

Stormwater Management Development Proposal

Drainage Analysis and Calculations

**8 Lily Pond Road
Boxford, Mass.**

Prepared for Owner:

John & Shannon Butt

8 Lily Pond Road
Boxford, MA 01921

October 13, 2022



MERRIMACK ENGINEERING SERVICES, Inc.

66 Park Street
Andover, Massachusetts 01810

planners • engineers • surveyors

Project Narrative

The subject site is a newly created house lot which was separated from 14 Lily pond Road by way of an ANR subdivision with the Boxford Planning Board.

The site is 4.8 acres in size, primarily wooded, with two distinct knolls of moderately to steep sloped terrain with geologic formations described as kame or eskers consisting of gravelly outwash soil. NRCS soil symbol 257 & 254, soil names Hinckley & Merrimac.

Existing physical features existed on the site prior to the subdivision that create 8 Lily Pond Road, features such as a paved tennis court, natural gravel bottom horse paddock and a gravel woods road.

The project consists of construction of a 4 bedroom house, paved driveway, subsurface sewage disposal system and on site well. The proposed area of development for the aforementioned and based on the proposed plans was approximately 37,000 s.f., below the threshold for a Boxford Stormwater Permit, however additional areas have been disturbed by the owner thus resulting in a disturbed area of 57,780 s.f.

All work proposed is shown on two separate plans prepared by Merrimack Engineering Services, "PLAN OF SUBSURFACE SEWAGE DISPOSAL SYSTEM in BOXFORD, MA as prepared for JOHN BUTT, 8 Lily Pond Road dated 1- 25- 2022 and PLAN OF LAND SHOWING CONSTRUCTION AND STORMWATER MANAGEMENT in BOXFORD, MA as prepared for owner, JOHN BUTT, 8 Lily Pond Road dated 9-2-22.

Description of Stormwater Compliance and Applicability

Pursuant to the Town of Boxford, MA Stormwater Management Regulations we have prepared the attached plans, analysis and calculations to demonstrate this projects compliance with the applicable regulations.

Temporary Construction Measures

A site walk has taken place with Town Officials, the owner and the design engineer for the purpose of understanding and to establish the precise limits of work and disturbance. The erosion control silt sock and silt fence have been installed in the agreed upon areas. The Limit of work devices will be established prior to any other site work or disturbance. The limit of work will be established by way of wooden stakes with construction tape installed from stake to stake specifying the site WORK LIMITS.

Temporary Construction measures will be installed before construction begins which include a crushed stone filter berm at the project entrance which is designed to filter and remove soils from construction vehicles tires exiting the site. A concrete cleanout sump will be installed for the purpose of trapping concrete residue left from concrete foundation clean outs. Both areas and details are shown on the attached plans.

Permanent Stormwater Design Features

Construction of the house and driveway will create permanent impervious areas. Roof gutters, and downspouts along with a roof drain infiltration system will collect roof runoff and discharge it into the ground and allow the runoff to discharge back into the natural underlying soils.

Additionally a 3' wide by 2' deep grass swale infiltration trench will be constructed along side the proposed driveway which will collect runoff from the impervious driveway and allow natural infiltration back into the underlying natural soils.

These Best Management Practices result in a post development site runoff less than what exists prior to construction. Design, construction and details of these BMP's are shown on the attached calculations, analysis and design plans and are in compliance with Mass Stormwater Guidelines as well as the Boxford Stormwater Regulations in terms of design criteria as it related to the design years, intensity and rainfall amounts, as well as with all design specifications, details and requirements.

Pollutants Removal

Because there are no drainage point source or sheet flow discharges, no additional consideration need be given to TSS or TP removal BMP's as any pollutants will attenuate in the underlying soils.

Operation & Maintenance

With regard to operation and maintenance of the stormwater features of this design, there are two features. The roof infiltration systems and the driveway infiltration trenches. The owner will be responsible for maintaining the roof gutters & down spouts, keeping them clear of leaves and debris, and periodically inspecting the roof infiltration systems as they are designed with inspection ports. With regard to the driveway infiltration trenches, they are specifically designed as grass lined swales at the ground surface with a 3 inch depression, designed to filter pollutants through a grass lined swale and through attenuation in the underlying soils. Maintenance with be performed by the owners by keeping the swales mowed and cut and clean and free of any leaves, branches and any other natural or unnatural trash or debris.

Project Summary

The subject project is minor in nature as it relates to the Spirit & Intent of the Town of Boxford Stormwater Management Regulations as it just meets the minimum area criteria for applicability to these Regulations and had the owner been better informed, could have avoided the necessity of having to require such permit as the project area specified on the design plans falls beneath the minimum area requirements of these regulations, Nonetheless, greater than 1.0 acre has and will be disturbed and the need for this permit exists. These attached plans, calculations and analysis demonstrate compliance with the applicable regulations and if nothing else, this project qualifies as minor in nature and may at the discretion of the Commission, relax the requirements as specified in section 295-5 C.(1)

8 LILLY POND ROAD

BOXFORD, MASSACHUSETTS

Calculations of Drainage System Components

Introduction

100-year storm – Rainfall for North Reading (NOAA Atlas 14):

(8.10" – Point Precipitation Frequency Estimates for Boxford, MA)

Corresponding runoff over impervious area, for curve number CN=98: 8.10" = 0.675'

Corresponding runoff over existing wood / grass combination area with Hinkley Soil (HSG "A"), for curve number CN=32: 0.67" = 0.06'

The Property Owner is planning to replace a dirt road on site with a paved one (6,500+/- s.f.) leading to the proposed house (3,383+/- s.f.) As of now, the proposed project area is a wood / grass combination, it does not have any storm drainage facility, and storm water runs off the site without any mitigation.

As shown on Proposed Plan of Land, the owner suggests mitigating the proposed roof (3,387 s.f.) runoff with 3 sets of Infiltration Chambers installed in the areas with original soil infiltration parameters. The site composed of Hinkley and Windsor loamy sands (HSG "A") and adjacent Merrimac sandy loam, and has the pre-development curve number CN=32 with corresponding runoff over wood / grass combination area 0.67" = 0.06'

The Town of Boxford requires 0.8" of runoff over the roof to be retained and mitigated by infiltration. The remaining 8.02" (100-yr storm) will form the post-development runoff from the 3,387 s.f. building roof.

Estimated Existing Runoff:

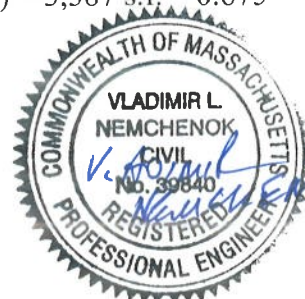
Estimated Existing Runoff Volume from the Project Area for 100-year storm (Wood / Grass Combination, Weighted CN = 38) is 0.406 af = **17,685 c.f.** (Total Runoff Area = 4.246 ac = 184,956 s.f. Average Runoff Depth = 1.15" = 0.0958', 96.13% Pervious, and 3.87% Impervious Area)

Proposed Runoff:

Proposed Site Runoff Volume for 100-year storm (Wood / Grass Combination, Weighted CN = 40 - Outside of Proposed Building Roof Area) is 0.464 af = **20,212 c.f.** (Total Runoff Area = 4.168 ac = 181,558 s.f. Average Runoff Depth = 1.33" = 0.1108', 94.27% Pervious, and 5.73% Impervious Area)

20,212 c.f. - 17685 c.f. = 2,527 c.f. - runoff increase on site due to site development (1.86% increase of Impervious Area.)

Proposed Building Roof Runoff: 3,387 s.f. * (8.10" / 12 in/ft) = 3,387 s.f. * 0.675' = **2,286 c.f.**



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BOXFORD, MASSACHUSETTS

Calculations of Drainage System Components (continued)

As it was mentioned above, The Town of Boxford requires 0.8" of runoff over the roof to be mitigated by infiltration. This portion of the roof runoff will be collected with a gutter and downspouts and the volume of water to be mitigated is calculated as follows (For Designations see attached Post – Development Plan):

PRS-1	1,175 s.f. building * 0.8"/12"/ft. = 78.3 c.f.
PRS-2	1,400 s.f. building * 0.8"/12"/ft. = 93.3 c.f.
PRS-3	812 s.f. building * 0.8"/12"/ft. = 54.2 c.f.

In according to indicated roof segments, as for storm drainage facility, the project suggests to build 3 groups of infiltration chambers Cultec R-180 HD which will allow to accommodate the required portion of impervious area proposed stormwater runoff increase, and infiltrate it on site.

Infiltration Chambers Settings

Chamber: Cultec R-180 HD

Length: 6.33' (Assembled + 0.5' @ each end); Width: 3.0'; Height 1.71'; Volume: 21.8 c.f.

Depth: 1.71' + 6" crushed stone base = 2.21'; Void ratio: 0.40; Infiltration: 2.41 in./hr. = 4.82 ft. /day

The soil tests on site show an acceptable Infiltration Soil Depth of 2 feet as required separation from the bottom of infiltration system to ESHWT) at all of the proposed Infiltration System locations. (All infiltration occurs in Loamy Sand Stratum based on Results of Soil Tests)

Group PRS-1 (3 chambers):

Crushed stone area: 9'x 26' (3' stone around) = 234 s.f.

Chambers Capacity: 21.8 c.f. x 3 = 65.4 c.f.

Crushed Stone Storage: [234 s.f. * 2.21' - 65.4 c.f.] * 0.4 = 180.7 c.f.

Infiltration Capacity = 234 s.f. * 4.82' = 1,127.9 c.f.

Bulk storage Group PRS-1 (3 chambers): = Chambers Capacity + Crushed Stone Storage + Infiltration Capacity = 65.4 c.f. + 180.7 c.f. + 1,127.9 = 1,374 c.f.

Group PRS-2 (4 chambers)

Crushed stone area: 18'x 20' (3' stone around) = 360 s.f.

Chambers Capacity: 21.8 c.f. x 4 = 87.2 c.f.

Crushed Stone Storage: [360 s.f. * 2.21' - 87.2 c.f.] * 0.4 = 283.4 c.f.

Infiltration Capacity = 360 s.f. * 4.82' = 1,735.2 c.f.

Bulk storage Group PRS-2 (4 chambers): = Chambers Capacity + Crushed Stone Storage + Infiltration Capacity = 87.2 c.f. + 283.4 c.f. + 1,735.2 = 2,105.8 c.f.

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BOXFORD, MASSACHUSETTS

Group PRS-3 (3 chambers)

Crushed stone area: 9' x 26' (3' stone around) = 234 s.f.

Chambers Capacity: 21.8 c.f. x 3 = 65.4 c.f.

Crushed Stone Storage: [234 s.f. * 2.21' - 65.4 c.f.] * 0.4 = 180.7 c.f.

Infiltration Capacity = 234 s.f. * 4.82' = 1,127.9 c.f.

Bulk storage Group PRS-3 (3 chambers): = Chambers Capacity + Crushed Stone Storage + Infiltration Capacity = 65.4 c.f. + 180.7 c.f. + 1,127.9 = 1,374 c.f.

78.3 c.f. (Segment-1 Roof Runoff) << 1,374 c.f. (Infiltration System-1 Capacity) - OK

93.3 c.f. (Segment-2 Roof Runoff) << 2,105 c.f. (Infiltration System-2 Capacity) - OK

54.2 c.f. (Segment-3 Roof Runoff) << 1,374 c.f. (Infiltration System-3 Capacity) - OK

Total Storage & Infiltration System Capacity: 1,374 + 2,105.8 + 1,374 = **4,853 c.f.**

Total Runoff Increase due to Site Development:

2,527 c.f. (1.86% increase of Impervious Area) + **2,286 c.f.** (Prop. Building Roof Runoff) = **4,813 c.f.**

4,813 c.f. < 4,853 c.f. - O.K.

so 3 Groups of total 10 Infiltration Chambers Cultec R-180 HD with 828 s.f. of Crushed Stone area will accommodate an entire (100%) of the 100-yr Storm Runoff Increase from Site Development (1.86% increase of Impervious Area & Building Roof)

Standard 3. Infiltration System Drawdown Time.

The Soils on the site were classified as Hinckley & Windsor Loamy Sands (66.7%) - HSG A and Merrimac Sandy Loam (33.3%) - HSG B. The whole Infiltration System is located within Hinckley Loamy Sands area - HSG A.

Infiltration: 2.41 inches / hour, as suggested by Rawls Rates Chart (see below).

An infiltration structure is proposed to meet Standard 3.

The total calculated 0.8" runoff from the proposed building roof is (78.3 c.f. + 93.3 c.f. + 54.2 c.f. = 225.8 c.f. - say 226 c.f.), and distributed uniformly into 3 groups of 10 infiltration chambers with total (storage & infiltration) capacity of 4,853 c.f. The total infiltration area of proposed chamber groups is 828 s.f. Determine if the proposed infiltration system will draw down the 226 c.f. of water within 72 hours.

Drawdown rate = 2.41 inches per hour (Rawls Rate for Loamy Sand) * 1 ft. / 12 inches * 828 s.f. = 166.3 c.f. / hour (see chart below);

So Drawdown time = 226 c.f. / 166.3 c.f./ hour = 1.36 hours < 72 hours, so the result is satisfactory for design purposes.

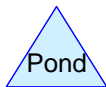
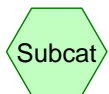
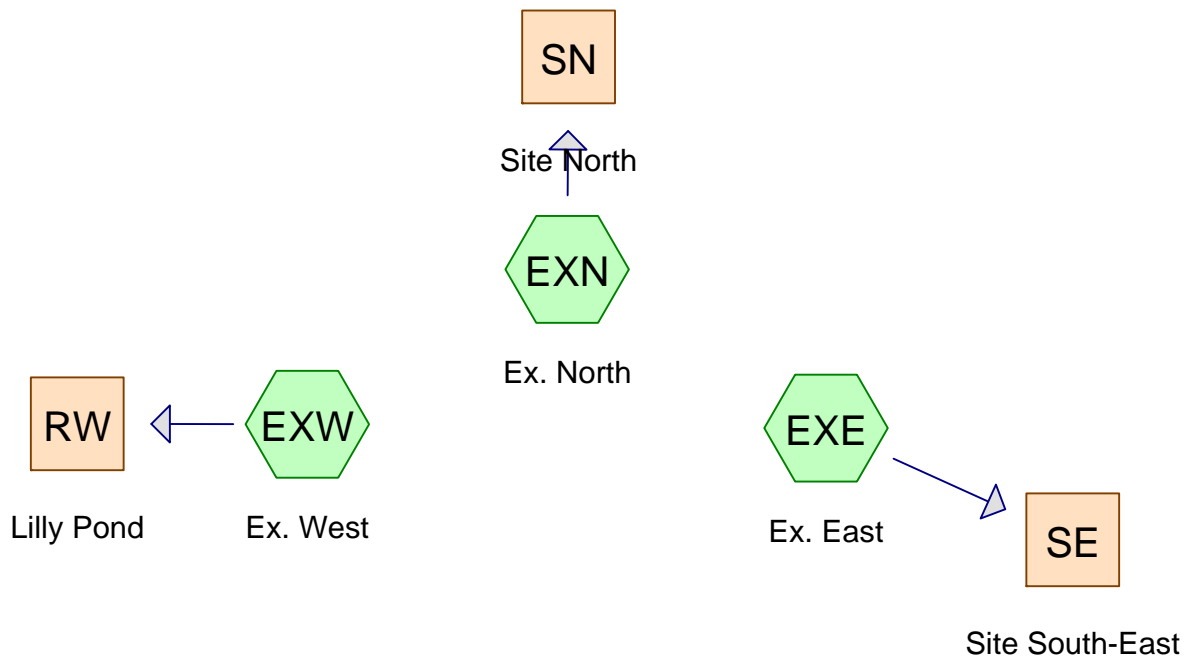
8 LILLY POND ROAD

BOXFORD, MASSACHUSETTS

Calculations of Drainage System Components (continued)

1982 Rawls Rates

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate (Inches / Hour)
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02



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Rainfall Events Listing

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	3.24	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.12	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.29	2
4	50-yr	Type III 24-hr		Default	24.00	1	7.15	2
5	100-yr	Type III 24-hr		Default	24.00	1	8.10	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.351	39	>75% Grass cover, Good, HSG A (EXE)
0.106	72	Dirt roads, HSG A (EXE)
0.224	76	Gravel roads, HSG A (EXW)
0.164	98	Shed & Tennis Court (EXE)
3.401	32	Woods/grass comb., Good, HSG A (EXE, EXN, EXW)
4.246	38	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.082	HSG A	EXE, EXN, EXW
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.164	Other	EXE
4.246		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.351	0.000	0.000	0.000	0.000	0.351	>75% Grass cover, Good	EXE
0.106	0.000	0.000	0.000	0.000	0.106	Dirt roads	EXE
0.224	0.000	0.000	0.000	0.000	0.224	Gravel roads	EXW
0.000	0.000	0.000	0.000	0.164	0.164	Shed & Tennis Court	EXE
3.401	0.000	0.000	0.000	0.000	3.401	Woods/grass comb., Good	EXE, EXN, EXW
4.082	0.000	0.000	0.000	0.164	4.246	TOTAL AREA	

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Type III 24-hr 2-yr Rainfall=3.24"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 EXE: Ex. East

Runoff Area=82,963 sf 8.62% Impervious Runoff Depth>0.01"
Flow Length=107' Tc=18.1 min CN=41 Runoff=0.00 cfs 0.001 af

Subcatchment EXN: Ex. North

Runoff Area=39,000 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=152' Tc=19.7 min CN=32 Runoff=0.00 cfs 0.000 af

Subcatchment EXW: Ex. West

Runoff Area=63,000 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=230' Tc=23.8 min CN=39 Runoff=0.00 cfs 0.000 af

Reach RW: Lilly Pond

Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SE: Site South-East

Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach SN: Site North

Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.246 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.00"
96.13% Pervious = 4.082 ac 3.87% Impervious = 0.164 ac

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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment EXE: Ex. East

Runoff = 0.00 cfs @ 22.50 hrs, Volume= 0.001 af, Depth> 0.01"
 Routed to Reach SE : Site South-East

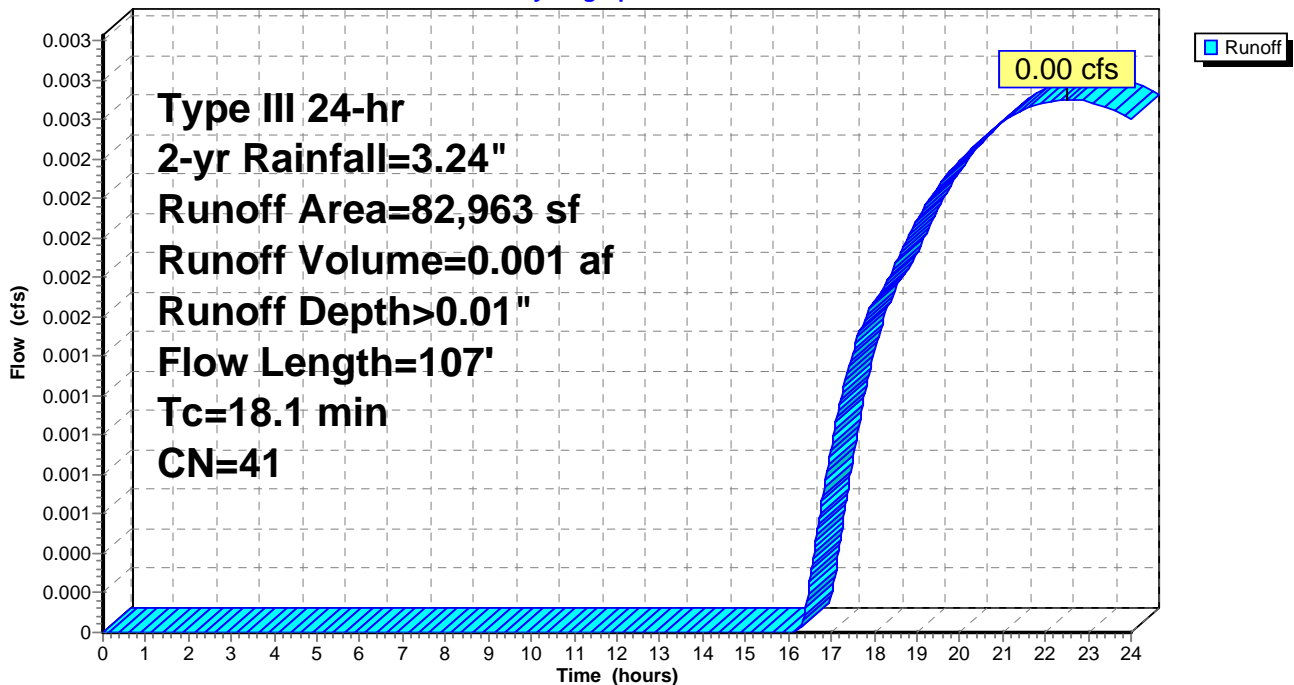
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr Rainfall=3.24"

Area (sf)	CN	Description
4,600	72	Dirt roads, HSG A
55,907	32	Woods/grass comb., Good, HSG A
15,306	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
82,963	41	Weighted Average
75,813		91.38% Pervious Area
7,150		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment EXE: Ex. East

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment EXN: Ex. North

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Reach SN : Site North

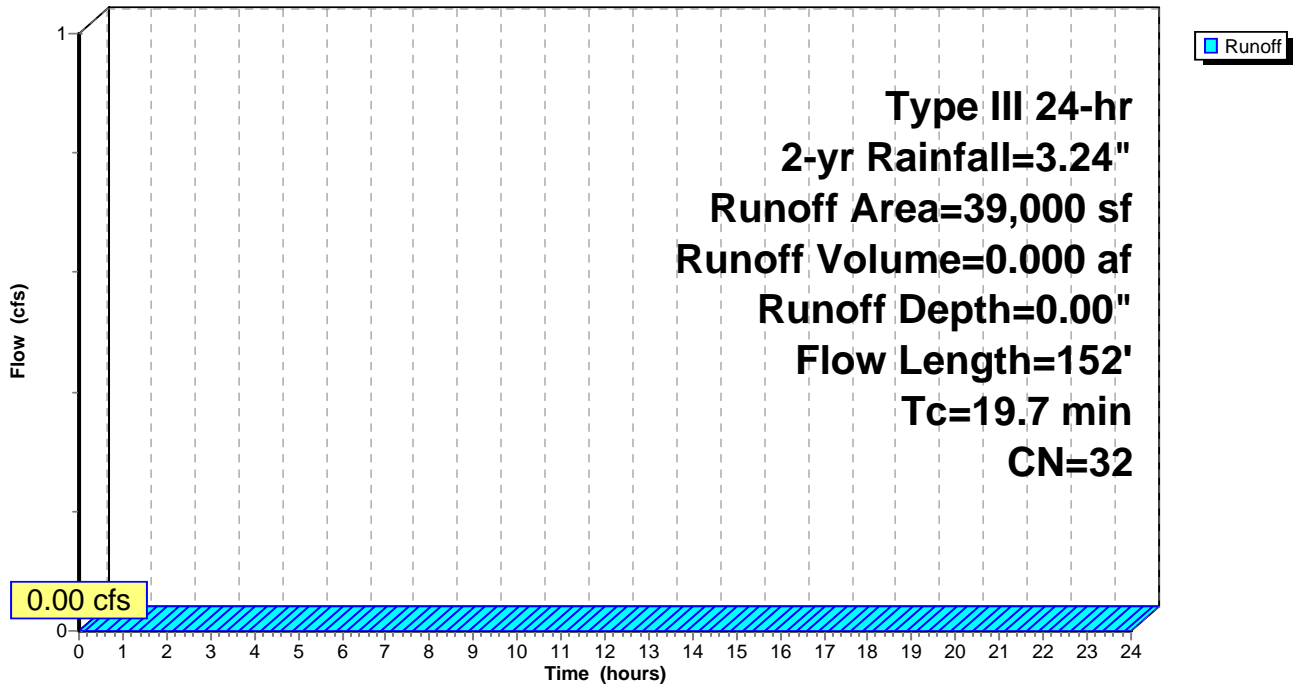
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr Rainfall=3.24"

Area (sf)	CN	Description
39,000	32	Woods/grass comb., Good, HSG A
39,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	50	0.2200	0.04		Sheet Flow, Flow North Woods: Light underbrush n= 0.400 P2= 0.20"
0.8	102	0.1670	2.04		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
19.7	152	Total			

Subcatchment EXN: Ex. North

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Reach RW: Lilly Pond

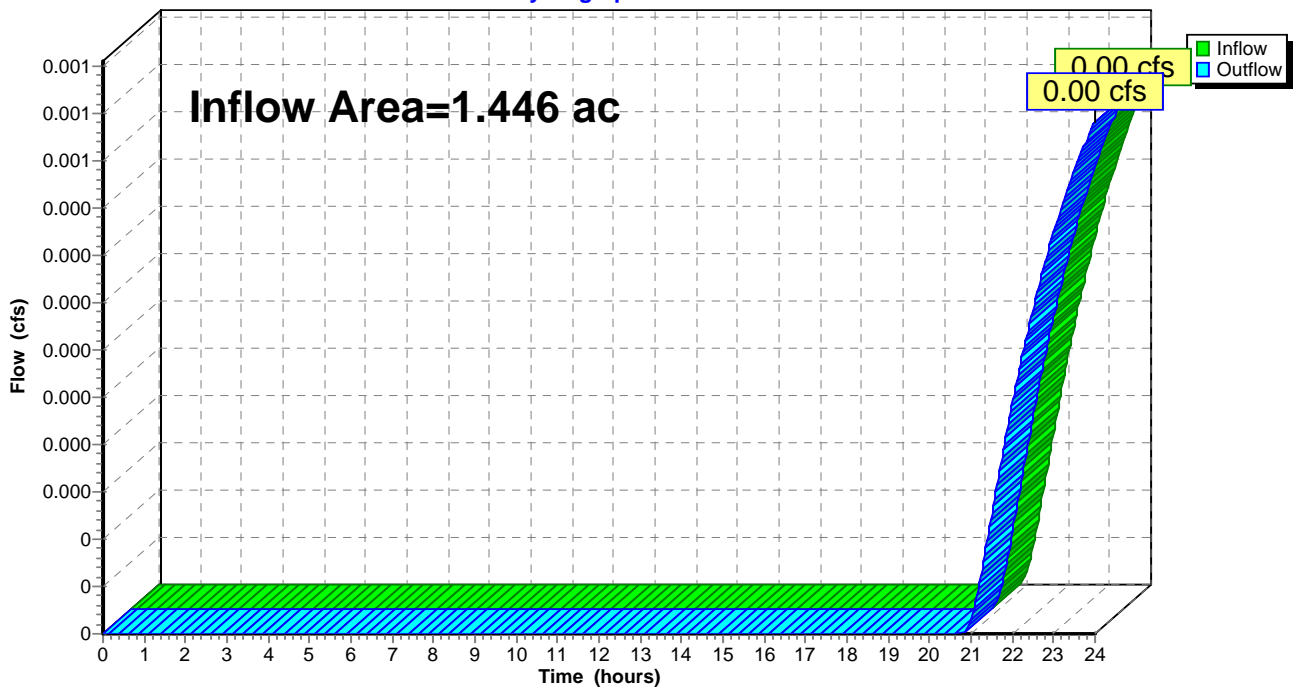
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.446 ac, 0.00% Impervious, Inflow Depth > 0.00" for 2-yr event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Reach SE: Site South-East

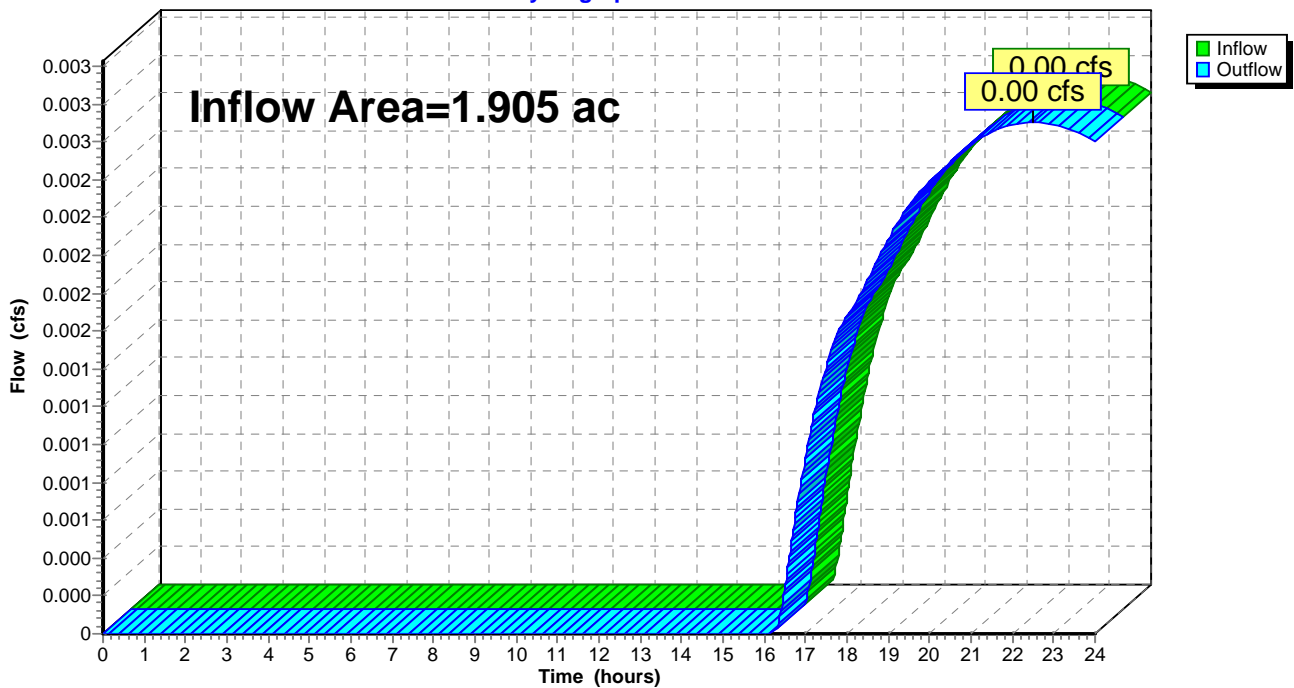
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.905 ac, 8.62% Impervious, Inflow Depth > 0.01" for 2-yr event
Inflow = 0.00 cfs @ 22.50 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 22.50 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SE: Site South-East

