Section 13. Stormwater Management Plan

SEBAGO TECHNICS

CIVIL ENGINEERING ▪ SURVEYING ▪ LANDSCAPE ARCHITECTURE

STORMWATER MANAGEMENT PLAN

for

Knight Farm Subdivision
Portland, Maine

Prepared for

Greenlight Enterprises, LLC
P.O. Box 963
Gray, ME 04039

March 2017

Table of Contents

Contents

Attachments

16533

STORMWATER MANAGEMENT PLAN

1728 Washington Avenue
Portland, Maine

Executive Summary

Greenlight Enterprises, LLC is submitting plans to develop within a 2.15 acre parcel off Washington Avenue into an 8 lot subdivision. The existing farmhouse will remain as a standalone lot. The existing barns and out-buildings will be removed. The property is shown as Lot A-3 on City of Portland Tax Map 351.

The development will create approximately 1.52 acres of new non-vegetated surface and 2.11 acres of new developed area as defined by the Maine Department of Environmental Protection (MDEP).

Roughly 18% or the site, is directly tributary to the combined sewer collection system in Washington Avenue. An additional 41% of the site is tributary to a ditch along the west side of Washington Avenue which eventually enters the combined sewer collection system through a downstream catch basin. The remaining 41% of the site, drains toward the western boundary of the site. As the proposed development is classified by the City of Portland as a Level III development, the site is required to comply with MaineDEP chapter 500 Standards, per Chapter 5 of City of Portland Technical Manual.

The project has been designed to provide treatment for 99.2% of the new non-vegetated area and 85.8% of the new developed area, which exceeds the required treatment level of Table 1 contained in MaineDEP Chapter 500, Section 4.C.(2)(a)(iii) amended date August 12, 2015. Treatment is achieved utilizing a grassed underdrained soil filter. Best Management Practices (BMPs) have been designed and sized in accordance with criteria published in Chapter 500 BMP's Technical Design Manual.

The project is within the watershed for Fall Brook, an urban impaired stream. This project does not trigger the Urban Impaired Stream Standard; however, the project discharges to a system within Washington Avenue that is a combined sewer system. Because of the combined sewer system is the only discharge available for the project, the project's detention system has been designed to meet the pre-construction discharge rates through the 100 year event.

16533

STORMWATER MANAGEMENT PLAN

Knight Farm Subdivision
Portland, Maine

I. Introduction

This Stormwater Management Plan has been prepared to address the potential impacts associated with this project due to the proposed modification in stormwater runoff characteristics. The stormwater management controls that are outlined in this plan have been designed to best suit the proposed development and to comply with applicable regulatory requirements.

II. Existing Conditions

The project site is currently a colonial farmhouse with various outbuildings with primarily grass land cover comprising of 2.15 acres in Portland.

Land Cover: The site is partially developed land consisting of grass land cover. The development site abuts Washington Avenue to the east, and single family residential structures to the north, south and west.

Site Topography: 18% of the site drains to an existing catch basin which is tied to the combined sewer collection system in Washington Avenue. An additional 41% of the site drains to a ditch along the west side of Washington Avenue and eventually into the combined sewer collection system through a downstream catch basin. The remaining 41% drains to the western boundary of the site.

Slopes on site range from 1% to 30% in eastern portion of the site, relatively flat along the central portion of the site, and steepen to 5% to 10% slopes along the southwestern portion of the site.

Surface Water Features: A portion of the site drains to an existing combined sewerage system within Washington Avenue. This collection system flows to the East End Wastewater Treatment Plant and once treated is discharged into Casco Bay.

Soils: Soil characteristics were obtained from the Soil Conservation Service (SCS) Medium Intensity Soil Survey of Cumberland County. Soils identified on the site (or within close proximity) are identified below in Table 1. These soil boundaries are identified on the attached watershed maps.

Table 1 – Proximity Soil Types and Characteristics

Soil Type	Symbol	HSG	K Factor
Hinckley loamy sand	HlB	A	0.17

The K factor is an erodibility index that relates each soil family based on a slight erosion potential of 0.10 to a high erosion potential of 0.64. An index number, greater than 0.32, indicates that a high level of erosion control measures must be taken in order to control erosion of this soil. The Hydrologic Soil Group (HSG) designation is based on a rating of the relative permeability of a soil, with Group "A" being extremely permeable such as coarse sand, to Group "D" having low permeability such as clay.

Historic Flooding: The Federal Emergency Management Agency (FEMA) lists the project site as Zone X, "Areas of 500 year flood based on the published Flood Insurance Rate Map (FEMA Community Panel Number 230051 0002C, dated December 8, 1998).

III. Proposed Development

The Applicant is proposing an 8 lot residential subdivision. The existing colonial farmhouse will remain as a standalone lot. The 8 new residential lots will be established along a 450-foot long roadway to be accepted as public road by the City of Portland.

Alterations to Land Cover: Completion of the proposed project will result in the creation of 1.52 acres of non-vegetated area and 2.11 acres of developed area.

IV. Downstream Ponds and Waterbodies

A majority of the project site is within the watershed for Fall Brook which is listed by the Maine Department of Environmental Protection as urban impaired stream.

V. Regulatory Requirements

A. City of Portland, Maine

The proposed development is classified as a Level III development and must comply with Section 5 of the City of Portland's Technical Manual stating that this development "shall be required to submit a Stormwater Management Plan pursuant to the regulations of the MDEP Chapter 500 Stormwater Management Rules, including Basic, General and Flooding Standards. The MDEP Chapter 500

rules describe stormwater management requirements for new development projects.

The following sections describe how this project will address these stormwater management performance standards.

Basic Standards: These standards include various erosion and sedimentation controls, inspection and maintenance procedures, and general housekeeping requirements. These performance standards are addressed in the Erosion and Sedimentation Control Plan on Plan Sheet 6 of 8 and in the Inspection, Maintenance, and Housekeeping Plan attached in Attachment C. Please refer to these documents for more detailed information.

General Standards: This standard presents minimum treatment thresholds for new non-vegetated areas and new developed areas to be treated by stormwater Best Management Practices (BMPs). General Standard BMPs have been defined by the MDEP and are described thoroughly in their publication "Stormwater Management for Maine: Best Management Practices Manual". Volume III of this manual contains additional information and sizing requirements for the treatment measures proposed for the proposed development.

Urban Impaired Stream Standard: This standard requires a payment of a compensation fee or mitigation of a project's impact by treating, reducing, or eliminating an off-site or on-site pre-development imperious stormwater source.

Flooding Standards: The MDEP requires that projects creating impervious areas greater than three (3) acres, or developed areas greater than twenty (20) acres address various flooding standards. The proposed project will not exceed the MDEP thresholds, but is required to meet the flooding standards for the City of Portland. The development will be designed to "detain, retain or result in the infiltration of stormwater from 24-hour storms of the 2-year, 10-year, and 25-year frequencies such that the peak flows of stormwater from the project site do not exceed the peak flows of stormwater prior to undertaking the project." A detailed stormwater model has been provided to demonstrate compliance with these standards.

VI. Stormwater Management BMPs

In order to meet the applicable regulations, the project will utilize a grassed underdrained soil filter located adjacent to the roadway. The BMP location is indicated on the attached plans.

A grassed underdrained soil filter must detain a runoff volume equal to 1" times the tributary impervious area and 0.4" times the tributary landscaped areas. The surface area of the system must be at least equal to 5% the impervious area and 2% of the landscaped area. Pre-treatment of the runoff must be provided by a sediment forebay, adequately sized to retain the anticipated winter sanding load. The runoff volume shall be discharged over a period of time not less than 24 hours and not greater than 48 hours.

The areas treated by this BMP are summarized in the stormwater treatment calculations attached in Attachment A: Stormwater Quality Calculations.

VII. Peak Flow Analysis

This section has been prepared to discuss the proposed modifications to peak flow rates as a result of the development.

A. Modeling Technique

In order to evaluate drainage characteristics in pre and post-development conditions, a quantitative analysis was performed to determine peak rates of runoff for the 2, 10, 25 and 100-year storm events. Runoff calculations were performed following the methodology outlined in the USDA Soil Conservation Service's "Urban Hydrology for Small Watersheds, Technical Release #55" and HydroCAD Stormwater Modeling System Software. A 24-hour, SCS Type III storm distribution for the 2, 10, 25 and 100-year storm frequencies were used for analysis.

The 24-hour rainfall values utilized in the hydrologic model for Southeast Cumberland County are as follows:

Table 2 - Storm Frequency Precipitation (in./24 hr)	
2-year	3.1
10-year	4.6
25-year	5.8
100-year	8.1

*Appendix H, MDEP Chapter 500, amended date Aug 12, 2015

B. Drainage Characteristics (Pre and Post-Development Watershed Delineation)

Two watershed study points (SP1 and SP2) were established to evaluate the pre-development and post-development peak runoff conditions for compliance with the Flooding Standard.

SP1 is located at the south eastern property boundary which is the limit of the site's contribution into the existing combined sewerage collection system. This study point combined the flow from the site into the existing catch basin on Washington Avenue as well as the runoff flowing into the ditch along the western side of Washington Avenue which ultimately flows into the combined sewerage system.

SP2 is located along the western boundary of the property. The runoff from the western boundary enters the Presumpscot River Watershed.

C. Pre-Development

SP1: SP1 has 2 drainage areas tributary to it; subareas 1S and 2S. Subarea 1S represents the portion of the site containing the farmhouse, most of the paved driveway, and the surrounding landscaped area which is tributary to the catch basin on the west side of Washington Avenue. Subarea 2S represents the area containing the majority of the barn as well as both of the outbuildings. This area drains to a ditch along the western boundary of Washington Avenue and eventually enters the combined sewerage system through a downstream catch basin.

SP2: SP2 is located at the western property line where drainage crosses the property line in the southwest portion of the site.

Subarea 1S represents the north east portion of the site which is mainly comprised of the existing farmhouse and the existing driveway. This area is directly tributary to the existing catch basin in Washington Avenue. The footprint of the farmhouse remains the same in both pre- and post- development conditions, however the existing garage and barn will be demolished and the existing driveway will be removed, the existing driveway location will be the approximate location of the new proposed public road. A new driveway will be constructed to the farmhouse, from the new public road.

Subarea 2S represents the south eastern and central part of the site which currently drains to a ditch along the western side of Washington Avenue. This area contains a portion of the barn and two other outbuildings which will all be removed in the post-development condition.

Subarea 3S represents the western section of the site which is currently an undeveloped open field.

D. Post-Development

Pre-development subarea 1S has been divided into two subareas. Subarea 10S represents the portion of the site which contains the majority of the existing farmhouse and a small portion of the new proposed roadway which will drain to the existing catch basin in Washington Avenue. Subarea 12S represents the portion of pre-development area 1S, which has been regraded such that any runoff will discharge into the proposed grassed underdrained soil filter.

Pre-development subarea 2S has been dived into two subareas. Subarea 20S represents the portion of pre-development area 2S which will drain to the proposed grassed underdrained soil filter. This includes the majority of the proposed roadway, 4 driveways, and 3 of the proposed buildings. Subarea 23S is a small portion of the development which will drain towards the southern property boundary.

Subarea 3S in pre-development represented the area which drained to the western property boundary. This area has been divided into two subareas in post-development. Subarea 32S represents the portion of pre-development area 3S which will drain to the proposed grassed underdrained soil filter. This includes a portion of the proposed roadway, 4 driveways, and 4 of the proposed buildings. The remaining area is represented by subarea 30S which will drain to the outside borders of the property similar to pre-development conditions. In both pre- and post- development conditions this area is entirely landscaped with no impervious.

E. Comparison

The watershed areas and times of concentration of the post-development watersheds vary from the existing conditions based on the proposed site development and grading. Table 3 summarizes the results of the hydrologic analysis of the project under pre-development and post-development conditions.

Table 3 – Stormwater Runoff Summary Table
Pre-Development vs. Post-Development

Study Point	Total Watershed Area (Ac)		Percent Impervious		Peak Rates of Runoff (cfs)							
					2-year		10-year		25-year		100-year	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
SP1	1.44	2.18	26%	38%	0.04	0.06	0.30	0.30	0.89	0.89	2.57	2.57
SP2	0.93	0.19	0%	0%	0.00	0.00	0.02	0.00	0.14	0.03	0.87	0.18

As depicted in the above table, post-development peak runoff rates at study point one will be at or below pre-development levels for the 10-year 25-year and 100 year storm events. There is a minor increase in the peak runoff rate for the 2-year storm event, at Study Point 1, which is anticipated to be 0.02 cfs greater than the pre-development rate. The only discharge during the 2 year event is through the under drain system which has a minimum sized bleeder (1.25”). As stated previously, the detention system has been designed through the 100 year storm event to account for the combined sewer of Washington Avenue. The post-development condition for study point 2 is at or below pre-development rates for all storm events, due the 80% reduction in area.

VIII. Water Quality Analysis

To achieve the required water quality treatment, a grassed underdrained soil filter is proposed to treat the majority of the development. The grassed underdrained soil filter has been designed and sized in accordance with the current Maine DEP Stormwater Best Management Practices handbook. Note that the existing landscaped portions of the standalone lot has been included in the treatment calculations.

The development has been designed to provide water quality treatment through implementation of approved BMP’s which provide for an impervious area treatment percentage of 99.2% and a developed area treatment percentage of 85.8%, which exceeds the required treatment levels of 95% and 80%, respectively, in accordance with MaineDEP Chapter 500, Section 4.C.(2)(a)(iii) amended date August 12, 2015.

Water Quality Volumes, BMP sizing volume calculations, and other supporting calculations are attached to this report.

X. Conclusions

The proposed development has been designed to meet the requirements of the City of Portland's Stormwater Technical Standards. The stormwater management system will treat 99.2% of the created impervious surface and 85.8% of the total developed area. The peak flow rates have been controlled to the greatest extent practical to be at pre-development levels. An anticipated increase of 0.02 cfs at Study Point 1 during the 2-year storm event is expected, but will not cause an unreasonable adverse effect on downstream the City's combined sewer system. Additionally, erosion and sedimentation controls have been outlined to prevent unreasonable impacts on the site and to the surrounding environment.

Prepared by,

SEBAGO TECHNICS, INC.

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Senior Project Manager

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Civil Engineer

RAM
March 14, 2017

STATE OF MAINE ROBERT A. McSORLEY No. 8420 LICENSED PROFESSIONAL ENGINEER

Robert A. McSorley 2017.03.15 18:40:14 -04'00'

Attachment A

Stormwater Quality Calculations

Table 1: MDEP GENERAL STANDARD CALCULATIONS
Knight Farm Subdivision, Portland
Job #16533

AREA ID	WATERSHED SIZE (S.F.)	EXISTING ONSITE IMPERVIOUS AREA (S.F.)	NEW ONSITE IMPERVIOUS AREA (S.F.)	EXISTING ONSITE LANDSCAPED AREA (S.F.)	NEW ONSITE LANDSCAPED AREA (S.F.)	NET NEW DEVELOPED AREA (S.F.)	NET EXISTING DEVELOPED AREAS (S.F.)	TREATMENT PROVIDED?	IMPERVIOUS AREA TREATED (S.F.)	LANDSCAPED AREA TREATED* (S.F.)	DEVELOPED AREA TREATED (S.F.)	TREATMENT BMP
1S	18,554	4,877		13,677			18,554					
2S	42,050	5,133		36,917			42,050					
3S	42,693			42,693			42,693					
Subtotal	103,297	10,010		93,287			103,297					
10S	7,876	1,401	660		5,815	6,475	1,401	NO	0	0	0	
12S	10,678	368	3,697		6,613	10,310	368	YES	4,065	6,613	10,678	
20S	40,524		15,927		24,597	40,524	0	YES	15,927	24,597	40,524	
23S	1,526				1,526	1,526	0	NO	0	0	0	
30S	6,749				6,749	6,749	0	NO	0	0	0	
32S	35,943		14,986		20,957	35,943	0	YES	14,986	20,957	35,943	
Subtotal (S.F.)	**103,297**	**1,769**	**35,270**	**0**	**66,257**	**101,527**	**1,769**		**34,978**	**52,167**	**87,145**	
			0.81		**1.52**	**2.33**						

*

TOTAL NEW IMPERVIOUS AREA (S.F.)	**35,270**	**TOTAL DEVELOPED AREA (S.F.)**	**101,527**
TOTAL IMPERVIOUS AREA RECEIVING TREATMENT (S.F.)	**34,978**	**TOTAL DEV. AREA RECEIVING TREATMENT (S.F.)**	**87,145**
% OF IMPERVIOUS AREA RECEIVING TREATMENT	**99.2%**	**% OF DEV. AREA RECEIVING TREATMENT**	**85.8%**

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JOB	16533		
SHEET NO.	1	OF	1
CALCULATED BY	GJH	DATE	1/27/2017
FILE NAME		PRNT DATE	3/9/2017

UNDERDRAINED SOIL FILTER

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter

Landscaped Area	52,167.00	SF					
Impervious Area	34,978.00	SF					

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	52,167.00	SF	Area	1,043.3	SF	
Total Impervious Area	34,978.00	SF	Area	1,748.9	SF	
Required Minimum Surface Area				2,792.2	SF	
Provided Surface Area				2,842.0	SF	

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

Landscaped Area	52,167.00	SF	Volume	1,738.9					
Impervious Area	34,978.00	SF	Volume	2,914.8					
CPV Required				4,653.7	CF	0.107	AF		
Provided CPV				4,654.0	CF	(Elevation 143.75 to 145.12)			

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

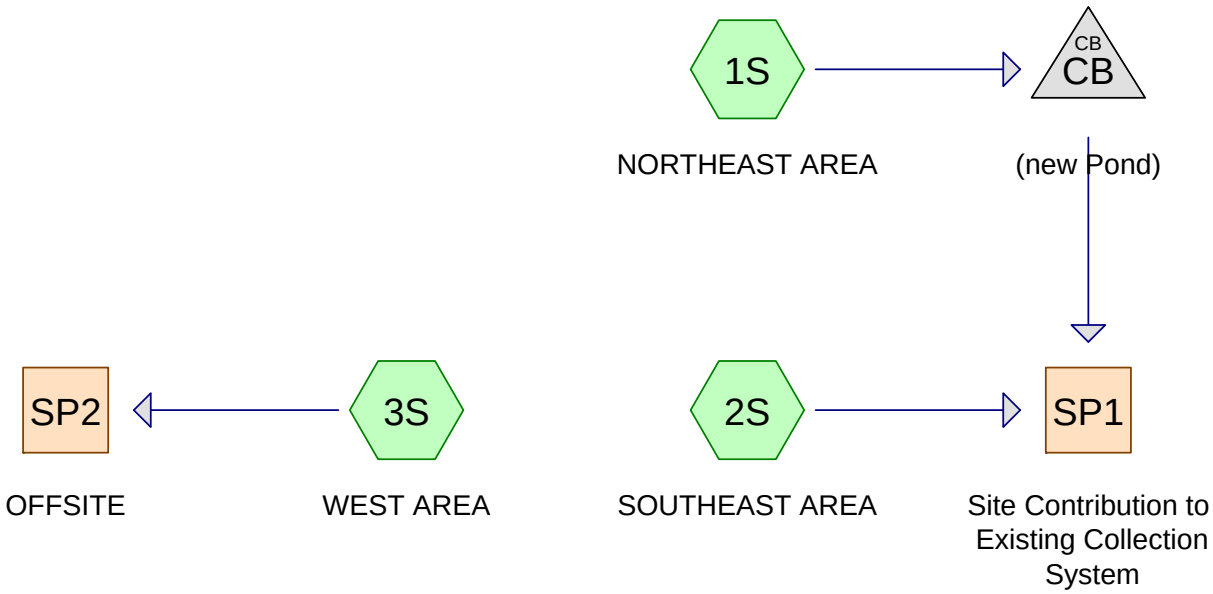
Annual Sediment Load: 50 cubic feet per acre per year of sanded area

Area to be sanded:	19462	SF							
Sediment Volume	22	CF							
Provided	28	CF	6	Inch Deep Forebay	with area of		55	sf	

Attachment B

HydroCAD Output

Predevelopment



Subcat Reach Pond Link

Routing Diagram for 16533-PRE
Prepared by Microsoft, Printed 3/8/2017

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.101	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S)
0.059	98	Paved parking, HSG A (1S, 2S)
0.171	98	Roofs, HSG A (1S, 2S)
0.040	30	Woods, Good, HSG A (2S)
2.371	**45**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.371	HSG A	1S, 2S, 3S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.371		**TOTAL AREA**

Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: NORTHEAST AREA Runoff Area=18,554 sf 26.29% Impervious Runoff Depth=0.22"
Tc=6.0 min CN=55 Runoff=0.04 cfs 0.008 af

Subcatchment 2S: SOUTHEAST AREA Runoff Area=42,050 sf 12.21% Impervious Runoff Depth=0.05"
Flow Length=303' Tc=11.4 min CN=46 Runoff=0.01 cfs 0.004 af

Subcatchment 3S: WEST AREA Runoff Area=42,693 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=153' Tc=6.2 min CN=39 Runoff=0.00 cfs 0.000 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.08' Max Vel=1.13 fps Inflow=0.04 cfs 0.012 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=0.04 cfs 0.012 af

Reach SP2: OFFSITE Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond CB: (new Pond) Peak Elev=140.43' Inflow=0.04 cfs 0.008 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.04 cfs 0.008 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.012 af Average Runoff Depth = 0.06"
90.31% Pervious = 2.142 ac 9.69% Impervious = 0.230 ac

Summary for Subcatchment 1S: NORTHEAST AREA

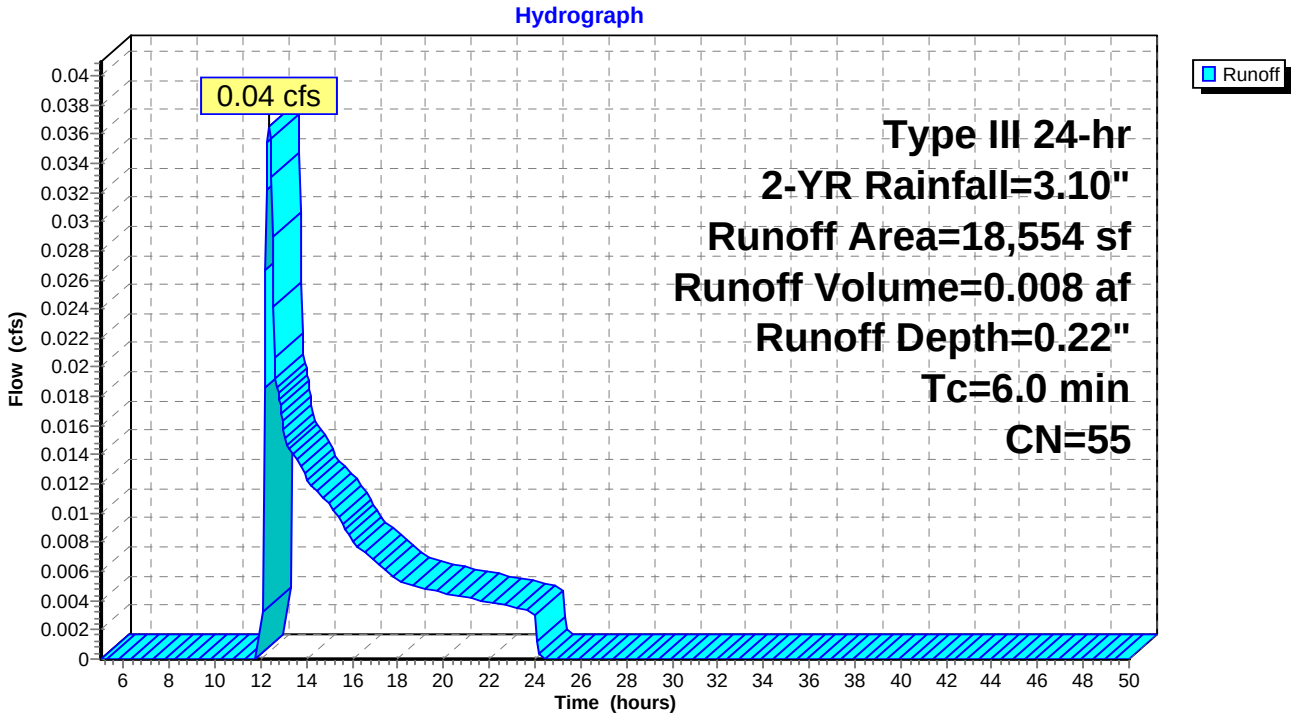
Runoff = 0.04 cfs @ 12.35 hrs, Volume= 0.008 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
2,652	98	Roofs, HSG A
2,225	98	Paved parking, HSG A
13,677	39	>75% Grass cover, Good, HSG A
18,554	55	Weighted Average
13,677		73.71% Pervious Area
4,877		26.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, <6 Minutes**

Subcatchment 1S: NORTHEAST AREA



Summary for Subcatchment 2S: SOUTHEAST AREA

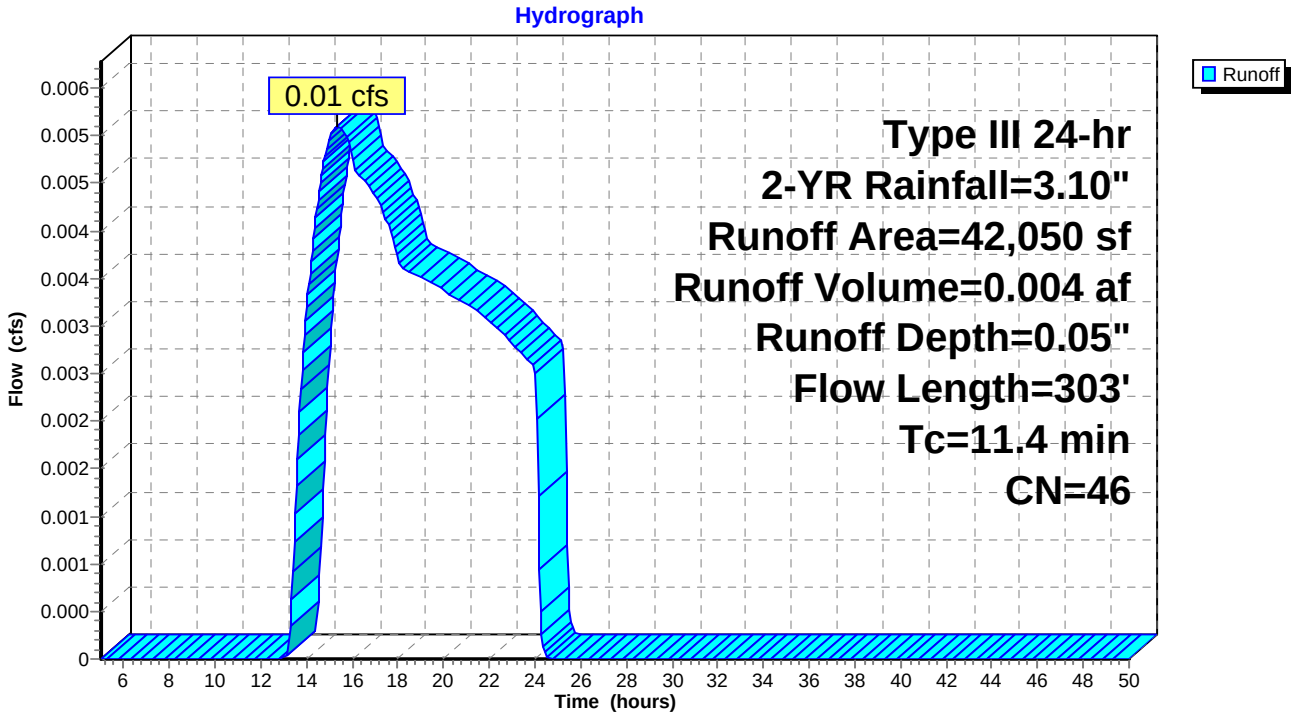
Runoff = 0.01 cfs @ 15.37 hrs, Volume= 0.004 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
4,795	98	Roofs, HSG A
339	98	Paved parking, HSG A
35,160	39	>75% Grass cover, Good, HSG A
1,756	30	Woods, Good, HSG A
42,050	46	Weighted Average
36,916		87.79% Pervious Area
5,134		12.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0115	0.13		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
3.4	155	0.0115	0.75		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.6	98	0.0200	0.99		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
11.4	303	Total			

Subcatchment 2S: SOUTHEAST AREA



Summary for Subcatchment 3S: WEST AREA

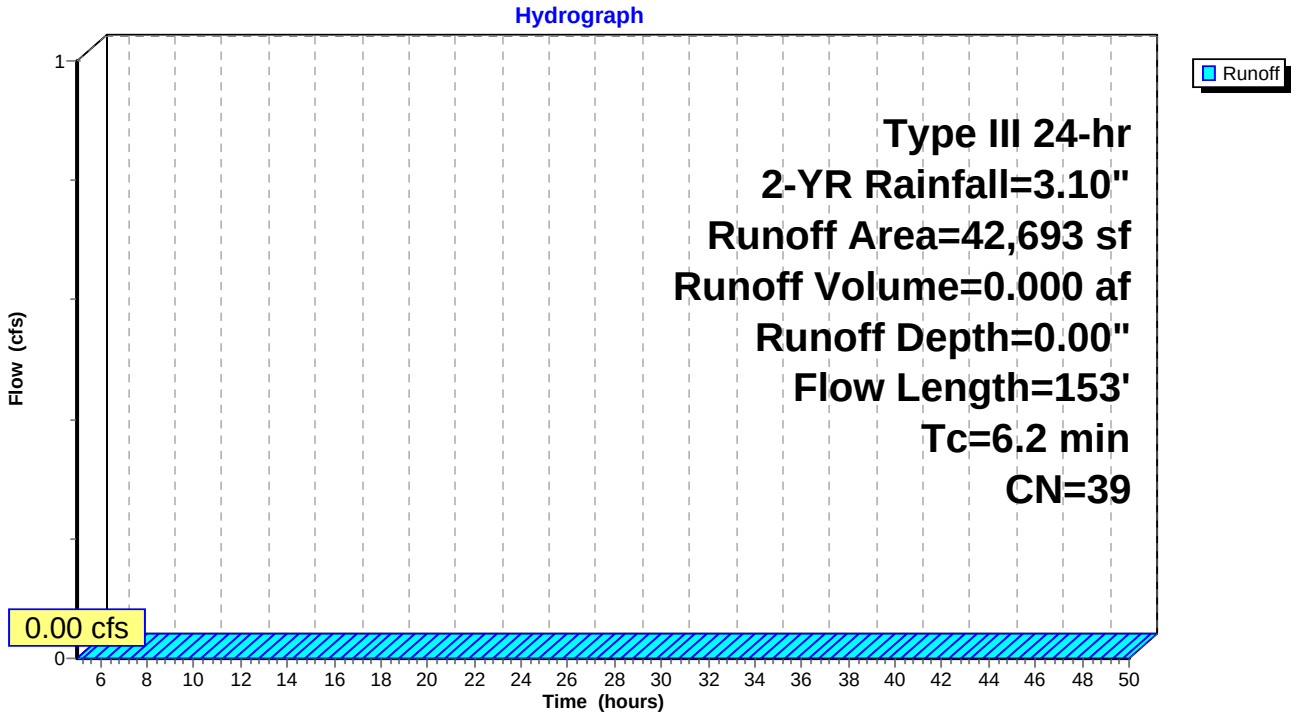
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
42,693	39	>75% Grass cover, Good, HSG A
42,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	47	0.0200	0.16		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
1.3	106	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.2	153	Total			

Subcatchment 3S: WEST AREA



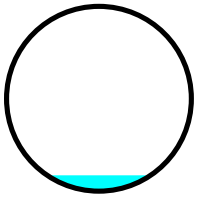
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 1.391 ac, 16.52% Impervious, Inflow Depth = 0.10" for 2-YR event
Inflow = 0.04 cfs @ 12.35 hrs, Volume= 0.012 af
Outflow = 0.04 cfs @ 12.42 hrs, Volume= 0.012 af, Atten= 1%, Lag= 3.9 min

