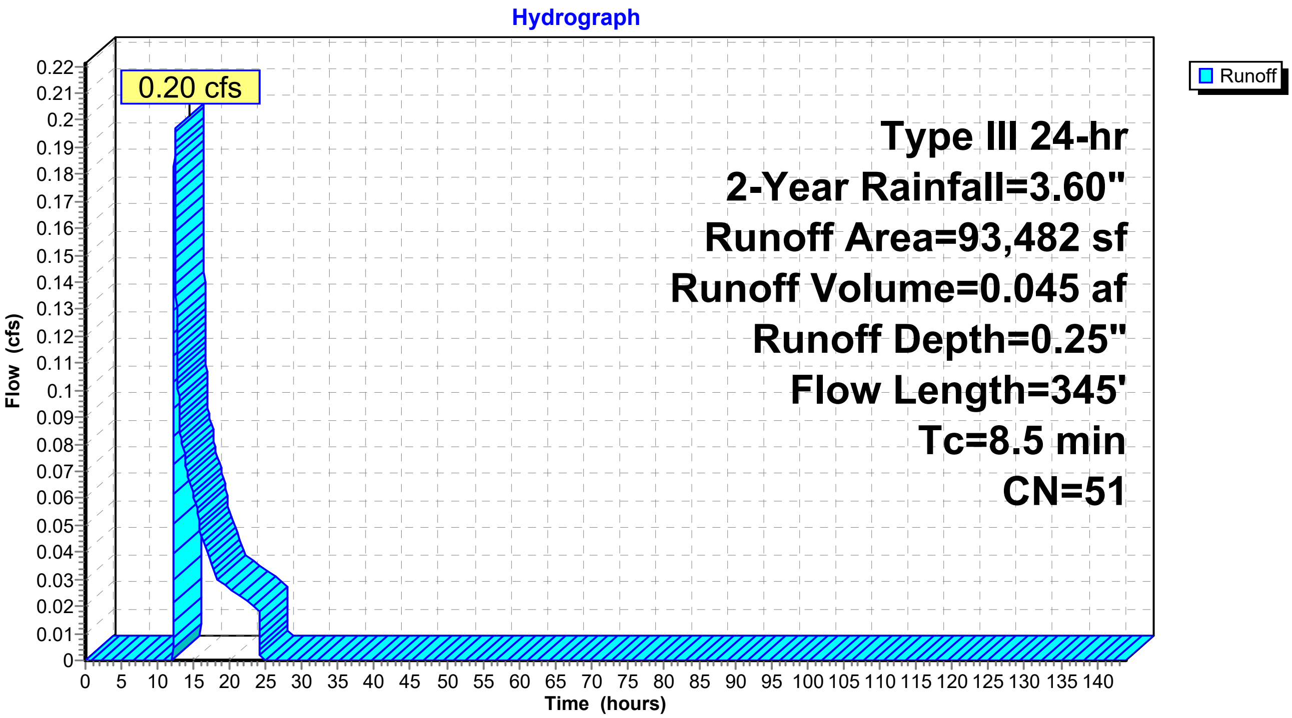
Runoff = 0.20 cfs @ 12.40 hrs, Volume= 0.045 af, Depth= 0.25"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	285	98	Riprap, HSG A
*	121	98	Riprap, HSG B
	9,682	30	Woods, Good, HSG A
	61,938	55	Woods, Good, HSG B
	8,282	61	>75% Grass cover, Good, HSG B
	1,762	39	>75% Grass cover, Good, HSG A
*	4,310	30	Woods, Good, HSG A - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	290	98	Paved drive, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
*	1,734	55	Woods, Good, HSG B - offsite
	93,482	51	Weighted Average
	92,786		99.26% Pervious Area
	696		0.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0700	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	295	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	345	Total			

Subcatchment 3B-S: Sub-3B-S



Summary for Subcatchment 4S: Sub-4

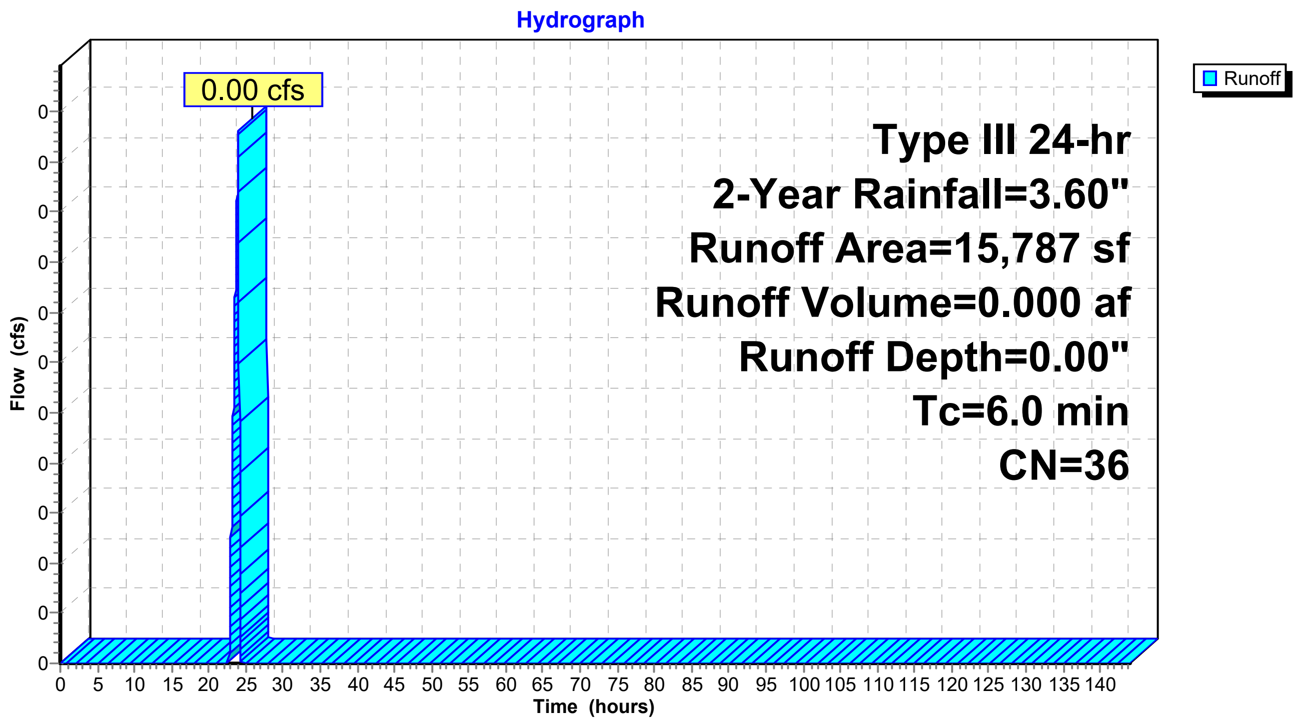
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
15,787	36	Woods, Fair, HSG A
15,787		100.00% Pervious Area

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

Subcatchment 4S: Sub-4



Summary for Subcatchment 5S: Sub-5

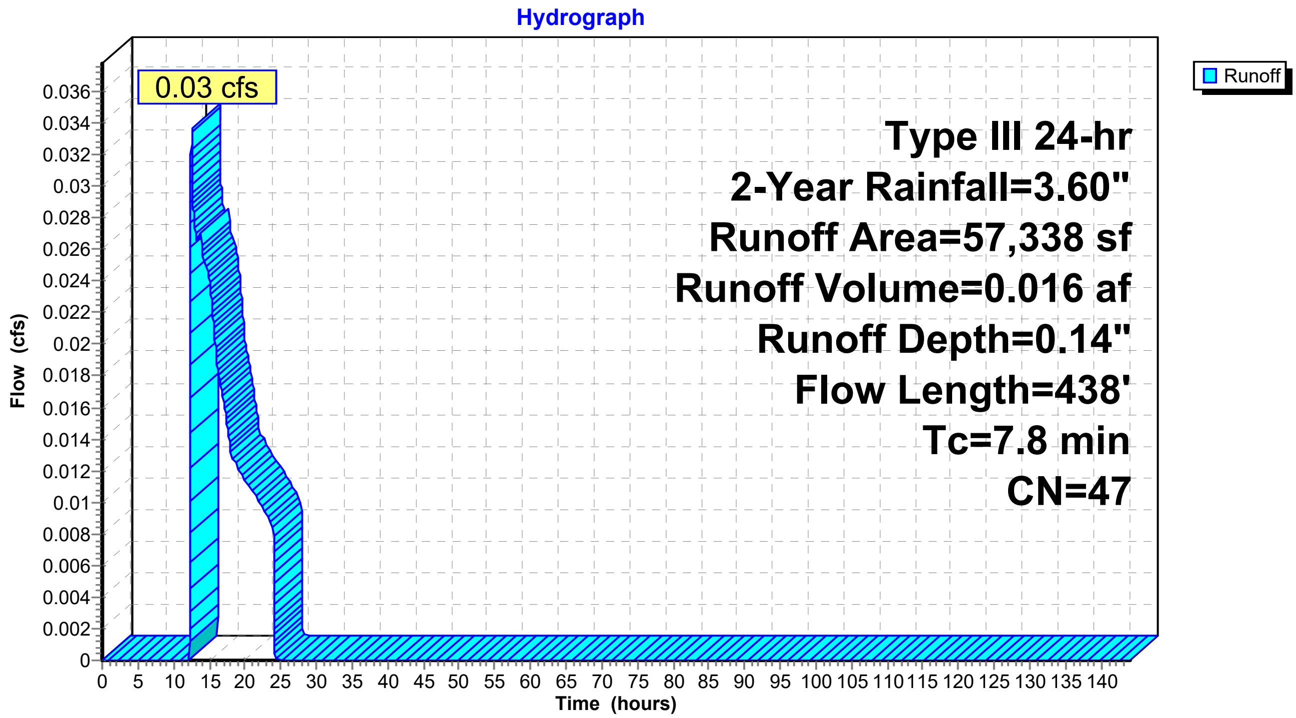
Runoff = 0.03 cfs @ 12.51 hrs, Volume= 0.016 af, Depth= 0.14"
Routed to Reach DP-5 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
	32,676	36	Woods, Fair, HSG A
	15,526	39	>75% Grass cover, Good, HSG A
	395	80	>75% Grass cover, Good, HSG D
*	318	98	Paved drive, HSG D
	2,148	98	Roofs, HSG A
*	5,322	98	Paved drive, HSG A
*	533	98	Patio, HSG A
*	235	98	Misc, HSG A
*	185	98	Ledge, HSG A
	57,338	47	Weighted Average
	48,597		84.76% Pervious Area
	8,741		15.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	39	0.1538	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.8	11	0.1100	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.60"
0.1	22	0.1166	5.50		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	54	0.0500	3.60		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
0.2	52	0.0770	4.47		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
1.0	175	0.0300	2.79		**Shallow Concentrated Flow, F-G** Unpaved Kv= 16.1 fps
0.3	85	0.1100	5.34		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
7.8	438	Total			

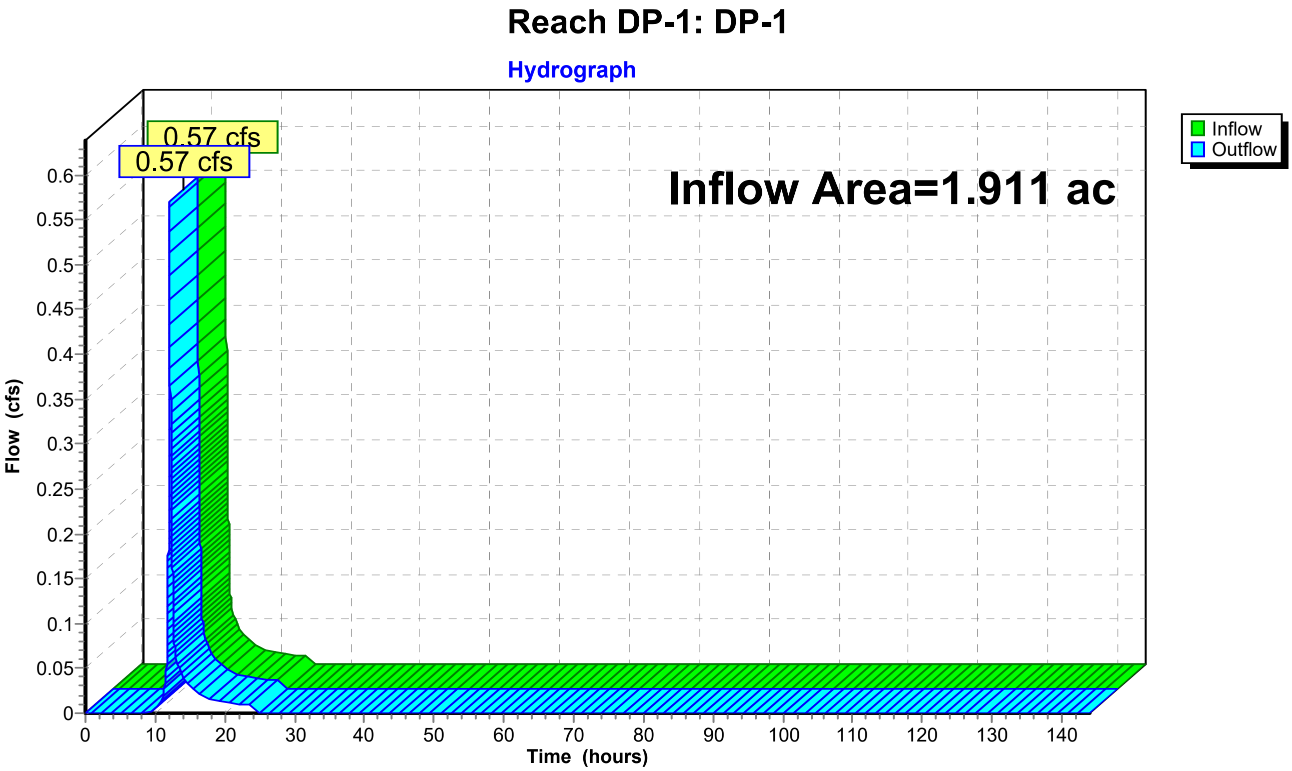
Subcatchment 5S: Sub-5



Summary for Reach DP-1: DP-1

Inflow Area = 1.911 ac, 11.60% Impervious, Inflow Depth = 0.26" for 2-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.042 af
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min

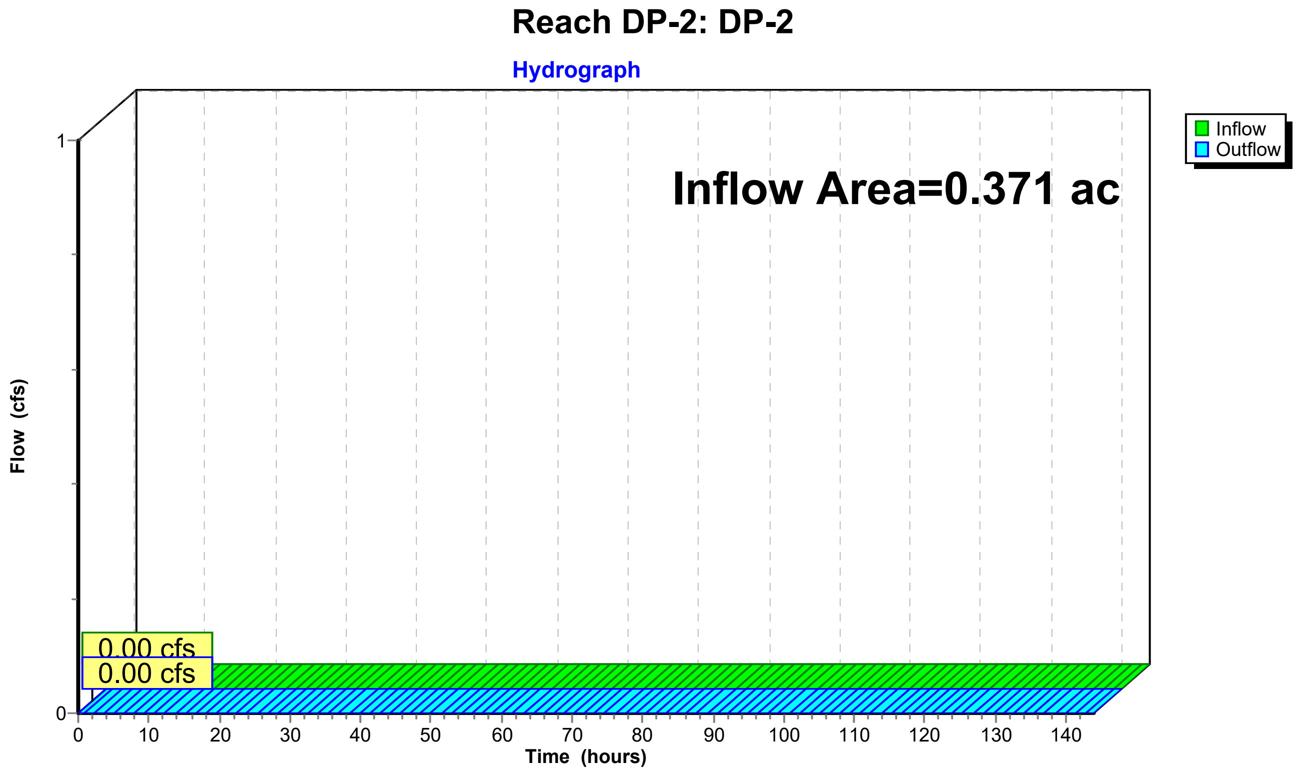
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-2: DP-2

Inflow Area = 0.371 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

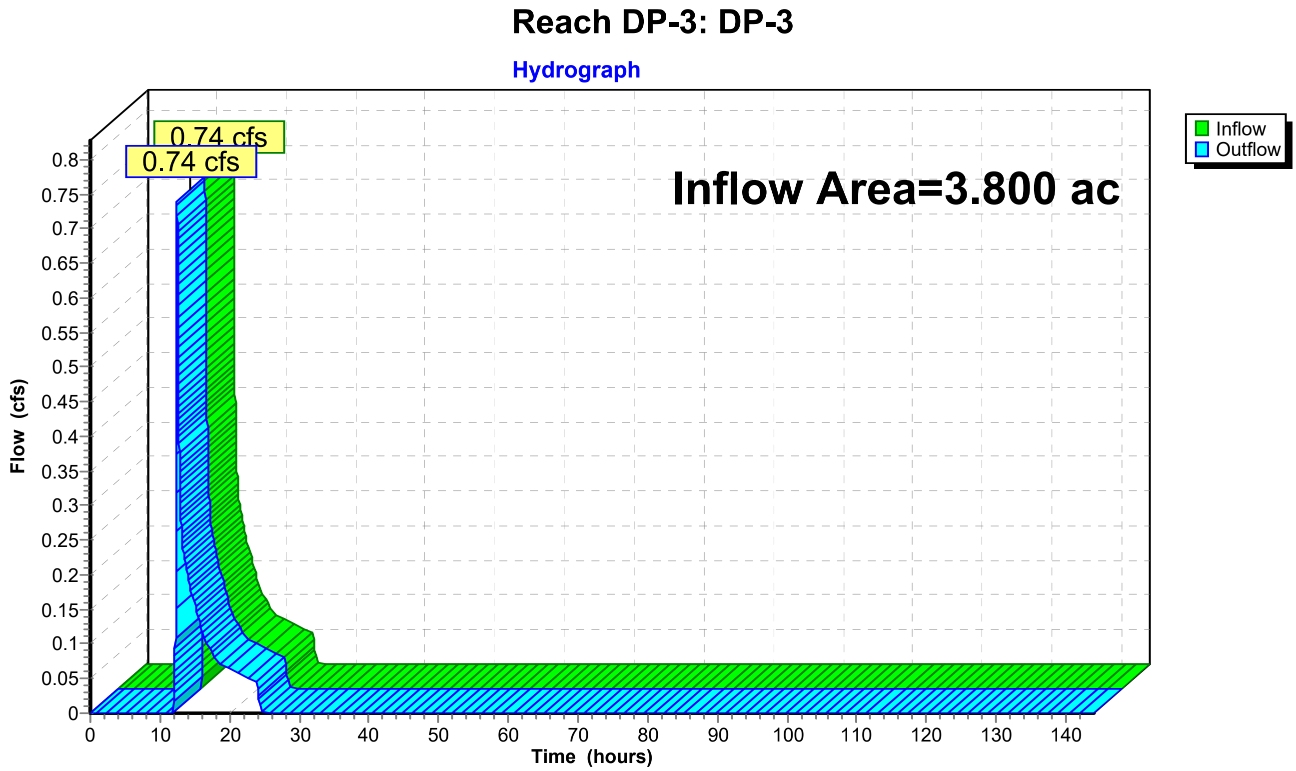
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-3: DP-3

Inflow Area = 3.800 ac, 17.85% Impervious, Inflow Depth = 0.39" for 2-Year event
Inflow = 0.74 cfs @ 12.41 hrs, Volume= 0.125 af
Outflow = 0.74 cfs @ 12.41 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min

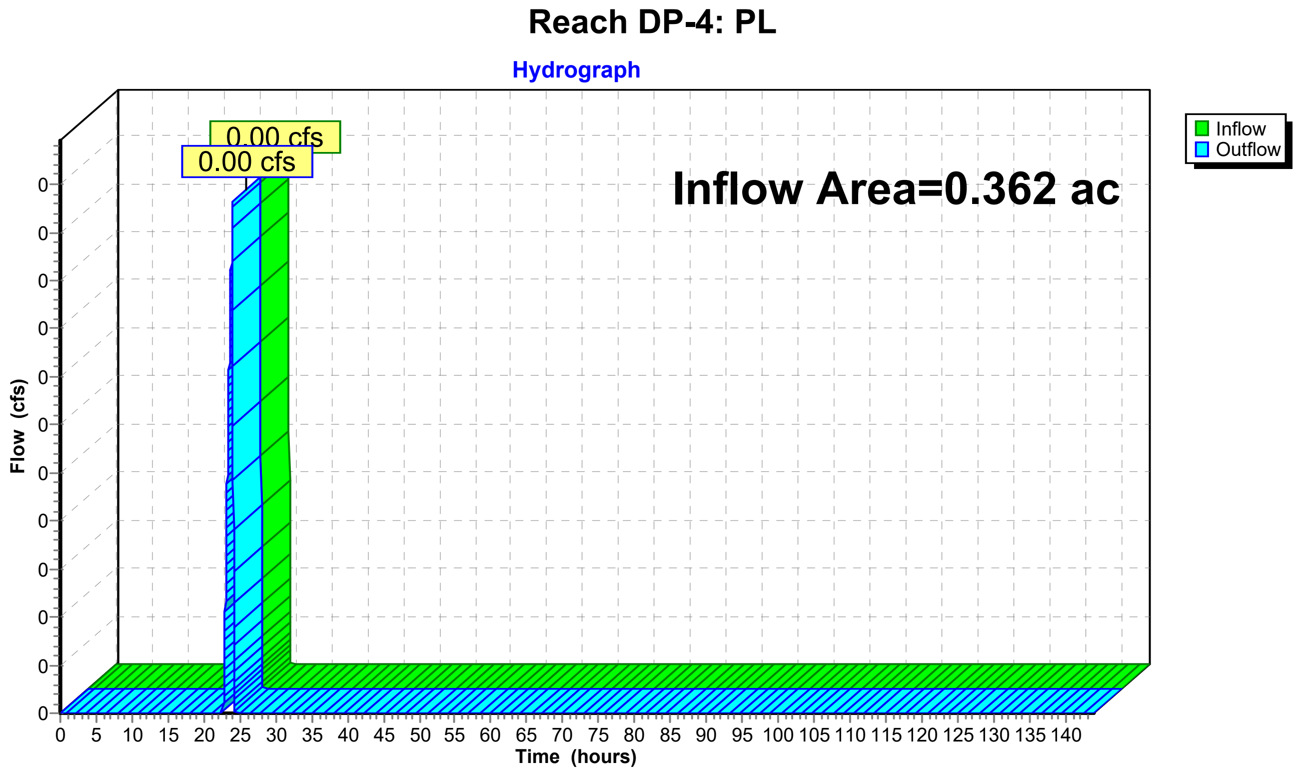
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-4: PL

Inflow Area = 0.362 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

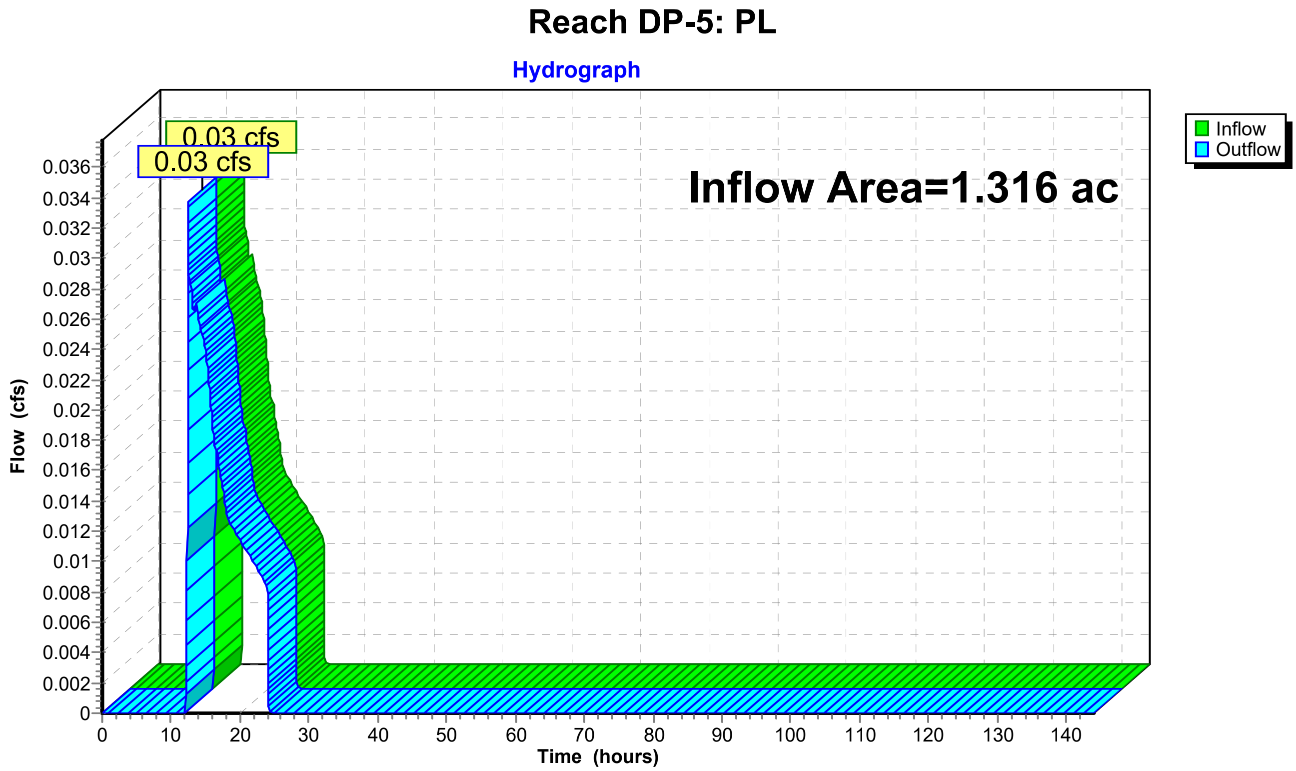
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-5: PL

Inflow Area = 1.316 ac, 15.24% Impervious, Inflow Depth = 0.14" for 2-Year event
Inflow = 0.03 cfs @ 12.51 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 12.51 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Pond D-1: Exist Detention Basin

Inflow Area = 0.720 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 62.00' @ 0.00 hrs Surf.Area= 4,336 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	62.00'	5,584 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

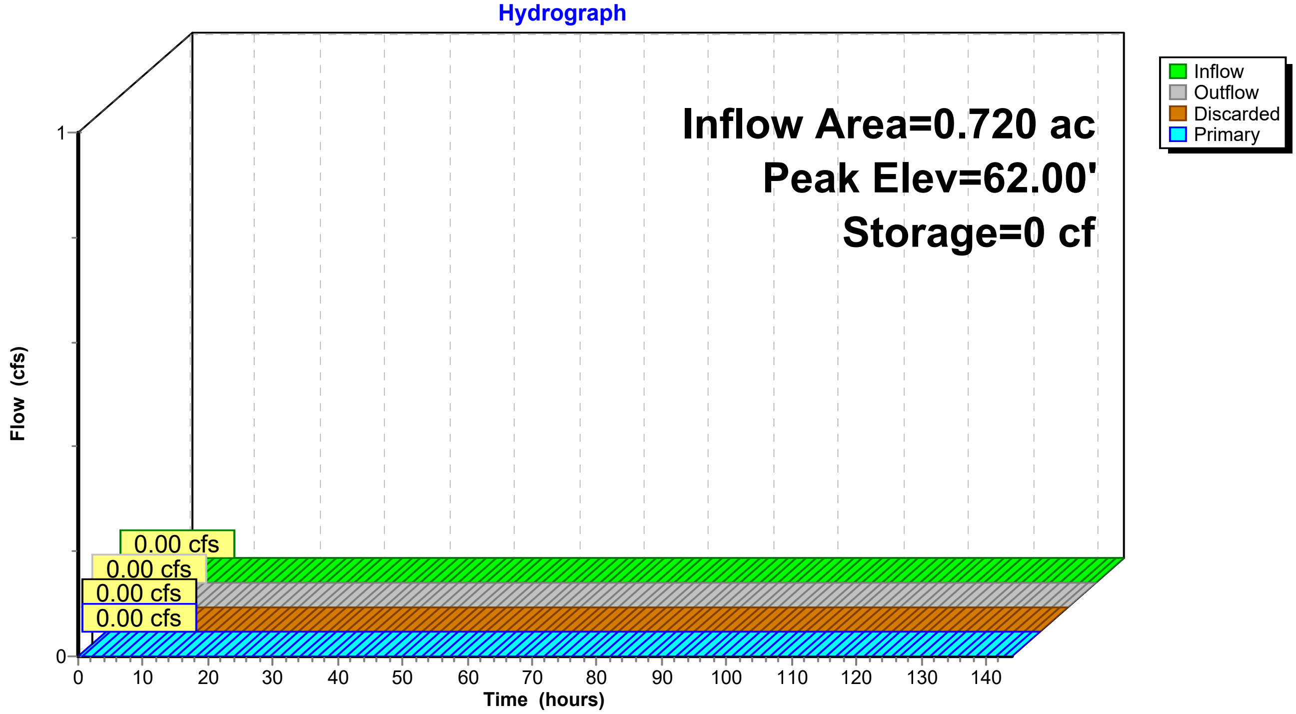
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.00	4,336	0	0
63.00	6,832	5,584	5,584

Device	Routing	Invert	Outlet Devices
#1	Primary	63.00'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	62.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.00' (Free Discharge)
└─**2=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.00' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist Detention Basin



Summary for Pond E-DB: Exist Detention Basin

Inflow Area = 1.654 ac, 40.04% Impervious, Inflow Depth = 0.66" for 2-Year event
Inflow = 0.87 cfs @ 12.16 hrs, Volume= 0.091 af
Outflow = 0.54 cfs @ 12.42 hrs, Volume= 0.080 af, Atten= 38%, Lag= 15.6 min
Primary = 0.54 cfs @ 12.42 hrs, Volume= 0.080 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 58.87' @ 12.42 hrs Surf.Area= 1,361 sf Storage= 741 cf

Plug-Flow detention time= 95.7 min calculated for 0.080 af (87% of inflow)
Center-of-Mass det. time= 37.2 min (936.9 - 899.7)

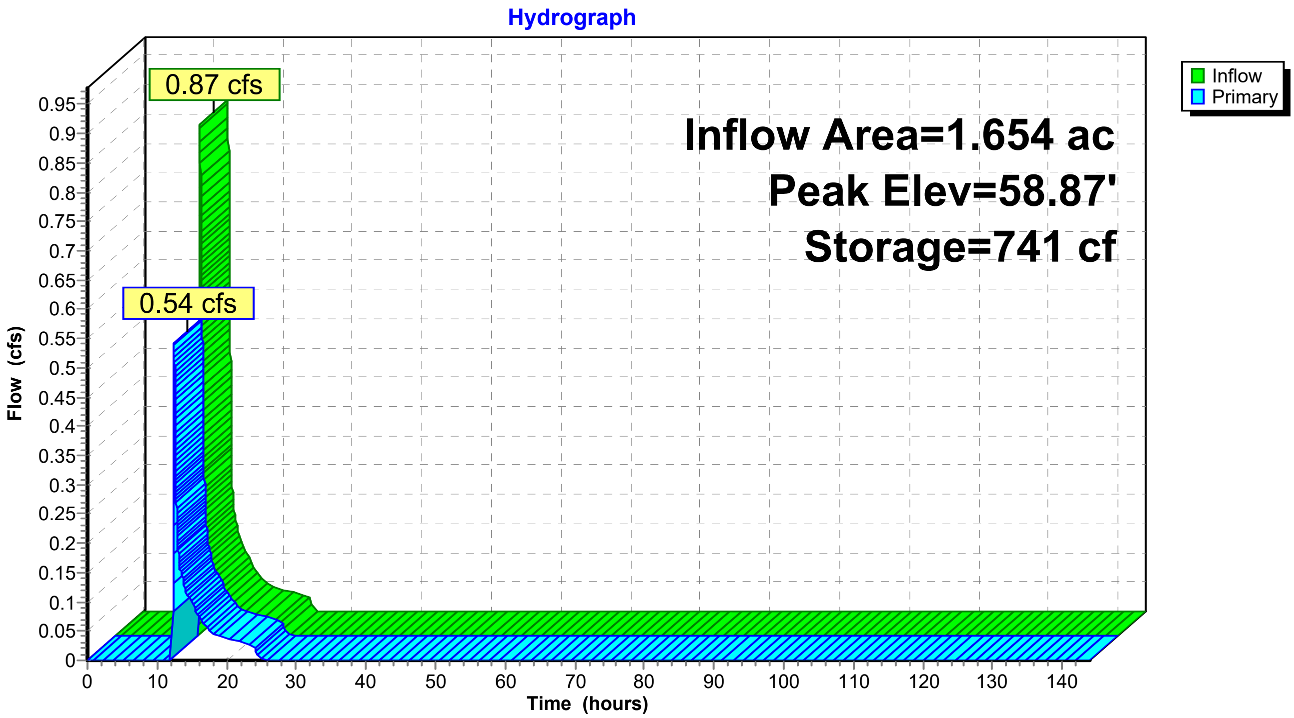
Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	7,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	336	0	0
59.00	1,511	924	924
60.00	3,233	2,372	3,296
61.00	4,826	4,030	7,325

Device	Routing	Invert	Outlet Devices
#1	Primary	58.12'	**12.0" Round RCP_Round 12"** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.12' / 58.05' S= 0.0028 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	58.68'	**2.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	59.88'	**7.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	58.68'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.54 cfs @ 12.42 hrs HW=58.87' TW=0.00' (Dynamic Tailwater)
1=RCP_Round 12" (Passes 0.54 cfs of 1.25 cfs potential flow)
2=Sharp-Crested Rectangular Weir (Weir Controls 0.54 cfs @ 1.44 fps)
4=Sharp-Crested Rectangular Weir (Passes 0.54 cfs of 1.37 cfs potential flow)
3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond E-DB: Exist Detention Basin



Time span=0.00-144.00 hrs, dt=0.01 hrs, 14401 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

Subcatchment1A-S: Sub-1A Runoff Area=12,960 sf 68.56% Impervious Runoff Depth=2.63"
Tc=6.0 min CN=79 Runoff=0.92 cfs 0.065 af

Subcatchment1B-S: Sub-1B Runoff Area=31,377 sf 0.00% Impervious Runoff Depth=0.06"
Flow Length=212' Tc=9.6 min CN=35 Runoff=0.01 cfs 0.004 af

Subcatchment1C-S: Sub-1C Runoff Area=19,404 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=269' Tc=16.6 min CN=37 Runoff=0.01 cfs 0.004 af

Subcatchment1D-S: Sub-1D Runoff Area=19,501 sf 3.95% Impervious Runoff Depth=0.19"
Flow Length=185' Tc=11.0 min CN=40 Runoff=0.01 cfs 0.007 af

Subcatchment2S: Sub-2 Runoff Area=16,140 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=164' Tc=8.6 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment3A-S: Sub-3A Runoff Area=72,040 sf 40.04% Impervious Runoff Depth=1.32"
Flow Length=534' Tc=9.4 min CN=62 Runoff=2.06 cfs 0.181 af

Subcatchment3B-S: Sub-3B-S Runoff Area=93,482 sf 0.74% Impervious Runoff Depth=0.66"
Flow Length=345' Tc=8.5 min CN=51 Runoff=0.94 cfs 0.119 af

Subcatchment4S: Sub-4 Runoff Area=15,787 sf 0.00% Impervious Runoff Depth=0.08"
Tc=6.0 min CN=36 Runoff=0.00 cfs 0.002 af

Subcatchment5S: Sub-5 Runoff Area=57,338 sf 15.24% Impervious Runoff Depth=0.47"
Flow Length=438' Tc=7.8 min CN=47 Runoff=0.29 cfs 0.051 af

Reach DP-1: DP-1 Inflow=0.92 cfs 0.076 af
Outflow=0.92 cfs 0.076 af

Reach DP-2: DP-2 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: DP-3 Inflow=2.53 cfs 0.289 af
Outflow=2.53 cfs 0.289 af

Reach DP-4: PL Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Reach DP-5: PL Inflow=0.29 cfs 0.051 af
Outflow=0.29 cfs 0.051 af

Pond D-1: Exist Detention Basin Peak Elev=62.00' Storage=0 cf Inflow=0.01 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond E-DB: Exist Detention Basin Peak Elev=59.09' Storage=1,070 cf Inflow=2.06 cfs 0.181 af
Outflow=1.66 cfs 0.170 af

Total Runoff Area = 7.760 ac Runoff Volume = 0.434 af Average Runoff Depth = 0.67"
85.82% Pervious = 6.660 ac 14.18% Impervious = 1.100 ac

Summary for Subcatchment 1A-S: Sub-1A

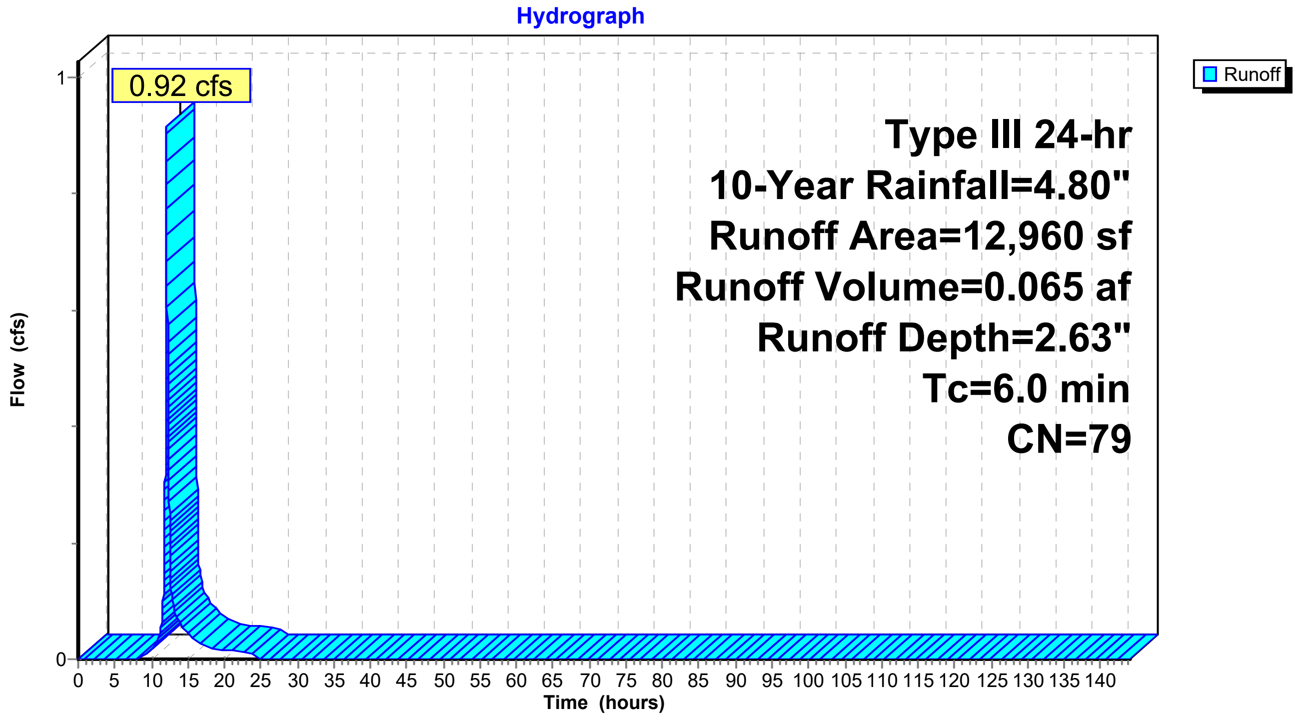
Runoff = 0.92 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.63"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
4,075	39	>75% Grass cover, Good, HSG A
8,885	98	Paved roads w/curbs & sewers, HSG A
12,960	79	Weighted Average
4,075		31.44% Pervious Area
8,885		68.56% Impervious Area

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

Subcatchment 1A-S: Sub-1A



Summary for Subcatchment 1B-S: Sub-1B

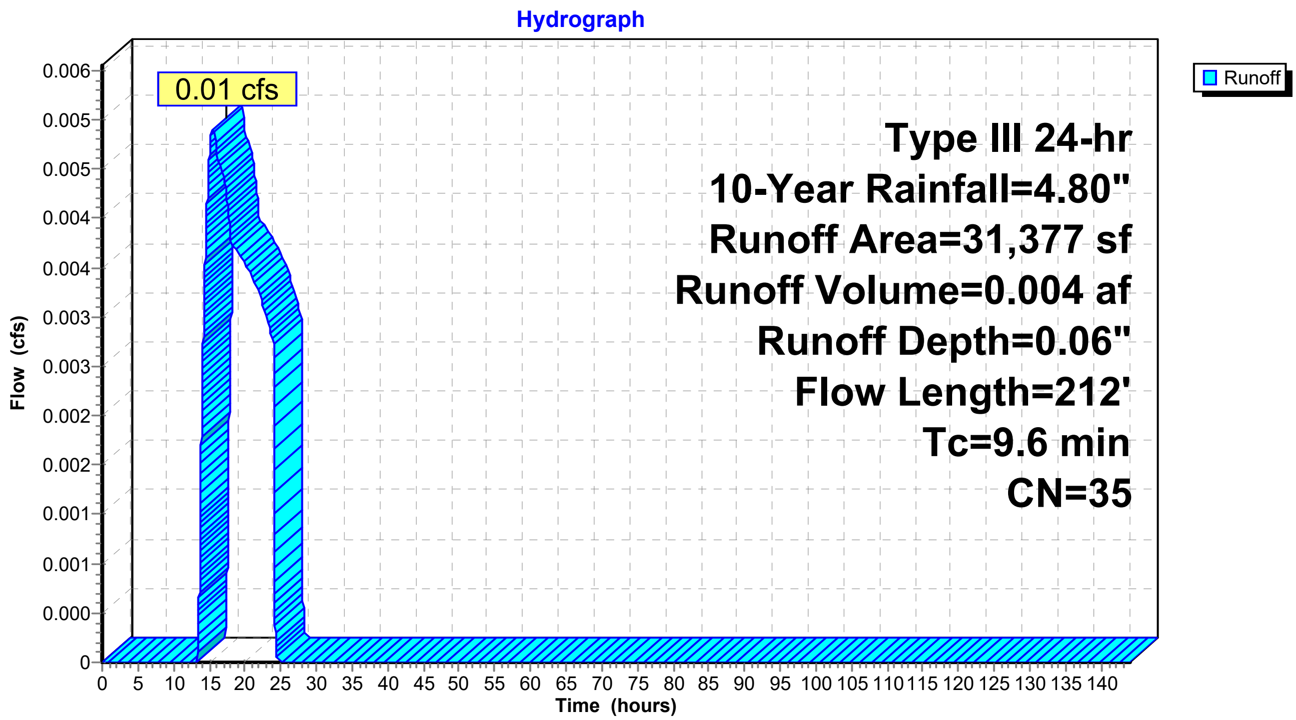
Runoff = 0.01 cfs @ 15.52 hrs, Volume= 0.004 af, Depth= 0.06"
Routed to Pond D-1 : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
22,072	30	Woods, Good, HSG A
1,755	39	>75% Grass cover, Good, HSG A
7,550	49	50-75% Grass cover, Fair, HSG A
31,377	35	Weighted Average
31,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	162	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	212	Total			

Subcatchment 1B-S: Sub-1B



Summary for Subcatchment 1C-S: Sub-1C

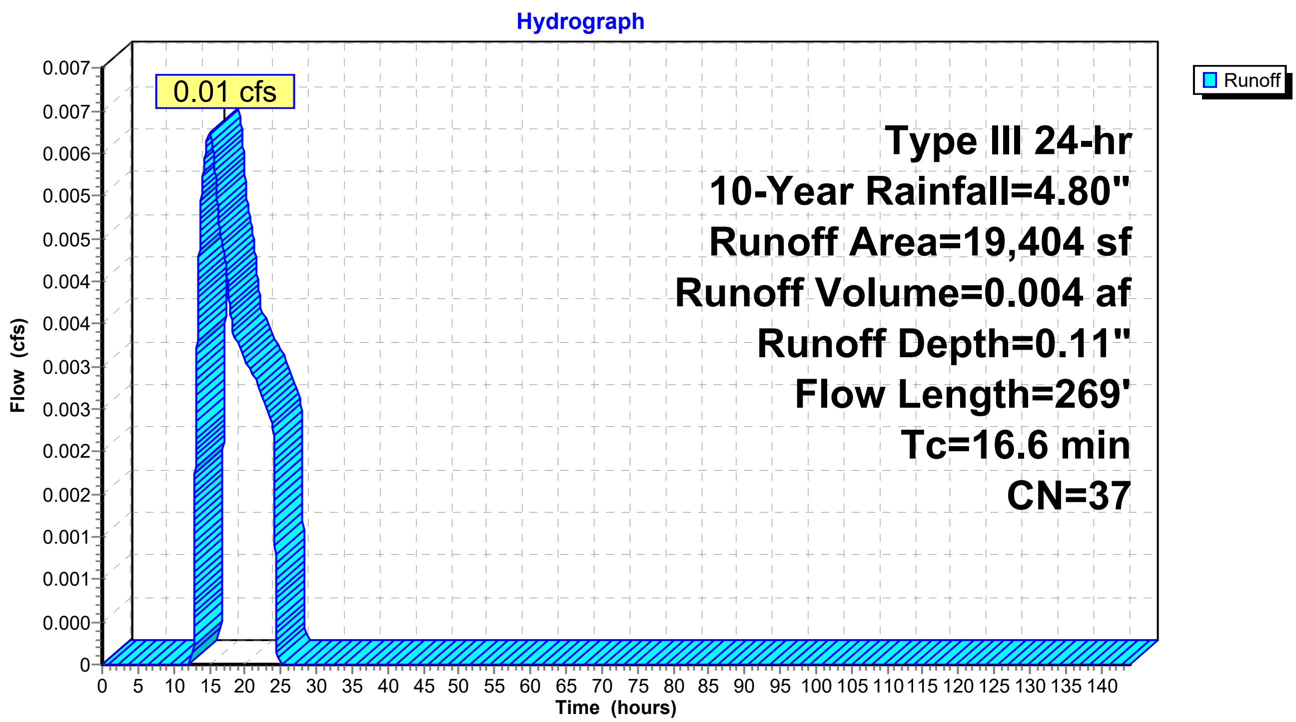
Runoff = 0.01 cfs @ 15.03 hrs, Volume= 0.004 af, Depth= 0.11"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	12,129	30	Woods, Good, HSG A
	1,513	39	>75% Grass cover, Good, HSG A
	3,840	55	Woods, Good, HSG B
*	899	30	Woods, Good, HSG A - offsite
	1,023	49	50-75% Grass cover, Fair, HSG A
	19,404	37	Weighted Average
	19,404		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.3	219	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.6	269	Total			

Subcatchment 1C-S: Sub-1C



Summary for Subcatchment 1D-S: Sub-1D

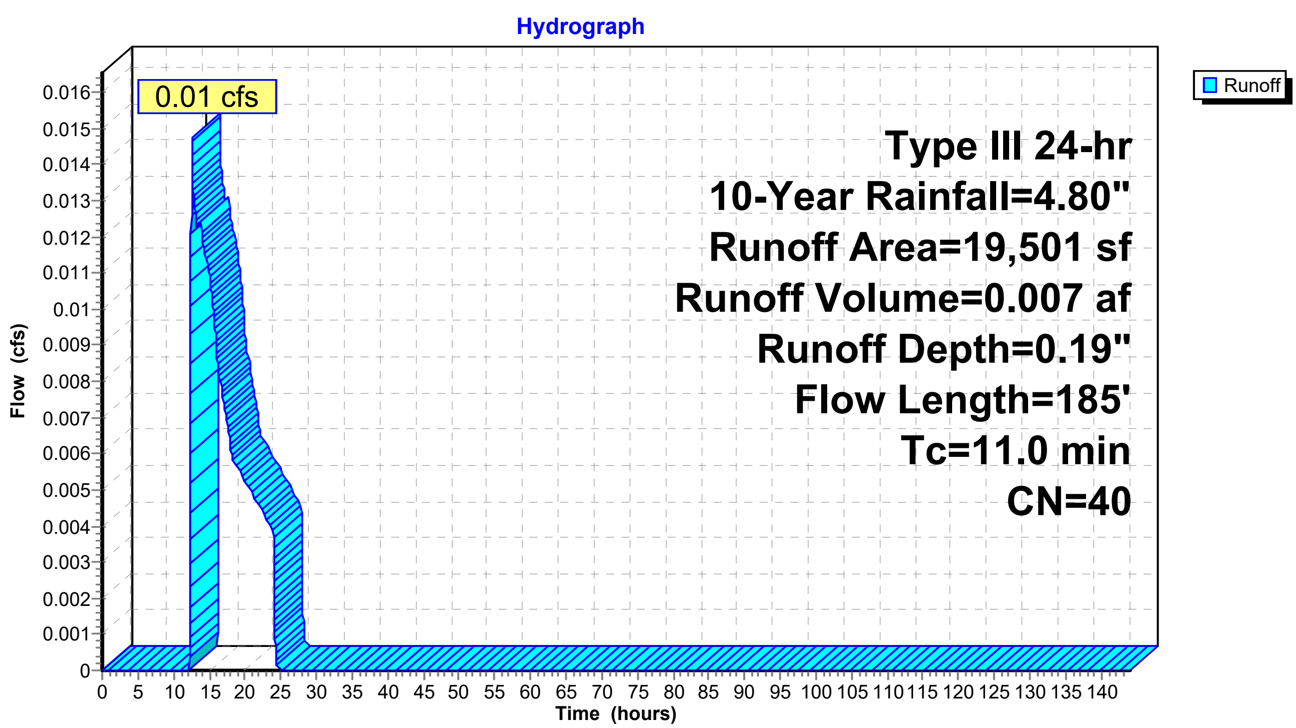
Runoff = 0.01 cfs @ 12.55 hrs, Volume= 0.007 af, Depth= 0.19"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	10,890	39	>75% Grass cover, Good, HSG A
	2,684	49	50-75% Grass cover, Fair, HSG A
*	770	98	Rubble Pile, HSG A
	5,157	30	Woods, Good, HSG A
	19,501	40	Weighted Average
	18,731		96.05% Pervious Area
	770		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.1	135	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.0	185	Total			

Subcatchment 1D-S: Sub-1D



Summary for Subcatchment 2S: Sub-2

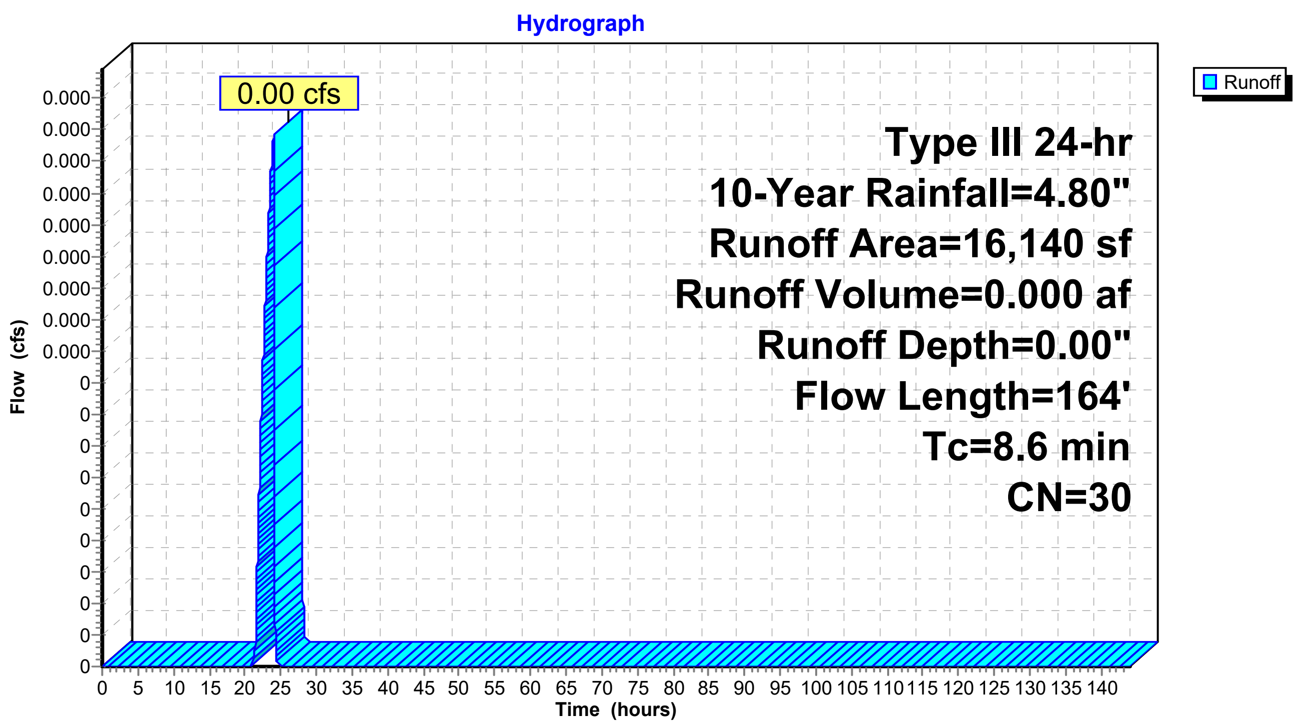
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
16,140	30	Woods, Good, HSG A
16,140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.9	114	0.0383	0.98		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.6	164	Total			

Subcatchment 2S: Sub-2



Summary for Subcatchment 3A-S: Sub-3A

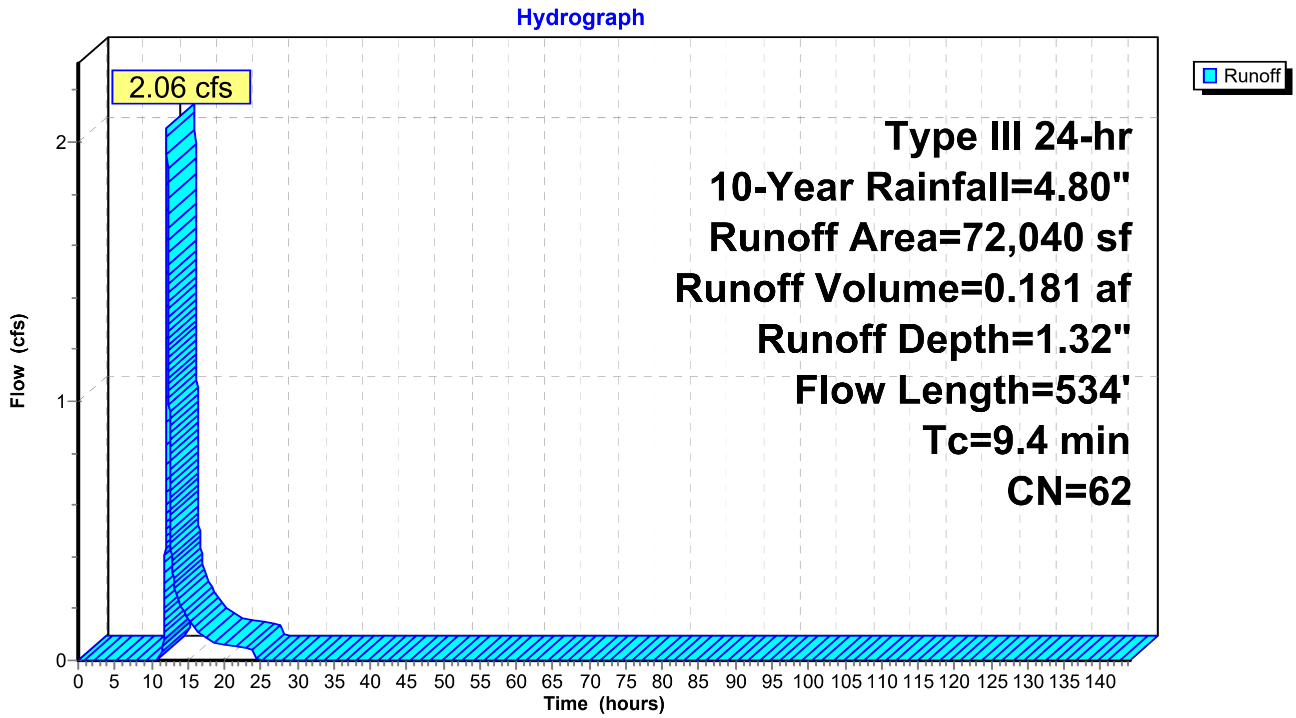
Runoff = 2.06 cfs @ 12.15 hrs, Volume= 0.181 af, Depth= 1.32"
Routed to Pond E-DB : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	1,384	98	Roofs, HSG A - offsite
*	16,069	98	Paved parking, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
*	1,189	39	>75% Grass cover, Good, HSG A - offsite
	24,471	30	Woods, Good, HSG A
	6,630	39	>75% Grass cover, Good, HSG A
	2,407	98	Paved roads w/curbs & sewers, HSG A
*	2,712	98	Existing Detention Basin, HSG A
*	810	98	Riprap, HSG A
	3,247	98	Paved roads w/curbs & sewers, HSG B
	2,784	55	Woods, Good, HSG B
*	938	98	Riprap, HSG B
	6,442	61	>75% Grass cover, Good, HSG B
*	1,275	98	Existing Detention Basin, HSG B
	72,040	62	Weighted Average
	43,198		59.96% Pervious Area
	28,842		40.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0160	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.60"
1.8	225	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	102	0.0090	1.93		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	157	0.0030	2.88	3.54	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
9.4	534	Total			

Subcatchment 3A-S: Sub-3A



Summary for Subcatchment 3B-S: Sub-3B-S

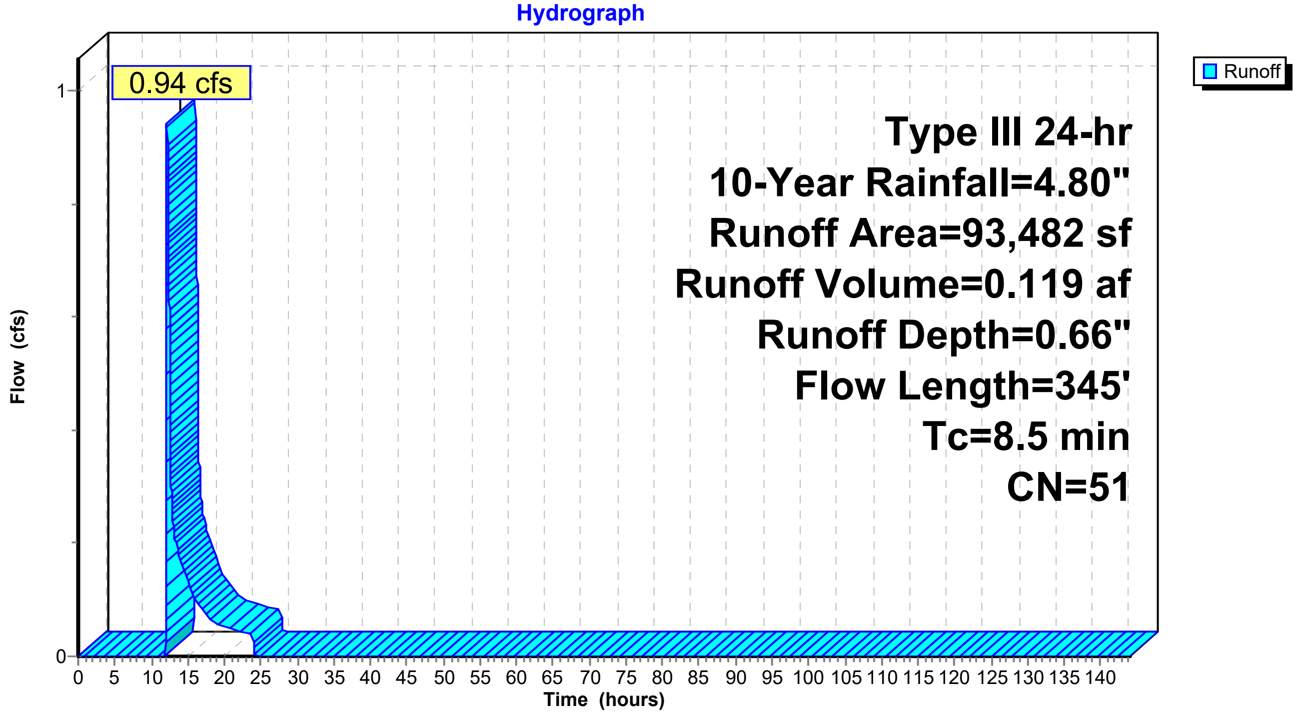
Runoff = 0.94 cfs @ 12.16 hrs, Volume= 0.119 af, Depth= 0.66"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	285	98	Riprap, HSG A
*	121	98	Riprap, HSG B
	9,682	30	Woods, Good, HSG A
	61,938	55	Woods, Good, HSG B
	8,282	61	>75% Grass cover, Good, HSG B
	1,762	39	>75% Grass cover, Good, HSG A
*	4,310	30	Woods, Good, HSG A - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	290	98	Paved drive, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
*	1,734	55	Woods, Good, HSG B - offsite
	93,482	51	Weighted Average
	92,786		99.26% Pervious Area
	696		0.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0700	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	295	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	345	Total			

Subcatchment 3B-S: Sub-3B-S



Summary for Subcatchment 4S: Sub-4

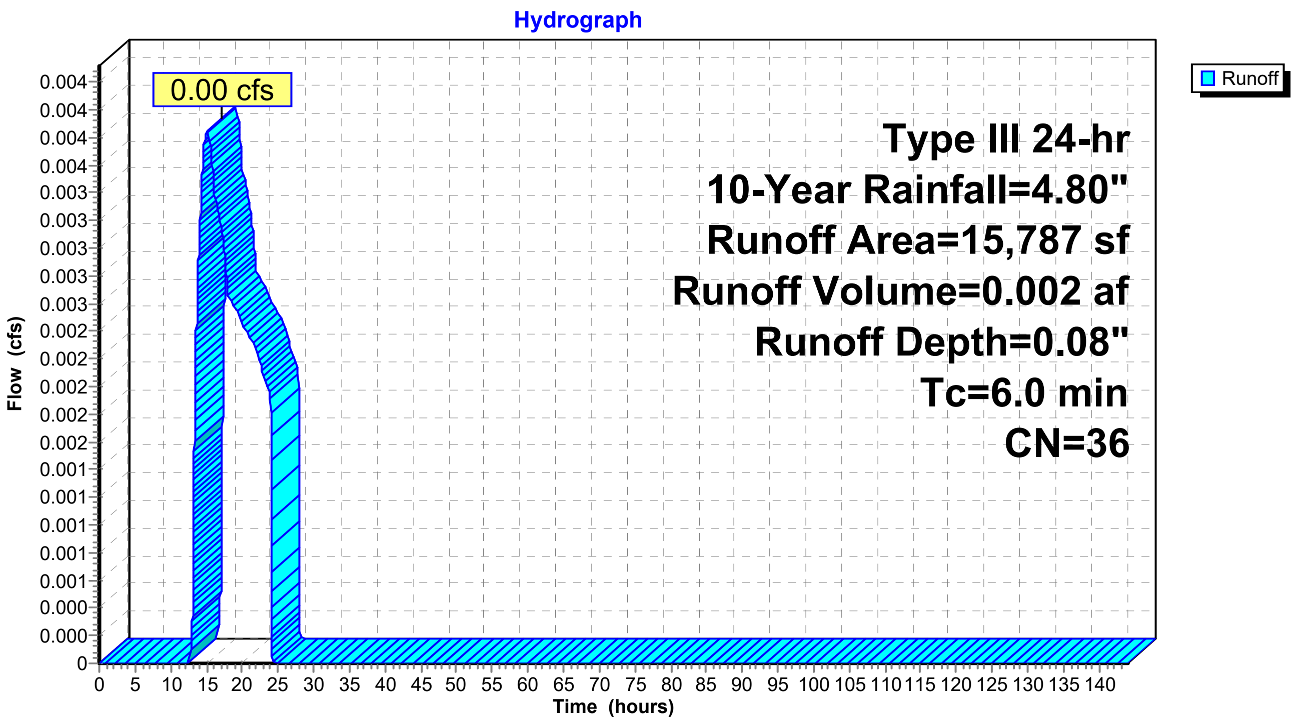
Runoff = 0.00 cfs @ 15.14 hrs, Volume= 0.002 af, Depth= 0.08"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
15,787	36	Woods, Fair, HSG A
15,787		100.00% Pervious Area

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

Subcatchment 4S: Sub-4



Summary for Subcatchment 5S: Sub-5

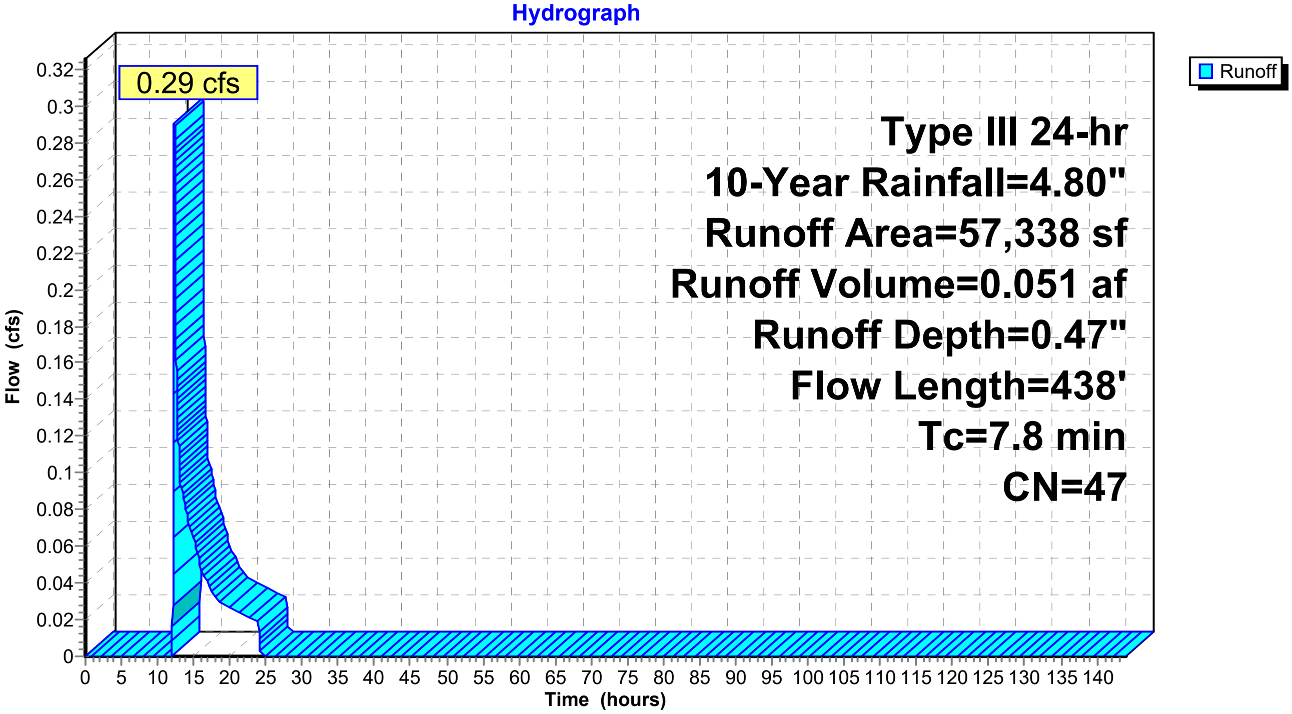
Runoff = 0.29 cfs @ 12.30 hrs, Volume= 0.051 af, Depth= 0.47"
Routed to Reach DP-5 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	32,676	36	Woods, Fair, HSG A
	15,526	39	>75% Grass cover, Good, HSG A
	395	80	>75% Grass cover, Good, HSG D
*	318	98	Paved drive, HSG D
	2,148	98	Roofs, HSG A
*	5,322	98	Paved drive, HSG A
*	533	98	Patio, HSG A
*	235	98	Misc, HSG A
*	185	98	Ledge, HSG A
	57,338	47	Weighted Average
	48,597		84.76% Pervious Area
	8,741		15.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	39	0.1538	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.8	11	0.1100	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.60"
0.1	22	0.1166	5.50		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	54	0.0500	3.60		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
0.2	52	0.0770	4.47		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
1.0	175	0.0300	2.79		**Shallow Concentrated Flow, F-G** Unpaved Kv= 16.1 fps
0.3	85	0.1100	5.34		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
7.8	438	Total			

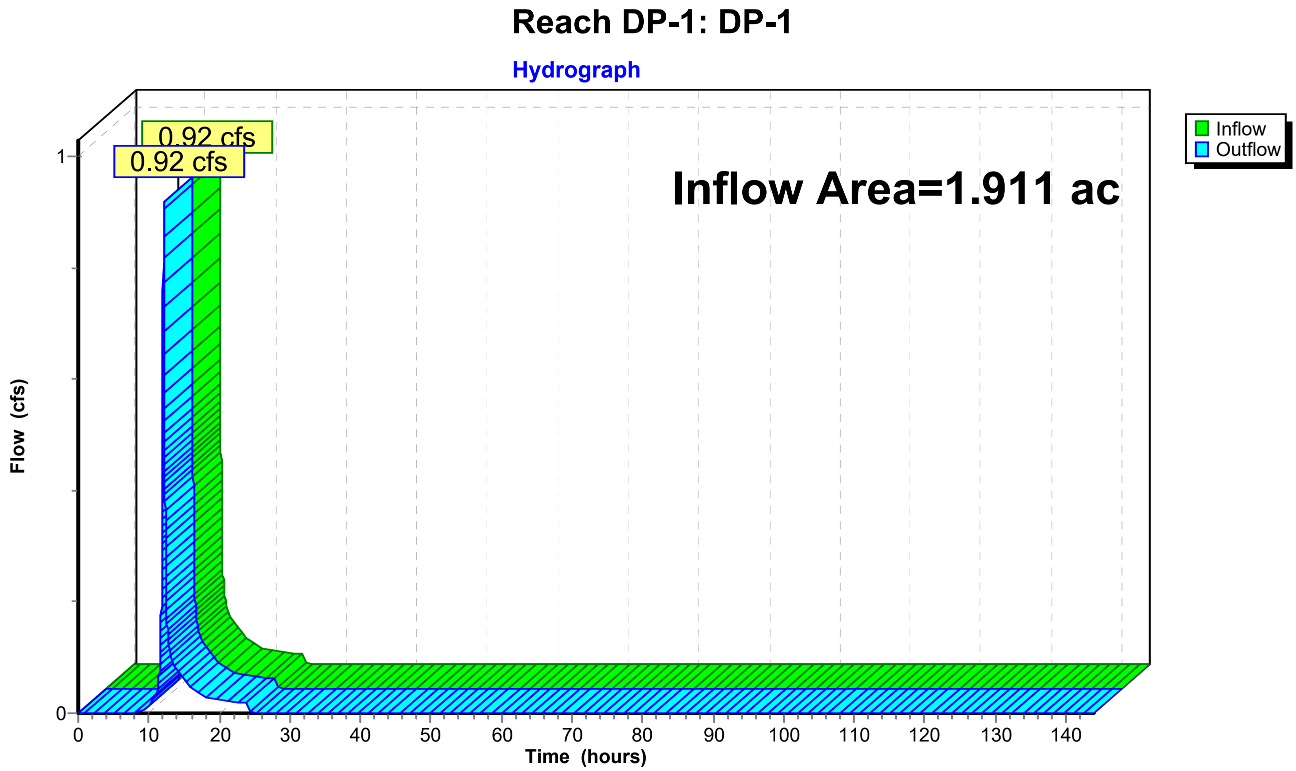
Subcatchment 5S: Sub-5



Summary for Reach DP-1: DP-1

Inflow Area = 1.911 ac, 11.60% Impervious, Inflow Depth = 0.48" for 10-Year event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 0.076 af
Outflow = 0.92 cfs @ 12.09 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min

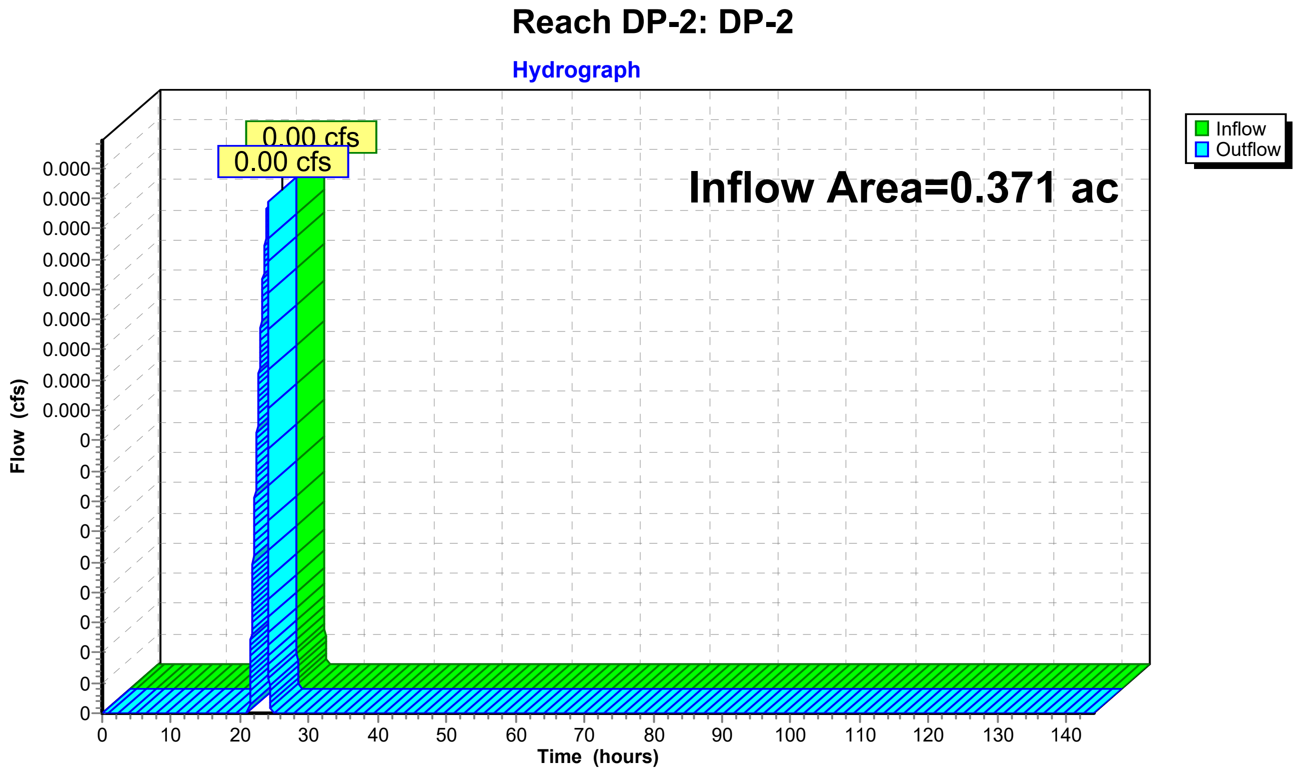
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-2: DP-2

Inflow Area = 0.371 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

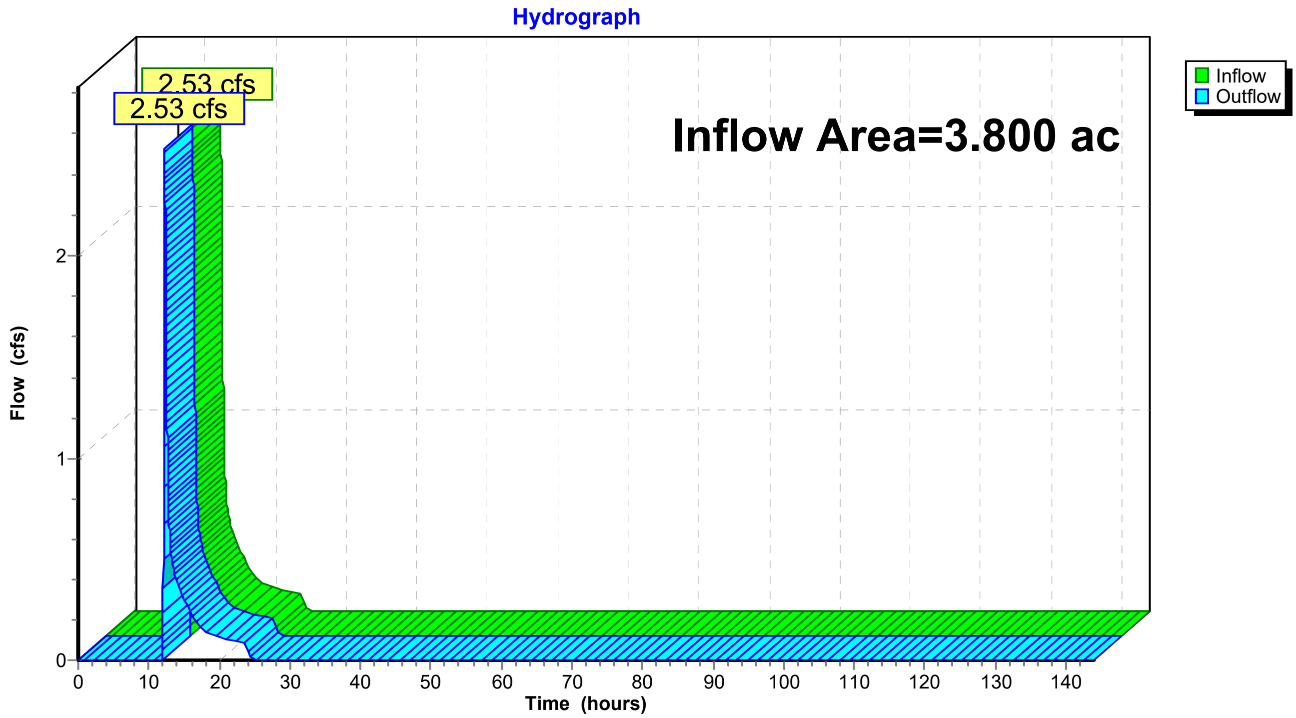


Summary for Reach DP-3: DP-3

Inflow Area =	3.800 ac, 17.85% Impervious, Inflow Depth = 0.91"	for 10-Year event
Inflow =	2.53 cfs @ 12.21 hrs, Volume=	0.289 af
Outflow =	2.53 cfs @ 12.21 hrs, Volume=	0.289 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

