



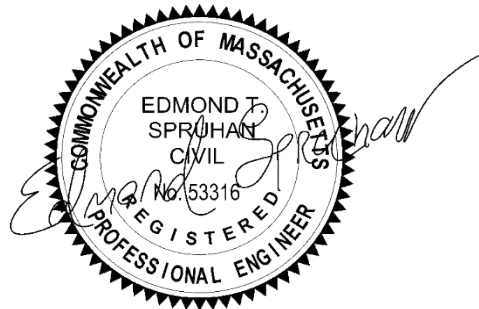
SPRUHAN ENGINEERING

80 Jewett St Unit 01, Newton, MA 02458
phone: 617-816-0722 email: edmond@spruhaneng.com

STORMWATER MANAGEMENT REPORT

PROJECT:

140 DARTMOUTH ST, NEWTON, MA



Prepared by:
Spruhan Engineering, P.C.
October 11, 2024

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1. Introduction

Spruhan Engineering, P.C. (“Spruhan”) has prepared this Stormwater Management Report for the proposed development of **140 Dartmouth Street, Newton, Massachusetts** (the “Property”). The proposed development consists of an addition to a single-family dwelling (the “Proposed Development”). The Property will also be improved with a renewed paved driveway, patio and landscaped areas.

Following Section 29-148(C)(3) of the City of Newton Ordinances, the Proposed Development requires a “major stormwater management permit” because it will increase the amount of impervious surface at the Property by more than 1,000 square feet. Spruhan has designed the proposed stormwater management system to meet these standards.

2. Existing Conditions

The Property is a 37,487.00 square foot lot located on Dartmouth Street, between Lansing Road and Fuller Street. The surrounding neighborhood is residential character and abutting properties are single-family dwellings. Table 1 provides a summary of the existing impervious, pervious, and landscaped areas at the Property.

EXISTING AREAS	
LOT AREA	37,487.00 S.F.
EXISTING IMPERVIOUS AREA	
ROOF HOUSE	3,145.37 S.F.
DRIVEWAY	1,142.15 S.F.
CONCRETE WALKWAY	325.97 S.F.
CONC/BRICK LANDING	87.46 S.F.
STONE WALKWAY/PATIO	838.71 S.F.
RETAINING WALL	142.57 S.F.
STONE/BRICK STEPS	264.59 S.F.
TOTAL	5,946.82 S.F.
EXISTING PERVIOUS AREA	
WINDOW WELL	18.88 S.F.
TOTAL	18.88 S.F.
LANDSCAPE AREA	31,521.30 S.F.

Table 1- Summary of the existing impervious, pervious and landscaped areas at the Property

2.1 Existing Topography and Drainage Infrastructure

The Property has an approximate 8.9% slope that runs from the North (the front of the Property) to the South (the rear of the Property). The Property does not have an existing drainage or infiltration system. Consequently, stormwater at the Property currently scours across the surface at grade.

3. Proposed Conditions

3.1 Project Description

The proposal consists of developing the property with an addition to a single-family dwelling. Table 2 details the proposed impervious, pervious, and landscaped areas at the Property.

PROPOSED AREAS	
LOT AREA	37,487.00 S.F.
PROPOSED IMPERVIOUS AREA	
ROOF HOUSE+ ADDITION	5,226.56 S.F.
DRIVEWAY	951.50 S.F.
CONCRETE WALKWAY	280.10 S.F.
CONC/BRICK LANDING	31.32 S.F.
TERRACE	1,161.75 S.F.
RETAINING WALL	206.72 S.F.
STONE/BRICK STEPS	108.69 S.F.
TOTAL	7,966.64 S.F.
PROPOSED PERVIOUS AREA	
	0.00 S.F.
TOTAL	0.00 S.F.
LANDSCAPE AREA	29,520.36 S.F.

Table 2- Proposed impervious, pervious, and landscaped areas at the Property

3.2 Soil Information (Summary)

The NRCS Web Soil Survey shows one Map Unit inside our area of interest. This is listed next and the percentages of Area of Interest in the Map unit Legend Table:

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
255A	Windsor loamy sand, 0 to 3 percent slopes	0.4	56.3%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	0.3	43.7%
Totals for Area of Interest		0.7	100.0%

Map unit **255A** refers to **sand**, these soils have a Hydrological soil group “A”.

Map unit **629C** refers to **gravelly loamy sand**, these soils have a Hydrological soil group “A”.

Also, a test pit was performed on the site and the hole log shows **loamy sand** was found and these properties were applied to the HydroCAD software calculations and Drawdown time calculations as well. Find the test pits results below.



DEEP OBSERVATION HOLE LOG												
DEEP OBSERVATION HOLE NUMBER:					TP-1		GROUND ELEVATION:					139.50
Depth (in)	Horizon/ Layer	Matrix: Color-Moist	Redoximorphic Features			Texture (USDA)	Coarse Fragments (Percent by Volume)		Structure	Consistence (Moist)	Other	
			Depth (in)	Color	Percent		Gravel	Cobbles & Stones				
0-11 (138.58)	Ap	10 YR 4/3	--	--	--	SANDY LOAM	--	--	CRB	FRI	--	
11-110 (130.33)	C	10 YR 7.5	--	--	--	LOAMY SAND	5	5	GRAN.	V.FRI	--	
--	--	--	--	--	--	--	--	--	--	--	--	
NOTES: 1. NO REDOX, WEEPING, OR STANDING WATER OBSERVED 2. LOGGED BY MATTHEW MUI, SE14259 ON 06/29/2024												

3.3 Infiltration System

The proposed infiltration system consists of 12 Stormtech Chambers embedded in a crushed stone pit. Calculations for such systems are shown next:

Design Criteria:

Proposed post-construction Impervious areas=	7,966.64 SF
Design for:	2" Rainstorm
Storage by 1 chamber =	46 CF (Stormtech SC-740)
Chamber height =	30.0" (2.5')
Stone cover thickness=	6" (0.5')
Stone base thickness=	24" (2.0')
Void ratio (crushed stone) =	0.40

Total Storage Required:

$$V_R = (2"/12) (7,966.64 \text{ SF}) = \underline{\underline{1,327.77 \text{ CF}}}$$

CAPACITY OF PROPOSED INFILTRATION SYSTEM

Volume	Invert	Avail. Storage	Storage Description
#1A	132.50'	1,636 cf	28.00'W x 33.14'L x 5.00'H Field A 4,640 cf Overall - 551 cf Embedded = 4,089 cf x 40.0% Voids
#2A	134.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	137.50'	9 cf	6.0" Round Pipe Storage -Impervious L= 47.5' S= 0.1474'
		2,196 cf	Total Available Storage

Total Storage Provided (**2,196.00 CF**) > Total Storage Required (**1,327.77 CF** CF/D)

The proposed infiltration system complies with the City of Newton Stormwater Management and Erosion Control Rules & Regulations, Section 5: Design Standards Part C.3.a page 6 of 17, where it states: "Stormwater management systems on new development sites shall be designed to: a) Retain the volume of runoff equivalent to, or greater than, two (2) inches multiplied by the total post-construction impervious surface area on the site..."

3.4 Drawdown time (Time to empty) Calculations.

Drawdown time (Time to empty) Calculations

$$Time = \frac{rv}{(k)(\text{Inf. System bottom Area})}$$

rv = Storage capacity of the infiltration system.

k = Rawls rate based on soil texture class (2.41 $\frac{\text{in}}{\text{hr}}$ for Sandy Loam)

$$\text{Time}_{\text{drawdown}} = (2,196 \text{ cf}) / [(2.41 \text{ in/hr}) (1\text{ft}/12\text{in}) (924 \text{ sf})]$$

$$\text{Time} = \underline{\underline{11.83 \text{ hr}}} < 72.00\text{hr}$$

3.5 Flowrate & volume of stormwater runoff summary.

The proposed infiltration system designed for this site will control the runoff from the site and substantially improve drainage at the property.

HydroCAD was used to model the site for the existing and proposed conditions for the 2-year, 10-year, 25-year, and 100-year type III storm events based on The NOAA Atlas 14, Volume 10, Version 3, Rain Information for Newton Center, Massachusetts, USA.

Storm Event	Precipitation depths NOAA Atlas 14 (inches)	Precipitation depths used (inches)
2-Year	3.26	3.26
10-Year	5.13	5.13
25-Year	6.30	6.30
100-Year	8.10	8.78**

Table 3- Precipitation depths used for the HydroCAD analysis.

**According to the City of Newton Stormwater Management and Erosion Control Rules & Regulations, Section 5: Design Standards Part B.6 page 5 of 17: “... the 100-year design storm is based on 8.78 inches of precipitation in 24 hours...”. In addition, Section 5: Design Standards Part C.2 page 6 of 17, states: “Projects shall comply with the Stormwater Standards of the most recent version of Massachusetts Stormwater Management Handbook (Handbook), and the City of Newton General Construction Detail Book and Streets Design Guide. Where an inconsistency exists between the Handbook and these Regulations, the stricter shall apply”.

Detailed HydroCAD calculations are included in Appendix A. Table 4, below, provides a summary of the existing and proposed conditions as they relate to flowrate and volume of stormwater runoff at the Property

SUMMARY TABLE				
Rainfall Event	Runoff Flow Rate (cfs)		Volume of Runoff (cf)	
	Existing	Proposed	Existing	Proposed
2-Year	0.44	0.12	1,815	706
10-Year	1.04	0.37	4,239	1,910
25-Year	1.69	0.67	6,201	2,805
100-Year	3.33	2.33	11,125	7,631

Table 4- Discharge points summary table.

3.6 Low Impact Development (LID)

Low Impact Development (LID) strategies use careful site design and decentralized stormwater management to reduce the environmental footprint of new growth and redevelopment. This approach improves water quality, minimizes the need for expensive pipe and pond stormwater systems, and creates more attractive developments.

The following strategies outline the LID methods that were implemented in this project:

1. **Use of Filter Mitts:**
 - a. Erosion control
 - b. Detains sediment, absorbs orders and degrades volatile organic compounds allows water by-pass, and is a food resource for beneficial microorganisms, which remediate by metabolizing wood preservatives, petroleum products, pesticides and both chlorinated and non-chlorinated hydrocarbons in stormwater runoff from reaching water resources, prevents erosion and silting on embankments parallel to creeks, lakes, and rivers, prevents erosion and turf loss on roadsides, hillsides, playing fields, and golf courses.
2. **Grass swales:** broad, open channels sown with erosion resistant and flood tolerant grasses.
 - a. Management Objectives:
 - i. Provide water quality treatment; remove suspended solids; heavy metals, trash.
 - ii. Reduce peak discharge rate and total runoff volume.
 - iii. Infiltrate water into the ground.
 - iv. Provide a location for snow storage.
3. **Infiltration Trenches and Dry Wells.** These are standard stormwater management structures that store water in the void space between crushed stone or gravel; the water slowly percolates downward into the subsoil.
 - a. Management Objectives:
 - i. Remove suspended solids, heavy metals trash, oil, and grease.
 - ii. Reduce peak discharge rate and total runoff volume.
 - iii. Provide modest infiltration and recharge.
 - iv. Provide snow storage areas.
4. **Other LID Implementations:**
 - a. Shared Driveways
 - b. Green Roofs
 - c. Blue Roofs
 - d. Tree box filters
 - e. Eliminating curbs and gutters or minimizing in new construction.
 - f. Soil Amendments.
 - g. Creating long flow paths over landscaped areas.
 - h. Creating terraces and check dams.
 - i. Pervious pavers.

- i. Infiltration, Filtration o Rain gardens.
- ii. Disconnected downspouts (not on hills).
- iii. Filter Mitts.

5. Low Impact Landscaping:

- a. Native, drought tolerant species.
- b. Turf area conversion (shrubs, etc.).
- c. Encouraging longer grass length.
- d. Planting wildflower meadows rather than turf along medians.

3.7 Total Suspended Solids (TSS) removal & Total Phosphorus (TP) reduction

According to City of Newton Stormwater Management and Erosion Control Rules & Regulations, Section 5: Design Standards Part:

- C.3.c: Stormwater management systems on **new development** sites shall be designed to:
 - a) Remove 90% of the average annual load of Total Suspended Solids generated from the total post-construction impervious area on the site; and
 - b) Calculate the existing and proposed average annual Total Phosphorus (TP) load based on the land use(s) and demonstrate 60% reduction of the TP load generated from the total post-construction impervious surface area on the site: and
- C.4.c: Stormwater management systems on **redevelopment** sites shall be designed to:
 - a) Remove 85% of the average annual load of Total Suspended Solids generated from the total post-construction impervious area on the site; and
 - b) Calculate the existing and proposed average annual Total Phosphorus (TP) load based on the land use(s) and demonstrate 50% reduction of the TP load generated from the total post-construction impervious surface area on the site: and

Therefore, the Stormwater system has been designed to remove 85% the average annual load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site and achieve a total of 60% reduction of the average annual Total Phosphorus (TP) load based generated from the total post-construction impervious surface area on the site.

INSTRUCTIONS:

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

Location:

	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
TSS Removal Calculation Worksheet	Subsurface Infiltration Structure	0.80	1.00	0.80	0.20
	Deep Sump and Hooded Catch Basin	0.25	0.20	0.05	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15

Total TSS Removal =

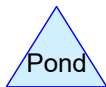
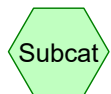
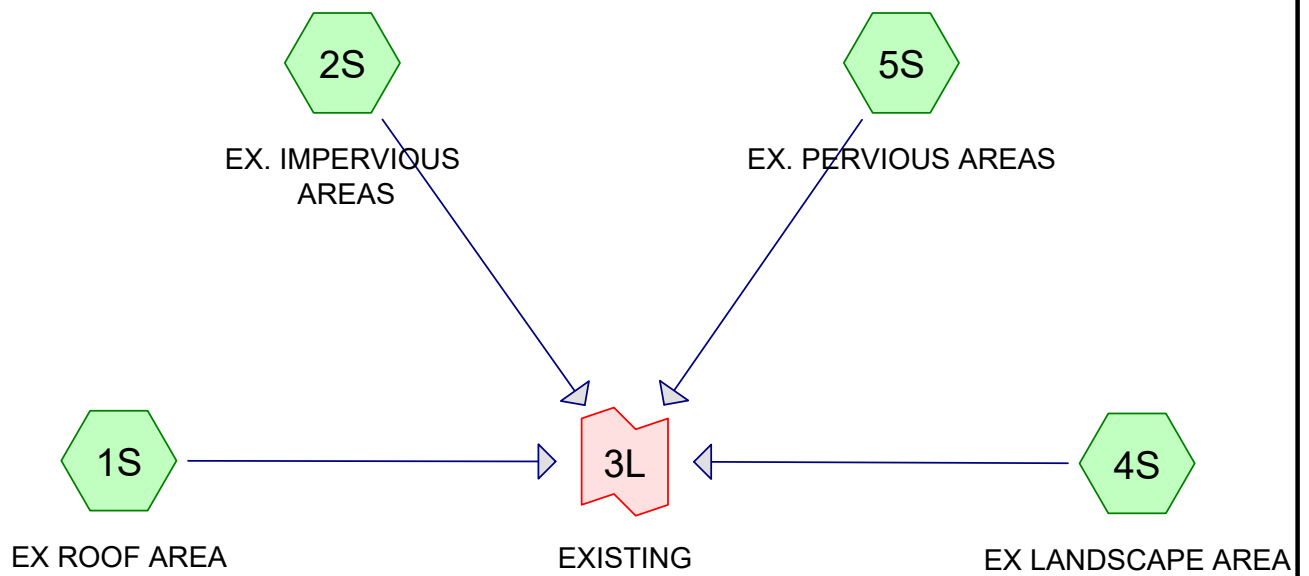
Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

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

PHOSPHORUS LOADS / REDUCTIONS	
TP = A*L; Where:	
A	= Total impervious area of post-development (acres)
L	= Load of a pollutant in pounds per acre per year.
Ac	= Captured impervious area of post-development (acres)
PRE-DEVELOPMENT PHOSPHORUS LOADING (Lpre)	
Tppre	= 0.1365 ACRES X 1.96 lbs/acre/year
Tppre	= <input type="text" value="0.268 lbs/year"/>
POST-DEVELOPMENT PHOSPHORUS LOADING (Lpost)	
TP _{post}	= 0.1829 Acres x 1.96 lbs/acre/year
TP _{post}	= <input type="text" value="0.358 lbs/year"/>
REDUCED TP LOAD	
REDUCED TP	= 0.1038 Acres x 1.96 lbs/acre/year
REDUCED TP	= <input type="text" value="0.204 lbs/year"/>
TOTAL PHOSPHORUS REDUCTION % (TP)	
TP RED. (%)	= <input type="text" value="56.77 %"/>

Appendix A – HydroCAD Calculations



Routing Diagram for 3- EXISTING
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3- EXISTING

Prepared by {enter your company name here}

Printed 8/20/2024

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
31,521	49	50-75% Grass cover, Fair, HSG A (4S)
1,142	98	Paved parking, HSG A (2S)
3,145	98	Roofs, HSG A (1S)
1,660	98	Unconnected pavement, HSG A (2S)
19	43	Woods/grass comb., Fair, HSG A (5S)
37,487	57	TOTAL AREA

3- EXISTING

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
37,487	HSG A	1S, 2S, 4S, 5S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
37,487		TOTAL AREA

3- EXISTING

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
31,521	0	0	0	0	31,521	50-75% Grass cover, Fair
1,142	0	0	0	0	1,142	Paved parking
3,145	0	0	0	0	3,145	Roofs
1,660	0	0	0	0	1,660	Unconnected pavement
19	0	0	0	0	19	Woods/grass comb., Fair
37,487	0	0	0	0	37,487	TOTAL AREA

Sub
Nun

3- EXISTING

Type III 24-hr 2-Year Rainfall=3.26"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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: EX ROOF AREA Runoff Area=3,145 sf 100.00% Impervious Runoff Depth=3.03"
Tc=5.0 min CN=98 Runoff=0.24 cfs 793 cf

Subcatchment 2S: EX. IMPERVIOUS Runoff Area=2,802 sf 100.00% Impervious Runoff Depth=3.03"
Tc=5.0 min CN=98 Runoff=0.21 cfs 707 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=31,521 sf 0.00% Impervious Runoff Depth=0.12"
Tc=5.0 min CN=49 Runoff=0.01 cfs 315 cf

Subcatchment 5S: EX. PERVIOUS AREAS Runoff Area=19 sf 0.00% Impervious Runoff Depth=0.03"
Tc=5.0 min CN=43 Runoff=0.00 cfs 0 cf

Link 3L: EXISTING

Inflow=0.44 cfs 1,815 cf
Primary=0.44 cfs 1,815 cf

Total Runoff Area = 37,487 sf Runoff Volume = 1,815 cf Average Runoff Depth = 0.58"
84.14% Pervious = 31,540 sf 15.86% Impervious = 5,947 sf

3- EXISTING

Type III 24-hr 2-Year Rainfall=3.26"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.24 cfs @ 12.07 hrs, Volume= 793 cf, Depth= 3.03"

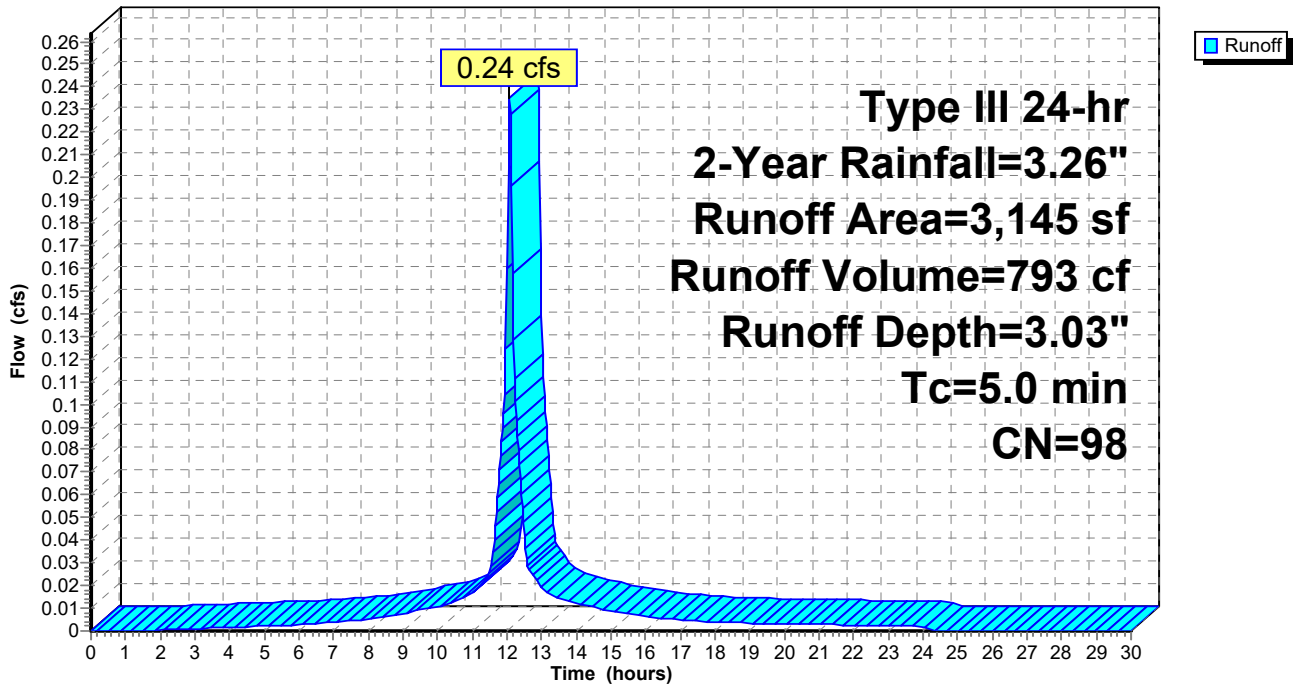
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.26"

Area (sf)	CN	Description
3,145	98	Roofs, HSG A
3,145		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA

Hydrograph



3- EXISTING

Type III 24-hr 2-Year Rainfall=3.26"

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Summary for Subcatchment 2S: EX. IMPERVIOUS AREAS

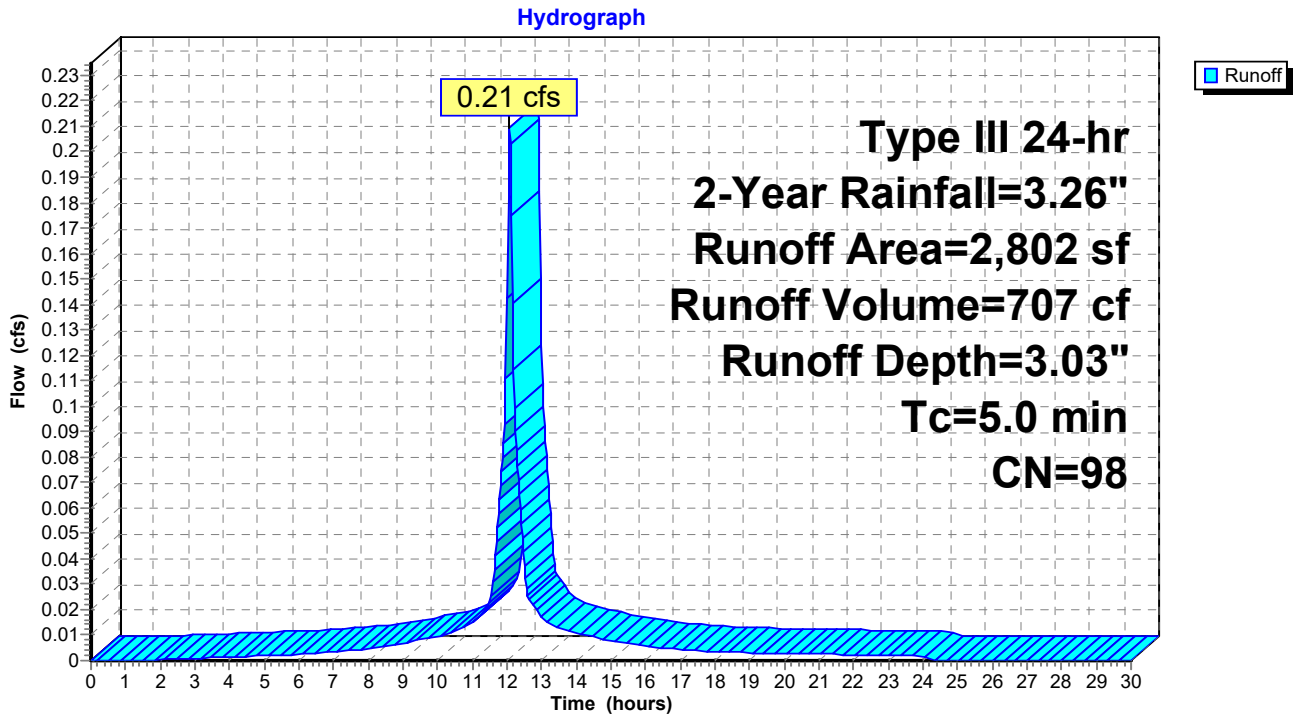
Runoff = 0.21 cfs @ 12.07 hrs, Volume= 707 cf, Depth= 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.26"

Area (sf)	CN	Description
1,142	98	Paved parking, HSG A
326	98	Unconnected pavement, HSG A
87	98	Unconnected pavement, HSG A
839	98	Unconnected pavement, HSG A
143	98	Unconnected pavement, HSG A
265	98	Unconnected pavement, HSG A
2,802	98	Weighted Average
2,802		100.00% Impervious Area
1,660		59.24% Unconnected

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

Subcatchment 2S: EX. IMPERVIOUS AREAS



3- EXISTING

Type III 24-hr 2-Year Rainfall=3.26"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 0.01 cfs @ 12.48 hrs, Volume= 315 cf, Depth= 0.12"

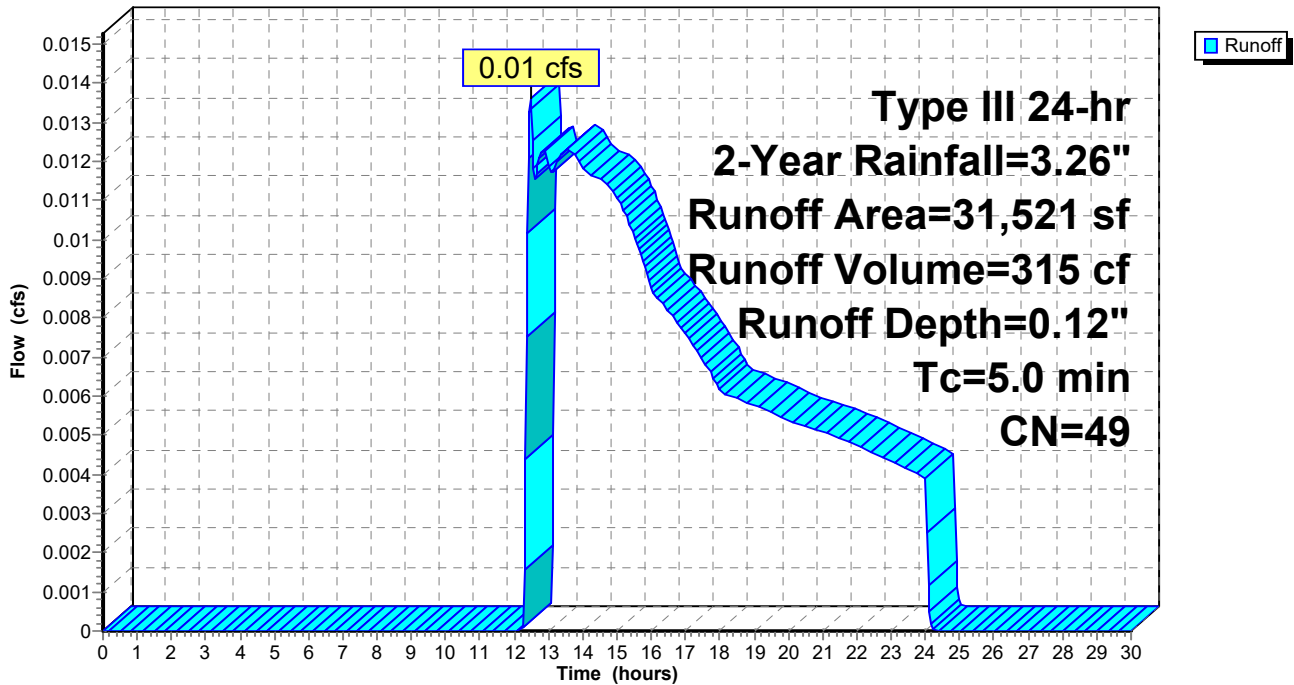
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.26"