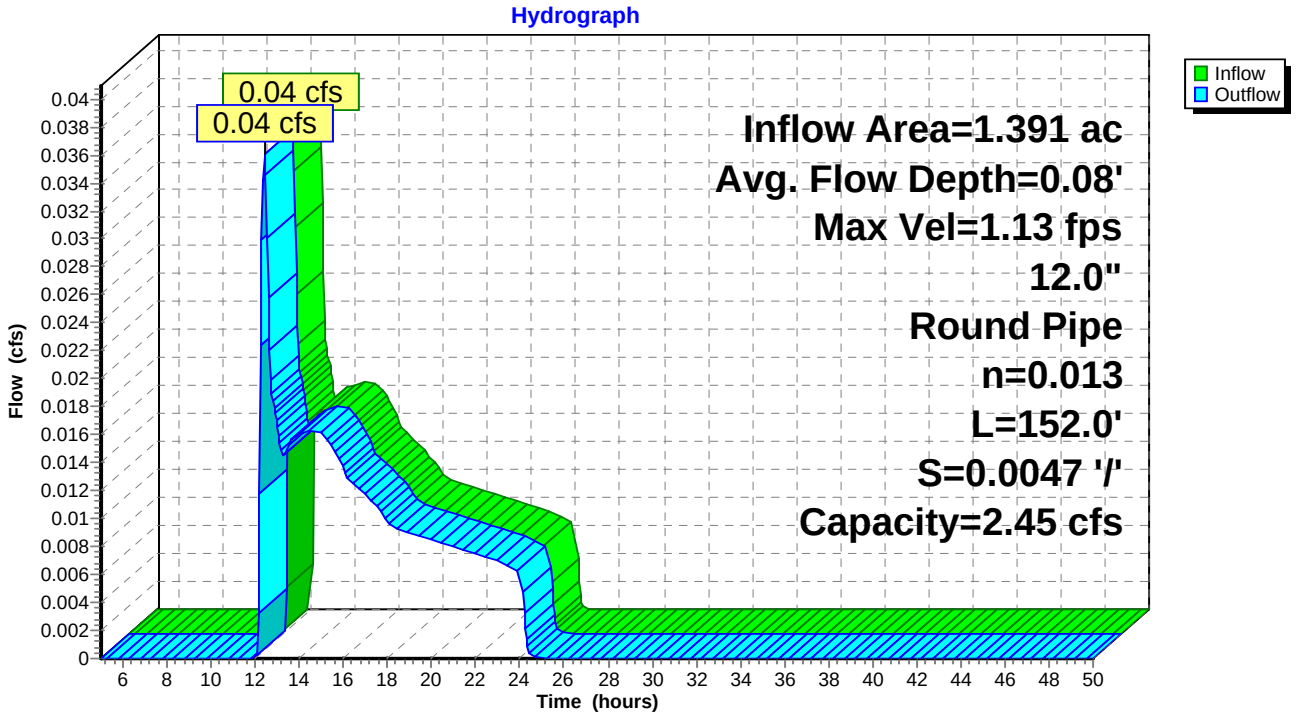
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.13 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 3.3 min

Peak Storage= 5 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

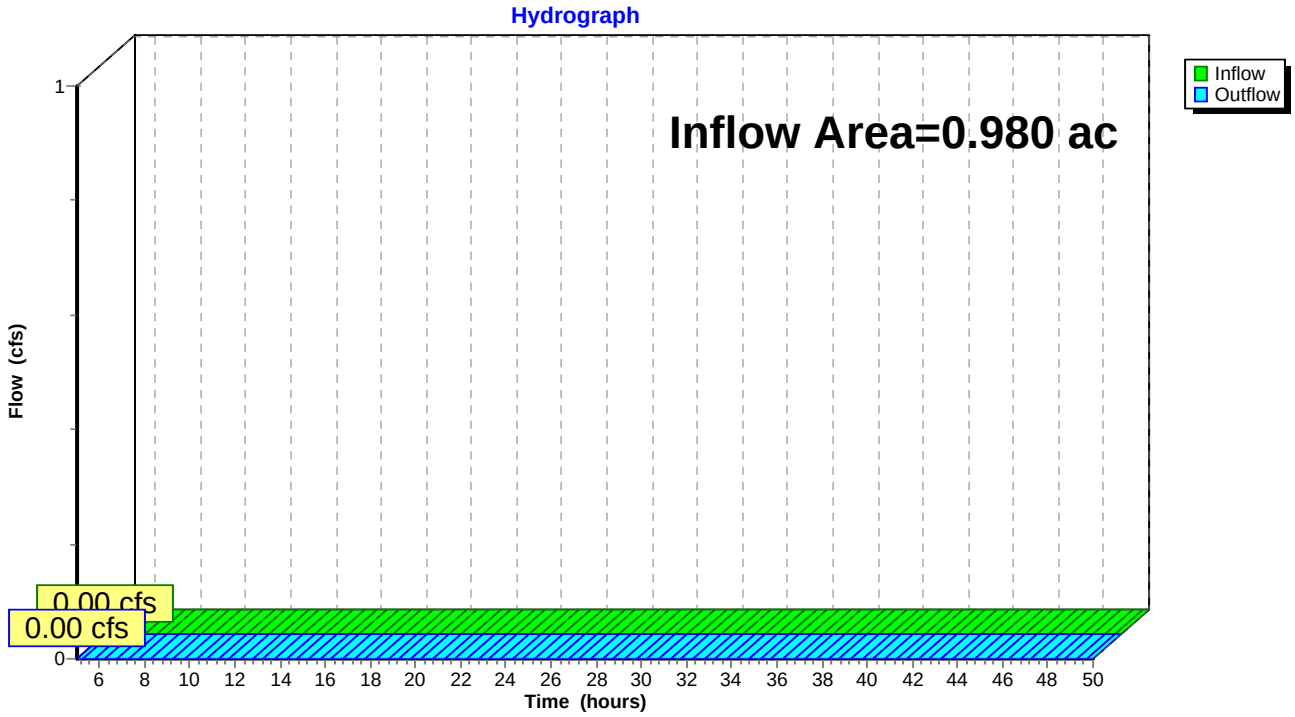


Summary for Reach SP2: OFFSITE

Inflow Area = 0.980 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: OFFSITE



Summary for Pond CB: (new Pond)

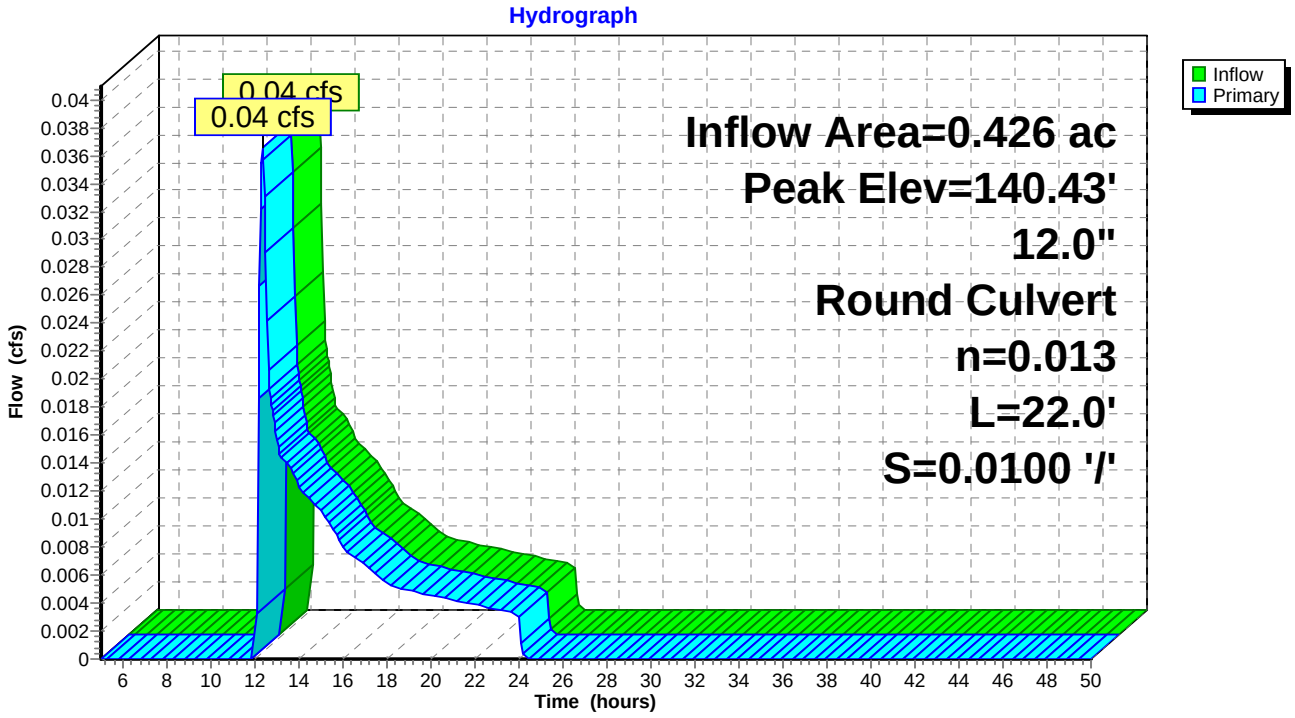
Inflow Area = 0.426 ac, 26.29% Impervious, Inflow Depth = 0.22" for 2-YR event
Inflow = 0.04 cfs @ 12.35 hrs, Volume= 0.008 af
Outflow = 0.04 cfs @ 12.35 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.35 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.43' @ 12.35 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.03 cfs @ 12.35 hrs HW=140.43' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.03 cfs @ 1.37 fps)

Pond CB: (new Pond)



Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: NORTHEAST AREA Runoff Area=18,554 sf 26.29% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=55 Runoff=0.29 cfs 0.028 af

Subcatchment 2S: SOUTHEAST AREA Runoff Area=42,050 sf 12.21% Impervious Runoff Depth=0.36"
Flow Length=303' Tc=11.4 min CN=46 Runoff=0.14 cfs 0.029 af

Subcatchment 3S: WEST AREA Runoff Area=42,693 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=153' Tc=6.2 min CN=39 Runoff=0.02 cfs 0.010 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.24' Max Vel=2.13 fps Inflow=0.30 cfs 0.057 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=0.30 cfs 0.057 af

Reach SP2: OFFSITE Inflow=0.02 cfs 0.010 af
Outflow=0.02 cfs 0.010 af

Pond CB: (new Pond) Peak Elev=140.62' Inflow=0.29 cfs 0.028 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.29 cfs 0.028 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.067 af Average Runoff Depth = 0.34"
90.31% Pervious = 2.142 ac 9.69% Impervious = 0.230 ac

Summary for Subcatchment 1S: NORTHEAST AREA

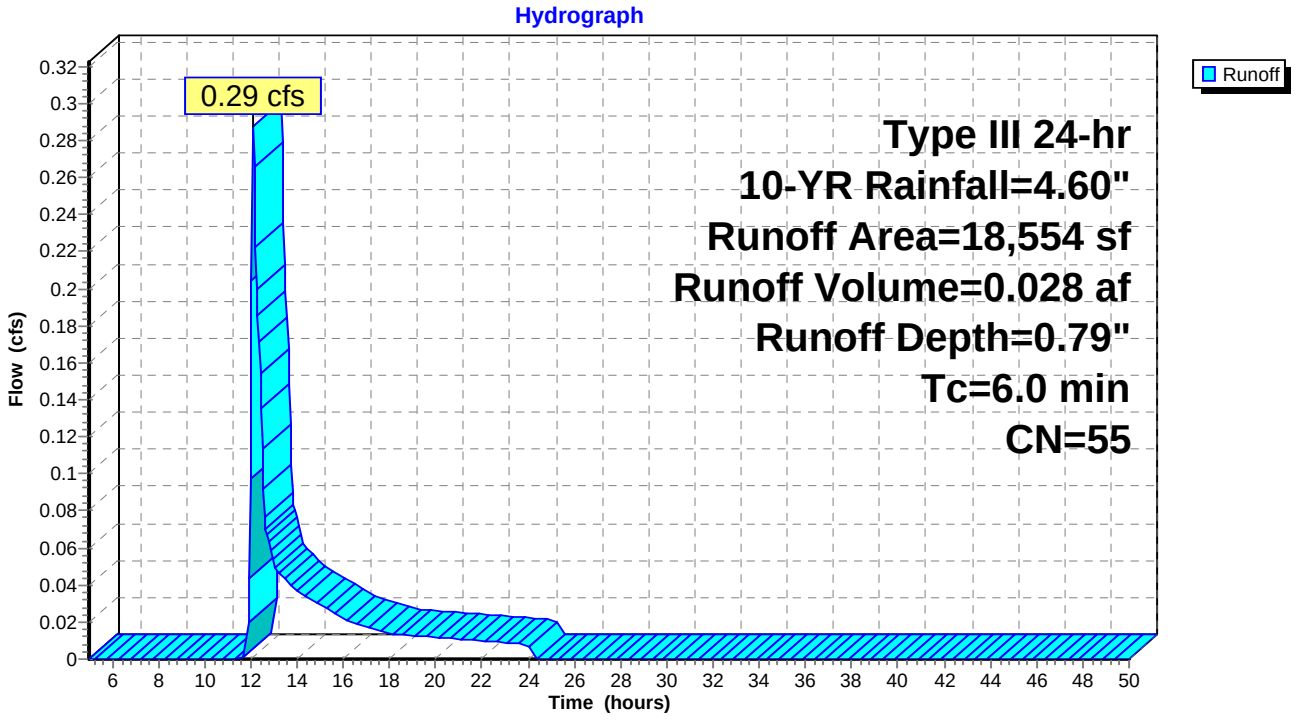
Runoff = 0.29 cfs @ 12.12 hrs, Volume= 0.028 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
2,652	98	Roofs, HSG A
2,225	98	Paved parking, HSG A
13,677	39	>75% Grass cover, Good, HSG A
18,554	55	Weighted Average
13,677		73.71% Pervious Area
4,877		26.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, <6 Minutes**

Subcatchment 1S: NORTHEAST AREA



Summary for Subcatchment 2S: SOUTHEAST AREA

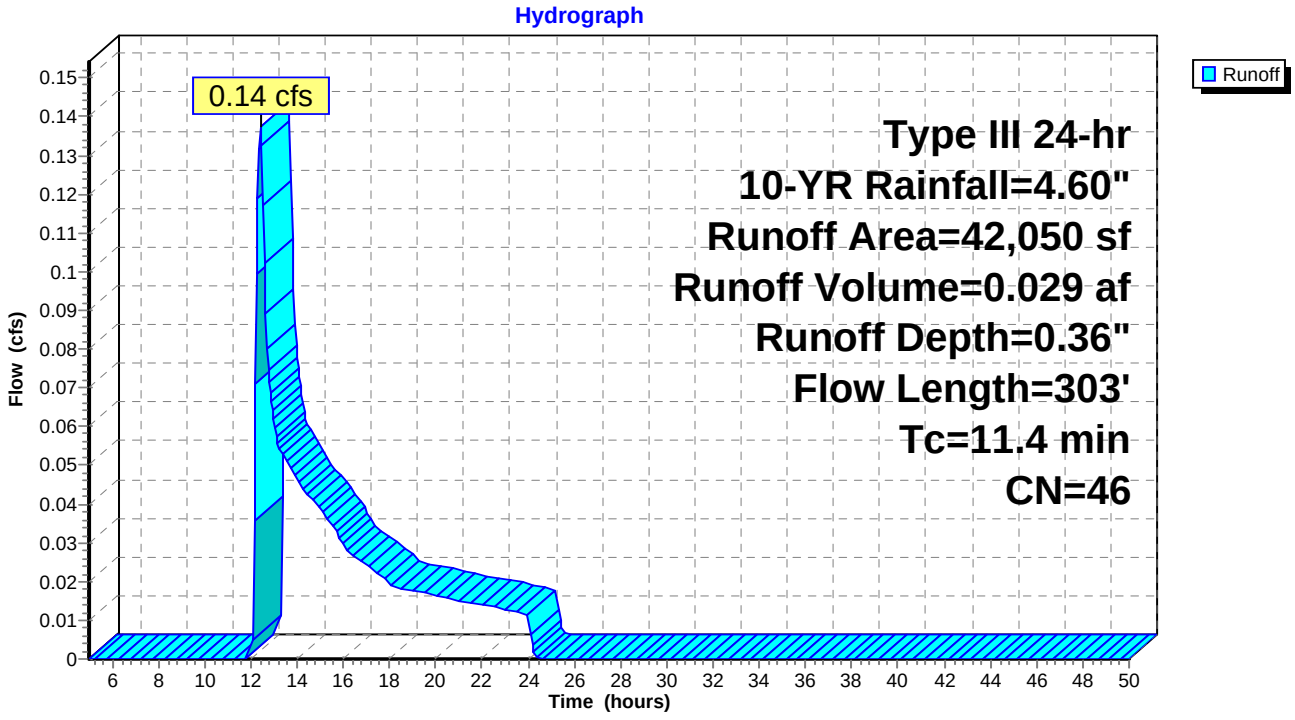
Runoff = 0.14 cfs @ 12.42 hrs, Volume= 0.029 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
4,795	98	Roofs, HSG A
339	98	Paved parking, HSG A
35,160	39	>75% Grass cover, Good, HSG A
1,756	30	Woods, Good, HSG A
42,050	46	Weighted Average
36,916		87.79% Pervious Area
5,134		12.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0115	0.13		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
3.4	155	0.0115	0.75		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.6	98	0.0200	0.99		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
11.4	303	Total			

Subcatchment 2S: SOUTHEAST AREA



Summary for Subcatchment 3S: WEST AREA

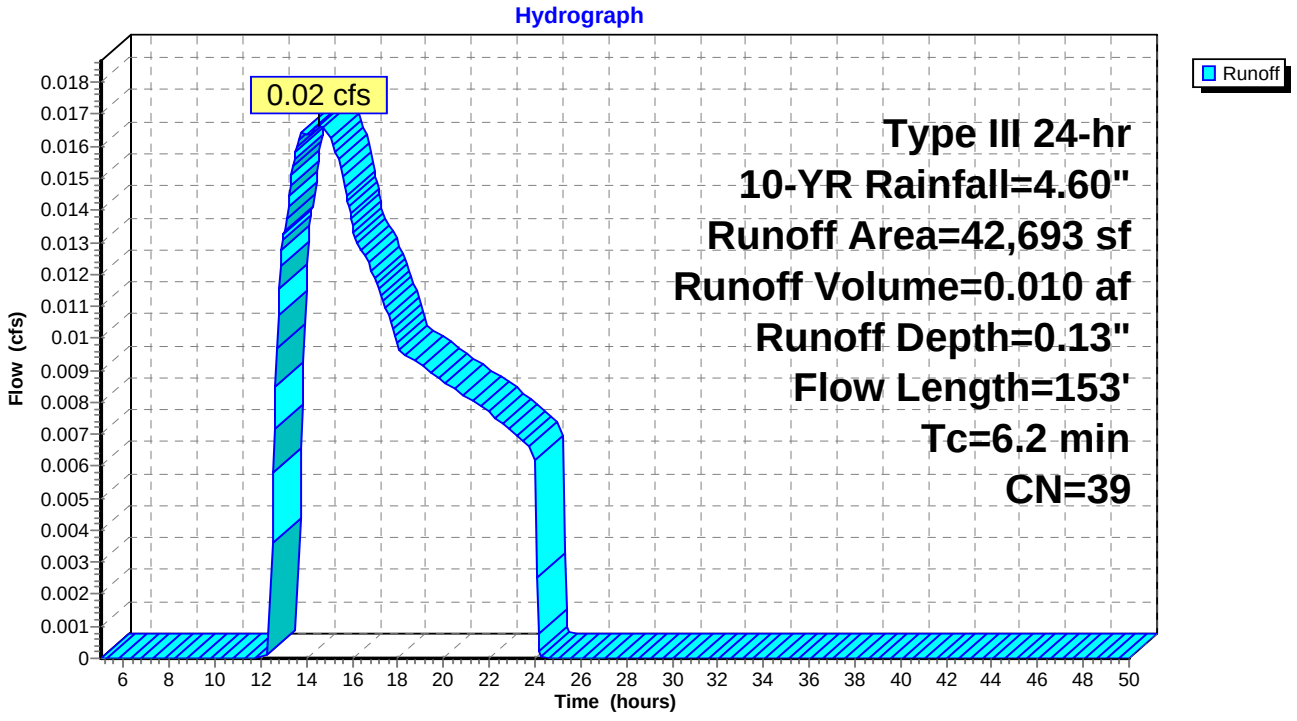
Runoff = 0.02 cfs @ 14.57 hrs, Volume= 0.010 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
42,693	39	>75% Grass cover, Good, HSG A
42,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	47	0.0200	0.16		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
1.3	106	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.2	153	Total			

Subcatchment 3S: WEST AREA



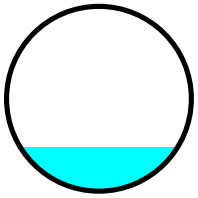
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 1.391 ac, 16.52% Impervious, Inflow Depth = 0.49" for 10-YR event
Inflow = 0.30 cfs @ 12.31 hrs, Volume= 0.057 af
Outflow = 0.30 cfs @ 12.34 hrs, Volume= 0.057 af, Atten= 0%, Lag= 1.9 min

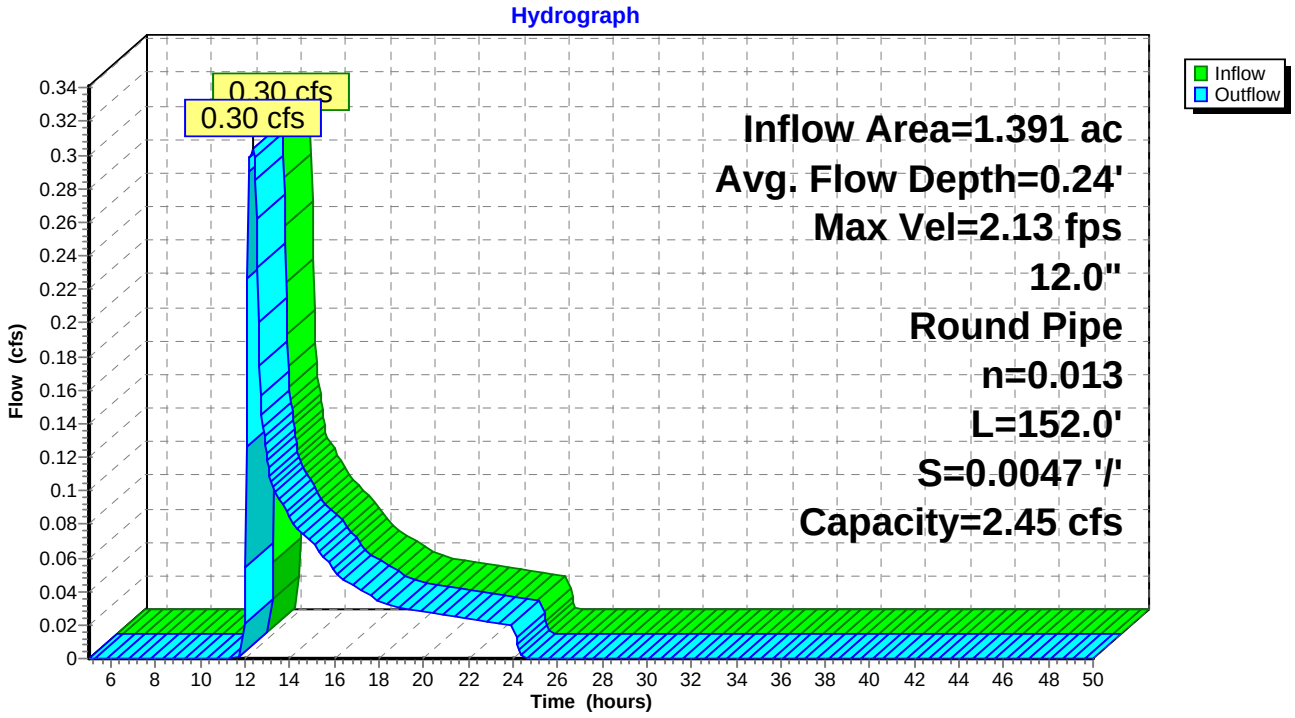
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 2.2 min

Peak Storage= 22 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

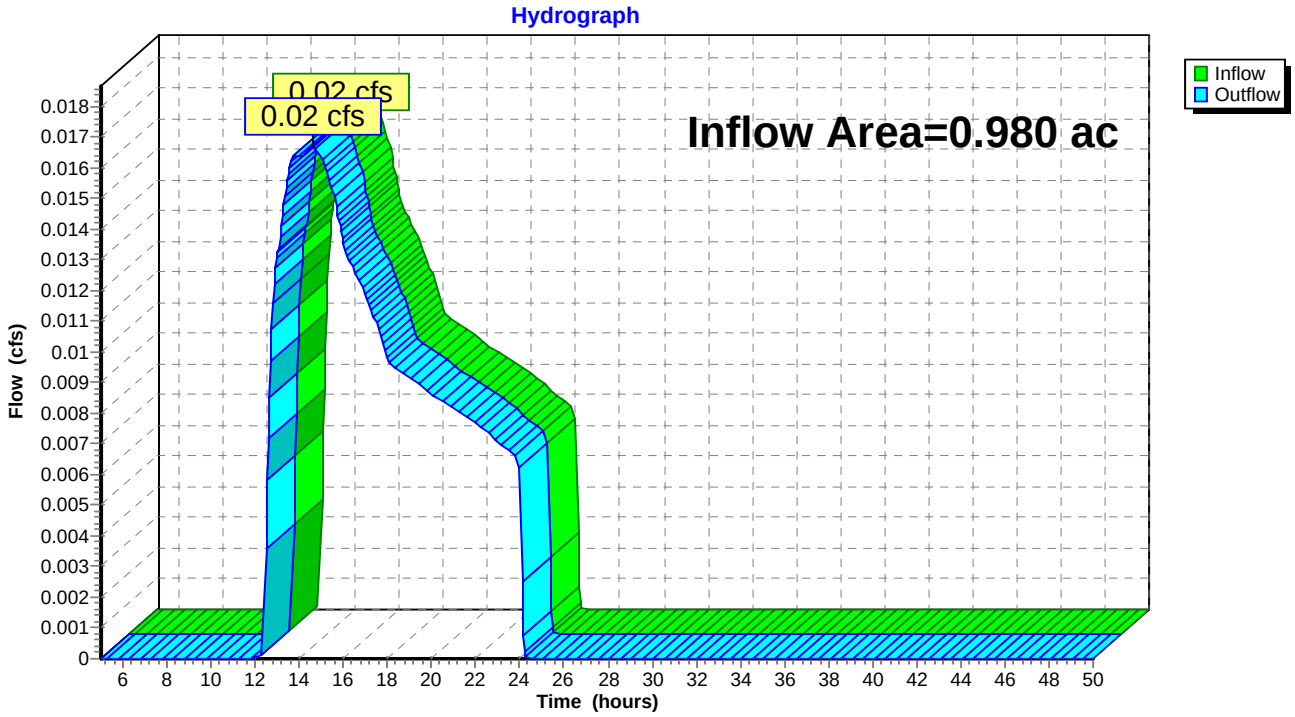


Summary for Reach SP2: OFFSITE

Inflow Area = 0.980 ac, 0.00% Impervious, Inflow Depth = 0.13" for 10-YR event
Inflow = 0.02 cfs @ 14.57 hrs, Volume= 0.010 af
Outflow = 0.02 cfs @ 14.57 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: OFFSITE



Summary for Pond CB: (new Pond)

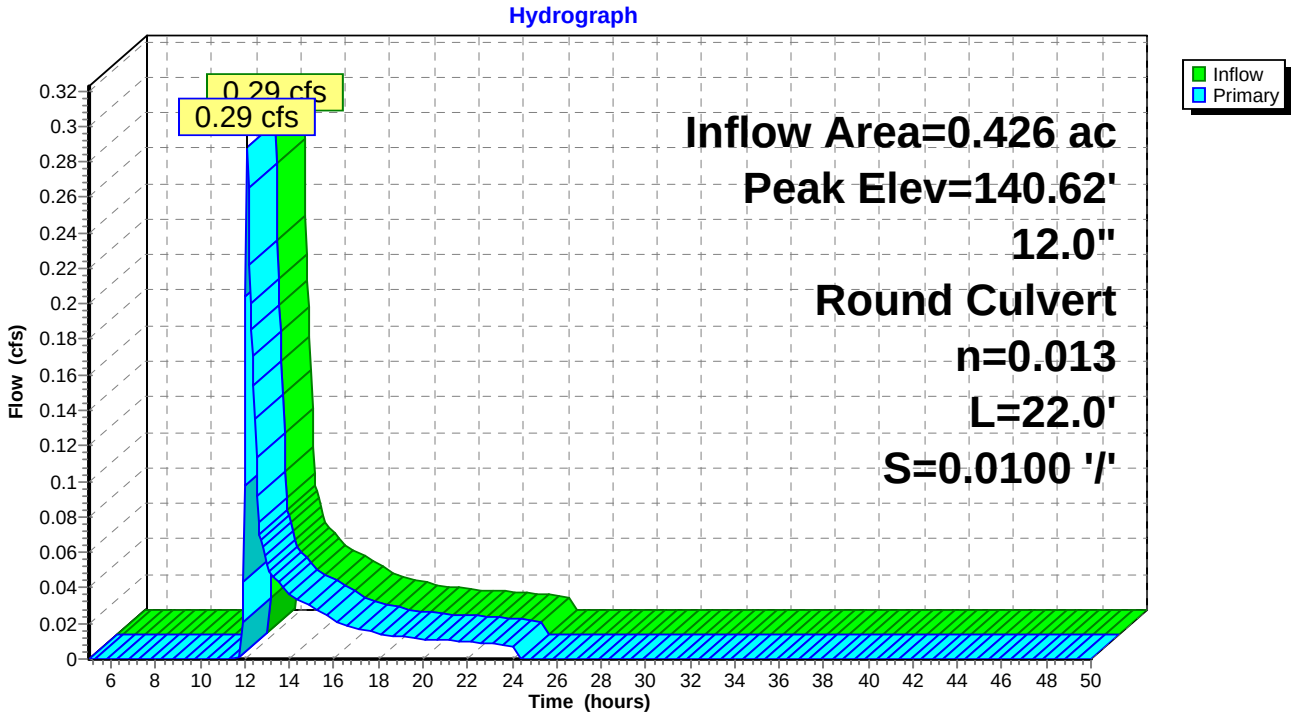
Inflow Area = 0.426 ac, 26.29% Impervious, Inflow Depth = 0.79" for 10-YR event
Inflow = 0.29 cfs @ 12.12 hrs, Volume= 0.028 af
Outflow = 0.29 cfs @ 12.12 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.12 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.62' @ 12.12 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.12 hrs HW=140.61' (Free Discharge)
1=Culvert (Barrel Controls 0.28 cfs @ 2.38 fps)

Pond CB: (new Pond)



Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: NORTHEAST AREA Runoff Area=18,554 sf 26.29% Impervious Runoff Depth=1.40"
Tc=6.0 min CN=55 Runoff=0.61 cfs 0.050 af

Subcatchment 2S: SOUTHEAST AREA Runoff Area=42,050 sf 12.21% Impervious Runoff Depth=0.78"
Flow Length=303' Tc=11.4 min CN=46 Runoff=0.44 cfs 0.063 af

Subcatchment 3S: WEST AREA Runoff Area=42,693 sf 0.00% Impervious Runoff Depth=0.39"
Flow Length=153' Tc=6.2 min CN=39 Runoff=0.14 cfs 0.032 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.42' Max Vel=2.89 fps Inflow=0.91 cfs 0.113 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=0.89 cfs 0.113 af

Reach SP2: OFFSITE Inflow=0.14 cfs 0.032 af
Outflow=0.14 cfs 0.032 af

Pond CB: (new Pond) Peak Elev=140.76' Inflow=0.61 cfs 0.050 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.61 cfs 0.050 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.145 af Average Runoff Depth = 0.73"
90.31% Pervious = 2.142 ac 9.69% Impervious = 0.230 ac

Summary for Subcatchment 1S: NORTHEAST AREA

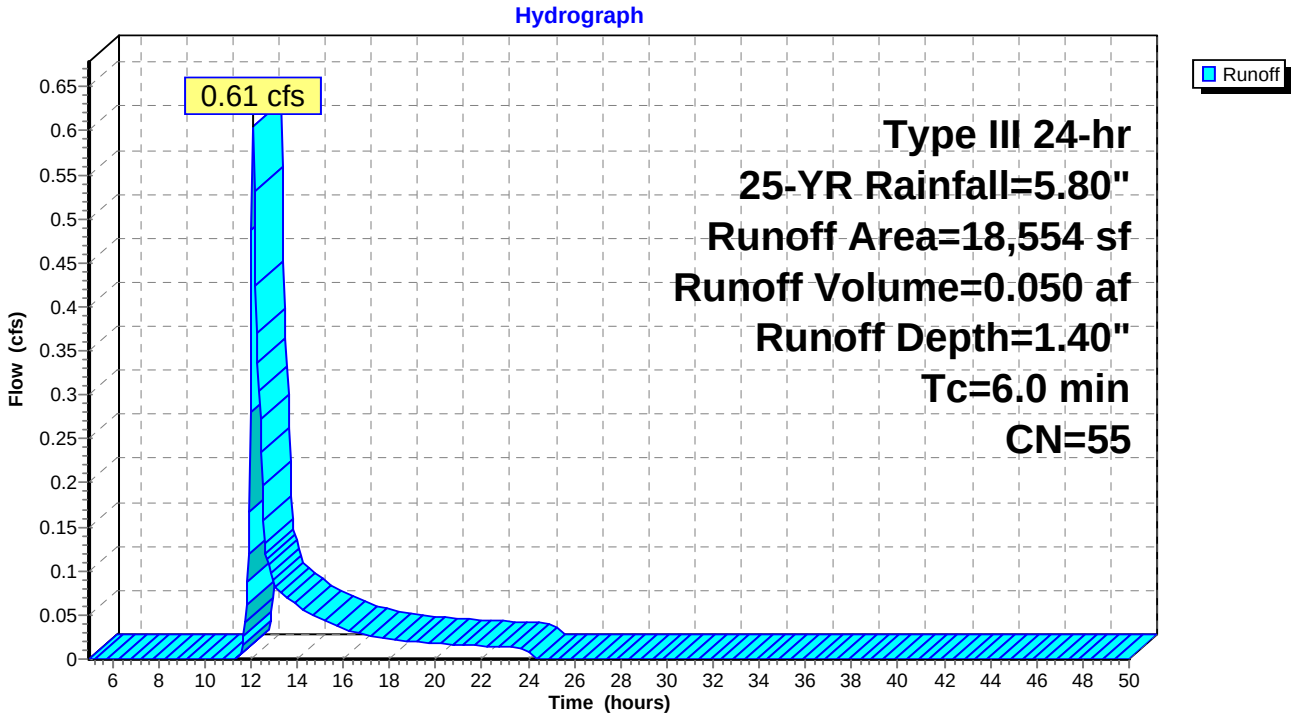
Runoff = 0.61 cfs @ 12.11 hrs, Volume= 0.050 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
2,652	98	Roofs, HSG A
2,225	98	Paved parking, HSG A
13,677	39	>75% Grass cover, Good, HSG A
18,554	55	Weighted Average
13,677		73.71% Pervious Area
4,877		26.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, <6 Minutes**

