Sullivan Engineering Group, LLC
Civil Engineers & Land Development Consultants

January 23, 2025

City of Methuen
Conservation Dept.

Re: 47 Lowell Street, Methuen
Drainage Report

This drainage study was conducted at 47 Lowell Street, Methuen due to the owner seeking to construct a new duplex townhouse, paved driveway, utility services, and site grading.

Soil testing was conducted on-site on 10/24/2024 by John D. Sullivan III, CSE and the testing was witnessed by Joseph Giarrusso, Methuen Consrvation Officer. The soil testhole locations and soil logs are referenced on the design plan. The native soil is a stratified sand which is highly suitable for groundwater recharge. A Rawls Rate of 8.27 in/hr has been assigned to the native sand layer.

The proposed drainage system will consist of Cultec Recharger 902 HD units bedded on 6 inches of crushed stone. The drainage infiltration system will collect stormwater from the driveway and the roof area of the proposed duplex townhouse. Pretreatment for the collected stormwater from the driveway will be in the form of a deep sump catchbasin. The bottom of the crushed stone bedding for the Cultec units are sited 2 feet above the seasonal high groundwater table.

There are two subcatchment drainage areas associated with this project. There is a small subcatchment that drains to Lowell Street (this subcatchment has been modeled but is considered "de-minimus" for this analysis). The second, and larger subcatchment is the remainder of the site. Based on site topography there is no off-site runoff from this site, since this site has an established low point on the property. To be conservative, the 2, 10, 25, and 100 year storm events were modeled utilizing the Extreme Precipitation Tables (Cornell study). The 100 year storm event is modeled for a 8.66"/24 hr storm.

The HydroCAD report models the Predevelopment Condition vs. Postdevelopment Condition for the entire site area. The stormwater design reduces the peak rate of runoff and volume for the 2, 10, 25 and 100 year storm event. The following is summary of the peak rate of runoff for various storm events for the largest subcatchment:

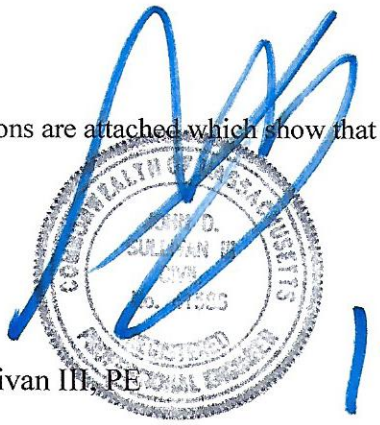
	Predevelopment (cfs)	Volume (AF)	Postdevelopment (cfs)	Volume (AF)
Storm Event				
2 Year	0.00	0.000	0.00	0.000
10 Year	0.00	0.000	0.00	0.000
25 Year	0.01	0.004	0.01	0.004
100 Year	0.13	0.025	0.64*	0.030

Under Stormwater management, the peak rate of runoff must be maintained or reduced for the 2 & 10 year storm event. * The 100 year postdevelopment peak rate of runoff exceeds the pre-development peak rate, but the volume of runoff is the same (within rounding standards) and there will be no off-site flooding since the subject site serves as "low point" for the drainage analysis

PO Box 2004 Woburn, MA 01888 (781) 854-8644 e-mail: jacksull53@comcast.net

HydroCAD calculations are attached which show that the infiltration field is sized properly for the various storm events.

Very Truly Yours,



1-23-25

John (Jack) D. Sullivan III, PE

Attachments:

- Extreme Precipitation Table
- NRCS Soil Map
- Predevelopment Drainage Plan
- Postdevelopment Drainage Plan
- HydroCAD analysis
- O&M plan

PO Box 2004 Woburn, MA 01888 (781) 854-8644 e-mail: jacksull53@comcast.net

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point

Smoothing	Yes
State	
Location	
Latitude	42.725 degrees North
Longitude	71.192 degrees West
Elevation	40 feet
Date/Time	Wed Jan 22 2025 11:19:04 GMT-0500 (Eastern Standard Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day
1yr	0.27	0.42	0.52	0.68	0.85	1.07	**1yr**	0.73	1.01	1.24	1.58	2.01	2.57	2.78	**1yr**	2.27	2.67
2yr	0.33	0.51	0.64	0.84	1.06	1.34	**2yr**	0.91	1.22	1.55	1.95	2.45	3.09	3.41	**2yr**	2.74	3.28
5yr	0.39	0.61	0.77	1.03	1.32	1.68	**5yr**	1.14	1.53	1.96	2.47	3.12	3.93	4.37	**5yr**	3.48	4.20
10yr	0.44	0.70	0.88	1.20	1.56	2.01	**10yr**	1.34	1.81	2.34	2.97	3.75	4.71	5.26	**10yr**	4.17	5.06
25yr	0.53	0.83	1.06	1.46	1.94	2.52	**25yr**	1.68	2.27	2.96	3.78	4.77	6.00	6.74	**25yr**	5.31	6.48
50yr	0.59	0.95	1.21	1.70	2.30	3.02	**50yr**	1.98	2.70	3.57	4.55	5.75	7.20	8.13	**50yr**	6.38	7.82
100yr	0.68	1.10	1.41	2.00	2.72	3.60	**100yr**	2.35	3.21	4.26	5.45	6.90	8.66	9.81	**100yr**	7.66	9.43
200yr	0.77	1.25	1.63	2.33	3.23	4.31	**200yr**	2.78	3.81	5.11	6.55	8.30	10.40	11.84	**200yr**	9.21	11.39
500yr	0.92	1.52	1.98	2.88	4.04	5.44	**500yr**	3.49	4.79	6.48	8.34	10.58	13.27	15.20	**500yr**	11.75	14.62

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day
1yr	0.24	0.37	0.45	0.60	0.74	0.88	**1yr**	0.64	0.86	1.11	1.37	1.67	2.37	2.57	**1yr**	2.10	2.47
2yr	0.32	0.49	0.61	0.82	1.01	1.21	**2yr**	0.87	1.18	1.39	1.82	2.33	3.00	3.32	**2yr**	2.65	3.19

Map Scale: 1:1,120 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

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 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	6.2	100.0%
Totals for Area of Interest			**6.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

PREDEVELOPMENT DRAINAGE MAP
W/ SUBCATCHMENTS SHOWN

LOT COV.	40%	2.3%
OPEN SPACE	10%	83%

* 12,000- DUPLEX

N/F
MARIA BODA TR
G. MARIE BODA 2019 REVOCABLE TRUST
BK. 15822 PG 339

N/F
MARIA BODA TR
RIE BODA 2019 REVOCABLE TRUST
BK. 15822 PG 339

N/F
RAYMOND & PALMA VOTER TR.
VOTER FAMILY TRUST
BK. 10697 PG 313

N/F
CAITLIN CONNOLLY & NICHOLAS COMEAU
BK. 15026 PG 97

N/F
NEIL DeBURRO & CRISTINE WILT TR.
DEWILT REALTY TRUST
BK. 17076 PG 99

N/F
FANNY WANDALY CLAROS FUNEZ
BK. 16978 PG 333

N/F
LUIS A & MARIA PUELLO
BK. 17627 PG 334

PEAK EL=154.6

PEAK EL=140.9

PEAK EL=169.7

PEAK EL=175.4

S24°34'37"W 88.45' 90' (DEED)

S61°29'48"E 334.58' 195.06'

N61°54'27"W 379.72' 379'(DEED)

N51°45'00"E 109.4'±

56.5'±

S61°29'48"E 133.17'(PLAN) 139.52'

LOT 2
A=23,949 S.F.

LOT 1
A=8029 S.F.

#47
2-STY.
PEAK EL=164.5

1S

2S

TP-1

TP-2

DEBRIS

14.4'

11.6'

1.6'

12.1'

50.00'

40.00'

59.00'

SMH
R=140.65
I=132.68

8" SEWER

WATER

GAS

WG

LOWELL STREET

MARISE BELICE TR
MARISE BELICE REVOCABLE TRUST OF 2022
BK. 17533 PG 87

POSTDEVELOPMENT DRAINAGE PLAN

5) SEWER SERVICE
FROM HOUSE TO
6) WATER & SEWER
7) BENCHMARK: MA

N/F
MARIA BODA TR
G. MARIE BODA 2019 REVOCABLE TRUST
BK. 15822 PG 339

N/F
A BODA TR
9 REVOCABLE TRUST
822 PG 339

Prop. Drainage Infiltration Field
Footprint: 21.5' x 26.69' Consisting
of Cultec Recharger 902HD Units
(Total of 21 Units)

S24°34'37"W 88.45'
88.45'
90' (DEED)
LOT 2
A=23,949 S.F.

Prop. 12" HPDE Drain
L=15' S=0.13'
Inv.=120.9'
Inv.=121.4'
TP-2

N/F
RAYMOND & PALMA VOTER TR.
VOTER FAMILY TRUST
BK. 10697 PG 313

Prop. Concrete Mini-Manhole
w/ Frame/Cover to Grade (Cover @ Elev=126.0')
Prop. 6" NDS Pop-up Emitter on 12" HDPE
drain line (vertical 6" HDPE extension)
Set Emitter at Elevation=124.3'
PEAK EL=140.9
INSTALL NEW 6' PVC FENCE
ALONG LOT LINE

INSTALL NEW 6' PVC FENCE

N/F
CAITLIN CONNOLLY & NICHOLAS COMEAU
BK. 15026 PG 97

PEAK EL=169.7

INSTALL NEW 6' PVC FENCE
ALONG LOT LINE

(131.0)
TW=132'
(131.5)
PROPOSED LANDSCAPED
BLOCK WALL (2'X2'X4')
TW=132'

Cleanout
to Grade
DECK
DECK
TP-1
RD
28'
FF=136
BAS=125
28'
FF=136
BAS=125
40'
Note: Entire Roof Area
of each Unit to be hardpiped
to the drainage infiltration field.
GF=125.5
GF=125.5'
1S_P
3S_P
PUMP
PUMP
125
126
124
1S_P
17.7'
RD
40'
334.58'
S61°29'48"E
195.05'
56.5'±
40'
SS
WS
33'±
379.12' (DEED)
N61°54'27"W

N/F
NEIL DeBURRO & CRISTINE WILT TR.
DEWILT REALTY TRUST
BK. 17076 PG 99

TW=125
Top of Berm=125.37'
Prop. Catchbasin w/ 4' Sump (See Detail)
Grate=125.0'
Invert=122.0' (12" HDPE)
Prop. 1' Wide Cape Cod Berm
L=40'
TW=129.5
PROPOSED LANDSCAPED
BLOCK WALL (2'X2'X4')
TW=132.5

N/F
LUIS A & MARIA PUELLO
BK. 17627 PG 334

TW=136
Prop. 3' Wide Grass Swale
6" Depth (Typ)

Prop. 3' Wide Grass Swale
6" Depth (Typ)

N/F
FANNY WANDALY CLAROS FUNEZ
BK. 16978 PG 333

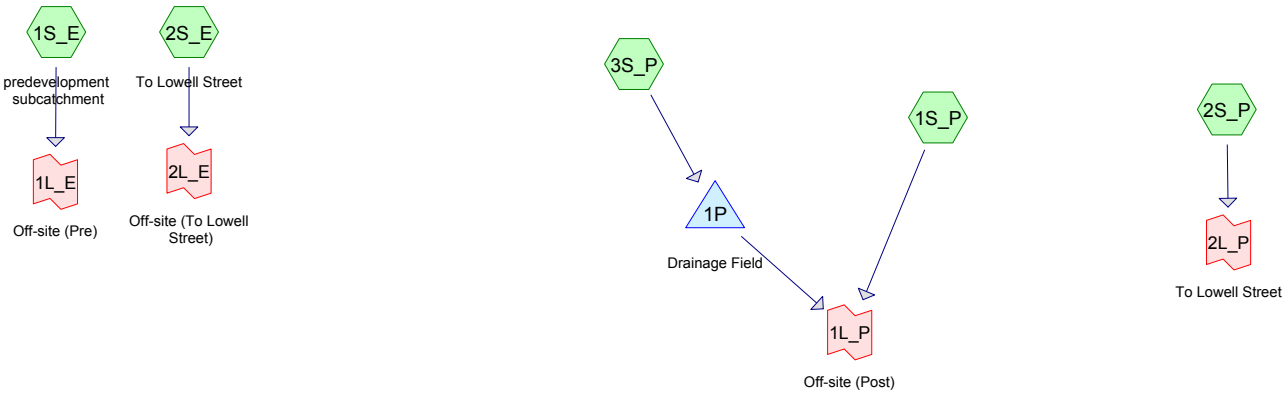
LOT 1
A=8029 S.F.
92.6'
109.4'±
30'
18'
17.7'
8.2
139.52'
133.17' (PLAN)
139.52' (FIELD)

PEAK EL=175.4
#47
2-STY.
2S_P
1.6'
12.1'
50.00'
18'
10'
20'
40.00'
N51°45'00"E
59.00'
BENCHMARK
MAG NAIL
EL=136.43
WG
WG
WG

PEAK E

SMH
R=140.65
I=132.68
PROP SMH
R=138±
I=129(OUT)
I=134(IN)
6" PVC
PROP CURB CUT
GAS
8" SEWER
S=4.86%
I=128±
WATER

LOWELL STREET



Subcat Reach Pond Link

Drainage Diagram for 47 Lowell Street

Prepared by Sullivan Engineering Group, LLC 1/23/2025

Time span=0.10-36.00 hrs, dt=0.01 hrs, 3591 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S_E: predevelopment subcatchment Runoff Area=19,914 sf Runoff Depth=0.00"
Tc=6.0 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment 1S_P: Runoff Area=5,837 sf Runoff Depth=0.00"
Tc=6.0 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment 2S_E: To Lowell Street Runoff Area=4,036 sf Runoff Depth=0.11"
Tc=6.0 min CN=50 Runoff=0.00 cfs 0.001 af

Subcatchment 2S_P: Runoff Area=4,035 sf Runoff Depth=0.55"
Tc=6.0 min CN=65 Runoff=0.04 cfs 0.004 af

Subcatchment 3S_P: Runoff Area=14,077 sf Runoff Depth=1.19"
Tc=6.0 min CN=78 Runoff=0.44 cfs 0.032 af

Pond 1P: Drainage Field Peak Elev=120.82' Storage=197 cf Inflow=0.44 cfs 0.032 af
Discarded=0.20 cfs 0.032 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.032 af

Link 1L_E: Off-site (Pre) Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 1L_P: Off-site (Post) Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 2L_E: Off-site (To Lowell Street) Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Link 2L_P: To Lowell Street Inflow=0.04 cfs 0.004 af
Primary=0.04 cfs 0.004 af

Total Runoff Area = 1.100 ac Runoff Volume = 0.037 af Average Runoff Depth = 0.41"

Subcatchment 1S_E: predevelopment subcatchment

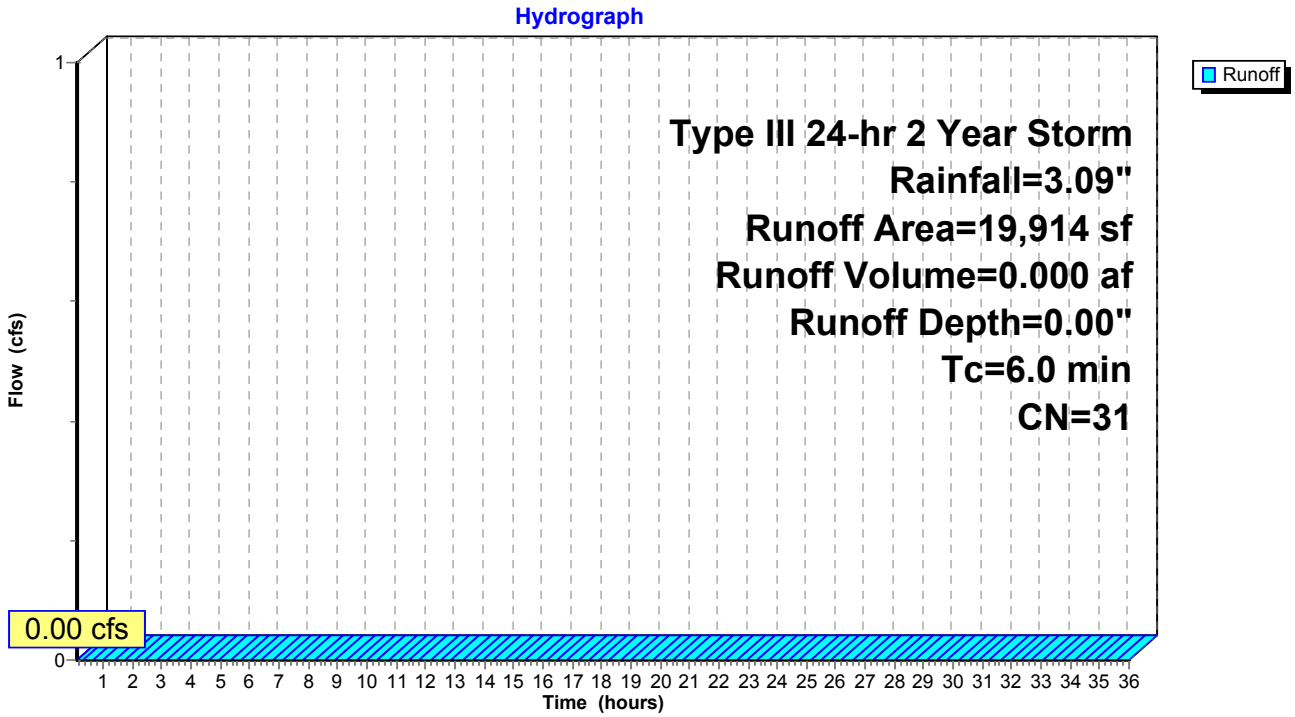
Runoff = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.09"

Area (sf)	CN	Description
242	98	Portion of Ex. House
18,475	30	Woods, Good, HSG A
1,197	39	>75% Grass cover, Good, HSG A
19,914	31	Weighted Average

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

Subcatchment 1S_E: predevelopment subcatchment



Subcatchment 1S_P:

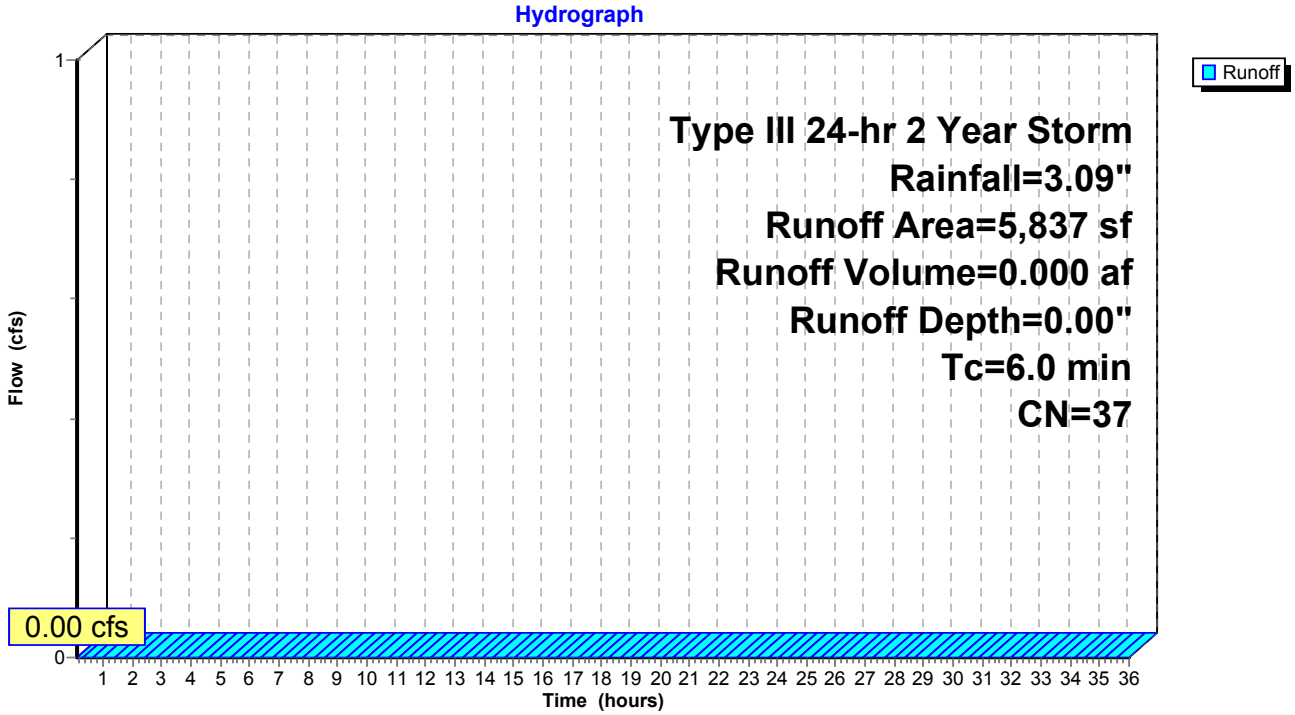
Runoff = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.09"

Area (sf)	CN	Description
4,637	39	>75% Grass cover, Good, HSG A
1,200	30	Woods, Good, HSG A
5,837	37	Weighted Average

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

Subcatchment 1S_P:



Subcatchment 2S_E: To Lowell Street

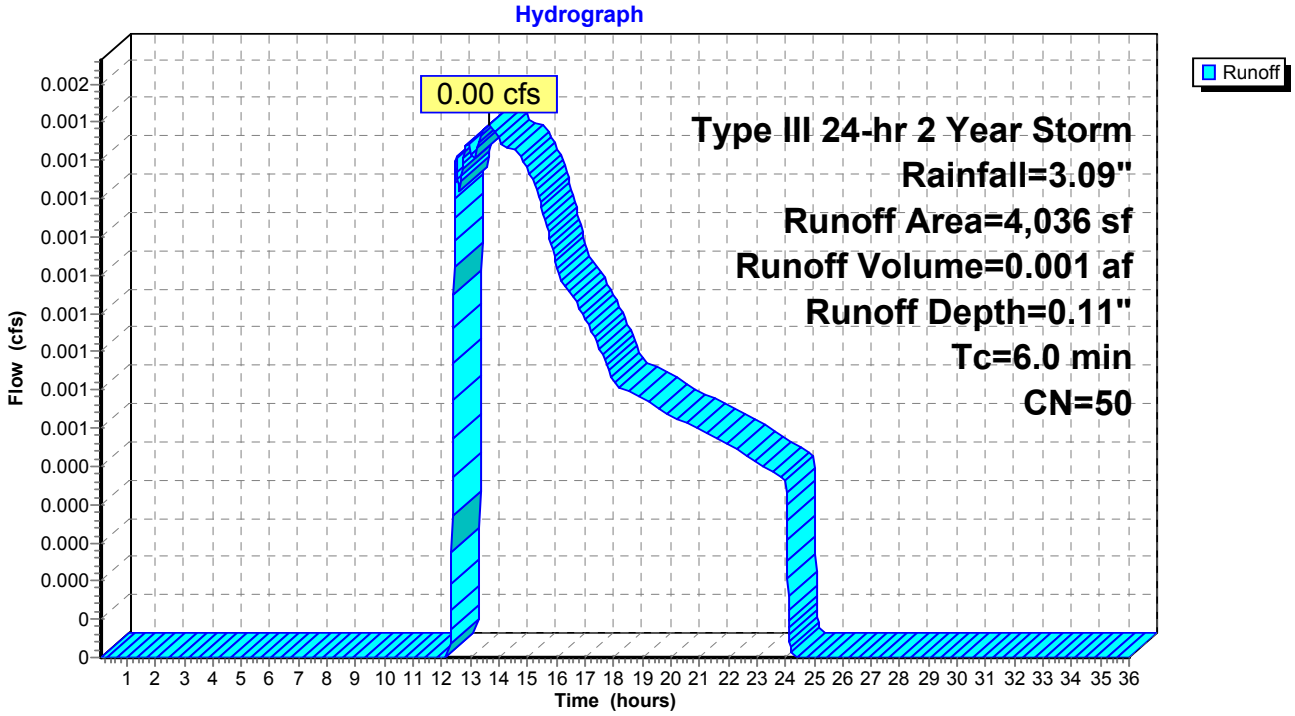
Runoff = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.09"

Area (sf)	CN	Description
750	98	Portion of ex. house
3,286	39	>75% Grass cover, Good, HSG A
4,036	50	Weighted Average

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

Subcatchment 2S_E: To Lowell Street



Subcatchment 2S_P:

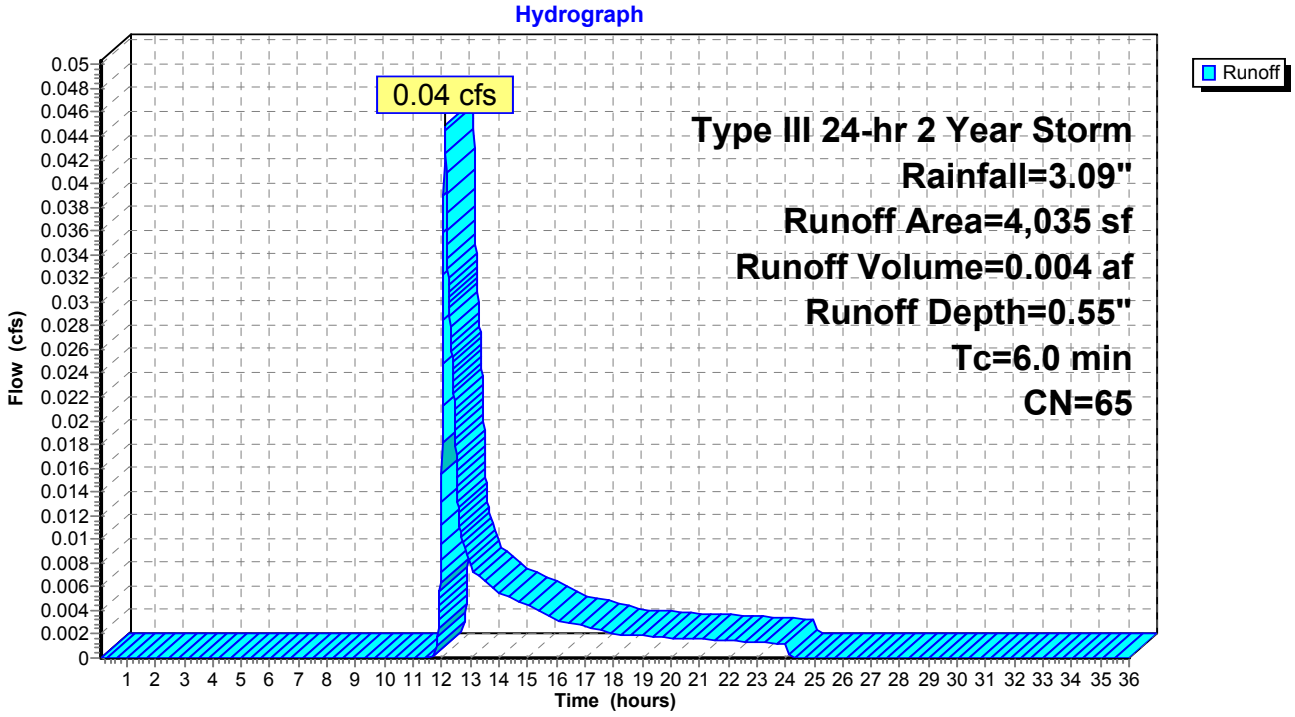
Runoff = 0.04 cfs @ 12.11 hrs, Volume= 0.004 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.09"

Area (sf)	CN	Description
750	98	Portion of House Roof
1,021	98	Portion of Paved driveway
2,264	39	>75% Grass cover, Good, HSG A
4,035	65	Weighted Average

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

Subcatchment 2S_P:



Subcatchment 3S_P:

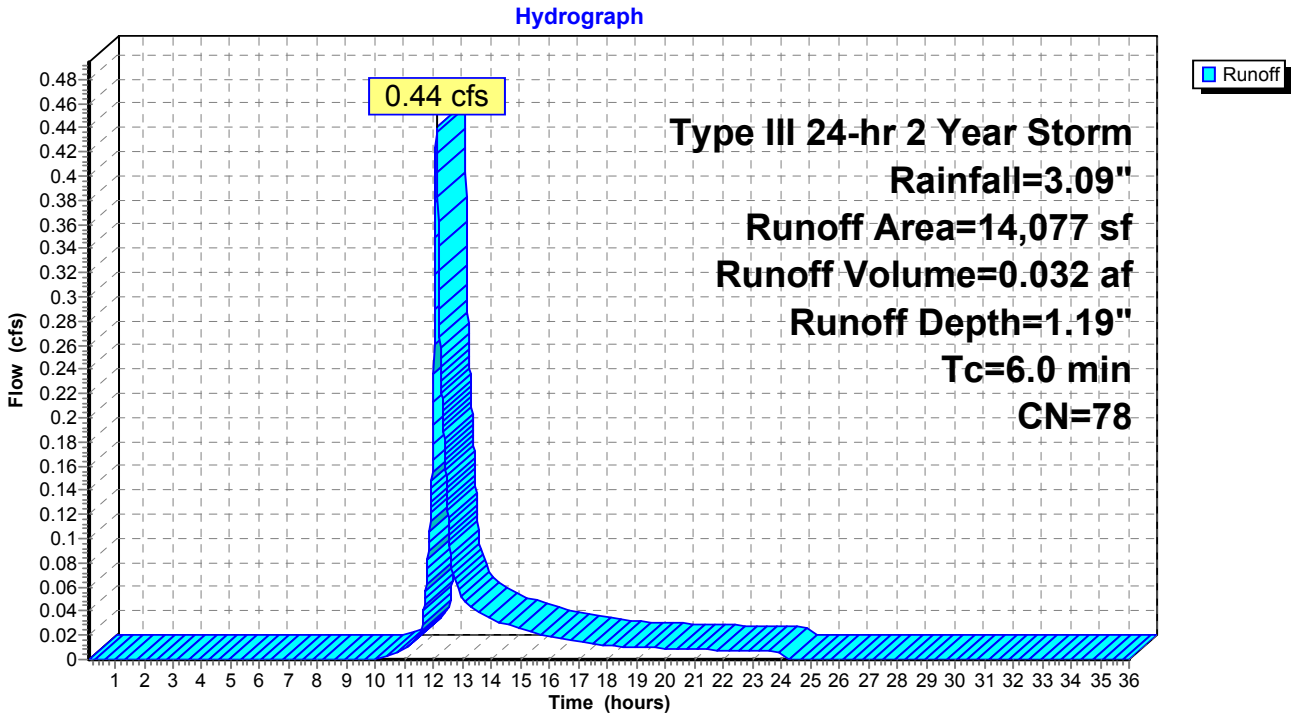
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.09"

Area (sf)	CN	Description
2,240	98	Entire House Roof
6,740	98	Entire Driveway
4,855	39	>75% Grass cover, Good, HSG A
242	98	Portion of Ex. House
14,077	78	Weighted Average

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

Subcatchment 3S_P:



Pond 1P: Drainage Field

Inflow Area = 0.323 ac, Inflow Depth = 1.19" for 2 Year Storm event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 0.032 af
Outflow = 0.20 cfs @ 12.33 hrs, Volume= 0.032 af, Atten= 56%, Lag= 14.4 min
Discarded = 0.20 cfs @ 12.33 hrs, Volume= 0.032 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Peak Elev= 120.82' @ 12.33 hrs Surf.Area= 1,020 sf Storage= 197 cf
Plug-Flow detention time= 6.8 min calculated for 0.032 af (100% of inflow)
Center-of-Mass det. time= 6.8 min (857.9 - 851.1)

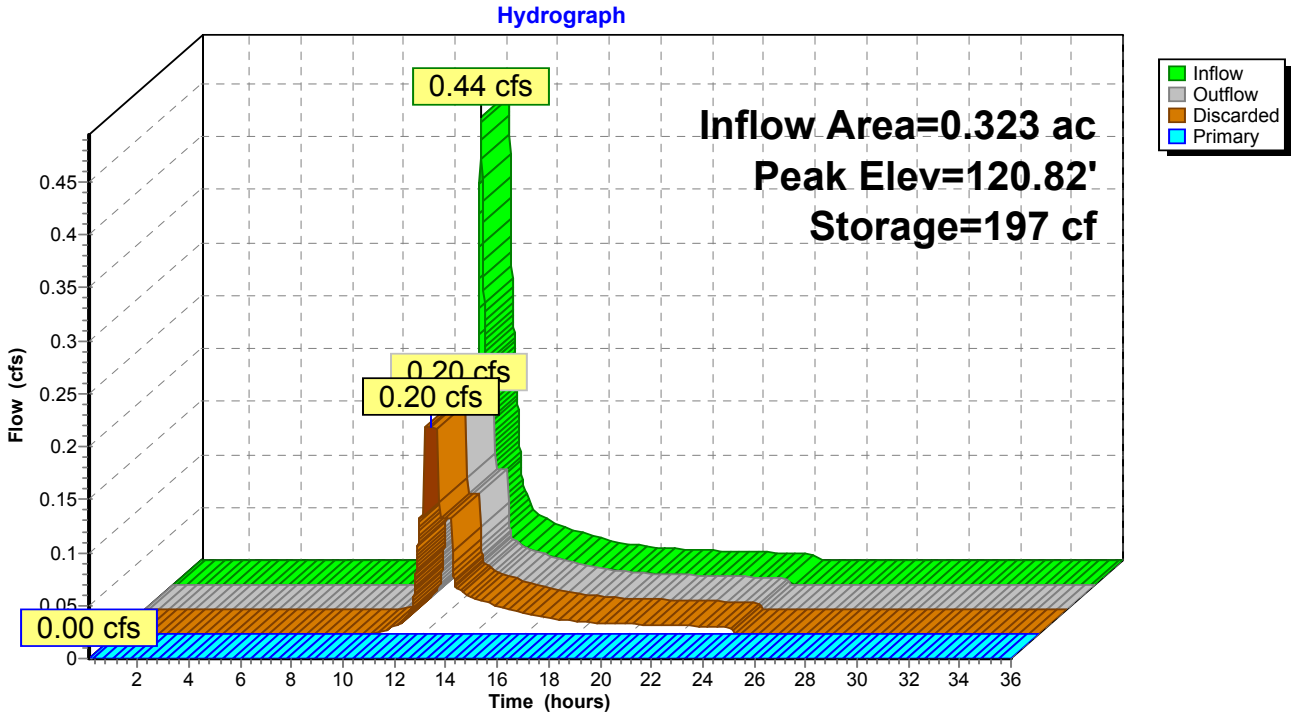
#	Invert	Avail.Storage	Storage Description
1	120.20'	1,090 cf	**21.50'W x 26.69'L x 4.75'H Prismatoid** 2,726 cf Overall x 40.0% Voids
2	120.70'	1,361 cf	**69.8"W x 48.0"H x 3.67'L Cultec R-902HD** x 21
		2,451 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.011486 fpm Exfiltration over entire Surface area**
2	Primary	124.30'	**6.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.20 cfs @ 12.33 hrs HW=120.82' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=120.20' (Free Discharge)
2=Orifice/Grate (Controls 0.00 cfs)

Pond 1P: Drainage Field

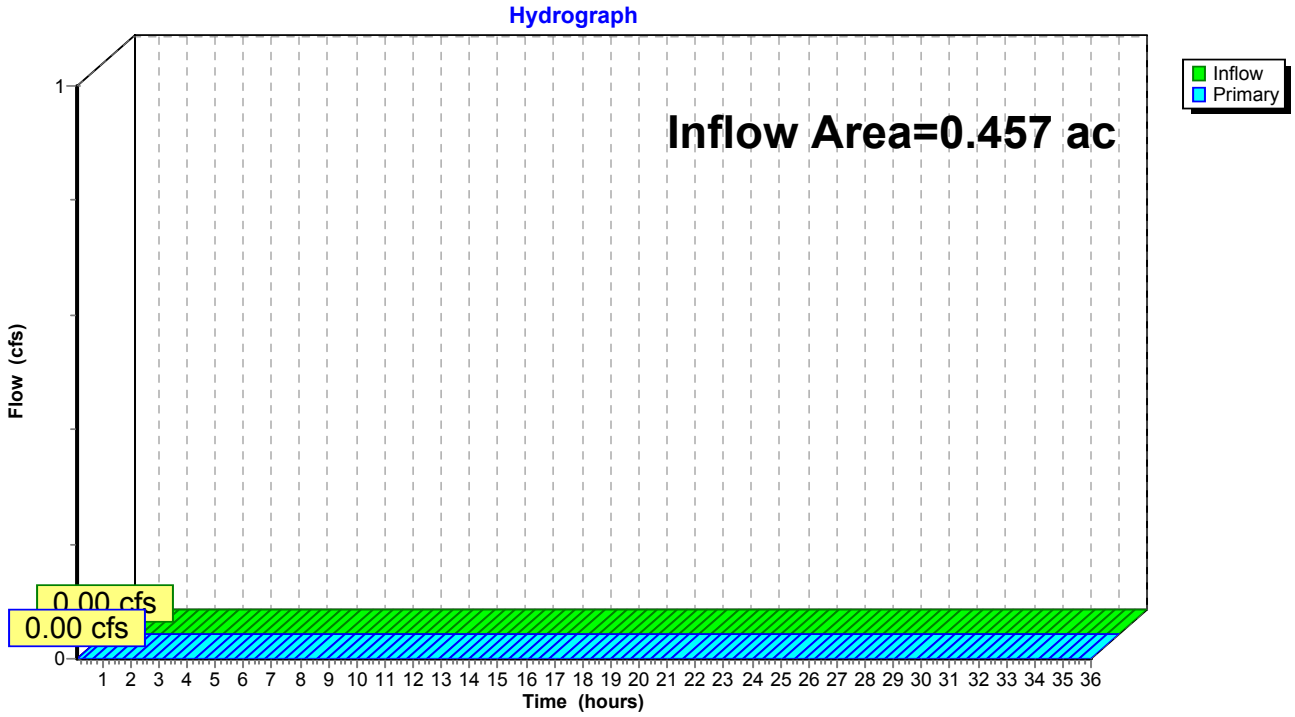


Link 1L_E: Off-site (Pre)

Inflow Area = 0.457 ac, Inflow Depth = 0.00" for 2 Year Storm event
Inflow = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_E: Off-site (Pre)