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Reach SN: Site North

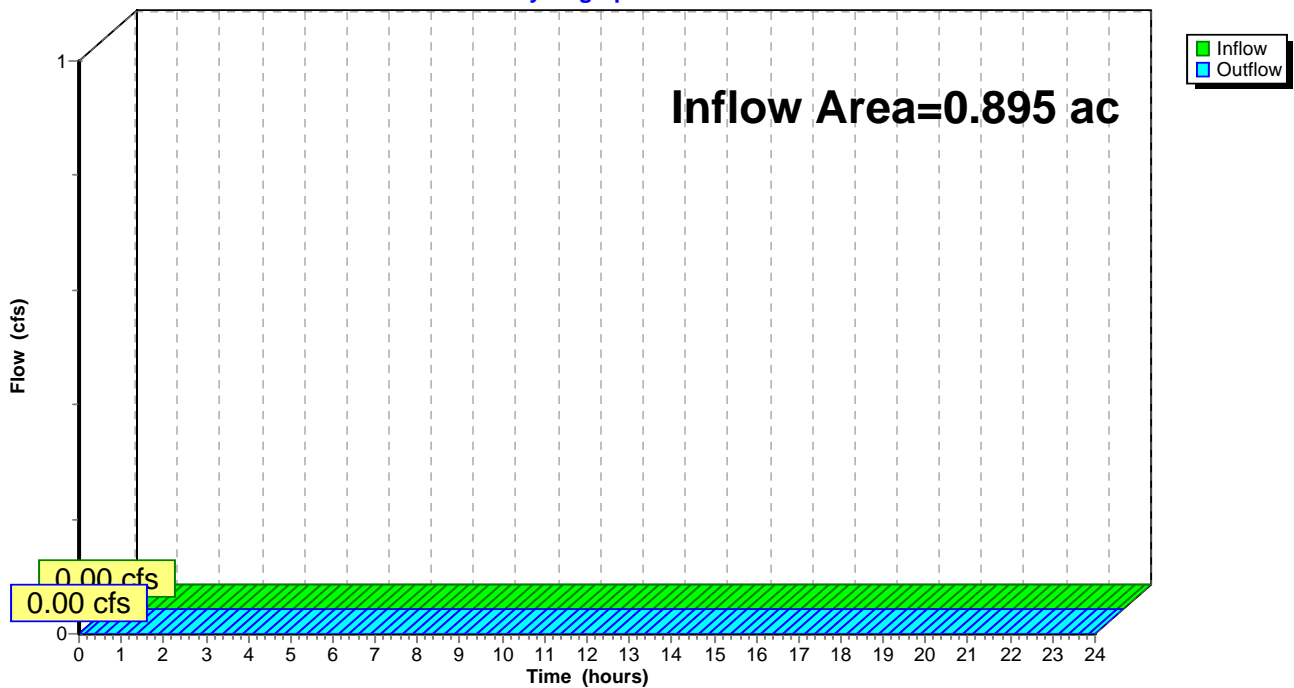
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 10-yr Rainfall=5.12"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 EXE: Ex. East

Runoff Area=82,963 sf 8.62% Impervious Runoff Depth>0.30"
Flow Length=107' Tc=18.1 min CN=41 Runoff=0.16 cfs 0.047 af

Subcatchment EXN: Ex. North

Runoff Area=39,000 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=152' Tc=19.7 min CN=32 Runoff=0.00 cfs 0.002 af

Subcatchment EXW: Ex. West

Runoff Area=63,000 sf 0.00% Impervious Runoff Depth>0.22"
Flow Length=230' Tc=23.8 min CN=39 Runoff=0.05 cfs 0.027 af

Reach RW: Lilly Pond

Inflow=0.05 cfs 0.027 af
Outflow=0.05 cfs 0.027 af

Reach SE: Site South-East

Inflow=0.16 cfs 0.047 af
Outflow=0.16 cfs 0.047 af

Reach SN: Site North

Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Total Runoff Area = 4.246 ac Runoff Volume = 0.077 af Average Runoff Depth = 0.22"
96.13% Pervious = 4.082 ac 3.87% Impervious = 0.164 ac

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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Subcatchment EXE: Ex. East

Runoff = 0.16 cfs @ 12.57 hrs, Volume= 0.047 af, Depth> 0.30"
 Routed to Reach SE : Site South-East

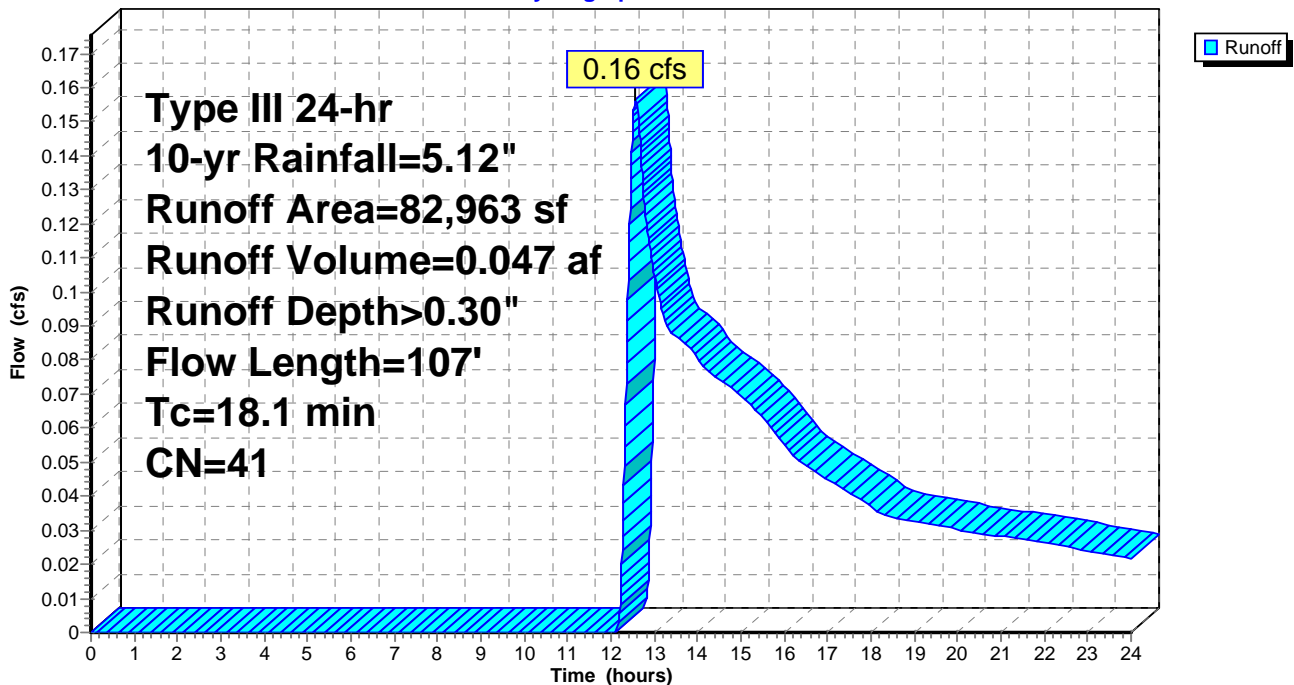
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr Rainfall=5.12"

Area (sf)	CN	Description
4,600	72	Dirt roads, HSG A
55,907	32	Woods/grass comb., Good, HSG A
15,306	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
82,963	41	Weighted Average
75,813		91.38% Pervious Area
7,150		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment EXE: Ex. East

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Subcatchment EXN: Ex. North

Runoff = 0.00 cfs @ 17.40 hrs, Volume= 0.002 af, Depth> 0.03"
 Routed to Reach SN : Site North

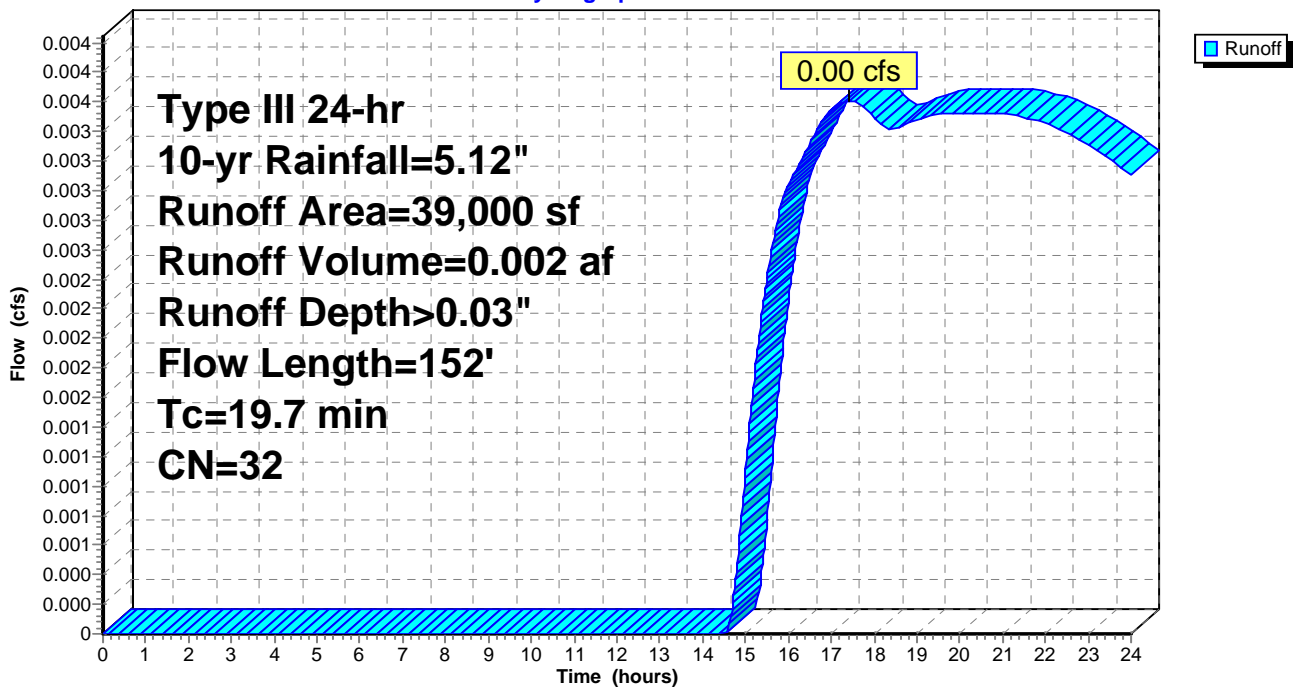
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr Rainfall=5.12"

Area (sf)	CN	Description
39,000	32	Woods/grass comb., Good, HSG A
39,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	50	0.2200	0.04		Sheet Flow, Flow North Woods: Light underbrush n= 0.400 P2= 0.20"
0.8	102	0.1670	2.04		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
19.7	152	Total			

Subcatchment EXN: Ex. North

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Subcatchment EXW: Ex. West

Runoff = 0.05 cfs @ 12.78 hrs, Volume= 0.027 af, Depth> 0.22"
 Routed to Reach RW : Lilly Pond

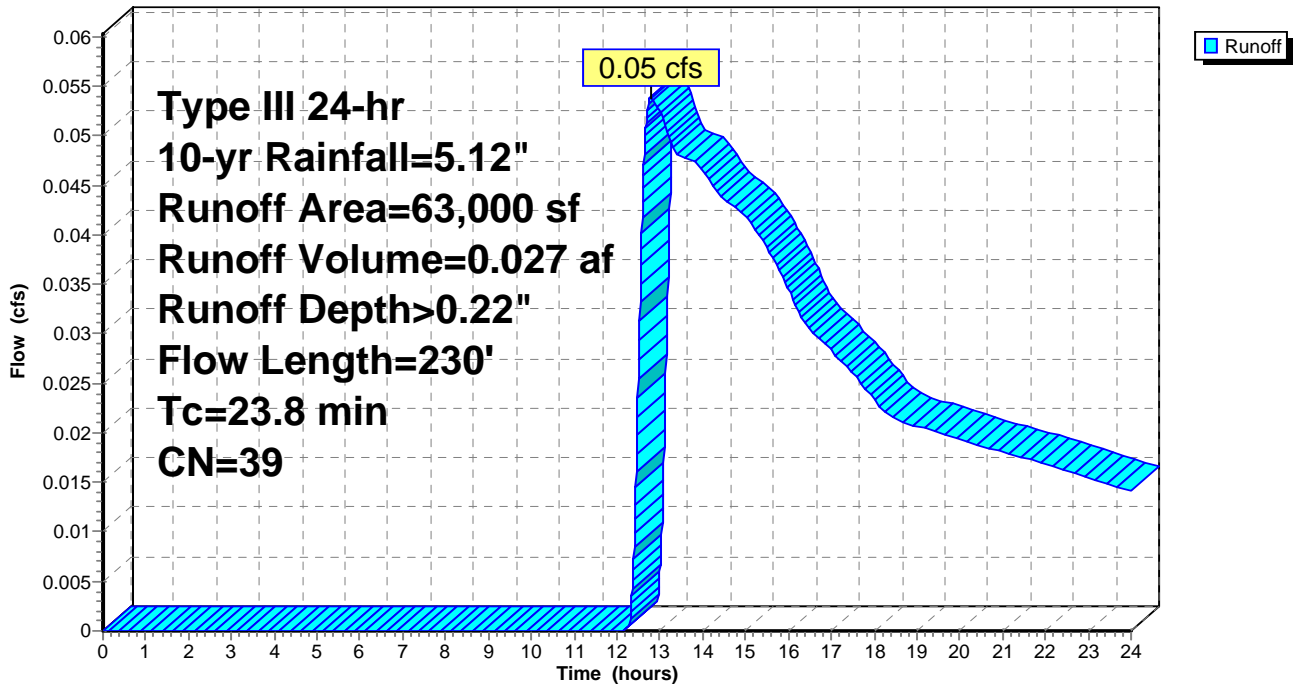
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr Rainfall=5.12"

Area (sf)	CN	Description
53,250	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
63,000	39	Weighted Average
63,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.1600	0.04		Sheet Flow, Flow West toward Lilly Pond Woods: Light underbrush n= 0.400 P2= 0.20"
2.3	180	0.0670	1.29		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
23.8	230	Total			

Subcatchment EXW: Ex. West

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Reach RW: Lilly Pond

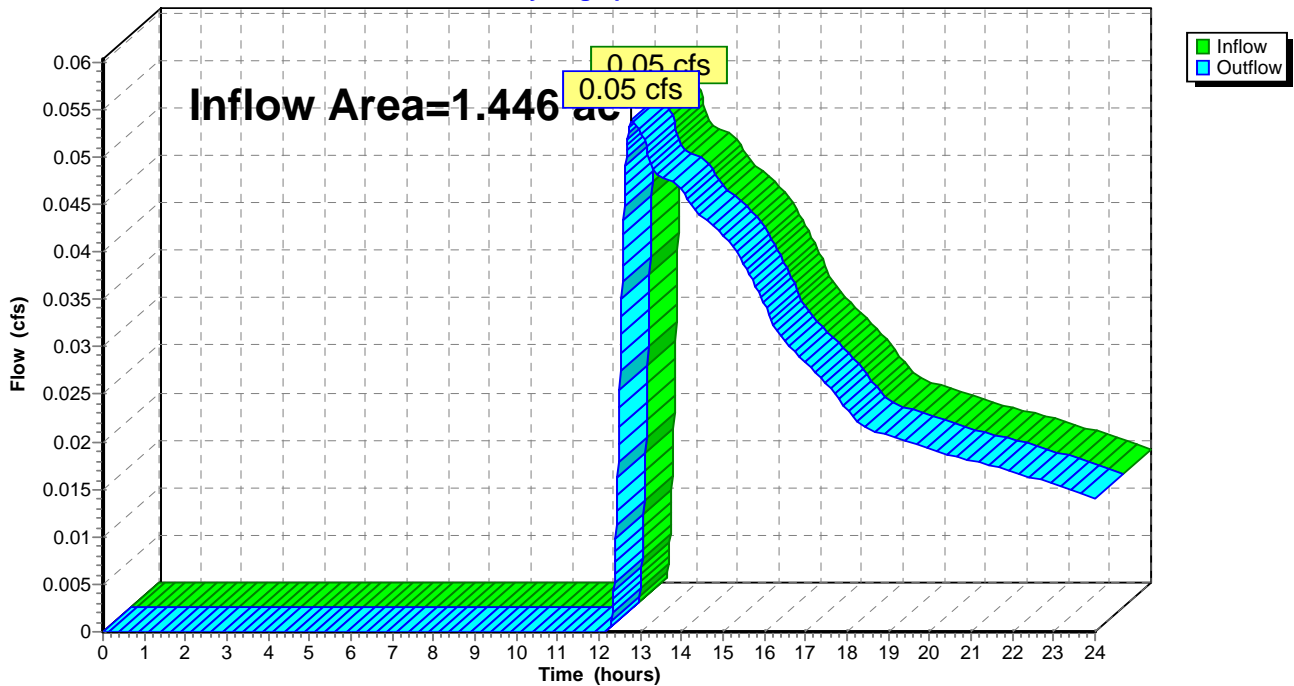
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.446 ac, 0.00% Impervious, Inflow Depth > 0.22" for 10-yr event
Inflow = 0.05 cfs @ 12.78 hrs, Volume= 0.027 af
Outflow = 0.05 cfs @ 12.78 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Reach SE: Site South-East

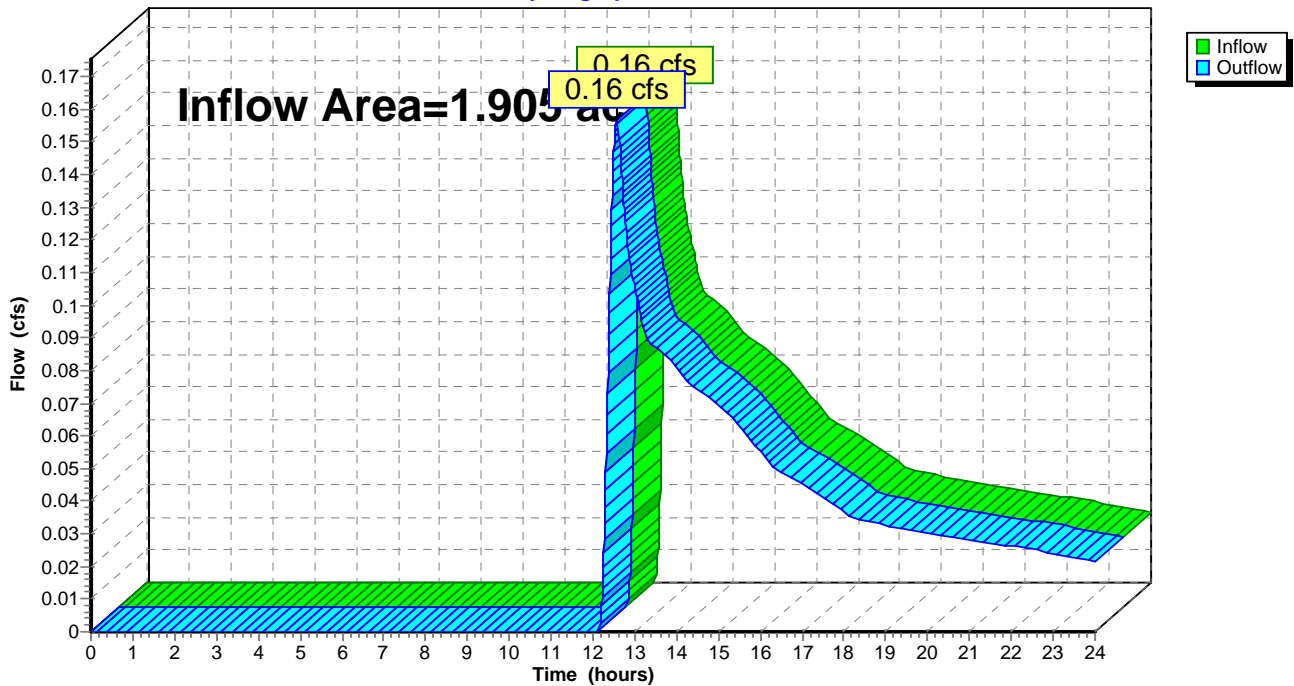
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.905 ac, 8.62% Impervious, Inflow Depth > 0.30" for 10-yr event
Inflow = 0.16 cfs @ 12.57 hrs, Volume= 0.047 af
Outflow = 0.16 cfs @ 12.57 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SE: Site South-East

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Reach SN: Site North

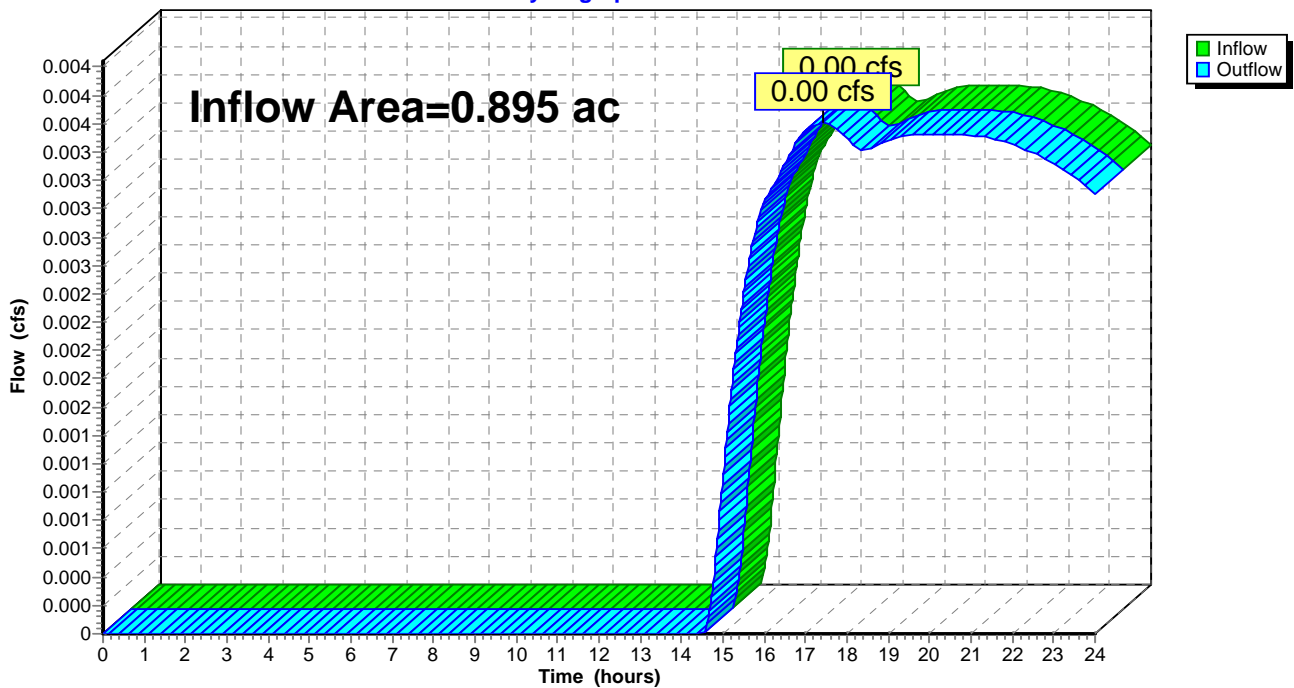
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth > 0.03" for 10-yr event
Inflow = 0.00 cfs @ 17.40 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 17.40 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 25-yr Rainfall=6.29"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 EXE: Ex. East

Runoff Area=82,963 sf 8.62% Impervious Runoff Depth>0.65"
Flow Length=107' Tc=18.1 min CN=41 Runoff=0.55 cfs 0.103 af

Subcatchment EXN: Ex. North

Runoff Area=39,000 sf 0.00% Impervious Runoff Depth>0.18"
Flow Length=152' Tc=19.7 min CN=32 Runoff=0.02 cfs 0.013 af

Subcatchment EXW: Ex. West

Runoff Area=63,000 sf 0.00% Impervious Runoff Depth>0.53"
Flow Length=230' Tc=23.8 min CN=39 Runoff=0.27 cfs 0.063 af

Reach RW: Lilly Pond

Inflow=0.27 cfs 0.063 af
Outflow=0.27 cfs 0.063 af

Reach SE: Site South-East

Inflow=0.55 cfs 0.103 af
Outflow=0.55 cfs 0.103 af

Reach SN: Site North

Inflow=0.02 cfs 0.013 af
Outflow=0.02 cfs 0.013 af

Total Runoff Area = 4.246 ac Runoff Volume = 0.179 af Average Runoff Depth = 0.51"
96.13% Pervious = 4.082 ac 3.87% Impervious = 0.164 ac

8 Lilly Road - Exist

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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Subcatchment EXE: Ex. East

Runoff = 0.55 cfs @ 12.45 hrs, Volume= 0.103 af, Depth> 0.65"
 Routed to Reach SE : Site South-East

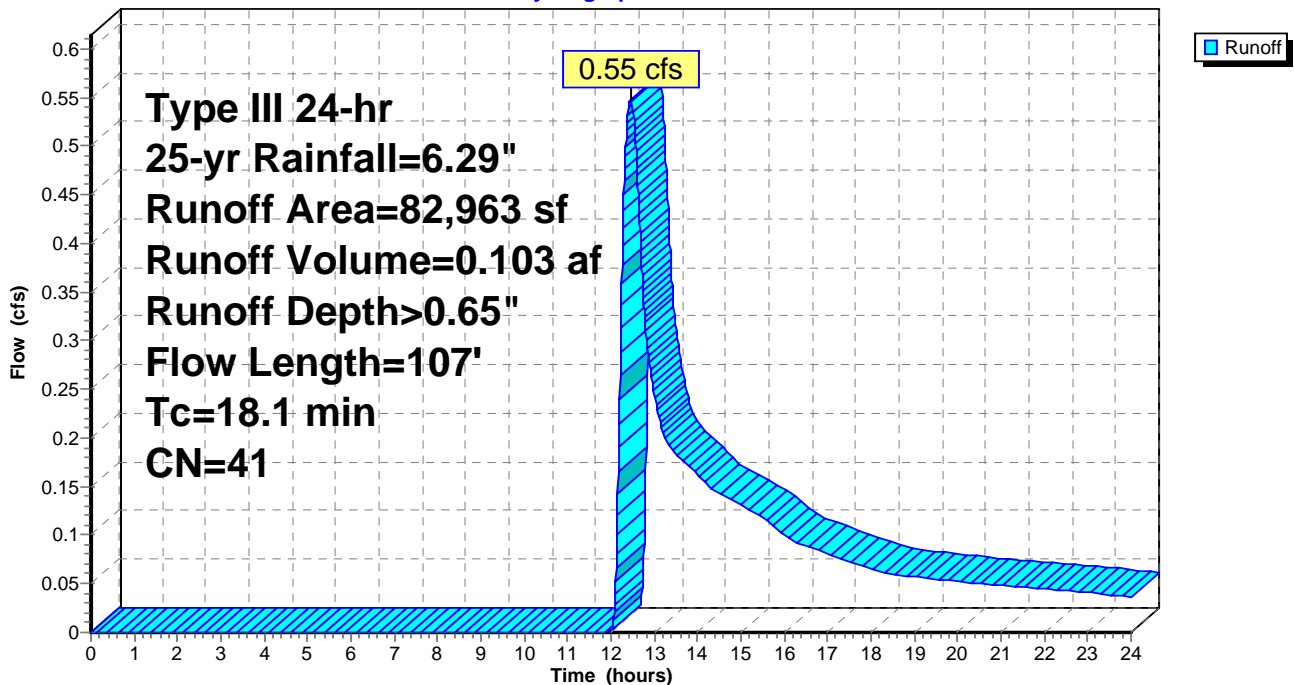
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
4,600	72	Dirt roads, HSG A
55,907	32	Woods/grass comb., Good, HSG A
15,306	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
82,963	41	Weighted Average
75,813		91.38% Pervious Area
7,150		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment EXE: Ex. East

Hydrograph



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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Subcatchment EXN: Ex. North

Runoff = 0.02 cfs @ 14.73 hrs, Volume= 0.013 af, Depth> 0.18"
 Routed to Reach SN : Site North

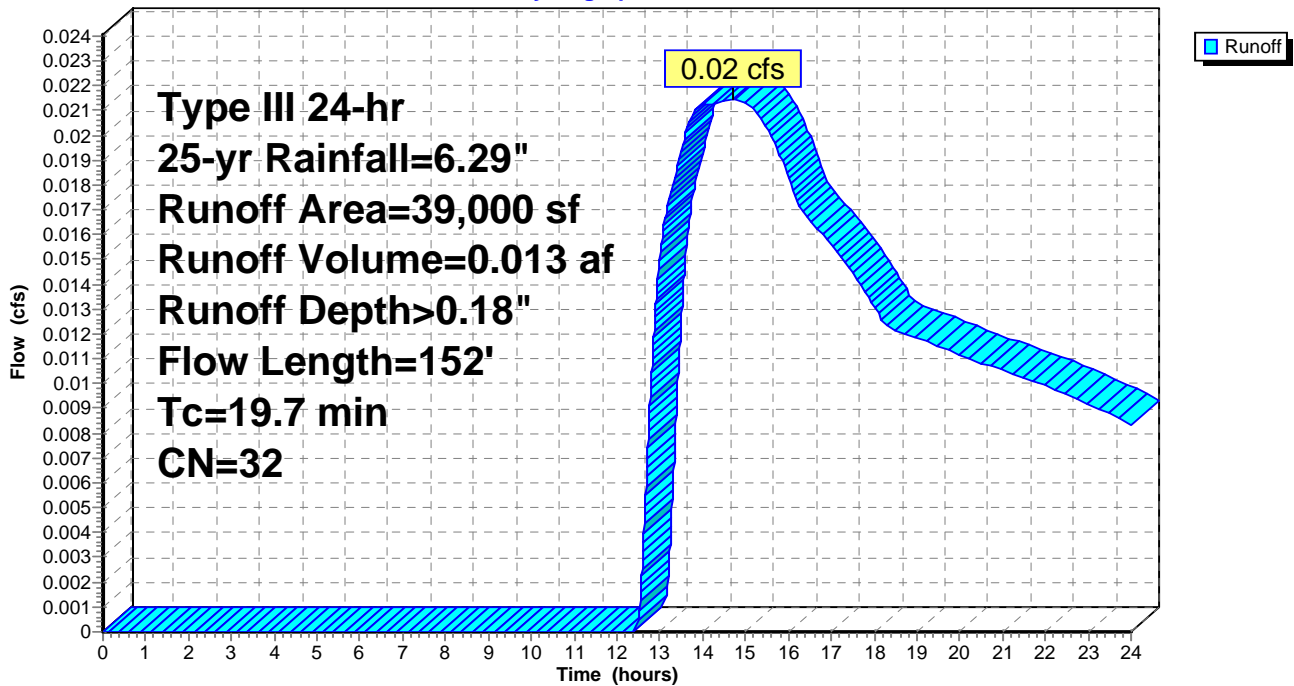
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
39,000	32	Woods/grass comb., Good, HSG A
39,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	50	0.2200	0.04		Sheet Flow, Flow North Woods: Light underbrush n= 0.400 P2= 0.20"
0.8	102	0.1670	2.04		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
19.7	152	Total			

