

# STORMWATER REPORT

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**97 Main Street  
Topsfield, Massachusetts**

**January 31, 2023  
Revised: April 13, 2023**

**Applicant:  
Montana Development  
23 Aaron Drive  
Topsfield, MA 01983**

**Prepared By  
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**W&S Project Data**  
TOPS-0076  
Smain#97(drainage).dwg  
EXISTING.hcp  
PROPOSED.hcp  
p:\TOPS-0076(97 Main Street)\drainage\stormwater\_report.docx



### Project Narrative

The subject property is located at 97 Main Street in Topsfield located within the Central Residential Zoning District. It is currently an undeveloped lot covered by trees and undergrowth with an intermittent stream on the north easterly portion of the lot.

The proposal is to construct a four-bedroom single family house on the lot. Coinciding with this proposal will be the construction of a paved driveway, regrading a portion of the lot, a proposed septic system and subsurface stormwater management area to capture roof runoff.

It should be noted that there is no change to the existing condition, therefore, in order to reduce the amount of paper required we have purposefully omitted the HydroCAD printout from this revision as well as the existing watershed, Long Term O&M Plan with inspection sheets and soils information.

### Peak Rate Runoff Tables

Examining the following Peak Rate/Volume of Runoff and Basin Performance table, the proposed stormwater management system is effective for mitigating the peak flow rates from the limit of watershed analysis for the 2-year, 10-year and 100-year storm events.

### Total Peak Runoff Tables

<b><i>Table 1.0: Total Peak Rate of Runoff   Comparison Location 3L</i></b>				
Description	2 Year	10 Year		100 Year
Existing Peak Rate of Runoff (cfs)	0.16	0.86		2.38
Proposed Peak Rate of Runoff (cfs)	0.16	0.84		2.33
Difference	-0.00	-0.02		-0.05

<b><i>Table 1.1: Total Peak Volume of Runoff   Comparison Location 3L</i></b>				
Description	2 Year	10 Year		100 Year
Existing Peak Volume of Runoff (cf)	935	3,097		7,822
Proposed Peak Volume of Runoff (cf)	908	2,970		7,463
Difference	-27	-127		-359

## Subwatershed Peak Runoff Tables

**Table 1.2: Peak Rate of Runoff | Comparison Location 2L**

Description	2 Year	10 Year		100 Year
Existing Peak Rate of Runoff (cfs)	0.14	0.76		2.11
Proposed Peak Rate of Runoff (cfs)	0.11	0.67		1.92
Difference	-0.03	-0.09		-0.19

**Table 1.3: Peak Rate of Runoff | Comparison Location 1L**

Description	2 Year	10 Year		100 Year
Existing Peak Rate of Runoff (cfs)	0.02	0.10		0.29
Proposed Peak Rate of Runoff (cfs)	0.05	0.17		0.41
Difference	0.03	0.07		2

**Table 1.4: Peak Volume of Runoff | Comparison Location 2L**

Description	2 Year	10 Year		100 Year
Existing Peak Volume of Runoff (cf)	817	2,693		6,785
Proposed Peak Volume of Runoff (cf)	703	2,403		6,169
Difference	-114	-290		-616

**Table 1.5: Peak Volume of Runoff | Comparison Location 1L**

Description	2 Year	10 Year		100 Year
Existing Peak Volume of Runoff (cf)	118	404		1,037
Proposed Peak Volume of Runoff (cf)	205	566		1,295
Difference	87	162		258

**Table 1.6: Stormwater Management Area 1P | Subsurface Infiltration Chambers Performance Table**

24 Hour		Peak Rates of Outflow (cfs)			
Type III Storm event	Peak Rate of Inflow (cfs)	Total (cfs)	Exfiltration (cfs)		Peak Water Level (ft)
<b>2 year</b>	0.10	0.01	0.01		99.43
<b>10 year</b>	0.16	0.01	0.01		100.12
<b>100 year</b>	0.26	0.01	0.01		101.80



***Drawdown Within 72 Hours:***

$$T_{\text{drawdown}} = [R_v \text{ total} / (K)(\text{Bottom Area})]$$

***Stormwater Management Area 1P - No Change***

$$R_v \text{ 1P} = 562 \text{ ft}^3 \text{ (peak volume in 100yr storm)}$$

$$K = 1.02 \text{ in/hr (Rawls Rate)}$$

$$\text{Bottom Area} = 274 \text{ ft}^2$$

$$T_{\text{drawdown}} = 562 / [(1.02)(274)/12] = 24.1 \text{ hours} < 72 \text{ hours}$$

***Recharge Volume:***

$$R_v \text{ required} = (\text{Impervious Area}) (F)$$

Site consists of Hydrologic Soils Group B:  $F_C = 0.35 \text{ in.}$

***Site Impervious Area Draining to Recharge Facilities:***

***Stormwater Management Area 1P (Subsurface Infiltration Basin)***

$$A_{\text{imp B soils}} = 1,428 \text{ ft}^2$$

$$R_v \text{ required} = [(1428) (0.35)/12] = 41.7 \text{ ft}^3$$

$$\text{Total } R_v \text{ required} = 41.7 \text{ ft}^3$$

$$R_v \text{ provided} = 588.8 \text{ ft}^3; \text{ Therefore Okay}$$

***Water Quality Volume: Not Require - roof runoff only***

$$V_{\text{wq required}} = (A_{\text{imp}})(D_{\text{wq}})$$

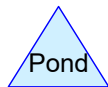
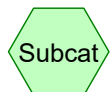
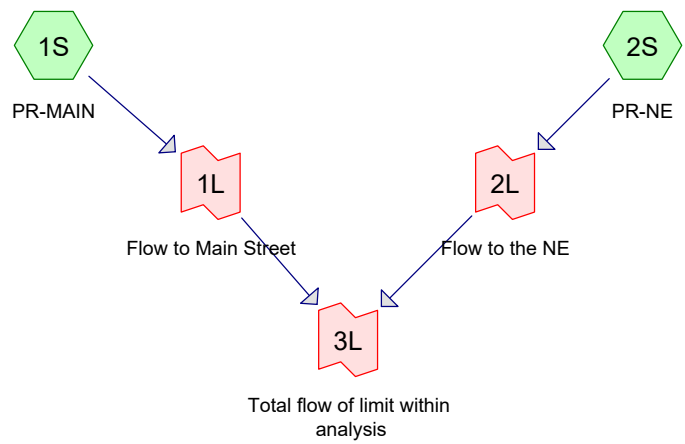
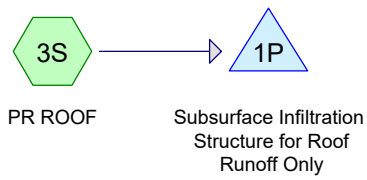
$$D_{\text{WQ}} = 0.5 \text{ in}$$

*HydroCAD Data*



*Proposed Condition*





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**Rainfall Events Listing (selected events)**

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.28	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.17	2
3	100-yr	Type III 24-hr		Default	24.00	1	8.18	2



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**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,510	61	>75% Grass cover, Good, HSG B (1S, 2S)
172	76	Flagstone or permeable paver walk, HSG B (1S, 2S)
1,649	98	Roofs, HSG B (1S, 3S)
1,354	98	Unconnected pavement, HSG B (1S, 2S)
13,414	55	Woods, Good, HSG B (2S)
<b>28,099</b>	<b>62</b>	<b>TOTAL AREA</b>

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**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
28,099	HSG B	1S, 2S, 3S
0	HSG C	
0	HSG D	
0	Other	
<b>28,099</b>		<b>TOTAL AREA</b>

**PROPOSED\_R1***Type III 24-hr 2-yr Rainfall=3.28"*

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**Summary for Subcatchment 1S: PR-MAIN**

Runoff = 0.05 cfs @ 12.11 hrs, Volume= 205 cf, Depth= 0.64"  
 Routed to Link 1L : Flow to Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2-yr Rainfall=3.28"

Area (sf)	CN	Adj	Description
3,270	61		>75% Grass cover, Good, HSG B
221	98		Roofs, HSG B
214	98		Unconnected pavement, HSG B
* 140	76		Flagstone or permeable paver walk, HSG B
3,845	66	65	Weighted Average, UI Adjusted
3,410			88.69% Pervious Area
435			11.31% Impervious Area
214			49.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.28"
0.4	45	0.0900	2.10		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0600	3.94		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.2	140	Total, Increased to minimum Tc = 6.0 min			

**PROPOSED\_R1**

Type III 24-hr 2-yr Rainfall=3.28"

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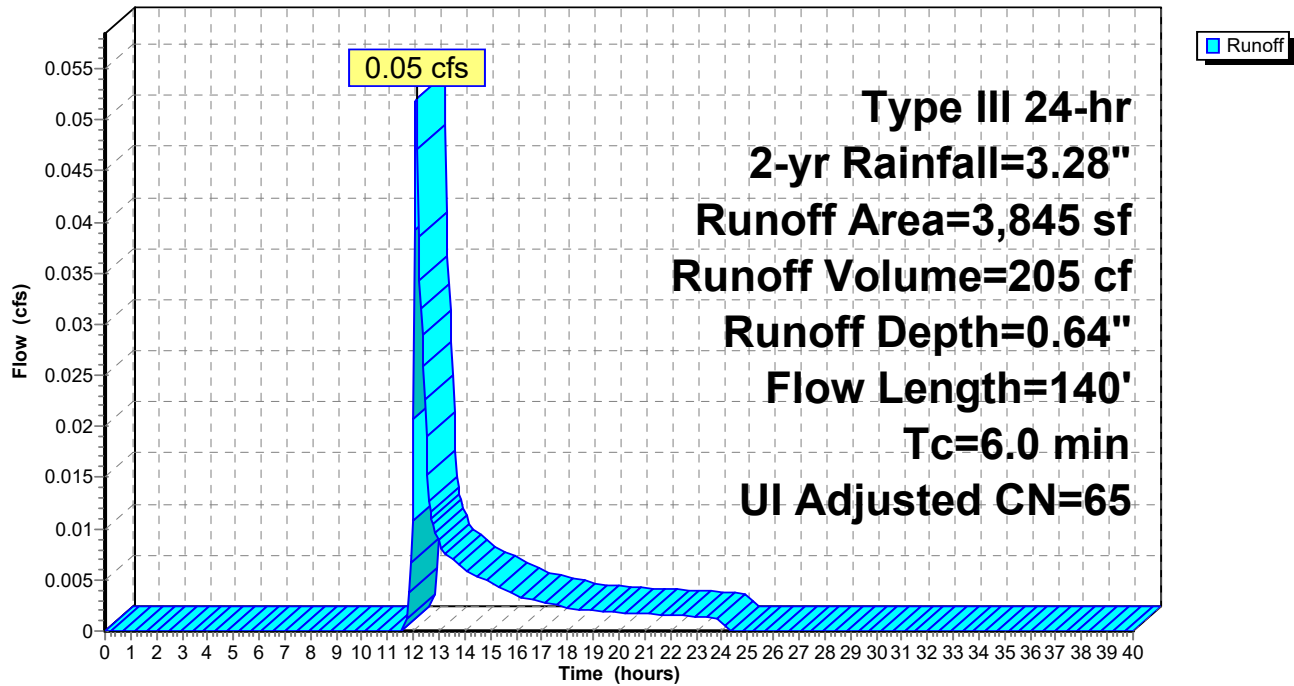
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**Subcatchment 1S: PR-MAIN**