Area (sf)	CN	Description
31,521	49	50-75% Grass cover, Fair, HSG A
31,521		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



3- EXISTING

Type III 24-hr 2-Year Rainfall=3.26"

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Summary for Subcatchment 5S: EX. PERVIOUS AREAS

Runoff = 0.00 cfs @ 16.91 hrs, Volume= 0 cf, Depth= 0.03"

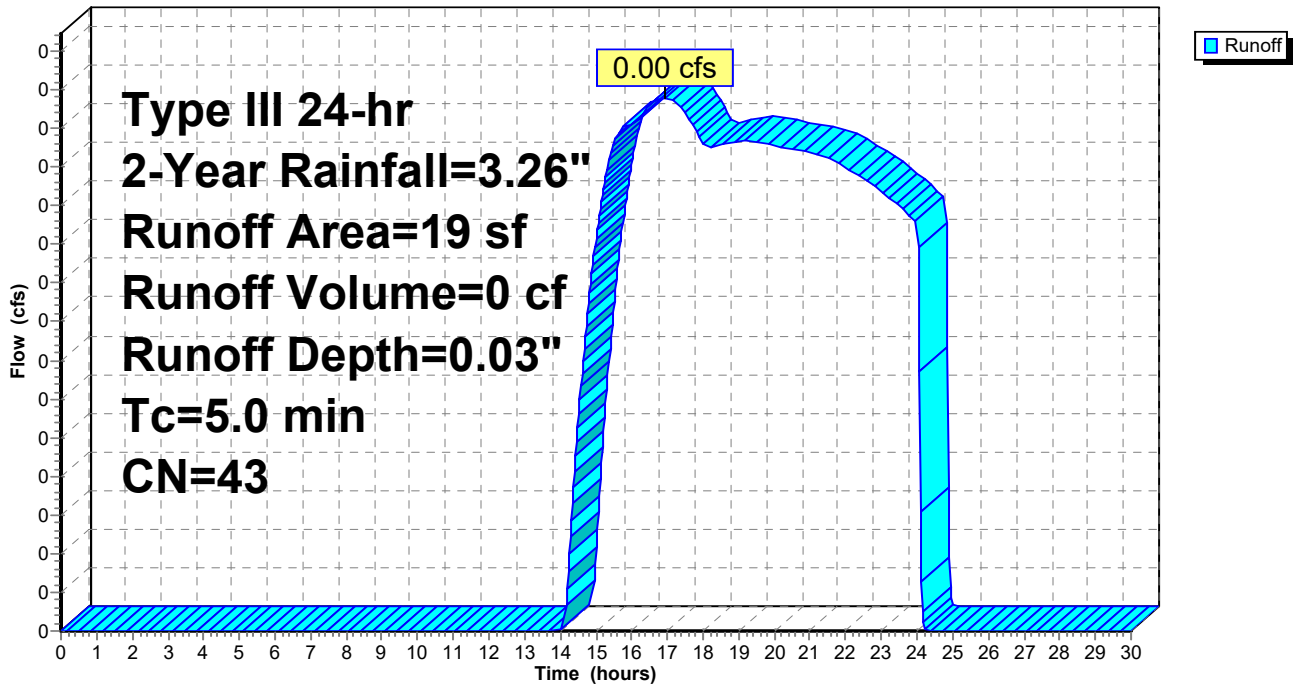
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.26"

Area (sf)	CN	Description
19	43	Woods/grass comb., Fair, HSG A
19		100.00% Pervious Area

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

Subcatchment 5S: EX. PERVIOUS AREAS

Hydrograph



3- EXISTING

Type III 24-hr 2-Year Rainfall=3.26"

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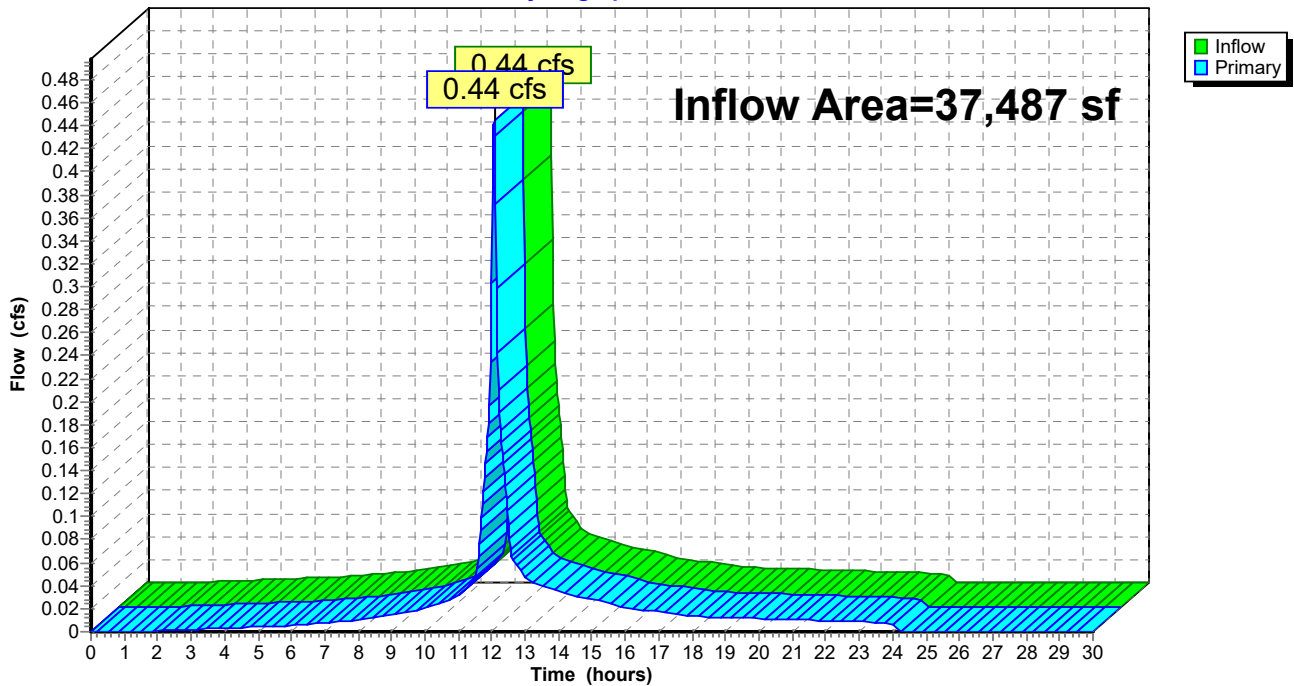
Summary for Link 3L: EXISTING

Inflow Area = 37,487 sf, 15.86% Impervious, Inflow Depth = 0.58" for 2-Year event
Inflow = 0.44 cfs @ 12.07 hrs, Volume= 1,815 cf
Primary = 0.44 cfs @ 12.07 hrs, Volume= 1,815 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph



3- EXISTING

Type III 24-hr 10-Year Rainfall=5.13"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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: EX ROOF AREA Runoff Area=3,145 sf 100.00% Impervious Runoff Depth=4.89"
Tc=5.0 min CN=98 Runoff=0.37 cfs 1,282 cf

Subcatchment 2S: EX. IMPERVIOUS Runoff Area=2,802 sf 100.00% Impervious Runoff Depth=4.89"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,143 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=31,521 sf 0.00% Impervious Runoff Depth=0.69"
Tc=5.0 min CN=49 Runoff=0.37 cfs 1,814 cf

Subcatchment 5S: EX. PERVIOUS AREAS Runoff Area=19 sf 0.00% Impervious Runoff Depth=0.39"
Tc=5.0 min CN=43 Runoff=0.00 cfs 1 cf

Link 3L: EXISTING

Inflow=1.04 cfs 4,239 cf
Primary=1.04 cfs 4,239 cf

Total Runoff Area = 37,487 sf Runoff Volume = 4,239 cf Average Runoff Depth = 1.36"
84.14% Pervious = 31,540 sf 15.86% Impervious = 5,947 sf

3- EXISTING

Type III 24-hr 10-Year Rainfall=5.13"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 1,282 cf, Depth= 4.89"

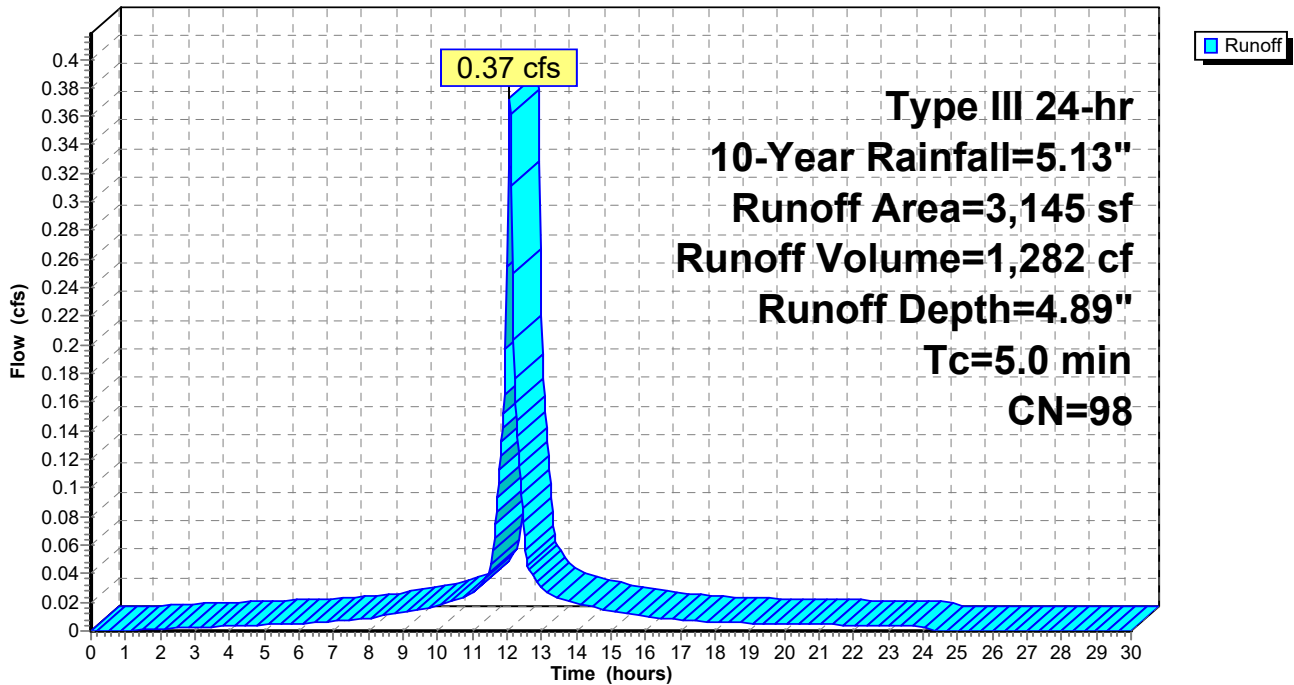
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (sf)	CN	Description
3,145	98	Roofs, HSG A
3,145		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA

Hydrograph



3- EXISTING

Type III 24-hr 10-Year Rainfall=5.13"

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Summary for Subcatchment 2S: EX. IMPERVIOUS AREAS

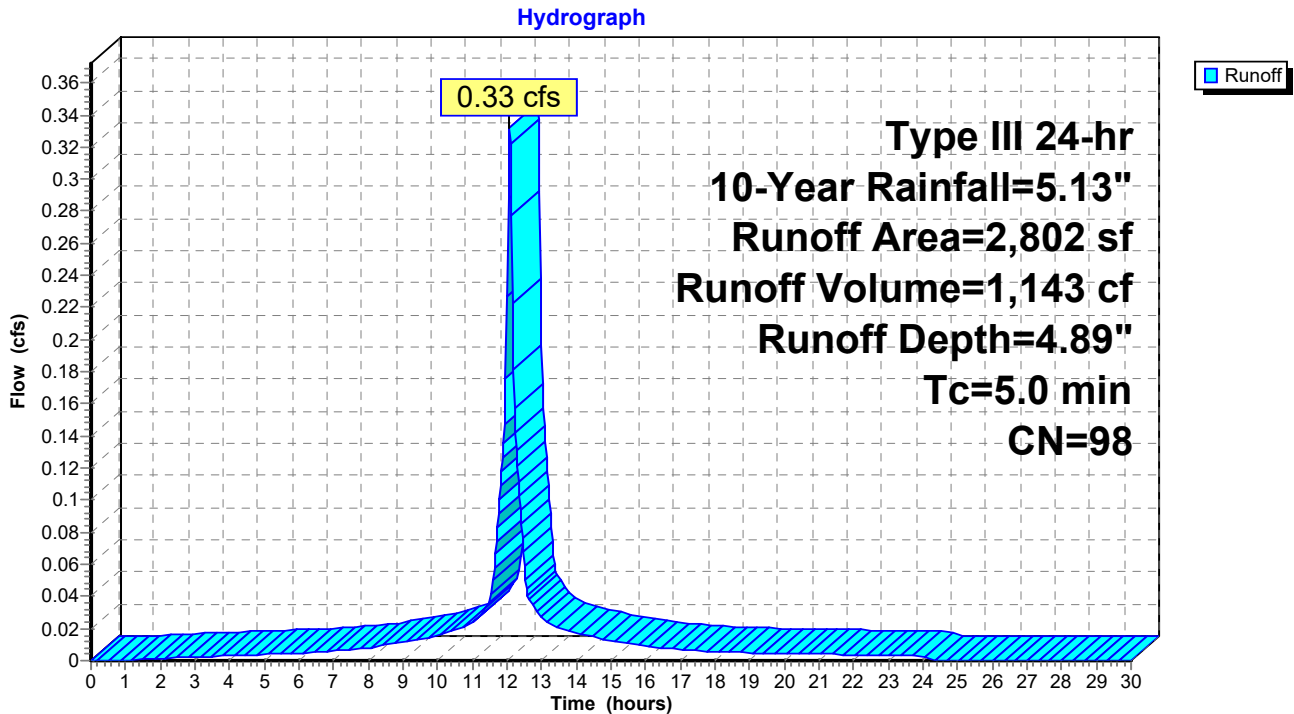
Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,143 cf, Depth= 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (sf)	CN	Description
1,142	98	Paved parking, HSG A
326	98	Unconnected pavement, HSG A
87	98	Unconnected pavement, HSG A
839	98	Unconnected pavement, HSG A
143	98	Unconnected pavement, HSG A
265	98	Unconnected pavement, HSG A
2,802	98	Weighted Average
2,802		100.00% Impervious Area
1,660		59.24% Unconnected

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

Subcatchment 2S: EX. IMPERVIOUS AREAS



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Type III 24-hr 10-Year Rainfall=5.13"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 0.37 cfs @ 12.11 hrs, Volume= 1,814 cf, Depth= 0.69"

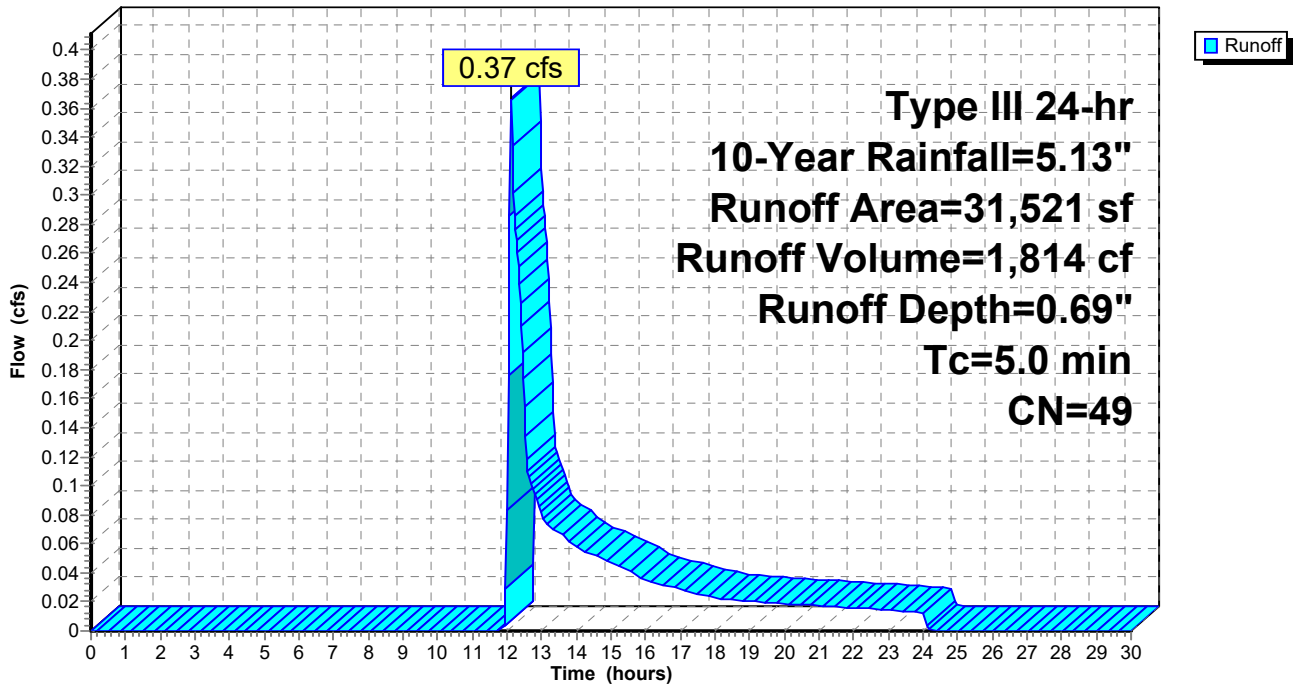
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (sf)	CN	Description
31,521	49	50-75% Grass cover, Fair, HSG A
31,521		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



3- EXISTING

Type III 24-hr 10-Year Rainfall=5.13"

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Summary for Subcatchment 5S: EX. PERVIOUS AREAS

Runoff = 0.00 cfs @ 12.32 hrs, Volume= 1 cf, Depth= 0.39"

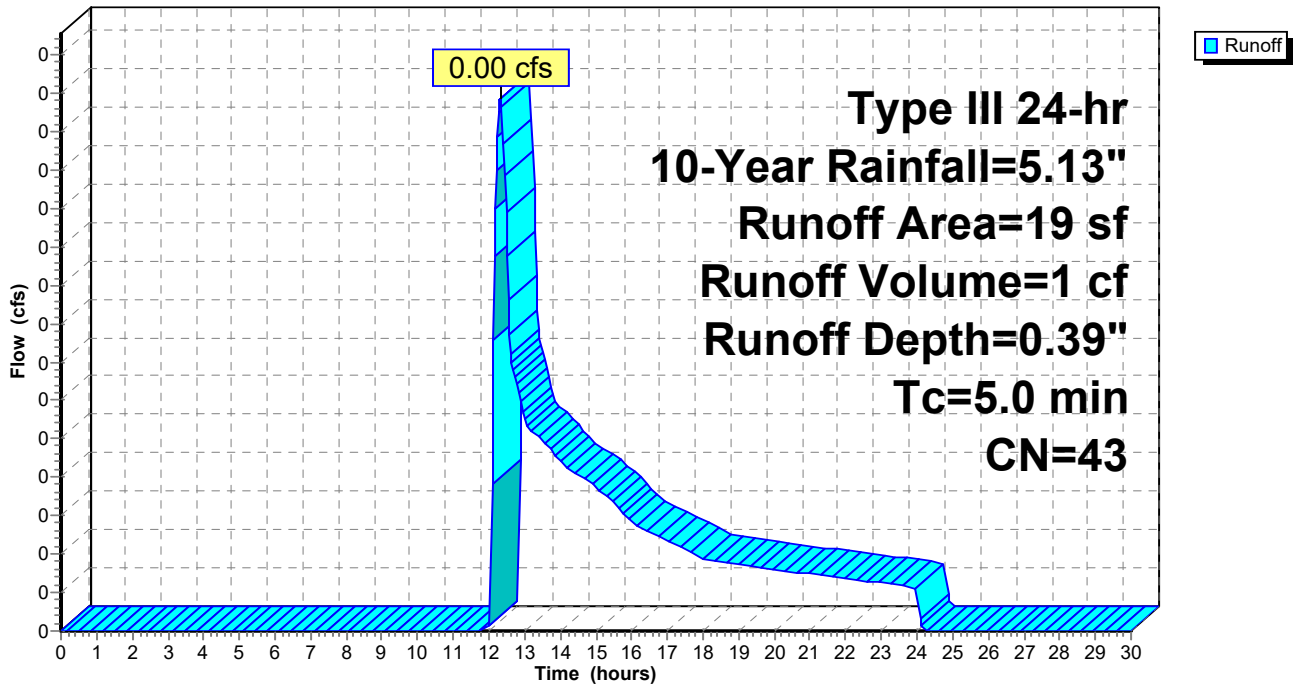
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (sf)	CN	Description
19	43	Woods/grass comb., Fair, HSG A
19		100.00% Pervious Area

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

Subcatchment 5S: EX. PERVIOUS AREAS

Hydrograph



3- EXISTING

Type III 24-hr 10-Year Rainfall=5.13"

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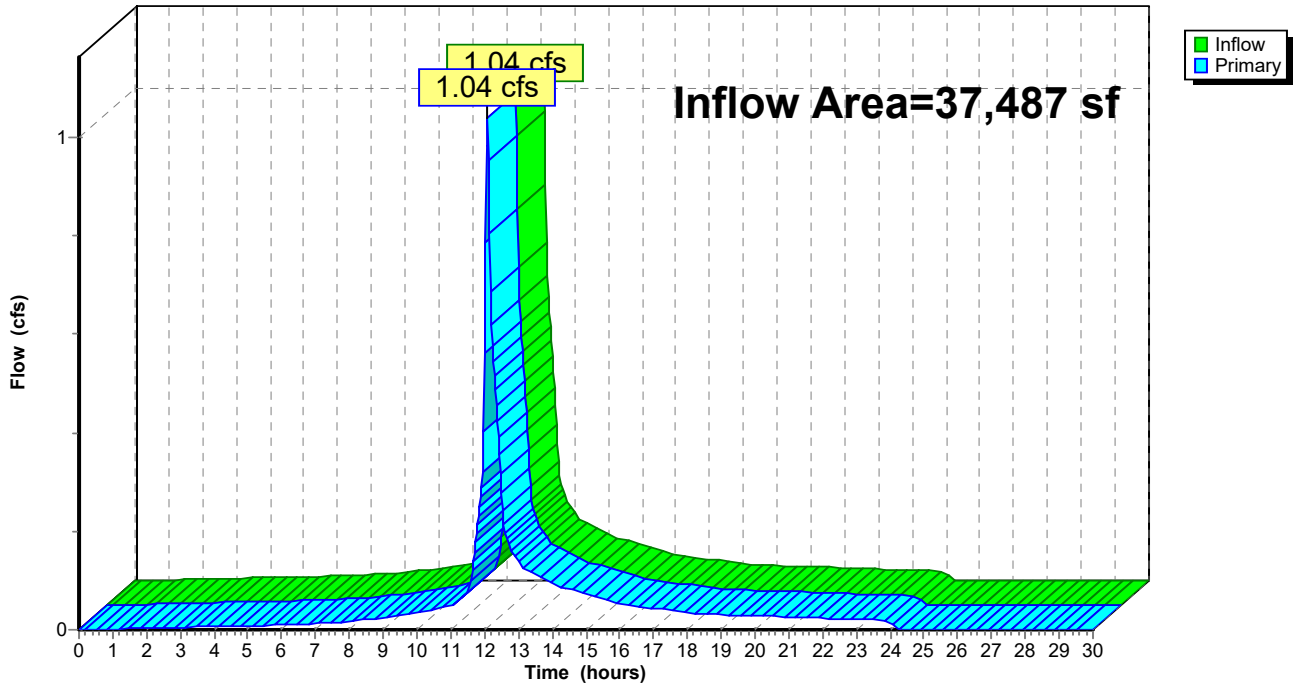
Summary for Link 3L: EXISTING

Inflow Area = 37,487 sf, 15.86% Impervious, Inflow Depth = 1.36" for 10-Year event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 4,239 cf
Primary = 1.04 cfs @ 12.09 hrs, Volume= 4,239 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph



3- EXISTING

Type III 24-hr 25-Year Rainfall=6.30"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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: EX ROOF AREA Runoff Area=3,145 sf 100.00% Impervious Runoff Depth=6.06"
Tc=5.0 min CN=98 Runoff=0.46 cfs 1,589 cf

Subcatchment 2S: EX. IMPERVIOUS Runoff Area=2,802 sf 100.00% Impervious Runoff Depth=6.06"
Tc=5.0 min CN=98 Runoff=0.41 cfs 1,415 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=31,521 sf 0.00% Impervious Runoff Depth=1.22"
Tc=5.0 min CN=49 Runoff=0.85 cfs 3,196 cf

Subcatchment 5S: EX. PERVIOUS AREAS Runoff Area=19 sf 0.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=43 Runoff=0.00 cfs 1 cf

Link 3L: EXISTING

Inflow=1.69 cfs 6,201 cf
Primary=1.69 cfs 6,201 cf

Total Runoff Area = 37,487 sf Runoff Volume = 6,201 cf Average Runoff Depth = 1.98"
84.14% Pervious = 31,540 sf 15.86% Impervious = 5,947 sf

3- EXISTING

Type III 24-hr 25-Year Rainfall=6.30"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.46 cfs @ 12.07 hrs, Volume= 1,589 cf, Depth= 6.06"

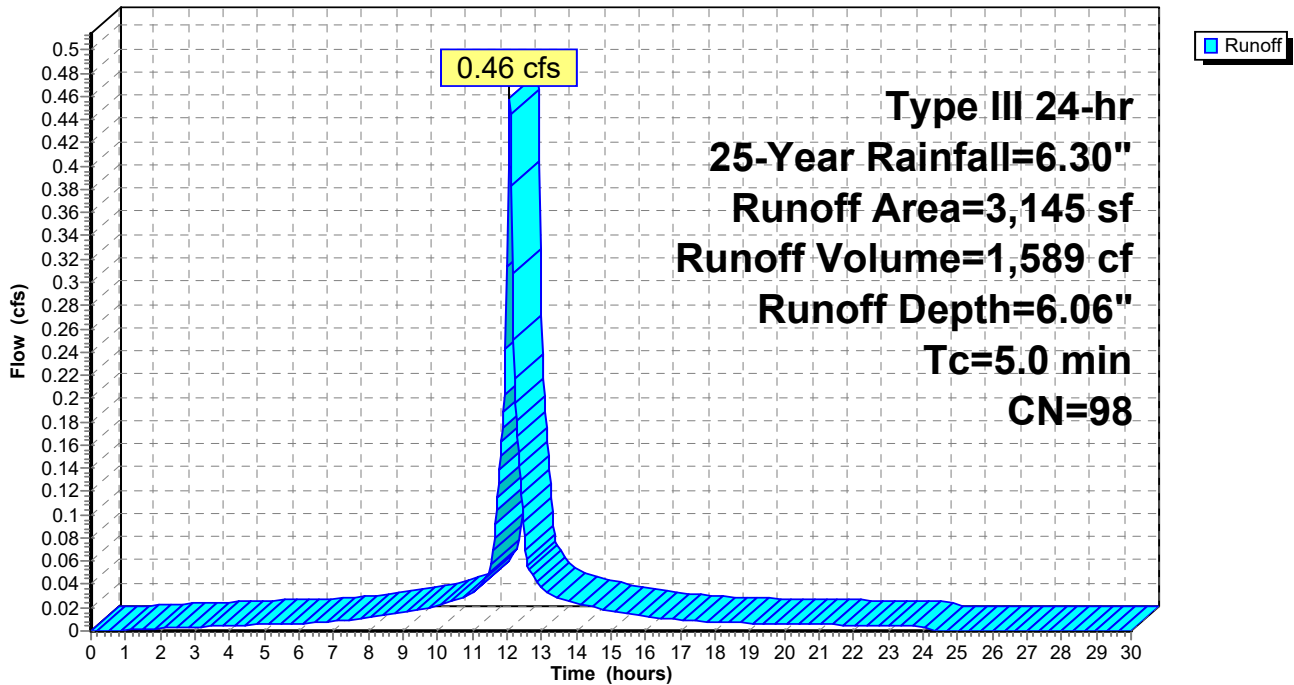
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25-Year Rainfall=6.30"