Subcatchment EXN: Ex. North

Hydrograph



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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Subcatchment EXW: Ex. West

Runoff = 0.27 cfs @ 12.58 hrs, Volume= 0.063 af, Depth> 0.53"
 Routed to Reach RW : Lilly Pond

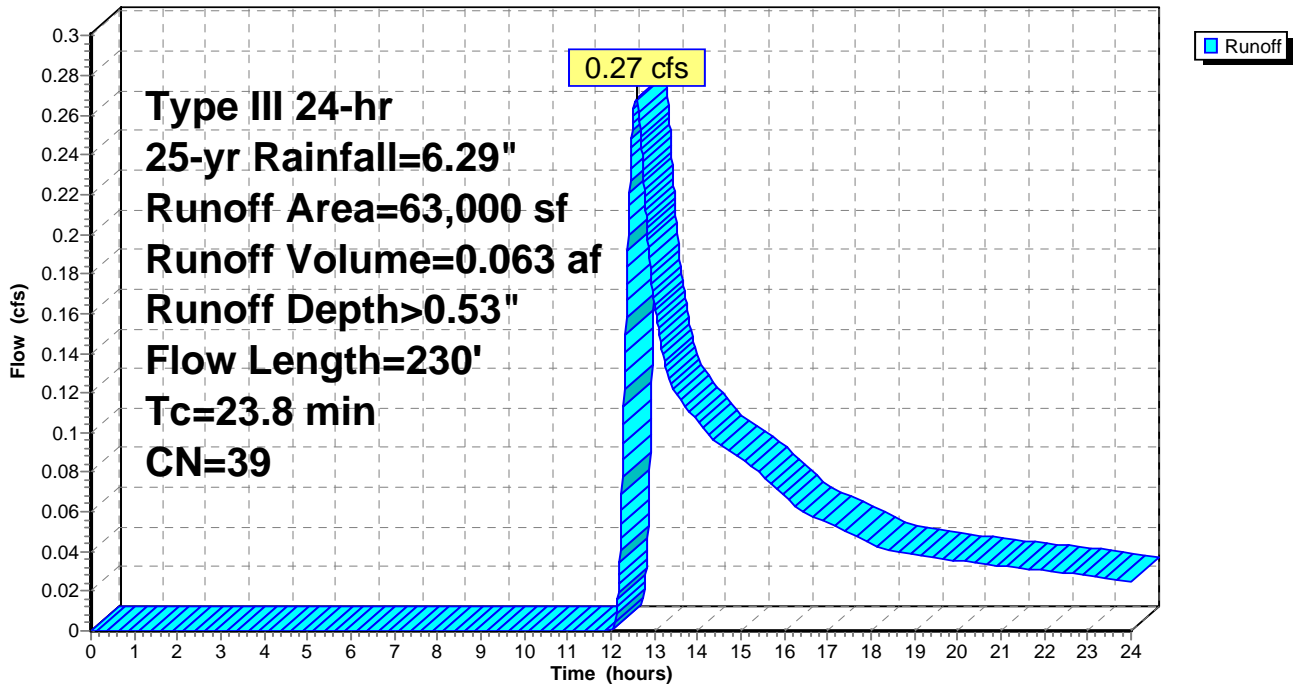
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
53,250	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
63,000	39	Weighted Average
63,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.1600	0.04		Sheet Flow, Flow West toward Lilly Pond Woods: Light underbrush n= 0.400 P2= 0.20"
2.3	180	0.0670	1.29		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
23.8	230	Total			

Subcatchment EXW: Ex. West

Hydrograph



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Type III 24-hr 25-yr Rainfall=6.29"

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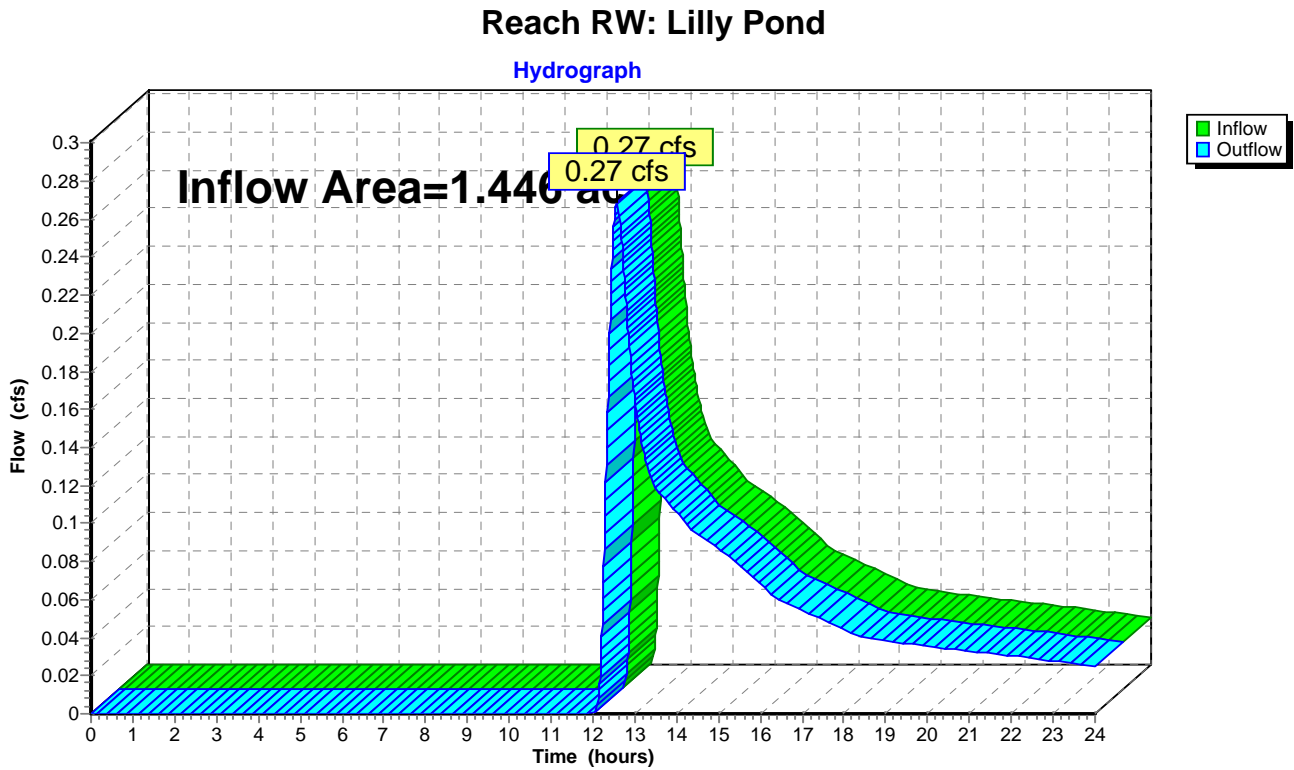
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Summary for Reach RW: Lilly Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.446 ac, 0.00% Impervious, Inflow Depth > 0.53" for 25-yr event
Inflow = 0.27 cfs @ 12.58 hrs, Volume= 0.063 af
Outflow = 0.27 cfs @ 12.58 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Reach SE: Site South-East

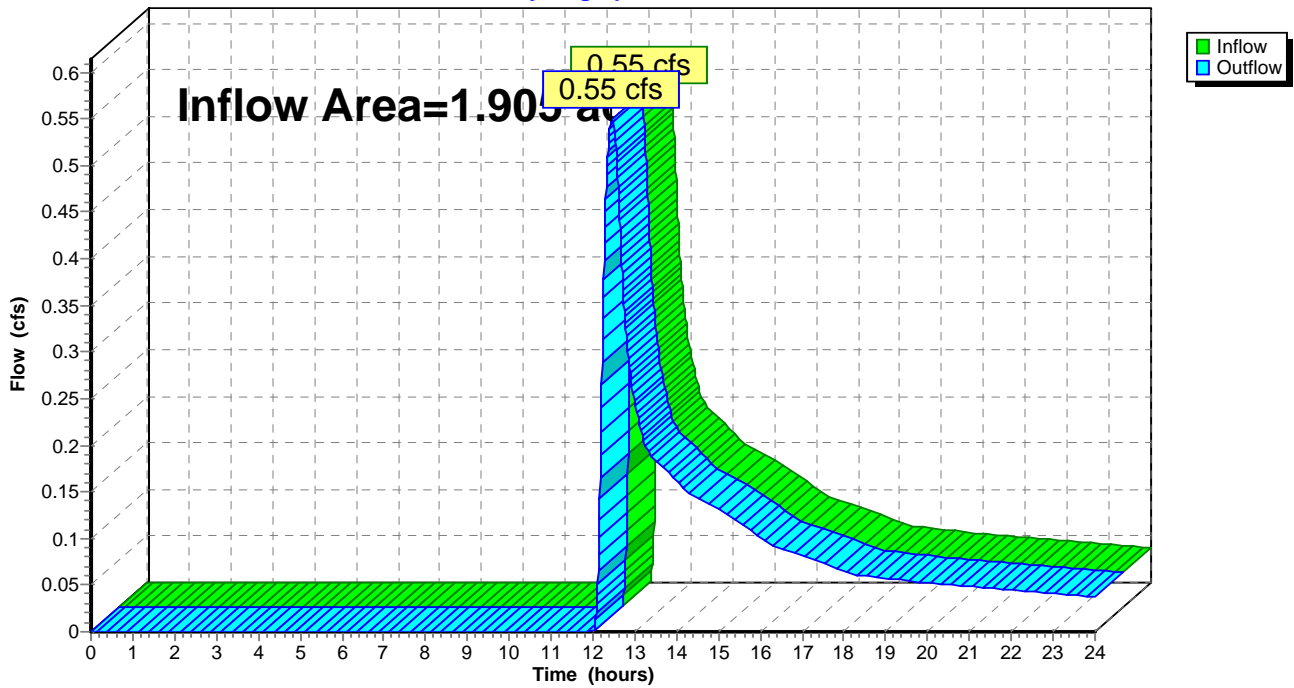
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.905 ac, 8.62% Impervious, Inflow Depth > 0.65" for 25-yr event
Inflow = 0.55 cfs @ 12.45 hrs, Volume= 0.103 af
Outflow = 0.55 cfs @ 12.45 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SE: Site South-East

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Reach SN: Site North

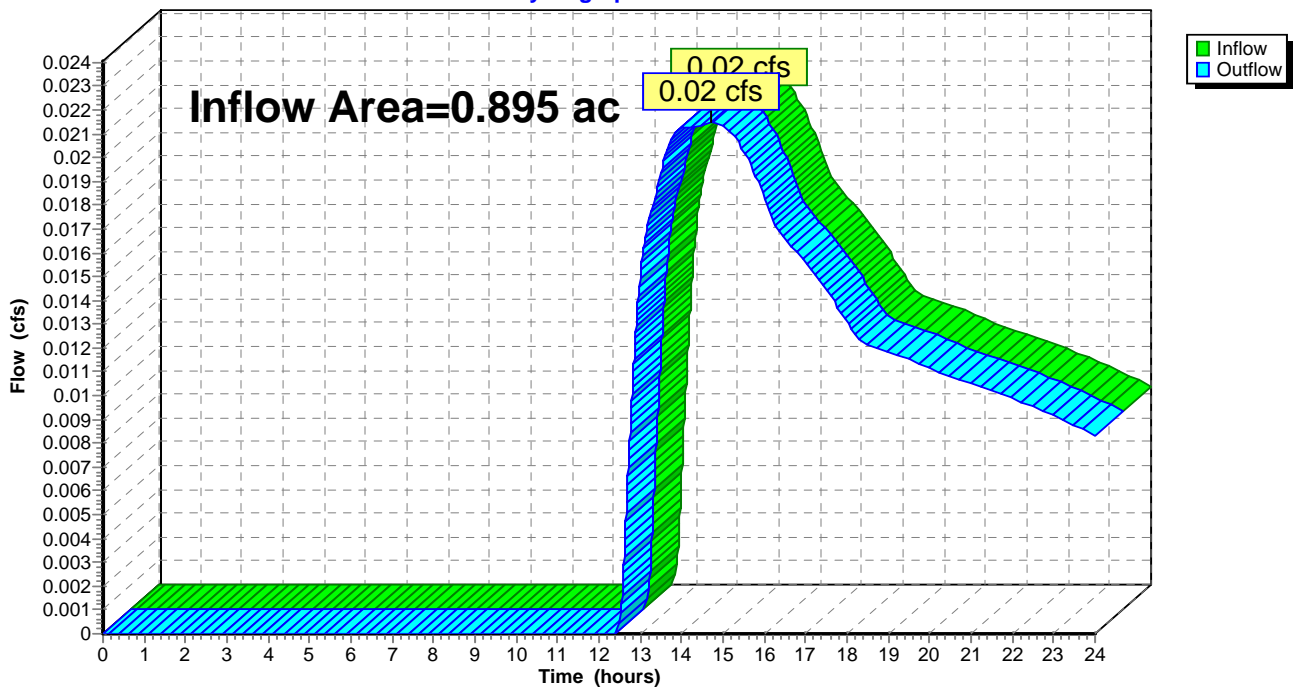
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth > 0.18" for 25-yr event
Inflow = 0.02 cfs @ 14.73 hrs, Volume= 0.013 af
Outflow = 0.02 cfs @ 14.73 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 50-yr Rainfall=7.15"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 EXE: Ex. East

Runoff Area=82,963 sf 8.62% Impervious Runoff Depth>0.97"
Flow Length=107' Tc=18.1 min CN=41 Runoff=0.98 cfs 0.154 af

Subcatchment EXN: Ex. North

Runoff Area=39,000 sf 0.00% Impervious Runoff Depth>0.34"
Flow Length=152' Tc=19.7 min CN=32 Runoff=0.06 cfs 0.026 af

Subcatchment EXW: Ex. West

Runoff Area=63,000 sf 0.00% Impervious Runoff Depth>0.81"
Flow Length=230' Tc=23.8 min CN=39 Runoff=0.52 cfs 0.098 af

Reach RW: Lilly Pond

Inflow=0.52 cfs 0.098 af
Outflow=0.52 cfs 0.098 af

Reach SE: Site South-East

Inflow=0.98 cfs 0.154 af
Outflow=0.98 cfs 0.154 af

Reach SN: Site North

Inflow=0.06 cfs 0.026 af
Outflow=0.06 cfs 0.026 af

Total Runoff Area = 4.246 ac Runoff Volume = 0.278 af Average Runoff Depth = 0.79"
96.13% Pervious = 4.082 ac 3.87% Impervious = 0.164 ac

8 Lilly Road - Exist

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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Subcatchment EXE: Ex. East

Runoff = 0.98 cfs @ 12.37 hrs, Volume= 0.154 af, Depth> 0.97"
 Routed to Reach SE : Site South-East

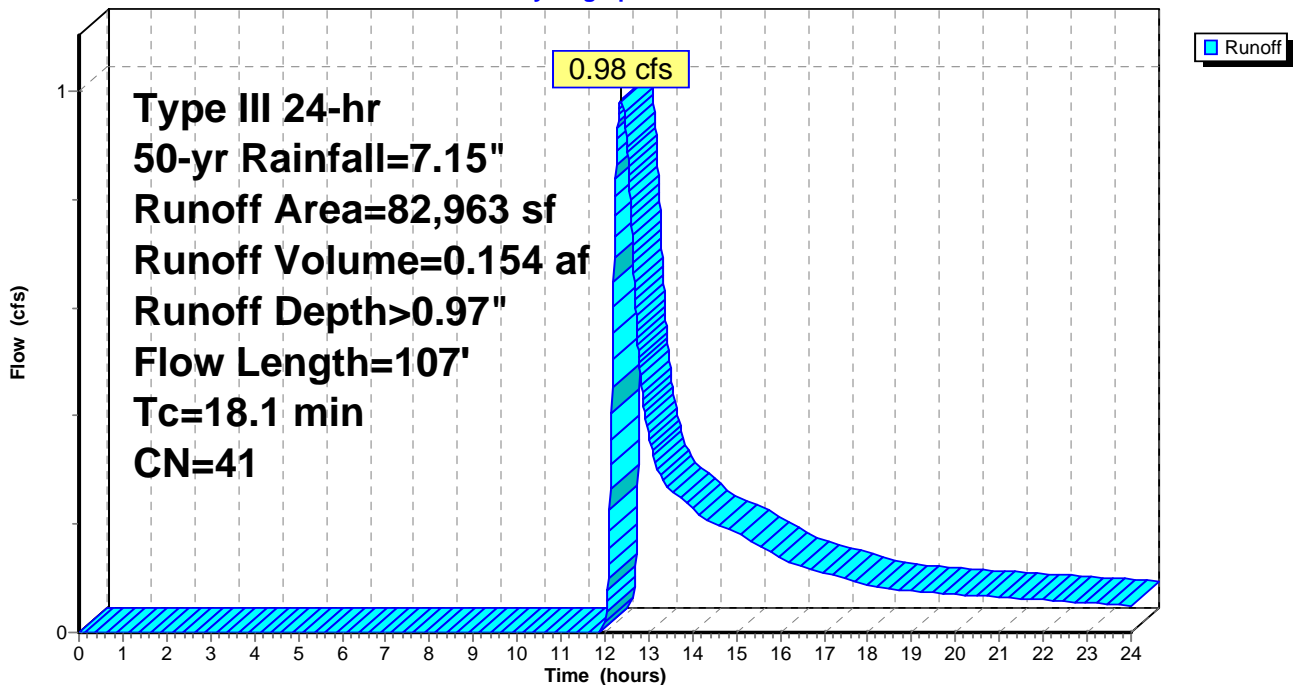
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-yr Rainfall=7.15"

Area (sf)	CN	Description
4,600	72	Dirt roads, HSG A
55,907	32	Woods/grass comb., Good, HSG A
15,306	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
82,963	41	Weighted Average
75,813		91.38% Pervious Area
7,150		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment EXE: Ex. East

Hydrograph



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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Subcatchment EXN: Ex. North

Runoff = 0.06 cfs @ 12.64 hrs, Volume= 0.026 af, Depth> 0.34"
 Routed to Reach SN : Site North

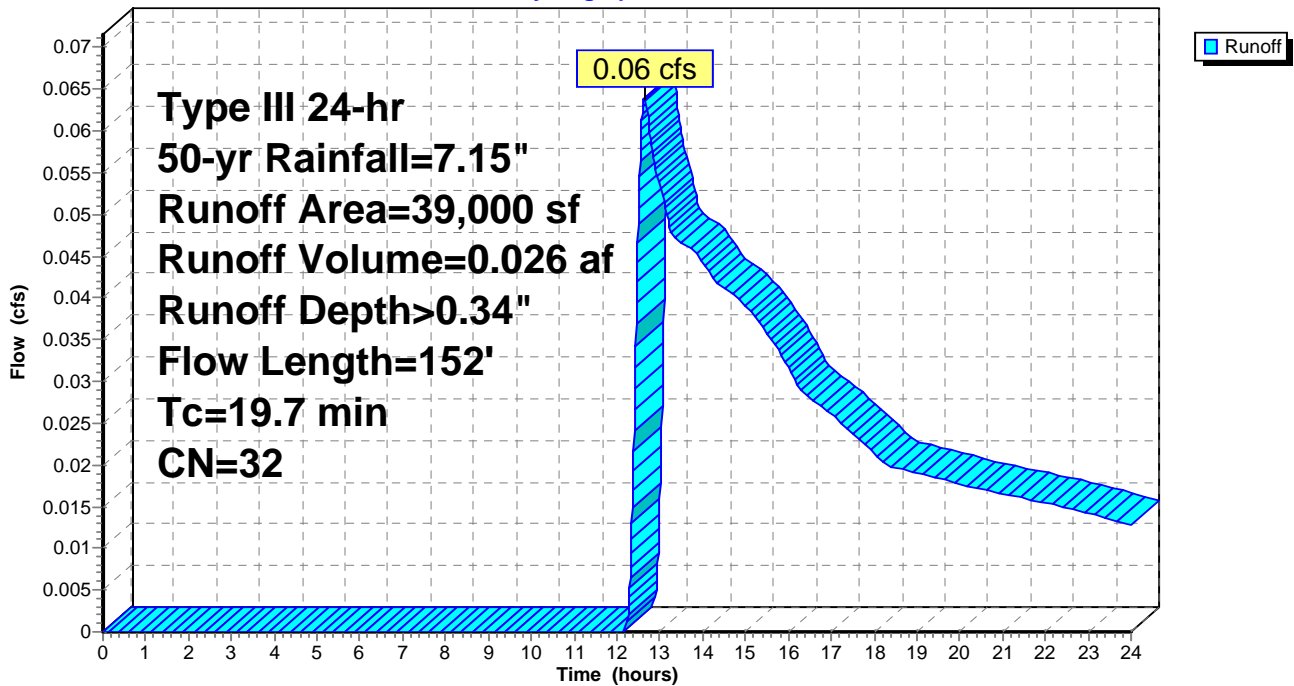
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-yr Rainfall=7.15"

Area (sf)	CN	Description
39,000	32	Woods/grass comb., Good, HSG A
39,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	50	0.2200	0.04		Sheet Flow, Flow North Woods: Light underbrush n= 0.400 P2= 0.20"
0.8	102	0.1670	2.04		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
19.7	152	Total			

Subcatchment EXN: Ex. North

Hydrograph



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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Subcatchment EXW: Ex. West

Runoff = 0.52 cfs @ 12.51 hrs, Volume= 0.098 af, Depth> 0.81"
 Routed to Reach RW : Lilly Pond

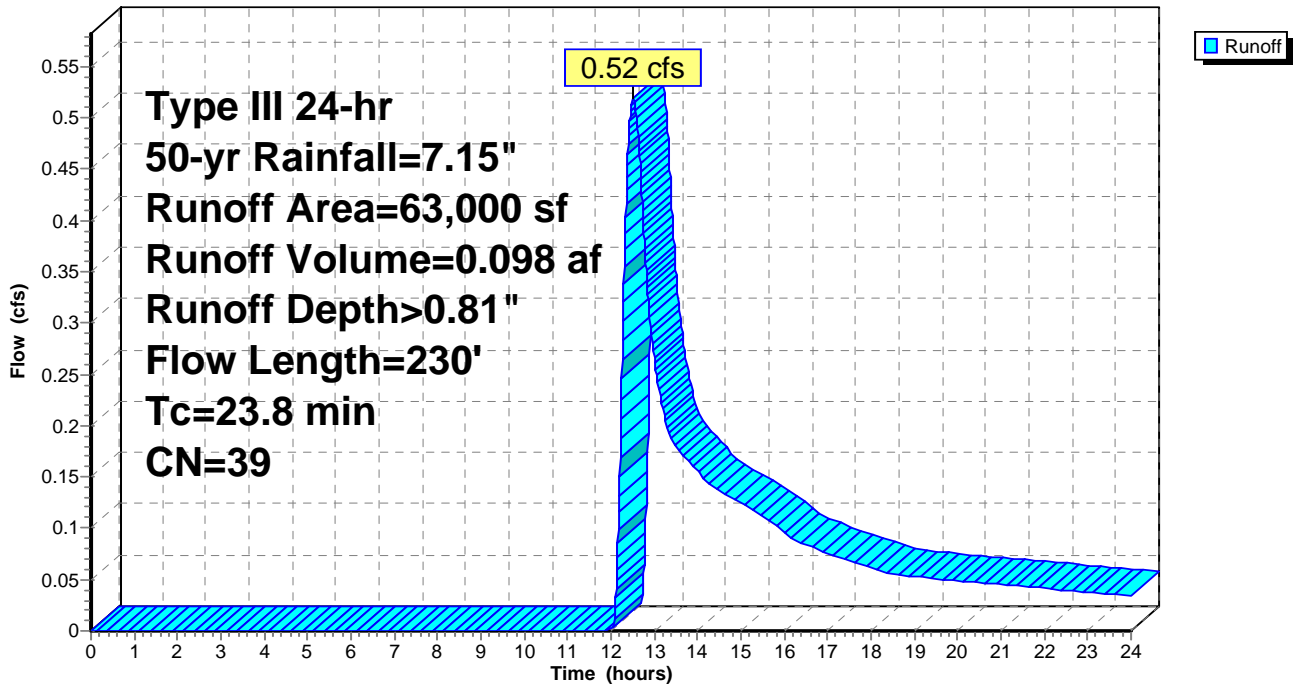
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-yr Rainfall=7.15"

Area (sf)	CN	Description
53,250	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
63,000	39	Weighted Average
63,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.1600	0.04		Sheet Flow, Flow West toward Lilly Pond Woods: Light underbrush n= 0.400 P2= 0.20"
2.3	180	0.0670	1.29		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
23.8	230	Total			

Subcatchment EXW: Ex. West

Hydrograph



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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Reach RW: Lilly Pond

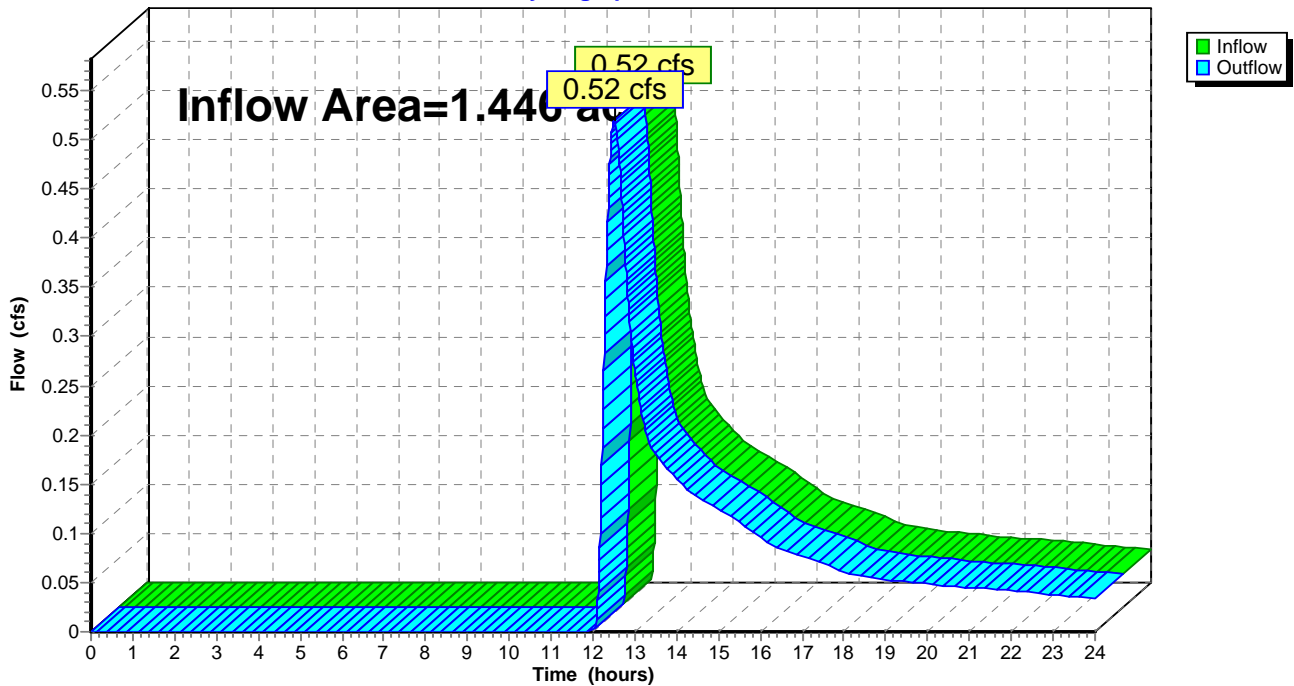
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.446 ac, 0.00% Impervious, Inflow Depth > 0.81" for 50-yr event
Inflow = 0.52 cfs @ 12.51 hrs, Volume= 0.098 af
Outflow = 0.52 cfs @ 12.51 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 50-yr Rainfall=7.15"