Hydrograph



**PROPOSED\_R1**

Type III 24-hr 2-yr Rainfall=3.28"

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**Summary for Subcatchment 2S: PR-NE**

Runoff = 0.11 cfs @ 12.16 hrs, Volume= 703 cf, Depth= 0.37"  
 Routed to Link 2L : Flow to the NE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2-yr Rainfall=3.28"

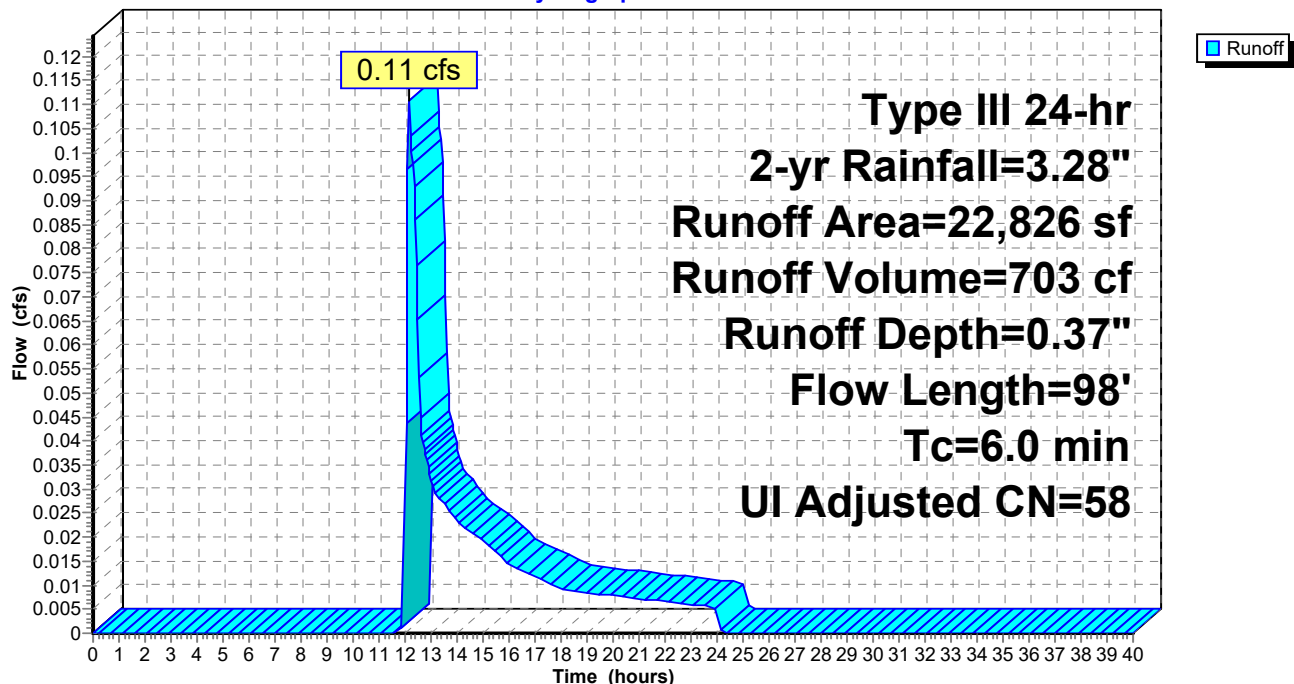
Area (sf)	CN	Adj	Description
13,414	55		Woods, Good, HSG B
8,240	61		>75% Grass cover, Good, HSG B
1,140	98		Unconnected pavement, HSG B
* 32	76		Flagstone or permeable paver walk, HSG B
22,826	59	58	Weighted Average, UI Adjusted
21,686			95.01% Pervious Area
1,140			4.99% Impervious Area
1,140			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.1400	0.33		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.28"
0.6	48	0.0350	1.31		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.2	98	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 2S: PR-NE**

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.28"

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**Summary for Subcatchment 3S: PR ROOF**

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 363 cf, Depth= 3.05"  
 Routed to Pond 1P : Subsurface Infiltration Structure for Roof Runoff Only

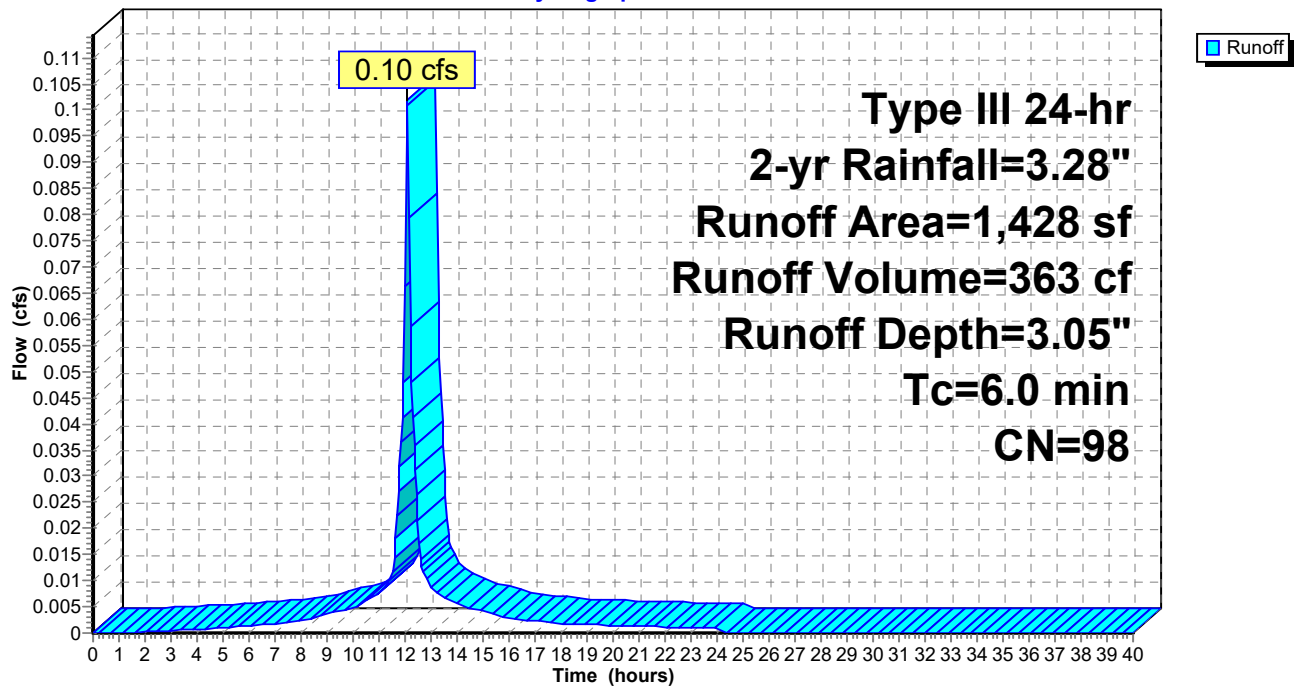
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2-yr Rainfall=3.28"

Area (sf)	CN	Description
1,428	98	Roofs, HSG B
1,428		100.00% Impervious Area

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

**Subcatchment 3S: PR ROOF**

Hydrograph



**PROPOSED\_R1***Type III 24-hr 2-yr Rainfall=3.28"*

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**Summary for Pond 1P: Subsurface Infiltration Structure for Roof Runoff Only**

Inflow Area = 1,428 sf, 100.00% Impervious, Inflow Depth = 3.05" for 2-yr event  
 Inflow = 0.10 cfs @ 12.09 hrs, Volume= 363 cf  
 Outflow = 0.01 cfs @ 11.45 hrs, Volume= 363 cf, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 11.45 hrs, Volume= 363 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 99.43' @ 13.64 hrs Surf.Area= 274 sf Storage= 148 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 178.2 min ( 934.1 - 755.9 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.50'	253 cf	<b>11.17'W x 24.50'L x 3.54'H Field A</b> 969 cf Overall - 335 cf Embedded = 634 cf x 40.0% Voids
#2A	99.00'	335 cf	<b>Cultec R-330XLHD x 6 Inside #1</b> Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		589 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 11.45 hrs HW=98.54' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

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*Type III 24-hr 2-yr Rainfall=3.28"*

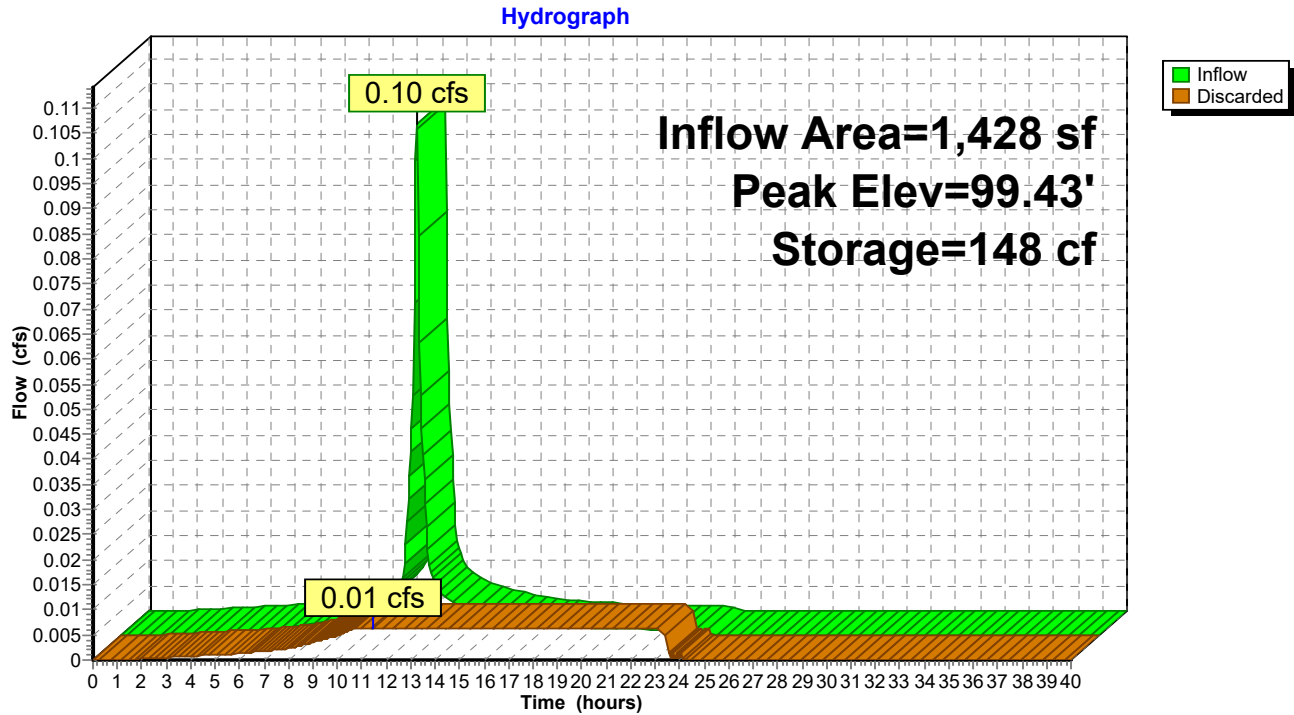
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**Pond 1P: Subsurface Infiltration Structure for Roof Runoff Only**