Area (sf)	CN	Description
3,145	98	Roofs, HSG A
3,145		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA

Hydrograph



3- EXISTING

Type III 24-hr 25-Year Rainfall=6.30"

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Summary for Subcatchment 2S: EX. IMPERVIOUS AREAS

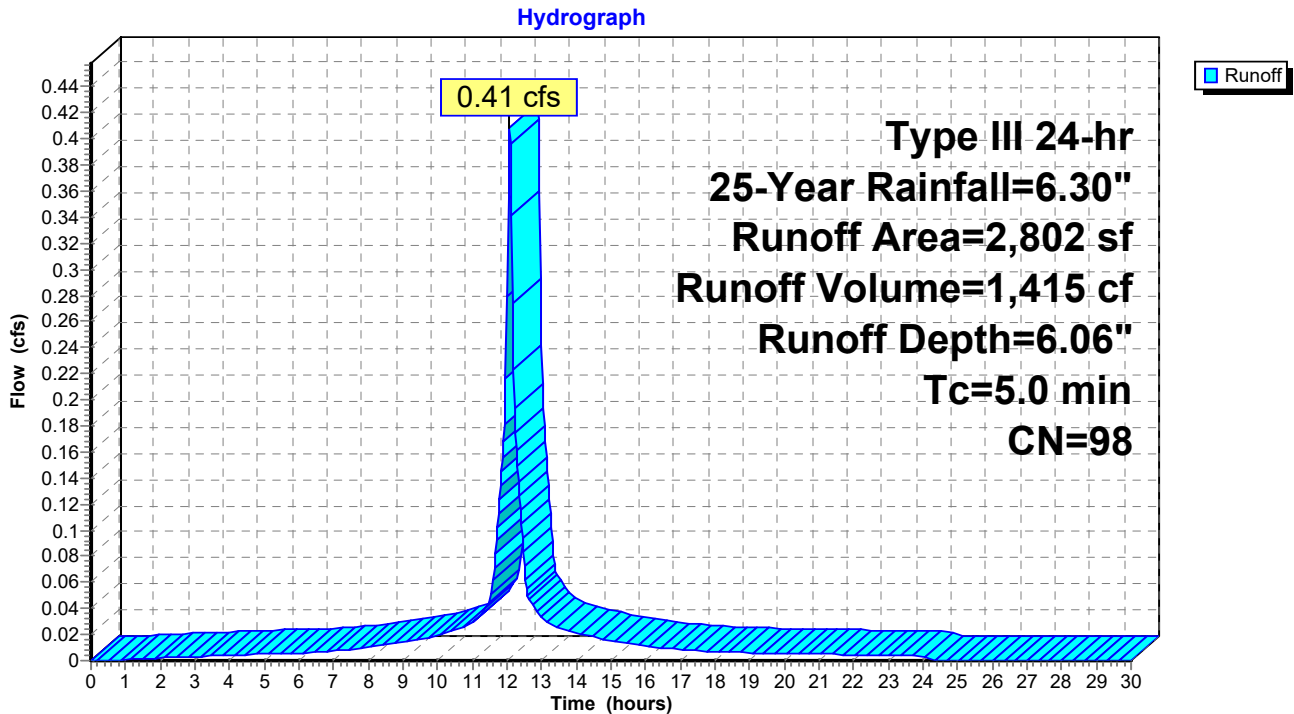
Runoff = 0.41 cfs @ 12.07 hrs, Volume= 1,415 cf, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.30"

Area (sf)	CN	Description
1,142	98	Paved parking, HSG A
326	98	Unconnected pavement, HSG A
87	98	Unconnected pavement, HSG A
839	98	Unconnected pavement, HSG A
143	98	Unconnected pavement, HSG A
265	98	Unconnected pavement, HSG A
2,802	98	Weighted Average
2,802		100.00% Impervious Area
1,660		59.24% Unconnected

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

Subcatchment 2S: EX. IMPERVIOUS AREAS



3- EXISTING

Type III 24-hr 25-Year Rainfall=6.30"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 3,196 cf, Depth= 1.22"

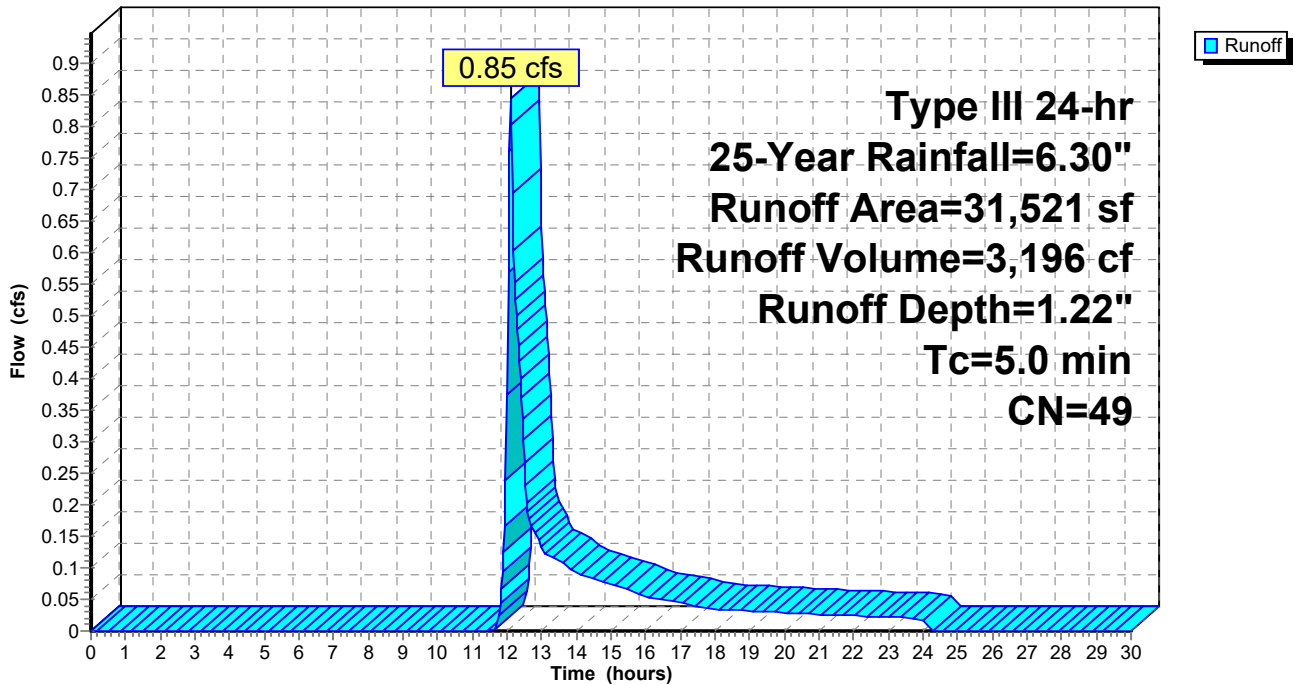
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.30"

Area (sf)	CN	Description
31,521	49	50-75% Grass cover, Fair, HSG A
31,521		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



3- EXISTING

Type III 24-hr 25-Year Rainfall=6.30"

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Summary for Subcatchment 5S: EX. PERVIOUS AREAS

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 1 cf, Depth= 0.79"

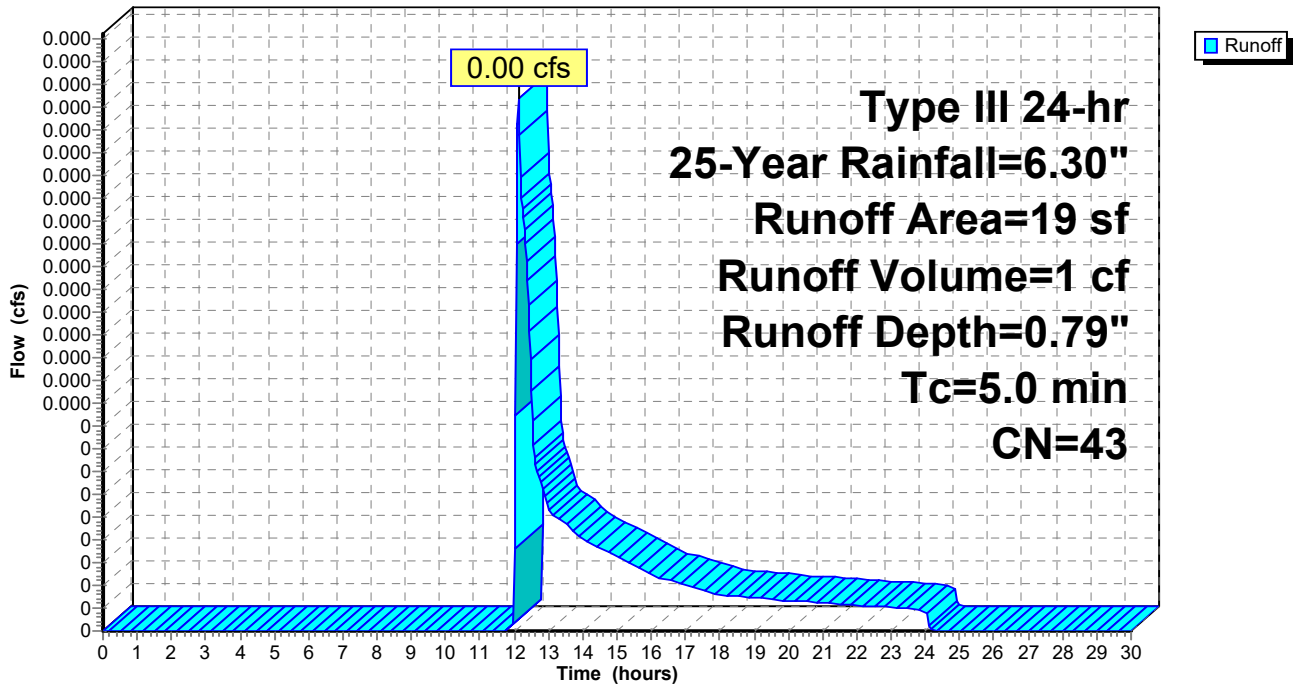
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=6.30"

Area (sf)	CN	Description
19	43	Woods/grass comb., Fair, HSG A
19		100.00% Pervious Area

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

Subcatchment 5S: EX. PERVIOUS AREAS

Hydrograph



3- EXISTING

Type III 24-hr 25-Year Rainfall=6.30"

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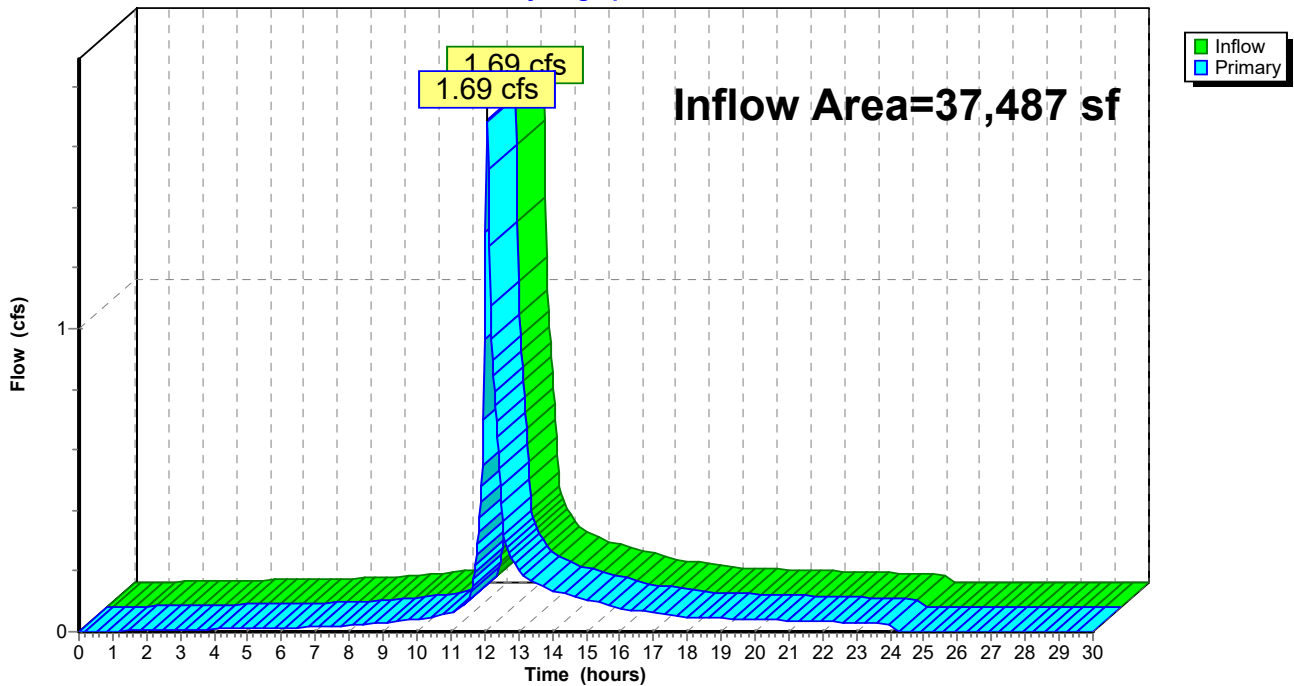
Summary for Link 3L: EXISTING

Inflow Area = 37,487 sf, 15.86% Impervious, Inflow Depth = 1.98" for 25-Year event
Inflow = 1.69 cfs @ 12.08 hrs, Volume= 6,201 cf
Primary = 1.69 cfs @ 12.08 hrs, Volume= 6,201 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

Hydrograph



3- EXISTING

Type III 24-hr 100-Year Rainfall=8.78"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 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: EX ROOF AREA Runoff Area=3,145 sf 100.00% Impervious Runoff Depth=8.54"
Tc=5.0 min CN=98 Runoff=0.64 cfs 2,238 cf

Subcatchment 2S: EX. IMPERVIOUS Runoff Area=2,802 sf 100.00% Impervious Runoff Depth=8.54"
Tc=5.0 min CN=98 Runoff=0.57 cfs 1,994 cf

Subcatchment 4S: EX LANDSCAPE AREA Runoff Area=31,521 sf 0.00% Impervious Runoff Depth=2.62"
Tc=5.0 min CN=49 Runoff=2.13 cfs 6,890 cf

Subcatchment 5S: EX. PERVIOUS AREAS Runoff Area=19 sf 0.00% Impervious Runoff Depth=1.94"
Tc=5.0 min CN=43 Runoff=0.00 cfs 3 cf

Link 3L: EXISTING

Inflow=3.33 cfs 11,125 cf
Primary=3.33 cfs 11,125 cf

Total Runoff Area = 37,487 sf Runoff Volume = 11,125 cf Average Runoff Depth = 3.56"
84.14% Pervious = 31,540 sf 15.86% Impervious = 5,947 sf

3- EXISTING

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 1S: EX ROOF AREA

Runoff = 0.64 cfs @ 12.07 hrs, Volume= 2,238 cf, Depth= 8.54"

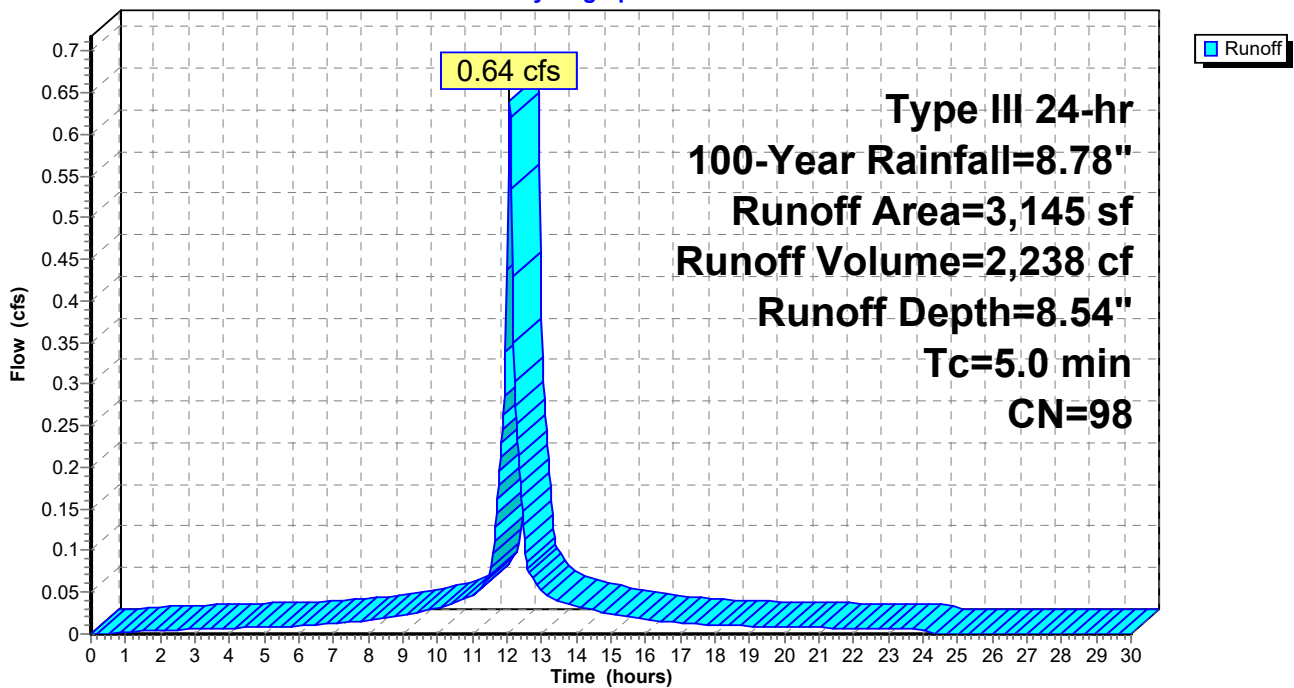
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
3,145	98	Roofs, HSG A
3,145		100.00% Impervious Area

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

Subcatchment 1S: EX ROOF AREA

Hydrograph



3- EXISTING

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 2S: EX. IMPERVIOUS AREAS

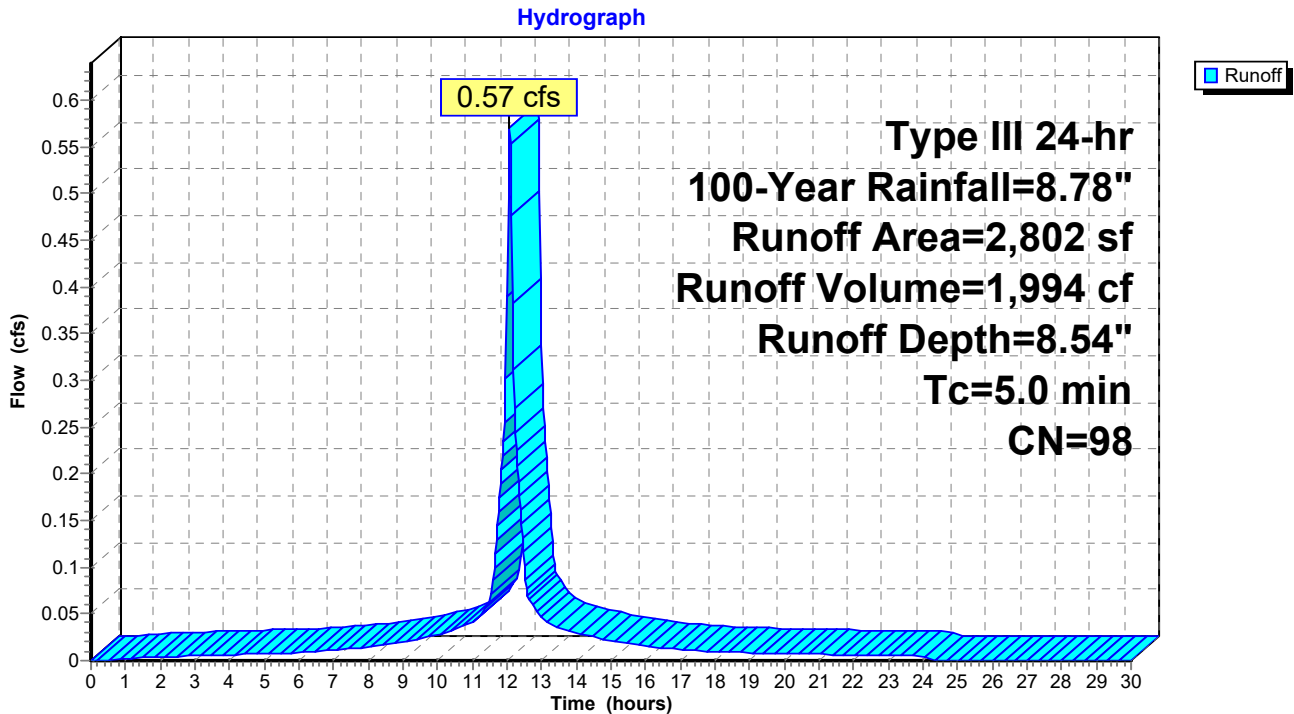
Runoff = 0.57 cfs @ 12.07 hrs, Volume= 1,994 cf, Depth= 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
1,142	98	Paved parking, HSG A
326	98	Unconnected pavement, HSG A
87	98	Unconnected pavement, HSG A
839	98	Unconnected pavement, HSG A
143	98	Unconnected pavement, HSG A
265	98	Unconnected pavement, HSG A
2,802	98	Weighted Average
2,802		100.00% Impervious Area
1,660		59.24% Unconnected

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

Subcatchment 2S: EX. IMPERVIOUS AREAS



3- EXISTING

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 4S: EX LANDSCAPE AREA

Runoff = 2.13 cfs @ 12.08 hrs, Volume= 6,890 cf, Depth= 2.62"

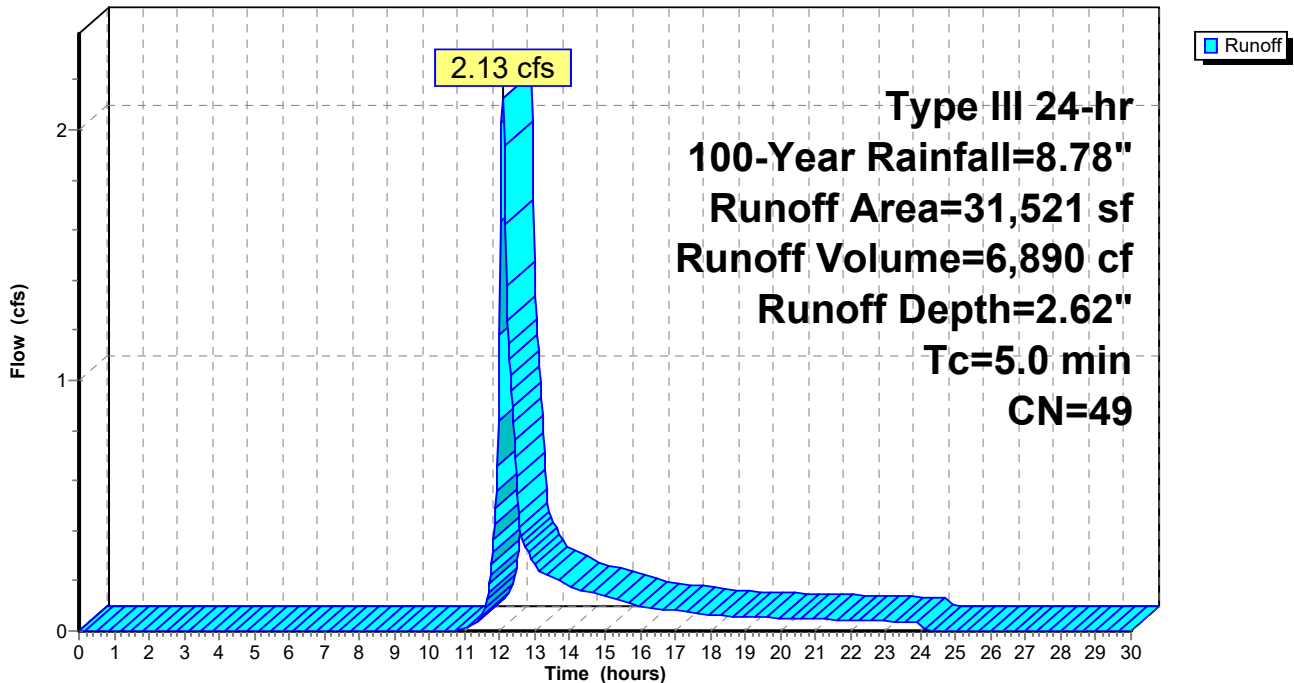
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
31,521	49	50-75% Grass cover, Fair, HSG A
31,521		100.00% Pervious Area

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

Subcatchment 4S: EX LANDSCAPE AREA

Hydrograph



3- EXISTING

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 5S: EX. PERVIOUS AREAS

Runoff = 0.00 cfs @ 12.09 hrs, Volume= 3 cf, Depth= 1.94"

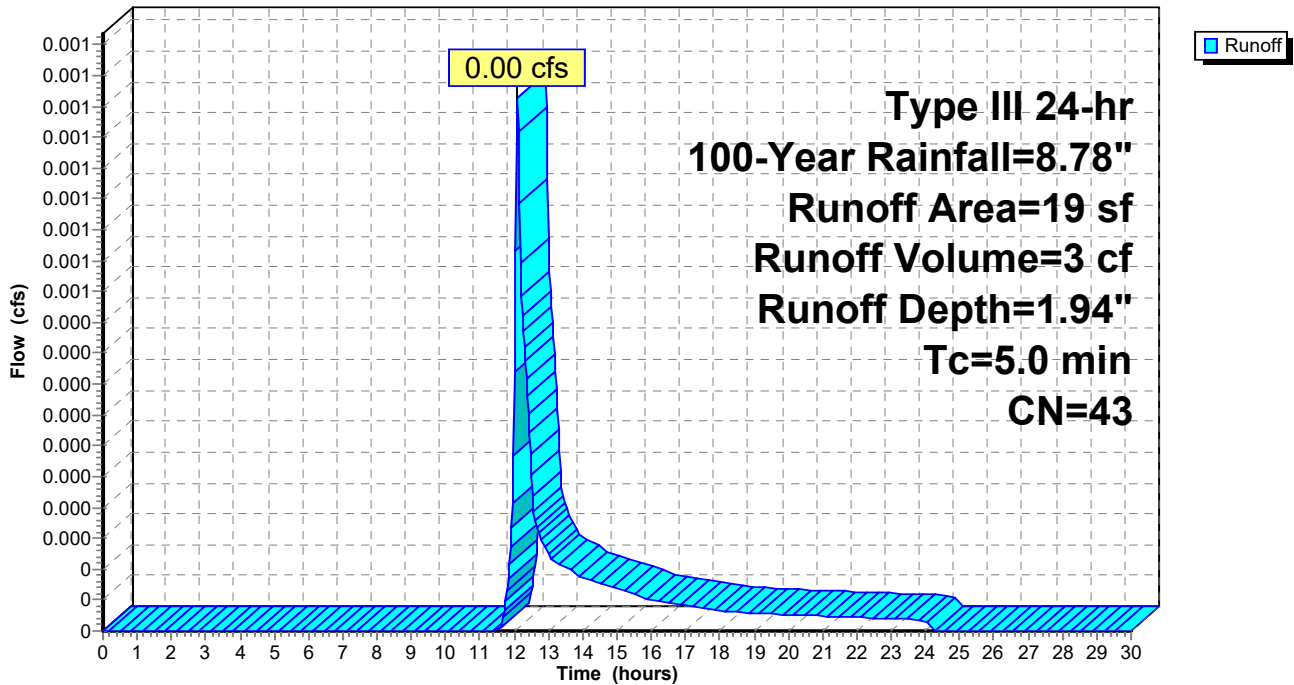
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
19	43	Woods/grass comb., Fair, HSG A
19		100.00% Pervious Area

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

Subcatchment 5S: EX. PERVIOUS AREAS

Hydrograph



3- EXISTING

Type III 24-hr 100-Year Rainfall=8.78"