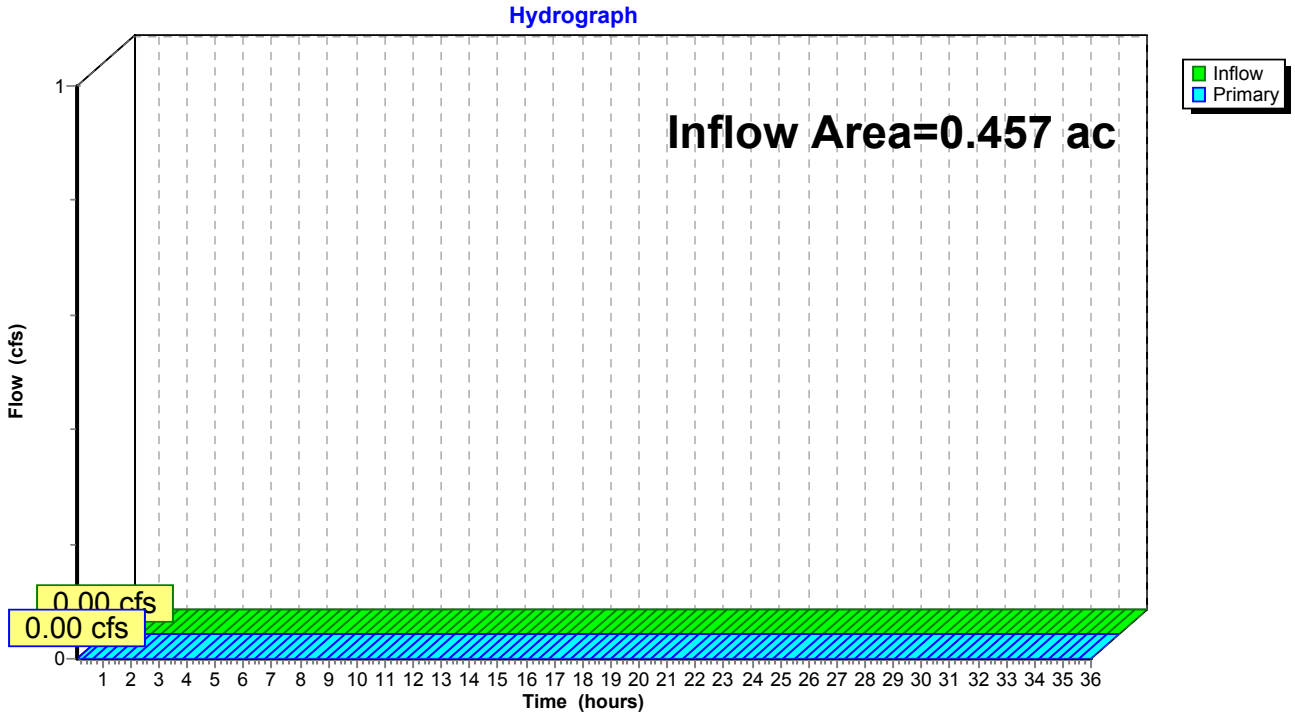


Link 1L_P: Off-site (Post)

Inflow Area = 0.457 ac, Inflow Depth = 0.00" for 2 Year Storm event
Inflow = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_P: Off-site (Post)

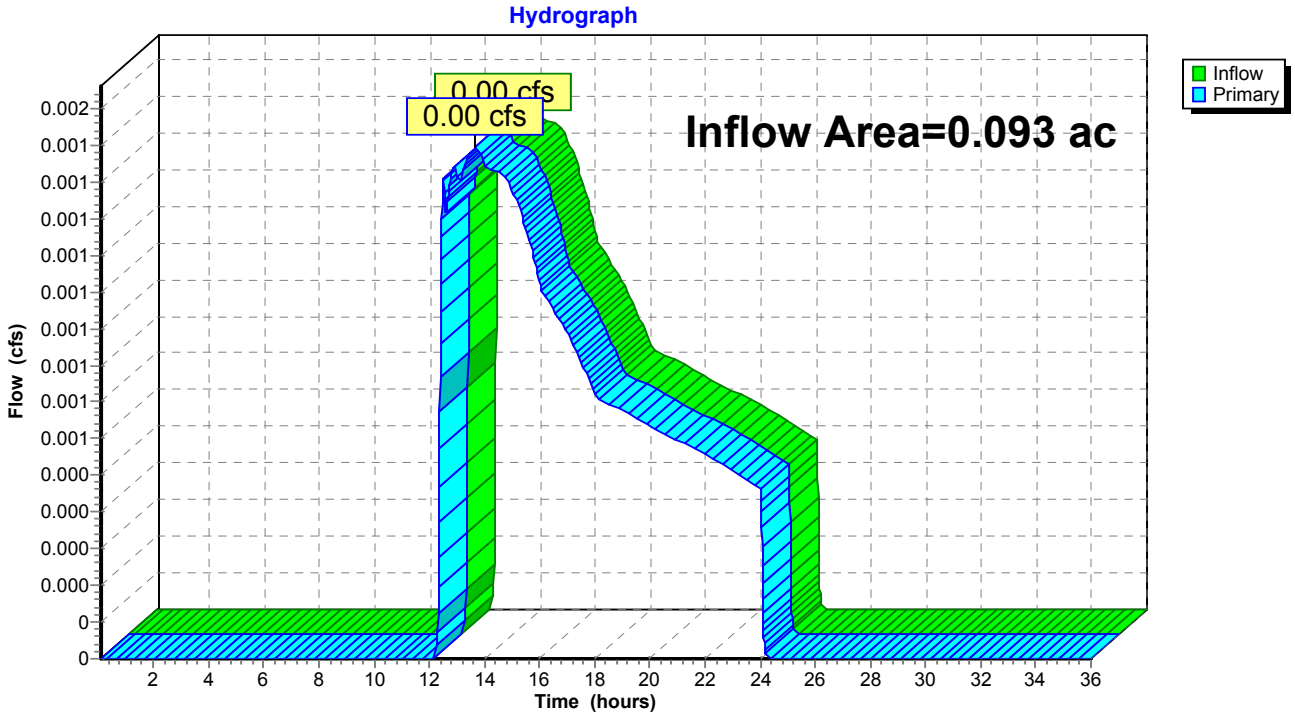


Link 2L_E: Off-site (To Lowell Street)

Inflow Area = 0.093 ac, Inflow Depth = 0.11" for 2 Year Storm event
Inflow = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_E: Off-site (To Lowell Street)

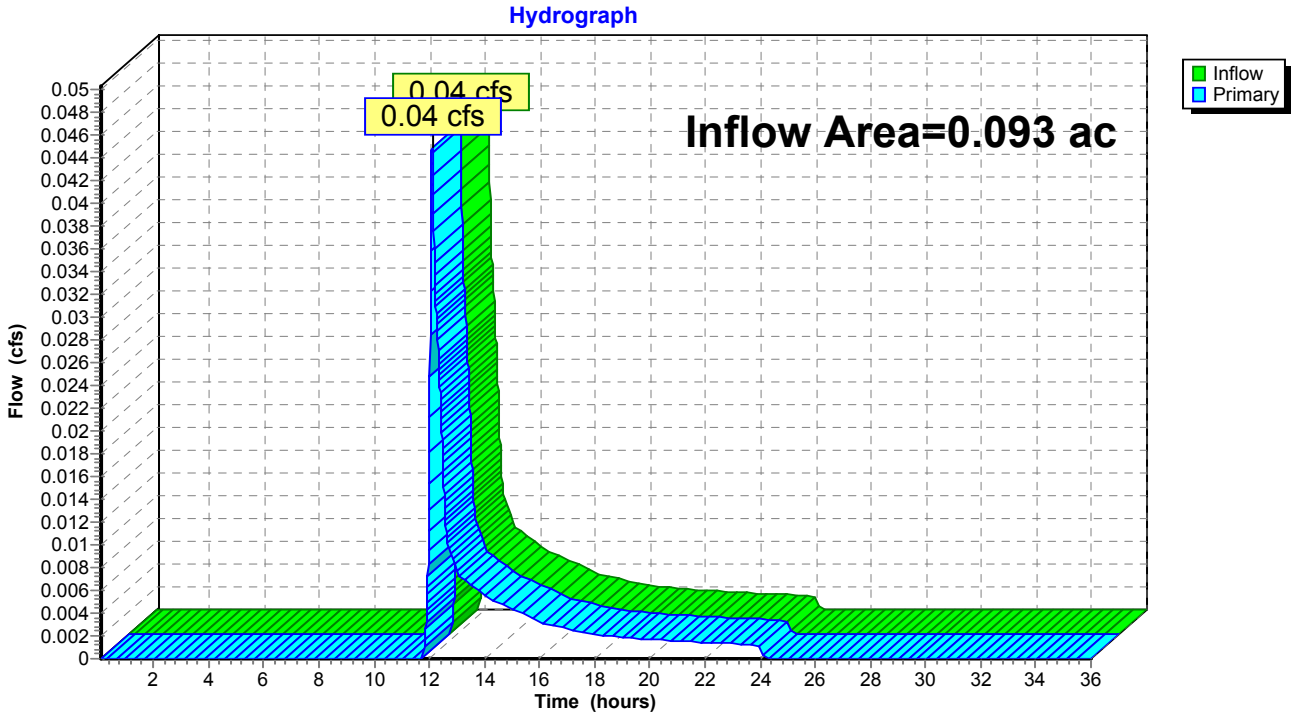


Link 2L_P: To Lowell Street

Inflow Area = 0.093 ac, Inflow Depth = 0.55" for 2 Year Storm event
Inflow = 0.04 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.04 cfs @ 12.11 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_P: To Lowell Street



Time span=0.10-36.00 hrs, dt=0.01 hrs, 3591 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S_E: predevelopment subcatchment Runoff Area=19,914 sf Runoff Depth=0.00"
Tc=6.0 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment 1S_P: Runoff Area=5,837 sf Runoff Depth=0.09"
Tc=6.0 min CN=37 Runoff=0.00 cfs 0.001 af

Subcatchment 2S_E: To Lowell Street Runoff Area=4,036 sf Runoff Depth=0.58"
Tc=6.0 min CN=50 Runoff=0.03 cfs 0.004 af

Subcatchment 2S_P: Runoff Area=4,035 sf Runoff Depth=1.46"
Tc=6.0 min CN=65 Runoff=0.15 cfs 0.011 af

Subcatchment 3S_P: Runoff Area=14,077 sf Runoff Depth=2.47"
Tc=6.0 min CN=78 Runoff=0.93 cfs 0.066 af

Pond 1P: Drainage Field Peak Elev=121.70' Storage=781 cf Inflow=0.93 cfs 0.066 af
Discarded=0.20 cfs 0.066 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.066 af

Link 1L_E: Off-site (Pre) Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 1L_P: Off-site (Post) Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Link 2L_E: Off-site (To Lowell Street) Inflow=0.03 cfs 0.004 af
Primary=0.03 cfs 0.004 af

Link 2L_P: To Lowell Street Inflow=0.15 cfs 0.011 af
Primary=0.15 cfs 0.011 af

Total Runoff Area = 1.100 ac Runoff Volume = 0.083 af Average Runoff Depth = 0.91"

Subcatchment 1S_E: predevelopment subcatchment

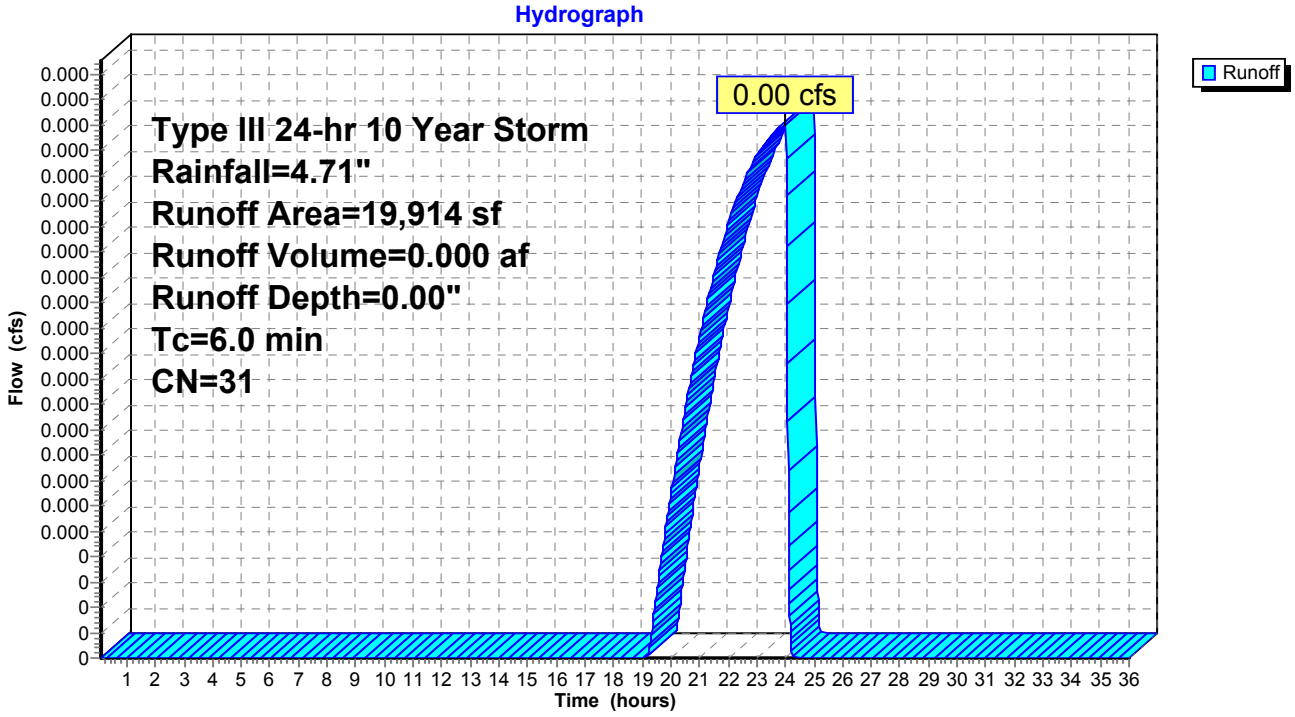
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.71"

Area (sf)	CN	Description
242	98	Portion of Ex. House
18,475	30	Woods, Good, HSG A
1,197	39	>75% Grass cover, Good, HSG A
19,914	31	Weighted Average

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

Subcatchment 1S_E: predevelopment subcatchment



Subcatchment 1S_P:

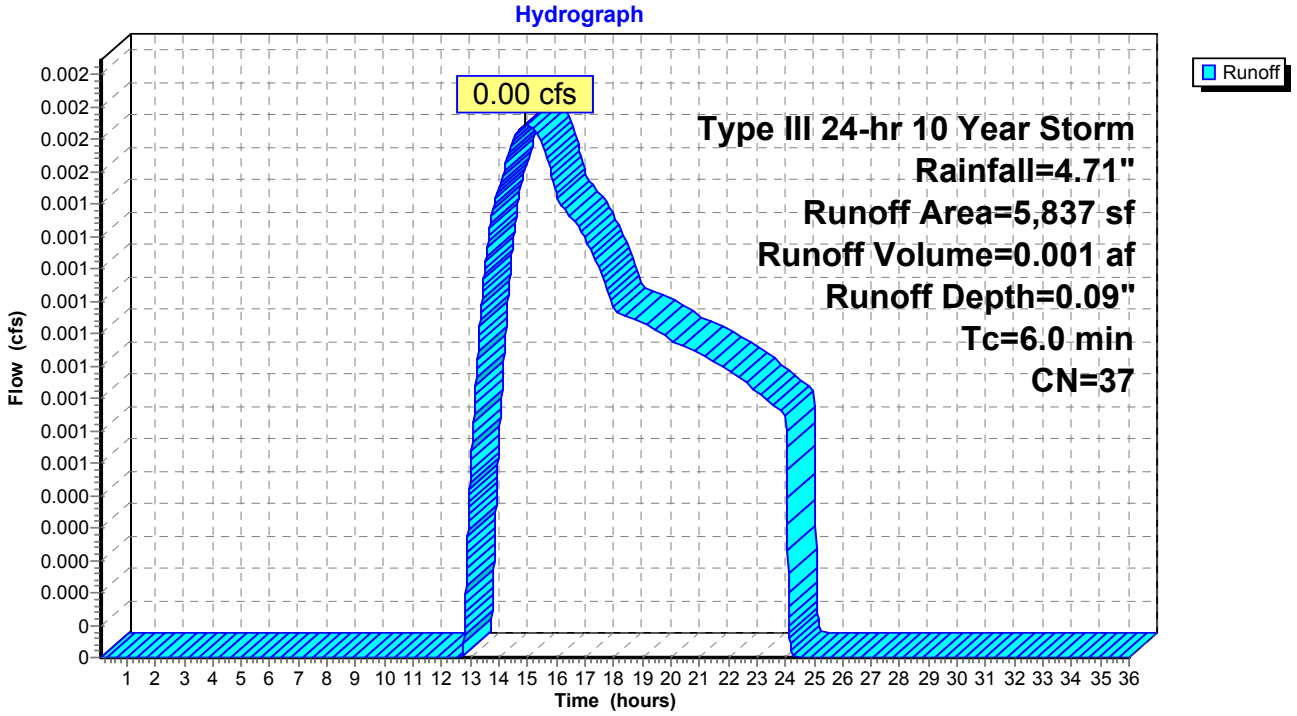
Runoff = 0.00 cfs @ 14.94 hrs, Volume= 0.001 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.71"

Area (sf)	CN	Description
4,637	39	>75% Grass cover, Good, HSG A
1,200	30	Woods, Good, HSG A
5,837	37	Weighted Average

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

Subcatchment 1S_P:



Subcatchment 2S_E: To Lowell Street

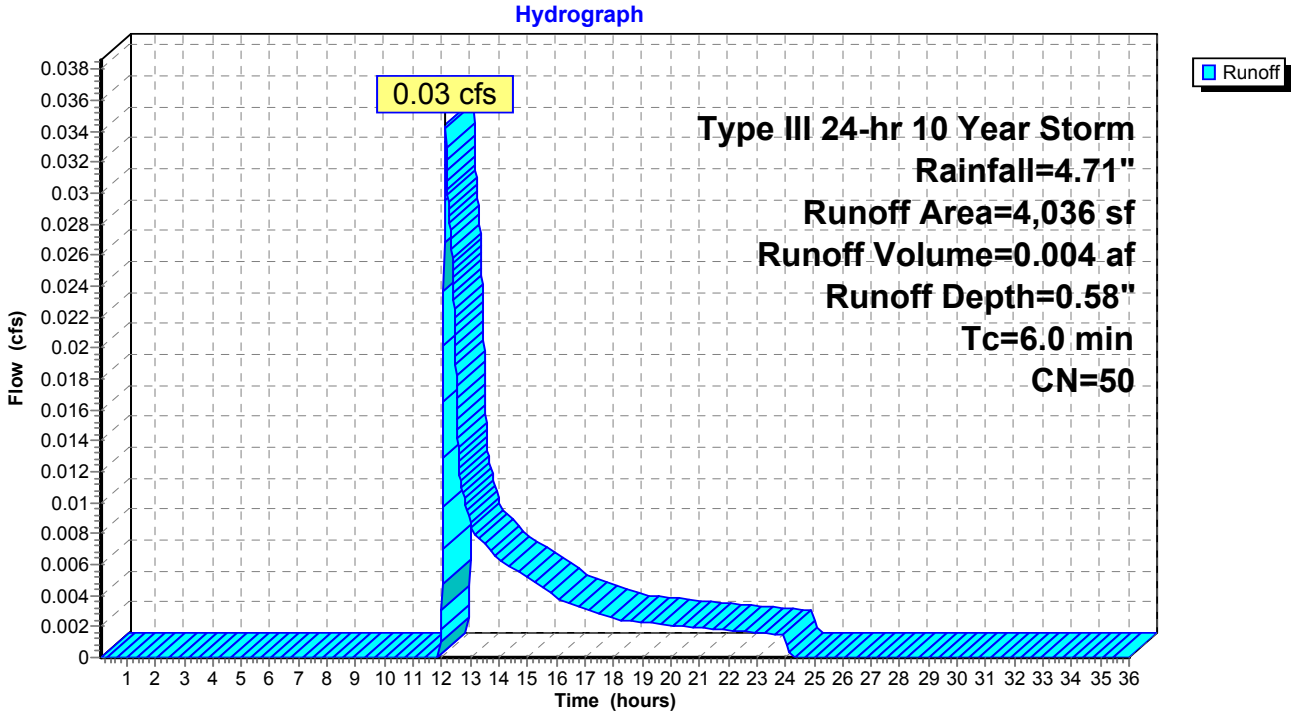
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.004 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.71"