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Type III 24-hr 2-yr Rainfall=3.28"

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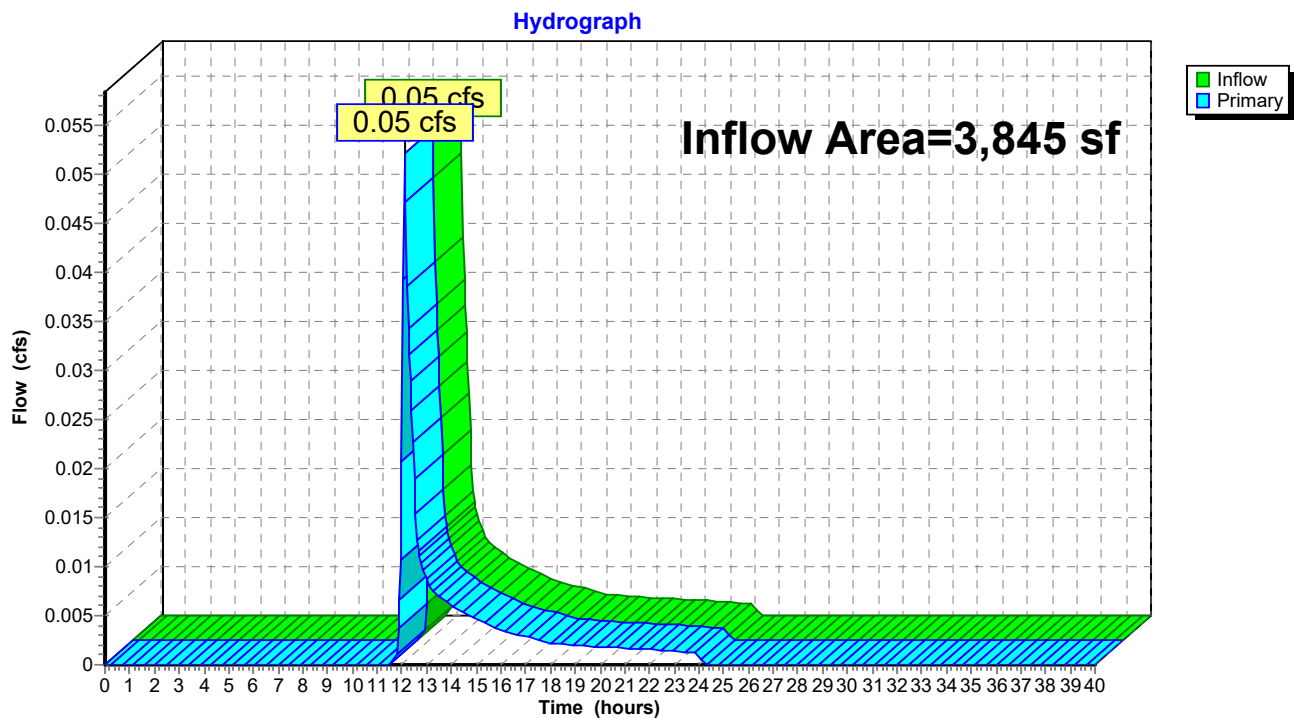
Page 11

### Summary for Link 1L: Flow to Main Street

Inflow Area = 3,845 sf, 11.31% Impervious, Inflow Depth = 0.64" for 2-yr event  
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 205 cf  
Primary = 0.05 cfs @ 12.11 hrs, Volume= 205 cf, Atten= 0%, Lag= 0.0 min  
Routed to Link 3L : Total flow of limit within analysis

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 1L: Flow to Main Street



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Type III 24-hr 2-yr Rainfall=3.28"

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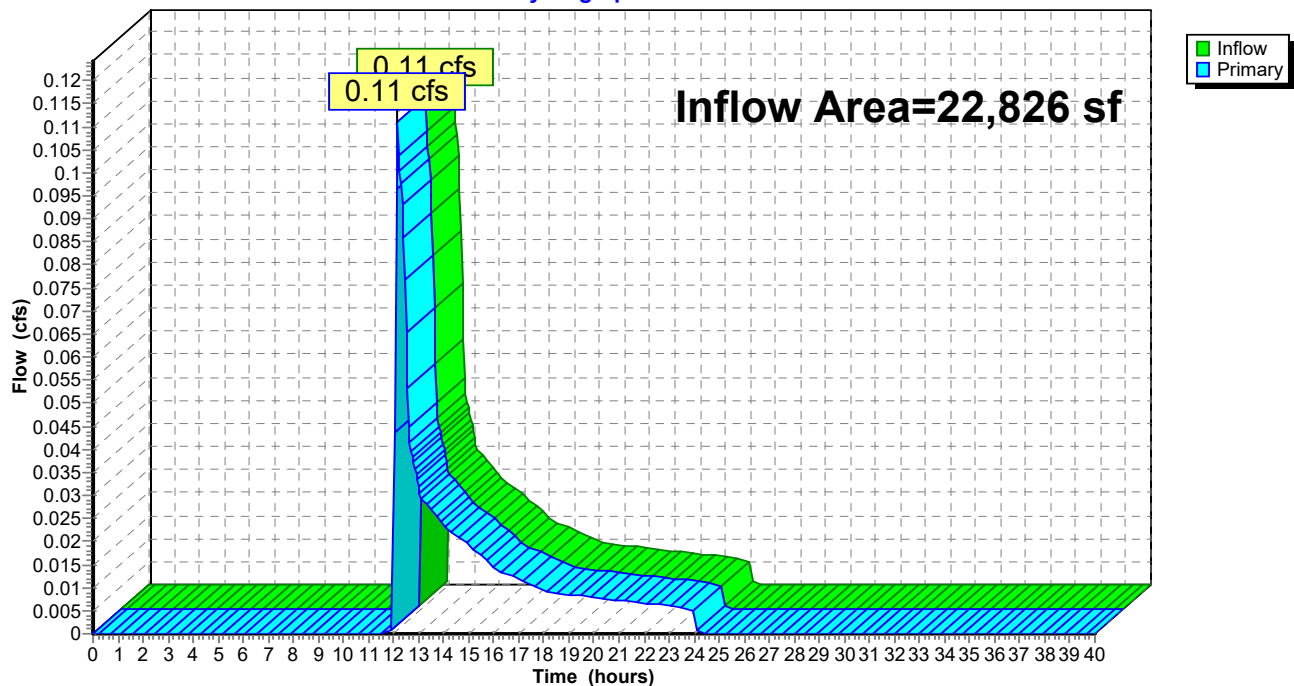
## Summary for Link 2L: Flow to the NE

Inflow Area = 22,826 sf, 4.99% Impervious, Inflow Depth = 0.37" for 2-yr event  
 Inflow = 0.11 cfs @ 12.16 hrs, Volume= 703 cf  
 Primary = 0.11 cfs @ 12.16 hrs, Volume= 703 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Link 3L : Total flow of limit within analysis

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

## Link 2L: Flow to the NE

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## PROPOSED\_R1

Type III 24-hr 2-yr Rainfall=3.28"

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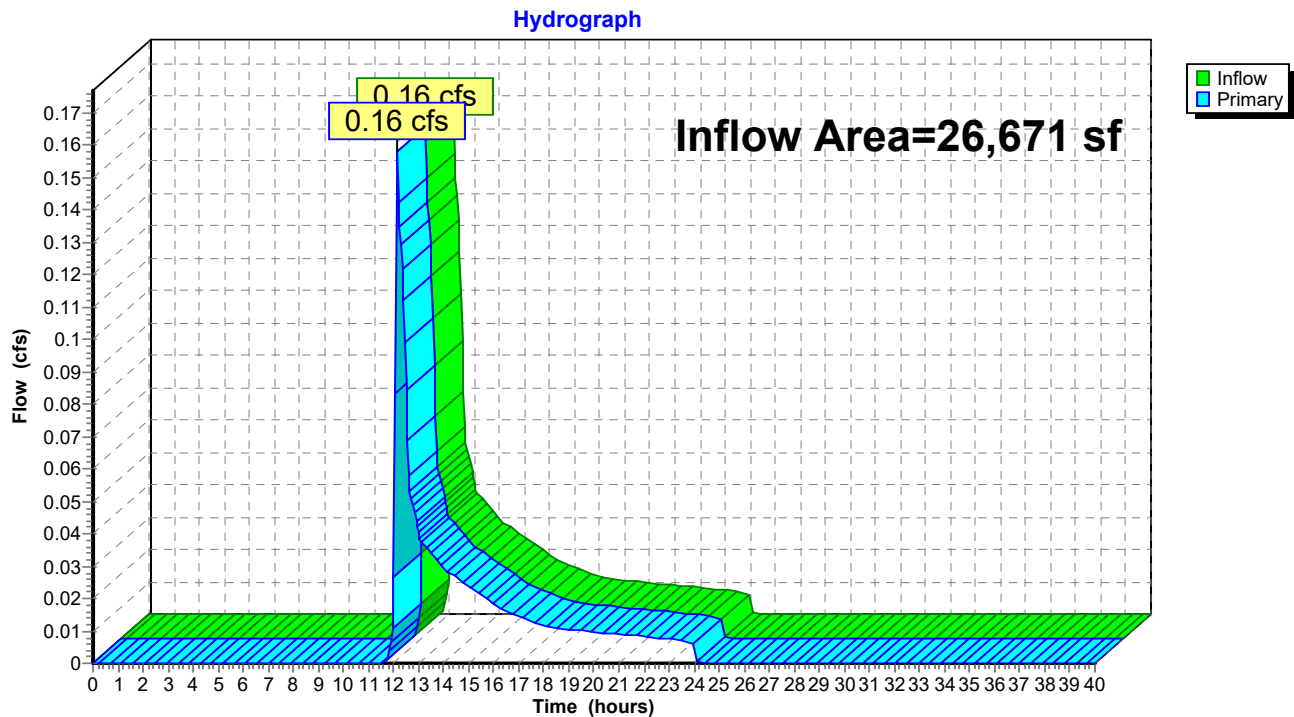
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### Summary for Link 3L: Total flow of limit within analysis

Inflow Area = 26,671 sf, 5.91% Impervious, Inflow Depth = 0.41" for 2-yr event  
 Inflow = 0.16 cfs @ 12.14 hrs, Volume= 908 cf  
 Primary = 0.16 cfs @ 12.14 hrs, Volume= 908 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 3L: Total flow of limit within analysis



**PROPOSED\_R1***Type III 24-hr 10-yr Rainfall=5.17"*

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**Summary for Subcatchment 1S: PR-MAIN**

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 566 cf, Depth= 1.77"  
 Routed to Link 1L : Flow to Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10-yr Rainfall=5.17"