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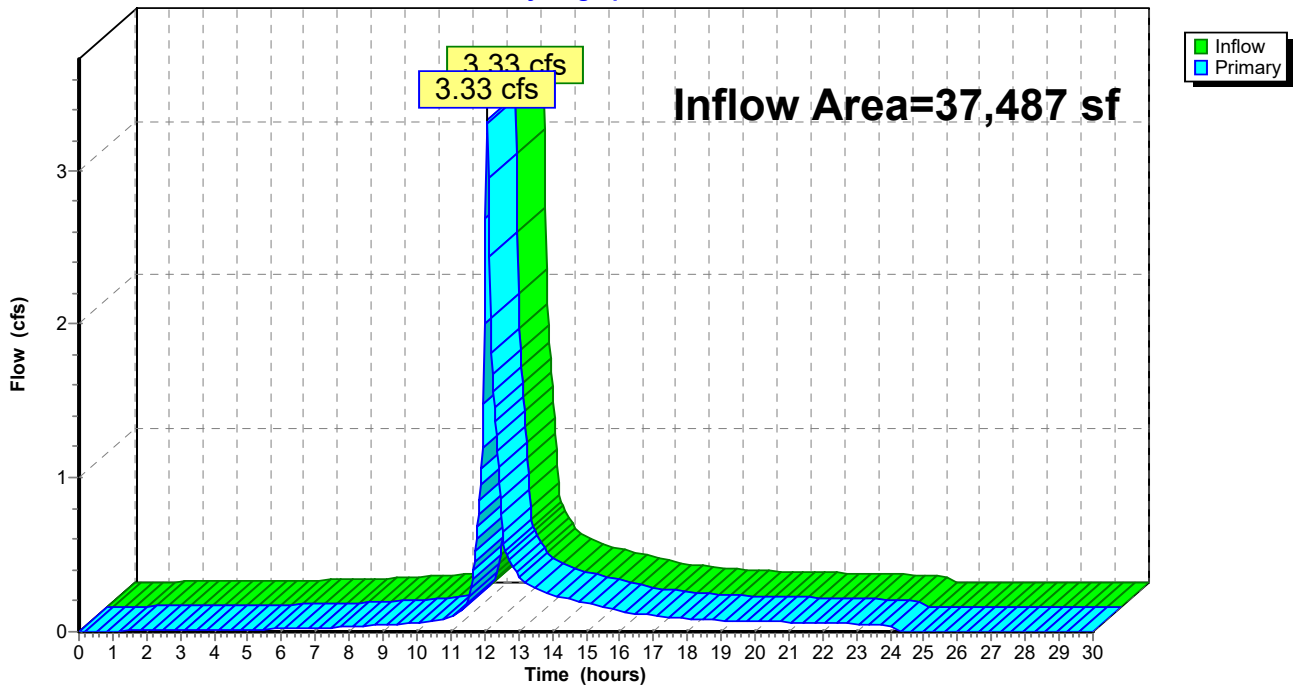
Summary for Link 3L: EXISTING

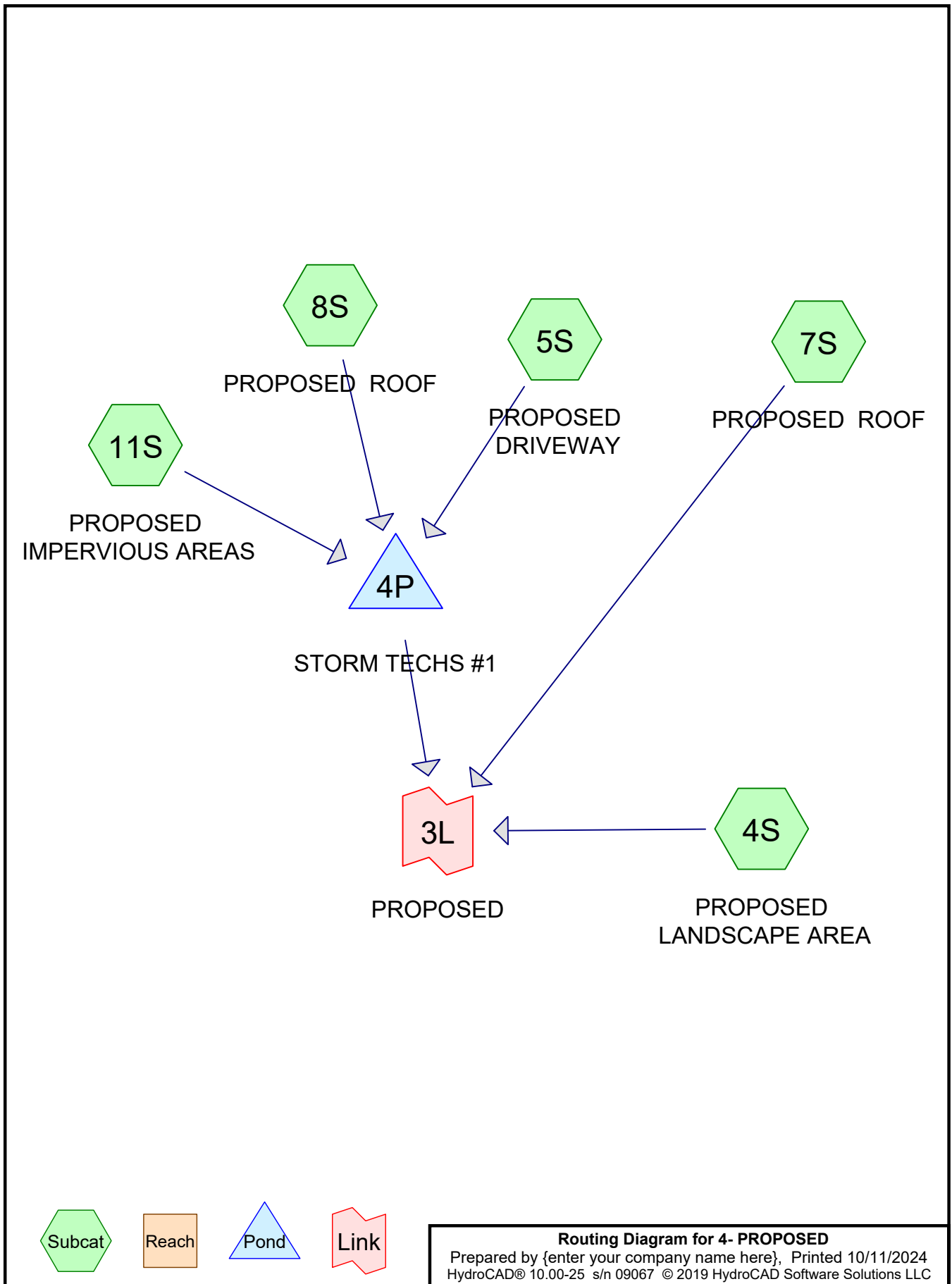
Inflow Area = 37,487 sf, 15.86% Impervious, Inflow Depth = 3.56" for 100-Year event
Inflow = 3.33 cfs @ 12.08 hrs, Volume= 11,125 cf
Primary = 3.33 cfs @ 12.08 hrs, Volume= 11,125 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: EXISTING

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
29,520	49	50-75% Grass cover, Fair, HSG A (4S)
952	98	Paved parking, HSG A (5S)
5,226	98	Roofs, HSG A (7S, 8S)
1,789	98	Unconnected pavement, HSG A (11S)
37,487	59	TOTAL AREA

4- PROPOSED

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
37,487	HSG A	4S, 5S, 7S, 8S, 11S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
37,487		TOTAL AREA

4- PROPOSED

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
29,520	0	0	0	0	29,520	50-75% Grass cover, Fair
952	0	0	0	0	952	Paved parking
5,226	0	0	0	0	5,226	Roofs
1,789	0	0	0	0	1,789	Unconnected pavement
37,487	0	0	0	0	37,487	TOTAL AREA

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4- PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROPOSED Runoff Area=29,520 sf 0.00% Impervious Runoff Depth=0.12"
 Tc=5.0 min CN=49 Runoff=0.01 cfs 290 cf

Subcatchment5S: PROPOSED DRIVEWAY Runoff Area=952 sf 100.00% Impervious Runoff Depth=3.02"
 Tc=5.0 min CN=98 Runoff=0.07 cfs 239 cf

Subcatchment7S: PROPOSED ROOF Runoff Area=1,655 sf 100.00% Impervious Runoff Depth=3.02"
 Tc=5.0 min CN=98 Runoff=0.12 cfs 416 cf

Subcatchment8S: PROPOSED ROOF Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=3.02"
 Tc=5.0 min CN=98 Runoff=0.27 cfs 898 cf

Subcatchment11S: PROPOSED Runoff Area=1,789 sf 100.00% Impervious Runoff Depth=3.02"
 Tc=5.0 min CN=98 Runoff=0.13 cfs 450 cf

Pond 4P: STORM TECHS #1 Peak Elev=133.94' Storage=536 cf Inflow=0.47 cfs 1,587 cf
 Discarded=0.05 cfs 1,587 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 1,587 cf

Link 3L: PROPOSED Inflow=0.12 cfs 706 cf
 Primary=0.12 cfs 706 cf

Total Runoff Area = 37,487 sf Runoff Volume = 2,293 cf Average Runoff Depth = 0.73"
78.75% Pervious = 29,520 sf 21.25% Impervious = 7,967 sf

4- PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.01 cfs @ 12.48 hrs, Volume= 290 cf, Depth= 0.12"

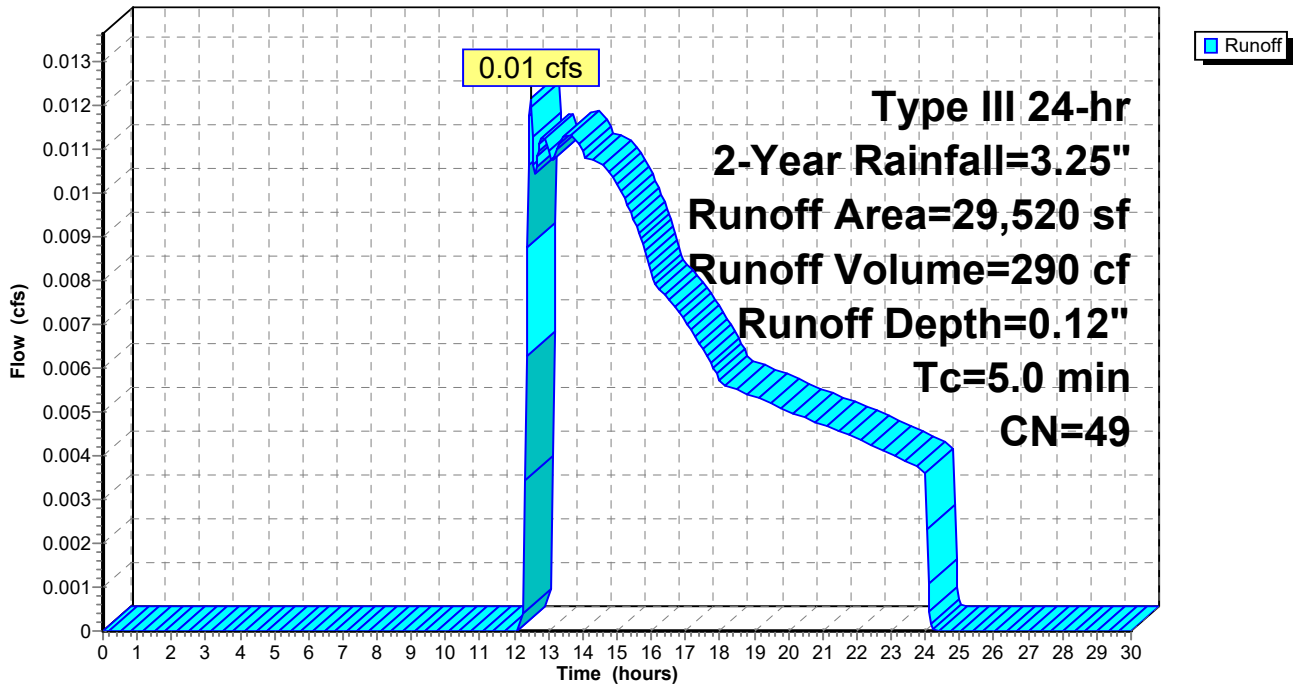
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
29,520	49	50-75% Grass cover, Fair, HSG A
29,520		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



4- PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 5S: PROPOSED DRIVEWAY

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 239 cf, Depth= 3.02"

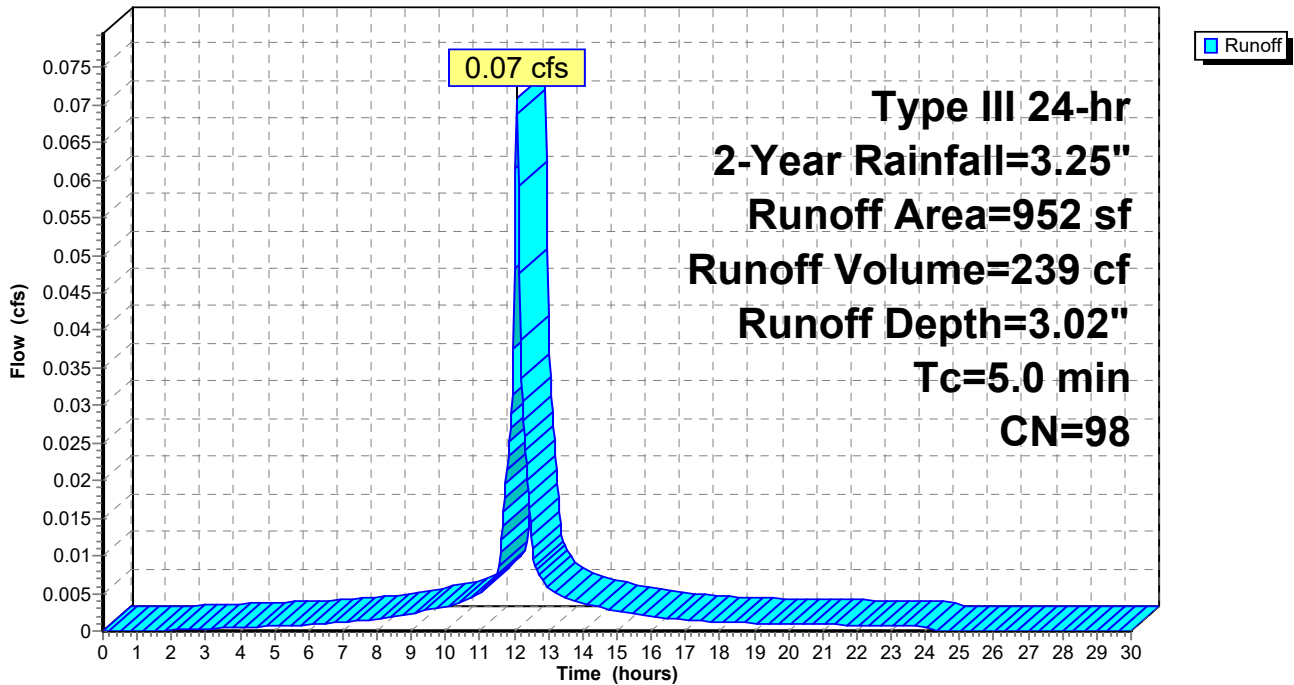
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
952	98	Paved parking, HSG A
952		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED DRIVEWAY

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 7S: PROPOSED ROOF

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 416 cf, Depth= 3.02"

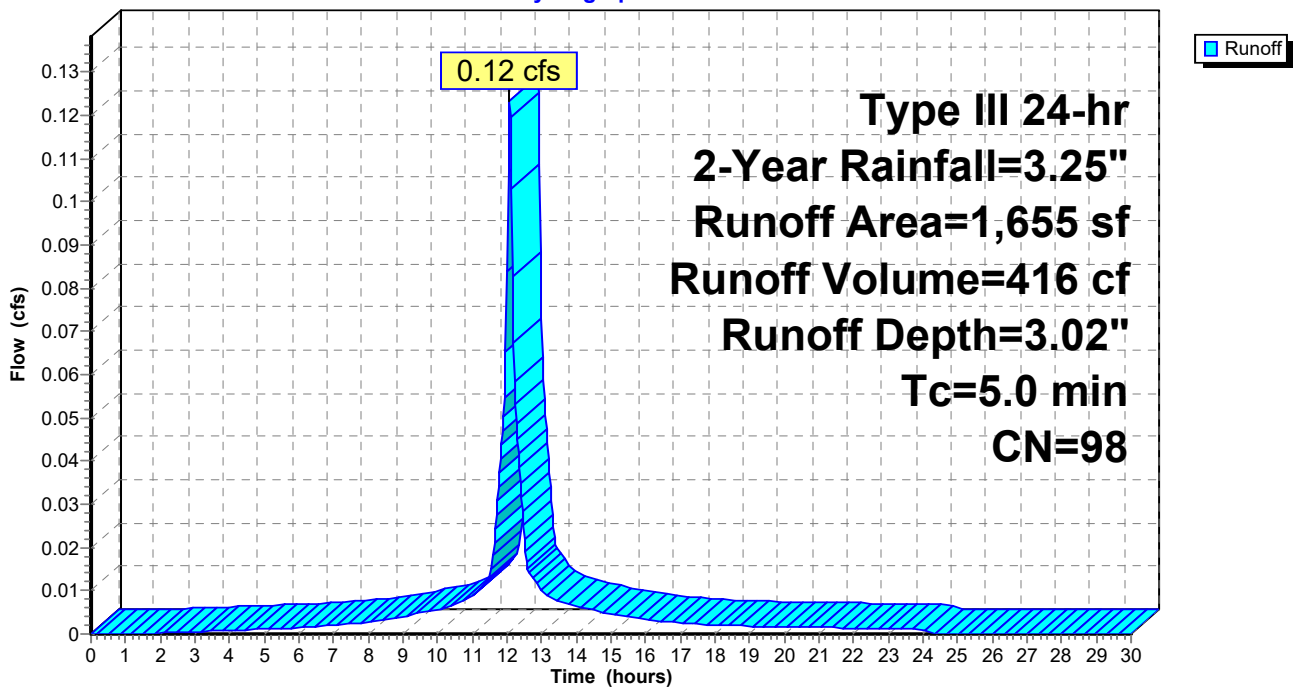
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
1,655	98	Roofs, HSG A
1,655		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 8S: PROPOSED ROOF

Runoff = 0.27 cfs @ 12.07 hrs, Volume= 898 cf, Depth= 3.02"

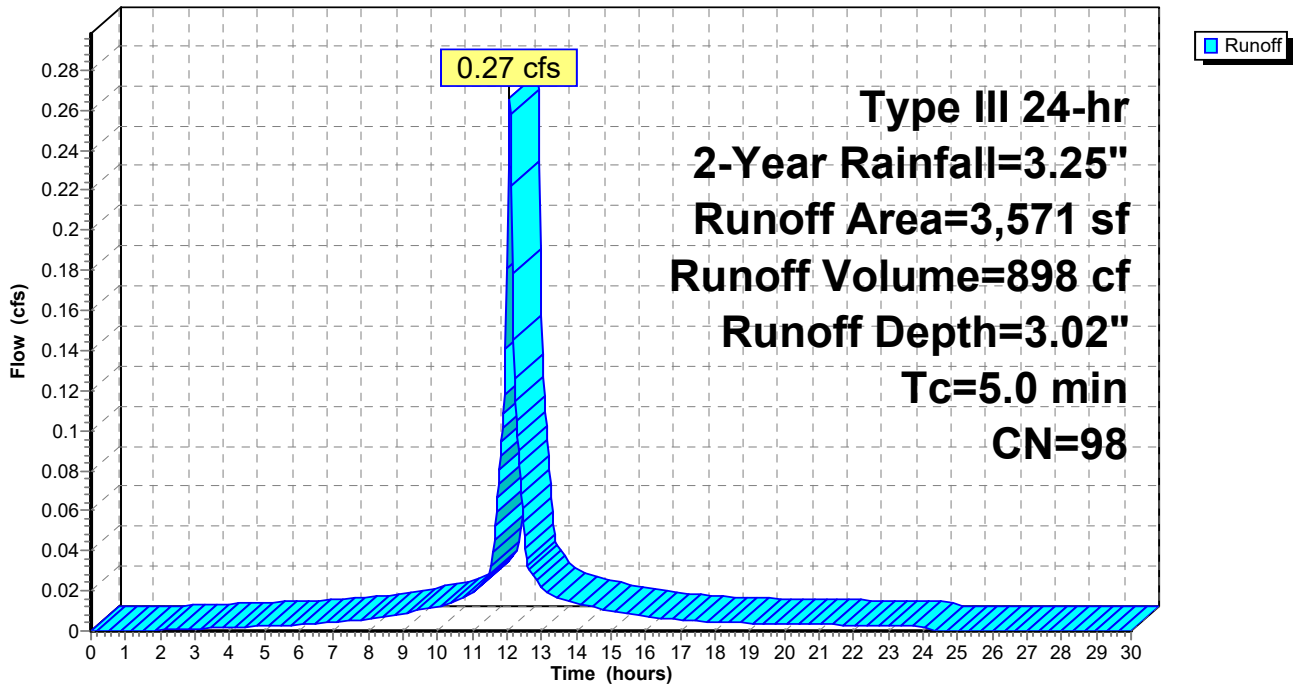
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
 Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
3,571	98	Roofs, HSG A
3,571		100.00% Impervious Area

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

Subcatchment 8S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Subcatchment 11S: PROPOSED IMPERVIOUS AREAS

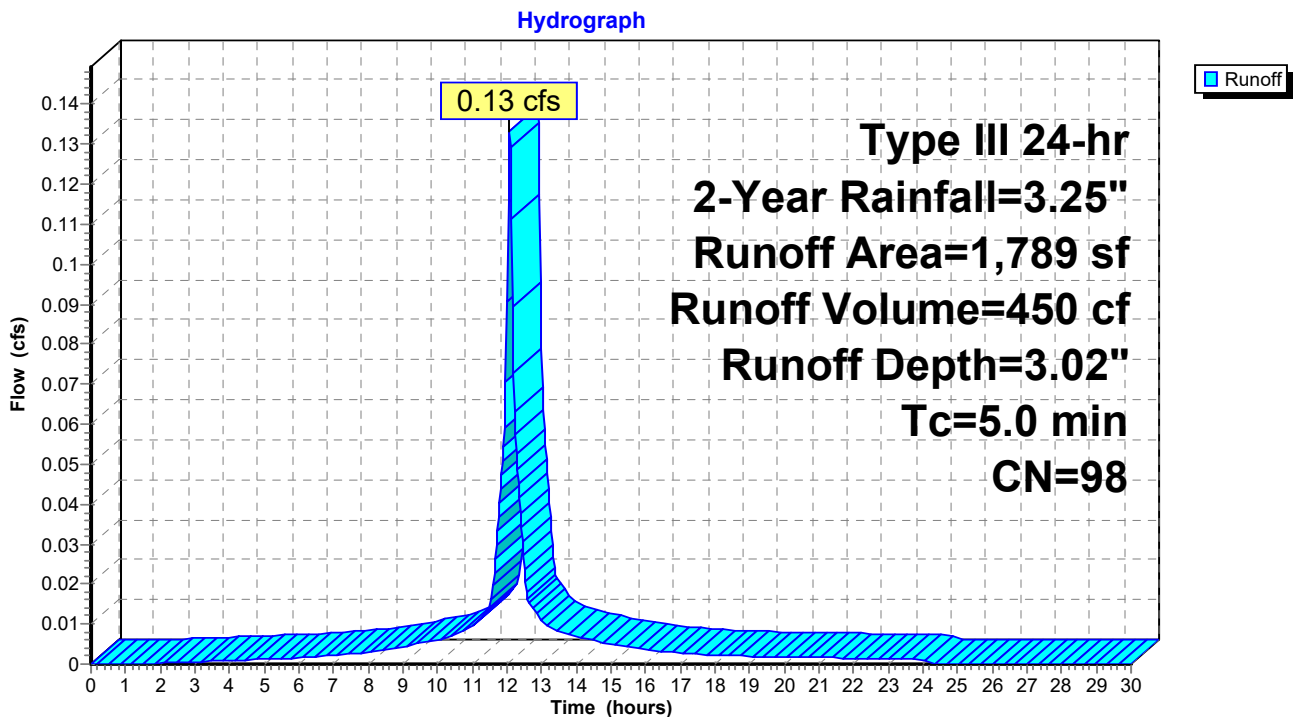
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 450 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-Year Rainfall=3.25"

Area (sf)	CN	Description
280	98	Unconnected pavement, HSG A
31	98	Unconnected pavement, HSG A
1,162	98	Unconnected pavement, HSG A
207	98	Unconnected pavement, HSG A
109	98	Unconnected pavement, HSG A
1,789	98	Weighted Average
1,789		100.00% Impervious Area
1,789		100.00% Unconnected

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

Subcatchment 11S: PROPOSED IMPERVIOUS AREAS



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Type III 24-hr 2-Year Rainfall=3.25"

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Summary for Pond 4P: STORM TECHS #1

Inflow Area = 6,312 sf, 100.00% Impervious, Inflow Depth = 3.02" for 2-Year event
 Inflow = 0.47 cfs @ 12.07 hrs, Volume= 1,587 cf
 Outflow = 0.05 cfs @ 11.67 hrs, Volume= 1,587 cf, Atten= 89%, Lag= 0.0 min
 Discarded = 0.05 cfs @ 11.67 hrs, Volume= 1,587 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 133.94' @ 12.68 hrs Surf.Area= 928 sf Storage= 536 cf

Plug-Flow detention time= 73.8 min calculated for 1,586 cf (100% of inflow)
 Center-of-Mass det. time= 73.7 min (828.9 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	132.50'	1,636 cf	28.00'W x 33.14'L x 5.00'H Field A 4,640 cf Overall - 551 cf Embedded = 4,089 cf x 40.0% Voids
#2A	134.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	137.50'	9 cf	6.0" Round Pipe Storage-Impervious L= 47.5' S= 0.1474 'l'
		2,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	132.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	139.80'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 11.67 hrs HW=132.63' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.50' (Free Discharge)
 ↑**2=Orifice/Grate** (Controls 0.00 cfs)

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Type III 24-hr 2-Year Rainfall=3.25"

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Pond 4P: STORM TECHS #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +61.0" End Stone x 2 = 33.14'

Base Length

4 Rows x 51.0" Wide + 24.0" Spacing x 3 + 30.0" Side Stone x 2 = 28.00' Base Width

24.0" Base + 30.0" Chamber Height + 6.0" Cover = 5.00' Field Height

12 Chambers x 45.9 cf = 551.3 cf Chamber Storage

4,640.1 cf Field - 551.3 cf Chambers = 4,088.8 cf Stone x 40.0% Voids = 1,635.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,186.8 cf = 0.050 af

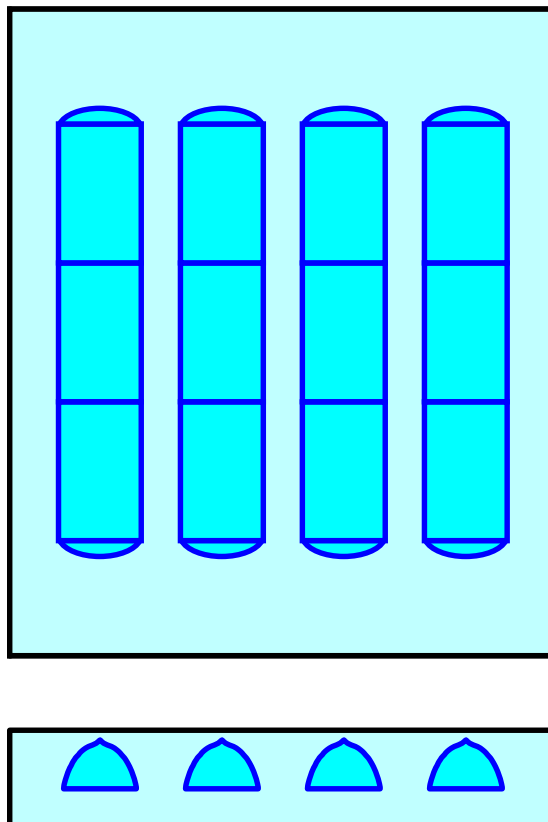
Overall Storage Efficiency = 47.1%

Overall System Size = 33.14' x 28.00' x 5.00'