Subcatchment 1S: NORTHEAST AREA



Summary for Subcatchment 2S: SOUTHEAST AREA

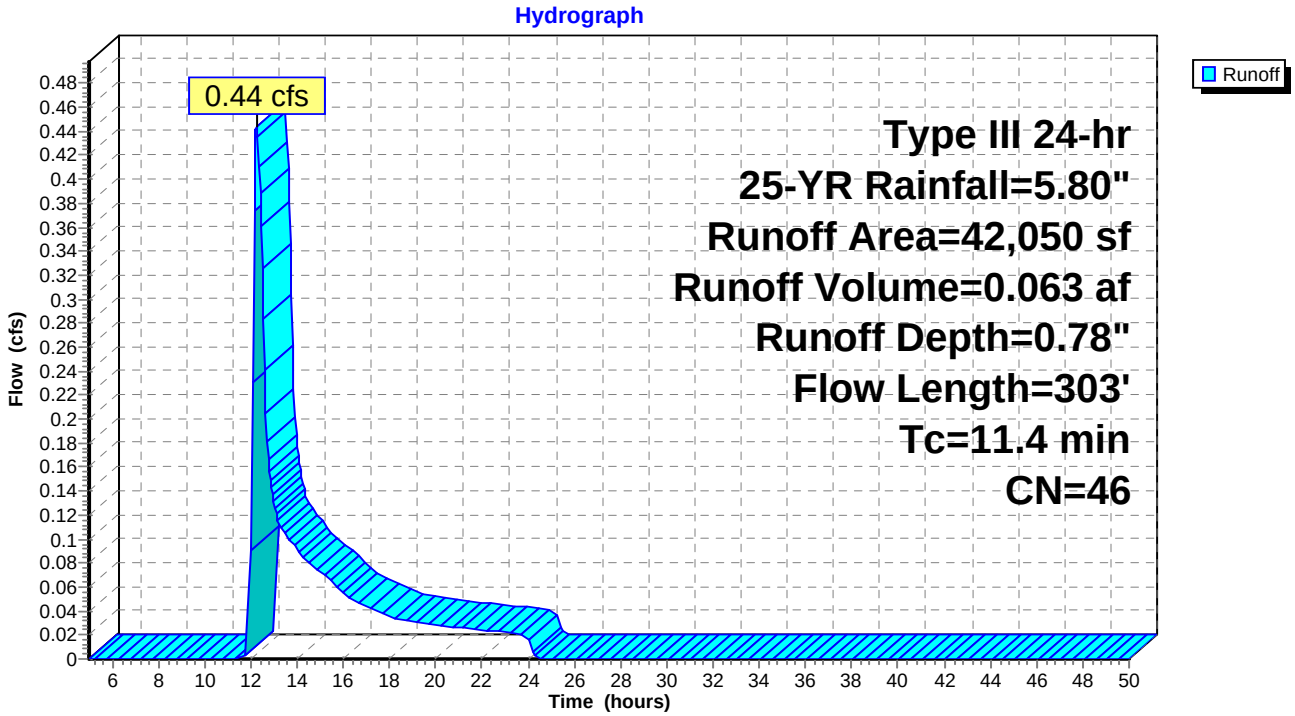
Runoff = 0.44 cfs @ 12.23 hrs, Volume= 0.063 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
4,795	98	Roofs, HSG A
339	98	Paved parking, HSG A
35,160	39	>75% Grass cover, Good, HSG A
1,756	30	Woods, Good, HSG A
42,050	46	Weighted Average
36,916		87.79% Pervious Area
5,134		12.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0115	0.13		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
3.4	155	0.0115	0.75		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.6	98	0.0200	0.99		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
11.4	303	Total			

Subcatchment 2S: SOUTHEAST AREA



Summary for Subcatchment 3S: WEST AREA

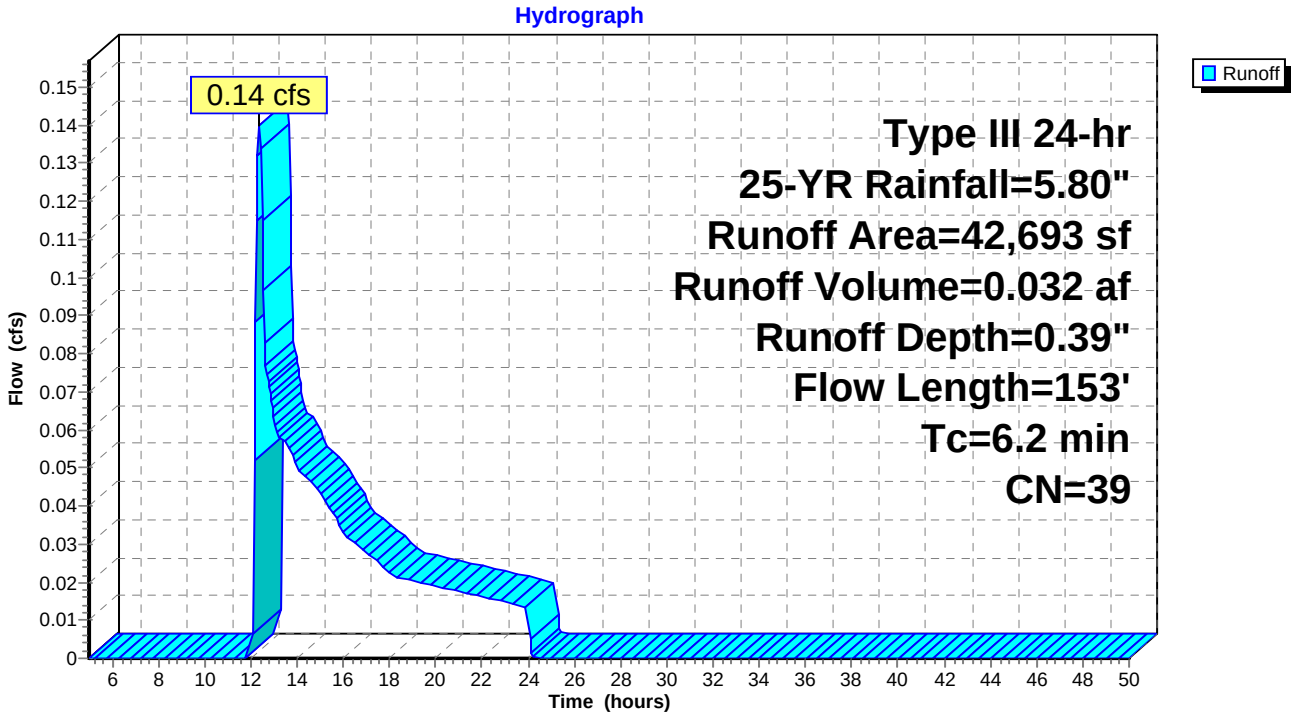
Runoff = 0.14 cfs @ 12.37 hrs, Volume= 0.032 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
42,693	39	>75% Grass cover, Good, HSG A
42,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	47	0.0200	0.16		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
1.3	106	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.2	153	Total			

Subcatchment 3S: WEST AREA



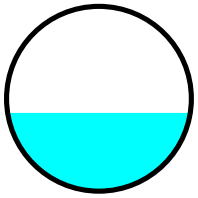
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 1.391 ac, 16.52% Impervious, Inflow Depth = 0.97" for 25-YR event
Inflow = 0.91 cfs @ 12.16 hrs, Volume= 0.113 af
Outflow = 0.89 cfs @ 12.19 hrs, Volume= 0.113 af, Atten= 2%, Lag= 1.9 min

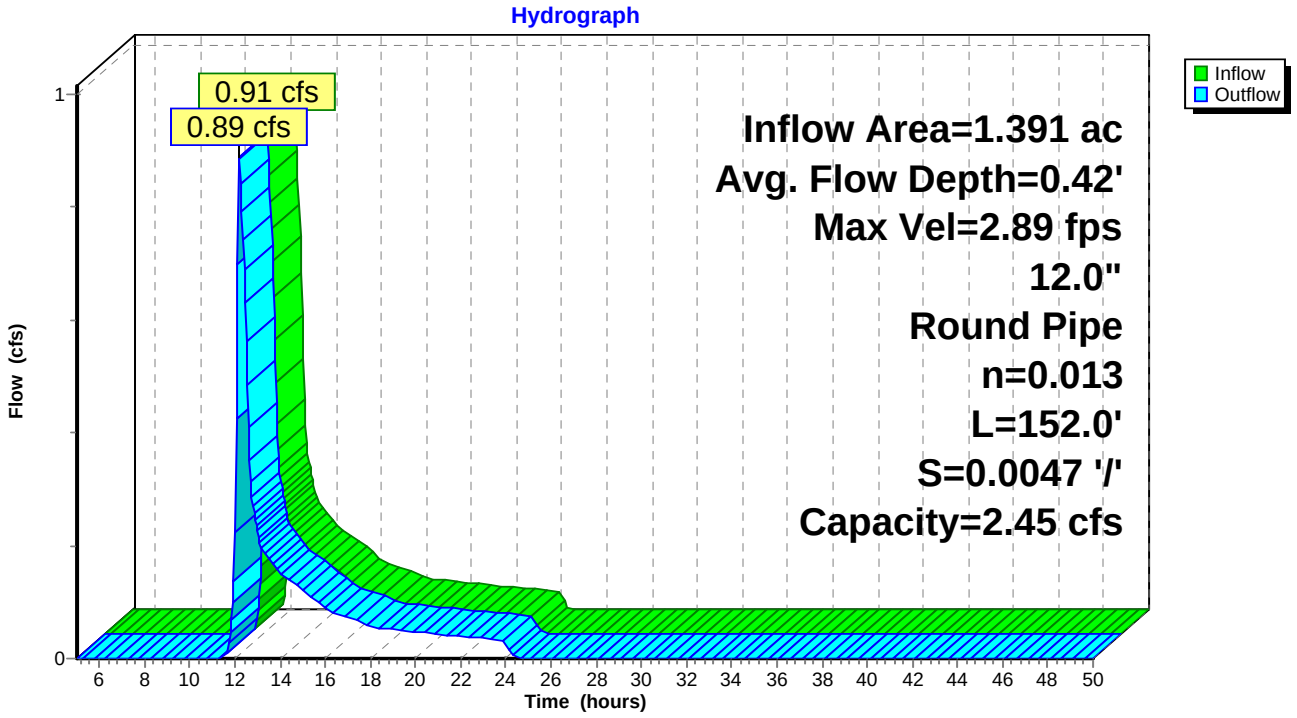
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.89 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 1.9 min

Peak Storage= 48 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

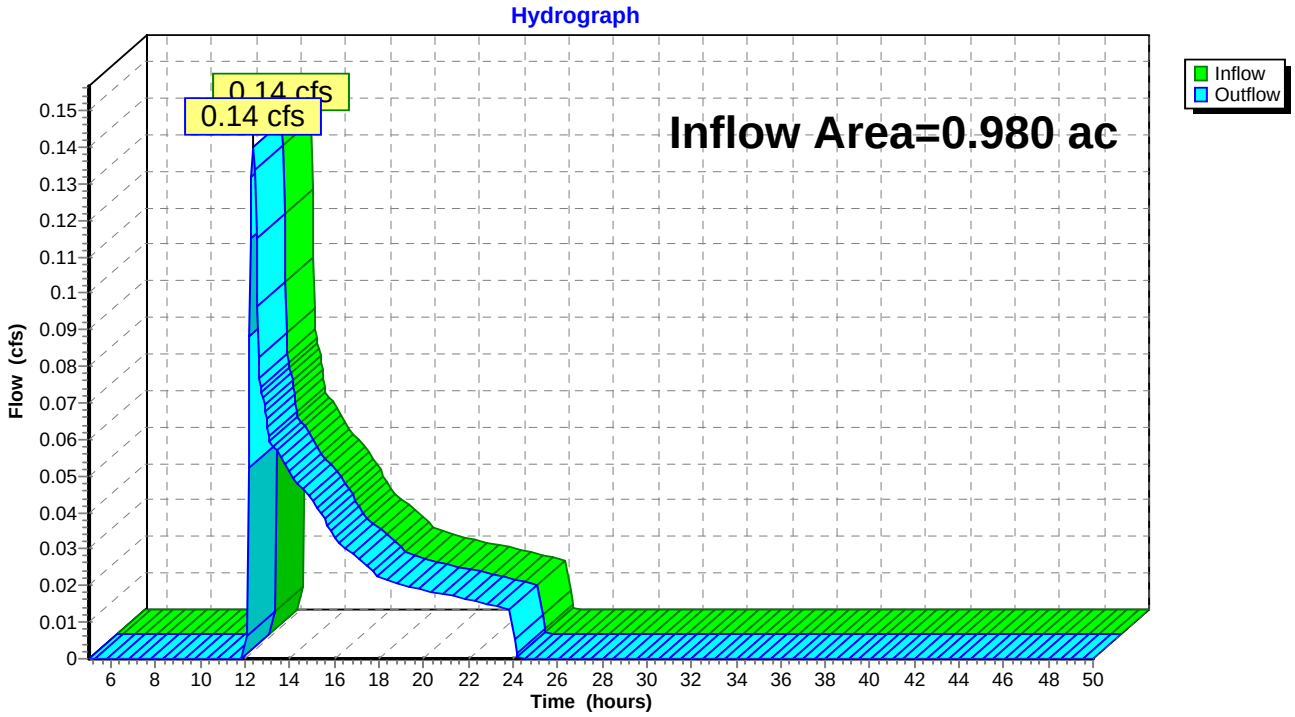


Summary for Reach SP2: OFFSITE

Inflow Area = 0.980 ac, 0.00% Impervious, Inflow Depth = 0.39" for 25-YR event
Inflow = 0.14 cfs @ 12.37 hrs, Volume= 0.032 af
Outflow = 0.14 cfs @ 12.37 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: OFFSITE



Summary for Pond CB: (new Pond)

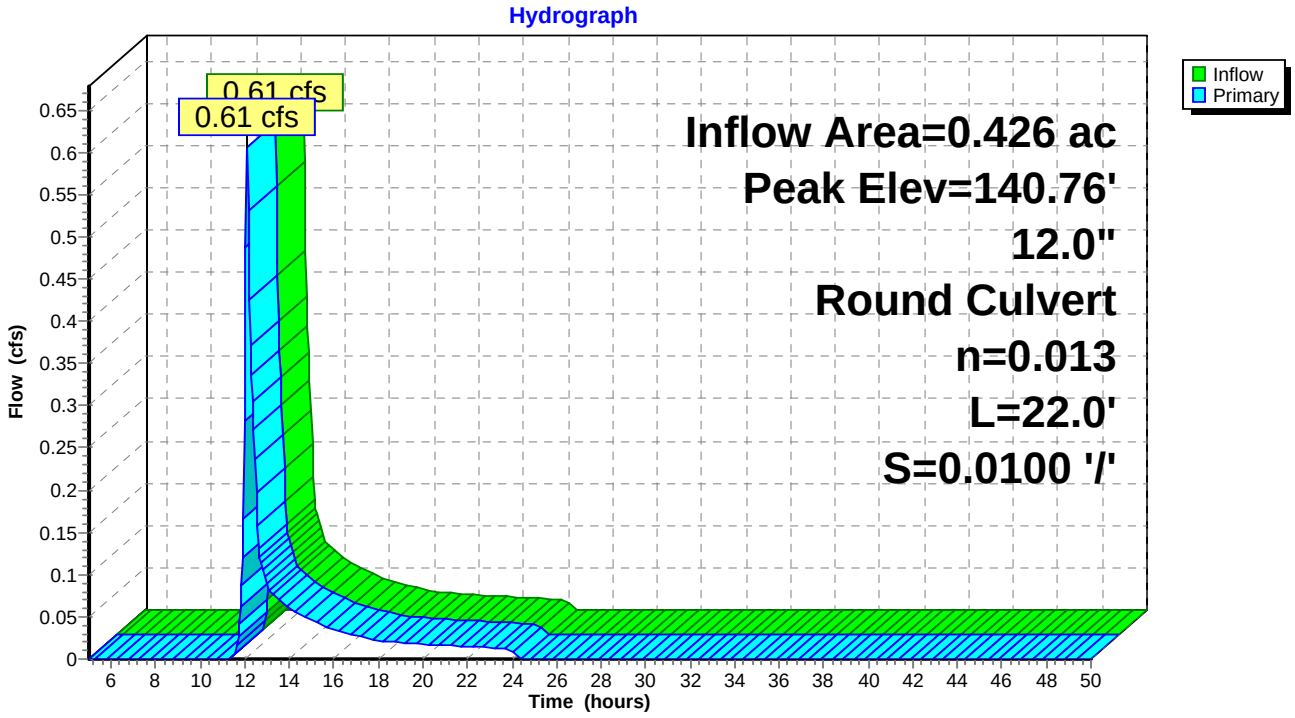
Inflow Area = 0.426 ac, 26.29% Impervious, Inflow Depth = 1.40" for 25-YR event
Inflow = 0.61 cfs @ 12.11 hrs, Volume= 0.050 af
Outflow = 0.61 cfs @ 12.11 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.11 hrs, Volume= 0.050 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.76' @ 12.11 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.59 cfs @ 12.11 hrs HW=140.76' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.59 cfs @ 2.84 fps)

Pond CB: (new Pond)



Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: NORTHEAST AREA Runoff Area=18,554 sf 26.29% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=55 Runoff=1.35 cfs 0.101 af

Subcatchment 2S: SOUTHEAST AREA Runoff Area=42,050 sf 12.21% Impervious Runoff Depth=1.89"
Flow Length=303' Tc=11.4 min CN=46 Runoff=1.51 cfs 0.152 af

Subcatchment 3S: WEST AREA Runoff Area=42,693 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=153' Tc=6.2 min CN=39 Runoff=0.87 cfs 0.098 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.89' Max Vel=3.56 fps Inflow=2.61 cfs 0.253 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=2.57 cfs 0.253 af

Reach SP2: OFFSITE Inflow=0.87 cfs 0.098 af
Outflow=0.87 cfs 0.098 af

Pond CB: (new Pond) Peak Elev=141.01' Inflow=1.35 cfs 0.101 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=1.35 cfs 0.101 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.351 af Average Runoff Depth = 1.78"
90.31% Pervious = 2.142 ac 9.69% Impervious = 0.230 ac

Summary for Subcatchment 1S: NORTHEAST AREA

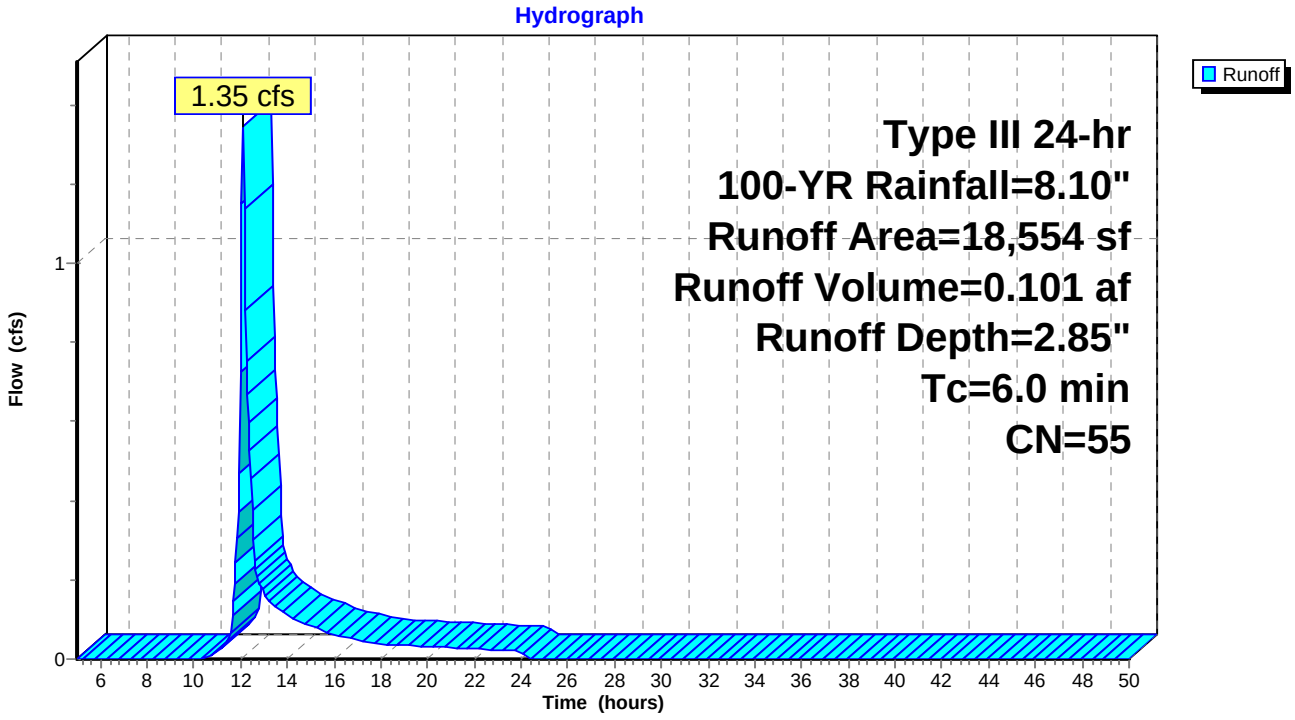
Runoff = 1.35 cfs @ 12.10 hrs, Volume= 0.101 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

Area (sf)	CN	Description
2,652	98	Roofs, HSG A
2,225	98	Paved parking, HSG A
13,677	39	>75% Grass cover, Good, HSG A
18,554	55	Weighted Average
13,677		73.71% Pervious Area
4,877		26.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, <6 Minutes**

Subcatchment 1S: NORTHEAST AREA



Summary for Subcatchment 2S: SOUTHEAST AREA

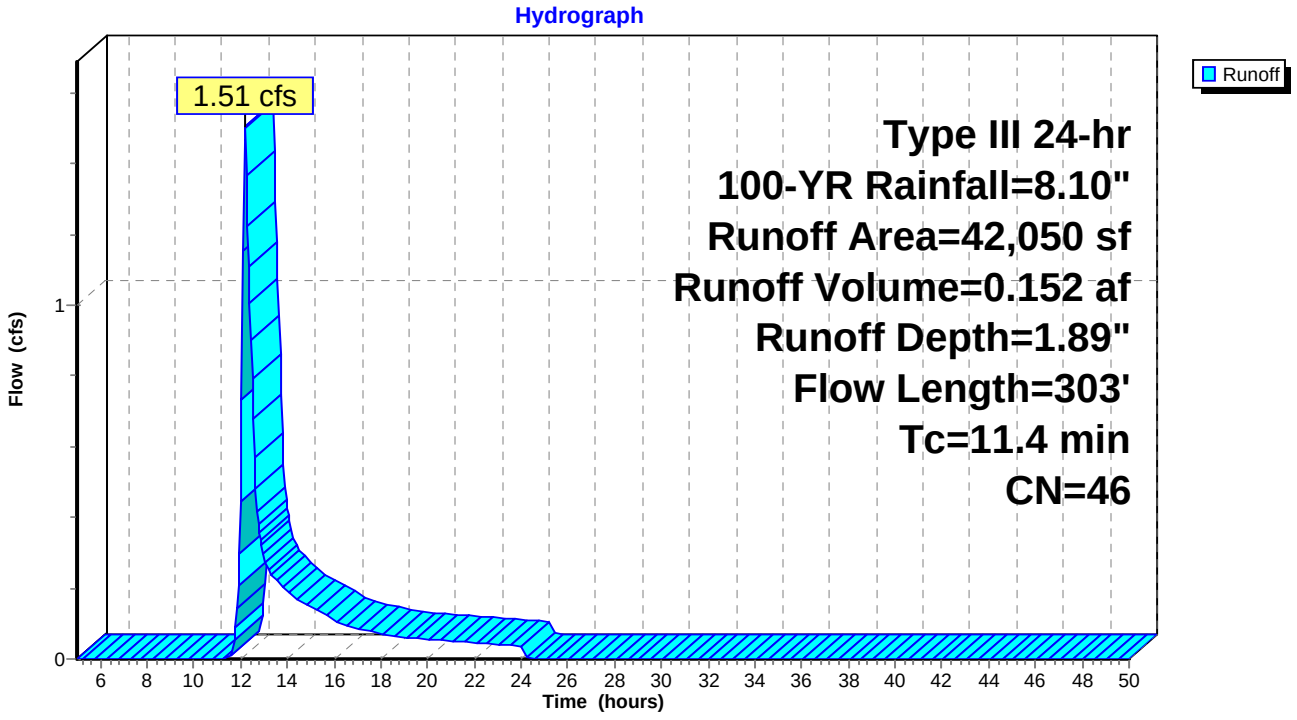
Runoff = 1.51 cfs @ 12.18 hrs, Volume= 0.152 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

Area (sf)	CN	Description
4,795	98	Roofs, HSG A
339	98	Paved parking, HSG A
35,160	39	>75% Grass cover, Good, HSG A
1,756	30	Woods, Good, HSG A
42,050	46	Weighted Average
36,916		87.79% Pervious Area
5,134		12.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0115	0.13		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
3.4	155	0.0115	0.75		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.6	98	0.0200	0.99		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
11.4	303	Total			

Subcatchment 2S: SOUTHEAST AREA



Summary for Subcatchment 3S: WEST AREA

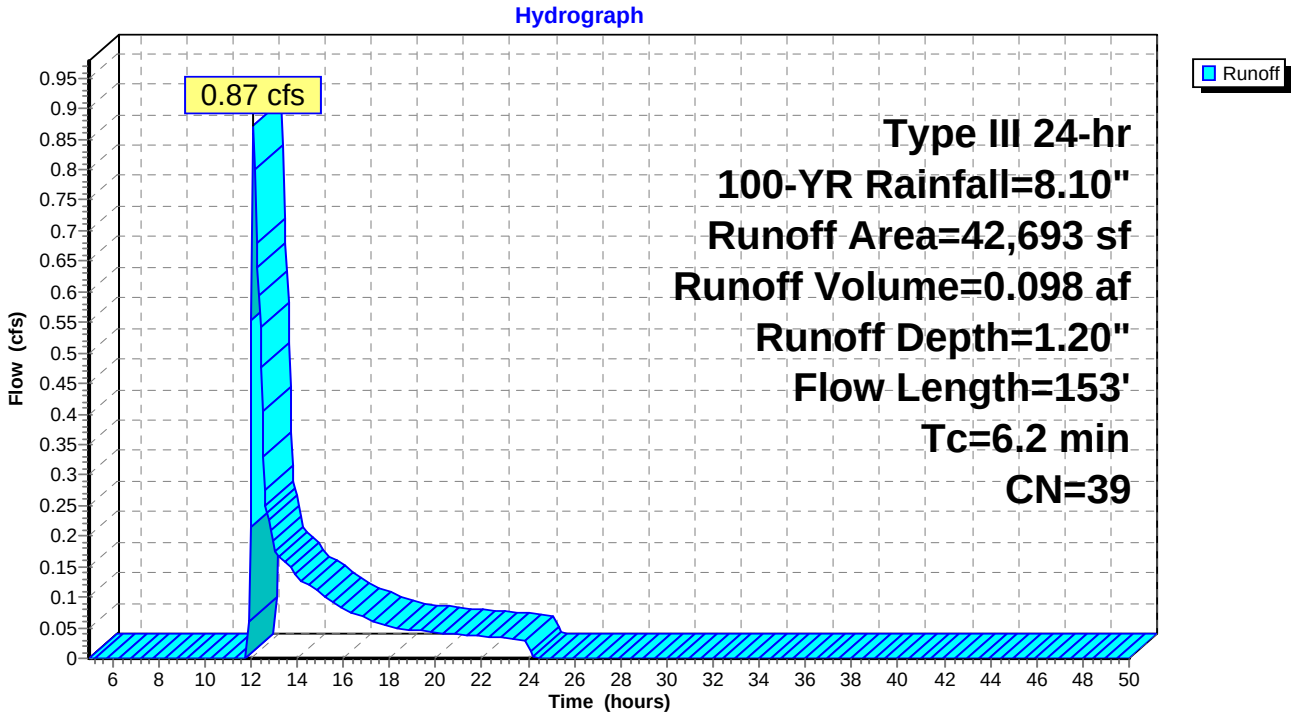
Runoff = 0.87 cfs @ 12.13 hrs, Volume= 0.098 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

Area (sf)	CN	Description
42,693	39	>75% Grass cover, Good, HSG A
42,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	47	0.0200	0.16		**Sheet Flow, A-B** Range n= 0.130 P2= 3.10"
1.3	106	0.0400	1.40		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.2	153	Total			

Subcatchment 3S: WEST AREA



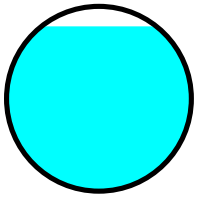
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 1.391 ac, 16.52% Impervious, Inflow Depth = 2.19" for 100-YR event
Inflow = 2.61 cfs @ 12.14 hrs, Volume= 0.253 af
Outflow = 2.57 cfs @ 12.17 hrs, Volume= 0.253 af, Atten= 1%, Lag= 1.6 min

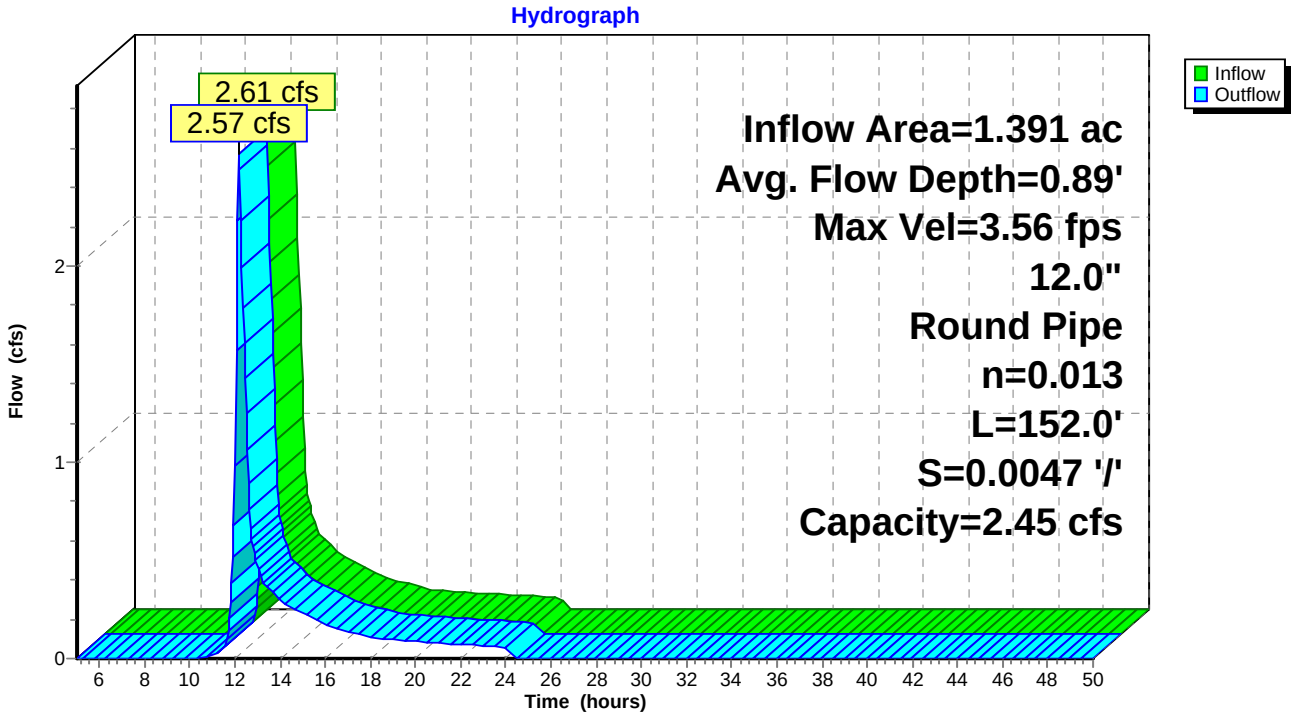
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 1.6 min