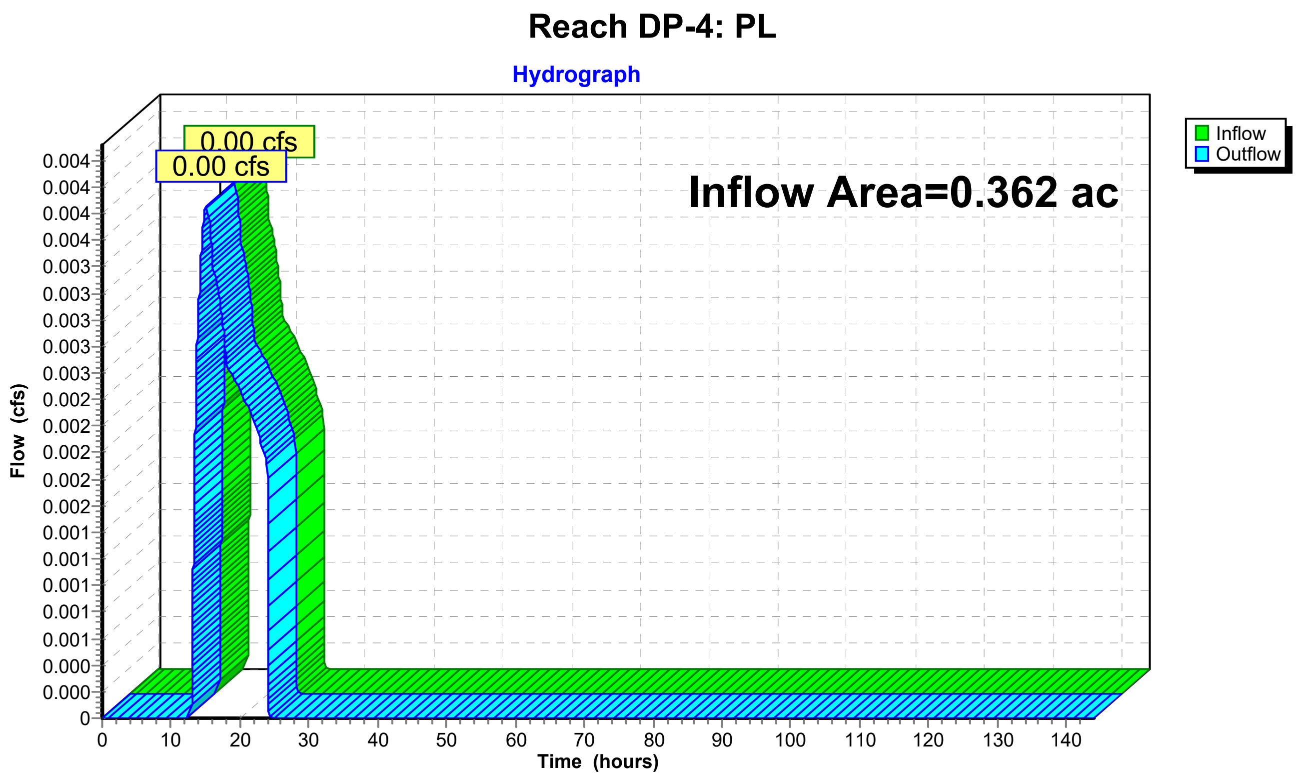
Reach DP-3: DP-3



Summary for Reach DP-4: PL

Inflow Area = 0.362 ac, 0.00% Impervious, Inflow Depth = 0.08" for 10-Year event
Inflow = 0.00 cfs @ 15.14 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 15.14 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

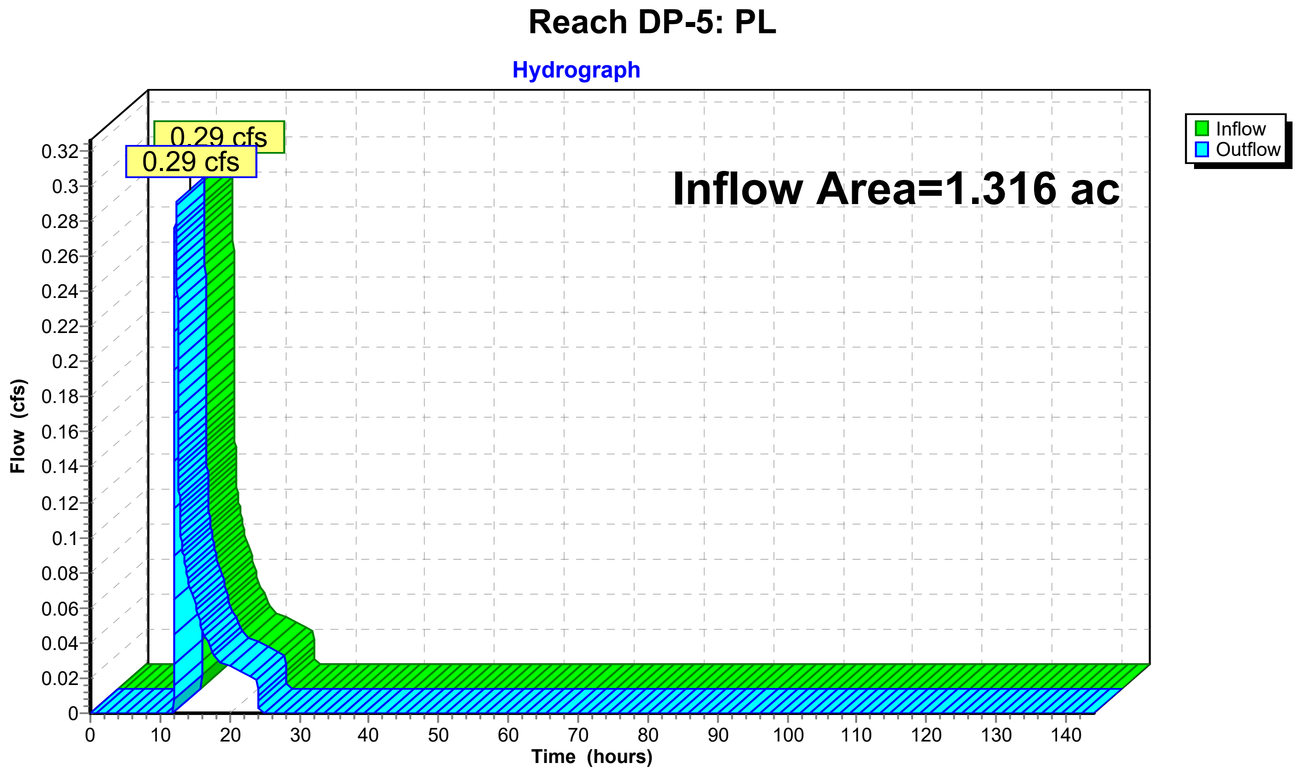
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-5: PL

Inflow Area = 1.316 ac, 15.24% Impervious, Inflow Depth = 0.47" for 10-Year event
Inflow = 0.29 cfs @ 12.30 hrs, Volume= 0.051 af
Outflow = 0.29 cfs @ 12.30 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Pond D-1: Exist Detention Basin

Inflow Area = 0.720 ac, 0.00% Impervious, Inflow Depth = 0.06" for 10-Year event
Inflow = 0.01 cfs @ 15.52 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 15.53 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.01 cfs @ 15.53 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 62.00' @ 15.53 hrs Surf.Area= 4,336 sf Storage= 0 cf

Plug-Flow detention time= 0.9 min calculated for 0.004 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (1,120.0 - 1,119.1)

Volume	Invert	Avail.Storage	Storage Description
#1	62.00'	5,584 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

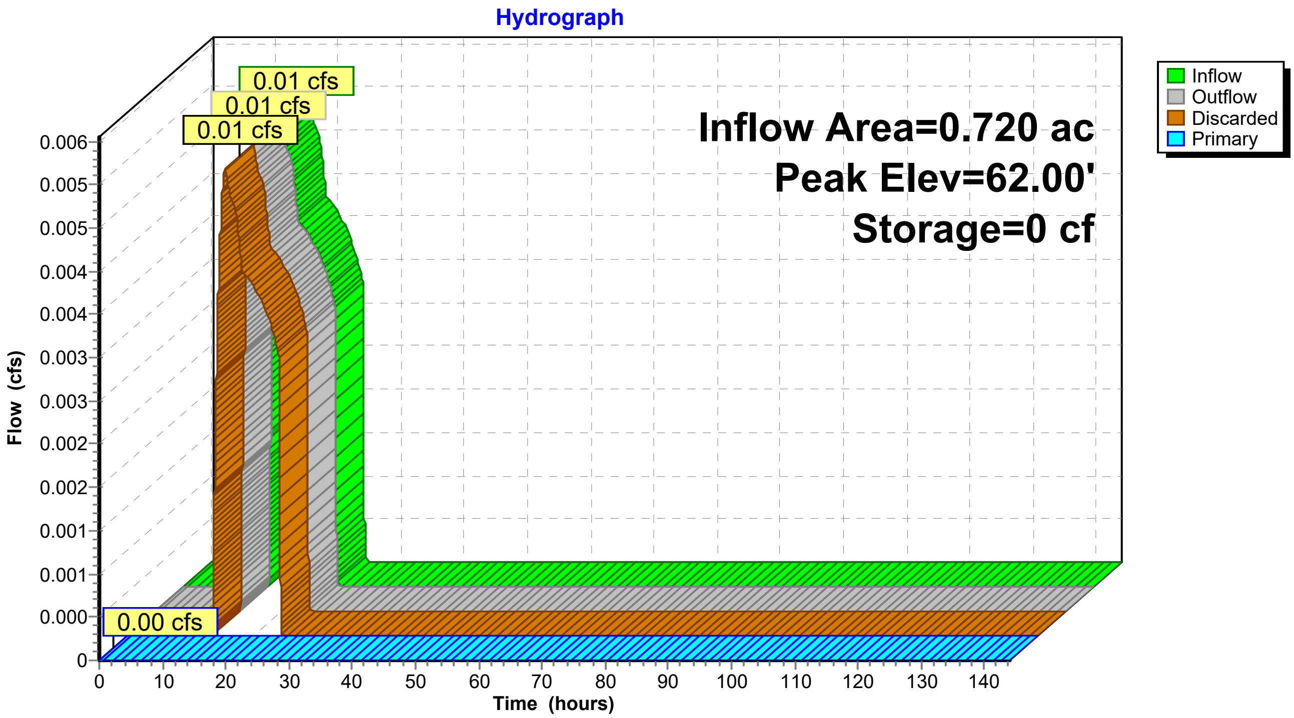
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.00	4,336	0	0
63.00	6,832	5,584	5,584

Device	Routing	Invert	Outlet Devices
#1	Primary	63.00'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	62.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 15.53 hrs HW=62.00' (Free Discharge)
└—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.00' TW=0.00' (Dynamic Tailwater)
└—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist Detention Basin



Summary for Pond E-DB: Exist Detention Basin

Inflow Area = 1.654 ac, 40.04% Impervious, Inflow Depth = 1.32" for 10-Year event
Inflow = 2.06 cfs @ 12.15 hrs, Volume= 0.181 af
Outflow = 1.66 cfs @ 12.23 hrs, Volume= 0.170 af, Atten= 19%, Lag= 5.2 min
Primary = 1.66 cfs @ 12.23 hrs, Volume= 0.170 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 59.09' @ 12.23 hrs Surf.Area= 1,670 sf Storage= 1,070 cf

Plug-Flow detention time= 53.0 min calculated for 0.170 af (94% of inflow)
Center-of-Mass det. time= 20.4 min (895.8 - 875.4)

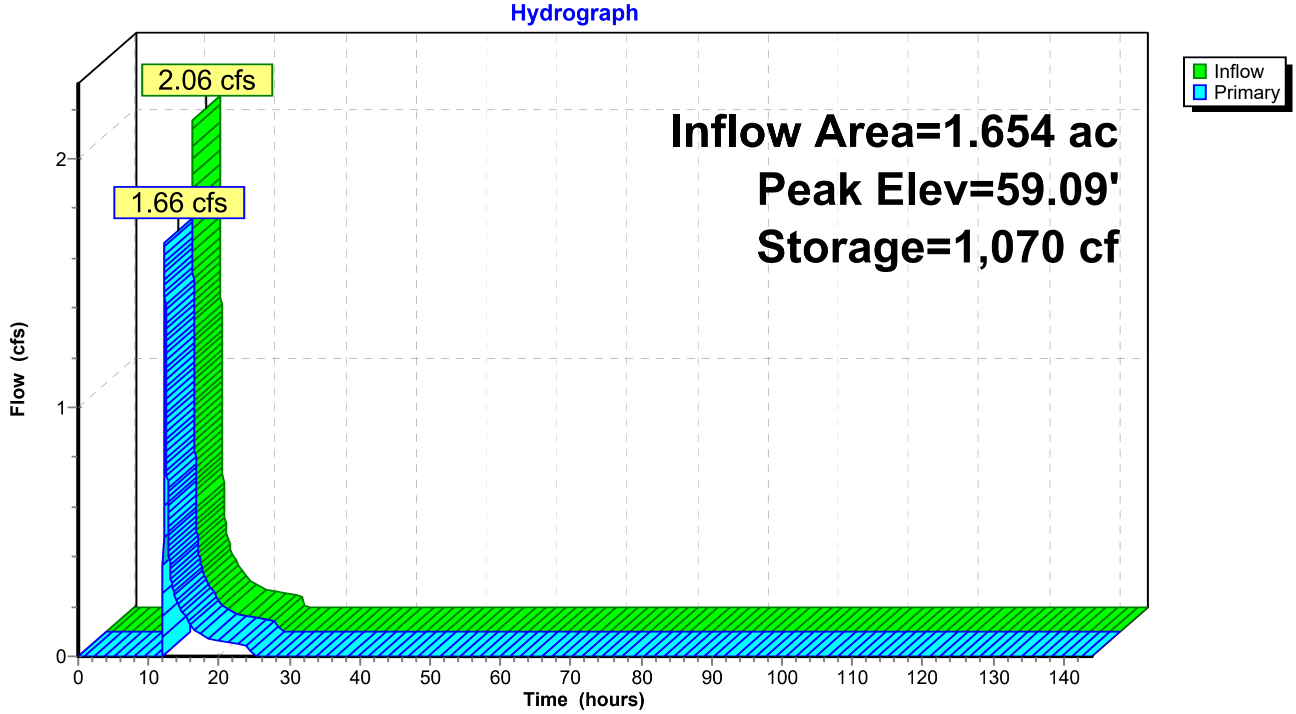
Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	7,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	336	0	0
59.00	1,511	924	924
60.00	3,233	2,372	3,296
61.00	4,826	4,030	7,325

Device	Routing	Invert	Outlet Devices
#1	Primary	58.12'	**12.0" Round RCP_Round 12"** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.12' / 58.05' S= 0.0028 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	58.68'	**2.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	59.88'	**7.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	58.68'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.66 cfs @ 12.23 hrs HW=59.09' TW=0.00' (Dynamic Tailwater)
1=RCP_Round 12" (Passes 1.66 cfs of 1.89 cfs potential flow)
2=Sharp-Crested Rectangular Weir (Weir Controls 1.66 cfs @ 2.10 fps)
4=Sharp-Crested Rectangular Weir (Passes 1.66 cfs of 4.25 cfs potential flow)
3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond E-DB: Exist Detention Basin



Time span=0.00-144.00 hrs, dt=0.01 hrs, 14401 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

Subcatchment1A-S: Sub-1A Runoff Area=12,960 sf 68.56% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=79 Runoff=1.19 cfs 0.085 af

Subcatchment1B-S: Sub-1B Runoff Area=31,377 sf 0.00% Impervious Runoff Depth=0.19"
Flow Length=212' Tc=9.6 min CN=35 Runoff=0.02 cfs 0.012 af

Subcatchment1C-S: Sub-1C Runoff Area=19,404 sf 0.00% Impervious Runoff Depth=0.27"
Flow Length=269' Tc=16.6 min CN=37 Runoff=0.03 cfs 0.010 af

Subcatchment1D-S: Sub-1D Runoff Area=19,501 sf 3.95% Impervious Runoff Depth=0.41"
Flow Length=185' Tc=11.0 min CN=40 Runoff=0.07 cfs 0.015 af

Subcatchment2S: Sub-2 Runoff Area=16,140 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=164' Tc=8.6 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment3A-S: Sub-3A Runoff Area=72,040 sf 40.04% Impervious Runoff Depth=1.89"
Flow Length=534' Tc=9.4 min CN=62 Runoff=3.09 cfs 0.260 af

Subcatchment3B-S: Sub-3B-S Runoff Area=93,482 sf 0.74% Impervious Runoff Depth=1.07"
Flow Length=345' Tc=8.5 min CN=51 Runoff=1.90 cfs 0.191 af

Subcatchment4S: Sub-4 Runoff Area=15,787 sf 0.00% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=36 Runoff=0.02 cfs 0.007 af

Subcatchment5S: Sub-5 Runoff Area=57,338 sf 15.24% Impervious Runoff Depth=0.81"
Flow Length=438' Tc=7.8 min CN=47 Runoff=0.74 cfs 0.088 af

Reach DP-1: DP-1 Inflow=1.19 cfs 0.110 af
Outflow=1.19 cfs 0.110 af

Reach DP-2: DP-2 Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach DP-3: DP-3 Inflow=4.14 cfs 0.439 af
Outflow=4.14 cfs 0.439 af

Reach DP-4: PL Inflow=0.02 cfs 0.007 af
Outflow=0.02 cfs 0.007 af

Reach DP-5: PL Inflow=0.74 cfs 0.088 af
Outflow=0.74 cfs 0.088 af

Pond D-1: Exist Detention Basin Peak Elev=62.00' Storage=1 cf Inflow=0.02 cfs 0.012 af
Discarded=0.02 cfs 0.012 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.012 af

Pond E-DB: Exist Detention Basin Peak Elev=59.27' Storage=1,403 cf Inflow=3.09 cfs 0.260 af
Outflow=2.39 cfs 0.249 af

Total Runoff Area = 7.760 ac Runoff Volume = 0.669 af Average Runoff Depth = 1.03"
85.82% Pervious = 6.660 ac 14.18% Impervious = 1.100 ac

Summary for Subcatchment 1A-S: Sub-1A

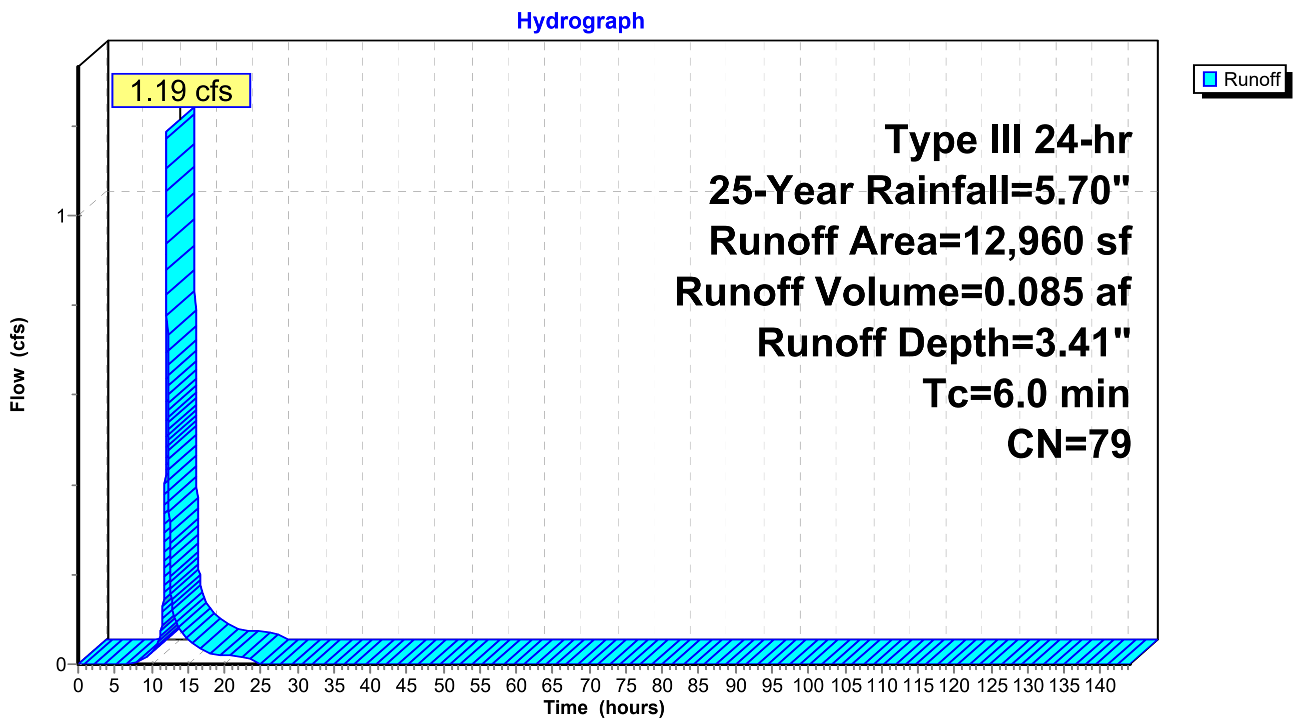
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.085 af, Depth= 3.41"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
4,075	39	>75% Grass cover, Good, HSG A
8,885	98	Paved roads w/curbs & sewers, HSG A
12,960	79	Weighted Average
4,075		31.44% Pervious Area
8,885		68.56% Impervious Area

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

Subcatchment 1A-S: Sub-1A



Summary for Subcatchment 1B-S: Sub-1B

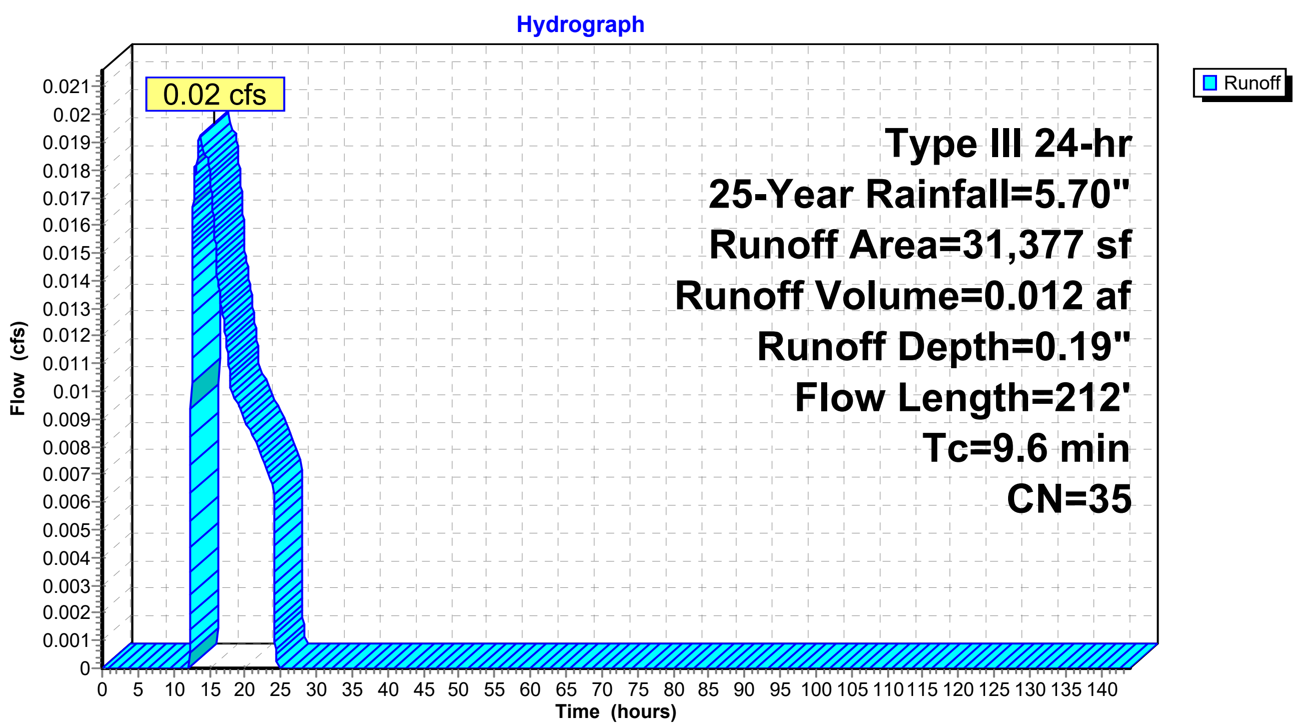
Runoff = 0.02 cfs @ 13.73 hrs, Volume= 0.012 af, Depth= 0.19"
Routed to Pond D-1 : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
22,072	30	Woods, Good, HSG A
1,755	39	>75% Grass cover, Good, HSG A
7,550	49	50-75% Grass cover, Fair, HSG A
31,377	35	Weighted Average
31,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	162	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	212	Total			

Subcatchment 1B-S: Sub-1B



Summary for Subcatchment 1C-S: Sub-1C

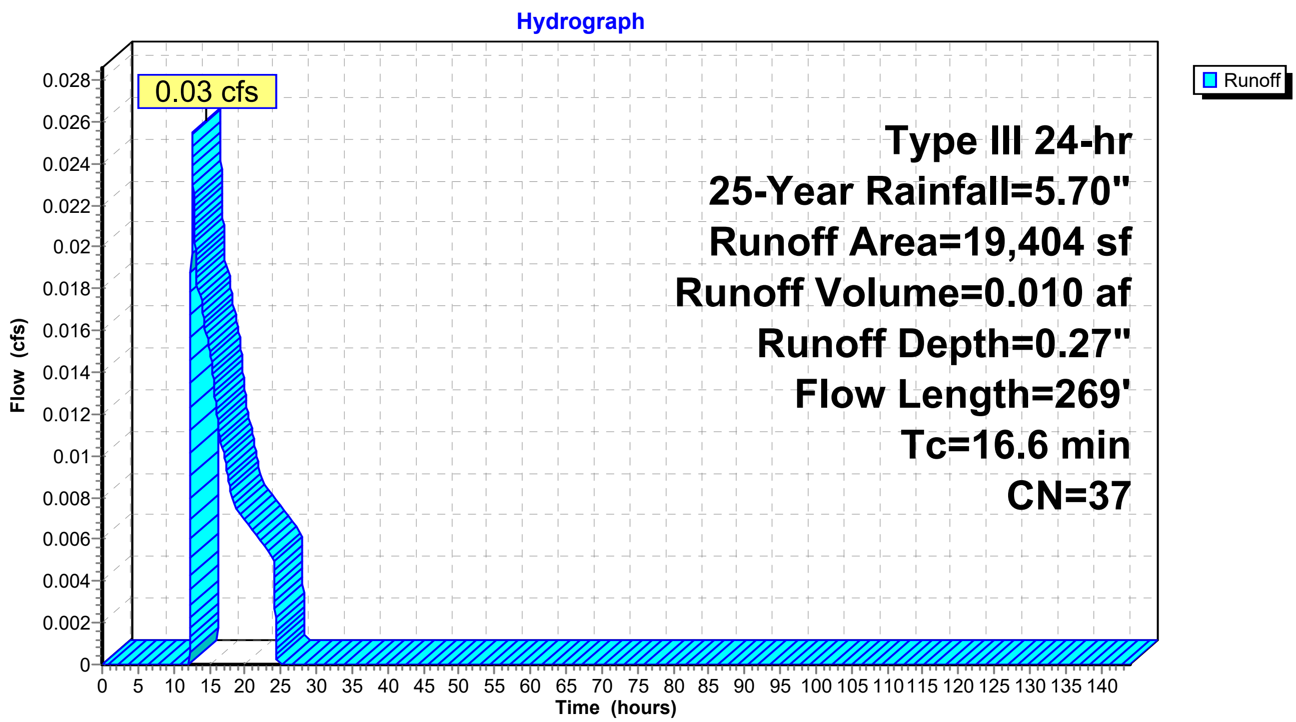
Runoff = 0.03 cfs @ 12.60 hrs, Volume= 0.010 af, Depth= 0.27"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	12,129	30	Woods, Good, HSG A
	1,513	39	>75% Grass cover, Good, HSG A
	3,840	55	Woods, Good, HSG B
*	899	30	Woods, Good, HSG A - offsite
	1,023	49	50-75% Grass cover, Fair, HSG A
	19,404	37	Weighted Average
	19,404		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.3	219	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.6	269	Total			

Subcatchment 1C-S: Sub-1C



Summary for Subcatchment 1D-S: Sub-1D

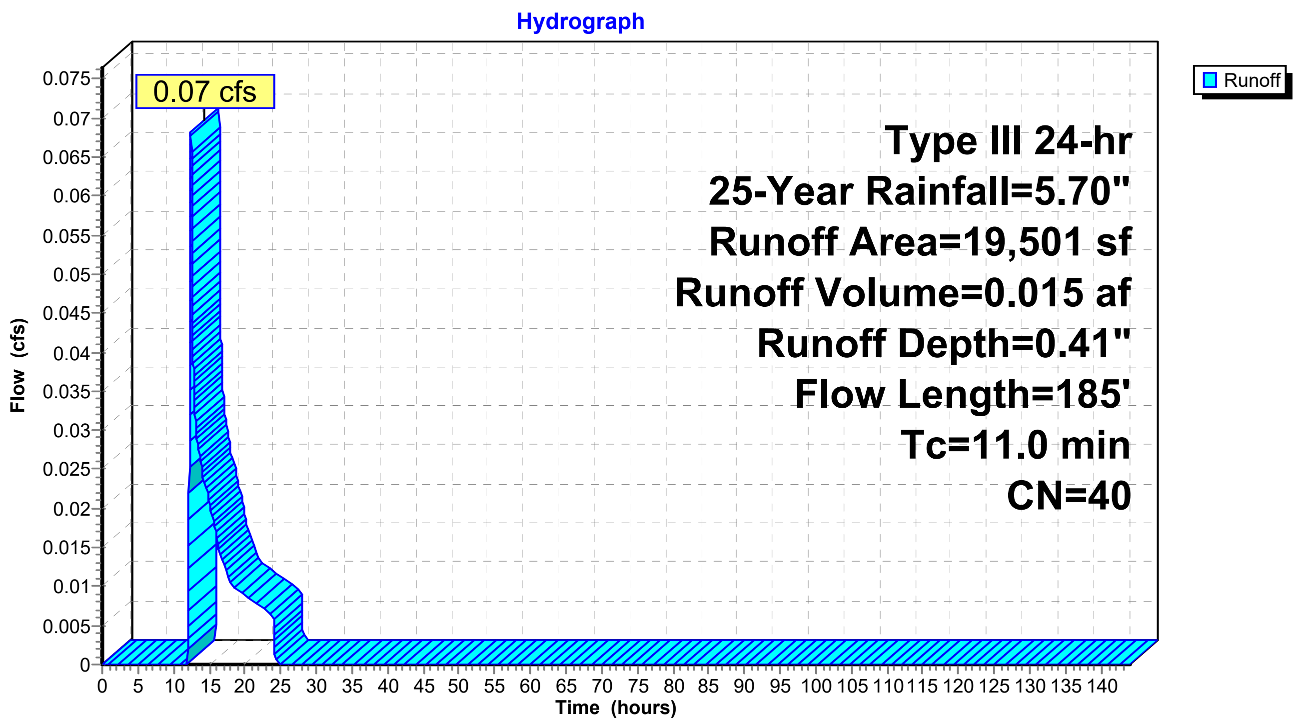
Runoff = 0.07 cfs @ 12.43 hrs, Volume= 0.015 af, Depth= 0.41"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	10,890	39	>75% Grass cover, Good, HSG A
	2,684	49	50-75% Grass cover, Fair, HSG A
*	770	98	Rubble Pile, HSG A
	5,157	30	Woods, Good, HSG A
	19,501	40	Weighted Average
	18,731		96.05% Pervious Area
	770		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.1	135	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.0	185	Total			

Subcatchment 1D-S: Sub-1D



Summary for Subcatchment 2S: Sub-2

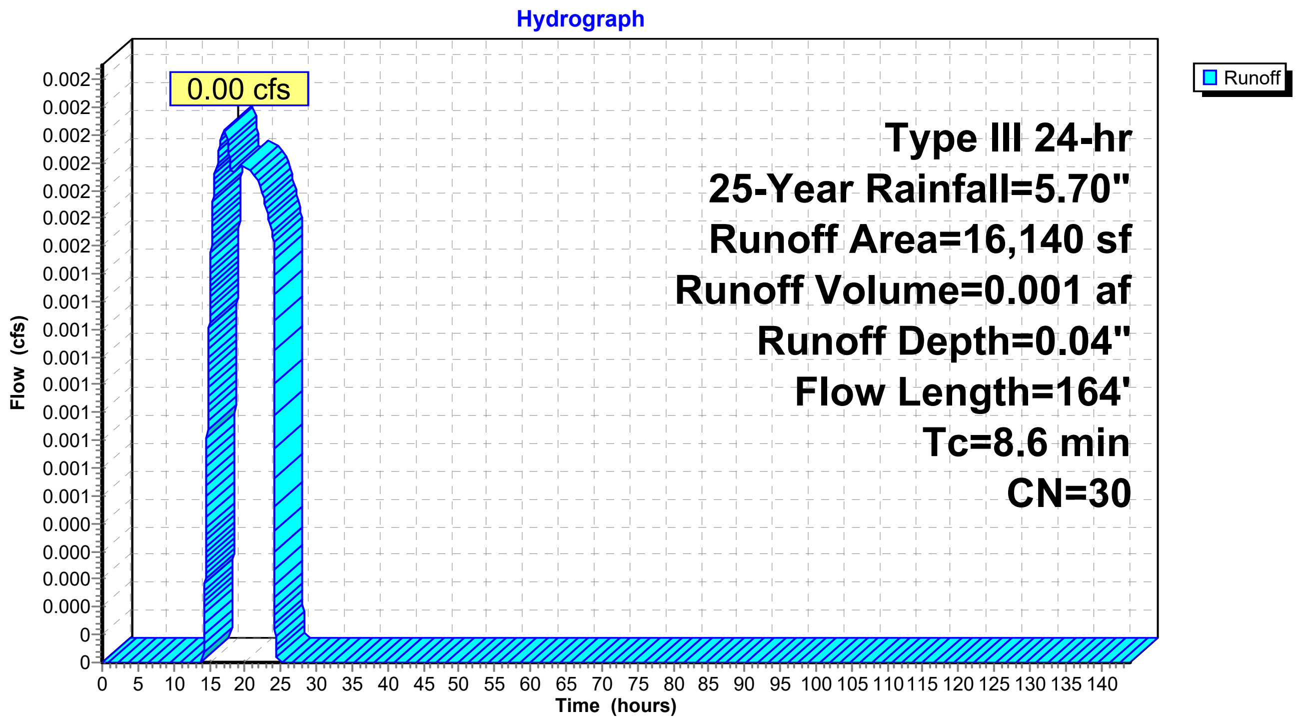
Runoff = 0.00 cfs @ 17.02 hrs, Volume= 0.001 af, Depth= 0.04"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
16,140	30	Woods, Good, HSG A
16,140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.9	114	0.0383	0.98		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.6	164	Total			

Subcatchment 2S: Sub-2



Summary for Subcatchment 3A-S: Sub-3A

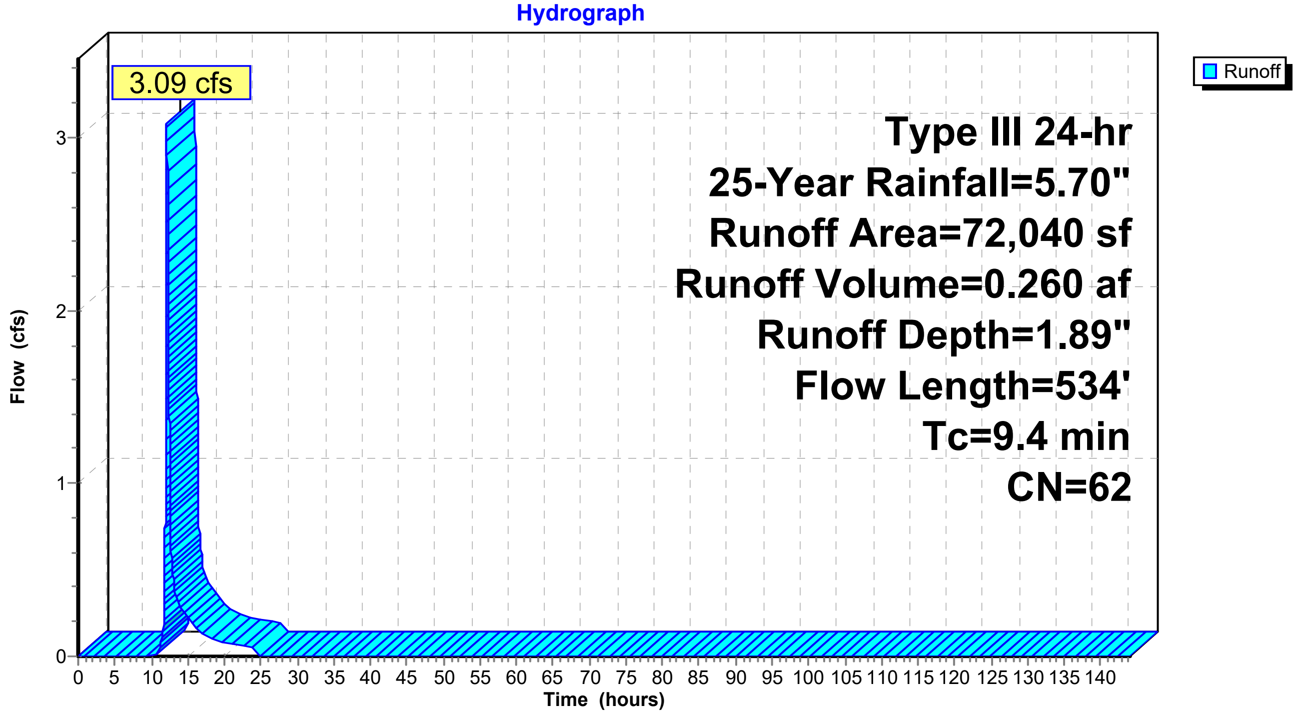
Runoff = 3.09 cfs @ 12.14 hrs, Volume= 0.260 af, Depth= 1.89"
Routed to Pond E-DB : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	1,384	98	Roofs, HSG A - offsite
*	16,069	98	Paved parking, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
*	1,189	39	>75% Grass cover, Good, HSG A - offsite
	24,471	30	Woods, Good, HSG A
	6,630	39	>75% Grass cover, Good, HSG A
	2,407	98	Paved roads w/curbs & sewers, HSG A
*	2,712	98	Existing Detention Basin, HSG A
*	810	98	Riprap, HSG A
	3,247	98	Paved roads w/curbs & sewers, HSG B
	2,784	55	Woods, Good, HSG B
*	938	98	Riprap, HSG B
	6,442	61	>75% Grass cover, Good, HSG B
*	1,275	98	Existing Detention Basin, HSG B
	72,040	62	Weighted Average
	43,198		59.96% Pervious Area
	28,842		40.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0160	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.60"
1.8	225	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	102	0.0090	1.93		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	157	0.0030	2.88	3.54	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
9.4	534	Total			

Subcatchment 3A-S: Sub-3A



Summary for Subcatchment 3B-S: Sub-3B-S

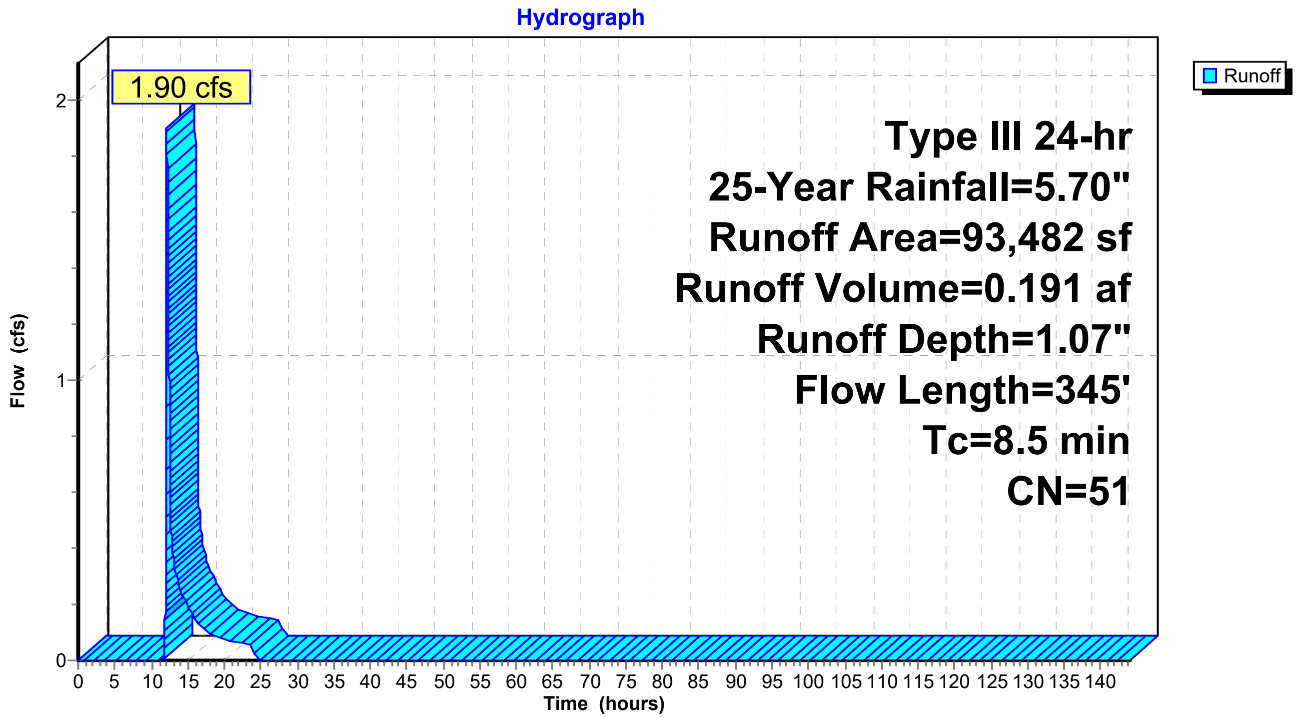
Runoff = 1.90 cfs @ 12.14 hrs, Volume= 0.191 af, Depth= 1.07"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	285	98	Riprap, HSG A
*	121	98	Riprap, HSG B
	9,682	30	Woods, Good, HSG A
	61,938	55	Woods, Good, HSG B
	8,282	61	>75% Grass cover, Good, HSG B
	1,762	39	>75% Grass cover, Good, HSG A
*	4,310	30	Woods, Good, HSG A - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	290	98	Paved drive, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
*	1,734	55	Woods, Good, HSG B - offsite
	93,482	51	Weighted Average
	92,786		99.26% Pervious Area
	696		0.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0700	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	295	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	345	Total			

Subcatchment 3B-S: Sub-3B-S



Summary for Subcatchment 4S: Sub-4

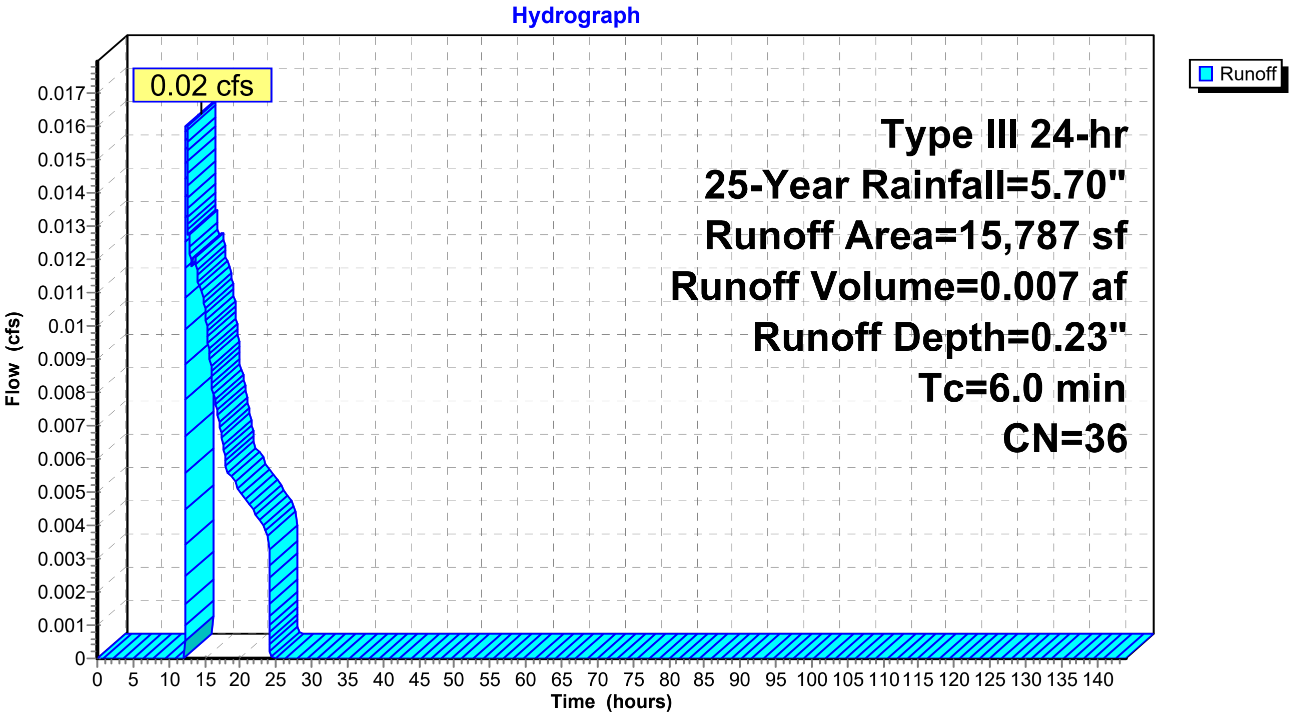
Runoff = 0.02 cfs @ 12.47 hrs, Volume= 0.007 af, Depth= 0.23"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
15,787	36	Woods, Fair, HSG A
15,787		100.00% Pervious Area

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

Subcatchment 4S: Sub-4



Summary for Subcatchment 5S: Sub-5

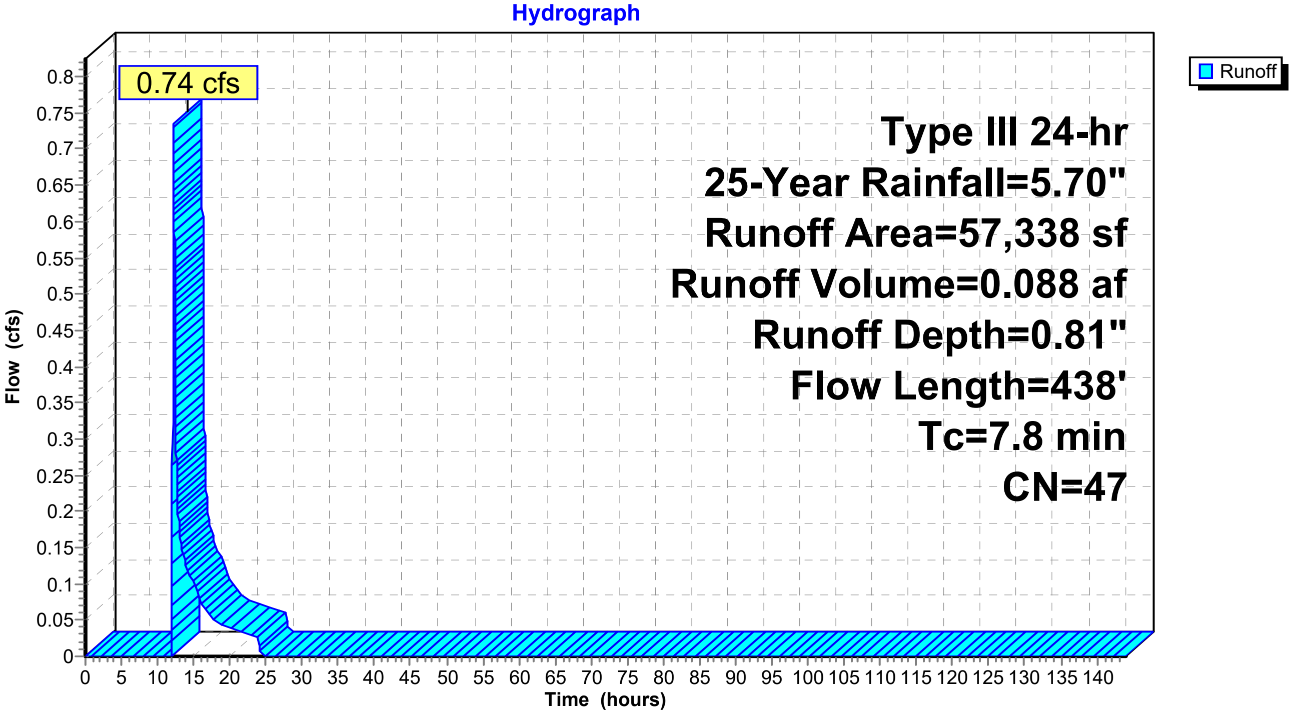
Runoff = 0.74 cfs @ 12.15 hrs, Volume= 0.088 af, Depth= 0.81"
Routed to Reach DP-5 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	32,676	36	Woods, Fair, HSG A
	15,526	39	>75% Grass cover, Good, HSG A
	395	80	>75% Grass cover, Good, HSG D
*	318	98	Paved drive, HSG D
	2,148	98	Roofs, HSG A
*	5,322	98	Paved drive, HSG A
*	533	98	Patio, HSG A
*	235	98	Misc, HSG A
*	185	98	Ledge, HSG A
	57,338	47	Weighted Average
	48,597		84.76% Pervious Area
	8,741		15.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	39	0.1538	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.8	11	0.1100	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.60"
0.1	22	0.1166	5.50		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	54	0.0500	3.60		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
0.2	52	0.0770	4.47		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
1.0	175	0.0300	2.79		**Shallow Concentrated Flow, F-G** Unpaved Kv= 16.1 fps
0.3	85	0.1100	5.34		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
7.8	438	Total			

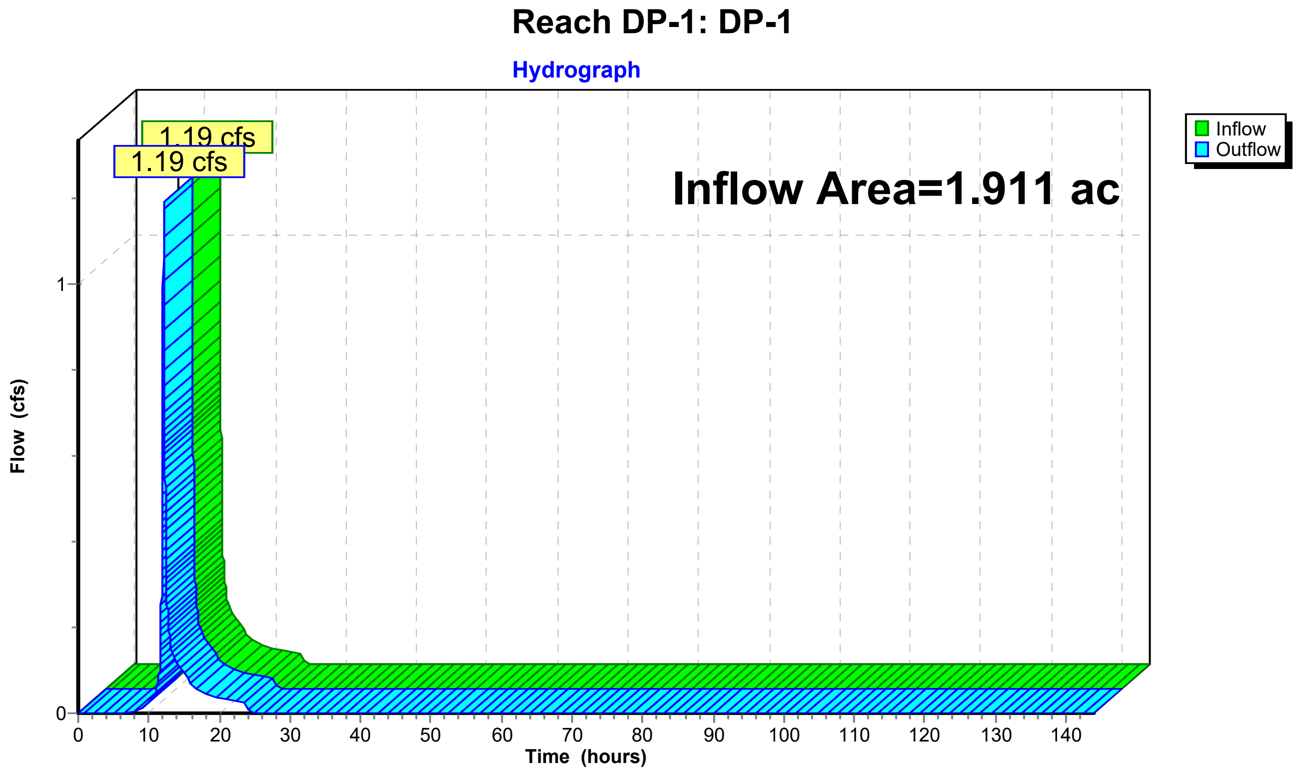
Subcatchment 5S: Sub-5



Summary for Reach DP-1: DP-1

Inflow Area = 1.911 ac, 11.60% Impervious, Inflow Depth = 0.69" for 25-Year event
Inflow = 1.19 cfs @ 12.09 hrs, Volume= 0.110 af
Outflow = 1.19 cfs @ 12.09 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

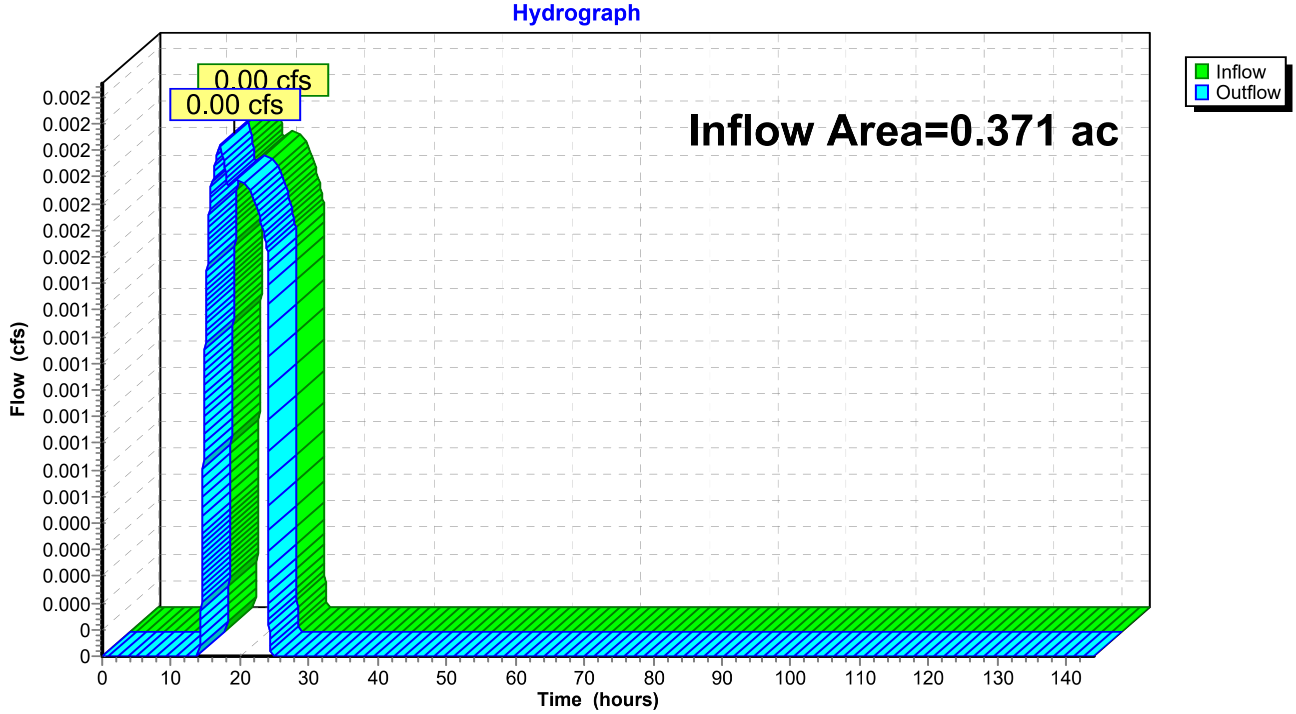


Summary for Reach DP-2: DP-2

Inflow Area = 0.371 ac, 0.00% Impervious, Inflow Depth = 0.04" for 25-Year event
Inflow = 0.00 cfs @ 17.02 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 17.02 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2

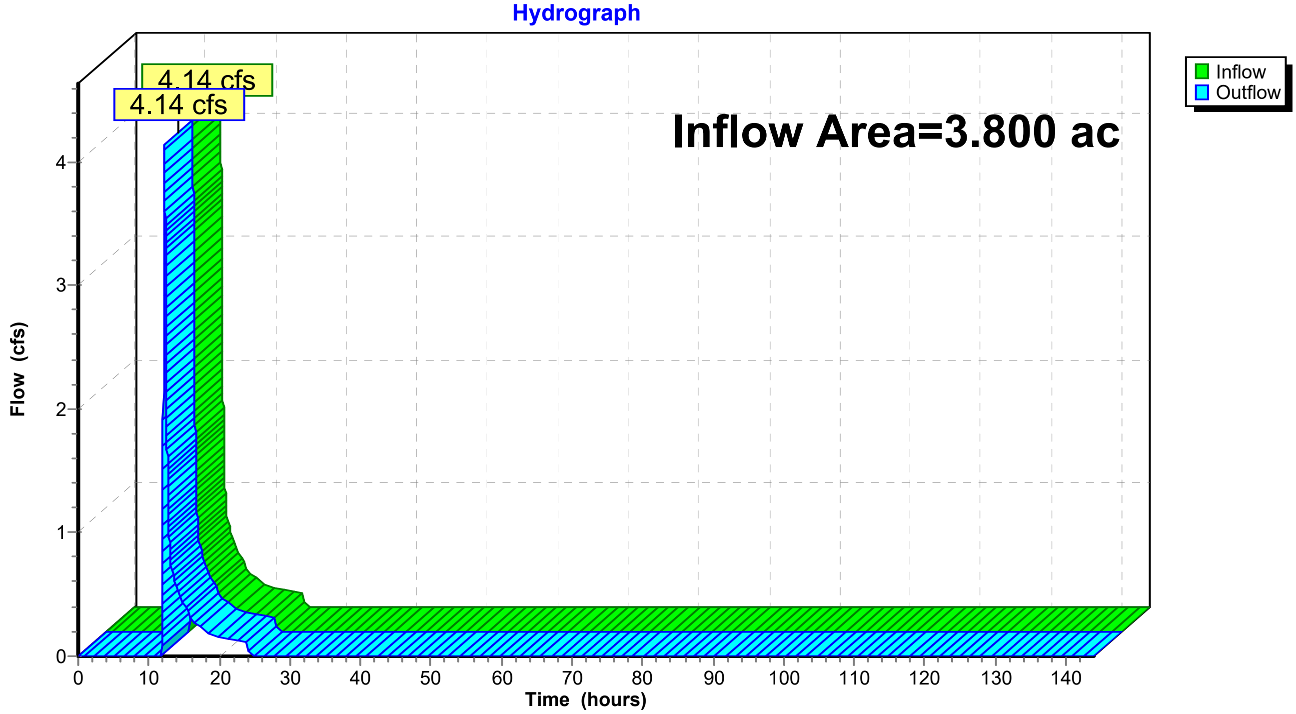


Summary for Reach DP-3: DP-3

Inflow Area = 3.800 ac, 17.85% Impervious, Inflow Depth = 1.39" for 25-Year event
Inflow = 4.14 cfs @ 12.17 hrs, Volume= 0.439 af
Outflow = 4.14 cfs @ 12.17 hrs, Volume= 0.439 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3

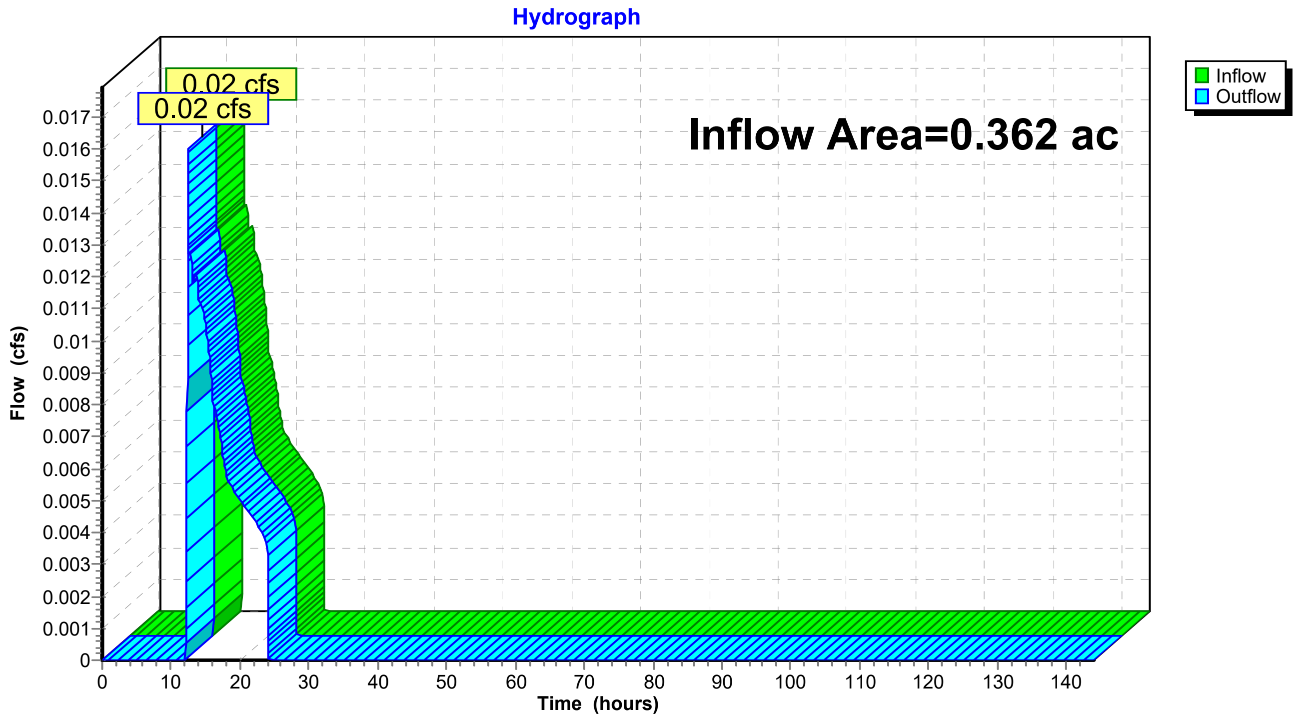


Summary for Reach DP-4: PL

Inflow Area = 0.362 ac, 0.00% Impervious, Inflow Depth = 0.23" for 25-Year event
Inflow = 0.02 cfs @ 12.47 hrs, Volume= 0.007 af
Outflow = 0.02 cfs @ 12.47 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

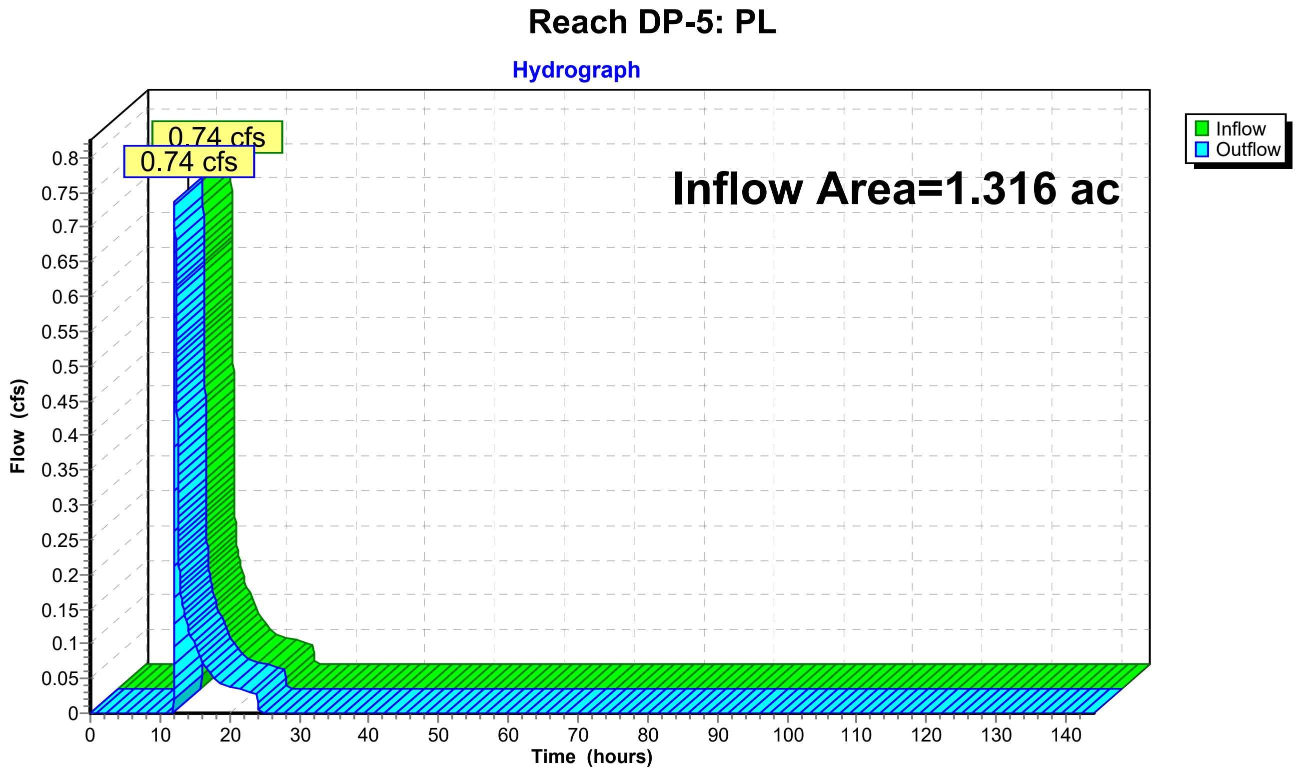
Reach DP-4: PL



Summary for Reach DP-5: PL

Inflow Area = 1.316 ac, 15.24% Impervious, Inflow Depth = 0.81" for 25-Year event
Inflow = 0.74 cfs @ 12.15 hrs, Volume= 0.088 af
Outflow = 0.74 cfs @ 12.15 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Pond D-1: Exist Detention Basin

Inflow Area = 0.720 ac, 0.00% Impervious, Inflow Depth = 0.19" for 25-Year event
Inflow = 0.02 cfs @ 13.73 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 13.75 hrs, Volume= 0.012 af, Atten= 0%, Lag= 1.0 min
Discarded = 0.02 cfs @ 13.75 hrs, Volume= 0.012 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 62.00' @ 13.75 hrs Surf.Area= 4,337 sf Storage= 1 cf

Plug-Flow detention time= 0.9 min calculated for 0.012 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (1,029.7 - 1,028.9)

Volume	Invert	Avail.Storage	Storage Description
#1	62.00'	5,584 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

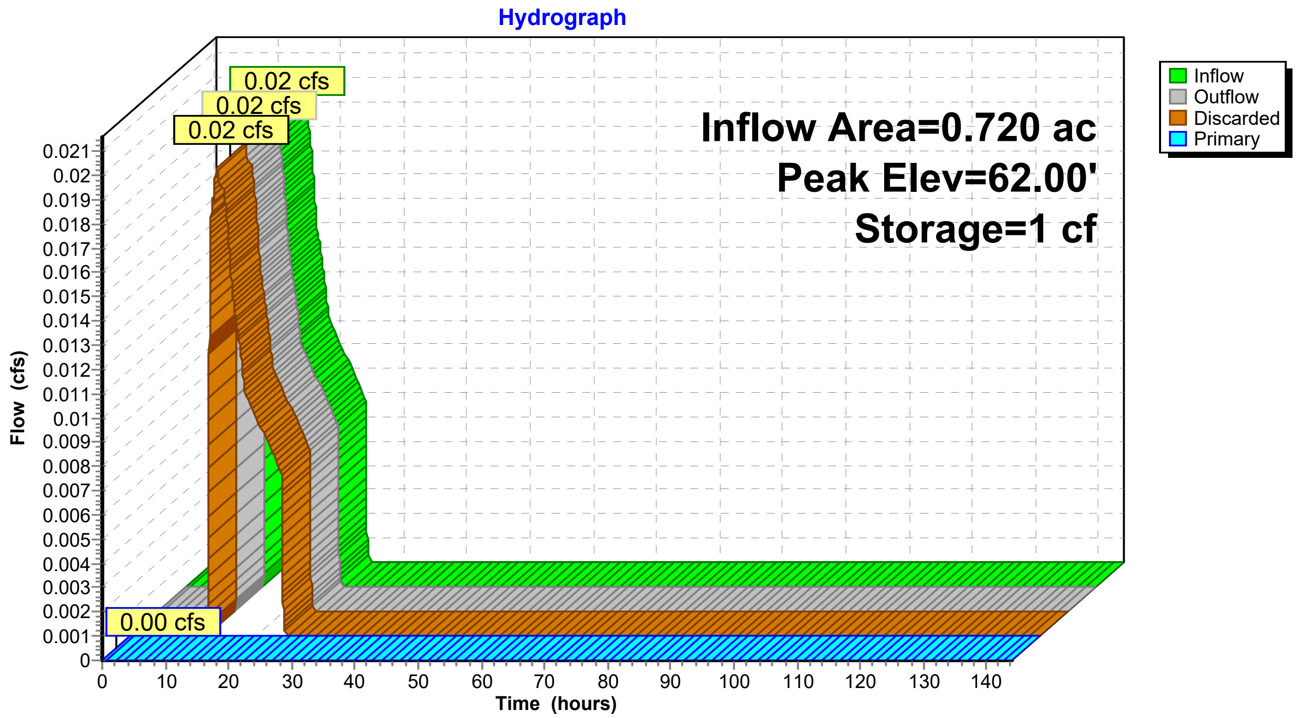
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.00	4,336	0	0
63.00	6,832	5,584	5,584

Device	Routing	Invert	Outlet Devices
#1	Primary	63.00'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	62.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 13.75 hrs HW=62.00' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond D-1: Exist Detention Basin



Summary for Pond E-DB: Exist Detention Basin

Inflow Area = 1.654 ac, 40.04% Impervious, Inflow Depth = 1.89" for 25-Year event
Inflow = 3.09 cfs @ 12.14 hrs, Volume= 0.260 af
Outflow = 2.39 cfs @ 12.24 hrs, Volume= 0.249 af, Atten= 23%, Lag= 5.7 min
Primary = 2.39 cfs @ 12.24 hrs, Volume= 0.249 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 59.27' @ 12.24 hrs Surf.Area= 1,984 sf Storage= 1,403 cf

Plug-Flow detention time= 40.1 min calculated for 0.249 af (96% of inflow)
Center-of-Mass det. time= 16.3 min (880.2 - 863.9)

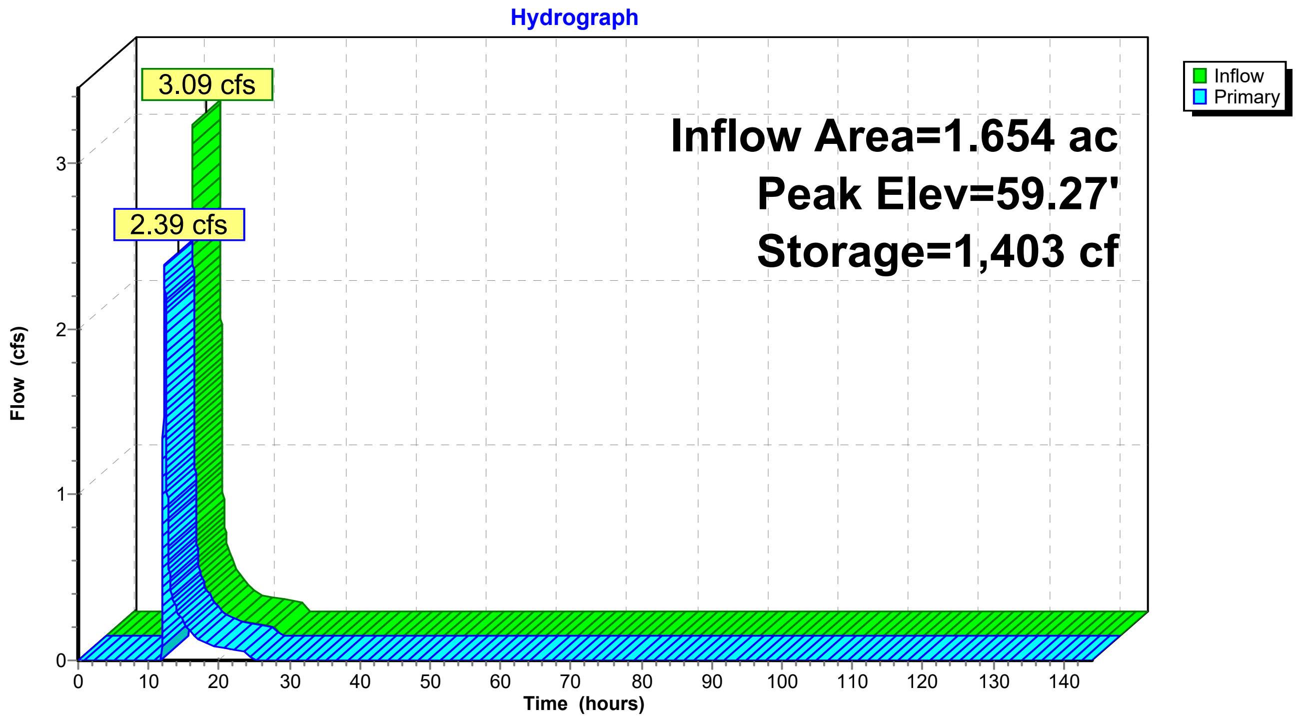
Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	7,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	336	0	0
59.00	1,511	924	924
60.00	3,233	2,372	3,296
61.00	4,826	4,030	7,325

Device	Routing	Invert	Outlet Devices
#1	Primary	58.12'	**12.0" Round RCP_Round 12"** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.12' / 58.05' S= 0.0028 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	58.68'	**2.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	59.88'	**7.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	58.68'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.39 cfs @ 12.24 hrs HW=59.27' TW=0.00' (Dynamic Tailwater)
└─**1=RCP_Round 12"** (Barrel Controls 2.39 cfs @ 3.31 fps)
  ├─**2=Sharp-Crested Rectangular Weir** (Passes 2.39 cfs of 2.82 cfs potential flow)
  │ └─**4=Sharp-Crested Rectangular Weir** (Passes 2.39 cfs of 7.32 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond E-DB: Exist Detention Basin



Time span=0.00-144.00 hrs, dt=0.01 hrs, 14401 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

Subcatchment1A-S: Sub-1A Runoff Area=12,960 sf 68.56% Impervious Runoff Depth=4.68"
Tc=6.0 min CN=79 Runoff=1.62 cfs 0.116 af

Subcatchment1B-S: Sub-1B Runoff Area=31,377 sf 0.00% Impervious Runoff Depth=0.52"
Flow Length=212' Tc=9.6 min CN=35 Runoff=0.14 cfs 0.031 af

Subcatchment1C-S: Sub-1C Runoff Area=19,404 sf 0.00% Impervious Runoff Depth=0.66"
Flow Length=269' Tc=16.6 min CN=37 Runoff=0.12 cfs 0.024 af

Subcatchment1D-S: Sub-1D Runoff Area=19,501 sf 3.95% Impervious Runoff Depth=0.88"
Flow Length=185' Tc=11.0 min CN=40 Runoff=0.22 cfs 0.033 af

Subcatchment2S: Sub-2 Runoff Area=16,140 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=164' Tc=8.6 min CN=30 Runoff=0.01 cfs 0.007 af

Subcatchment3A-S: Sub-3A Runoff Area=72,040 sf 40.04% Impervious Runoff Depth=2.87"
Flow Length=534' Tc=9.4 min CN=62 Runoff=4.86 cfs 0.396 af

Subcatchment3B-S: Sub-3B-S Runoff Area=93,482 sf 0.74% Impervious Runoff Depth=1.81"
Flow Length=345' Tc=8.5 min CN=51 Runoff=3.71 cfs 0.324 af

Subcatchment4S: Sub-4 Runoff Area=15,787 sf 0.00% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=36 Runoff=0.09 cfs 0.018 af

Subcatchment5S: Sub-5 Runoff Area=57,338 sf 15.24% Impervious Runoff Depth=1.46"
Flow Length=438' Tc=7.8 min CN=47 Runoff=1.72 cfs 0.160 af

Reach DP-1: DP-1 Inflow=1.71 cfs 0.173 af
Outflow=1.71 cfs 0.173 af

Reach DP-2: DP-2 Inflow=0.01 cfs 0.007 af
Outflow=0.01 cfs 0.007 af

Reach DP-3: DP-3 Inflow=6.45 cfs 0.709 af
Outflow=6.45 cfs 0.709 af

Reach DP-4: PL Inflow=0.09 cfs 0.018 af
Outflow=0.09 cfs 0.018 af

Reach DP-5: PL Inflow=1.72 cfs 0.160 af
Outflow=1.72 cfs 0.160 af

Pond D-1: Exist Detention Basin Peak Elev=62.00' Storage=7 cf Inflow=0.14 cfs 0.031 af
Discarded=0.14 cfs 0.031 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.031 af

Pond E-DB: Exist Detention Basin Peak Elev=59.65' Storage=2,278 cf Inflow=4.86 cfs 0.396 af
Outflow=3.24 cfs 0.385 af

Total Runoff Area = 7.760 ac Runoff Volume = 1.110 af Average Runoff Depth = 1.72"
85.82% Pervious = 6.660 ac 14.18% Impervious = 1.100 ac