Area (sf)	CN	Adj	Description
3,270	61		>75% Grass cover, Good, HSG B
221	98		Roofs, HSG B
214	98		Unconnected pavement, HSG B
* 140	76		Flagstone or permeable paver walk, HSG B
3,845	66	65	Weighted Average, UI Adjusted
3,410			88.69% Pervious Area
435			11.31% Impervious Area
214			49.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.28"
0.4	45	0.0900	2.10		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0600	3.94		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.2	140	Total, Increased to minimum Tc = 6.0 min			

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Type III 24-hr 10-yr Rainfall=5.17"

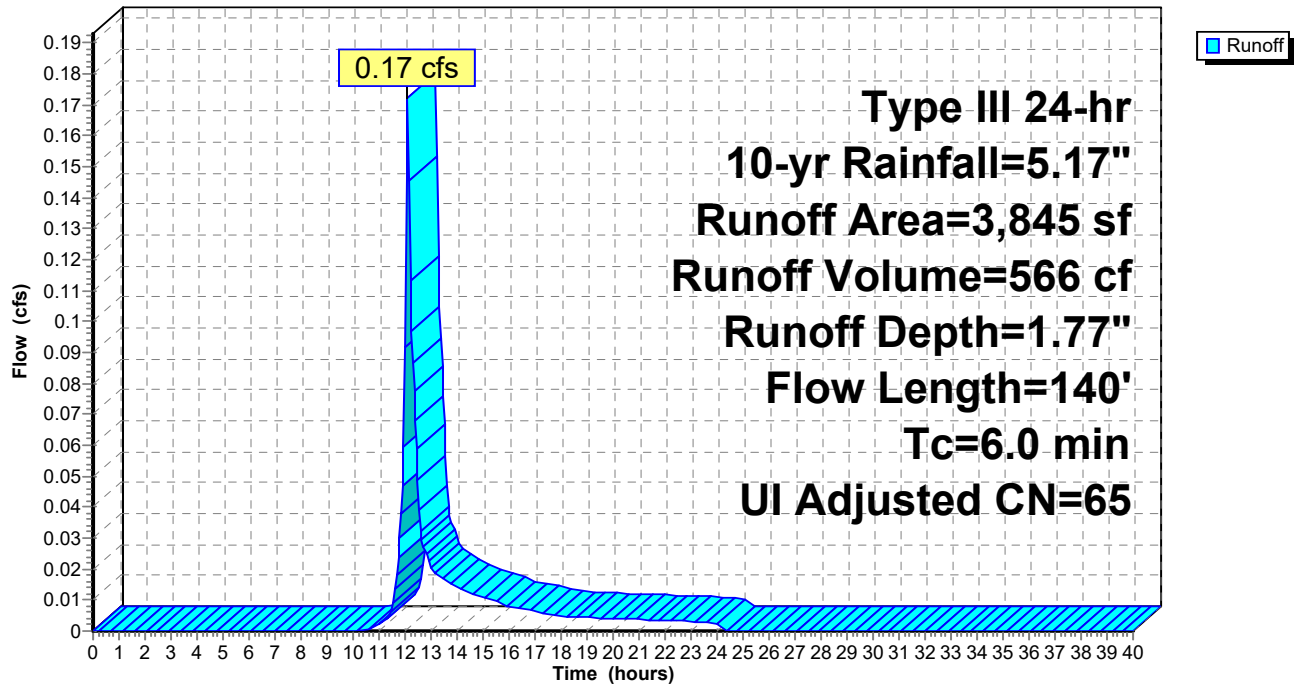
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**Subcatchment 1S: PR-MAIN**

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**Summary for Subcatchment 2S: PR-NE**

Runoff = 0.67 cfs @ 12.11 hrs, Volume= 2,403 cf, Depth= 1.26"  
 Routed to Link 2L : Flow to the NE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10-yr Rainfall=5.17"

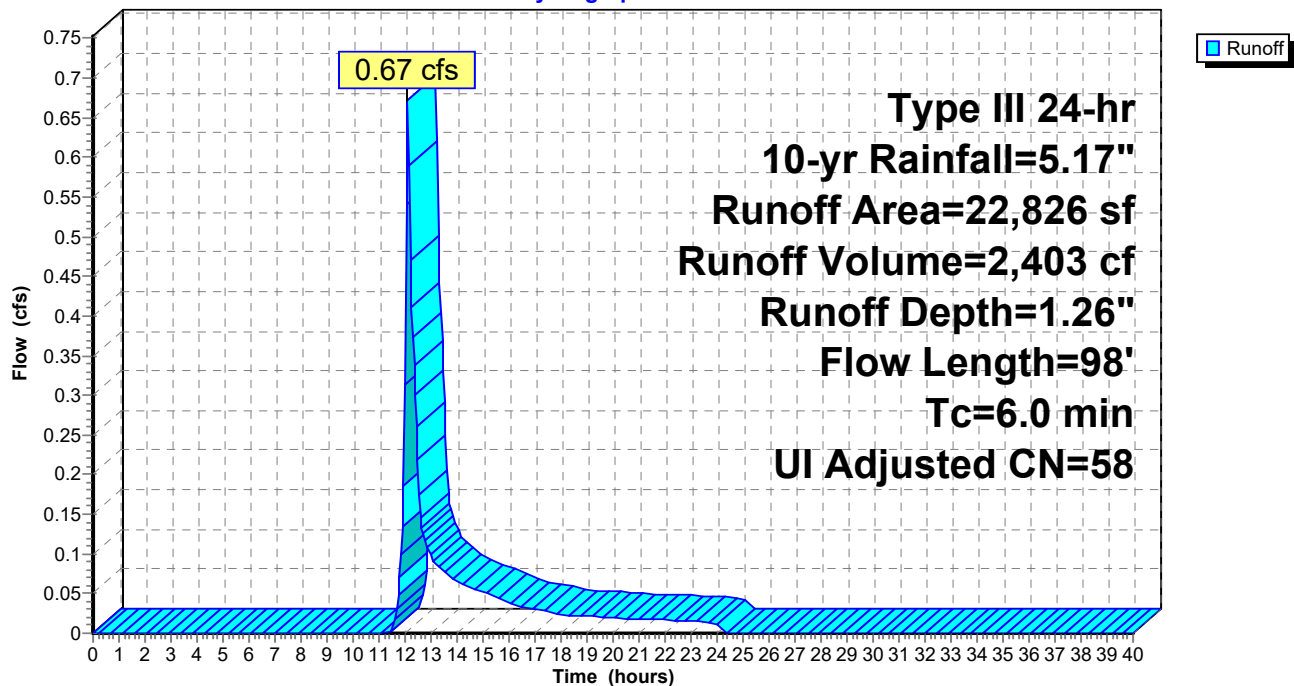
Area (sf)	CN	Adj	Description
13,414	55		Woods, Good, HSG B
8,240	61		>75% Grass cover, Good, HSG B
1,140	98		Unconnected pavement, HSG B
* 32	76		Flagstone or permeable paver walk, HSG B
22,826	59	58	Weighted Average, UI Adjusted
21,686			95.01% Pervious Area
1,140			4.99% Impervious Area
1,140			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.1400	0.33		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.28"
0.6	48	0.0350	1.31		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.2	98	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 2S: PR-NE**

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.17"

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## **Summary for Subcatchment 3S: PR ROOF**

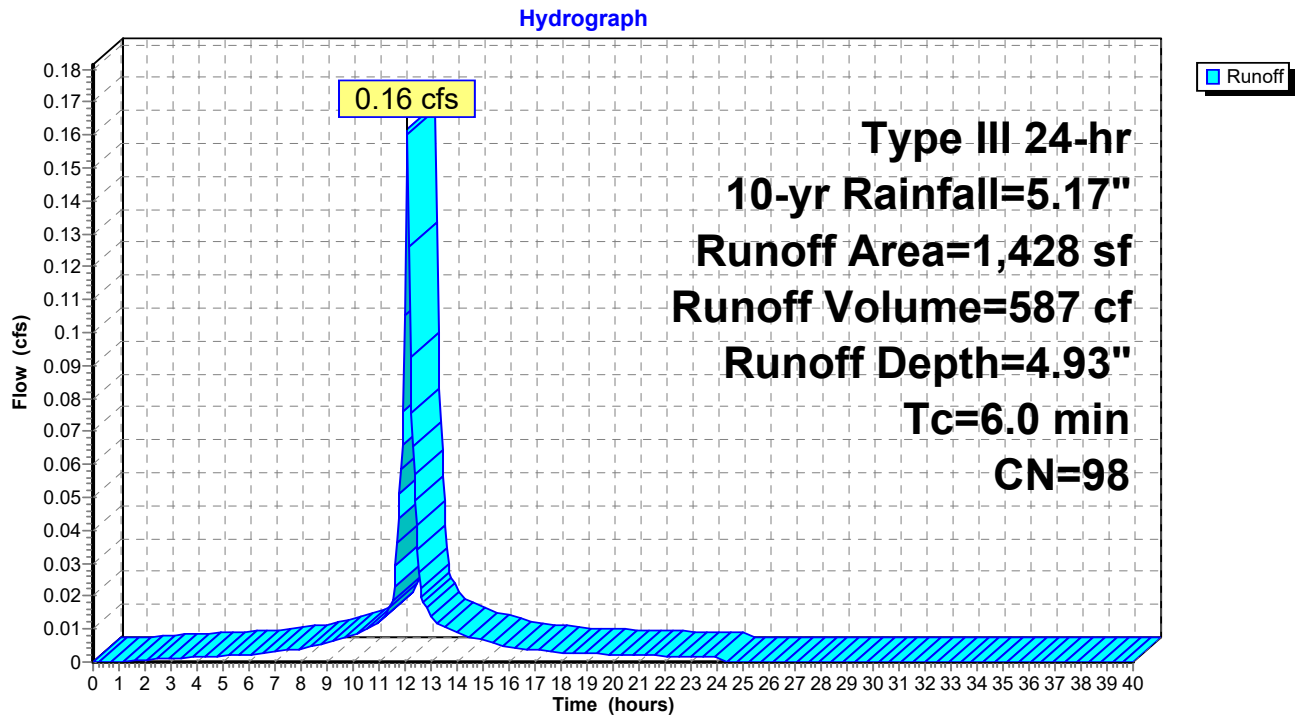
Runoff = 0.16 cfs @ 12.09 hrs, Volume= 587 cf, Depth= 4.93"  
Routed to Pond 1P : Subsurface Infiltration Structure for Roof Runoff Only

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-yr Rainfall=5.17"

Area (sf)	CN	Description
1,428	98	Roofs, HSG B
1,428		100.00% Impervious Area

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

## **Subcatchment 3S: PR ROOF**



**PROPOSED\_R1***Type III 24-hr 10-yr Rainfall=5.17"*

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**Summary for Pond 1P: Subsurface Infiltration Structure for Roof Runoff Only**

Inflow Area = 1,428 sf, 100.00% Impervious, Inflow Depth = 4.93" for 10-yr event  
 Inflow = 0.16 cfs @ 12.09 hrs, Volume= 587 cf  
 Outflow = 0.01 cfs @ 10.30 hrs, Volume= 587 cf, Atten= 96%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 10.30 hrs, Volume= 587 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 100.12' @ 15.06 hrs Surf.Area= 274 sf Storage= 292 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 378.2 min ( 1,125.7 - 747.5 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.50'	253 cf	<b>11.17'W x 24.50'L x 3.54'H Field A</b> 969 cf Overall - 335 cf Embedded = 634 cf x 40.0% Voids
#2A	99.00'	335 cf	<b>Cultec R-330XLHD x 6 Inside #1</b> Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		589 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 10.30 hrs HW=98.54' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)