Peak Storage= 112 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

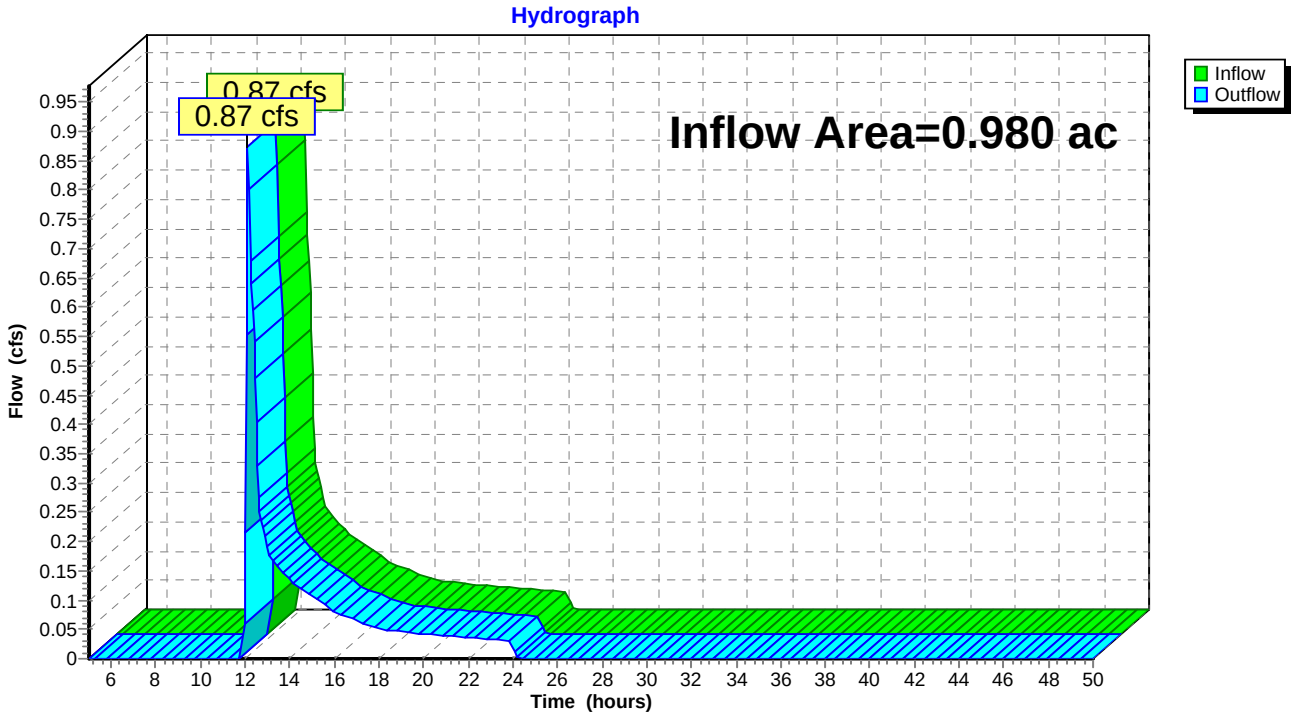


Summary for Reach SP2: OFFSITE

Inflow Area = 0.980 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-YR event
Inflow = 0.87 cfs @ 12.13 hrs, Volume= 0.098 af
Outflow = 0.87 cfs @ 12.13 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: OFFSITE



Summary for Pond CB: (new Pond)

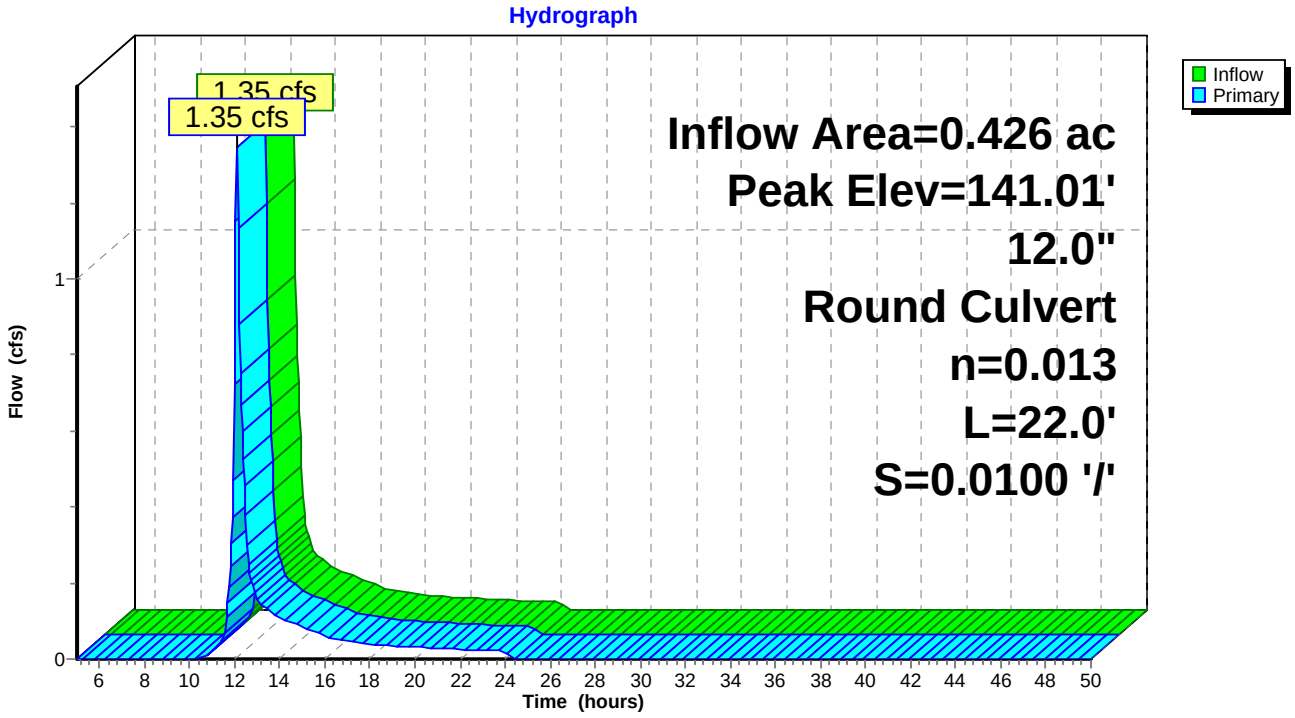
Inflow Area = 0.426 ac, 26.29% Impervious, Inflow Depth = 2.85" for 100-YR event
Inflow = 1.35 cfs @ 12.10 hrs, Volume= 0.101 af
Outflow = 1.35 cfs @ 12.10 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min
Primary = 1.35 cfs @ 12.10 hrs, Volume= 0.101 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 141.01' @ 12.10 hrs
Flood Elev= 146.58'

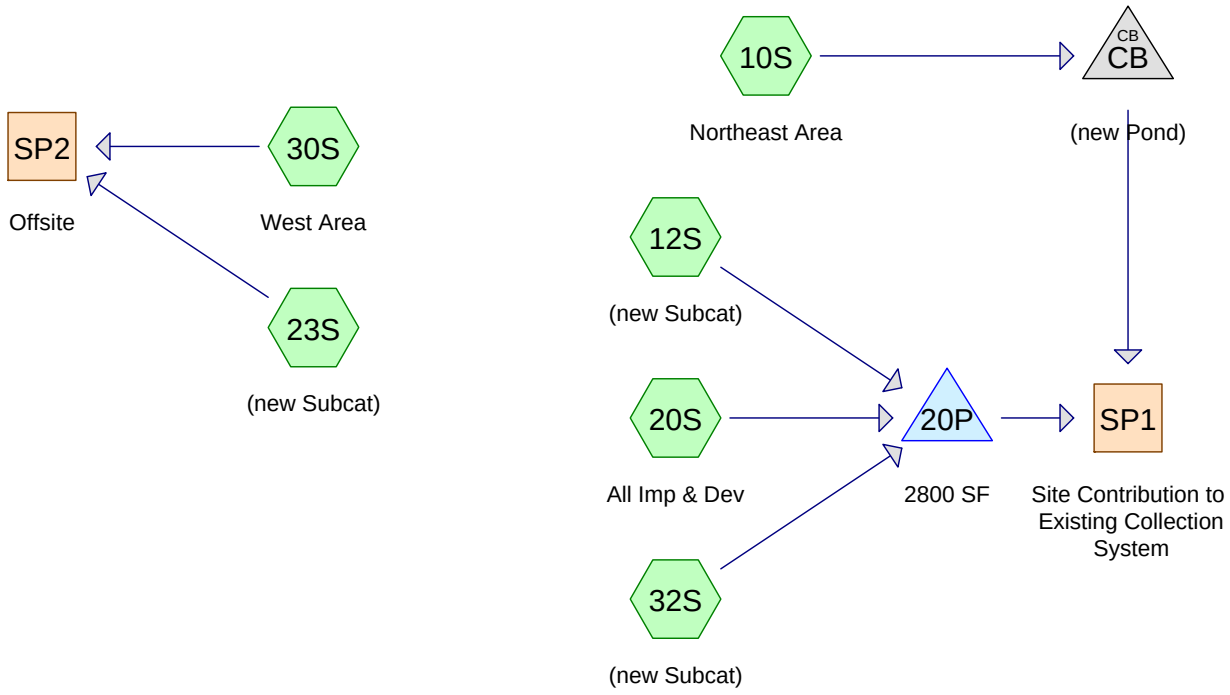
Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.34 cfs @ 12.10 hrs HW=141.01' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.34 cfs @ 3.38 fps)

Pond CB: (new Pond)



Postdevelopment



Subcat Reach Pond Link

Routing Diagram for 16533-POST
Prepared by Microsoft, Printed 3/8/2017

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.565	49	50-75% Grass cover, Fair, HSG A (20S)
0.956	39	>75% Grass cover, Good, HSG A (10S, 12S, 23S, 30S, 32S)
0.041	98	Existing Impervious (10S, 12S)
0.100	98	New Impervious (10S, 12S)
0.254	98	Paved parking, HSG A (20S)
0.171	98	Pavement (32S)
0.173	98	Roofs (32S)
0.112	98	Unconnected roofs, HSG A (20S)
2.371	**63**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.887	HSG A	10S, 12S, 20S, 23S, 30S, 32S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.485	Other	10S, 12S, 32S
2.371		**TOTAL AREA**

Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Northeast Area Runoff Area=7,876 sf 26.17% Impervious Runoff Depth=0.20"
Tc=6.0 min CN=54 Runoff=0.01 cfs 0.003 af

Subcatchment 12S: (new Subcat) Runoff Area=10,678 sf 38.07% Impervious Runoff Depth=0.40"
Tc=6.0 min CN=61 Runoff=0.07 cfs 0.008 af

Subcatchment 20S: All Imp & Dev Runoff Area=40,524 sf 39.30% Impervious Runoff Depth=0.68"
Tc=6.0 min CN=68 Runoff=0.62 cfs 0.053 af

Subcatchment 23S: (new Subcat) Runoff Area=1,526 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 30S: West Area Runoff Area=6,749 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 32S: (new Subcat) Runoff Area=35,943 sf 41.69% Impervious Runoff Depth=0.51"
Tc=6.0 min CN=64 Runoff=0.36 cfs 0.035 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.10' Max Vel=1.29 fps Inflow=0.06 cfs 0.099 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=0.06 cfs 0.099 af

Reach SP2: Offsite Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 20P: 2800 SF Peak Elev=144.52' Storage=2,412 cf Inflow=1.04 cfs 0.096 af
Primary=0.05 cfs 0.096 af Secondary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.096 af

Pond CB: (new Pond) Peak Elev=140.39' Inflow=0.01 cfs 0.003 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.01 cfs 0.003 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.099 af Average Runoff Depth = 0.50"
64.14% Pervious = 1.521 ac 35.86% Impervious = 0.850 ac

Summary for Subcatchment 10S: Northeast Area

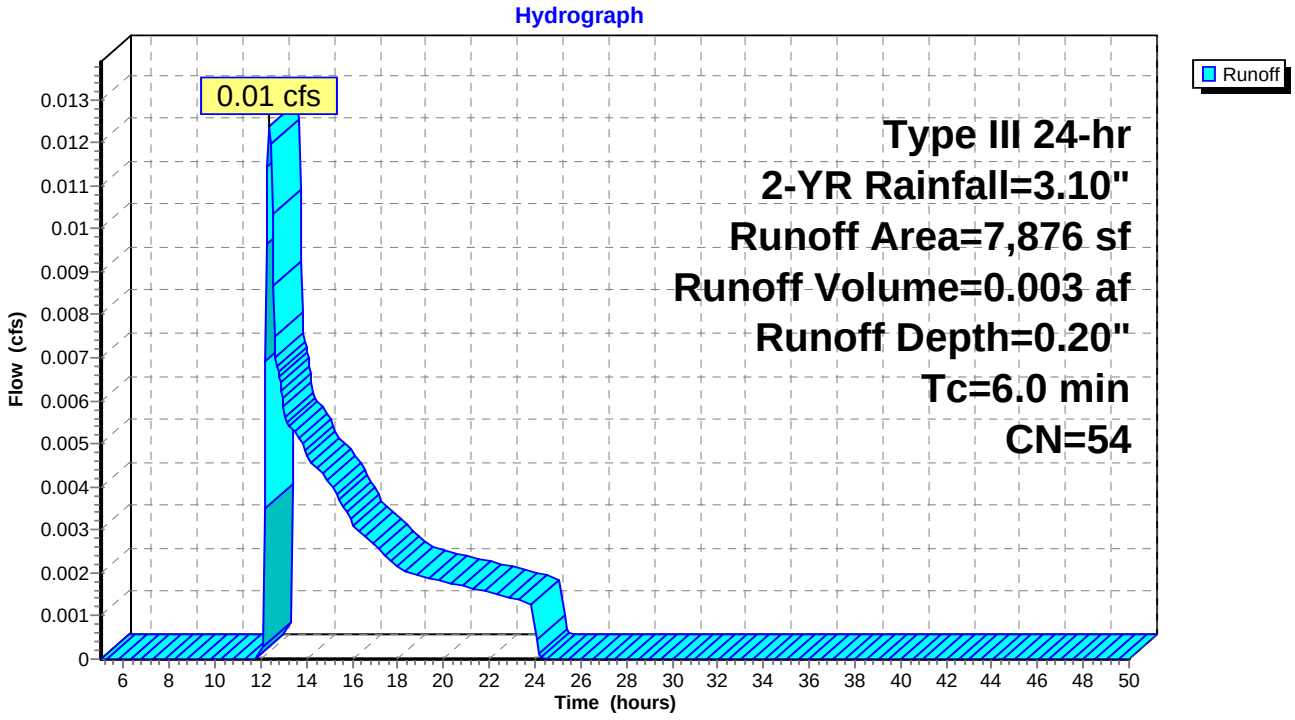
Runoff = 0.01 cfs @ 12.38 hrs, Volume= 0.003 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	1,401	98	Existing Impervious
*	660	98	New Impervious
	5,815	39	>75% Grass cover, Good, HSG A
	7,876	54	Weighted Average
	5,815		73.83% Pervious Area
	2,061		26.17% Impervious Area

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

Subcatchment 10S: Northeast Area



Summary for Subcatchment 12S: (new Subcat)

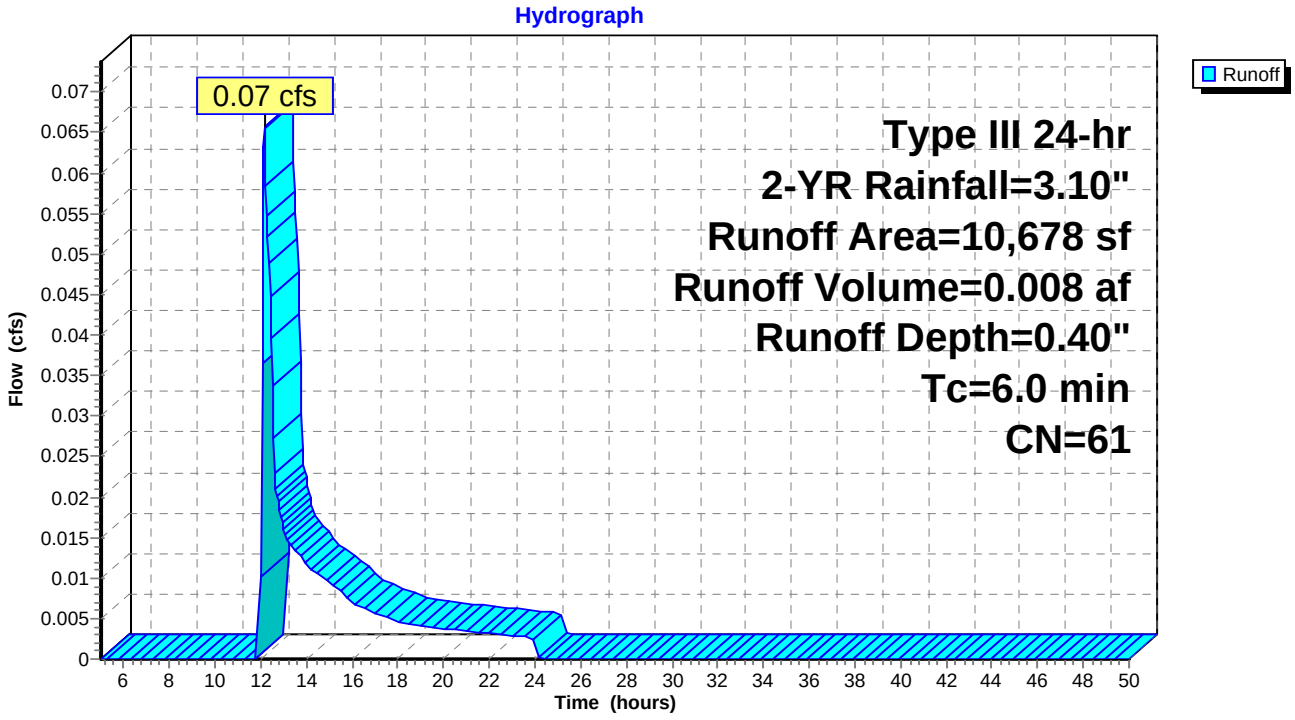
Runoff = 0.07 cfs @ 12.14 hrs, Volume= 0.008 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	368	98	Existing Impervious
*	3,697	98	New Impervious
	6,613	39	>75% Grass cover, Good, HSG A
	10,678	61	Weighted Average
	6,613		61.93% Pervious Area
	4,065		38.07% Impervious Area

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

Subcatchment 12S: (new Subcat)



Summary for Subcatchment 20S: All Imp & Dev

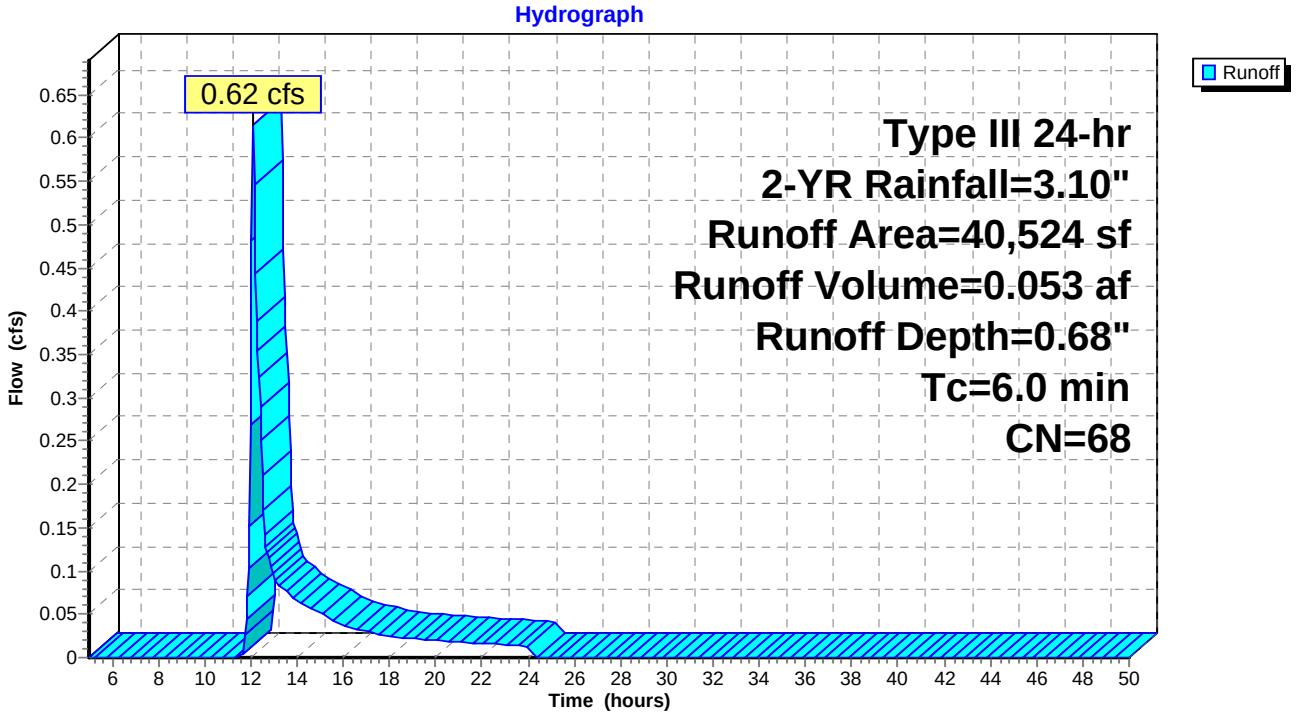
Runoff = 0.62 cfs @ 12.11 hrs, Volume= 0.053 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
11,061	98	Paved parking, HSG A
4,866	98	Unconnected roofs, HSG A
24,597	49	50-75% Grass cover, Fair, HSG A
40,524	68	Weighted Average
24,597		60.70% Pervious Area
15,927		39.30% Impervious Area
4,866		30.55% Unconnected

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

Subcatchment 20S: All Imp & Dev



Summary for Subcatchment 23S: (new Subcat)

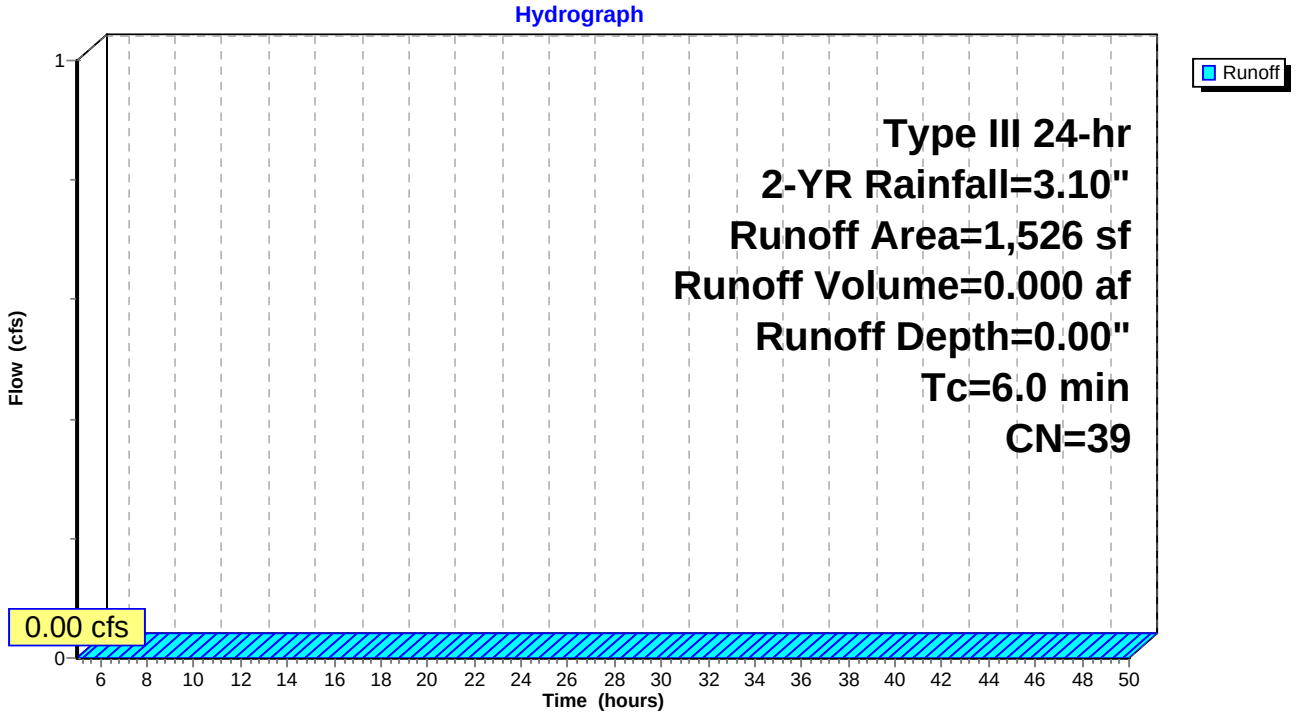
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
1,526	39	>75% Grass cover, Good, HSG A
1,526		100.00% Pervious Area

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

Subcatchment 23S: (new Subcat)



Summary for Subcatchment 30S: West Area

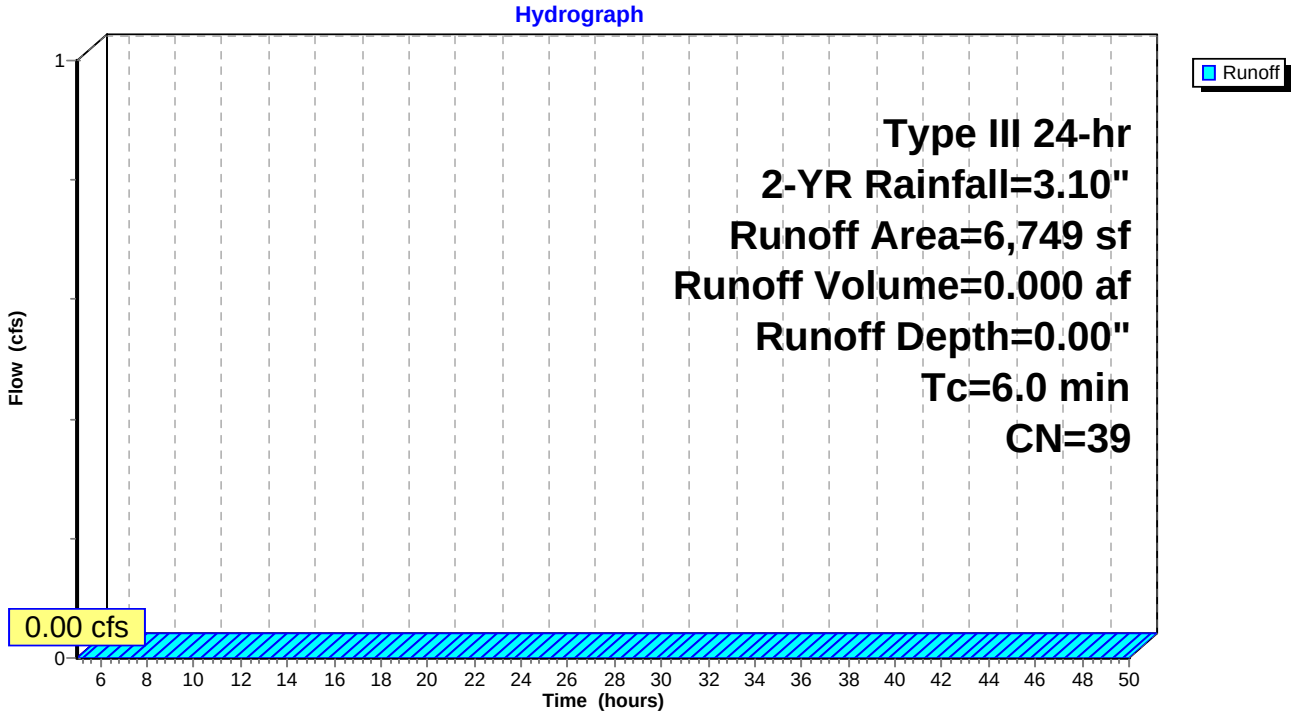
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
6,749	39	>75% Grass cover, Good, HSG A
6,749		100.00% Pervious Area

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

Subcatchment 30S: West Area



Summary for Subcatchment 32S: (new Subcat)

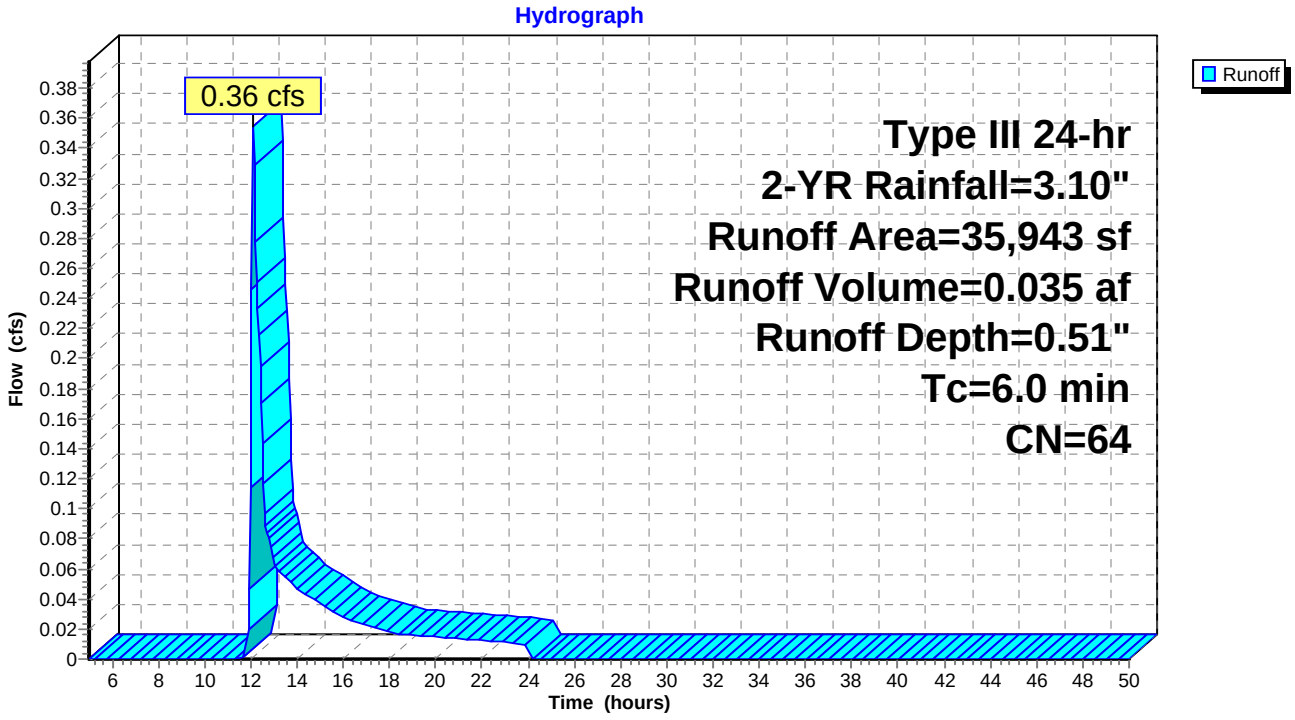
Runoff = 0.36 cfs @ 12.12 hrs, Volume= 0.035 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

	Area (sf)	CN	Description
*	7,432	98	Pavement
*	7,554	98	Roofs
	20,957	39	>75% Grass cover, Good, HSG A
	35,943	64	Weighted Average
	20,957		58.31% Pervious Area
	14,986		41.69% Impervious Area

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

Subcatchment 32S: (new Subcat)



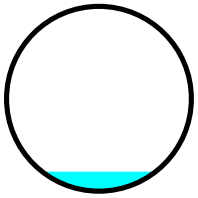
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 2.181 ac, 38.98% Impervious, Inflow Depth = 0.55" for 2-YR event
Inflow = 0.06 cfs @ 12.39 hrs, Volume= 0.099 af
Outflow = 0.06 cfs @ 12.45 hrs, Volume= 0.099 af, Atten= 0%, Lag= 3.4 min

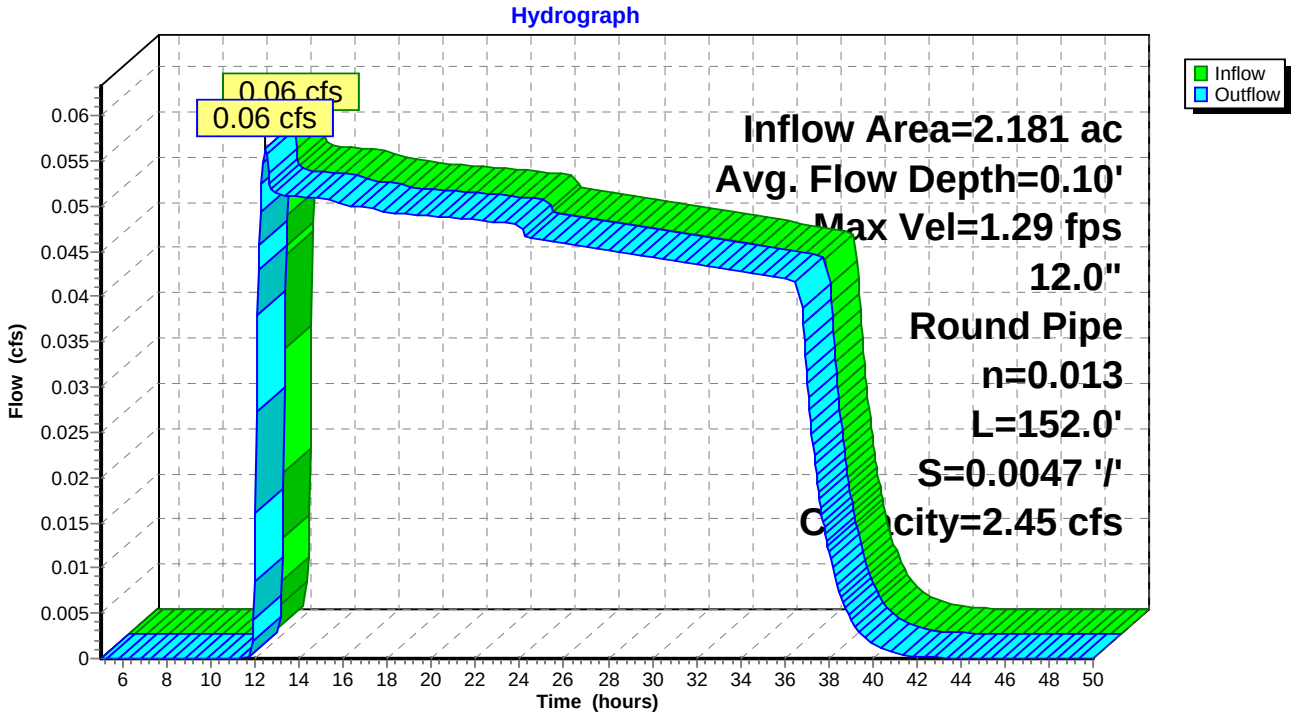
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.29 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 2.4 min