Summary for Subcatchment 1A-S: Sub-1A

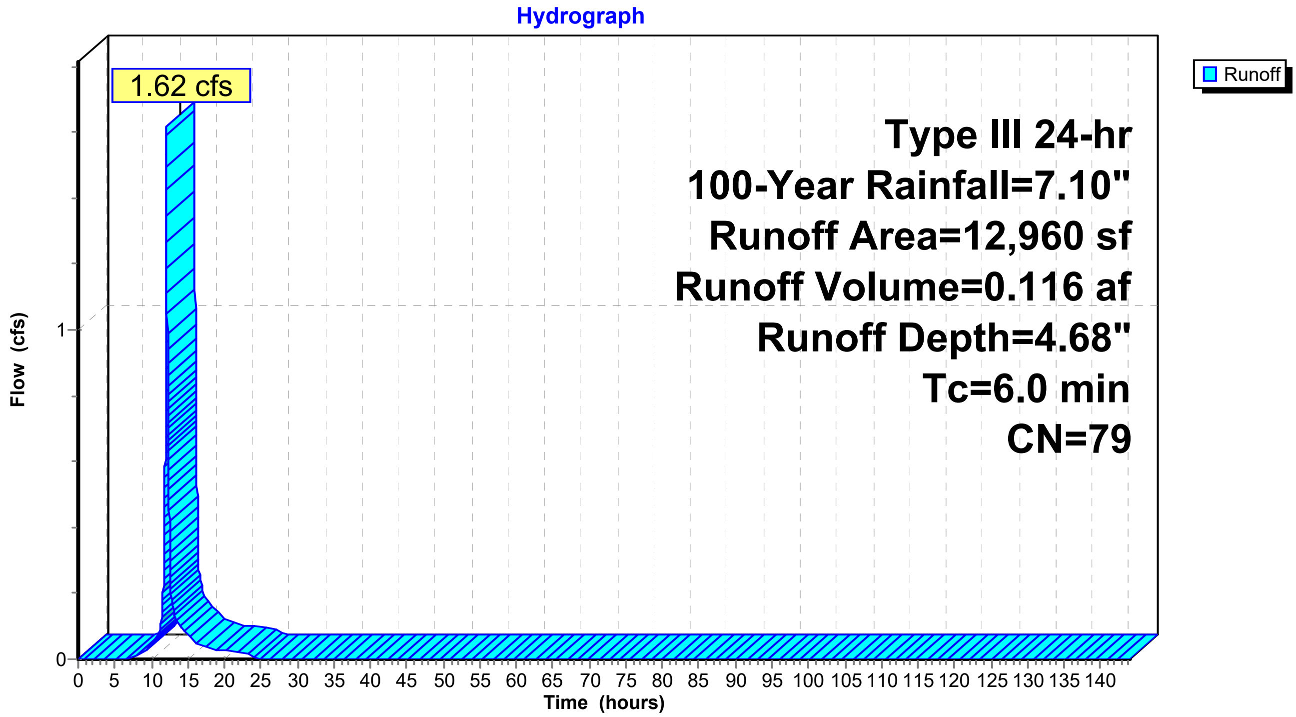
Runoff = 1.62 cfs @ 12.09 hrs, Volume= 0.116 af, Depth= 4.68"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
4,075	39	>75% Grass cover, Good, HSG A
8,885	98	Paved roads w/curbs & sewers, HSG A
12,960	79	Weighted Average
4,075		31.44% Pervious Area
8,885		68.56% Impervious Area

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

Subcatchment 1A-S: Sub-1A



Summary for Subcatchment 1B-S: Sub-1B

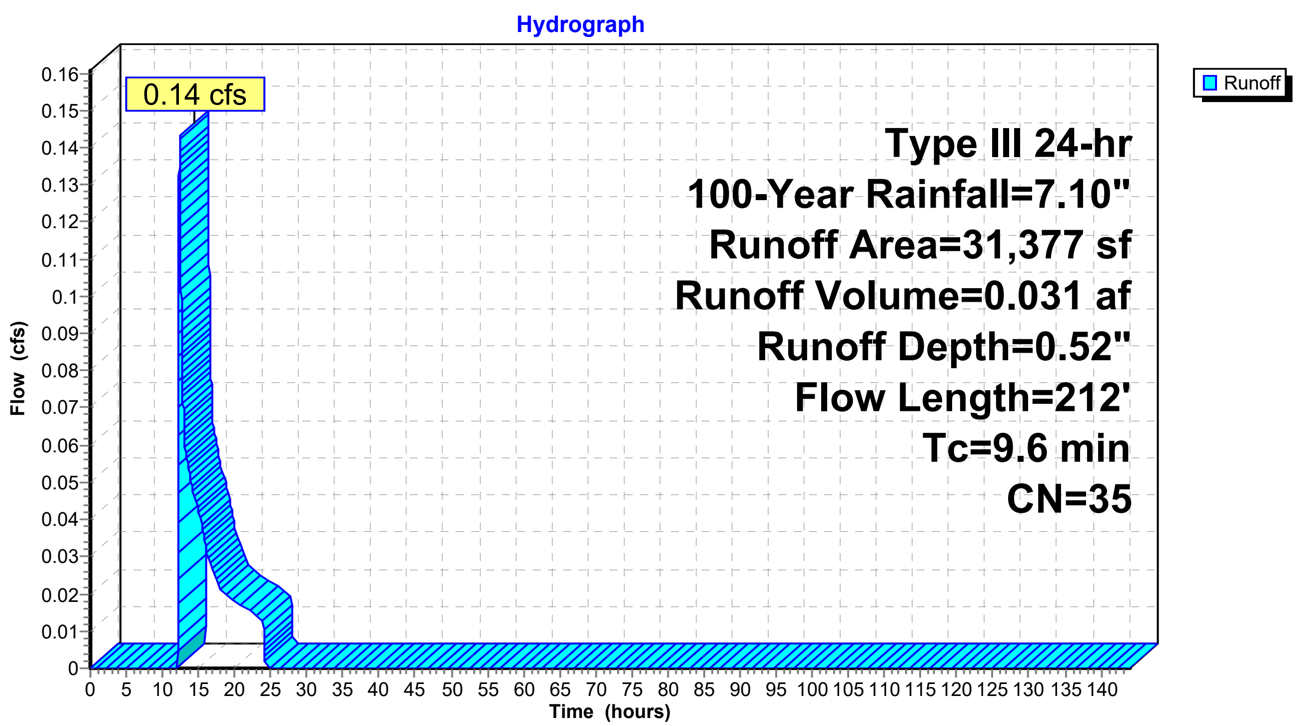
Runoff = 0.14 cfs @ 12.40 hrs, Volume= 0.031 af, Depth= 0.52"
Routed to Pond D-1 : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
22,072	30	Woods, Good, HSG A
1,755	39	>75% Grass cover, Good, HSG A
7,550	49	50-75% Grass cover, Fair, HSG A
31,377	35	Weighted Average
31,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	162	0.0120	1.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	212	Total			

Subcatchment 1B-S: Sub-1B



Summary for Subcatchment 1C-S: Sub-1C

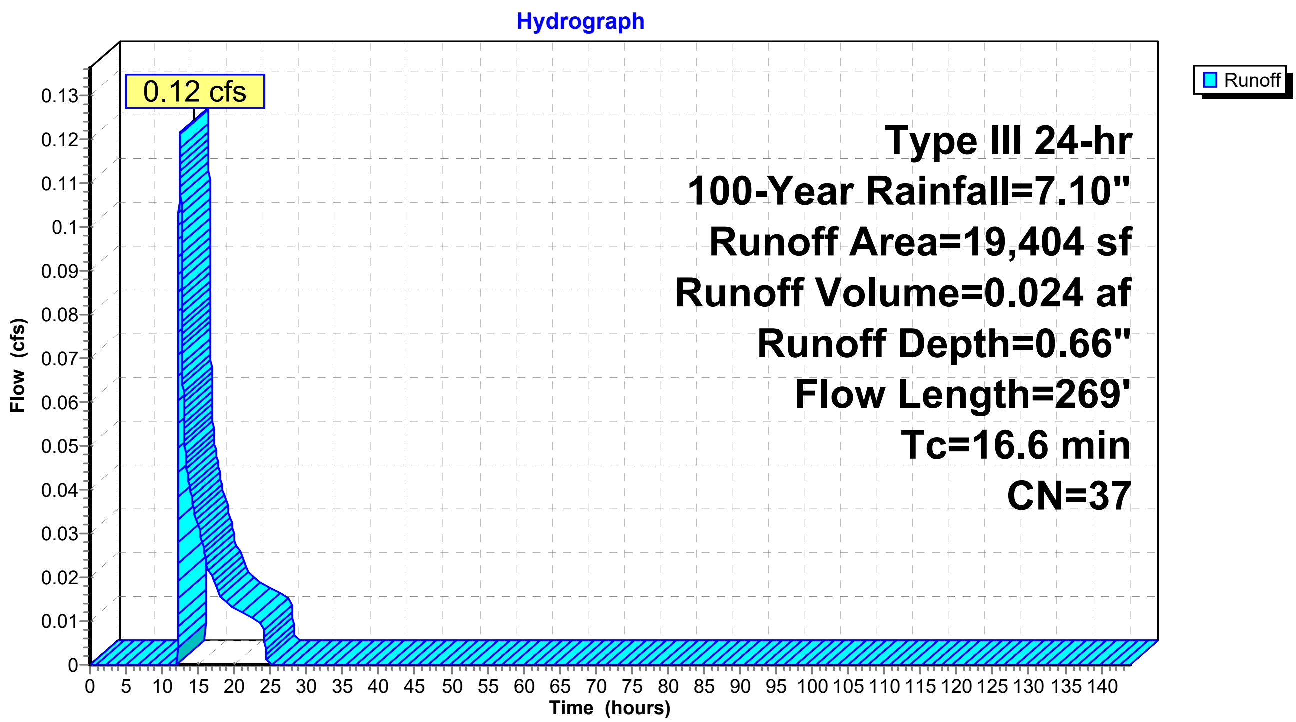
Runoff = 0.12 cfs @ 12.45 hrs, Volume= 0.024 af, Depth= 0.66"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	12,129	30	Woods, Good, HSG A
	1,513	39	>75% Grass cover, Good, HSG A
	3,840	55	Woods, Good, HSG B
*	899	30	Woods, Good, HSG A - offsite
	1,023	49	50-75% Grass cover, Fair, HSG A
	19,404	37	Weighted Average
	19,404		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0120	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
2.3	219	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.6	269	Total			

Subcatchment 1C-S: Sub-1C



Summary for Subcatchment 1D-S: Sub-1D

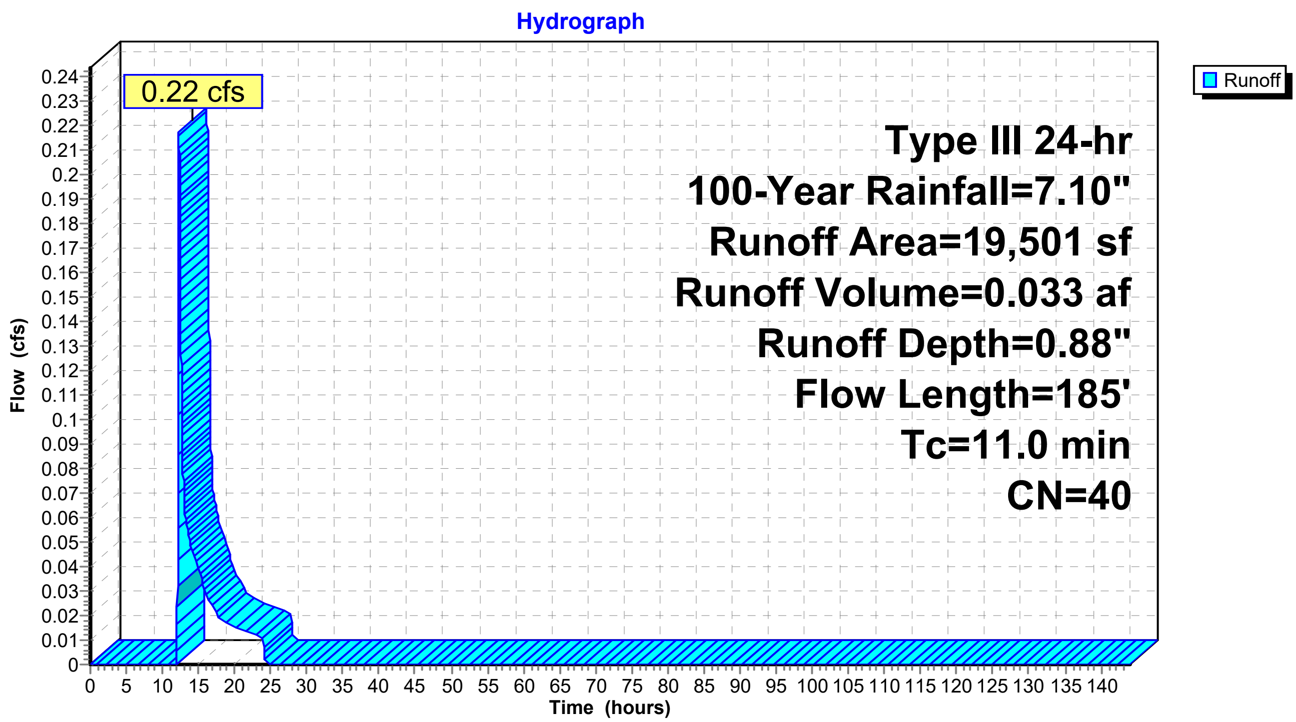
Runoff = 0.22 cfs @ 12.23 hrs, Volume= 0.033 af, Depth= 0.88"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	10,890	39	>75% Grass cover, Good, HSG A
	2,684	49	50-75% Grass cover, Fair, HSG A
*	770	98	Rubble Pile, HSG A
	5,157	30	Woods, Good, HSG A
	19,501	40	Weighted Average
	18,731		96.05% Pervious Area
	770		3.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.1	135	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.0	185	Total			

Subcatchment 1D-S: Sub-1D



Summary for Subcatchment 2S: Sub-2

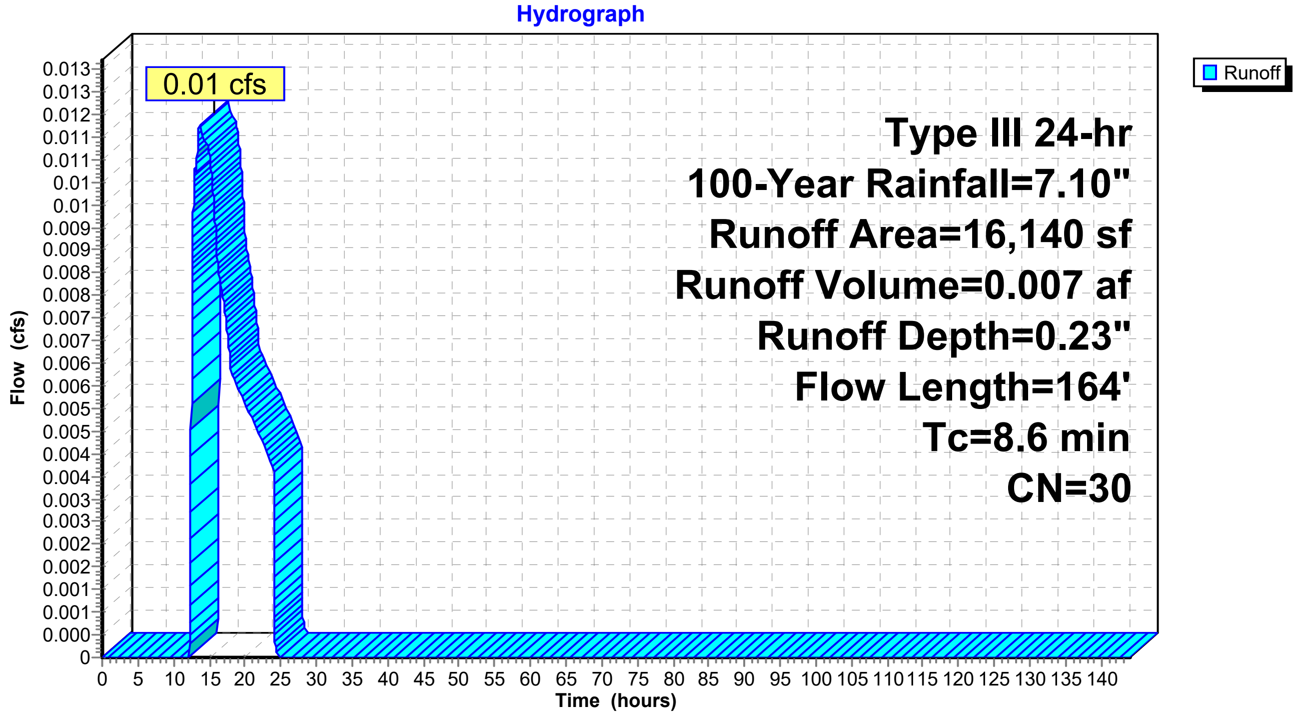
Runoff = 0.01 cfs @ 13.75 hrs, Volume= 0.007 af, Depth= 0.23"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
16,140	30	Woods, Good, HSG A
16,140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.9	114	0.0383	0.98		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.6	164	Total			

Subcatchment 2S: Sub-2



Summary for Subcatchment 3A-S: Sub-3A

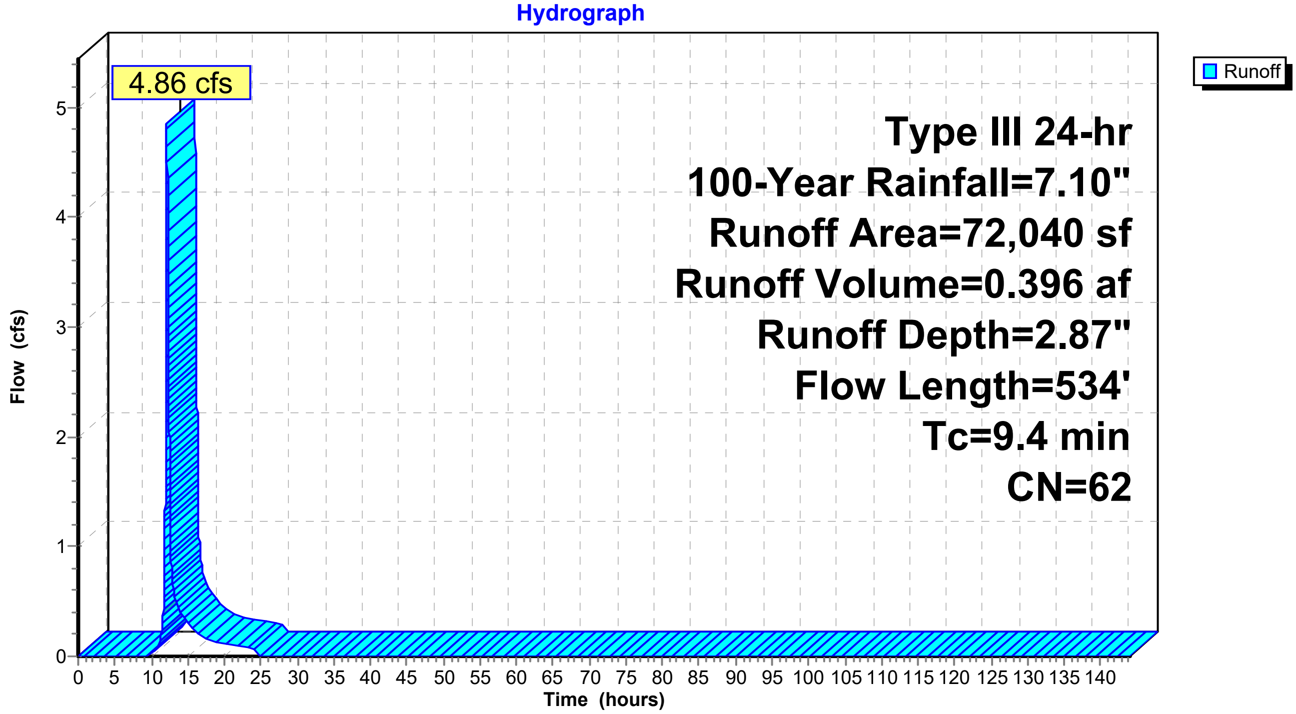
Runoff = 4.86 cfs @ 12.14 hrs, Volume= 0.396 af, Depth= 2.87"
Routed to Pond E-DB : Exist Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	1,384	98	Roofs, HSG A - offsite
*	16,069	98	Paved parking, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
*	1,189	39	>75% Grass cover, Good, HSG A - offsite
	24,471	30	Woods, Good, HSG A
	6,630	39	>75% Grass cover, Good, HSG A
	2,407	98	Paved roads w/curbs & sewers, HSG A
*	2,712	98	Existing Detention Basin, HSG A
*	810	98	Riprap, HSG A
	3,247	98	Paved roads w/curbs & sewers, HSG B
	2,784	55	Woods, Good, HSG B
*	938	98	Riprap, HSG B
	6,442	61	>75% Grass cover, Good, HSG B
*	1,275	98	Existing Detention Basin, HSG B
	72,040	62	Weighted Average
	43,198		59.96% Pervious Area
	28,842		40.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0160	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.60"
1.8	225	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	102	0.0090	1.93		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	157	0.0030	2.88	3.54	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
9.4	534	Total			

Subcatchment 3A-S: Sub-3A



Summary for Subcatchment 3B-S: Sub-3B-S

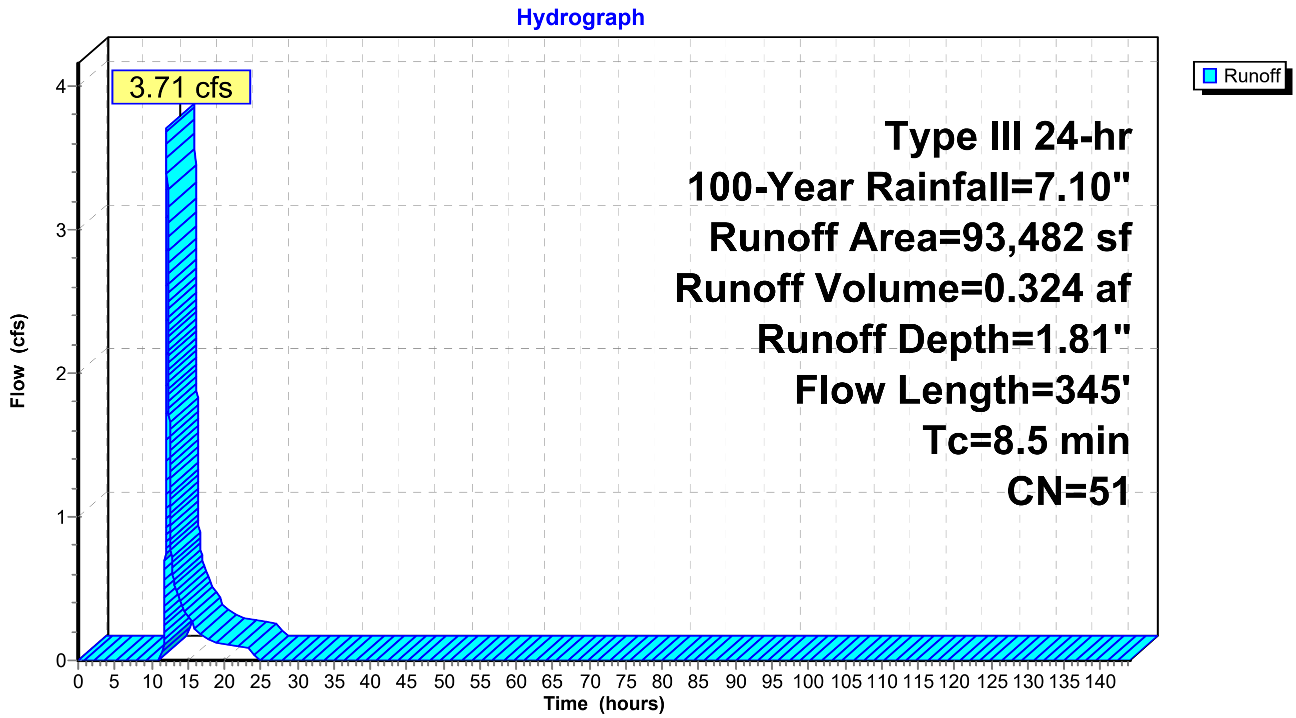
Runoff = 3.71 cfs @ 12.13 hrs, Volume= 0.324 af, Depth= 1.81"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	285	98	Riprap, HSG A
*	121	98	Riprap, HSG B
	9,682	30	Woods, Good, HSG A
	61,938	55	Woods, Good, HSG B
	8,282	61	>75% Grass cover, Good, HSG B
	1,762	39	>75% Grass cover, Good, HSG A
*	4,310	30	Woods, Good, HSG A - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	290	98	Paved drive, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
*	1,734	55	Woods, Good, HSG B - offsite
	93,482	51	Weighted Average
	92,786		99.26% Pervious Area
	696		0.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0700	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.60"
1.5	295	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	345	Total			

Subcatchment 3B-S: Sub-3B-S



Summary for Subcatchment 4S: Sub-4

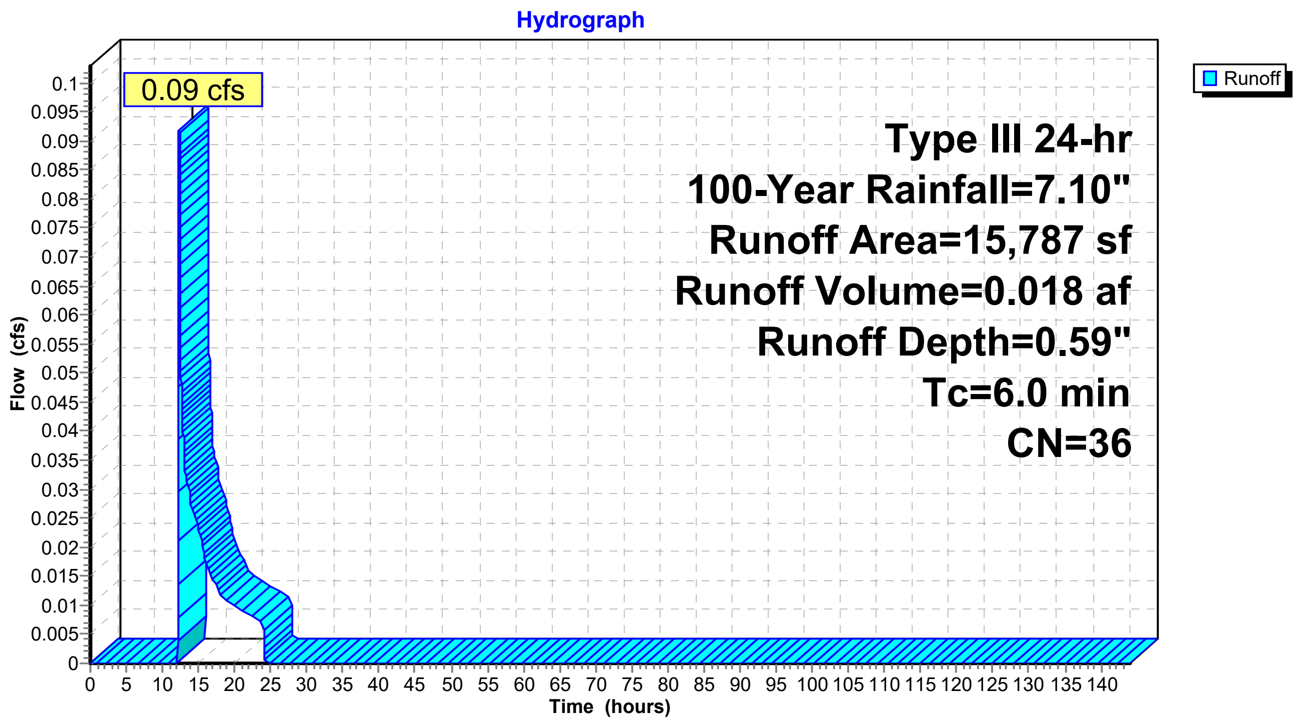
Runoff = 0.09 cfs @ 12.32 hrs, Volume= 0.018 af, Depth= 0.59"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
15,787	36	Woods, Fair, HSG A
15,787		100.00% Pervious Area

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

Subcatchment 4S: Sub-4



Summary for Subcatchment 5S: Sub-5

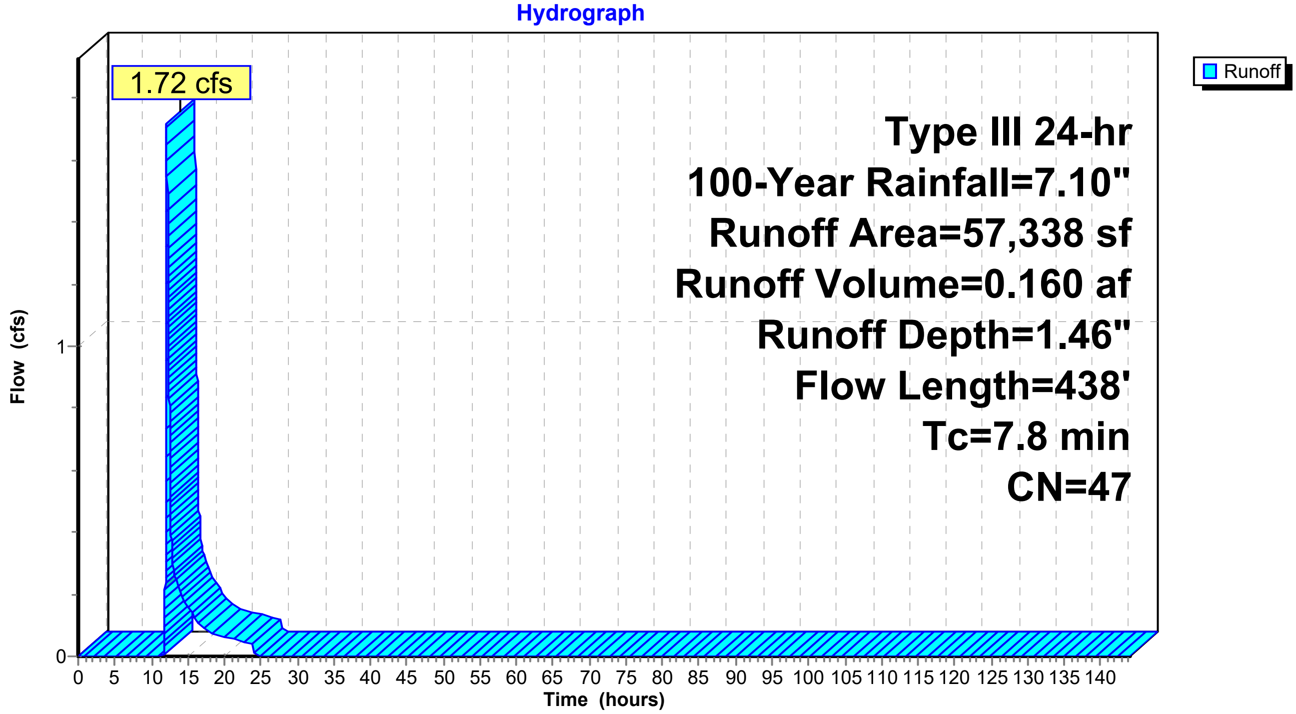
Runoff = 1.72 cfs @ 12.13 hrs, Volume= 0.160 af, Depth= 1.46"
Routed to Reach DP-5 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	32,676	36	Woods, Fair, HSG A
	15,526	39	>75% Grass cover, Good, HSG A
	395	80	>75% Grass cover, Good, HSG D
*	318	98	Paved drive, HSG D
	2,148	98	Roofs, HSG A
*	5,322	98	Paved drive, HSG A
*	533	98	Patio, HSG A
*	235	98	Misc, HSG A
*	185	98	Ledge, HSG A
	57,338	47	Weighted Average
	48,597		84.76% Pervious Area
	8,741		15.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	39	0.1538	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.60"
1.8	11	0.1100	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.60"
0.1	22	0.1166	5.50		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.2	54	0.0500	3.60		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
0.2	52	0.0770	4.47		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
1.0	175	0.0300	2.79		**Shallow Concentrated Flow, F-G** Unpaved Kv= 16.1 fps
0.3	85	0.1100	5.34		**Shallow Concentrated Flow, G-H** Unpaved Kv= 16.1 fps
7.8	438	Total			

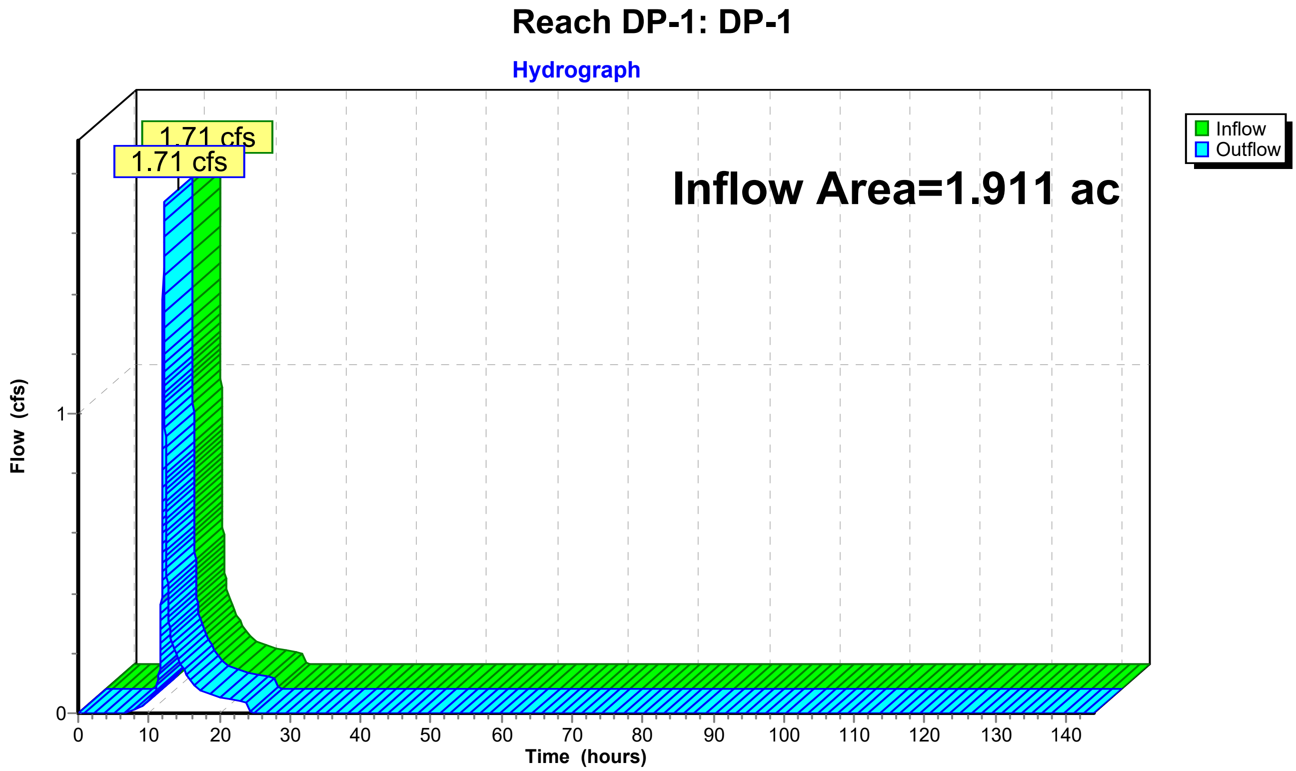
Subcatchment 5S: Sub-5



Summary for Reach DP-1: DP-1

Inflow Area = 1.911 ac, 11.60% Impervious, Inflow Depth = 1.09" for 100-Year event
Inflow = 1.71 cfs @ 12.09 hrs, Volume= 0.173 af
Outflow = 1.71 cfs @ 12.09 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

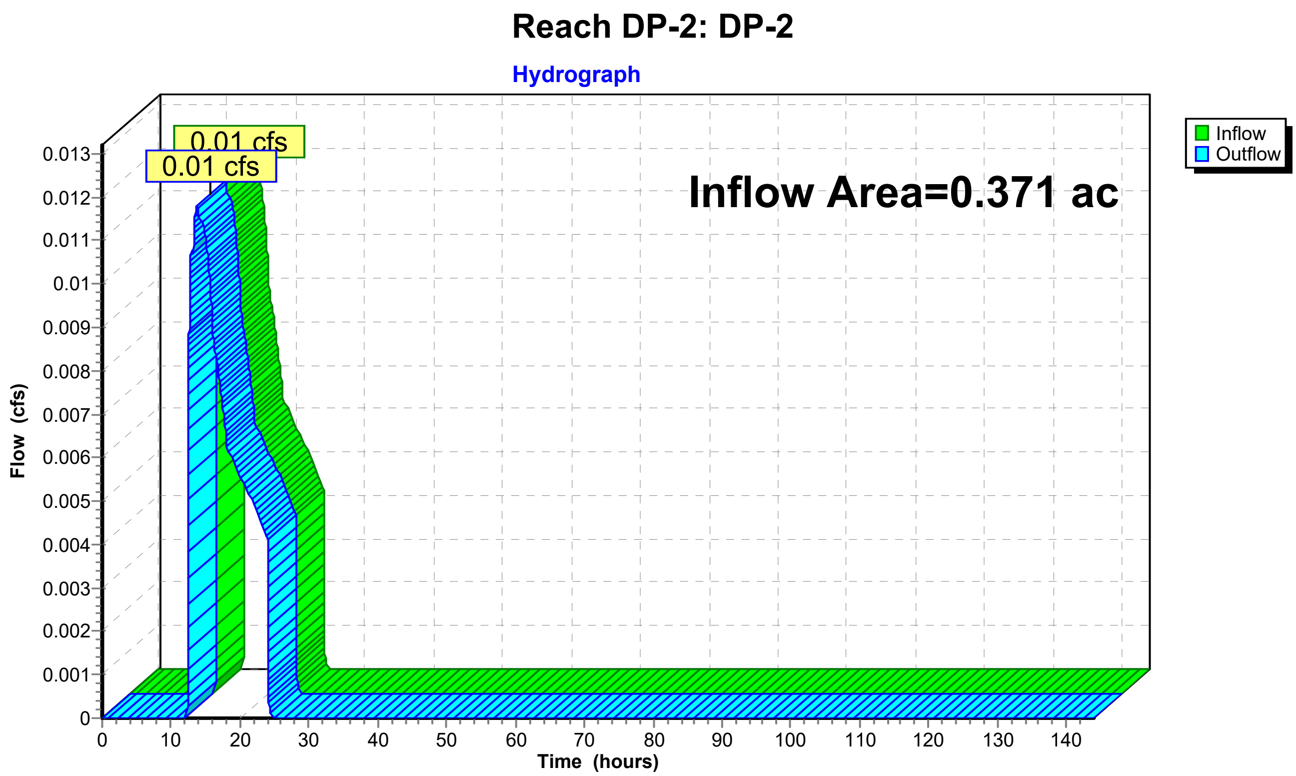
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-2: DP-2

Inflow Area =	0.371 ac,	0.00% Impervious, Inflow Depth = 0.23"	for 100-Year event	
Inflow =	0.01 cfs @	13.75 hrs, Volume=	0.007 af	
Outflow =	0.01 cfs @	13.75 hrs, Volume=	0.007 af,	Atten= 0%, Lag= 0.0 min

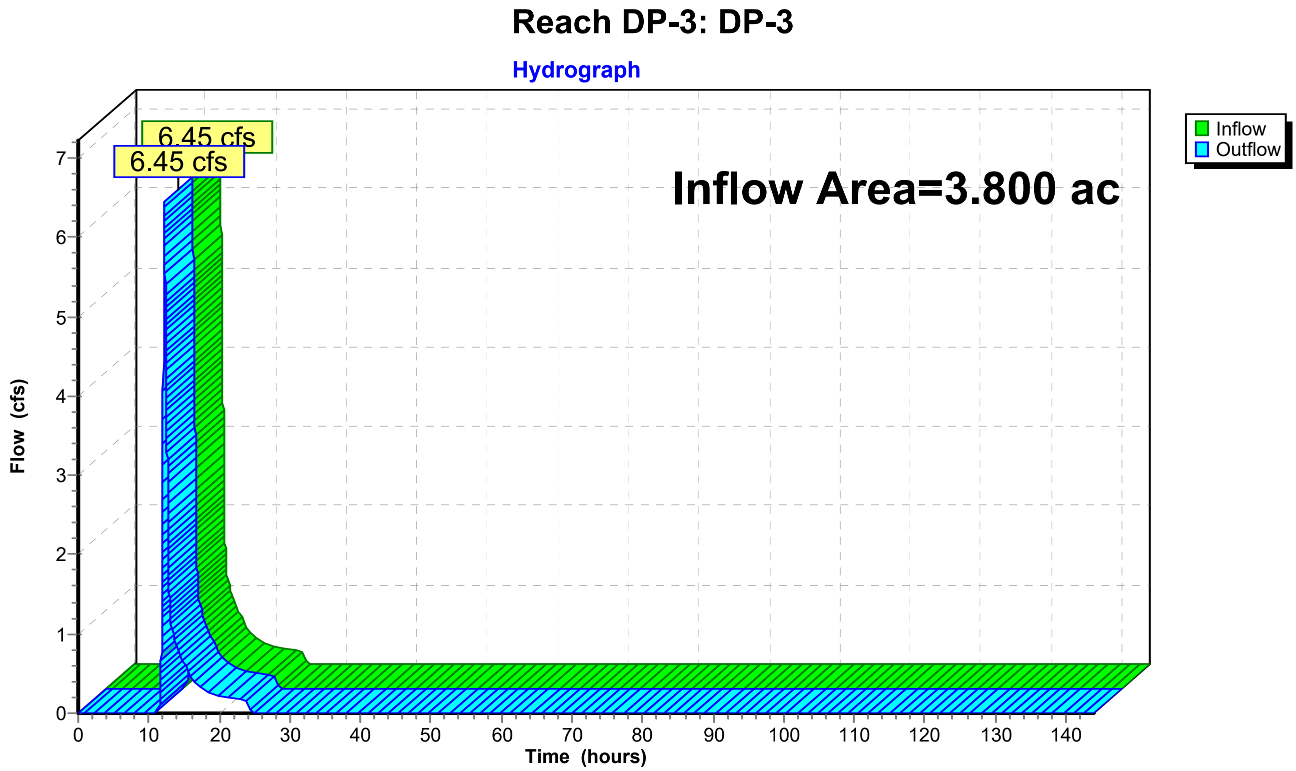
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Reach DP-3: DP-3

Inflow Area = 3.800 ac, 17.85% Impervious, Inflow Depth = 2.24" for 100-Year event
Inflow = 6.45 cfs @ 12.16 hrs, Volume= 0.709 af
Outflow = 6.45 cfs @ 12.16 hrs, Volume= 0.709 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

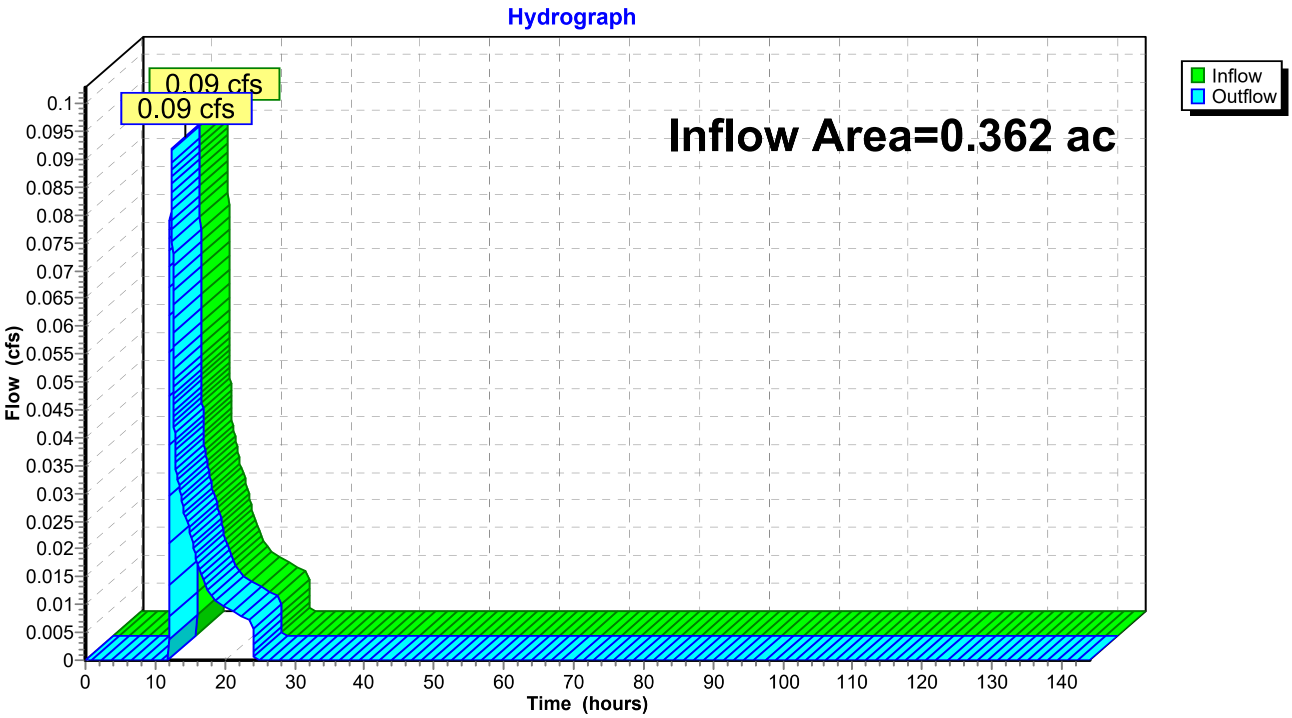


Summary for Reach DP-4: PL

Inflow Area = 0.362 ac, 0.00% Impervious, Inflow Depth = 0.59" for 100-Year event
Inflow = 0.09 cfs @ 12.32 hrs, Volume= 0.018 af
Outflow = 0.09 cfs @ 12.32 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs

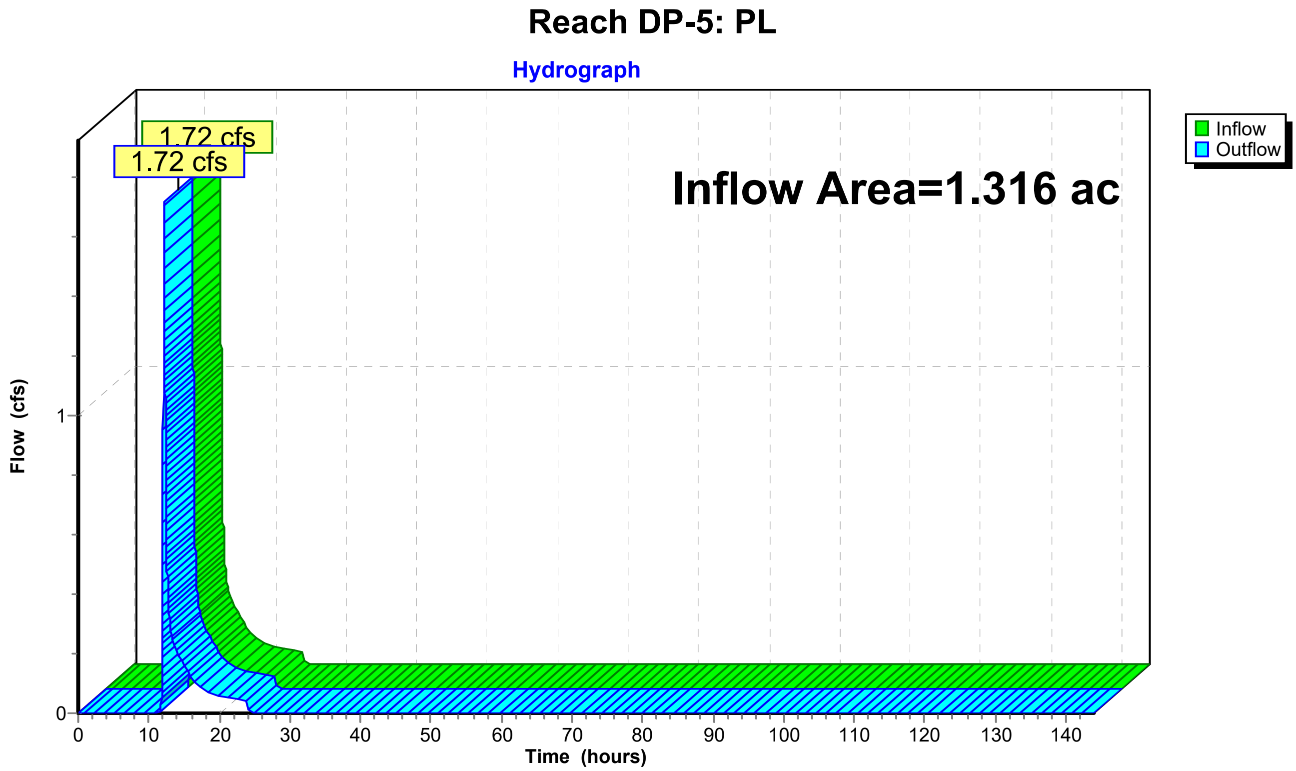
Reach DP-4: PL



Summary for Reach DP-5: PL

Inflow Area = 1.316 ac, 15.24% Impervious, Inflow Depth = 1.46" for 100-Year event
Inflow = 1.72 cfs @ 12.13 hrs, Volume= 0.160 af
Outflow = 1.72 cfs @ 12.13 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs



Summary for Pond D-1: Exist Detention Basin

Inflow Area = 0.720 ac, 0.00% Impervious, Inflow Depth = 0.52" for 100-Year event
Inflow = 0.14 cfs @ 12.40 hrs, Volume= 0.031 af
Outflow = 0.14 cfs @ 12.42 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.9 min
Discarded = 0.14 cfs @ 12.42 hrs, Volume= 0.031 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 62.00' @ 12.42 hrs Surf.Area= 4,340 sf Storage= 7 cf

Plug-Flow detention time= 0.9 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (964.5 - 963.6)

Volume	Invert	Avail.Storage	Storage Description
#1	62.00'	5,584 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

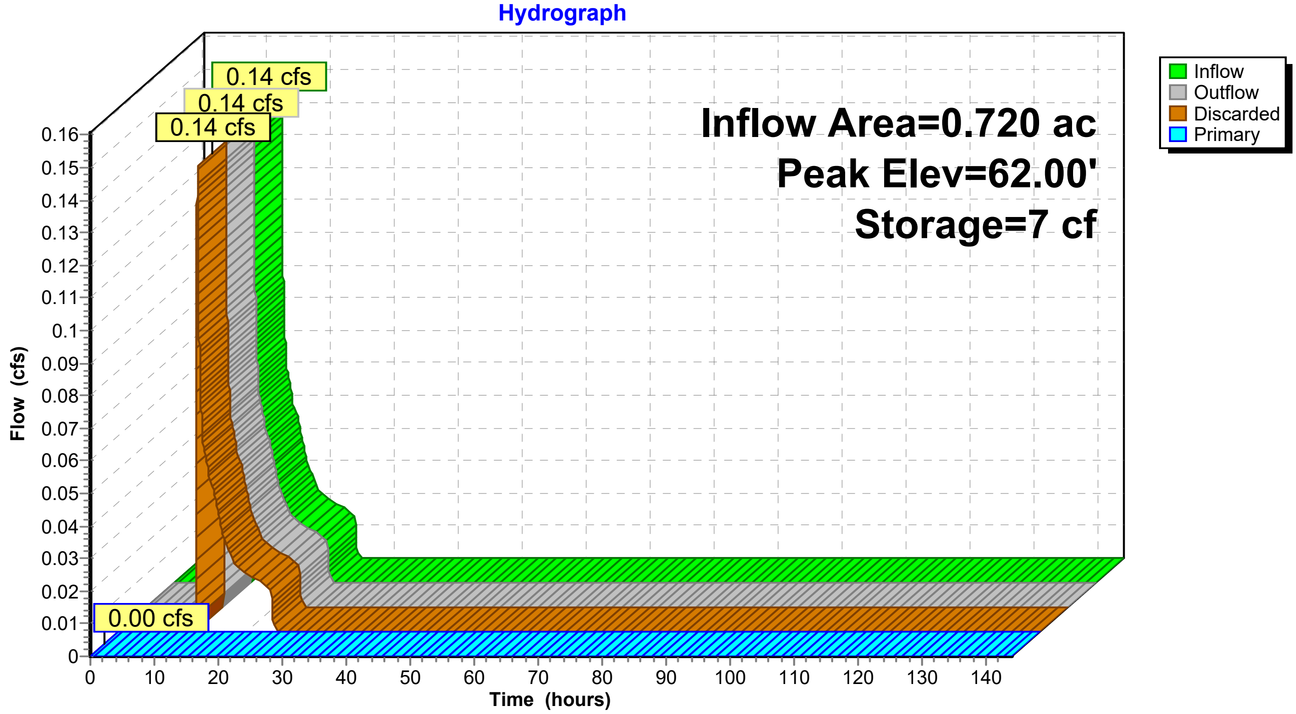
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.00	4,336	0	0
63.00	6,832	5,584	5,584

Device	Routing	Invert	Outlet Devices
#1	Primary	63.00'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Discarded	62.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 12.42 hrs HW=62.00' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=62.00' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Exist Detention Basin



Summary for Pond E-DB: Exist Detention Basin

Inflow Area = 1.654 ac, 40.04% Impervious, Inflow Depth = 2.87" for 100-Year event
Inflow = 4.86 cfs @ 12.14 hrs, Volume= 0.396 af
Outflow = 3.24 cfs @ 12.27 hrs, Volume= 0.385 af, Atten= 33%, Lag= 8.1 min
Primary = 3.24 cfs @ 12.27 hrs, Volume= 0.385 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.01 hrs
Peak Elev= 59.65' @ 12.27 hrs Surf.Area= 2,636 sf Storage= 2,278 cf

Plug-Flow detention time= 30.6 min calculated for 0.385 af (97% of inflow)
Center-of-Mass det. time= 14.2 min (865.4 - 851.2)

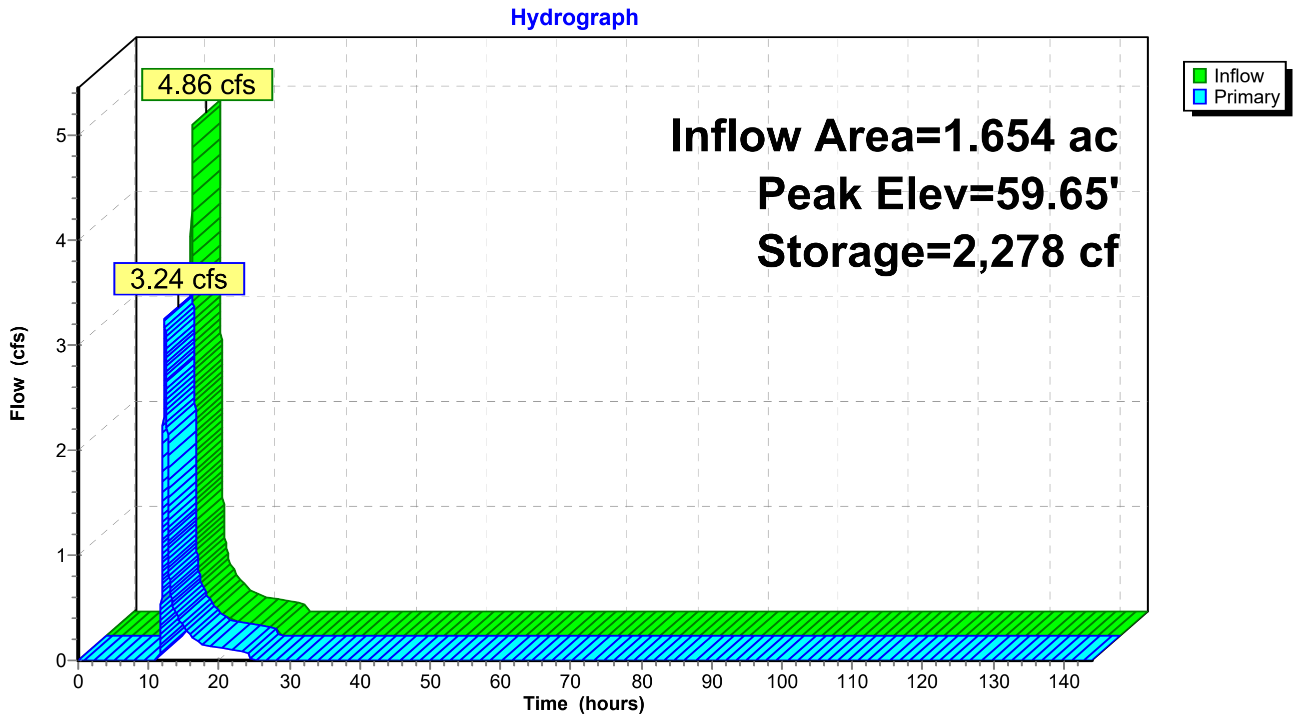
Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	7,325 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	336	0	0
59.00	1,511	924	924
60.00	3,233	2,372	3,296
61.00	4,826	4,030	7,325

Device	Routing	Invert	Outlet Devices
#1	Primary	58.12'	**12.0" Round RCP_Round 12"** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.12' / 58.05' S= 0.0028 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	58.68'	**2.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	59.88'	**7.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	58.68'	**5.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

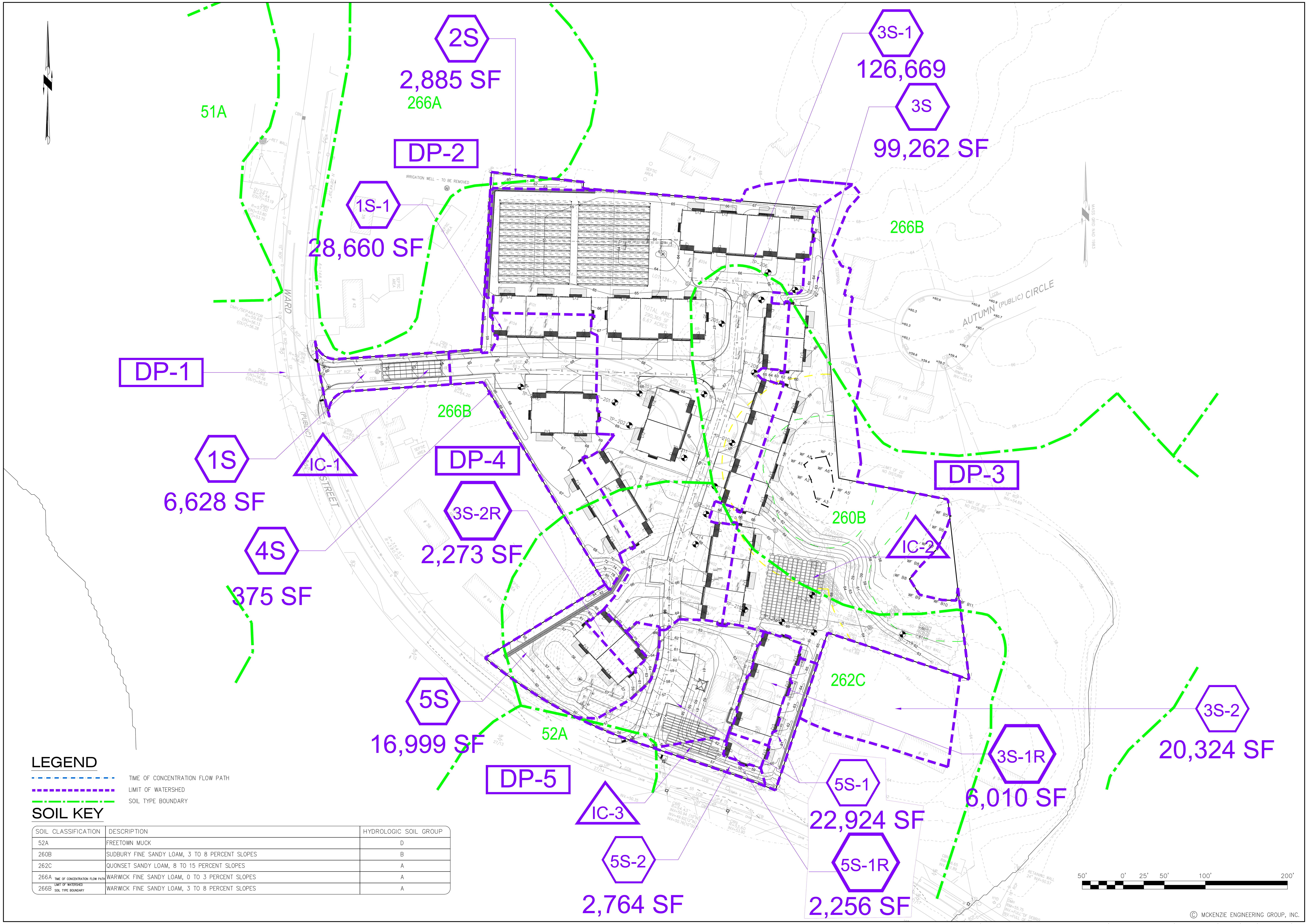
Primary OutFlow Max=3.24 cfs @ 12.27 hrs HW=59.65' TW=0.00' (Dynamic Tailwater)
└─**1=RCP_Round 12"** (Barrel Controls 3.24 cfs @ 4.12 fps)
  ├─**2=Sharp-Crested Rectangular Weir** (Passes 3.24 cfs of 5.67 cfs potential flow)
  │ └─**4=Sharp-Crested Rectangular Weir** (Passes 3.24 cfs of 15.08 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond E-DB: Exist Detention Basin



A P P E N D I X B

Post-Development Design Condition



LEGEND

- TIME OF CONCENTRATION FLOW PATH
- LIMIT OF WATERSHED
- SOIL TYPE BOUNDARY

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
52A	FREETOWN MUCK	D
260B	SUDBURY FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	B
262C	QUONSET SANDY LOAM, 8 TO 15 PERCENT SLOPES	A
266A TIME OF CONCENTRATION FLOW PATH	WARWICK FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES	A
266B LIMIT OF WATERSHED SOIL TYPE BOUNDARY	WARWICK FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES	A

REV	DATE	DESCRIPTION	BY	APP
1	2/2/18	REVIEW COMMENTS	SBS	BCM
2	3/9/18	REVIEW COMMENTS	SBS	BCM
3	4/25/18	REVIEW COMMENTS	SBS	BCM
4	12/19/18	RECONFIGURATION	SBS	BCM
5	6/8/26	C.C. NOI SUBMISSION	SBS	BCM

MCKENZIE ENGINEERING GROUP
Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061
Ph: 781-792-3900
www.mckeng.com

COMPREHENSIVE PERMIT PLAN

KNOWN AS

RIVER STONE

(ASSESSORS MAP 124, LOTS 70-75 & LOT 26)
VIKING LANE & WARD STREET
HINGHAM, MASSACHUSETTS

PROFESSIONAL ENGINEER:

APPLICANT:
RIVER STONE, LLC
293R WASHINGTON STREET
NORWELL, MASSACHUSETTS 02061

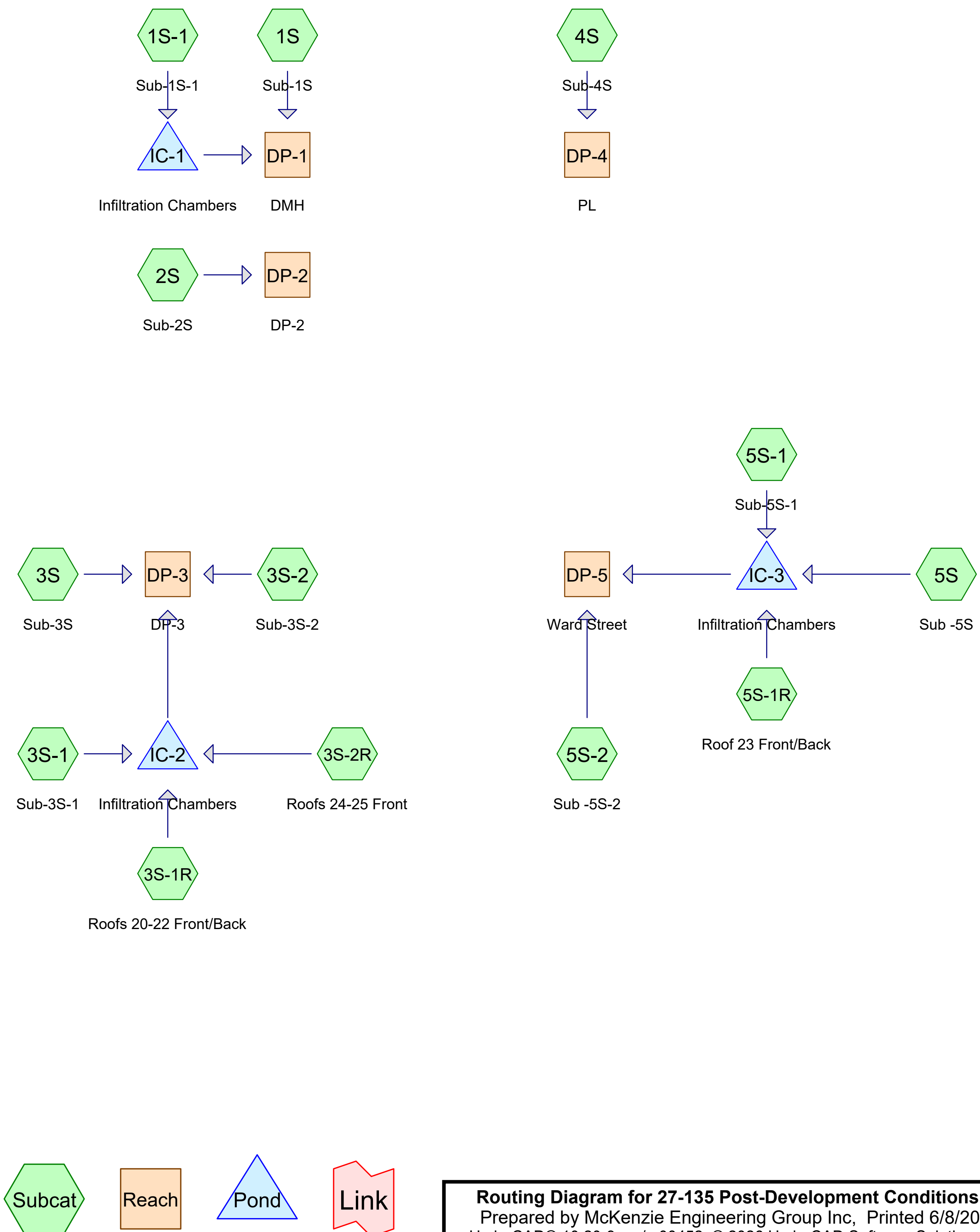
ZBA PERMIT PLAN

DRAWN BY:	SBS
DESIGNED BY:	SBS
CHECKED BY:	BCM
APPROVED BY:	BCM
DATE:	JANUARY 8, 2018
SCALE:	1"=50'
PROJECT NO.:	27-135

DWG. TITLE:
Post-Dev. Watershed Plan

DWG. NO:
WS-2

D:\ONEDRIVE – MCKENZIE ENGINEERING GROUP, INC\MCK FILE SHARE – MEG\2007 PROJECTS\27-135\DWGS\CUT SHEETS\NOI SUBMISSION R9\27-135 WS-2 (R9)-1.DWG



Routing Diagram for 27-135 Post-Development Conditions (R9)
Prepared by McKenzie Engineering Group Inc, Printed 6/8/2026
HydroCAD® 10.20-9a s/n 00452

Rainfall Events Listing

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	3.60	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.70	2
4	100-Year	Type III 24-hr		Default	24.00	1	7.10	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.663	39	>75% Grass cover, Good, HSG A (1S, 1S-1, 2S, 3S, 3S-1, 4S, 5S, 5S-1, 5S-2)
0.523	39	>75% Grass cover, Good, HSG A - offsite (3S, 3S-2)
0.657	61	>75% Grass cover, Good, HSG B (3S, 3S-1)
0.022	61	>75% Grass cover, Good, HSG B - offsite (3S)
0.008	80	>75% Grass cover, Good, HSG D (5S-1)
0.084	98	Decks, HSG A (1S-1, 3S, 3S-1, 5S, 5S-1)
0.022	98	Decks, HSG B (3S, 3S-1)
0.383	98	Paved drives, HSG A (1S-1, 3S-1, 5S-1)
0.007	98	Paved drives, HSG A - offsite (3S)
0.061	98	Paved drives, HSG B (3S-1)
0.457	98	Paved roads w/curbs & sewers, HSG A (1S, 1S-1, 3S-1, 5S-1)
0.181	98	Paved roads w/curbs & sewers, HSG B (3S-1)
0.007	98	Paved roads w/curbs & sewers, HSG D (5S-1)
0.121	98	Paved sidewalk, HSG A (1S, 1S-1, 3S-1, 5S-1)
0.024	98	Paved sidewalk, HSG B (3S-1)
0.001	98	Paved sidewalk, HSG D (5S-1)
0.006	98	Paved walks, HSG A (1S-1)
0.004	98	Riprap, HSG A (3S)
0.004	98	Riprap, HSG B (3S)
1.215	98	Roofs, HSG A (1S-1, 3S, 3S-1, 3S-1R, 3S-2R, 5S, 5S-1R)
0.302	98	Roofs, HSG B (3S, 3S-1)
0.023	98	Walks, HSG A (3S-1, 5S-1)
0.008	98	Walks, HSG B (3S-1)
0.018	98	Walls, HSG A (5S, 5S-1)
0.003	30	Woods, Good, HSG A (3S)
0.138	30	Woods, Good, HSG A - offsite (3S, 3S-2)
0.781	55	Woods, Good, HSG B (3S)
0.040	55	Woods, Good, HSG B - offsite (3S)
7.760	**65**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.642	HSG A	1S, 1S-1, 2S, 3S, 3S-1, 3S-1R, 3S-2, 3S-2R, 4S, 5S, 5S-1, 5S-1R, 5S-2
2.102	HSG B	3S, 3S-1
0.000	HSG C	
0.016	HSG D	5S-1
0.000	Other	
7.760		**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
3.185	0.679	0.000	0.008	0.000	3.873	>75% Grass cover, Good	1S, 1S-1, 2S, 3S, 3S-1, 3S-2, 4S, 5S, 5S-1, 5S-2
0.084	0.022	0.000	0.000	0.000	0.107	Decks	1S-1, 3S, 3S-1, 5S, 5S-1
0.390	0.061	0.000	0.000	0.000	0.451	Paved drives	1S-1, 3S, 3S-1, 5S-1
0.457	0.181	0.000	0.007	0.000	0.644	Paved roads w/curbs & sewers	1S, 1S-1, 3S-1, 5S-1

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.121	0.024	0.000	0.001	0.000	0.147	Paved sidewalk	1S, 1S-1, 3S-1, 5S-1
0.006	0.000	0.000	0.000	0.000	0.006	Paved walks	1S-1
0.004	0.004	0.000	0.000	0.000	0.008	Riprap	3S
1.215	0.302	0.000	0.000	0.000	1.517	Roofs	1S-1, 3S, 3S-1, 3S-1R, 3S-2R, 5S, 5S-1R
0.023	0.008	0.000	0.000	0.000	0.030	Walks	3S-1, 5S-1
0.018	0.000	0.000	0.000	0.000	0.018	Walls	5S, 5S-1
0.141	0.821	0.000	0.000	0.000	0.962	Woods, Good	3S, 3S-2
5.642	**2.102**	**0.000**	**0.016**	**0.000**	**7.760**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	IC-1	58.10	57.42	67.0	0.0101	0.013	0.0	12.0	0.0	
2	IC-2	58.17	58.05	24.0	0.0050	0.013	0.0	12.0	0.0	

Time span=0.00-144.00 hrs, dt=0.02 hrs, 7201 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

Subcatchment1S: Sub-1S Runoff Area=6,628 sf 64.88% Impervious Runoff Depth=1.51"
Tc=6.0 min CN=77 Runoff=0.26 cfs 0.019 af

Subcatchment1S-1: Sub-1S-1 Runoff Area=28,660 sf 63.31% Impervious Runoff Depth=1.44"
Tc=6.0 min CN=76 Runoff=1.08 cfs 0.079 af

Subcatchment2S: Sub-2S Runoff Area=2,885 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment3S: Sub-3S Runoff Area=99,262 sf 9.98% Impervious Runoff Depth=0.42"
Tc=6.0 min CN=56 Runoff=0.57 cfs 0.079 af

Subcatchment3S-1: Sub-3S-1 Runoff Area=126,669 sf 55.14% Impervious Runoff Depth=1.19"
Tc=6.0 min CN=72 Runoff=3.84 cfs 0.288 af

Subcatchment3S-1R: Roofs 20-22 Runoff Area=6,010 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.039 af

Subcatchment3S-2: Sub-3S-2 Runoff Area=20,324 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=38 Runoff=0.00 cfs 0.000 af

Subcatchment3S-2R: Roofs 24-25 Front Runoff Area=2,273 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.18 cfs 0.015 af

Subcatchment4S: Sub-4S Runoff Area=375 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment5S: Sub -5S Runoff Area=16,999 sf 15.22% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=48 Runoff=0.02 cfs 0.005 af

Subcatchment5S-1: Sub-5S-1 Runoff Area=22,924 sf 52.92% Impervious Runoff Depth=1.13"
Tc=6.0 min CN=71 Runoff=0.65 cfs 0.049 af

Subcatchment5S-1R: Roof 23 Front/Back Runoff Area=2,256 sf 100.00% Impervious Runoff Depth=3.37"
Tc=6.0 min CN=98 Runoff=0.18 cfs 0.015 af

Subcatchment5S-2: Sub -5S-2 Runoff Area=2,764 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Reach DP-1: DMH Inflow=0.26 cfs 0.019 af
Outflow=0.26 cfs 0.019 af

Reach DP-2: DP-2 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: DP-3 Inflow=0.57 cfs 0.079 af
Outflow=0.57 cfs 0.079 af

Reach DP-4: PL Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Ward Street Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond IC-1: Infiltration Chambers Peak Elev=58.29' Storage=673 cf Inflow=1.08 cfs 0.079 af
Discarded=0.29 cfs 0.079 af Primary=0.00 cfs 0.000 af Outflow=0.29 cfs 0.079 af

Pond IC-2: Infiltration Chambers Peak Elev=60.49' Storage=3,054 cf Inflow=4.50 cfs 0.341 af
Discarded=1.10 cfs 0.341 af Primary=0.00 cfs 0.000 af Outflow=1.10 cfs 0.341 af

Pond IC-3: Infiltration Chambers Peak Elev=52.79' Storage=184 cf Inflow=0.83 cfs 0.069 af
Outflow=0.46 cfs 0.069 af

Total Runoff Area = 7.760 ac Runoff Volume = 0.588 af Average Runoff Depth = 0.91"
62.30% Pervious = 4.834 ac 37.70% Impervious = 2.926 ac

Summary for Subcatchment 1S: Sub-1S

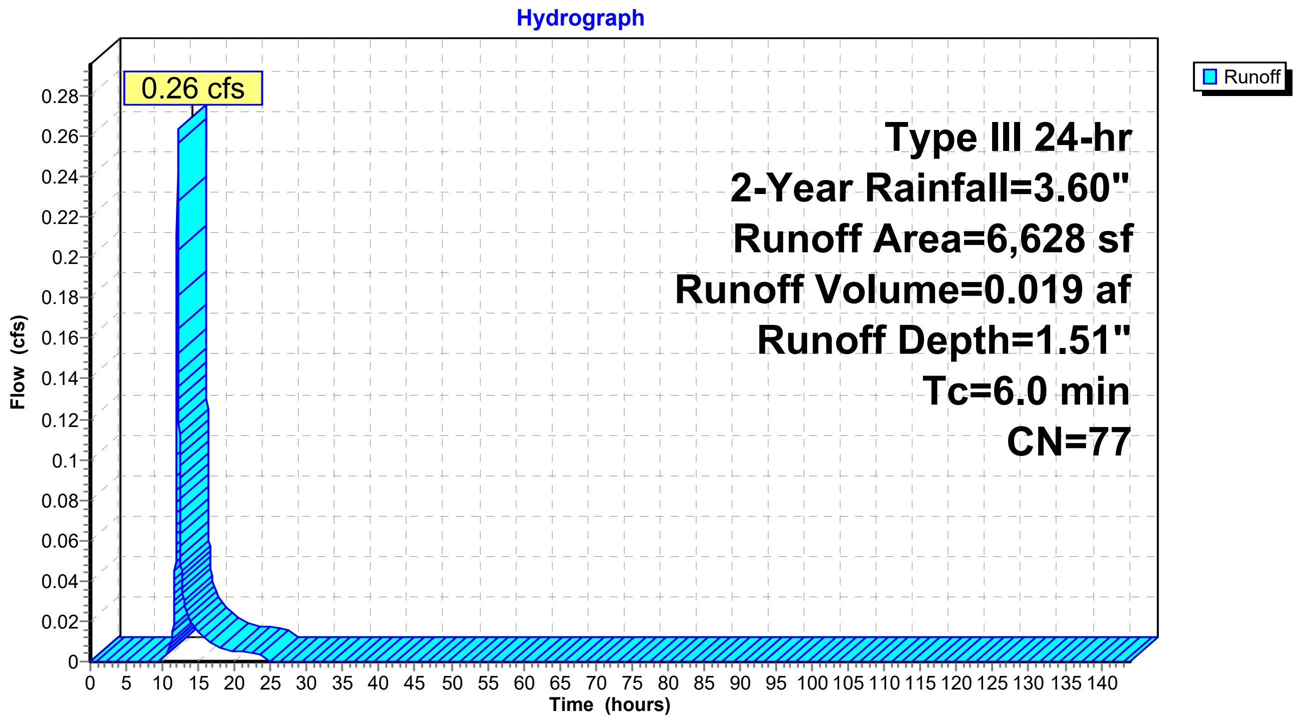
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.019 af, Depth= 1.51"
Routed to Reach DP-1 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
	2,328	39	>75% Grass cover, Good, HSG A
	3,451	98	Paved roads w/curbs & sewers, HSG A
*	849	98	Paved sidewalk, HSG A
	6,628	77	Weighted Average
	2,328		35.12% Pervious Area
	4,300		64.88% Impervious Area