Area (sf)	CN	Description
750	98	Portion of ex. house
3,286	39	>75% Grass cover, Good, HSG A
4,036	50	Weighted Average

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

Subcatchment 2S_E: To Lowell Street



Subcatchment 2S_P:

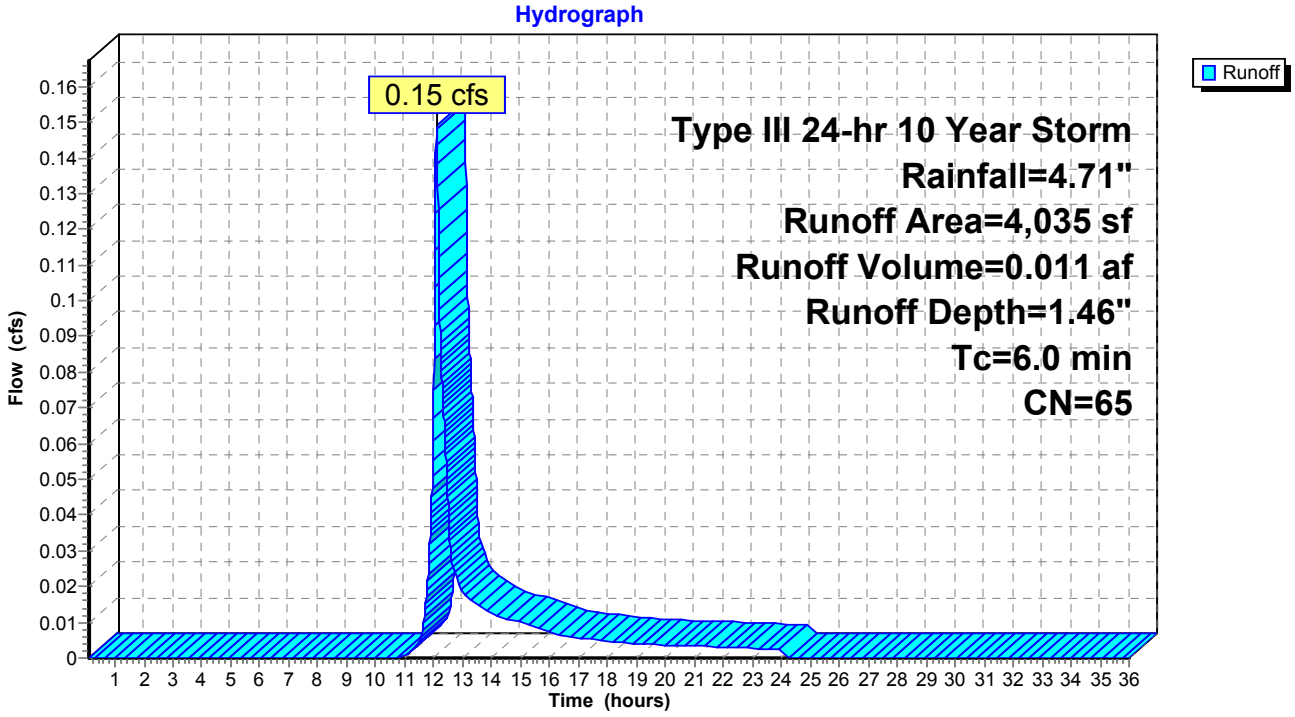
Runoff = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.71"

Area (sf)	CN	Description
750	98	Portion of House Roof
1,021	98	Portion of Paved driveway
2,264	39	>75% Grass cover, Good, HSG A
4,035	65	Weighted Average

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

Subcatchment 2S_P:



Subcatchment 3S_P:

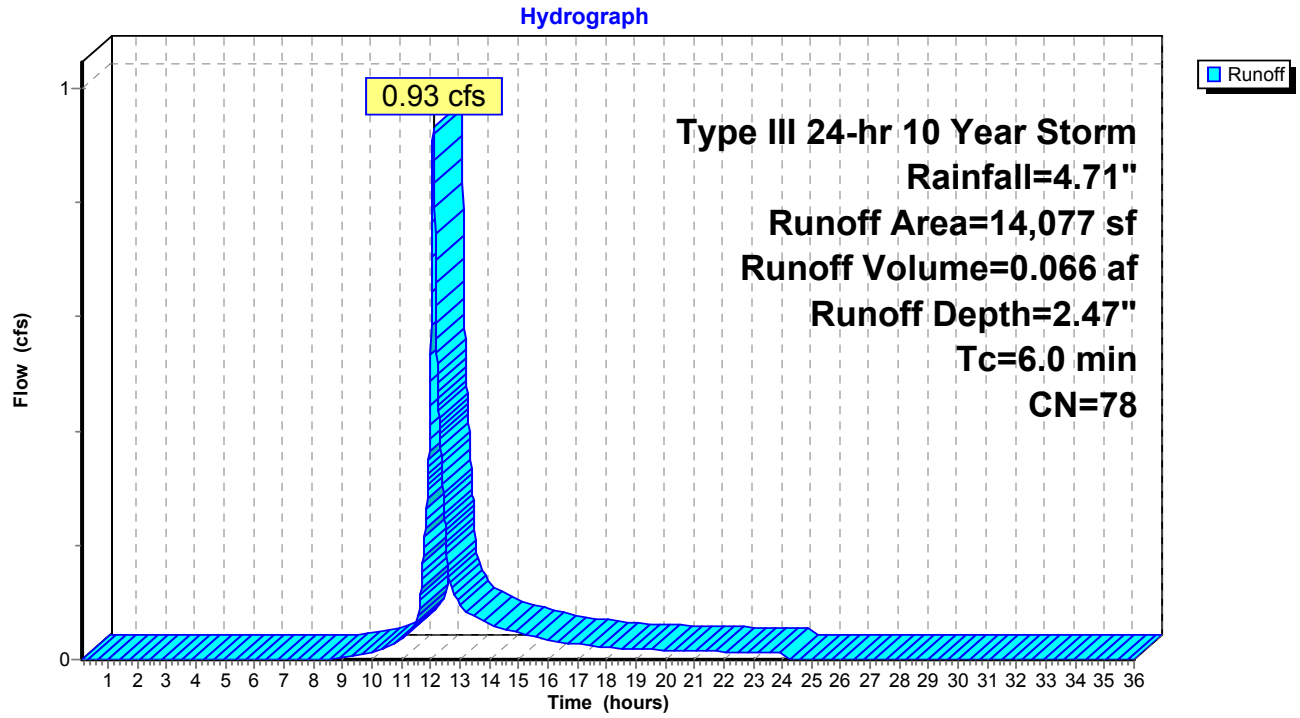
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.066 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.71"

Area (sf)	CN	Description
2,240	98	Entire House Roof
6,740	98	Entire Driveway
4,855	39	>75% Grass cover, Good, HSG A
242	98	Portion of Ex. House
14,077	78	Weighted Average

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

Subcatchment 3S_P:



Pond 1P: Drainage Field

Inflow Area = 0.323 ac, Inflow Depth = 2.47" for 10 Year Storm event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 0.066 af
Outflow = 0.20 cfs @ 14.03 hrs, Volume= 0.066 af, Atten= 79%, Lag= 116.7 min
Discarded = 0.20 cfs @ 14.03 hrs, Volume= 0.066 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Peak Elev= 121.70' @ 12.54 hrs Surf.Area= 995 sf Storage= 781 cf
Plug-Flow detention time= 25.9 min calculated for 0.066 af (100% of inflow)
Center-of-Mass det. time= 25.9 min (855.7 - 829.8)

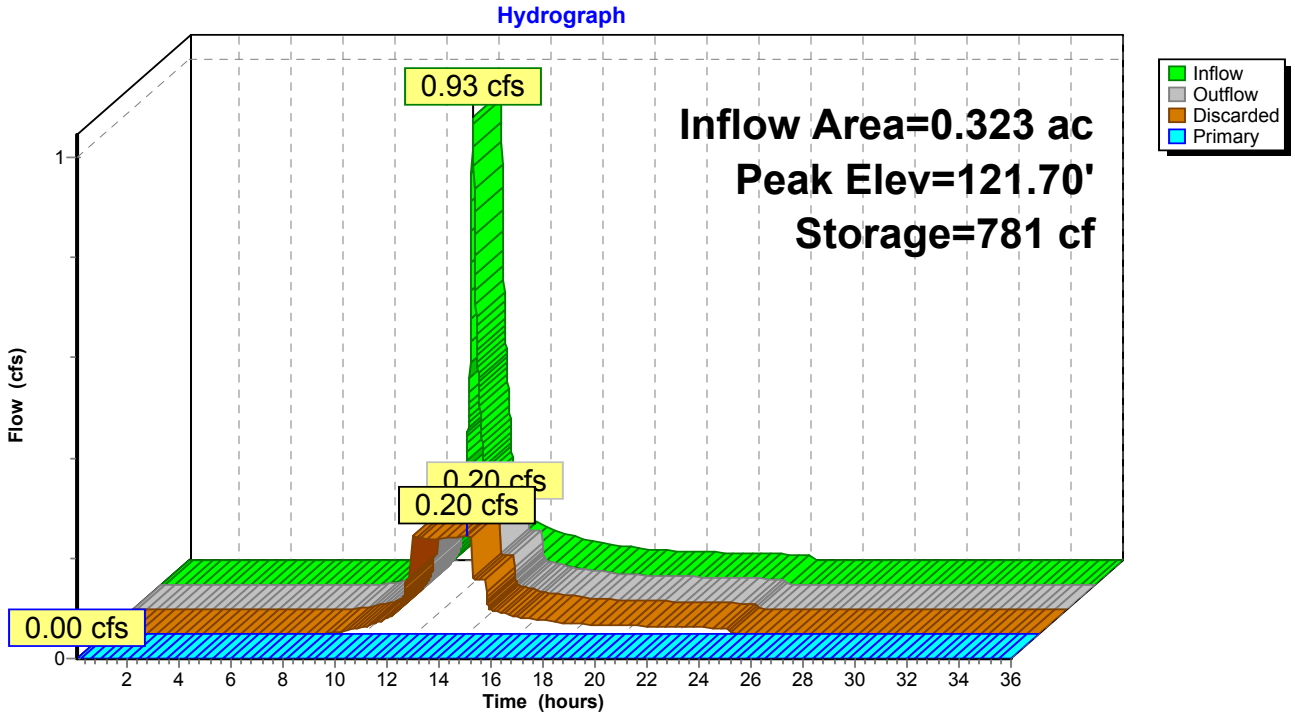
#	Invert	Avail.Storage	Storage Description
1	120.20'	1,090 cf	**21.50'W x 26.69'L x 4.75'H Prismatoid**
			2,726 cf Overall x 40.0% Voids
2	120.70'	1,361 cf	**69.8"W x 48.0"H x 3.67'L Cultec R-902HD** x 21
		2,451 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.011486 fpm Exfiltration over entire Surface area**
2	Primary	124.30'	**6.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.20 cfs @ 14.03 hrs HW=120.87' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=120.20' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Drainage Field

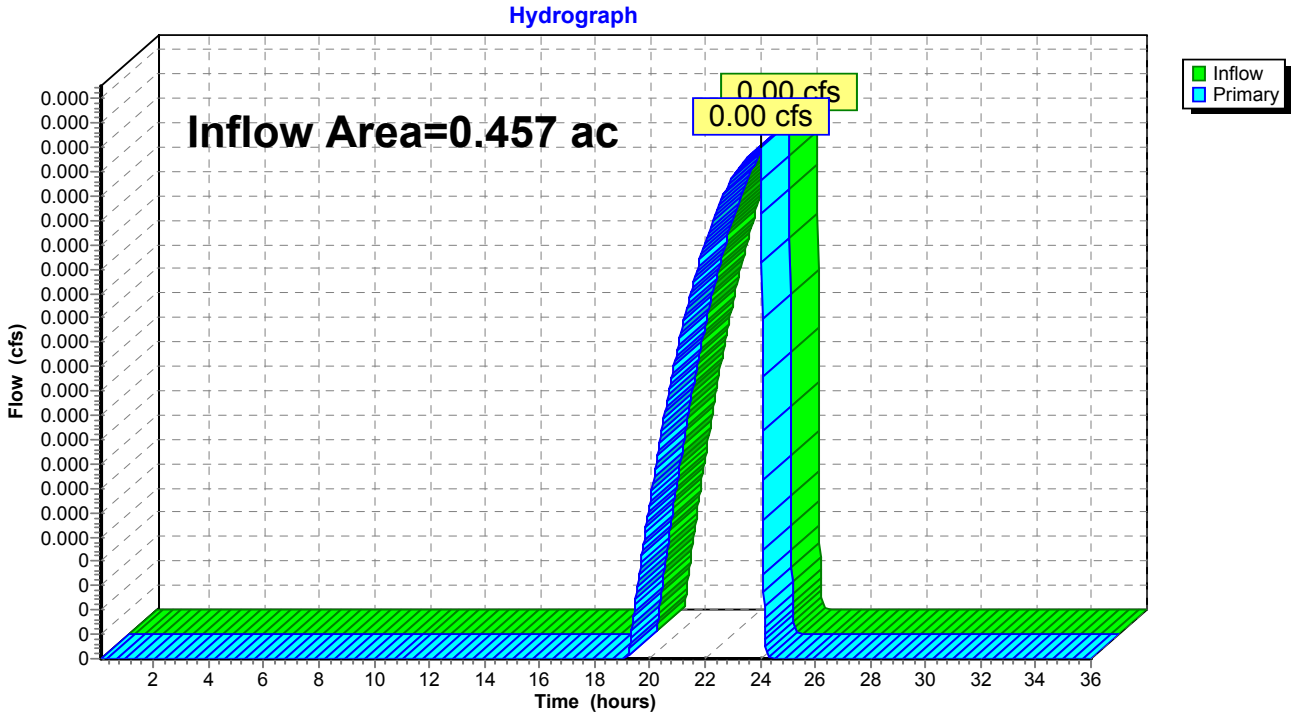


Link 1L_E: Off-site (Pre)

Inflow Area = 0.457 ac, Inflow Depth = 0.00" for 10 Year Storm event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_E: Off-site (Pre)

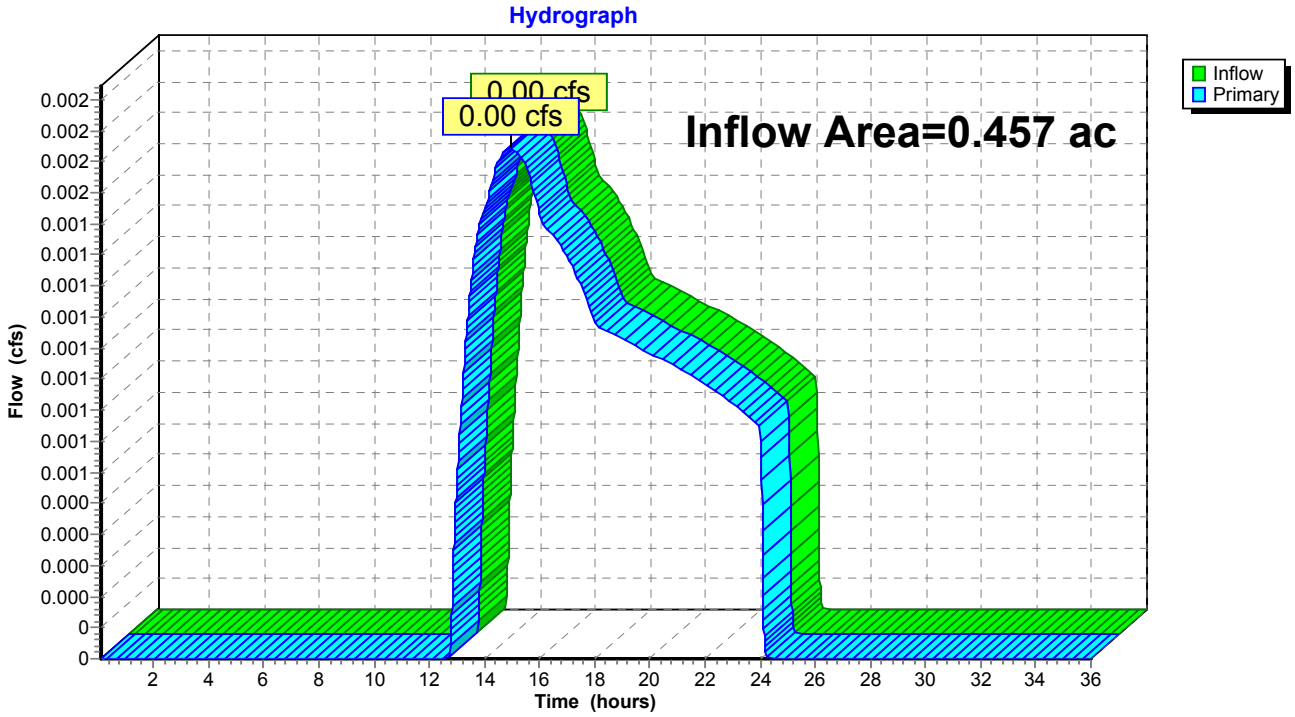


Link 1L_P: Off-site (Post)

Inflow Area = 0.457 ac, Inflow Depth = 0.03" for 10 Year Storm event
Inflow = 0.00 cfs @ 14.94 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 14.94 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_P: Off-site (Post)