**PROPOSED\_R1**

Type III 24-hr 10-yr Rainfall=5.17"

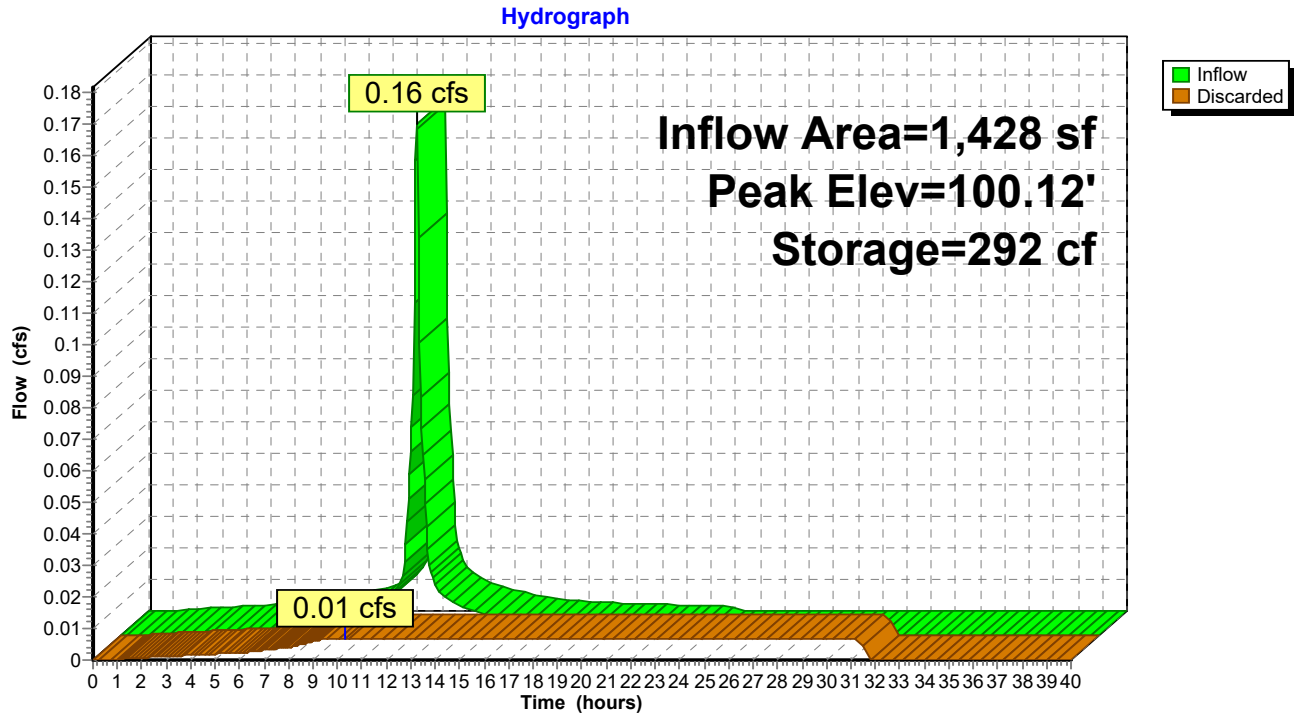
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**Pond 1P: Subsurface Infiltration Structure for Roof Runoff Only**



# PROPOSED\_R1

Type III 24-hr 10-yr Rainfall=5.17"

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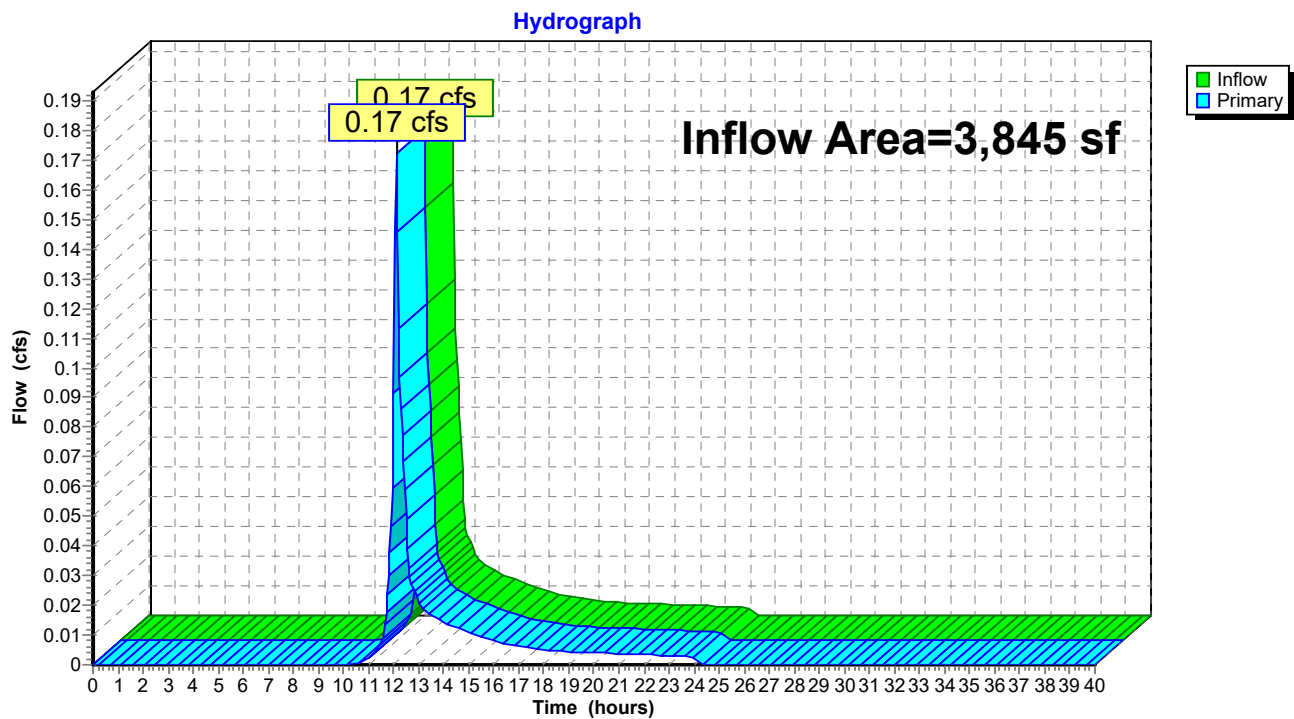
Page 20

## Summary for Link 1L: Flow to Main Street

Inflow Area = 3,845 sf, 11.31% Impervious, Inflow Depth = 1.77" for 10-yr event  
 Inflow = 0.17 cfs @ 12.10 hrs, Volume= 566 cf  
 Primary = 0.17 cfs @ 12.10 hrs, Volume= 566 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Link 3L : Total flow of limit within analysis

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

## Link 1L: Flow to Main Street



# PROPOSED\_R1

Type III 24-hr 10-yr Rainfall=5.17"

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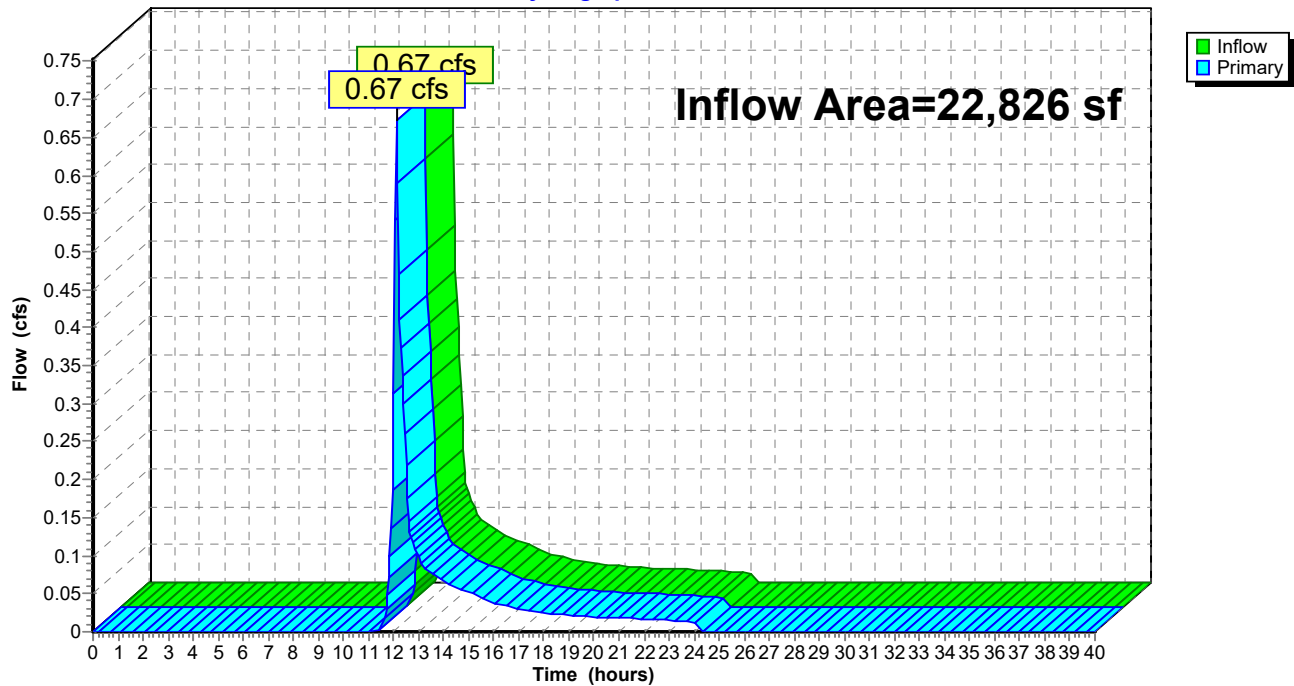
## Summary for Link 2L: Flow to the NE

Inflow Area = 22,826 sf, 4.99% Impervious, Inflow Depth = 1.26" for 10-yr event  
 Inflow = 0.67 cfs @ 12.11 hrs, Volume= 2,403 cf  
 Primary = 0.67 cfs @ 12.11 hrs, Volume= 2,403 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Link 3L : Total flow of limit within analysis

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

## Link 2L: Flow to the NE

Hydrograph



## PROPOSED\_R1

Type III 24-hr 10-yr Rainfall=5.17"