Peak Storage= 7 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

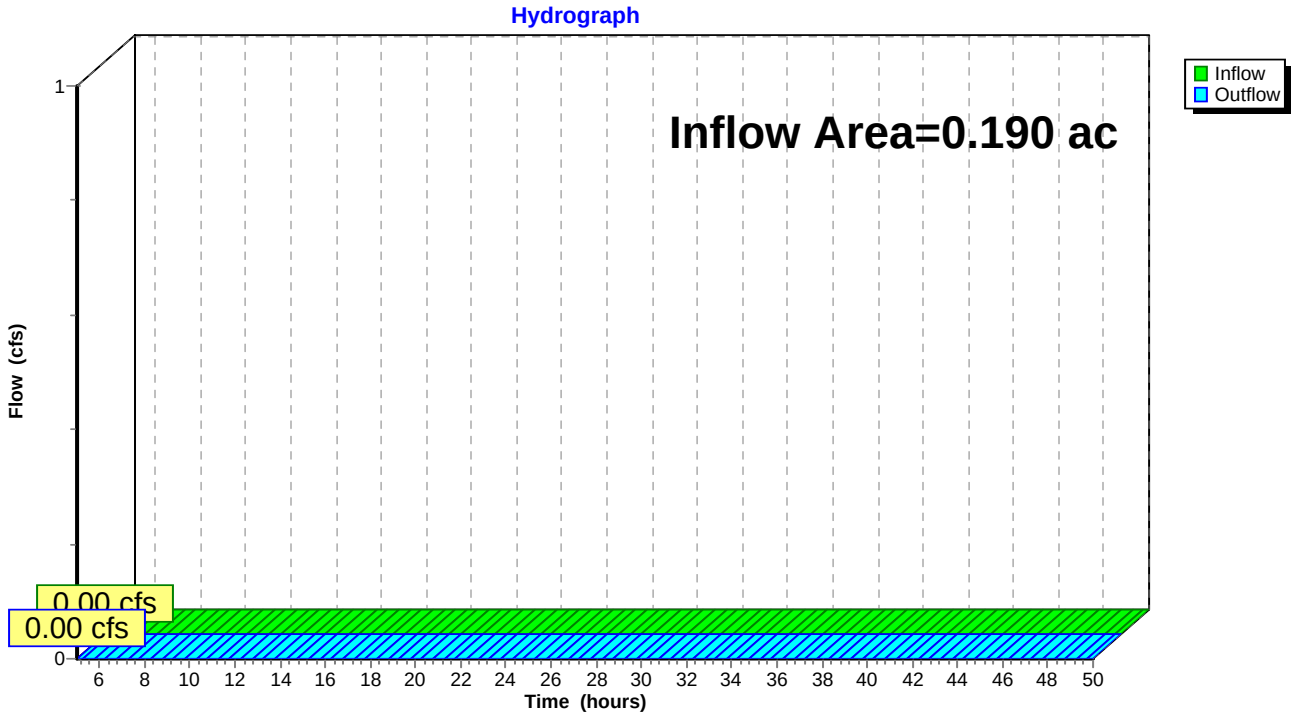


Summary for Reach SP2: Offsite

Inflow Area = 0.190 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: Offsite



Summary for Pond 20P: 2800 SF

Inflow Area = 2.001 ac, 40.14% Impervious, Inflow Depth = 0.58" for 2-YR event
Inflow = 1.04 cfs @ 12.11 hrs, Volume= 0.096 af
Outflow = 0.05 cfs @ 17.92 hrs, Volume= 0.096 af, Atten= 95%, Lag= 348.2 min
Primary = 0.05 cfs @ 17.92 hrs, Volume= 0.096 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 144.52' @ 17.92 hrs Surf.Area= 3,452 sf Storage= 2,412 cf

Plug-Flow detention time= 579.8 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 580.3 min (1,475.4 - 895.1)

Volume	Invert	Avail.Storage	Storage Description
#1	143.75'	25,953 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

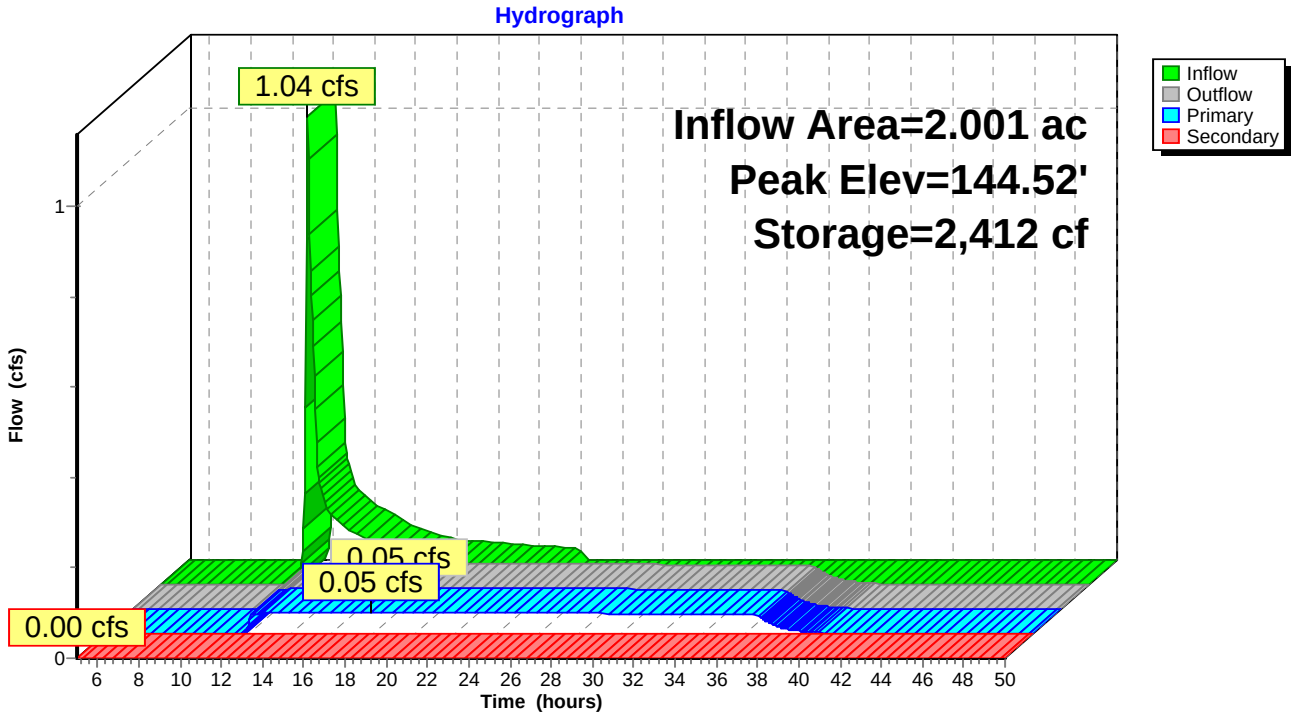
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
143.75	2,843	0	0
144.00	3,016	732	732
145.00	3,855	3,436	4,168
146.00	4,601	4,228	8,396
147.00	5,404	5,003	13,398
148.00	6,263	5,834	19,232
149.00	7,179	6,721	25,953

Device	Routing	Invert	Outlet Devices
#1	Primary	140.75'	**12.0" Round Culvert** L= 54.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.75' / 138.86' S= 0.0350 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	141.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	144.93'	**5.5" W x 6.5" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	146.56'	**18" Nyloplast 18" Domed Structure** Head (feet) 0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.37 0.40 0.45 0.50 Disch. (cfs) 0.000 0.200 0.500 0.800 1.400 1.900 2.500 3.100 3.500 3.600 3.800 4.000
#5	Secondary	149.00'	**12.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.05 cfs @ 17.92 hrs HW=144.52' (Free Discharge)
└─**1=Culvert** (Passes 0.05 cfs of 6.84 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 8.65 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=18" Nyloplast 18" Domed Structure** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=143.75' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: 2800 SF



Summary for Pond CB: (new Pond)

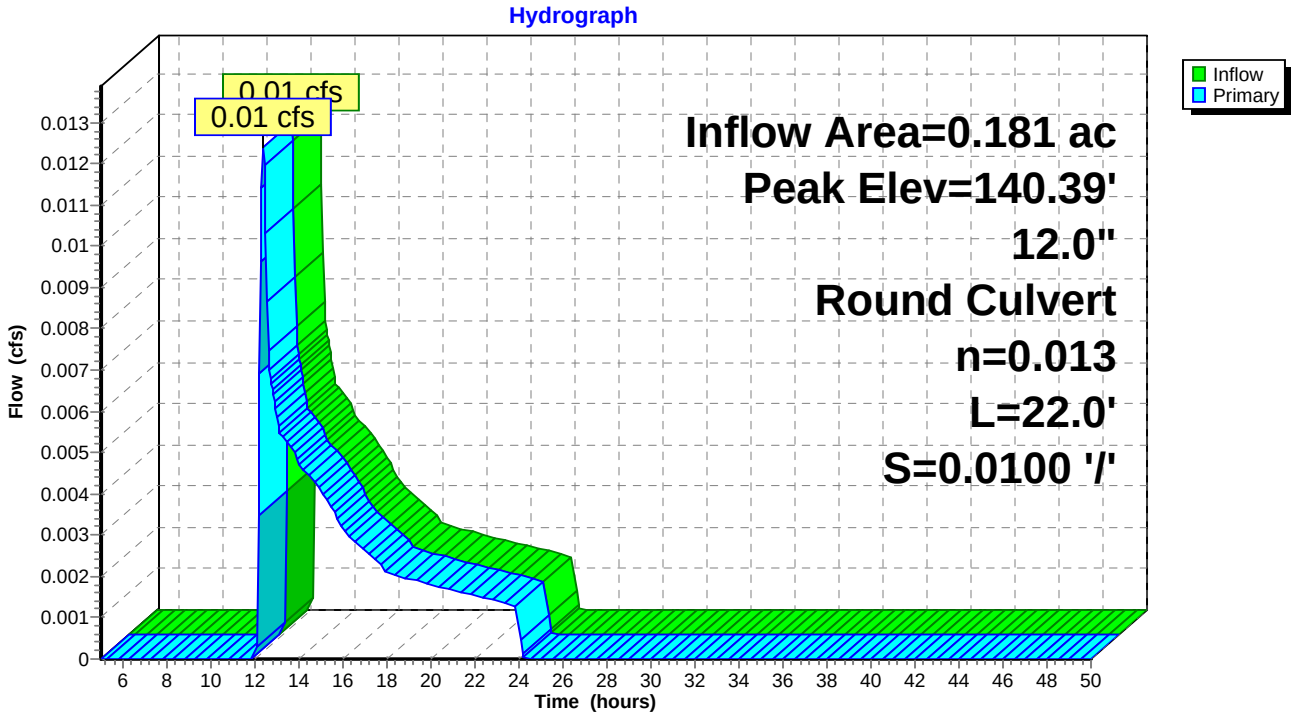
Inflow Area = 0.181 ac, 26.17% Impervious, Inflow Depth = 0.20" for 2-YR event
Inflow = 0.01 cfs @ 12.38 hrs, Volume= 0.003 af
Outflow = 0.01 cfs @ 12.38 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.38 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.39' @ 12.38 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 12.38 hrs HW=140.39' (Free Discharge)
1=Culvert (Barrel Controls 0.01 cfs @ 0.98 fps)

Pond CB: (new Pond)



Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Northeast Area Runoff Area=7,876 sf 26.17% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=54 Runoff=0.11 cfs 0.011 af

Subcatchment 12S: (new Subcat) Runoff Area=10,678 sf 38.07% Impervious Runoff Depth=1.14"
Tc=6.0 min CN=61 Runoff=0.28 cfs 0.023 af

Subcatchment 20S: All Imp & Dev Runoff Area=40,524 sf 39.30% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=68 Runoff=1.65 cfs 0.124 af

Subcatchment 23S: (new Subcat) Runoff Area=1,526 sf 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 30S: West Area Runoff Area=6,749 sf 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.002 af

Subcatchment 32S: (new Subcat) Runoff Area=35,943 sf 41.69% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=64 Runoff=1.17 cfs 0.091 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.24' Max Vel=2.11 fps Inflow=0.30 cfs 0.249 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=0.30 cfs 0.249 af

Reach SP2: Offsite Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Pond 20P: 2800 SF Peak Elev=145.22' Storage=5,037 cf Inflow=3.10 cfs 0.239 af
Primary=0.28 cfs 0.238 af Secondary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.238 af

Pond CB: (new Pond) Peak Elev=140.51' Inflow=0.11 cfs 0.011 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.11 cfs 0.011 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.252 af Average Runoff Depth = 1.27"
64.14% Pervious = 1.521 ac 35.86% Impervious = 0.850 ac

Summary for Subcatchment 10S: Northeast Area

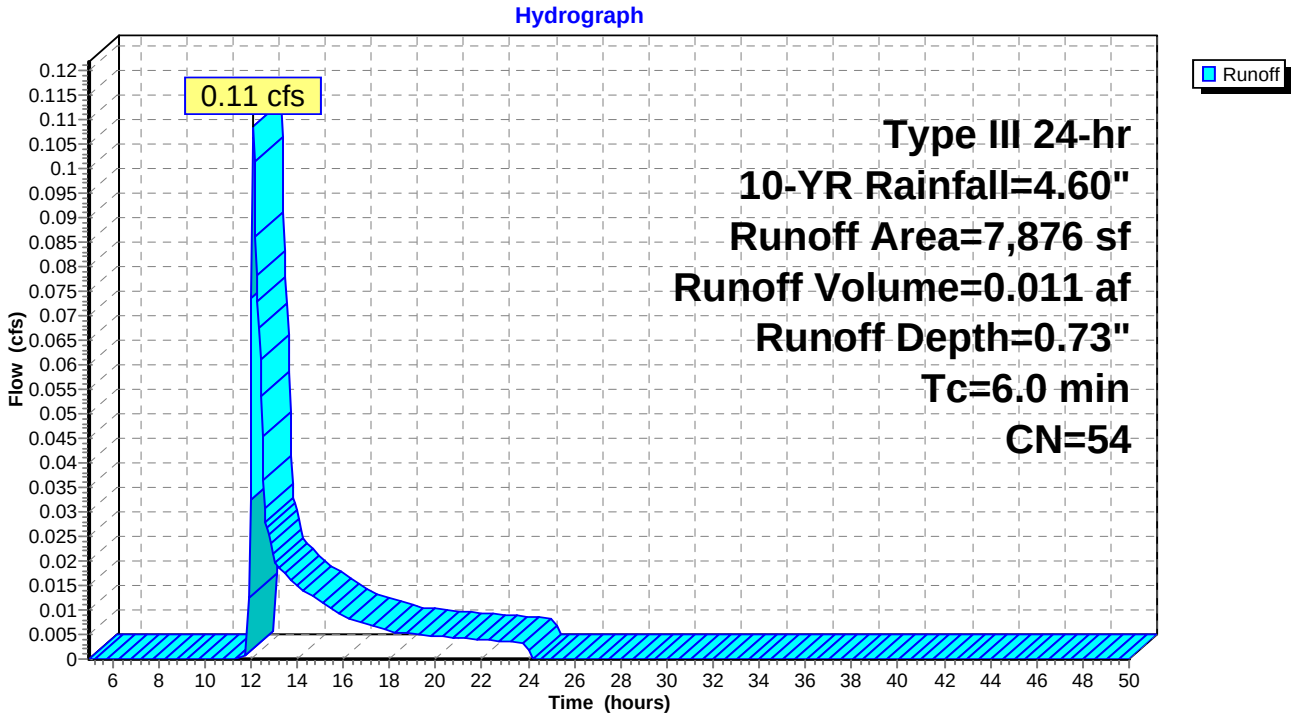
Runoff = 0.11 cfs @ 12.12 hrs, Volume= 0.011 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	1,401	98	Existing Impervious
*	660	98	New Impervious
	5,815	39	>75% Grass cover, Good, HSG A
	7,876	54	Weighted Average
	5,815		73.83% Pervious Area
	2,061		26.17% Impervious Area

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

Subcatchment 10S: Northeast Area



Summary for Subcatchment 12S: (new Subcat)

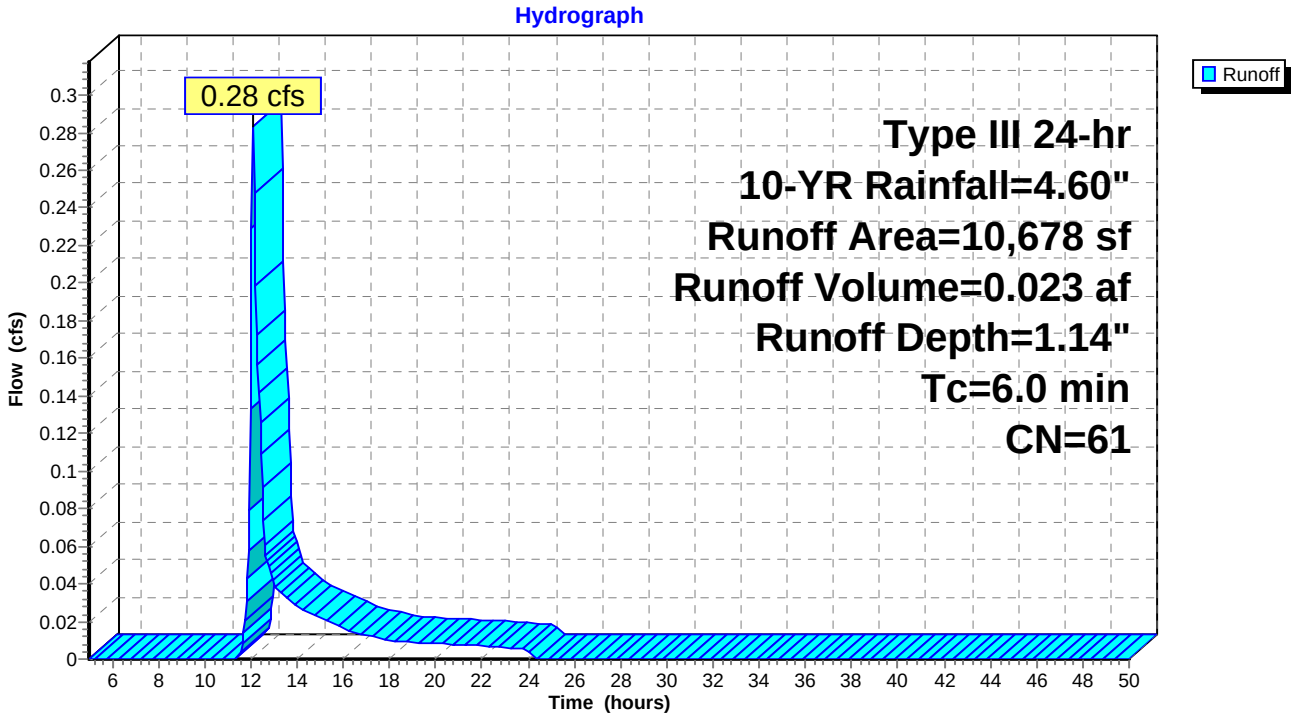
Runoff = 0.28 cfs @ 12.11 hrs, Volume= 0.023 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	368	98	Existing Impervious
*	3,697	98	New Impervious
	6,613	39	>75% Grass cover, Good, HSG A
	10,678	61	Weighted Average
	6,613		61.93% Pervious Area
	4,065		38.07% Impervious Area

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

Subcatchment 12S: (new Subcat)



Summary for Subcatchment 20S: All Imp & Dev

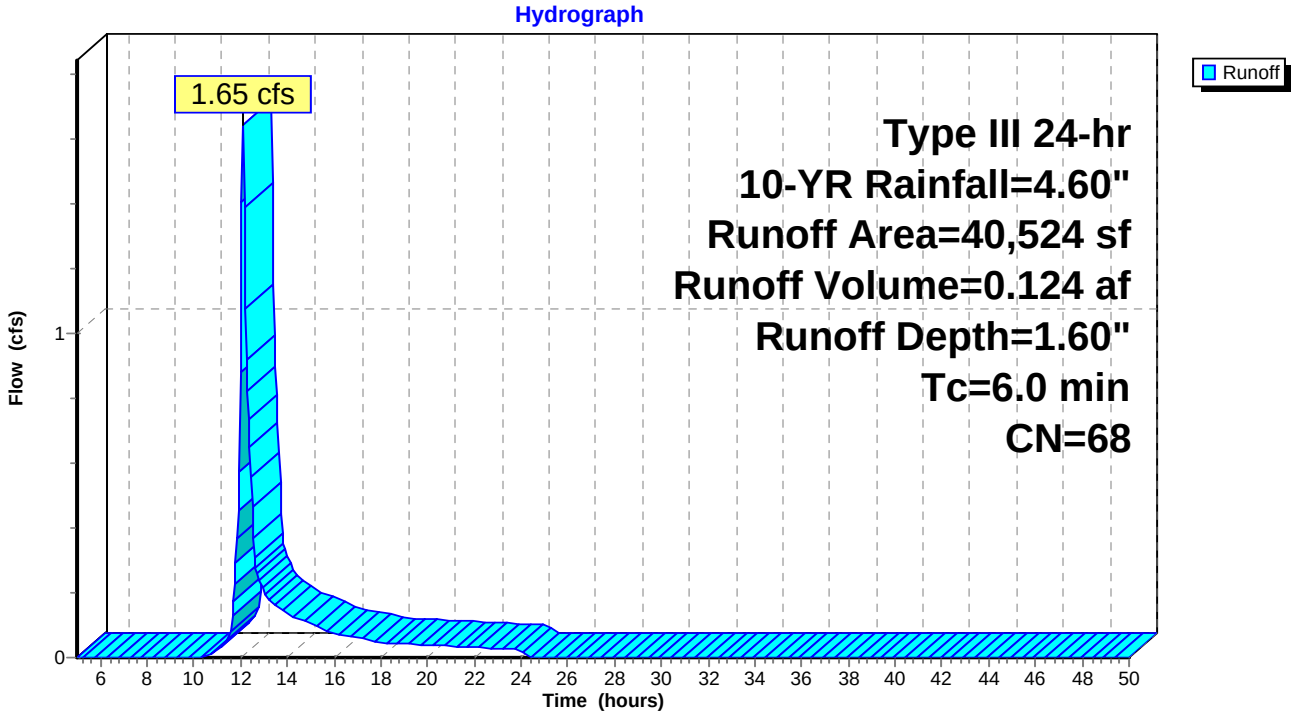
Runoff = 1.65 cfs @ 12.10 hrs, Volume= 0.124 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
11,061	98	Paved parking, HSG A
4,866	98	Unconnected roofs, HSG A
24,597	49	50-75% Grass cover, Fair, HSG A
40,524	68	Weighted Average
24,597		60.70% Pervious Area
15,927		39.30% Impervious Area
4,866		30.55% Unconnected

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

Subcatchment 20S: All Imp & Dev



Summary for Subcatchment 23S: (new Subcat)

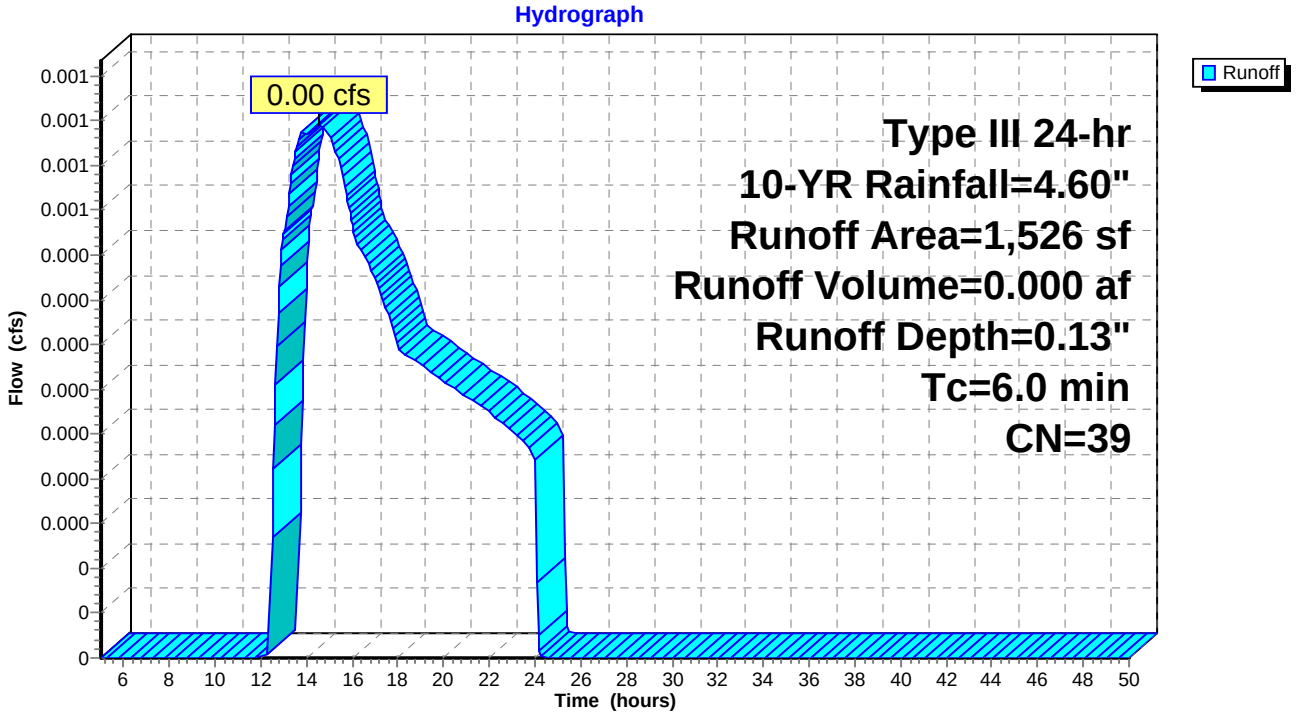
Runoff = 0.00 cfs @ 14.58 hrs, Volume= 0.000 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
1,526	39	>75% Grass cover, Good, HSG A
1,526		100.00% Pervious Area

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

Subcatchment 23S: (new Subcat)



Summary for Subcatchment 30S: West Area

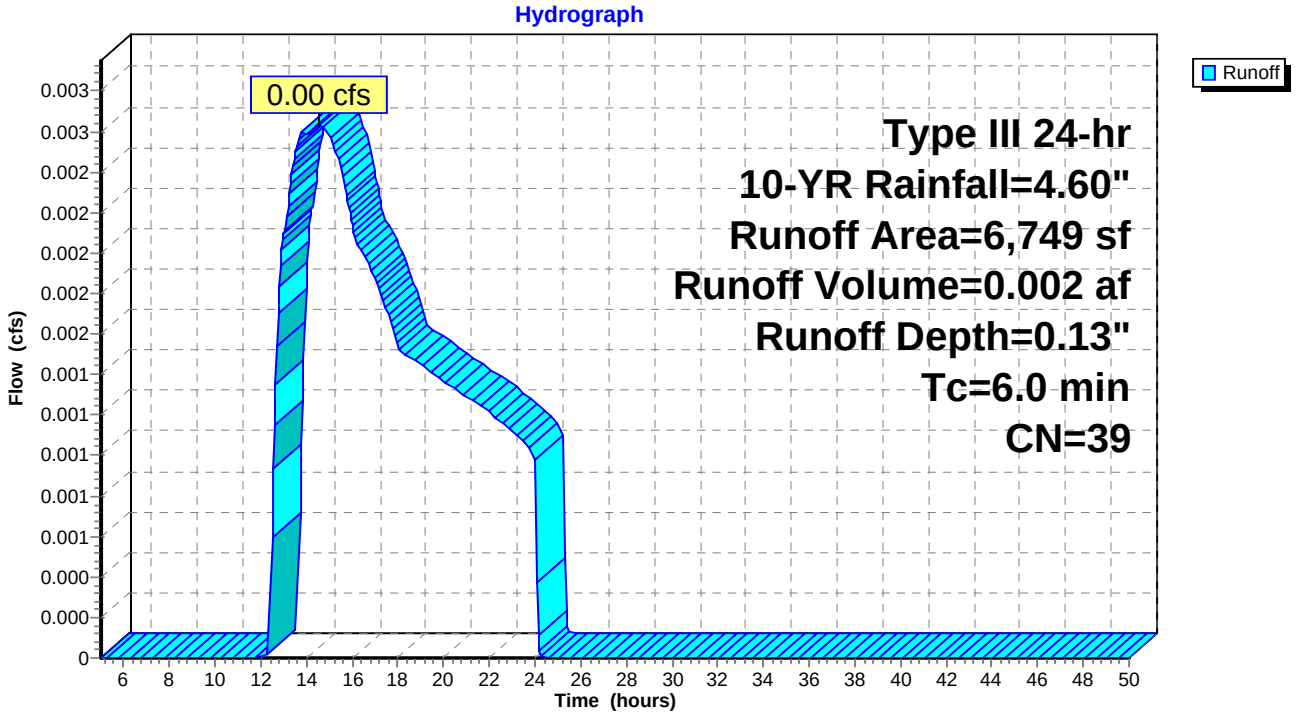
Runoff = 0.00 cfs @ 14.58 hrs, Volume= 0.002 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
6,749	39	>75% Grass cover, Good, HSG A
6,749		100.00% Pervious Area

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

Subcatchment 30S: West Area



Summary for Subcatchment 32S: (new Subcat)

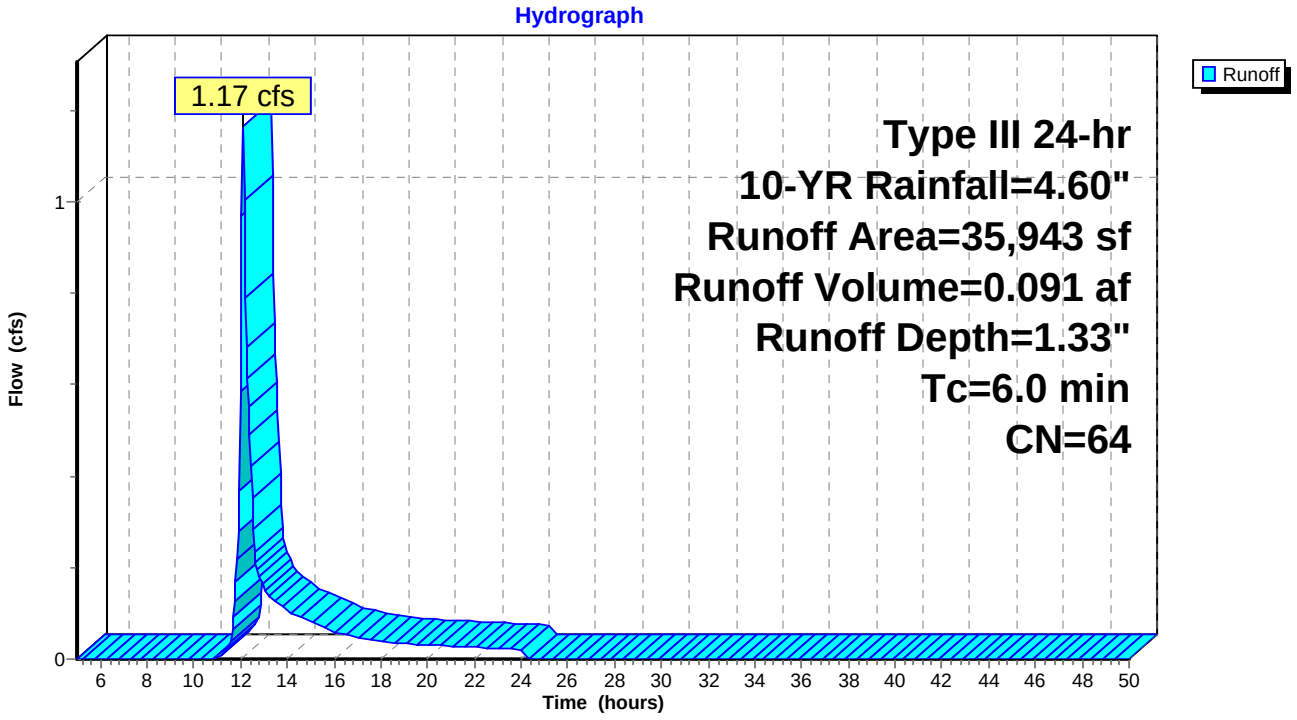
Runoff = 1.17 cfs @ 12.10 hrs, Volume= 0.091 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