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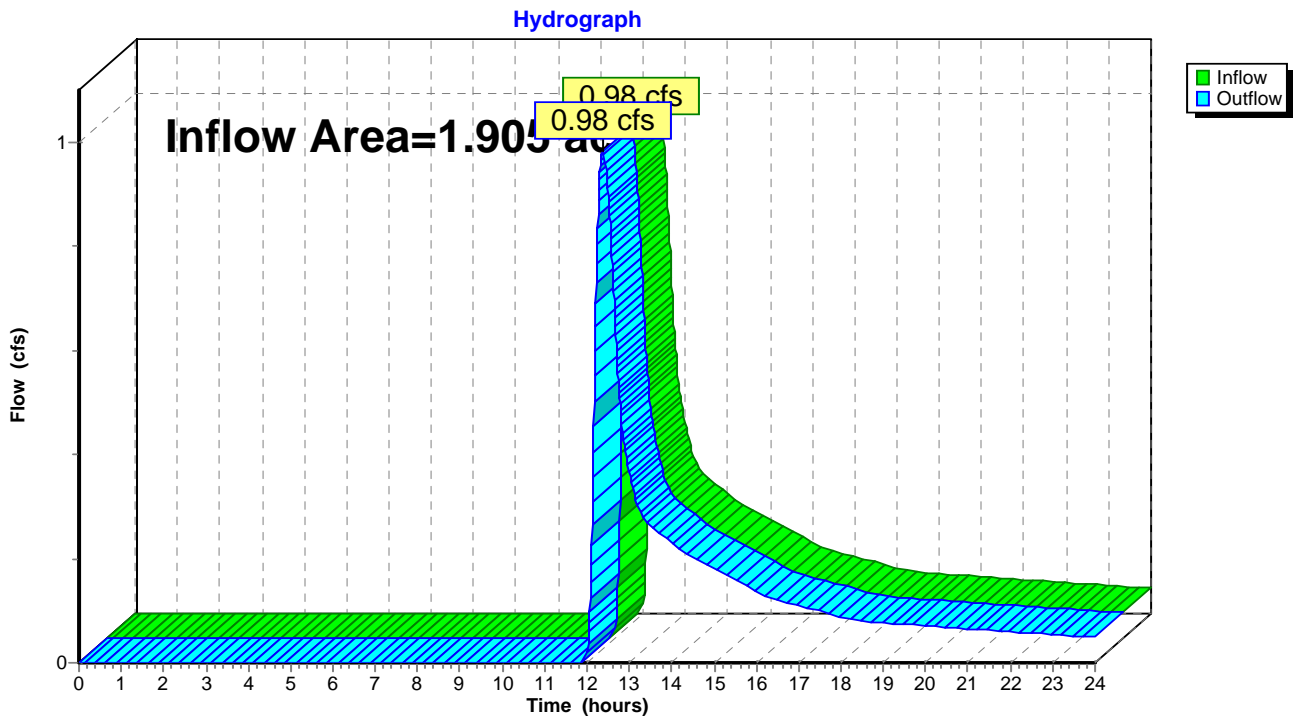
Summary for Reach SE: Site South-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.905 ac, 8.62% Impervious, Inflow Depth > 0.97" for 50-yr event
Inflow = 0.98 cfs @ 12.37 hrs, Volume= 0.154 af
Outflow = 0.98 cfs @ 12.37 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SE: Site South-East



8 Lilly Road - Exist

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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Reach SN: Site North

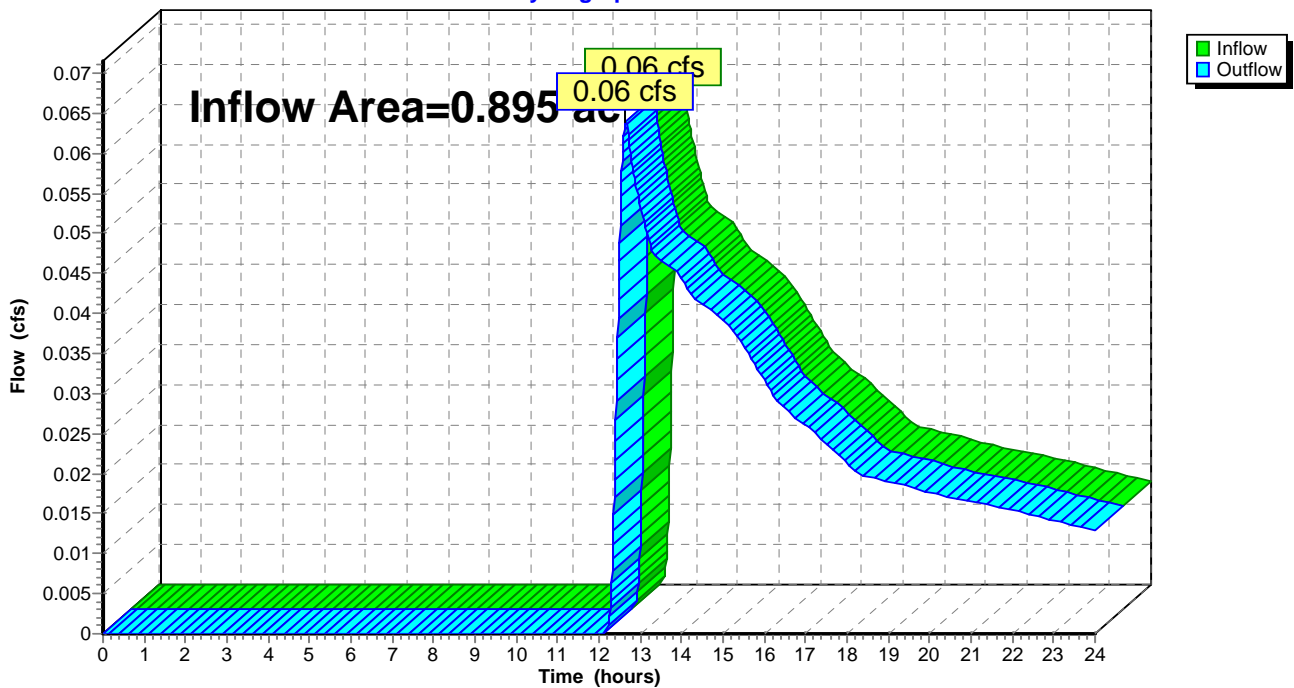
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth > 0.34" for 50-yr event
Inflow = 0.06 cfs @ 12.64 hrs, Volume= 0.026 af
Outflow = 0.06 cfs @ 12.64 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Exist

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Type III 24-hr 100-yr Rainfall=8.10"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 EXE: Ex. East

Runoff Area=82,963 sf 8.62% Impervious Runoff Depth>1.38"
Flow Length=107' Tc=18.1 min CN=41 Runoff=1.61 cfs 0.219 af

Subcatchment EXN: Ex. North

Runoff Area=39,000 sf 0.00% Impervious Runoff Depth>0.58"
Flow Length=152' Tc=19.7 min CN=32 Runoff=0.17 cfs 0.044 af

Subcatchment EXW: Ex. West

Runoff Area=63,000 sf 0.00% Impervious Runoff Depth>1.19"
Flow Length=230' Tc=23.8 min CN=39 Runoff=0.89 cfs 0.143 af

Reach RW: Lilly Pond

Inflow=0.89 cfs 0.143 af
Outflow=0.89 cfs 0.143 af

Reach SE: Site South-East

Inflow=1.61 cfs 0.219 af
Outflow=1.61 cfs 0.219 af

Reach SN: Site North

Inflow=0.17 cfs 0.044 af
Outflow=0.17 cfs 0.044 af

Total Runoff Area = 4.246 ac Runoff Volume = 0.406 af Average Runoff Depth = 1.15"
96.13% Pervious = 4.082 ac 3.87% Impervious = 0.164 ac

8 Lilly Road - Exist

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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Subcatchment EXE: Ex. East

Runoff = 1.61 cfs @ 12.32 hrs, Volume= 0.219 af, Depth> 1.38"
 Routed to Reach SE : Site South-East

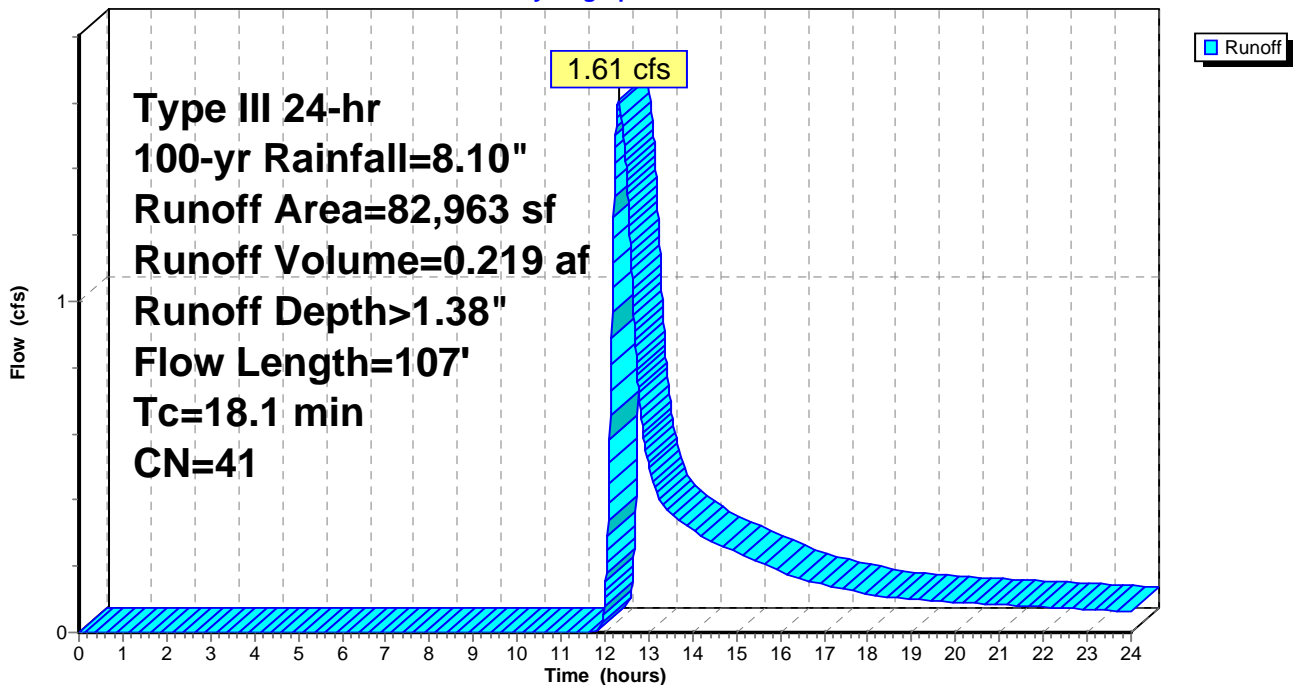
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr Rainfall=8.10"

Area (sf)	CN	Description
4,600	72	Dirt roads, HSG A
55,907	32	Woods/grass comb., Good, HSG A
15,306	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
82,963	41	Weighted Average
75,813		91.38% Pervious Area
7,150		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment EXE: Ex. East

Hydrograph



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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Subcatchment EXN: Ex. North

Runoff = 0.17 cfs @ 12.55 hrs, Volume= 0.044 af, Depth> 0.58"
 Routed to Reach SN : Site North

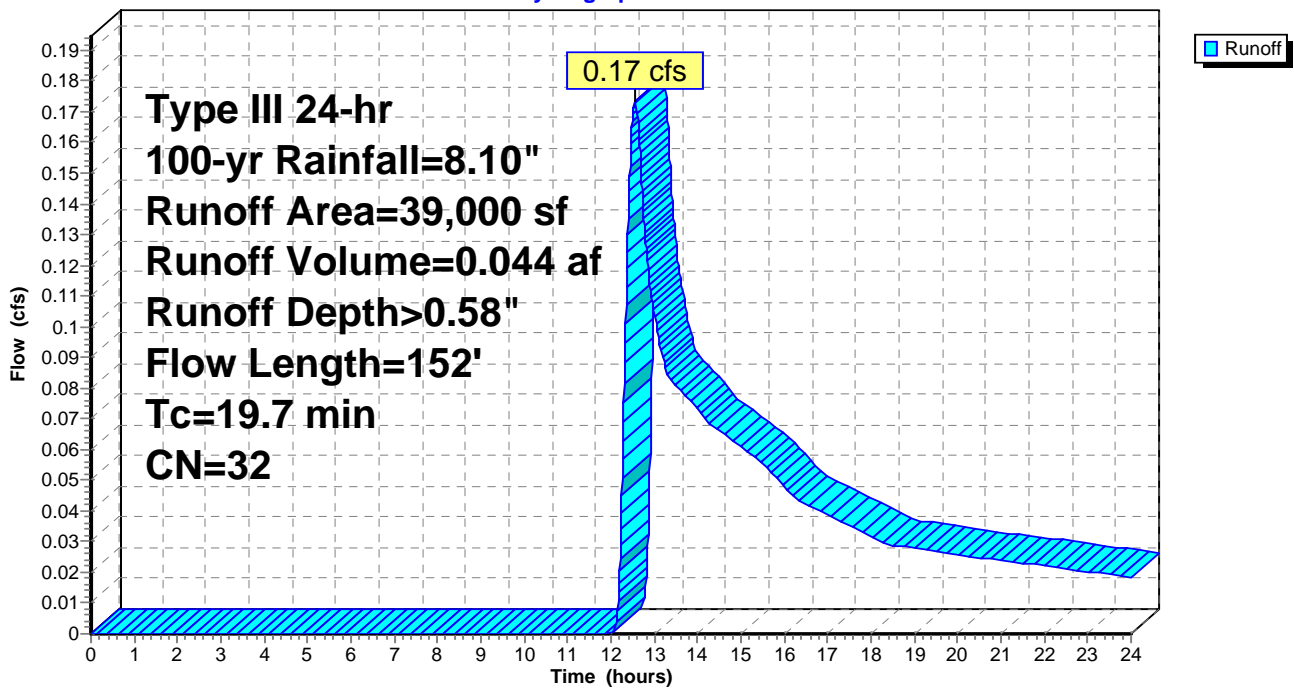
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr Rainfall=8.10"

Area (sf)	CN	Description
39,000	32	Woods/grass comb., Good, HSG A
39,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.9	50	0.2200	0.04		Sheet Flow, Flow North Woods: Light underbrush n= 0.400 P2= 0.20"
0.8	102	0.1670	2.04		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
19.7	152	Total			

Subcatchment EXN: Ex. North

Hydrograph



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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Subcatchment EXW: Ex. West

Runoff = 0.89 cfs @ 12.45 hrs, Volume= 0.143 af, Depth> 1.19"
 Routed to Reach RW : Lilly Pond

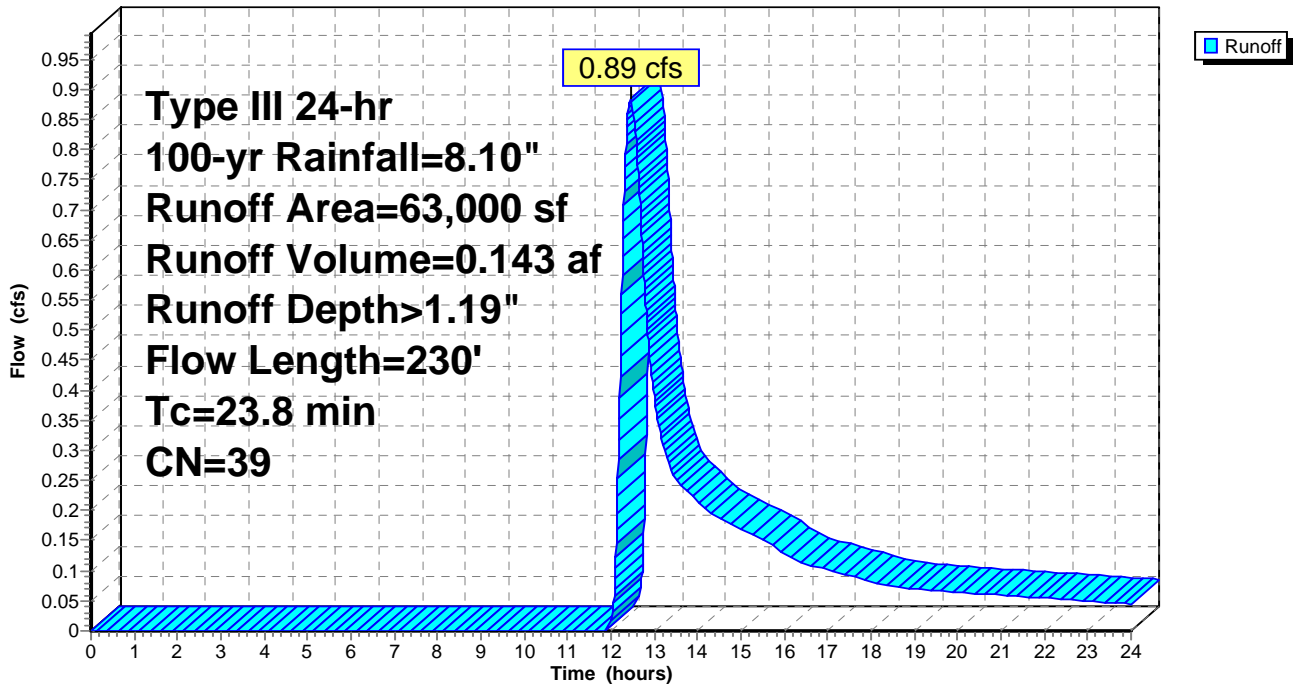
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr Rainfall=8.10"

Area (sf)	CN	Description
53,250	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
63,000	39	Weighted Average
63,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.1600	0.04		Sheet Flow, Flow West toward Lilly Pond Woods: Light underbrush n= 0.400 P2= 0.20"
2.3	180	0.0670	1.29		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
23.8	230	Total			

Subcatchment EXW: Ex. West

Hydrograph



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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Reach RW: Lilly Pond

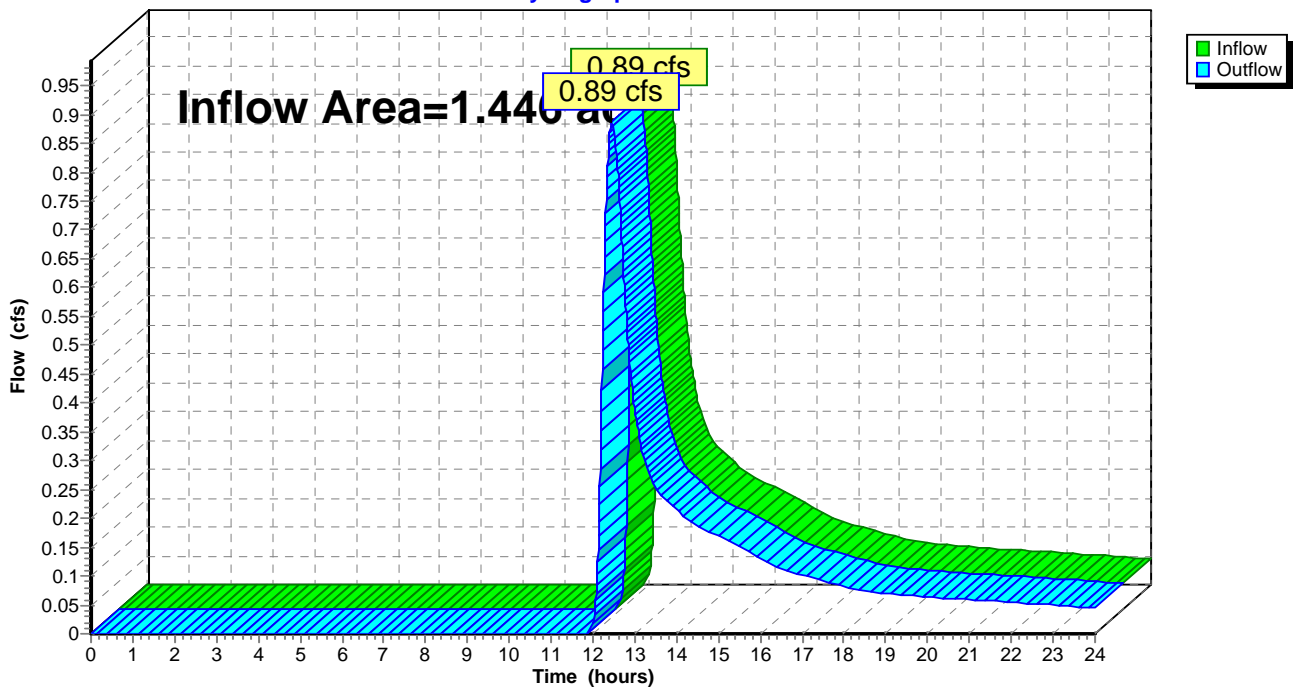
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.446 ac, 0.00% Impervious, Inflow Depth > 1.19" for 100-yr event
Inflow = 0.89 cfs @ 12.45 hrs, Volume= 0.143 af
Outflow = 0.89 cfs @ 12.45 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



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Type III 24-hr 100-yr Rainfall=8.10"

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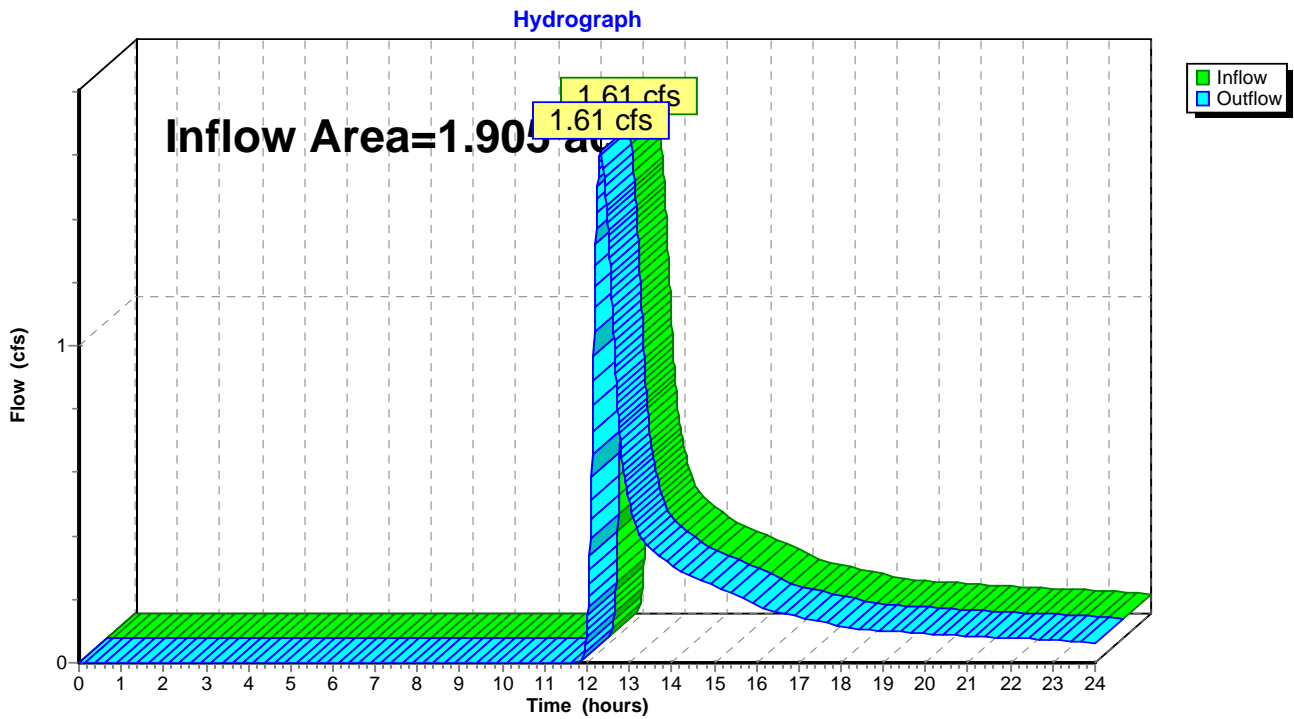
Summary for Reach SE: Site South-East

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.905 ac, 8.62% Impervious, Inflow Depth > 1.38" for 100-yr event
Inflow = 1.61 cfs @ 12.32 hrs, Volume= 0.219 af
Outflow = 1.61 cfs @ 12.32 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SE: Site South-East



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Type III 24-hr 100-yr Rainfall=8.10"

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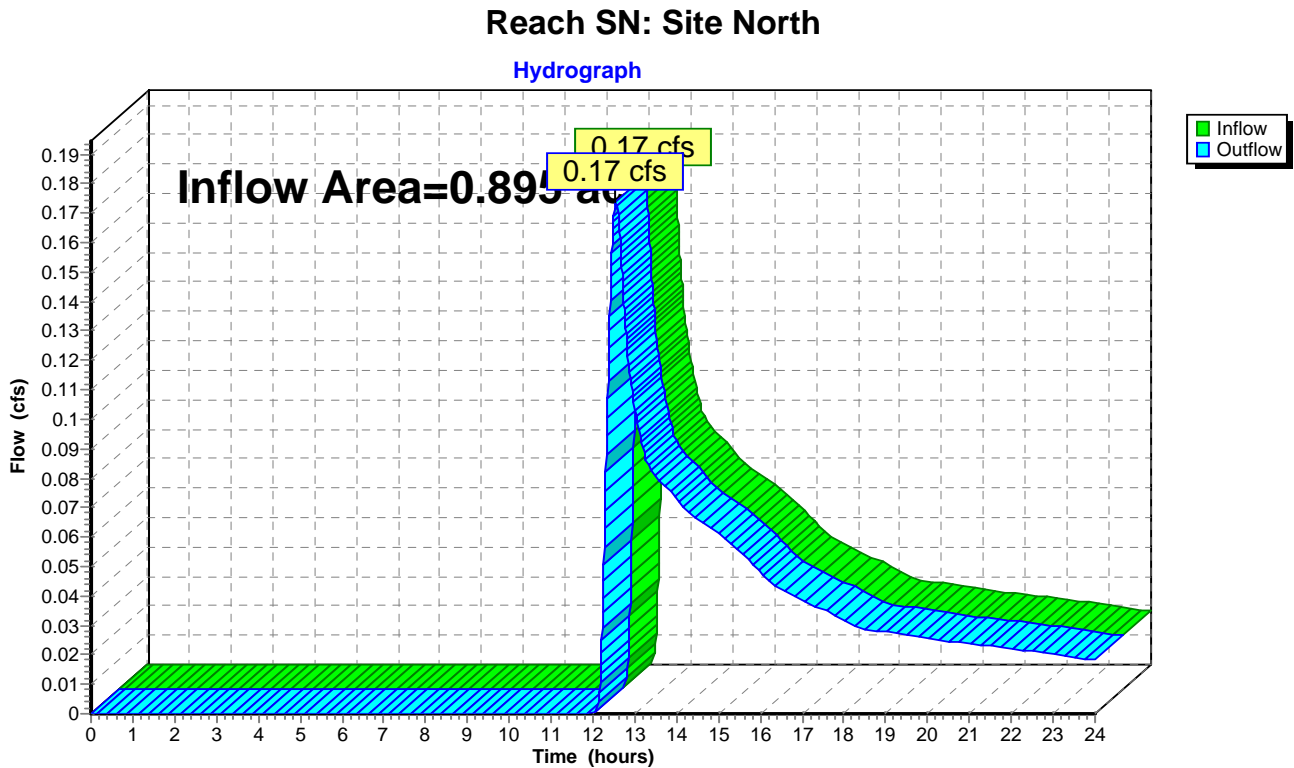
Page 40

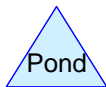
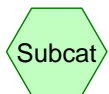
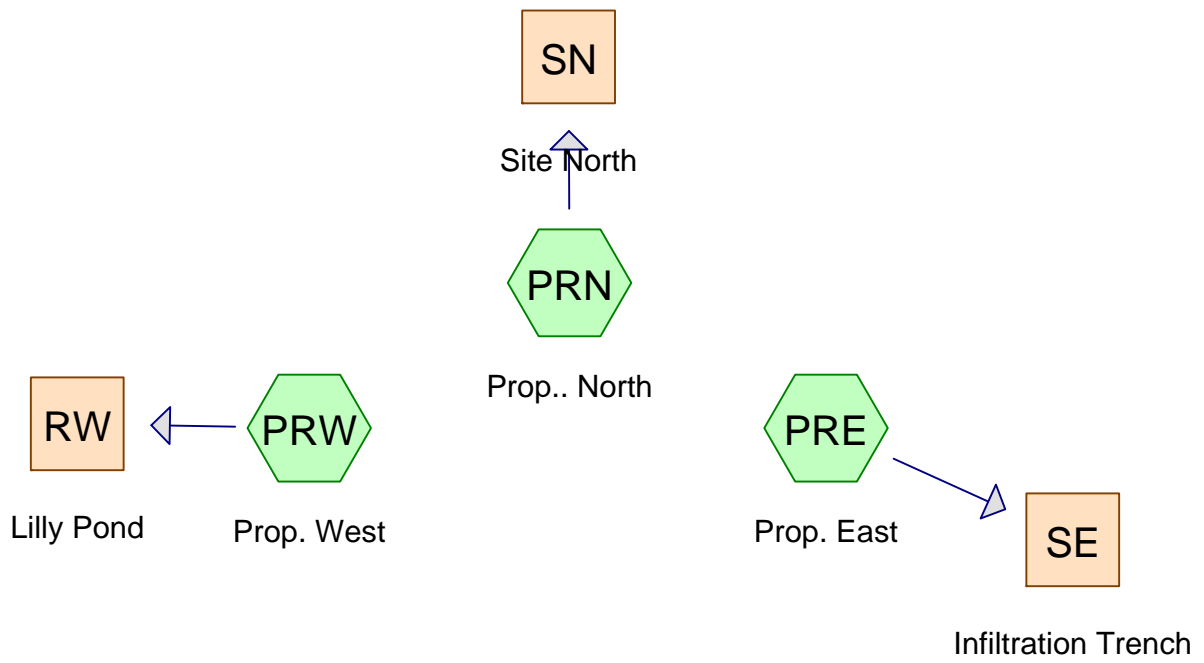
Summary for Reach SN: Site North

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth > 0.58" for 100-yr event
Inflow = 0.17 cfs @ 12.55 hrs, Volume= 0.044 af
Outflow = 0.17 cfs @ 12.55 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs





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Rainfall Events Listing

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	3.24	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.12	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.29	2
4	50-yr	Type III 24-hr		Default	24.00	1	7.15	2
5	100-yr	Type III 24-hr		Default	24.00	1	8.10	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.945	39	>75% Grass cover, Good, HSG A (PRE, PRN)
0.224	76	Gravel roads, HSG A (PRW)
0.149	83	Paved roads w/open ditches, 50% imp, HSG A (PRE)
0.164	98	Shed & Tennis Court (PRE)
2.686	32	Woods/grass comb., Good, HSG A (PRE, PRN, PRW)
4.168	40	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.004	HSG A	PRE, PRN, PRW
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.164	Other	PRE
4.168		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.945	0.000	0.000	0.000	0.000	0.945	>75% Grass cover, Good	
0.224	0.000	0.000	0.000	0.000	0.224	Gravel roads	
0.149	0.000	0.000	0.000	0.000	0.149	Paved roads w/open ditches, 50% imp	
0.000	0.000	0.000	0.000	0.164	0.164	Shed & Tennis Court	
2.686	0.000	0.000	0.000	0.000	2.686	Woods/grass comb., Good	
4.004	0.000	0.000	0.000	0.164	4.168	TOTAL AREA	