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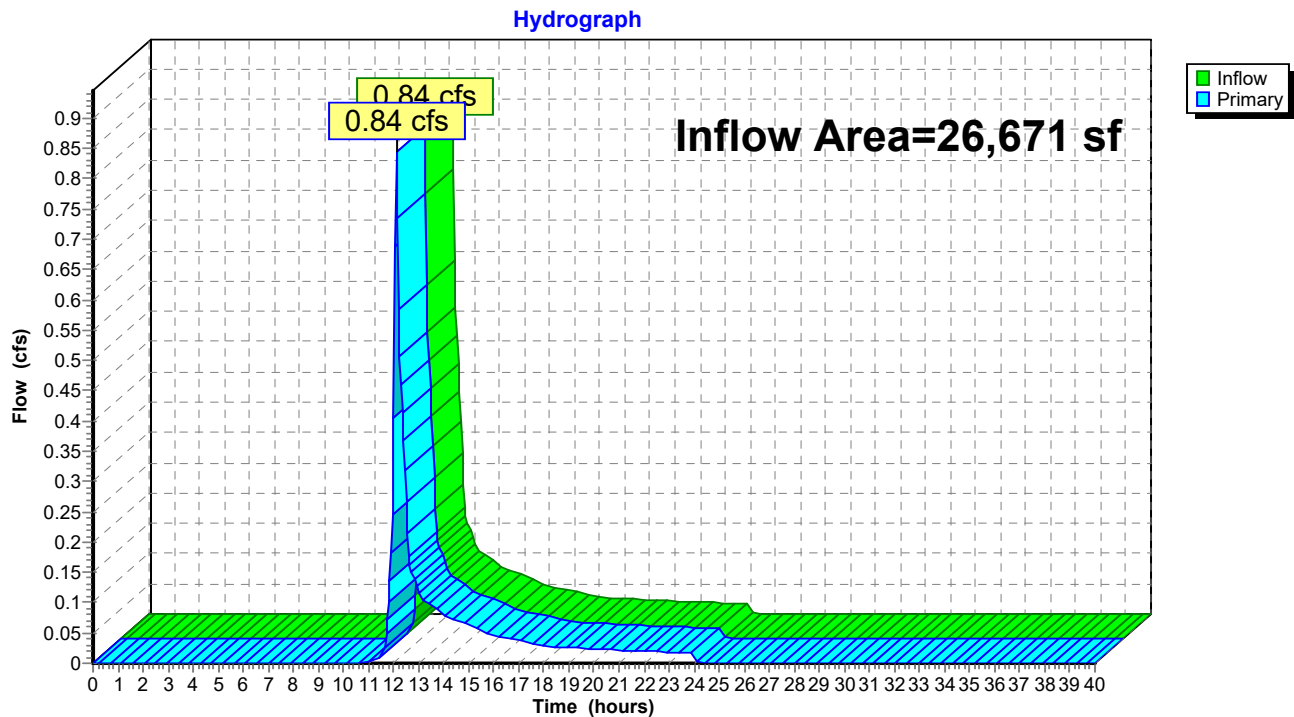
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### Summary for Link 3L: Total flow of limit within analysis

Inflow Area = 26,671 sf, 5.91% Impervious, Inflow Depth = 1.34" for 10-yr event  
 Inflow = 0.84 cfs @ 12.10 hrs, Volume= 2,970 cf  
 Primary = 0.84 cfs @ 12.10 hrs, Volume= 2,970 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 3L: Total flow of limit within analysis



**PROPOSED\_R1***Type III 24-hr 100-yr Rainfall=8.18"*

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**Summary for Subcatchment 1S: PR-MAIN**

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,295 cf, Depth= 4.04"  
 Routed to Link 1L : Flow to Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-yr Rainfall=8.18"

Area (sf)	CN	Adj	Description
3,270	61		>75% Grass cover, Good, HSG B
221	98		Roofs, HSG B
214	98		Unconnected pavement, HSG B
* 140	76		Flagstone or permeable paver walk, HSG B
3,845	66	65	Weighted Average, UI Adjusted
3,410			88.69% Pervious Area
435			11.31% Impervious Area
214			49.20% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.28"
0.4	45	0.0900	2.10		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0600	3.94		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.2	140	Total, Increased to minimum Tc = 6.0 min			

**PROPOSED\_R1**

Type III 24-hr 100-yr Rainfall=8.18"

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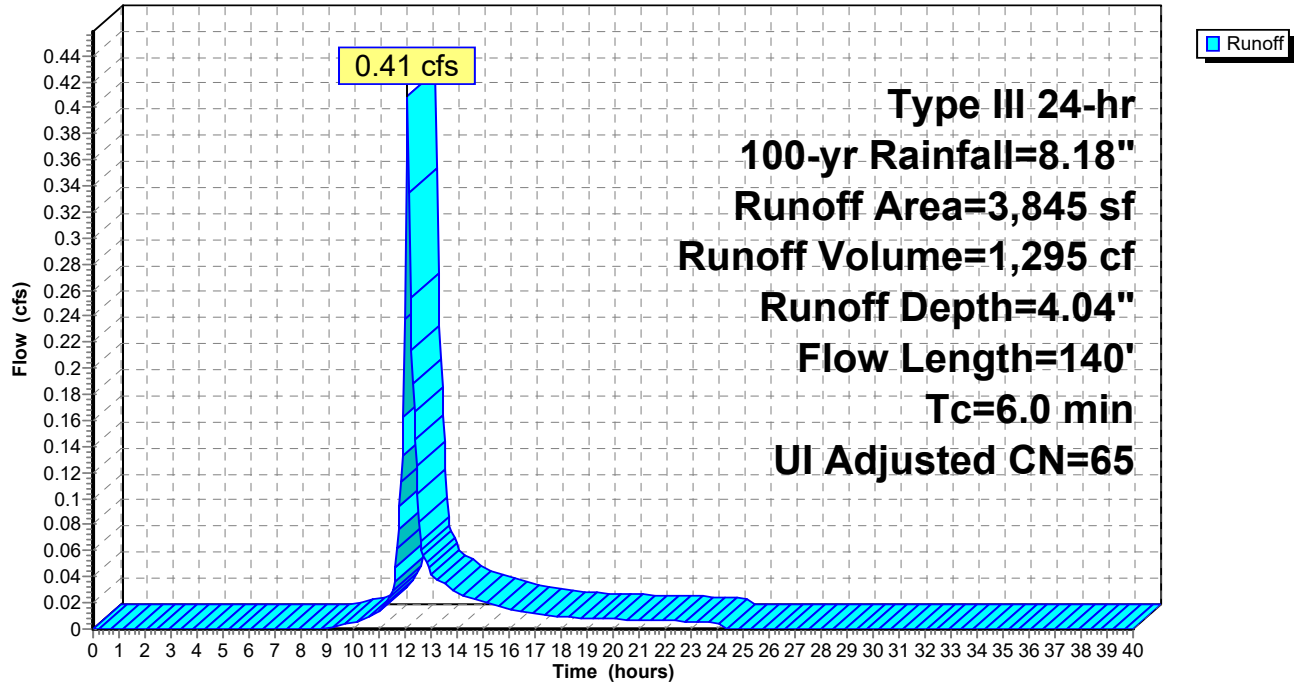
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**Subcatchment 1S: PR-MAIN**

Hydrograph



**PROPOSED\_R1**

Type III 24-hr 100-yr Rainfall=8.18"

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**Summary for Subcatchment 2S: PR-NE**

Runoff = 1.92 cfs @ 12.10 hrs, Volume= 6,169 cf, Depth= 3.24"  
 Routed to Link 2L : Flow to the NE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-yr Rainfall=8.18"

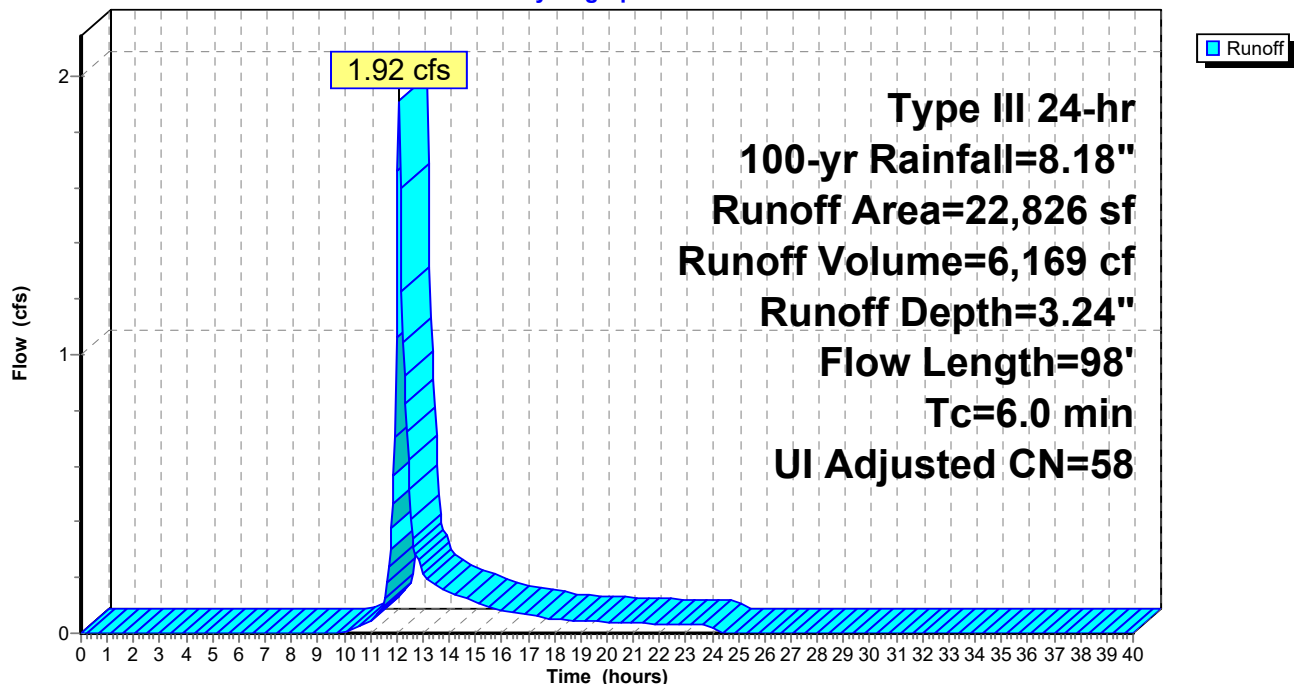
Area (sf)	CN	Adj	Description
13,414	55		Woods, Good, HSG B
8,240	61		>75% Grass cover, Good, HSG B
1,140	98		Unconnected pavement, HSG B
* 32	76		Flagstone or permeable paver walk, HSG B
22,826	59	58	Weighted Average, UI Adjusted
21,686			95.01% Pervious Area
1,140			4.99% Impervious Area
1,140			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.1400	0.33		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.28"
0.6	48	0.0350	1.31		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.2	98	Total, Increased to minimum Tc = 6.0 min			

**Subcatchment 2S: PR-NE**

Hydrograph



**PROPOSED\_R1**

Type III 24-hr 100-yr Rainfall=8.18"

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**Summary for Subcatchment 3S: PR ROOF**

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 945 cf, Depth= 7.94"  
 Routed to Pond 1P : Subsurface Infiltration Structure for Roof Runoff Only