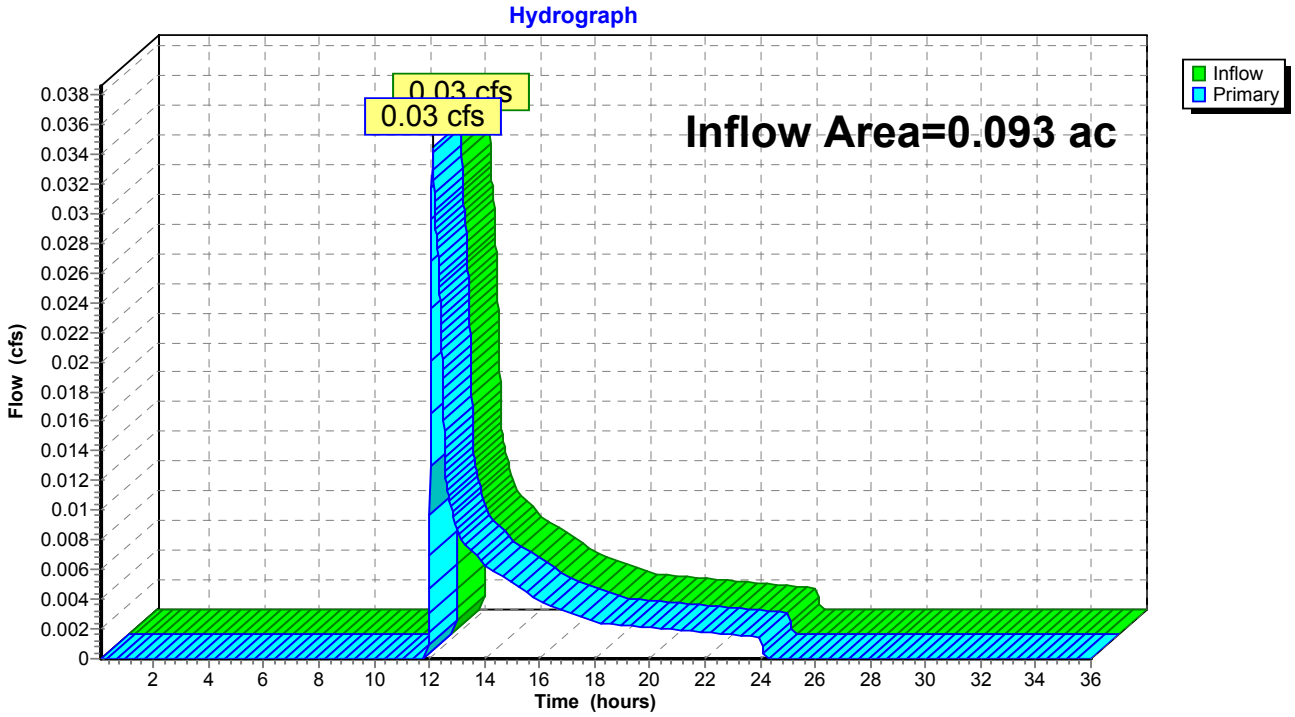


Link 2L_E: Off-site (To Lowell Street)

Inflow Area = 0.093 ac, Inflow Depth = 0.58" for 10 Year Storm event
Inflow = 0.03 cfs @ 12.13 hrs, Volume= 0.004 af
Primary = 0.03 cfs @ 12.13 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_E: Off-site (To Lowell Street)

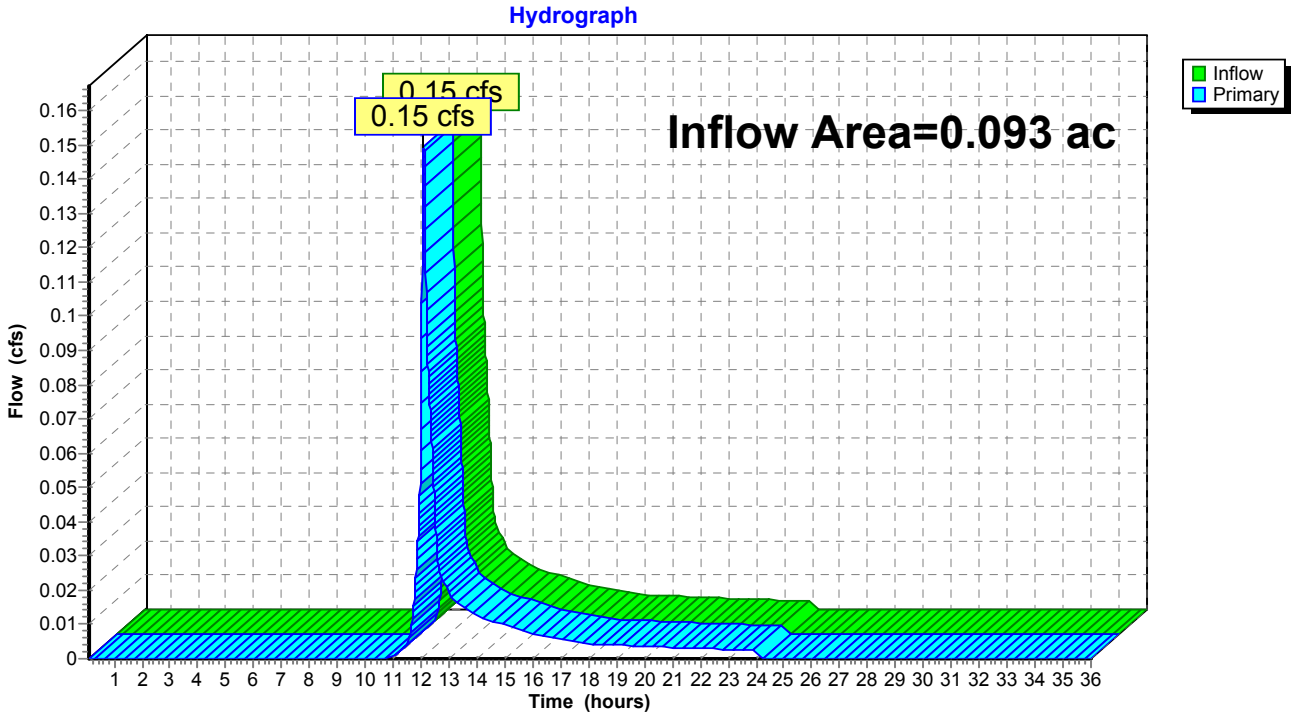


Link 2L_P: To Lowell Street

Inflow Area = 0.093 ac, Inflow Depth = 1.46" for 10 Year Storm event
Inflow = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af
Primary = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_P: To Lowell Street



Time span=0.10-36.00 hrs, dt=0.01 hrs, 3591 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S_E: predevelopment subcatchment Runoff Area=19,914 sf Runoff Depth=0.10"
Tc=6.0 min CN=31 Runoff=0.01 cfs 0.004 af

Subcatchment 1S_P: Runoff Area=5,837 sf Runoff Depth=0.34"
Tc=6.0 min CN=37 Runoff=0.01 cfs 0.004 af

Subcatchment 2S_E: To Lowell Street Runoff Area=4,036 sf Runoff Depth=1.14"
Tc=6.0 min CN=50 Runoff=0.10 cfs 0.009 af

Subcatchment 2S_P: Runoff Area=4,035 sf Runoff Depth=2.35"
Tc=6.0 min CN=65 Runoff=0.25 cfs 0.018 af

Subcatchment 3S_P: Runoff Area=14,077 sf Runoff Depth=3.58"
Tc=6.0 min CN=78 Runoff=1.35 cfs 0.096 af

Pond 1P: Drainage Field Peak Elev=122.63' Storage=1,372 cf Inflow=1.35 cfs 0.096 af
Discarded=0.20 cfs 0.096 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.096 af

Link 1L_E: Off-site (Pre) Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

Link 1L_P: Off-site (Post) Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

Link 2L_E: Off-site (To Lowell Street) Inflow=0.10 cfs 0.009 af
Primary=0.10 cfs 0.009 af

Link 2L_P: To Lowell Street Inflow=0.25 cfs 0.018 af
Primary=0.25 cfs 0.018 af

Total Runoff Area = 1.100 ac Runoff Volume = 0.131 af Average Runoff Depth = 1.43"

Subcatchment 1S_E: predevelopment subcatchment

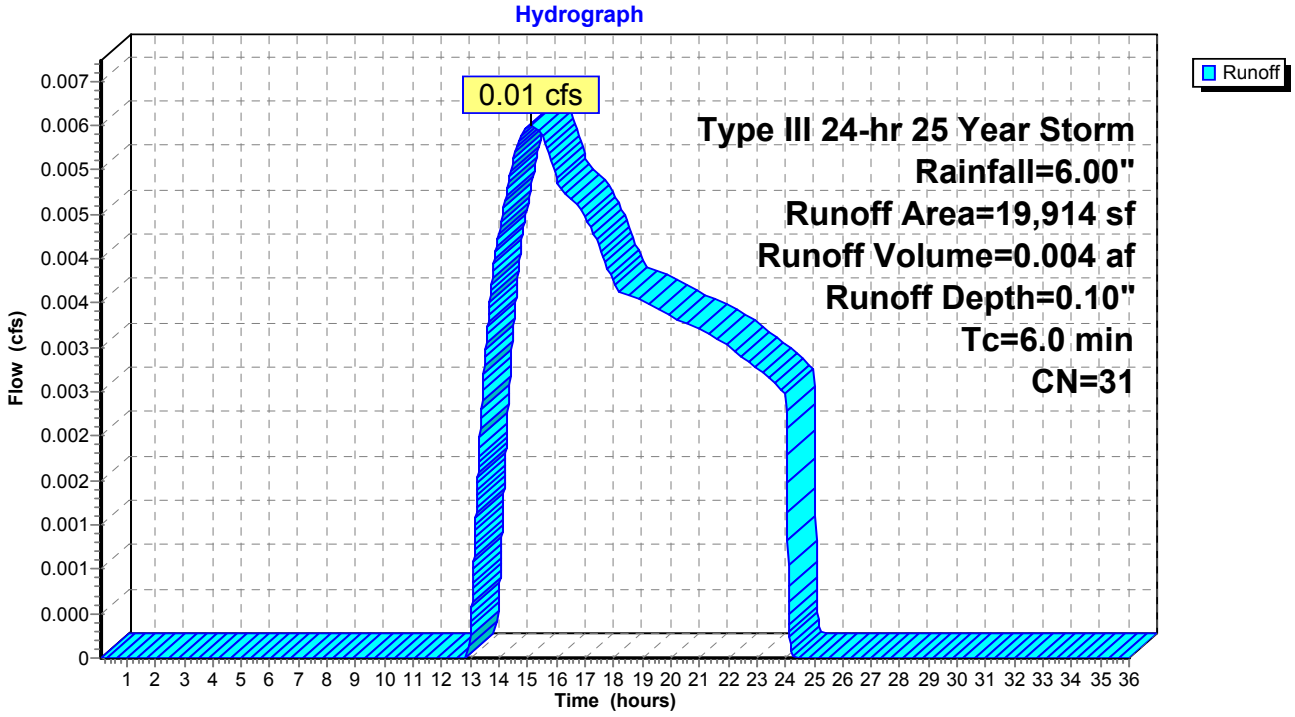
Runoff = 0.01 cfs @ 15.14 hrs, Volume= 0.004 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (sf)	CN	Description
242	98	Portion of Ex. House
18,475	30	Woods, Good, HSG A
1,197	39	>75% Grass cover, Good, HSG A
19,914	31	Weighted Average

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

Subcatchment 1S_E: predevelopment subcatchment



Subcatchment 1S_P:

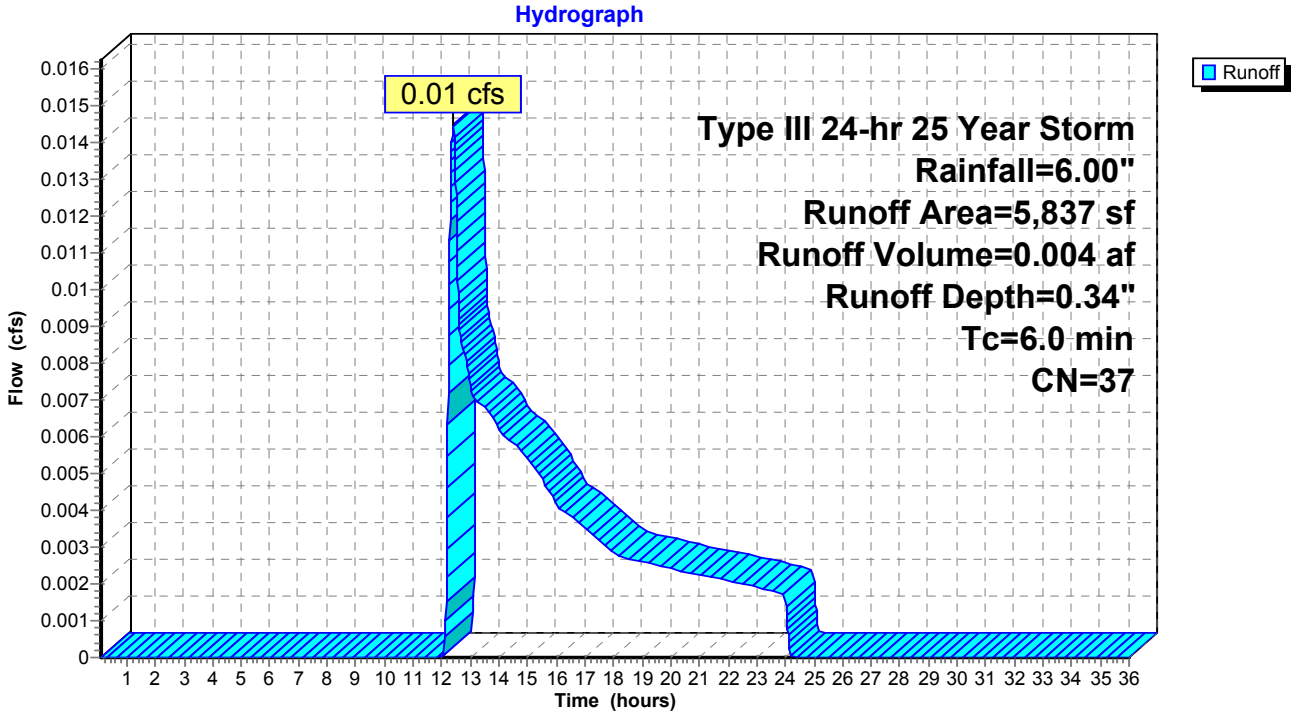
Runoff = 0.01 cfs @ 12.40 hrs, Volume= 0.004 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (sf)	CN	Description
4,637	39	>75% Grass cover, Good, HSG A
1,200	30	Woods, Good, HSG A
5,837	37	Weighted Average

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

Subcatchment 1S_P:



Subcatchment 2S_E: To Lowell Street

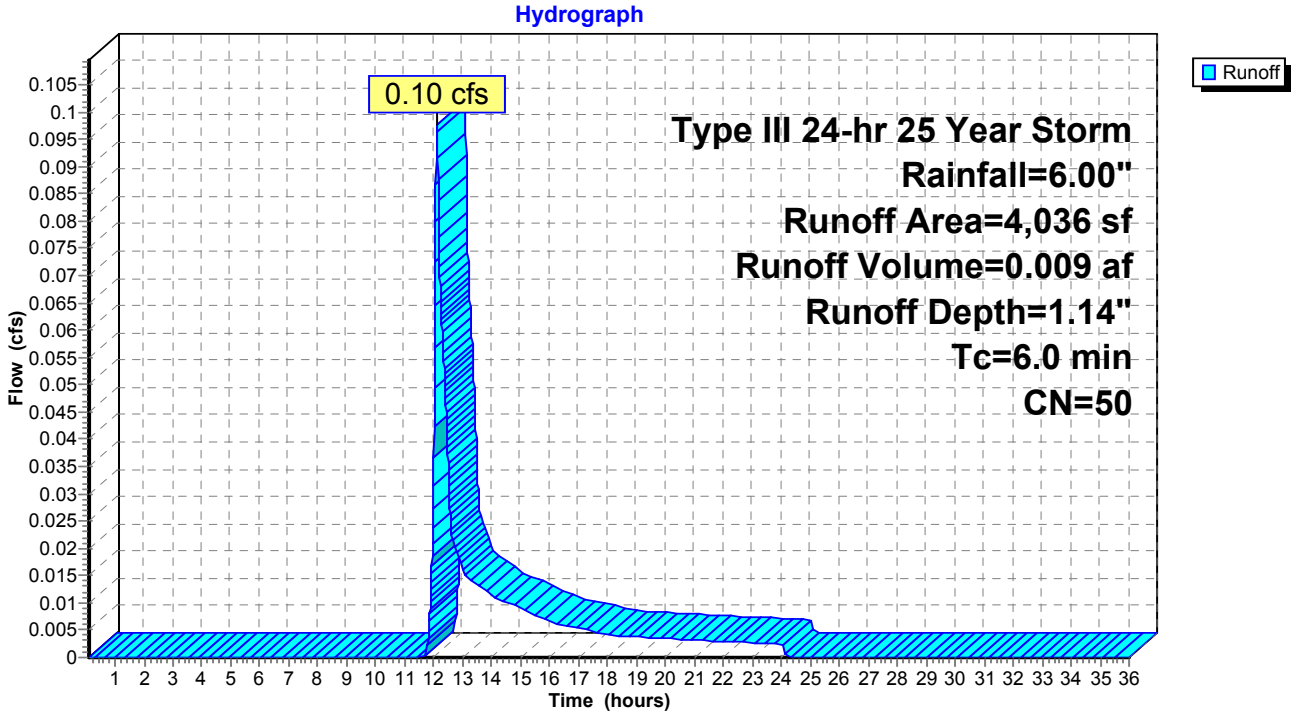
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (sf)	CN	Description
750	98	Portion of ex. house
3,286	39	>75% Grass cover, Good, HSG A
4,036	50	Weighted Average

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

Subcatchment 2S_E: To Lowell Street



Subcatchment 2S_P:

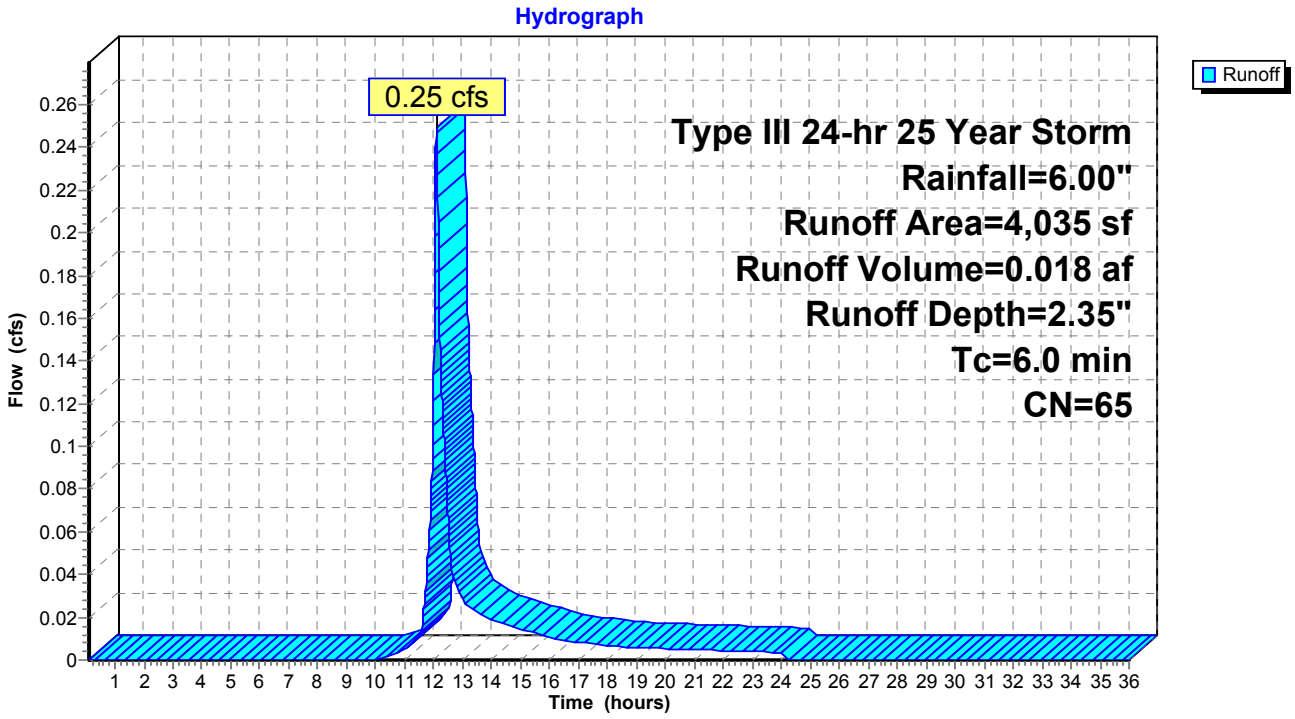
Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (sf)	CN	Description
750	98	Portion of House Roof
1,021	98	Portion of Paved driveway
2,264	39	>75% Grass cover, Good, HSG A
4,035	65	Weighted Average