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

Subcatchment 1S: Sub-1S



Summary for Subcatchment 1S-1: Sub-1S-1

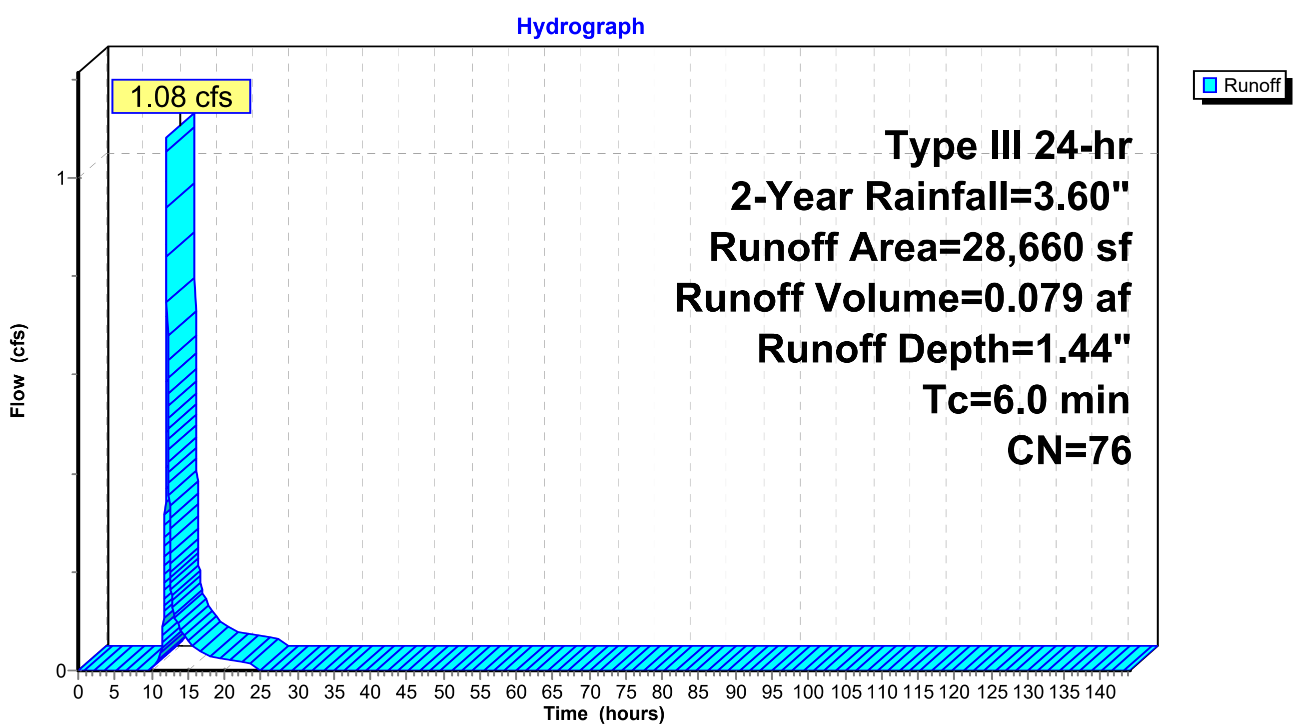
Runoff = 1.08 cfs @ 12.09 hrs, Volume= 0.079 af, Depth= 1.44"
Routed to Pond IC-1 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
	10,515	39	>75% Grass cover, Good, HSG A
	3,661	98	Paved roads w/curbs & sewers, HSG A
*	1,004	98	Paved sidewalk, HSG A
*	2,080	98	Paved drives, HSG A
*	752	98	Decks, HSG A
	10,407	98	Roofs, HSG A
*	241	98	Paved walks, HSG A
	28,660	76	Weighted Average
	10,515		36.69% Pervious Area
	18,145		63.31% Impervious Area

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

Subcatchment 1S-1: Sub-1S-1



Summary for Subcatchment 2S: Sub-2S

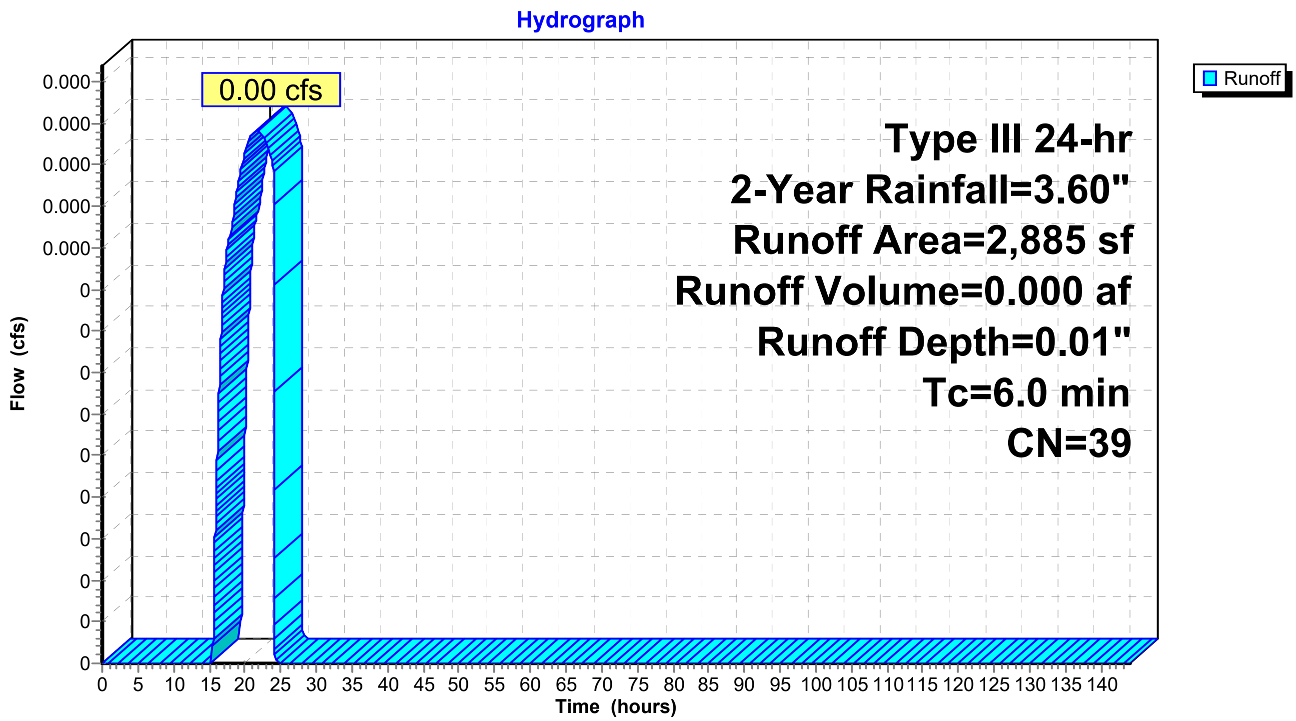
Runoff = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
2,885	39	>75% Grass cover, Good, HSG A
2,885		100.00% Pervious Area

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

Subcatchment 2S: Sub-2S



Summary for Subcatchment 3S: Sub-3S

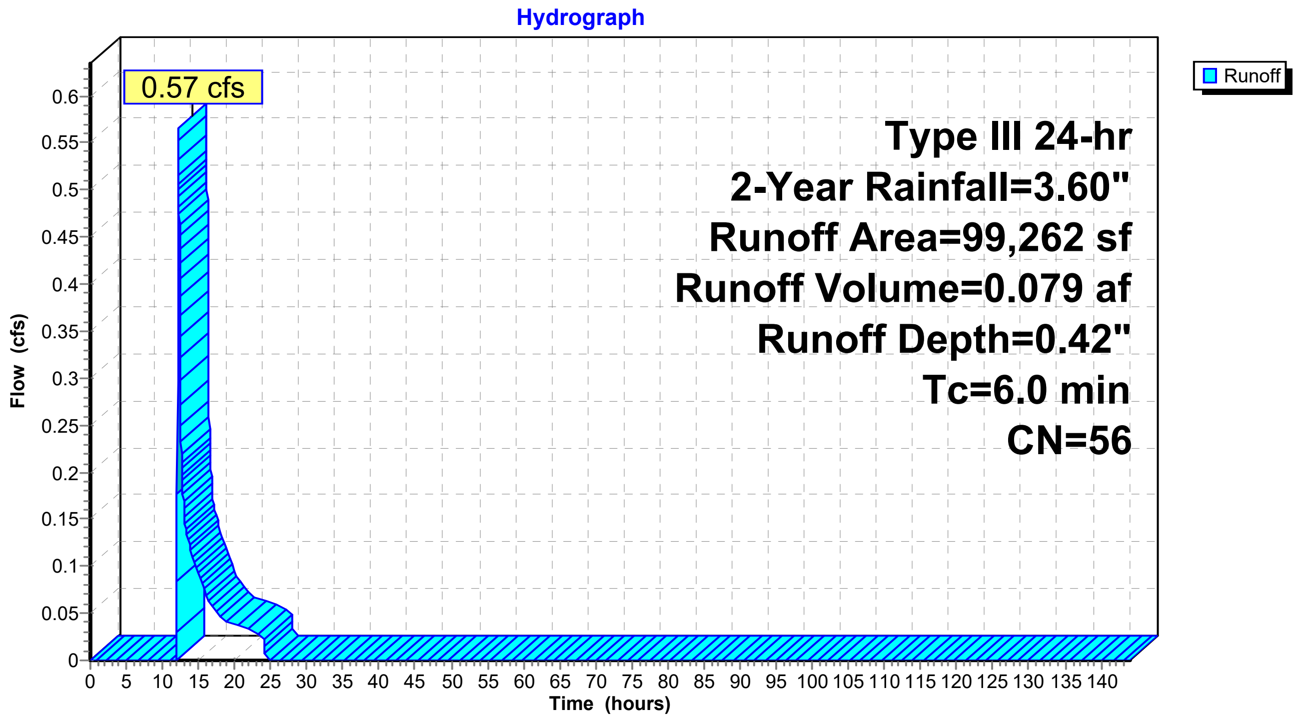
Runoff = 0.57 cfs @ 12.14 hrs, Volume= 0.079 af, Depth= 0.42"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	290	98	Paved drives, HSG A - offsite
*	4,310	30	Woods, Good, HSG A - offsite
*	1,734	55	Woods, Good, HSG B - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
	23,550	61	>75% Grass cover, Good, HSG B
	20,523	39	>75% Grass cover, Good, HSG A
*	454	98	Decks, HSG A
*	895	98	Decks, HSG B
	2,628	98	Roofs, HSG A
	5,310	98	Roofs, HSG B
*	167	98	Riprap, HSG B
*	160	98	Riprap, HSG A
	34,033	55	Woods, Good, HSG B
	130	30	Woods, Good, HSG A
	99,262	56	Weighted Average
	89,358		90.02% Pervious Area
	9,904		9.98% Impervious Area

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

Subcatchment 3S: Sub-3S



Summary for Subcatchment 3S-1: Sub-3S-1

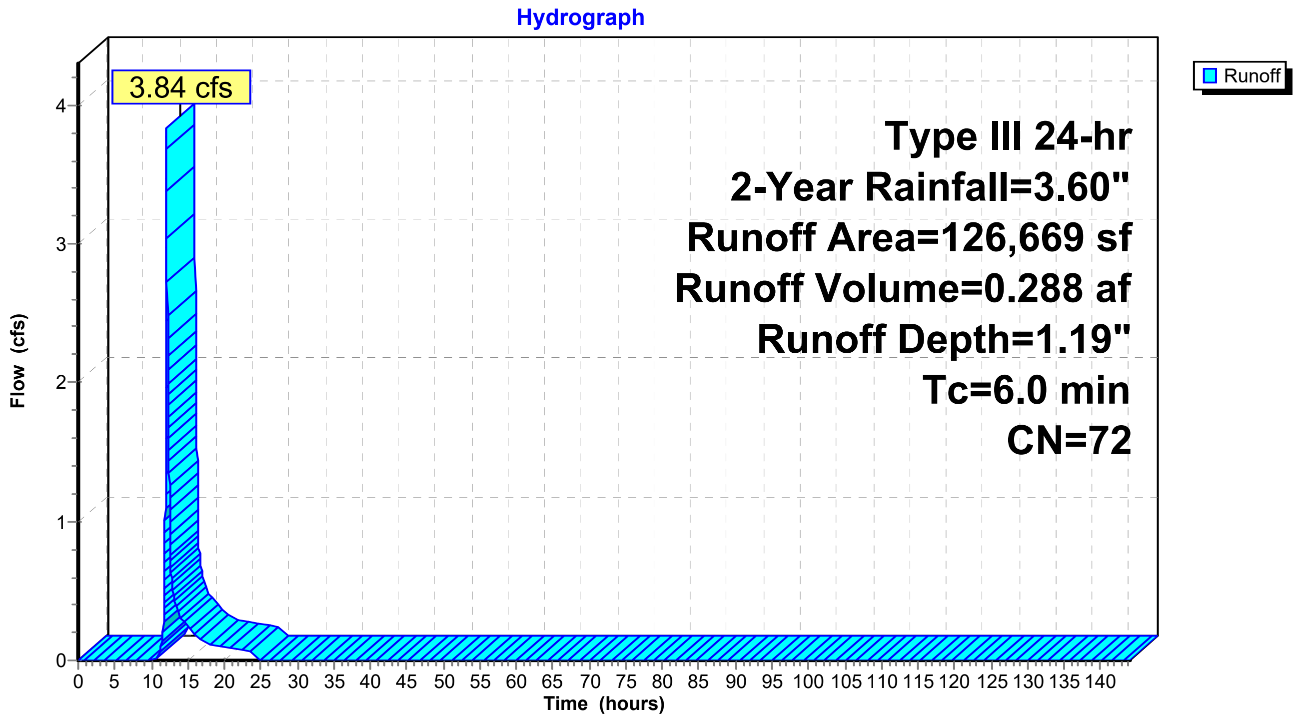
Runoff = 3.84 cfs @ 12.10 hrs, Volume= 0.288 af, Depth= 1.19"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	8,418	98	Paved drives, HSG A
*	2,654	98	Paved drives, HSG B
*	9,803	98	Paved roads w/curbs & sewers, HSG A
*	7,871	98	Paved roads w/curbs & sewers, HSG B
*	736	98	Walks, HSG A
*	335	98	Walks, HSG B
*	43,330	39	>75% Grass cover, Good, HSG A
*	5,078	61	>75% Grass cover, Good, HSG B
*	1,706	98	Decks, HSG A
*	84	98	Decks, HSG B
*	7,838	98	Roofs, HSG B
*	27,432	98	Roofs, HSG A
*	8,421	39	>75% Grass cover, Good, HSG A
*	1,911	98	Paved sidewalk, HSG A
*	1,052	98	Paved sidewalk, HSG B
	126,669	72	Weighted Average
	56,829		44.86% Pervious Area
	69,840		55.14% Impervious Area

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

Subcatchment 3S-1: Sub-3S-1



Summary for Subcatchment 3S-1R: Roofs 20-22 Front/Back

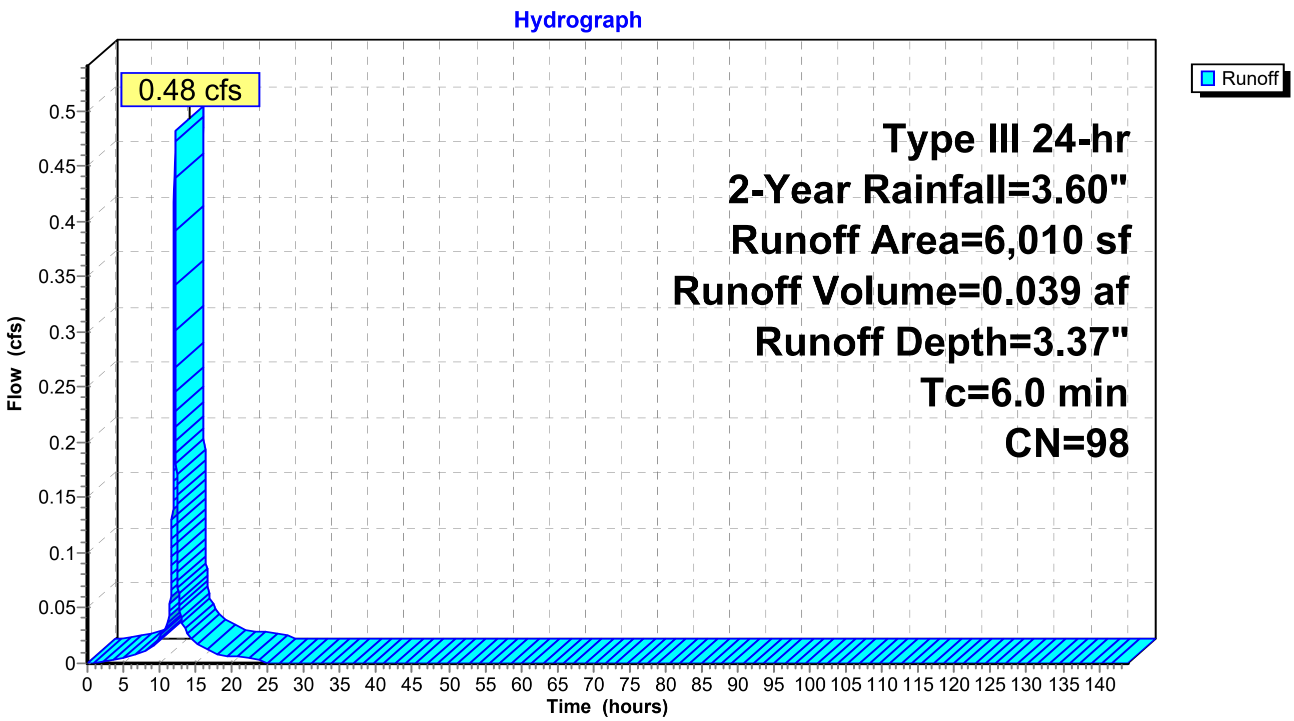
Runoff = 0.48 cfs @ 12.08 hrs, Volume= 0.039 af, Depth= 3.37"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	6,010	98	Roofs, HSG A
	6,010		100.00% Impervious Area

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

Subcatchment 3S-1R: Roofs 20-22 Front/Back



Summary for Subcatchment 3S-2: Sub-3S-2

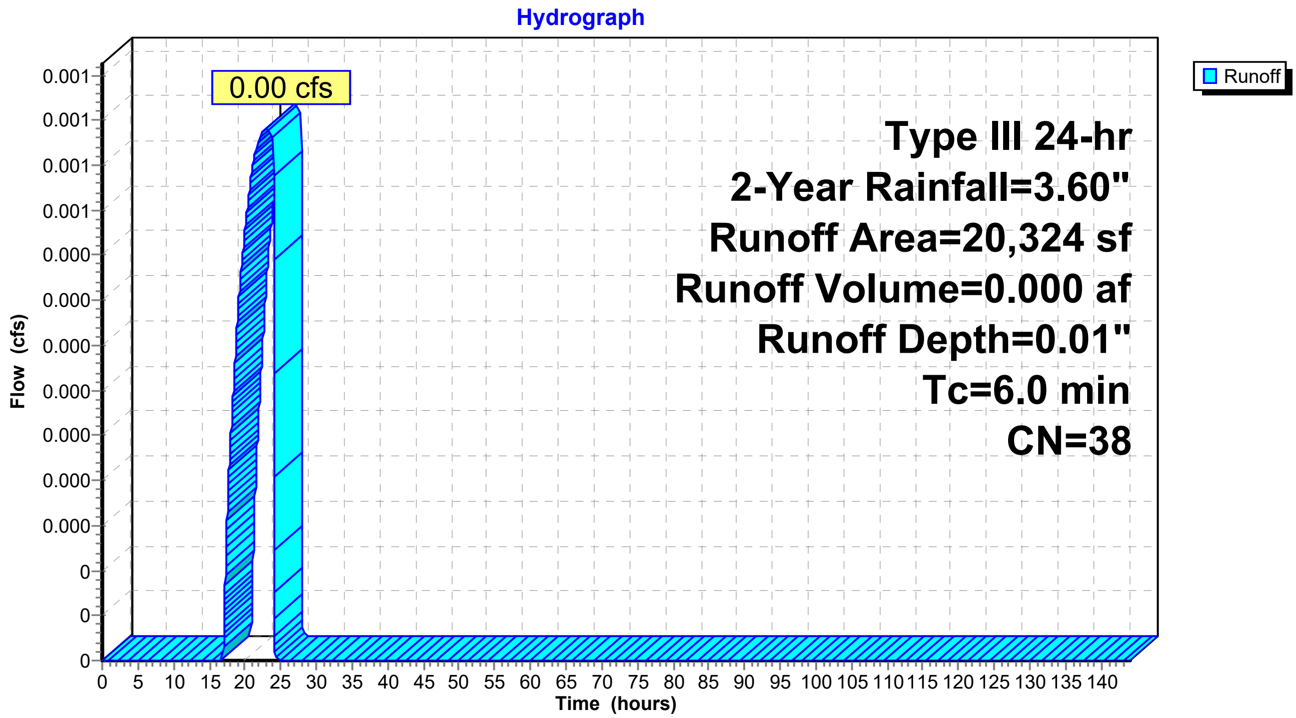
Runoff = 0.00 cfs @ 22.96 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	18,642	39	>75% Grass cover, Good, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
	20,324	38	Weighted Average
	20,324		100.00% Pervious Area

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

Subcatchment 3S-2: Sub-3S-2



Summary for Subcatchment 3S-2R: Roofs 24-25 Front

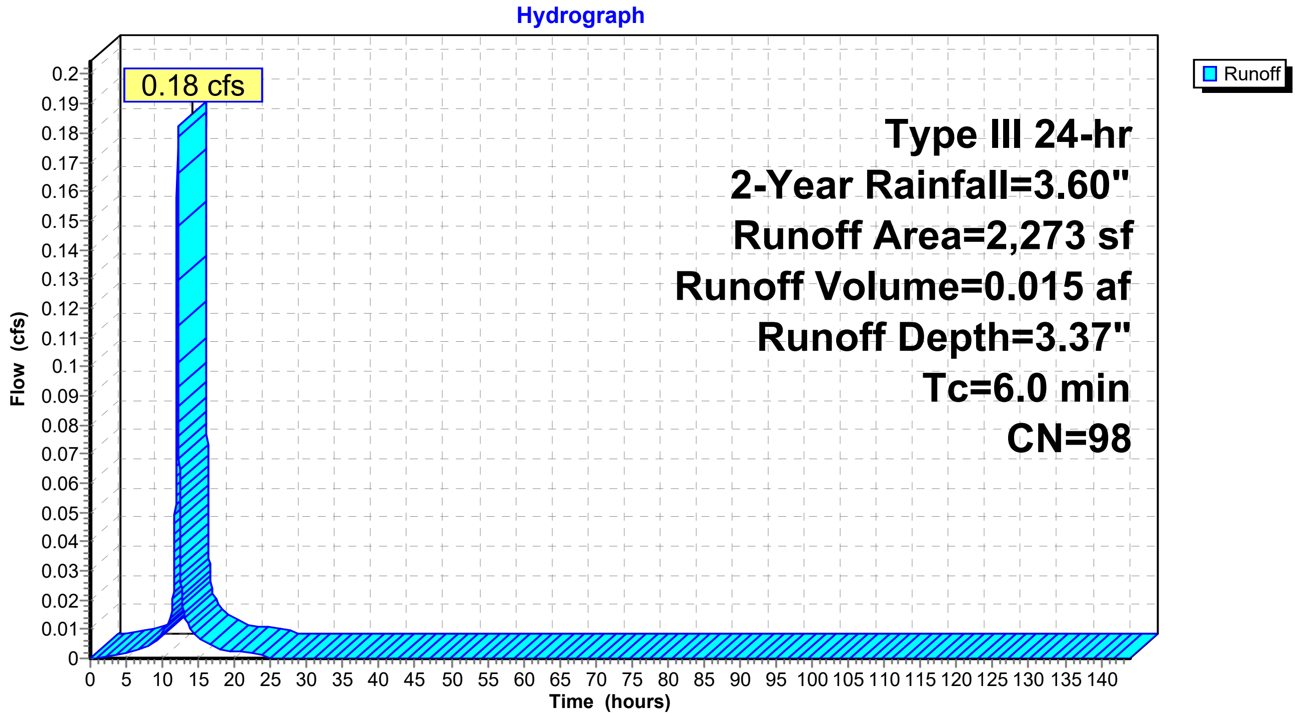
Runoff = 0.18 cfs @ 12.08 hrs, Volume= 0.015 af, Depth= 3.37"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
2,273	98	Roofs, HSG A
2,273		100.00% Impervious Area

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

Subcatchment 3S-2R: Roofs 24-25 Front



Summary for Subcatchment 4S: Sub-4S

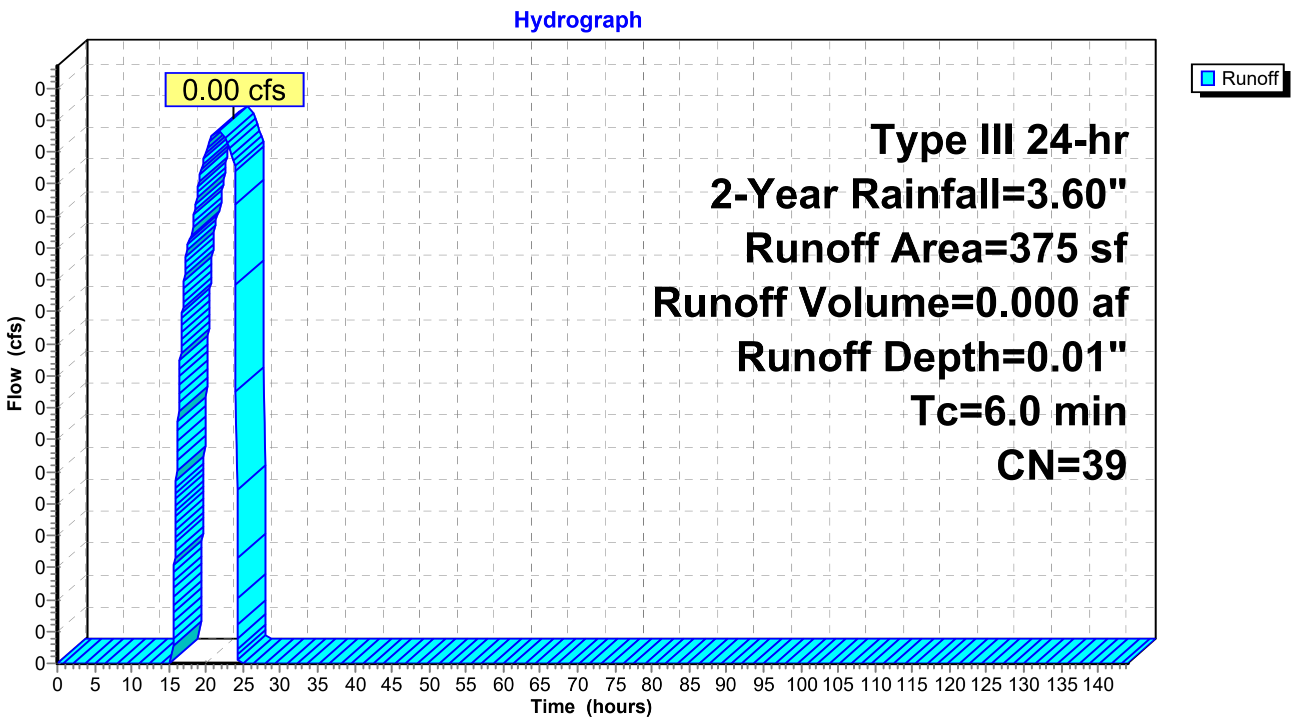
Runoff = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
375	39	>75% Grass cover, Good, HSG A
375		100.00% Pervious Area

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

Subcatchment 4S: Sub-4S



Summary for Subcatchment 5S: Sub -5S

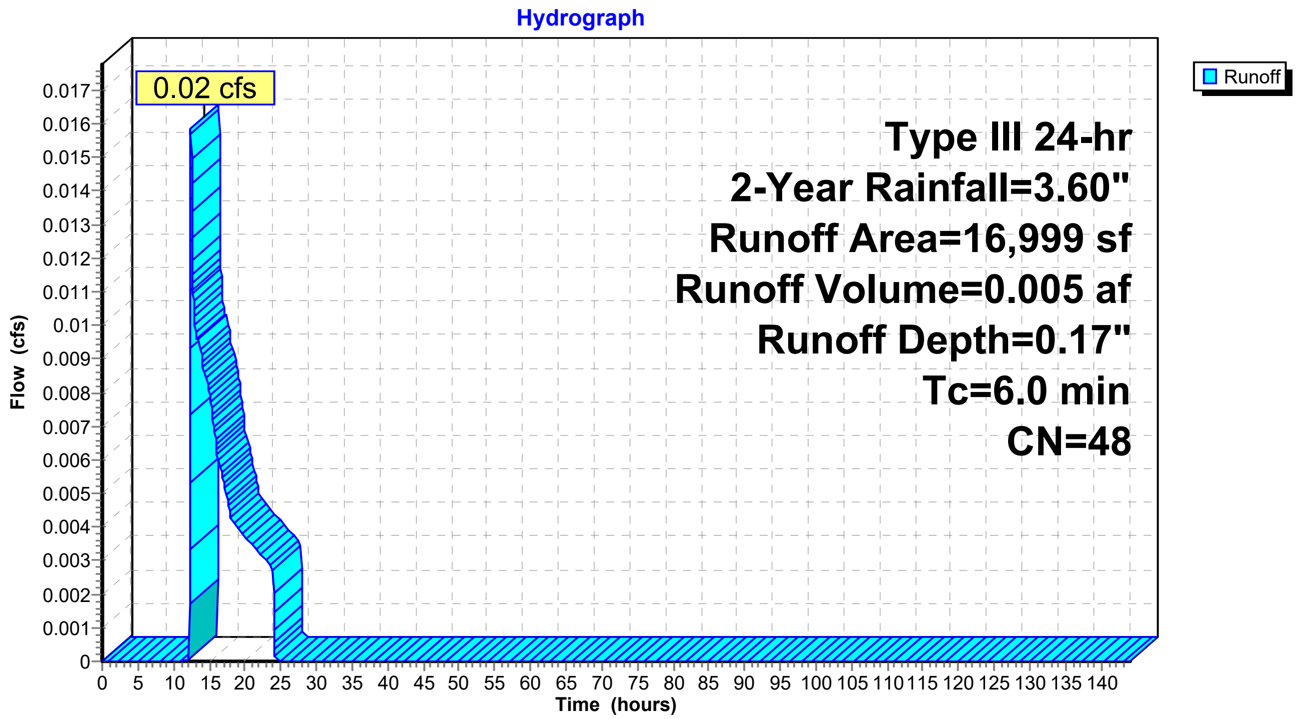
Runoff = 0.02 cfs @ 12.44 hrs, Volume= 0.005 af, Depth= 0.17"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	156	98	Decks, HSG A
	14,411	39	>75% Grass cover, Good, HSG A
*	525	98	Walls, HSG A
	1,907	98	Roofs, HSG A
	16,999	48	Weighted Average
	14,411		84.78% Pervious Area
	2,588		15.22% Impervious Area

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

Subcatchment 5S: Sub -5S



Summary for Subcatchment 5S-1: Sub-5S-1

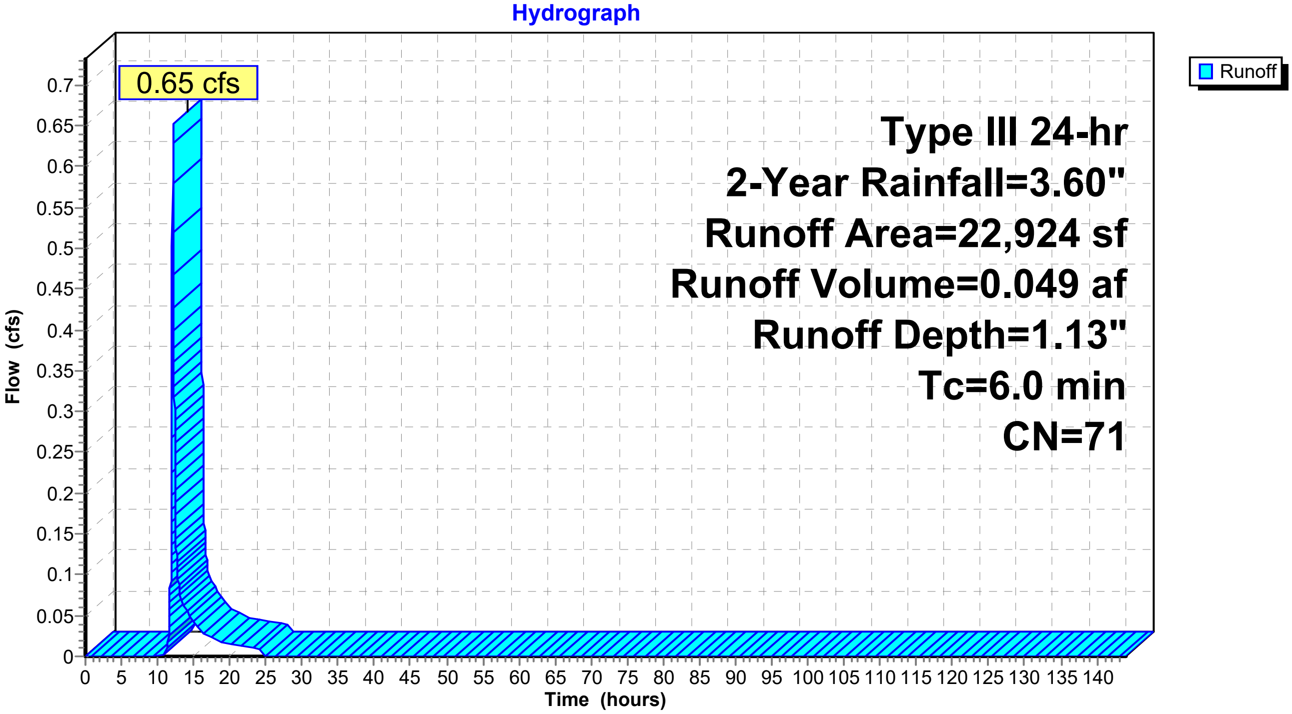
Runoff = 0.65 cfs @ 12.10 hrs, Volume= 0.049 af, Depth= 1.13"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	6,186	98	Paved drives, HSG A
	2,972	98	Paved roads w/curbs & sewers, HSG A
*	247	98	Walks, HSG A
	10,428	39	>75% Grass cover, Good, HSG A
*	1,508	98	Paved sidewalk, HSG A
*	62	98	Paved sidewalk, HSG D
	286	98	Paved roads w/curbs & sewers, HSG D
	365	80	>75% Grass cover, Good, HSG D
*	272	98	Walls, HSG A
*	598	98	Decks, HSG A
	22,924	71	Weighted Average
	10,793		47.08% Pervious Area
	12,131		52.92% Impervious Area

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

Subcatchment 5S-1: Sub-5S-1



Summary for Subcatchment 5S-1R: Roof 23 Front/Back

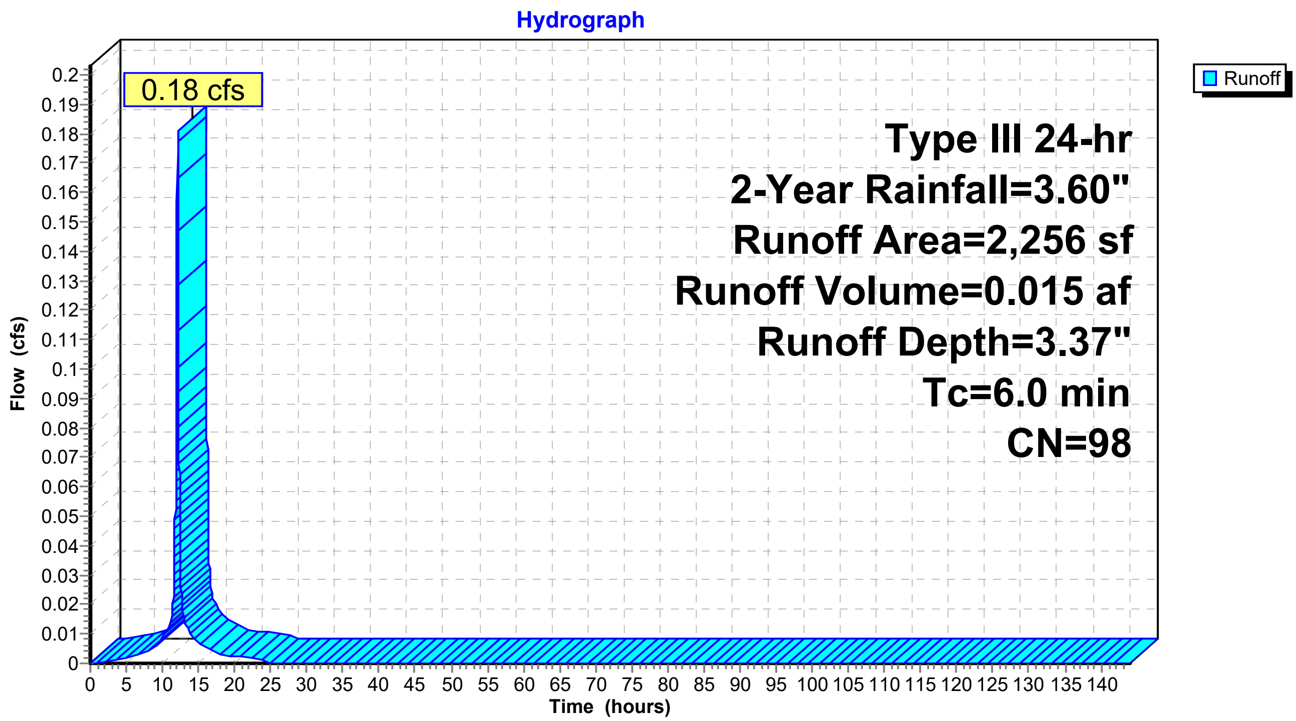
Runoff = 0.18 cfs @ 12.08 hrs, Volume= 0.015 af, Depth= 3.37"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

	Area (sf)	CN	Description
*	2,256	98	Roofs, HSG A
	2,256		100.00% Impervious Area

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

Subcatchment 5S-1R: Roof 23 Front/Back



Summary for Subcatchment 5S-2: Sub -5S-2

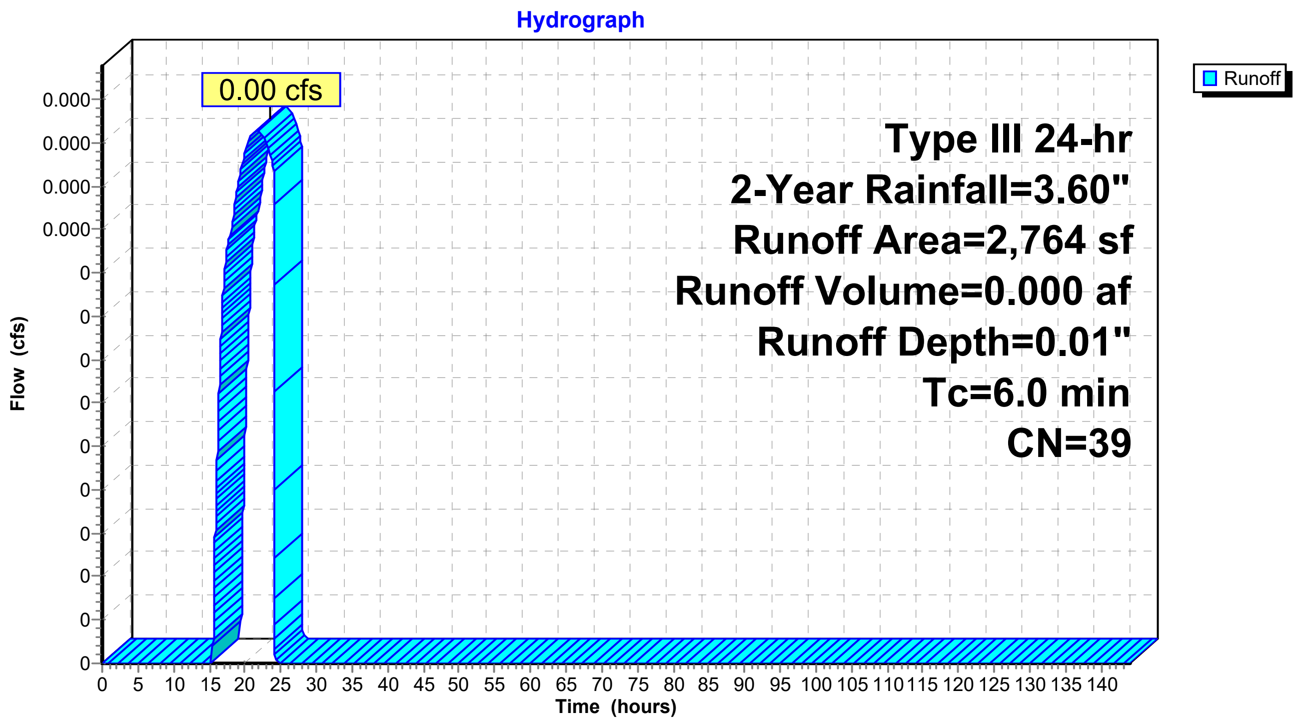
Runoff = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach DP-5 : Ward Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.60"

Area (sf)	CN	Description
2,764	39	>75% Grass cover, Good, HSG A
2,764		100.00% Pervious Area

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

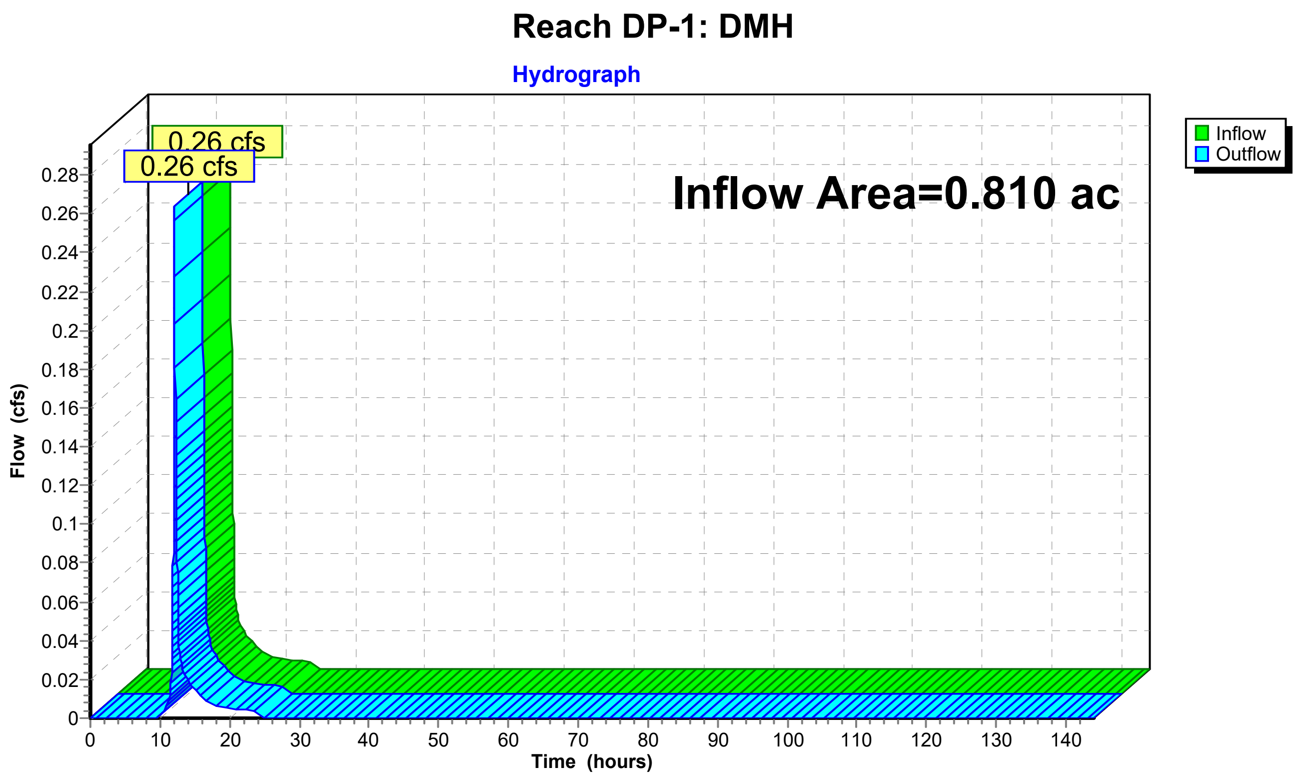
Subcatchment 5S-2: Sub -5S-2



Summary for Reach DP-1: DMH

Inflow Area =	0.810 ac, 63.61% Impervious, Inflow Depth = 0.28"	for 2-Year event	
Inflow =	0.26 cfs @ 12.09 hrs, Volume=	0.019 af	
Outflow =	0.26 cfs @ 12.09 hrs, Volume=	0.019 af, Atten= 0%, Lag= 0.0 min	

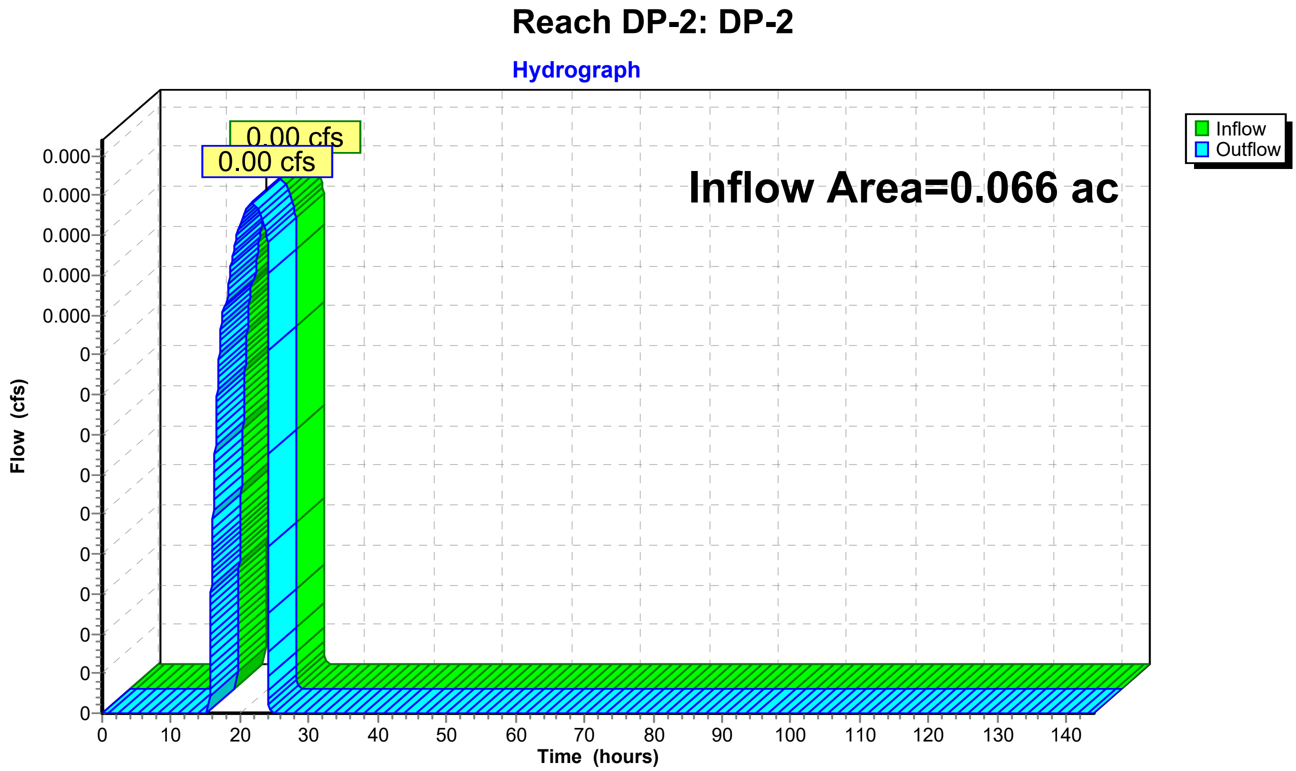
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-2: DP-2

Inflow Area = 0.066 ac, 0.00% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

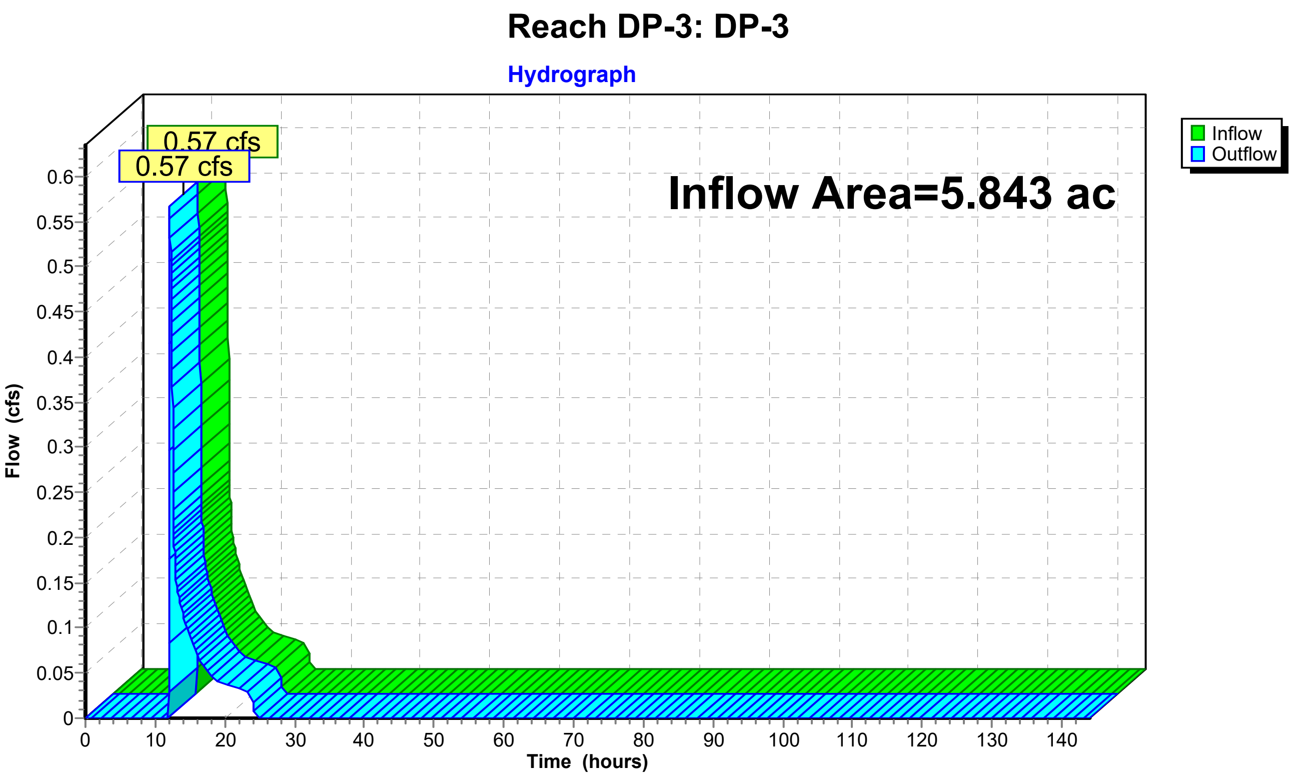
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-3: DP-3

Inflow Area = 5.843 ac, 34.58% Impervious, Inflow Depth = 0.16" for 2-Year event
Inflow = 0.57 cfs @ 12.14 hrs, Volume= 0.079 af
Outflow = 0.57 cfs @ 12.14 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

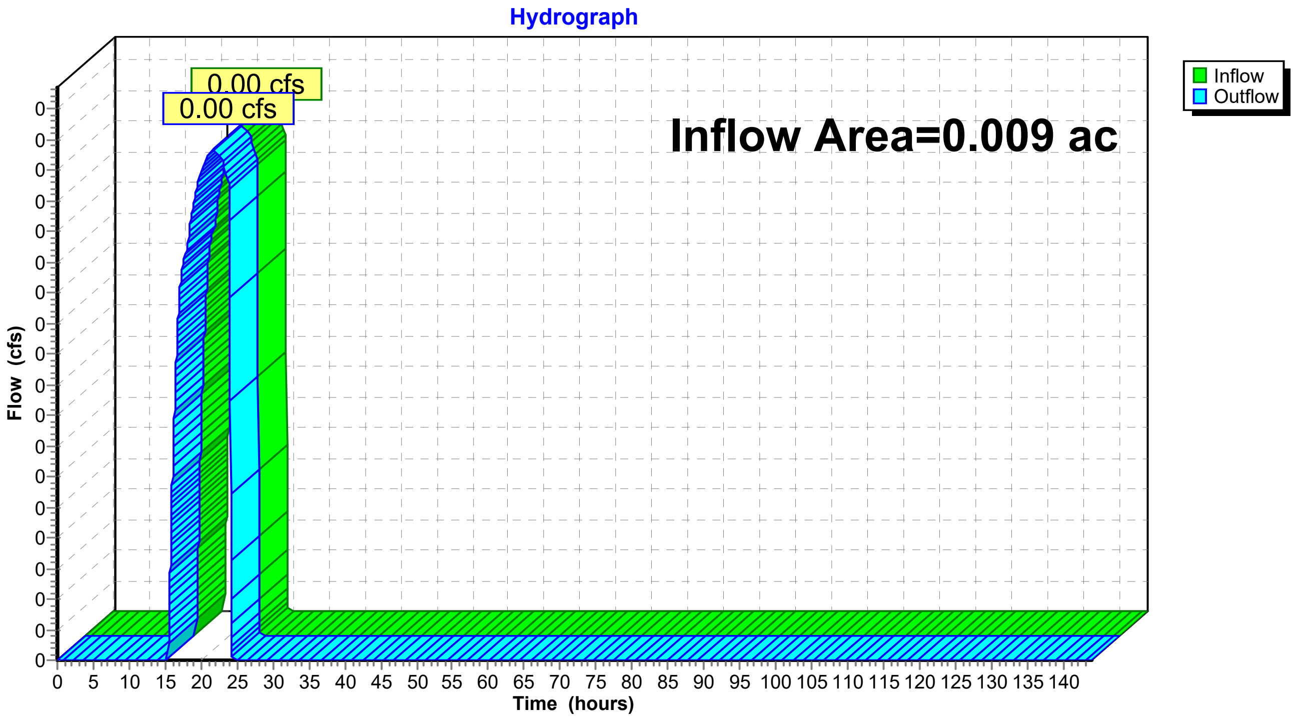


Summary for Reach DP-4: PL

Inflow Area = 0.009 ac, 0.00% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 21.68 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

Reach DP-4: PL

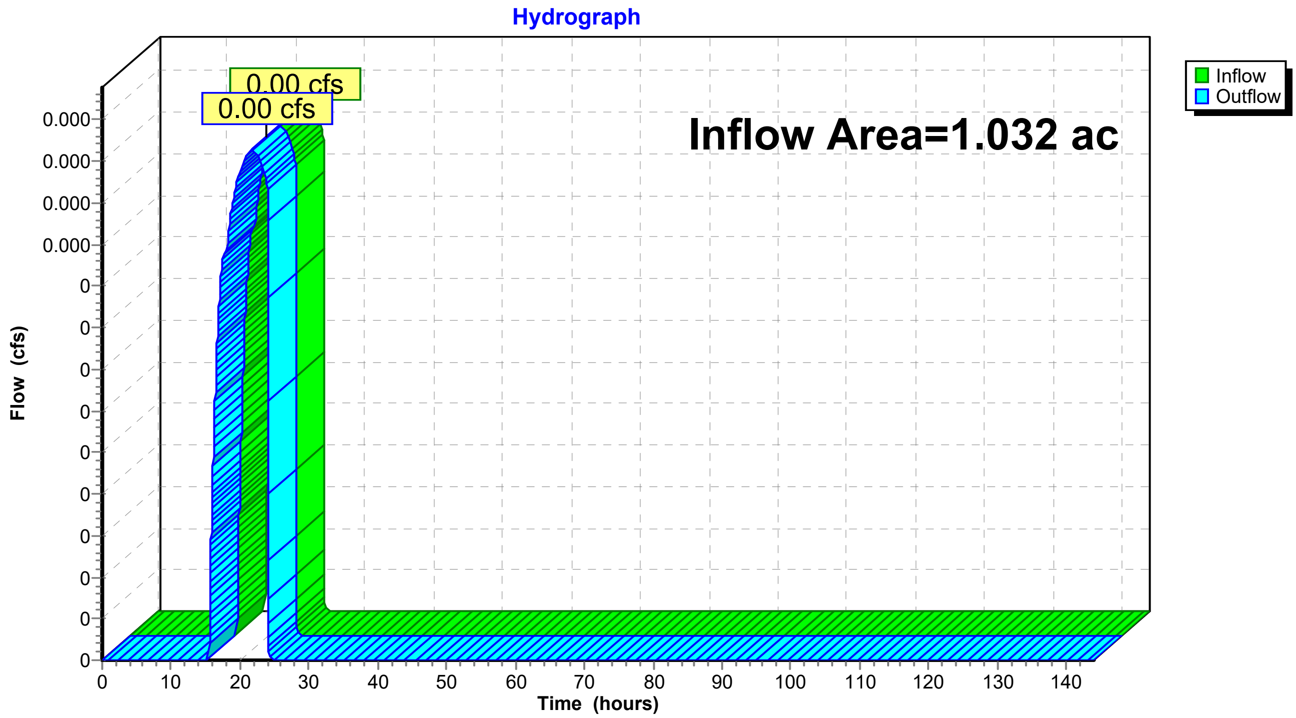


Summary for Reach DP-5: Ward Street

Inflow Area =	1.032 ac, 37.77% Impervious, Inflow Depth = 0.00"	for 2-Year event	
Inflow =	0.00 cfs @ 21.68 hrs, Volume=	0.000 af	
Outflow =	0.00 cfs @ 21.68 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

Reach DP-5: Ward Street



Summary for Pond IC-1: Infiltration Chambers

Inflow Area = 0.658 ac, 63.31% Impervious, Inflow Depth = 1.44" for 2-Year event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 0.079 af
Outflow = 0.29 cfs @ 11.96 hrs, Volume= 0.079 af, Atten= 73%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.96 hrs, Volume= 0.079 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 58.29' @ 12.50 hrs Surf.Area= 1,526 sf Storage= 673 cf

Plug-Flow detention time= 12.2 min calculated for 0.079 af (100% of inflow)
Center-of-Mass det. time= 12.2 min (861.1 - 848.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.50'	1,388 cf	**20.50'W x 74.43'L x 3.50'H Field A** 5,341 cf Overall - 1,871 cf Embedded = 3,470 cf x 40.0% Voids
#2A	58.00'	1,871 cf	**Cultec R-300HD** x 40 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 40 Chambers in 4 Rows Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf
		3,259 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.10'	**12.0" Round Culvert** L= 67.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.10' / 57.42' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.35'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	57.50'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.29 cfs @ 11.96 hrs HW=57.54' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.50' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IC-1: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

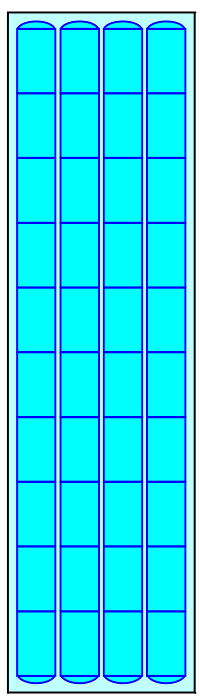
10 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 72.43' Row Length +12.0" End Stone x 2 = 74.43' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

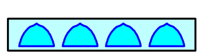
40 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 4 Rows = 1,870.9 cf Chamber Storage

5,340.6 cf Field - 1,870.9 cf Chambers = 3,469.7 cf Stone x 40.0% Voids = 1,387.9 cf Stone Storage

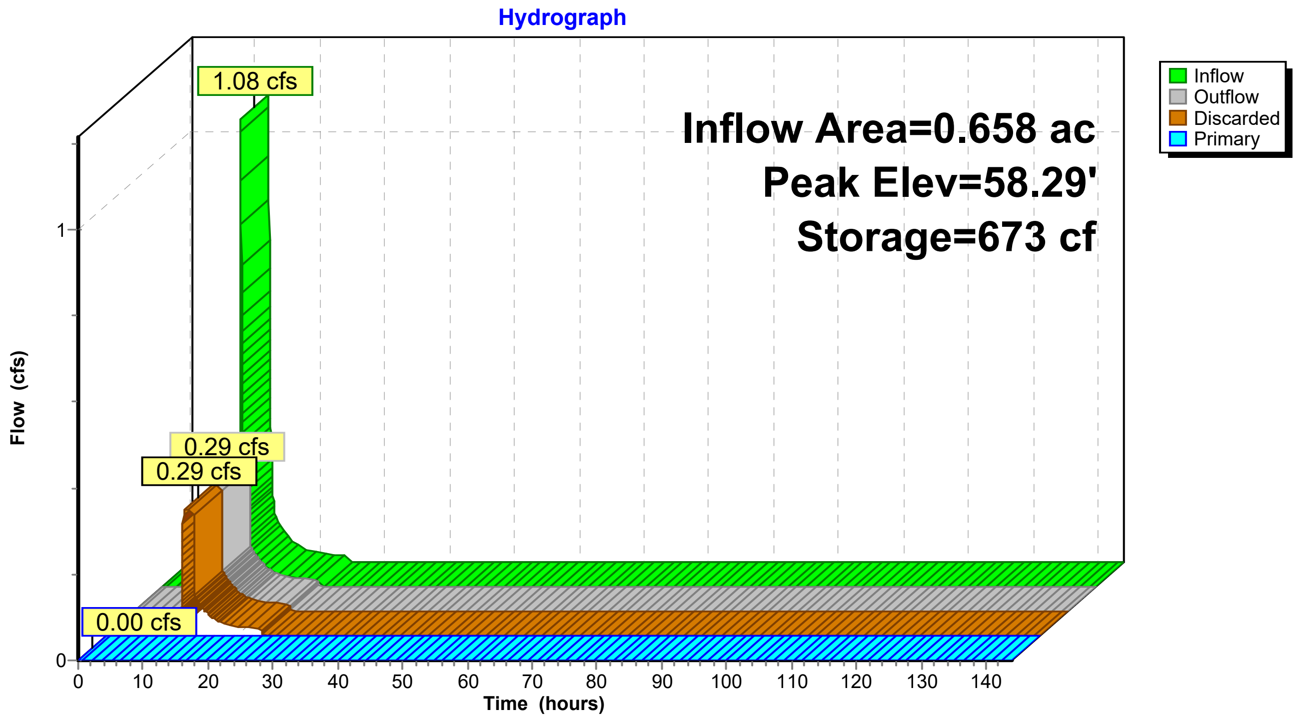
Chamber Storage + Stone Storage = 3,258.8 cf = 0.075 af
Overall Storage Efficiency = 61.0%
Overall System Size = 74.43' x 20.50' x 3.50'

40 Chambers
197.8 cy Field
128.5 cy Stone





Pond IC-1: Infiltration Chambers



Summary for Pond IC-2: Infiltration Chambers

Inflow Area = 3.098 ac, 57.89% Impervious, Inflow Depth = 1.32" for 2-Year event
Inflow = 4.50 cfs @ 12.09 hrs, Volume= 0.341 af
Outflow = 1.10 cfs @ 11.98 hrs, Volume= 0.341 af, Atten= 76%, Lag= 0.0 min
Discarded = 1.10 cfs @ 11.98 hrs, Volume= 0.341 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 60.49' @ 12.53 hrs Surf.Area= 5,725 sf Storage= 3,054 cf

Plug-Flow detention time= 14.9 min calculated for 0.341 af (100% of inflow)
Center-of-Mass det. time= 14.9 min (859.2 - 844.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	59.60'	5,405 cf	**70.25'W x 81.50'L x 4.00'H Field A**
			22,901 cf Overall - 9,389 cf Embedded = 13,512 cf x 40.0% Voids
#2A	60.10'	9,389 cf	**Cultec R-360HD** x 252 Inside #1
			Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
			Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
			252 Chambers in 12 Rows
			Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf
		14,794 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.17'	**12.0" Round Culvert**
			L= 24.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 58.17' / 58.05' S= 0.0050 '/' Cc= 0.900
			n= 0.013, Flow Area= 0.79 sf
#2	Device 1	61.40'	**9.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	63.50'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir**
			2 End Contraction(s)
#4	Discarded	59.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=1.10 cfs @ 11.98 hrs HW=59.67' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=59.60' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.00 cfs of 2.87 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond IC-2: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf

60.0" Wide + 9.0" Spacing = 69.0" C-C Row Spacing

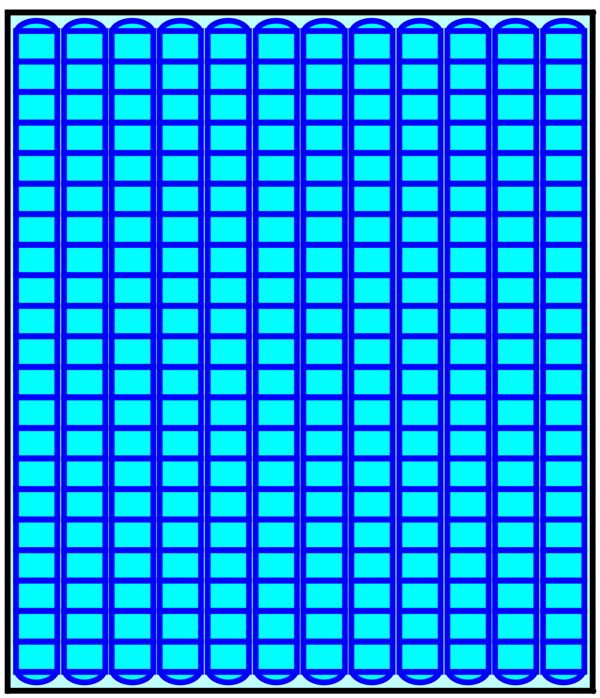
21 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 79.50' Row Length +12.0" End Stone x 2 = 81.50' Base Length
12 Rows x 60.0" Wide + 9.0" Spacing x 11 + 12.0" Side Stone x 2 = 70.25' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

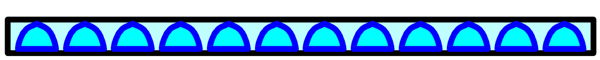
252 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 12 Rows = 9,389.5 cf Chamber Storage

22,901.5 cf Field - 9,389.5 cf Chambers = 13,512.0 cf Stone x 40.0% Voids = 5,404.8 cf Stone Storage

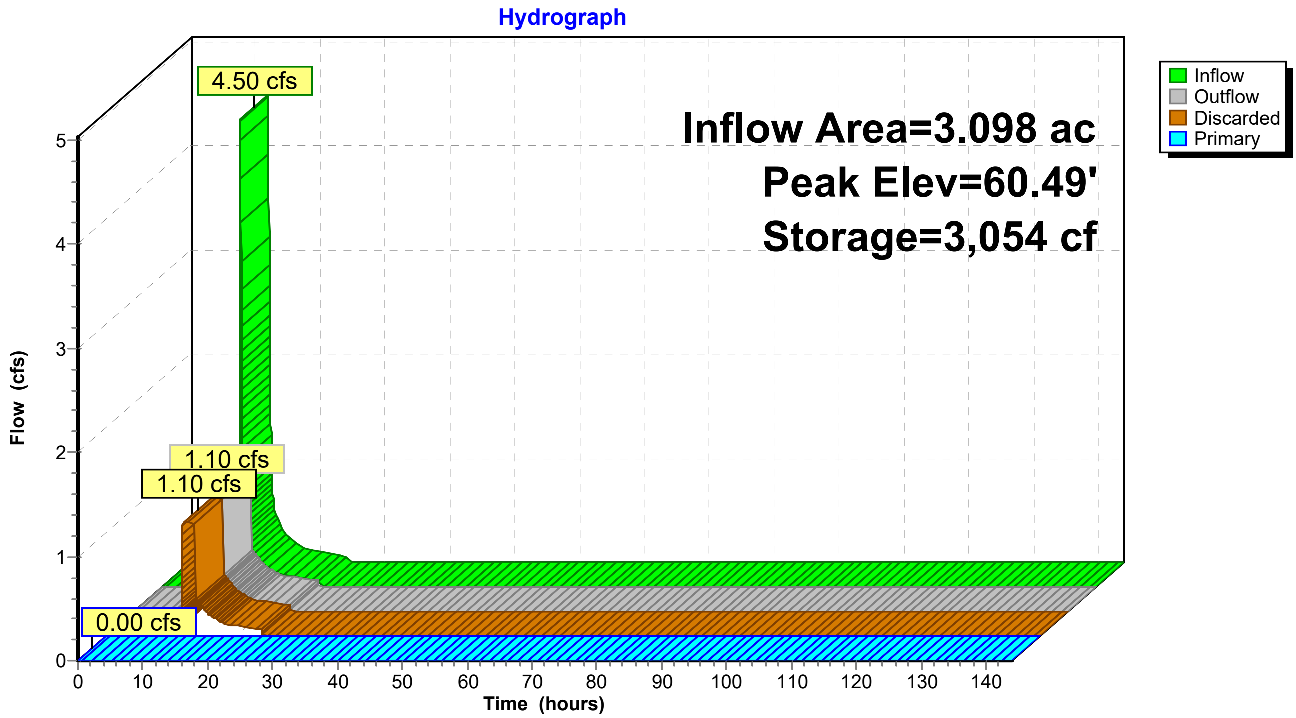
Chamber Storage + Stone Storage = 14,794.3 cf = 0.340 af
Overall Storage Efficiency = 64.6%
Overall System Size = 81.50' x 70.25' x 4.00'

252 Chambers
848.2 cy Field
500.4 cy Stone





Pond IC-2: Infiltration Chambers



Summary for Pond IC-3: Infiltration Chambers

Inflow Area = 0.968 ac, 40.25% Impervious, Inflow Depth = 0.86" for 2-Year event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 0.069 af
Outflow = 0.46 cfs @ 12.04 hrs, Volume= 0.069 af, Atten= 44%, Lag= 0.0 min
Discarded = 0.46 cfs @ 12.04 hrs, Volume= 0.069 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 52.79' @ 12.24 hrs Surf.Area= 2,418 sf Storage= 184 cf

Plug-Flow detention time= 1.9 min calculated for 0.069 af (100% of inflow)
Center-of-Mass det. time= 1.9 min (853.4 - 851.6)

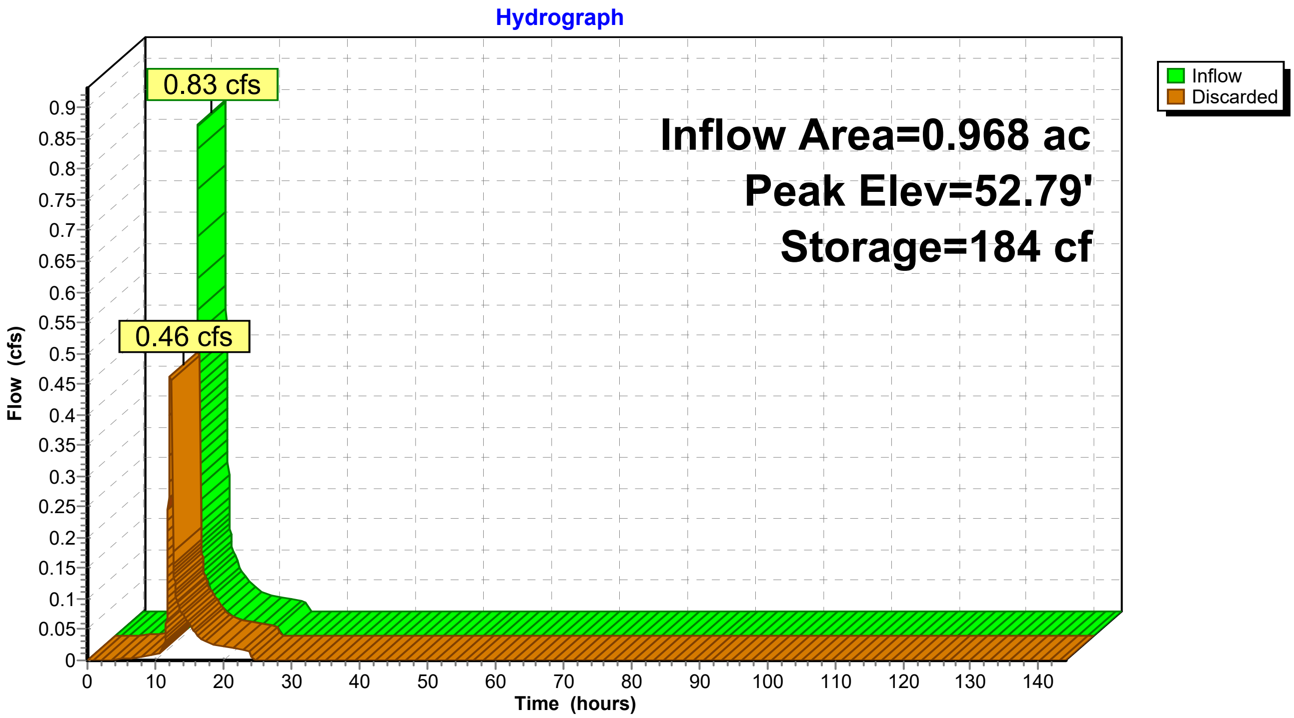
Volume	Invert	Avail.Storage	Storage Description
#1	52.60'	1,731 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 6,142 cf Overall - 1,814 cf Embedded = 4,328 cf x 40.0% Voids
#2	53.10'	1,814 cf	**Cultec R-150XLHD** x 66 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		3,545 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.60	2,418	0	0
55.14	2,418	6,142	6,142

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.46 cfs @ 12.04 hrs HW=52.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.46 cfs)

Pond IC-3: Infiltration Chambers



Time span=0.00-144.00 hrs, dt=0.02 hrs, 7201 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

Subcatchment1S: Sub-1S Runoff Area=6,628 sf 64.88% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=77 Runoff=0.44 cfs 0.031 af

Subcatchment1S-1: Sub-1S-1 Runoff Area=28,660 sf 63.31% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=76 Runoff=1.82 cfs 0.130 af

Subcatchment2S: Sub-2S Runoff Area=2,885 sf 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment3S: Sub-3S Runoff Area=99,262 sf 9.98% Impervious Runoff Depth=0.94"
Tc=6.0 min CN=56 Runoff=2.00 cfs 0.179 af

Subcatchment3S-1: Sub-3S-1 Runoff Area=126,669 sf 55.14% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=72 Runoff=6.86 cfs 0.496 af

Subcatchment3S-1R: Roofs 20-22 Runoff Area=6,010 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.65 cfs 0.052 af

Subcatchment3S-2: Sub-3S-2 Runoff Area=20,324 sf 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=38 Runoff=0.01 cfs 0.005 af

Subcatchment3S-2R: Roofs 24-25 Front Runoff Area=2,273 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.24 cfs 0.020 af

Subcatchment4S: Sub-4S Runoff Area=375 sf 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment5S: Sub -5S Runoff Area=16,999 sf 15.22% Impervious Runoff Depth=0.51"
Tc=6.0 min CN=48 Runoff=0.11 cfs 0.017 af

Subcatchment5S-1: Sub-5S-1 Runoff Area=22,924 sf 52.92% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=71 Runoff=1.19 cfs 0.086 af

Subcatchment5S-1R: Roof 23 Front/Back Runoff Area=2,256 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.24 cfs 0.020 af

Subcatchment5S-2: Sub -5S-2 Runoff Area=2,764 sf 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Reach DP-1: DMH Inflow=0.44 cfs 0.031 af
Outflow=0.44 cfs 0.031 af

Reach DP-2: DP-2 Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach DP-3: DP-3 Inflow=2.00 cfs 0.184 af
Outflow=2.00 cfs 0.184 af

Reach DP-4: PL Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Ward Street Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond IC-1: Infiltration Chambers Peak Elev=59.10' Storage=1,639 cf Inflow=1.82 cfs 0.130 af
Discarded=0.29 cfs 0.130 af Primary=0.00 cfs 0.000 af Outflow=0.29 cfs 0.130 af

Pond IC-2: Infiltration Chambers Peak Elev=61.44' Storage=7,459 cf Inflow=7.75 cfs 0.568 af
Discarded=1.10 cfs 0.568 af Primary=0.01 cfs 0.000 af Outflow=1.10 cfs 0.568 af

Pond IC-3: Infiltration Chambers Peak Elev=53.29' Storage=863 cf Inflow=1.52 cfs 0.123 af
Outflow=0.46 cfs 0.123 af

Total Runoff Area = 7.760 ac Runoff Volume = 1.037 af Average Runoff Depth = 1.60"
62.30% Pervious = 4.834 ac 37.70% Impervious = 2.926 ac

Summary for Subcatchment 1S: Sub-1S

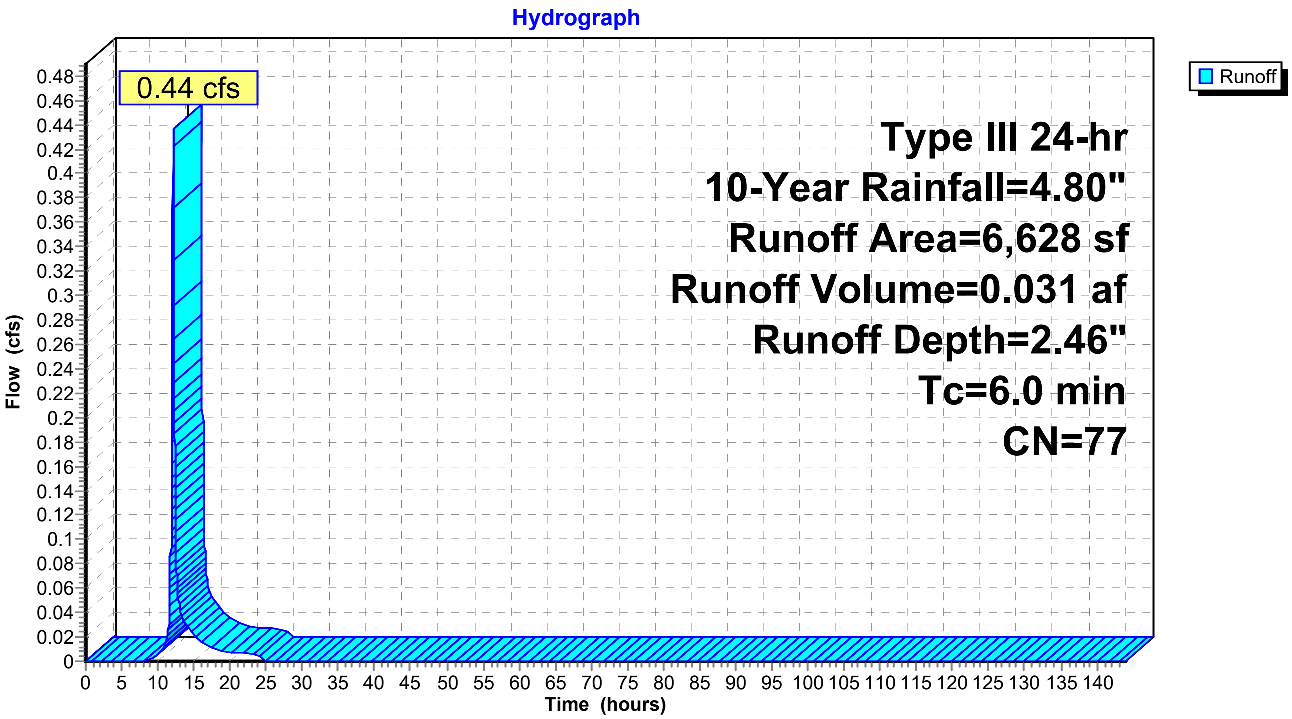
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 2.46"
Routed to Reach DP-1 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	2,328	39	>75% Grass cover, Good, HSG A
	3,451	98	Paved roads w/curbs & sewers, HSG A
*	849	98	Paved sidewalk, HSG A
	6,628	77	Weighted Average
	2,328		35.12% Pervious Area
	4,300		64.88% Impervious Area