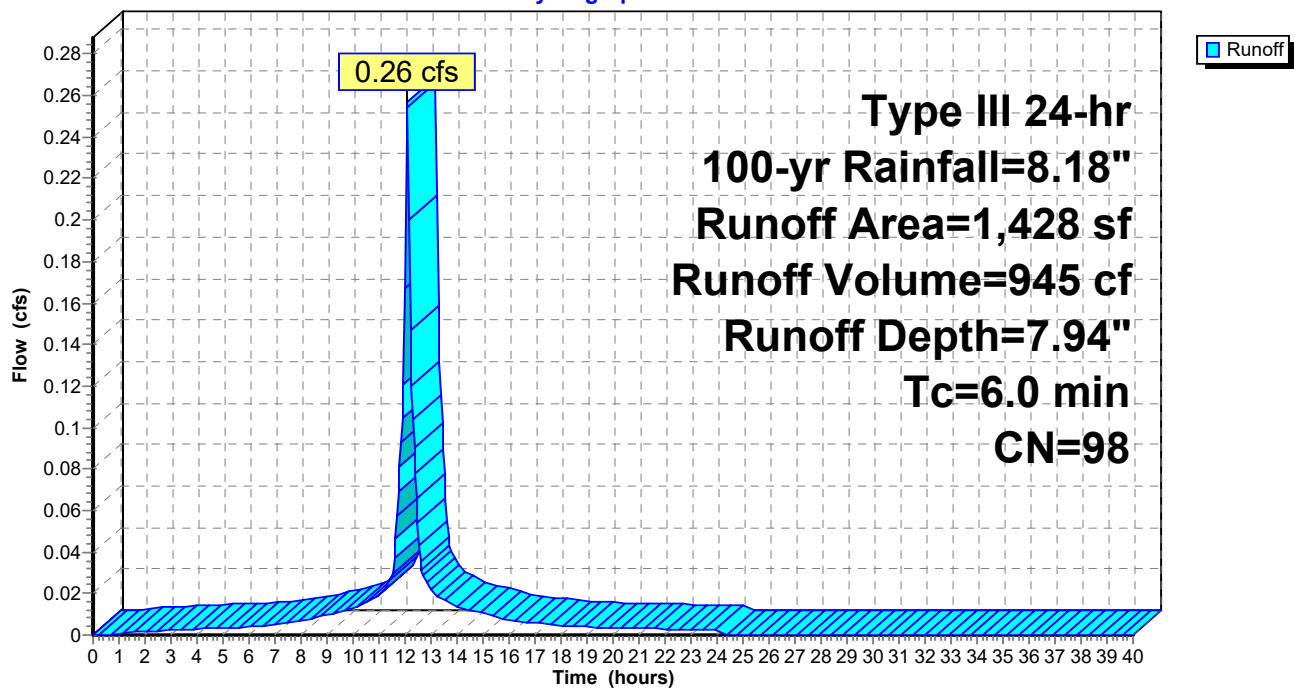
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-yr Rainfall=8.18"

Area (sf)	CN	Description
1,428	98	Roofs, HSG B
1,428		100.00% Impervious Area

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

**Subcatchment 3S: PR ROOF**

Hydrograph





**PROPOSED\_R1***Type III 24-hr 100-yr Rainfall=8.18"*

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**Summary for Pond 1P: Subsurface Infiltration Structure for Roof Runoff Only**

Inflow Area = 1,428 sf, 100.00% Impervious, Inflow Depth = 7.94" for 100-yr event  
 Inflow = 0.26 cfs @ 12.09 hrs, Volume= 945 cf  
 Outflow = 0.01 cfs @ 8.85 hrs, Volume= 829 cf, Atten= 97%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 8.85 hrs, Volume= 829 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 101.80' @ 16.51 hrs Surf.Area= 274 sf Storage= 562 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 586.5 min ( 1,327.4 - 740.9 )

Volume	Invert	Avail.Storage	Storage Description
#1A	98.50'	253 cf	<b>11.17'W x 24.50'L x 3.54'H Field A</b> 969 cf Overall - 335 cf Embedded = 634 cf x 40.0% Voids
#2A	99.00'	335 cf	<b>Cultec R-330XLHD x 6 Inside #1</b> Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		589 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	98.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 8.85 hrs HW=98.54' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

**PROPOSED\_R1**

*Type III 24-hr 100-yr Rainfall=8.18"*

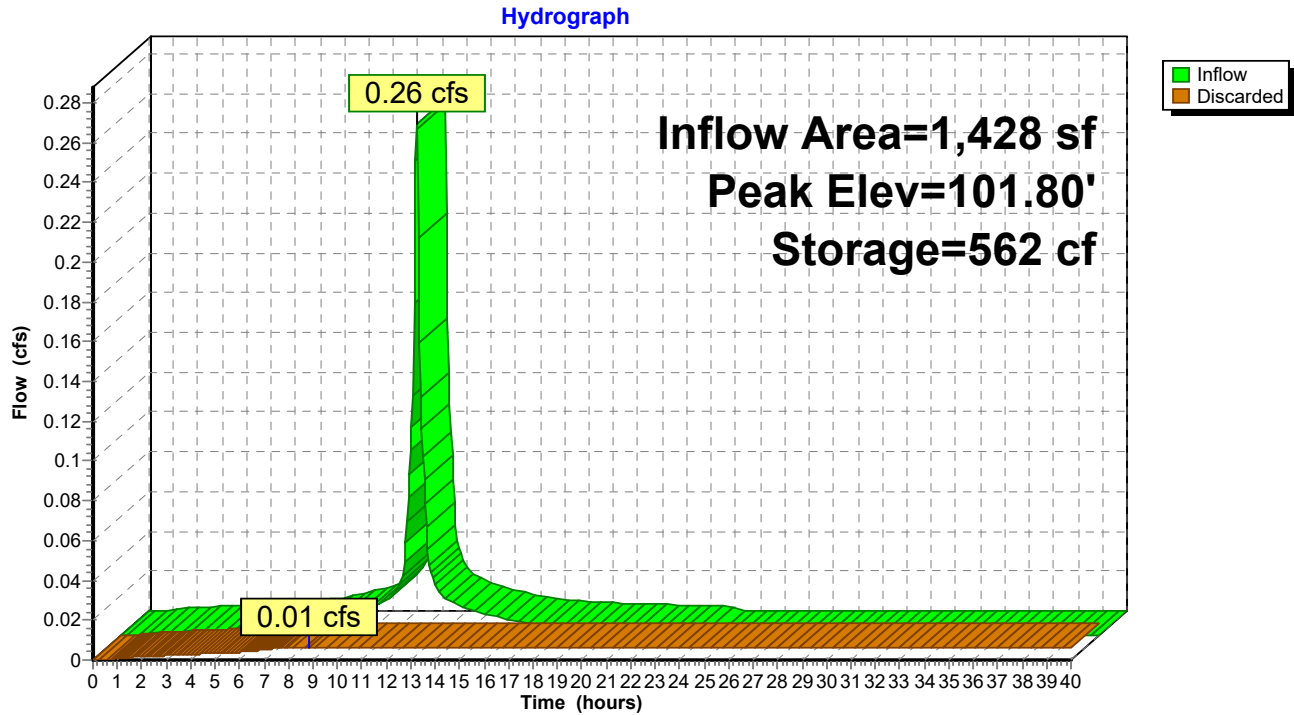
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**Pond 1P: Subsurface Infiltration Structure for Roof Runoff Only**



## PROPOSED\_R1

Type III 24-hr 100-yr Rainfall=8.18"

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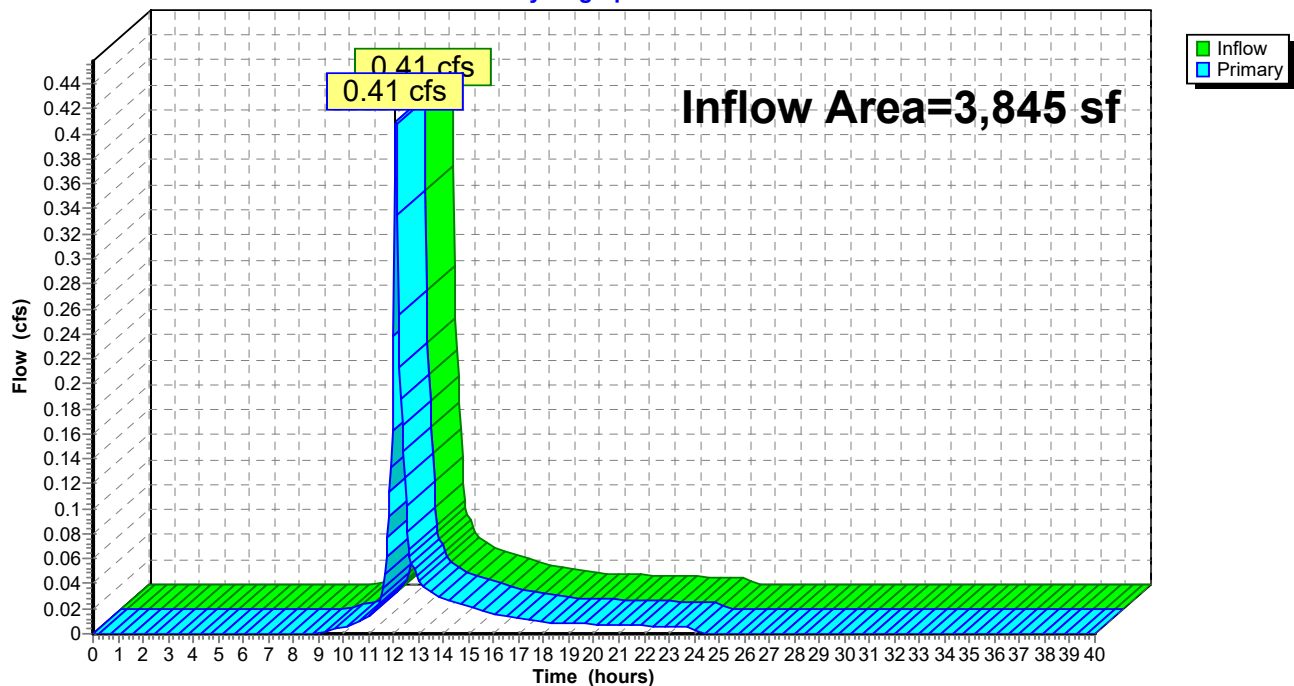
### Summary for Link 1L: Flow to Main Street

Inflow Area = 3,845 sf, 11.31% Impervious, Inflow Depth = 4.04" for 100-yr event  
 Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,295 cf  
 Primary = 0.41 cfs @ 12.09 hrs, Volume= 1,295 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Link 3L : Total flow of limit within analysis

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 1L: Flow to Main Street

Hydrograph



## PROPOSED\_R1

Type III 24-hr 100-yr Rainfall=8.18"