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

Subcatchment 2S_P:



Subcatchment 3S_P:

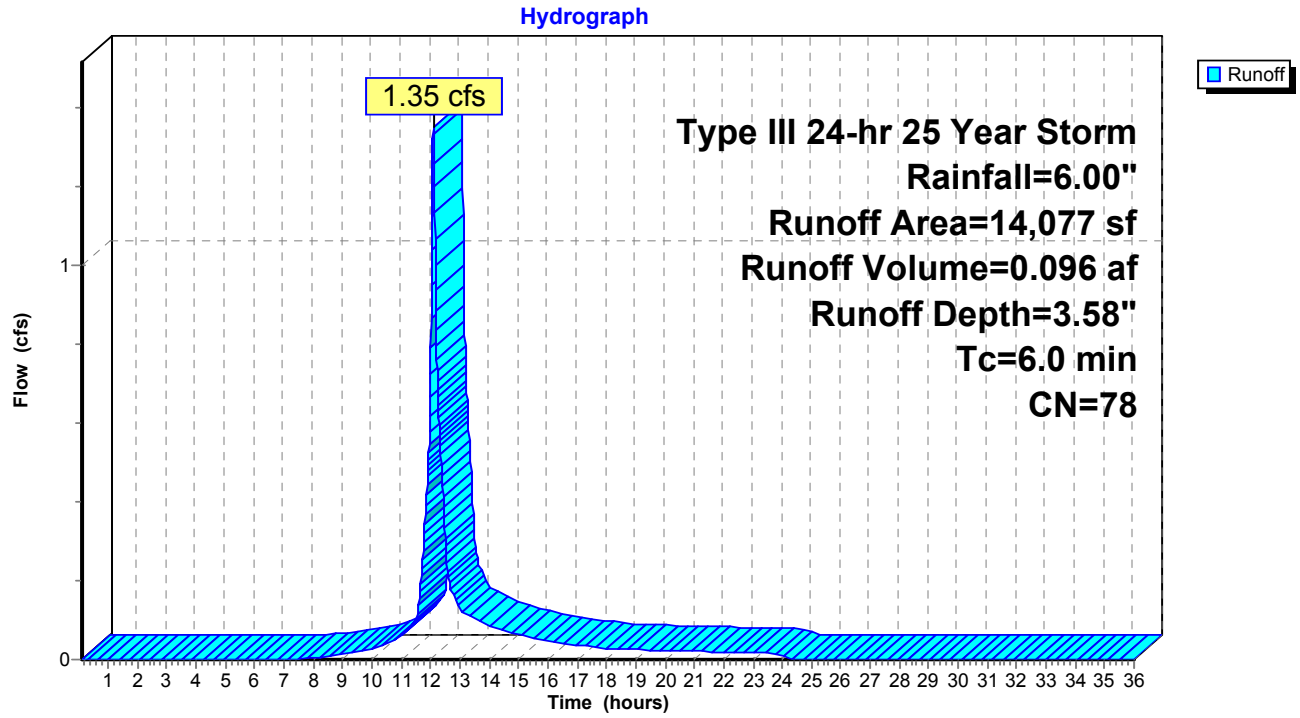
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 0.096 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (sf)	CN	Description
2,240	98	Entire House Roof
6,740	98	Entire Driveway
4,855	39	>75% Grass cover, Good, HSG A
242	98	Portion of Ex. House
14,077	78	Weighted Average

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

Subcatchment 3S_P:



Pond 1P: Drainage Field

Inflow Area = 0.323 ac, Inflow Depth = 3.58" for 25 Year Storm event
Inflow = 1.35 cfs @ 12.09 hrs, Volume= 0.096 af
Outflow = 0.20 cfs @ 15.80 hrs, Volume= 0.096 af, Atten= 86%, Lag= 222.9 min
Discarded = 0.20 cfs @ 15.80 hrs, Volume= 0.096 af
Primary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Peak Elev= 122.63' @ 12.66 hrs Surf.Area= 961 sf Storage= 1,372 cf
Plug-Flow detention time= 52.9 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 52.8 min (872.0 - 819.1)

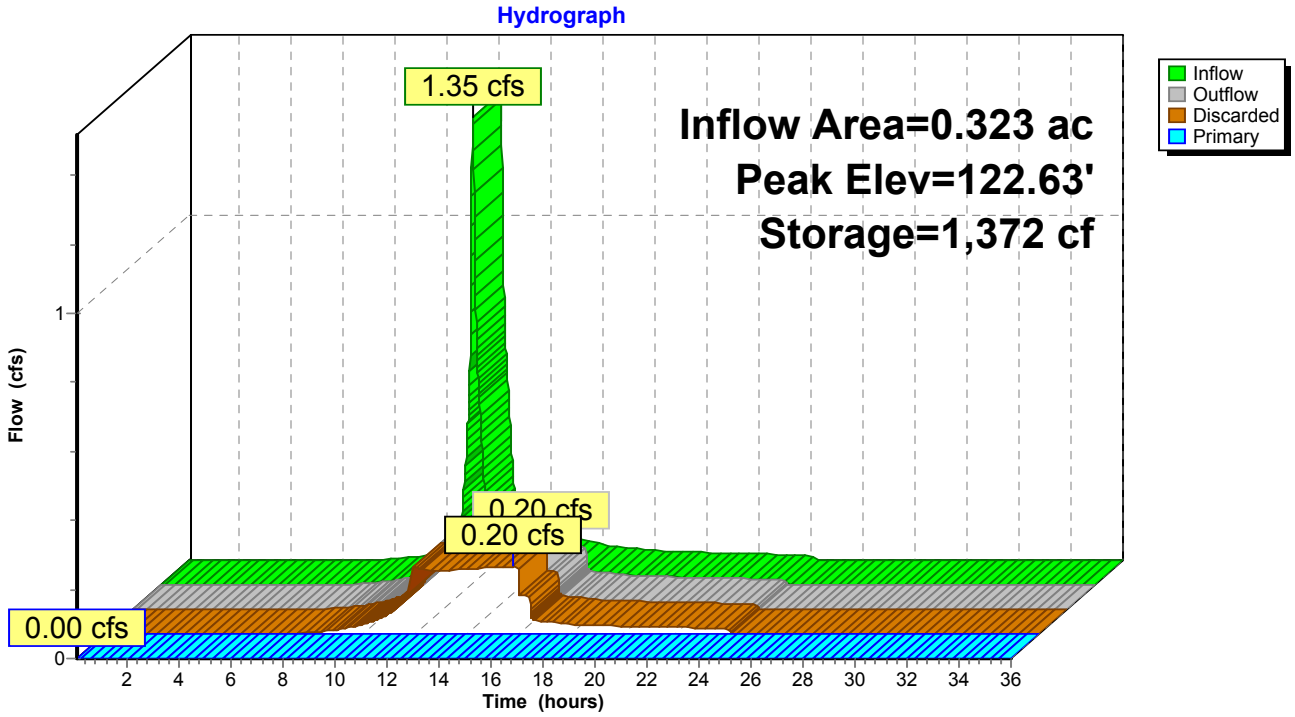
#	Invert	Avail.Storage	Storage Description
1	120.20'	1,090 cf	**21.50'W x 26.69'L x 4.75'H Prismatoid** 2,726 cf Overall x 40.0% Voids
2	120.70'	1,361 cf	**69.8"W x 48.0"H x 3.67'L Cultec R-902HD** x 21
		2,451 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.011486 fpm Exfiltration over entire Surface area**
2	Primary	124.30'	**6.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.20 cfs @ 15.80 hrs HW=120.87' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.10 hrs HW=120.20' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Drainage Field

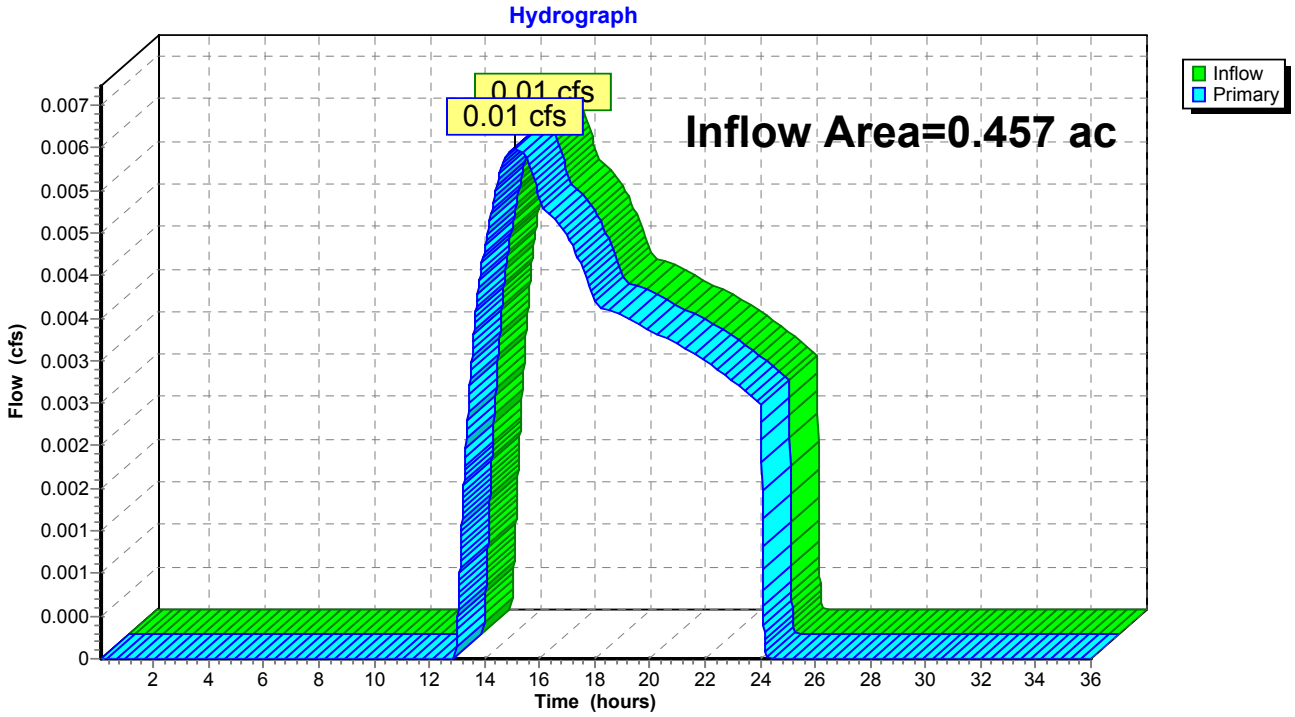


Link 1L_E: Off-site (Pre)

Inflow Area = 0.457 ac, Inflow Depth = 0.10" for 25 Year Storm event
Inflow = 0.01 cfs @ 15.14 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 15.14 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_E: Off-site (Pre)

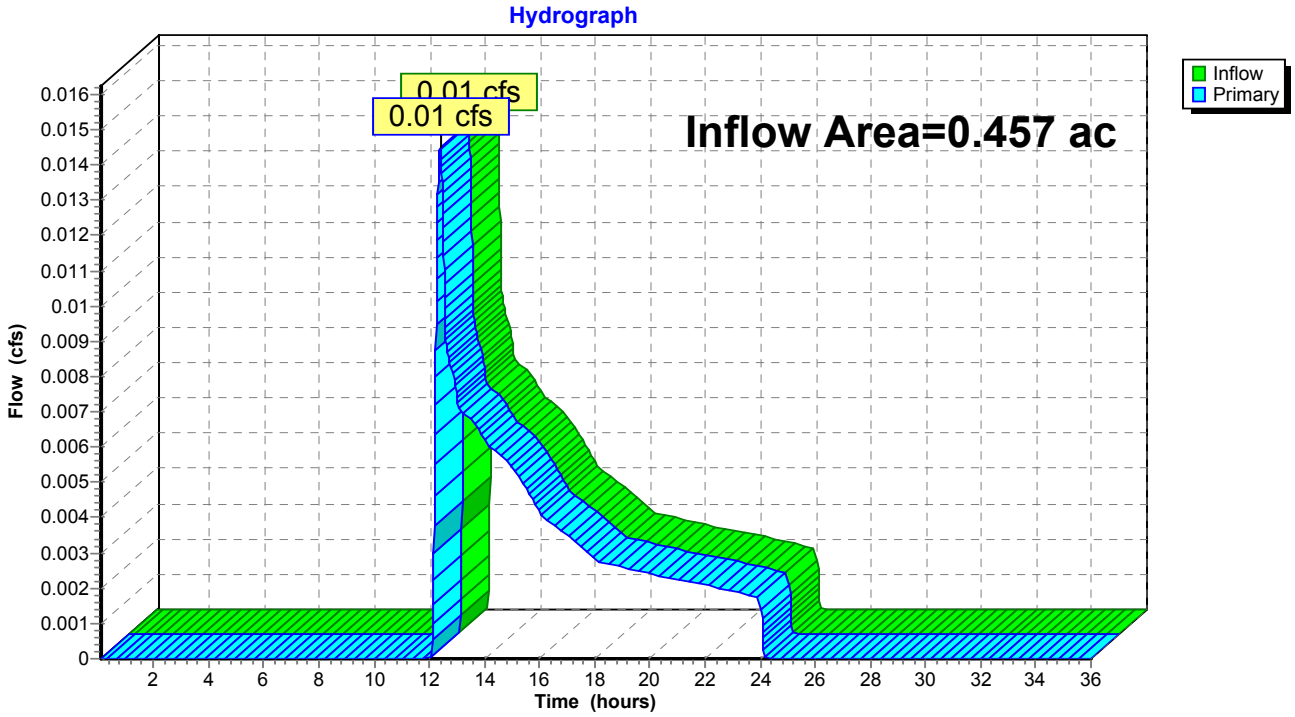


Link 1L_P: Off-site (Post)

Inflow Area = 0.457 ac, Inflow Depth = 0.10" for 25 Year Storm event
Inflow = 0.01 cfs @ 12.40 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 12.40 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_P: Off-site (Post)

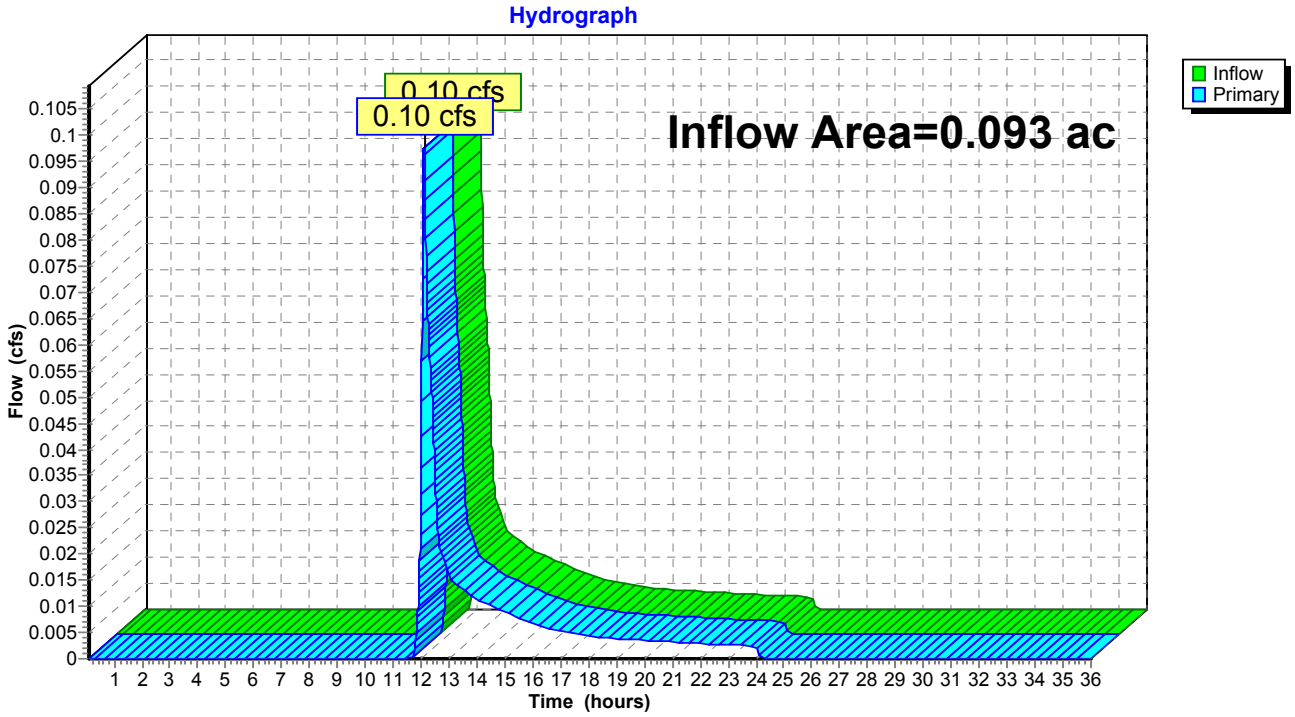


Link 2L_E: Off-site (To Lowell Street)

Inflow Area = 0.093 ac, Inflow Depth = 1.14" for 25 Year Storm event
Inflow = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af
Primary = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_E: Off-site (To Lowell Street)

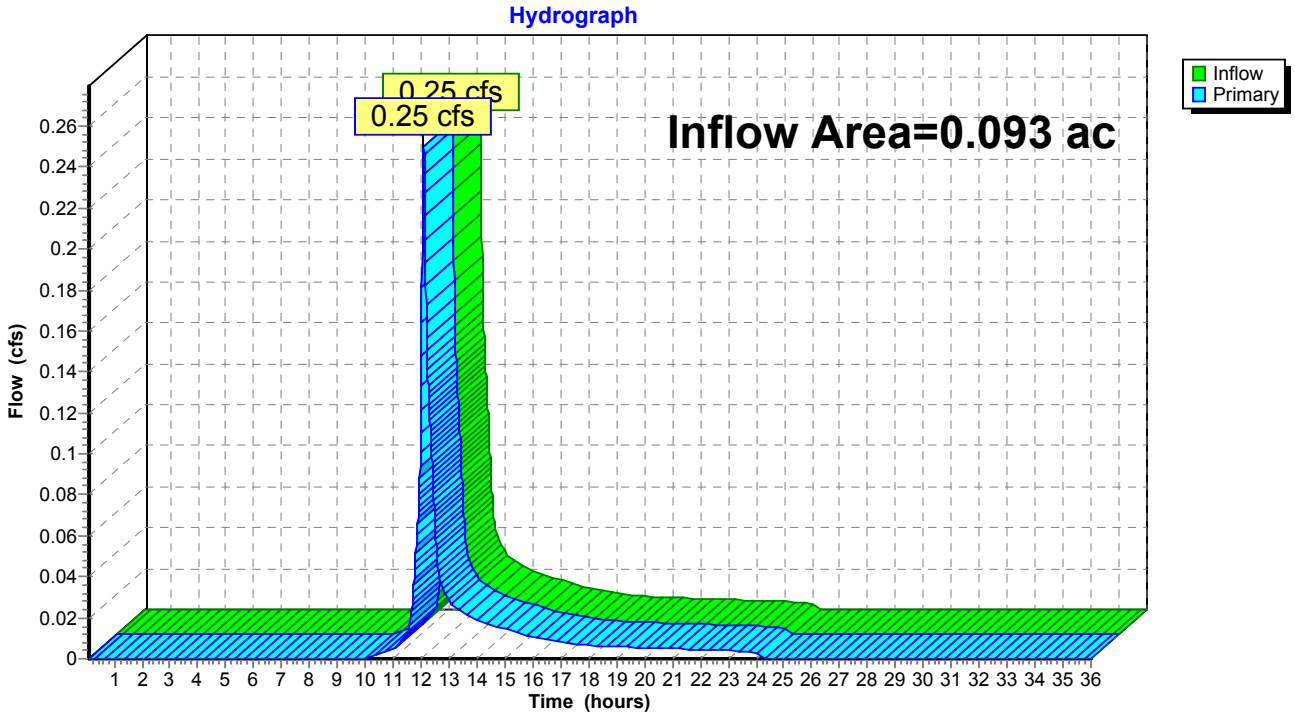


Link 2L_P: To Lowell Street

Inflow Area = 0.093 ac, Inflow Depth = 2.35" for 25 Year Storm event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.018 af
Primary = 0.25 cfs @ 12.09 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_P: To Lowell Street