8 Lilly Road - Prop

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Type III 24-hr 2-yr Rainfall=3.24"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 PRE: Prop. East

Runoff Area=76,262 sf 13.65% Impervious Runoff Depth>0.06"
Flow Length=107' Tc=18.1 min CN=46 Runoff=0.01 cfs 0.009 af

Subcatchment PRN: Prop.. North

Runoff Area=38,400 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=126' Tc=13.8 min CN=33 Runoff=0.00 cfs 0.000 af

Subcatchment PRW: Prop. West

Runoff Area=66,915 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=165' Tc=21.5 min CN=38 Runoff=0.00 cfs 0.000 af

Reach RW: Lilly Pond

Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SE: Infiltration Trench

Avg. Flow Depth=0.11' Max Vel=0.24 fps Inflow=0.01 cfs 0.009 af
n=0.104 L=450.0' S=0.0089 '/' Capacity=11.21 cfs Outflow=0.01 cfs 0.008 af

Reach SN: Site North

Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 4.168 ac Runoff Volume = 0.009 af Average Runoff Depth = 0.03"
94.27% Pervious = 3.930 ac 5.73% Impervious = 0.239 ac

8 Lilly Road - Prop

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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment PRE: Prop. East

Runoff = 0.01 cfs @ 15.18 hrs, Volume= 0.009 af, Depth> 0.06"
 Routed to Reach SE : Infiltration Trench

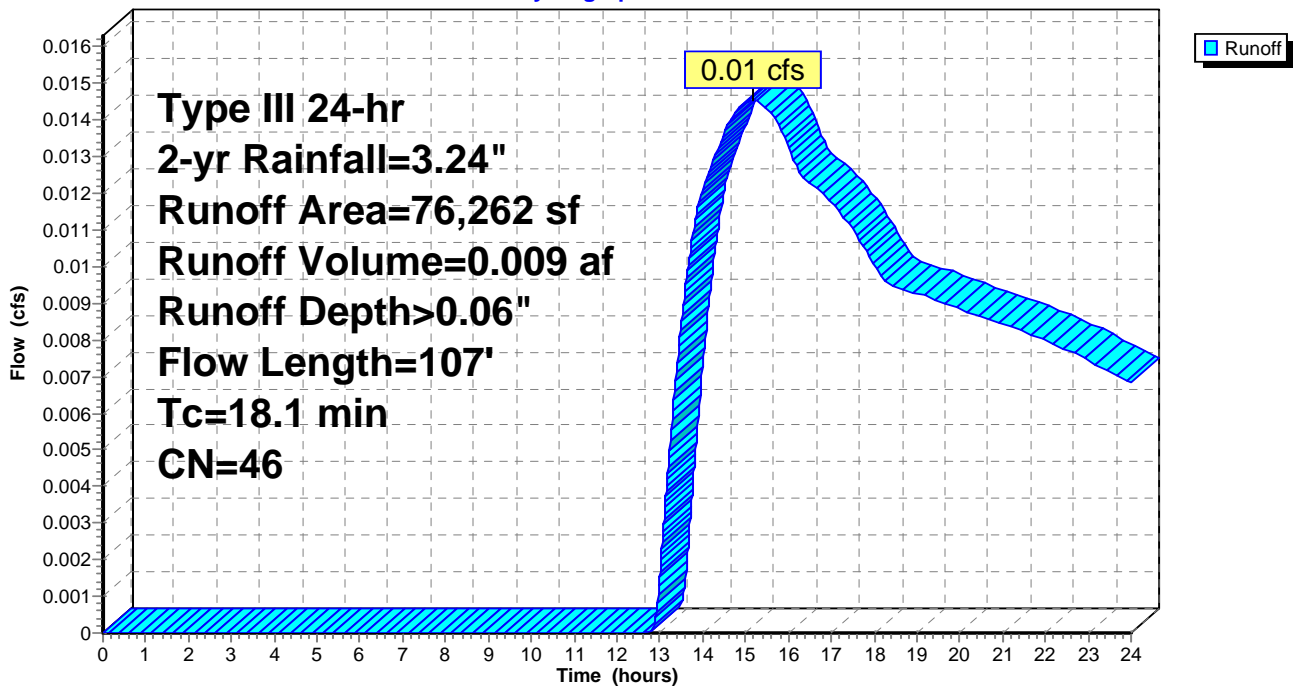
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr Rainfall=3.24"

Area (sf)	CN	Description
6,512	83	Paved roads w/open ditches, 50% imp, HSG A
24,300	32	Woods/grass comb., Good, HSG A
23,100	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
15,200	39	>75% Grass cover, Good, HSG A
76,262	46	Weighted Average
65,856		86.35% Pervious Area
10,406		13.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment PRE: Prop. East

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment PRN: Prop.. North

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Reach SN : Site North

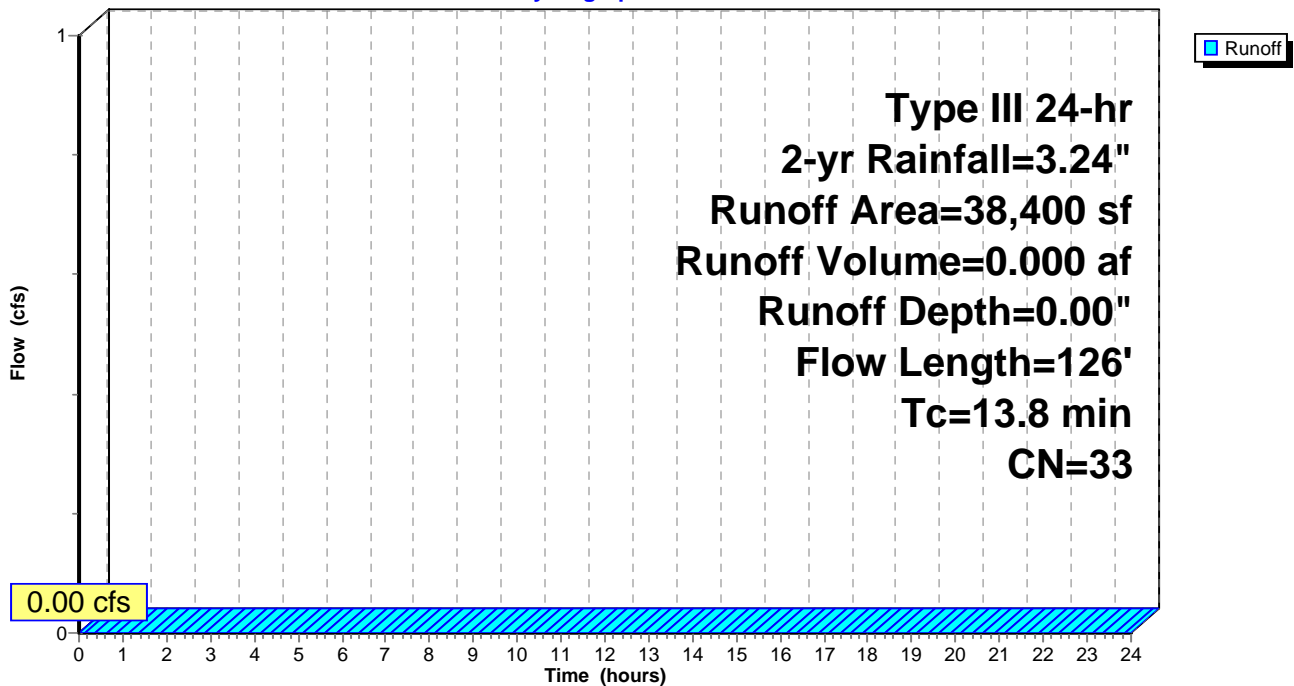
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr Rainfall=3.24"

Area (sf)	CN	Description
35,540	32	Woods/grass comb., Good, HSG A
2,860	39	>75% Grass cover, Good, HSG A
38,400	33	Weighted Average
38,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	50	0.2000	0.06		Sheet Flow, Flow North Grass: Dense n= 0.240 P2= 0.20"
0.7	76	0.1440	1.90		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
13.8	126	Total			

Subcatchment PRN: Prop.. North

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Subcatchment PRW: Prop. West

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Reach RW : Lilly Pond

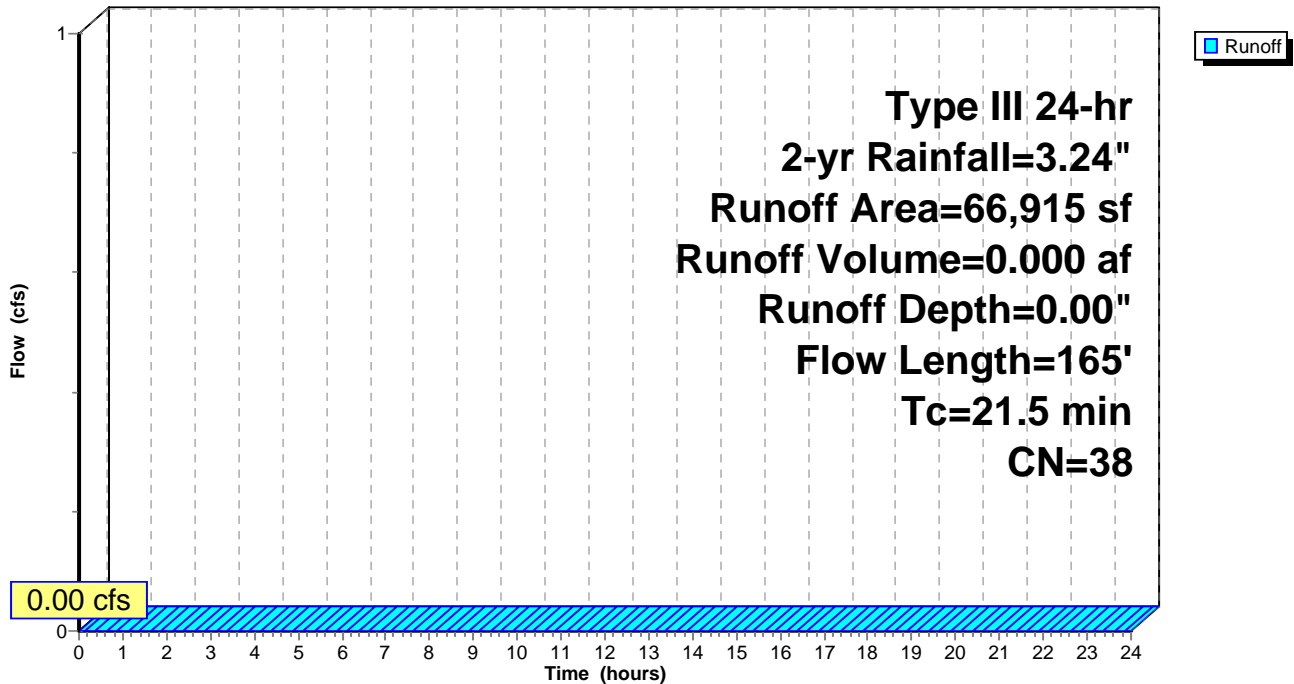
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-yr Rainfall=3.24"

Area (sf)	CN	Description
57,165	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
66,915	38	Weighted Average
66,915		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0267	0.04		Sheet Flow, Flow West toward Lilly Pond Grass: Short n= 0.150 P2= 0.20"
1.4	115	0.0700	1.32		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
21.5	165	Total			

Subcatchment PRW: Prop. West

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Reach RW: Lilly Pond

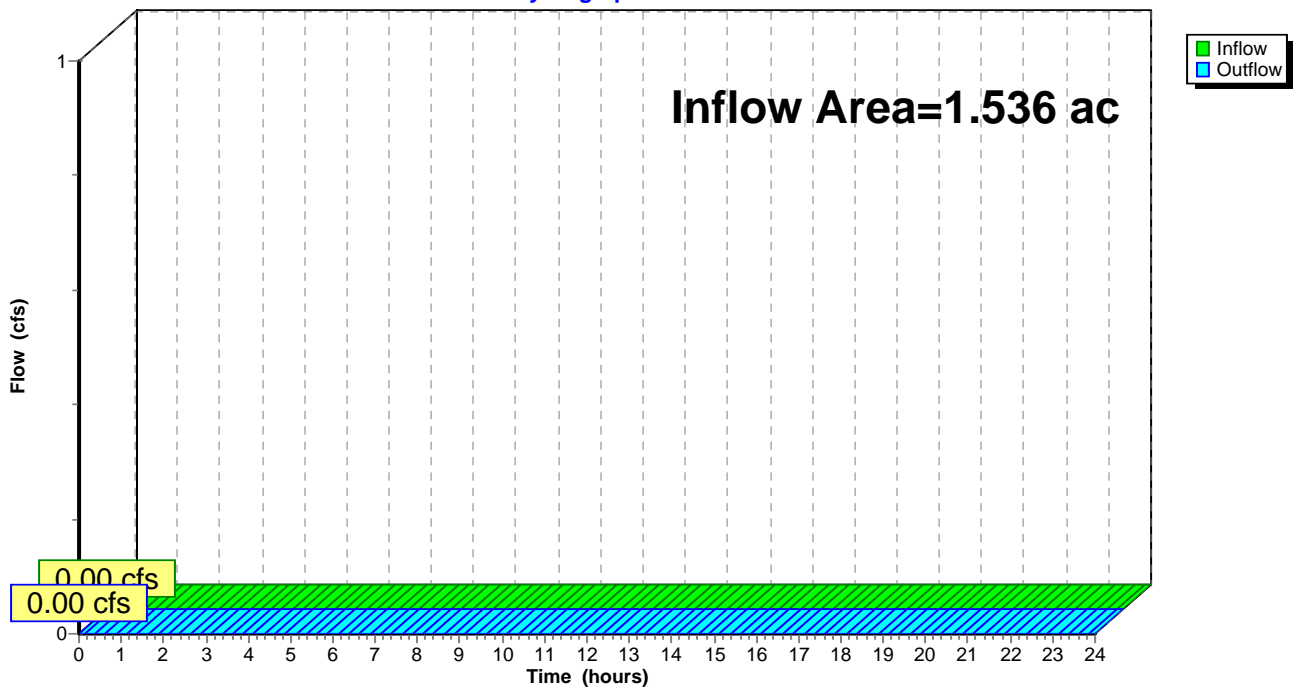
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.536 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.24"

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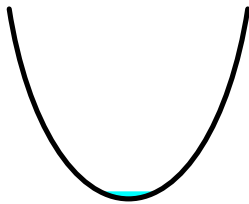
Summary for Reach SE: Infiltration Trench

Inflow Area = 1.751 ac, 13.65% Impervious, Inflow Depth > 0.06" for 2-yr event
Inflow = 0.01 cfs @ 15.18 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 16.12 hrs, Volume= 0.008 af, Atten= 2%, Lag= 56.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 31.7 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 36.4 min

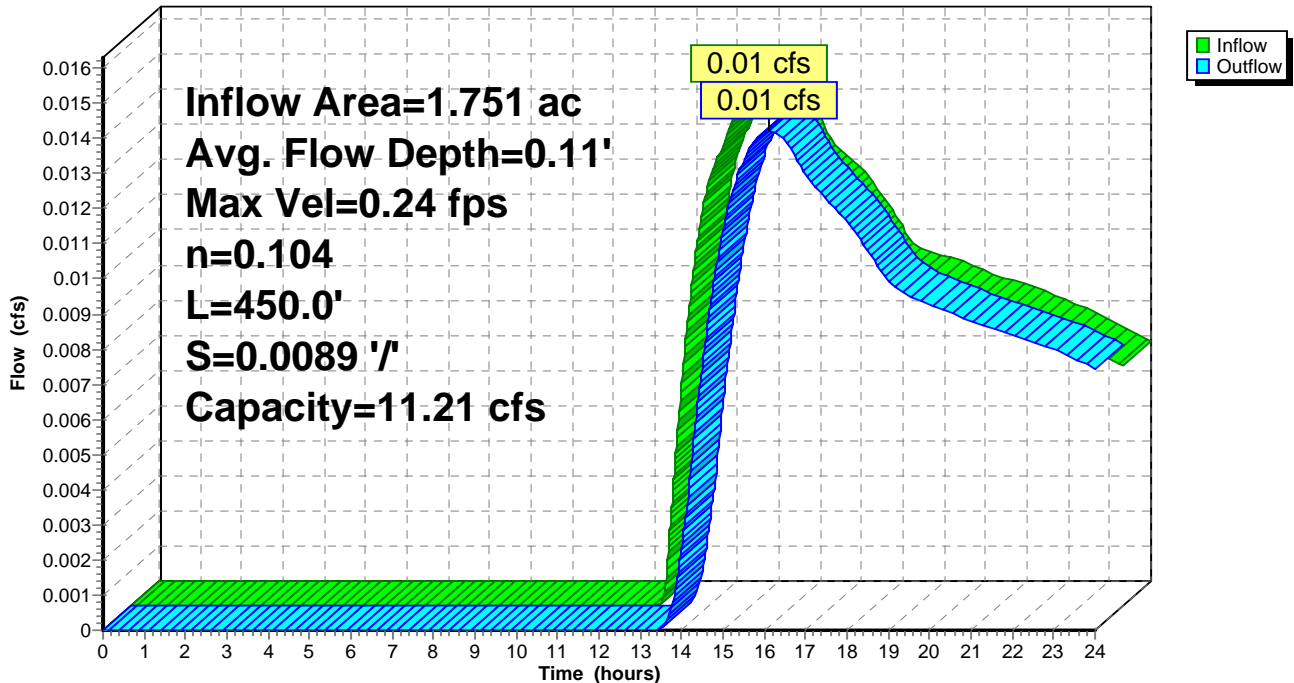
Peak Storage= 27 cf @ 15.59 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 0.78'
Bank-Full Depth= 3.00' Flow Area= 8.0 sf, Capacity= 11.21 cfs

4.00' x 3.00' deep Parabolic Channel, n= 0.104 Riprap, 6-inch
Length= 450.0' Slope= 0.0089 '/'
Inlet Invert= 124.00', Outlet Invert= 120.00'



Reach SE: Infiltration Trench

Hydrograph



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Type III 24-hr 2-yr Rainfall=3.24"

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Summary for Reach SN: Site North

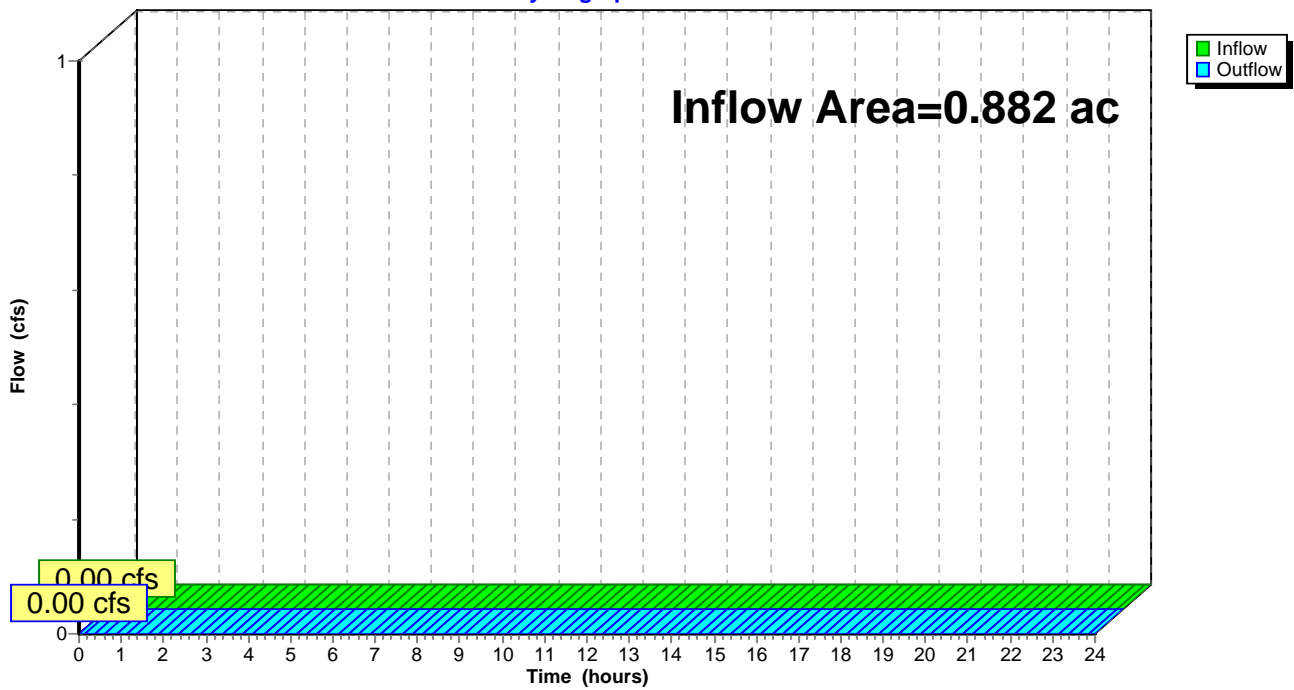
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.882 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 PRE: Prop. East

Runoff Area=76,262 sf 13.65% Impervious Runoff Depth>0.53"
Flow Length=107' Tc=18.1 min CN=46 Runoff=0.41 cfs 0.077 af

Subcatchment PRN: Prop.. North

Runoff Area=38,400 sf 0.00% Impervious Runoff Depth>0.05"
Flow Length=126' Tc=13.8 min CN=33 Runoff=0.01 cfs 0.004 af

Subcatchment PRW: Prop. West

Runoff Area=66,915 sf 0.00% Impervious Runoff Depth>0.19"
Flow Length=165' Tc=21.5 min CN=38 Runoff=0.04 cfs 0.024 af

Reach RW: Lilly Pond

Inflow=0.04 cfs 0.024 af
Outflow=0.04 cfs 0.024 af

Reach SE: Infiltration Trench

Avg. Flow Depth=0.52' Max Vel=0.58 fps Inflow=0.41 cfs 0.077 af
n=0.104 L=450.0' S=0.0089 '/' Capacity=11.21 cfs Outflow=0.34 cfs 0.075 af

Reach SN: Site North

Inflow=0.01 cfs 0.004 af
Outflow=0.01 cfs 0.004 af

Total Runoff Area = 4.168 ac Runoff Volume = 0.104 af Average Runoff Depth = 0.30"
94.27% Pervious = 3.930 ac 5.73% Impervious = 0.239 ac

8 Lilly Road - Prop

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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Subcatchment PRE: Prop. East

Runoff = 0.41 cfs @ 12.45 hrs, Volume= 0.077 af, Depth> 0.53"
 Routed to Reach SE : Infiltration Trench

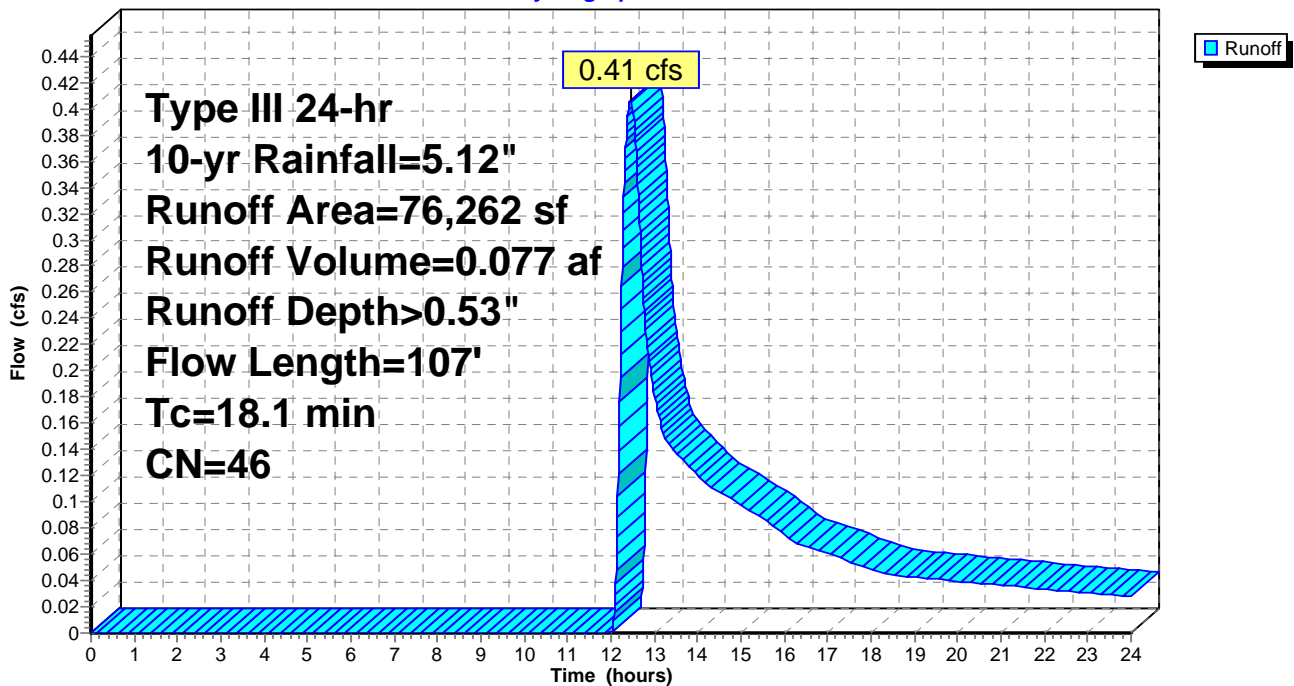
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr Rainfall=5.12"

Area (sf)	CN	Description
6,512	83	Paved roads w/open ditches, 50% imp, HSG A
24,300	32	Woods/grass comb., Good, HSG A
23,100	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
15,200	39	>75% Grass cover, Good, HSG A
76,262	46	Weighted Average
65,856		86.35% Pervious Area
10,406		13.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment PRE: Prop. East

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Subcatchment PRN: Prop.. North

Runoff = 0.01 cfs @ 15.78 hrs, Volume= 0.004 af, Depth> 0.05"
 Routed to Reach SN : Site North

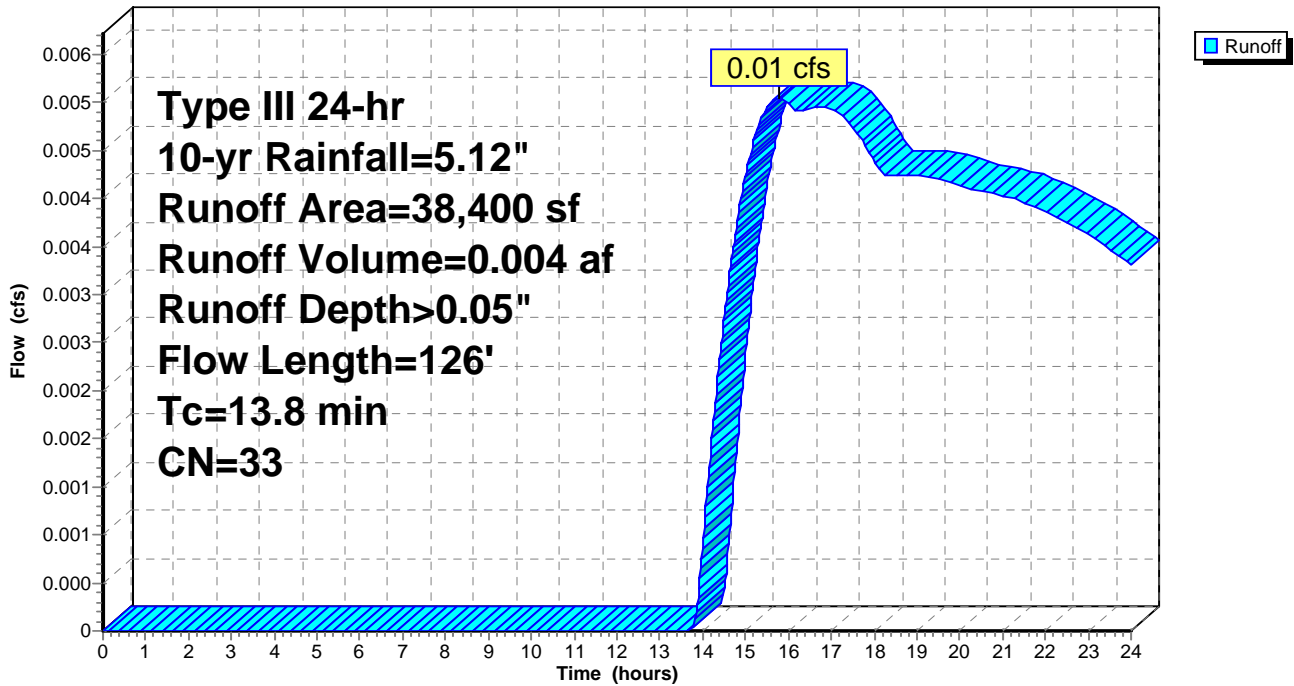
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr Rainfall=5.12"

Area (sf)	CN	Description
35,540	32	Woods/grass comb., Good, HSG A
2,860	39	>75% Grass cover, Good, HSG A
38,400	33	Weighted Average
38,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	50	0.2000	0.06		Sheet Flow, Flow North Grass: Dense n= 0.240 P2= 0.20"
0.7	76	0.1440	1.90		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
13.8	126	Total			

Subcatchment PRN: Prop.. North

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Subcatchment PRW: Prop. West

Runoff = 0.04 cfs @ 13.83 hrs, Volume= 0.024 af, Depth> 0.19"
 Routed to Reach RW : Lilly Pond