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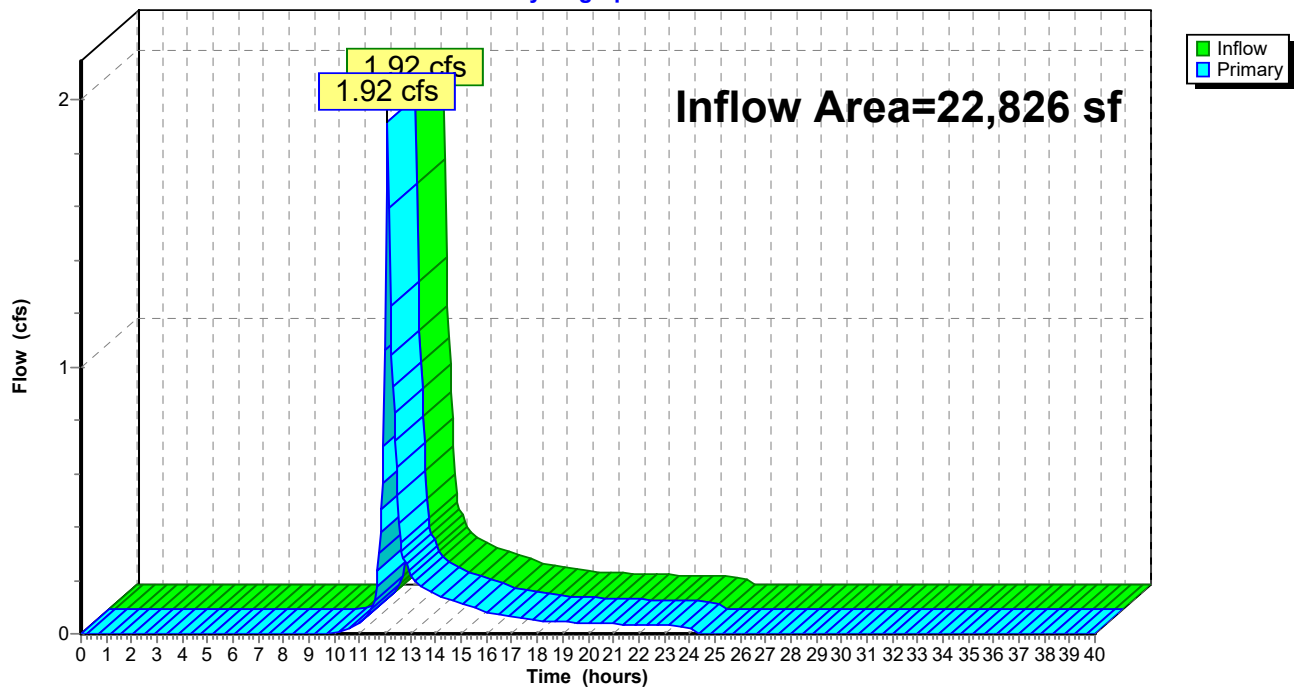
### Summary for Link 2L: Flow to the NE

Inflow Area = 22,826 sf, 4.99% Impervious, Inflow Depth = 3.24" for 100-yr event  
 Inflow = 1.92 cfs @ 12.10 hrs, Volume= 6,169 cf  
 Primary = 1.92 cfs @ 12.10 hrs, Volume= 6,169 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Link 3L : Total flow of limit within analysis

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 2L: Flow to the NE

Hydrograph



## PROPOSED\_R1

Type III 24-hr 100-yr Rainfall=8.18"

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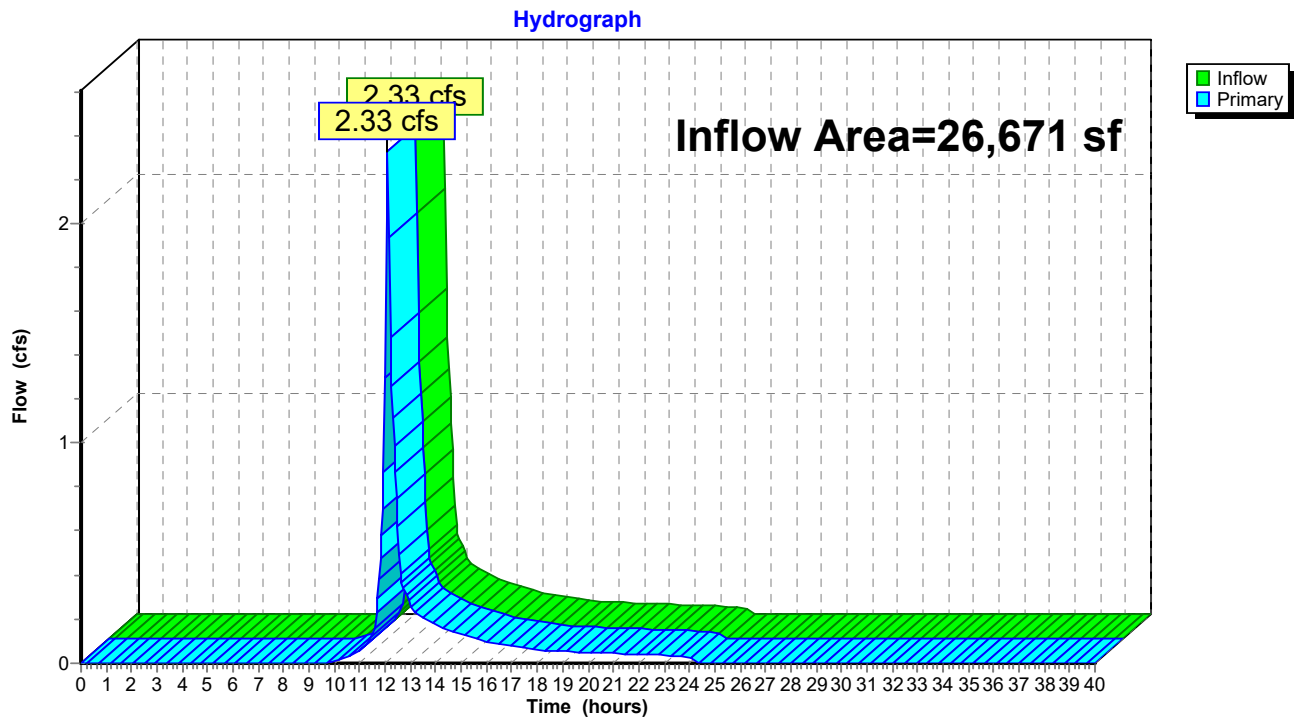
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### Summary for Link 3L: Total flow of limit within analysis

Inflow Area = 26,671 sf, 5.91% Impervious, Inflow Depth = 3.36" for 100-yr event  
 Inflow = 2.33 cfs @ 12.10 hrs, Volume= 7,463 cf  
 Primary = 2.33 cfs @ 12.10 hrs, Volume= 7,463 cf, Atten= 0%, Lag= 0.0 min

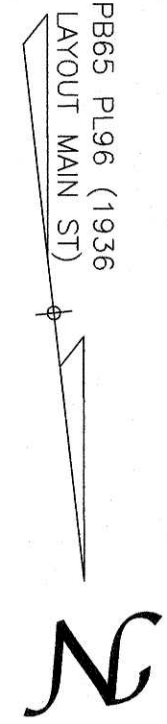
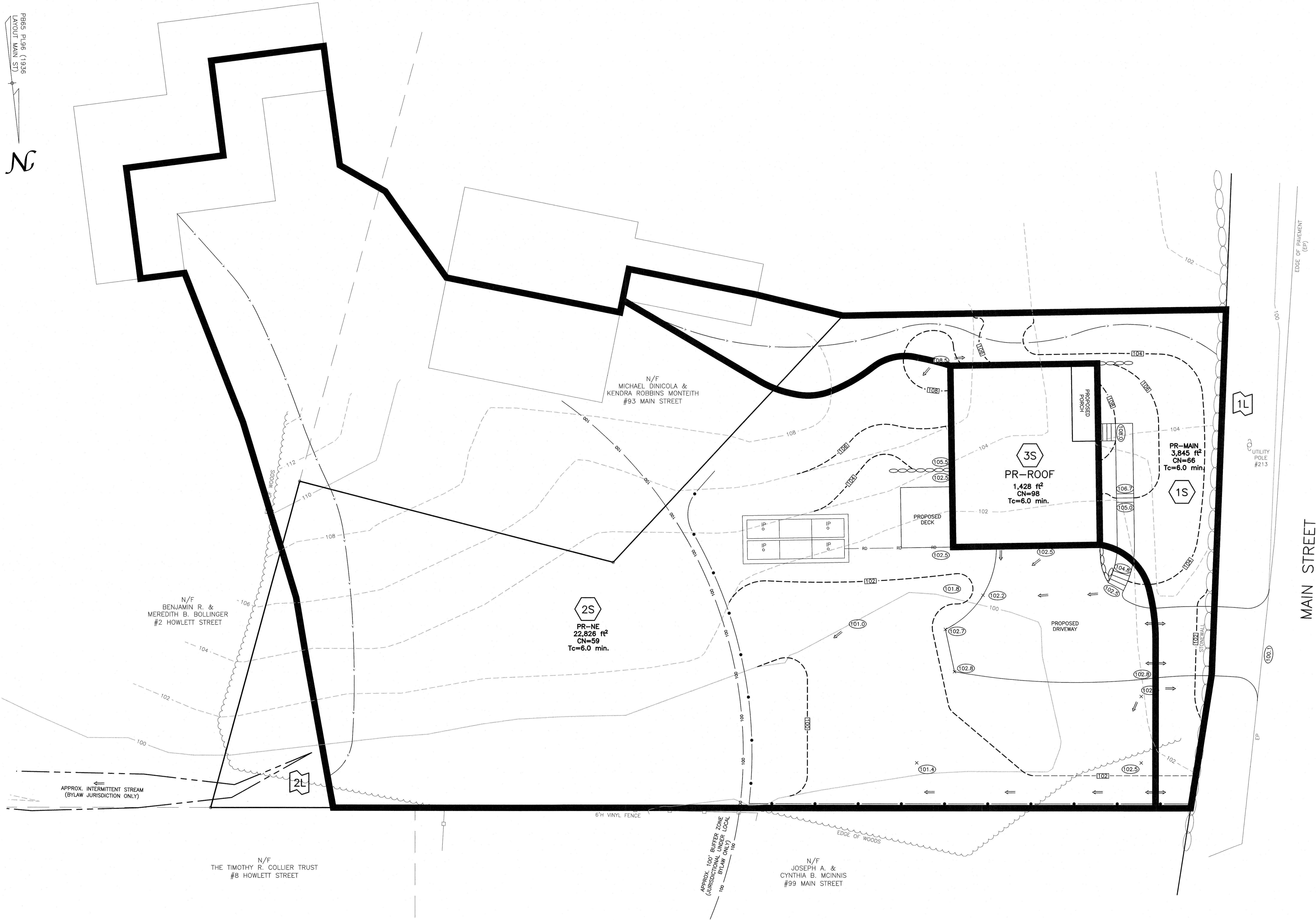
Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

### Link 3L: Total flow of limit within analysis





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PROPOSED WATERSHED MAP  
#97 MAIN STREET, TOPSFIELD, MA

DRAWING: PR-WSD

SHEET 1 OF 1

0' 5' 10' 20'  
SCALE: 1"=10'

JANUARY 30, 2023

WATERSHED BOUNDARIES

4/13/2023

SEAL



Designed By: SML  
Drawn By: SML  
Reviewed By: RLW  
Project Manager: RLW  
Job File Number: TOPS-0076  
Drawing File Folder: TOPS76  
☐ Drawing Issued for Review Only  
☒ Drawing Issued for Permit  
☐ Drawing Issued for Construction

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