Time span=0.10-36.00 hrs, dt=0.01 hrs, 3591 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S_E: predevelopment subcatchment Runoff Area=19,914 sf Runoff Depth=0.67"
Tc=6.0 min CN=31 Runoff=0.13 cfs 0.025 af

Subcatchment 1S_P: Runoff Area=5,837 sf Runoff Depth=1.24"
Tc=6.0 min CN=37 Runoff=0.13 cfs 0.014 af

Subcatchment 2S_E: To Lowell Street Runoff Area=4,036 sf Runoff Depth=2.66"
Tc=6.0 min CN=50 Runoff=0.27 cfs 0.021 af

Subcatchment 2S_P: Runoff Area=4,035 sf Runoff Depth=4.43"
Tc=6.0 min CN=65 Runoff=0.48 cfs 0.034 af

Subcatchment 3S_P: Runoff Area=14,077 sf Runoff Depth=6.00"
Tc=6.0 min CN=78 Runoff=2.24 cfs 0.162 af

Pond 1P: Drainage Field Peak Elev=124.65' Storage=2,382 cf Inflow=2.24 cfs 0.162 af
Discarded=0.20 cfs 0.145 af Primary=0.56 cfs 0.016 af Outflow=0.68 cfs 0.162 af

Link 1L_E: Off-site (Pre) Inflow=0.13 cfs 0.025 af
Primary=0.13 cfs 0.025 af

Link 1L_P: Off-site (Post) Inflow=0.64 cfs 0.030 af
Primary=0.64 cfs 0.030 af

Link 2L_E: Off-site (To Lowell Street) Inflow=0.27 cfs 0.021 af
Primary=0.27 cfs 0.021 af

Link 2L_P: To Lowell Street Inflow=0.48 cfs 0.034 af
Primary=0.48 cfs 0.034 af

Total Runoff Area = 1.100 ac Runoff Volume = 0.256 af Average Runoff Depth = 2.79"

Subcatchment 1S_E: predevelopment subcatchment

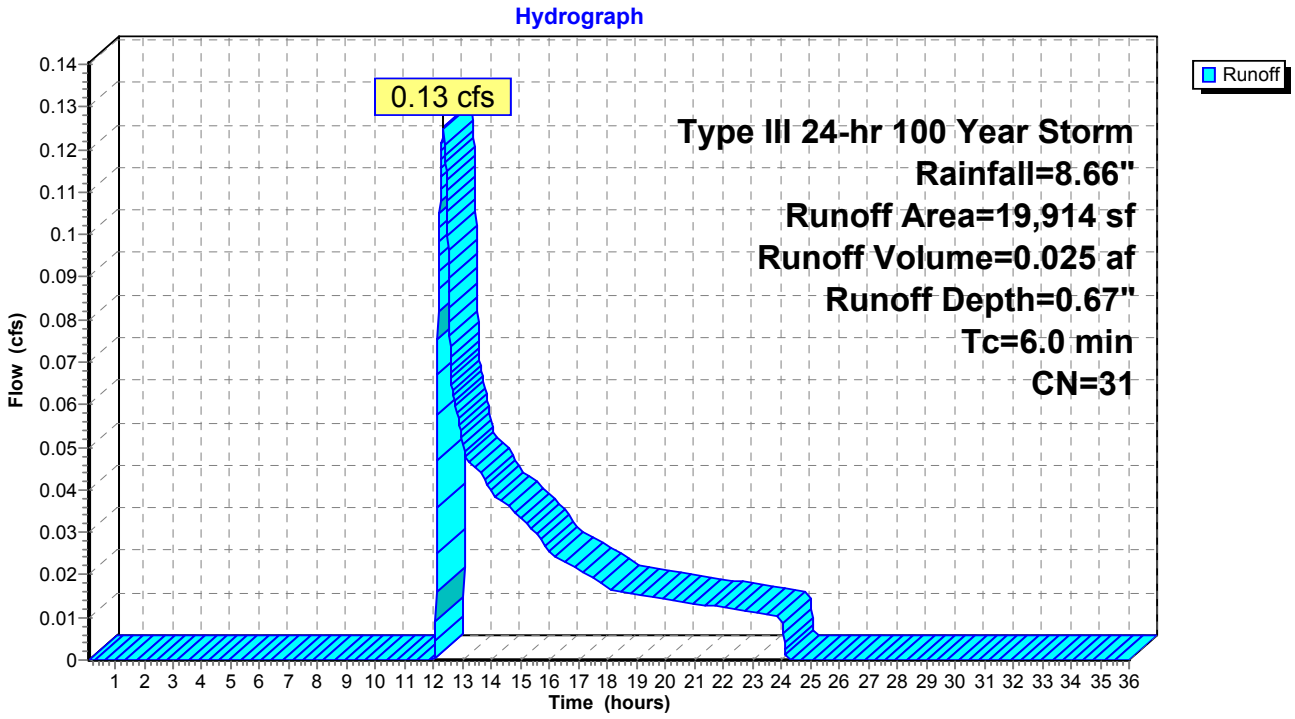
Runoff = 0.13 cfs @ 12.34 hrs, Volume= 0.025 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.66"

Area (sf)	CN	Description
242	98	Portion of Ex. House
18,475	30	Woods, Good, HSG A
1,197	39	>75% Grass cover, Good, HSG A
19,914	31	Weighted Average

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

Subcatchment 1S_E: predevelopment subcatchment



Subcatchment 1S_P:

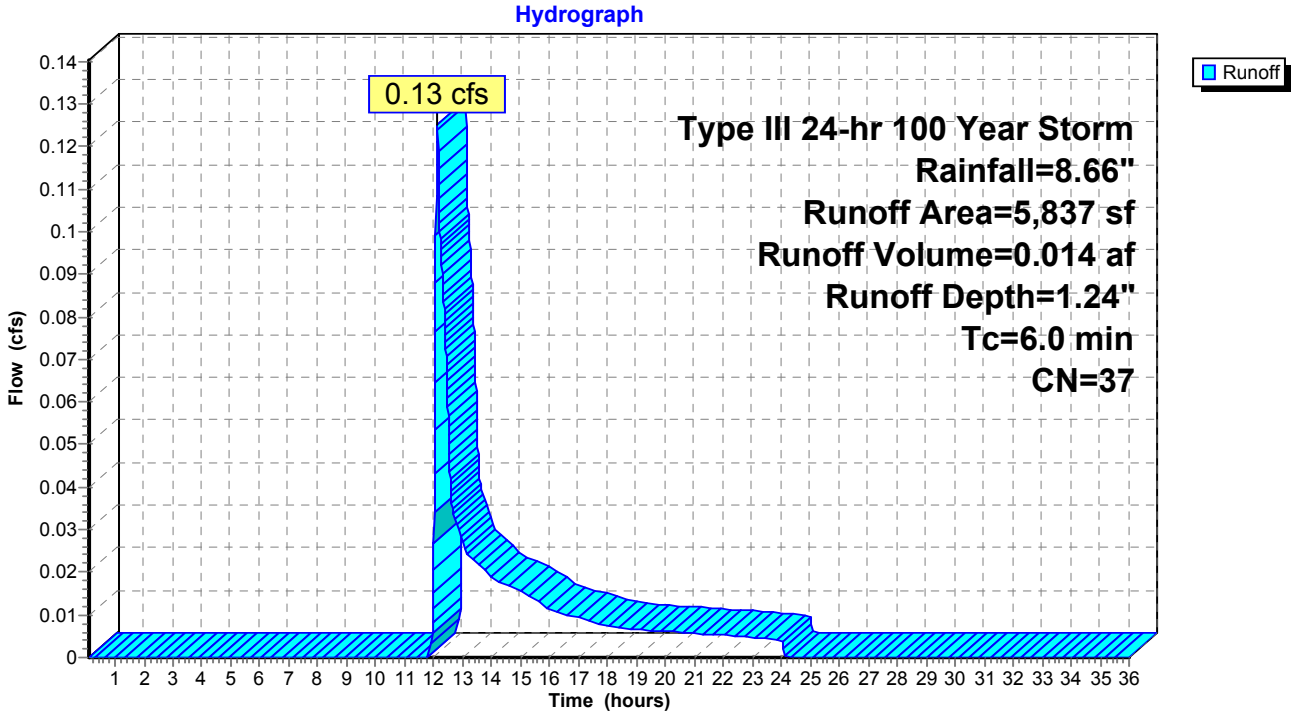
Runoff = 0.13 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.66"

Area (sf)	CN	Description
4,637	39	>75% Grass cover, Good, HSG A
1,200	30	Woods, Good, HSG A
5,837	37	Weighted Average

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

Subcatchment 1S_P:



Subcatchment 2S_E: To Lowell Street

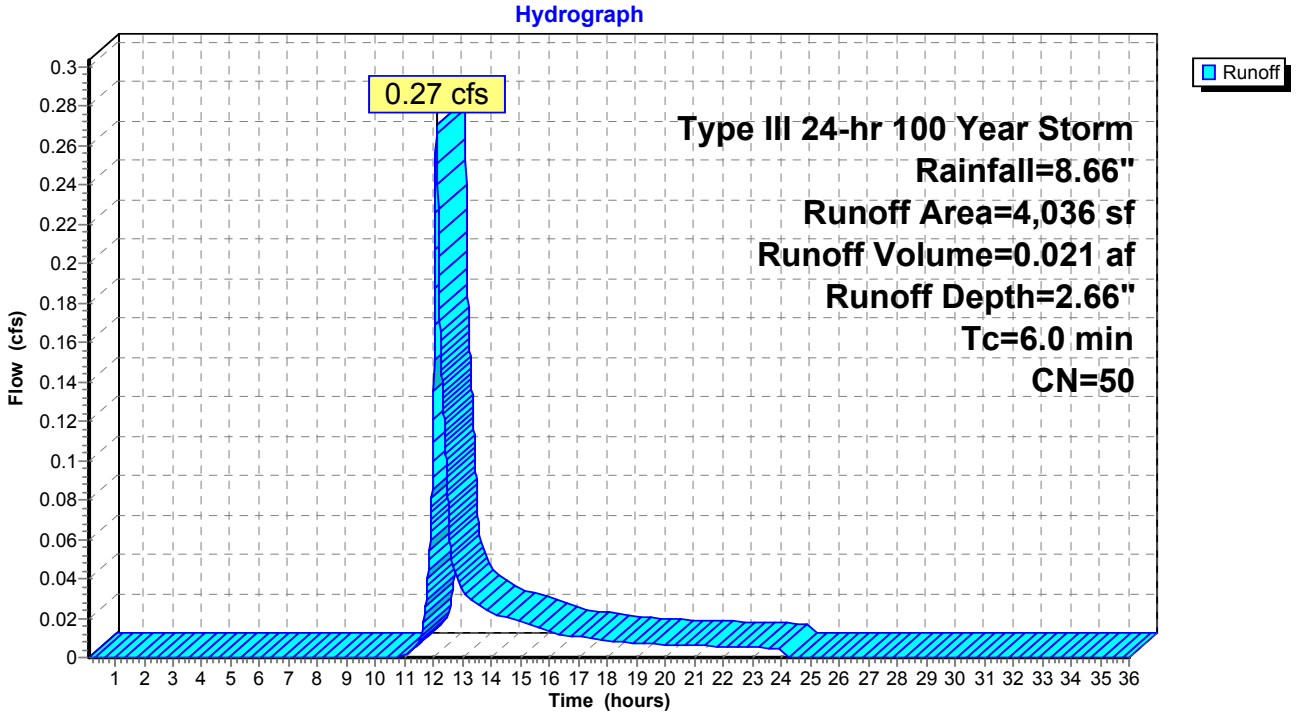
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 0.021 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.66"

Area (sf)	CN	Description
750	98	Portion of ex. house
3,286	39	>75% Grass cover, Good, HSG A
4,036	50	Weighted Average

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

Subcatchment 2S_E: To Lowell Street



Subcatchment 2S_P:

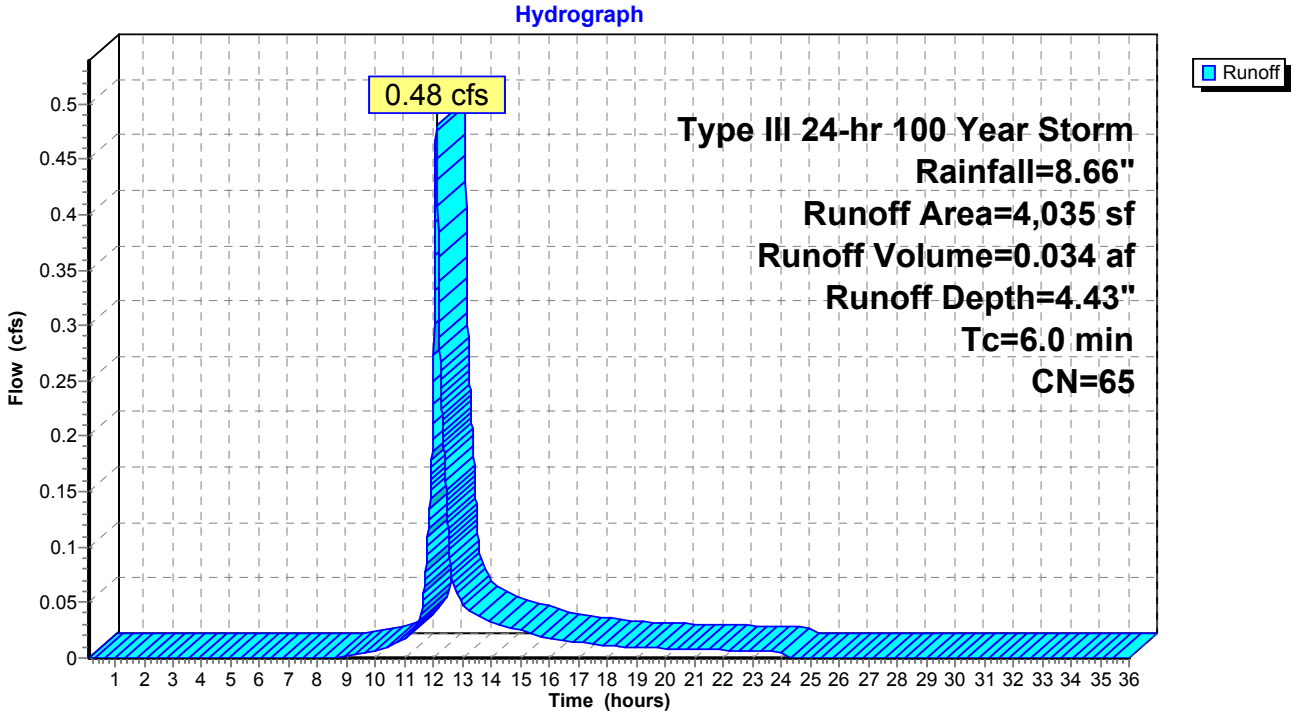
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 4.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.66"

Area (sf)	CN	Description
750	98	Portion of House Roof
1,021	98	Portion of Paved driveway
2,264	39	>75% Grass cover, Good, HSG A
4,035	65	Weighted Average

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

Subcatchment 2S_P:



Subcatchment 3S_P:

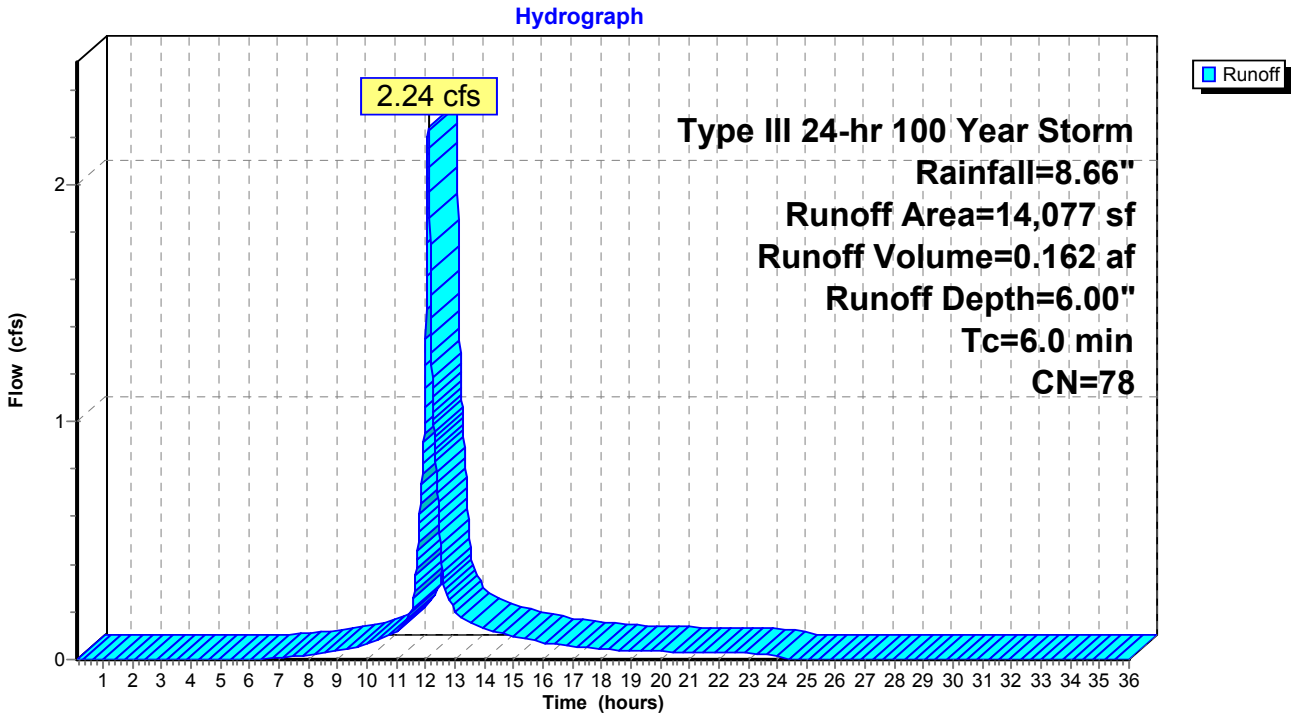
Runoff = 2.24 cfs @ 12.09 hrs, Volume= 0.162 af, Depth= 6.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.66"