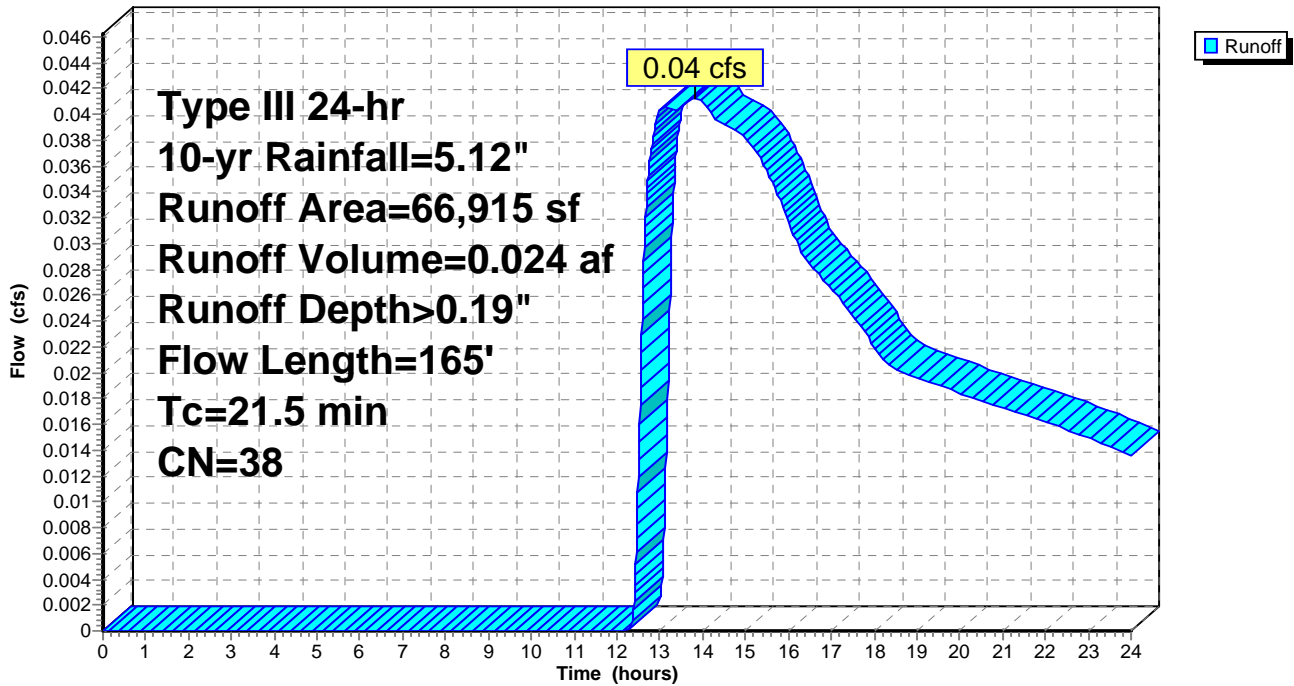
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-yr Rainfall=5.12"

Area (sf)	CN	Description
57,165	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
66,915	38	Weighted Average
66,915		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0267	0.04		Sheet Flow, Flow West toward Lilly Pond Grass: Short n= 0.150 P2= 0.20"
1.4	115	0.0700	1.32		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
21.5	165	Total			

Subcatchment PRW: Prop. West

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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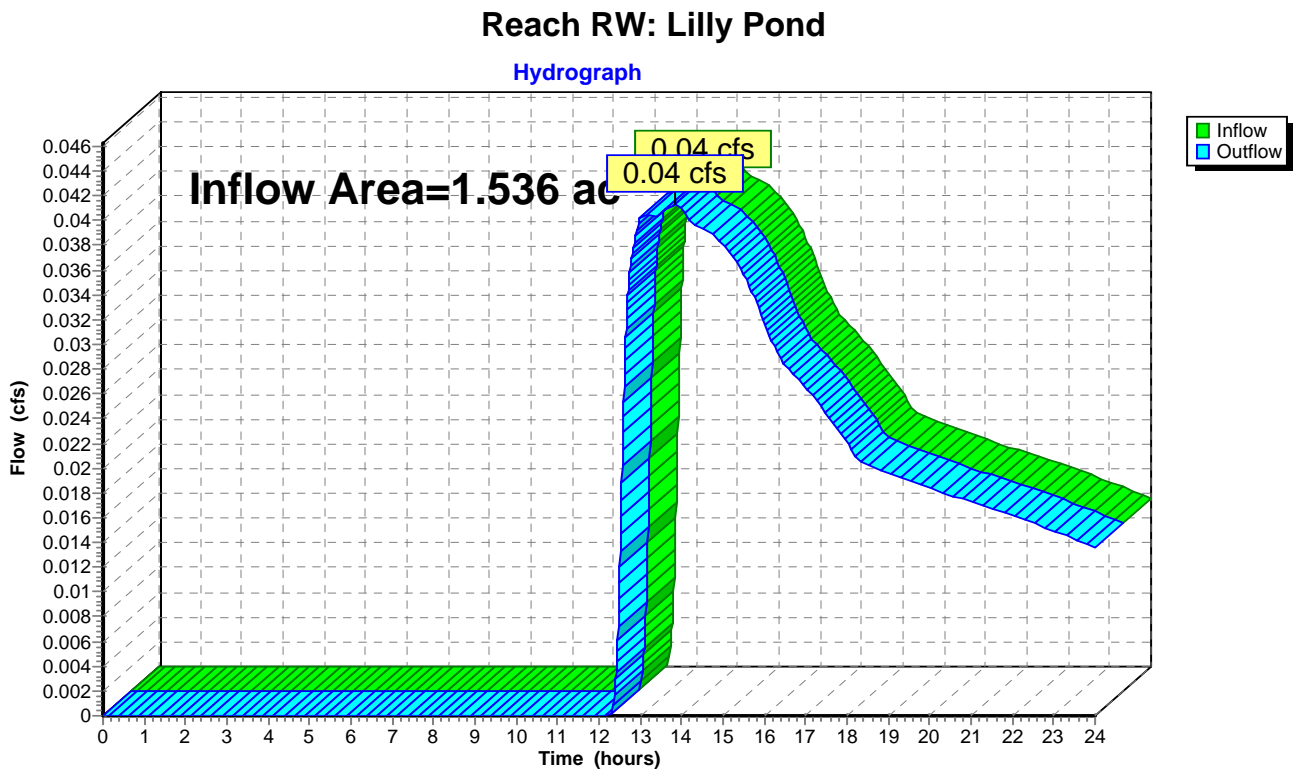
Page 17

Summary for Reach RW: Lilly Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.536 ac, 0.00% Impervious, Inflow Depth > 0.19" for 10-yr event
Inflow = 0.04 cfs @ 13.83 hrs, Volume= 0.024 af
Outflow = 0.04 cfs @ 13.83 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



8 Lilly Road - Prop

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Type III 24-hr 10-yr Rainfall=5.12"

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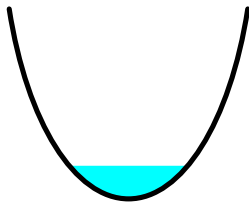
Summary for Reach SE: Infiltration Trench

Inflow Area = 1.751 ac, 13.65% Impervious, Inflow Depth > 0.53" for 10-yr event
Inflow = 0.41 cfs @ 12.45 hrs, Volume= 0.077 af
Outflow = 0.34 cfs @ 12.84 hrs, Volume= 0.075 af, Atten= 17%, Lag= 23.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.58 fps, Min. Travel Time= 12.9 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 20.6 min

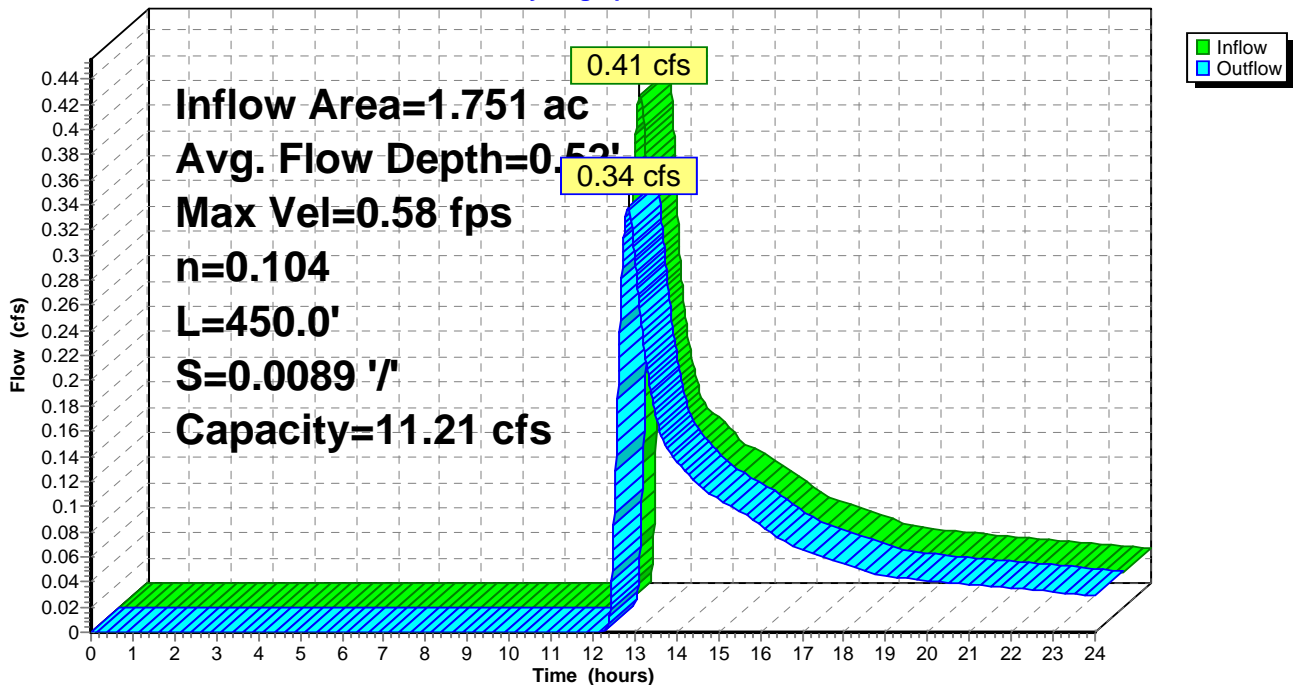
Peak Storage= 261 cf @ 12.62 hrs
Average Depth at Peak Storage= 0.52' , Surface Width= 1.67'
Bank-Full Depth= 3.00' Flow Area= 8.0 sf, Capacity= 11.21 cfs

4.00' x 3.00' deep Parabolic Channel, n= 0.104 Riprap, 6-inch
Length= 450.0' Slope= 0.0089 '/'
Inlet Invert= 124.00', Outlet Invert= 120.00'



Reach SE: Infiltration Trench

Hydrograph



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Type III 24-hr 10-yr Rainfall=5.12"

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Summary for Reach SN: Site North

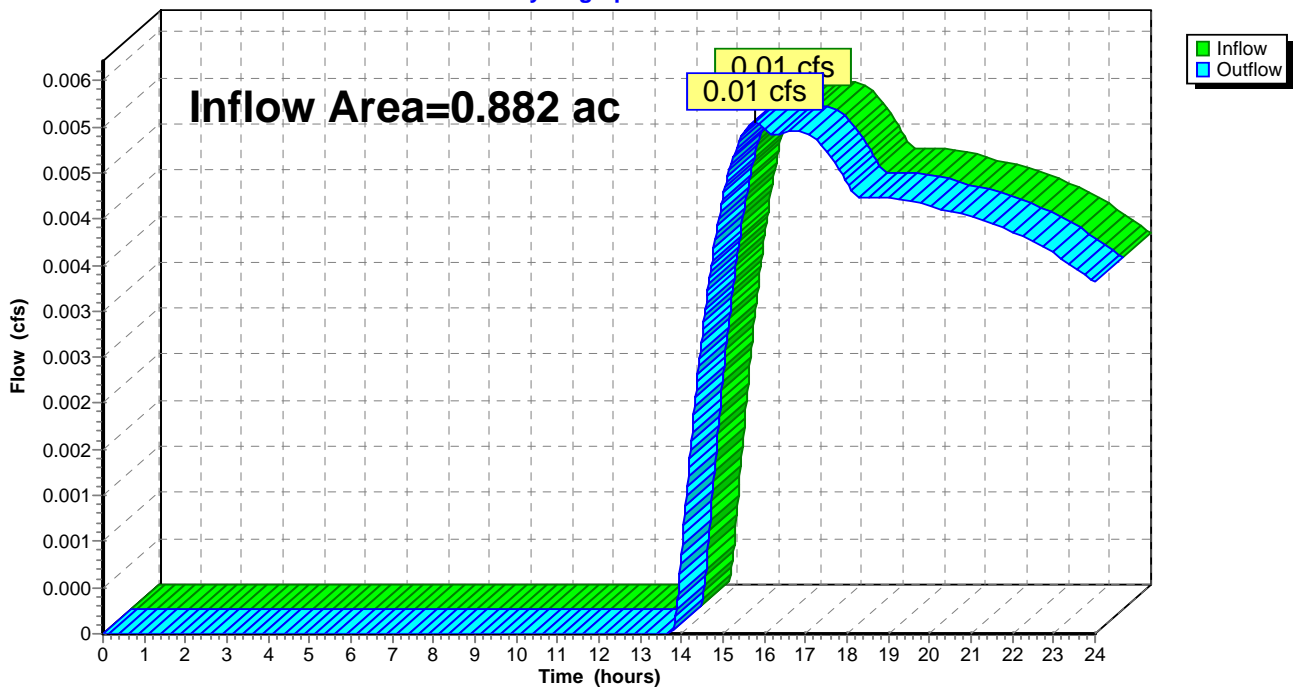
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.882 ac, 0.00% Impervious, Inflow Depth > 0.05" for 10-yr event
Inflow = 0.01 cfs @ 15.78 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 15.78 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 25-yr Rainfall=6.29"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 PRE: Prop. East

Runoff Area=76,262 sf 13.65% Impervious Runoff Depth>0.98"
Flow Length=107' Tc=18.1 min CN=46 Runoff=1.01 cfs 0.144 af

Subcatchment PRN: Prop.. North

Runoff Area=38,400 sf 0.00% Impervious Runoff Depth>0.22"
Flow Length=126' Tc=13.8 min CN=33 Runoff=0.03 cfs 0.016 af

Subcatchment PRW: Prop. West

Runoff Area=66,915 sf 0.00% Impervious Runoff Depth>0.47"
Flow Length=165' Tc=21.5 min CN=38 Runoff=0.24 cfs 0.060 af

Reach RW: Lilly Pond

Inflow=0.24 cfs 0.060 af
Outflow=0.24 cfs 0.060 af

Reach SE: Infiltration Trench

Avg. Flow Depth=0.83' Max Vel=0.75 fps Inflow=1.01 cfs 0.144 af
n=0.104 L=450.0' S=0.0089 '/ Capacity=11.21 cfs Outflow=0.87 cfs 0.142 af

Reach SN: Site North

Inflow=0.03 cfs 0.016 af
Outflow=0.03 cfs 0.016 af

Total Runoff Area = 4.168 ac Runoff Volume = 0.220 af Average Runoff Depth = 0.63"
94.27% Pervious = 3.930 ac 5.73% Impervious = 0.239 ac

8 Lilly Road - Prop

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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Subcatchment PRE: Prop. East

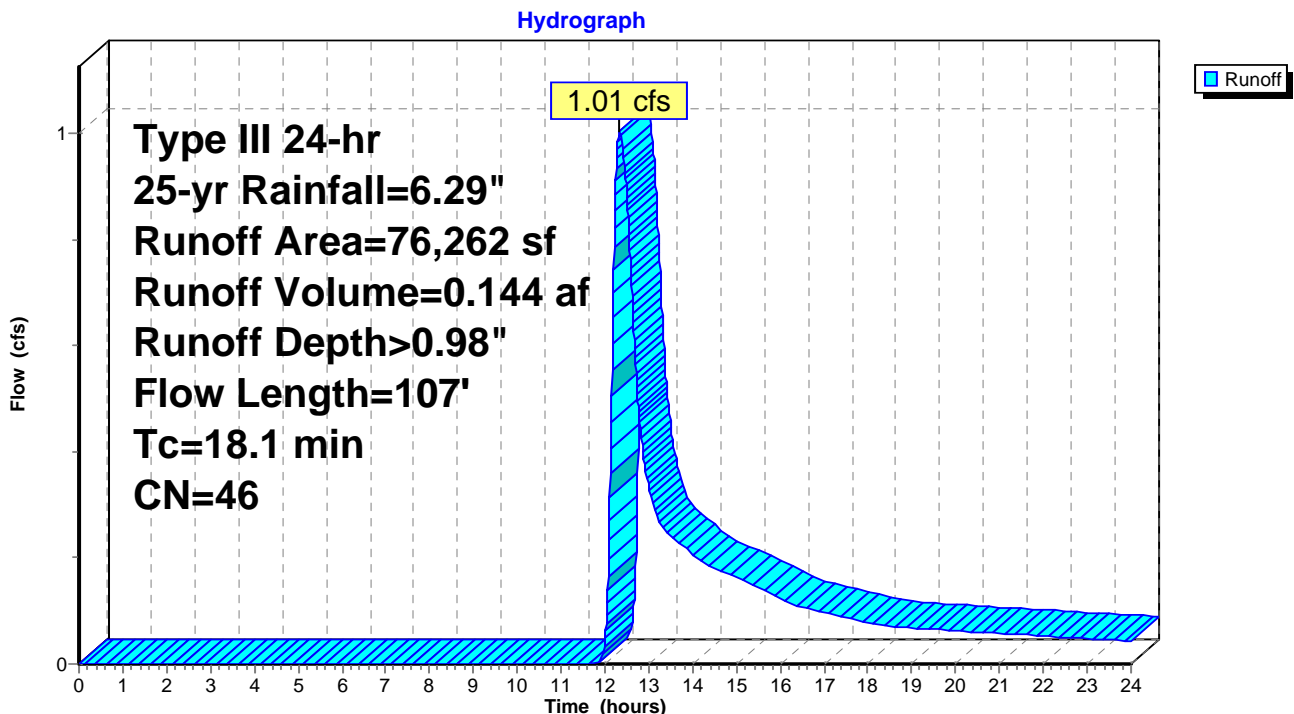
Runoff = 1.01 cfs @ 12.33 hrs, Volume= 0.144 af, Depth> 0.98"
 Routed to Reach SE : Infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
6,512	83	Paved roads w/open ditches, 50% imp, HSG A
24,300	32	Woods/grass comb., Good, HSG A
23,100	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
15,200	39	>75% Grass cover, Good, HSG A
76,262	46	Weighted Average
65,856		86.35% Pervious Area
10,406		13.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment PRE: Prop. East



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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Subcatchment PRN: Prop.. North

Runoff = 0.03 cfs @ 13.75 hrs, Volume= 0.016 af, Depth> 0.22"
 Routed to Reach SN : Site North

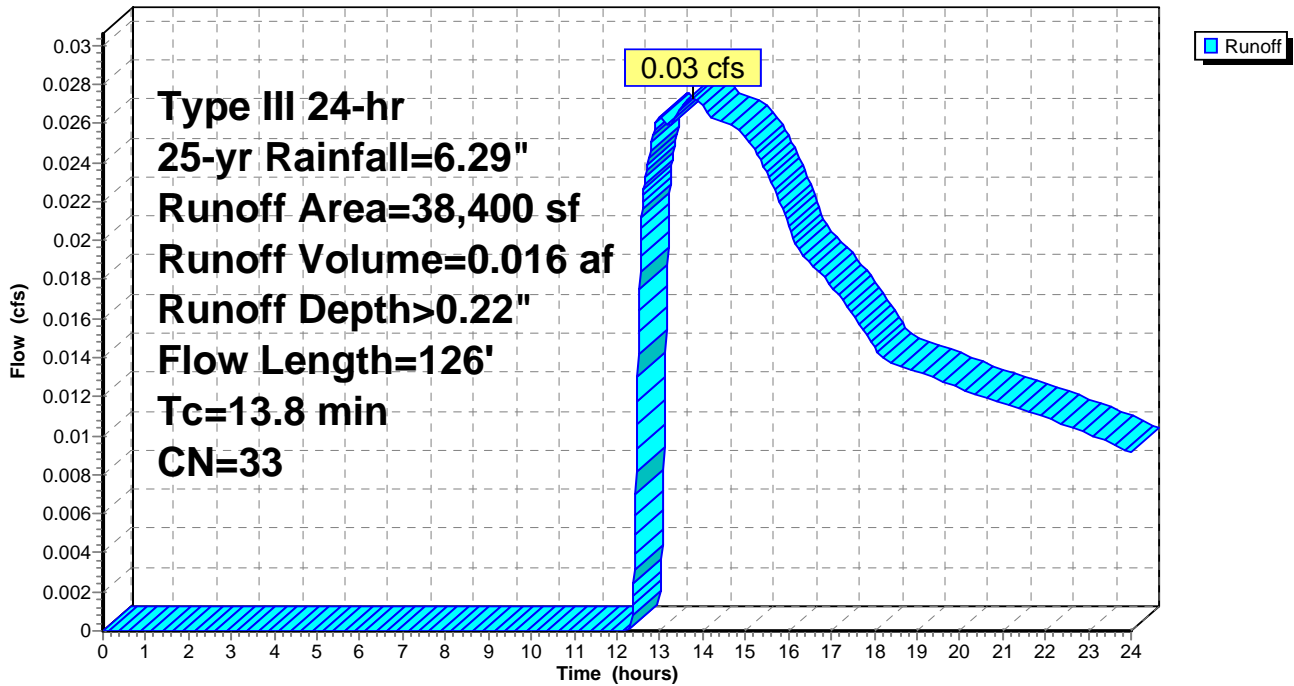
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
35,540	32	Woods/grass comb., Good, HSG A
2,860	39	>75% Grass cover, Good, HSG A
38,400	33	Weighted Average
38,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	50	0.2000	0.06		Sheet Flow, Flow North Grass: Dense n= 0.240 P2= 0.20"
0.7	76	0.1440	1.90		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
13.8	126	Total			

Subcatchment PRN: Prop.. North

Hydrograph



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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Subcatchment PRW: Prop. West

Runoff = 0.24 cfs @ 12.57 hrs, Volume= 0.060 af, Depth> 0.47"
 Routed to Reach RW : Lilly Pond

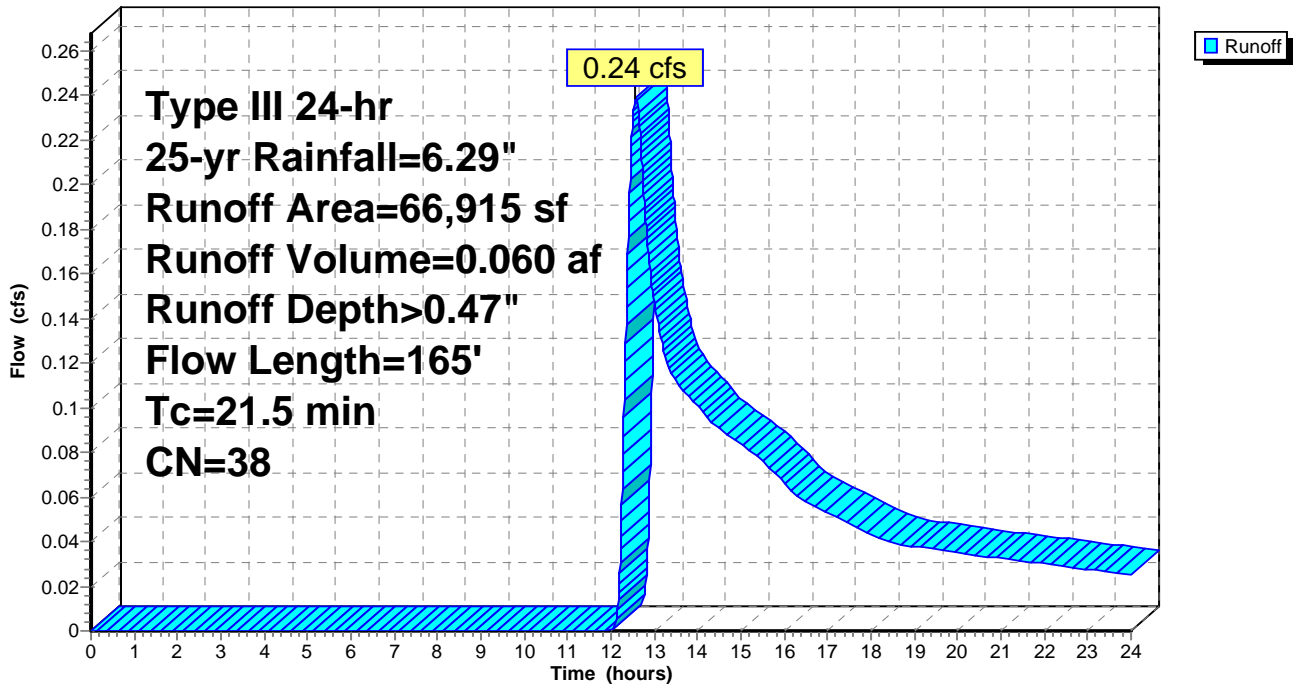
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
57,165	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
66,915	38	Weighted Average
66,915		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0267	0.04		Sheet Flow, Flow West toward Lilly Pond Grass: Short n= 0.150 P2= 0.20"
1.4	115	0.0700	1.32		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
21.5	165	Total			

Subcatchment PRW: Prop. West

Hydrograph



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Type III 24-hr 25-yr Rainfall=6.29"

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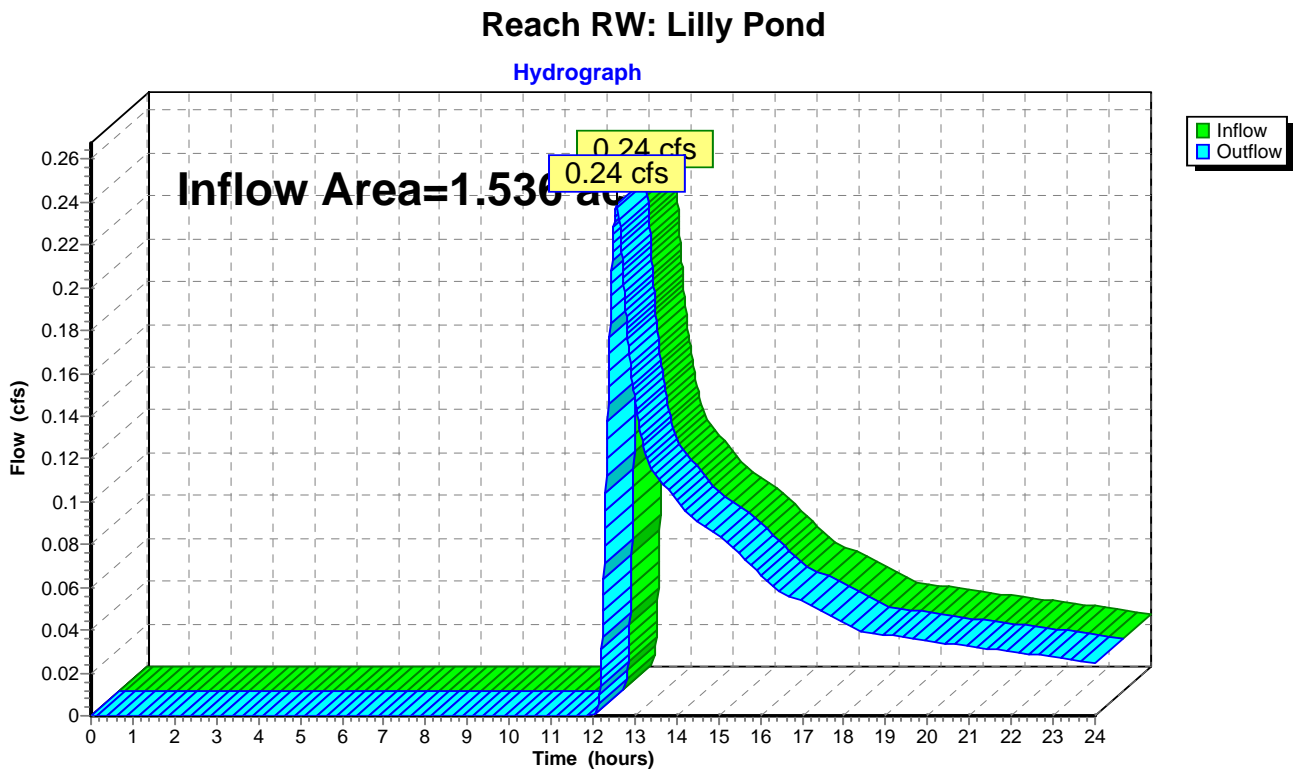
Page 24

Summary for Reach RW: Lilly Pond

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.536 ac, 0.00% Impervious, Inflow Depth > 0.47" for 25-yr event
Inflow = 0.24 cfs @ 12.57 hrs, Volume= 0.060 af
Outflow = 0.24 cfs @ 12.57 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



8 Lilly Road - Prop

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Type III 24-hr 25-yr Rainfall=6.29"

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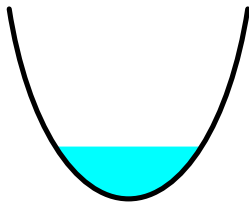
Summary for Reach SE: Infiltration Trench

Inflow Area = 1.751 ac, 13.65% Impervious, Inflow Depth > 0.98" for 25-yr event
Inflow = 1.01 cfs @ 12.33 hrs, Volume= 0.144 af
Outflow = 0.87 cfs @ 12.68 hrs, Volume= 0.142 af, Atten= 14%, Lag= 20.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.75 fps, Min. Travel Time= 10.0 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 17.7 min