12 Chambers

171.9 cy Field

151.4 cy Stone



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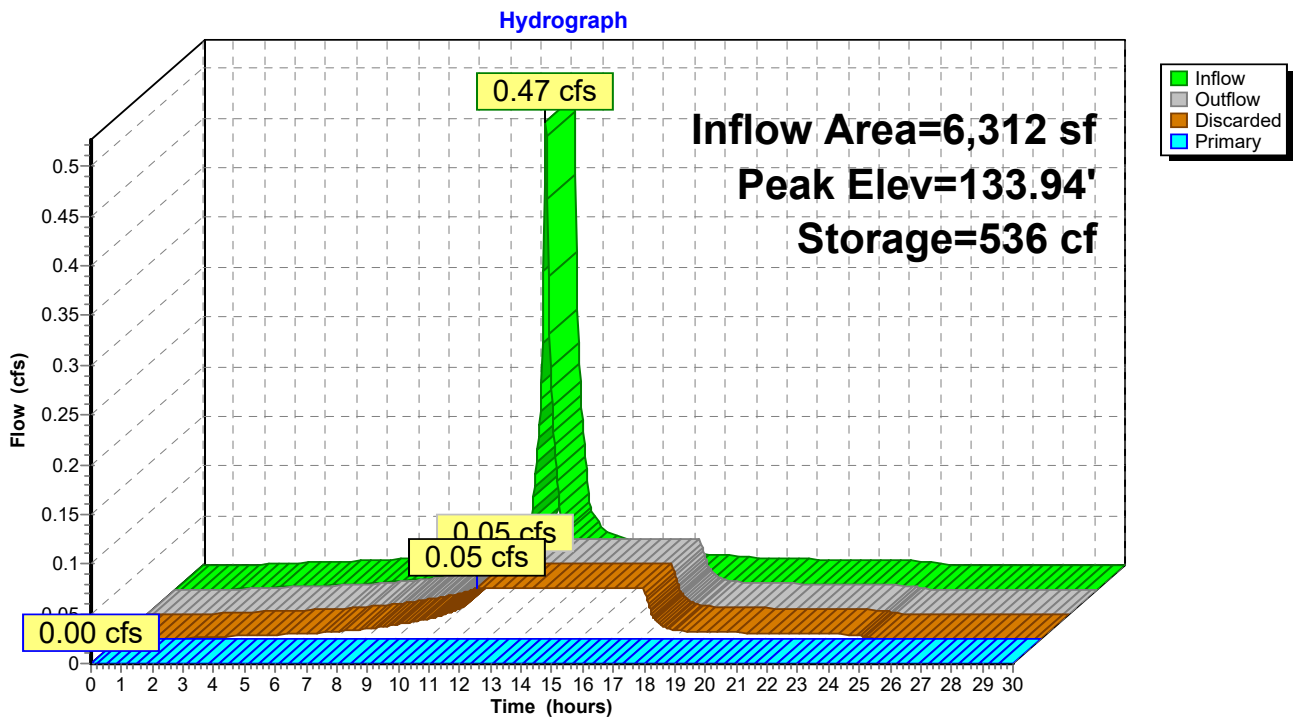
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Type III 24-hr 2-Year Rainfall=3.25"

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Pond 4P: STORM TECHS #1



4- PROPOSED

Type III 24-hr 2-Year Rainfall=3.25"

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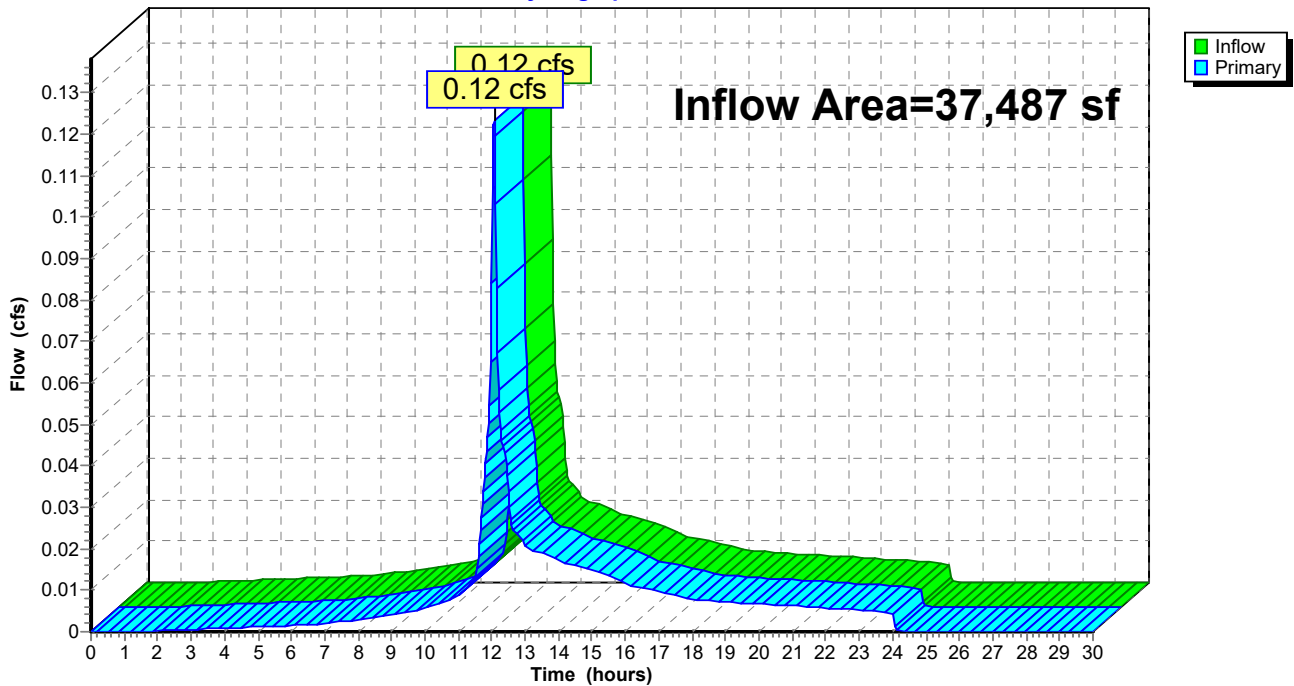
Summary for Link 3L: PROPOSED

Inflow Area = 37,487 sf, 21.25% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 706 cf
Primary = 0.12 cfs @ 12.07 hrs, Volume= 706 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROPOSED Runoff Area=29,520 sf 0.00% Impervious Runoff Depth=0.53"
 Tc=5.0 min CN=49 Runoff=0.21 cfs 1,295 cf

Subcatchment5S: PROPOSED DRIVEWAY Runoff Area=952 sf 100.00% Impervious Runoff Depth=4.46"
 Tc=5.0 min CN=98 Runoff=0.10 cfs 354 cf

Subcatchment7S: PROPOSED ROOF Runoff Area=1,655 sf 100.00% Impervious Runoff Depth=4.46"
 Tc=5.0 min CN=98 Runoff=0.18 cfs 616 cf

Subcatchment8S: PROPOSED ROOF Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=4.46"
 Tc=5.0 min CN=98 Runoff=0.39 cfs 1,328 cf

Subcatchment11S: PROPOSED Runoff Area=1,789 sf 100.00% Impervious Runoff Depth=4.46"
 Tc=5.0 min CN=98 Runoff=0.19 cfs 665 cf

Pond 4P: STORM TECHS #1 Peak Elev=134.77' Storage=896 cf Inflow=0.69 cfs 2,348 cf
 Discarded=0.05 cfs 2,348 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 2,348 cf

Link 3L: PROPOSED Inflow=0.37 cfs 1,910 cf
 Primary=0.37 cfs 1,910 cf

Total Runoff Area = 37,487 sf Runoff Volume = 4,258 cf Average Runoff Depth = 1.36"
78.75% Pervious = 29,520 sf 21.25% Impervious = 7,967 sf

4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.21 cfs @ 12.13 hrs, Volume= 1,295 cf, Depth= 0.53"

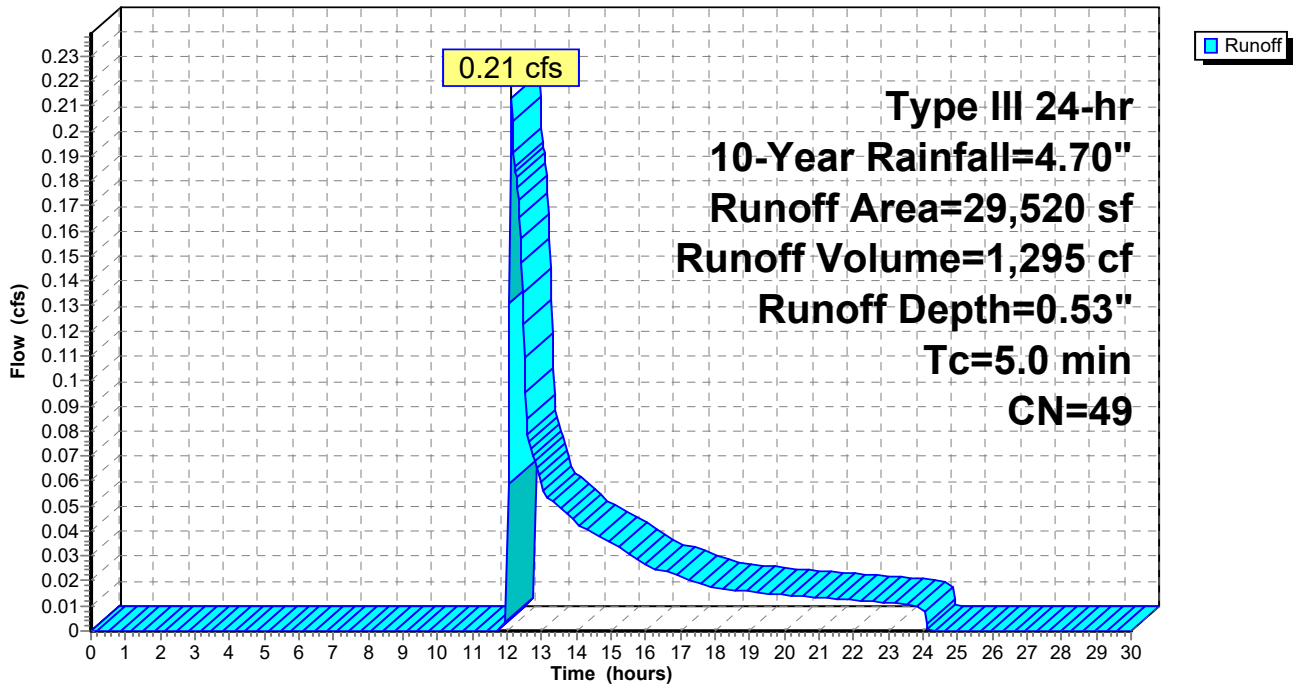
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
29,520	49	50-75% Grass cover, Fair, HSG A
29,520		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 5S: PROPOSED DRIVEWAY

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 354 cf, Depth= 4.46"

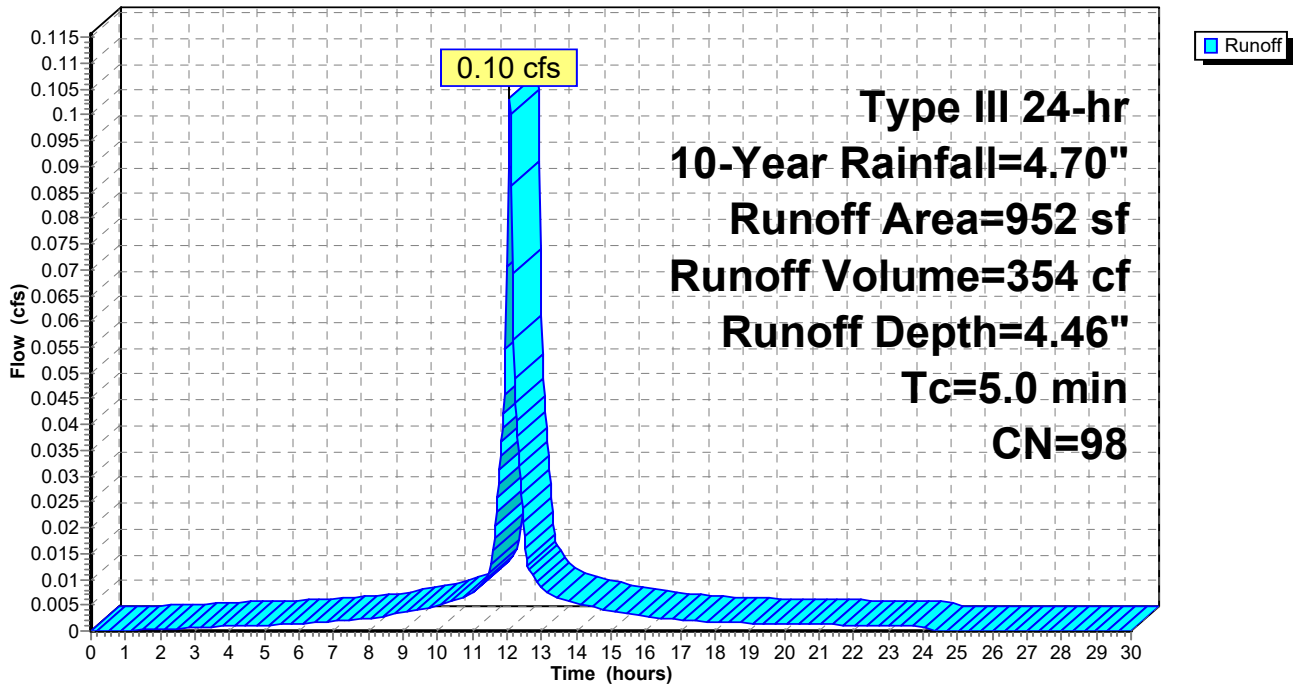
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
952	98	Paved parking, HSG A
952		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED DRIVEWAY

Hydrograph



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 7S: PROPOSED ROOF

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 616 cf, Depth= 4.46"

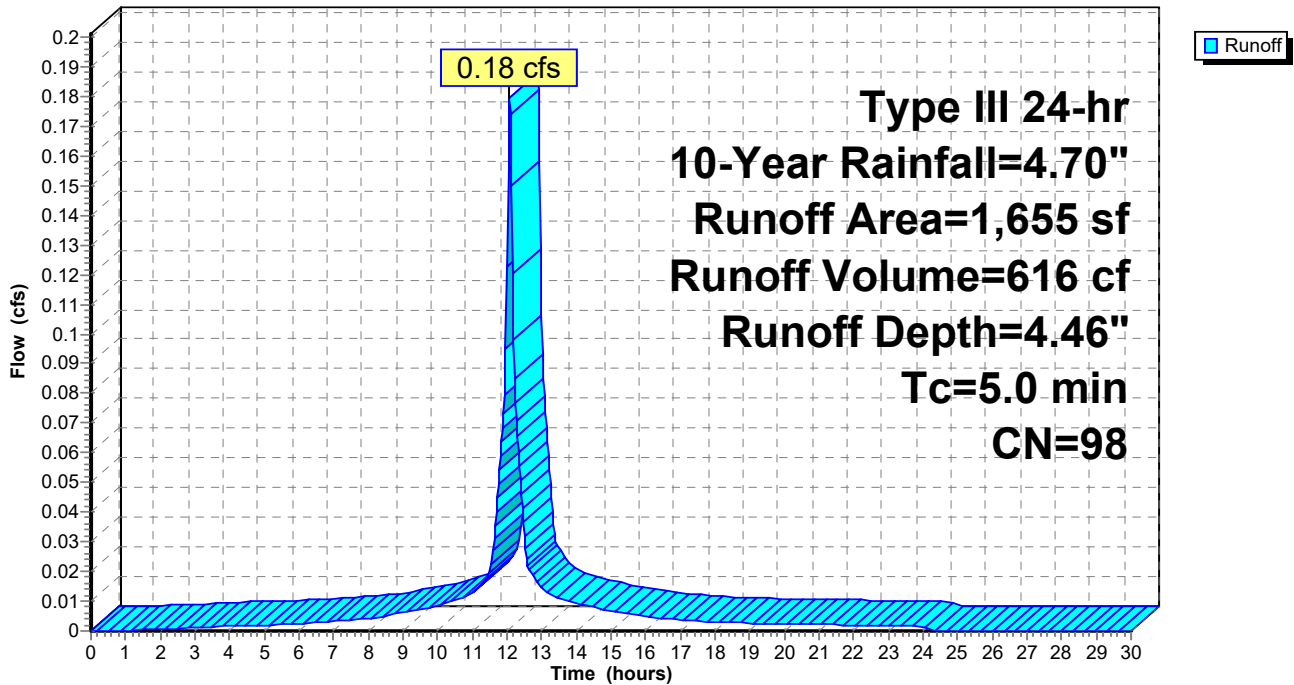
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
1,655	98	Roofs, HSG A
1,655		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF

Hydrograph



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 8S: PROPOSED ROOF

Runoff = 0.39 cfs @ 12.07 hrs, Volume= 1,328 cf, Depth= 4.46"

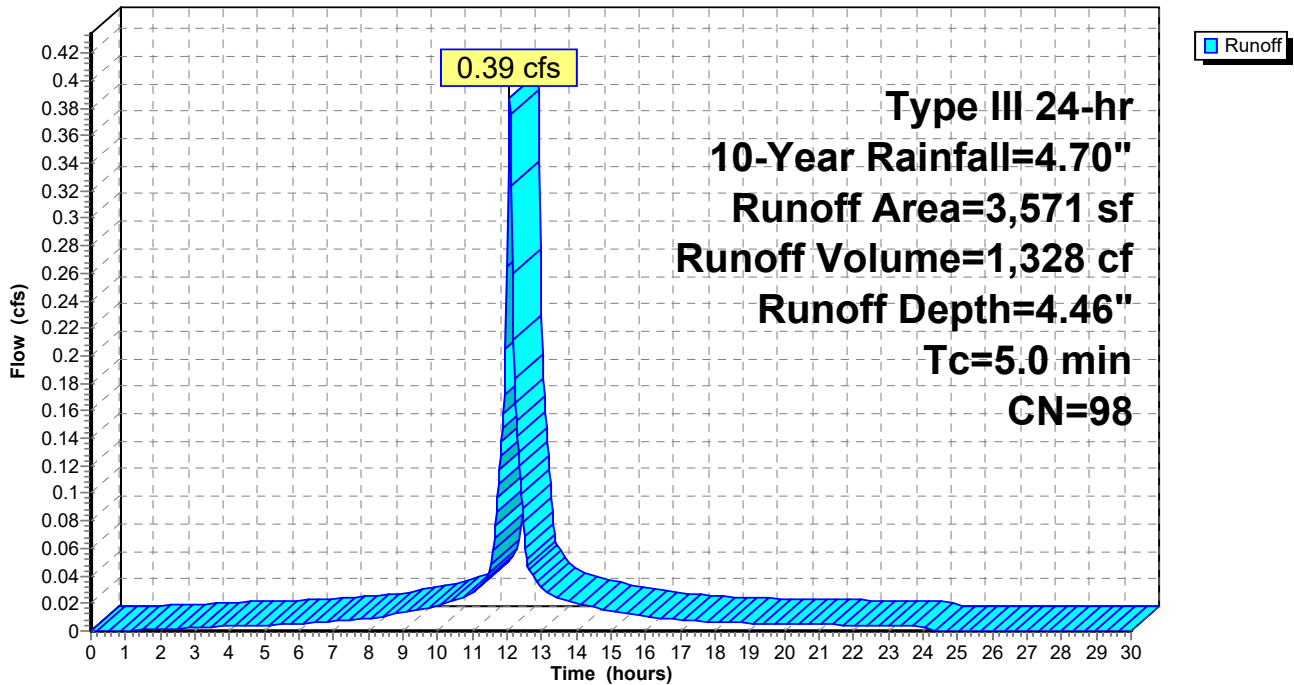
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,571	98	Roofs, HSG A
3,571		100.00% Impervious Area

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

Subcatchment 8S: PROPOSED ROOF

Hydrograph



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Subcatchment 11S: PROPOSED IMPERVIOUS AREAS

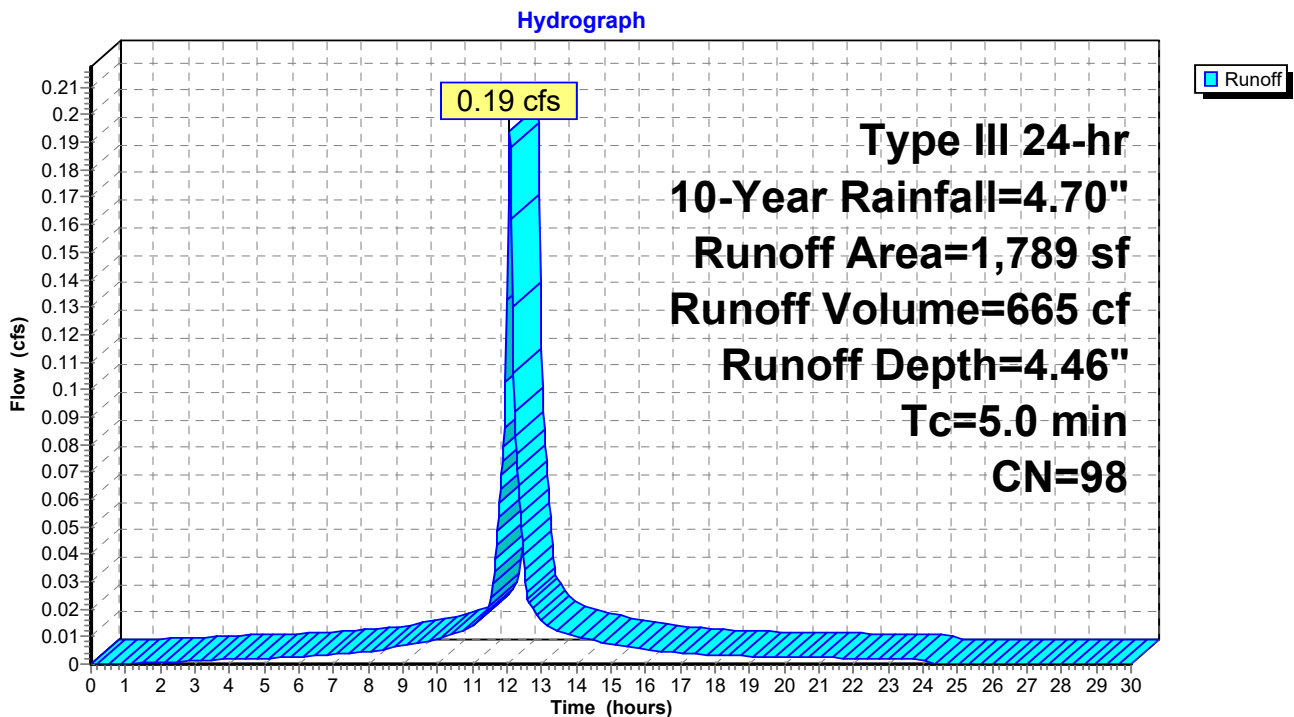
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 665 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
280	98	Unconnected pavement, HSG A
31	98	Unconnected pavement, HSG A
1,162	98	Unconnected pavement, HSG A
207	98	Unconnected pavement, HSG A
109	98	Unconnected pavement, HSG A
1,789	98	Weighted Average
1,789		100.00% Impervious Area
1,789		100.00% Unconnected

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

Subcatchment 11S: PROPOSED IMPERVIOUS AREAS



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Summary for Pond 4P: STORM TECHS #1

Inflow Area = 6,312 sf, 100.00% Impervious, Inflow Depth = 4.46" for 10-Year event
 Inflow = 0.69 cfs @ 12.07 hrs, Volume= 2,348 cf
 Outflow = 0.05 cfs @ 11.31 hrs, Volume= 2,348 cf, Atten= 92%, Lag= 0.0 min
 Discarded = 0.05 cfs @ 11.31 hrs, Volume= 2,348 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 134.77' @ 13.05 hrs Surf.Area= 928 sf Storage= 896 cf

Plug-Flow detention time= 131.5 min calculated for 2,348 cf (100% of inflow)
 Center-of-Mass det. time= 131.4 min (879.5 - 748.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	132.50'	1,636 cf	28.00'W x 33.14'L x 5.00'H Field A 4,640 cf Overall - 551 cf Embedded = 4,089 cf x 40.0% Voids
#2A	134.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	137.50'	9 cf	6.0" Round Pipe Storage-Impervious L= 47.5' S= 0.1474 'l'
		2,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	132.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	139.80'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 11.31 hrs HW=132.63' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.50' (Free Discharge)
 ↑**2=Orifice/Grate** (Controls 0.00 cfs)

4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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Pond 4P: STORM TECHS #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +61.0" End Stone x 2 = 33.14' Base Length

4 Rows x 51.0" Wide + 24.0" Spacing x 3 + 30.0" Side Stone x 2 = 28.00' Base Width

24.0" Base + 30.0" Chamber Height + 6.0" Cover = 5.00' Field Height

12 Chambers x 45.9 cf = 551.3 cf Chamber Storage

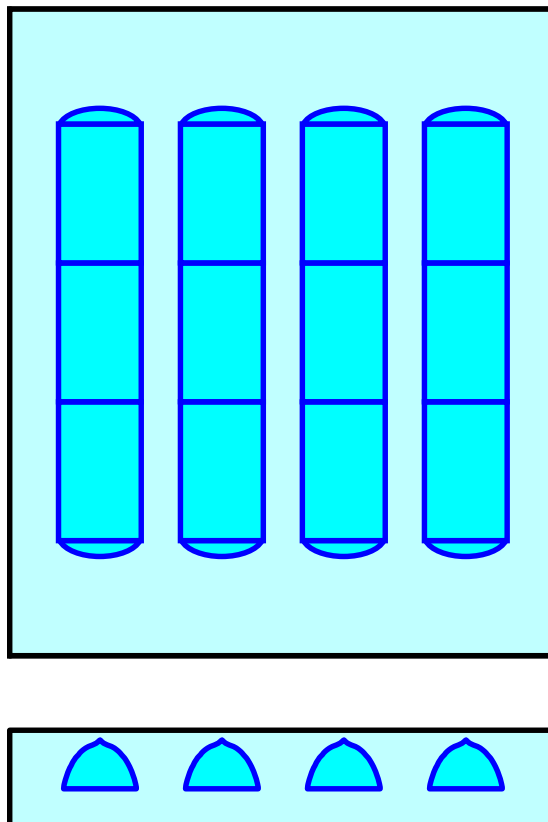
4,640.1 cf Field - 551.3 cf Chambers = 4,088.8 cf Stone x 40.0% Voids = 1,635.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,186.8 cf = 0.050 af

Overall Storage Efficiency = 47.1%

Overall System Size = 33.14' x 28.00' x 5.00'

12 Chambers
171.9 cy Field
151.4 cy Stone



4- PROPOSED

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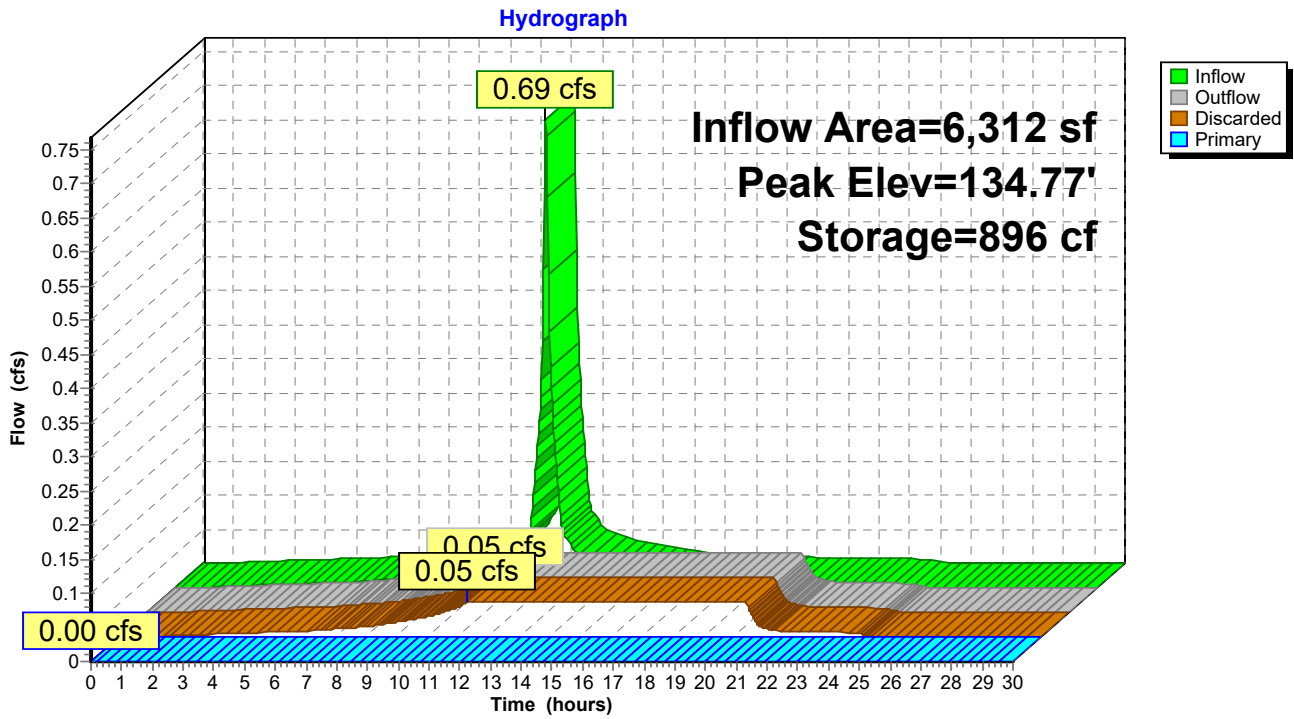
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Type III 24-hr 10-Year Rainfall=4.70"