	Area (sf)	CN	Description
*	7,432	98	Pavement
*	7,554	98	Roofs
	20,957	39	>75% Grass cover, Good, HSG A
	35,943	64	Weighted Average
	20,957		58.31% Pervious Area
	14,986		41.69% Impervious Area

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

Subcatchment 32S: (new Subcat)



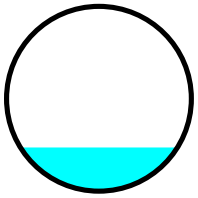
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 2.181 ac, 38.98% Impervious, Inflow Depth > 1.37" for 10-YR event
Inflow = 0.30 cfs @ 13.80 hrs, Volume= 0.249 af
Outflow = 0.30 cfs @ 13.83 hrs, Volume= 0.249 af, Atten= 0%, Lag= 2.1 min

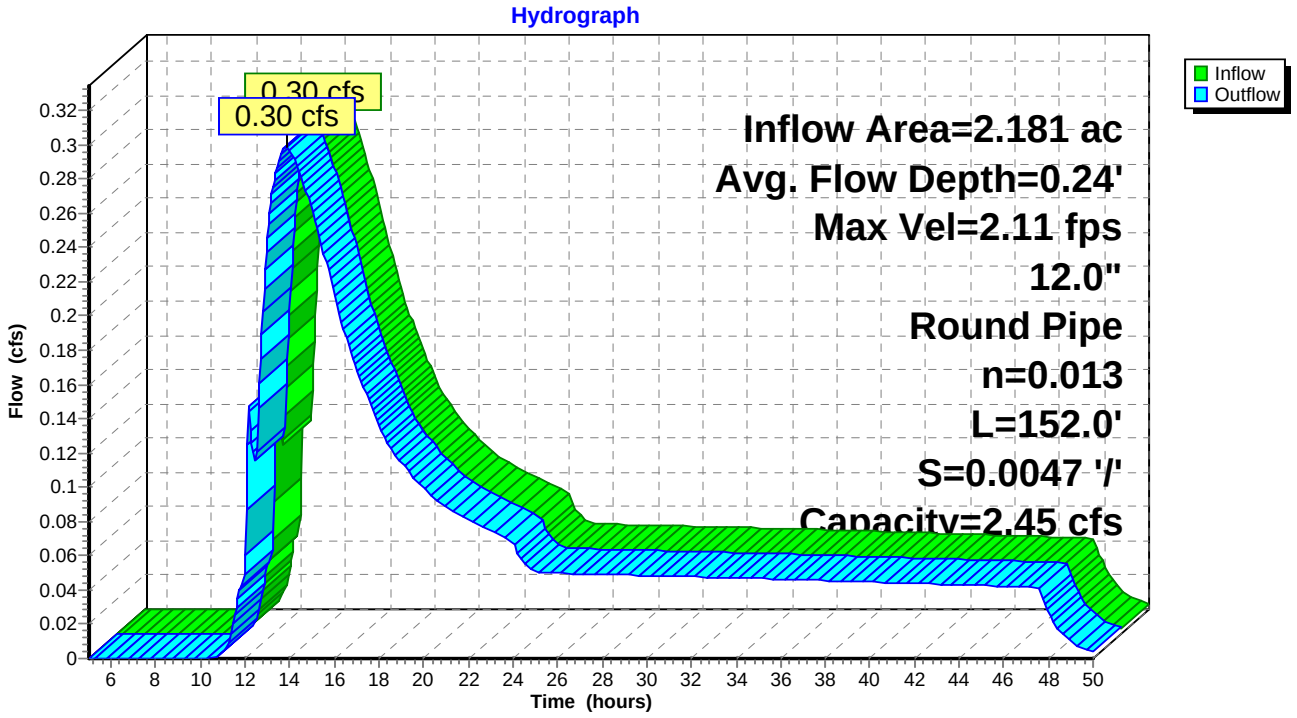
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.11 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 1.9 min

Peak Storage= 21 cf @ 13.81 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

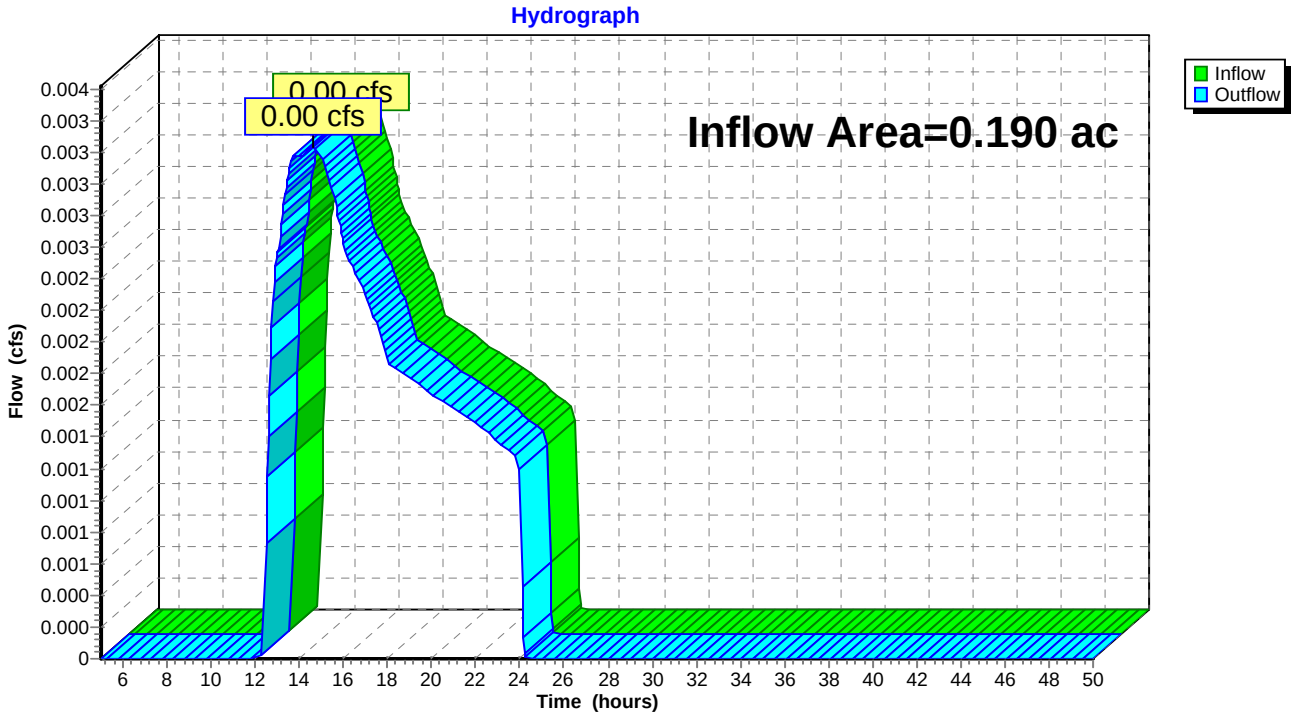


Summary for Reach SP2: Offsite

Inflow Area = 0.190 ac, 0.00% Impervious, Inflow Depth = 0.13" for 10-YR event
Inflow = 0.00 cfs @ 14.58 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 14.58 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: Offsite



Summary for Pond 20P: 2800 SF

Inflow Area = 2.001 ac, 40.14% Impervious, Inflow Depth = 1.43" for 10-YR event
Inflow = 3.10 cfs @ 12.10 hrs, Volume= 0.239 af
Outflow = 0.28 cfs @ 13.84 hrs, Volume= 0.238 af, Atten= 91%, Lag= 104.3 min
Primary = 0.28 cfs @ 13.84 hrs, Volume= 0.238 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 145.22' @ 13.84 hrs Surf.Area= 4,020 sf Storage= 5,037 cf

Plug-Flow detention time= 584.5 min calculated for 0.238 af (100% of inflow)
Center-of-Mass det. time= 583.8 min (1,448.0 - 864.1)

Volume	Invert	Avail.Storage	Storage Description
#1	143.75'	25,953 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

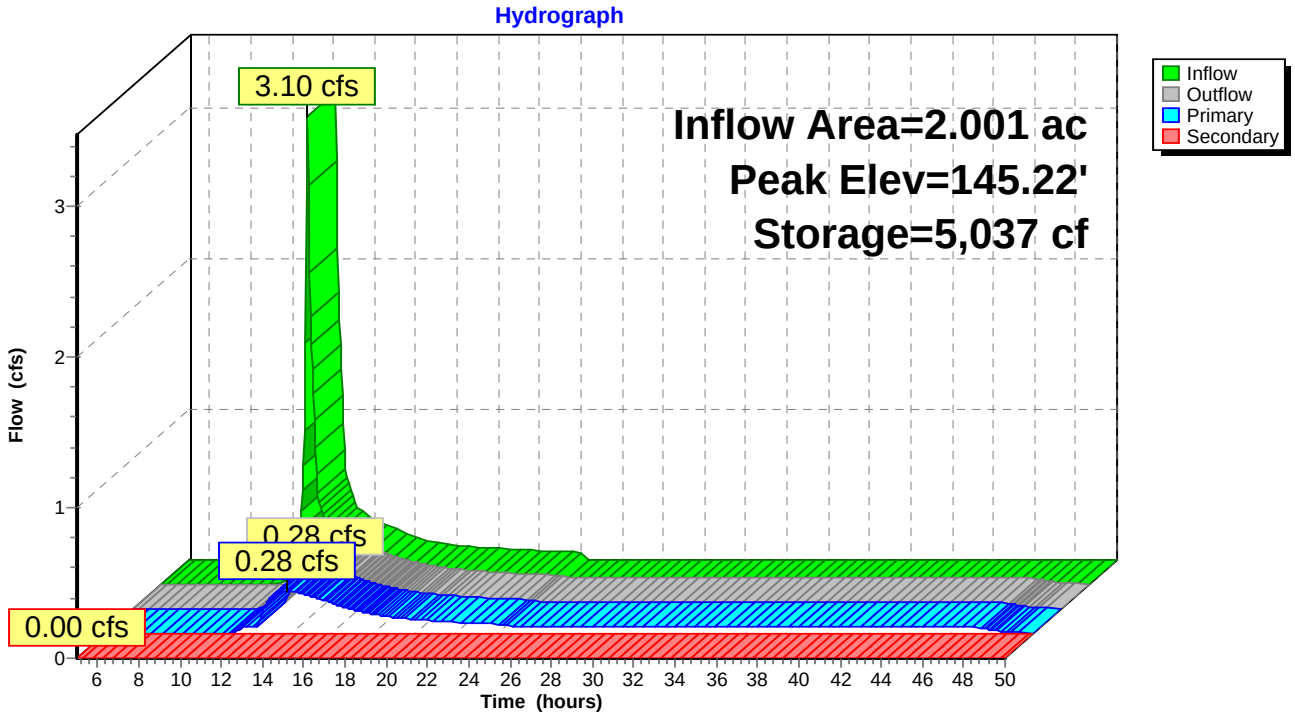
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
143.75	2,843	0	0
144.00	3,016	732	732
145.00	3,855	3,436	4,168
146.00	4,601	4,228	8,396
147.00	5,404	5,003	13,398
148.00	6,263	5,834	19,232
149.00	7,179	6,721	25,953

Device	Routing	Invert	Outlet Devices
#1	Primary	140.75'	**12.0" Round Culvert** L= 54.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.75' / 138.86' S= 0.0350 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	141.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	144.93'	**5.5" W x 6.5" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	146.56'	**18" Nyloplast 18" Domed Structure** Head (feet) 0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.37 0.40 0.45 0.50 Disch. (cfs) 0.000 0.200 0.500 0.800 1.400 1.900 2.500 3.100 3.500 3.600 3.800 4.000
#5	Secondary	149.00'	**12.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.28 cfs @ 13.84 hrs HW=145.22' (Free Discharge)
└─**1=Culvert** (Passes 0.28 cfs of 7.54 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.54 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.23 cfs @ 1.73 fps)
  └─**4=18" Nyloplast 18" Domed Structure** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=143.75' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: 2800 SF



Summary for Pond CB: (new Pond)

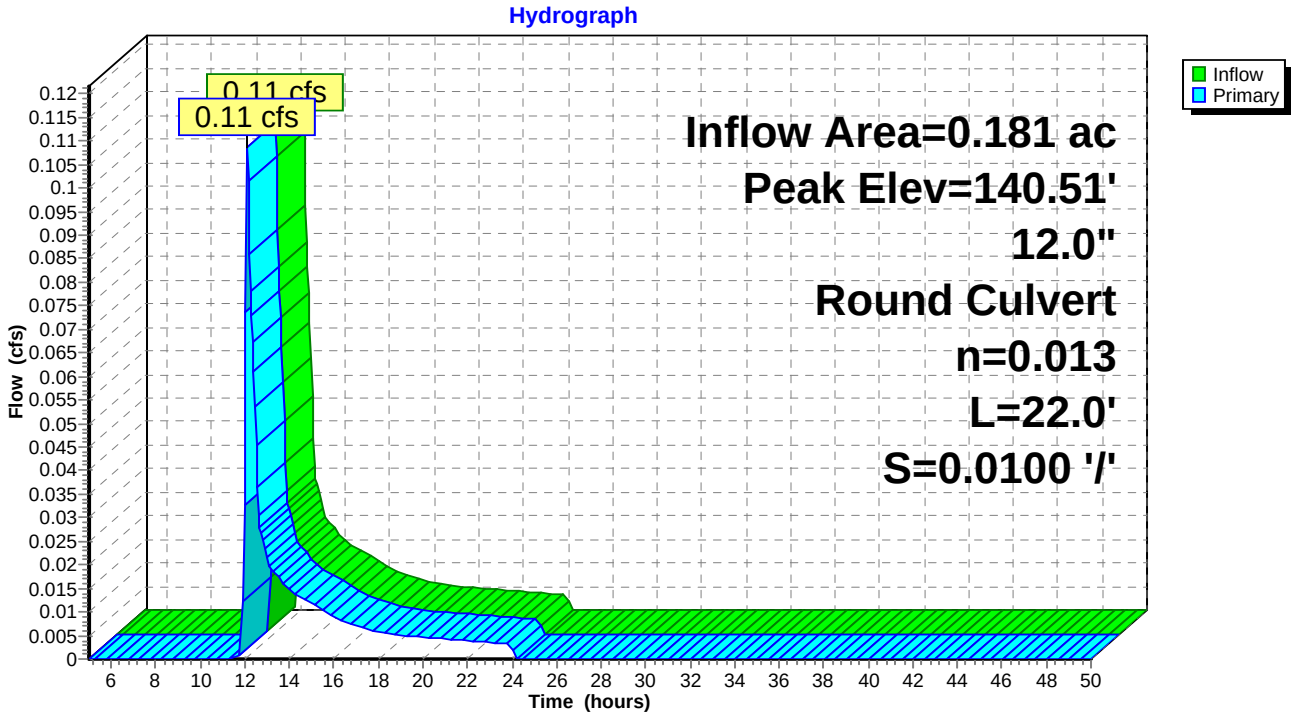
Inflow Area = 0.181 ac, 26.17% Impervious, Inflow Depth = 0.73" for 10-YR event
Inflow = 0.11 cfs @ 12.12 hrs, Volume= 0.011 af
Outflow = 0.11 cfs @ 12.12 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.12 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.51' @ 12.12 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.10 cfs @ 12.12 hrs HW=140.50' (Free Discharge)
1=Culvert (Barrel Controls 0.10 cfs @ 1.86 fps)

Pond CB: (new Pond)



Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Northeast Area Runoff Area=7,876 sf 26.17% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=54 Runoff=0.24 cfs 0.020 af

Subcatchment 12S: (new Subcat) Runoff Area=10,678 sf 38.07% Impervious Runoff Depth=1.87"
Tc=6.0 min CN=61 Runoff=0.50 cfs 0.038 af

Subcatchment 20S: All Imp & Dev Runoff Area=40,524 sf 39.30% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=68 Runoff=2.61 cfs 0.191 af

Subcatchment 23S: (new Subcat) Runoff Area=1,526 sf 0.00% Impervious Runoff Depth=0.39"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.001 af

Subcatchment 30S: West Area Runoff Area=6,749 sf 0.00% Impervious Runoff Depth=0.39"
Tc=6.0 min CN=39 Runoff=0.02 cfs 0.005 af

Subcatchment 32S: (new Subcat) Runoff Area=35,943 sf 41.69% Impervious Runoff Depth=2.12"
Tc=6.0 min CN=64 Runoff=1.95 cfs 0.146 af

Reach SP1: Site Contribution to Avg. Flow Depth=0.42' Max Vel=2.87 fps Inflow=0.89 cfs 0.395 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=0.89 cfs 0.395 af

Reach SP2: Offsite Inflow=0.03 cfs 0.006 af
Outflow=0.03 cfs 0.006 af

Pond 20P: 2800 SF Peak Elev=145.64' Storage=6,797 cf Inflow=5.06 cfs 0.376 af
Primary=0.84 cfs 0.375 af Secondary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.375 af

Pond CB: (new Pond) Peak Elev=140.59' Inflow=0.24 cfs 0.020 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.24 cfs 0.020 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.402 af Average Runoff Depth = 2.03"
64.14% Pervious = 1.521 ac 35.86% Impervious = 0.850 ac

Summary for Subcatchment 10S: Northeast Area

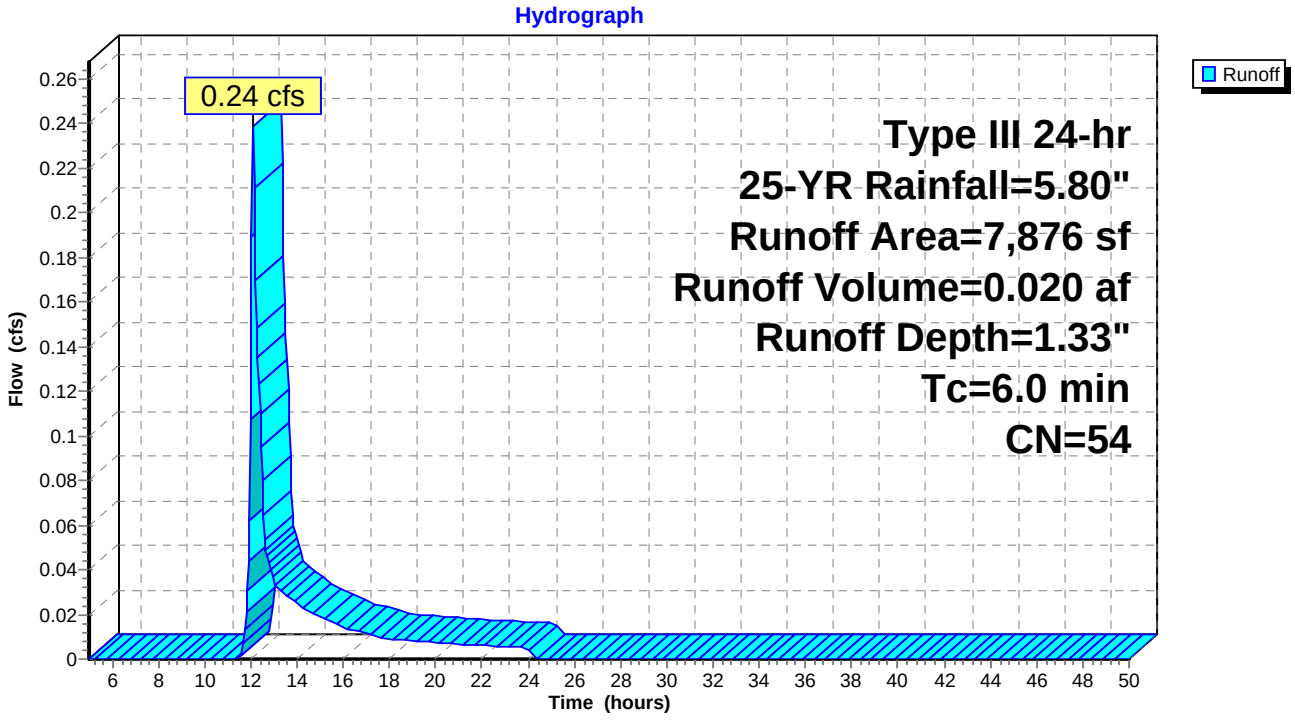
Runoff = 0.24 cfs @ 12.11 hrs, Volume= 0.020 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	1,401	98	Existing Impervious
*	660	98	New Impervious
	5,815	39	>75% Grass cover, Good, HSG A
	7,876	54	Weighted Average
	5,815		73.83% Pervious Area
	2,061		26.17% Impervious Area

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

Subcatchment 10S: Northeast Area



Summary for Subcatchment 12S: (new Subcat)

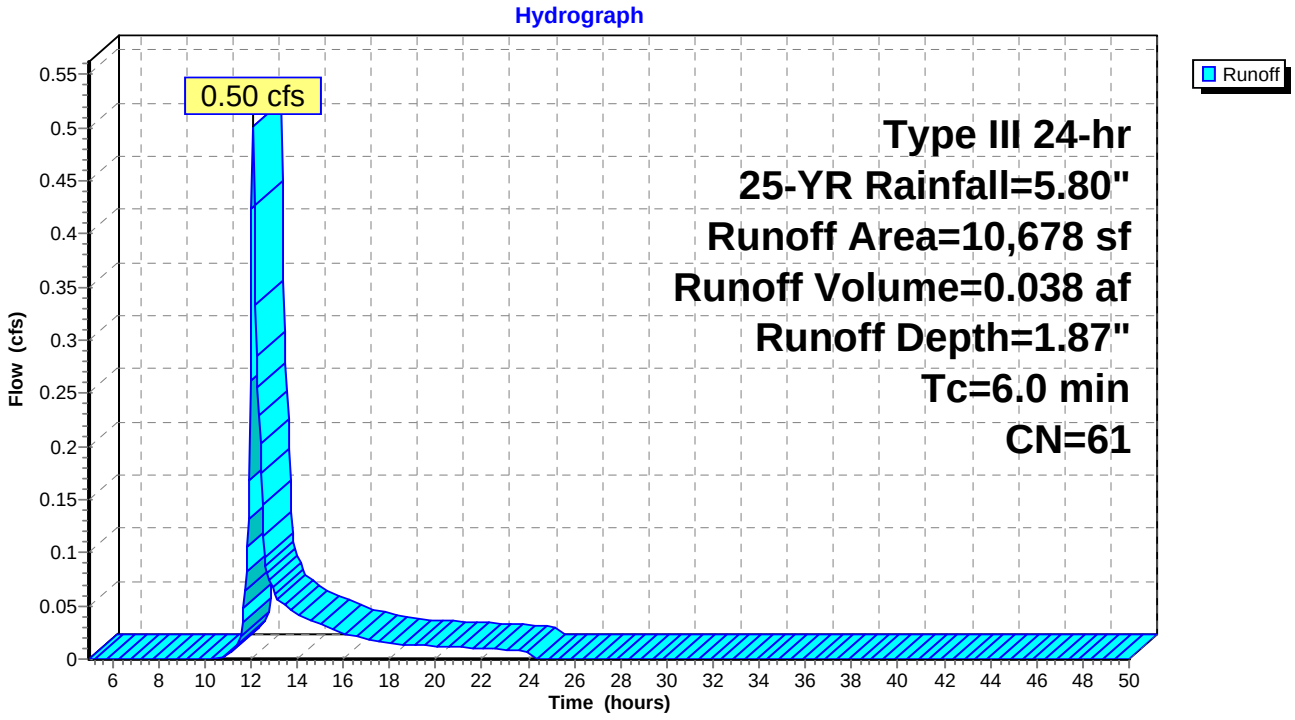
Runoff = 0.50 cfs @ 12.10 hrs, Volume= 0.038 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	368	98	Existing Impervious
*	3,697	98	New Impervious
	6,613	39	>75% Grass cover, Good, HSG A
	10,678	61	Weighted Average
	6,613		61.93% Pervious Area
	4,065		38.07% Impervious Area

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

Subcatchment 12S: (new Subcat)



Summary for Subcatchment 20S: All Imp & Dev

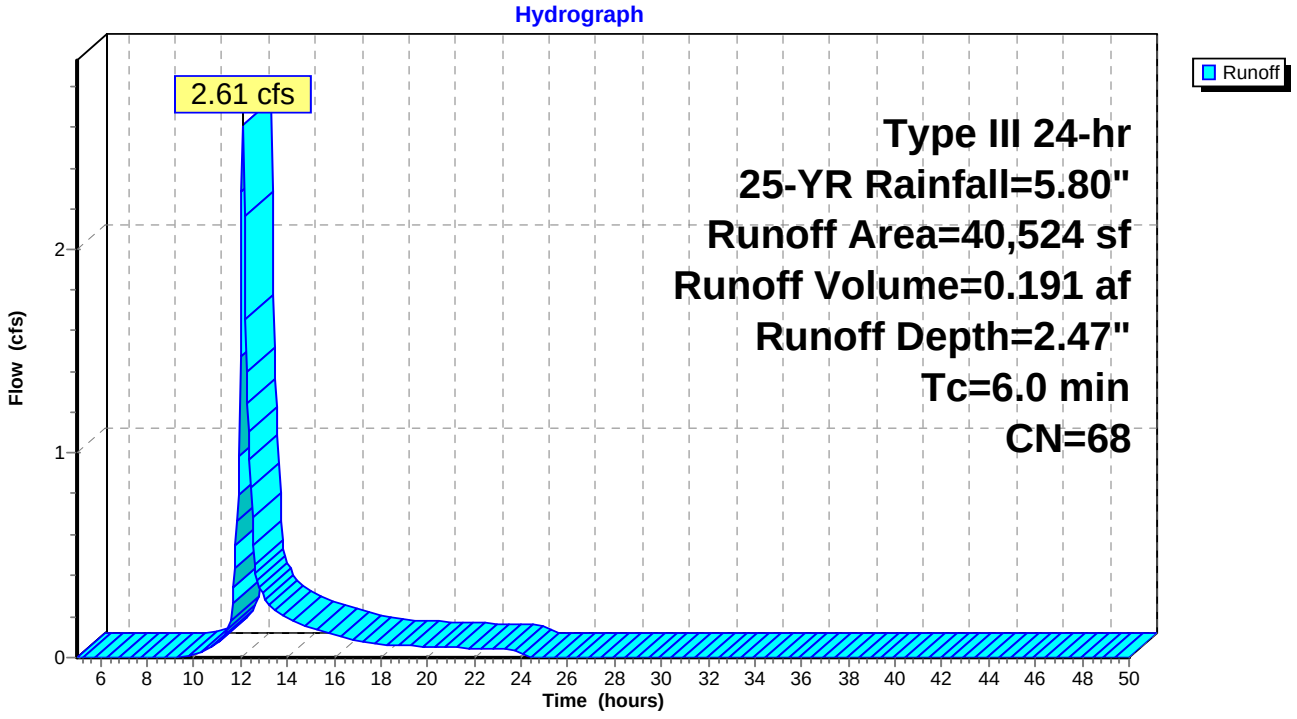
Runoff = 2.61 cfs @ 12.10 hrs, Volume= 0.191 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
11,061	98	Paved parking, HSG A
4,866	98	Unconnected roofs, HSG A
24,597	49	50-75% Grass cover, Fair, HSG A
40,524	68	Weighted Average
24,597		60.70% Pervious Area
15,927		39.30% Impervious Area
4,866		30.55% Unconnected

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

Subcatchment 20S: All Imp & Dev



Summary for Subcatchment 23S: (new Subcat)

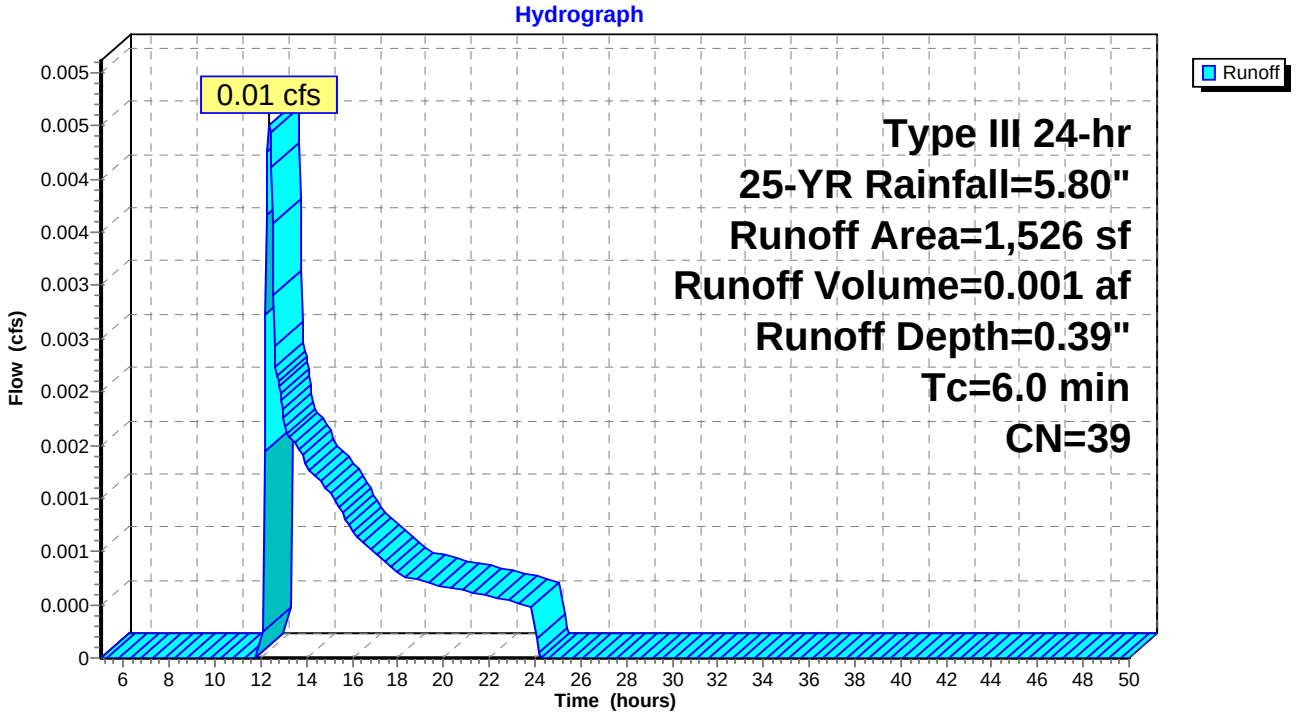
Runoff = 0.01 cfs @ 12.37 hrs, Volume= 0.001 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,526	39	>75% Grass cover, Good, HSG A
1,526		100.00% Pervious Area

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

Subcatchment 23S: (new Subcat)



Summary for Subcatchment 30S: West Area

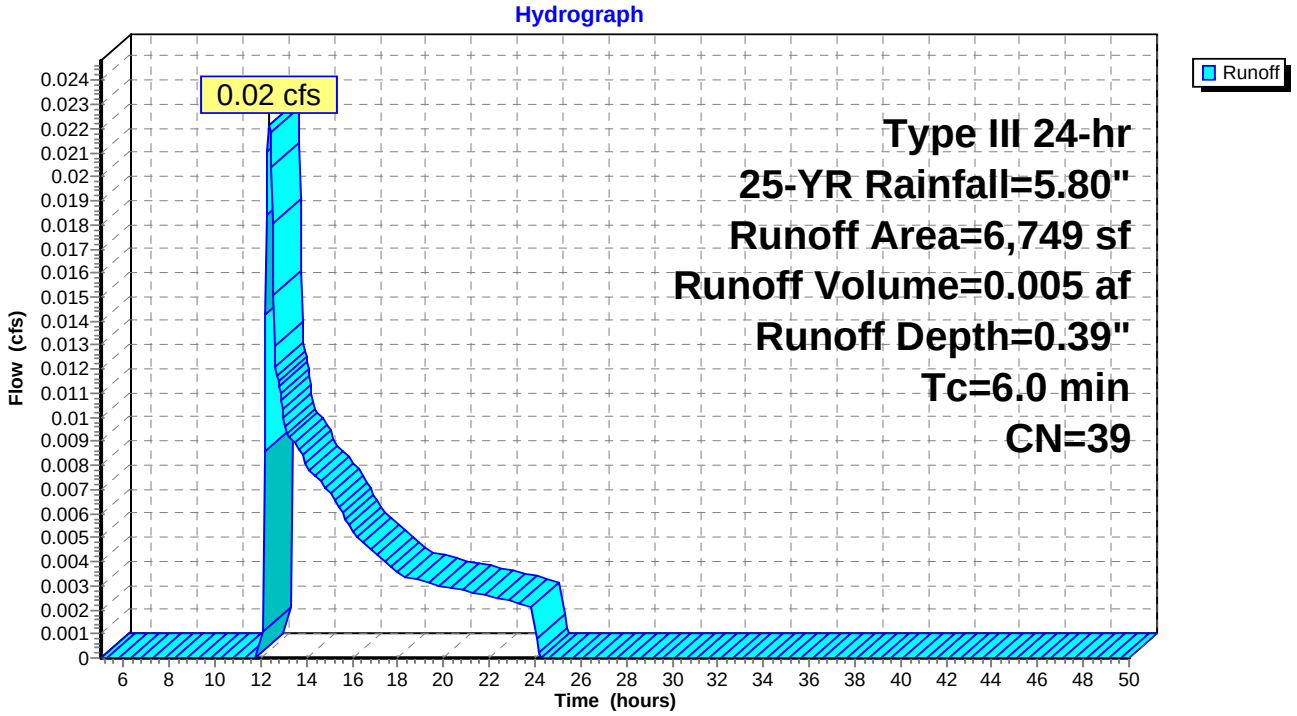
Runoff = 0.02 cfs @ 12.37 hrs, Volume= 0.005 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
6,749	39	>75% Grass cover, Good, HSG A
6,749		100.00% Pervious Area