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

Subcatchment 1S: Sub-1S



Summary for Subcatchment 1S-1: Sub-1S-1

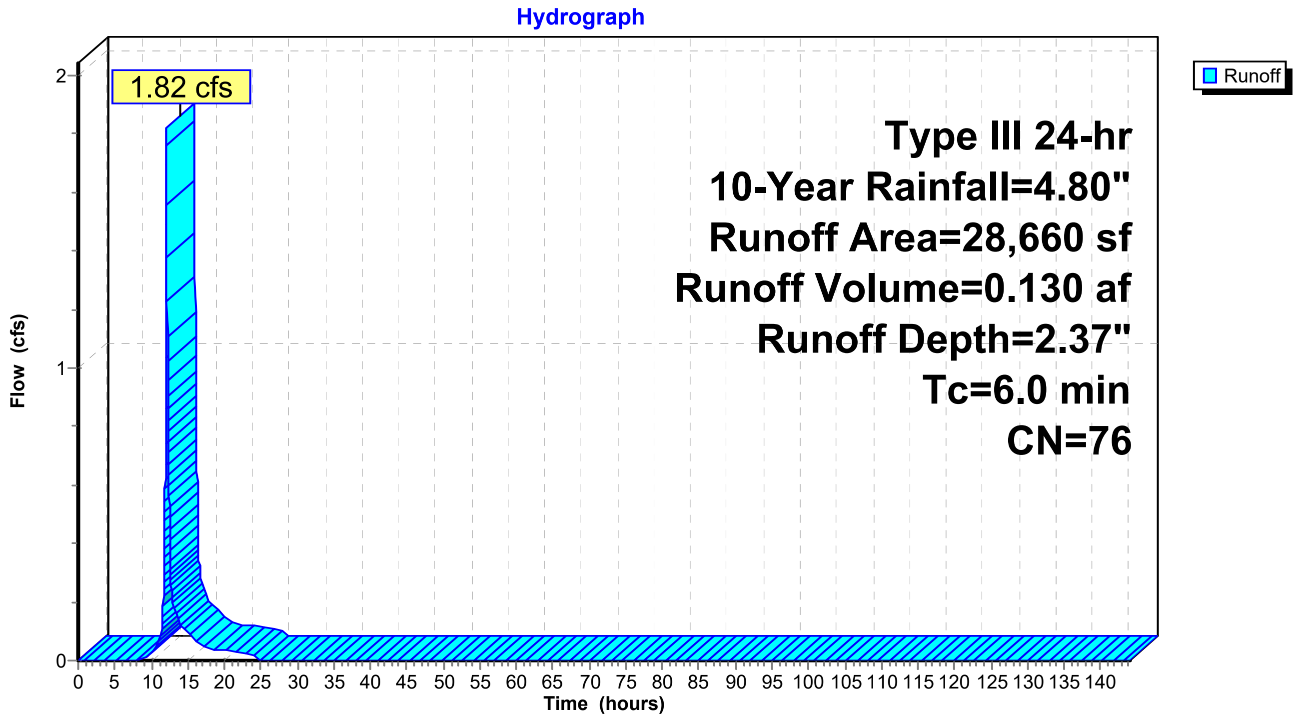
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.130 af, Depth= 2.37"
Routed to Pond IC-1 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	10,515	39	>75% Grass cover, Good, HSG A
	3,661	98	Paved roads w/curbs & sewers, HSG A
*	1,004	98	Paved sidewalk, HSG A
*	2,080	98	Paved drives, HSG A
*	752	98	Decks, HSG A
	10,407	98	Roofs, HSG A
*	241	98	Paved walks, HSG A
	28,660	76	Weighted Average
	10,515		36.69% Pervious Area
	18,145		63.31% Impervious Area

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

Subcatchment 1S-1: Sub-1S-1



Summary for Subcatchment 2S: Sub-2S

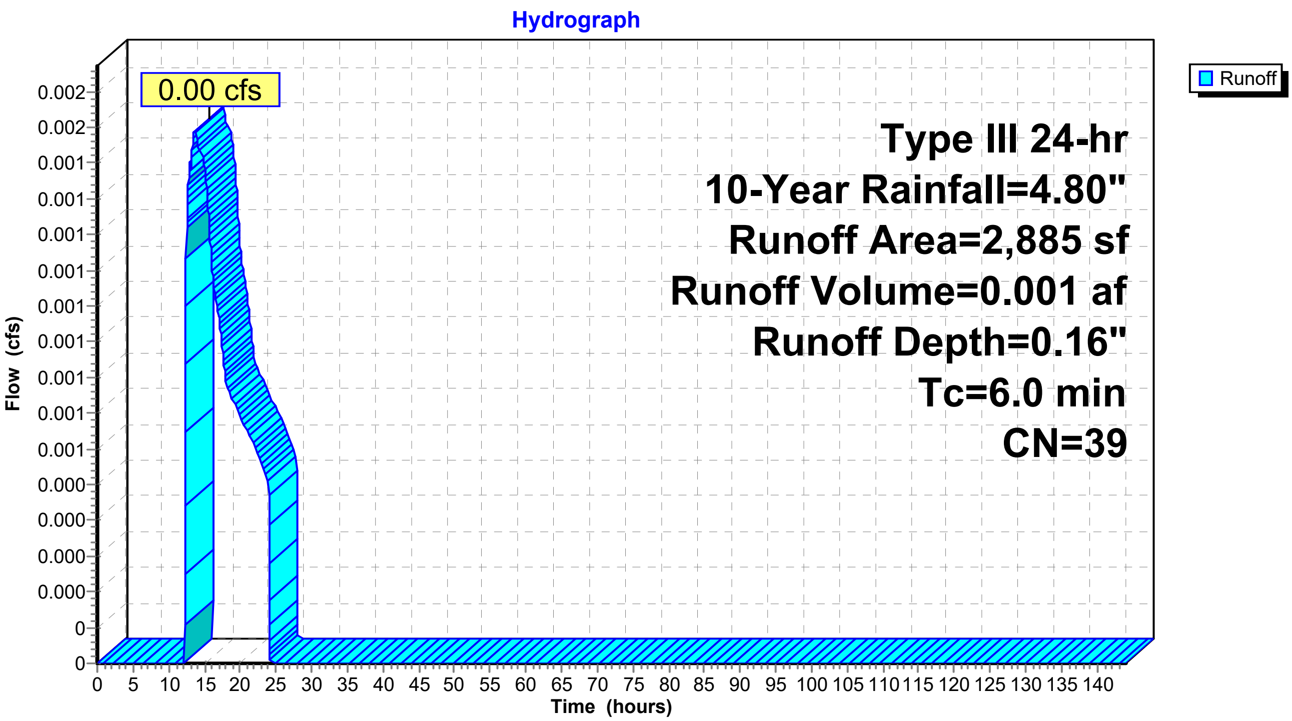
Runoff = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af, Depth= 0.16"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,885	39	>75% Grass cover, Good, HSG A
2,885		100.00% Pervious Area

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

Subcatchment 2S: Sub-2S



Summary for Subcatchment 3S: Sub-3S

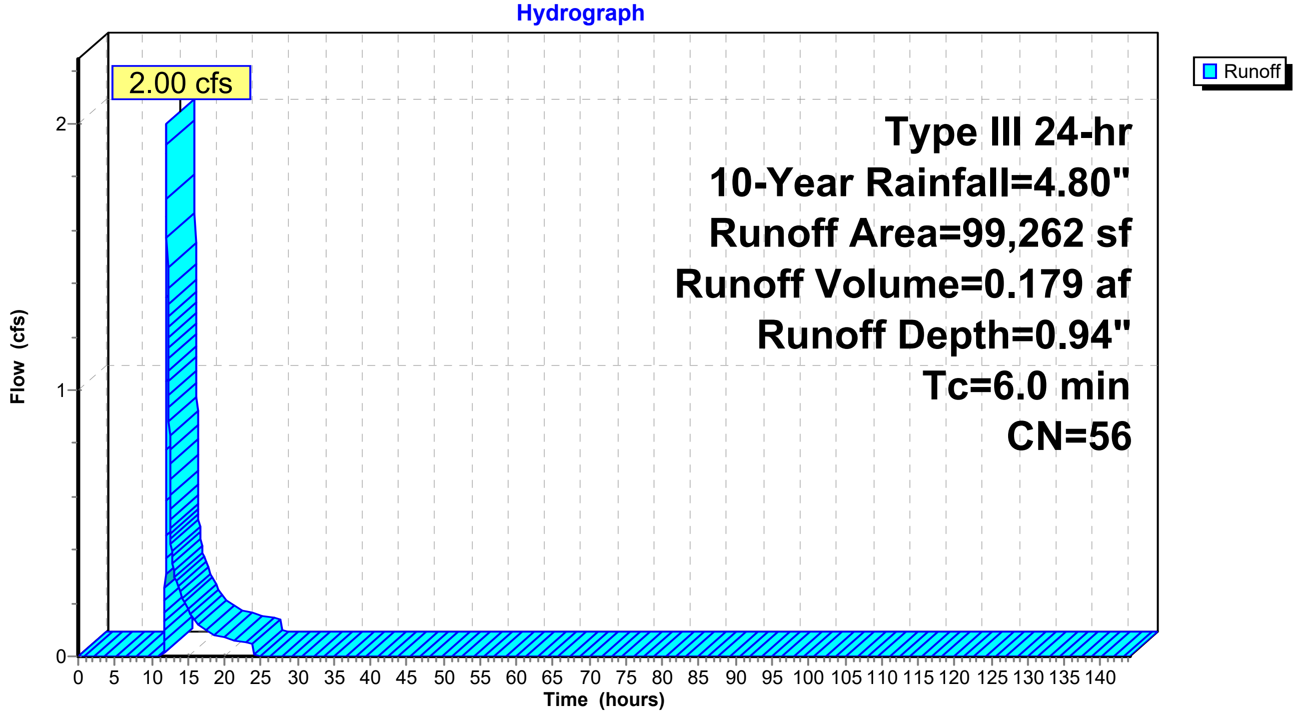
Runoff = 2.00 cfs @ 12.11 hrs, Volume= 0.179 af, Depth= 0.94"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	290	98	Paved drives, HSG A - offsite
*	4,310	30	Woods, Good, HSG A - offsite
*	1,734	55	Woods, Good, HSG B - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
	23,550	61	>75% Grass cover, Good, HSG B
	20,523	39	>75% Grass cover, Good, HSG A
*	454	98	Decks, HSG A
*	895	98	Decks, HSG B
	2,628	98	Roofs, HSG A
	5,310	98	Roofs, HSG B
*	167	98	Riprap, HSG B
*	160	98	Riprap, HSG A
	34,033	55	Woods, Good, HSG B
	130	30	Woods, Good, HSG A
	99,262	56	Weighted Average
	89,358		90.02% Pervious Area
	9,904		9.98% Impervious Area

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

Subcatchment 3S: Sub-3S



Summary for Subcatchment 3S-1: Sub-3S-1

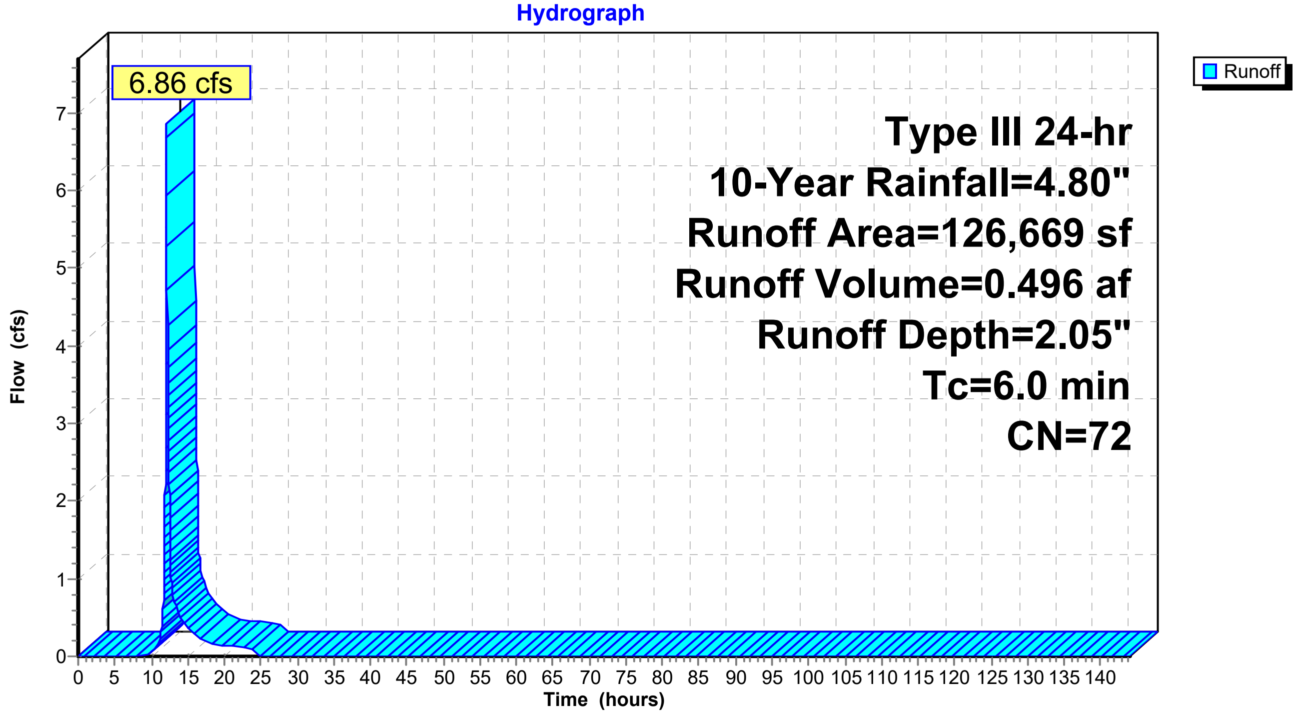
Runoff = 6.86 cfs @ 12.09 hrs, Volume= 0.496 af, Depth= 2.05"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	8,418	98	Paved drives, HSG A
*	2,654	98	Paved drives, HSG B
*	9,803	98	Paved roads w/curbs & sewers, HSG A
*	7,871	98	Paved roads w/curbs & sewers, HSG B
*	736	98	Walks, HSG A
*	335	98	Walks, HSG B
*	43,330	39	>75% Grass cover, Good, HSG A
*	5,078	61	>75% Grass cover, Good, HSG B
*	1,706	98	Decks, HSG A
*	84	98	Decks, HSG B
*	7,838	98	Roofs, HSG B
*	27,432	98	Roofs, HSG A
*	8,421	39	>75% Grass cover, Good, HSG A
*	1,911	98	Paved sidewalk, HSG A
*	1,052	98	Paved sidewalk, HSG B
	126,669	72	Weighted Average
	56,829		44.86% Pervious Area
	69,840		55.14% Impervious Area

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

Subcatchment 3S-1: Sub-3S-1



Summary for Subcatchment 3S-1R: Roofs 20-22 Front/Back

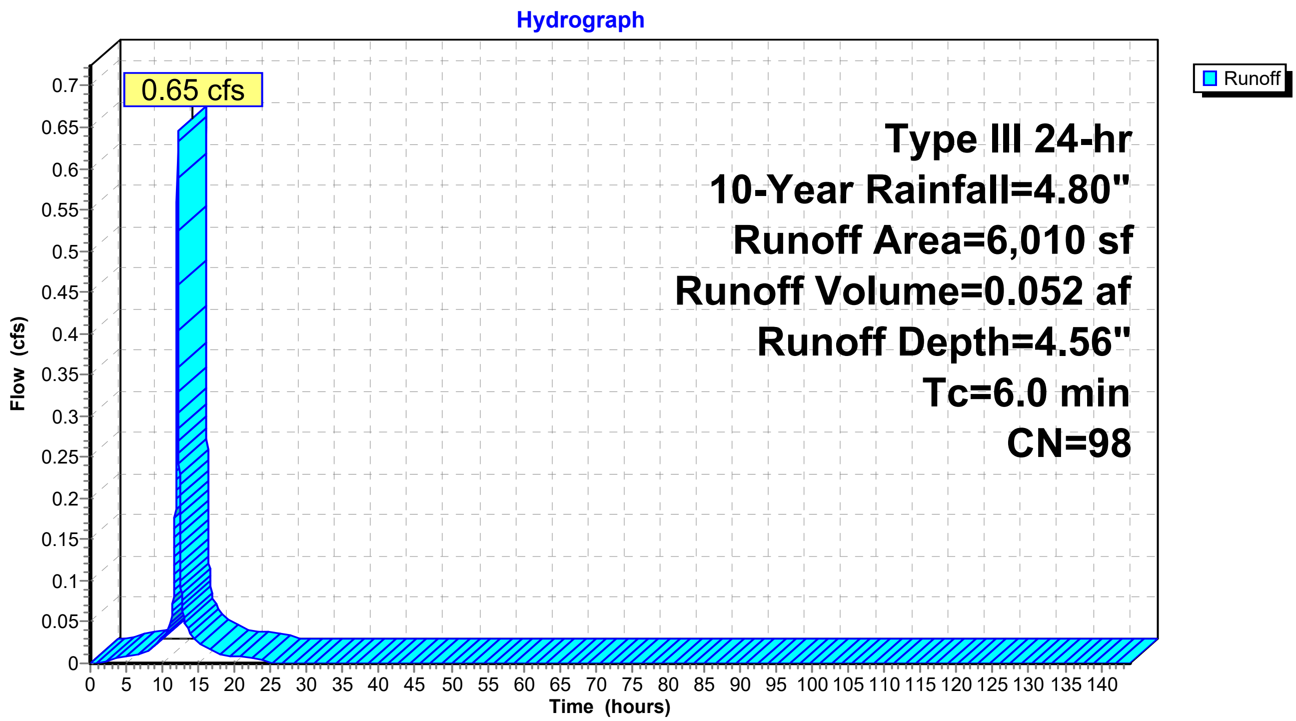
Runoff = 0.65 cfs @ 12.08 hrs, Volume= 0.052 af, Depth= 4.56"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	6,010	98	Roofs, HSG A
	6,010		100.00% Impervious Area

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

Subcatchment 3S-1R: Roofs 20-22 Front/Back



Summary for Subcatchment 3S-2: Sub-3S-2

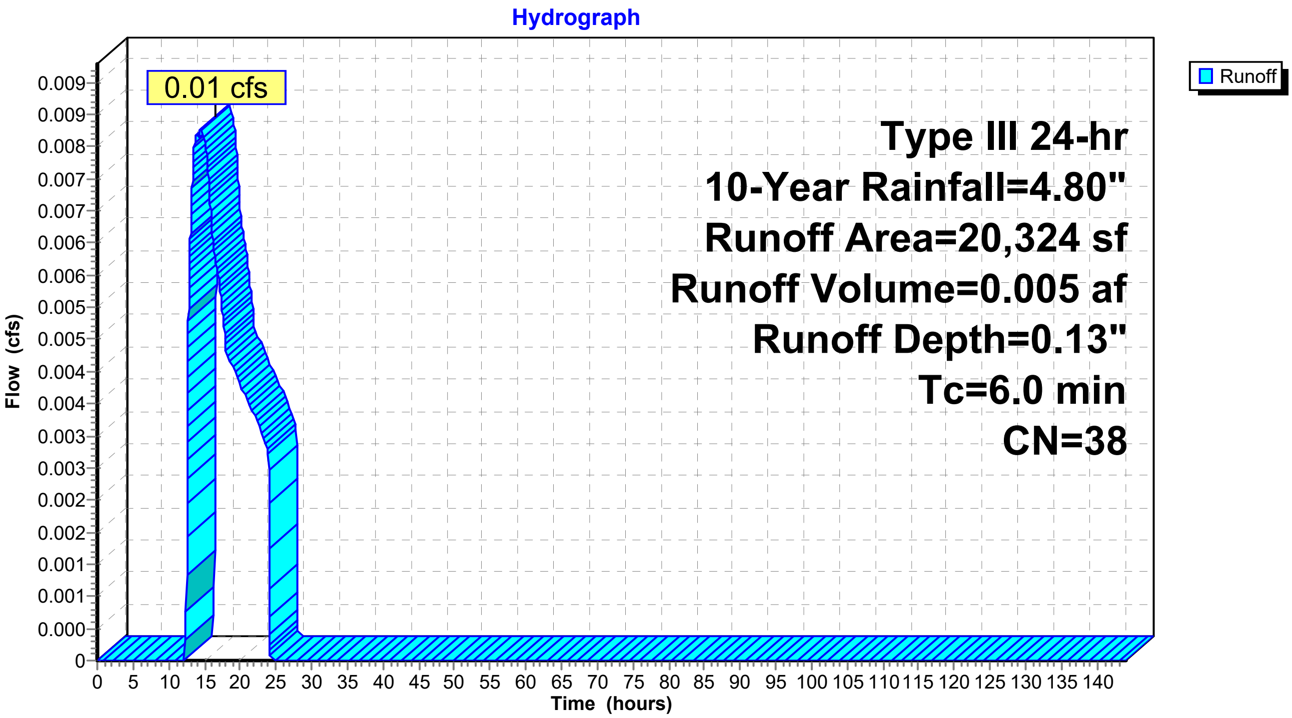
Runoff = 0.01 cfs @ 14.56 hrs, Volume= 0.005 af, Depth= 0.13"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	18,642	39	>75% Grass cover, Good, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
	20,324	38	Weighted Average
	20,324		100.00% Pervious Area

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

Subcatchment 3S-2: Sub-3S-2



Summary for Subcatchment 3S-2R: Roofs 24-25 Front

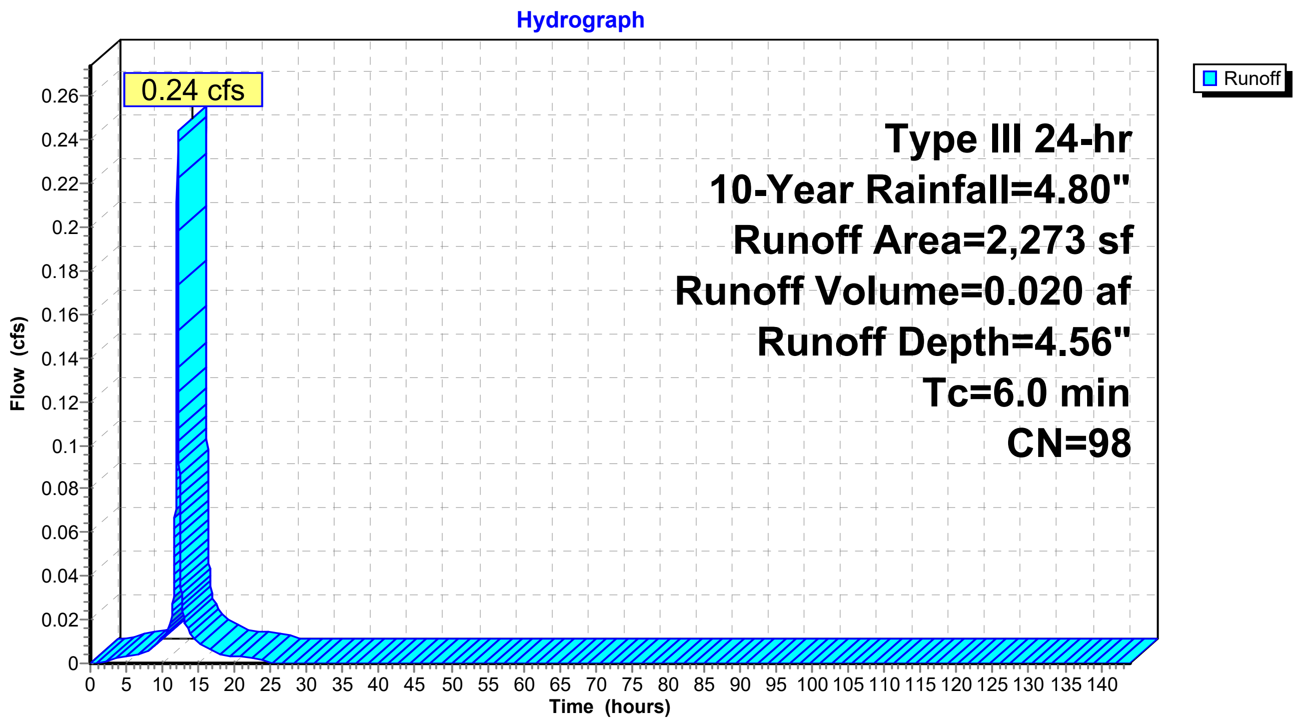
Runoff = 0.24 cfs @ 12.08 hrs, Volume= 0.020 af, Depth= 4.56"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,273	98	Roofs, HSG A
2,273		100.00% Impervious Area

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

Subcatchment 3S-2R: Roofs 24-25 Front



Summary for Subcatchment 4S: Sub-4S

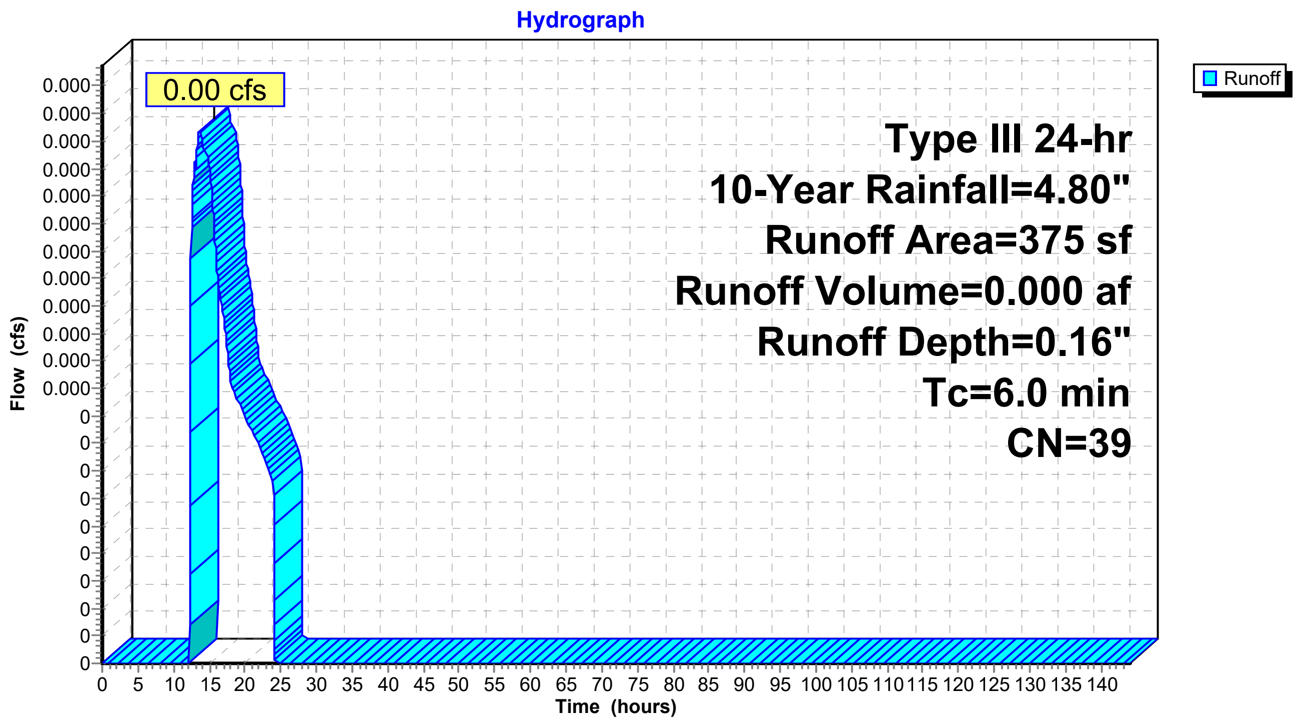
Runoff = 0.00 cfs @ 13.68 hrs, Volume= 0.000 af, Depth= 0.16"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
375	39	>75% Grass cover, Good, HSG A
375		100.00% Pervious Area

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

Subcatchment 4S: Sub-4S



Summary for Subcatchment 5S: Sub -5S

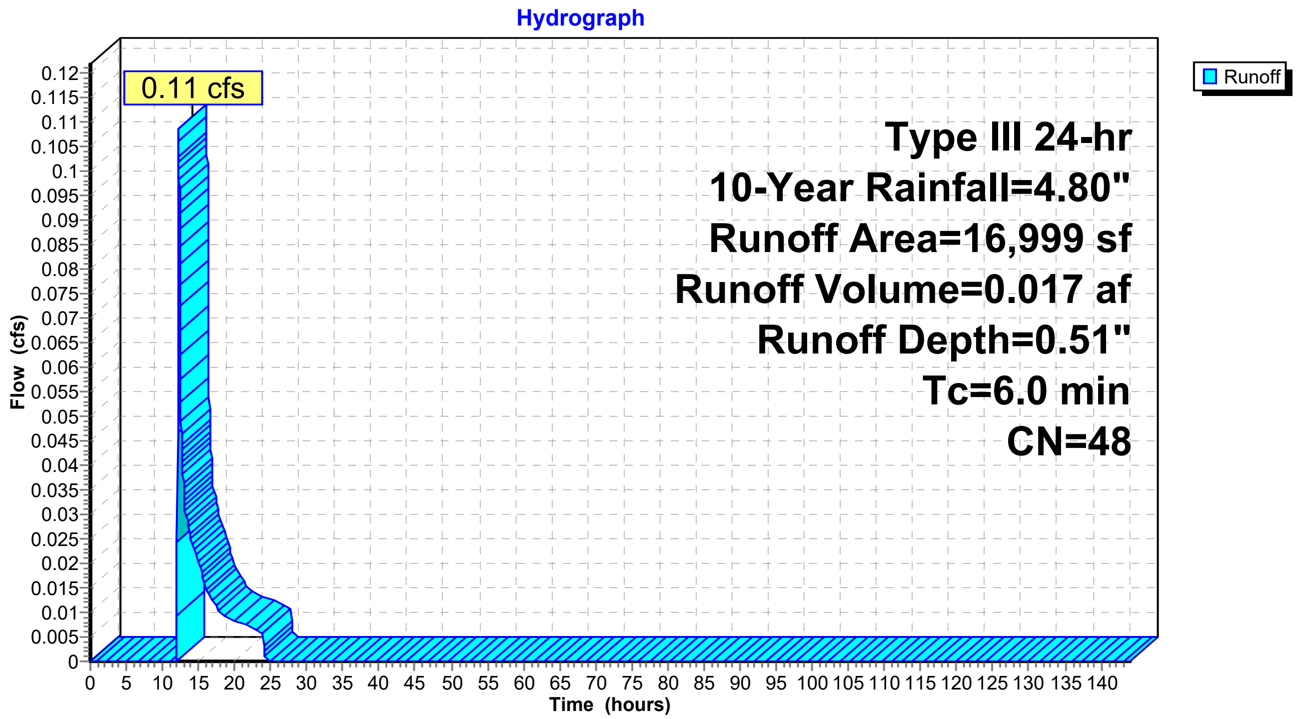
Runoff = 0.11 cfs @ 12.15 hrs, Volume= 0.017 af, Depth= 0.51"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	156	98	Decks, HSG A
	14,411	39	>75% Grass cover, Good, HSG A
*	525	98	Walls, HSG A
	1,907	98	Roofs, HSG A
	16,999	48	Weighted Average
	14,411		84.78% Pervious Area
	2,588		15.22% Impervious Area

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

Subcatchment 5S: Sub -5S



Summary for Subcatchment 5S-1: Sub-5S-1

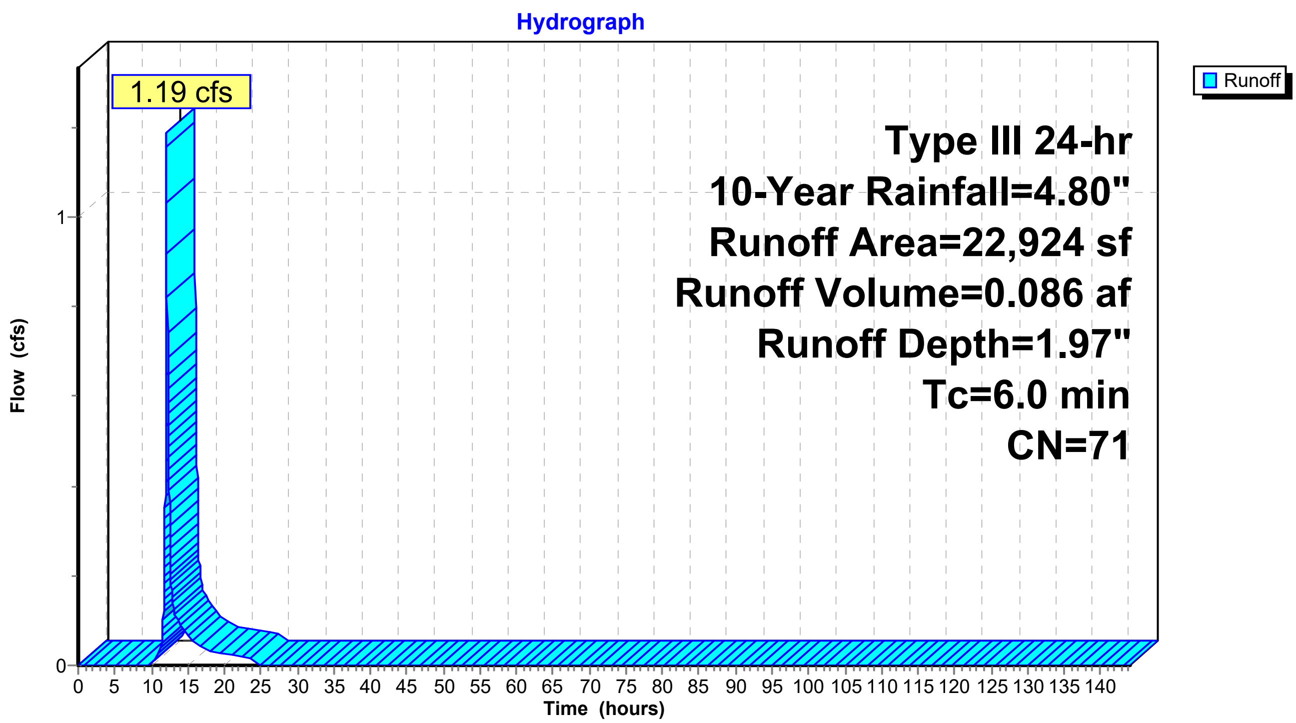
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.086 af, Depth= 1.97"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	6,186	98	Paved drives, HSG A
	2,972	98	Paved roads w/curbs & sewers, HSG A
*	247	98	Walks, HSG A
	10,428	39	>75% Grass cover, Good, HSG A
*	1,508	98	Paved sidewalk, HSG A
*	62	98	Paved sidewalk, HSG D
	286	98	Paved roads w/curbs & sewers, HSG D
	365	80	>75% Grass cover, Good, HSG D
*	272	98	Walls, HSG A
*	598	98	Decks, HSG A
	22,924	71	Weighted Average
	10,793		47.08% Pervious Area
	12,131		52.92% Impervious Area

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

Subcatchment 5S-1: Sub-5S-1



Summary for Subcatchment 5S-1R: Roof 23 Front/Back

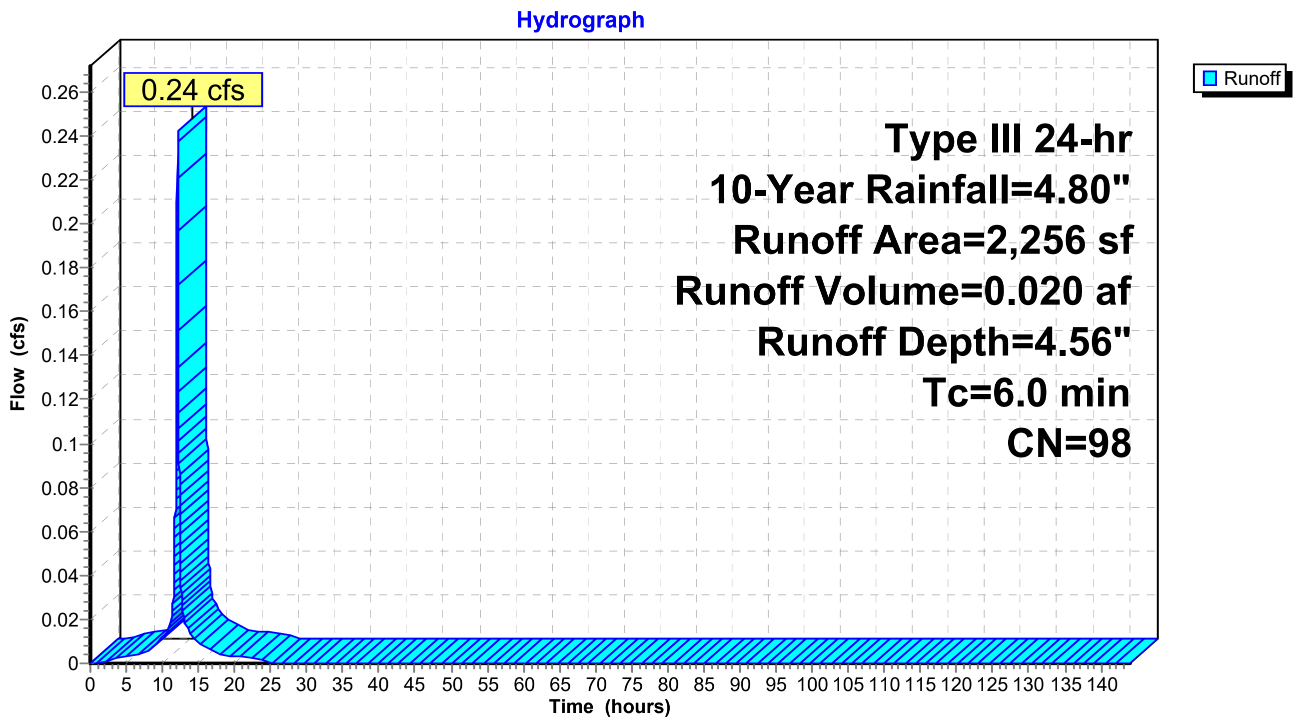
Runoff = 0.24 cfs @ 12.08 hrs, Volume= 0.020 af, Depth= 4.56"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	2,256	98	Roofs, HSG A
	2,256		100.00% Impervious Area

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

Subcatchment 5S-1R: Roof 23 Front/Back



Summary for Subcatchment 5S-2: Sub -5S-2

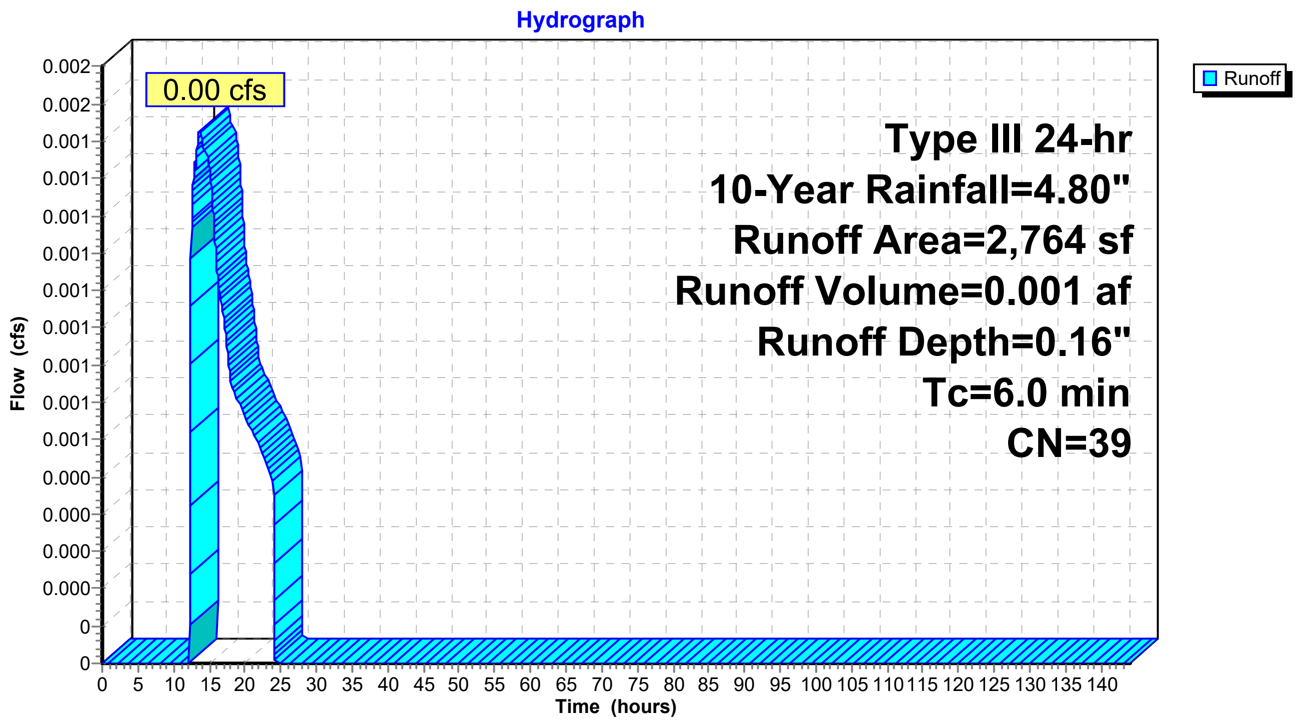
Runoff = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af, Depth= 0.16"
Routed to Reach DP-5 : Ward Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,764	39	>75% Grass cover, Good, HSG A
2,764		100.00% Pervious Area

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

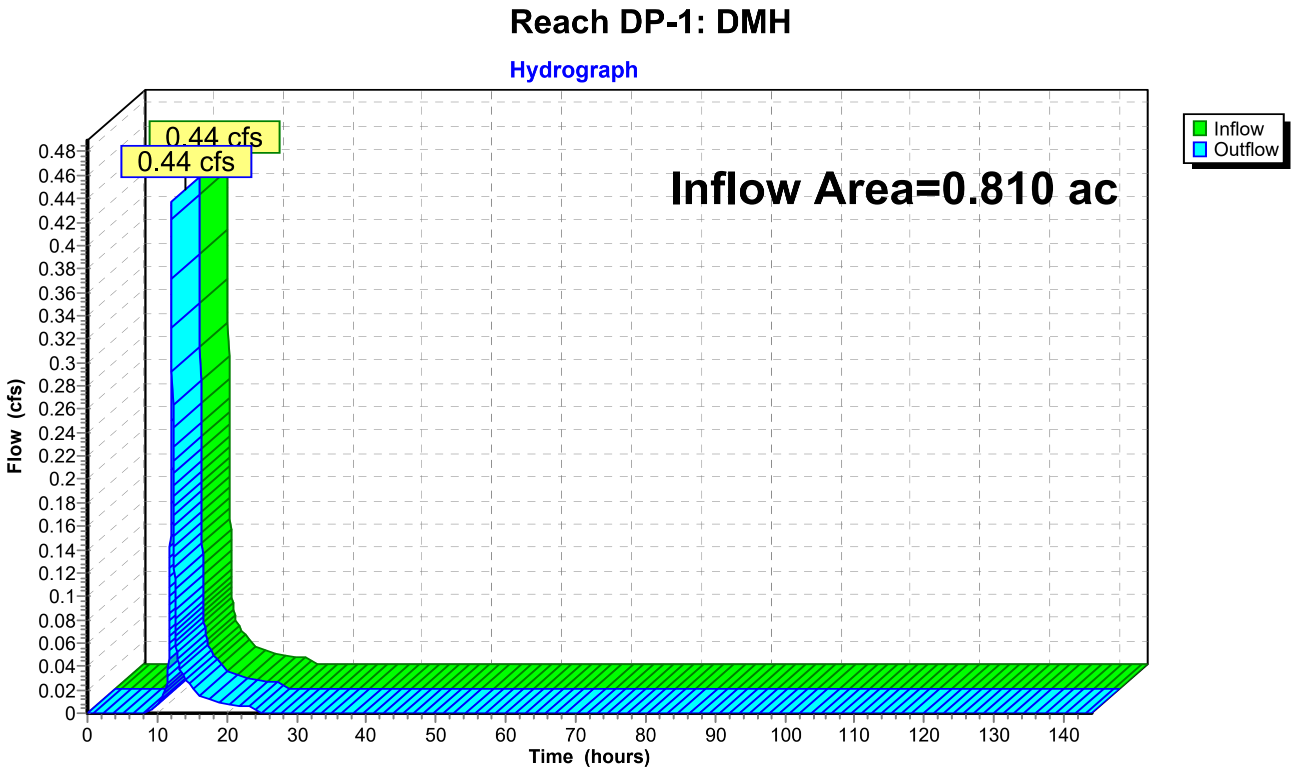
Subcatchment 5S-2: Sub -5S-2



Summary for Reach DP-1: DMH

Inflow Area = 0.810 ac, 63.61% Impervious, Inflow Depth = 0.46" for 10-Year event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 0.031 af
Outflow = 0.44 cfs @ 12.09 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

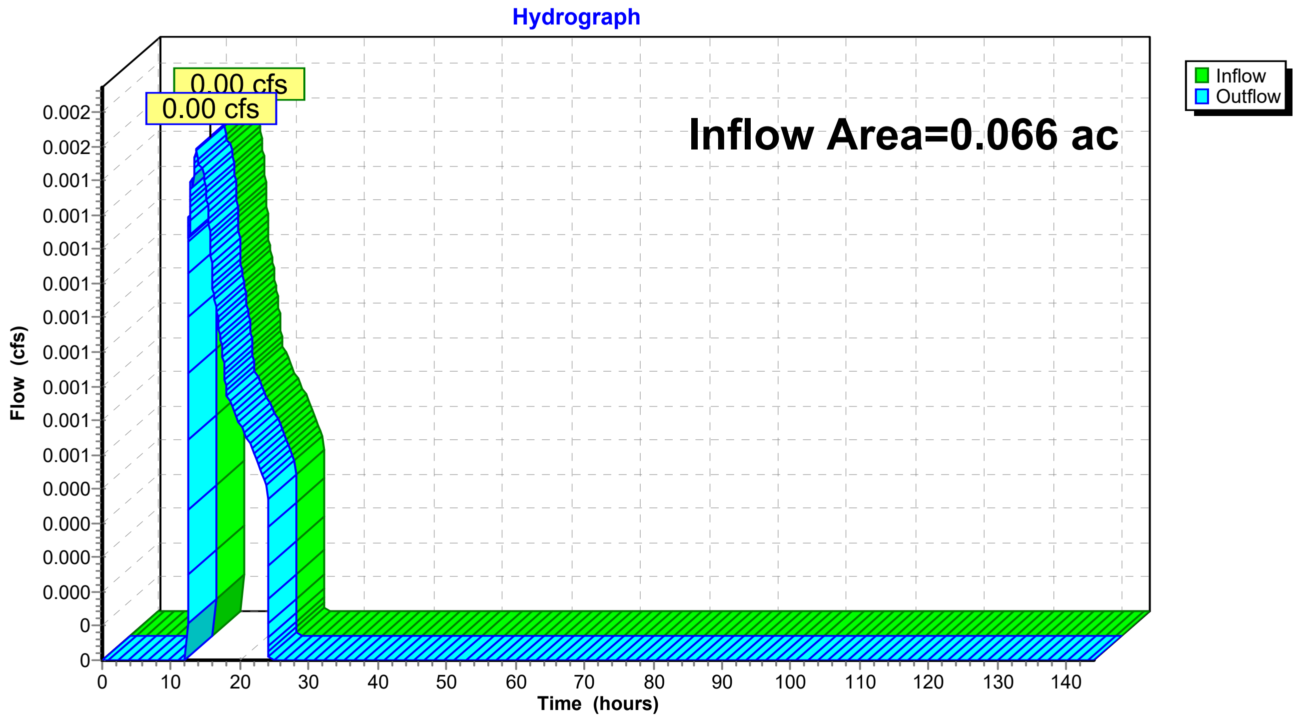


Summary for Reach DP-2: DP-2

Inflow Area =	0.066 ac,	0.00% Impervious, Inflow Depth = 0.16"	for 10-Year event
Inflow =	0.00 cfs @	13.68 hrs, Volume=	0.001 af
Outflow =	0.00 cfs @	13.68 hrs, Volume=	0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

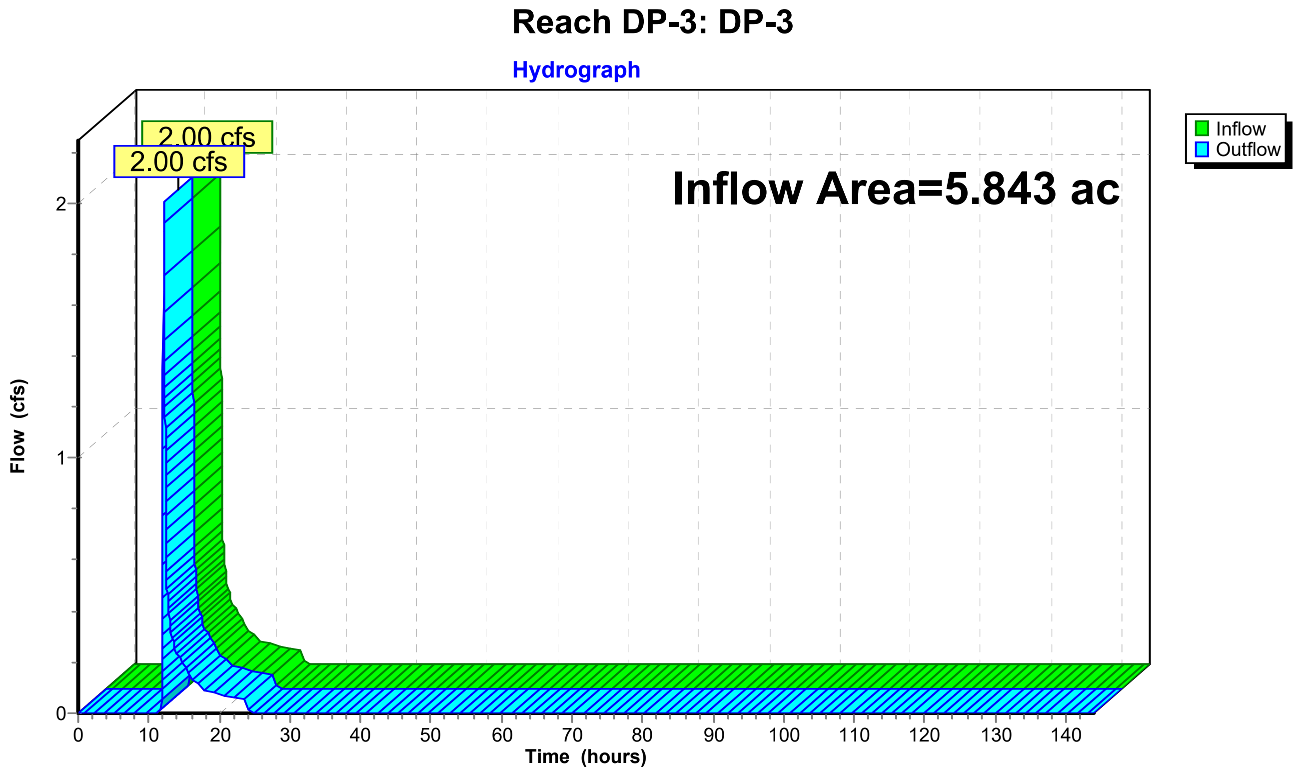
Reach DP-2: DP-2



Summary for Reach DP-3: DP-3

Inflow Area = 5.843 ac, 34.58% Impervious, Inflow Depth = 0.38" for 10-Year event
Inflow = 2.00 cfs @ 12.11 hrs, Volume= 0.184 af
Outflow = 2.00 cfs @ 12.11 hrs, Volume= 0.184 af, Atten= 0%, Lag= 0.0 min

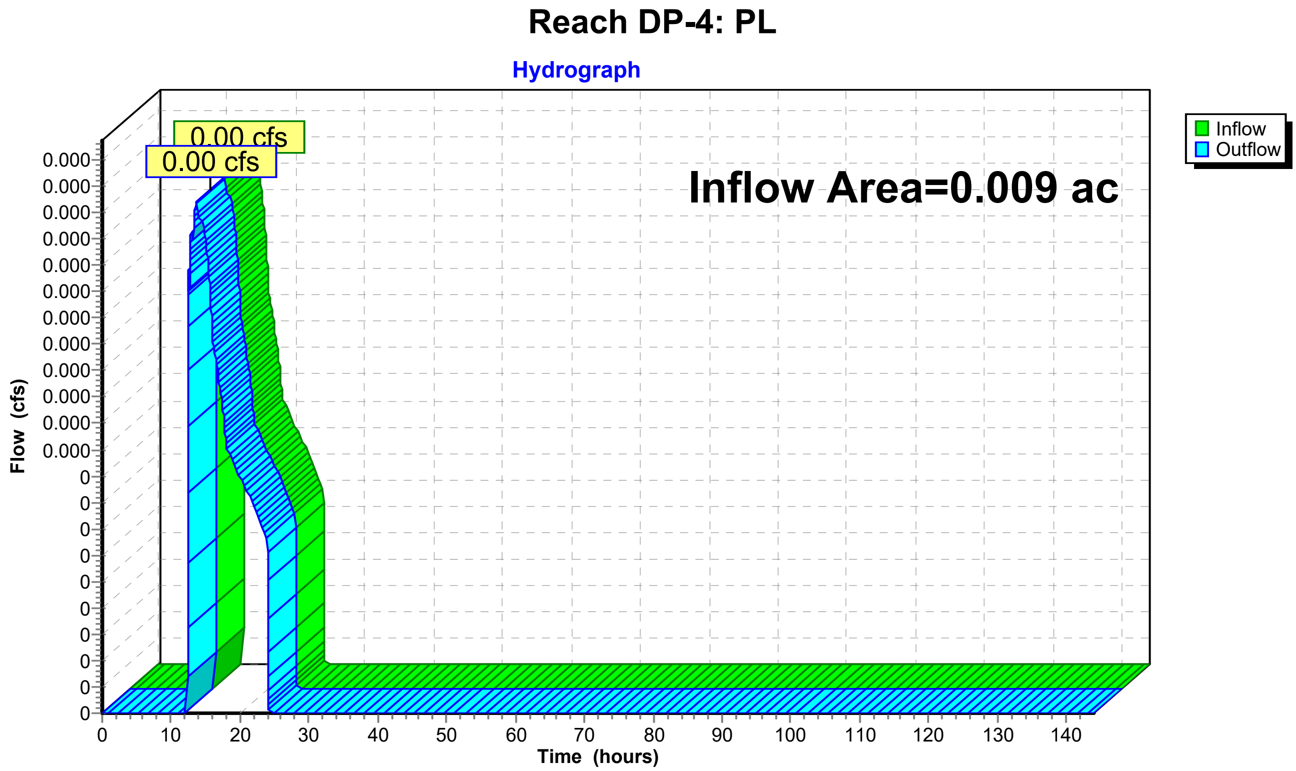
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-4: PL

Inflow Area = 0.009 ac, 0.00% Impervious, Inflow Depth = 0.16" for 10-Year event
Inflow = 0.00 cfs @ 13.68 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 13.68 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

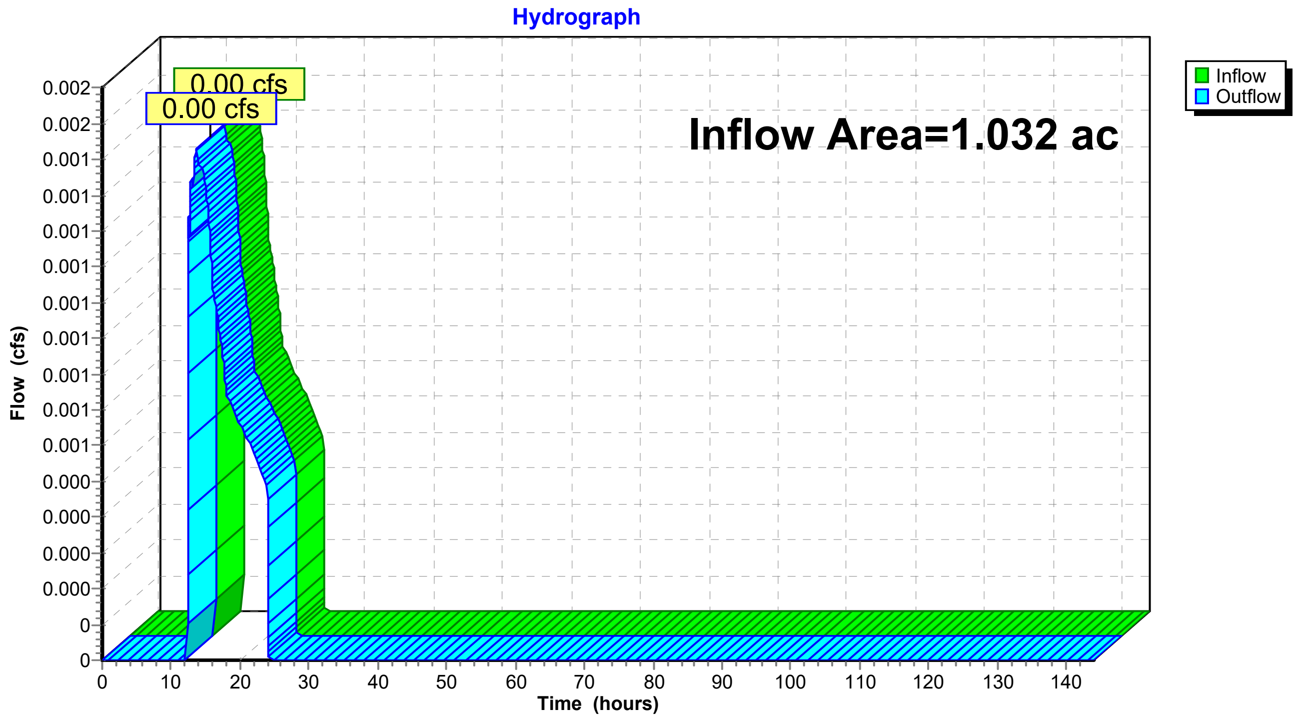


Summary for Reach DP-5: Ward Street

Inflow Area = 1.032 ac, 37.77% Impervious, Inflow Depth = 0.01" for 10-Year event
Inflow = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