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Pond 4P: STORM TECHS #1



4- PROPOSED

Type III 24-hr 10-Year Rainfall=4.70"

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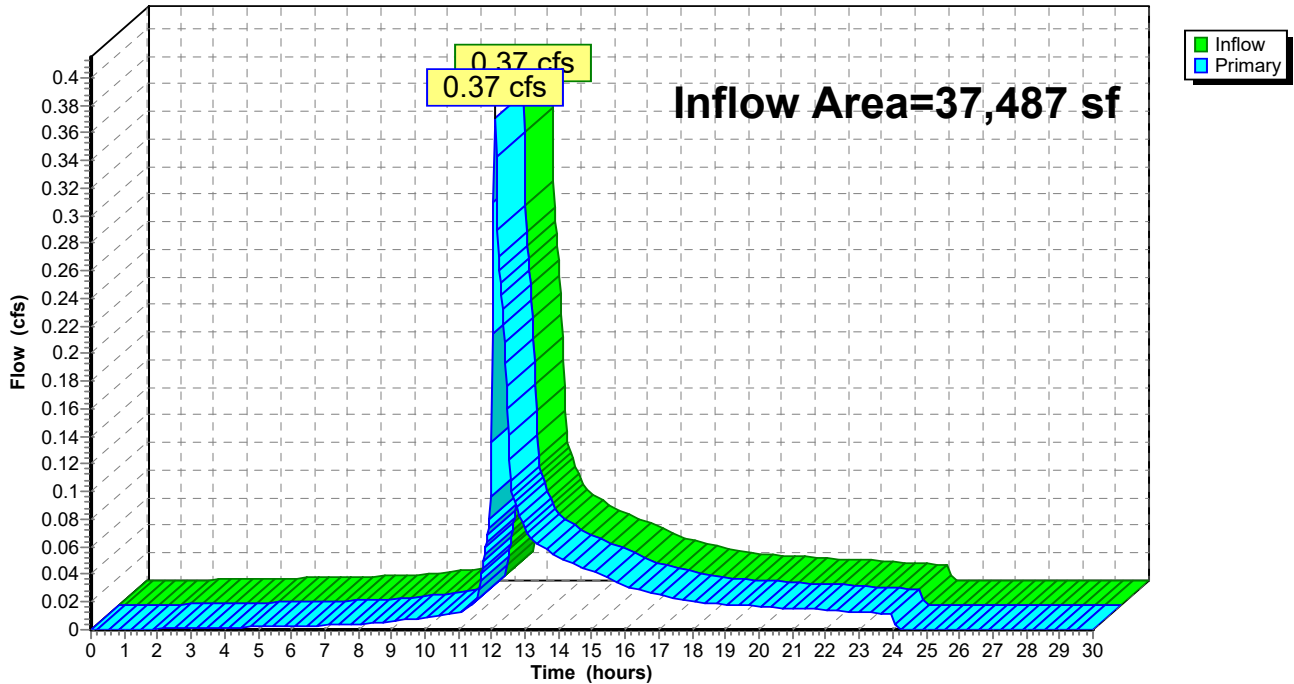
Summary for Link 3L: PROPOSED

Inflow Area = 37,487 sf, 21.25% Impervious, Inflow Depth = 0.61" for 10-Year event
Inflow = 0.37 cfs @ 12.10 hrs, Volume= 1,910 cf
Primary = 0.37 cfs @ 12.10 hrs, Volume= 1,910 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROPOSED Runoff Area=29,520 sf 0.00% Impervious Runoff Depth=0.85"
 Tc=5.0 min CN=49 Runoff=0.48 cfs 2,079 cf

Subcatchment5S: PROPOSED DRIVEWAY Runoff Area=952 sf 100.00% Impervious Runoff Depth=5.26"
 Tc=5.0 min CN=98 Runoff=0.12 cfs 417 cf

Subcatchment7S: PROPOSED ROOF Runoff Area=1,655 sf 100.00% Impervious Runoff Depth=5.26"
 Tc=5.0 min CN=98 Runoff=0.21 cfs 726 cf

Subcatchment8S: PROPOSED ROOF Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=5.26"
 Tc=5.0 min CN=98 Runoff=0.45 cfs 1,566 cf

Subcatchment11S: PROPOSED Runoff Area=1,789 sf 100.00% Impervious Runoff Depth=5.26"
 Tc=5.0 min CN=98 Runoff=0.23 cfs 785 cf

Pond 4P: STORM TECHS #1 Peak Elev=135.17' Storage=1,116 cf Inflow=0.80 cfs 2,768 cf
 Discarded=0.05 cfs 2,768 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 2,768 cf

Link 3L: PROPOSED Inflow=0.67 cfs 2,805 cf
 Primary=0.67 cfs 2,805 cf

Total Runoff Area = 37,487 sf Runoff Volume = 5,573 cf Average Runoff Depth = 1.78"
78.75% Pervious = 29,520 sf 21.25% Impervious = 7,967 sf

4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

Runoff = 0.48 cfs @ 12.10 hrs, Volume= 2,079 cf, Depth= 0.85"

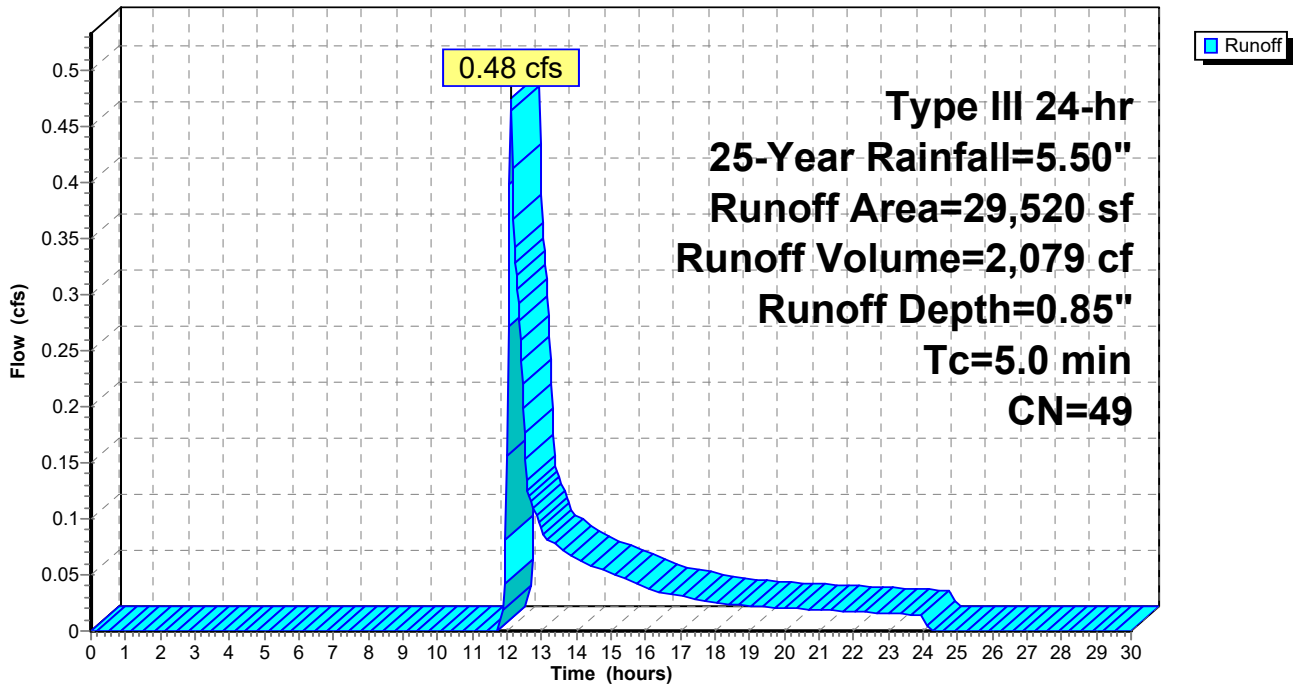
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
29,520	49	50-75% Grass cover, Fair, HSG A
29,520		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA

Hydrograph



4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 5S: PROPOSED DRIVEWAY

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 417 cf, Depth= 5.26"

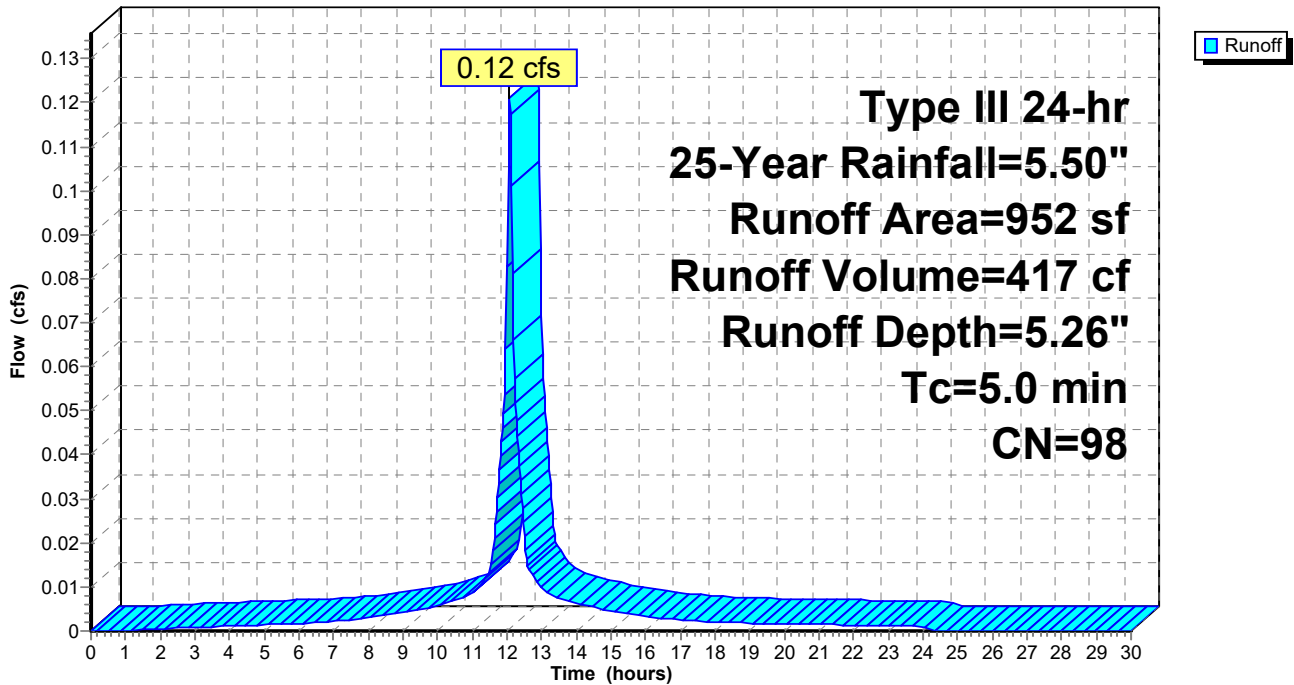
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
952	98	Paved parking, HSG A
952		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED DRIVEWAY

Hydrograph



4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 7S: PROPOSED ROOF

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 726 cf, Depth= 5.26"

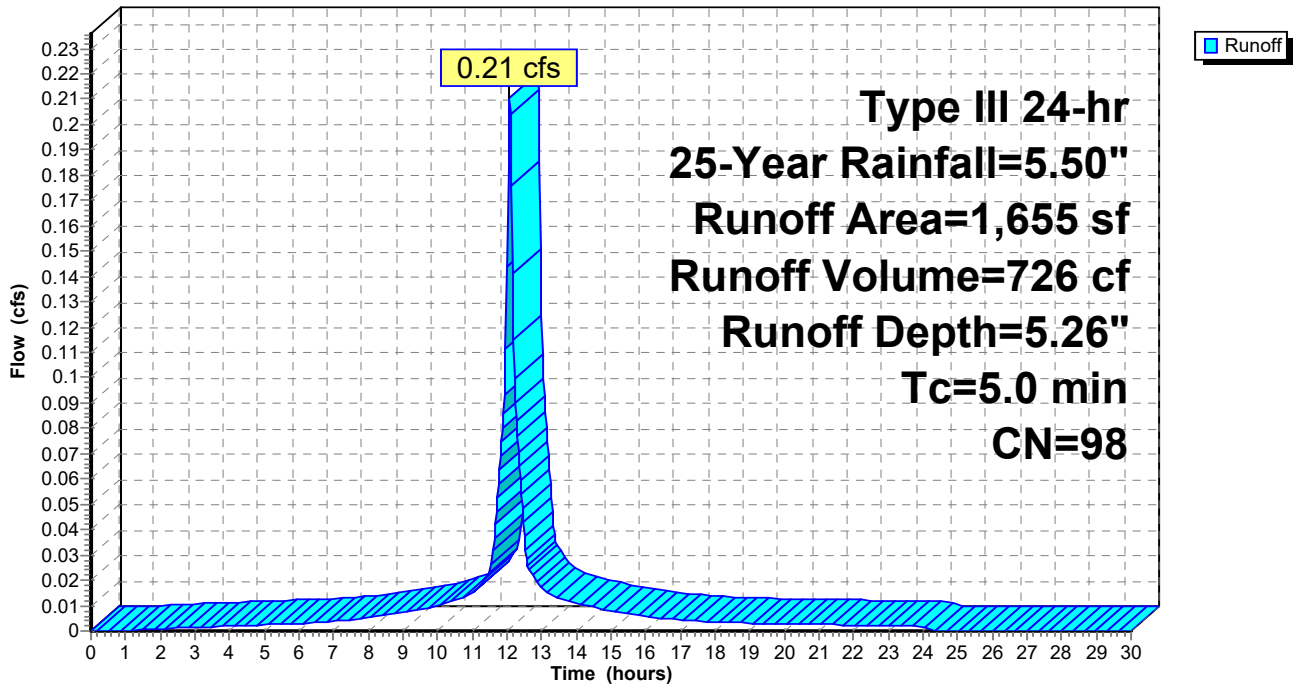
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
1,655	98	Roofs, HSG A
1,655		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 8S: PROPOSED ROOF

Runoff = 0.45 cfs @ 12.07 hrs, Volume= 1,566 cf, Depth= 5.26"

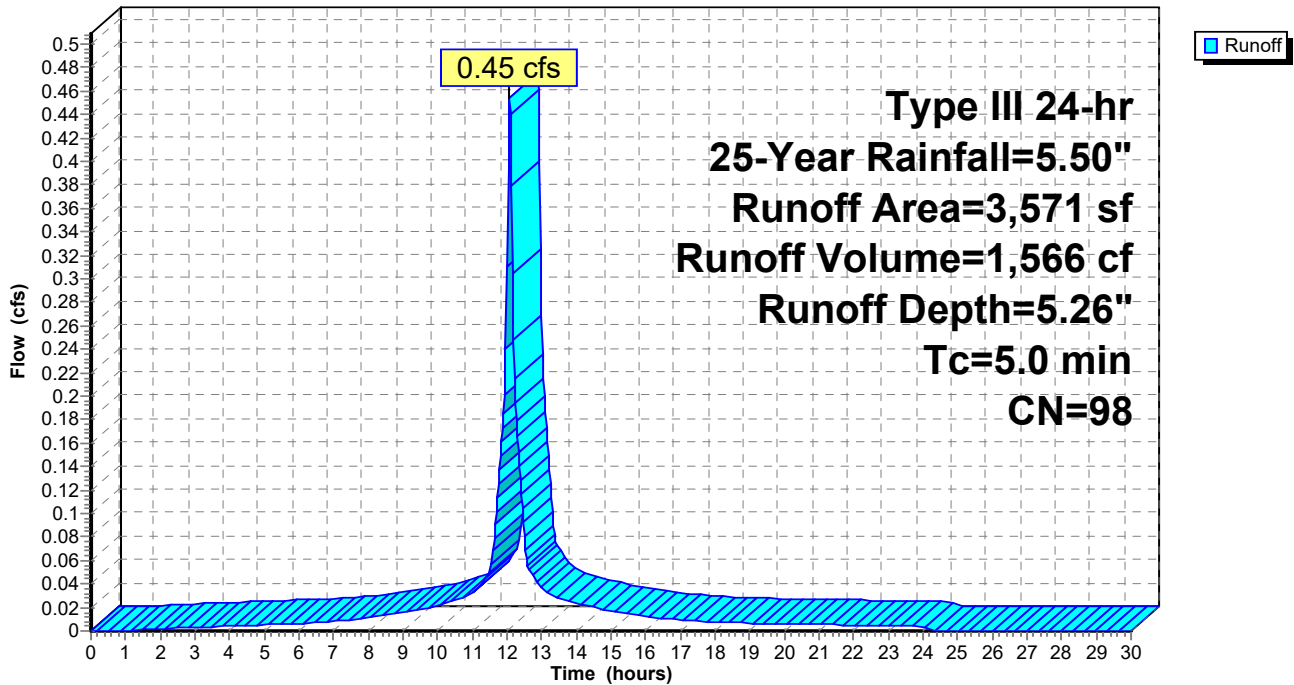
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
3,571	98	Roofs, HSG A
3,571		100.00% Impervious Area

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

Subcatchment 8S: PROPOSED ROOF

Hydrograph



4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Subcatchment 11S: PROPOSED IMPERVIOUS AREAS

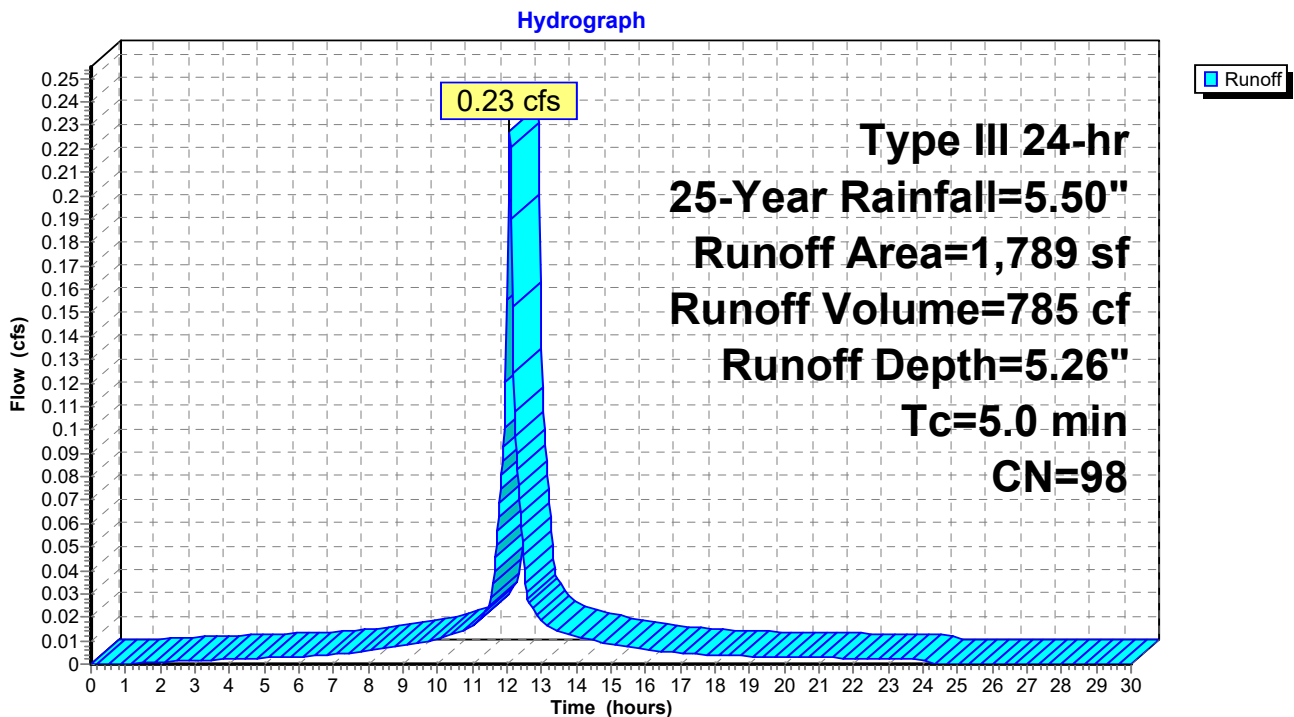
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 785 cf, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
280	98	Unconnected pavement, HSG A
31	98	Unconnected pavement, HSG A
1,162	98	Unconnected pavement, HSG A
207	98	Unconnected pavement, HSG A
109	98	Unconnected pavement, HSG A
1,789	98	Weighted Average
1,789		100.00% Impervious Area
1,789		100.00% Unconnected

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

Subcatchment 11S: PROPOSED IMPERVIOUS AREAS



4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Summary for Pond 4P: STORM TECHS #1

Inflow Area = 6,312 sf, 100.00% Impervious, Inflow Depth = 5.26" for 25-Year event
 Inflow = 0.80 cfs @ 12.07 hrs, Volume= 2,768 cf
 Outflow = 0.05 cfs @ 11.04 hrs, Volume= 2,768 cf, Atten= 94%, Lag= 0.0 min
 Discarded = 0.05 cfs @ 11.04 hrs, Volume= 2,768 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 135.17' @ 13.43 hrs Surf.Area= 928 sf Storage= 1,116 cf

Plug-Flow detention time= 168.9 min calculated for 2,765 cf (100% of inflow)
 Center-of-Mass det. time= 168.8 min (914.4 - 745.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	132.50'	1,636 cf	28.00'W x 33.14'L x 5.00'H Field A 4,640 cf Overall - 551 cf Embedded = 4,089 cf x 40.0% Voids
#2A	134.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	137.50'	9 cf	6.0" Round Pipe Storage-Impervious L= 47.5' S= 0.1474 'l'
		2,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	132.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	139.80'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 11.04 hrs HW=132.63' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=132.50' (Free Discharge)
 ↑**2=Orifice/Grate** (Controls 0.00 cfs)

4- PROPOSED

Type III 24-hr 25-Year Rainfall=5.50"

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Pond 4P: STORM TECHS #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +61.0" End Stone x 2 = 33.14' Base Length

4 Rows x 51.0" Wide + 24.0" Spacing x 3 + 30.0" Side Stone x 2 = 28.00' Base Width

24.0" Base + 30.0" Chamber Height + 6.0" Cover = 5.00' Field Height

12 Chambers x 45.9 cf = 551.3 cf Chamber Storage

4,640.1 cf Field - 551.3 cf Chambers = 4,088.8 cf Stone x 40.0% Voids = 1,635.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,186.8 cf = 0.050 af

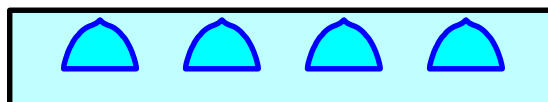
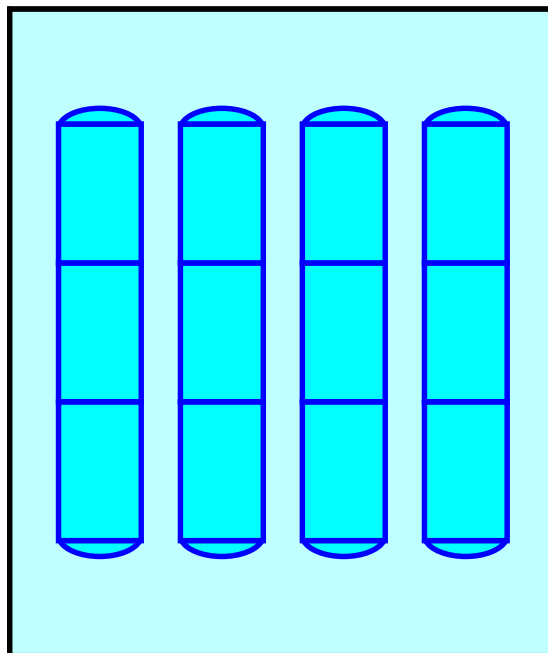
Overall Storage Efficiency = 47.1%

Overall System Size = 33.14' x 28.00' x 5.00'

12 Chambers

171.9 cy Field

151.4 cy Stone



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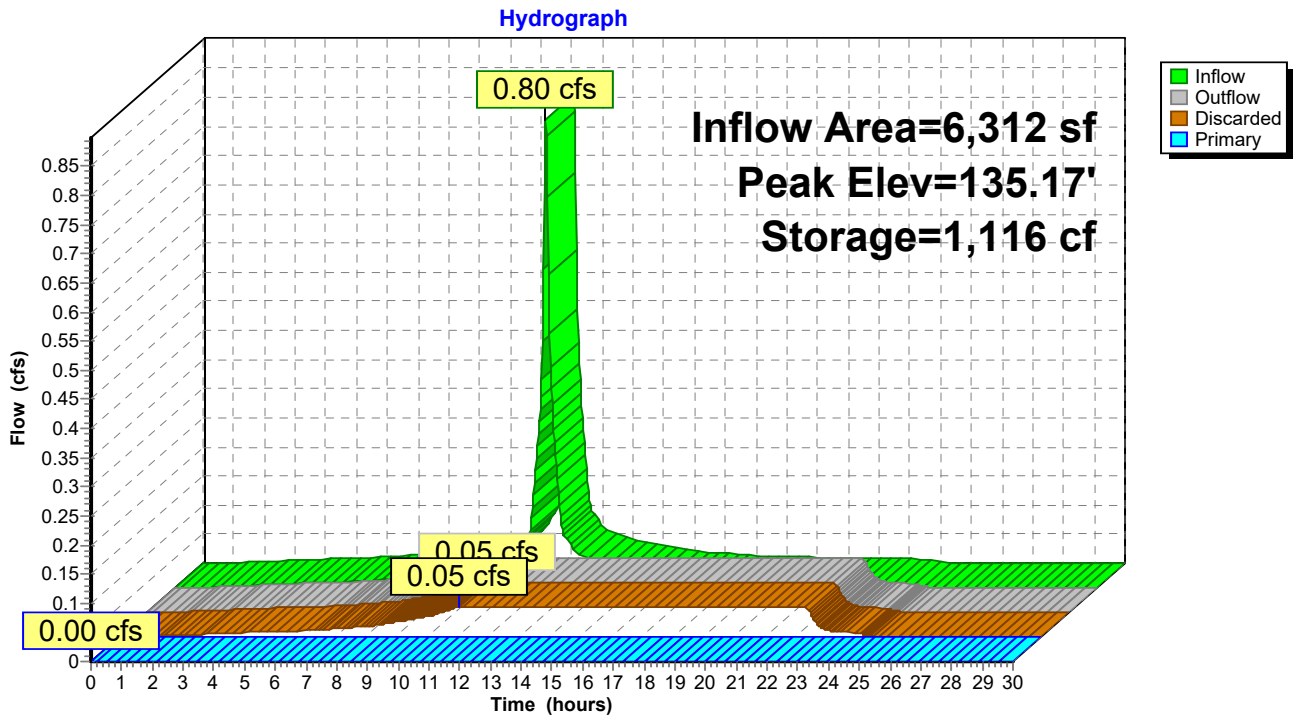
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Type III 24-hr 25-Year Rainfall=5.50"

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Pond 4P: STORM TECHS #1



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Type III 24-hr 25-Year Rainfall=5.50"