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

Subcatchment 30S: West Area



Summary for Subcatchment 32S: (new Subcat)

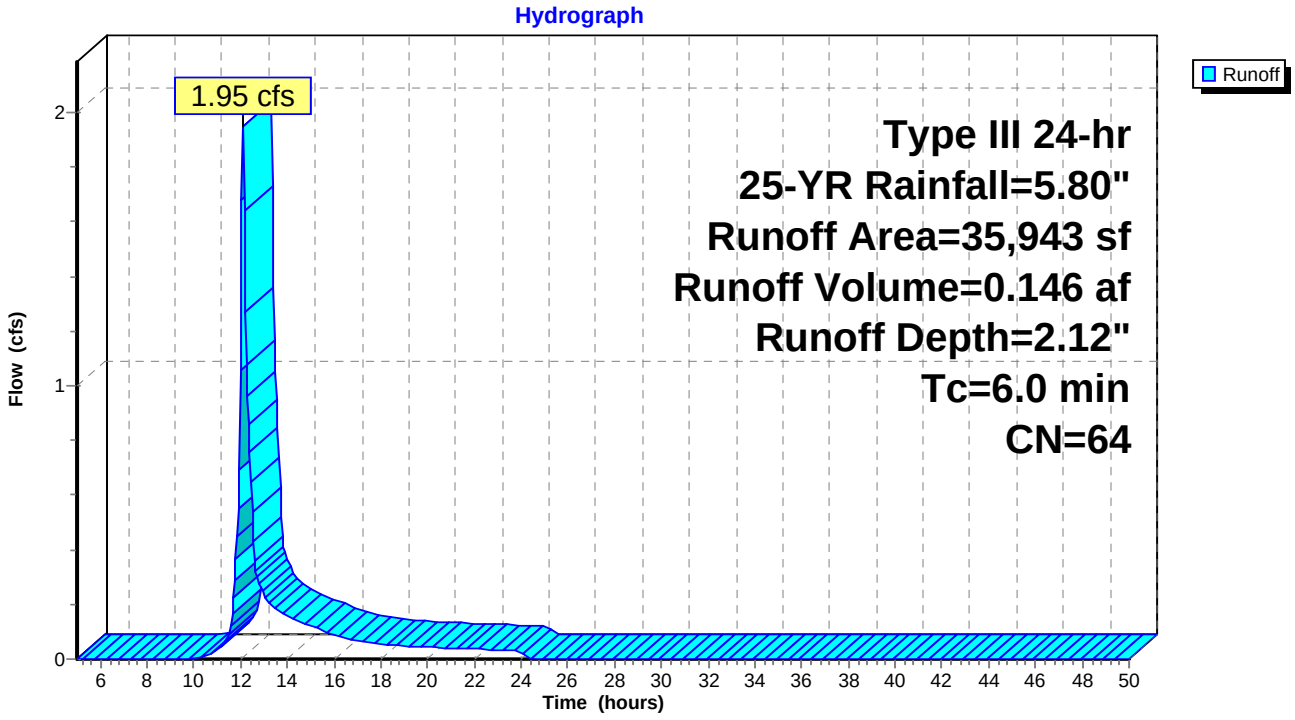
Runoff = 1.95 cfs @ 12.10 hrs, Volume= 0.146 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
*	7,432	98	Pavement
*	7,554	98	Roofs
	20,957	39	>75% Grass cover, Good, HSG A
	35,943	64	Weighted Average
	20,957		58.31% Pervious Area
	14,986		41.69% Impervious Area

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

Subcatchment 32S: (new Subcat)



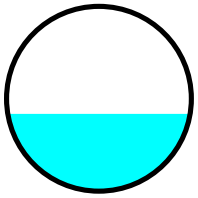
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 2.181 ac, 38.98% Impervious, Inflow Depth > 2.17" for 25-YR event
Inflow = 0.89 cfs @ 12.54 hrs, Volume= 0.395 af
Outflow = 0.89 cfs @ 12.57 hrs, Volume= 0.395 af, Atten= 0%, Lag= 1.8 min

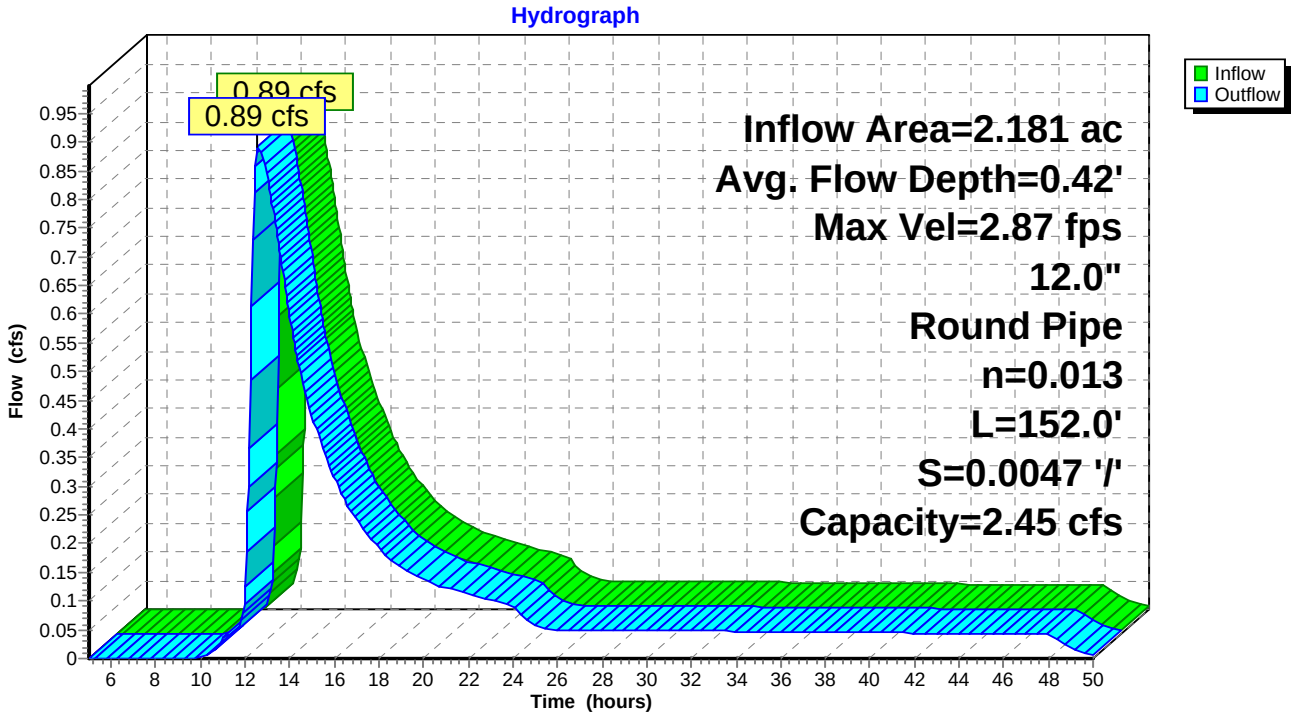
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.87 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.42 fps, Avg. Travel Time= 1.8 min

Peak Storage= 47 cf @ 12.55 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

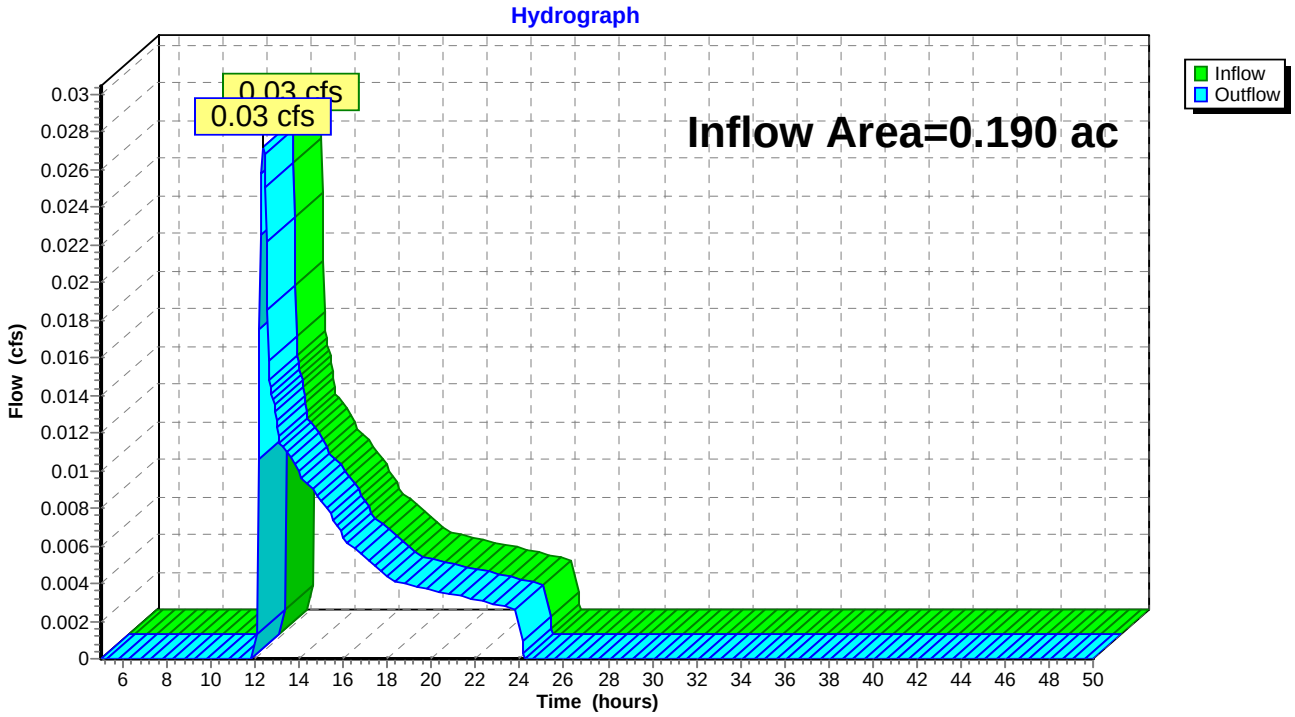


Summary for Reach SP2: Offsite

Inflow Area = 0.190 ac, 0.00% Impervious, Inflow Depth = 0.39" for 25-YR event
Inflow = 0.03 cfs @ 12.37 hrs, Volume= 0.006 af
Outflow = 0.03 cfs @ 12.37 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: Offsite



Summary for Pond 20P: 2800 SF

Inflow Area = 2.001 ac, 40.14% Impervious, Inflow Depth = 2.25" for 25-YR event
Inflow = 5.06 cfs @ 12.10 hrs, Volume= 0.376 af
Outflow = 0.84 cfs @ 12.65 hrs, Volume= 0.375 af, Atten= 84%, Lag= 32.9 min
Primary = 0.84 cfs @ 12.65 hrs, Volume= 0.375 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 145.64' @ 12.65 hrs Surf.Area= 4,334 sf Storage= 6,797 cf

Plug-Flow detention time= 401.7 min calculated for 0.375 af (100% of inflow)
Center-of-Mass det. time= 402.2 min (1,252.5 - 850.3)

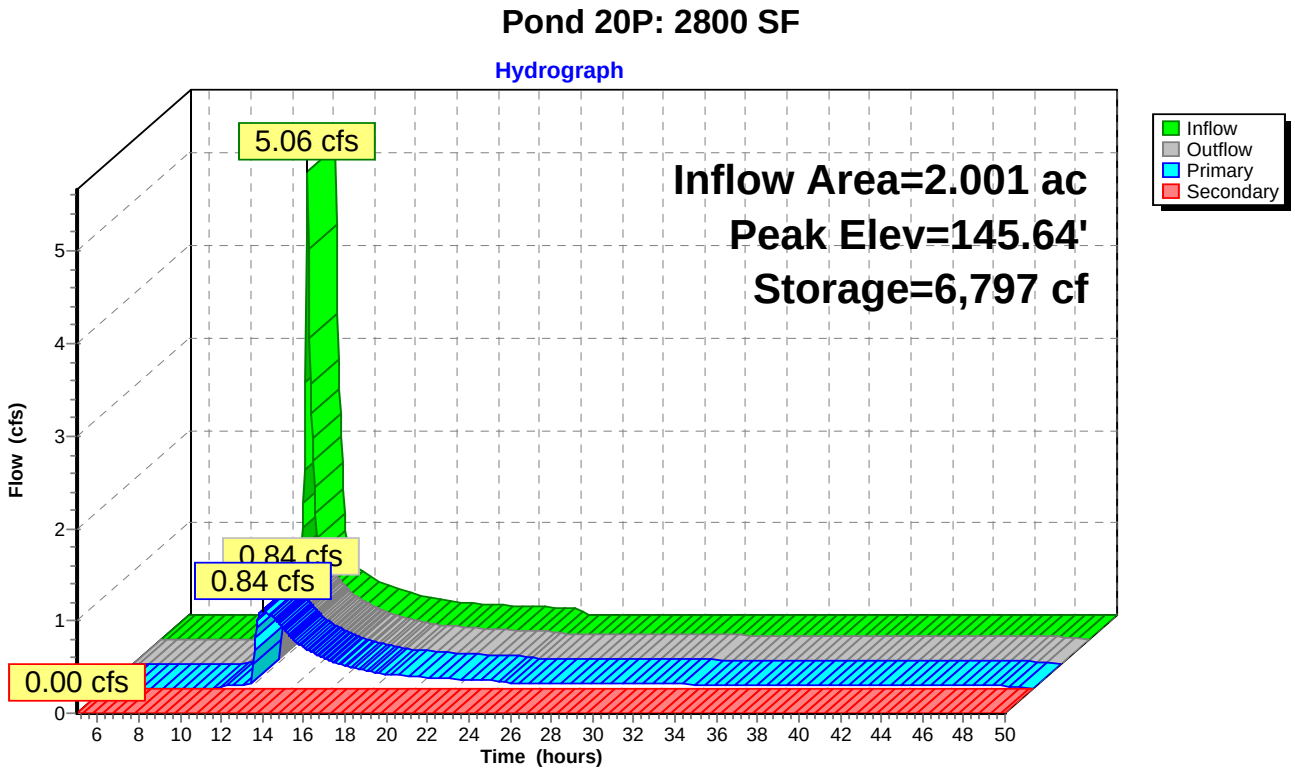
Volume	Invert	Avail.Storage	Storage Description
#1	143.75'	25,953 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
143.75	2,843	0	0
144.00	3,016	732	732
145.00	3,855	3,436	4,168
146.00	4,601	4,228	8,396
147.00	5,404	5,003	13,398
148.00	6,263	5,834	19,232
149.00	7,179	6,721	25,953

Device	Routing	Invert	Outlet Devices
#1	Primary	140.75'	**12.0" Round Culvert** L= 54.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.75' / 138.86' S= 0.0350 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	141.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	144.93'	**5.5" W x 6.5" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	146.56'	**18" Nyloplast 18" Domed Structure** Head (feet) 0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.37 0.40 0.45 0.50 Disch. (cfs) 0.000 0.200 0.500 0.800 1.400 1.900 2.500 3.100 3.500 3.600 3.800 4.000
#5	Secondary	149.00'	**12.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.84 cfs @ 12.65 hrs HW=145.64' (Free Discharge)
└─**1=Culvert** (Passes 0.84 cfs of 7.93 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 10.04 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.78 cfs @ 3.14 fps)
  └─**4=18" Nyloplast 18" Domed Structure** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=143.75' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond CB: (new Pond)

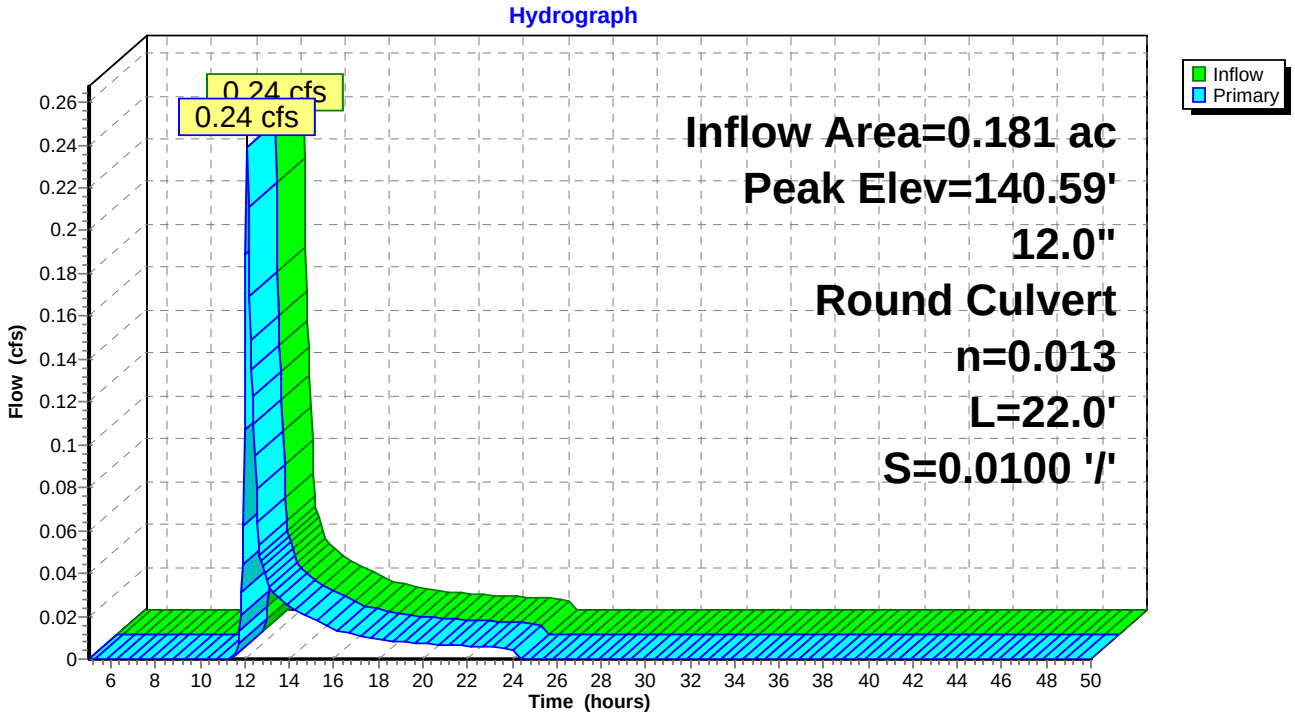
Inflow Area = 0.181 ac, 26.17% Impervious, Inflow Depth = 1.33" for 25-YR event
Inflow = 0.24 cfs @ 12.11 hrs, Volume= 0.020 af
Outflow = 0.24 cfs @ 12.11 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.11 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.59' @ 12.11 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.11 hrs HW=140.59' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.23 cfs @ 2.29 fps)

Pond CB: (new Pond)



Time span=5.00-50.00 hrs, dt=0.05 hrs, 901 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: Northeast Area Runoff Area=7,876 sf 26.17% Impervious Runoff Depth=2.74"
Tc=6.0 min CN=54 Runoff=0.55 cfs 0.041 af

Subcatchment 12S: (new Subcat) Runoff Area=10,678 sf 38.07% Impervious Runoff Depth=3.52"
Tc=6.0 min CN=61 Runoff=0.98 cfs 0.072 af

Subcatchment 20S: All Imp & Dev Runoff Area=40,524 sf 39.30% Impervious Runoff Depth=4.32"
Tc=6.0 min CN=68 Runoff=4.62 cfs 0.335 af

Subcatchment 23S: (new Subcat) Runoff Area=1,526 sf 0.00% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=39 Runoff=0.03 cfs 0.004 af

Subcatchment 30S: West Area Runoff Area=6,749 sf 0.00% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=39 Runoff=0.14 cfs 0.015 af

Subcatchment 32S: (new Subcat) Runoff Area=35,943 sf 41.69% Impervious Runoff Depth=3.86"
Tc=6.0 min CN=64 Runoff=3.65 cfs 0.265 af

Reach SP1: Site Contribution to Avg. Flow Depth=1.00' Max Vel=3.56 fps Inflow=2.69 cfs 0.713 af
12.0" Round Pipe n=0.013 L=152.0' S=0.0047 '/' Capacity=2.45 cfs Outflow=2.57 cfs 0.713 af

Reach SP2: Offsite Inflow=0.18 cfs 0.019 af
Outflow=0.18 cfs 0.019 af

Pond 20P: 2800 SF Peak Elev=146.73' Storage=11,944 cf Inflow=9.25 cfs 0.672 af
Primary=2.52 cfs 0.671 af Secondary=0.00 cfs 0.000 af Outflow=2.52 cfs 0.671 af

Pond CB: (new Pond) Peak Elev=140.74' Inflow=0.55 cfs 0.041 af
12.0" Round Culvert n=0.013 L=22.0' S=0.0100 '/' Outflow=0.55 cfs 0.041 af

Total Runoff Area = 2.371 ac Runoff Volume = 0.733 af Average Runoff Depth = 3.71"
64.14% Pervious = 1.521 ac 35.86% Impervious = 0.850 ac

Summary for Subcatchment 10S: Northeast Area

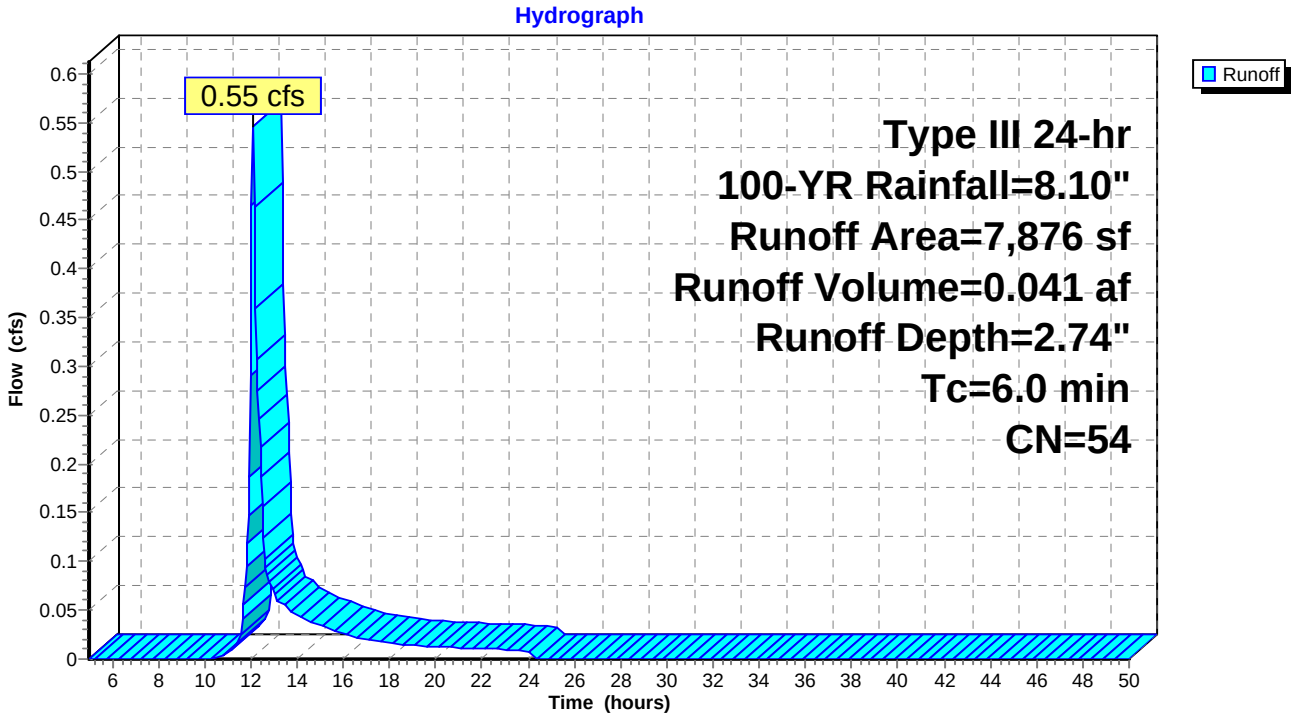
Runoff = 0.55 cfs @ 12.10 hrs, Volume= 0.041 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

	Area (sf)	CN	Description
*	1,401	98	Existing Impervious
*	660	98	New Impervious
	5,815	39	>75% Grass cover, Good, HSG A
	7,876	54	Weighted Average
	5,815		73.83% Pervious Area
	2,061		26.17% Impervious Area

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

Subcatchment 10S: Northeast Area



Summary for Subcatchment 12S: (new Subcat)

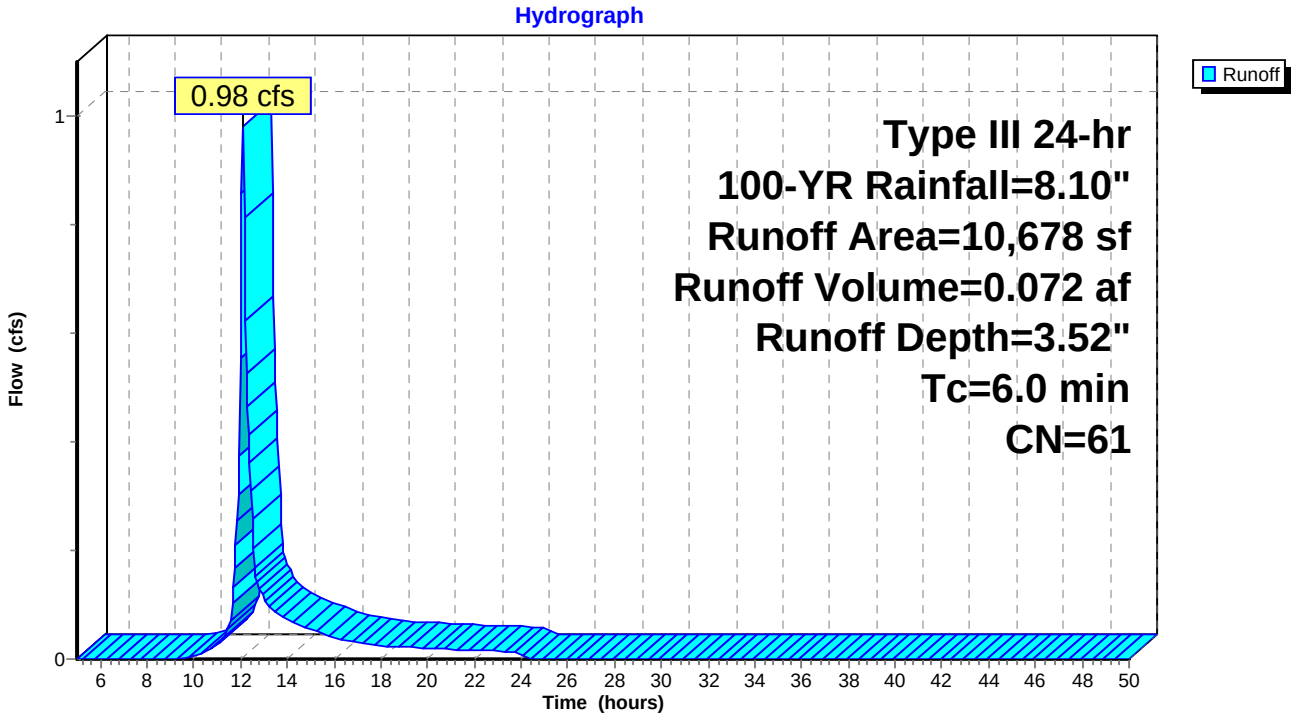
Runoff = 0.98 cfs @ 12.10 hrs, Volume= 0.072 af, Depth= 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

	Area (sf)	CN	Description
*	368	98	Existing Impervious
*	3,697	98	New Impervious
	6,613	39	>75% Grass cover, Good, HSG A
	10,678	61	Weighted Average
	6,613		61.93% Pervious Area
	4,065		38.07% Impervious Area

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

Subcatchment 12S: (new Subcat)



Summary for Subcatchment 20S: All Imp & Dev

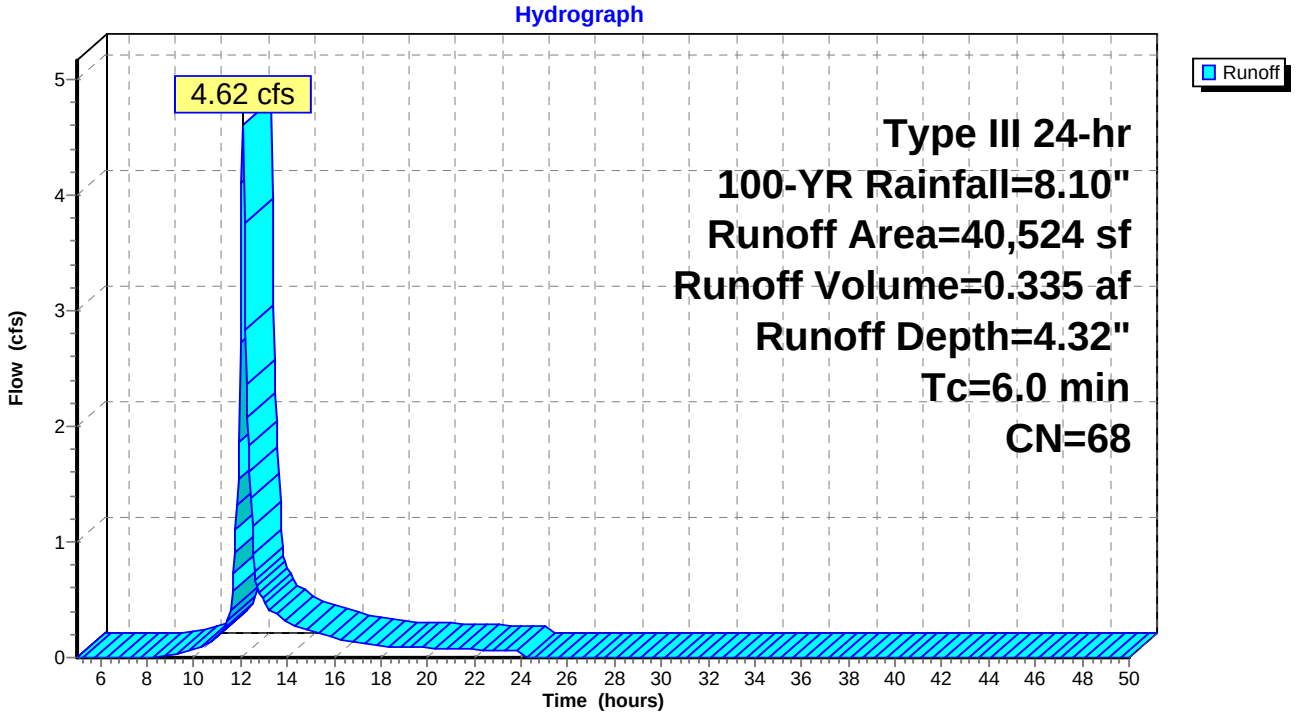
Runoff = 4.62 cfs @ 12.09 hrs, Volume= 0.335 af, Depth= 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

Area (sf)	CN	Description
11,061	98	Paved parking, HSG A
4,866	98	Unconnected roofs, HSG A
24,597	49	50-75% Grass cover, Fair, HSG A
40,524	68	Weighted Average
24,597		60.70% Pervious Area
15,927		39.30% Impervious Area
4,866		30.55% Unconnected

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

Subcatchment 20S: All Imp & Dev



Summary for Subcatchment 23S: (new Subcat)