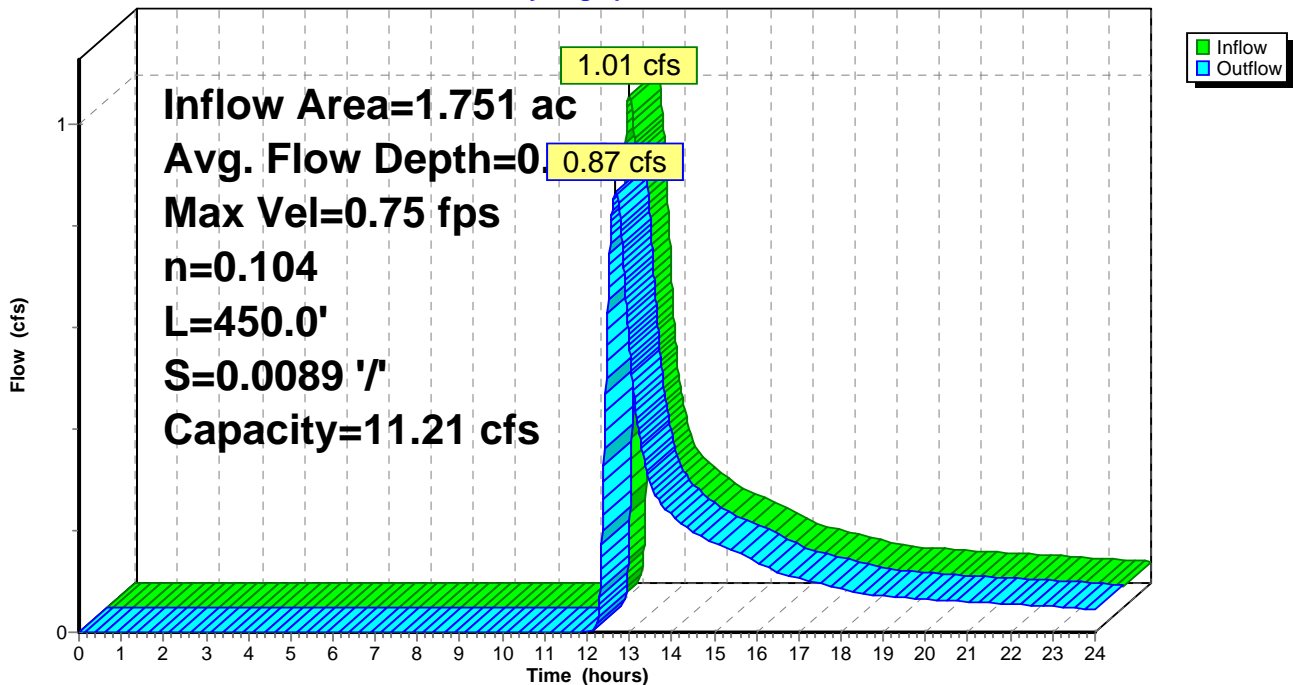
Peak Storage= 519 cf @ 12.51 hrs
Average Depth at Peak Storage= 0.83' , Surface Width= 2.10'
Bank-Full Depth= 3.00' Flow Area= 8.0 sf, Capacity= 11.21 cfs

4.00' x 3.00' deep Parabolic Channel, n= 0.104 Riprap, 6-inch
Length= 450.0' Slope= 0.0089 1/'
Inlet Invert= 124.00', Outlet Invert= 120.00'



Reach SE: Infiltration Trench

Hydrograph



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Type III 24-hr 25-yr Rainfall=6.29"

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Summary for Reach SN: Site North

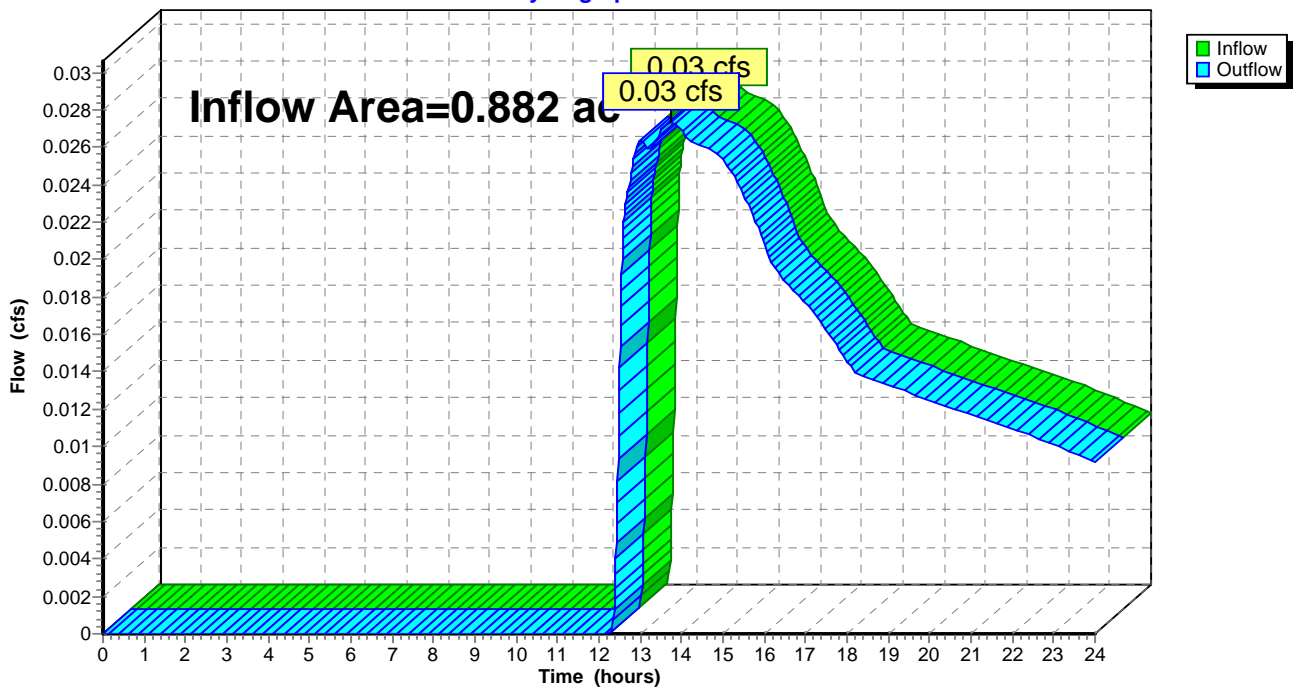
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.882 ac, 0.00% Impervious, Inflow Depth > 0.22" for 25-yr event
Inflow = 0.03 cfs @ 13.75 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 13.75 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 50-yr Rainfall=7.15"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 PRE: Prop. East

Runoff Area=76,262 sf 13.65% Impervious Runoff Depth>1.39"
Flow Length=107' Tc=18.1 min CN=46 Runoff=1.59 cfs 0.202 af

Subcatchment PRN: Prop.. North

Runoff Area=38,400 sf 0.00% Impervious Runoff Depth>0.40"
Flow Length=126' Tc=13.8 min CN=33 Runoff=0.10 cfs 0.030 af

Subcatchment PRW: Prop. West

Runoff Area=66,915 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=165' Tc=21.5 min CN=38 Runoff=0.49 cfs 0.095 af

Reach RW: Lilly Pond

Inflow=0.49 cfs 0.095 af
Outflow=0.49 cfs 0.095 af

Reach SE: Infiltration Trench

Avg. Flow Depth=1.04' Max Vel=0.85 fps Inflow=1.59 cfs 0.202 af
n=0.104 L=450.0' S=0.0089 '/' Capacity=11.21 cfs Outflow=1.38 cfs 0.200 af

Reach SN: Site North

Inflow=0.10 cfs 0.030 af
Outflow=0.10 cfs 0.030 af

Total Runoff Area = 4.168 ac Runoff Volume = 0.327 af Average Runoff Depth = 0.94"
94.27% Pervious = 3.930 ac 5.73% Impervious = 0.239 ac

8 Lilly Road - Prop

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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Subcatchment PRE: Prop. East

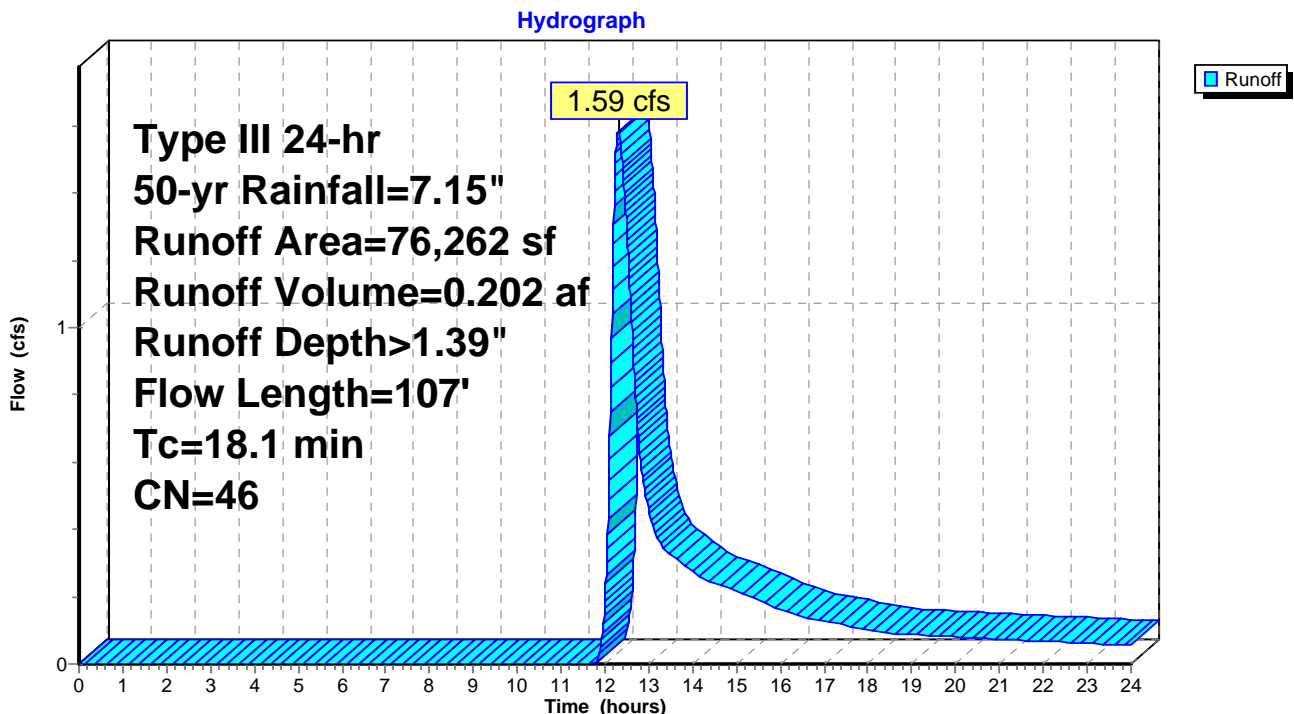
Runoff = 1.59 cfs @ 12.30 hrs, Volume= 0.202 af, Depth> 1.39"
 Routed to Reach SE : Infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-yr Rainfall=7.15"

Area (sf)	CN	Description
6,512	83	Paved roads w/open ditches, 50% imp, HSG A
24,300	32	Woods/grass comb., Good, HSG A
23,100	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
15,200	39	>75% Grass cover, Good, HSG A
76,262	46	Weighted Average
65,856		86.35% Pervious Area
10,406		13.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment PRE: Prop. East



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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Subcatchment PRN: Prop.. North

Runoff = 0.10 cfs @ 12.52 hrs, Volume= 0.030 af, Depth> 0.40"
 Routed to Reach SN : Site North

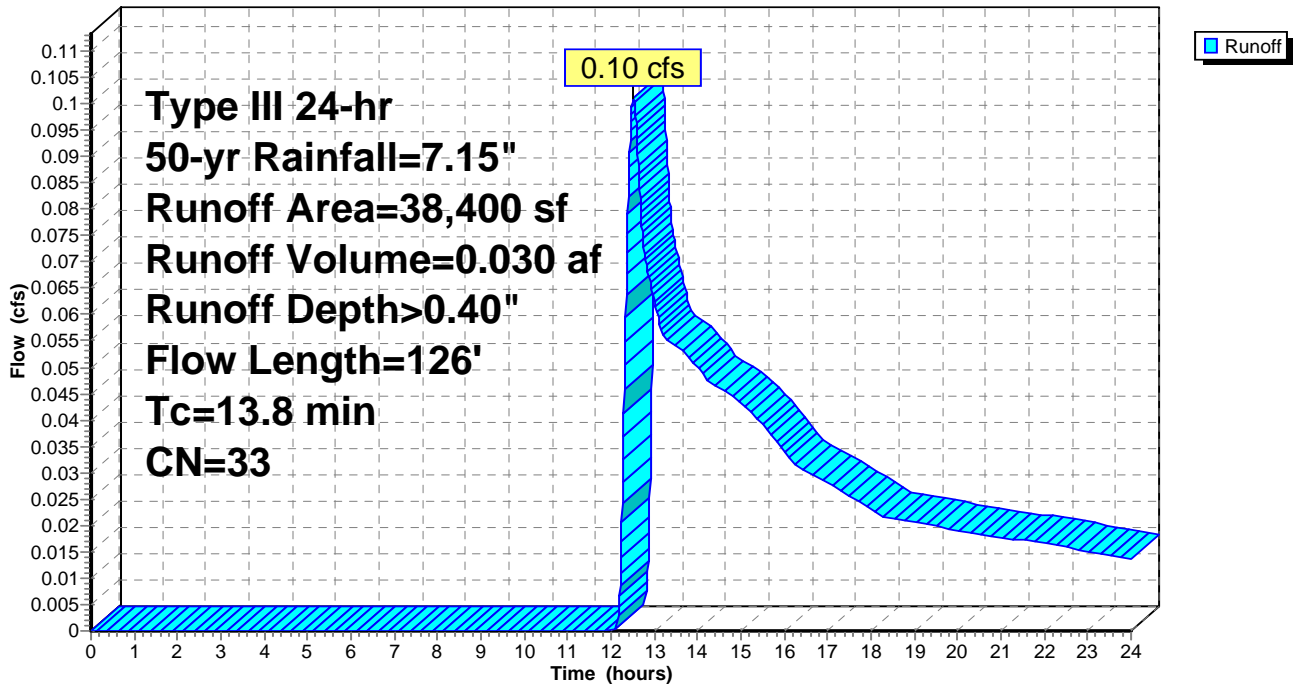
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-yr Rainfall=7.15"

Area (sf)	CN	Description
35,540	32	Woods/grass comb., Good, HSG A
2,860	39	>75% Grass cover, Good, HSG A
38,400	33	Weighted Average
38,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	50	0.2000	0.06		Sheet Flow, Flow North Grass: Dense n= 0.240 P2= 0.20"
0.7	76	0.1440	1.90		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
13.8	126	Total			

Subcatchment PRN: Prop.. North

Hydrograph



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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Subcatchment PRW: Prop. West

Runoff = 0.49 cfs @ 12.50 hrs, Volume= 0.095 af, Depth> 0.74"

Routed to Reach RW : Lilly Pond

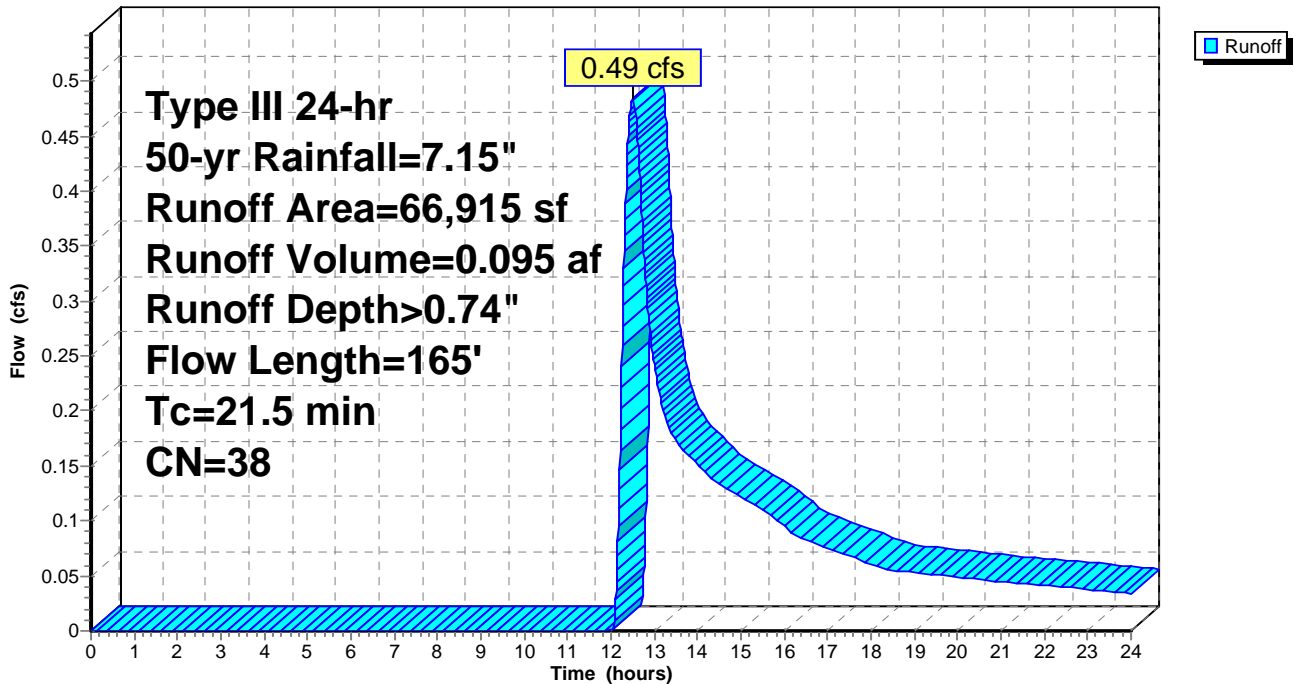
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=7.15"

Area (sf)	CN	Description
57,165	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
66,915	38	Weighted Average
66,915		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0267	0.04		Sheet Flow, Flow West toward Lilly Pont Grass: Short n= 0.150 P2= 0.20"
1.4	115	0.0700	1.32		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
21.5	165	Total			

Subcatchment PRW: Prop. West

Hydrograph



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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Reach RW: Lilly Pond

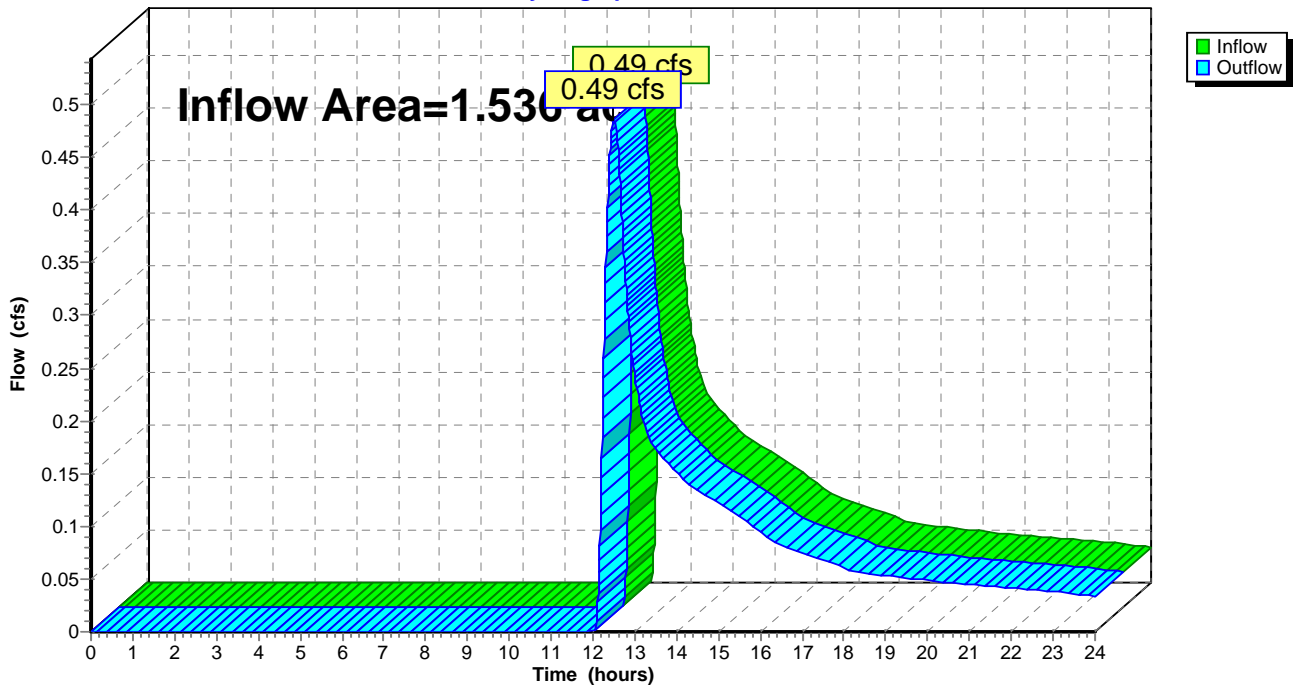
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.536 ac, 0.00% Impervious, Inflow Depth > 0.74" for 50-yr event
Inflow = 0.49 cfs @ 12.50 hrs, Volume= 0.095 af
Outflow = 0.49 cfs @ 12.50 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



8 Lilly Road - Prop

Prepared by Merrimack Engineering

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Type III 24-hr 50-yr Rainfall=7.15"

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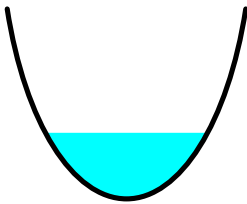
Summary for Reach SE: Infiltration Trench

Inflow Area = 1.751 ac, 13.65% Impervious, Inflow Depth > 1.39" for 50-yr event
Inflow = 1.59 cfs @ 12.30 hrs, Volume= 0.202 af
Outflow = 1.38 cfs @ 12.60 hrs, Volume= 0.200 af, Atten= 13%, Lag= 17.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.85 fps, Min. Travel Time= 8.9 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 16.4 min

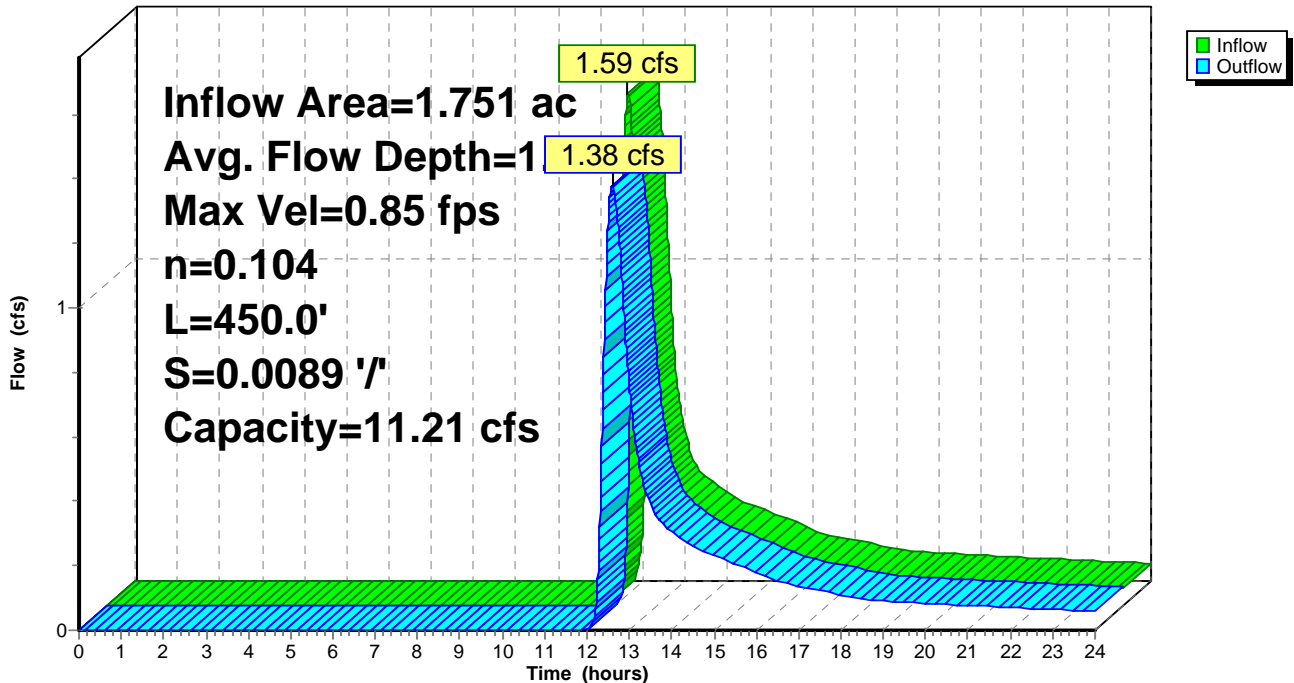
Peak Storage= 735 cf @ 12.45 hrs
Average Depth at Peak Storage= 1.04' , Surface Width= 2.35'
Bank-Full Depth= 3.00' Flow Area= 8.0 sf, Capacity= 11.21 cfs

4.00' x 3.00' deep Parabolic Channel, n= 0.104 Riprap, 6-inch
Length= 450.0' Slope= 0.0089 '/'
Inlet Invert= 124.00', Outlet Invert= 120.00'



Reach SE: Infiltration Trench

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 50-yr Rainfall=7.15"

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Summary for Reach SN: Site North

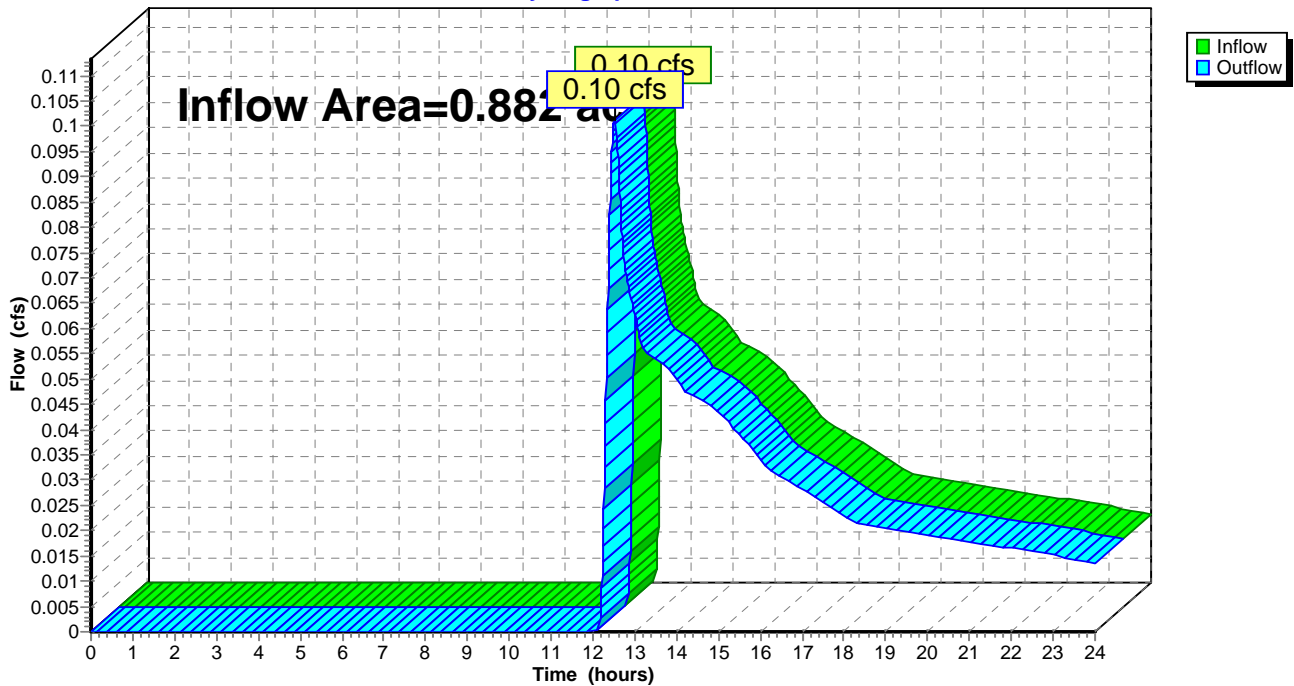
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.882 ac, 0.00% Impervious, Inflow Depth > 0.40" for 50-yr event
Inflow = 0.10 cfs @ 12.52 hrs, Volume= 0.030 af
Outflow = 0.10 cfs @ 12.52 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 PRE: Prop. East

Runoff Area=76,262 sf 13.65% Impervious Runoff Depth>1.88"
Flow Length=107' Tc=18.1 min CN=46 Runoff=2.33 cfs 0.274 af

Subcatchment PRN: Prop.. North

Runoff Area=38,400 sf 0.00% Impervious Runoff Depth>0.67"
Flow Length=126' Tc=13.8 min CN=33 Runoff=0.23 cfs 0.049 af

Subcatchment PRW: Prop. West

Runoff Area=66,915 sf 0.00% Impervious Runoff Depth>1.10"
Flow Length=165' Tc=21.5 min CN=38 Runoff=0.85 cfs 0.140 af

Reach RW: Lilly Pond

Inflow=0.85 cfs 0.140 af
Outflow=0.85 cfs 0.140 af

Reach SE: Infiltration Trench

Avg. Flow Depth=1.27' Max Vel=0.94 fps Inflow=2.33 cfs 0.274 af
n=0.104 L=450.0' S=0.0089 '/' Capacity=11.21 cfs Outflow=2.05 cfs 0.272 af

Reach SN: Site North

Inflow=0.23 cfs 0.049 af
Outflow=0.23 cfs 0.049 af

Total Runoff Area = 4.168 ac Runoff Volume = 0.464 af Average Runoff Depth = 1.33"
94.27% Pervious = 3.930 ac 5.73% Impervious = 0.239 ac

8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Subcatchment PRE: Prop. East