Reach DP-5: Ward Street



Summary for Pond IC-1: Infiltration Chambers

```
Inflow Area =        0.658 ac, 63.31% Impervious, Inflow Depth =  2.37"   for 10-Year event
Inflow      =      1.82 cfs @  12.09 hrs, Volume=         0.130 af
Outflow     =      0.29 cfs @  11.78 hrs, Volume=         0.130 af, Atten= 84%, Lag= 0.0 min
Discarded   =      0.29 cfs @  11.78 hrs, Volume=         0.130 af
Primary     =      0.00 cfs @   0.00 hrs, Volume=         0.000 af
   Routed to Reach DP-1 : DMH
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 59.10' @ 12.60 hrs Surf.Area= 1,526 sf Storage= 1,639 cf

Plug-Flow detention time= 37.7 min calculated for 0.130 af (100% of inflow)
Center-of-Mass det. time= 37.7 min (871.9 - 834.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.50'	1,388 cf	**20.50'W x 74.43'L x 3.50'H Field A** 5,341 cf Overall - 1,871 cf Embedded = 3,470 cf x 40.0% Voids
#2A	58.00'	1,871 cf	**Cultec R-300HD** x 40 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 40 Chambers in 4 Rows Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf
		3,259 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.10'	**12.0" Round Culvert** L= 67.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 58.10' / 57.42' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.35'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	57.50'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.29 cfs @ 11.78 hrs HW=57.54' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=57.50' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IC-1: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger®300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

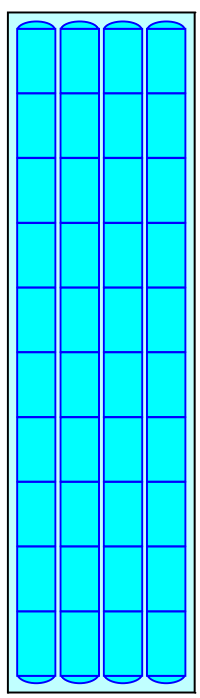
10 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 72.43' Row Length +12.0" End Stone x 2 = 74.43' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

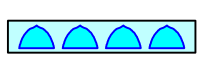
40 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 4 Rows = 1,870.9 cf Chamber Storage

5,340.6 cf Field - 1,870.9 cf Chambers = 3,469.7 cf Stone x 40.0% Voids = 1,387.9 cf Stone Storage

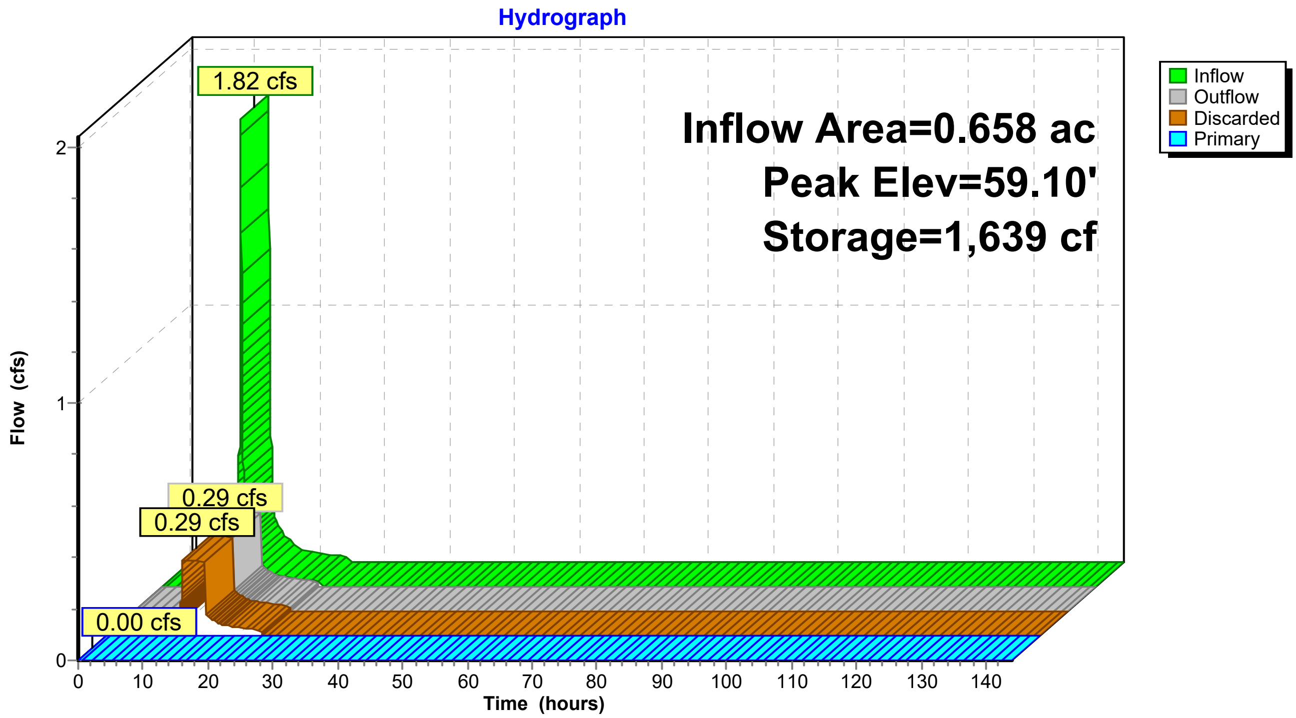
Chamber Storage + Stone Storage = 3,258.8 cf = 0.075 af
Overall Storage Efficiency = 61.0%
Overall System Size = 74.43' x 20.50' x 3.50'

40 Chambers
197.8 cy Field
128.5 cy Stone





Pond IC-1: Infiltration Chambers



Summary for Pond IC-2: Infiltration Chambers

Inflow Area = 3.098 ac, 57.89% Impervious, Inflow Depth = 2.20" for 10-Year event
Inflow = 7.75 cfs @ 12.09 hrs, Volume= 0.568 af
Outflow = 1.10 cfs @ 12.70 hrs, Volume= 0.568 af, Atten= 86%, Lag= 36.4 min
Discarded = 1.10 cfs @ 11.80 hrs, Volume= 0.568 af
Primary = 0.01 cfs @ 12.70 hrs, Volume= 0.000 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 61.44' @ 12.70 hrs Surf.Area= 5,725 sf Storage= 7,459 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 48.6 min (881.0 - 832.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	59.60'	5,405 cf	**70.25'W x 81.50'L x 4.00'H Field A** 22,901 cf Overall - 9,389 cf Embedded = 13,512 cf x 40.0% Voids
#2A	60.10'	9,389 cf	**Cultec R-360HD** x 252 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 252 Chambers in 12 Rows Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf
		14,794 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.17'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.17' / 58.05' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	61.40'	**9.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	63.50'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	59.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=1.10 cfs @ 11.80 hrs HW=59.65' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=0.01 cfs @ 12.70 hrs HW=61.44' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.01 cfs of 4.97 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.70 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IC-2: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger®360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf

60.0" Wide + 9.0" Spacing = 69.0" C-C Row Spacing

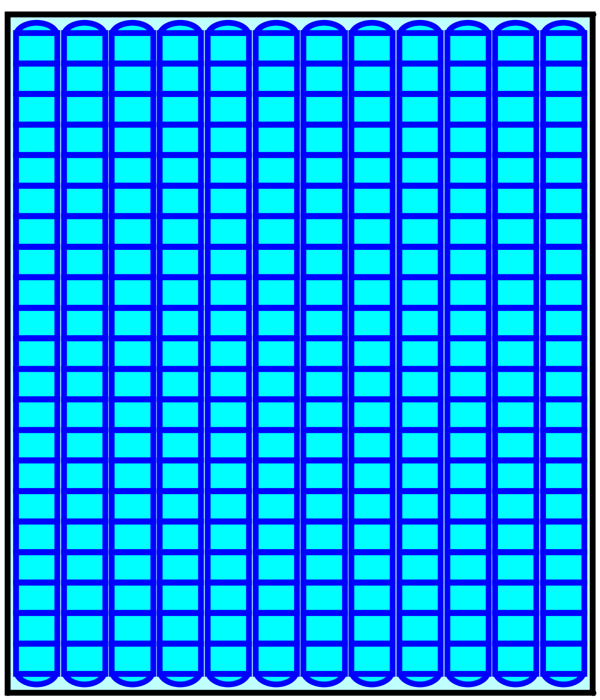
21 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 79.50' Row Length +12.0" End Stone x 2 = 81.50' Base Length
12 Rows x 60.0" Wide + 9.0" Spacing x 11 + 12.0" Side Stone x 2 = 70.25' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

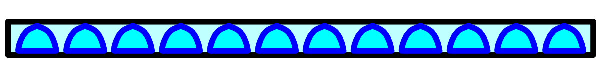
252 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 12 Rows = 9,389.5 cf Chamber Storage

22,901.5 cf Field - 9,389.5 cf Chambers = 13,512.0 cf Stone x 40.0% Voids = 5,404.8 cf Stone Storage

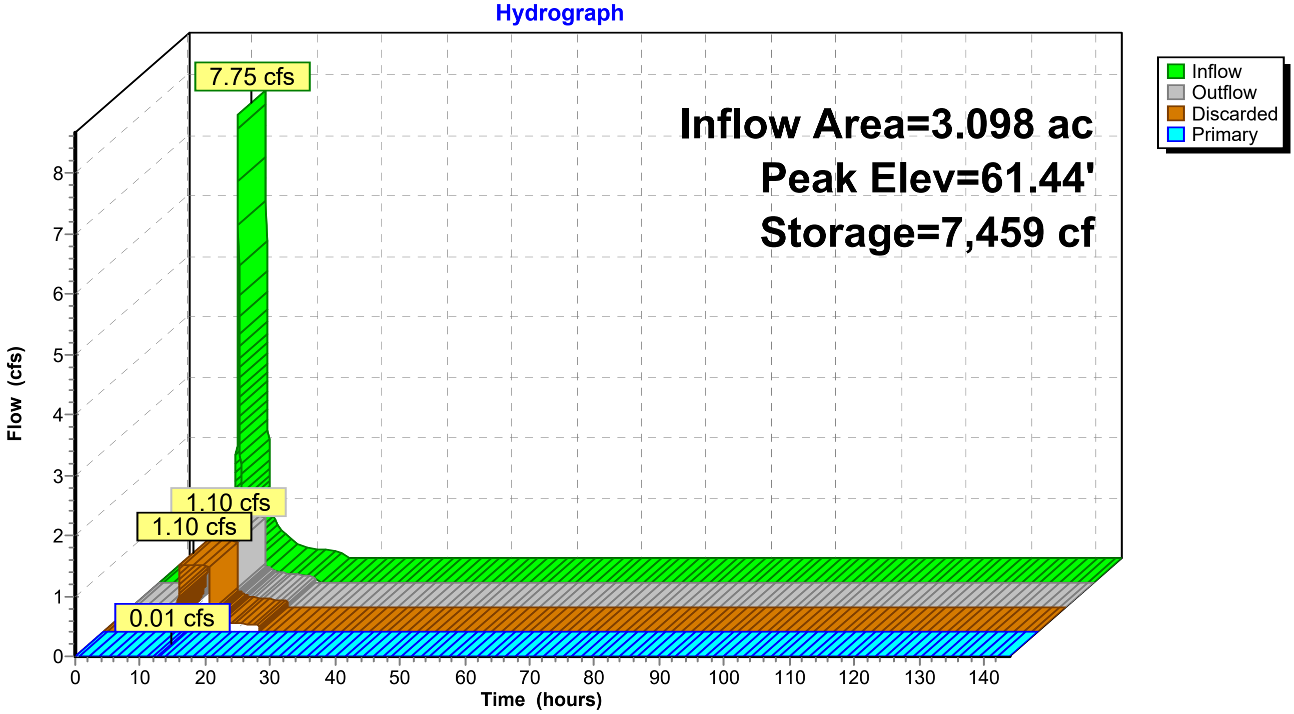
Chamber Storage + Stone Storage = 14,794.3 cf = 0.340 af
Overall Storage Efficiency = 64.6%
Overall System Size = 81.50' x 70.25' x 4.00'

252 Chambers
848.2 cy Field
500.4 cy Stone





Pond IC-2: Infiltration Chambers



Summary for Pond IC-3: Infiltration Chambers

Inflow Area = 0.968 ac, 40.25% Impervious, Inflow Depth = 1.52" for 10-Year event
Inflow = 1.52 cfs @ 12.10 hrs, Volume= 0.123 af
Outflow = 0.46 cfs @ 11.96 hrs, Volume= 0.123 af, Atten= 69%, Lag= 0.0 min
Discarded = 0.46 cfs @ 11.96 hrs, Volume= 0.123 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 53.29' @ 12.48 hrs Surf.Area= 2,418 sf Storage= 863 cf

Plug-Flow detention time= 9.0 min calculated for 0.123 af (100% of inflow)
Center-of-Mass det. time= 9.0 min (852.0 - 843.1)

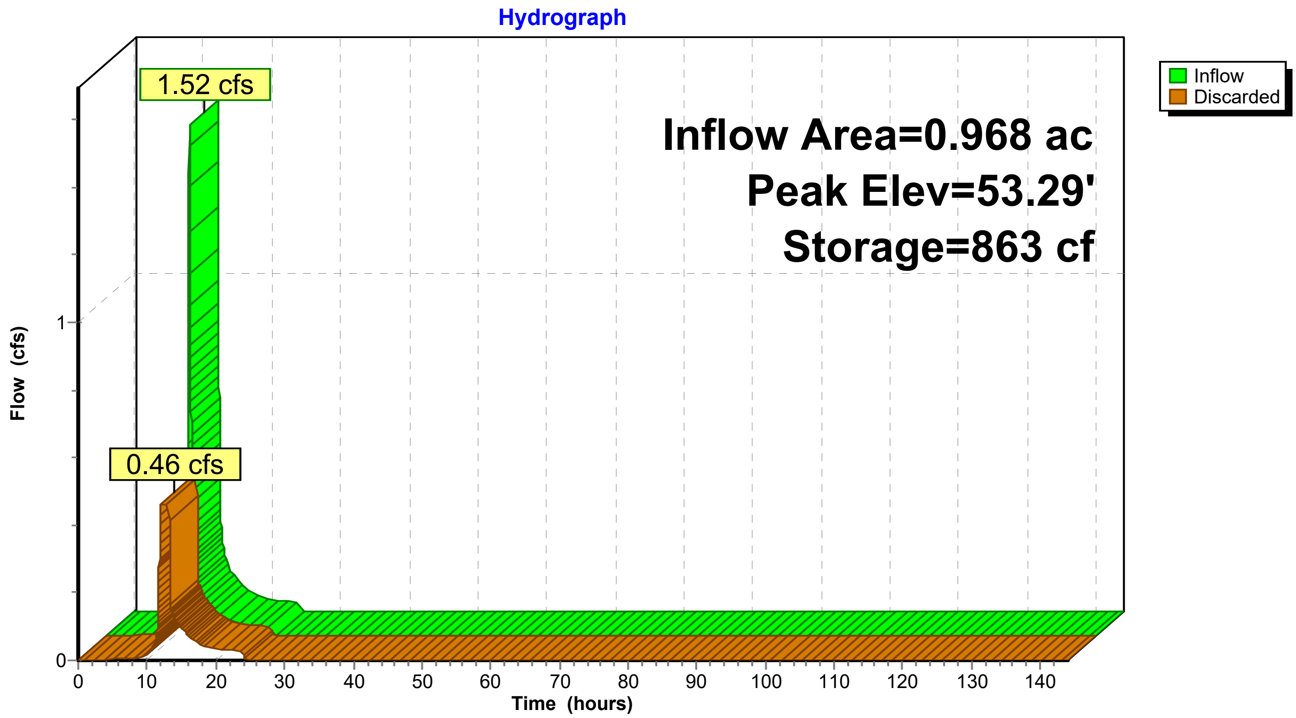
Volume	Invert	Avail.Storage	Storage Description
#1	52.60'	1,731 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 6,142 cf Overall - 1,814 cf Embedded = 4,328 cf x 40.0% Voids
#2	53.10'	1,814 cf	**Cultec R-150XLHD** x 66 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		3,545 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.60	2,418	0	0
55.14	2,418	6,142	6,142

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.46 cfs @ 11.96 hrs HW=52.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.46 cfs)

Pond IC-3: Infiltration Chambers



Time span=0.00-144.00 hrs, dt=0.02 hrs, 7201 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

Subcatchment1S: Sub-1S Runoff Area=6,628 sf 64.88% Impervious Runoff Depth=3.22"
Tc=6.0 min CN=77 Runoff=0.57 cfs 0.041 af

Subcatchment1S-1: Sub-1S-1 Runoff Area=28,660 sf 63.31% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=76 Runoff=2.41 cfs 0.171 af

Subcatchment2S: Sub-2S Runoff Area=2,885 sf 0.00% Impervious Runoff Depth=0.36"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.002 af

Subcatchment3S: Sub-3S Runoff Area=99,262 sf 9.98% Impervious Runoff Depth=1.42"
Tc=6.0 min CN=56 Runoff=3.35 cfs 0.270 af

Subcatchment3S-1: Sub-3S-1 Runoff Area=126,669 sf 55.14% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=72 Runoff=9.32 cfs 0.666 af

Subcatchment3S-1R: Roofs 20-22 Runoff Area=6,010 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=0.77 cfs 0.063 af

Subcatchment3S-2: Sub-3S-2 Runoff Area=20,324 sf 0.00% Impervious Runoff Depth=0.32"
Tc=6.0 min CN=38 Runoff=0.05 cfs 0.012 af

Subcatchment3S-2R: Roofs 24-25 Front Runoff Area=2,273 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.024 af

Subcatchment4S: Sub-4S Runoff Area=375 sf 0.00% Impervious Runoff Depth=0.36"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment5S: Sub -5S Runoff Area=16,999 sf 15.22% Impervious Runoff Depth=0.87"
Tc=6.0 min CN=48 Runoff=0.27 cfs 0.028 af

Subcatchment5S-1: Sub-5S-1 Runoff Area=22,924 sf 52.92% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=71 Runoff=1.63 cfs 0.117 af

Subcatchment5S-1R: Roof 23 Front/Back Runoff Area=2,256 sf 100.00% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.024 af

Subcatchment5S-2: Sub -5S-2 Runoff Area=2,764 sf 0.00% Impervious Runoff Depth=0.36"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.002 af

Reach DP-1: DMH Inflow=0.57 cfs 0.051 af
Outflow=0.57 cfs 0.051 af

Reach DP-2: DP-2 Inflow=0.01 cfs 0.002 af
Outflow=0.01 cfs 0.002 af

Reach DP-3: DP-3 Inflow=3.35 cfs 0.354 af
Outflow=3.35 cfs 0.354 af

Reach DP-4: PL Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Ward Street Inflow=0.01 cfs 0.002 af
Outflow=0.01 cfs 0.002 af

Pond IC-1: Infiltration Chambers Peak Elev=59.66' Storage=2,254 cf Inflow=2.41 cfs 0.171 af
Discarded=0.29 cfs 0.161 af Primary=0.31 cfs 0.010 af Outflow=0.60 cfs 0.171 af

Pond IC-2: Infiltration Chambers Peak Elev=62.07' Storage=10,141 cf Inflow=10.39 cfs 0.753 af
Discarded=1.10 cfs 0.681 af Primary=1.15 cfs 0.072 af Outflow=2.25 cfs 0.753 af

Pond IC-3: Infiltration Chambers Peak Elev=53.71' Storage=1,650 cf Inflow=2.17 cfs 0.168 af
Outflow=0.46 cfs 0.168 af

Total Runoff Area = 7.760 ac Runoff Volume = 1.420 af Average Runoff Depth = 2.20"
62.30% Pervious = 4.834 ac 37.70% Impervious = 2.926 ac

Summary for Subcatchment 1S: Sub-1S

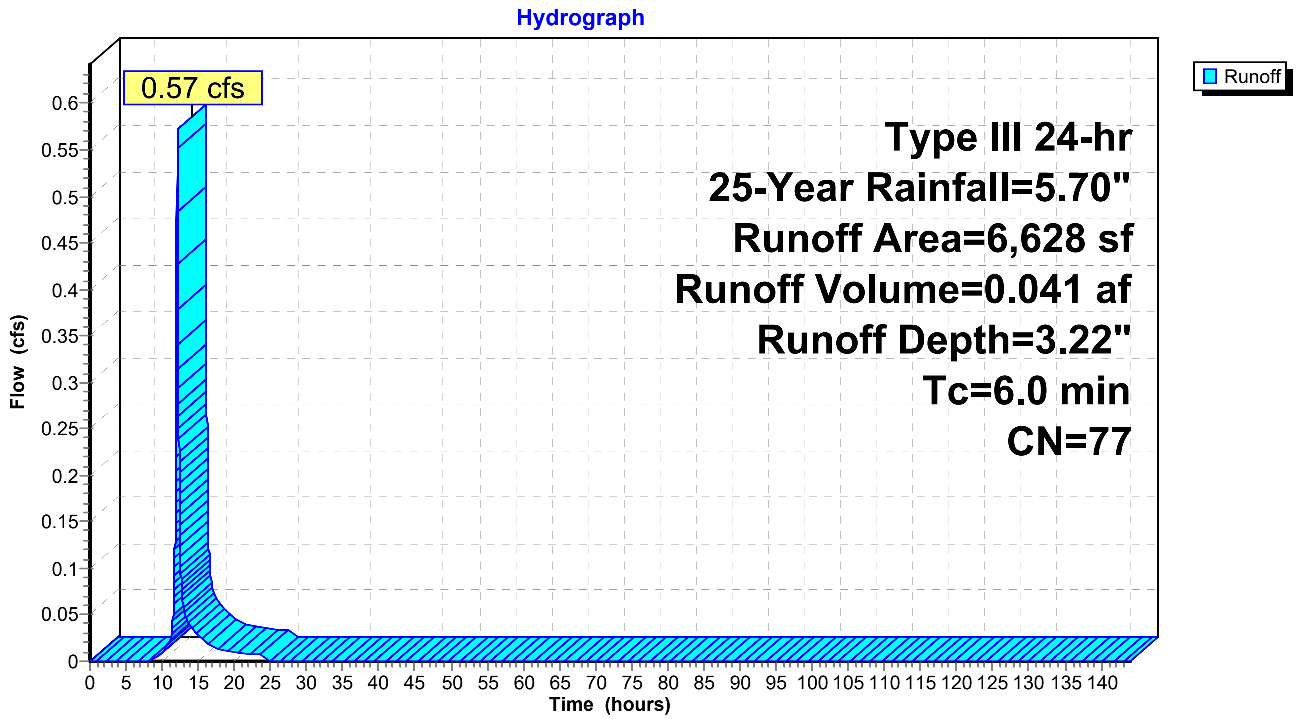
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 3.22"
Routed to Reach DP-1 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	2,328	39	>75% Grass cover, Good, HSG A
	3,451	98	Paved roads w/curbs & sewers, HSG A
*	849	98	Paved sidewalk, HSG A
	6,628	77	Weighted Average
	2,328		35.12% Pervious Area
	4,300		64.88% Impervious Area

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

Subcatchment 1S: Sub-1S



Summary for Subcatchment 1S-1: Sub-1S-1

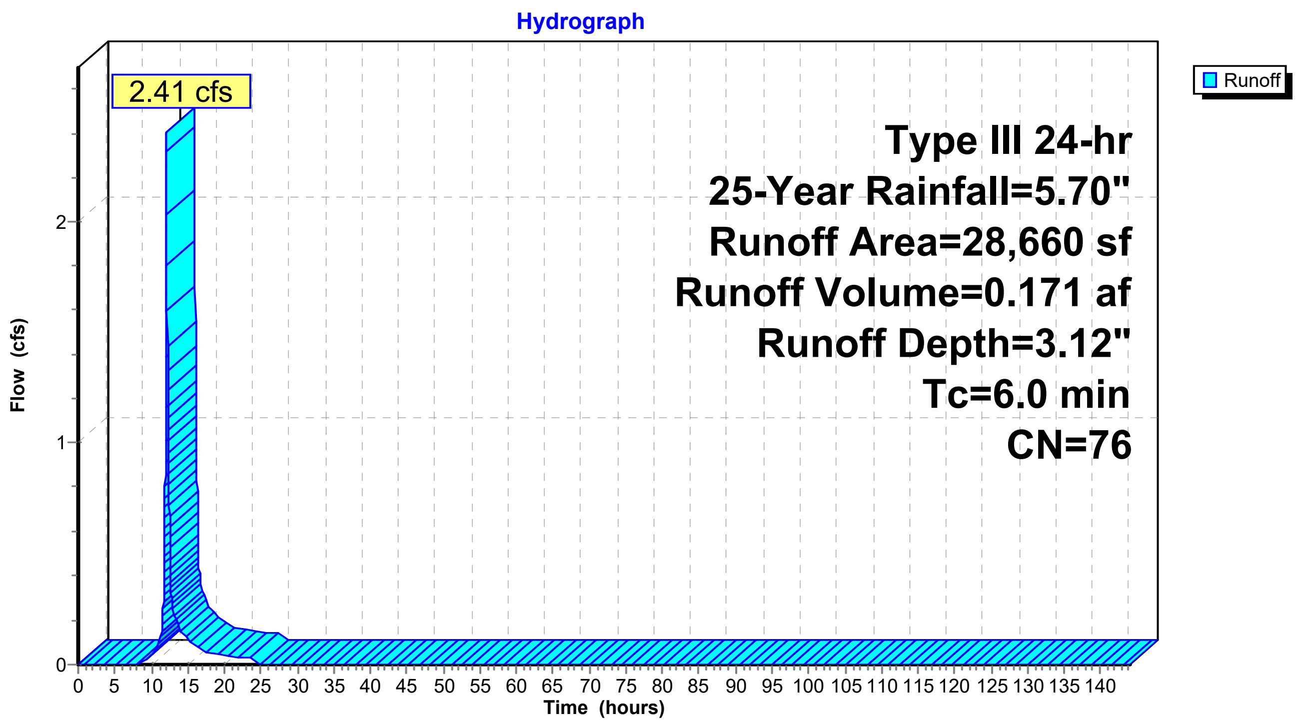
Runoff = 2.41 cfs @ 12.09 hrs, Volume= 0.171 af, Depth= 3.12"
Routed to Pond IC-1 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	10,515	39	>75% Grass cover, Good, HSG A
	3,661	98	Paved roads w/curbs & sewers, HSG A
*	1,004	98	Paved sidewalk, HSG A
*	2,080	98	Paved drives, HSG A
*	752	98	Decks, HSG A
	10,407	98	Roofs, HSG A
*	241	98	Paved walks, HSG A
	28,660	76	Weighted Average
	10,515		36.69% Pervious Area
	18,145		63.31% Impervious Area

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

Subcatchment 1S-1: Sub-1S-1



Summary for Subcatchment 2S: Sub-2S

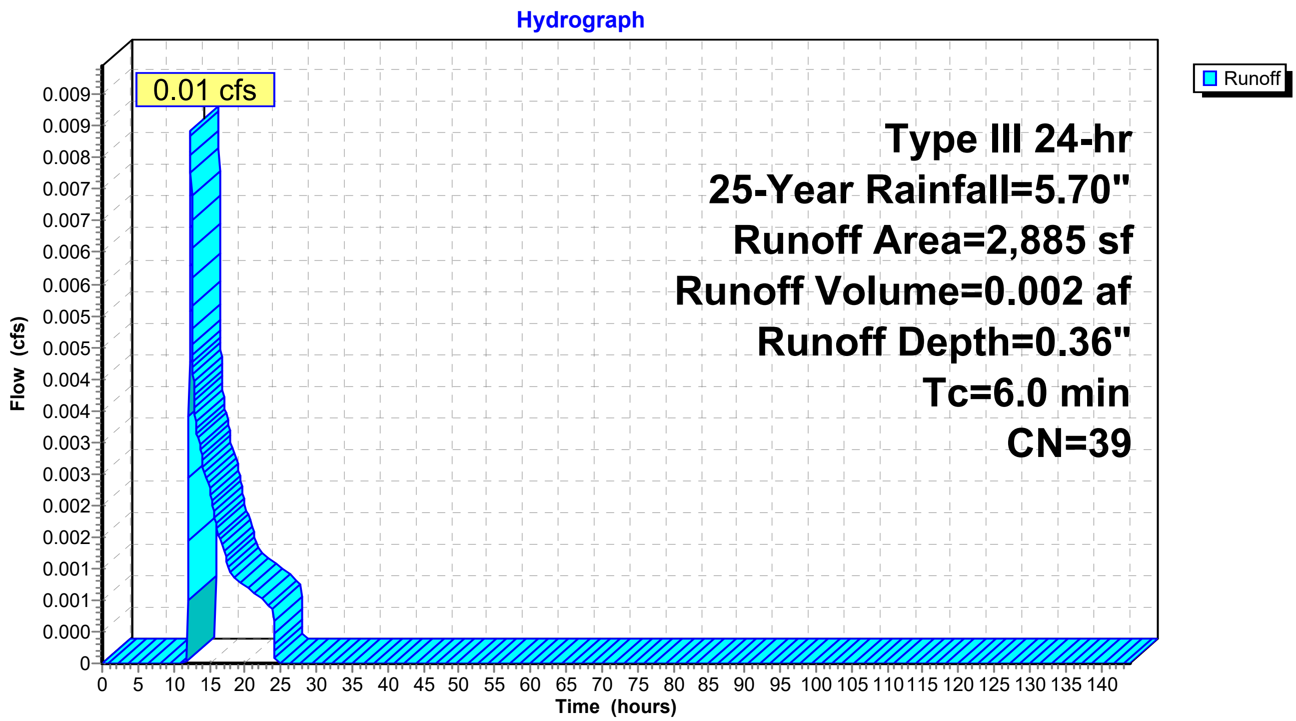
Runoff = 0.01 cfs @ 12.38 hrs, Volume= 0.002 af, Depth= 0.36"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
2,885	39	>75% Grass cover, Good, HSG A
2,885		100.00% Pervious Area

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

Subcatchment 2S: Sub-2S



Summary for Subcatchment 3S: Sub-3S

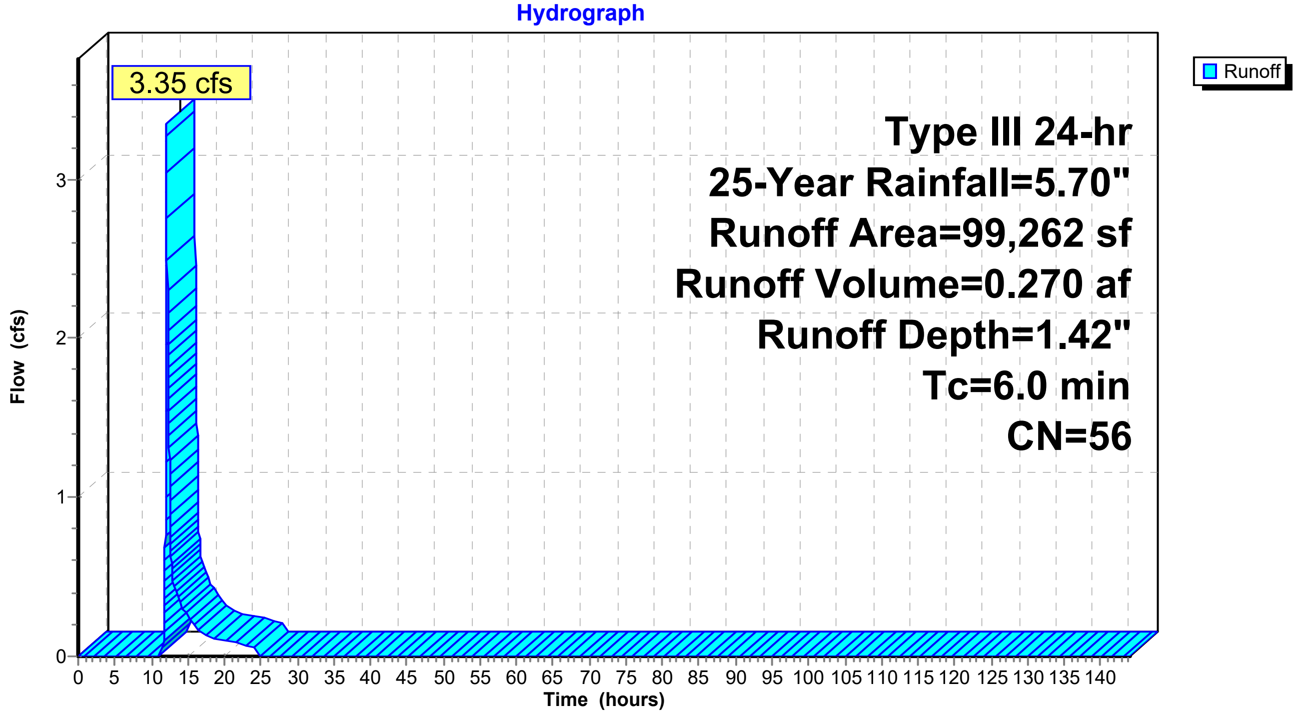
Runoff = 3.35 cfs @ 12.10 hrs, Volume= 0.270 af, Depth= 1.42"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	290	98	Paved drives, HSG A - offsite
*	4,310	30	Woods, Good, HSG A - offsite
*	1,734	55	Woods, Good, HSG B - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
	23,550	61	>75% Grass cover, Good, HSG B
	20,523	39	>75% Grass cover, Good, HSG A
*	454	98	Decks, HSG A
*	895	98	Decks, HSG B
	2,628	98	Roofs, HSG A
	5,310	98	Roofs, HSG B
*	167	98	Riprap, HSG B
*	160	98	Riprap, HSG A
	34,033	55	Woods, Good, HSG B
	130	30	Woods, Good, HSG A
	99,262	56	Weighted Average
	89,358		90.02% Pervious Area
	9,904		9.98% Impervious Area

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

Subcatchment 3S: Sub-3S



Summary for Subcatchment 3S-1: Sub-3S-1

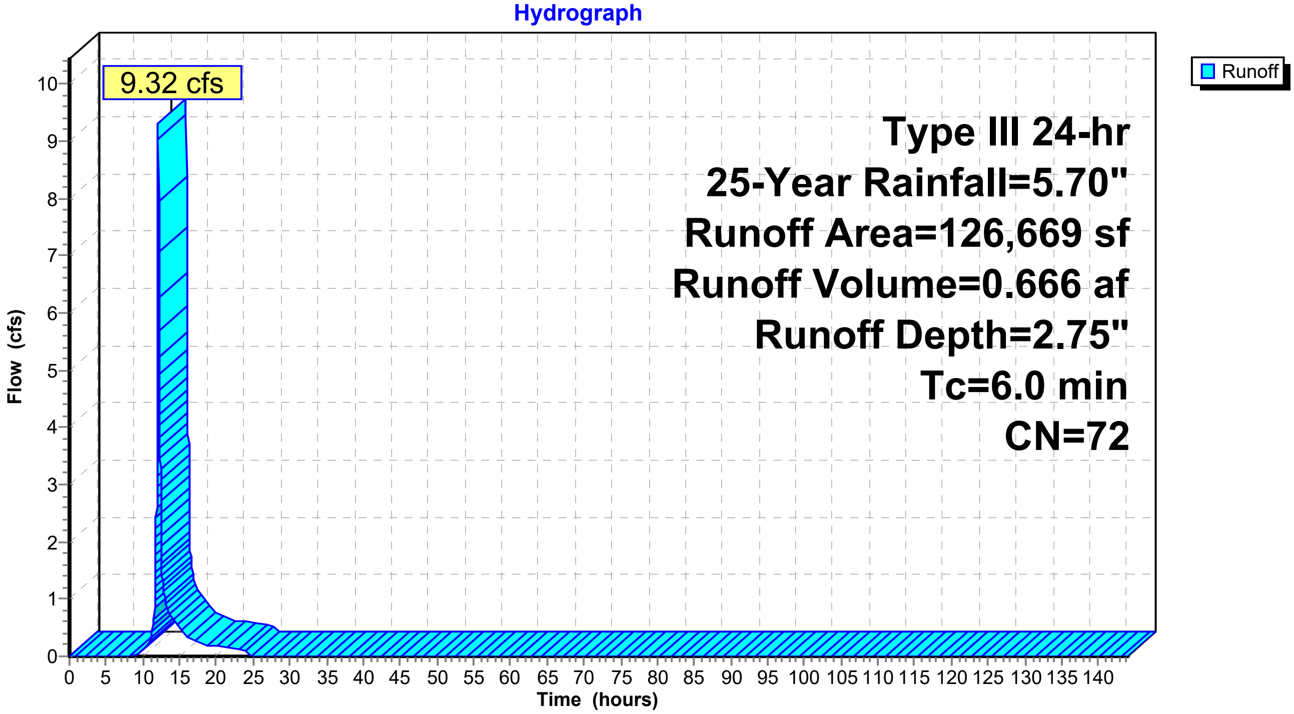
Runoff = 9.32 cfs @ 12.09 hrs, Volume= 0.666 af, Depth= 2.75"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	8,418	98	Paved drives, HSG A
*	2,654	98	Paved drives, HSG B
*	9,803	98	Paved roads w/curbs & sewers, HSG A
*	7,871	98	Paved roads w/curbs & sewers, HSG B
*	736	98	Walks, HSG A
*	335	98	Walks, HSG B
*	43,330	39	>75% Grass cover, Good, HSG A
*	5,078	61	>75% Grass cover, Good, HSG B
*	1,706	98	Decks, HSG A
*	84	98	Decks, HSG B
*	7,838	98	Roofs, HSG B
*	27,432	98	Roofs, HSG A
*	8,421	39	>75% Grass cover, Good, HSG A
*	1,911	98	Paved sidewalk, HSG A
*	1,052	98	Paved sidewalk, HSG B
	126,669	72	Weighted Average
	56,829		44.86% Pervious Area
	69,840		55.14% Impervious Area

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

Subcatchment 3S-1: Sub-3S-1



Summary for Subcatchment 3S-1R: Roofs 20-22 Front/Back

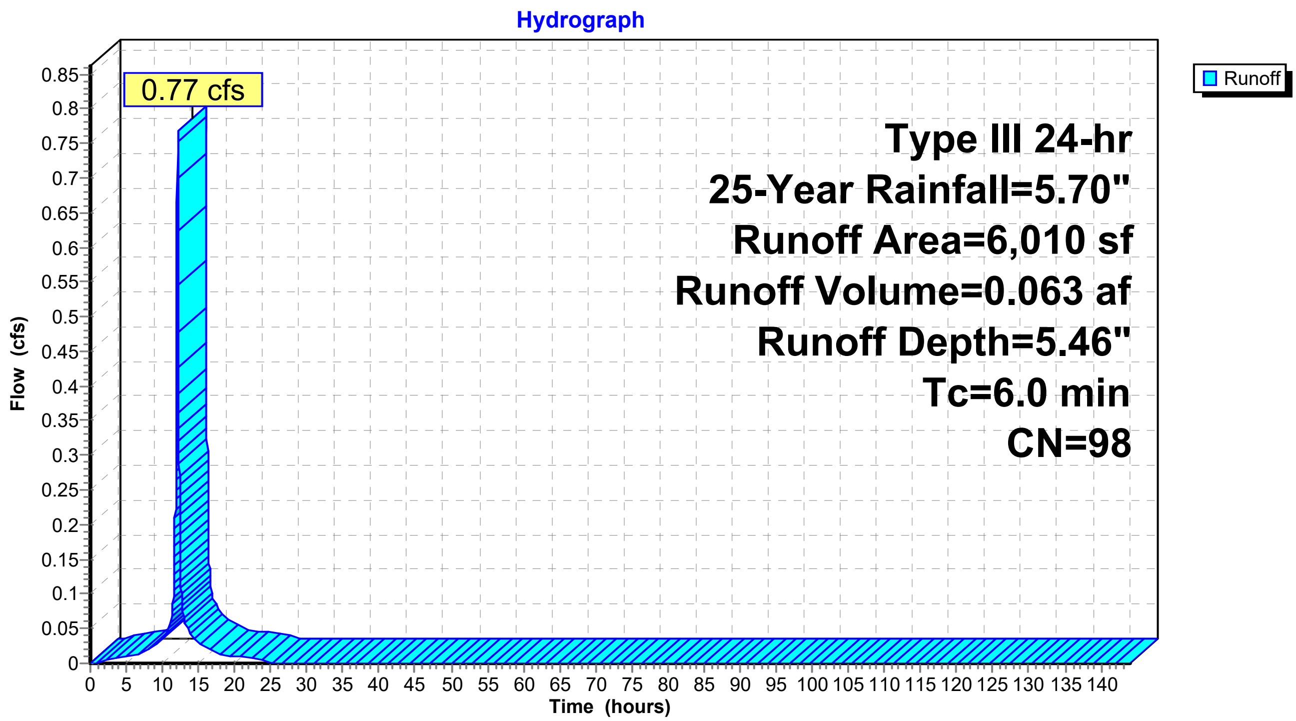
Runoff = 0.77 cfs @ 12.08 hrs, Volume= 0.063 af, Depth= 5.46"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	6,010	98	Roofs, HSG A
	6,010		100.00% Impervious Area

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

Subcatchment 3S-1R: Roofs 20-22 Front/Back



Summary for Subcatchment 3S-2: Sub-3S-2

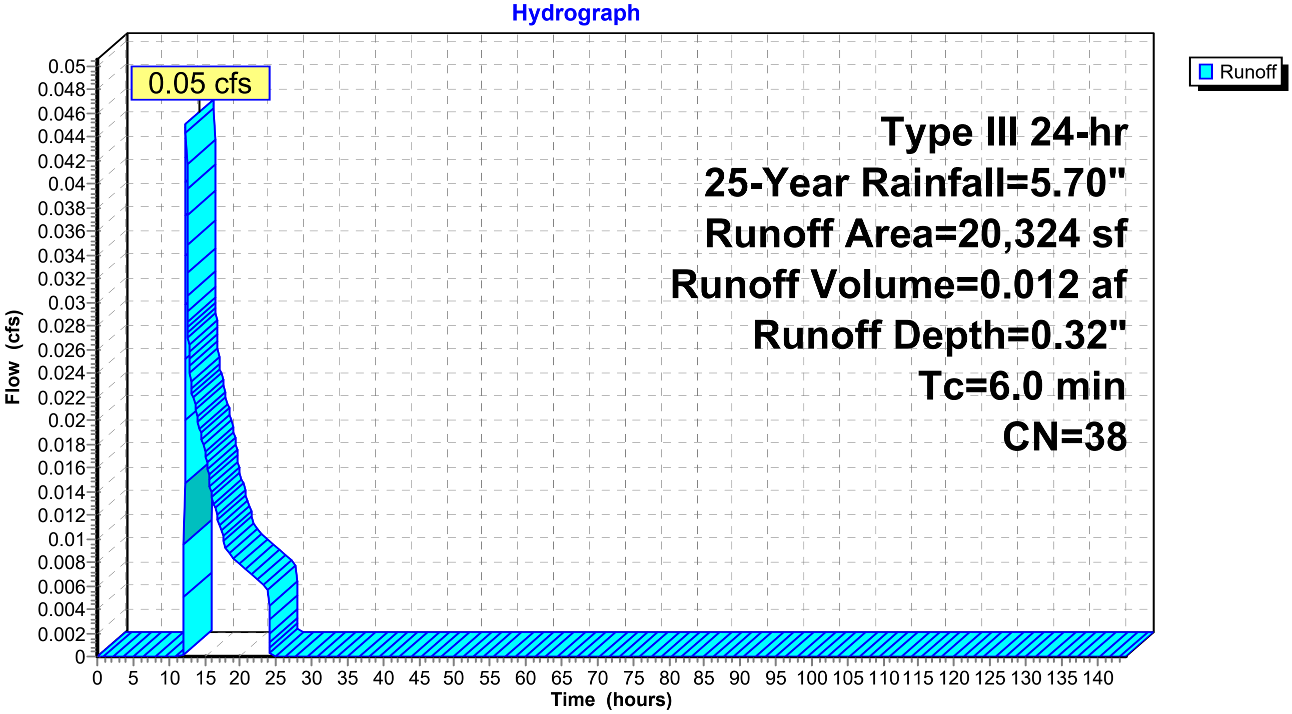
Runoff = 0.05 cfs @ 12.40 hrs, Volume= 0.012 af, Depth= 0.32"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	18,642	39	>75% Grass cover, Good, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
	20,324	38	Weighted Average
	20,324		100.00% Pervious Area

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

Subcatchment 3S-2: Sub-3S-2



Summary for Subcatchment 3S-2R: Roofs 24-25 Front

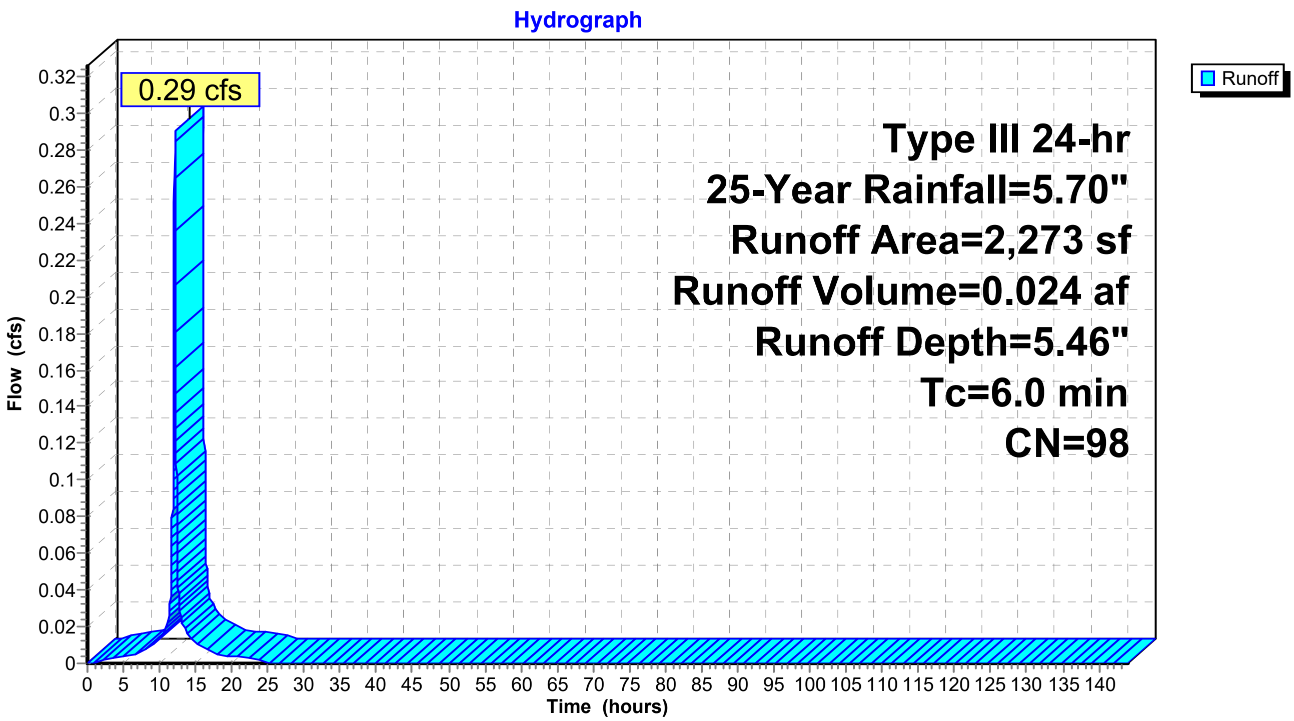
Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 5.46"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
2,273	98	Roofs, HSG A
2,273		100.00% Impervious Area

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

Subcatchment 3S-2R: Roofs 24-25 Front



Summary for Subcatchment 4S: Sub-4S

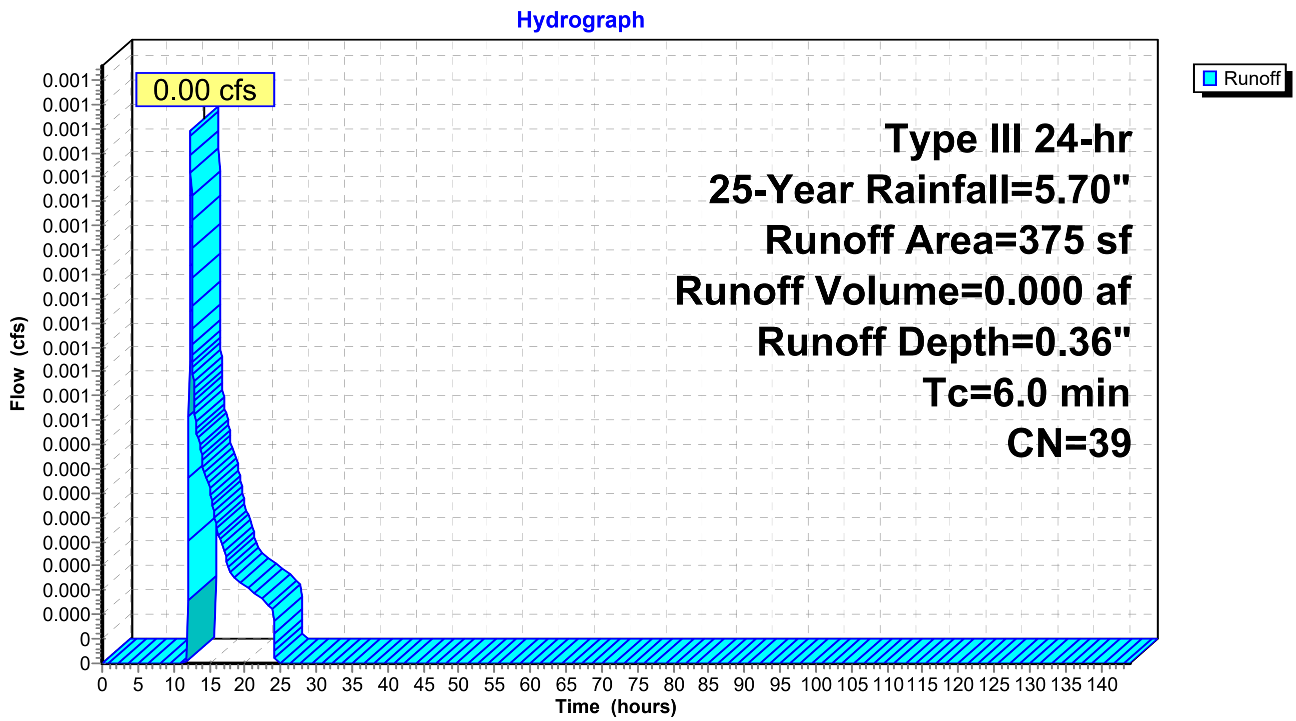
Runoff = 0.00 cfs @ 12.38 hrs, Volume= 0.000 af, Depth= 0.36"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
375	39	>75% Grass cover, Good, HSG A
375		100.00% Pervious Area

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

Subcatchment 4S: Sub-4S



Summary for Subcatchment 5S: Sub -5S

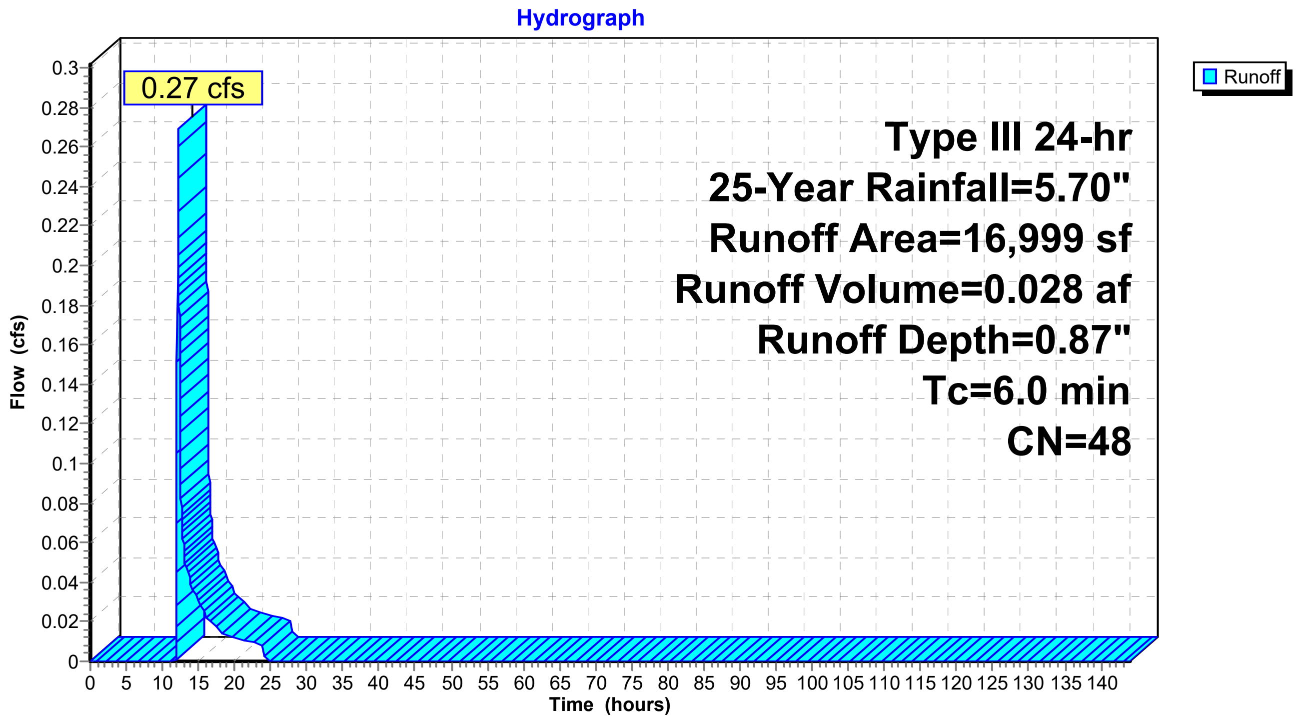
Runoff = 0.27 cfs @ 12.12 hrs, Volume= 0.028 af, Depth= 0.87"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	156	98	Decks, HSG A
	14,411	39	>75% Grass cover, Good, HSG A
*	525	98	Walls, HSG A
	1,907	98	Roofs, HSG A
	16,999	48	Weighted Average
	14,411		84.78% Pervious Area
	2,588		15.22% Impervious Area

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

Subcatchment 5S: Sub -5S



Summary for Subcatchment 5S-1: Sub-5S-1

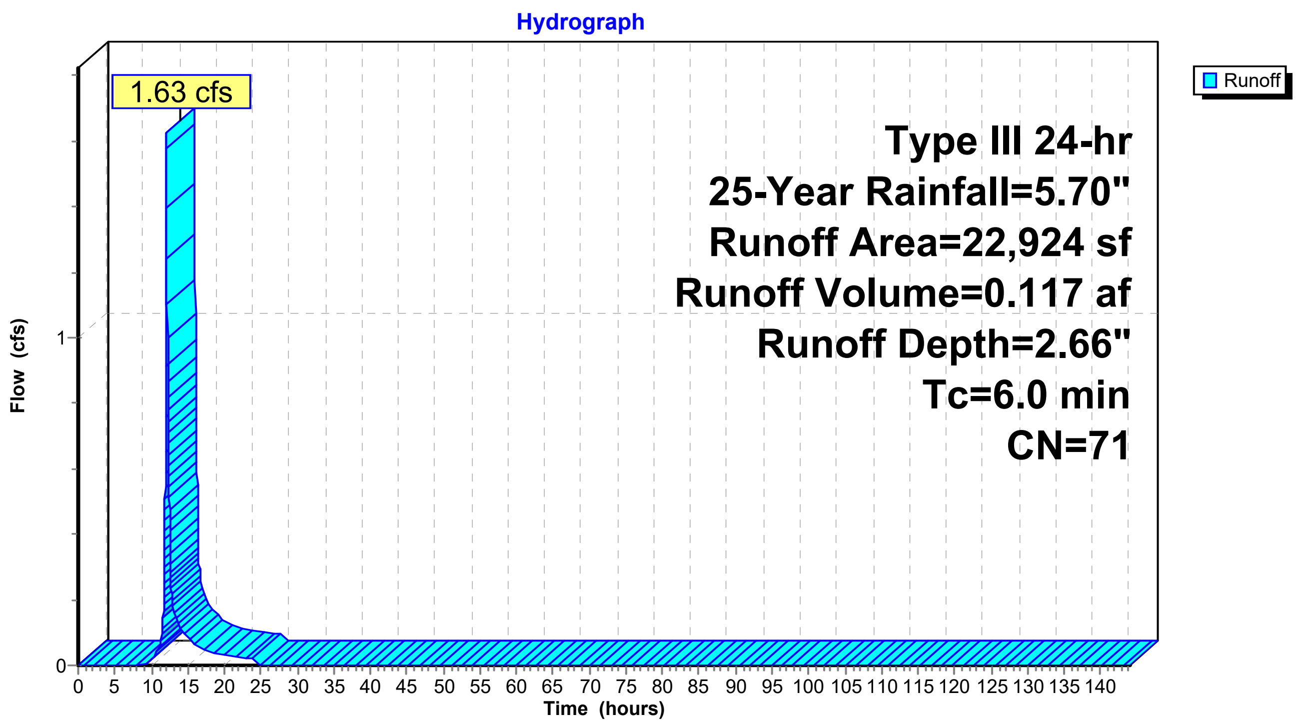
Runoff = 1.63 cfs @ 12.09 hrs, Volume= 0.117 af, Depth= 2.66"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	6,186	98	Paved drives, HSG A
	2,972	98	Paved roads w/curbs & sewers, HSG A
*	247	98	Walks, HSG A
	10,428	39	>75% Grass cover, Good, HSG A
*	1,508	98	Paved sidewalk, HSG A
*	62	98	Paved sidewalk, HSG D
	286	98	Paved roads w/curbs & sewers, HSG D
	365	80	>75% Grass cover, Good, HSG D
*	272	98	Walls, HSG A
*	598	98	Decks, HSG A
	22,924	71	Weighted Average
	10,793		47.08% Pervious Area
	12,131		52.92% Impervious Area

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

Subcatchment 5S-1: Sub-5S-1



Summary for Subcatchment 5S-1R: Roof 23 Front/Back

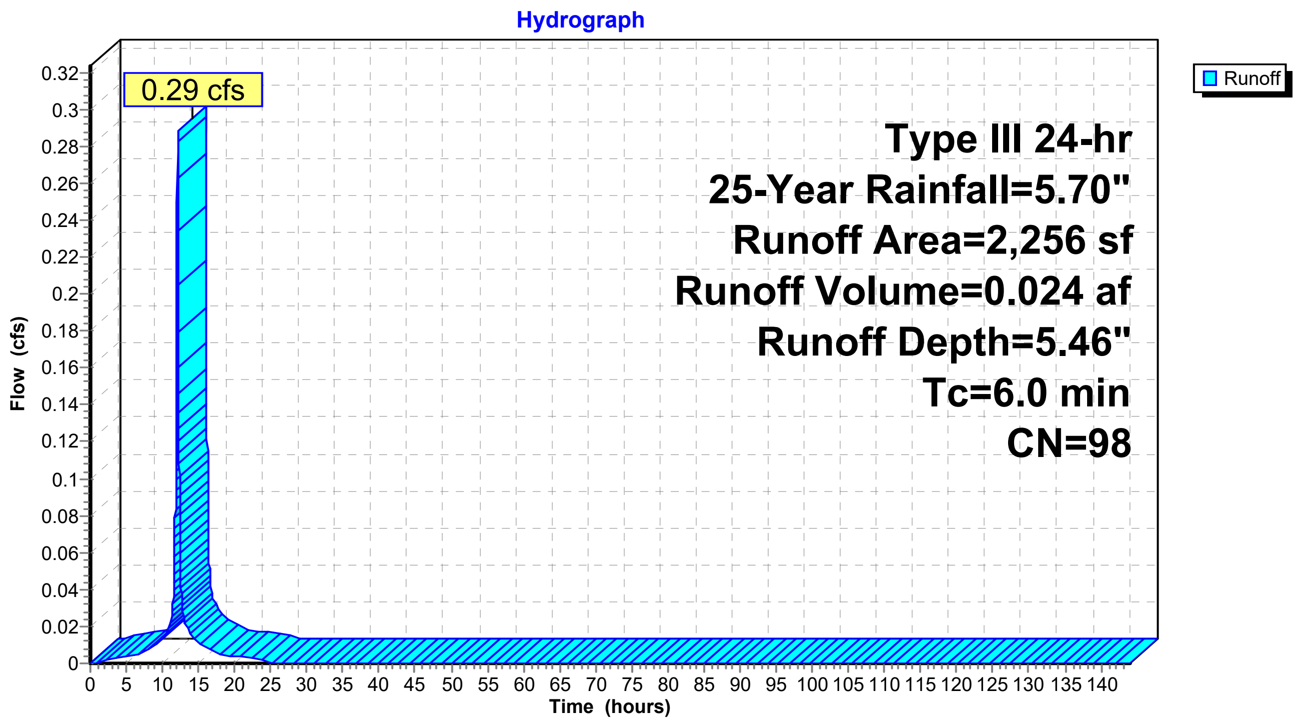
Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 5.46"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	2,256	98	Roofs, HSG A
	2,256		100.00% Impervious Area

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

Subcatchment 5S-1R: Roof 23 Front/Back



Summary for Subcatchment 5S-2: Sub -5S-2

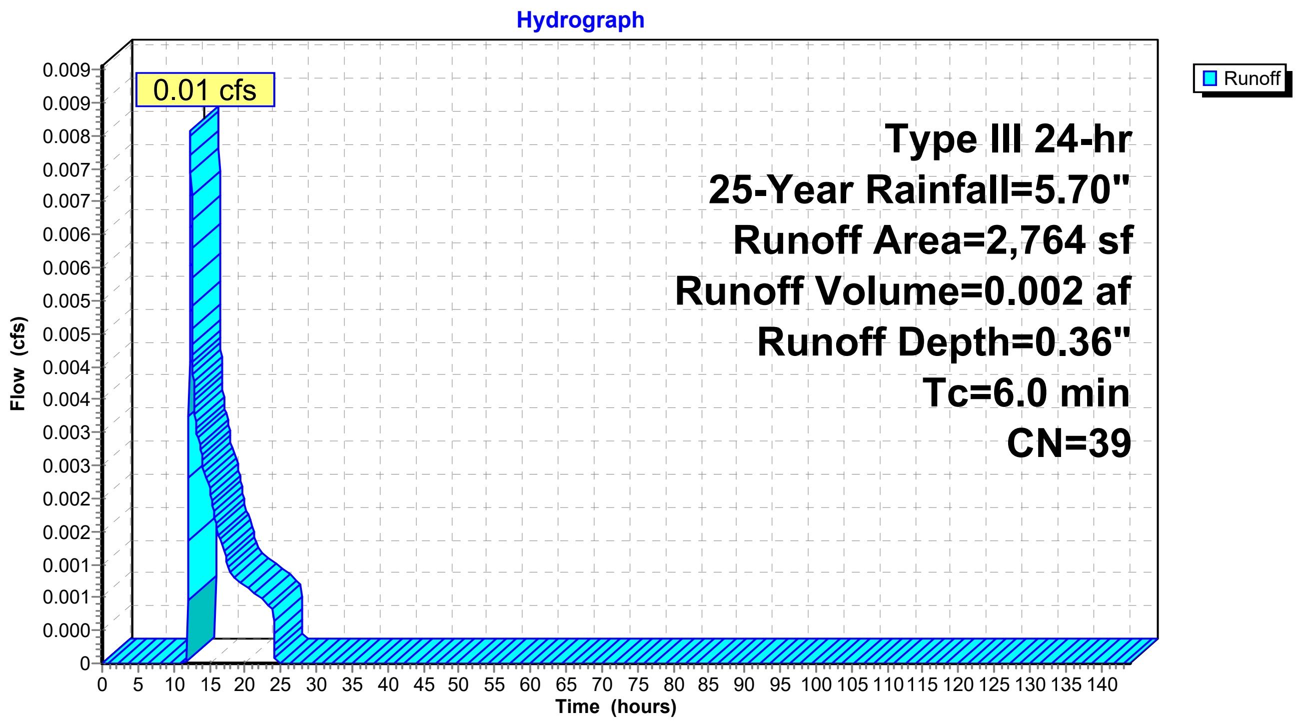
Runoff = 0.01 cfs @ 12.38 hrs, Volume= 0.002 af, Depth= 0.36"
Routed to Reach DP-5 : Ward Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
2,764	39	>75% Grass cover, Good, HSG A
2,764		100.00% Pervious Area

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

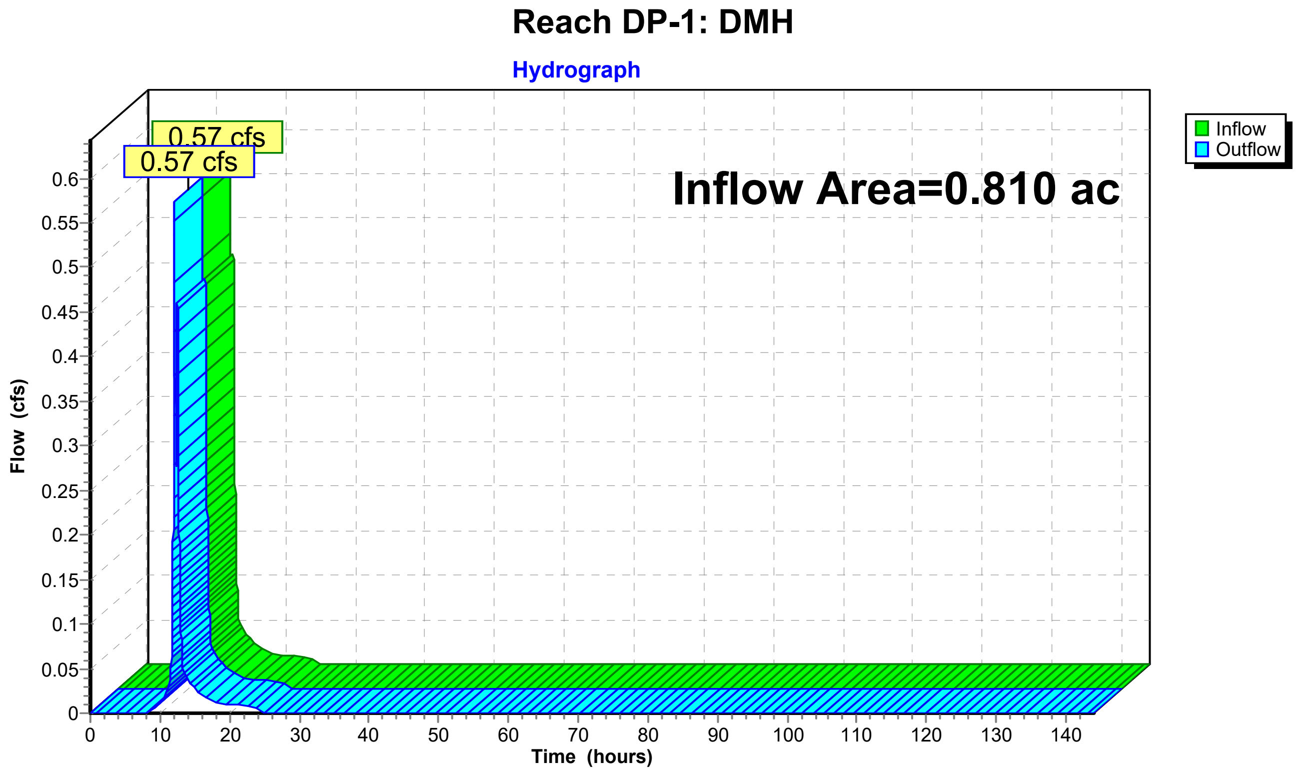
Subcatchment 5S-2: Sub -5S-2



Summary for Reach DP-1: DMH

Inflow Area = 0.810 ac, 63.61% Impervious, Inflow Depth = 0.76" for 25-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.051 af
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

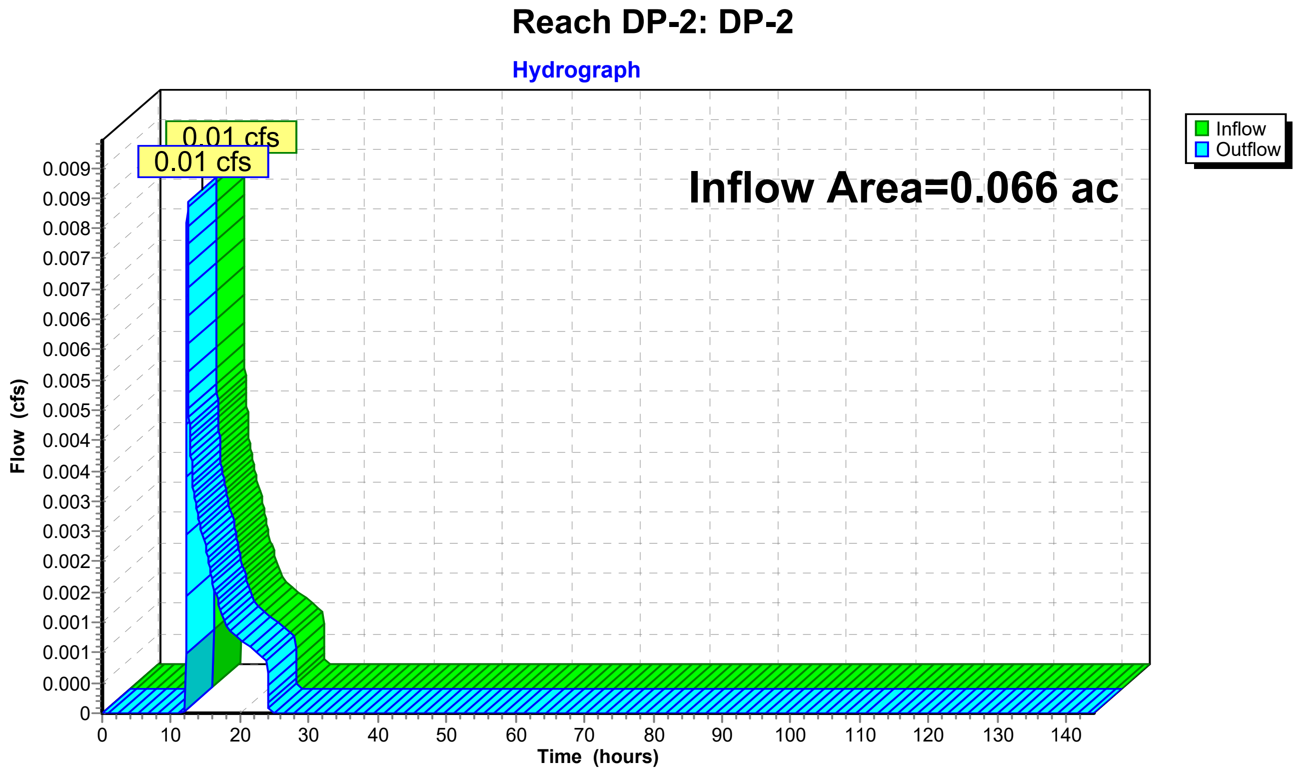
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-2: DP-2

Inflow Area = 0.066 ac, 0.00% Impervious, Inflow Depth = 0.36" for 25-Year event
Inflow = 0.01 cfs @ 12.38 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 12.38 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

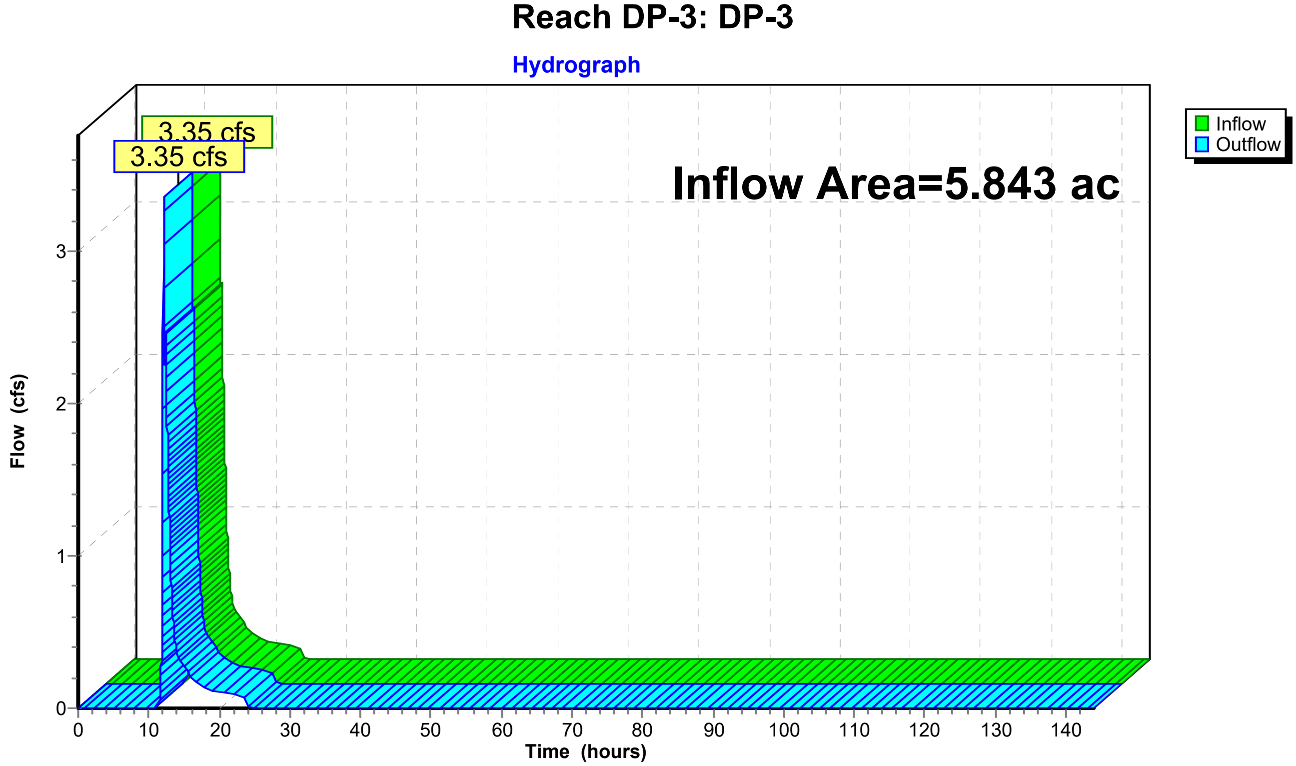
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-3: DP-3

Inflow Area =	5.843 ac,	34.58% Impervious,	Inflow Depth = 0.73"	for 25-Year event	
Inflow =	3.35 cfs @	12.10 hrs, Volume=	0.354 af		
Outflow =	3.35 cfs @	12.10 hrs, Volume=	0.354 af,	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

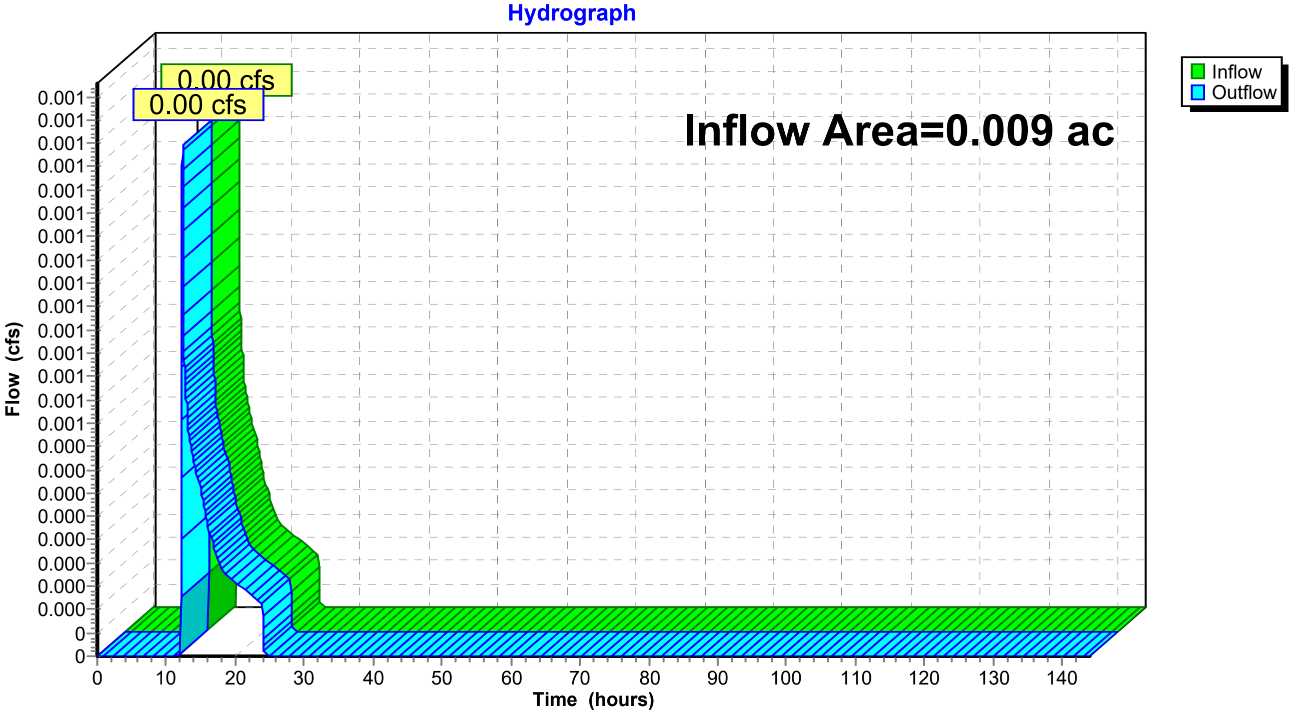


Summary for Reach DP-4: PL

Inflow Area = 0.009 ac, 0.00% Impervious, Inflow Depth = 0.36" for 25-Year event
Inflow = 0.00 cfs @ 12.38 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 12.38 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

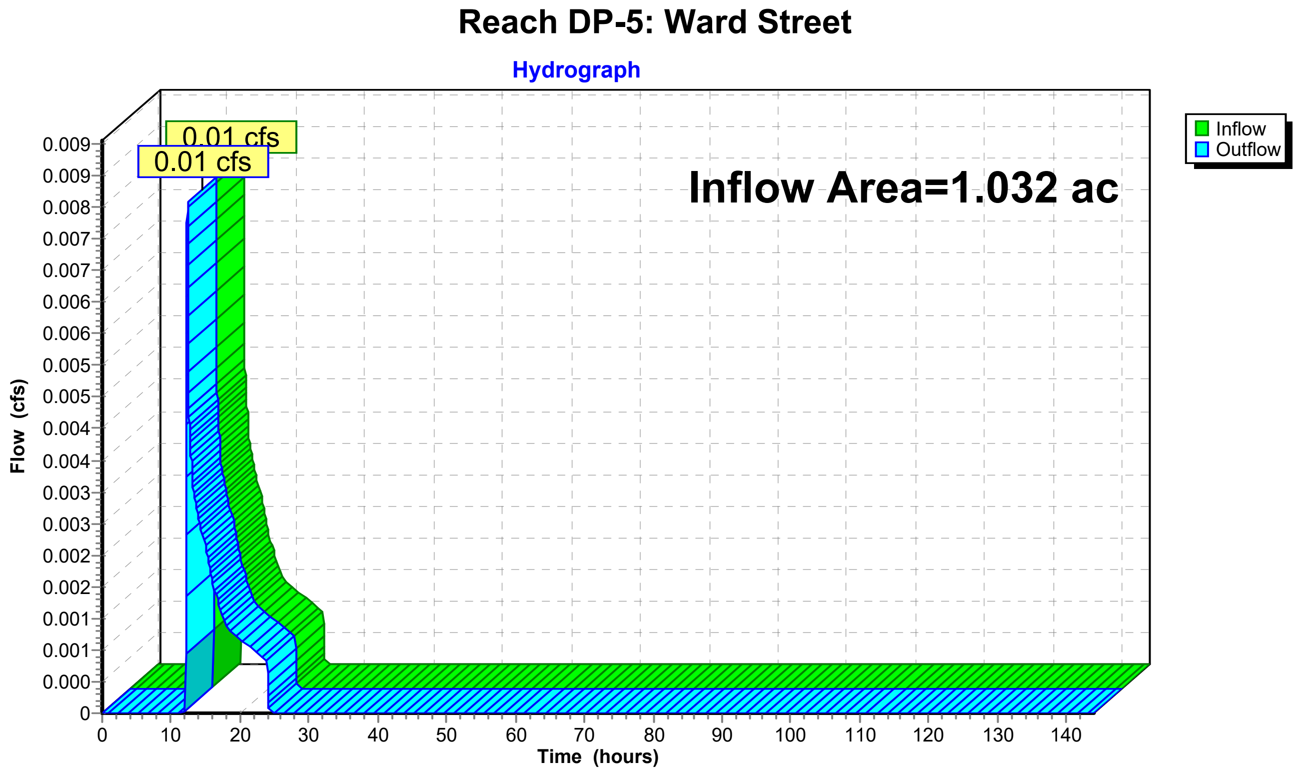
Reach DP-4: PL



Summary for Reach DP-5: Ward Street

Inflow Area = 1.032 ac, 37.77% Impervious, Inflow Depth = 0.02" for 25-Year event
Inflow = 0.01 cfs @ 12.38 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 12.38 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Pond IC-1: Infiltration Chambers

Inflow Area = 0.658 ac, 63.31% Impervious, Inflow Depth = 3.12" for 25-Year event
Inflow = 2.41 cfs @ 12.09 hrs, Volume= 0.171 af
Outflow = 0.60 cfs @ 12.49 hrs, Volume= 0.171 af, Atten= 75%, Lag= 24.0 min
Discarded = 0.29 cfs @ 11.72 hrs, Volume= 0.161 af
Primary = 0.31 cfs @ 12.49 hrs, Volume= 0.010 af
Routed to Reach DP-1 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 59.66' @ 12.49 hrs Surf.Area= 1,526 sf Storage= 2,254 cf

Plug-Flow detention time= 49.2 min calculated for 0.171 af (100% of inflow)
Center-of-Mass det. time= 49.2 min (875.5 - 826.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.50'	1,388 cf	**20.50'W x 74.43'L x 3.50'H Field A**
			5,341 cf Overall - 1,871 cf Embedded = 3,470 cf x 40.0% Voids
#2A	58.00'	1,871 cf	**Cultec R-300HD** x 40 Inside #1
			Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
			Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
			40 Chambers in 4 Rows
			Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf
		3,259 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.10'	**12.0" Round Culvert**
			L= 67.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 58.10' / 57.42' S= 0.0101 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.35'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir**
			2 End Contraction(s)
#4	Discarded	57.50'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.29 cfs @ 11.72 hrs HW=57.55' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.31 cfs @ 12.49 hrs HW=59.66' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.31 cfs of 3.70 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.31 cfs @ 1.91 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IC-1: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

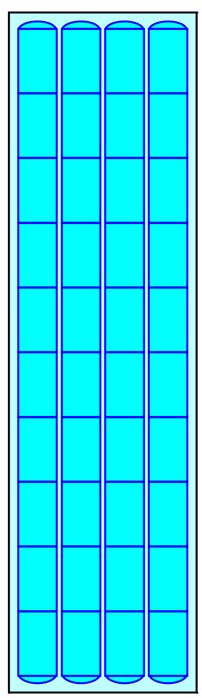
10 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 72.43' Row Length +12.0" End Stone x 2 = 74.43' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

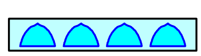
40 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 4 Rows = 1,870.9 cf Chamber Storage

5,340.6 cf Field - 1,870.9 cf Chambers = 3,469.7 cf Stone x 40.0% Voids = 1,387.9 cf Stone Storage

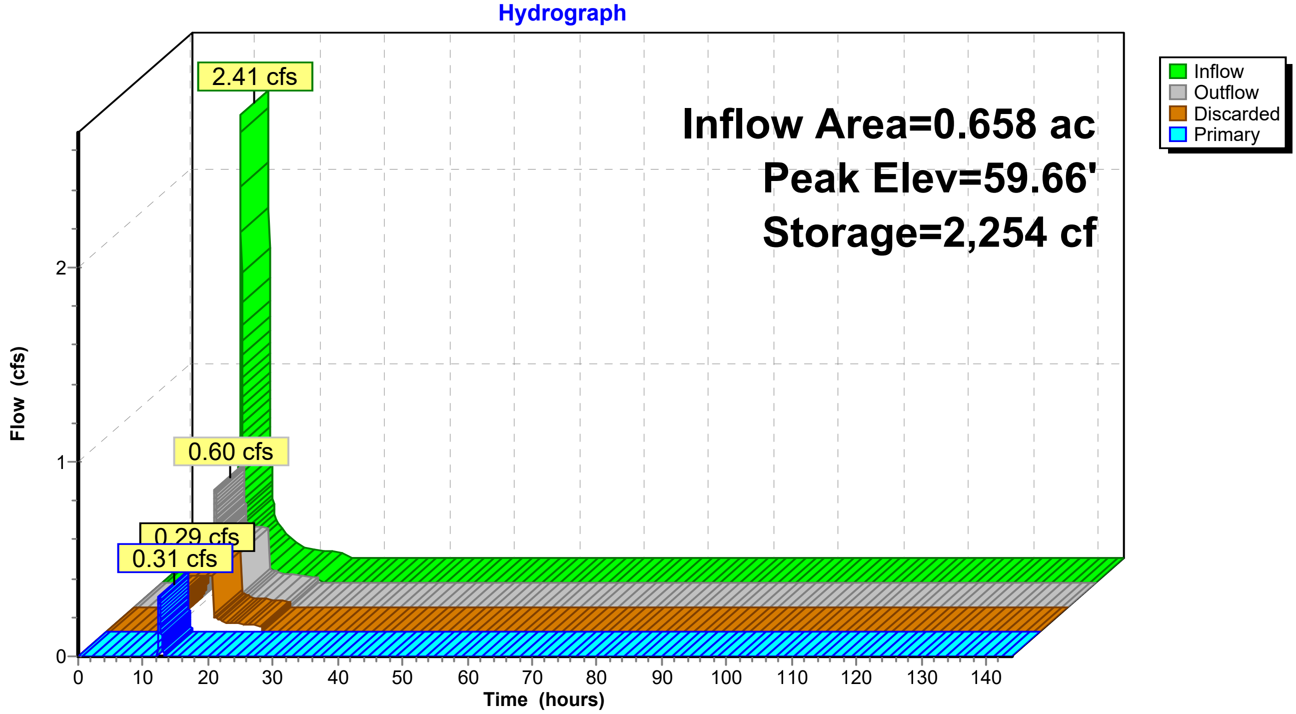
Chamber Storage + Stone Storage = 3,258.8 cf = 0.075 af
Overall Storage Efficiency = 61.0%
Overall System Size = 74.43' x 20.50' x 3.50'

40 Chambers
197.8 cy Field
128.5 cy Stone





Pond IC-1: Infiltration Chambers



Summary for Pond IC-2: Infiltration Chambers

Inflow Area = 3.098 ac, 57.89% Impervious, Inflow Depth = 2.92" for 25-Year event
Inflow = 10.39 cfs @ 12.09 hrs, Volume= 0.753 af
Outflow = 2.25 cfs @ 12.53 hrs, Volume= 0.753 af, Atten= 78%, Lag= 26.2 min
Discarded = 1.10 cfs @ 11.72 hrs, Volume= 0.681 af
Primary = 1.15 cfs @ 12.53 hrs, Volume= 0.072 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 62.07' @ 12.53 hrs Surf.Area= 5,725 sf Storage= 10,141 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 56.1 min (881.7 - 825.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	59.60'	5,405 cf	**70.25'W x 81.50'L x 4.00'H Field A** 22,901 cf Overall - 9,389 cf Embedded = 13,512 cf x 40.0% Voids
#2A	60.10'	9,389 cf	**Cultec R-360HD** x 252 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 252 Chambers in 12 Rows Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf
		14,794 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.17'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.17' / 58.05' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	61.40'	**9.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	63.50'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	59.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=1.10 cfs @ 11.72 hrs HW=59.65' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=1.15 cfs @ 12.53 hrs HW=62.07' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.15 cfs of 5.50 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.15 cfs @ 2.78 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IC-2: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf

60.0" Wide + 9.0" Spacing = 69.0" C-C Row Spacing

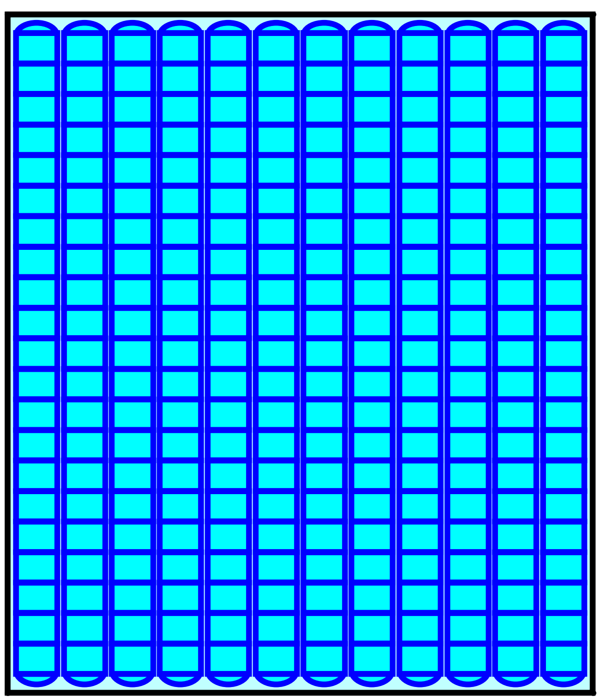
21 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 79.50' Row Length +12.0" End Stone x 2 = 81.50' Base Length
12 Rows x 60.0" Wide + 9.0" Spacing x 11 + 12.0" Side Stone x 2 = 70.25' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

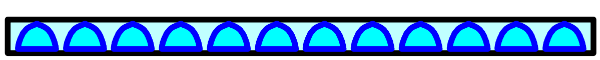
252 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 12 Rows = 9,389.5 cf Chamber Storage

22,901.5 cf Field - 9,389.5 cf Chambers = 13,512.0 cf Stone x 40.0% Voids = 5,404.8 cf Stone Storage

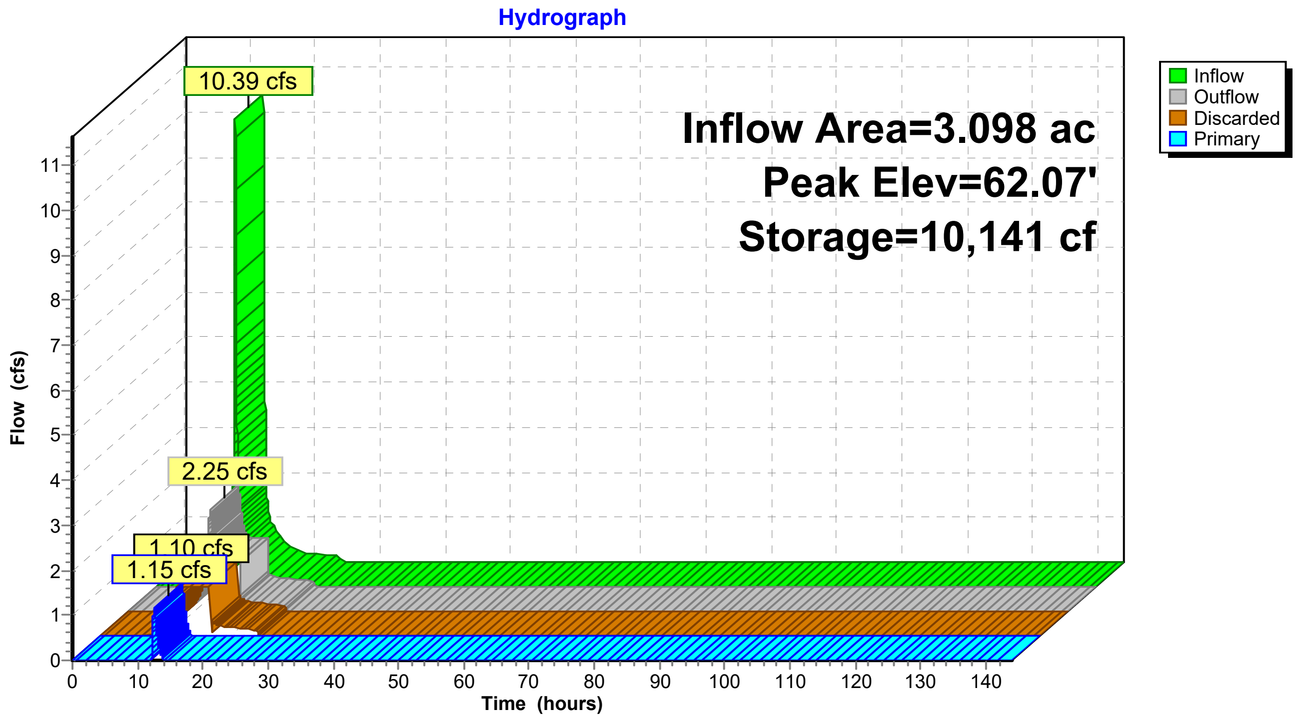
Chamber Storage + Stone Storage = 14,794.3 cf = 0.340 af
Overall Storage Efficiency = 64.6%
Overall System Size = 81.50' x 70.25' x 4.00'

252 Chambers
848.2 cy Field
500.4 cy Stone





Pond IC-2: Infiltration Chambers



Summary for Pond IC-3: Infiltration Chambers

Inflow Area = 0.968 ac, 40.25% Impervious, Inflow Depth = 2.09" for 25-Year event
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 0.168 af
Outflow = 0.46 cfs @ 11.86 hrs, Volume= 0.168 af, Atten= 79%, Lag= 0.0 min
Discarded = 0.46 cfs @ 11.86 hrs, Volume= 0.168 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 53.71' @ 12.55 hrs Surf.Area= 2,418 sf Storage= 1,650 cf

Plug-Flow detention time= 20.1 min calculated for 0.168 af (100% of inflow)
Center-of-Mass det. time= 20.1 min (857.4 - 837.2)

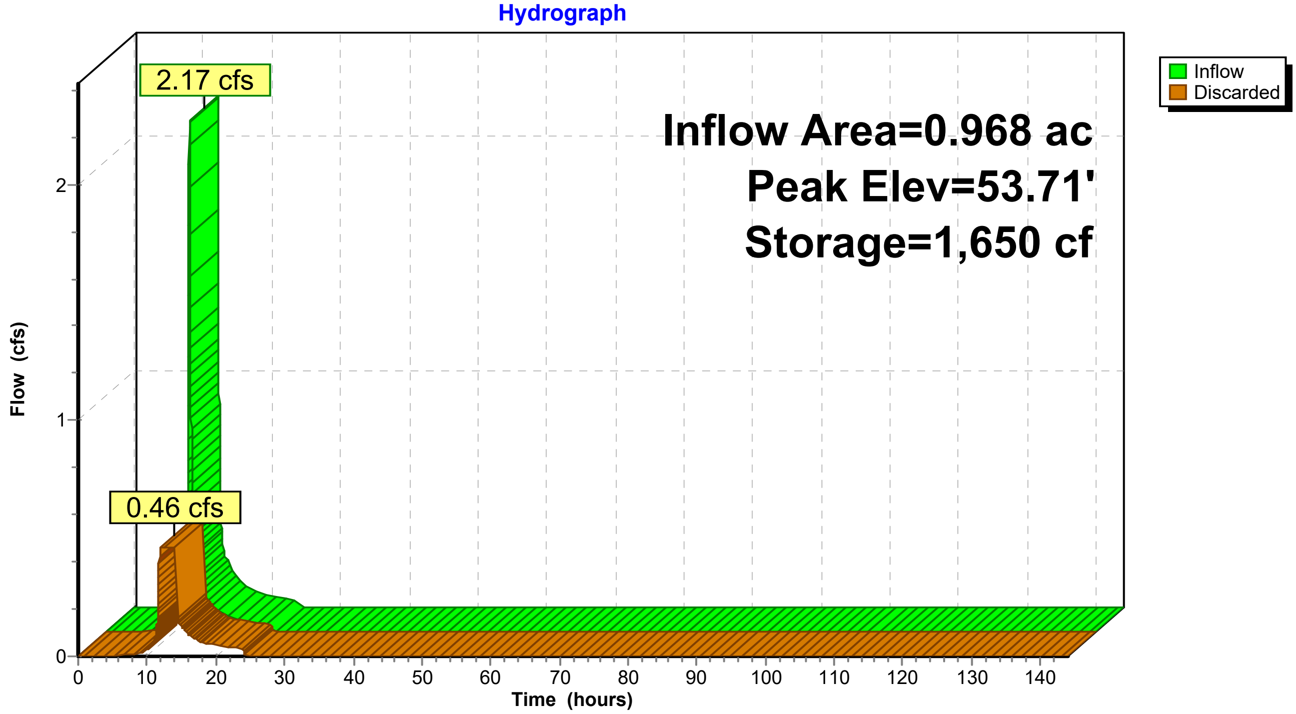
Volume	Invert	Avail.Storage	Storage Description
#1	52.60'	1,731 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 6,142 cf Overall - 1,814 cf Embedded = 4,328 cf x 40.0% Voids
#2	53.10'	1,814 cf	**Cultec R-150XLHD** x 66 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		3,545 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.60	2,418	0	0
55.14	2,418	6,142	6,142

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.46 cfs @ 11.86 hrs HW=52.63' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.46 cfs)

Pond IC-3: Infiltration Chambers



Time span=0.00-144.00 hrs, dt=0.02 hrs, 7201 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

Subcatchment1S: Sub-1S Runoff Area=6,628 sf 64.88% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=77 Runoff=0.79 cfs 0.056 af

Subcatchment1S-1: Sub-1S-1 Runoff Area=28,660 sf 63.31% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=76 Runoff=3.34 cfs 0.238 af

Subcatchment2S: Sub-2S Runoff Area=2,885 sf 0.00% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=39 Runoff=0.03 cfs 0.004 af

Subcatchment3S: Sub-3S Runoff Area=99,262 sf 9.98% Impervious Runoff Depth=2.28"
Tc=6.0 min CN=56 Runoff=5.76 cfs 0.434 af

Subcatchment3S-1: Sub-3S-1 Runoff Area=126,669 sf 55.14% Impervious Runoff Depth=3.91"
Tc=6.0 min CN=72 Runoff=13.33 cfs 0.949 af

Subcatchment3S-1R: Roofs 20-22 Runoff Area=6,010 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.96 cfs 0.079 af

Subcatchment3S-2: Sub-3S-2 Runoff Area=20,324 sf 0.00% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=38 Runoff=0.17 cfs 0.028 af

Subcatchment3S-2R: Roofs 24-25 Front Runoff Area=2,273 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.36 cfs 0.030 af

Subcatchment4S: Sub-4S Runoff Area=375 sf 0.00% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment5S: Sub -5S Runoff Area=16,999 sf 15.22% Impervious Runoff Depth=1.54"
Tc=6.0 min CN=48 Runoff=0.59 cfs 0.050 af

Subcatchment5S-1: Sub-5S-1 Runoff Area=22,924 sf 52.92% Impervious Runoff Depth=3.81"
Tc=6.0 min CN=71 Runoff=2.35 cfs 0.167 af

Subcatchment5S-1R: Roof 23 Front/Back Runoff Area=2,256 sf 100.00% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=98 Runoff=0.36 cfs 0.030 af

Subcatchment5S-2: Sub -5S-2 Runoff Area=2,764 sf 0.00% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=39 Runoff=0.03 cfs 0.004 af

Reach DP-1: DMH Inflow=1.55 cfs 0.102 af
Outflow=1.55 cfs 0.102 af

Reach DP-2: DP-2 Inflow=0.03 cfs 0.004 af
Outflow=0.03 cfs 0.004 af

Reach DP-3: DP-3 Inflow=6.26 cfs 0.702 af
Outflow=6.26 cfs 0.702 af

Reach DP-4: PL
Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach DP-5: Ward Street
Inflow=0.03 cfs 0.004 af
Outflow=0.03 cfs 0.004 af

Pond IC-1: Infiltration Chambers
Peak Elev=60.06' Storage=2,628 cf Inflow=3.34 cfs 0.238 af
Discarded=0.29 cfs 0.193 af Primary=1.20 cfs 0.045 af Outflow=1.49 cfs 0.238 af

Pond IC-2: Infiltration Chambers
Peak Elev=63.27' Storage=14,036 cf Inflow=14.65 cfs 1.057 af
Discarded=1.10 cfs 0.818 af Primary=2.60 cfs 0.240 af Outflow=3.70 cfs 1.057 af

Pond IC-3: Infiltration Chambers
Peak Elev=54.77' Storage=3,184 cf Inflow=3.28 cfs 0.247 af
Outflow=0.46 cfs 0.247 af

Total Runoff Area = 7.760 ac Runoff Volume = 2.070 af Average Runoff Depth = 3.20"
62.30% Pervious = 4.834 ac 37.70% Impervious = 2.926 ac

Summary for Subcatchment 1S: Sub-1S

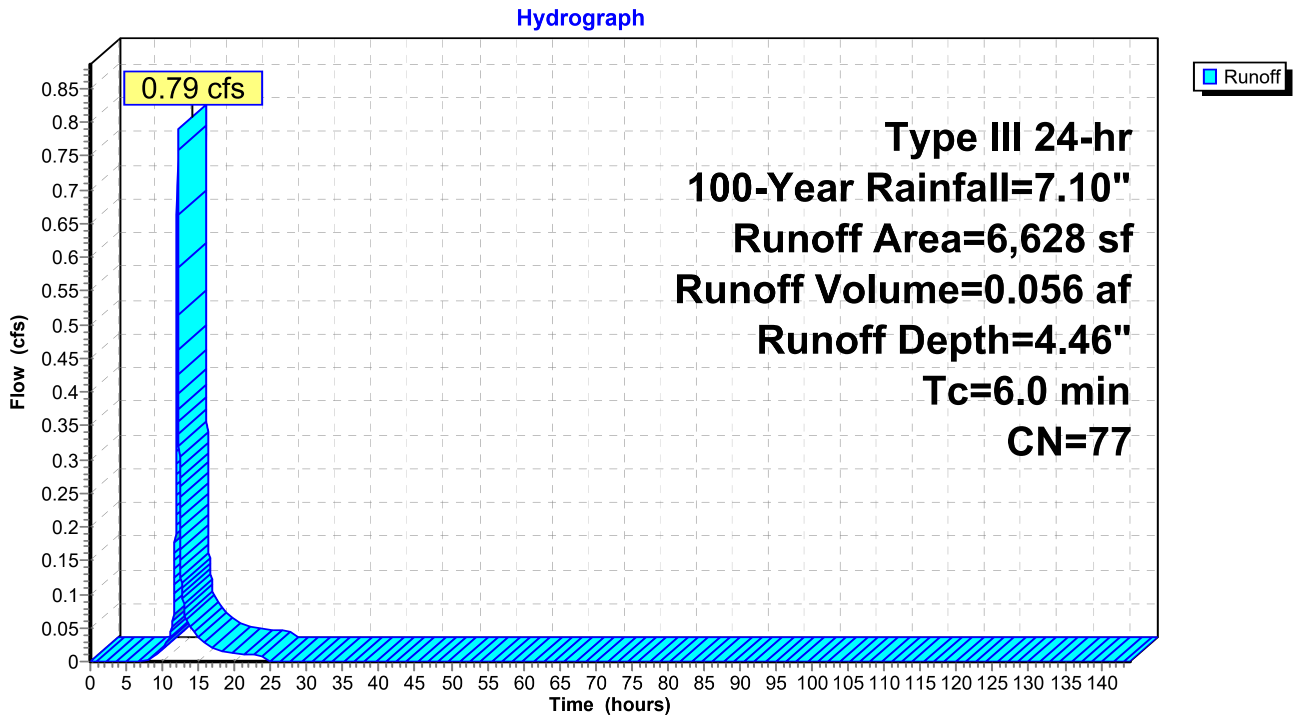
Runoff = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af, Depth= 4.46"
Routed to Reach DP-1 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	2,328	39	>75% Grass cover, Good, HSG A
	3,451	98	Paved roads w/curbs & sewers, HSG A
*	849	98	Paved sidewalk, HSG A
	6,628	77	Weighted Average
	2,328		35.12% Pervious Area
	4,300		64.88% Impervious Area

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

Subcatchment 1S: Sub-1S



Summary for Subcatchment 1S-1: Sub-1S-1

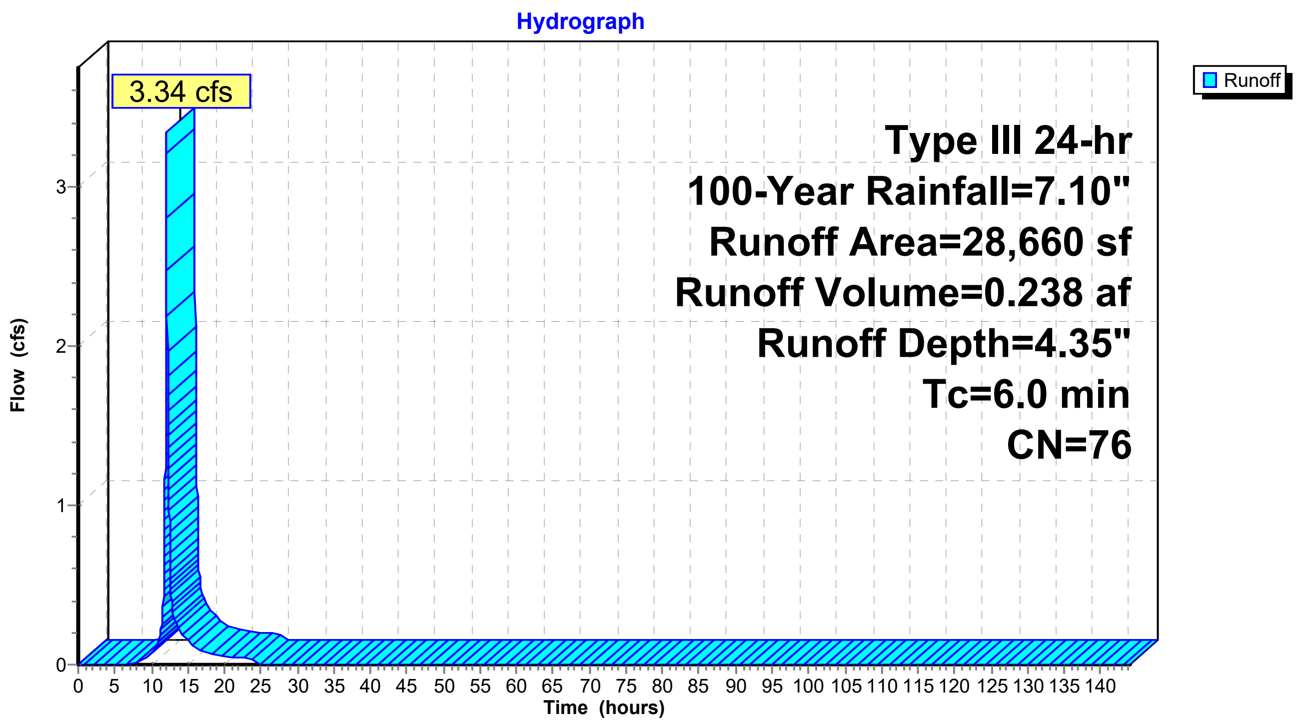
Runoff = 3.34 cfs @ 12.09 hrs, Volume= 0.238 af, Depth= 4.35"
Routed to Pond IC-1 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	10,515	39	>75% Grass cover, Good, HSG A
	3,661	98	Paved roads w/curbs & sewers, HSG A
*	1,004	98	Paved sidewalk, HSG A
*	2,080	98	Paved drives, HSG A
*	752	98	Decks, HSG A
	10,407	98	Roofs, HSG A
*	241	98	Paved walks, HSG A
	28,660	76	Weighted Average
	10,515		36.69% Pervious Area
	18,145		63.31% Impervious Area

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

Subcatchment 1S-1: Sub-1S-1



Summary for Subcatchment 2S: Sub-2S

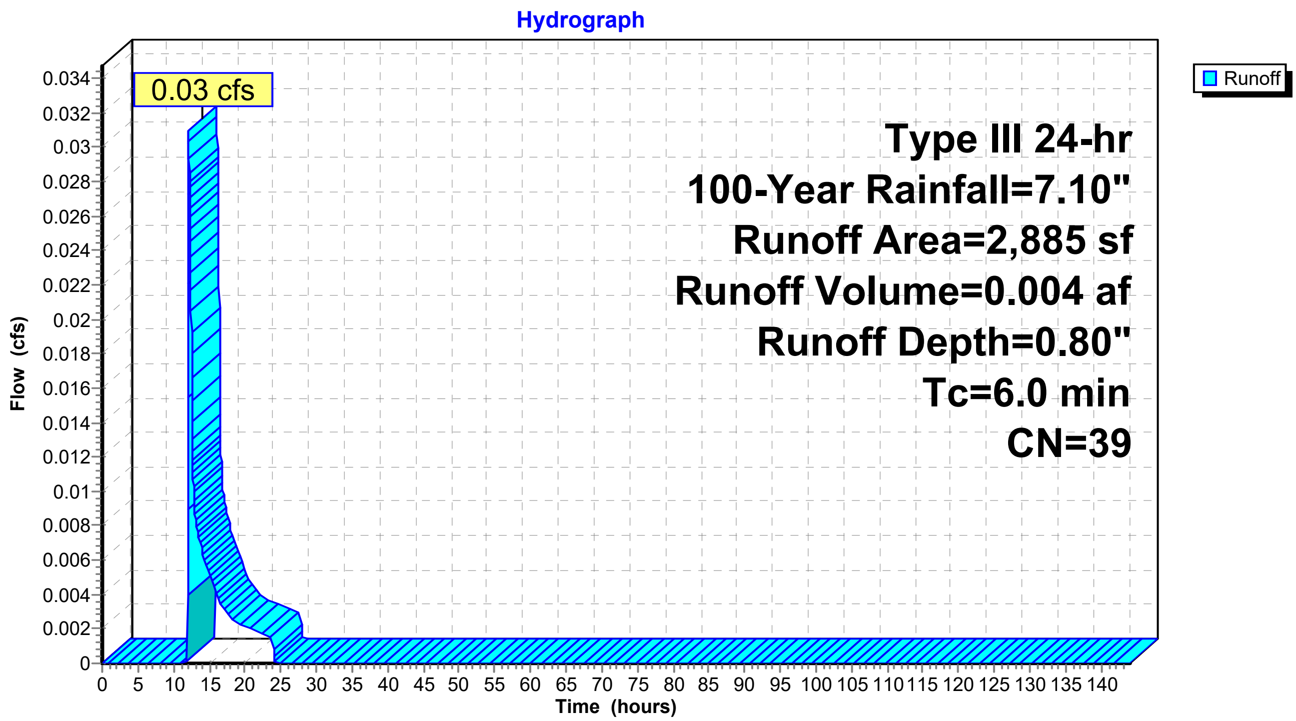
Runoff = 0.03 cfs @ 12.14 hrs, Volume= 0.004 af, Depth= 0.80"
Routed to Reach DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
2,885	39	>75% Grass cover, Good, HSG A
2,885		100.00% Pervious Area

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

Subcatchment 2S: Sub-2S



Summary for Subcatchment 3S: Sub-3S

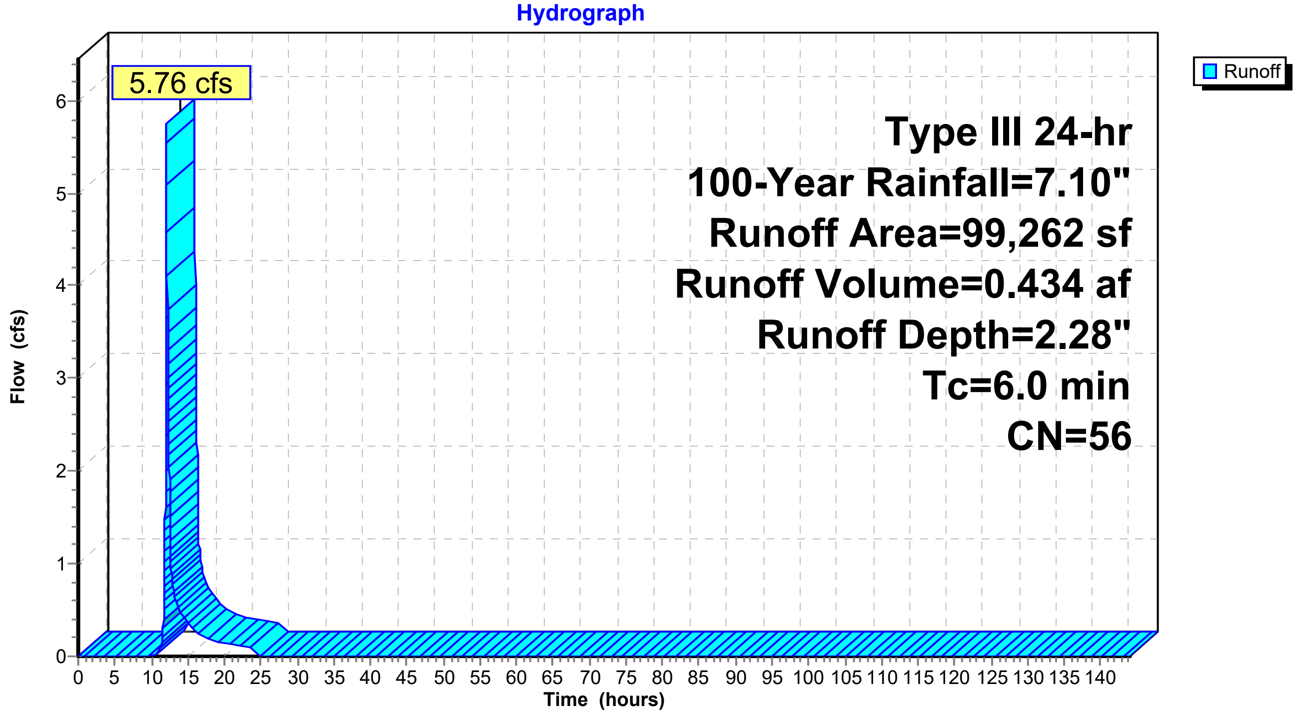
Runoff = 5.76 cfs @ 12.10 hrs, Volume= 0.434 af, Depth= 2.28"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	290	98	Paved drives, HSG A - offsite
*	4,310	30	Woods, Good, HSG A - offsite
*	1,734	55	Woods, Good, HSG B - offsite
*	4,121	39	>75% Grass cover, Good, HSG A - offsite
*	957	61	>75% Grass cover, Good, HSG B - offsite
	23,550	61	>75% Grass cover, Good, HSG B
	20,523	39	>75% Grass cover, Good, HSG A
*	454	98	Decks, HSG A
*	895	98	Decks, HSG B
	2,628	98	Roofs, HSG A
	5,310	98	Roofs, HSG B
*	167	98	Riprap, HSG B
*	160	98	Riprap, HSG A
	34,033	55	Woods, Good, HSG B
	130	30	Woods, Good, HSG A
	99,262	56	Weighted Average
	89,358		90.02% Pervious Area
	9,904		9.98% Impervious Area

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

Subcatchment 3S: Sub-3S



Summary for Subcatchment 3S-1: Sub-3S-1

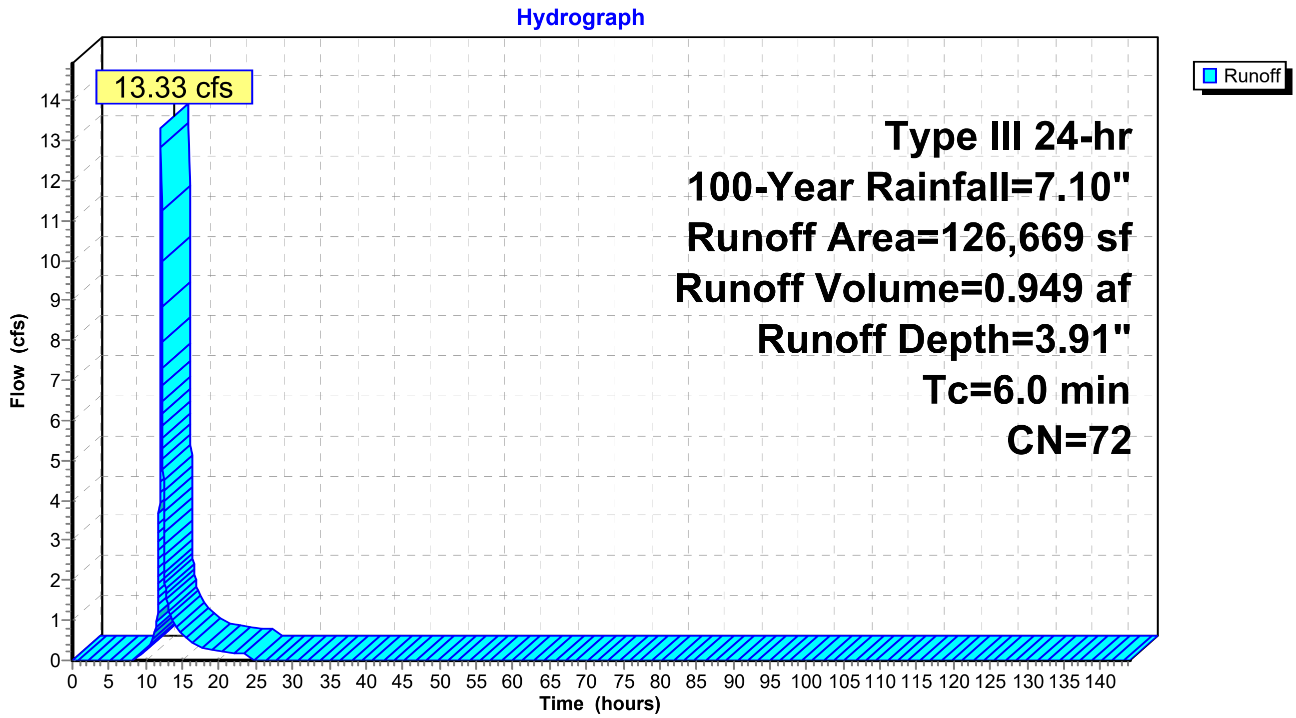
Runoff = 13.33 cfs @ 12.09 hrs, Volume= 0.949 af, Depth= 3.91"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	8,418	98	Paved drives, HSG A
*	2,654	98	Paved drives, HSG B
*	9,803	98	Paved roads w/curbs & sewers, HSG A
*	7,871	98	Paved roads w/curbs & sewers, HSG B
*	736	98	Walks, HSG A
*	335	98	Walks, HSG B
*	43,330	39	>75% Grass cover, Good, HSG A
*	5,078	61	>75% Grass cover, Good, HSG B
*	1,706	98	Decks, HSG A
*	84	98	Decks, HSG B
*	7,838	98	Roofs, HSG B
*	27,432	98	Roofs, HSG A
*	8,421	39	>75% Grass cover, Good, HSG A
*	1,911	98	Paved sidewalk, HSG A
*	1,052	98	Paved sidewalk, HSG B
	126,669	72	Weighted Average
	56,829		44.86% Pervious Area
	69,840		55.14% Impervious Area

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

Subcatchment 3S-1: Sub-3S-1



Summary for Subcatchment 3S-1R: Roofs 20-22 Front/Back

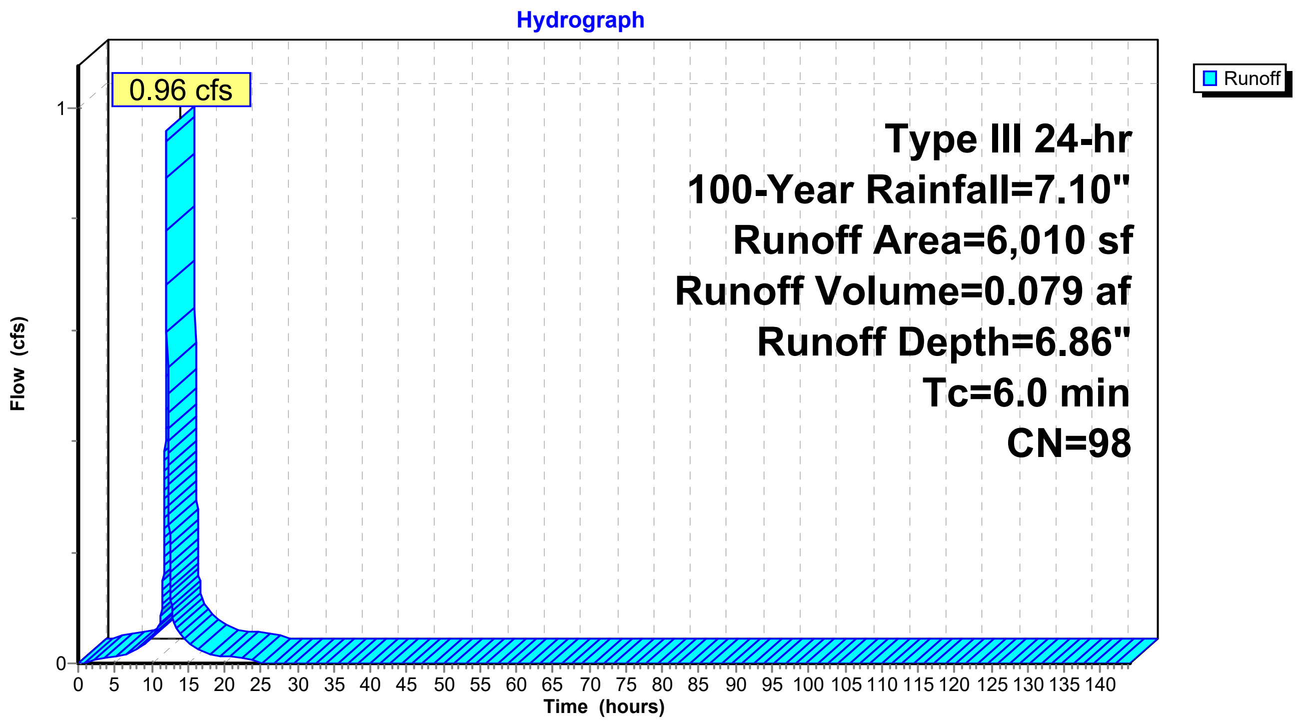
Runoff = 0.96 cfs @ 12.08 hrs, Volume= 0.079 af, Depth= 6.86"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	6,010	98	Roofs, HSG A
	6,010		100.00% Impervious Area

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

Subcatchment 3S-1R: Roofs 20-22 Front/Back



Summary for Subcatchment 3S-2: Sub-3S-2

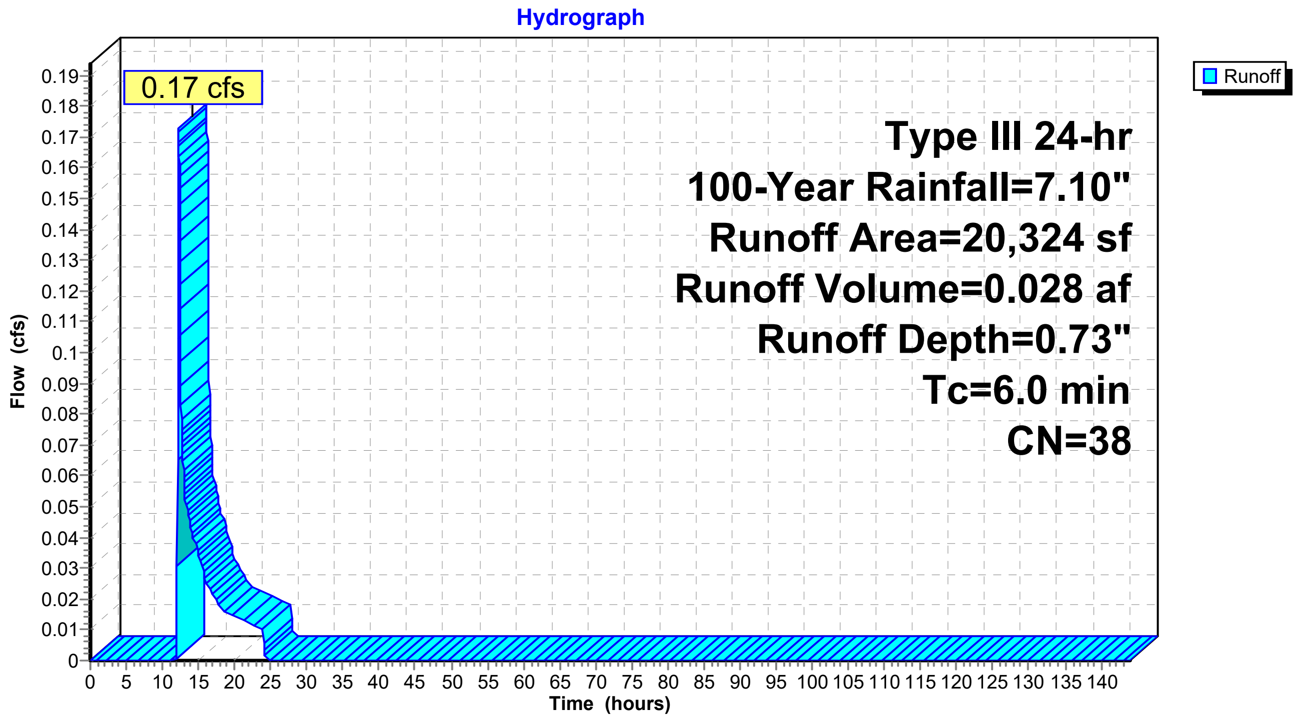
Runoff = 0.17 cfs @ 12.15 hrs, Volume= 0.028 af, Depth= 0.73"
Routed to Reach DP-3 : DP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	18,642	39	>75% Grass cover, Good, HSG A - offsite
*	1,682	30	Woods, Good, HSG A - offsite
	20,324	38	Weighted Average
	20,324		100.00% Pervious Area

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

Subcatchment 3S-2: Sub-3S-2



Summary for Subcatchment 3S-2R: Roofs 24-25 Front

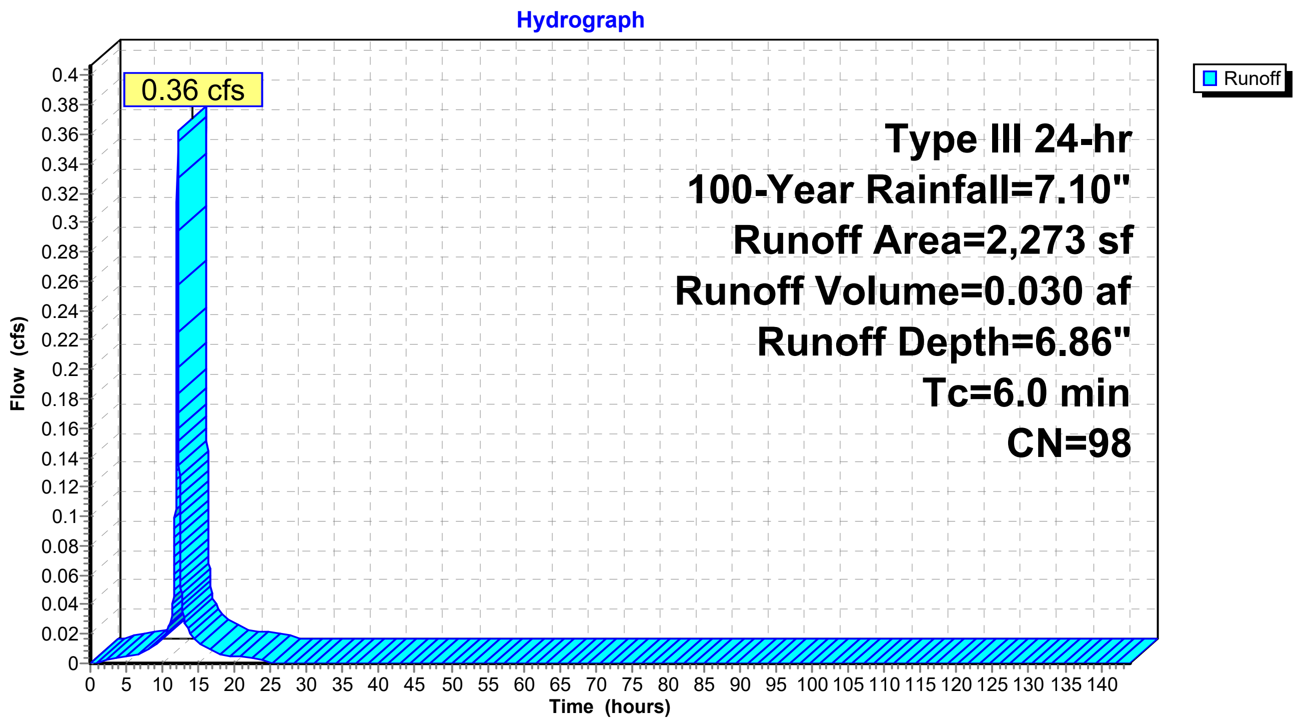
Runoff = 0.36 cfs @ 12.08 hrs, Volume= 0.030 af, Depth= 6.86"
Routed to Pond IC-2 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
2,273	98	Roofs, HSG A
2,273		100.00% Impervious Area

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

Subcatchment 3S-2R: Roofs 24-25 Front



Summary for Subcatchment 4S: Sub-4S

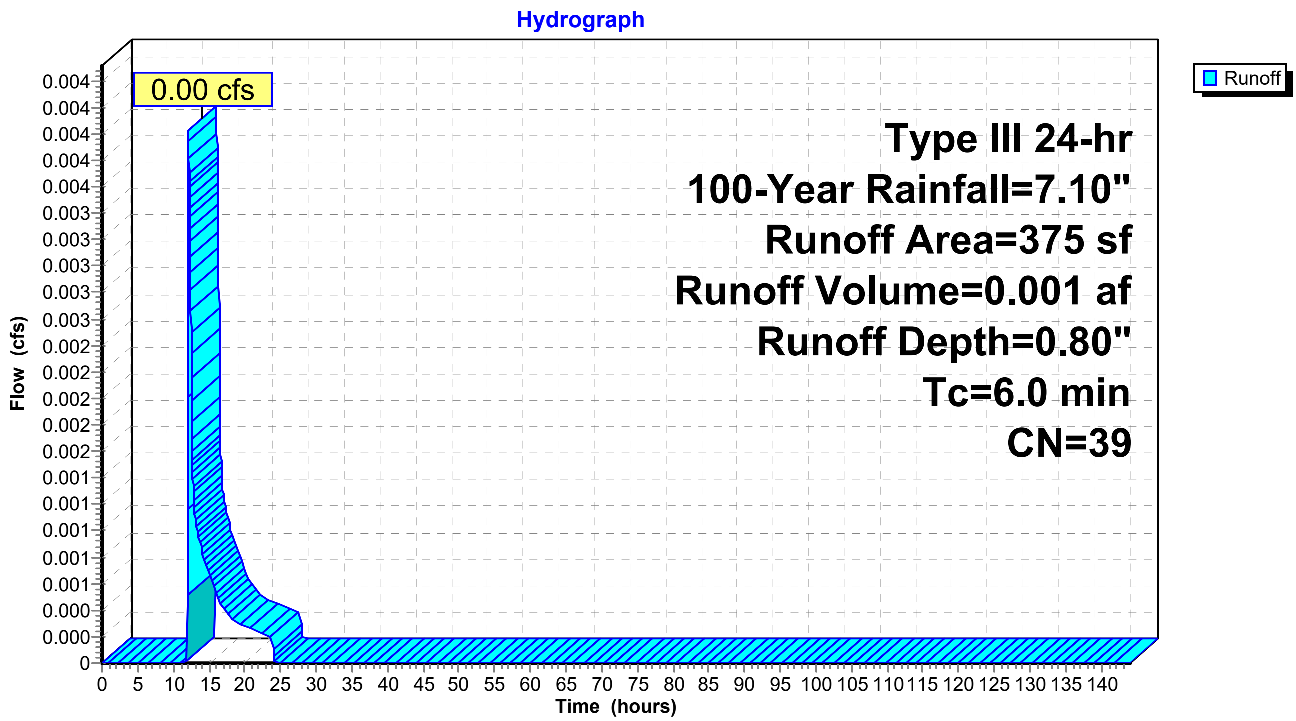
Runoff = 0.00 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 0.80"
Routed to Reach DP-4 : PL

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
375	39	>75% Grass cover, Good, HSG A
375		100.00% Pervious Area

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

Subcatchment 4S: Sub-4S



Summary for Subcatchment 5S: Sub -5S

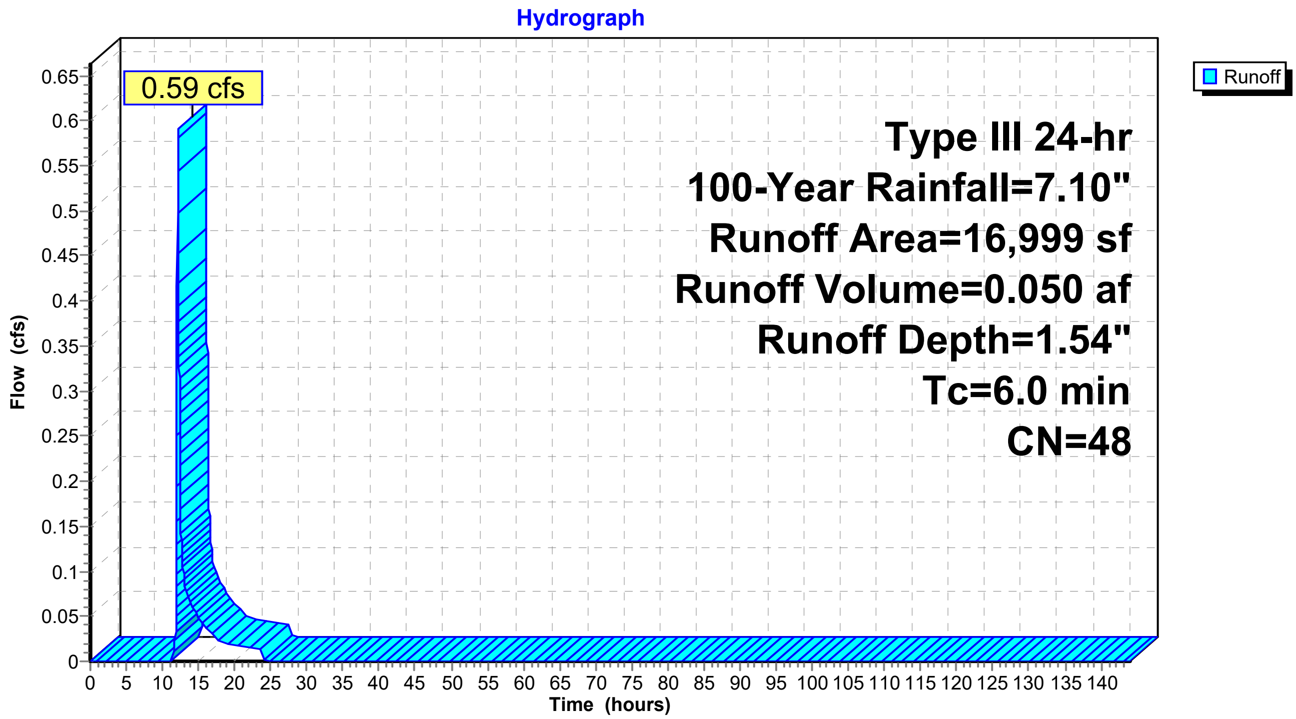
Runoff = 0.59 cfs @ 12.10 hrs, Volume= 0.050 af, Depth= 1.54"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	156	98	Decks, HSG A
	14,411	39	>75% Grass cover, Good, HSG A
*	525	98	Walls, HSG A
	1,907	98	Roofs, HSG A
	16,999	48	Weighted Average
	14,411		84.78% Pervious Area
	2,588		15.22% Impervious Area

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

Subcatchment 5S: Sub -5S



Summary for Subcatchment 5S-1: Sub-5S-1

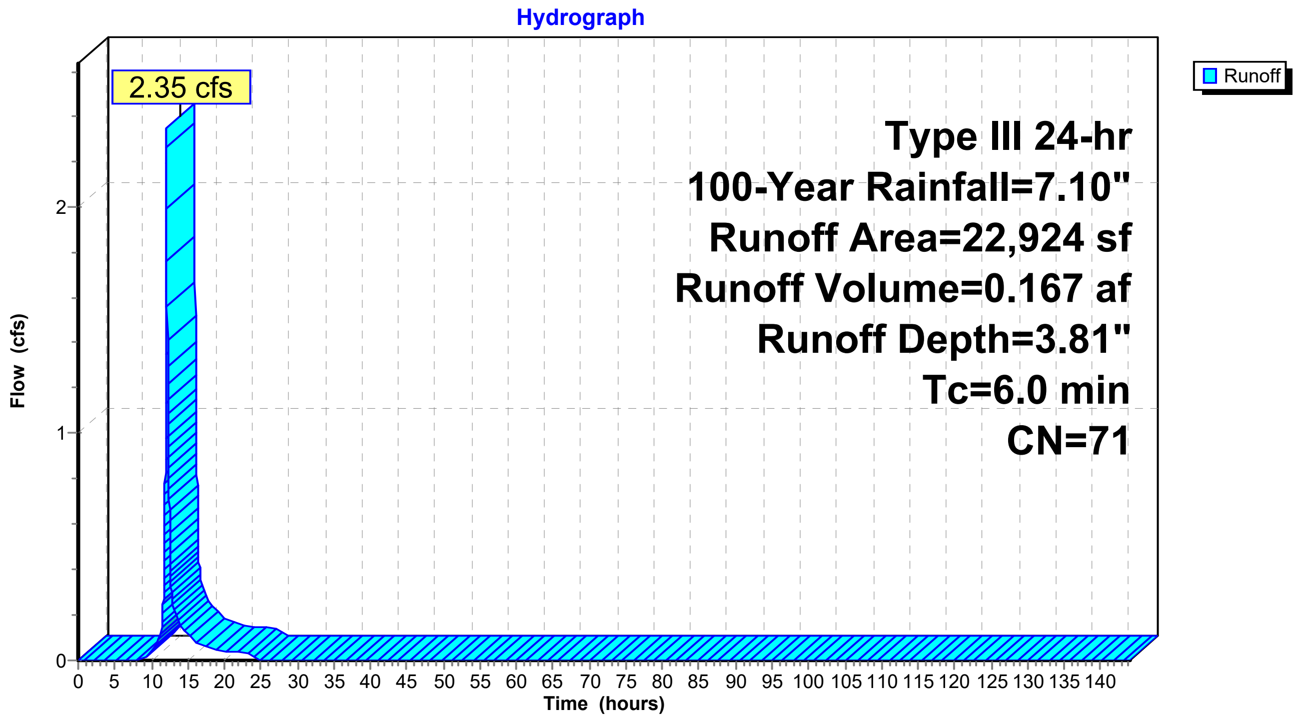
Runoff = 2.35 cfs @ 12.09 hrs, Volume= 0.167 af, Depth= 3.81"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	6,186	98	Paved drives, HSG A
	2,972	98	Paved roads w/curbs & sewers, HSG A
*	247	98	Walks, HSG A
	10,428	39	>75% Grass cover, Good, HSG A
*	1,508	98	Paved sidewalk, HSG A
*	62	98	Paved sidewalk, HSG D
	286	98	Paved roads w/curbs & sewers, HSG D
	365	80	>75% Grass cover, Good, HSG D
*	272	98	Walls, HSG A
*	598	98	Decks, HSG A
	22,924	71	Weighted Average
	10,793		47.08% Pervious Area
	12,131		52.92% Impervious Area

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

Subcatchment 5S-1: Sub-5S-1



Summary for Subcatchment 5S-1R: Roof 23 Front/Back

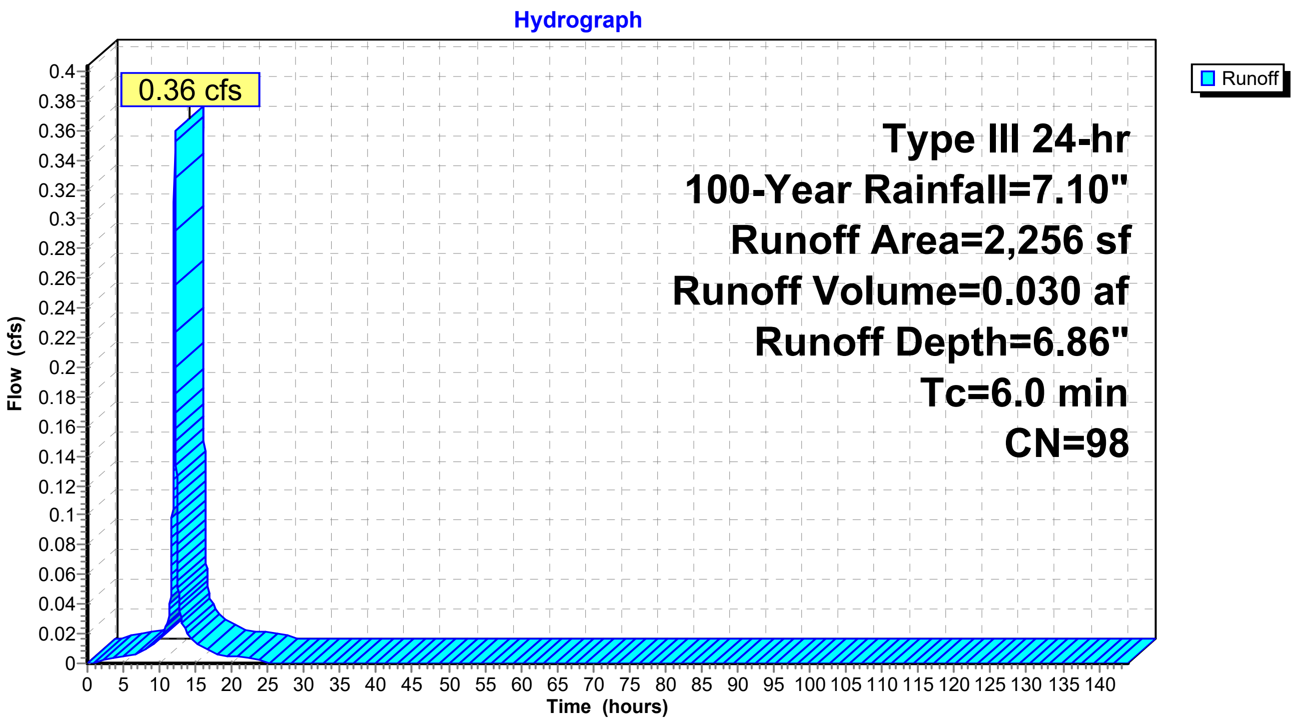
Runoff = 0.36 cfs @ 12.08 hrs, Volume= 0.030 af, Depth= 6.86"
Routed to Pond IC-3 : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	2,256	98	Roofs, HSG A
	2,256		100.00% Impervious Area

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

Subcatchment 5S-1R: Roof 23 Front/Back



Summary for Subcatchment 5S-2: Sub -5S-2

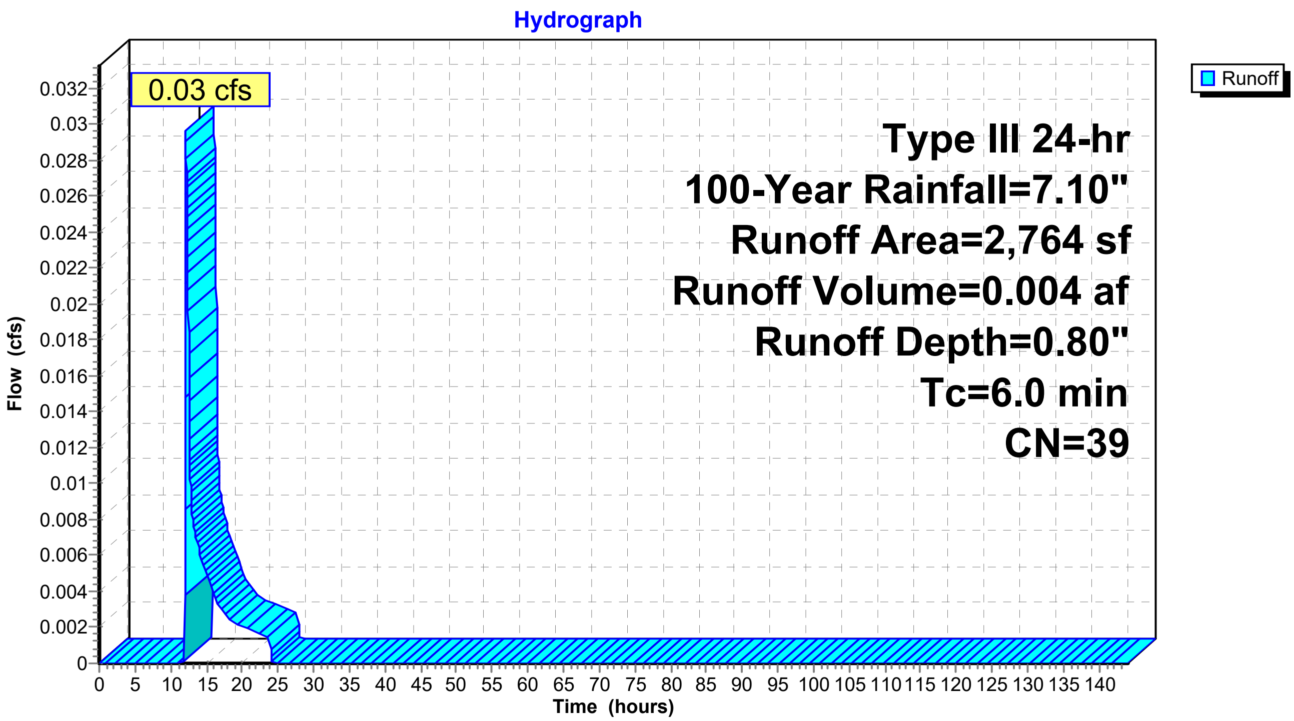
Runoff = 0.03 cfs @ 12.14 hrs, Volume= 0.004 af, Depth= 0.80"
Routed to Reach DP-5 : Ward Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
2,764	39	>75% Grass cover, Good, HSG A
2,764		100.00% Pervious Area

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

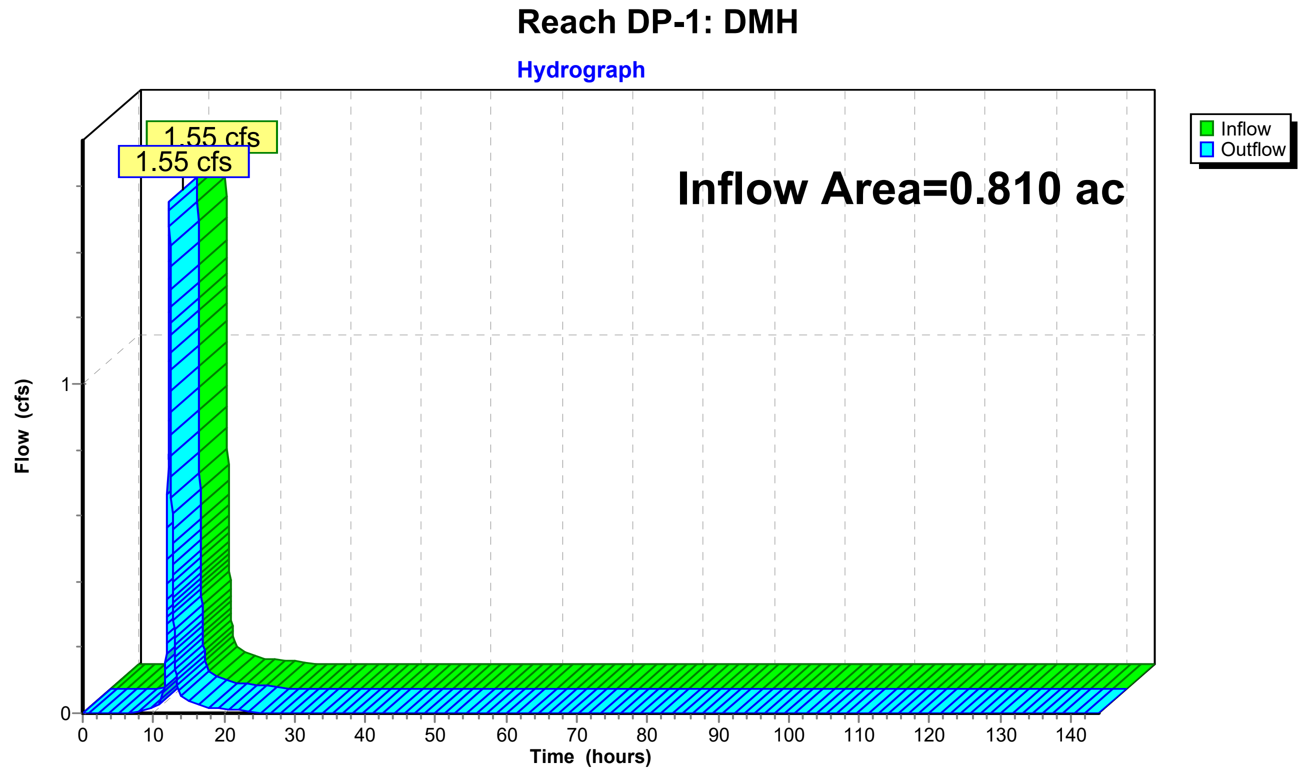
Subcatchment 5S-2: Sub -5S-2



Summary for Reach DP-1: DMH

Inflow Area = 0.810 ac, 63.61% Impervious, Inflow Depth = 1.51" for 100-Year event
Inflow = 1.55 cfs @ 12.28 hrs, Volume= 0.102 af
Outflow = 1.55 cfs @ 12.28 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min

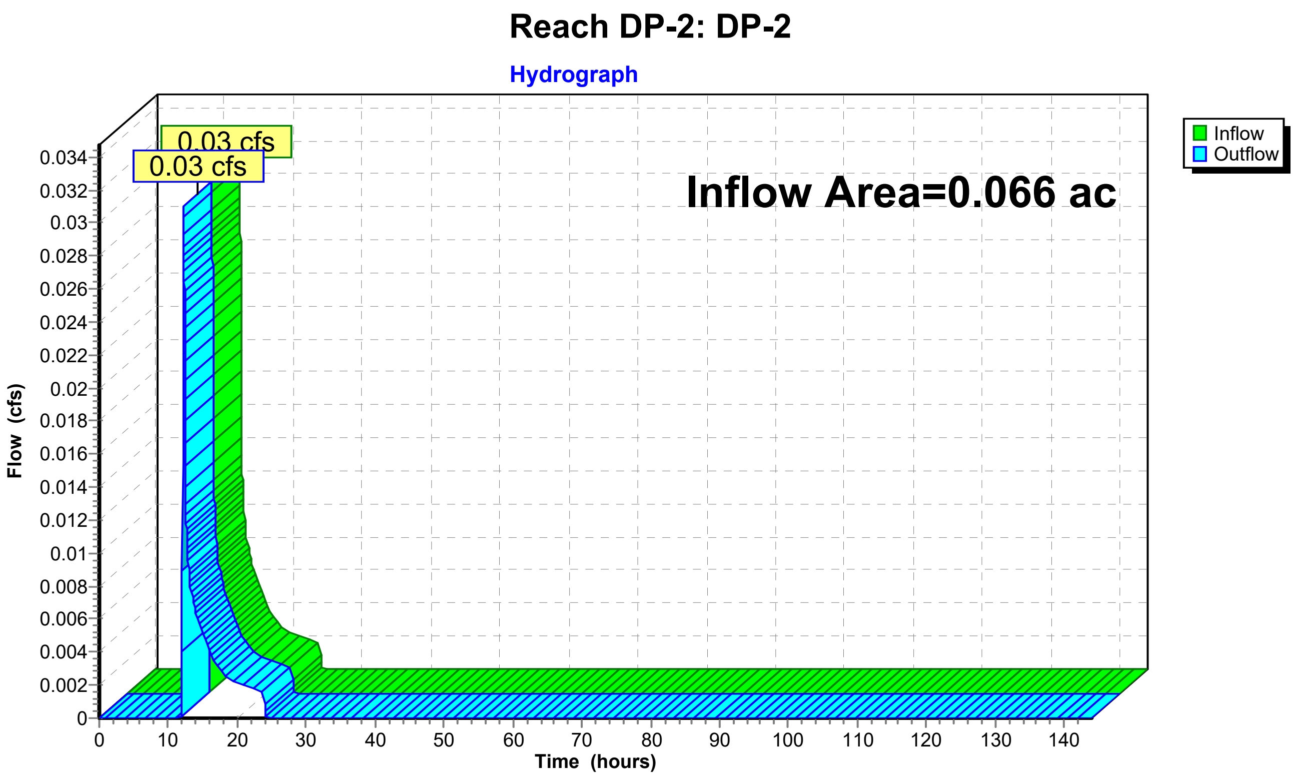
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-2: DP-2

Inflow Area =	0.066 ac,	0.00% Impervious,	Inflow Depth = 0.80"	for 100-Year event	
Inflow =	0.03 cfs @	12.14 hrs,	Volume=	0.004 af	
Outflow =	0.03 cfs @	12.14 hrs,	Volume=	0.004 af,	Atten= 0%, Lag= 0.0 min

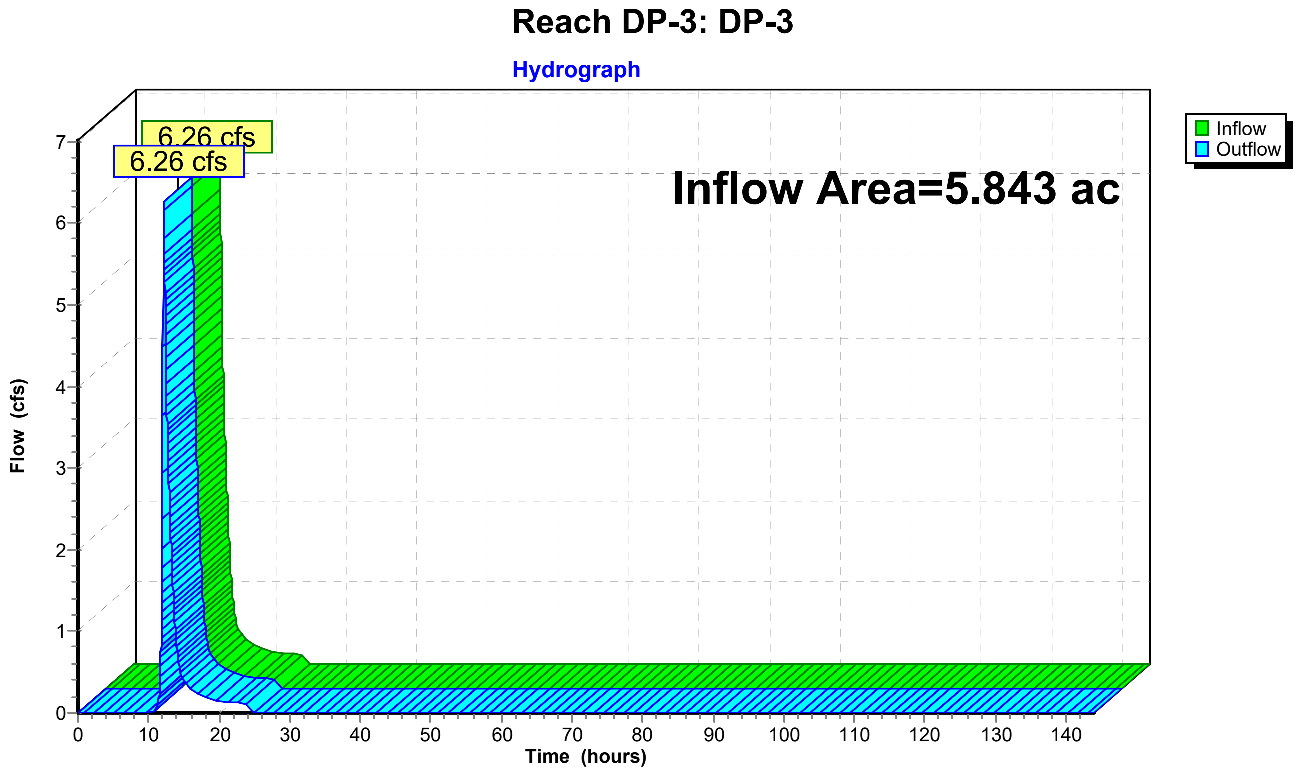
Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs



Summary for Reach DP-3: DP-3

Inflow Area =	5.843 ac,	34.58% Impervious,	Inflow Depth = 1.44"	for 100-Year event
Inflow =	6.26 cfs @	12.13 hrs, Volume=	0.702 af	
Outflow =	6.26 cfs @	12.13 hrs, Volume=	0.702 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

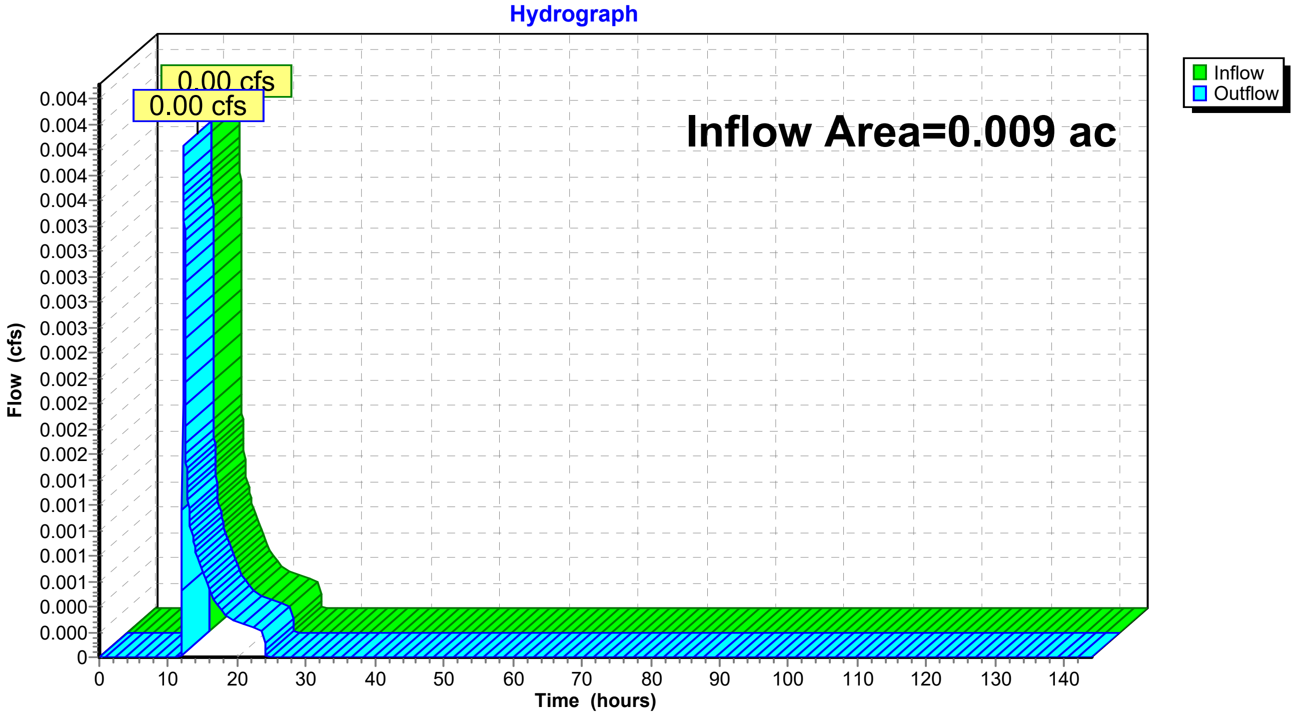


Summary for Reach DP-4: PL

Inflow Area = 0.009 ac, 0.00% Impervious, Inflow Depth = 0.80" for 100-Year event
Inflow = 0.00 cfs @ 12.14 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 12.14 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

Reach DP-4: PL

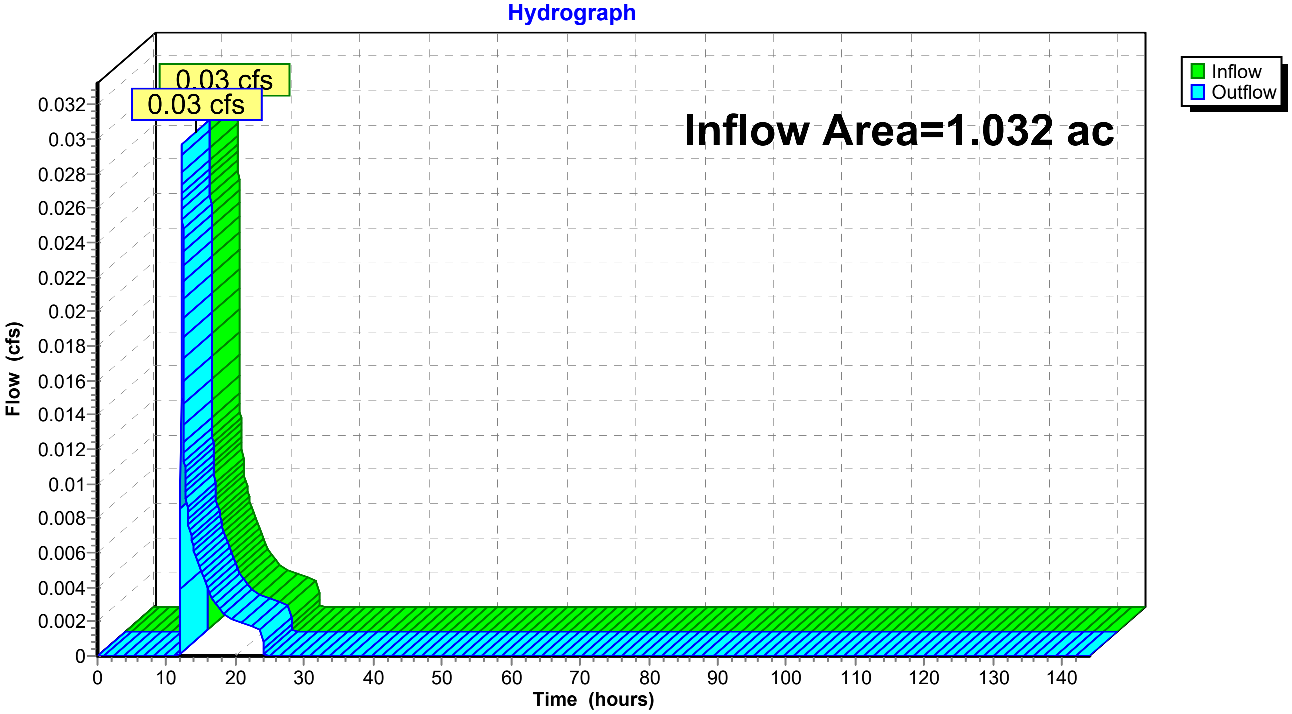


Summary for Reach DP-5: Ward Street

Inflow Area =	1.032 ac,	37.77% Impervious,	Inflow Depth = 0.05"	for 100-Year event	
Inflow =	0.03 cfs @	12.14 hrs,	Volume=	0.004 af	
Outflow =	0.03 cfs @	12.14 hrs,	Volume=	0.004 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs

Reach DP-5: Ward Street



Summary for Pond IC-1: Infiltration Chambers

Inflow Area = 0.658 ac, 63.31% Impervious, Inflow Depth = 4.35" for 100-Year event
Inflow = 3.34 cfs @ 12.09 hrs, Volume= 0.238 af
Outflow = 1.49 cfs @ 12.29 hrs, Volume= 0.238 af, Atten= 55%, Lag= 12.0 min
Discarded = 0.29 cfs @ 11.62 hrs, Volume= 0.193 af
Primary = 1.20 cfs @ 12.29 hrs, Volume= 0.045 af
Routed to Reach DP-1 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 60.06' @ 12.29 hrs Surf.Area= 1,526 sf Storage= 2,628 cf

Plug-Flow detention time= 45.6 min calculated for 0.238 af (100% of inflow)
Center-of-Mass det. time= 45.6 min (862.4 - 816.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	57.50'	1,388 cf	**20.50'W x 74.43'L x 3.50'H Field A**
			5,341 cf Overall - 1,871 cf Embedded = 3,470 cf x 40.0% Voids
#2A	58.00'	1,871 cf	**Cultec R-300HD** x 40 Inside #1
			Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
			Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
			40 Chambers in 4 Rows
			Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf
		3,259 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.10'	**12.0" Round Culvert**
			L= 67.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 58.10' / 57.42' S= 0.0101 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	59.35'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	60.00'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir**
			2 End Contraction(s)
#4	Discarded	57.50'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.29 cfs @ 11.62 hrs HW=57.54' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=1.19 cfs @ 12.29 hrs HW=60.06' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.19 cfs of 4.25 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.02 cfs @ 2.94 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.17 cfs @ 0.77 fps)

Pond IC-1: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 4 rows = 21.2 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

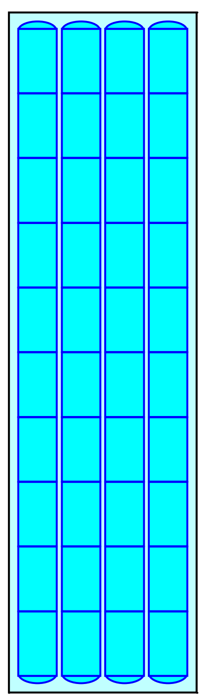
10 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 72.43' Row Length +12.0" End Stone x 2 = 74.43' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

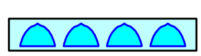
40 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 4 Rows = 1,870.9 cf Chamber Storage

5,340.6 cf Field - 1,870.9 cf Chambers = 3,469.7 cf Stone x 40.0% Voids = 1,387.9 cf Stone Storage

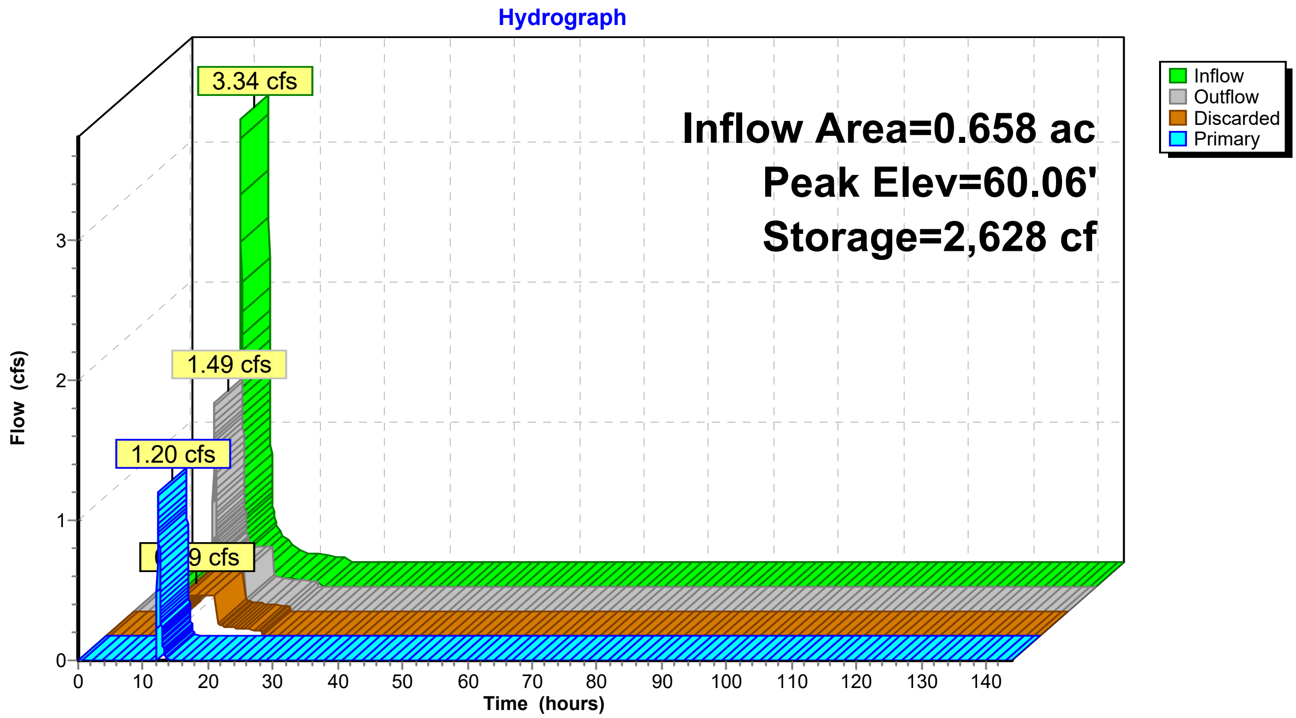
Chamber Storage + Stone Storage = 3,258.8 cf = 0.075 af
Overall Storage Efficiency = 61.0%
Overall System Size = 74.43' x 20.50' x 3.50'

40 Chambers
197.8 cy Field
128.5 cy Stone





Pond IC-1: Infiltration Chambers



Summary for Pond IC-2: Infiltration Chambers

Inflow Area = 3.098 ac, 57.89% Impervious, Inflow Depth = 4.10" for 100-Year event
Inflow = 14.65 cfs @ 12.09 hrs, Volume= 1.057 af
Outflow = 3.70 cfs @ 12.48 hrs, Volume= 1.057 af, Atten= 75%, Lag= 23.7 min
Discarded = 1.10 cfs @ 11.62 hrs, Volume= 0.818 af
Primary = 2.60 cfs @ 12.48 hrs, Volume= 0.240 af
Routed to Reach DP-3 : DP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 63.27' @ 12.48 hrs Surf.Area= 5,725 sf Storage= 14,036 cf

Plug-Flow detention time= 55.8 min calculated for 1.057 af (100% of inflow)
Center-of-Mass det. time= 55.8 min (873.0 - 817.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	59.60'	5,405 cf	**70.25'W x 81.50'L x 4.00'H Field A** 22,901 cf Overall - 9,389 cf Embedded = 13,512 cf x 40.0% Voids
#2A	60.10'	9,389 cf	**Cultec R-360HD** x 252 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 252 Chambers in 12 Rows Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf
		14,794 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	58.17'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.17' / 58.05' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	61.40'	**9.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	63.50'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	59.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=1.10 cfs @ 11.62 hrs HW=59.65' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=2.60 cfs @ 12.48 hrs HW=63.27' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.60 cfs of 6.40 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.60 cfs @ 5.88 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IC-2: Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-360HD (Cultec Recharger® 360HD)
Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf
Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap
Cap Storage= 6.5 cf x 2 x 12 rows = 155.0 cf

60.0" Wide + 9.0" Spacing = 69.0" C-C Row Spacing

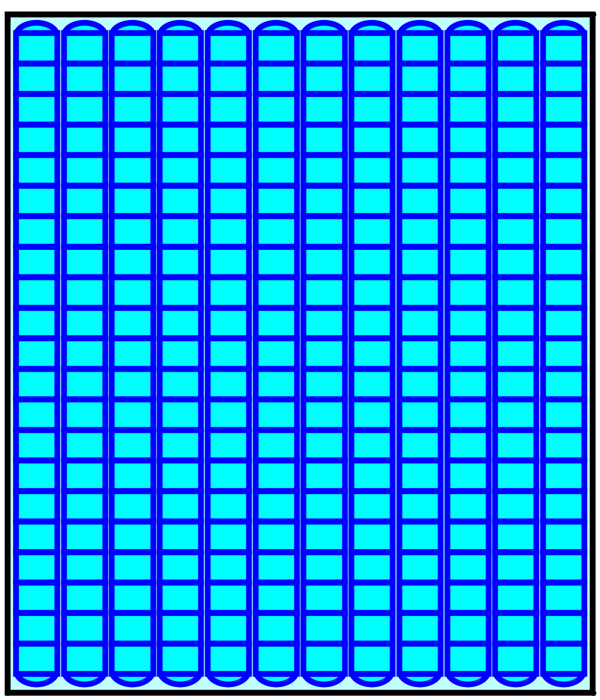
21 Chambers/Row x 3.67' Long +1.25' Cap Length x 2 = 79.50' Row Length +12.0" End Stone x 2 = 81.50' Base Length
12 Rows x 60.0" Wide + 9.0" Spacing x 11 + 12.0" Side Stone x 2 = 70.25' Base Width
6.0" Stone Base + 36.0" Chamber Height + 6.0" Stone Cover = 4.00' Field Height

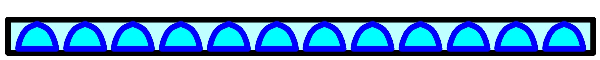
252 Chambers x 36.6 cf + 6.5 cf Cap Volume x 2 x 12 Rows = 9,389.5 cf Chamber Storage

22,901.5 cf Field - 9,389.5 cf Chambers = 13,512.0 cf Stone x 40.0% Voids = 5,404.8 cf Stone Storage

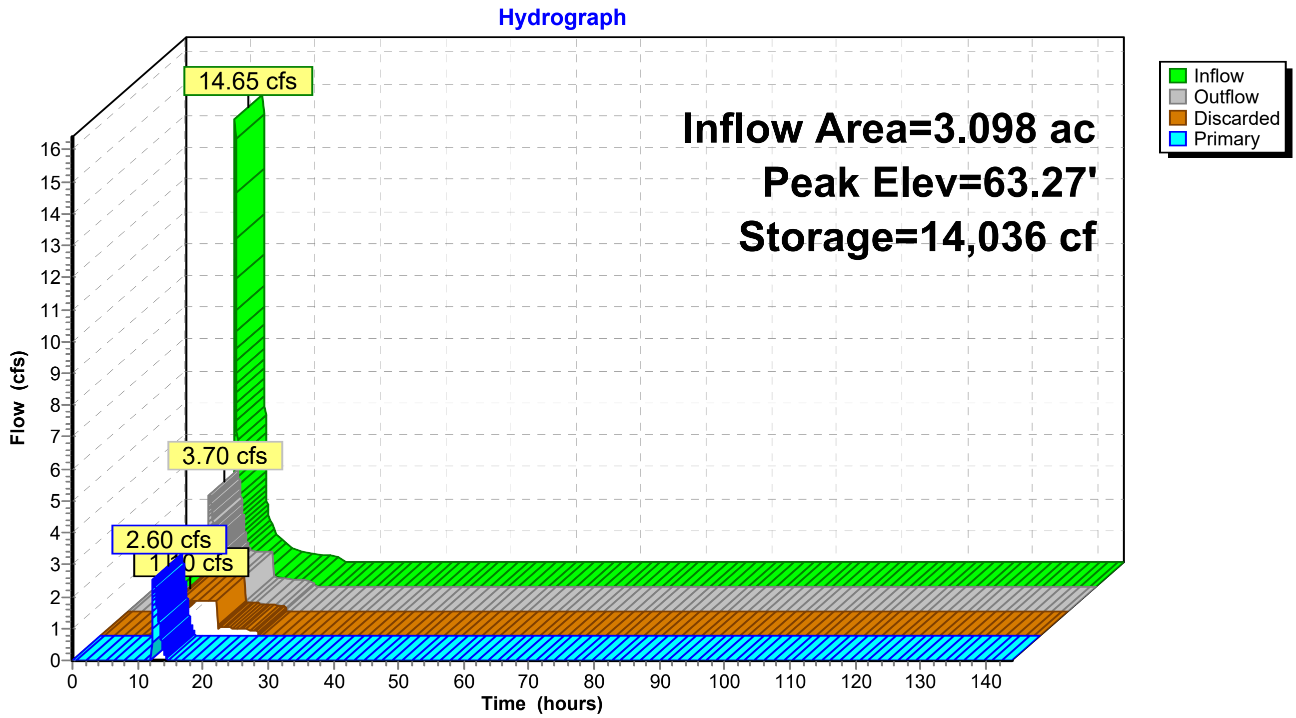
Chamber Storage + Stone Storage = 14,794.3 cf = 0.340 af
Overall Storage Efficiency = 64.6%
Overall System Size = 81.50' x 70.25' x 4.00'

252 Chambers
848.2 cy Field
500.4 cy Stone





Pond IC-2: Infiltration Chambers



Summary for Pond IC-3: Infiltration Chambers

Inflow Area = 0.968 ac, 40.25% Impervious, Inflow Depth = 3.06" for 100-Year event
Inflow = 3.28 cfs @ 12.09 hrs, Volume= 0.247 af
Outflow = 0.46 cfs @ 11.74 hrs, Volume= 0.247 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.46 cfs @ 11.74 hrs, Volume= 0.247 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-144.00 hrs, dt= 0.02 hrs