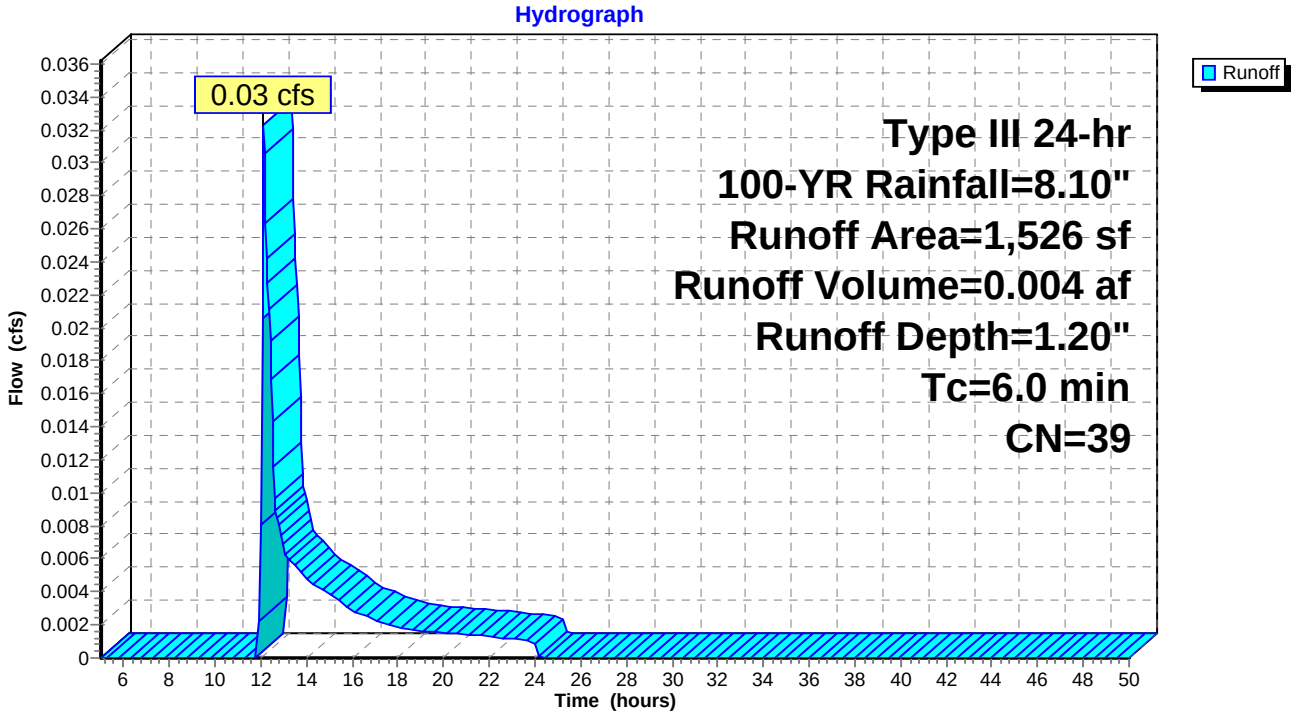
Runoff = 0.03 cfs @ 12.12 hrs, Volume= 0.004 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

Area (sf)	CN	Description
1,526	39	>75% Grass cover, Good, HSG A
1,526		100.00% Pervious Area

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

Subcatchment 23S: (new Subcat)



Summary for Subcatchment 30S: West Area

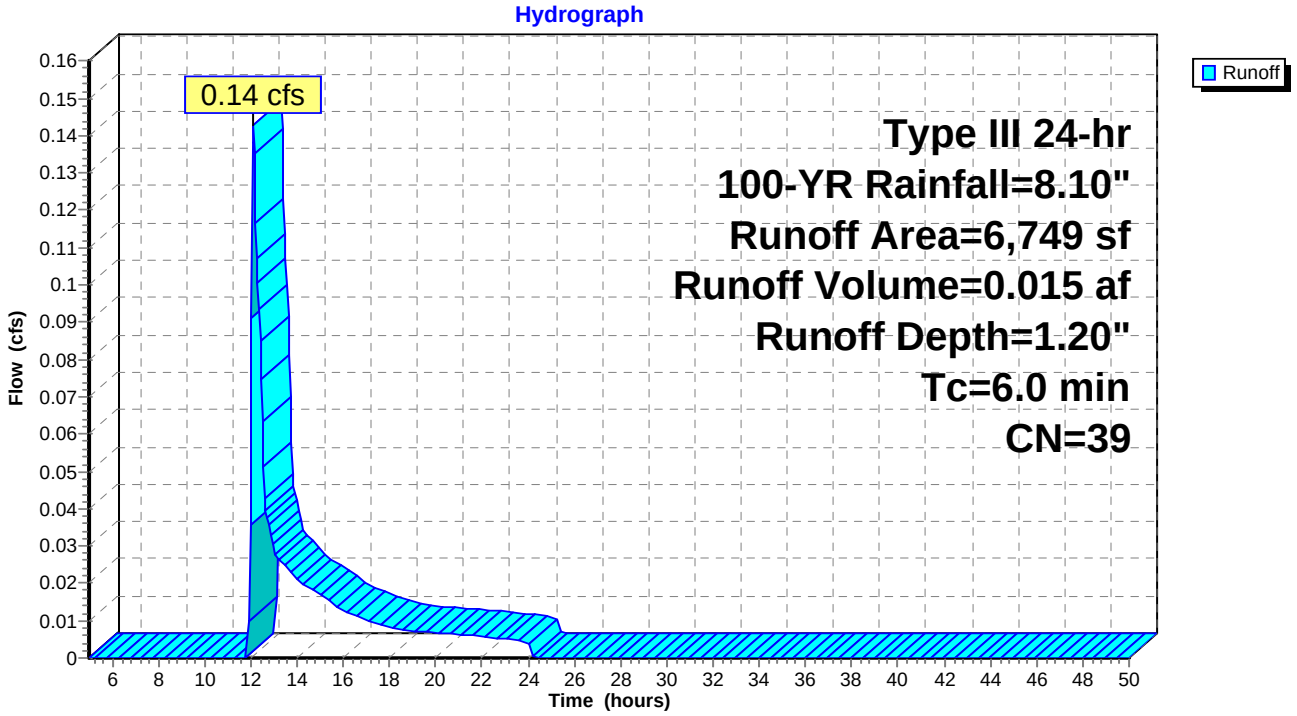
Runoff = 0.14 cfs @ 12.12 hrs, Volume= 0.015 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

Area (sf)	CN	Description
6,749	39	>75% Grass cover, Good, HSG A
6,749		100.00% Pervious Area

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

Subcatchment 30S: West Area



Summary for Subcatchment 32S: (new Subcat)

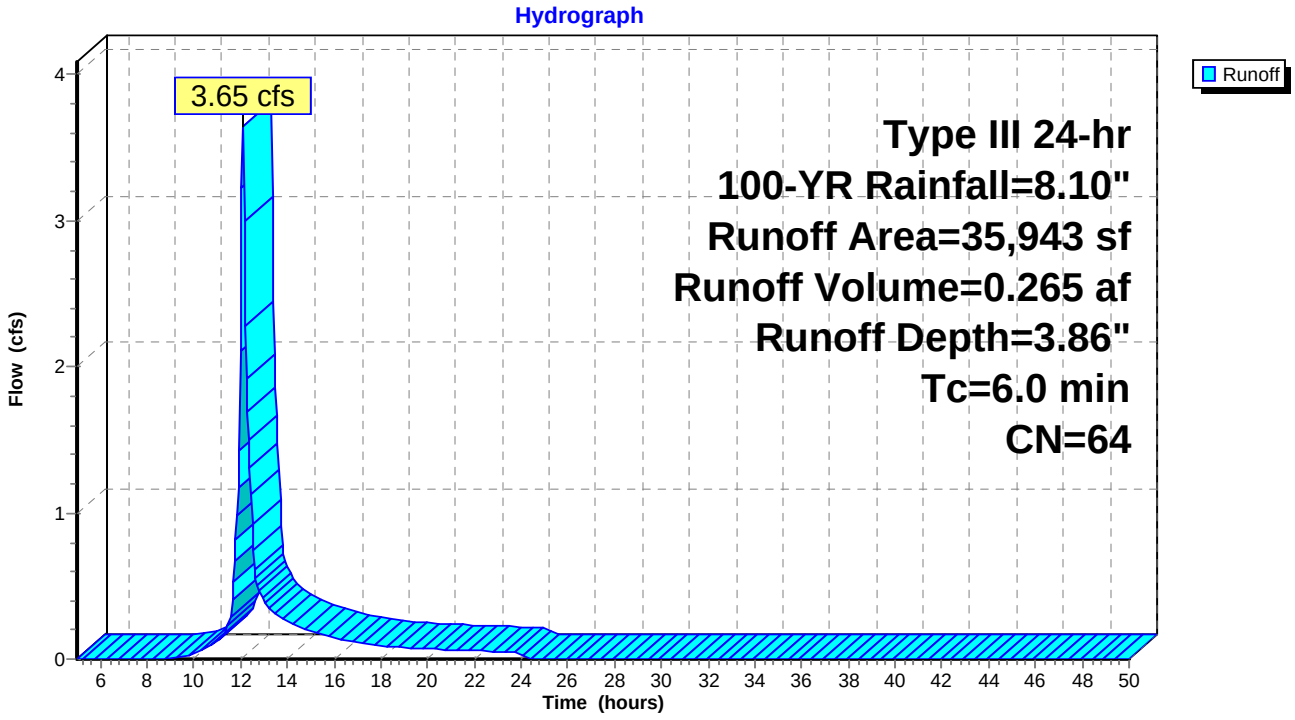
Runoff = 3.65 cfs @ 12.09 hrs, Volume= 0.265 af, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.10"

	Area (sf)	CN	Description
*	7,432	98	Pavement
*	7,554	98	Roofs
	20,957	39	>75% Grass cover, Good, HSG A
	35,943	64	Weighted Average
	20,957		58.31% Pervious Area
	14,986		41.69% Impervious Area

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

Subcatchment 32S: (new Subcat)



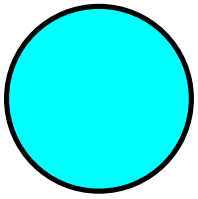
Summary for Reach SP1: Site Contribution to Existing Collection System

Inflow Area = 2.181 ac, 38.98% Impervious, Inflow Depth > 3.92" for 100-YR event
Inflow = 2.69 cfs @ 12.47 hrs, Volume= 0.713 af
Outflow = 2.57 cfs @ 12.59 hrs, Volume= 0.713 af, Atten= 4%, Lag= 7.0 min

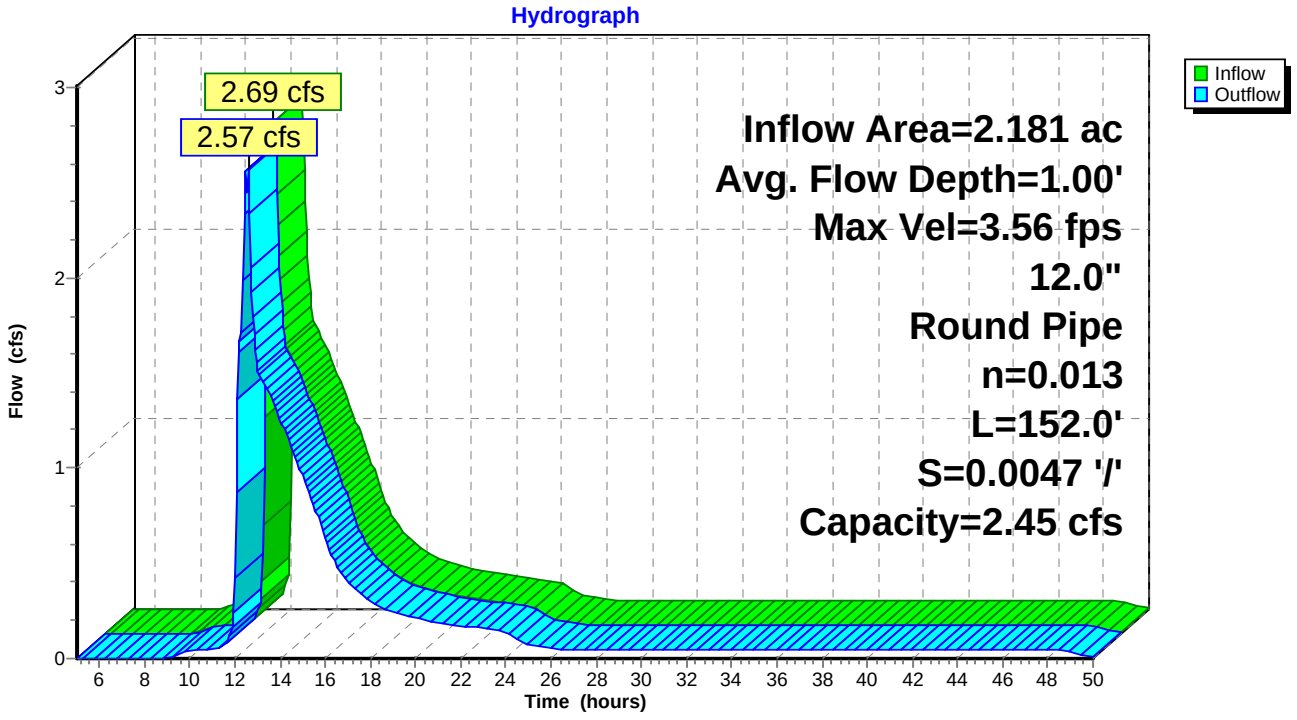
Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 1.7 min

Peak Storage= 120 cf @ 12.53 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.45 cfs

12.0" Round Pipe
n= 0.013 Clay tile
Length= 152.0' Slope= 0.0047 '/'
Inlet Invert= 139.12', Outlet Invert= 138.40'



Reach SP1: Site Contribution to Existing Collection System

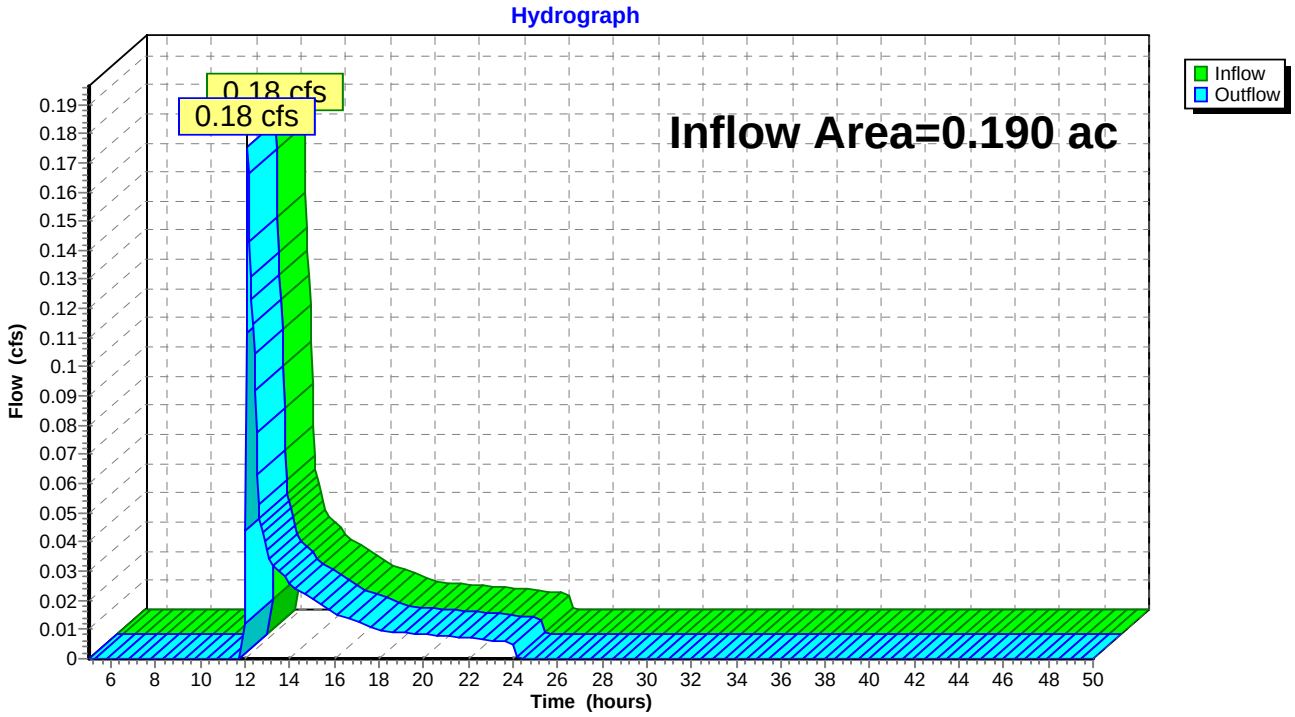


Summary for Reach SP2: Offsite

Inflow Area = 0.190 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-YR event
Inflow = 0.18 cfs @ 12.12 hrs, Volume= 0.019 af
Outflow = 0.18 cfs @ 12.12 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs

Reach SP2: Offsite



Summary for Pond 20P: 2800 SF

Inflow Area = 2.001 ac, 40.14% Impervious, Inflow Depth = 4.03" for 100-YR event
Inflow = 9.25 cfs @ 12.09 hrs, Volume= 0.672 af
Outflow = 2.52 cfs @ 12.48 hrs, Volume= 0.671 af, Atten= 73%, Lag= 23.4 min
Primary = 2.52 cfs @ 12.48 hrs, Volume= 0.671 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 146.73' @ 12.48 hrs Surf.Area= 5,183 sf Storage= 11,944 cf

Plug-Flow detention time= 262.8 min calculated for 0.671 af (100% of inflow)
Center-of-Mass det. time= 263.4 min (1,096.7 - 833.4)

Volume	Invert	Avail.Storage	Storage Description
#1	143.75'	25,953 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

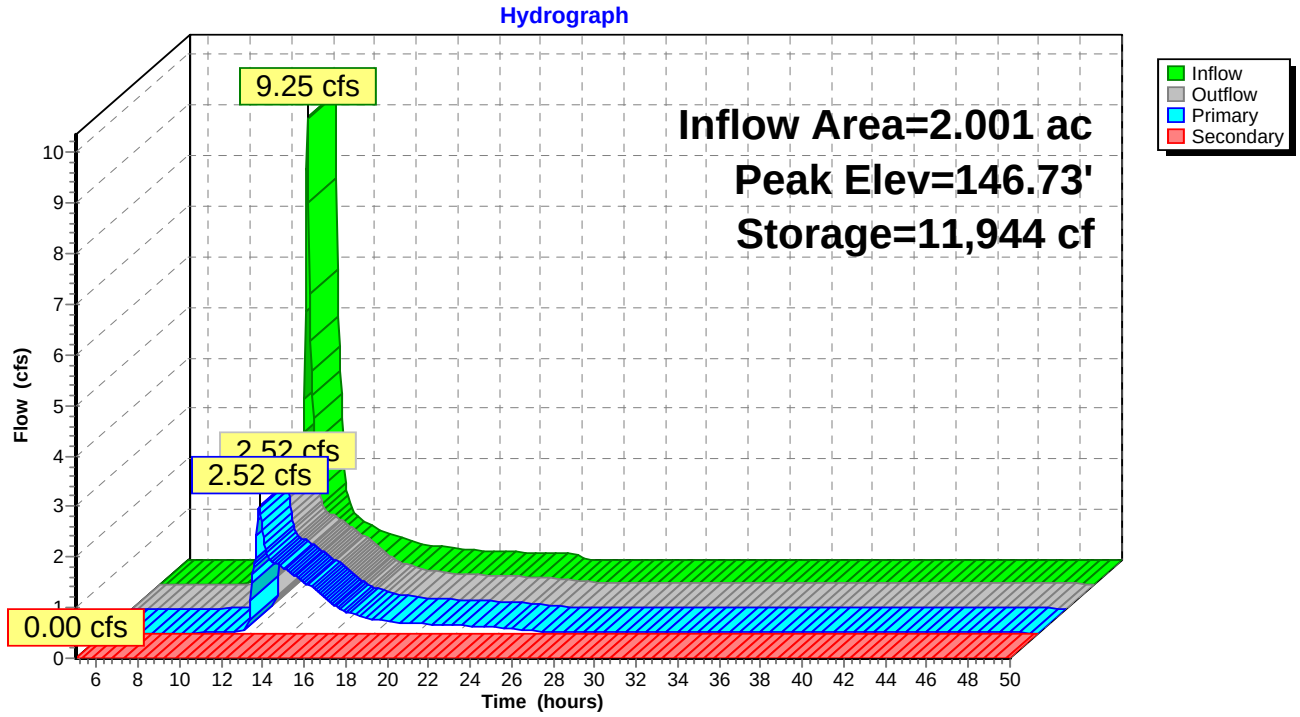
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
143.75	2,843	0	0
144.00	3,016	732	732
145.00	3,855	3,436	4,168
146.00	4,601	4,228	8,396
147.00	5,404	5,003	13,398
148.00	6,263	5,834	19,232
149.00	7,179	6,721	25,953

Device	Routing	Invert	Outlet Devices
#1	Primary	140.75'	**12.0" Round Culvert** L= 54.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.75' / 138.86' S= 0.0350 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	141.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	144.93'	**5.5" W x 6.5" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	146.56'	**18" Nyloplast 18" Domed Structure** Head (feet) 0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.37 0.40 0.45 0.50 Disch. (cfs) 0.000 0.200 0.500 0.800 1.400 1.900 2.500 3.100 3.500 3.600 3.800 4.000
#5	Secondary	149.00'	**12.0' long x 6.0' 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) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=2.50 cfs @ 12.48 hrs HW=146.72' (Free Discharge)
└─**1=Culvert** (Passes 2.50 cfs of 8.85 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 11.22 fps)
  └─**3=Orifice/Grate** (Orifice Controls 1.47 cfs @ 5.93 fps)
  └─**4=18" Nyloplast 18" Domed Structure** (Custom Controls 0.96 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=143.75' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 20P: 2800 SF



Summary for Pond CB: (new Pond)

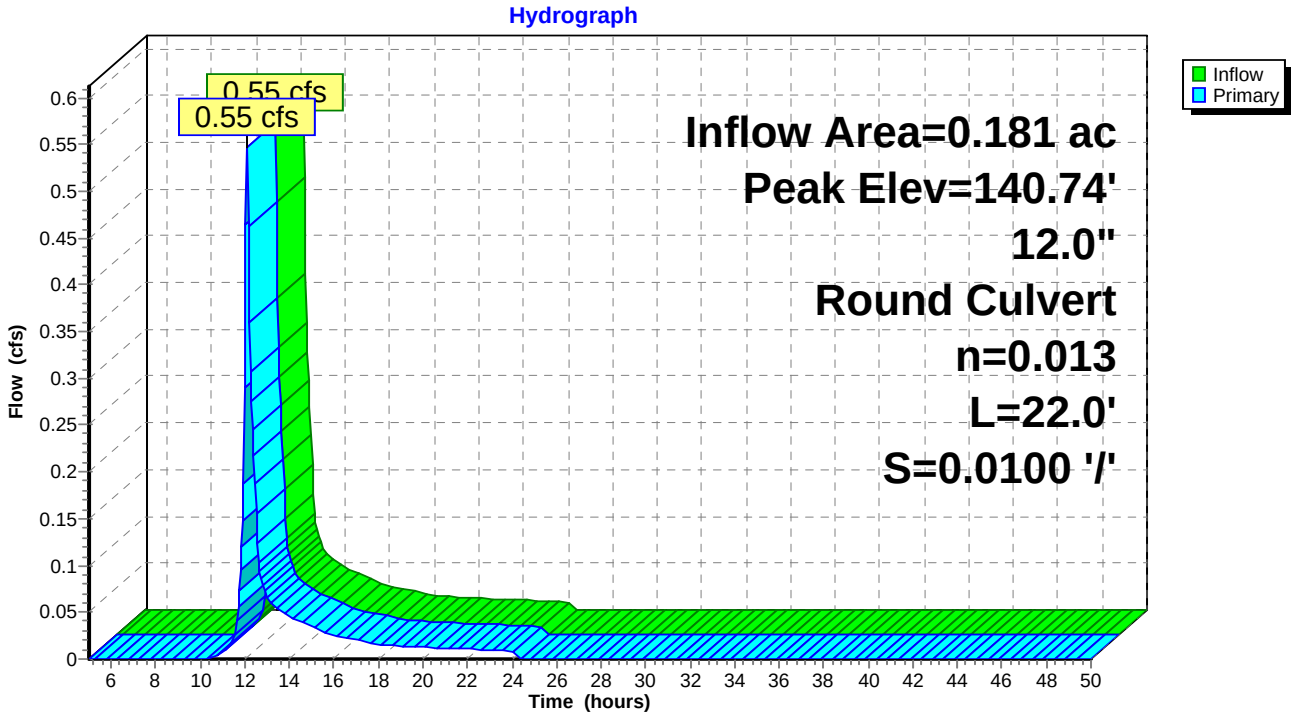
Inflow Area = 0.181 ac, 26.17% Impervious, Inflow Depth = 2.74" for 100-YR event
Inflow = 0.55 cfs @ 12.10 hrs, Volume= 0.041 af
Outflow = 0.55 cfs @ 12.10 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.10 hrs, Volume= 0.041 af

Routing by Stor-Ind method, Time Span= 5.00-50.00 hrs, dt= 0.05 hrs
Peak Elev= 140.74' @ 12.10 hrs
Flood Elev= 146.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	140.34'	**12.0" Round Culvert** L= 22.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 140.34' / 140.12' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 12.10 hrs HW=140.74' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.54 cfs @ 2.78 fps)

Pond CB: (new Pond)



Attachment C

Inspection, Maintenance and Housekeeping Plan

16533

INSPECTION, MAINTENANCE AND HOUSEKEEPING PLAN

Knight Farm Subdivision
Portland, ME

Introduction

During construction, Greenlight Enterprises, LLC will be the responsible party for maintaining construction BMP's. Upon completion of the proposed development, a homeowners' association will be the responsible party for maintaining the stormwater management system. The responsible party shall schedule maintenance of all stormwater management structures, the establishment of any contract services required to implement the program, and the keeping of records and maintenance logbook.

Records of all inspections and maintenance work accomplished must be kept on file and retained for a minimum 5-year time span. The maintenance logbook will be made available to the Maine Department of Environmental Protection (MDEP) and the City of Portland upon request. At a minimum, the appropriate and relevant activities for each of the stormwater management systems will be performed on the prescribed schedule.

The following plan outlines the anticipated inspection, maintenance, and housekeeping procedures for the erosion and sedimentation controls as well as stormwater management devices for the project site. Also, this plan outlines several housekeeping requirements that shall be followed during and after construction. These procedures should be followed in order to ensure the intended function of the designed measures and to prevent unreasonable adverse impacts to the surrounding environment.

The procedures outlined in the Inspection, Maintenance, and Housekeeping Plan is provided as an overview of the anticipated practices to be used on this site. In some instances, additional measures may be required due to unexpected conditions. For additional details on any of the erosion and sedimentation control measures or stormwater management devices to be utilized on this project, refer to the most recently revised edition of the "Maine Erosion and Sedimentation Control BMP" manual and/or the "Stormwater Management for Maine: Best Management Practices" manual as published by the MDEP.

During Construction

1. **Inspection:** During the construction process, it is the Contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. These responsibilities include inspecting disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall

be inspected at least once a week as well as before and after a storm event, and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in any applicable permits, shall conduct the inspections.

2. **Maintenance:** All measures shall be maintained in an effective operating condition until areas are permanently stabilized. If Best Management Practices (BMPs) need to be maintained or modified, additional BMPs are necessary, or other corrective action is needed, implementation must be completed within seven (7) calendar days and prior to any storm event (rainfall).

3. **Documentation:** A log summarizing the inspections and any corrective action taken must be maintained on-site. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of erosion and sedimentation controls, material storage areas, and vehicle access points to the site. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken.

   The log must be made accessible to the appropriate regulatory agency upon request. The permittee shall retain a copy of the log for a period of at least three (3) years from the completion of permanent stabilization.

4. **Specific Inspection and Maintenance Tasks:** The following is a list of erosion control and stormwater management measures and the specific inspection and maintenance tasks to be performed during construction.

   A. <u>Sediment Barriers:</u>

   - Hay bale barriers, silt fences, and filter berms shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
   - If the fabric on silt fence or filter barrier should decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, it shall be replaced.
   - Sediment deposits should be removed after each storm event. They must be removed before deposits reach approximately one-half the height of the barrier.
   - Filter berms shall be reshaped as needed.
   - Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required should be dressed to conform to the existing grade, prepared, and seeded.

   B. <u>Riprap Materials:</u>

   - Once a riprap installation has been completed, it should require very little maintenance. It

shall, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone.

C. Erosion Control Blankets:

- Inspect these reinforced areas semi-annually and after significant rainfall events for slumping, sliding, seepage, and scour. Pay close attention to unreinforced areas adjacent to the erosion control blankets, which may experience accelerated erosion.
- Review all applicable inspection and maintenance procedures recommended by the specific blanket manufacturer. These tasks shall be included in addition to this plan.

D. Temporary Storm Drain Inlet Protection:

- The inlet protection structure shall be inspected before each rain event and repaired as necessary.
- Sediment shall be removed and the storm drain sediment barrier restored to its original dimensions when the sediment has accumulated to half of the design depth of the trap.
- Structures shall be removed upon permanent stabilization of the tributary area.
- Upon removal of the structure, all accumulated sediments downstream of the structure shall be cleaned from the storm drain system.

E. Stabilized Construction Entrances/Exits:

- The exit shall be maintained in a condition that will prevent tracking of sediment onto public rights-of-way.
- When the control pad becomes ineffective, the stone shall be removed along with the collected soil material. The entrance should then be reconstructed.
- Areas that have received mud-tracking or sediment deposits shall be swept or washed. Washing shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device (not into storm drains, ditches, or waterways).

F. Temporary Seed and Mulch:

- Mulched areas should be inspected after rain events to check for rill erosion.
- If less than 90% of the soil surface is covered by mulch, additional mulch shall be applied in bare areas.
- In applications where seeding and mulch have been applied in conjunction with erosion control blankets, the blankets must be inspected after rain events for dislocation or undercutting.
- Mulch shall continue to be reapplied until 95% of the soil surface has established temporary vegetative cover.

G. Stabilized Drainage Swales:

- Sediment accumulation in the swale shall be removed once the cross section of the swale is reduced by 25%.
- The swales shall be inspected after rainfall events. Any evidence of sloughing of the side slopes or channel erosion shall be repaired and corrective action should be taken to prevent reoccurrence of the problem.
- In addition to the stabilized lining of the channel (i.e. erosion control blankets), stone check dams may be needed to further reduce channel velocity.

5. **Housekeeping:** The following general performance standards apply to the proposed project.

A. Spill Prevention: Controls must be used to prevent pollutants from being discharged from materials on-site, including storage practices to minimize exposure of the materials to stormwater, and appropriate spill prevention, containment, and response planning and implementation.

B. Groundwater Protection: During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors, accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

C. Fugitive Sediment and Dust: Actions must be taken to insure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control.

D. Debris and Other Materials: Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

E. Trench or Foundation Dewatering: Trench dewatering is the removal of water from trenches, foundations, cofferdams, ponds, and other areas within the construction area that retain water after excavation. In most cases, the collected water is heavily silted and hinders correct and safe construction practices. The collected water must be removed from the ponded area, either through gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved.

After Construction

1. **Inspection:** After construction, the owner or operator shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan.

2. **Maintenance, and repair:** If a BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator shall take corrective actions to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective actions to the Department of Public Services (DPS). The following is a list of permanent erosion control and stormwater management measures and the inspection, maintenance, and housekeeping tasks to be performed after construction.

   A. Vegetated Areas:
      - Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems.
      - Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. Underdrained Grass Filter
      - The inlet and outlet of the BMP shall be checked periodically to ensure that flow structures are not blocked by debris. Inspections should be conducted monthly during wet weather conditions from March to November.
      - Debris and sediment buildup shall be removed from the forebay and basin upon reaching a 6-inch accumulation within the forebay and 2 inches within the basin, but not less than annually.
      - Mowing of grass may be conducted semiannually to a height of no less than 6-inches, with hand held trimmers or push mowers
      - Grass filters shall be inspected annually for erosion, destabilization of sideslopes, embankment settling and other signs of structural failure. Corrective action should be taken immediately upon identification of problems.
      - Rototill top of filter bed when ponding exceeds 48 hours
      - Replace top several inches of filter material when ponding exceeds 72 hours

   C. Catch Basins:
      - Inspect and, if required, clean-out catch basins at least once a year, preferably in early spring.
      - Clean out must include the removal and legal disposal of accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins.

3. **Annual Report:** The owner or operator or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification that the person has inspected the BMPs and that they are adequately maintained and functioning as intended by the approved post-construction stormwater management plan, or that they require maintenance or repair, including the record of the deficiency and corrective actions taken.

4. **Duration of Maintenance:** Perform maintenance as described and required for any associated permits unless and until the system is formally accepted by a municipality or quasi-municipal district, or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system. If a municipality or quasi-municipal district chooses to accept a stormwater management system, or a component of a stormwater system, it must provide a letter to the MDEP stating that it assumes responsibility for the system. The letter must specify the components of the system for which the municipality or district will assume responsibility, and that the municipality or district agrees to maintain those components of the system in compliance with MDEP standards. Upon such assumption of responsibility, and approval by the MDEP, the municipality, quasi-municipal district, or association becomes a co-permittee for this purpose only and must comply with all terms and conditions of the permit.

Attachments

Attachment 1 – Sample Stormwater Inspection and Maintenance Form
1728 Washington Avenue, Portland, Maine

Sample Stormwater Inspection and Maintenance Form

1728 Washington Avenue
Portland, Maine
Attachment 1

This log is intended to accompany the stormwater Inspection, Maintenance and Housekeeping Plan for the Portland Retirement Residence. The following items shall be checked, cleaned and maintained on a regular basis as specified in the Maintenance Plan and as described in the table below. This log shall be kept on file for a minimum of five (5) years and shall be available for review. Qualified personnel familiar with drainage systems and soils shall perform all inspections. Attached is a copy of the construction and post-construction maintenance logs.

Item	Maintenance Required & Frequency	Date Completed	Maintenance Personnel	Comments
Vegetated Areas	Inspect Slopes			
	Replant Bare Areas			
	Check after Major Storms			
Underdrained Grass Filter	Inspect inlets/outlets to ensure no blockage from debris			
	Inspect sideslopes annually for erosion, destabilization, and embankment settling.			
Catch Basins and Culverts	Remove accumulated sediment and debris			
	Sump depth			