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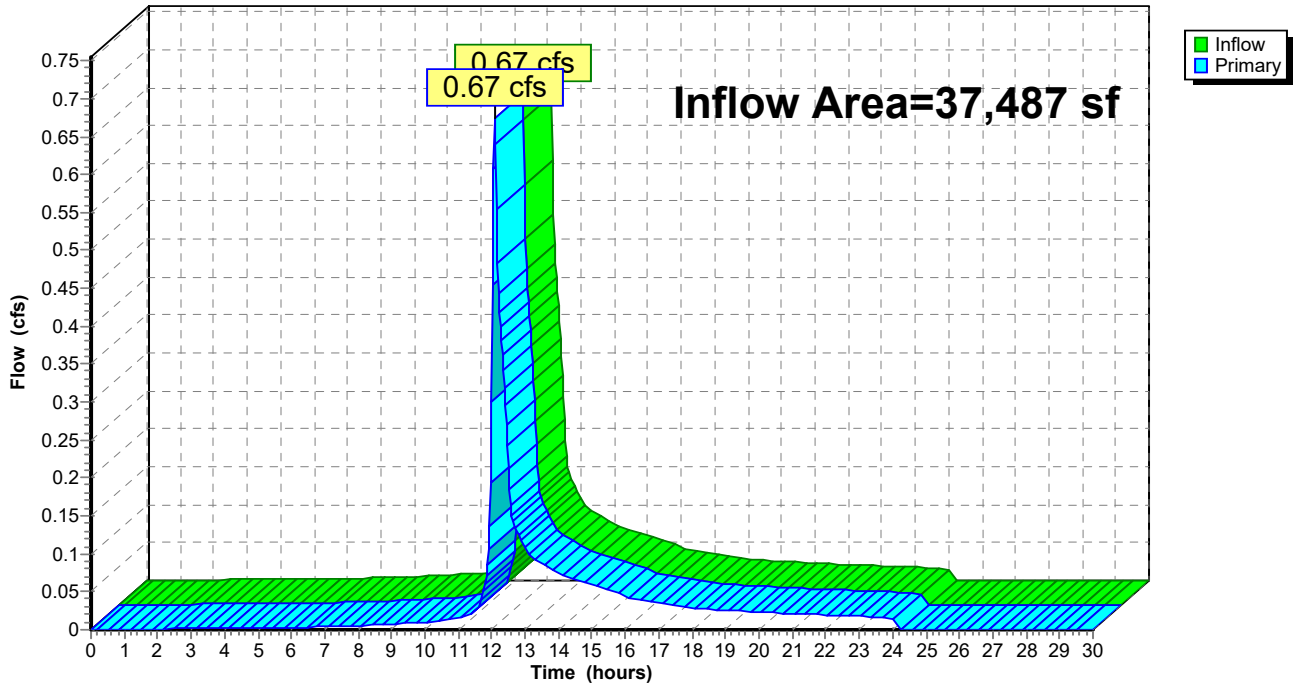
Summary for Link 3L: PROPOSED

Inflow Area = 37,487 sf, 21.25% Impervious, Inflow Depth = 0.90" for 25-Year event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 2,805 cf
Primary = 0.67 cfs @ 12.09 hrs, Volume= 2,805 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

Hydrograph



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROPOSED Runoff Area=29,520 sf 0.00% Impervious Runoff Depth=2.62"
 Tc=5.0 min CN=49 Runoff=2.00 cfs 6,452 cf

Subcatchment5S: PROPOSED DRIVEWAY Runoff Area=952 sf 100.00% Impervious Runoff Depth=8.54"
 Tc=5.0 min CN=98 Runoff=0.19 cfs 677 cf

Subcatchment7S: PROPOSED ROOF Runoff Area=1,655 sf 100.00% Impervious Runoff Depth=8.54"
 Tc=5.0 min CN=98 Runoff=0.34 cfs 1,178 cf

Subcatchment8S: PROPOSED ROOF Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=8.54"
 Tc=5.0 min CN=98 Runoff=0.73 cfs 2,541 cf

Subcatchment11S: PROPOSED Runoff Area=1,789 sf 100.00% Impervious Runoff Depth=8.54"
 Tc=5.0 min CN=98 Runoff=0.36 cfs 1,273 cf

Pond 4P: STORM TECHS #1 Peak Elev=139.80' Storage=2,190 cf Inflow=1.29 cfs 4,492 cf
 Discarded=0.05 cfs 4,414 cf Primary=0.00 cfs 1 cf Outflow=0.05 cfs 4,415 cf

Link 3L: PROPOSED Inflow=2.33 cfs 7,631 cf
 Primary=2.33 cfs 7,631 cf

Total Runoff Area = 37,487 sf Runoff Volume = 12,122 cf Average Runoff Depth = 3.88"
78.75% Pervious = 29,520 sf 21.25% Impervious = 7,967 sf

4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 4S: PROPOSED LANDSCAPE AREA

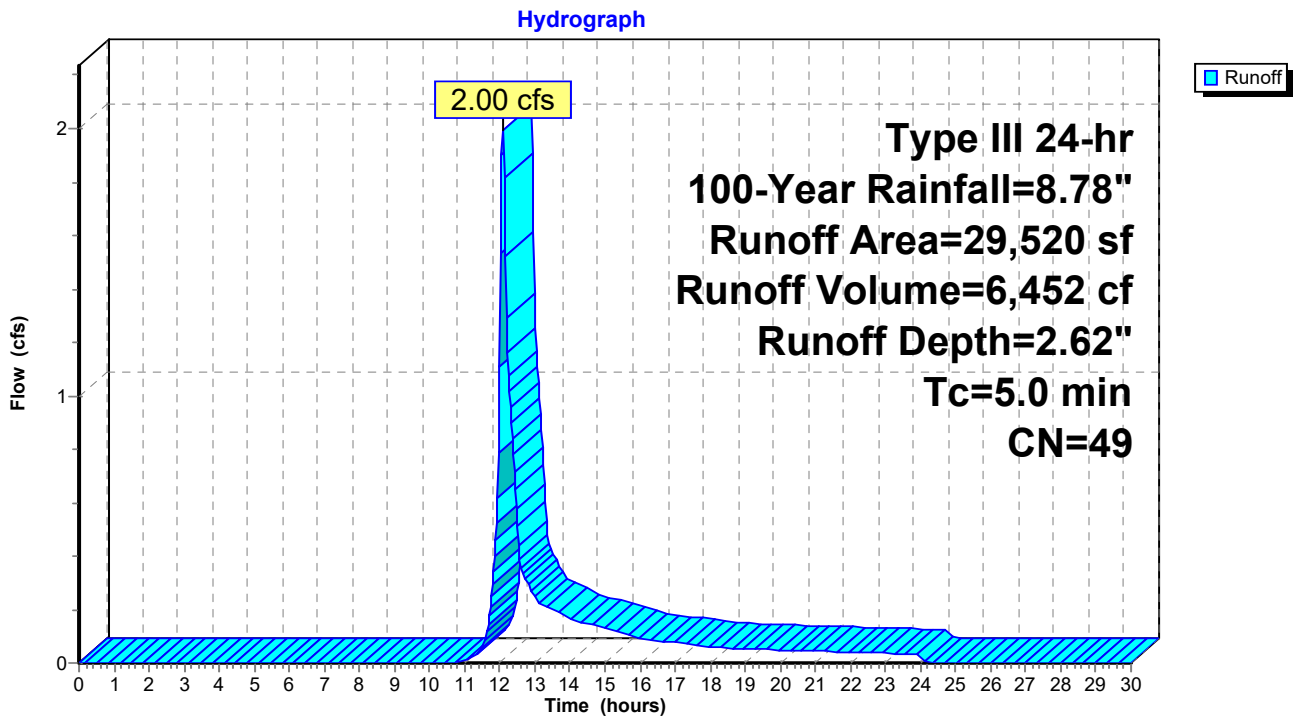
Runoff = 2.00 cfs @ 12.08 hrs, Volume= 6,452 cf, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
29,520	49	50-75% Grass cover, Fair, HSG A
29,520		100.00% Pervious Area

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

Subcatchment 4S: PROPOSED LANDSCAPE AREA



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 5S: PROPOSED DRIVEWAY

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 677 cf, Depth= 8.54"

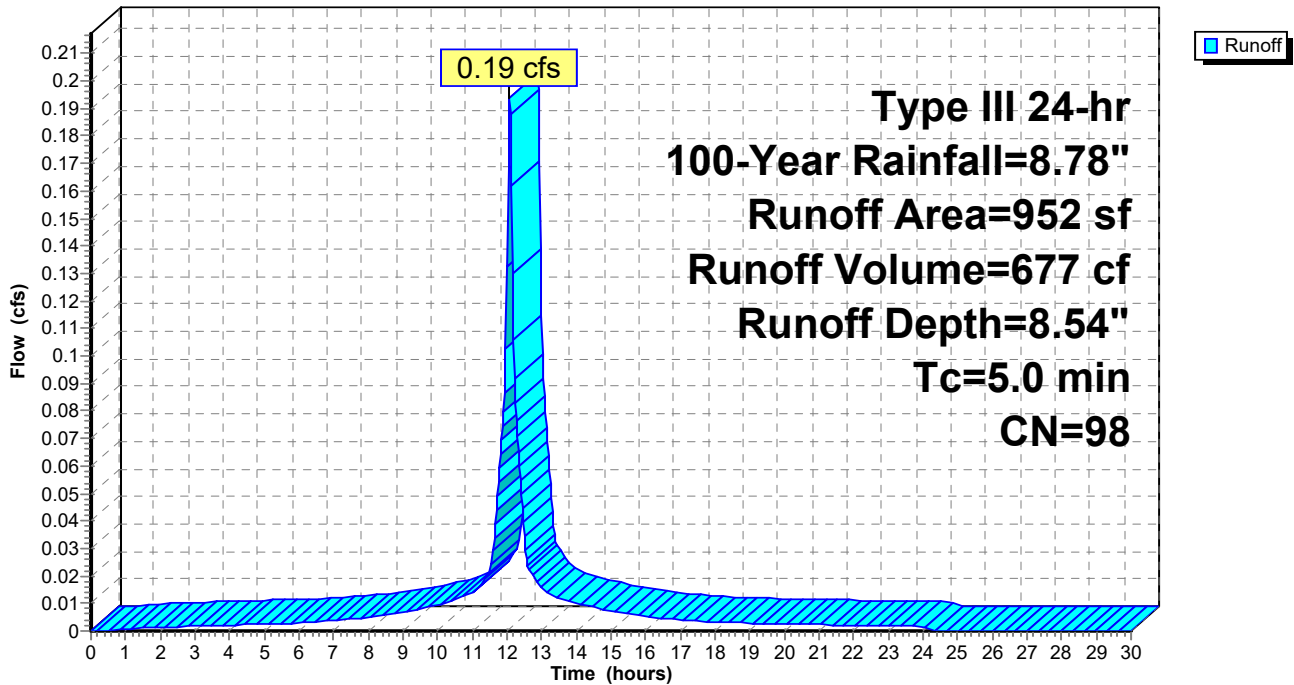
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
 Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
952	98	Paved parking, HSG A
952		100.00% Impervious Area

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

Subcatchment 5S: PROPOSED DRIVEWAY

Hydrograph



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 7S: PROPOSED ROOF

Runoff = 0.34 cfs @ 12.07 hrs, Volume= 1,178 cf, Depth= 8.54"

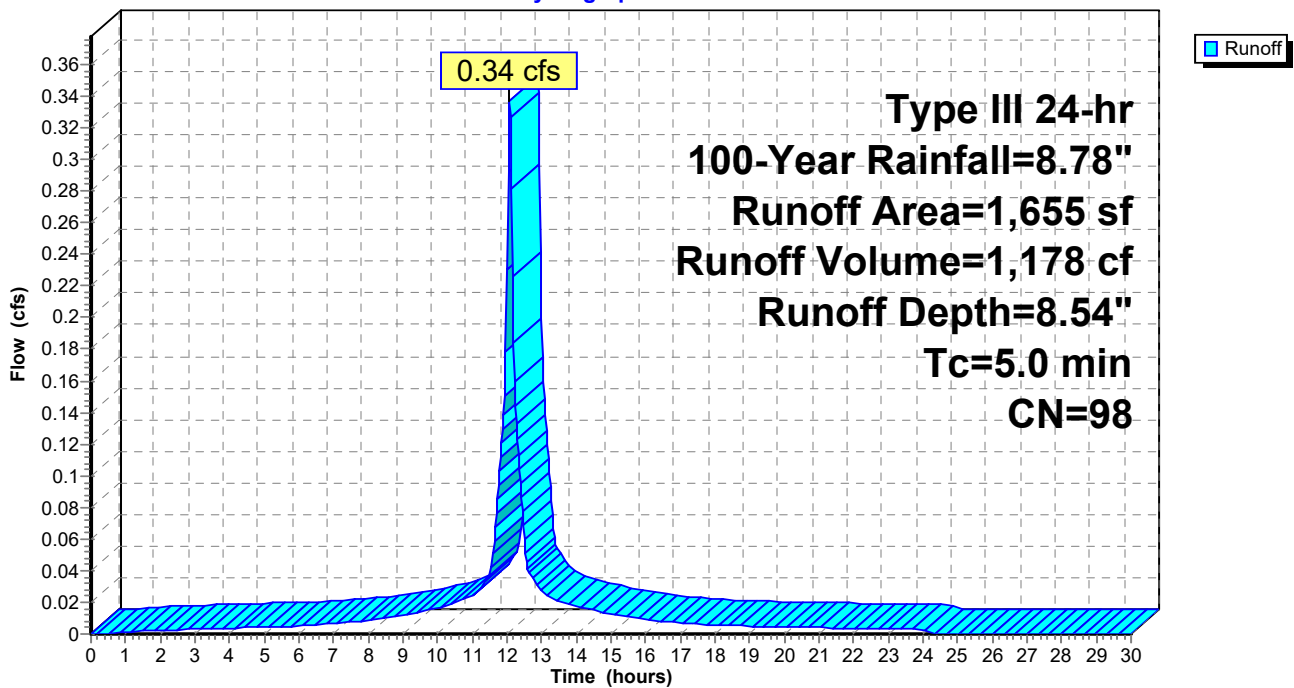
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
1,655	98	Roofs, HSG A
1,655		100.00% Impervious Area

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

Subcatchment 7S: PROPOSED ROOF

Hydrograph



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 8S: PROPOSED ROOF

Runoff = 0.73 cfs @ 12.07 hrs, Volume= 2,541 cf, Depth= 8.54"

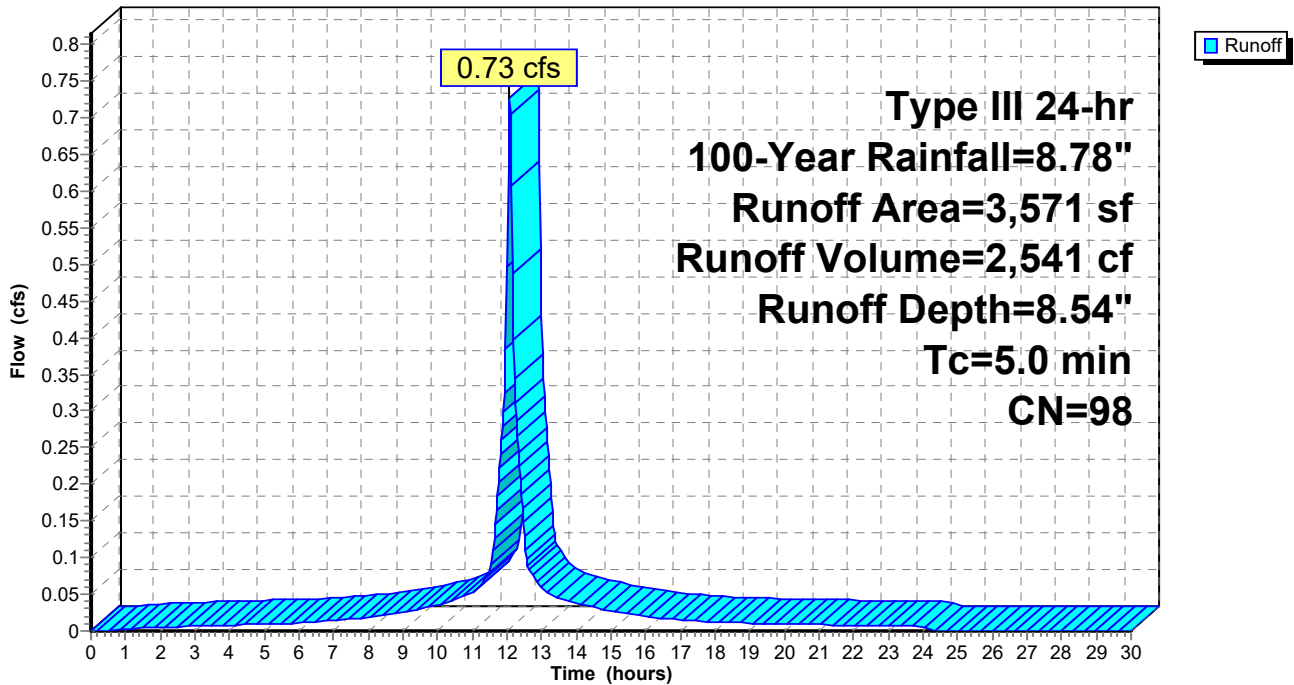
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
3,571	98	Roofs, HSG A
3,571		100.00% Impervious Area

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

Subcatchment 8S: PROPOSED ROOF

Hydrograph



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Subcatchment 11S: PROPOSED IMPERVIOUS AREAS

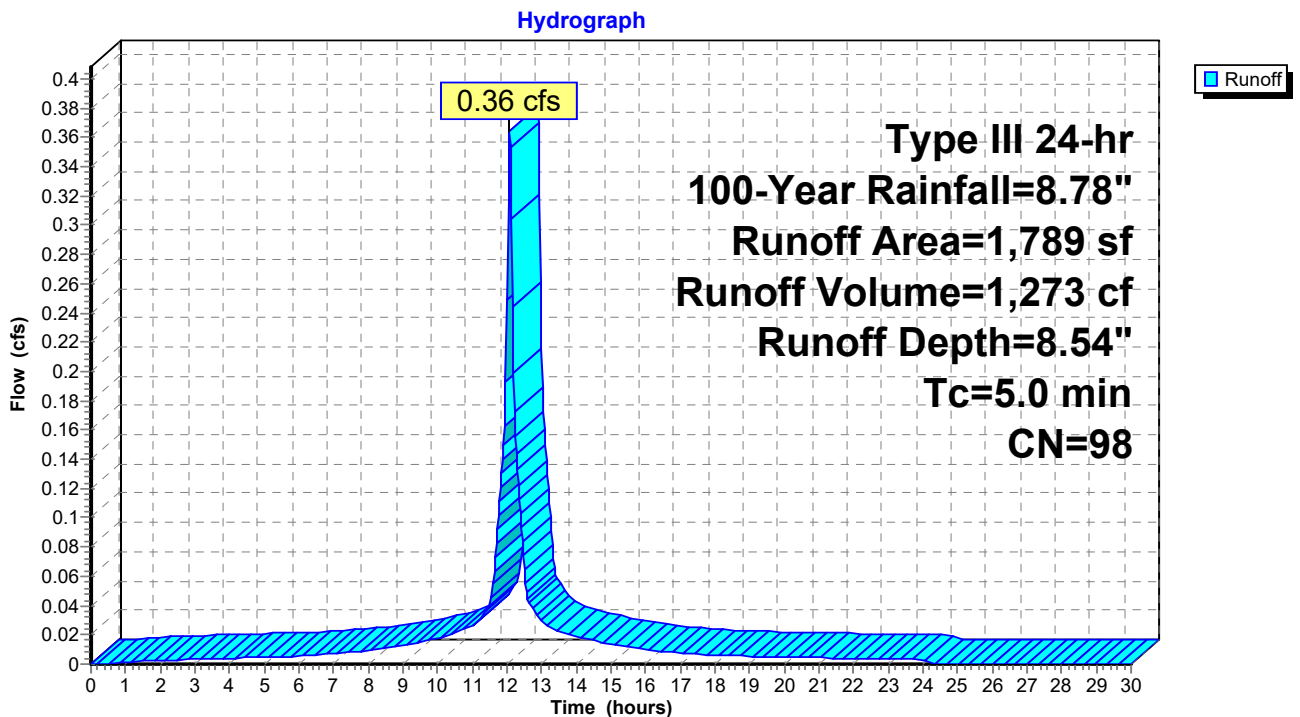
Runoff = 0.36 cfs @ 12.07 hrs, Volume= 1,273 cf, Depth= 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
280	98	Unconnected pavement, HSG A
31	98	Unconnected pavement, HSG A
1,162	98	Unconnected pavement, HSG A
207	98	Unconnected pavement, HSG A
109	98	Unconnected pavement, HSG A
1,789	98	Weighted Average
1,789		100.00% Impervious Area
1,789		100.00% Unconnected

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

Subcatchment 11S: PROPOSED IMPERVIOUS AREAS



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Summary for Pond 4P: STORM TECHS #1

Inflow Area = 6,312 sf, 100.00% Impervious, Inflow Depth = 8.54" for 100-Year event
 Inflow = 1.29 cfs @ 12.07 hrs, Volume= 4,492 cf
 Outflow = 0.05 cfs @ 14.68 hrs, Volume= 4,415 cf, Atten= 96%, Lag= 156.6 min
 Discarded = 0.05 cfs @ 9.66 hrs, Volume= 4,414 cf
 Primary = 0.00 cfs @ 14.68 hrs, Volume= 1 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 139.80' @ 14.67 hrs Surf.Area= 928 sf Storage= 2,190 cf

Plug-Flow detention time= 352.0 min calculated for 4,415 cf (98% of inflow)
 Center-of-Mass det. time= 340.7 min (1,079.9 - 739.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	132.50'	1,636 cf	28.00'W x 33.14'L x 5.00'H Field A 4,640 cf Overall - 551 cf Embedded = 4,089 cf x 40.0% Voids
#2A	134.50'	551 cf	ADS_StormTech SC-740 +Cap x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
#3	137.50'	9 cf	6.0" Round Pipe Storage-Impervious L= 47.5' S= 0.1474 'l'
		2,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	132.50'	2.410 in/hr Exfiltration over Surface area
#2	Primary	139.80'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 9.66 hrs HW=132.63' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 14.68 hrs HW=139.80' (Free Discharge)
 ↑**2=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.11 fps)

4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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Pond 4P: STORM TECHS #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 24.0" Spacing = 75.0" C-C Row Spacing

3 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 22.98' Row Length +61.0" End Stone x 2 = 33.14' Base Length

4 Rows x 51.0" Wide + 24.0" Spacing x 3 + 30.0" Side Stone x 2 = 28.00' Base Width

24.0" Base + 30.0" Chamber Height + 6.0" Cover = 5.00' Field Height

12 Chambers x 45.9 cf = 551.3 cf Chamber Storage

4,640.1 cf Field - 551.3 cf Chambers = 4,088.8 cf Stone x 40.0% Voids = 1,635.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,186.8 cf = 0.050 af

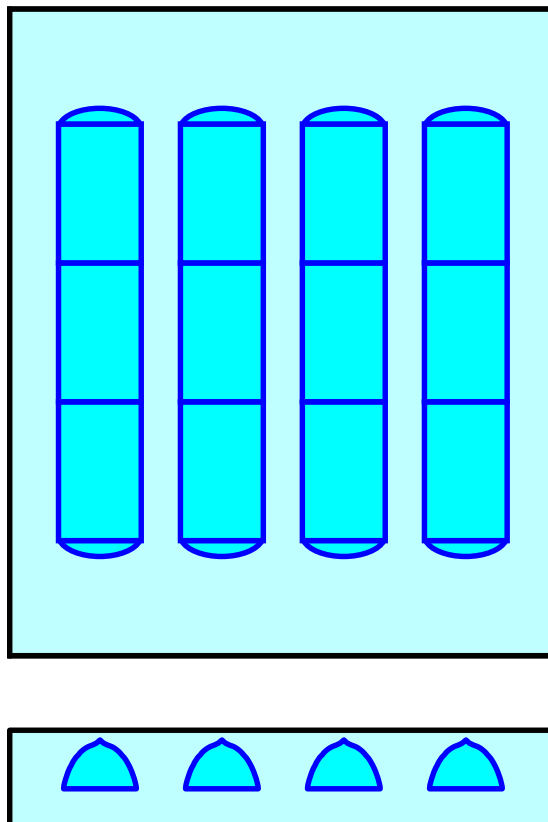
Overall Storage Efficiency = 47.1%

Overall System Size = 33.14' x 28.00' x 5.00'

12 Chambers

171.9 cy Field

151.4 cy Stone



4- PROPOSED

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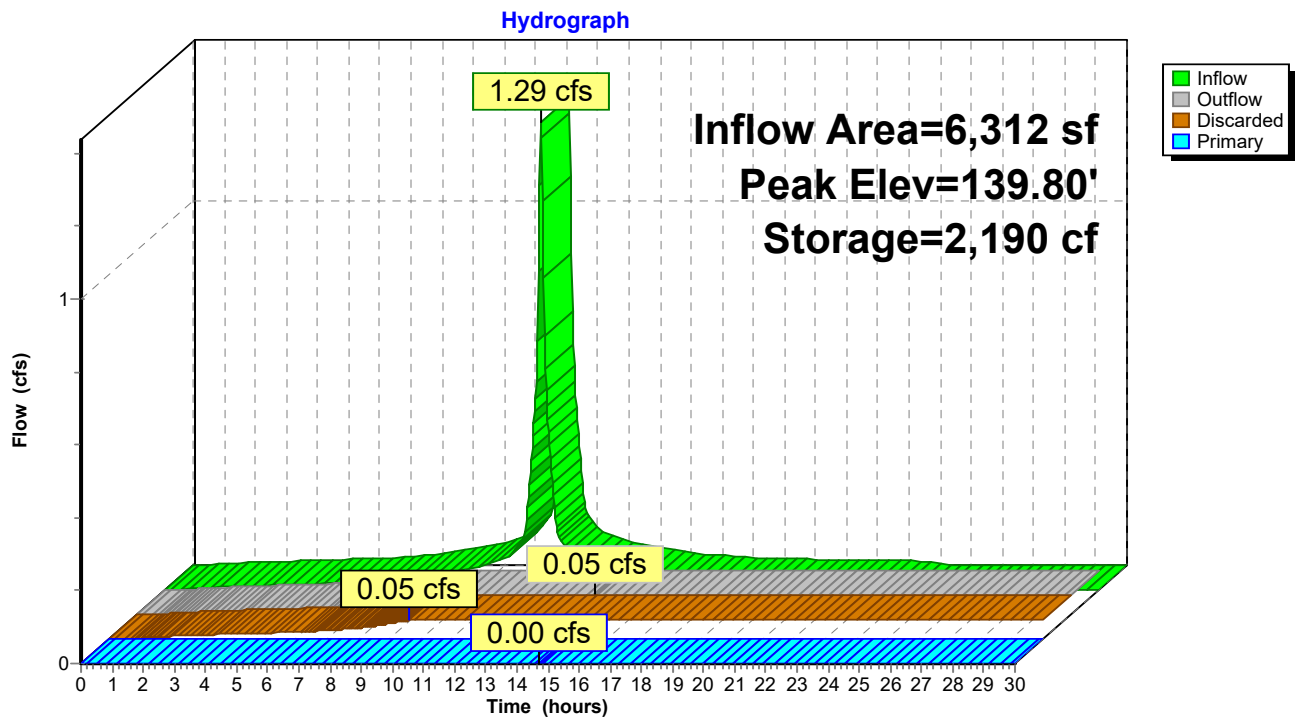
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Type III 24-hr 100-Year Rainfall=8.78"

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Pond 4P: STORM TECHS #1



4- PROPOSED

Type III 24-hr 100-Year Rainfall=8.78"