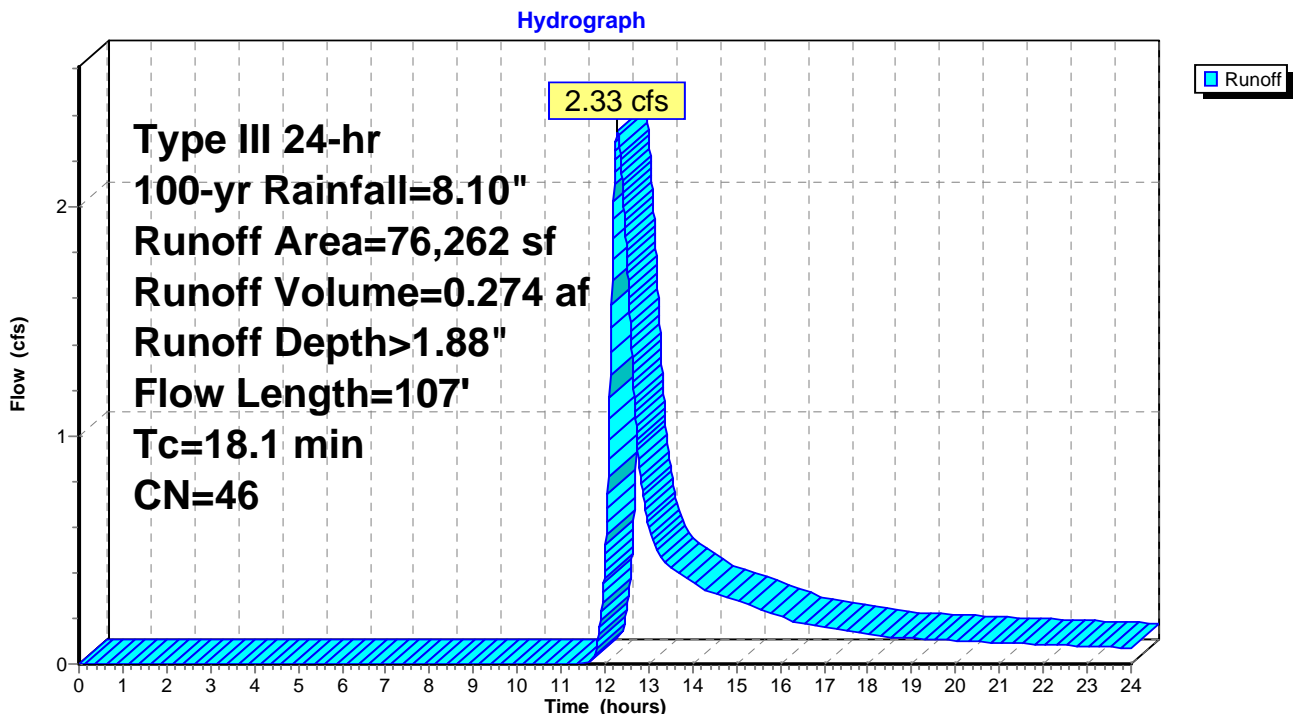
Runoff = 2.33 cfs @ 12.29 hrs, Volume= 0.274 af, Depth> 1.88"
 Routed to Reach SE : Infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr Rainfall=8.10"

Area (sf)	CN	Description
6,512	83	Paved roads w/open ditches, 50% imp, HSG A
24,300	32	Woods/grass comb., Good, HSG A
23,100	39	>75% Grass cover, Good, HSG A
* 7,150	98	Shed & Tennis Court
15,200	39	>75% Grass cover, Good, HSG A
76,262	46	Weighted Average
65,856		86.35% Pervious Area
10,406		13.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	50	0.2600	0.05		Sheet Flow, Floe South-East Woods: Light underbrush n= 0.400 P2= 0.20"
0.4	57	0.2500	2.50		Shallow Concentrated Flow, Flow South-East Woodland Kv= 5.0 fps
18.1	107	Total			

Subcatchment PRE: Prop. East



8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Subcatchment PRN: Prop.. North

Runoff = 0.23 cfs @ 12.44 hrs, Volume= 0.049 af, Depth> 0.67"
 Routed to Reach SN : Site North

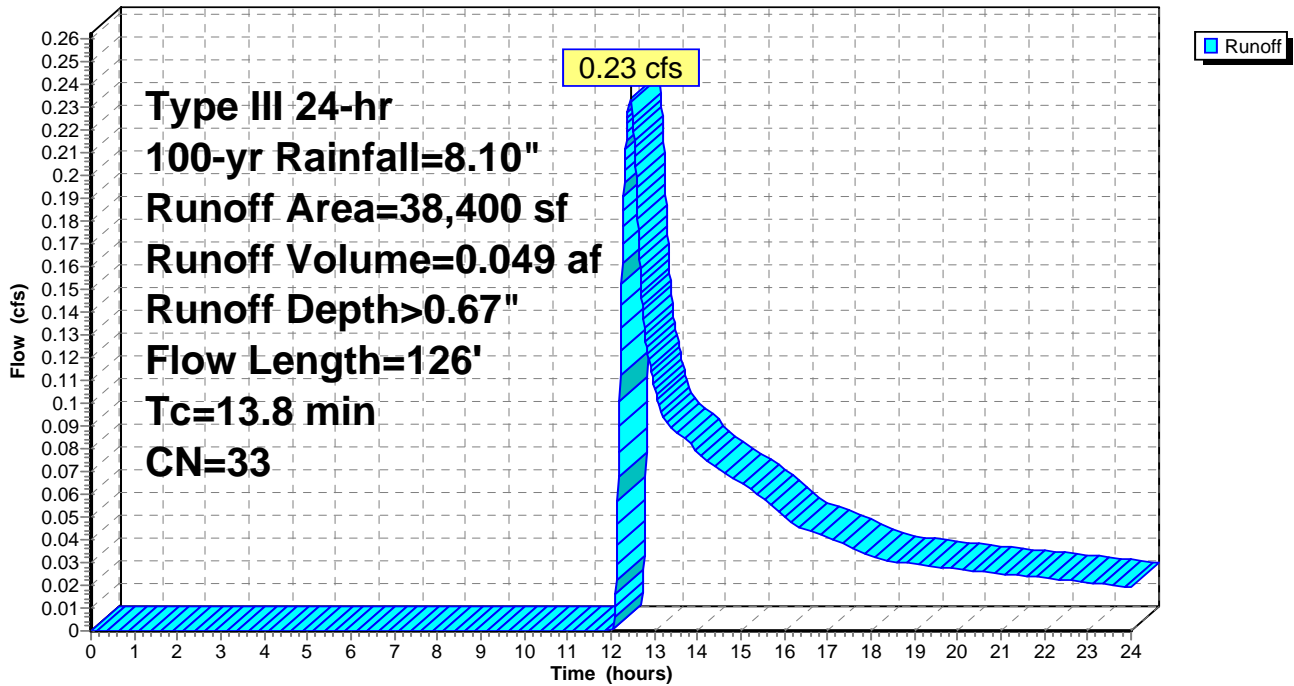
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr Rainfall=8.10"

Area (sf)	CN	Description
35,540	32	Woods/grass comb., Good, HSG A
2,860	39	>75% Grass cover, Good, HSG A
38,400	33	Weighted Average
38,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	50	0.2000	0.06		Sheet Flow, Flow North Grass: Dense n= 0.240 P2= 0.20"
0.7	76	0.1440	1.90		Shallow Concentrated Flow, Flow North Woodland Kv= 5.0 fps
13.8	126	Total			

Subcatchment PRN: Prop.. North

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Subcatchment PRW: Prop. West

Runoff = 0.85 cfs @ 12.43 hrs, Volume= 0.140 af, Depth> 1.10"
 Routed to Reach RW : Lilly Pond

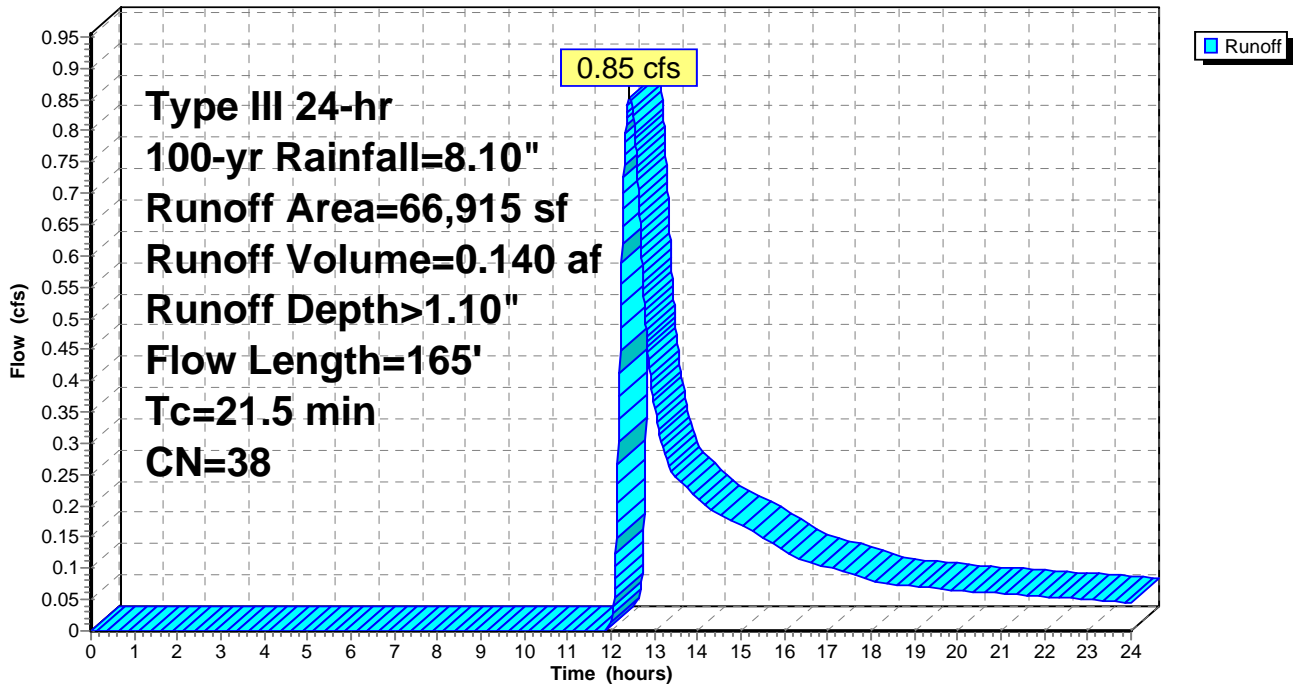
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-yr Rainfall=8.10"

Area (sf)	CN	Description
57,165	32	Woods/grass comb., Good, HSG A
9,750	76	Gravel roads, HSG A
66,915	38	Weighted Average
66,915		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.1	50	0.0267	0.04		Sheet Flow, Flow West toward Lilly Pond Grass: Short n= 0.150 P2= 0.20"
1.4	115	0.0700	1.32		Shallow Concentrated Flow, Flow west toward Lilly Pond Woodland Kv= 5.0 fps
21.5	165	Total			

Subcatchment PRW: Prop. West

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Reach RW: Lilly Pond

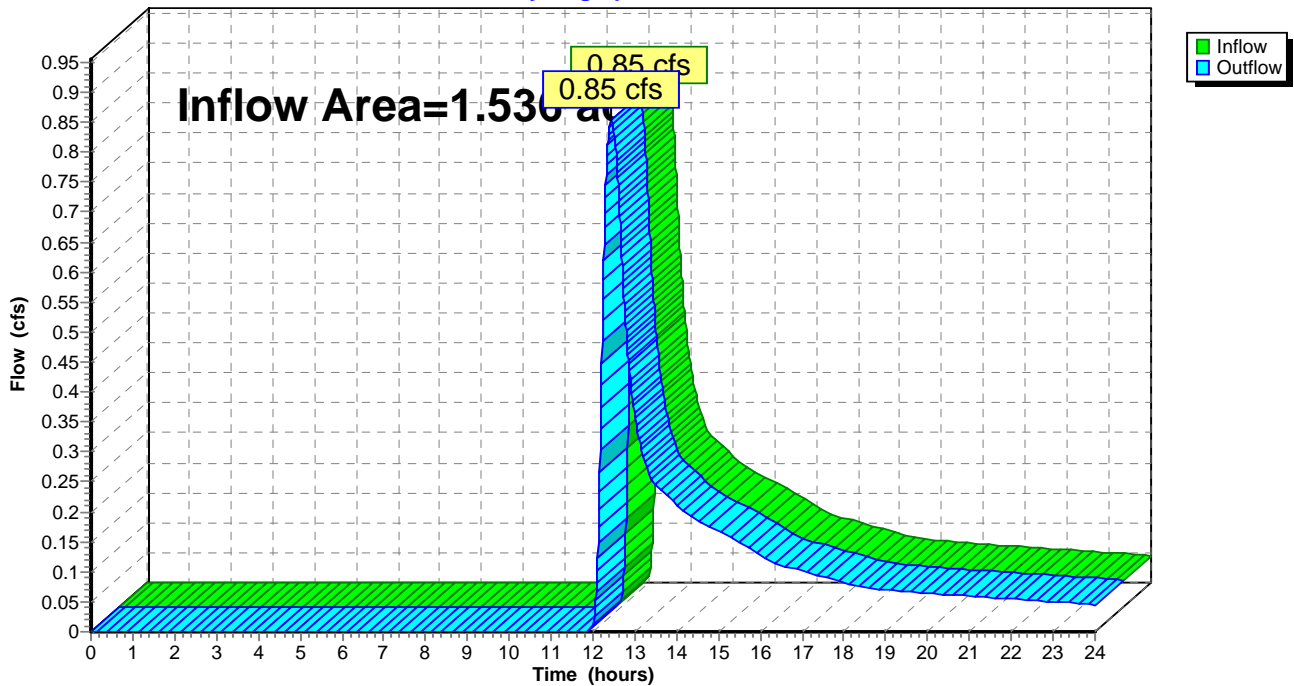
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.536 ac, 0.00% Impervious, Inflow Depth > 1.10" for 100-yr event
Inflow = 0.85 cfs @ 12.43 hrs, Volume= 0.140 af
Outflow = 0.85 cfs @ 12.43 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach RW: Lilly Pond

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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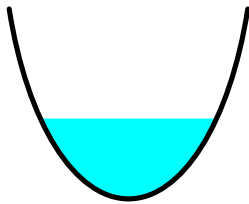
Summary for Reach SE: Infiltration Trench

Inflow Area = 1.751 ac, 13.65% Impervious, Inflow Depth > 1.88" for 100-yr event
Inflow = 2.33 cfs @ 12.29 hrs, Volume= 0.274 af
Outflow = 2.05 cfs @ 12.55 hrs, Volume= 0.272 af, Atten= 12%, Lag= 15.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.94 fps, Min. Travel Time= 8.0 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 15.3 min

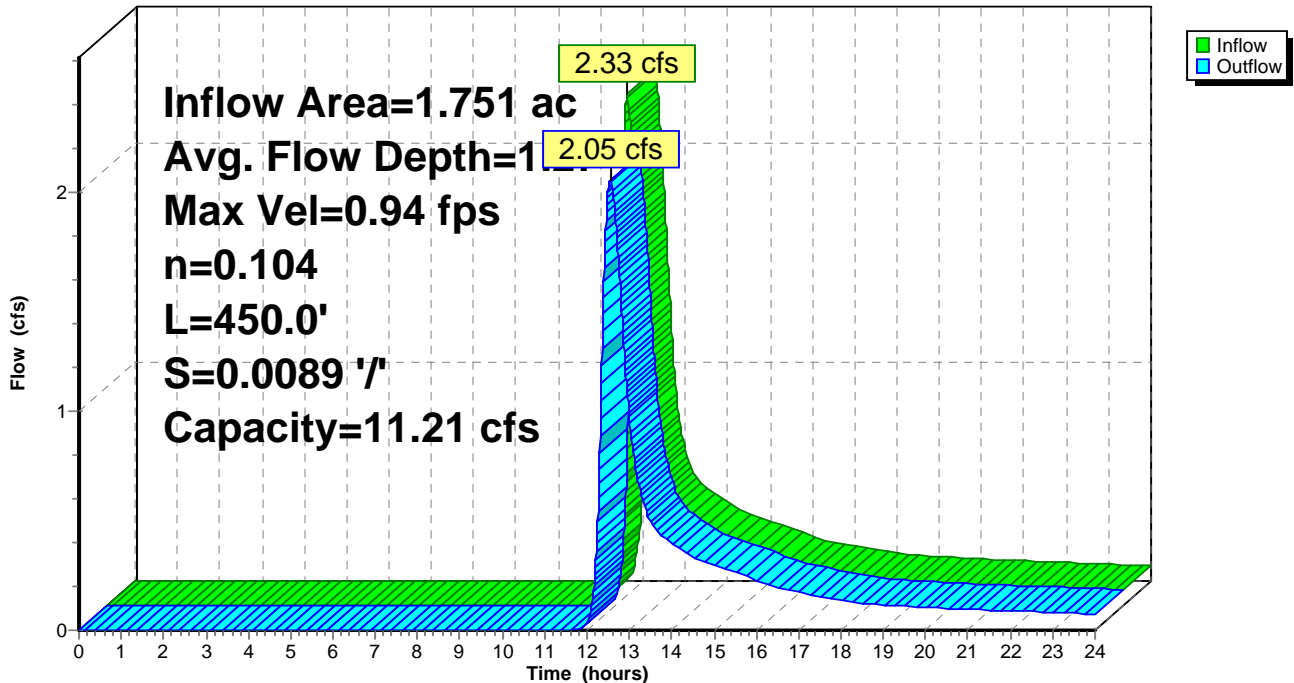
Peak Storage= 988 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.27' , Surface Width= 2.60'
Bank-Full Depth= 3.00' Flow Area= 8.0 sf, Capacity= 11.21 cfs

4.00' x 3.00' deep Parabolic Channel, n= 0.104 Riprap, 6-inch
Length= 450.0' Slope= 0.0089 1/'
Inlet Invert= 124.00', Outlet Invert= 120.00'



Reach SE: Infiltration Trench

Hydrograph



8 Lilly Road - Prop

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Type III 24-hr 100-yr Rainfall=8.10"

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Summary for Reach SN: Site North

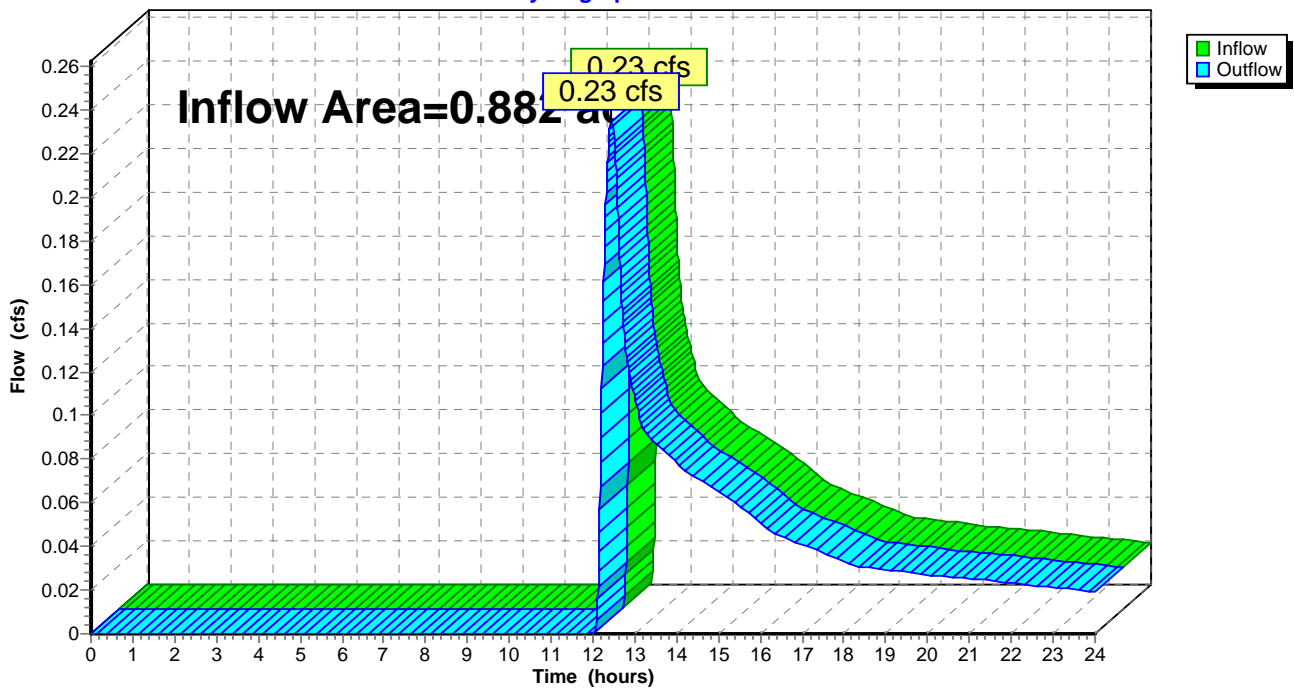
[40] Hint: Not Described (Outflow=Inflow)

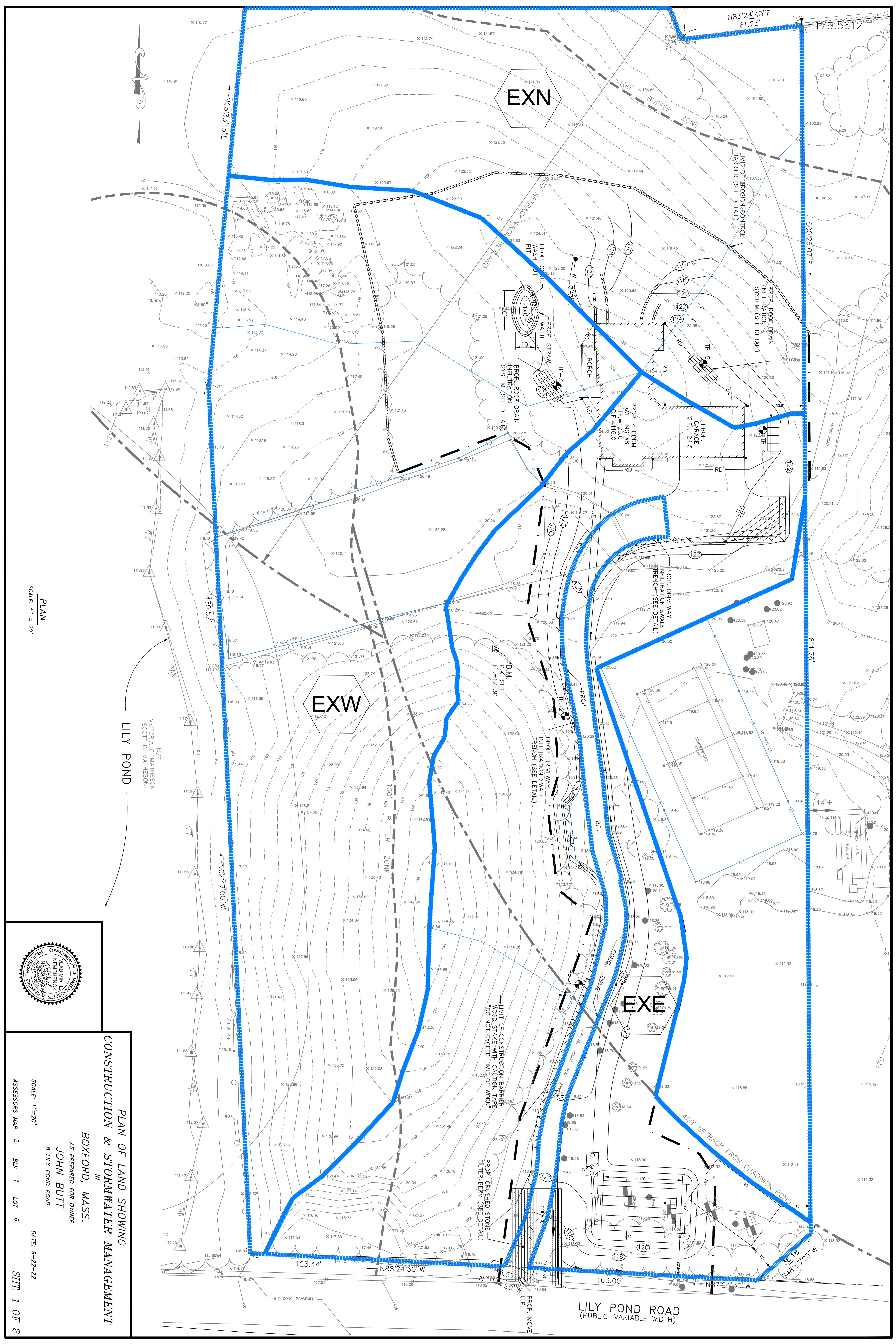
Inflow Area = 0.882 ac, 0.00% Impervious, Inflow Depth > 0.67" for 100-yr event
Inflow = 0.23 cfs @ 12.44 hrs, Volume= 0.049 af
Outflow = 0.23 cfs @ 12.44 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach SN: Site North

Hydrograph





EXN

EXW

EXE

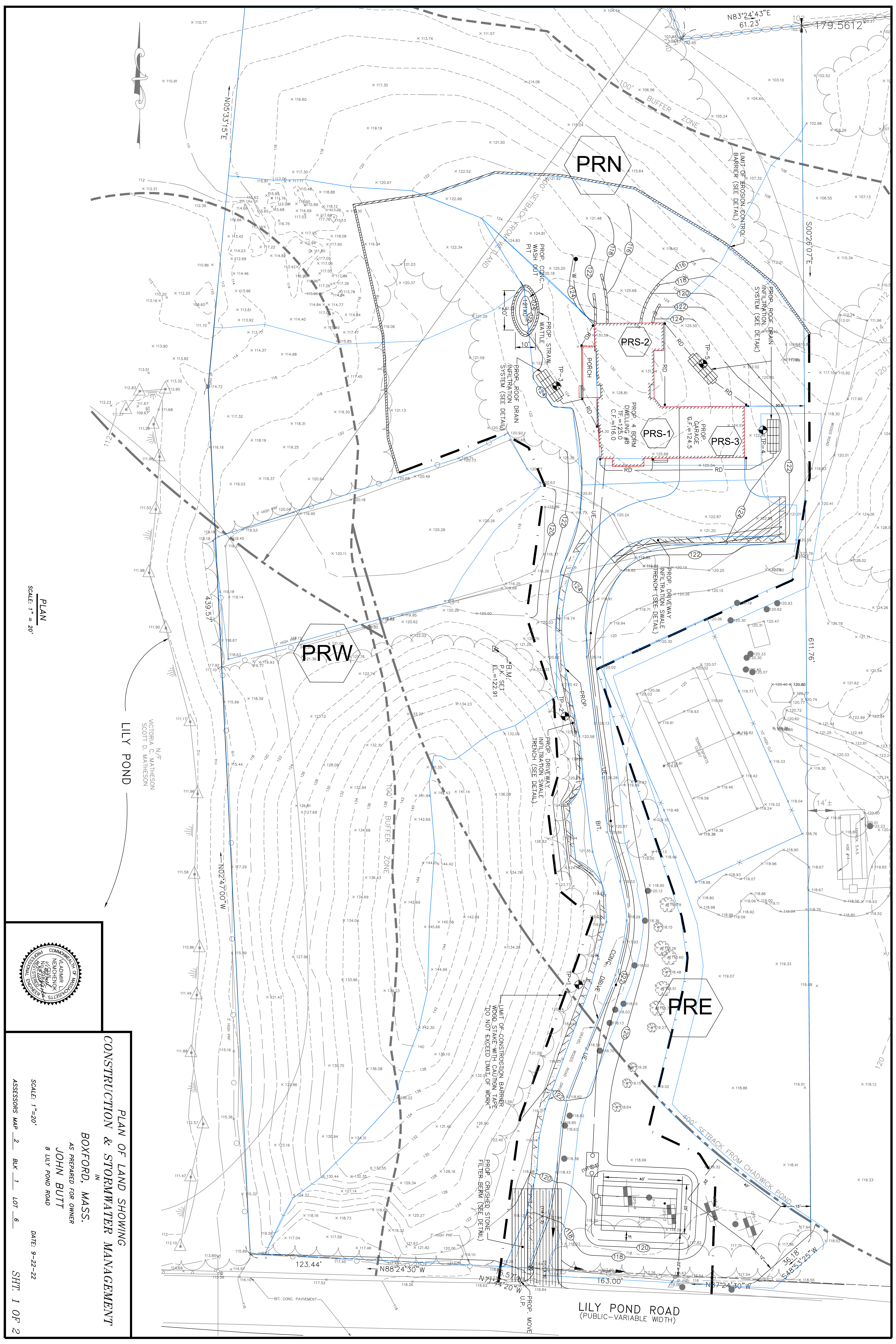
PLAN
SCALE: 1" = 20'



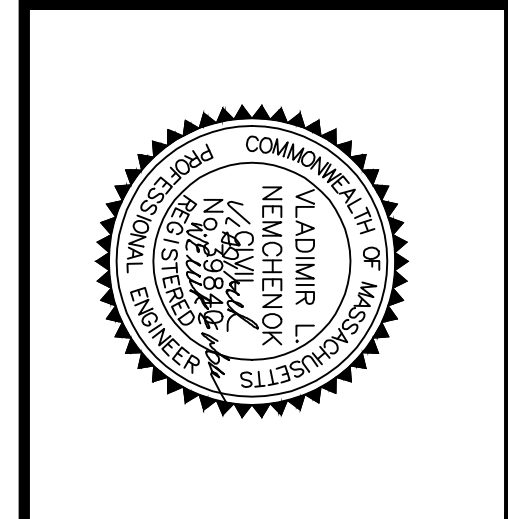
**PLAN OF LAND SHOWING
CONSTRUCTION & STORMWATER MANAGEMENT**

BOXFORD, MASS.
AS PREPARED FOR OWNER
JOHN BUTT
8 LILY POND ROAD
DATE: 9-22-22
ASSESSORS MAP 2 BLK 1 LOT 6
SHT. 1 OF 2

LILY POND ROAD
(PUBLIC-VARIABLE WIDTH)



PLAN
SCALE: 1" = 20'



**PLAN OF LAND SHOWING
CONSTRUCTION & STORMWATER MANAGEMENT**
IN
BOXFORD, MASS.
AS PREPARED FOR OWNER
JOHN BUTT
8 LILY POND ROAD

SCALE: 1" = 20'
ASSESSORS MAP 2 BLK 1 LOT 6
DATE: 9-22-22
SHT. 1 OF 2