Peak Elev= 54.77' @ 12.72 hrs Surf.Area= 2,418 sf Storage= 3,184 cf

Plug-Flow detention time= 48.7 min calculated for 0.247 af (100% of inflow)
Center-of-Mass det. time= 48.7 min (878.4 - 829.6)

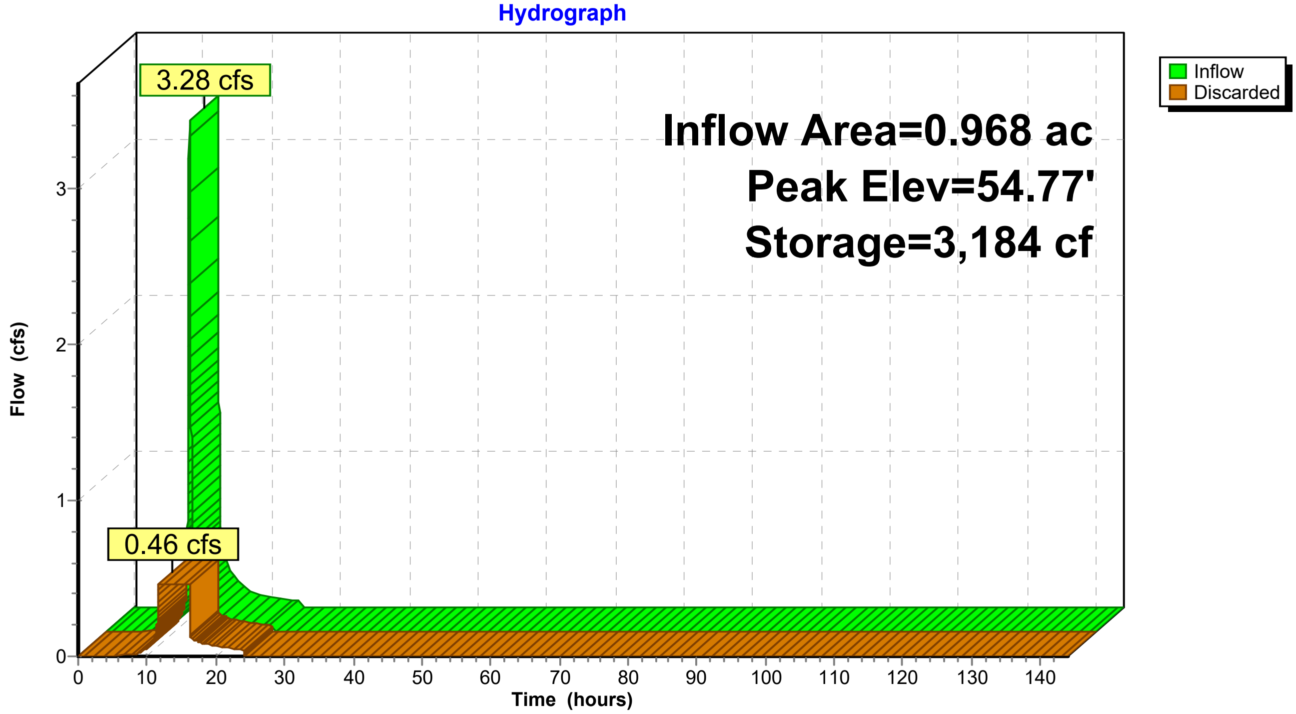
Volume	Invert	Avail.Storage	Storage Description
#1	52.60'	1,731 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 6,142 cf Overall - 1,814 cf Embedded = 4,328 cf x 40.0% Voids
#2	53.10'	1,814 cf	**Cultec R-150XLHD** x 66 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		3,545 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
52.60	2,418	0	0
55.14	2,418	6,142	6,142

Device	Routing	Invert	Outlet Devices
#1	Discarded	52.60'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'

Discarded OutFlow Max=0.46 cfs @ 11.74 hrs HW=52.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.46 cfs)

Pond IC-3: Infiltration Chambers



A P P E N D I X C

Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

6/8/26

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

  ☐ Credit 1

  ☐ Credit 2

  ☐ Credit 3

☐ Use of “country drainage” versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ______________________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:
- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

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

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

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

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

- ☐ The project is ***not*** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

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

A P P E N D I X D

Illicit Discharge Compliance Statement
Stormwater Management Facility Calculations
TSS Removal Worksheets

Illicit Discharge Compliance Statement

I, Bradley C. McKenzie, P.E., hereby notify the Hingham Conservation Commission that I have not witnessed, nor am aware of any existing illicit discharges at the site known as River Stone - Viking Lane and Ward Street in Hingham, Massachusetts. I also hereby certify that the development of said property as illustrated on the final plans entitled “Comprehensive Permit Plans known as River Stone, Hingham, Mass,” prepared by McKenzie Engineering Group. Inc. dated October 7, 2015 and as revised and approved by the Hingham Conservation Commission and maintenance thereof in accordance with the “Construction Phase Operations and Maintenance Plan” and “Long-Term Operations and Maintenance Plan” prepared by McKenzie Engineering Group, Inc. dated June 8, 2026 and as revised and approved by the Hingham Conservation Commission will not create any new illicit discharges. There is no warranty implied regarding future illicit discharges that may occur as a result of improper construction or maintenance of the stormwater management system or unforeseen accidents.

Name: Bradley C. McKenzie, P.E.

Company: McKenzie Engineering Group, Inc.

Title: President

Signature:

Date: 6/8/2026

MCKENZIE ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

RIVER STONE
HINGHAM, MA **6/8/2026**

Sediment Trap Sizing for Proposed Outlets - FES-1

Key: [ ] input data in cell

Equation: d_{10}=(0.0125(Q_{10})^(4/3))/(Tw * D_0)

Outlet Pipe Diameter (D_o):	12	in.	=	1	ft.		
10-yr Flow (Q_{10}):	1.14	cfs					
Depth of Trap (Y) (1/2 pipe diameter, 1ft. min):	6	in.	=	0.5	ft.	use -->	1 ft.
Depth of Tailwater (Tw) (assume 0.2')	0.2	ft.					
Min. Stone Size (d_{100}) (8" min.)	0.074	ft.	=	0.893	in.	use -->	8 in.

Trap Size

Length (l) (3'+3'+3(D_0))	9	ft.
Width (w) (3'+3'+2(D_0))	8	ft.

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RIVER STONE
HINGHAM, MA

2/28/2022
REVISED 6/8/2026

REQUIRED RECHARGE VOLUME (CF) *"STATIC METHOD"* ONSITE AREAS

WATERSHED #	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) A SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) B SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) C SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) D SOIL		REQUIRED RECHARGE VOLUME (CF)
1S	4,300	0.60		0.35		0.25		0.10		215
1S-1	18,145	0.60		0.35		0.25		0.10		907
2S		0.60		0.35		0.25		0.10		0
3S onsite	3,242	0.60	6,372	0.35		0.25		0.10		348
3S-1	50,006	0.60	19,834	0.35		0.25		0.10		3,079
3S-2 onsite		0.60		0.35		0.25		0.10		0
3S-1R	6,010	0.60		0.35		0.25		0.10		301
3S-2R	2,273	0.60		0.35		0.25		0.10		114
4S		0.60		0.35		0.25		0.10		0
5S	2,588	0.60		0.35		0.25		0.10		129
5S-1	11,783	0.60		0.35		0.25	348	0.10		592
5S-2		0.60		0.35		0.25		0.10		0
5S-1R	2,256	0.60		0.35		0.25		0.10		113
TOTAL	**100,603**		**26,206**				**348**			**5,797**

CAPTURE ADJUSTMENT

WATERSHED #	IMPERVIOUS AREA (SF)	IMPERVIOUS COLLECTED	TOWARDS INFILTRATION	STANDARD NO. 3 > 65% CAPTURED	CAPTURE ADJUSTMENT	REQUIRED RECHARGE
TOTAL SITE	127,157	113,243	89.06%	CAPTURE ADJUSTMENT REQUIRED	1.12	6,510

PROVIDED RECHARGE VOLUME (CF)
BELOW INVERT ELEVATIONS

	REQUIRED RECHARGE VOLUME (CF)	POND	STORAGE VOLUME PROVIDED (CF)	NET STORAGE VOLUME PROVIDED (CF)
	6,510	IC-1	636	
		IC-2	7,270	
		IC-3	3,506	
TOTAL			**11,412**	**4,902**

Stage-Area-Storage for Pond IC-1: Infiltration Chambers

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
57.50	**1,526**	0	60.10	1,526	2,667
57.55	1,526	31	60.15	1,526	2,709
57.60	1,526	61	60.20	1,526	2,749
57.65	1,526	92	60.25	1,526	2,787
57.70	1,526	122	60.30	1,526	2,823
57.75	1,526	153	60.35	1,526	2,858
57.80	1,526	183	60.40	1,526	2,891
57.85	1,526	214	60.45	1,526	2,923
57.90	1,526	244	60.50	1,526	2,954
57.95	1,526	275	60.55	1,526	2,984
58.00	1,526	305	60.60	1,526	3,015
58.05	1,526	368	60.65	1,526	3,045
58.10	1,526	431	60.70	1,526	3,076
58.15	1,526	494	60.75	1,526	3,106
58.20	1,526	557	60.80	1,526	3,137
58.25	1,526	619	60.85	1,526	3,167
58.30	1,526	681	60.90	1,526	3,198
58.35	1,526	743	60.95	1,526	3,228
58.40	1,526	805	61.00	1,526	**3,259**
58.45	1,526	867			
58.50	1,526	928			
58.55	1,526	989			
58.60	1,526	1,050			
58.65	1,526	1,110			
58.70	1,526	1,170			
58.75	1,526	1,230			
58.80	1,526	1,290			
58.85	1,526	1,349			
58.90	1,526	1,408			
58.95	1,526	1,466			
59.00	1,526	1,525			
59.05	1,526	1,582			
59.10	1,526	1,640			
59.15	1,526	1,697			
59.20	1,526	1,753			
59.25	1,526	1,809			
59.30	1,526	1,865			
59.35	1,526	1,920			
59.40	1,526	1,974			
59.45	1,526	2,028			
59.50	1,526	2,082			
59.55	1,526	2,135			
59.60	1,526	2,187			
59.65	1,526	2,239			
59.70	1,526	2,290			
59.75	1,526	2,340			
59.80	1,526	2,389			
59.85	1,526	2,438			
59.90	1,526	2,485			
59.95	1,526	2,532			
60.00	1,526	2,578			
60.05	1,526	2,623			

Stage-Area-Storage for Pond IC-2: Infiltration Chambers

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
59.60	**5,725**	0	62.20	5,725	10,677
59.65	5,725	115	62.25	5,725	10,874
59.70	5,725	229	62.30	5,725	11,070
59.75	5,725	344	62.35	5,725	11,262
59.80	5,725	458	62.40	5,725	11,452
59.85	5,725	573	62.45	5,725	11,640
59.90	5,725	687	62.50	5,725	11,824
59.95	5,725	802	62.55	5,725	12,005
60.00	5,725	916	62.60	5,725	12,182
60.05	5,725	1,031	62.65	5,725	12,355
60.10	5,725	1,145	62.70	5,725	12,524
60.15	5,725	1,388	62.75	5,725	12,688
60.20	5,725	1,631	62.80	5,725	12,846
60.25	5,725	1,874	62.85	5,725	12,996
60.30	5,725	2,116	62.90	5,725	13,138
60.35	5,725	2,358	62.95	5,725	13,274
60.40	5,725	2,599	63.00	5,725	13,404
60.45	5,725	2,839	63.05	5,725	13,529
60.50	5,725	3,079	63.10	5,725	13,649
60.55	5,725	3,319	63.15	5,725	13,764
60.60	5,725	3,558	63.20	5,725	13,878
60.65	5,725	3,796	63.25	5,725	13,993
60.70	5,725	4,033	63.30	5,725	14,107
60.75	5,725	4,270	63.35	5,725	14,222
60.80	5,725	4,506	63.40	5,725	14,336
60.85	5,725	4,741	63.45	5,725	14,451
60.90	5,725	4,975	63.50	5,725	14,565
60.95	5,725	5,209	63.55	5,725	14,680
61.00	5,725	5,442	63.60	5,725	**14,794**
61.05	5,725	5,674	63.65	5,725	14,794
61.10	5,725	5,905	63.70	5,725	14,794
61.15	5,725	6,135	63.75	5,725	14,794
61.20	5,725	6,364	63.80	5,725	14,794
61.25	5,725	6,592	63.85	5,725	14,794
61.30	5,725	6,819	63.90	5,725	14,794
61.35	5,725	7,045	63.95	5,725	14,794
61.40	5,725	7,270	64.00	5,725	14,794
61.45	5,725	7,494	64.05	5,725	14,794
61.50	5,725	7,716	64.10	5,725	14,794
61.55	5,725	7,937	64.15	5,725	14,794
61.60	5,725	8,157	64.20	5,725	14,794
61.65	5,725	8,376	64.25	5,725	14,794
61.70	5,725	8,593	64.30	5,725	14,794
61.75	5,725	8,809	64.35	5,725	14,794
61.80	5,725	9,024	64.40	5,725	14,794
61.85	5,725	9,236	64.45	5,725	14,794
61.90	5,725	9,447	64.50	5,725	14,794
61.95	5,725	9,657			
62.00	5,725	9,865			
62.05	5,725	10,071			
62.10	5,725	10,275			
62.15	5,725	10,477			

Stage-Area-Storage for Pond IC-3: Infiltration Chambers

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
52.60	**2,418**	0
52.65	2,418	48
52.70	2,418	97
52.75	2,418	145
52.80	2,418	193
52.85	2,418	242
52.90	2,418	290
52.95	2,418	339
53.00	2,418	387
53.05	2,418	435
53.10	2,418	484
53.15	2,418	583
53.20	2,418	681
53.25	2,418	778
53.30	2,418	875
53.35	2,418	971
53.40	2,418	1,067
53.45	2,418	1,163
53.50	2,418	1,258
53.55	2,418	1,353
53.60	2,418	1,448
53.65	2,418	1,542
53.70	2,418	1,635
53.75	2,418	1,727
53.80	2,418	1,819
53.85	2,418	1,909
53.90	2,418	1,998
53.95	2,418	2,087
54.00	2,418	2,173
54.05	2,418	2,259
54.10	2,418	2,342
54.15	2,418	2,424
54.20	2,418	2,504
54.25	2,418	2,582
54.30	2,418	2,657
54.35	2,418	2,729
54.40	2,418	2,796
54.45	2,418	2,859
54.50	2,418	2,917
54.55	2,418	2,971
54.60	2,418	3,023
54.65	2,418	3,071
54.70	2,418	3,119
54.75	2,418	3,168
54.80	2,418	3,216
54.85	2,418	3,265
54.90	2,418	3,313
54.95	2,418	3,361
55.00	2,418	3,410
55.05	2,418	3,458
55.10	2,418	**3,506**

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RIVER STONE **2/28/2022**
HINGHAM, MA **REVISED 6/8/2026**

DRAWDOWN WITHIN 72 HOURS ANALYSIS
`

POND	RAWLS RATE (IN/HR)*	STORAGE VOLUME PROVIDED (CF)	BOTTOM AREA (FT2)	DRAWDOWN (HR)
IC-1	8.27	636	1,526	1
IC-2	8.27	7,270	5,725	2
IC-3	8.27	3,506	2,418	2

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RIVER STONE **2/28/2022**
HINGHAM, MA **REVISED 6/8/2026**

WATER QUALITY VOLUME ANALYSIS FOR ENTIRE SITE

WATERSHED	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	WATER QUALITY VOLUME REQUIRED (CF)	VOLUME TREATED IN INFILTRATION CHAMBERS BELOW INVERT EL	VOLUME TREATED IN CONSTRUCTED WETLAND
1S	4,300	1.00	358		
1S-1	18,145	1.00	1,512		
2S	0	1.00	0		
3S onsite	9,614	1.00	801		
3S-1	69,840	1.00	5,820		
3S-2 onsite		1.00	0		
3S-1R	6,010	1.00	501		
3S-2R	2,273	1.00	189		
			0		
			0		
4S		1.00	0		
5S	2,588	1.00	216		
5S-1	12,131	1.00	1,011		
5S-2	0	1.00	0		
5S-1R	2,256	1.00	188		
TOTAL	**127,157**		**10,596**	**0**	

WATER QUALITY VOLUME ANALYSIS - PROPRIETARY STORMWATER TREATMENTS UNITS (FIRST DEFENSE UNITS) FOR PRE-TREATMENT

FD UNIT	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	qu (Fig 4) Tc 6 min. (CSM/IN)	AREA (SM)	WATER QUALITY REQUIRED (CFS)
FD-1	4,300	1.00	774	1.542E-04	0.119
FD-2	18,145	1.00	774	6.509E-04	0.504
FD-3	69,840	1.00	774	2.505E-03	1.939
FD-4	17,978	1.00	774	6.449E-04	0.499
FD-5	11,397	1.00	774	4.088E-04	0.316
TOTAL	**121,660**				**3.378**

USE 4-FOOT DIAMETER HIGH CAPACITY FIRST DEFENSE UNITS. EXCEPT FD-3 USE 6' DIA.

Hydro International

First Defense®

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® 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® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Components

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

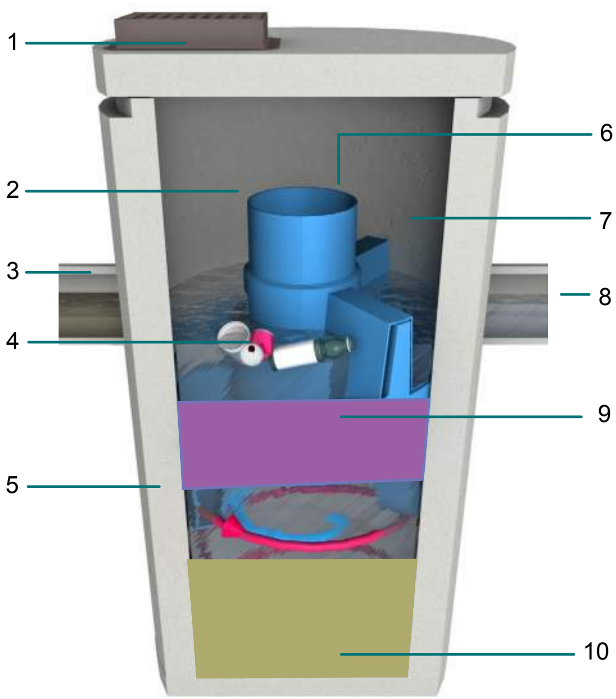

Fig.1 The First Defense® has internal components designed to efficiently capture pollutants and prevent washout at peak flows.

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

How it Works

The First Defense® 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 integral bypass conveys infrequent peak flows directly to the outlet chute, 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®

Maintenance

The First Defense® needs minimal maintenance, but like all structural best management practices maintenance is necessary for the long-term protection of the environment.

Sediments captured by the First Defense® are stored in the sump; floatable trash and hydrocarbons are stored on the surface of the standing water. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (**Fig.2**).

More information can be found in the First Defense® Operation and Maintenance Manual, available at hydro-int.com/firstdefense.

Fig.2 Maintenance is performed with a vactor truck.

First Defense® Sizing & Design

Design Options for Inlet and Internal Bypass Arrangements

For maximum flexibility the First Defense® inlet and internal bypass arrangements are available in two configurations (**Fig.3a & 3b**). Model parameters and design criteria are shown in **Table 1**.

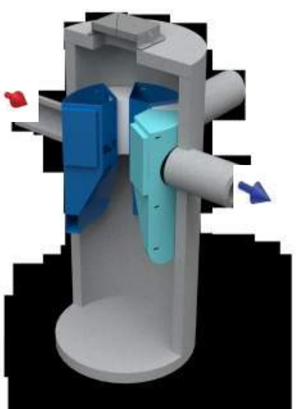

Fig.3a Inlet configurations for all models include options for inlet grates and multiple inlet pipes.

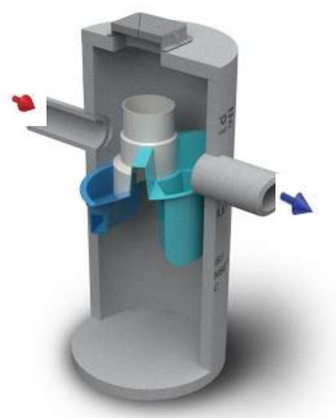

Fig.3b First Defense®-*HC* with higher capacity internal bypass and larger maximum pipe diameter.

Free *Stormwater Separator 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.

Table 1. First Defense® Models and Design Criteria.

First Defense® Model Number	Diameter	Typical Flow Rates for TSS Treatment		Peak Online Flow Rate	Maximum Pipe Diameter¹	Oil Storage Capacity	Typical Sediment Storage Capacity²	Minimum Distance from Outlet Invert to Top of Rim³	Standard Distance from Outlet Invert to Sump Floor
		106µm	230µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd³ / m³)	(ft / m)	(ft / m)
FD-4	4 / 1.2	0.7 / 20	1.2 / 34	6 / 170	18 / 450	180 / 681	0.7 / 0.5	3.1 / 1.1	4.97 / 1.5
FD-4HC				18 / 510	24 / 600	191 / 723		2.3 - 3.9 / 0.7 - 1.2	
FD-6	6 / 1.8	2.2 / 63	3.8 / 108	18 / 510	24 / 600	420 / 1,590	1.6 / 1.2	4.0 / 1.2	5.97 / 1.8
FD-6HC				32 / 906	30 / 750	496 / 1,878		3.0 - 5.1 / 0.9 - 1.6	

[1]Contact Hydro International when larger pipe sizes are required.

[2]Contact Hydro International when custom sediment storage capacity is required.

[3]The minimum distance for the 4HC and 6HC models depends on pipe diameter.

Figure 4: for First 1-inch Runoff, Table of qu values for Ia/P Curve = 0.034, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)
0.01	835
0.03	835
0.05	831
0.067	814
0.083	795
0.1	774
0.116	755
0.133	736
0.15	717
0.167	700
0.183	685
0.2	669
0.217	654
0.233	641
0.25	628
0.3	593
0.333	572
0.35	563
0.4	536
0.416	528
0.5	491
0.583	460
0.6	454
0.667	433
0.7	424
0.8	398
0.9	376
1	356
1.1	339
1.2	323
1.3	309
1.4	296
1.5	285
1.6	274
1.7	264
1.8	255
1.9	247
2	239
2.1	232
2.2	225
2.3	219
2.4	213
2.5	207
2.6	202

Tc (Hours)	qu (csm/in)
2.7	197
2.8	192
2.9	187
3	183
3.1	179
3.2	175
3.3	171
3.4	168
3.5	164
3.6	161
3.7	158
3.8	155
3.9	152
4	149
4.1	146
4.2	144
4.3	141
4.4	139
4.5	137
4.6	134
4.7	132
4.8	130
4.9	128
5	126
5.1	124
5.2	122
5.3	120
5.4	119
5.5	117
5.6	115
5.7	114
5.8	112
5.9	111
6	109
6.1	108
6.2	106
6.3	105
6.4	104
6.5	102
6.6	101
6.7	100
6.8	99
6.9	98
7	96

Tc (Hours)	qu (csm/in)
7.1	95
7.2	94
7.3	93
7.4	92
7.5	91
7.6	90
7.7	89
7.8	88
7.9	87
8	86
8.1	85
8.2	84
8.3	84
8.4	83
8.5	82
8.6	81
8.7	80
8.8	79
8.9	79
9	78
9.1	77
9.2	76
9.3	76
9.4	75
9.5	74
9.6	74
9.7	73
9.8	72
9.9	72
10	71

Standard 4: Pre-treatment for IC-1

MCKENZIE ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

NAME:	River Stone Hingham, MA	**Proj. No.:**	27-135
CLIENT:	River Stone, LLC	**Date:**	6/8/2026
COUNTY:	Plymouth	**Revised:**	
		Computed by:	SBS
		Checked by:	BCM

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load (*F)	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.70	0.75	0.53	0.23
	0.00	0.23	0.00	0.23
	0.00	0.23	0.00	0.23
	0.00	0.23	0.00	0.23

Total TSS Removal = 78%

*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

Standard 4: Total Suspended Solids Calculation: IC-1

MCKENZIE ENGINEERING GROUP
Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

NAME: River Stone
Hingham, MA
CLIENT: River Stone, LLC
COUNTY: Plymouth

Proj. No.: 27-135
Date: 6/8/2026
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load (*F)	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.70**	**0.75**	**0.53**	**0.23**
Subsurface Infiltration Structure	**0.80**	**0.23**	**0.18**	**0.05**
	0.00	**0.05**	**0.00**	**0.05**
	0.00	**0.05**	**0.00**	**0.05**

Total TSS Removal = **96%**

*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

Mass. Dept. of Environmental Protection

Standard 4: Pre-treatment for IC-2

MCKENZIE ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

NAME: River Stone
Hingham, MA
CLIENT: River Stone, LLC
COUNTY: Plymouth

Proj. No.: 27-125
Date: 6/8/2026
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load (*F)	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.70	0.75	0.53	0.23
	0.00	0.23	0.00	0.23
	0.00	0.23	0.00	0.23
	0.00	0.23	0.00	0.23

Total TSS Removal = 78%

*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

Standard 4: Total Suspended Solids Calculation: IC-2

NAME: River Stone
Hingham, MA
CLIENT: River Stone, LLC
COUNTY: Plymouth

Proj. No.: 27-135
Date: 6/8/2026
Revised:
Computed by: SBS
Checked by: BCM

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load (*F)	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.70	0.75	0.53	0.23
Subsurface Infiltration Structure	0.80	0.23	0.18	0.05
	0.00	0.05	0.00	0.05
	0.00	0.05	0.00	0.05

Total TSS Removal = 96%

*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

Standard 4: Pre-treatment for IC-3

MCKENZIE ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

NAME: River Stone
Hingham, MA
CLIENT: River Stone, LLC
COUNTY: Plymouth

Proj. No.: 27-125
Date: 6/8/2026
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load (*F)	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.70**	**0.75**	**0.53**	**0.23**
	0.00	**0.23**	**0.00**	**0.23**
	0.00	**0.23**	**0.00**	**0.23**
	0.00	**0.23**	**0.00**	**0.23**

Total TSS Removal = **78%**

*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

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

Standard 4: Total Suspended Solids Calculation: IC-3

NAME: River Stone
Hingham, MA
CLIENT: River Stone, LLC
COUNTY: Plymouth

Proj. No.: 27-135
Date: 6/8/2026
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load (*F)	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.70	0.75	0.53	0.23
Subsurface Infiltration Structure	0.80	0.23	0.18	0.05
	0.00	0.05	0.00	0.05
	0.00	0.05	0.00	0.05

Total TSS Removal = **96%**

*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

Mass. Dept. of Environmental Protection

MCKENZIE ENGINEERING GROUP
Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

Storm Drainage Computations: Closed Drainage System

Name: **River Stone**
Hingham, MA
Client: **River Stone, LLC**

Proj. No.: **27-135**
Date: **3/9/18** **Rev 12/19/18, 6/8/26**
Computed by: **SBS**
Checked by: **BCM**

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

k_e= **0.5**

LOCATION						FLOW TIME (MIN)					DESIGN						CAPACITY								
FROM	TO	AREA (AC.)	C	C x A	SUM C x A	PIPE	CONC TIME	i*	Q cfs	Q Bypass cfs	Q Total cfs	V fps	n	PIPE SIZE	SLOPE	MATERIAL	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM UPPER	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft
EX-CB1	FD-2	0.20	0.82	0.16	0.16	0.05	6.0	7.0	1.2	0.00	1.2	2.7	0.013	12	0.006	HDPE	2.7	3.4	9	0.05	64.20	60.98	60.93	61.49	2.7
EX-CB2	FD-2	0.46	0.62	0.28	0.28	0.05	6.0	7.0	2.0	0.00	2.0	3.1	0.013	12	0.005	HDPE	2.5	3.2	10	0.05	64.20	60.98	60.93	61.35	2.9
FD-2	IC-1				0.45	0.01	6.1	7.0	3.1	0.00	3.1	6.9	0.013	12	0.034	HDPE	6.6	8.4	5	0.17	64.35	58.97	58.80	59.55	4.8
IC-1	DMH-1				0.12	0.02	6.0	7.0	0.8	0.00	0.8	3.3	0.013	12	0.012	HDPE	4.0	5.1	4	0.05	65.92	58.15	58.10	59.00	6.9
DMH-1	FD-1				0.12	0.36	6.0	7.0	0.8	0.00	0.8	3.1	0.013	12	0.010	HDPE	3.6	4.6	67	0.68	65.92	58.10	57.42	58.97	6.9
CB-1	FD-1	0.08	0.78	0.06	0.06	0.07	6.0	7.0	0.4	0.00	0.4	2.1	0.013	12	0.007	HDPE	2.9	3.7	9	0.06	59.84	56.91	56.85	57.93	1.9
CB-2	FD-1	0.08	0.59	0.05	0.18	0.08	6.0	7.0	1.2	0.00	1.2	3.1	0.013	12	0.007	HDPE	3.1	3.9	16	0.12	59.86	56.97	56.85	57.96	1.9
FD-1	EX-DMH				0.35	0.18	6.4	6.9	2.4	0.00	2.4	3.8	0.013	12	0.008	HDPE	3.1	4.0	42	0.32	60.03	56.85	56.53	57.87	2.2
CB-3	DMH-2	0.16	0.12	0.02	0.35	0.06	6.0	7.0	2.5	0.00	2.5	3.2	0.013	12	0.005	HDPE	2.4	3.1	11	0.05	66.77	61.92	61.87	62.45	4.3
DCB-4	DMH-2	0.56	0.69	0.38	0.35	0.12	6.0	7.0	2.5	0.00	2.5	3.3	0.013	12	0.005	HDPE	2.5	3.1	23	0.11	66.99	61.98	61.87	62.51	4.5
DMH-2	DMH-3				0.71	0.13	6.1	7.0	4.9	0.00	4.9	3.9	0.013	15	0.005	HDPE	4.6	3.8	31	0.16	66.94	61.87	61.71	62.34	4.6
CB-5	DMH-5	0.18	0.73	0.13	0.13	0.18	6.0	7.0	0.9	0.00	0.9	2.5	0.013	12	0.005	HDPE	2.5	3.2	26	0.13	65.85	62.30	62.17	62.43	3.4
CB-6	DMH-5	0.50	0.81	0.40	0.40	0.06	6.0	7.0	2.8	0.00	2.8	3.2	0.013	12	0.005	HDPE	2.4	3.1	11	0.05	65.85	62.22	62.17	62.27	3.6
DMH-5	DMH-4				0.53	0.06	6.2	5.0	2.7	0.00	2.7	3.2	0.013	15	0.005	HDPE	4.4	3.5	11	0.05	65.91	62.17	62.12	63.17	2.7
AD-1	DMH-6	1.05	0.44	0.46	0.46	0.24	6.2	5.0	2.3	0.00	2.3	3.3	0.013	12	0.005	HDPE	2.5	3.2	47	0.24	63.00	62.73	62.49	63.63	-0.6
DMH-6	DMH-4				0.46	0.38	6.5	4.9	2.3	0.00	2.3	3.3	0.013	12	0.005	HDPE	2.5	3.2	74	0.37	65.00	62.49	62.12	63.27	1.7
DMH-4	DMH-3				1.00	0.35	6.8	4.8	4.8	0.00	4.8	3.8	0.013	18	0.005	HDPE	7.5	4.2	81	0.41	66.02	62.12	61.71	62.95	3.1
DMH-3	FD-3				1.00	0.74	6.8	4.8	4.8	0.00	4.8	3.8	0.013	18	0.005	HDPE	7.4	4.2	171	0.86	66.79	61.71	60.85	62.54	4.3
FD-3	DMH-7				1.00	0.39	6.0	7.0	7.0	0.00	7.0	4.3	0.013	18	0.005	HDPE	7.4	4.2	101	0.50	68.31	60.85	60.35	61.35	7.0
DMH-7	IC-2				1.00	0.08	0.0	9.2	9.2	0.00	9.2	5.7	0.013	18	0.009	HDPE	9.8	5.5	29	0.25	64.20	60.35	60.10	60.89	3.3
IC-2	DMH-9 (OCS)				0.39	0.33	6.0	7.0	2.7	0.00	2.7	3.3	0.013	12	0.005	HDPE	2.5	3.2	65	0.32	65.50	60.10	59.78	60.74	4.8
DBL CB-7	FD-4	0.26	0.68		0.23	0.11	6.0	7.0	1.6	0.00	1.6	2.8	0.013	12	0.005	HDPE	2.5	3.1	19	0.09	64.06	60.86	60.77	61.49	2.6
DBL CB-8	FD-4	0.21	0.76		0.23	0.05	6.0	7.0	1.6	0.00	1.6	2.9	0.013	12	0.005	HDPE	2.5	3.2	8	0.04	63.62	60.81	60.77	61.43	2.2
RD-1	FD-4	0.05	0.90		0.23	0.22	6.0	7.0	1.6	0.00	1.6	3.8	0.013	12	0.010	HDPE	3.6	4.5	49	0.49	64.06	61.26	60.77	61.81	2.2
FD-4	DMH-8				0.23	0.57	6.1	7.0	1.6	0.00	1.6	2.9	0.013	12	0.005	HDPE	2.5	3.2	100	0.50	63.30	60.77	60.27	61.36	1.9
RD-2	DMH-8	0.07	0.90		0.23	0.68	6.7	6.8	1.6	0.00	1.6	2.9	0.013	12	0.005	HDPE	2.5	3.2	118	0.59	61.00	60.86	60.27	61.45	-0.5
DMH-8	IC-2				0.23	0.07	7.4	6.7	1.6	0.00	1.6	2.9	0.013	12	0.005	HDPE	2.6	3.3	13	0.07	64.50	60.27	60.20	60.82	3.7
RD-3	IC-2				0.23	0.82	7.4	6.6	1.6	0.00	1.6	2.9	0.013	12	0.005	HDPE	2.5	3.2	141	0.71	60.95	60.91	60.20	61.46	-0.5

Storm Drainage Computations: Closed Drainage System

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

Name: **River Stone**
Hingham, MA
Client: **River Stone, LLC**

Proj. No.: **27-135**
Date: **3/9/18** **Rev 12/19/18, 6/8/26**
Computed by: **SBS**
Checked by: **BCM**

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

k_e= **0.5**

LOCATION						FLOW TIME (MIN)					DESIGN						CAPACITY								
FROM	TO	AREA (AC.)	C	C x A	SUM C x A	PIPE	CONC TIME	i*	Q cfs	Q Bypass cfs	Q Total cfs	V fps	n	PIPE SIZE	SLOPE	MATERIAL	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM UPPER	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft
DBL CB-9	FD-5	0.17	0.63	0.11	0.11	0.12	6.0	7.0	0.7	0.00	0.7	2.3	0.013	12	0.005	HDPE	2.4	3.1	17	0.08	55.74	53.24	53.16	53.72	2.0
DBL CB-10	FD-5	0.36	0.58	0.21	0.21	0.10	6.0	7.0	1.5	0.00	1.5	2.8	0.013	12	0.005	HDPE	2.5	3.2	16	0.08	55.74	53.24	53.16	53.90	1.8
FD-5	IC-3				0.31	0.12	6.1	7.0	2.2	0.00	2.2	3.2	0.013	12	0.005	HDPE	2.5	3.2	23	0.12	55.73	53.16	53.10	54.24	1.5

AD-3	IC-3	0.39	0.43	0.17	0.17	0.69	6.0	7.0	1.2	0.00	1.2	2.8	0.013	12	0.006	HDPE	2.7	3.4	115	0.64	55.50	53.74	53.10	54.73	0.8

AD-2	TEE	0.08	0.43	0.03	0.03	0.17	6.0	7.0	0.2	0.00	0.2	2.3	0.013	6	0.010	HDPE	0.6	2.9	23	0.23	55.80	54.04	53.81	55.05	0.8
RD-4	TEE	0.00	0.00	0.00	0.03	0.09	6.2	7.0	0.2	0.00	0.2	2.3	0.013	6	0.010	HDPE	0.6	2.9	13	0.13	59.00	53.94	53.81	54.91	4.1
TEE	TEE	0.06	0.00	0.00	0.03	0.33	6.2	7.0	0.2	0.00	0.2	2.3	0.013	6	0.010	HDPE	0.6	2.9	45	0.45	59.00	53.81	53.36	55.86	3.1
RD-5	TEE	0.00	0.00	0.00	0.03	0.07	6.3	6.9	0.2	0.00	0.2	2.3	0.013	6	0.010	HDPE	0.6	2.9	10	0.10	59.00	53.46	53.36	55.51	3.5
TEE	IC-3				0.10	0.14	6.3	6.9	0.7	0.00	0.7	3.0	0.013	8	0.010	HDPE	1.2	3.5	26	0.26	59.00	53.36	53.10	55.36	3.6

A P P E N D I X E

Operation and Maintenance Plans

CONSTRUCTION PHASE POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN)

for

River Stone

In

Hingham, Massachusetts
(Assessor's Map 124, Lots 70-75 and Lot 26)

Submitted to:

TOWN OF HINGHAM

Prepared for:

River Stone, LLC
239R Washington Street
Norwell, Massachusetts 02061

Prepared by:

MCKENZIE ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

June 8, 2026

TABLE OF CONTENTS

Construction Phase Pollution Prevention & Erosion and Sedimentation Control Plan

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control. These practices correspond with the project site plans entitled "Comprehensive Permit Plans known as River Stone (Assessors' Map 124, Lots 70-75 and Lot 26), Viking Lane and Ward Street, Hingham, Massachusetts," prepared by McKenzie Engineering Group, Inc. (MEG) and dated October 7, 2015, with a latest revision date of June 8, 2026. Hereinafter referred to as the Site Plans.

Property Owner:

River Stone, LLC
293R Washington Street
Norwell, MA 02061

Developer Contact Information:

River Stone, LLC
293R Washington Street
Norwell, MA 02061

Town of Hingham Contact Information:

Hingham Department of Public Works
Ashley Sanford, Superintendent
25 Bare Cove Park Drive
Hingham, MA 02043
Phone: 781-741-1430

Hingham Conservation Commission
Shannon Palmer, Agent
210 Central Street
Hingham, MA 02043
Phone: 781-741-1445

Hingham Building Department
Michael J. Clancy, Commissioner
210 Central Street
Hingham, MA 02043
Phone: 781-741-1445

Hingham Zoning Board of Appeals
Jennifer Oram, Zoning Administrative
210 Central Street
Hingham, MA 02043
Phone: 781-741-1445

Erosion and Sedimentation Control Practices:

Structural Practices:

1) **Compost Filter Tube Sock Barrier Controls** – A compost filter tube 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 should be installed as shown on the Erosion Control Detail Plan.

   Compost Filter Tube Design/Installation Requirements

   a) Locate the compost filter tube identified on the plans.
   b) The compost filter tube 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 sock should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.
   c) The compost filter tube shall be staked every 8 linear feet with 1-inch by 1-inch stakes.
   d) Compost filter tubes 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.

   Compost Filter Tube Inspection/Maintenance

   a) Compost filter tubes 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 sock. Sediment will be removed from behind the silt sock when it becomes about ½ foot deep at the silt sock. Take care to avoid undermining the sock during cleanout.
   c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.
   d) Remove all compost filter tube materials only after the contributing drainage areas have been properly stabilized. Sediment deposits and silt sock materials remaining after stakes have been removed should be graded to conform to the existing topography and vegetated.

2) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the proposed entrance on Ward Street. The stabilized construction entrances will be installed immediately after the site entrance and associated roadway cut/fill are cleared and grubbed, and access to the site is maintained. Stormwater runoff from the entrance will be diverted to temporary sedimentation basins along the proposed driveway. The construction entrance will keep mud and sediment from being tracked off the construction site onto Ward Street by vehicles leaving the site. The stabilized construction entrances shall be constructed as shown on the Erosion Control Detail Plan.

Construction Entrance Design/Construction Requirements *

a) Grade foundation for positive drainage towards the temporary sedimentation basin along the side of the roadway.

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. If a large amount of traffic is expected at the entrance, then the stabilized construction entrance should be wide enough to fit two vehicles across with room to spare.

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 street. The wash area should be a level area with 3-inch washed stone minimum, or a commercial rack.

f) Water employed in the washing process shall be directed to a sediment trap or approved sediment-trapping device prior to discharge to a temporary sedimentation basin along side the site entrance drives. Sediment should be prevented from entering any watercourses.

Construction Entrance Inspection/Maintenance *

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Ward 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 sediment traps should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.

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

g) Broken road pavement on Ward 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. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

3) **Inlet Protection** – Inlet Protection will be utilized around the catch basin grates. The inlet protection will allow the storm drain inlets to be used before final stabilization. This structural practice will allow early use of the drainage system if the detention basin is already stabilized. 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 Inspection/Maintenance Requirements *

a) All trapping devices and the structures they protect should be inspected after every rainstorm and repairs made as necessary.

b) Sediment should be removed from the trapping devices 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 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, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- The contractor shall provide erosion control measures around all soil stockpiles.

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

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

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

Temporary Seeding Inspection/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., 3.2 inches of rainfall within a twenty-four hour period). Stands should be uniform and dense. Fertilize, 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

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 Inspection/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 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) 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 mowing's 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 Design/Installation 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. All brush, tree limbs, tree trunk and stump disposal shall take place off site and within 30 days of cutting. All disposal shall be in accordance with federal, state and local regulations. Any temporary stockpiling of brush, tree limbs, tree trunks or stumps shall be surrounded with an erosion control barrier. 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 Inspection/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. Slopes should be limed and fertilized as necessary to keep vegetation healthy. 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 respread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a
b) 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.

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

d) 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 hydroseeding, 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 for construction haul roads. 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.

Non-Stormwater Discharges:

During construction activities at the site, some water from the site will be suitable for discharge to the detention areas and/or temporary sediment basin areas. Non-stormwater discharges will be directed to recharge groundwater and to replenish wetland resource areas.

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.

Soil Stockpiling *:

Topsoil and subsoil from the driveway and parking area 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 silt sock or hay bale barrier erosion control measure should be placed surrounding each stockpile.

5) As needed, the stockpiled topsoil and subsoil are redistributed throughout the site.

Pollution Prevention:

Fueling and Maintenance of Equipment or Vehicles

Refueling/maintenance Rules – 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. In the event of mechanical failure of a vehicle, the vehicle shall be moved to the designated maintenance area on the site to perform maintenance. 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. Refueling for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. 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. 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

Vehicle Washing Rules - 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 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 - Building products are not anticipated during this phase of construction.

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 locations. Store all weather sensitive materials in closed containers in accordance with manufacturer’s recommendations.

Maintenance Requirements

1. The site supervisor shall regularly inspect the designated storage areas as well as any portions of the site under construction to ensure that all materials are properly stored. The site supervisor shall immediately address any issues and instruct personnel to secure and properly store all materials.

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

Refueling and maintenance for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. 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 and maintenance of equipment shall take place in designated areas whenever possible. 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.

Maintenance Requirements

1. 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.

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 collected in approved containers and disposed of in accordance with municipal, state and federal regulations.

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 regularly inspect all portions of the project under construction and ensure that all hazardous or toxic materials are disposed of in accordance with the practices detailed above and shall immediately correct any improper 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.)

Construction and domestic waste shall be disposed of in a trash receptacle (dumpster) which shall be removed and disposed of at an approved land fill.

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

1. Trash receptacles (dumpsters) and recyclable waste material containers shall be located as needed throughout the site.

Maintenance Requirements

1. The site supervisor shall inspect all trash receptacles 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

During the construction process, portable toilets will be provided in an appropriate location during the construction process.

Maintenance Requirements

1. The site supervisor shall execute a contract with a vendor to supply and maintain portable toilets throughout the site for the project duration. 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. 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. Install straw bale and plastic liner washout pit at the designated location on site. Concrete trucks shall wash out only at washout pit or other similar acceptable facility such as a portable roll-off washout pit.

2. 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) to ensure that they are properly maintained. If necessary, wash water in a concrete 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 wash out 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 the discharge of nitrogen or phosphorus.

1. Store all fertilizers in designated locations. Store all weather-sensitive materials in closed containers in accordance with the 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.

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. Stored fertilizer shall be properly covered or enclosed in a designated location to prevent introduction into stormwater runoff.

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 or 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 following Spill Containment & Management Plan, including Spill Report, Emergency Response Equipment Inventory, and Emergency Notification and phone numbers.

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible for securing the services of a licensed engineer or similar professional (inspector) on an ongoing basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." 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 since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, 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 and submit copies of the form to the Hingham Conservation Commission upon request.

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. The forms list each of the measures to be inspected on the site, the inspector's name, the date of the inspection, the condition of the measure/area inspected, maintenance or repair performed, and any changes that should be made to the Pollution Prevention & Erosion and Sedimentation Control Plan to control or eliminate unforeseen pollution of storm water.

Project Location: River Stone, Viking Lane, and Ward Street - Hingham, MA   Date:

Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed: (List Items)	Date of Cleaning/ Repair	Performed by
Siltsock Erosion Control Barrier	After heavy rainfall events (minimum weekly)			1. Sediment level 2. Material tears or repairs	☐yes ☐no		
Stabilized Construction Entrance	After heavy rainfall events (minimum weekly)			1. Sediment build-up or clogging	☐yes ☐no		
Inlet Protection	After heavy rainfall events (minimum weekly)			1. Sediment level 2. Sack tears or damage	☐yes ☐no		
Temporary Seeding	After heavy rainfall events (minimum weekly)				☐yes ☐no		
Geotextiles	After heavy rainfall events (minimum weekly)				☐yes ☐no		
Mulching & Netting	After heavy rainfall events (minimum weekly)				☐yes ☐no		
Land Grading	After heavy rainfall events (minimum weekly)				☐yes ☐no		

Topsoiling	After heavy rainfall events (minimum weekly)				☐yes ☐no		
Permanent Seeding	After heavy rainfall events (minimum weekly)				☐yes ☐no		
Dust Control	After heavy rainfall events (minimum weekly)				☐yes ☐no		

(1) Refer to the Massachusetts Stormwater Handbook issued January 2, 2008.

Notes (Include deviations from : Site Plan Approval or Order of Conditions, Construction Sequence and Approved Plan):

Stormwater Control Manager ________________________________

Spill Containment and Management Plan

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) 293 5620
Board of Health Phone:	(781) 293 2718
Conservation Commission Phone:	(781) 293 4674

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
--	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) 293 2300

   POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 293 6363

   DEPARTMENT OF PUBLIC WORKS
   BUSINESS: (781) 293 5620

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (617) 556-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

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

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

5. DEPARTMENT OF PUBLIC WORKS
   CONTACT: Superintendent Ashley Sanford
   PHONE: (781) 741-1430

   CONSERVATION COMMISSION
   CONTACT: Conservation Agent, Shannon Palmer
   PHONE: (781) 741-1445

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

POST-DEVELOPMENT BEST MANAGEMENT PRACTICE
OPERATION AND MAINTENANCE PLAN &
LONG-TERM POLLUTION PREVENTION PLAN