Area (sf)	CN	Description
2,240	98	Entire House Roof
6,740	98	Entire Driveway
4,855	39	>75% Grass cover, Good, HSG A
242	98	Portion of Ex. House
14,077	78	Weighted Average

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

Subcatchment 3S_P:



Pond 1P: Drainage Field

Inflow Area = 0.323 ac, Inflow Depth = 6.00" for 100 Year Storm event
Inflow = 2.24 cfs @ 12.09 hrs, Volume= 0.162 af
Outflow = 0.68 cfs @ 12.42 hrs, Volume= 0.162 af, Atten= 70%, Lag= 19.9 min
Discarded = 0.20 cfs @ 11.76 hrs, Volume= 0.145 af
Primary = 0.56 cfs @ 12.42 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs
Peak Elev= 124.65' @ 12.42 hrs Surf.Area= 593 sf Storage= 2,382 cf
Plug-Flow detention time= 106.5 min calculated for 0.162 af (100% of inflow)
Center-of-Mass det. time= 106.5 min (911.0 - 804.4)

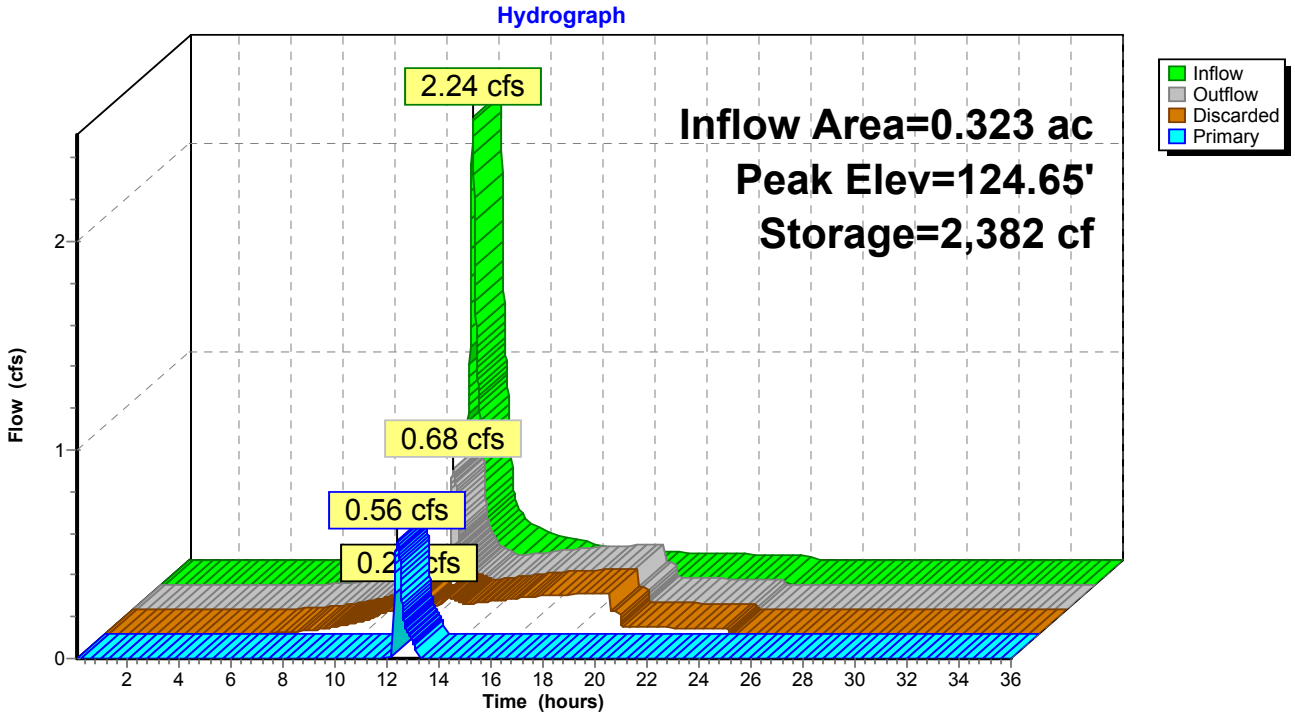
#	Invert	Avail.Storage	Storage Description
1	120.20'	1,090 cf	**21.50'W x 26.69'L x 4.75'H Prismatoid** 2,726 cf Overall x 40.0% Voids
2	120.70'	1,361 cf	**69.8"W x 48.0"H x 3.67'L Cultec R-902HD** x 21
		2,451 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.011486 fpm Exfiltration over entire Surface area**
2	Primary	124.30'	**6.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Discarded OutFlow Max=0.20 cfs @ 11.76 hrs HW=120.87' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.56 cfs @ 12.42 hrs HW=124.65' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.56 cfs @ 2.9 fps)

Pond 1P: Drainage Field

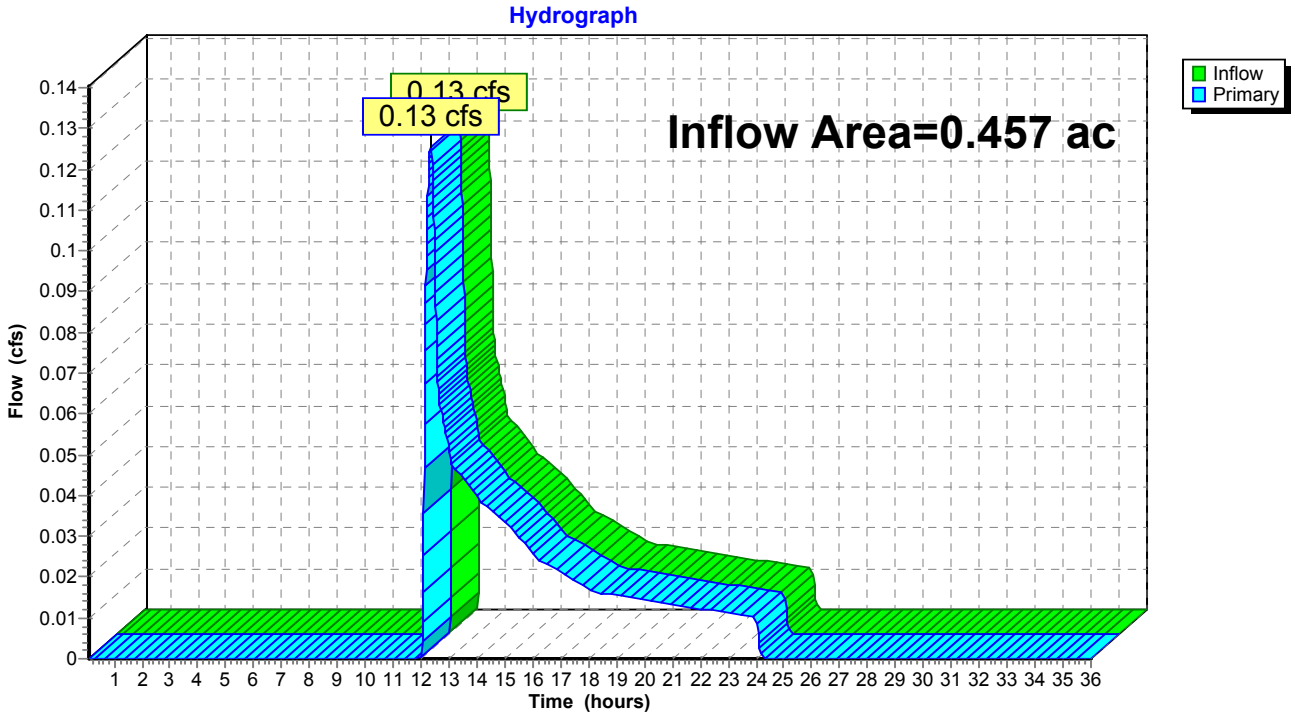


Link 1L_E: Off-site (Pre)

Inflow Area = 0.457 ac, Inflow Depth = 0.67" for 100 Year Storm event
Inflow = 0.13 cfs @ 12.34 hrs, Volume= 0.025 af
Primary = 0.13 cfs @ 12.34 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_E: Off-site (Pre)

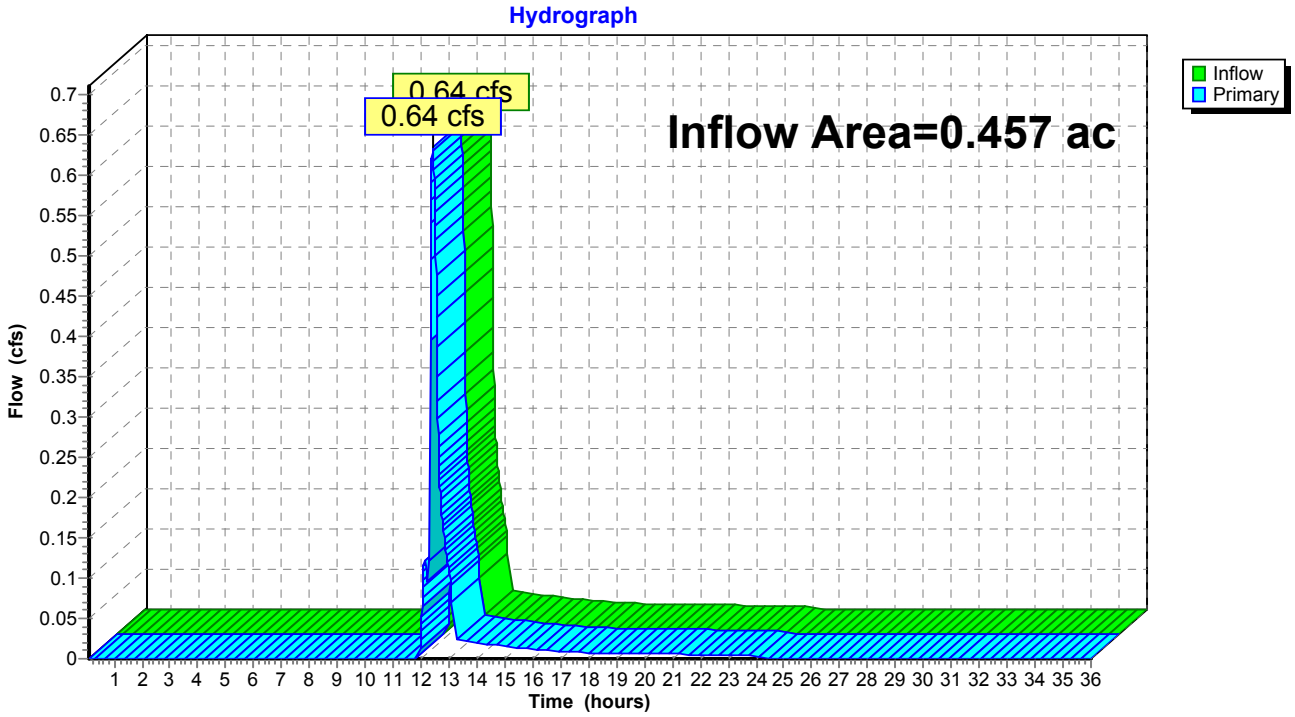


Link 1L_P: Off-site (Post)

Inflow Area = 0.457 ac, Inflow Depth = 0.79" for 100 Year Storm event
Inflow = 0.64 cfs @ 12.41 hrs, Volume= 0.030 af
Primary = 0.64 cfs @ 12.41 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 1L_P: Off-site (Post)

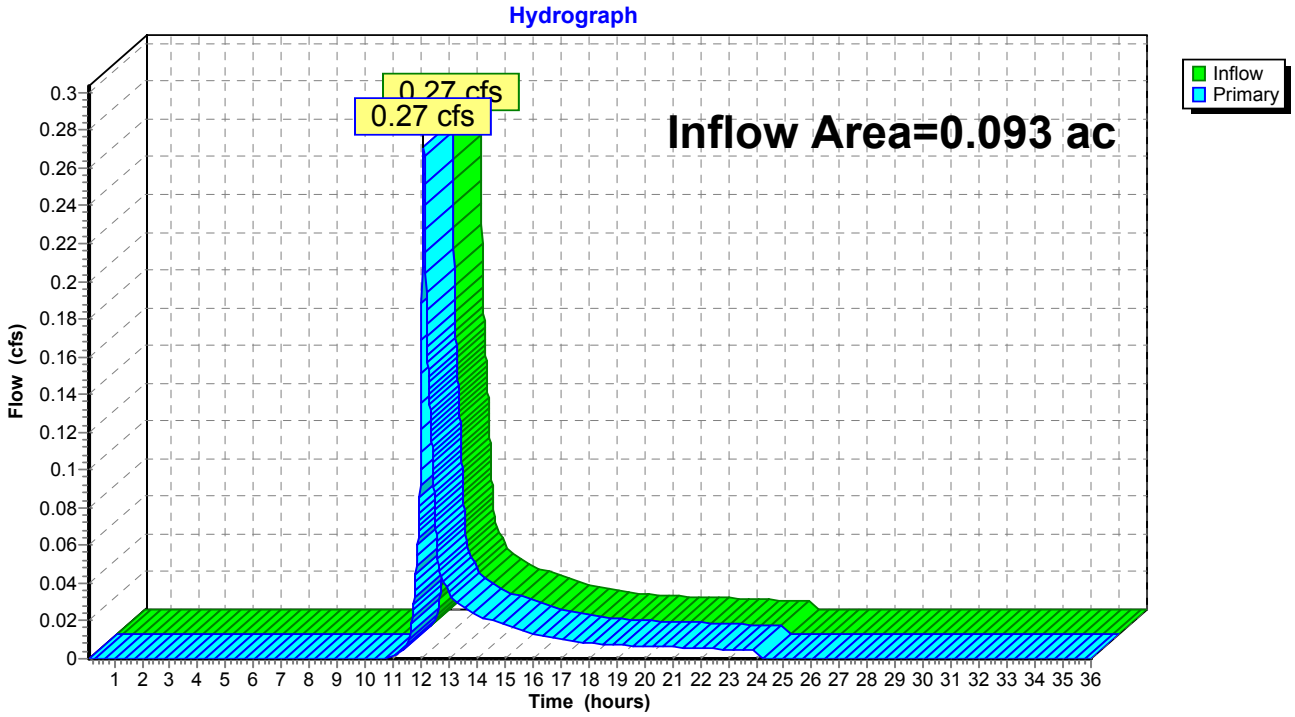


Link 2L_E: Off-site (To Lowell Street)

Inflow Area = 0.093 ac, Inflow Depth = 2.66" for 100 Year Storm event
Inflow = 0.27 cfs @ 12.10 hrs, Volume= 0.021 af
Primary = 0.27 cfs @ 12.10 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_E: Off-site (To Lowell Street)

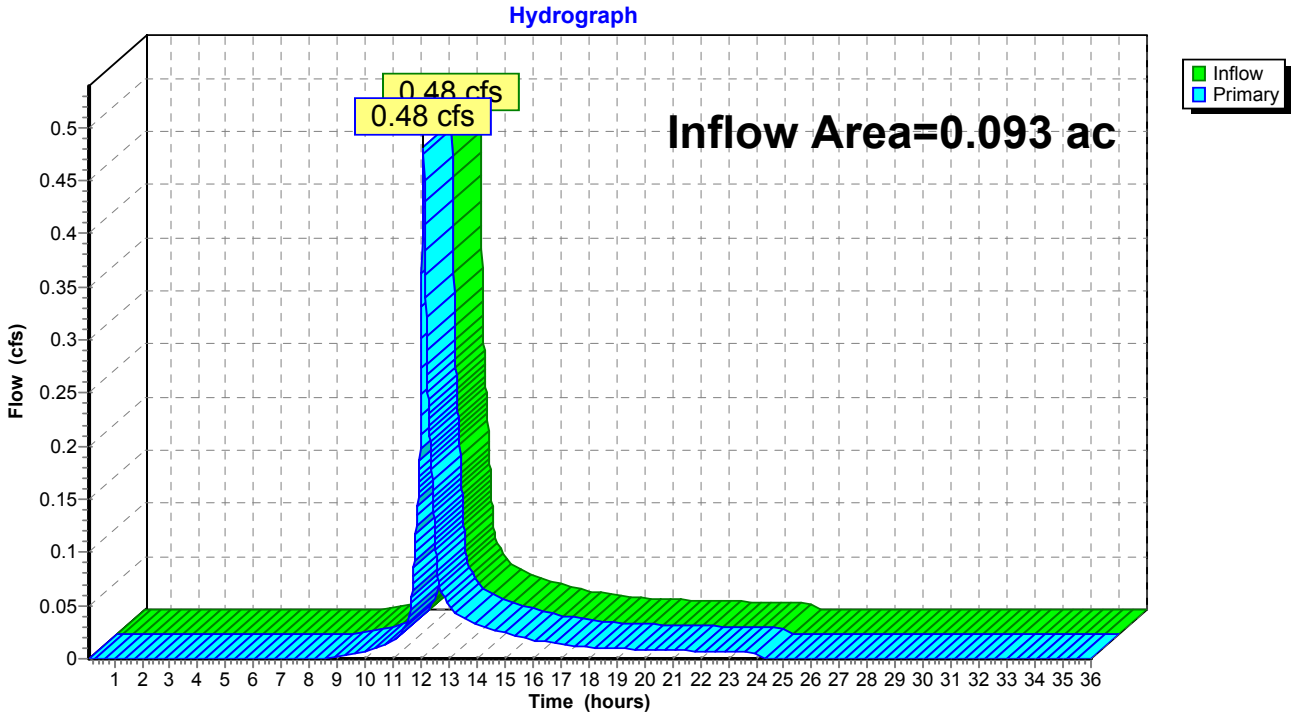


Link 2L_P: To Lowell Street

Inflow Area = 0.093 ac, Inflow Depth = 4.43" for 100 Year Storm event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af
Primary = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.10-36.00 hrs, dt= 0.01 hrs

Link 2L_P: To Lowell Street



Sullivan Engineering Group, LLC
Civil Engineers & Land Development Consultants

Post-Construction -Stormwater Maintenance Plan
47 Lowell Street, Methuen

Beginning with the construction of the drainage system, and continuing in perpetuity thereafter, the owner(s) of the site shall maintain in accordance with the following schedule:

a. Pavement sweeping and snow plowing – Pavement and walkways shall be swept in the early spring immediately after snow melt and at least twice other times annually. Snow shall be plowed onto grass areas. Sediments shall be removed from snow storage areas in the early spring.
b. Paving and curbing – Paving and curbing shall be maintained in good condition to channel surface runoff into the deep sump hooded catchbasins.
c. Roof drain inlets, downspouts, and roof drain pipes - All components of the roof drain collection system shall be inspected at least 2 times per year. Sediments and debris shall be removed and disposed of in accordance with all applicable federal, state, and local laws. Any components that become damaged shall be repaired or replaced immediately upon discovery to assure proper functionality.
d. Vegetation shall be maintained in healthy condition to prevent erosion and sedimentation in the drainage collection system.
e. Infiltration chambers – The level of water in the infiltration chambers shall be monitored during and after heavy rain storms at least 2 times per year during the first year of operation and at least twice annually thereafter for evidence of clogging or other problems. If water does not leave the chambers within 72 hours after the storm, or if water breaks out on the surface above the system, or if the roof collection system begins to overflow frequently (for the 10 year storm intensity or less intense storms), the infiltration bed is likely clogged. The infiltration bed shall be cleaned and repaired or replaced as needed to maintain proper functioning.
f. The catchbasin sumps shall be inspected at least 2 times per year. Sediments and debris shall be removed and disposed of in accordance with all applicable federal, state, and local laws.

PO Box 2004 Woburn, MA 01888 (781) 854-8644 e-mail: jacksull53@comcast.net