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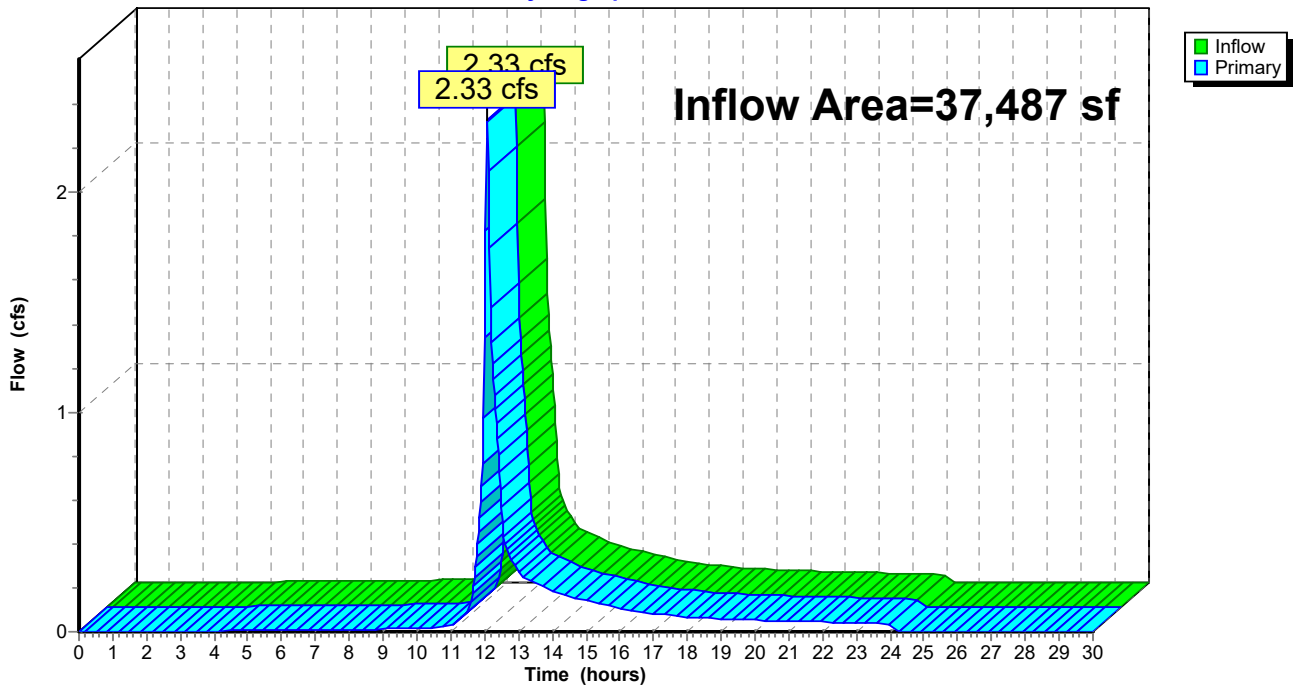
Summary for Link 3L: PROPOSED

Inflow Area = 37,487 sf, 21.25% Impervious, Inflow Depth = 2.44" for 100-Year event
Inflow = 2.33 cfs @ 12.08 hrs, Volume= 7,631 cf
Primary = 2.33 cfs @ 12.08 hrs, Volume= 7,631 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs

Link 3L: PROPOSED

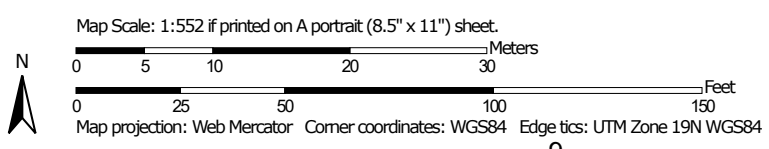
Hydrograph



Appendix B – Soil Information




Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 23, Sep 12, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
255A	Windsor loamy sand, 0 to 3 percent slopes	0.4	56.3%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	0.3	43.7%
Totals for Area of Interest		0.7	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

255A—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg

Elevation: 0 to 990 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash plains, outwash terraces, deltas, dunes

Landform position (three-dimensional): Tread, riser

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand

Bw - 3 to 25 inches: loamy sand

C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components**Deerfield, loamy sand**

Percent of map unit: 10 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, tal
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest,
 rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

629C—Canton-Charlton-Urban land complex, 3 to 15 percent slopes**Map Unit Setting**

National map unit symbol: 9959
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 40 percent
Charlton and similar soils: 30 percent
Urban land: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton**Setting**

Landform: Hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable sandy basal till derived
 from granite and gneiss

Typical profile*H1 - 0 to 8 inches: fine sandy loam**H2 - 8 to 21 inches: fine sandy loam**H3 - 21 to 65 inches: gravelly loamy sand***Properties and qualities***Slope: 3 to 15 percent**Depth to restrictive feature: 18 to 30 inches to strongly contrasting textural stratification**Drainage class: Well drained**Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)**Depth to water table: More than 80 inches**Frequency of flooding: None**Frequency of ponding: None**Available water supply, 0 to 60 inches: Very low (about 2.9 inches)***Interpretive groups***Land capability classification (irrigated): None specified**Land capability classification (nonirrigated): 3e**Hydrologic Soil Group: A**Ecological site: F144AY034CT - Well Drained Till Uplands**Hydric soil rating: No***Description of Charlton****Setting***Landform: Ground moraines, drumlins**Landform position (two-dimensional): Backslope**Landform position (three-dimensional): Side slope**Down-slope shape: Linear**Across-slope shape: Convex**Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss***Typical profile***H1 - 0 to 5 inches: fine sandy loam**H2 - 5 to 22 inches: sandy loam**H3 - 22 to 65 inches: gravelly sandy loam***Properties and qualities***Slope: 3 to 15 percent**Depth to restrictive feature: More than 80 inches**Drainage class: Well drained**Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)**Depth to water table: More than 80 inches**Frequency of flooding: None**Frequency of ponding: None**Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)***Interpretive groups***Land capability classification (irrigated): None specified**Land capability classification (nonirrigated): 3e**Hydrologic Soil Group: A**Ecological site: F144AY034CT - Well Drained Till Uplands**Hydric soil rating: No*

Description of Urban Land

Setting

Landform position (two-dimensional): Foothlope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Montauk

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Hillslopes, depressions
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 1 percent
Hydric soil rating: No

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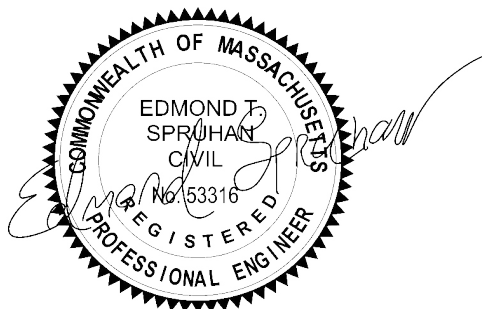
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Appendix C - Storm Water Operations & Maintenance Plan

SPRUHAN ENGINEERING, P.C.
OPERATIONS &
MAINTENANCE
PLAN

140 DARTMOUTH ST, NEWTON, MA
10/11/2024



Prepared by: Spruhan Engineering, P.C.

Operations & Maintenance Plan

Introduction

The following Stormwater Operations & Maintenance plan is for 140 Dartmouth St, Newton, MA. All erosion and sediment control measures to be used are to be constructed and installed according to the 'Massachusetts Erosion and Sediment Control Guidelines for Urban and Sub-Urban Areas.' The plan consists of the following elements:

- Owners' information
- Operation and maintenance guidance – Pre and Post Construction
- Landscape installation and maintenance guidance
- Proposed inspection log

All erosion and sediment control measures must be installed prior to the commencement of any work. All sediment and erosion control measures shall remain in place until the entire site has been stabilized. The site is deemed stabilized when all landscaped areas have been loamed and seeded with vegetation having had the chance to establish itself. Any proposed paved areas shall have their binder course of pavement installed prior to the removal of these control measures.

The long-term operation and maintenance of a stormwater management system is as critical to its performance as its design and construction. Proper operation and maintenance ensure that the BMP will continue to remove pollutants effectively over the long-term, decreases the risk of re-suspending sediment; and therefore, improves water quality. Without proper maintenance, BMPs are likely to fail and no longer provide the necessary stormwater treatment.

The maintenance of the Drainage System is the exclusive responsibility of the Property Owner. Annual reports (example below) should be submitted to the Town Engineer every January for the prior year.

- **Property Owners: Jamie Leventhal.**

Name and contact information:

Jamie Leventhal.

279 Chestnut Street, Newton, MA 02456
(617) 794- 4616

Maintenance Responsibilities:

The maintenance of the stormwater runoff controls is the responsibility of the proponent until the property is sold; after any sale, the responsibility shifts to the to the homeowner(s) or successive homeowner(s).

The actual work to inspect and clean the catch basin and the infiltration systems shall be subcontracted to a company that specializes in the cleaning of storm drainage facilities.

Change on ownership:

This plan is valid in perpetuity and any future property owners are solely responsible for the management of the stormwater system on-site in accordance with this O&M Plan

Operations & Maintenance

The following operations and maintenance plan has been developed in order to preserve the drainage infrastructure that will be constructed and to ensure the drainage and infiltration system continues to function as designed.

• Before & During Construction Operation and Maintenance Plan:

- Significant efforts shall be made to only disturb the minimum amount of area necessary to reduce potential erosion and sediment runoff. The control of dust in disturbed areas shall consist of at the least, wetting of disturbed soil or application of calcium chloride as required to minimize airborne dust.
- A stabilized construction entrance shall be installed to reduce the tracking of material onto the main road, &, if necessary, a wheel wash station put in place.
- Hay wattles shall be installed per the site plan to prevent sediment from being washed off site.
- All drainage structures shall be protected by filter fabric (or approved equal) to prevent sedimentation from entering the drainage system during the construction period.
- Driveway, pavement, and roadway (if required) areas shall be swept to remove sediments prior to introduction into the storm water management system.
- Drainage structures shall be inspected daily and cleaned as necessary of all sedimentation and construction materials during the construction period.
- The contractor is required to contact the engineer of record for drainage system inspection at least 72 hours prior to backfilling in order to receive inspection signoff.

- **Post Construction Operation and Maintenance Plan**

Once the construction is completed, it is the owner's responsibility to maintain the items outlined below to ensure the efficiency and integrity of the drainage systems. The post-construction inspections shall take place at a minimum of once during the Spring (March-May), and a minimum of once during the fall (September – November) and after every major storm.

- **All drainage structures and pipes** shall be inspected on a minimum on a semi-annual basis. These inspections shall take place during the spring and fall months of the year. The inspector shall take note of any debris/sediment/clogging and shall document the condition of each structure. Based upon the observed condition, the inspector shall make recommendations if any further action is required.
- **All drainage structures, including manholes, trench drains, cleanouts, and catch basins**, shall be inspected four times per year and shall be cleaned of all sand, debris, and sediment four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the basin to the lowest pipe invert.
- **Roof Gutters and cleanouts** shall be inspected annually and after major rain events. Remove leaves and sediment as necessary to allow rainwater to flow into the system.
- **Storm-tech SC-740 Maintenance procedures:**
 - Storm-tech systems shall be inspected at a minimum on a semi-annual basis, or after a major storm event.
 - Remove lid and cap from inspection ports which must be brought to finished grade.
 - Using a flashlight and stadia rod, measure the depth of sediment
 - If sediment is above 3" depth, then cleaning is required
 - A licensed professional shall provide cleanout/ flushing services of all sediment and debris via cleanouts and catch basins located per plans.
 - All caps and covers shall be replaced

Other Activities:

Pavement Sweeping: The paved areas shall be swept every quarter, so four (4) times per year.

Lawn and Landscape Repairs: The lawn and landscaped areas on the site shall be inspected in the spring and fall of each year and the areas shall be restabilized as needed by seeding as lawn or mulching landscaped areas.

An INSPECTION LOG example format is shown below on Table B.1. This must be filled every

time an inspection or maintenance activity is performed on any element of the stormwater management on site, included but not limited to:

- a) Pretreatment devices.
- b) Vegetation or filter media.
- c) control structures.
- d) Embankments and slopes.
- e) Inlet and outlet channels and structures.
- f) Underground drainage.
- g) Sediment and debris accumulation in storage and forebay areas (including catch basins).
- h) Any nonstructural practices.
- i) Any other item that could affect the proper function of the stormwater management system
- j) Annual reporting must be submitted to the Department of Public Works.

Jamie Leventhal
Jamie Leventhal
PROPERTY OWNER

*** FINAL IMPORTANT NOTE: PROVISIONS MUST EXIST ALLOWING THE CITY OF NEWTON OR HIS/HER DESIGNEE TO ENTER THE PROPERTY AT REASONABLE TIMES AND IN A REASONABLE MANNER FOR THE PURPOSE OF INSPECTION.**

**OPERATION & MAINTENANCE PLAN
LOG SHEET
140 DARTMOUTH ST, NEWTON, MA**

INSPECTION REPORT:

Inspection Firm: _____

Inspector's Name: _____ Date: _____

Components Inspected: _____

Signed: _____

SYSTEM MAINTENANCE:

Maintenance Firm: _____ Date: _____

Catch Basin Cleaned: Yes ___ No ___ Comments: _____

Manhole & Sumps Cleaned: Yes ___ No ___ Comments: _____

Drain Lines Inspected: Yes ___ No ___ Comments: _____

Stormwater unit System Cleaned: Yes ___ No ___ Comments: _____

Estimate of Material Removed: _____

Other Comments: _____

Signed: _____

Table B.1. Inspection log

Appendix D
Precipitation Frequency Estimates for Newton (NOAA Atlas 14 Volume 10 V3)

140 Dartmouth St, Newton, MA



NOAA Atlas 14, Volume 10, Version 3
Location name: Newton Center, Massachusetts, USA*

Latitude: 42.3385°, Longitude: -71.2071°

Elevation: 96 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.302 (0.239-0.383)	0.373 (0.294-0.473)	0.489 (0.384-0.623)	0.585 (0.457-0.750)	0.717 (0.542-0.968)	0.816 (0.604-1.13)	0.921 (0.662-1.33)	1.04 (0.705-1.54)	1.23 (0.795-1.88)	1.38 (0.872-2.16)
10-min	0.428 (0.338-0.543)	0.529 (0.417-0.671)	0.693 (0.544-0.882)	0.829 (0.647-1.06)	1.02 (0.768-1.37)	1.16 (0.856-1.60)	1.30 (0.938-1.89)	1.48 (0.999-2.18)	1.74 (1.12-2.66)	1.95 (1.24-3.06)
15-min	0.504 (0.398-0.638)	0.622 (0.490-0.789)	0.815 (0.640-1.04)	0.975 (0.762-1.25)	1.20 (0.903-1.61)	1.36 (1.01-1.88)	1.54 (1.10-2.22)	1.74 (1.18-2.57)	2.04 (1.32-3.13)	2.30 (1.45-3.60)
30-min	0.687 (0.543-0.871)	0.849 (0.669-1.08)	1.11 (0.875-1.42)	1.33 (1.04-1.71)	1.63 (1.23-2.21)	1.86 (1.38-2.57)	2.10 (1.51-3.04)	2.38 (1.61-3.52)	2.81 (1.82-4.31)	3.18 (2.01-4.97)
60-min	0.871 (0.688-1.10)	1.08 (0.848-1.36)	1.41 (1.11-1.79)	1.69 (1.32-2.16)	2.07 (1.57-2.80)	2.35 (1.74-3.26)	2.66 (1.92-3.86)	3.02 (2.04-4.46)	3.58 (2.32-5.49)	4.06 (2.57-6.35)
2-hr	1.13 (0.900-1.43)	1.40 (1.11-1.76)	1.84 (1.45-2.32)	2.20 (1.73-2.80)	2.70 (2.06-3.63)	3.07 (2.29-4.24)	3.47 (2.53-5.03)	3.97 (2.69-5.81)	4.75 (3.09-7.22)	5.43 (3.45-8.42)
3-hr	1.32 (1.05-1.66)	1.63 (1.30-2.05)	2.14 (1.70-2.69)	2.56 (2.02-3.24)	3.14 (2.40-4.21)	3.56 (2.67-4.91)	4.03 (2.95-5.82)	4.62 (3.13-6.72)	5.54 (3.61-8.38)	6.35 (4.04-9.79)
6-hr	1.71 (1.37-2.13)	2.10 (1.69-2.63)	2.75 (2.20-3.44)	3.28 (2.60-4.13)	4.02 (3.09-5.34)	4.56 (3.44-6.22)	5.15 (3.78-7.37)	5.89 (4.02-8.50)	7.06 (4.61-10.6)	8.07 (5.15-12.3)
12-hr	2.18 (1.76-2.70)	2.68 (2.16-3.32)	3.48 (2.80-4.33)	4.15 (3.32-5.19)	5.07 (3.92-6.69)	5.75 (4.36-7.78)	6.49 (4.78-9.19)	7.40 (5.07-10.6)	8.81 (5.78-13.1)	10.0 (6.42-15.2)
24-hr	2.63 (2.14-3.23)	3.26 (2.65-4.01)	4.28 (3.46-5.29)	5.13 (4.13-6.37)	6.30 (4.90-8.26)	7.16 (5.46-9.63)	8.10 (6.01-11.4)	9.28 (6.38-13.2)	11.1 (7.31-16.3)	12.7 (8.15-19.0)
2-day	3.01 (2.46-3.67)	3.79 (3.10-4.63)	5.08 (4.14-6.23)	6.14 (4.97-7.58)	7.61 (5.96-9.93)	8.68 (6.67-11.6)	9.87 (7.40-13.9)	11.4 (7.86-16.0)	13.9 (9.16-20.2)	16.1 (10.3-23.8)
3-day	3.30 (2.71-4.02)	4.15 (3.41-5.05)	5.54 (4.53-6.77)	6.69 (5.44-8.22)	8.28 (6.52-10.8)	9.44 (7.28-12.6)	10.7 (8.07-15.0)	12.4 (8.57-17.3)	15.1 (10.0-21.9)	17.5 (11.3-25.9)
4-day	3.58 (2.95-4.34)	4.46 (3.67-5.41)	5.90 (4.83-7.18)	7.09 (5.77-8.68)	8.73 (6.89-11.3)	9.93 (7.68-13.2)	11.3 (8.49-15.7)	13.0 (9.00-18.1)	15.8 (10.5-22.8)	18.3 (11.8-26.9)
7-day	4.33 (3.59-5.22)	5.25 (4.34-6.34)	6.75 (5.56-8.17)	7.99 (6.54-9.73)	9.70 (7.68-12.5)	10.9 (8.49-14.4)	12.3 (9.32-17.0)	14.1 (9.82-19.5)	17.0 (11.3-24.3)	19.6 (12.7-28.5)
10-day	5.03 (4.18-6.04)	5.97 (4.96-7.18)	7.51 (6.21-9.06)	8.78 (7.21-10.7)	10.5 (8.36-13.4)	11.8 (9.18-15.4)	13.2 (9.98-18.1)	15.0 (10.5-20.7)	17.9 (11.9-25.4)	20.4 (13.2-29.5)
20-day	7.05 (5.90-8.42)	8.07 (6.74-9.63)	9.73 (8.10-11.7)	11.1 (9.18-13.4)	13.0 (10.3-16.3)	14.4 (11.2-18.5)	15.9 (11.9-21.2)	17.6 (12.4-23.9)	20.1 (13.5-28.3)	22.2 (14.4-31.8)
30-day	8.72 (7.33-10.4)	9.79 (8.22-11.6)	11.5 (9.64-13.8)	13.0 (10.8-15.6)	15.0 (11.9-18.7)	16.5 (12.8-21.0)	18.1 (13.5-23.7)	19.7 (13.9-26.6)	22.0 (14.8-30.6)	23.7 (15.4-33.8)
45-day	10.8 (9.11-12.8)	11.9 (10.1-14.1)	13.8 (11.6-16.4)	15.3 (12.8-18.3)	17.4 (13.9-21.5)	19.1 (14.8-24.0)	20.7 (15.4-26.7)	22.3 (15.7-29.8)	24.2 (16.4-33.6)	25.7 (16.8-36.4)
60-day	12.5 (10.6-14.8)	13.7 (11.6-16.2)	15.6 (13.2-18.5)	17.2 (14.4-20.5)	19.4 (15.5-23.9)	21.2 (16.4-26.4)	22.8 (16.9-29.2)	24.3 (17.3-32.5)	26.2 (17.7-36.2)	27.5 (18.0-38.7)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

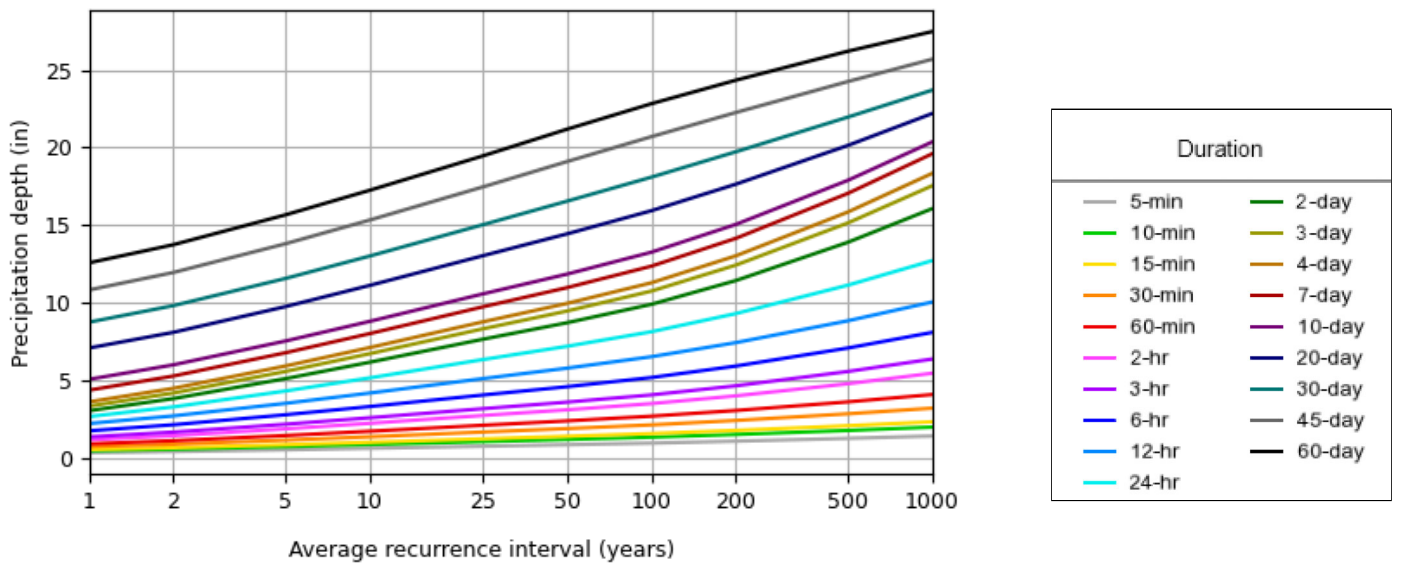
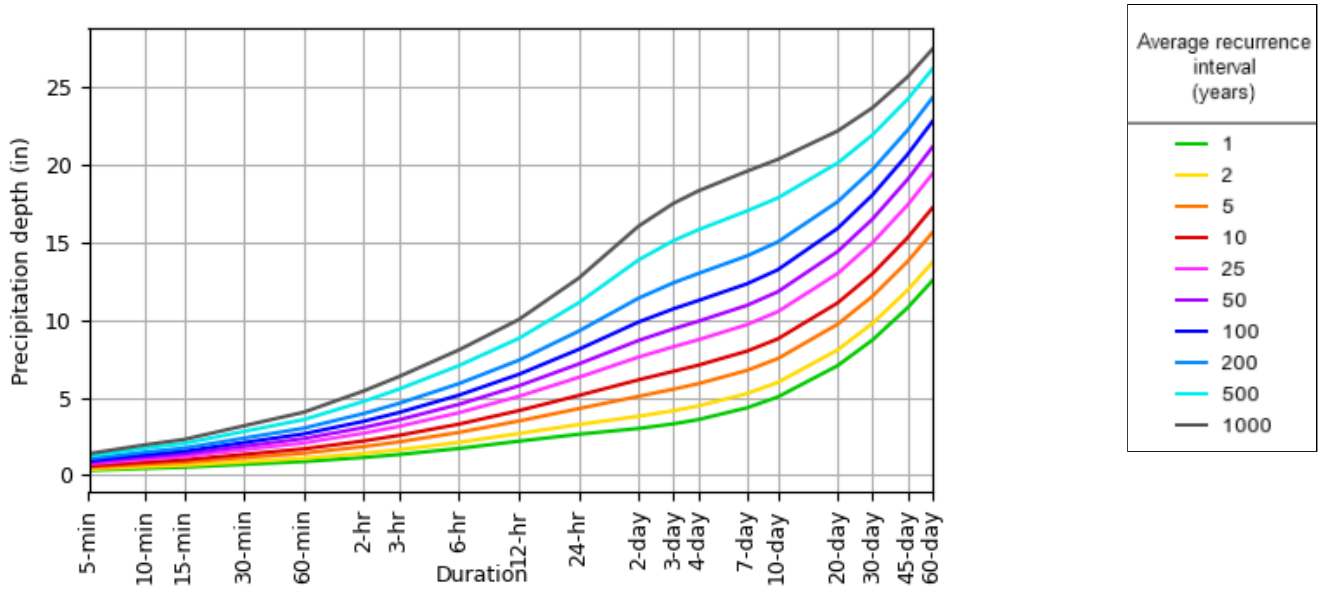
Please refer to NOAA Atlas 14 document for more information.

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PF graphical

140 Dartmouth St, Newton, MA

PDS-based depth-duration-frequency (DDF) curves Latitude: 42.3385°, Longitude: -71.2071°

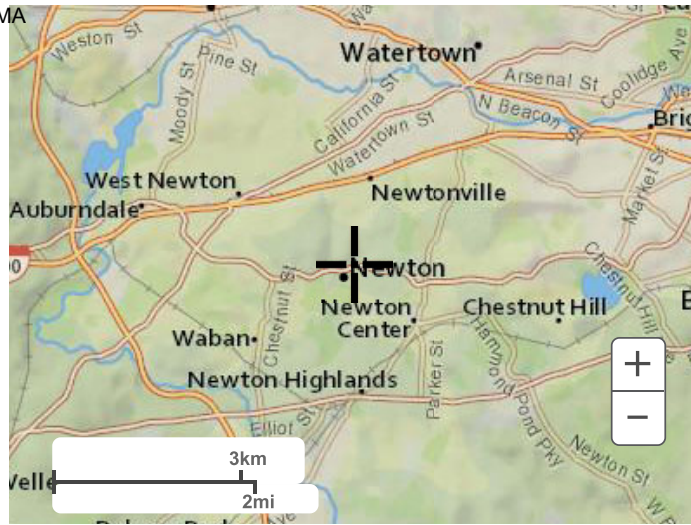


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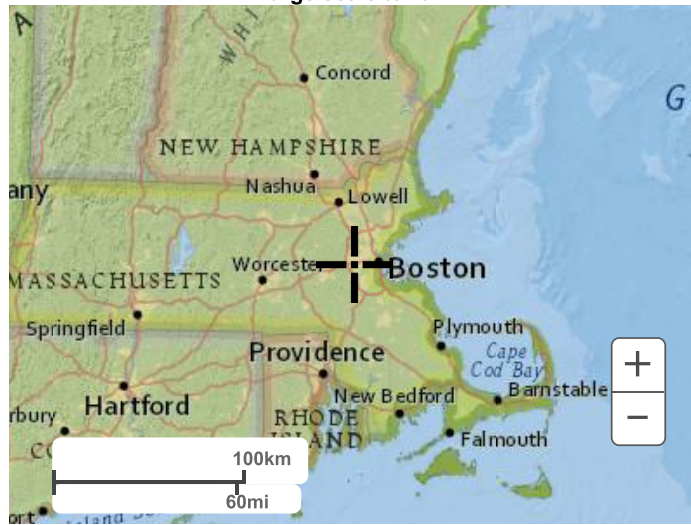
Maps & aerials

Small scale terrain

140 Dartmouth St, Newton, MA



Large scale terrain

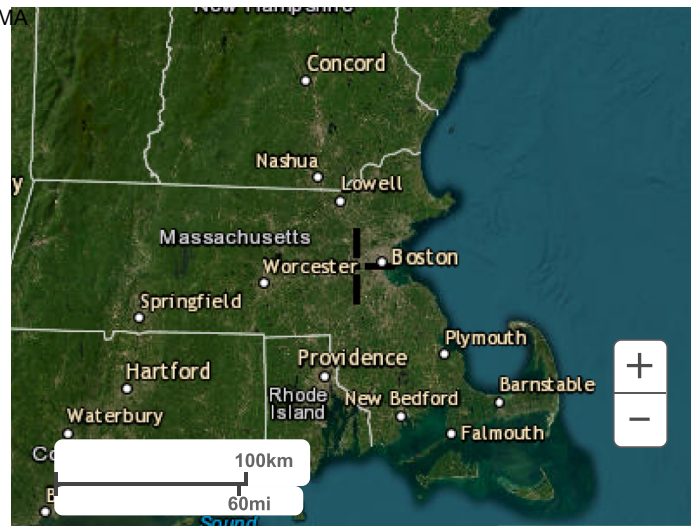


Large scale map



Large scale aerial

140 Dartmouth St, Newton, MA



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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