for

River Stone

In

Hingham, Massachusetts
(Assessor's Map 124, Lots 70-75 and Lot 26)

Submitted to:

TOWN OF HINGHAM

Prepared for:

River Stone, LLC
239R Washington Street
Norwell, Massachusetts 02061

Prepared by:

MCKENZIE
ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

June 8, 2026

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Post-Development Best Management Practices (BMPs)
Operation and Maintenance Plan

Property Owner:

River Stone, LLC
293R Washington Street
Norwell, MA 02061

Developer Contact Information:

River Stone, LLC
293R Washington Street
Norwell, MA 02061

Town of Hingham Contact Information:

Hingham Department of Public Works
Ashley Sanford, Superintendent
25 Bare Cove Park Drive
Hingham, MA 02043
Phone: 781-741-1430

Hingham Conservation Commission
Shannon Palmer, Agent
210 Central Street
Hingham, MA 02043
Phone: 781-741-1445

Hingham Building Department
Michael J. Clancy, Commissioner
210 Central Street
Hingham, MA 02043
Phone: 781-741-1445

Hingham Zoning Board of Appeals
Jennifer Oram, Zoning Administrative
210 Central Street
Hingham, MA 02043
Phone: 781-741-1445

Long-Term Operations and Maintenance
General Conditions

1. The property owner shall be responsible for scheduling regular inspections and maintenance of the stormwater BMP's as illustrated on the design plans and detailed in the following long-term operations and maintenance plan.
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 owner shall:
   a. Maintain an Operation and Maintenance Log (see Attachment A) for the last three years. 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. Make the log available to the Hingham Department of Public Works and Planning Board upon request;
   c. Allow members and agents of the Hingham Department of Public Works to enter the premises and ensure that the Owner has complied with the Operation and Maintenance Plan requirements for each BMP.
4. A recommended inspection and maintenance schedule is outlined below based on statewide averages. This 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. At the commencement of the first year of service, a more accurate inspection/maintenance schedule should be determined based on the level of service for this site.

Best Management Practices Operations and Maintenance

1. **Paved Areas –** Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

   The frequency of sweeping shall average:

   - Monthly, if by a high-efficiency vacuum sweeper
   - Bi-weekly if by a regenerative air sweeper
   - Weekly, if by a mechanical sweeper

   Salt used for de-icing on the parking lot during winter months shall 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.

   Cost: The property owner should consult local sweeping contractors for detailed cost estimates.

2. **Deep Sump Catch Basins -** Catch basin grates shall be checked quarterly, 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.

Cost: Estimated $50 - $100 per cleaning as needed. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

3. **Outlet Control Structures –** Outlet control structures shall be checked quarterly and following heavy rainfalls to verify that the orifices are not clogged by debris. Debris shall be removed from and disposed of properly. Outlet control structures shall be inspected and cleaned bi-annually of all accumulated sediments. Material shall be removed from the outlet control structures and disposed of in accordance with all applicable regulations.

   Cost: Estimated $50 - $100 per cleaning as needed. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

4. **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 of 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.

   Cost: $500-$1000 per cleaning if an excavator is necessary to remove sediment. The Owner should consult local landscape contractors for a detailed cost estimate.

5. **Proprietary Pretreatment Units –** The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit, a minimum of annually and following heavy rain events. Perform maintenance once the stored volume reaches 15% of the unit capacity, or immediately in the event of a spill. Perform Maintenance at quarterly intervals during the first year of installation, so an accurate maintenance schedule can be established. Sediment and debris should be removed through the 24-inch diameter outlet riser pipe. Alternatively, oil and floatables should be removed through the 18-inch oil inspection port. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations. Consult the Medfield Board of Health for transfer station locations prior to disposing the separator contents. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the First Defense units.
   Cost: Cleaning should be included along with the routine maintenance of the catch basins. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

6. **Subsurface Infiltration Chamber System –** Proper maintenance of the subsurface infiltration system is essential to the long-term effectiveness of the infiltration function. The subsurface infiltration system shall have inspection ports and additional inspections should be scheduled during the first few months to ensure proper stabilization and function. Thereafter, they shall be checked semiannually and following heavy rainfalls, defined as a 1-year storm event exceeding 2.5 inches of rainfall within a twenty-four-hour period. Water levels in the chambers shall be checked to verify proper drainage. Ponding water in a chamber indicates failure from the bottom. If water remains within the chambers

after 72-hours following a storm event, steps to restore the infiltration function shall be taken, as directed by a qualified stormwater management professional. In order to rectify the problem, accumulated sediment must be removed from the bottom of the chamber. The stone aggregate and filter fabric must be removed and replaced, and the underlying soil layer must be scarified to encourage proper infiltration. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the Cultec chambers.

Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

7. **Pesticides, Herbicides, and Fertilizers -** Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.

   All structural BMP's as identified on the site plans will be owned and maintained by the homeowner's association of the development and shall run with the title of the property.

   Cost: Included in the routine landscaping maintenance schedule. The Owner should consult local landscaping contractors for details.

8. **Snow Removal -** Snow accumulations removed from the access roads and visitor parking area should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Excess snow should be removed from the site and properly disposed of in an approved snow disposal facility. Care must be exercised not to deposit snow in the following areas: in the rain gardens, bioswales, and where sand and debris can get into the watercourse.

   Cost: The owner should consult local snow removal contractors for a detailed cost estimate.

Maintenance Responsibilities

All post-construction maintenance activities should be documented, kept on file, and made available to the Hingham DPW and, upon request, to the Planning Board.
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.

Long-Term Pollution Prevention Plan
Good Housekeeping:

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 Norwell.

MADEP has prepared several materials for homeowners 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
TurpentineBug spraysAntifreeze
Paint thinners, strippers, varnishes and stains
Arts and crafts chemicals
Charcoal lighter fluid
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
Shoe polish
Windshield wiper fluid

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.

Landscape Maintenance:

This management measure seeks to control the stormwater impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of stormwater 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.

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 chloropyrifos, which, even at very low levels, can be harmful to aquatic life. The major source of pesticides to urban streams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs, including appropriate pesticide use management as part of the program.
- Raise public awareness by referring homeowners to "A Homeowner's Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way", Massachusetts Department of Food and Agriculture, Pesticide Bureau or link

http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman>

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 among homeowners who 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.

Proper Management of Deicing Chemicals and Snow:

Roadways shall be maintained by the Developer/Property Owners. 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 into 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.

Illicit Discharges:

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

The following is a list of EPA allowed non-stormwater discharges. If the non-stormwater discharge is not listed, it is prohibited.

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. Street wash water,
16. Discharges or flows from firefighting activities occur during emergency conditions.

Project Location: River Stone, Viking Lane, and Ward Street - Hingham, MA

Stormwater Management – Post Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check (1)	Cleaning/Repair Needed: ☐yes ☐no (List Items)	Date of Cleaning/ Repair	Performed by
Street Sweeping Maintenance	4-times annually - specifically in Spring and Fall			1. Sediment build-up 2. Trash and debris 3. Minor Spills (vehicular)			
Deep Sump and Hooded Catch Basin	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8” 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			
Outlet Control Structure	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8” 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Orifice and outlet blockages			
Proprietary Pretreatment Units	After heavy rainfall events (minimum annually)			1. Sediment level exceeds Manufacturer’s specification 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Outlet blockages			
Subsurface Infiltration Tanks	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up 2. Standing Water greater than 48 hours			
Outlet Protection	Quarterly			1. Sediment build-up 2. Trash and debris 3. Displacement of rip rap 4. Excess vegetation			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP’s.

Notes (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan):
1.

Stormwater Control Manager ________________________________ Stamp:

Spill Containment and Management Plan

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) 293 5620
Board of Health Phone:	(781) 293 2718
Conservation Commission Phone:	(781) 293 4674

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
--	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) 293 2300

   POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 293 6363

   DEPARTMENT OF PUBLIC WORKS
   BUSINESS: (781) 293 5620

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (617) 556-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

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

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

5. DEPARTMENT OF PUBLIC WORKS
   CONTACT: Superintendent Ashley Sanford
   PHONE: (781) 741-1430

   CONSERVATION COMMISSION
   CONTACT: Conservation Agent, Shannon Palmer
   PHONE: (781) 741-1445

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

Contactor® & Recharger®
Stormwater Chambers

Operation and Maintenance Guidelines
for CULTEC Stormwater Management Systems

The Founder of Plastic Chamber Technology
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CULTEC, Inc.
P.O. Box 280
878 Federal Road
Brookfield, Connecticut 06804 USA
www.cultec.com

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Contact Information:
For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at custservice@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CULG008 05-17
May 2017

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row.
The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to determine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. **Manhole Access**
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. **StormFilter Access**
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. **Minor Maintenance**
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. **Major Maintenance**
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.

WQMP
Operation & Maintenance (O&M) Plan

Project Name:____

Prepared for:

Project Name: ____

Address:____

City, State Zip:____

Prepared on:

Date:____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ___

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

BMP OPERATION & MAINTENANCE LOG

Project Name: ____

Today's Date:____

Name of Person Performing Activity (Printed):____

Signature: ____

BMP Name (As Shown in O&M Plan)	**Brief Description of Implementation, Maintenance, and Inspection Activity Performed**

Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

Major Maintenance

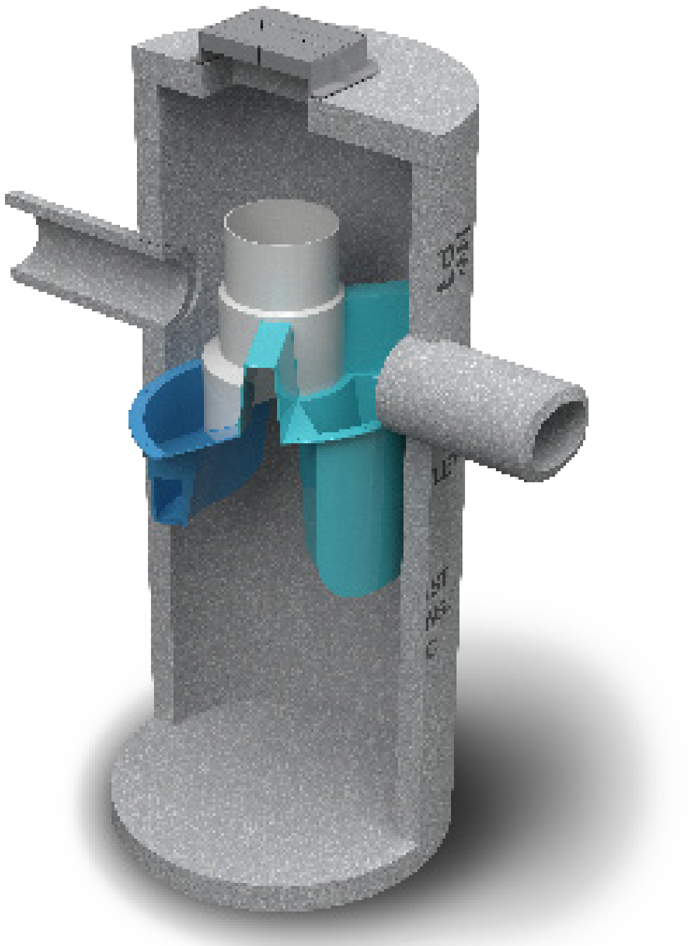
	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater manage-ment chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		□ Clean stormwater management chambers and feed connectors of any debris. □ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	□ Year 9	Date:	
	□ Year 18	Date:	
	□ Year 27	Date:	
	□ Year 36	Date:	
	45 years after commissioning		□ Clean stormwater management chambers and feed connectors of any debris. □ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. □ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. □ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. □ Attain the appropriate approvals as required. □ Establish a new operation and maintenance schedule.
			Notes
	□ Year 45	Date:	

Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Month 1	Date:	
	□ Month 2	Date:	
	□ Month 3	Date:	
	□ Month 4	Date:	
	□ Month 5	Date:	
	□ Month 6	Date:	
	□ Month 7	Date:	
	□ Month 8	Date:	
	□ Month 9	Date:	
	□ Month 10	Date:	
	□ Month 11	Date:	
	□ Month 12	Date:	
	Spring and Fall		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	Yearly		□ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	□ Year 1	Date:	
	□ Year 2	Date:	
	□ Year 3	Date:	
	□ Year 4	Date:	
	□ Year 5	Date:	
	□ Year 6	Date:	
	□ Year 7	Date:	



Operation and Maintenance Manual

First Defense® High Capacity and First Defense® Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

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

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 to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

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
- 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

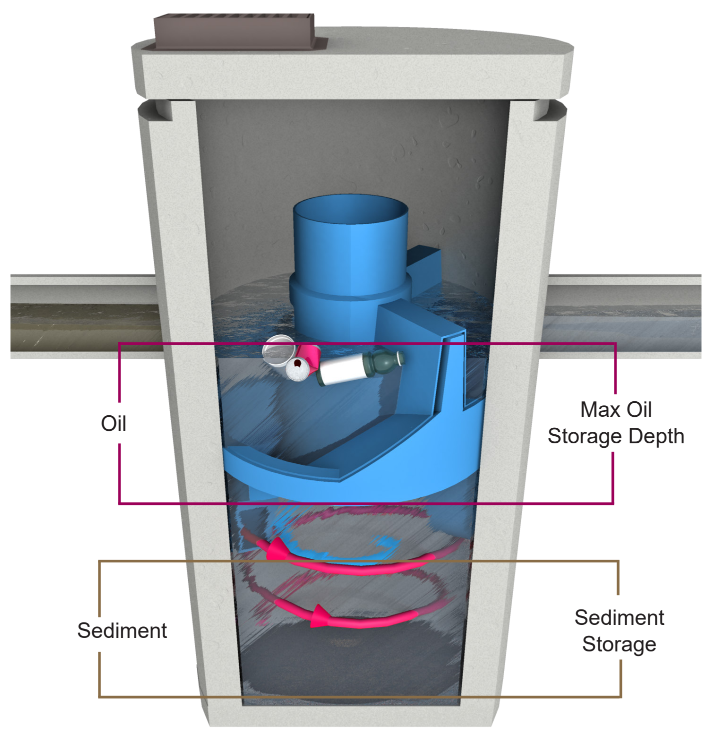


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility 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.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

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**

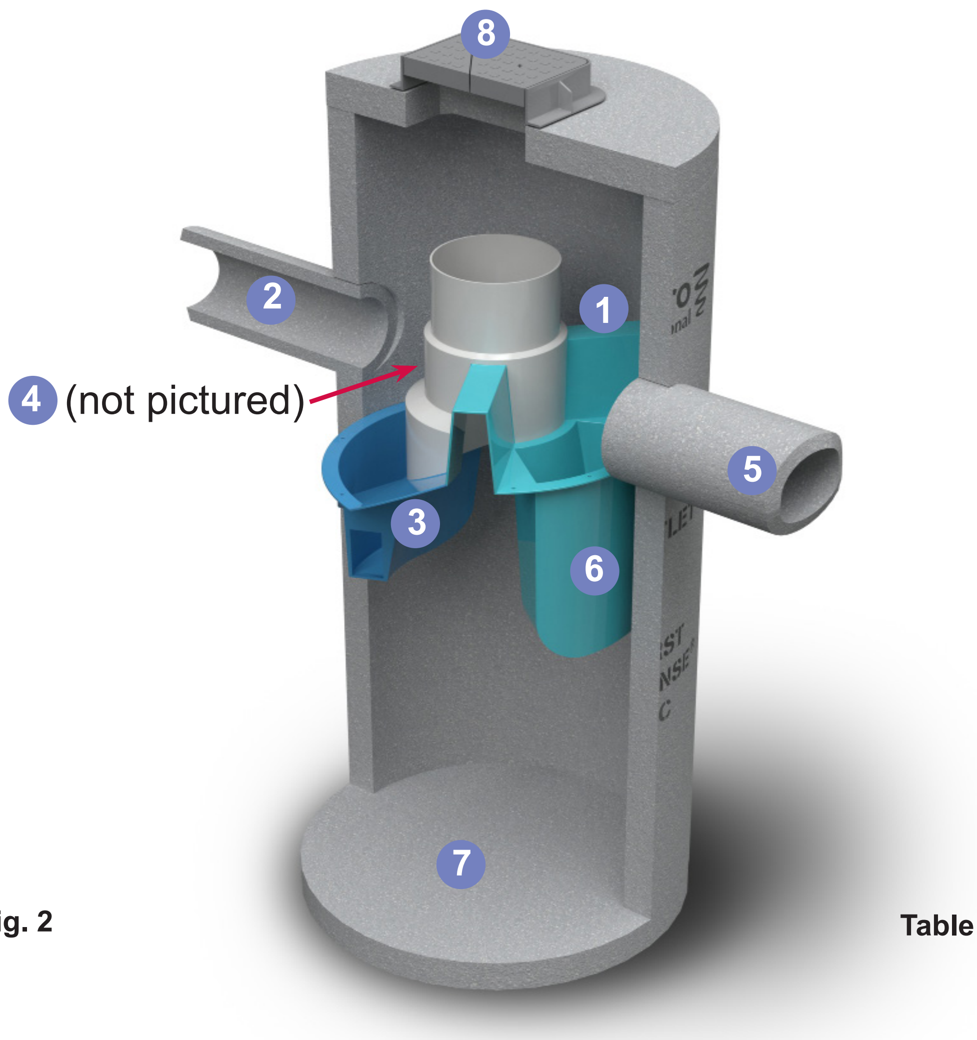


Fig. 2

Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
8 / 2.4
10 / 3.0

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.

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® 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.

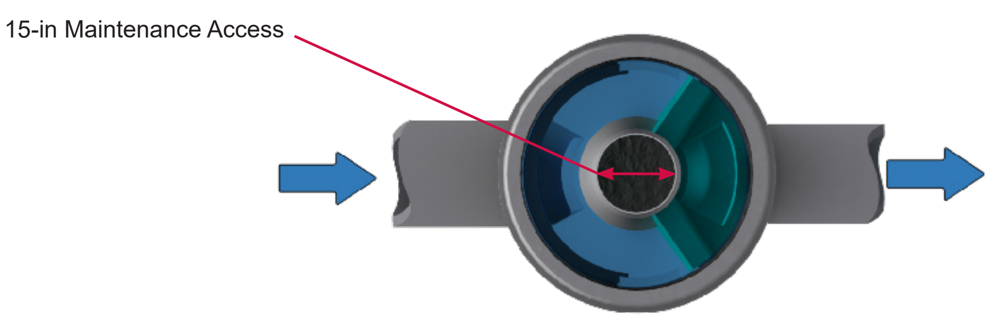


Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

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 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.

Fig.4 Floatables are removed with a vactor hose

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.4).

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 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.

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 or with the skimmer or net

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

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.

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.	

Hydro International

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): [3-FT] [4-FT] [5-FT] [6-FT] [8-FT] [10-FT]

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

Hydro International®

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

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

Hydro International

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

FD_O+M_J_2009(2)

A P P E N D I X F

Soil Testing Results

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey — Web Soil Survey (NRCS) (Source) — 266B (Soil Map Unit) — Warwick fine sandy loam (Soil Series)

   Outwash plain (Landform) — Suitable for building sites (Soil Limitations)

   Outwash (Soil Parent material)

3. Surficial Geological Report — 2018 (Year Published/Source) — Coarse deposits (Map Unit)

   Gravel deposits, sand & gravel deposits and sand deposits
   Description of Geologic Map Unit:

4. Flood Rate Insurance Map — Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No — If yes, MassGIS Wetland Data Layer: ______ (Wetland Type)

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24 (Month/Day/ Year) — Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-200 (Hole #) 8/7/2024 (Date) 12:00 PM (Time) ______ (Weather) 42.211820 (Latitude) 70.911215 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash Outwash plain (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

Property Line 35+/- feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-18"	F	Fill			Cnc : Dpl:						
18"-84"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Boulder or ledge refusal at 84". No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-201 (Hole #) | 8/6/2024 (Date) | ______ (Time) | ______ (Weather) | 42.211711 (Latitude) | 70.910541 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-5% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet

   Property Line 125+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-36"	F	Fill			Cnc : Dpl:						
36"-87"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Ledge refusal at 87" at east end of test pit rising toward west end. No observed redox or groundwater.

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-200 Obs. Hole # TP-201

	Obs. Hole # TP-200	Obs. Hole # TP-201
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	>84" inches	>87" inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

______________________ Index Well Number ______________________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. 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

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 18 inches Lower boundary: 84 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis	August 7, 2024
Signature of Soil Evaluator	Date
Alan W. Loomis / SE#1405	June 30, 2028
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Patrick Brennan, P.E.	Hingham Zoning Board of Appeals
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey Web Soil Survey (NRCS)
Source
266B
Soil Map Unit
Warwick fine sandy loam
Soil Series

Outwash plain
Landform
Suitable for building sites
Soil Limitations

Outwash
Soil Parent material

3. Surficial Geological Report 2018
Year Published/Source
Coarse deposits
Map Unit

Gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-202 (Hole #) 8/6/2024 (Date) 11:00 AM (Time) ______ (Weather) 42.211681 (Latitude) 70.910448 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash Outwash plain (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

Property Line 125+/- feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-36"	F	Fill			Cnc : Dpl:						
36"-108"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse very gravelly
108"-114"	C2	Sandy loam	2.5Y5/3	108"	Cnc : Dpl:		15%	15%	Massive	Firm	Some boulder
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: ______

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-203 (Hole #) | 8/6/2024 (Date) | 10:40 AM (Time) | Rainy (Weather) | 42.211760 (Latitude) | 70.910354 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-5% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet

   Property Line 150+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-32"	F	Fill			Cnc : Dpl:						
32"-93"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Ledge refusal at 93". No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-202 Obs. Hole # TP-203

	Obs. Hole # TP-202	Obs. Hole # TP-203
☒ Depth to soil redoximorphic features	108 inches	_____ inches
☒ Depth to observed standing water in observation hole	_____ inches	>93" inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ______________ Reading Date ______________

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. 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

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 36 inches Lower boundary: 108 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis	August 7, 2024
Signature of Soil Evaluator	Date
Alan W. Loomis / SE#1405	June 30, 2028
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Patrick Brennan, P.E.	Hingham Zoning Board of Appeals
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey: Web Soil Survey (NRCS) (Source); 266B (Soil Map Unit); Warwick fine sandy loam (Soil Series)

   Outwash plain (Landform); Suitable for building sites (Soil Limitations)

   Outwash (Soil Parent material)

3. Surficial Geological Report: 2018 (Year Published/Source); Coarse deposits (Map Unit)

   Gravel deposits, sand & gravel deposits and sand deposits
   Description of Geologic Map Unit:

4. Flood Rate Insurance Map — Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No — If yes, MassGIS Wetland Data Layer: ______ Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24 (Month/Day/ Year) — Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-204 (Hole #) | 8/6/2024 (Date) | 1:25 PM (Time) | ______ (Weather) | 42.211856 (Latitude) | 70.910045 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
Property Line 155+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-20"	F	Fill			Cnc : Dpl:						
20"-108"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25-30%	15%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-205 (Hole #) | 8/6/2024 (Date) | 2:45 PM (Time) | ______ (Weather) | 42.212007 (Latitude) | 70.910010 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5-8% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet

   Property Line 130+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No   If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No   If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-10"	A	Sandy loaml	10YR3/3		Cnc : Dpl:		10%	10%	Massive	Friable	
10"-14"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		10%	10%	Massive	Friable	
14"-120"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-204 Obs. Hole # TP-205

	Obs. Hole # TP-204	Obs. Hole # TP-205
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	>108 inches	>120" inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____________________ Index Well Number _____________________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. 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

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 14 inches Lower boundary: 120 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis	August 7, 2024
Signature of Soil Evaluator	Date
Alan W. Loomis / SE#1405	June 30, 2028
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Patrick Brennan, P.E.	Hingham Zoning Board of Appeals
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey: Web Soil Survey (NRCS) — Source; 260B — Soil Map Unit; Sudbury fine sandy loam — Soil Series

   Outwash plain — Landform; Suitable for building sites — Soil Limitations

   Outwash — Soil Parent material

3. Surficial Geological Report: 2018 — Year Published/Source; Coarse deposits — Map Unit

   Gravel deposits, sand & gravel deposits and sand deposits
   Description of Geologic Map Unit:

4. Flood Rate Insurance Map — Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No — If yes, MassGIS Wetland Data Layer: ______ Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24 — Month/Day/ Year — Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-206 (Hole #) 8/6/2024 (Date) ______ (Time) ______ (Weather) 42.212188 (Latitude) 70.909825 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) — Pine & oak (Vegetation) — Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) — 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash — Outwash plain (Landform) — ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet — Drainage Way >100 feet — Wetlands >100 feet

Property Line 70+/- feet — Drinking Water Well ______ feet — Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-15"	F	Fill			Cnc : Dpl:						
15"-84"	C1	Sand	2.5Y4/3		Cnc : Dpl:		20%	10%	Single grain	Loose	Medium-coarse
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-207 (Hole #) 8/6/2024 (Date) 3:10 PM (Time) ______ (Weather) 42.212134 (Latitude) 70.909699 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 5-8% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash Outwash plain (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

   Property Line 35+/- feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-18"	F	Fill			Cnc : Dpl:						
18"-84"	C1	Sand	2.5Y4/3		Cnc : Dpl:		20%	10%	Massive	Friable	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-206 Obs. Hole # TP-207

☐ Depth to soil redoximorphic features _____ inches _____ inches

☒ Depth to observed standing water in observation hole >84 inches >84 inches

☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology) _____ inches _____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. 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

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 14 inches Lower boundary: 120 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis
Signature of Soil Evaluator

August 7, 2024
Date

Alan W. Loomis / SE#1405
Typed or Printed Name of Soil Evaluator / License #

June 30, 2028
Expiration Date of License

Patrick Brennan, P.E.
Name of Approving Authority Witness

Hingham Zoning Board of Appeals
Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey
   Web Soil Survey (NRCS)
   Source
   260B
   Soil Map Unit
   Sudbury fine sandy loam
   Soil Series
   Outwash plain
   Landform
   Suitable for building sites
   Soil Limitations
   Outwash
   Soil Parent material

3. Surficial Geological Report
   2018
   Year Published/Source
   Coarse deposits
   Map Unit
   Gravel deposits, sand & gravel deposits and sand deposits
   Description of Geologic Map Unit:

4. Flood Rate Insurance Map   Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No   If yes, MassGIS Wetland Data Layer:
   Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24
   Month/Day/ Year
   Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-208 (Hole #) 8/6/2024 (Date) 3:00 PM (Time) ______ (Weather) 42.212100 (Latitude) 70.909836 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash — Outwash plain (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

Property Line 80+/- feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-10"	A	Sandy loam	10YR3/3		Cnc : Dpl:		10%	10%	Massive	Friable	
10"-27"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		10%	10%	Massive	Friable	
27"-108"	C1	Sand	2.5Y4/3	55"	Cnc : Dpl:		20%	10%	Single grain	Loose	Medium-coarse
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-209 (Hole #) 8/6/2024 (Date) ______ (Time) ______ (Weather) 42.211822 (Latitude) 70.909876 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 5-8% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash Outwash plain (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

   Property Line 90+/- feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-6"	A	Sandy loam	10YR3/3		Cnc : Dpl:		10%	10%	Massive	Friable	
6"-20"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		10%	10%	Massive	Friable	
20"-100"	C1	Sand	2.5Y4/3	55"	Cnc : Dpl:	30-40%	20%	10%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Moisture at bottom of excavation.

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-208 Obs. Hole # TP-209

	Obs. Hole # TP-208	Obs. Hole # TP-209
☒ Depth to soil redoximorphic features	_____ inches	55 inches
☒ Depth to observed standing water in observation hole	>108 inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ______________ Reading Date ______________

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. 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

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 27 inches Lower boundary: 108 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis	August 7, 2024
Signature of Soil Evaluator	Date
Alan W. Loomis / SE#1405	June 30, 2028
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Patrick Brennan, P.E.	Hingham Zoning Board of Appeals
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey Web Soil Survey (NRCS)
Source
260B
Soil Map Unit
Sudbury fine sandy loam
Soil Series

Outwash plain
Landform
Suitable for building sites
Soil Limitations

Outwash
Soil Parent material

3. Surficial Geological Report 2018
Year Published/Source
Coarse deposits
Map Unit

Gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-211 (Hole #) 8/6/2024 (Date) ______ (Time) ______ (Weather) 42.211540 (Latitude) 70.910150 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) — Pine & oak (Vegetation) — Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) — 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash — Outwash plain (Landform) — ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet; Drainage Way >100 feet; Wetlands >100 feet; Property Line 160+/- feet; Drinking Water Well ______ feet; Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-48"	F	Fill			Cnc : Dpl:						
48"-96"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	20%	Single grain	Loose	Medium-coarse
96"-114"	C2	Sandy loam	2.5Y5/3		Cnc : Dpl:				Massive	Firm	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-212 (Hole #) | 8/6/2024 (Date) | ______ (Time) | ______ (Weather) | 42.211822 (Latitude) | 70.909876 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5-8% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet

   Property Line 90+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-15"	F	Fill			Cnc : Dpl:						
15"-45"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater. Ledge or boulder refusal at 45"+/-

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-211 Obs. Hole # TP-212

	Obs. Hole # TP-211	Obs. Hole # TP-212
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	>114 inches	>45 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

______________________ Index Well Number ______________________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. 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

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 48 inches Lower boundary: 96 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis

Signature of Soil Evaluator

August 7, 2024

Date

Alan W. Loomis / SE#1405

Typed or Printed Name of Soil Evaluator / License #

June 30, 2028

Expiration Date of License

Patrick Brennan, P.E.

Name of Approving Authority Witness

Hingham Zoning Board of Appeals

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey Web Soil Survey (NRCS)
Source
260B
Soil Map Unit
Sudbury fine sandy loam
Soil Series
Outwash plain
Landform
Suitable for building sites
Soil Limitations
Outwash
Soil Parent material

3. Surficial Geological Report 2018
Year Published/Source
Coarse deposits
Map Unit
Gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-215 (Hole #) | 8/7/2024 (Date) | ______ (Time) | ______ (Weather) | 42.211061 (Latitude) | 70.909914 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
Property Line 105+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-10"	A	Sandy loam	10YR3/3		Cnc : Dpl:		10%	10%	Massive	Friable	
10"-24"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		10%	10%	Granular	Friable	
24"-120"	C1	Sand	2.5Y4/3		Cnc : Dpl:		40-50%	20%	Single grain	Loose	Medium-coarse
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-216 (Hole #) | 8/7/2024 (Date) | ______ (Time) | ______ (Weather) | 42.211025 (Latitude) | 70.909761 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5-8% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet

   Property Line 55+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-14"	A	Sandy loam	10YR4/3		Cnc : Dpl:		10%	5%	Massive	Friable	
14"-24"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		10%	5%	Granular	Friable	
24"-78"	C1	Sand	2.5Y4/3		Cnc : Dpl:		30-35%	20%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-215 Obs. Hole # TP-216

		Obs. Hole # TP-215	Obs. Hole # TP-216
☐	Depth to soil redoximorphic features	_____ inches	_____ inches
☒	Depth to observed standing water in observation hole	>120 inches	>78 inches
☐	Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

______________________ Index Well Number

______________________ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. 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

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 24 inches Lower boundary: 120 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis

Signature of Soil Evaluator

August 7, 2024
Date

Alan W. Loomis / SE#1405
Typed or Printed Name of Soil Evaluator / License #

June 30, 2028
Expiration Date of License

Patrick Brennan, P.E.
Name of Approving Authority Witness

Hingham Zoning Board of Appeals
Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey Web Soil Survey (NRCS)
Source
260B
Soil Map Unit
Sudbury fine sandy loam
Soil Series
Outwash plain
Landform
Suitable for building sites
Soil Limitations
Outwash
Soil Parent material

3. Surficial Geological Report 2018
Year Published/Source
Coarse deposits
Map Unit
Gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-217 (Hole #) 8/7/2024 (Date) ____ (Time) ____ (Weather) 42.210986 (Latitude) 70.909611 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 3-5% (Slope (%))

Description of Location: ____

2. Soil Parent Material: Outwash Outwash plain (Landform) ____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet
   Property Line 20+/- feet Drinking Water Well ____ feet Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-10"	A	Sandy loam	10YR3/3		Cnc : Dpl:		10%	5%	Massive	Friable	
10"-24"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		10%	5%	Granular	Friable	
24"-84"	C1	Sand	2.5Y4/3		Cnc : Dpl:		25%	15%	Single grain	Loose	Medium-coarse very gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-218 (Hole #) | 8/7/2024 (Date) | ______ (Time) | ______ (Weather) | 42.211089 (Latitude) | 70.909640 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Pine & oak (Vegetation) | Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5-8% (Slope (%))

   Description of Location: ______

2. Soil Parent Material: Outwash | Outwash plain (Landform) | ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet

   Property Line 50+/- feet | Drinking Water Well ______ feet | Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No | If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No | If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-24"	A/F	Sandy loam	10YR4/3		Cnc : Dpl:						
24"-42"	Bw	Loamy sand	10YR4/6		Cnc : Dpl:		25%	10%	Granular	Friable	
42"-100"	C1	Sand	2.5Y5/4		Cnc : Dpl:		15%	5%	Single grain	Loose	Medium
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
No observed redox or groundwater.

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-217 Obs. Hole # TP-218

- ☐ Depth to soil redoximorphic features _____ inches _____ inches
- ☒ Depth to observed standing water in observation hole >84 inches >100 inches
- ☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology) _____ inches _____ inches

_____________________ Index Well Number _____________________ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. 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

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 24 inches Lower boundary: 120 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis

Signature of Soil Evaluator	August 7, 2024 Date
Alan W. Loomis / SE#1405 Typed or Printed Name of Soil Evaluator / License #	June 30, 2028 Expiration Date of License
Patrick Brennan, P.E. Name of Approving Authority Witness	Hingham Zoning Board of Appeals Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Viking Lane, LLC & Xerxes Realty Trust
Owner Name

4-9 Viking Lane
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey
   Web Soil Survey (NRCS) — Source
   260B — Soil Map Unit
   Sudbury fine sandy loam — Soil Series
   Outwash plain — Landform
   Suitable for building sites — Soil Limitations
   Outwash — Soil Parent material

3. Surficial Geological Report
   2018 — Year Published/Source
   Coarse deposits — Map Unit
   Gravel deposits, sand & gravel deposits and sand deposits — Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: ______ Wetland Type

7. Current Water Resource Conditions (USGS): 8/6/24 & 8/7/24 — Month/Day/ Year
   Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-219 (Hole #) 8/7/2024 (Date) ______ (Time) ______ (Weather) 42.210942 (Latitude) 70.909222 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) Pine & oak (Vegetation) Common (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 3-5% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Outwash Outwash plain (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet

Property Line 25+/- feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ______ Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-4"	A/F				Cnc : Dpl:						
4"-52"	C1	Sand	2.5Y4/3	20"	Cnc : Dpl:	30%	20%	10%	Single grain	Loose	Medium-coarse gravelly
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: ______

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: _____
Hole # ______ Date ______ Time ______ Weather ______ Latitude ______ Longitude ______

1. Land Use: ______ (e.g., woodland, agricultural field, vacant lot, etc.) ______ Vegetation ______ Surface Stones (e.g., cobbles, stones, boulders, etc.) ______ Slope (%)

   Description of Location: ______

2. Soil Parent Material: ______ ______ Landform ______ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Wetlands ______ feet

   Property Line ______ feet Drinking Water Well ______ feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: ______ Depth to Weeping in Hole ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

______

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-219 Obs. Hole # _____

☒ Depth to soil redoximorphic features — 30 inches — _____ inches

☐ Depth to observed standing water in observation hole — _____ inches — _____ inches

☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology) — _____ inches — _____ inches

_______________ Index Well Number _______________ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. 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

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 4 inches Lower boundary: 52 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Hingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Alan W. Loomis	August 7, 2024
Signature of Soil Evaluator	Date
Alan W. Loomis / SE#1405	June 30, 2028
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Patrick Brennan, P.E.	Hingham Zoning Board of Appeals
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams: