DRAINAGE SUMMARY

PROPOSED CONDOMINIUM DEVELOPMENT
120 NORWOOD AVE
NEWTON, MASSACHUSETTS

July 29, 2022

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DRAINAGE SUMMARY
PROPOSED CONDOMINIUM DEVELOPMENT
120 NORWOOD AVE
NEWTON, MASSACHUSETTS

The proposed project consists of the demolition of an existing multi-family residential dwelling, and the construction of a 4-unit condominium development including new driveways at 120 Norwood Ave in Newton, MA, under the requirements of the City of Newton Stormwater Management and Erosion Control Rules & Regulations.

The on-site soils in the area are shown as "626B – Merrimac-Urban land complex, 0 to 8 percent slopes" soils on the NRCS Soils Survey map of the area, which are areas that fall within Hydrological Soil Groups of A & D. To confirm soil conditions, VTP performed three (3) test pits onsite on February 17, 2022 and found the parent material to be sand and gravel. For purposes of our design, VTP has used A soils with an infiltration rate of 8.27 in/hr in accordance with Table 2.3.3. 1982 Rawles Rates from the Massachusetts Stormwater Handbook.

Ground cover on the site is a dense residential grass area, buildings, and bituminous concrete walkways and driveway. The existing drainage on the site flows overland from to a lowpoint in the northeast corner of the property. Overall, the site will maintain the current flow pattern, however new collection systems for the proposed impervious areas have been provided to collect the runoff and attenuate offsite flows.

There are no wetlands or other Resource Areas within 100 feet of the lot. The proposed drainage controls are designed to capture & contain the runoff from the proposed impervious areas. This system will store the runoff from the new impervious area and allow the stored water to slowly infiltrate after the storm event and overflow offsite.

Under the proposed conditions, with the new building and driveways the rate of site runoff from the re-developed lot area will be less than the existing conditions for the 2, 10, 25 & 100-year storm events. The proposed controls have been designed to store this increase to maintain the pre and post runoff rates.

COMPLIANCE WITH STORMWATER STANDARDS

Untreated Stormwater (Standard 1)

The project is designed so that new stormwater conveyances (outfalls/discharges) do not discharge untreated stormwater into, or cause erosion to, existing wetlands.

Post-Development Peak Rates (Standard 2)

A hydrologic study was performed to determine the rate of runoff for the 100-year storm events under pre-development (existing) conditions. Unmitigated post-development rates were then computed in a similar manner. The study point where the peak rates were compared were taken at one (1) location at the existing offsite flow area. From these

analyses, it was determined that the proposed project and its stormwater management system would not increase the peak runoff rates above existing levels. It is the intent of the stormwater management system to minimize impacts to drainage patterns, and downstream property prior to its release from the site or discharge to wetlands.

The *United States Department of Agriculture (U.S.D.A)*. Soil Conservation Service (SCS) Technical Release 55 (TR-55), 1986, was used as the procedure for estimating runoff. A SCS TR-20-based computer program was used for estimating peak discharges. TR-55 is a generally accepted model for use on small sites that begin with a rainfall amount uniformly imposed on the watershed over a specified time distribution. Mass rainfall is converted to mass runoff by using a runoff curve number (CN). CN is based on soils, plant cover, impervious areas, interception, and surface storage. Runoff is then transformed into a hydrograph that depends on runoff travel time through segments of the watershed.

Development in a watershed changes the watershed's response to precipitation. The most common effects are reduced infiltration and decreased travel time, which can result in significantly higher peak rates of runoff. The volume of runoff is determined primarily by the amount of precipitation and by infiltration characteristics related to soil type, antecedent rainfall, type of vegetal cover, impervious surfaces, and surface retention. Travel time is determined primarily by slope, flow length, depth of flow, and roughness of flow surfaces. Peak rates of discharge are based on the relationship of the above parameters, as well as the total drainage area of the watershed, the location of the development in relation to the total drainage area, and the effect of any flood control works or other manmade storage. Peak rates of discharge are also influenced by the distribution of rainfall within a given storm event.

Stormwater management computations for the full-build were performed using a SCS-based *HYDROCAD* for existing and proposed conditions, curve numbers, time of concentrations and unit hydrograph computations.

Existing Conditions

Table 1. Shows the curve numbers, areas and times of concentration used to develop the pre-development hydrologic model of the site.

Table 1. – Existing Conditions					
Sub-Areas	**Surface Cover**	**Curve Number (CN)**	**Area (SF)**	**Tc (Mins.)**	**Remarks**
Area #1				6.0	
	Exist. Bldgs.	98	3,350		Incls. decks
	Exist. Walks	98	1,163		Incls. Patios
	Exist. Drive	98	3,800		Incl. Walks
	Exist. Passageway	98	1,160		
	Lawn Areas	39	15,424		

		Total Area	24,897		
*CN based on Class A soils.					

Proposed Conditions

The proposed conditions will result in a new collection system that will collect the site run-off from the proposed dwellings and proposed driveways and direct it to underground leaching systems prior to overflowing off-site.

Table 2. Shows the curve numbers, areas and times of concentration used to develop the post-development hydrologic model of the site.

Table 2. – Proposed Conditions					
Sub-Areas	**Surface Cover**	**Curve Number (CN)**	**Area (SF)**	**Tc (Mins.)**	**Remarks**
Area #1				6.0	
	Lawn Area	39	12,326		
	Prop. Patios	98	1,040		
	Exist. Drive	98	1,160		Passageway
Area #2					
	Prop. Building	98	2,324		Unit 1 & 2
	Prop. Driveways	98	4,000		Front Portion
Area #3					
	Prop. Building	98	2,324		Unit 3 & 4
	Prop. Driveway	98	1,723		Rear Portion
		Total Area	24,897		
*CN based on Class A soils.					

Peak Rate Summary

Table 3. Shows the peak runoff for the existing, as well as for the developed site at 2, 10, 25 & 100-year design storms.

Areas	**Design Storm**	**Existing Runoff* (CFS)**	**Existing Volume* (Ac-Ft)**	**Proposed Runoff* (CFS)**	**Proposed Volume* (Ac-Ft)**
Offsite Flow					
Existing	2-yr.	0.17	0.018	0.00	0.002
	10-yr.	0.73	0.053	0.09	0.012
	25-yr.	1.27	0.088	0.29	0.025
	100-yr.	2.65	0.179	1.23	0.087

Recharge to Groundwater (Standard 3)

The change in groundcover for the new development will change by increasing the impervious areas by approximately 1,935 sf. Groundwater infiltration will be achieved through the individual underground storage areas.

Required Recharge Volume for the entire site was calculated in accordance with the Massachusetts Stormwater Management Standards:

Rv = F * impervious area (in acres)
Rv = (0.60/12) * 0.288 = 0.014 Ac-ft. = 628.55 CF

Rv = Required Recharge Volume;
F = Target Depth Factor (0.60 in. for soils of Hydrologic Soil Group A);
Impervious area = building, pavement on site in post development condition (0.288 Ac).

The two proposed onsite leaching systems will store and infiltrate 628.55 cf in just the 2-year storm event.

Removal of TSS (Standard 4)

The proposed building will have clean runoff and the proposed driveways will flow through catchbasins/manholes with a 4' deep sump, and then infiltration to address TSS removal.

BMP[1]	Rate[1]	Load*	Removed (C*D)	Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Subsurface Infiltration Structure	**0.80**	**0.75**	**0.60**	**0.15**

Total TSS Removal =	**85%**

Land Uses with Higher Potential Pollutant Loads (Standard 5)

The use proposed does not differ from the current use of the space and has no higher potential for pollution.

Critical Areas (Standard 6 – Water Quality Treatments)

This site does not lie within a critical area. One-half inch (1/2") of runoff is the standard for treatment relative to water quality, but as stated prior, the proposed use will not create pollutants in excess of what exists today.

Redevelopment (Standard 7)

Redevelopment projects are those that involve development, rehabilitation or expansion on previously developed sites provided the redevelopment results in no net increase in impervious area. Furthermore, components of redevelopment project, which include development of previously undeveloped sites, do not fall under Standard 7. In addition, redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

The project, as proposed, are new buildings, replacing existing buildings on a developed sited and we are increasing the impervious area, however it is minimal. VTP has considered this project a new development and we have met all of the applicable standards of the Massachusetts Stormwater Policy.

Erosion and Sedimentation Controls (Standard 8)

Erosion Control measures have been provided on the plans that accompany this application.

Operation and Maintenance Plan (Standard 9)

An Operation and Maintenance (O&M) Plan is provided as part of the application.

Prohibition of Illicit Discharges

The Owner and User of the facility, assures that there will not be illicit discharges to the nearby wetlands from the proposed facility.

Floodplain (310 CMR 10.57)

The project site does not fall with a floodplain district.

<u>City of Newton Standards</u>

In accordance with the City of Newton's Stormwater Management and Erosion Control Rules and Regulations, this project requires a Minor Stormwater Permit, as it is a residential development less than 4 units with land disturbance less than 0.5 acres.

Storage of Total Impervious area

The proposed project results in a post-development total impervious area of 3,575 SF. Per the City of Newton's Stormwater Management and Erosion Control Rules and Regulations, Section 5, Subsection B.1, this project is a teardown of an existing structure and therefore requires the applicant to retain 2" of runoff for the total of all impervious area.

Volume = (2"/12) * (4,048 sf) = 2,095 CF

As noted in the post-development HydroCAD report provided, the proposed BMP's offer a total storage volume of 0.05 acre-ft, which is equivalent to **2,178 CF** of available storage, which exceeds the required storage capacity of 2,095 CF

Total Phosphorus Removal

Existing Phosphorus Load

BMP Sub Area	Land Use Category	Cover Type	Area (Acres)	PLER (lb/acre/yr)*
1	Developed Land Pervious (HSG- A)	Impervious	0.217	1.96
2	Medium-Density Residential (MDR)	Pervious	0.354	0.03

***From Table 3-1 of appendix F.**

BMP_{Load} = (0.217 x 1.96) + (0.354 x 0.03) = 0.435 lbs P/yr

Proposed BMP's

Infiltration System #1

$BMP_{Volume\ ft3}$ (see HydroCAD) = 0.03 acre-ft = 1,306.8 ft^3

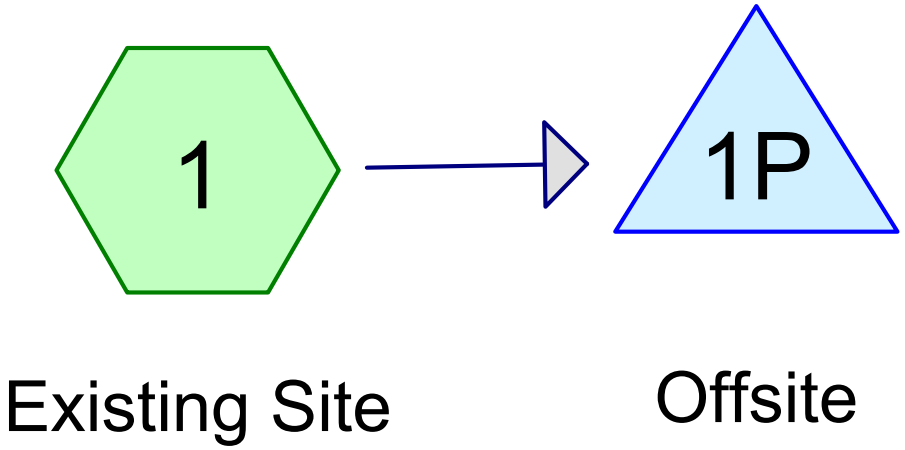
$BMP_{inches\ of\ runoff}$ = BMP_{Volume} (ft^3)/IA x 12 in/ft x 1 acre/43,560 ft^2
= 1,306.8 ft^3/0.145 acre x 12 in/ft x 1 acre/43,560 ft^2
= 2.48 in.

Infiltration System #2

$BMP_{Volume\ ft3}$ (see HydroCAD) = 0.02 acre-ft = 871.20 ft^3

$BMP_{inches\ of\ runoff}$ = BMP_{Volume} (ft^3)/IA x 12 in/ft x 1 acre/43,560 ft^2
= 871.20 ft^3/0.093 acre x 12 in/ft x 1 acre/43,560 ft^2
= 2.58 in.

In accordance with BMP Curves for Soil Infiltration Rate: Infiltration Basin the BMP will have a 100% load reduction Efficiency for soils with an infiltration rate of 8.27 in/hr. and at least 2.0 inches of runoff.



Subcat Reach Pond Link

Routing Diagram for 120 Norwood Ave - Existing
Prepared by HP, Printed 7/29/2022

120 Norwood Ave - Existing

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.354	39	>75% Grass cover, Good, HSG A (1)
0.087	98	Exist. Drive (1)
0.027	98	Exist. Passageway (1)
0.027	98	Exist. Walks & Patios (1)
0.077	98	Existing Buildings & Decks (1)
0.572	**61**	**TOTAL AREA**

120 Norwood Ave - Existing
Prepared by HP

Summary for Subcatchment 1: Existing Site

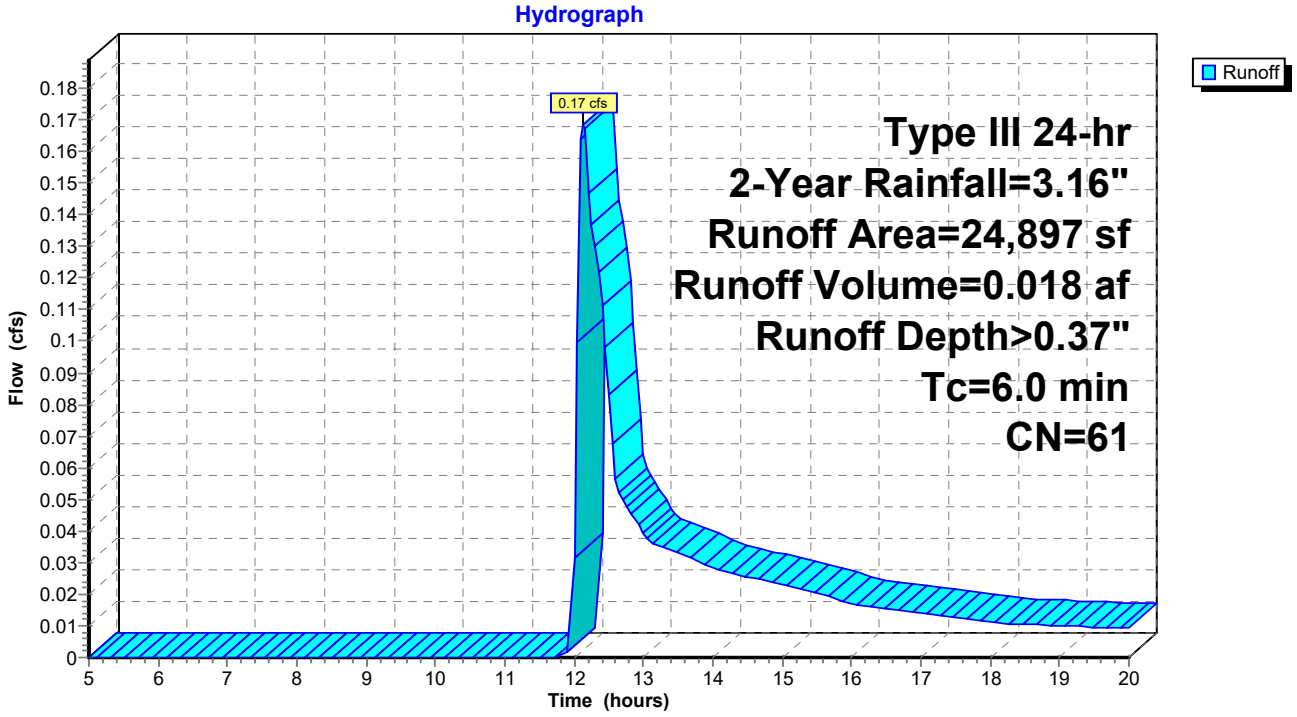
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.018 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
	15,424	39	>75% Grass cover, Good, HSG A
*	3,800	98	Exist. Drive
*	1,160	98	Exist. Passageway
*	1,163	98	Exist. Walks & Patios
*	3,350	98	Existing Buildings & Decks
	24,897	61	Weighted Average
	15,424		61.95% Pervious Area
	9,473		38.05% Impervious Area

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

Subcatchment 1: Existing Site



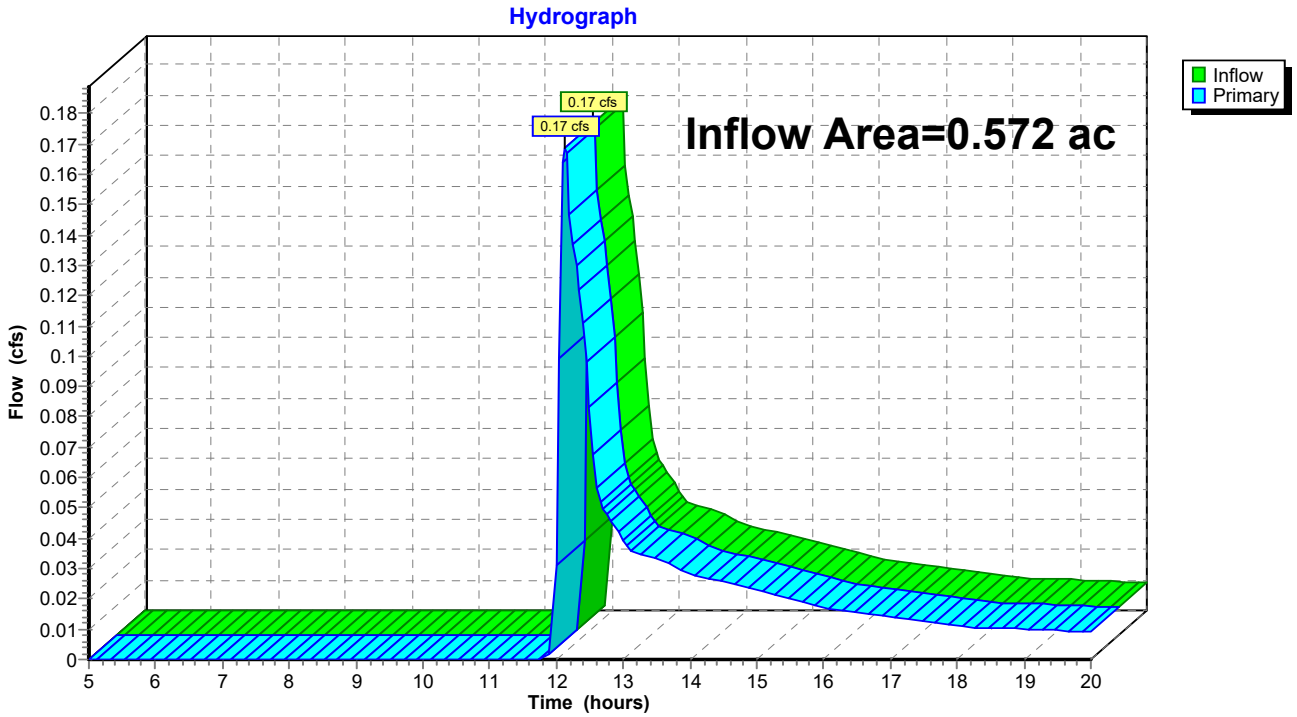
120 Norwood Ave - Existing
Prepared by HP

Summary for Pond 1P: Offsite

Inflow Area = 0.572 ac, 38.05% Impervious, Inflow Depth > 0.37" for 2-Year event
Inflow = 0.17 cfs @ 12.13 hrs, Volume= 0.018 af
Primary = 0.17 cfs @ 12.13 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



Summary for Subcatchment 1: Existing Site

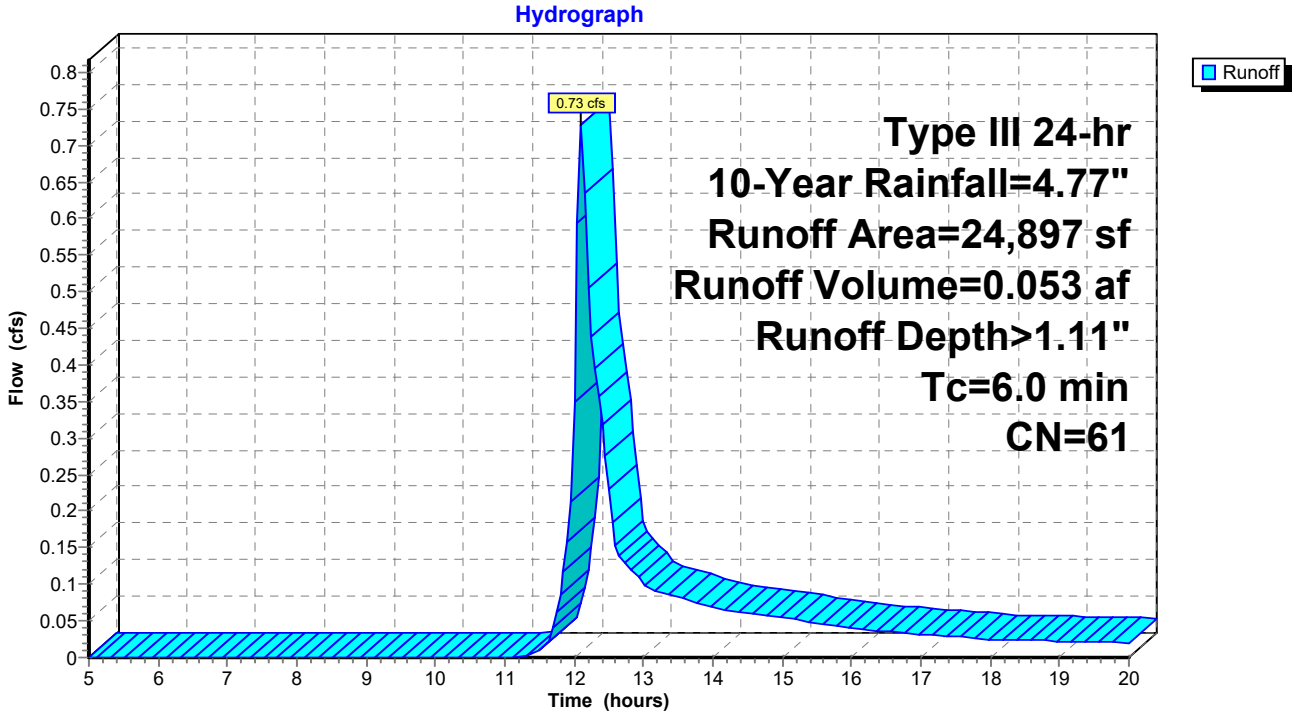
Runoff = 0.73 cfs @ 12.10 hrs, Volume= 0.053 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
	15,424	39	>75% Grass cover, Good, HSG A
*	3,800	98	Exist. Drive
*	1,160	98	Exist. Passageway
*	1,163	98	Exist. Walks & Patios
*	3,350	98	Existing Buildings & Decks
	24,897	61	Weighted Average
	15,424		61.95% Pervious Area
	9,473		38.05% Impervious Area

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

Subcatchment 1: Existing Site



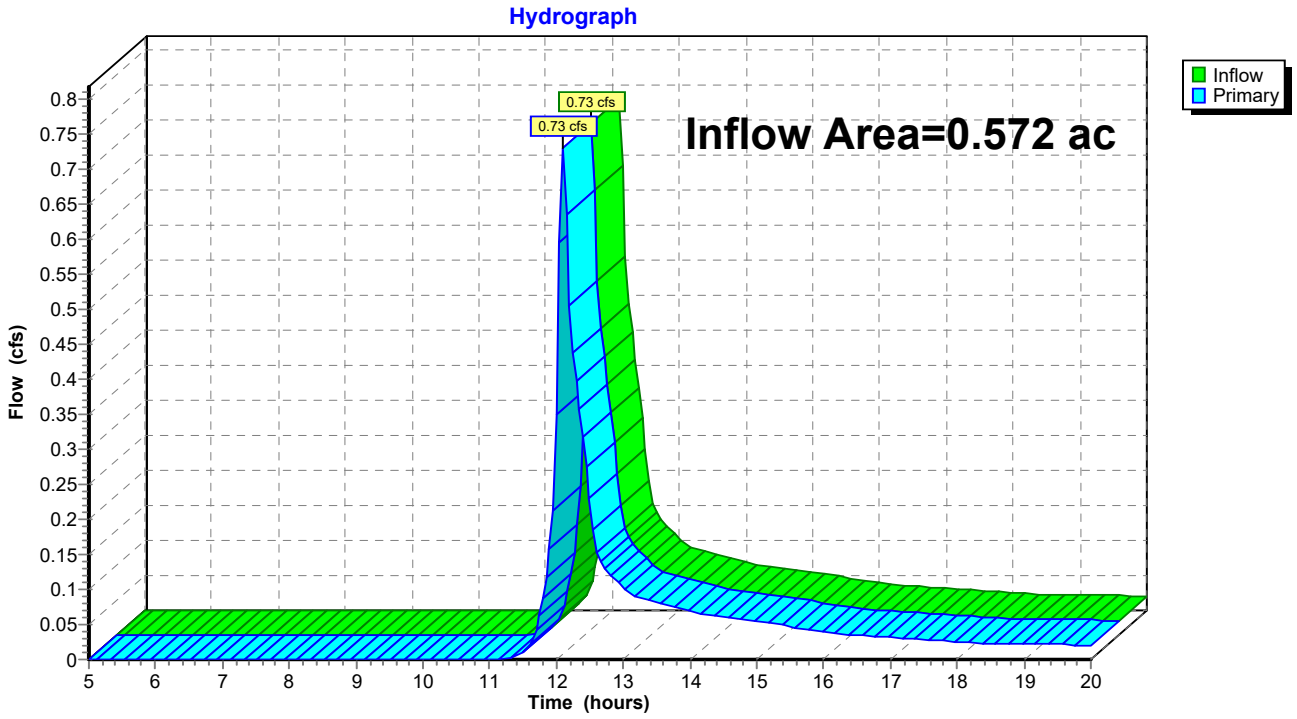
120 Norwood Ave - Existing
Prepared by HP

Summary for Pond 1P: Offsite

Inflow Area = 0.572 ac, 38.05% Impervious, Inflow Depth > 1.11" for 10-Year event
Inflow = 0.73 cfs @ 12.10 hrs, Volume= 0.053 af
Primary = 0.73 cfs @ 12.10 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



120 Norwood Ave - Existing
Prepared by HP

Summary for Subcatchment 1: Existing Site

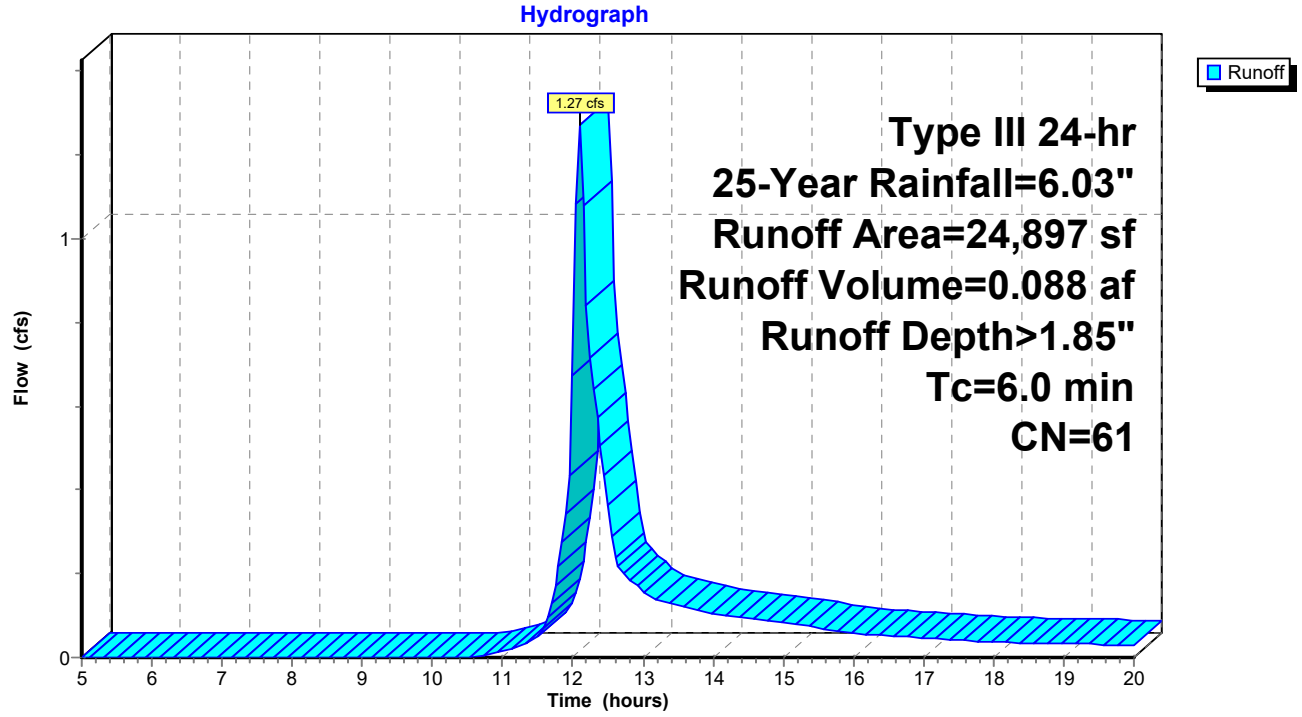
Runoff = 1.27 cfs @ 12.10 hrs, Volume= 0.088 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
	15,424	39	>75% Grass cover, Good, HSG A
*	3,800	98	Exist. Drive
*	1,160	98	Exist. Passageway
*	1,163	98	Exist. Walks & Patios
*	3,350	98	Existing Buildings & Decks
	24,897	61	Weighted Average
	15,424		61.95% Pervious Area
	9,473		38.05% Impervious Area

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

Subcatchment 1: Existing Site

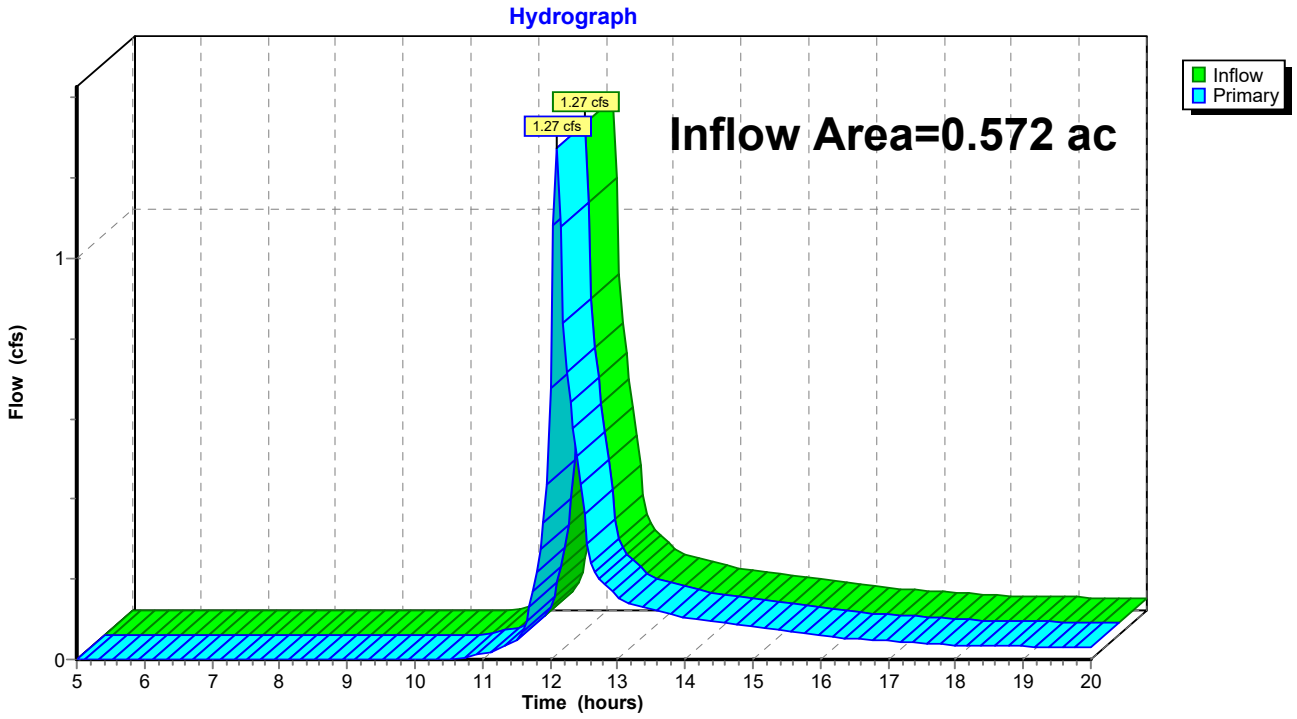


Summary for Pond 1P: Offsite

Inflow Area = 0.572 ac, 38.05% Impervious, Inflow Depth > 1.85" for 25-Year event
Inflow = 1.27 cfs @ 12.10 hrs, Volume= 0.088 af
Primary = 1.27 cfs @ 12.10 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



120 Norwood Ave - Existing
Prepared by HP

Summary for Subcatchment 1: Existing Site

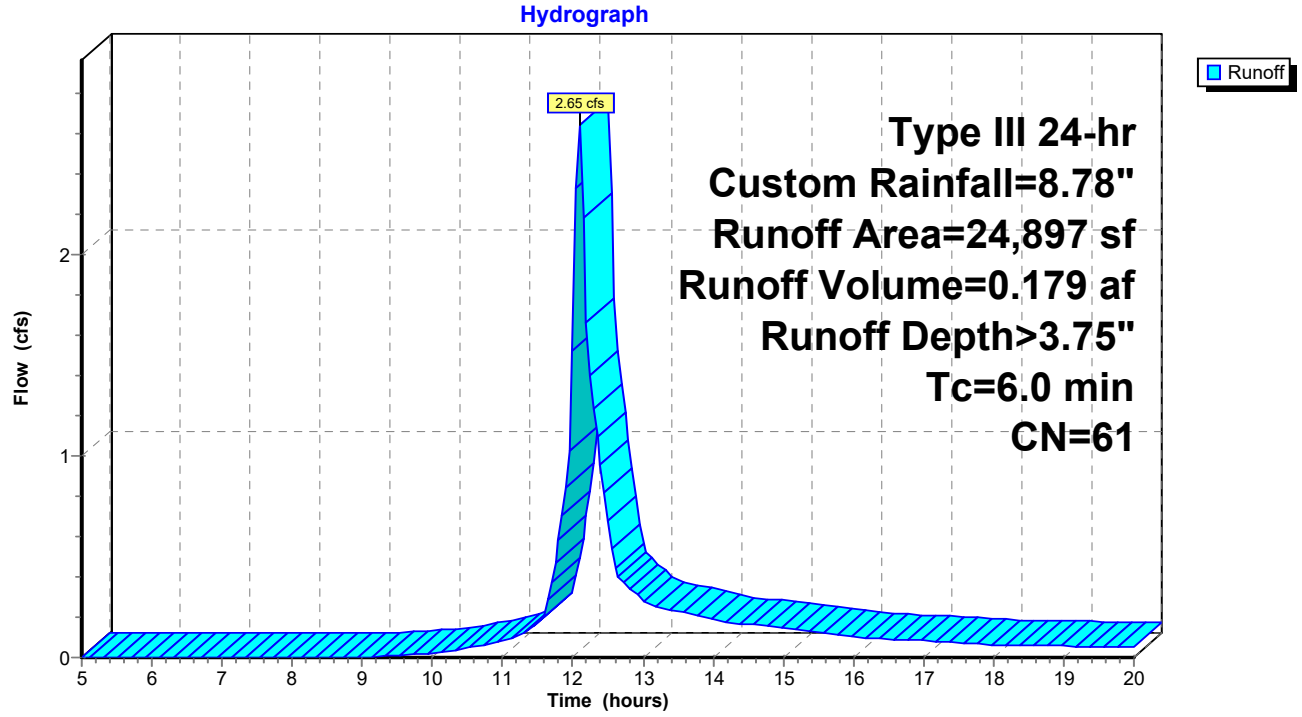
Runoff = 2.65 cfs @ 12.10 hrs, Volume= 0.179 af, Depth> 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr Custom Rainfall=8.78"

	Area (sf)	CN	Description
	15,424	39	>75% Grass cover, Good, HSG A
*	3,800	98	Exist. Drive
*	1,160	98	Exist. Passageway
*	1,163	98	Exist. Walks & Patios
*	3,350	98	Existing Buildings & Decks
	24,897	61	Weighted Average
	15,424		61.95% Pervious Area
	9,473		38.05% Impervious Area

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

Subcatchment 1: Existing Site

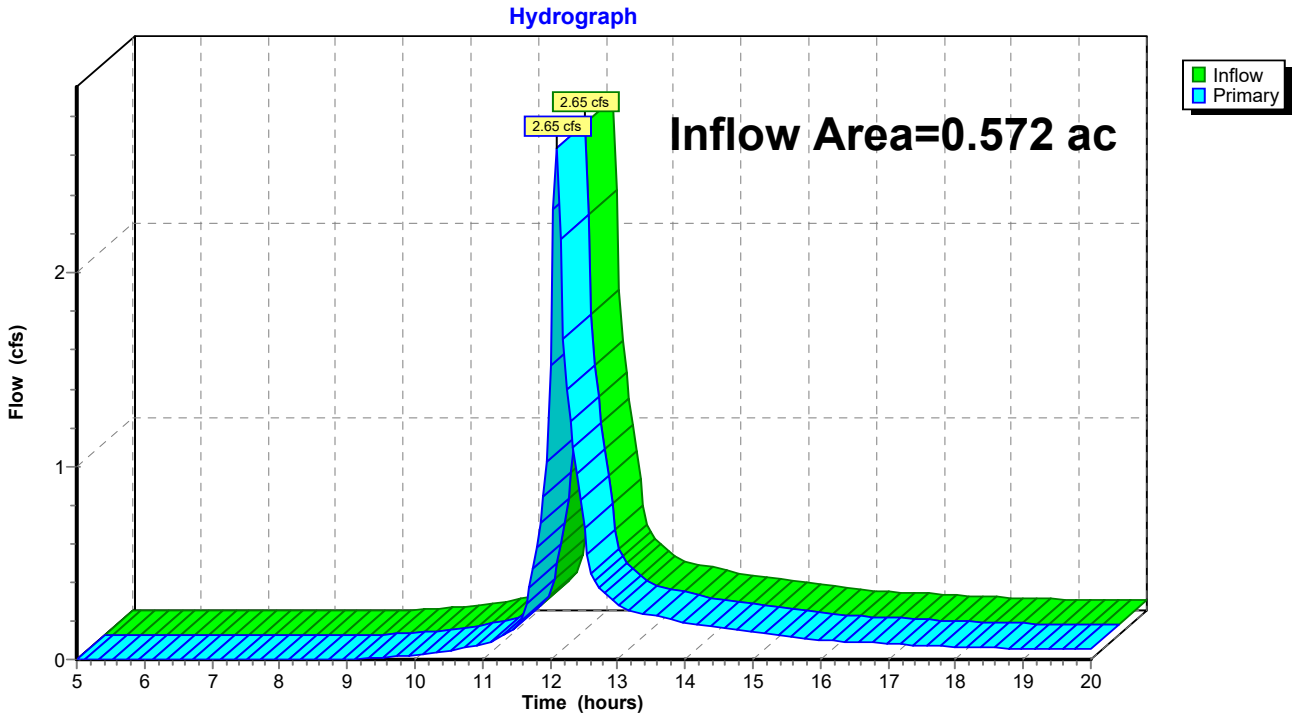


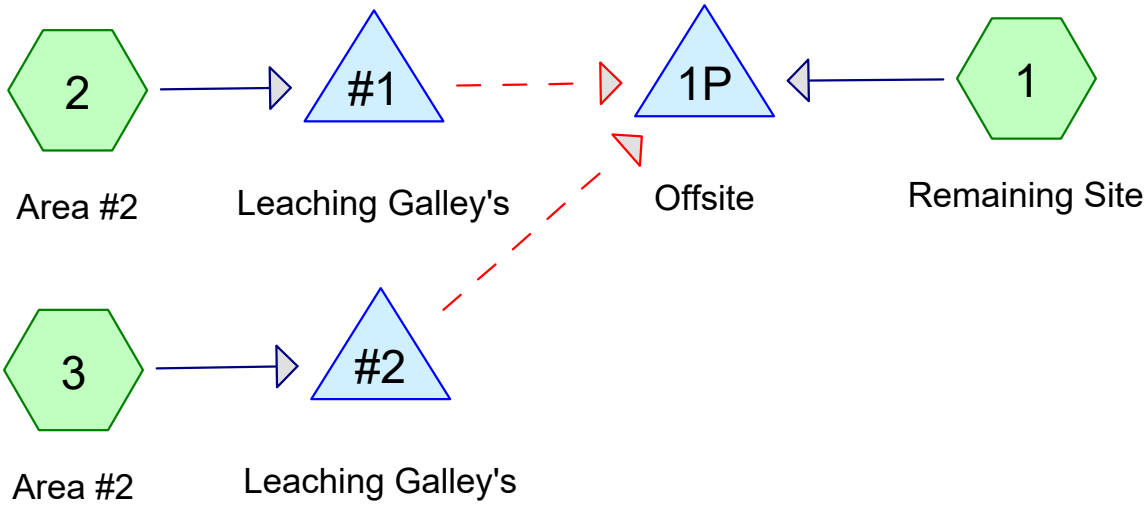
Summary for Pond 1P: Offsite

Inflow Area = 0.572 ac, 38.05% Impervious, Inflow Depth > 3.75" for Custom event
Inflow = 2.65 cfs @ 12.10 hrs, Volume= 0.179 af
Primary = 2.65 cfs @ 12.10 hrs, Volume= 0.179 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite





Subcat Reach Pond Link

Routing Diagram for 120 Norwood Ave - Proposed
Prepared by HP, Printed 7/29/2022

120 Norwood Ave - Proposed

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.283	39	>75% Grass cover, Good, HSG A (1)
0.027	98	Existing Passageway Drive (1)
0.107	98	Prop. Building (2, 3)
0.131	98	Prop. Driveway (2, 3)
0.024	98	Prop. Patios (1)
0.572	**69**	**TOTAL AREA**

Summary for Subcatchment 1: Remaining Site

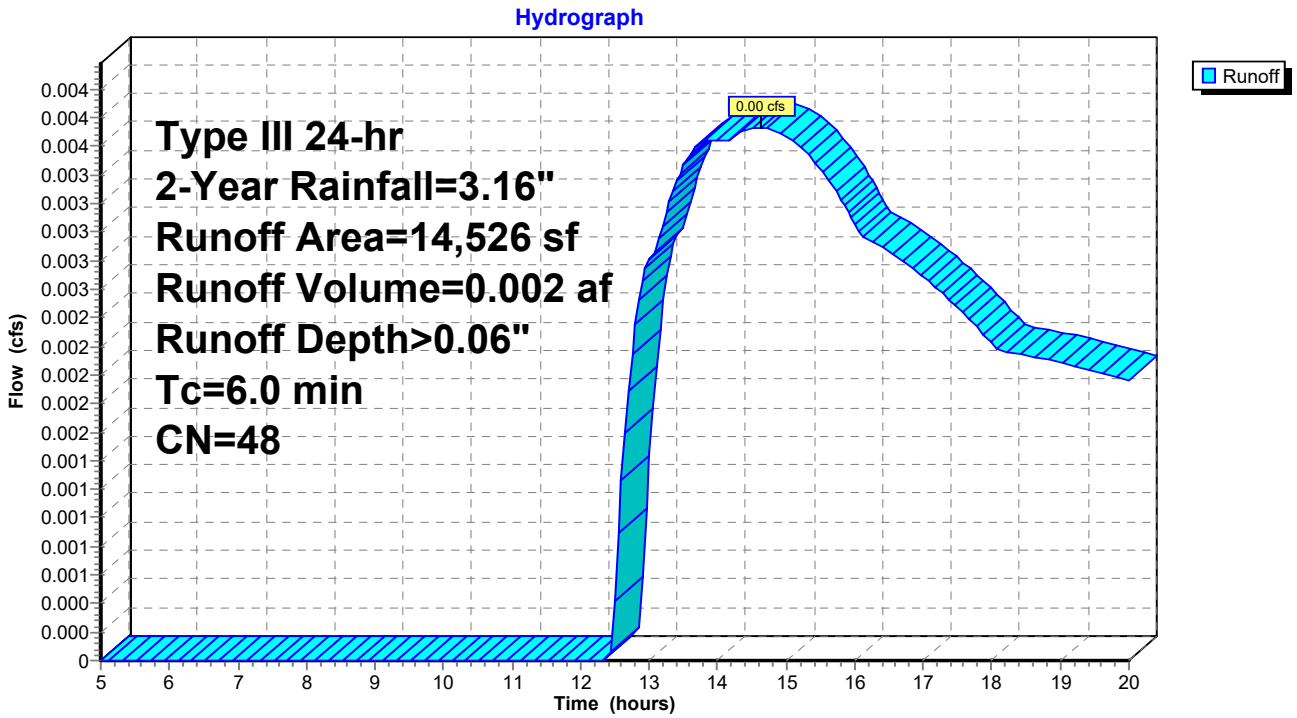
Runoff = 0.00 cfs @ 14.62 hrs, Volume= 0.002 af, Depth> 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
	12,326	39	>75% Grass cover, Good, HSG A
*	1,040	98	Prop. Patios
*	1,160	98	Existing Passageway Drive
	14,526	48	Weighted Average
	12,326		84.85% Pervious Area
	2,200		15.15% Impervious Area

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

Subcatchment 1: Remaining Site



120 Norwood Ave - Proposed
Prepared by HP

Summary for Subcatchment 2: Area #2

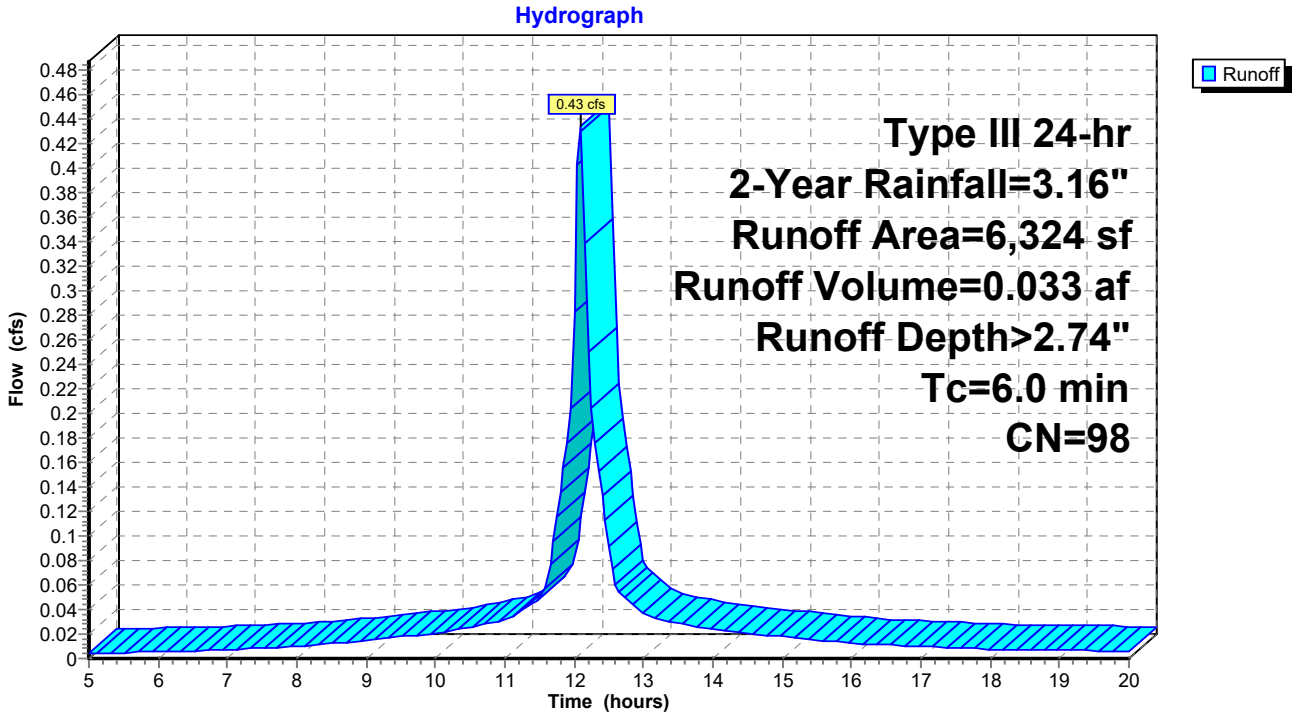
Runoff = 0.43 cfs @ 12.09 hrs, Volume= 0.033 af, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
*	4,000	98	Prop. Driveway
*	2,324	98	Prop. Building
	6,324	98	Weighted Average
	6,324		100.00% Impervious Area

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

Subcatchment 2: Area #2



120 Norwood Ave - Proposed
Prepared by HP

Summary for Subcatchment 3: Area #2

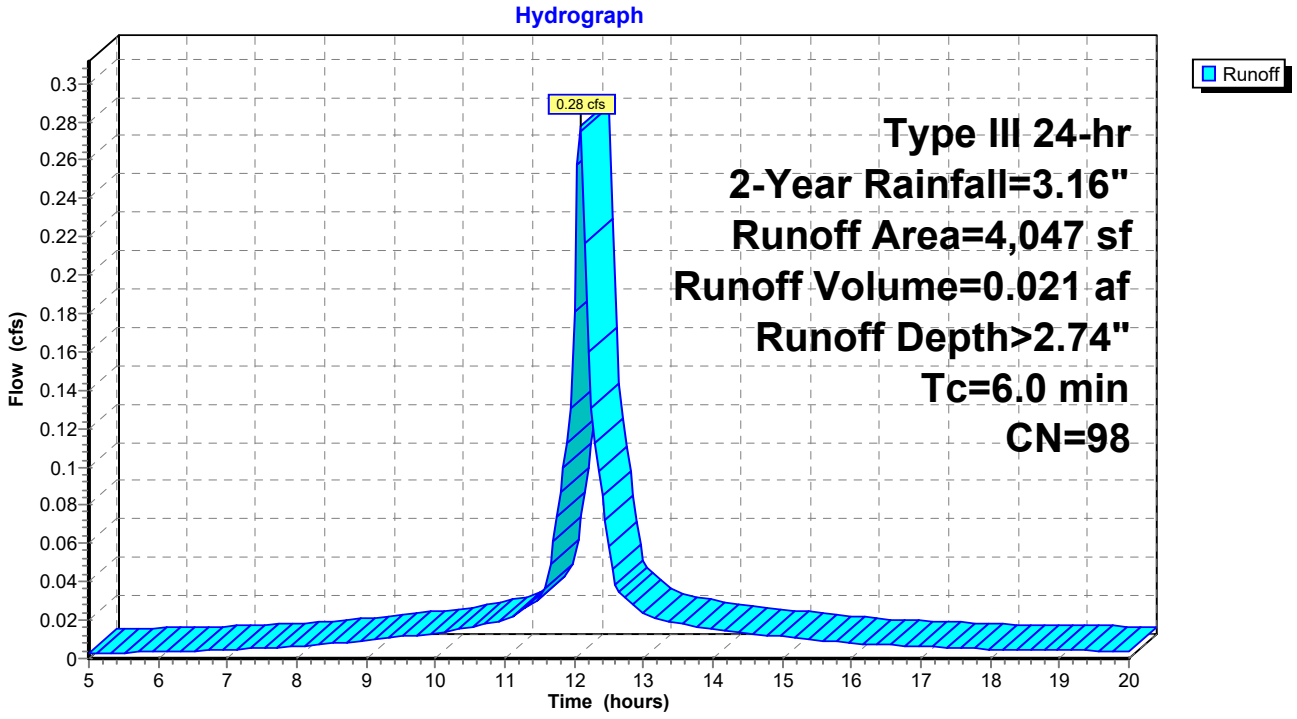
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.021 af, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
*	1,723	98	Prop. Driveway
*	2,324	98	Prop. Building
	4,047	98	Weighted Average
	4,047		100.00% Impervious Area

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

Subcatchment 3: Area #2



Summary for Pond #1: Leaching Galley's

Inflow Area = 0.145 ac,100.00% Impervious, Inflow Depth > 2.74" for 2-Year event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 0.033 af
Outflow = 0.10 cfs @ 11.75 hrs, Volume= 0.033 af, Atten= 78%, Lag= 0.0 min
Discarded = 0.10 cfs @ 11.75 hrs, Volume= 0.033 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 49.05' @ 12.49 hrs Surf.Area= 0.012 ac Storage= 0.008 af

Plug-Flow detention time= 17.9 min calculated for 0.033 af (100% of inflow)
Center-of-Mass det. time= 17.7 min (756.4 - 738.7)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.006 af	**7.83'W x 65.00'L x 3.33'H Gravel** 0.039 af Overall - 0.023 af Embedded = 0.016 af x 40.0% Voids
#2	48.50'	0.023 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 6 Inside #1
		0.030 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.10 cfs @ 11.75 hrs HW=48.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑**2=Orifice** (Controls 0.00 cfs)

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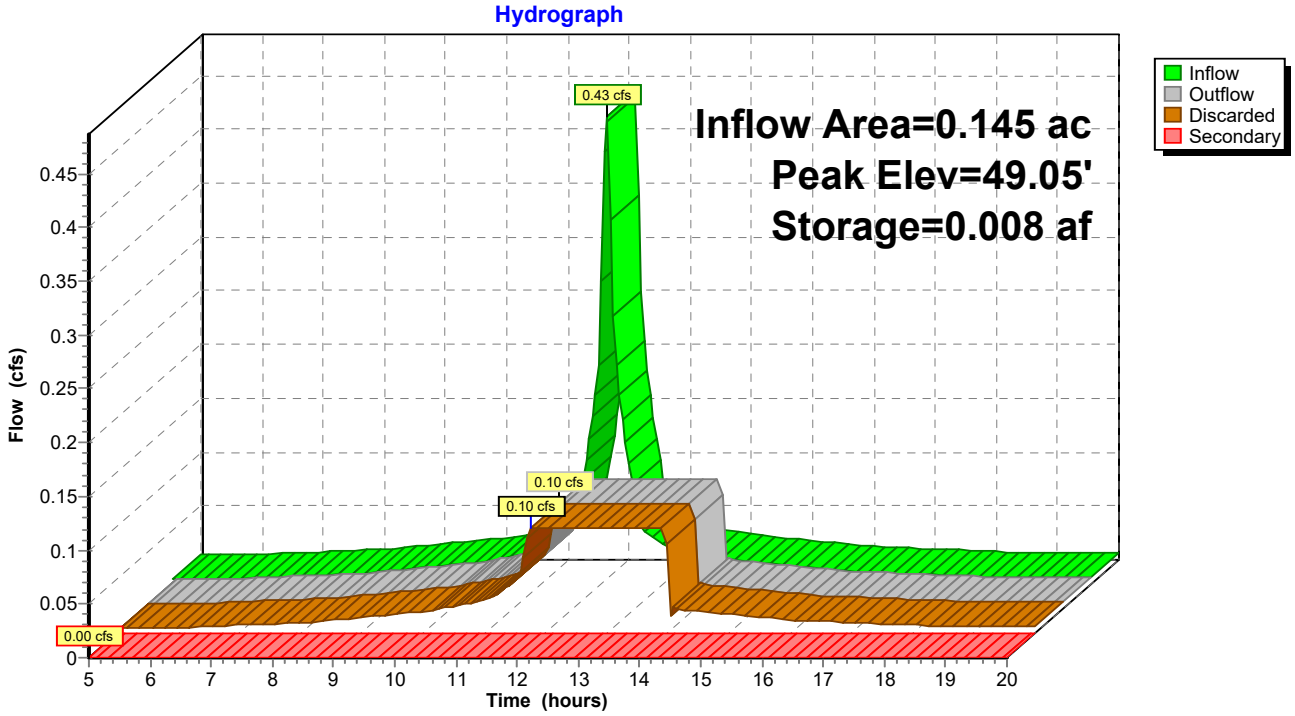
Pond #1: Leaching Galley's



Summary for Pond #2: Leaching Galley's

Inflow Area = 0.093 ac,100.00% Impervious, Inflow Depth > 2.74" for 2-Year event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 0.021 af
Outflow = 0.07 cfs @ 11.75 hrs, Volume= 0.021 af, Atten= 76%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.75 hrs, Volume= 0.021 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 48.98' @ 12.47 hrs Surf.Area= 0.008 ac Storage= 0.005 af

Plug-Flow detention time= 15.9 min calculated for 0.021 af (100% of inflow)
Center-of-Mass det. time= 15.7 min (754.3 - 738.7)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.004 af	**7.83'W x 44.00'L x 3.33'H Gravel** 0.026 af Overall - 0.015 af Embedded = 0.011 af x 40.0% Voids
#2	48.50'	0.015 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 4 Inside #1
		0.020 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.07 cfs @ 11.75 hrs HW=48.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑**2=Orifice** (Controls 0.00 cfs)

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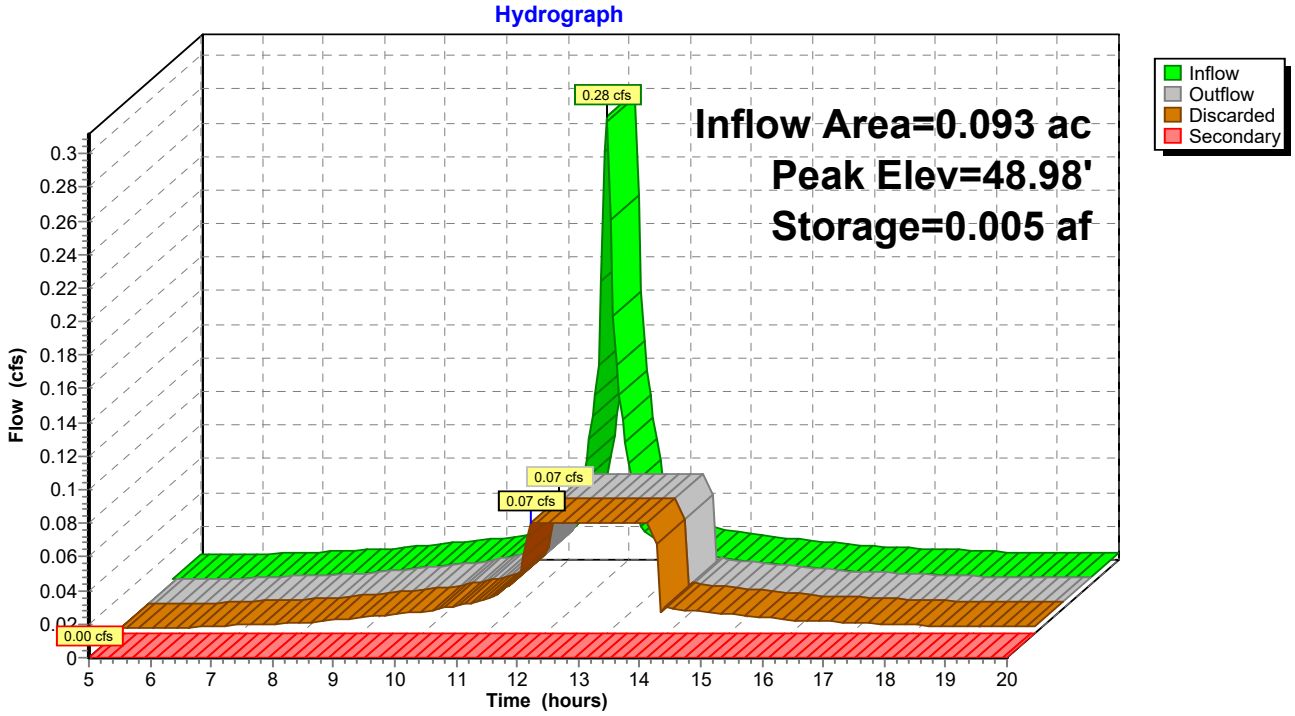
Pond #2: Leaching Galley's



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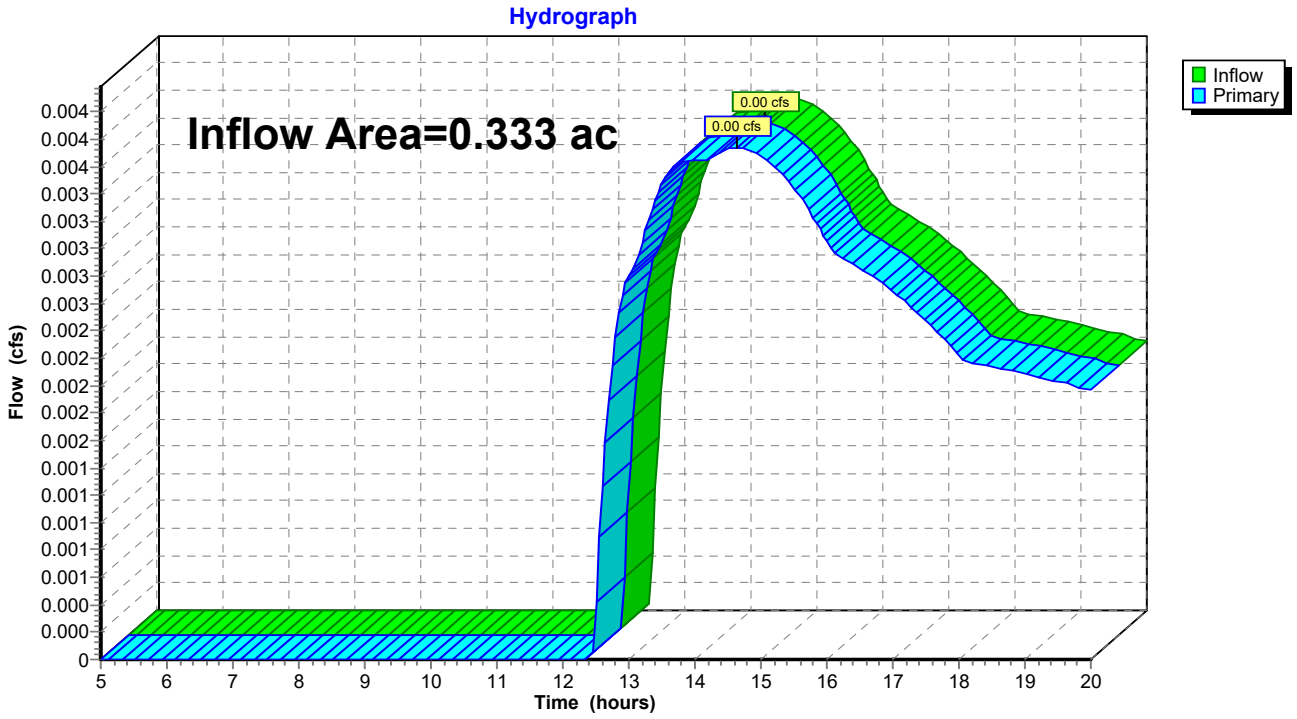
Summary for Pond 1P: Offsite

Inflow Area = 0.333 ac, 15.15% Impervious, Inflow Depth > 0.06" for 2-Year event
Inflow = 0.00 cfs @ 14.62 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 14.62 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



Summary for Subcatchment 1: Remaining Site

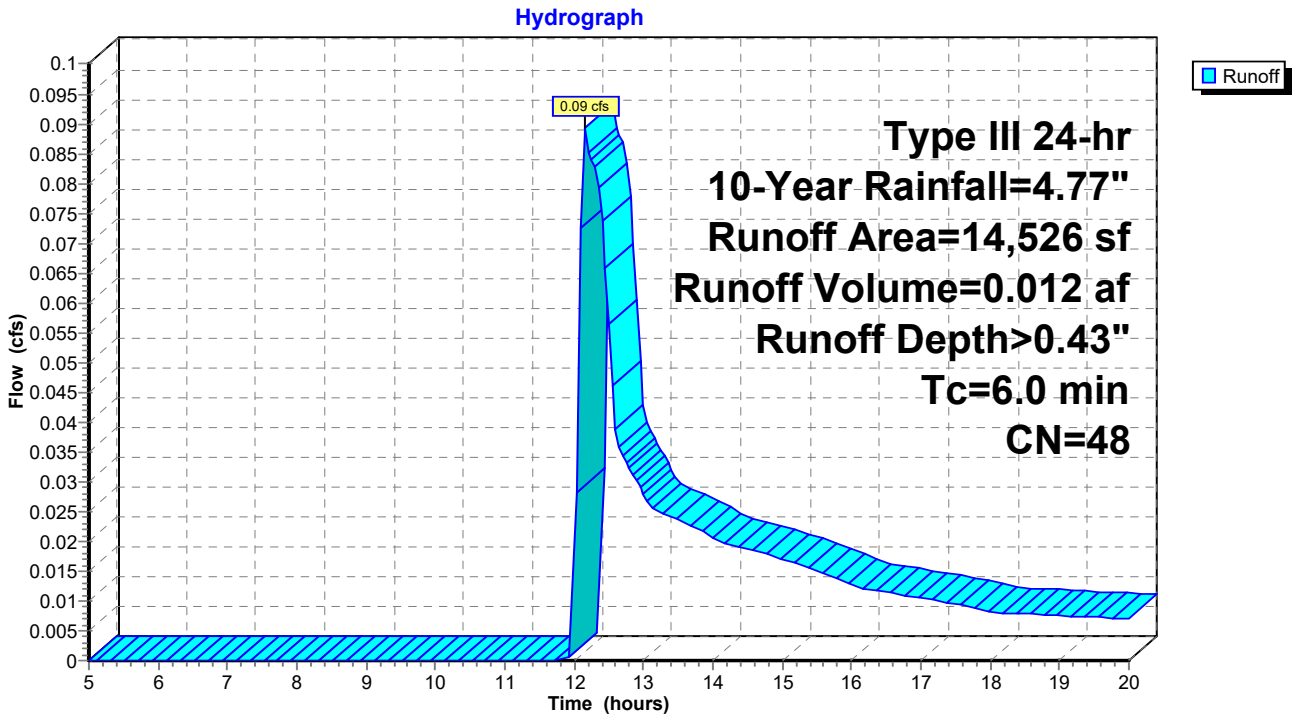
Runoff = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af, Depth> 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
	12,326	39	>75% Grass cover, Good, HSG A
*	1,040	98	Prop. Patios
*	1,160	98	Existing Passageway Drive
	14,526	48	Weighted Average
	12,326		84.85% Pervious Area
	2,200		15.15% Impervious Area

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

Subcatchment 1: Remaining Site



Summary for Subcatchment 2: Area #2

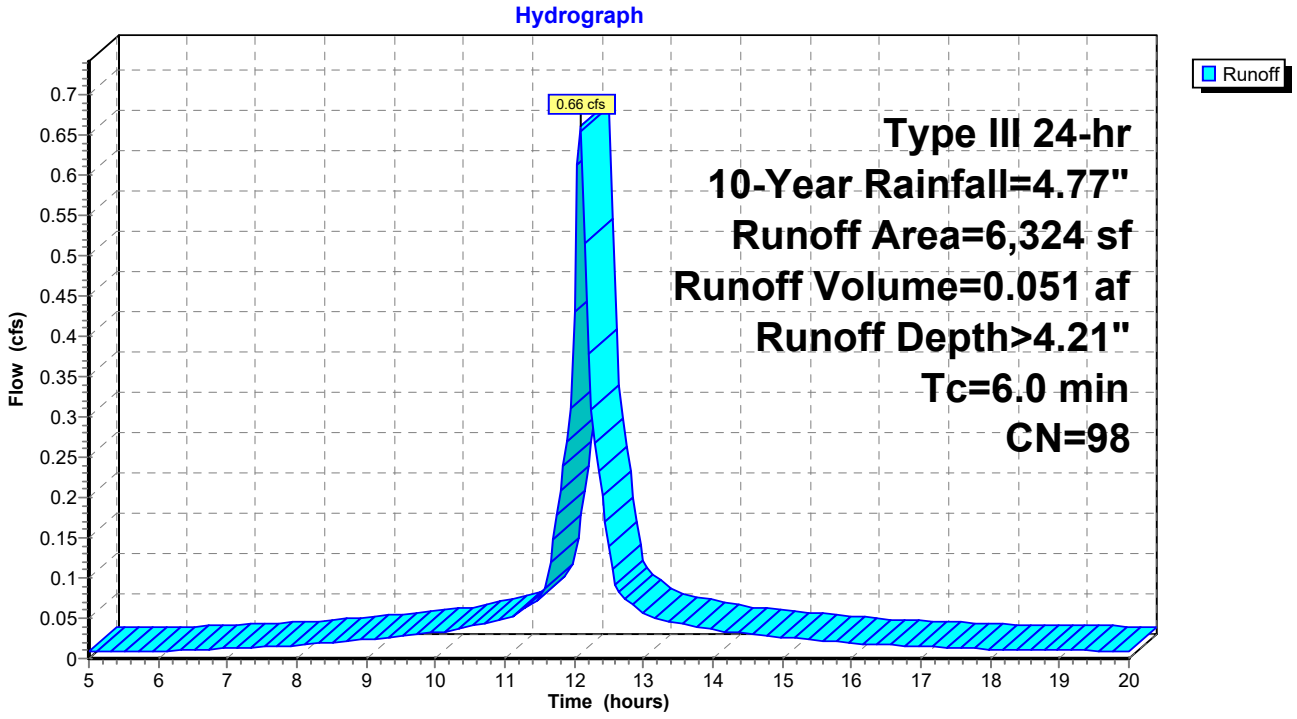
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.051 af, Depth> 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
*	4,000	98	Prop. Driveway
*	2,324	98	Prop. Building
	6,324	98	Weighted Average
	6,324		100.00% Impervious Area

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

Subcatchment 2: Area #2



Summary for Subcatchment 3: Area #2

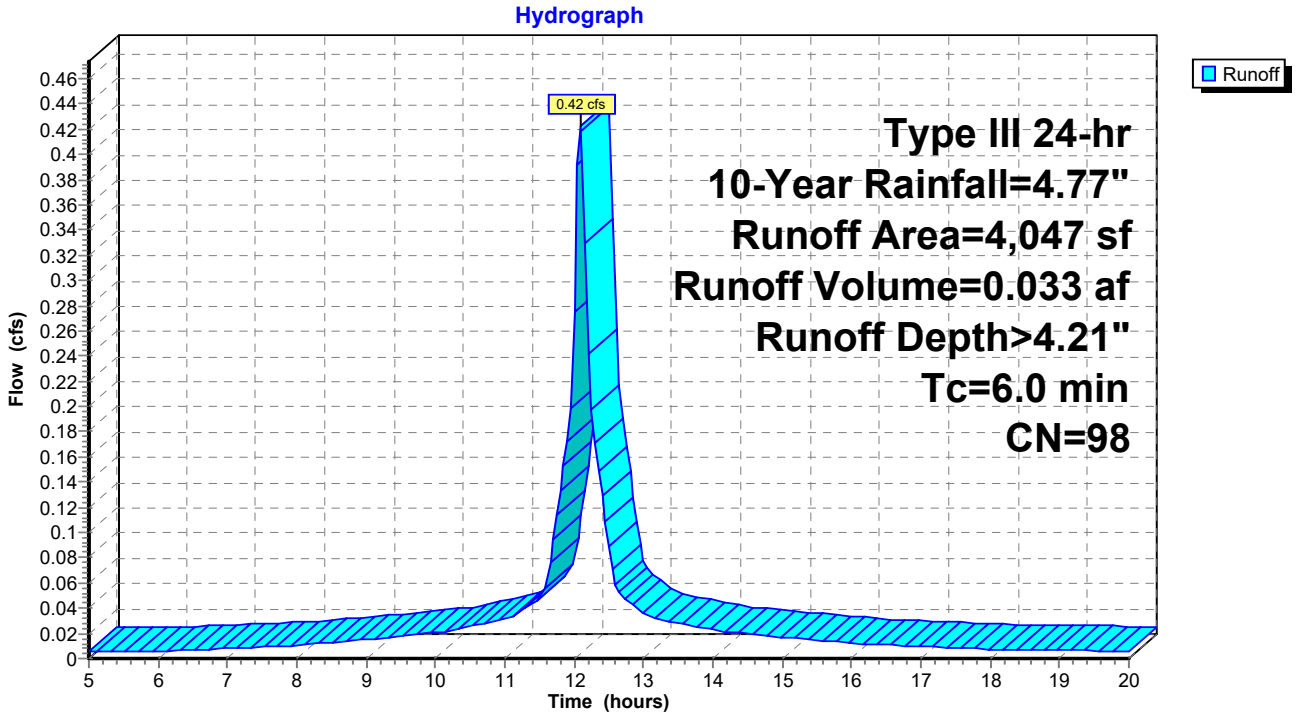
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.033 af, Depth> 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
*	1,723	98	Prop. Driveway
*	2,324	98	Prop. Building
	4,047	98	Weighted Average
	4,047		100.00% Impervious Area

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

Subcatchment 3: Area #2



Summary for Pond #1: Leaching Galley's

Inflow Area = 0.145 ac,100.00% Impervious, Inflow Depth > 4.21" for 10-Year event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.051 af
Outflow = 0.10 cfs @ 11.65 hrs, Volume= 0.051 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.10 cfs @ 11.65 hrs, Volume= 0.051 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 49.84' @ 12.59 hrs Surf.Area= 0.012 ac Storage= 0.015 af

Plug-Flow detention time= 41.6 min calculated for 0.051 af (100% of inflow)
Center-of-Mass det. time= 41.2 min (776.6 - 735.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.006 af	**7.83'W x 65.00'L x 3.33'H Gravel**
			0.039 af Overall - 0.023 af Embedded = 0.016 af x 40.0% Voids
#2	48.50'	0.023 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 6 Inside #1
		0.030 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.10 cfs @ 11.65 hrs HW=48.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑**2=Orifice** (Controls 0.00 cfs)

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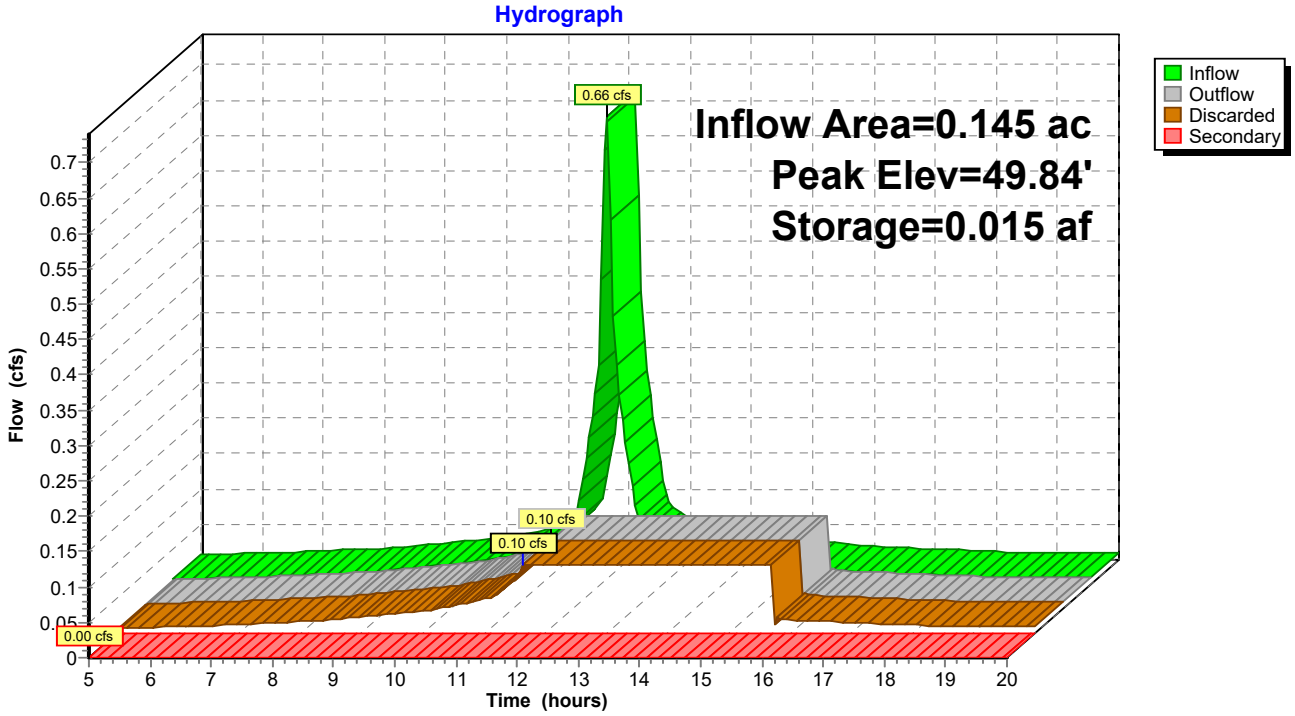
Pond #1: Leaching Galley's



Summary for Pond #2: Leaching Galley's

Inflow Area = 0.093 ac,100.00% Impervious, Inflow Depth > 4.21" for 10-Year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 0.033 af
Outflow = 0.07 cfs @ 11.65 hrs, Volume= 0.033 af, Atten= 84%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.65 hrs, Volume= 0.033 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 49.72' @ 12.57 hrs Surf.Area= 0.008 ac Storage= 0.009 af

Plug-Flow detention time= 37.3 min calculated for 0.032 af (100% of inflow)
Center-of-Mass det. time= 36.9 min (772.3 - 735.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.004 af	**7.83'W x 44.00'L x 3.33'H Gravel**
			0.026 af Overall - 0.015 af Embedded = 0.011 af x 40.0% Voids
#2	48.50'	0.015 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 4 Inside #1
		0.020 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.07 cfs @ 11.65 hrs HW=48.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑**2=Orifice** (Controls 0.00 cfs)

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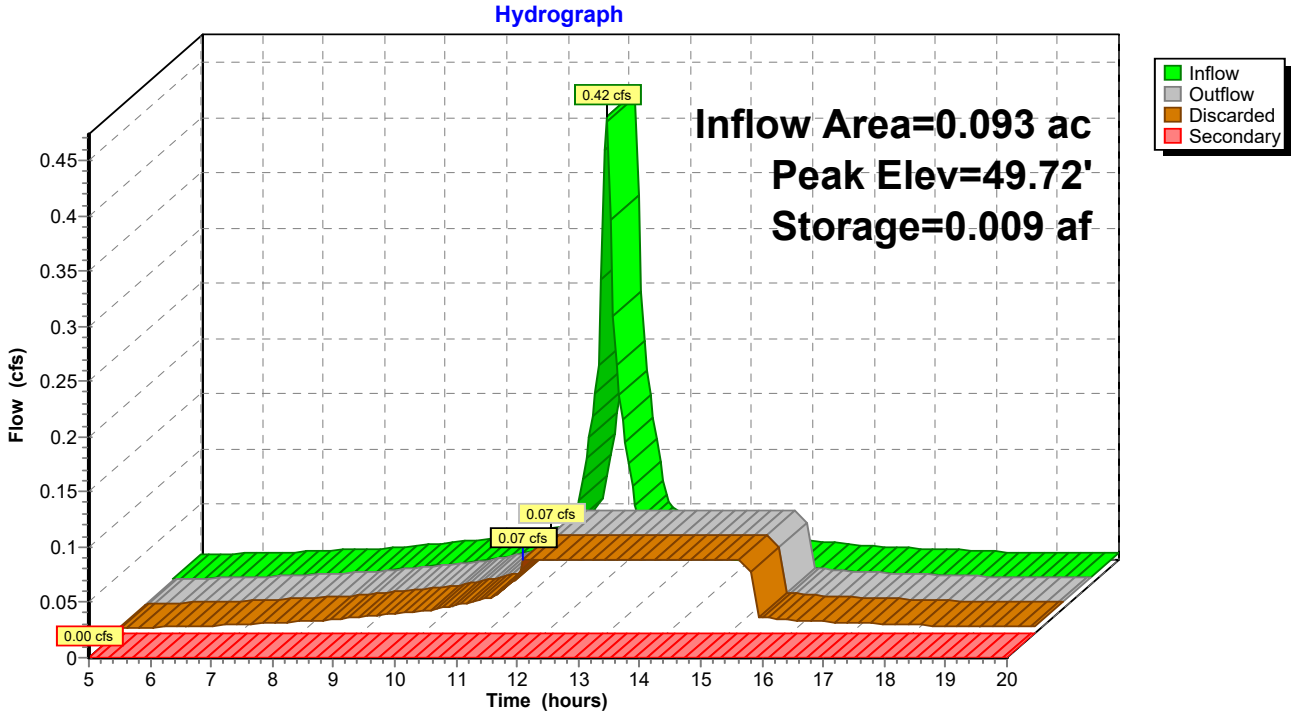
Pond #2: Leaching Galley's

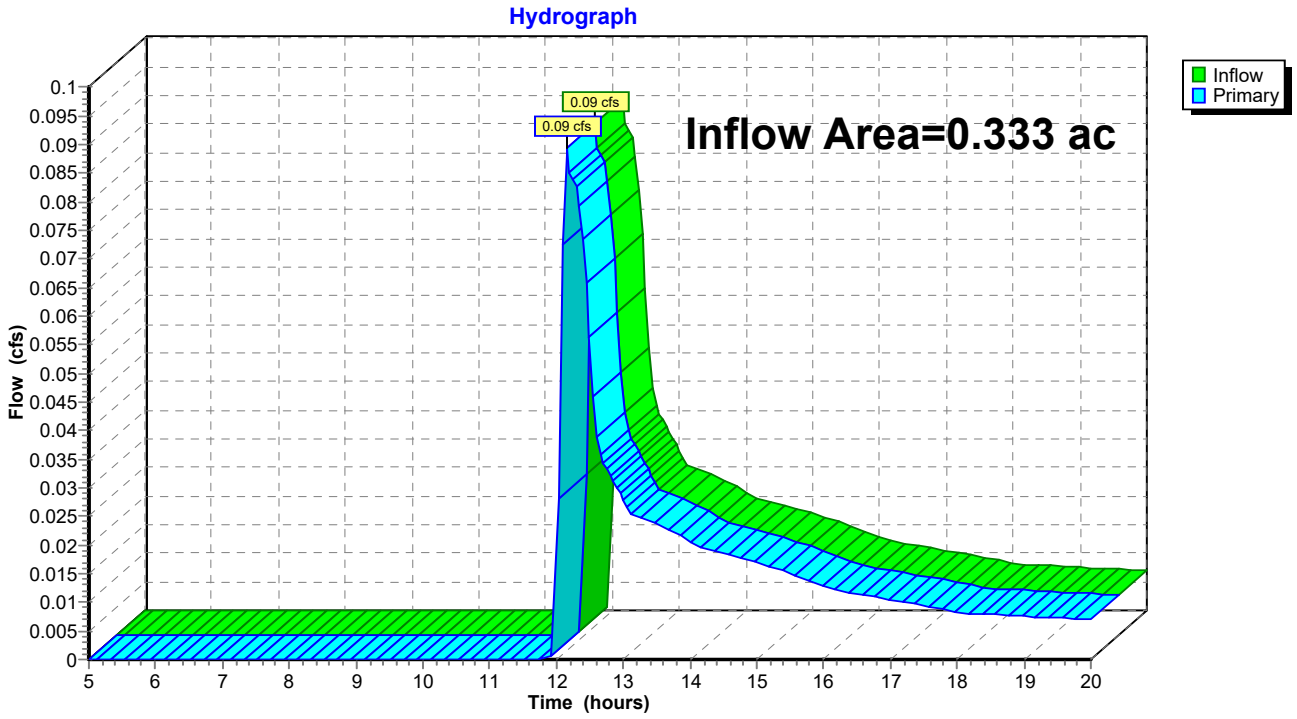


Summary for Pond 1P: Offsite

Inflow Area = 0.333 ac, 15.15% Impervious, Inflow Depth > 0.43" for 10-Year event
Inflow = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af
Primary = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



Summary for Subcatchment 1: Remaining Site

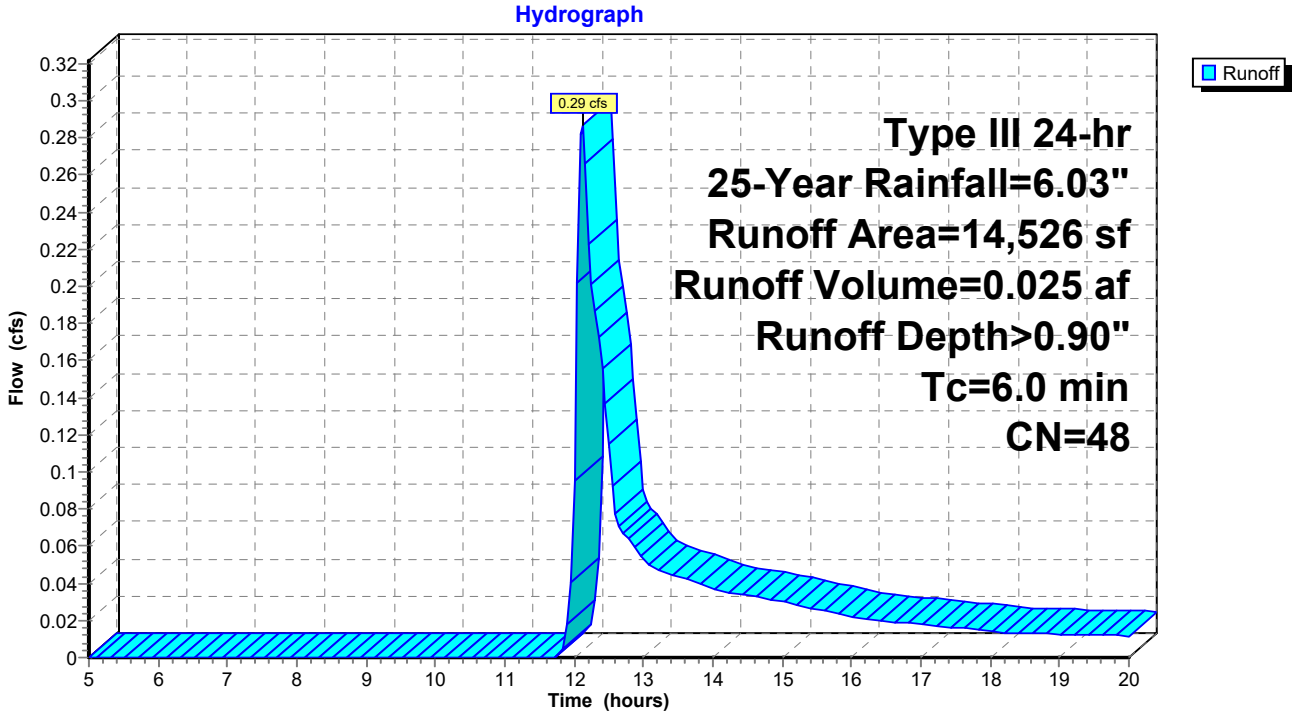
Runoff = 0.29 cfs @ 12.12 hrs, Volume= 0.025 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
	12,326	39	>75% Grass cover, Good, HSG A
*	1,040	98	Prop. Patios
*	1,160	98	Existing Passageway Drive
	14,526	48	Weighted Average
	12,326		84.85% Pervious Area
	2,200		15.15% Impervious Area

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

Subcatchment 1: Remaining Site



Summary for Subcatchment 2: Area #2

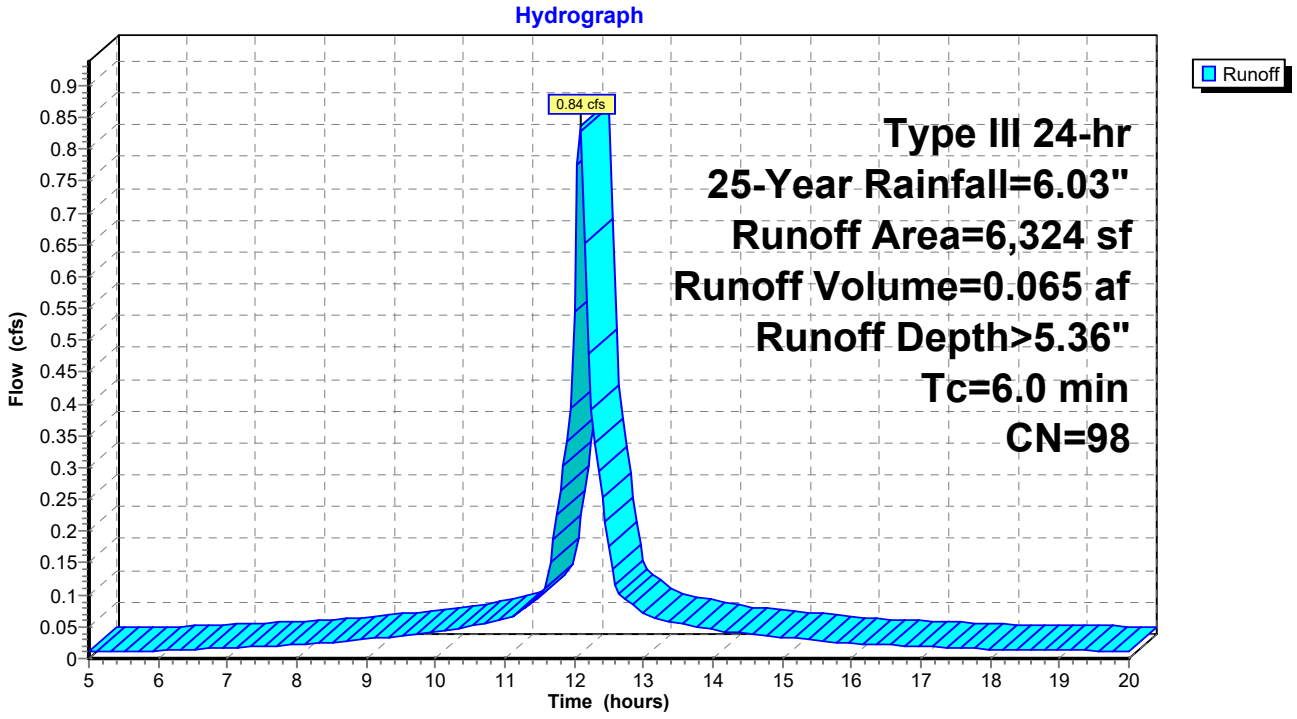
Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.065 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
*	4,000	98	Prop. Driveway
*	2,324	98	Prop. Building
	6,324	98	Weighted Average
	6,324		100.00% Impervious Area

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

Subcatchment 2: Area #2



Summary for Subcatchment 3: Area #2

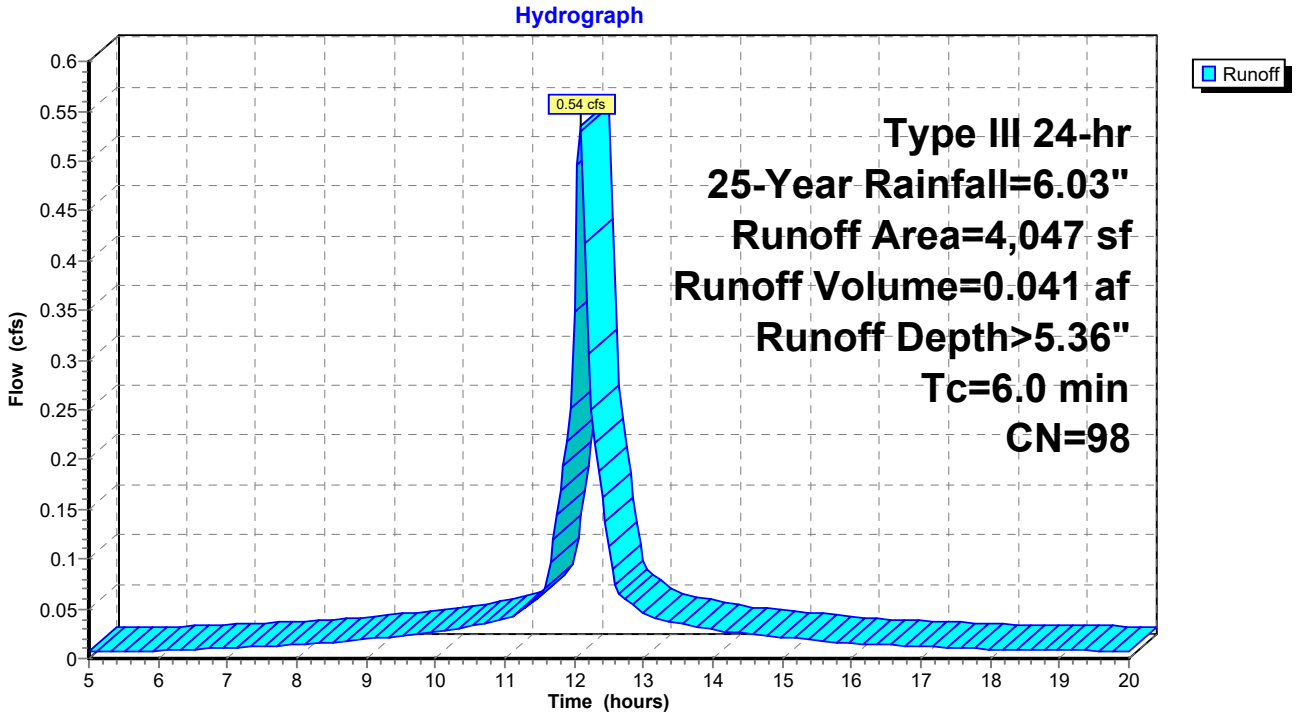
Runoff = 0.54 cfs @ 12.09 hrs, Volume= 0.041 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
*	1,723	98	Prop. Driveway
*	2,324	98	Prop. Building
	4,047	98	Weighted Average
	4,047		100.00% Impervious Area

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

Subcatchment 3: Area #2



Summary for Pond #1: Leaching Galley's

Inflow Area = 0.145 ac,100.00% Impervious, Inflow Depth > 5.36" for 25-Year event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.065 af
Outflow = 0.10 cfs @ 11.55 hrs, Volume= 0.065 af, Atten= 88%, Lag= 0.0 min
Discarded = 0.10 cfs @ 11.55 hrs, Volume= 0.065 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 50.49' @ 12.70 hrs Surf.Area= 0.012 ac Storage= 0.021 af

Plug-Flow detention time= 64.4 min calculated for 0.065 af (100% of inflow)
Center-of-Mass det. time= 63.9 min (798.1 - 734.1)

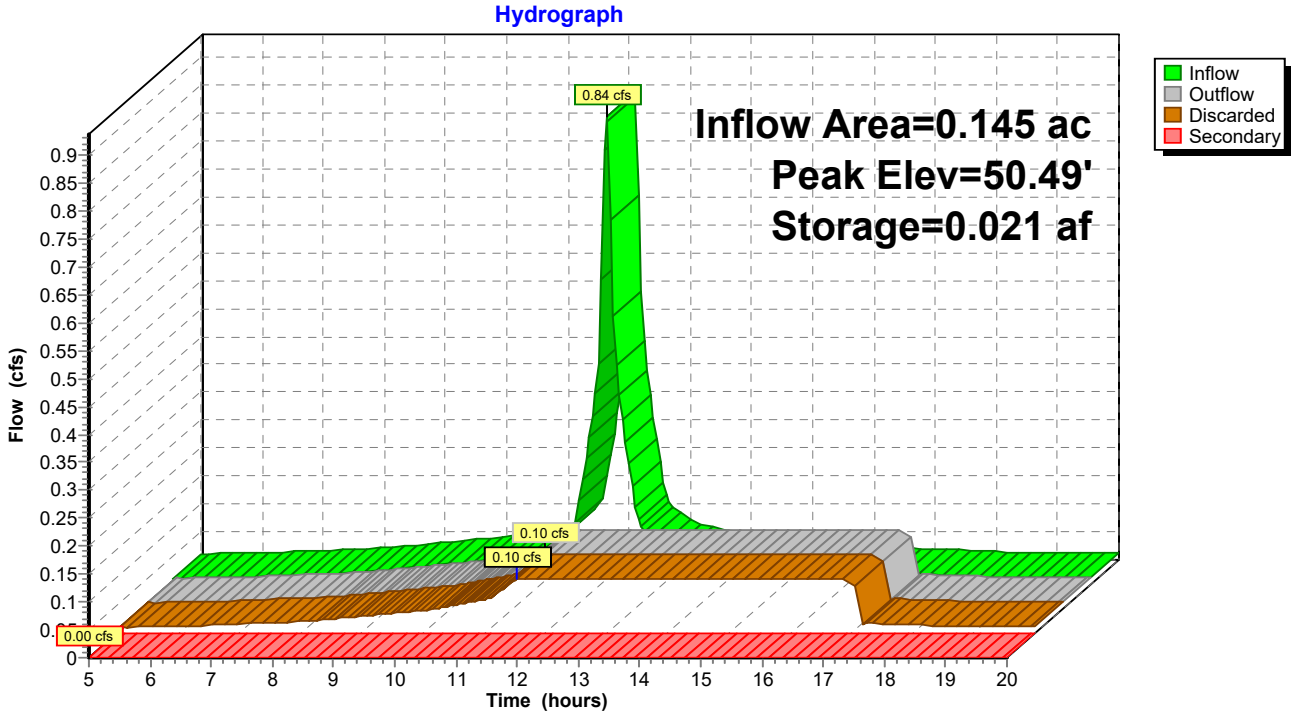
Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.006 af	**7.83'W x 65.00'L x 3.33'H Gravel**
			0.039 af Overall - 0.023 af Embedded = 0.016 af x 40.0% Voids
#2	48.50'	0.023 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 6 Inside #1
		0.030 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.10 cfs @ 11.55 hrs HW=48.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑**2=Orifice** (Controls 0.00 cfs)

Pond #1: Leaching Galley's



Summary for Pond #2: Leaching Galley's

Inflow Area = 0.093 ac,100.00% Impervious, Inflow Depth > 5.36" for 25-Year event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.041 af
Outflow = 0.07 cfs @ 11.60 hrs, Volume= 0.041 af, Atten= 88%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.60 hrs, Volume= 0.041 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 50.33' @ 12.66 hrs Surf.Area= 0.008 ac Storage= 0.013 af

Plug-Flow detention time= 57.9 min calculated for 0.041 af (100% of inflow)
Center-of-Mass det. time= 57.6 min (791.8 - 734.1)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.004 af	**7.83'W x 44.00'L x 3.33'H Gravel**
			0.026 af Overall - 0.015 af Embedded = 0.011 af x 40.0% Voids
#2	48.50'	0.015 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 4 Inside #1
		0.020 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.07 cfs @ 11.60 hrs HW=48.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=48.00' (Free Discharge)
↑**2=Orifice** (Controls 0.00 cfs)

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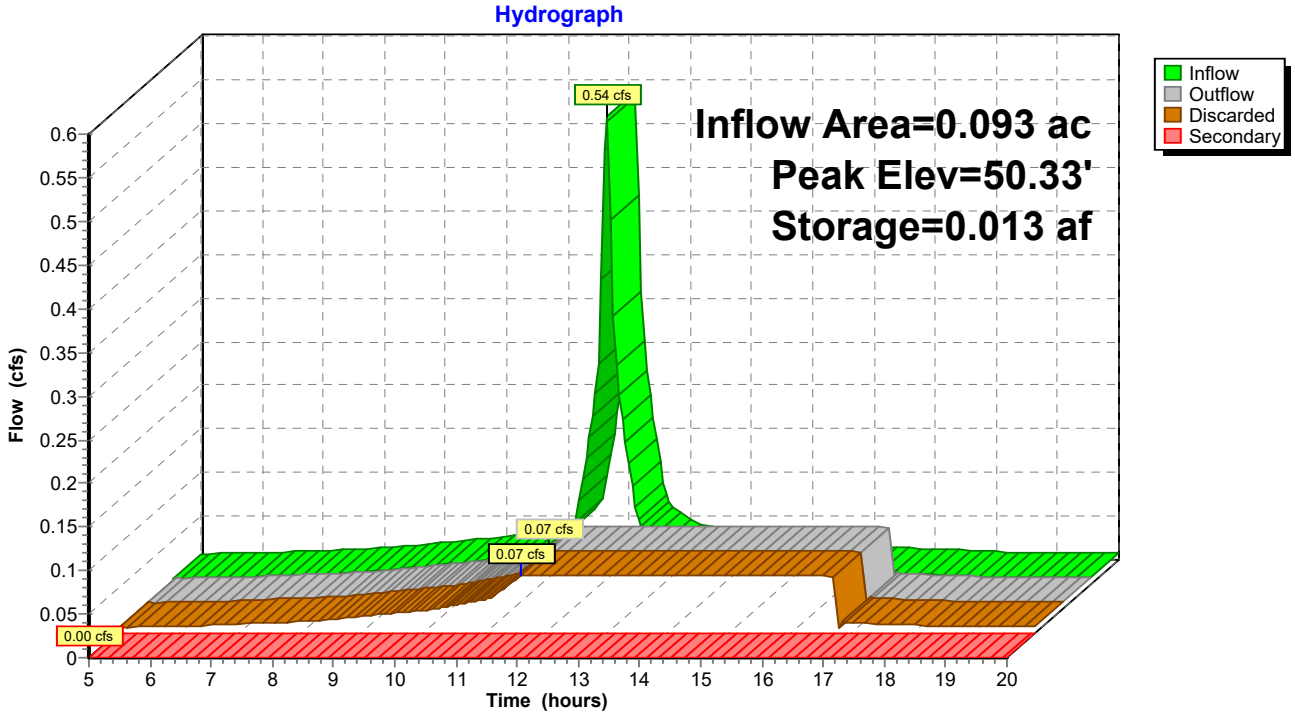
Pond #2: Leaching Galley's

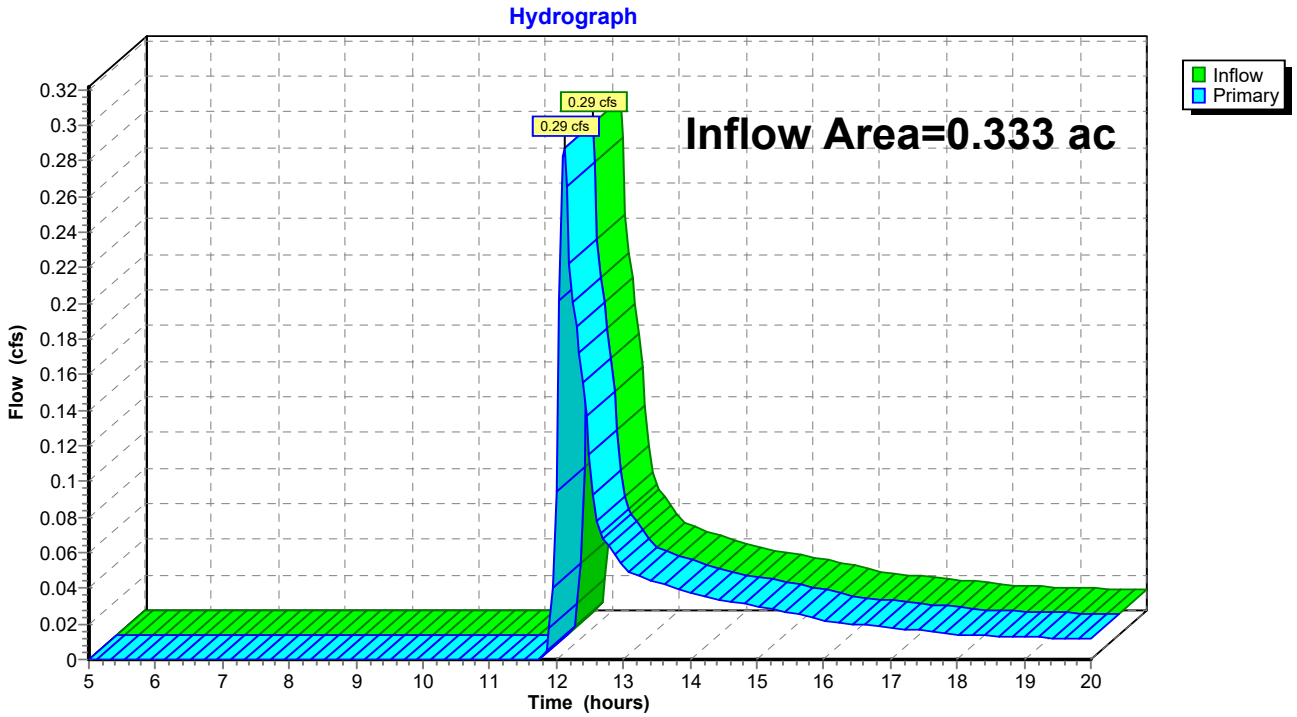


Summary for Pond 1P: Offsite

Inflow Area = 0.333 ac, 15.15% Impervious, Inflow Depth > 0.90" for 25-Year event
Inflow = 0.29 cfs @ 12.12 hrs, Volume= 0.025 af
Primary = 0.29 cfs @ 12.12 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



Summary for Subcatchment 1: Remaining Site

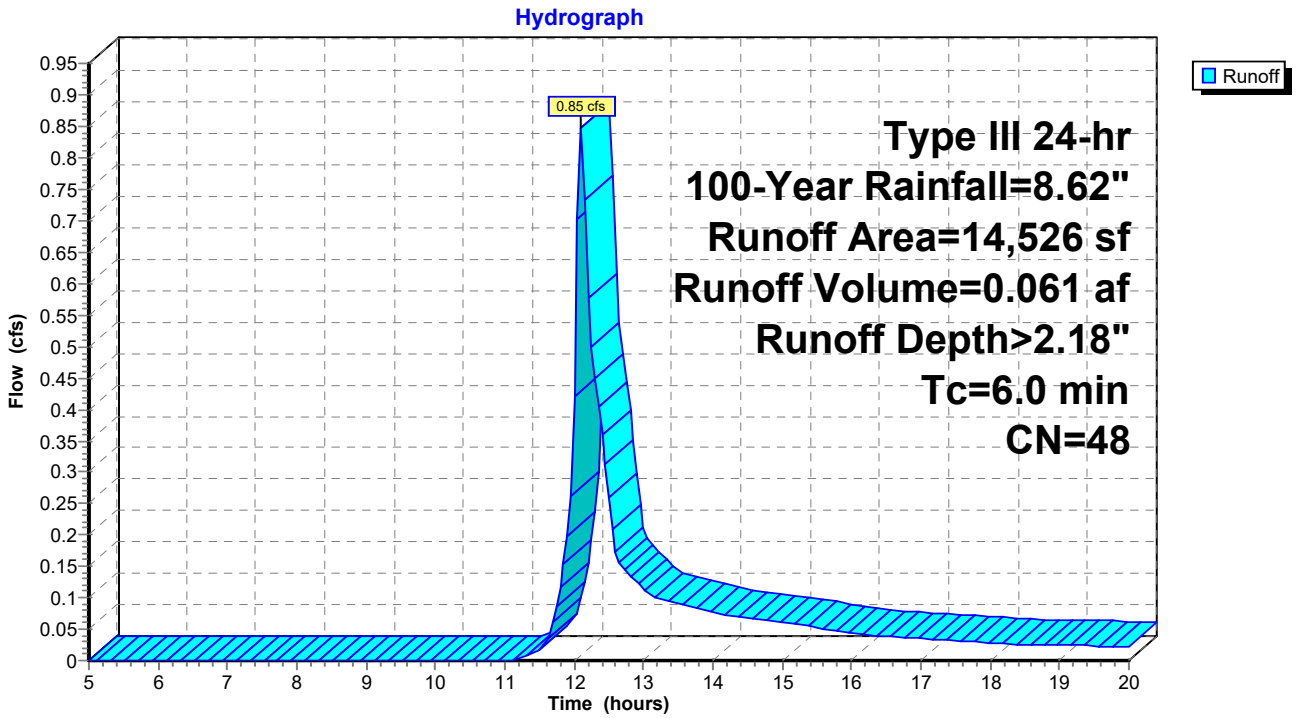
Runoff = 0.85 cfs @ 12.10 hrs, Volume= 0.061 af, Depth> 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.62"

	Area (sf)	CN	Description
	12,326	39	>75% Grass cover, Good, HSG A
*	1,040	98	Prop. Patios
*	1,160	98	Existing Passageway Drive
	14,526	48	Weighted Average
	12,326		84.85% Pervious Area
	2,200		15.15% Impervious Area

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

Subcatchment 1: Remaining Site



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Summary for Subcatchment 2: Area #2

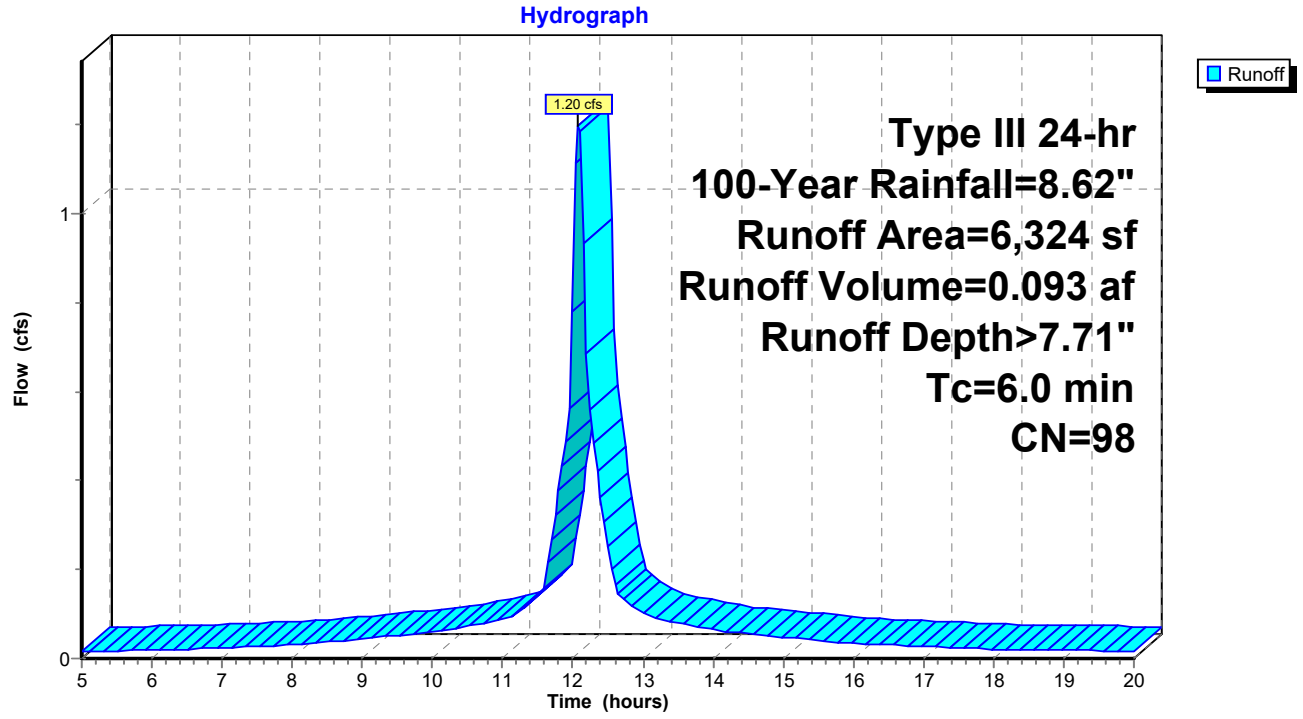
Runoff = 1.20 cfs @ 12.09 hrs, Volume= 0.093 af, Depth> 7.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.62"

	Area (sf)	CN	Description
*	4,000	98	Prop. Driveway
*	2,324	98	Prop. Building
	6,324	98	Weighted Average
	6,324		100.00% Impervious Area

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

Subcatchment 2: Area #2



Summary for Subcatchment 3: Area #2

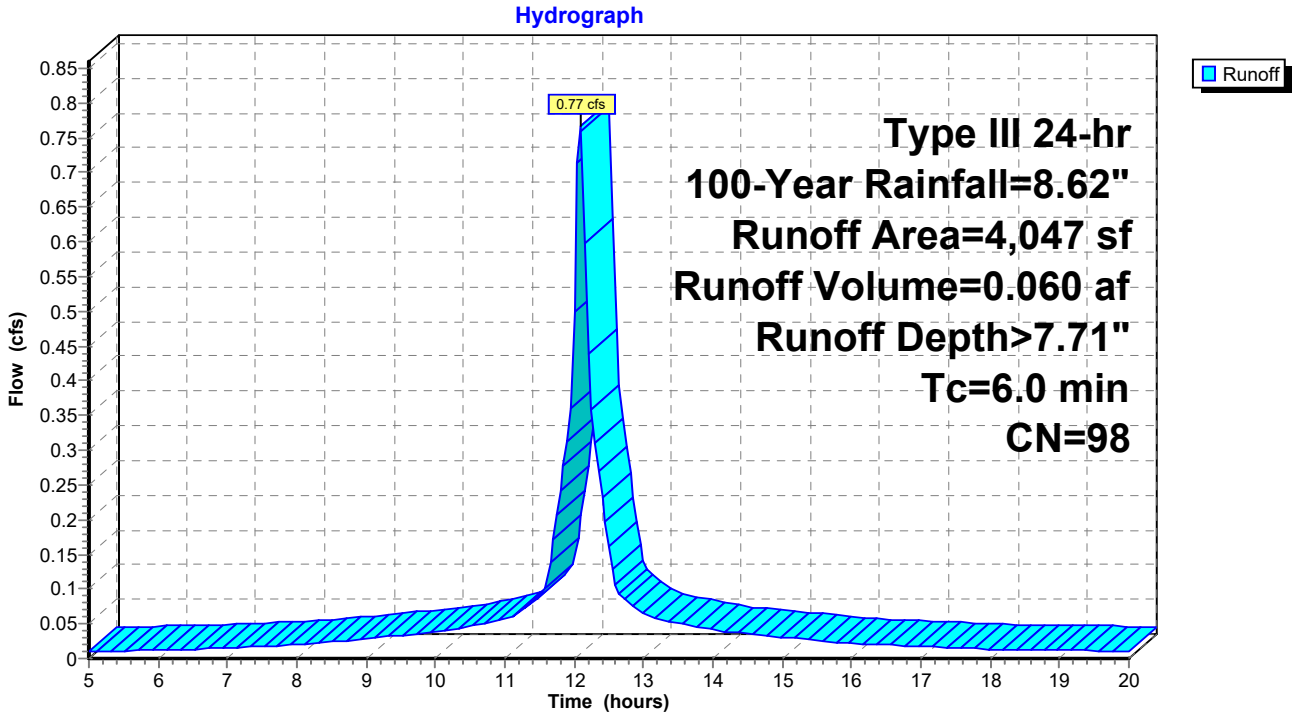
Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 7.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.62"

	Area (sf)	CN	Description
*	1,723	98	Prop. Driveway
*	2,324	98	Prop. Building
	4,047	98	Weighted Average
	4,047		100.00% Impervious Area

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

Subcatchment 3: Area #2



Summary for Pond #1: Leaching Galley's

Inflow Area = 0.145 ac,100.00% Impervious, Inflow Depth > 7.71" for 100-Year event
Inflow = 1.20 cfs @ 12.09 hrs, Volume= 0.093 af
Outflow = 0.51 cfs @ 12.29 hrs, Volume= 0.093 af, Atten= 58%, Lag= 12.1 min
Discarded = 0.10 cfs @ 11.20 hrs, Volume= 0.079 af
Secondary = 0.41 cfs @ 12.29 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 50.94' @ 12.29 hrs Surf.Area= 0.012 ac Storage= 0.026 af

Plug-Flow detention time= 61.5 min calculated for 0.093 af (100% of inflow)
Center-of-Mass det. time= 61.0 min (793.8 - 732.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.006 af	**7.83'W x 65.00'L x 3.33'H Gravel**
			0.039 af Overall - 0.023 af Embedded = 0.016 af x 40.0% Voids
#2	48.50'	0.023 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 6 Inside #1
		0.030 af	Total Available Storage

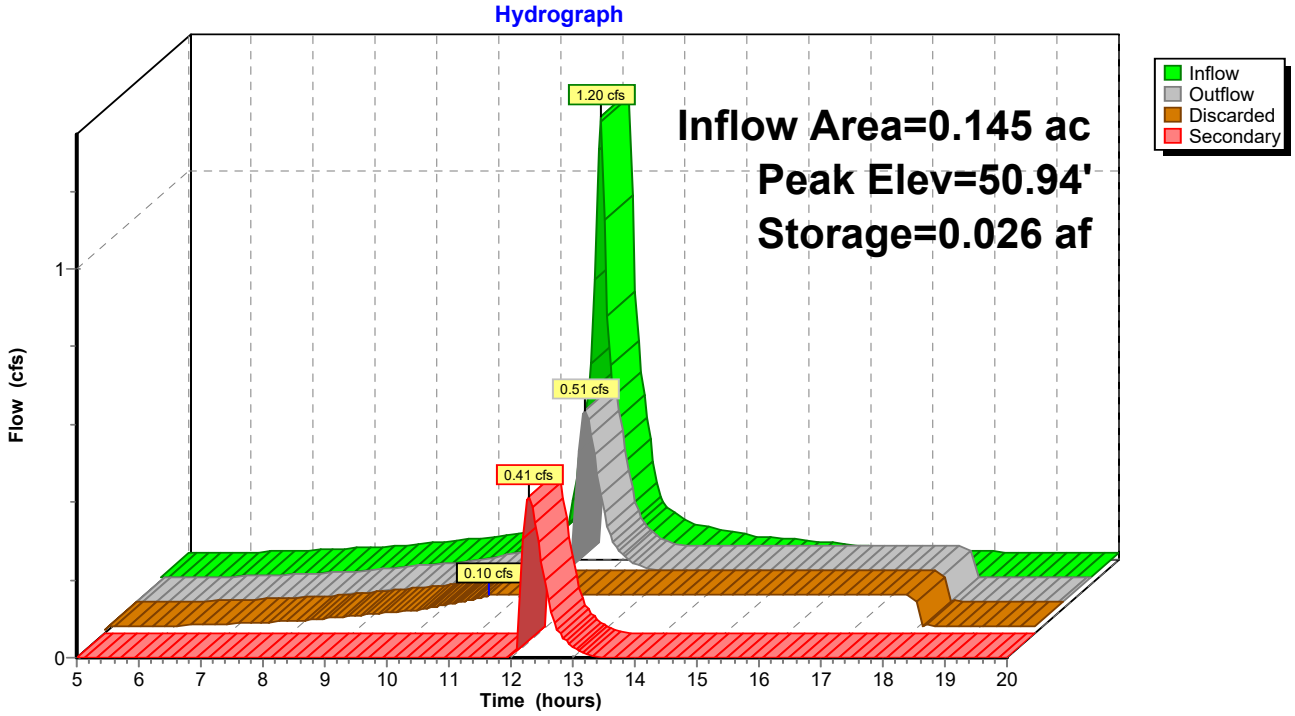
Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.10 cfs @ 11.20 hrs HW=48.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Secondary OutFlow Max=0.41 cfs @ 12.29 hrs HW=50.94' (Free Discharge)
└**2=Orifice** (Orifice Controls 0.41 cfs @ 2.25 fps)

120 Norwood Ave - Proposed
Prepared by HP

Pond #1: Leaching Galley's



Summary for Pond #2: Leaching Galley's

Inflow Area = 0.093 ac,100.00% Impervious, Inflow Depth > 7.71" for 100-Year event
Inflow = 0.77 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.33 cfs @ 12.29 hrs, Volume= 0.060 af, Atten= 58%, Lag= 12.4 min
Discarded = 0.07 cfs @ 11.25 hrs, Volume= 0.052 af
Secondary = 0.26 cfs @ 12.29 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 50.82' @ 12.29 hrs Surf.Area= 0.008 ac Storage= 0.017 af

Plug-Flow detention time= 61.0 min calculated for 0.059 af (100% of inflow)
Center-of-Mass det. time= 60.5 min (793.4 - 732.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	0.004 af	**7.83'W x 44.00'L x 3.33'H Gravel**
			0.026 af Overall - 0.015 af Embedded = 0.011 af x 40.0% Voids
#2	48.50'	0.015 af	**5.68'W x 10.50'L x 2.83'H Leaching Galley** x 4 Inside #1
		0.020 af	Total Available Storage

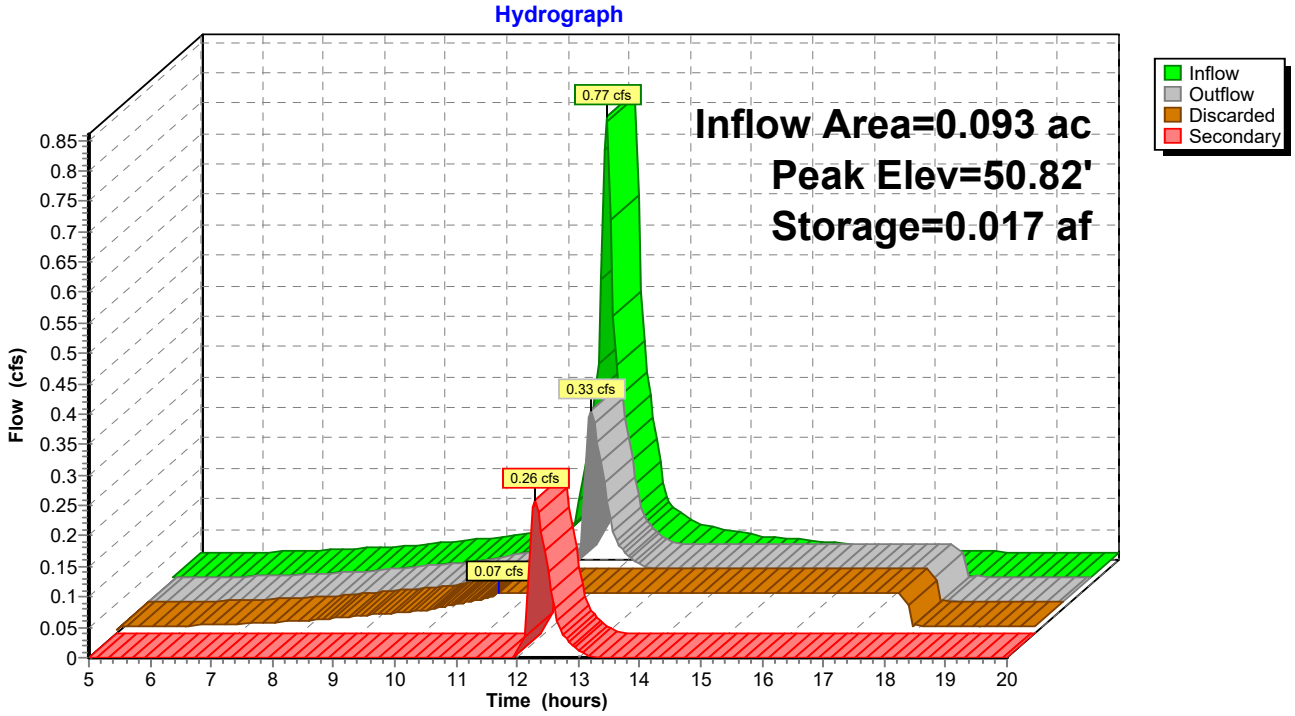
Device	Routing	Invert	Outlet Devices
#1	Discarded	48.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Secondary	50.50'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.07 cfs @ 11.25 hrs HW=48.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Secondary OutFlow Max=0.26 cfs @ 12.29 hrs HW=50.82' (Free Discharge)
└**2=Orifice** (Orifice Controls 0.26 cfs @ 1.93 fps)

120 Norwood Ave - Proposed
Prepared by HP

Pond #2: Leaching Galley's



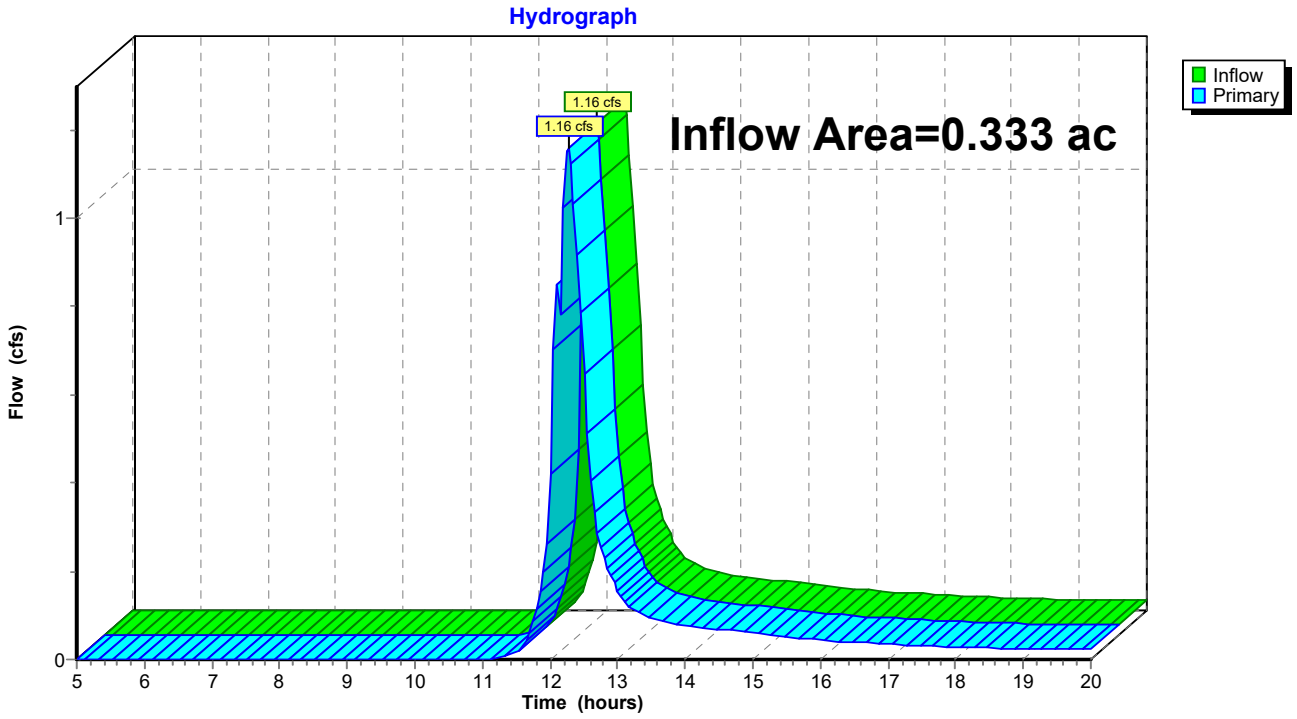
120 Norwood Ave - Proposed
Prepared by HP

Summary for Pond 1P: Offsite

Inflow Area = 0.333 ac, 15.15% Impervious, Inflow Depth > 2.97" for 100-Year event
Inflow = 1.16 cfs @ 12.27 hrs, Volume= 0.082 af
Primary = 1.16 cfs @ 12.27 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Offsite



Soil Map—Middlesex County, Massachusetts

Map Scale: 1:496 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Sep 25, 2020—Oct 4, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	0.6	100.0%
Totals for Area of Interest		**0.6**	**100.0%**

#392-22

OPERATION & MAINTENANCE PLAN

STORMWATER MANAGEMENT FACILITIES
PROPOSED CONDOMINIUM DEVELOPMENT
120 NORWOOD AVE
NEWTON, MASSACHUSETTS

June 29, 2022

VERNE T. PORTER JR., PLS
LAND SURVEYORS – CIVIL ENGINEERS
354 ELLIOT STREET
NEWTON, MA 02464

OPERATION & MAINTENANCE PLAN
STORMWATER MANAGEMENT FACILITIES
PROPOSED CONDOMINIUM DEVELOPMENT
120 NORWOOD AVE
NEWTON, MA

The proposed project includes stormwater runoff controls associated with the construction of a new 4-unit condominium development and driveways. The major components associated with maintenance needs are the proposed leaching gallies that will handle runoff from the proposed building and proposed driveway. These will need to be cleaned periodically as noted below. Cleaning of this structures shall be done by the property owner or by a specialty contractor with hydraulic cleaning ability. The following outlines the major maintenance issues associated with the project:

Leaching Galley/Cleaning:

The proposed leaching gallies should be inspected monthly during the first year, and then every third year following the 1-year inspection.

The leaching gallies are equipped with a frame and cover. After removal of the cover, a stadia rod should be used to measure the depth of sediment. If the depth of sediment is in excess of 3", then the sediment should be removed.

Catch Basin Inspection/Cleaning:

Have all catchbasins cleaned out completely twice annually during April and October, if required.

Drain Manhole Inspection/Cleaning:

Have all drain manholes cleaned out completely twice annually during April and October, if required.

Trench Drain Inspection/Cleaning:

Have all trench drains cleaned out completely twice annually during April and October, if required.

Street Sweeping

Have the driveway swept bi-annually in April and October.

MAINTENANCE RESPONSIBILITIES

The maintenance of the Drainage System is the responsibility of the Property Owners. The actual work can be accomplished by the Owner or can be subcontracted to a company that specializes in the cleaning of storm drainage facilities. Inspections should be performed by independent individual such as the design engineer or other experienced individual in the field.

Construction period pollution control

Erosion and sedimentation control measures will be implemented prior to and during construction activities to minimize impacts from land disturbance activities. Erosion and sedimentation control measures implemented on the site will include, at a minimum, dust control measures, the installation of silt fence barriers on the up-gradient side of resource areas, and catch basin inlet protection. Controls may also include temporary sedimentation basins and diversion swales and temporary seeding. The erosion and sedimentation controls will be inspected at the end of the day if precipitation is forecast, and after each rainfall event of 0.5 inches or more. Should construction occur during winter months, seasonally appropriate stabilization measure will be utilized.

Below is a summary of the minimum construction period pollution control requirements. These topics are presented as a means of demonstrating understanding of pollution control but are not meant to supplant preparation of the SWPPP. Please refer to the SWPPP for complete construction activity details.

a. Dust Control

Mitigation measures will be implemented to control fugitive dust during construction activities. Dust control measure may include seeding, wet suppression, application of soil stabilization agents, or other measures to control dust generated by construction activities. The Contractor shall confirm with state and local regulations to see if the use of calcium chloride for dust suppression is allowed.

b. Erosion Control Barriers

Prior to any ground disturbance, erosion control barriers will be installed at the limit of work at down-gradient positions on the site. The barriers will consist of silt fence and staked hay bales and will be entrenched in the soil to prevent underflow.

c. Catch Basin/Trench Drain Inlet Protection

All existing and newly installed catch basins or trench drains shall be protected during construction with a filter insert system. These sedimentation control measures will be regularly maintained until the drainage area tributary to the catch basin has been stabilized.

d. Temporary Sedimentation Basins and Diversion Swales

If necessary, temporary sedimentation basins will be constructed to prevent transport of fine-grained sediment into wetland resource areas and other off-site areas. These temporary basins will be located where appropriate, as determined by the contractor. Temporary diversion swales or berms may be used to convey runoff from construction areas to temporary or previously constructed basins.

e. Temporary Seeding

Temporary seeding will be used where vegetative cover is required for less than one year on disturbed soil areas. Such areas will be seeded if the soils will be exposed without construction activity for more than 30 days. Rapidly growing annual grasses, such as annual rye grass, oats, perennial rye grass or winter rye will be uniformly applied. Depending on the slope, the soil may be covered with a layer of straw mulch, an erosion control blanket, or a bonded fiber matrix.

f. Permanent Seeding

Upon completion of the final grading, any areas not covered by pavement, other forms of stabilization, including landscaping, will be seeded with rapidly growing annual rye grass/red fescue seed mix.

STORMWATER MANAGEMENT REPORT
PROPOSED CONDOMINIUM DEVELOPMENT
120 NORWOOD AVE
NEWTON, MASSACHUSETTS

INSPECTION REPORT:

Inspection Firm: _____

Inspectors Name: _____ Date: _____

Components Inspected: _____

Signed: _____

SYSTEM MAINTENANCE:

Maintenance Firm: _____ Date: _____

Leaching Gallies Inspected: Yes____No__Comments:_____ _____

_____

Leaching Gallies Cleaned: Yes____No__Comments:_____

Catchbasins Inspected: Yes____No__Comments:_____

_____

Catchbasins Cleaned: Yes____No__Comments:_____

Manhole Inspected: Yes____No__Comments:_____

_____

Manhole Cleaned: Yes____No__Comments:_____

Trench Drain Inspected: Yes____No__Comments:_____

_____

Trench Drain Cleaned: Yes____No__Comments:_____

Estimate of Material Removed: _____

Other Comments: _____

_____

_____

Signed: _____

Middlesex County, Massachusetts

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)

Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Hinckley

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

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Windsor

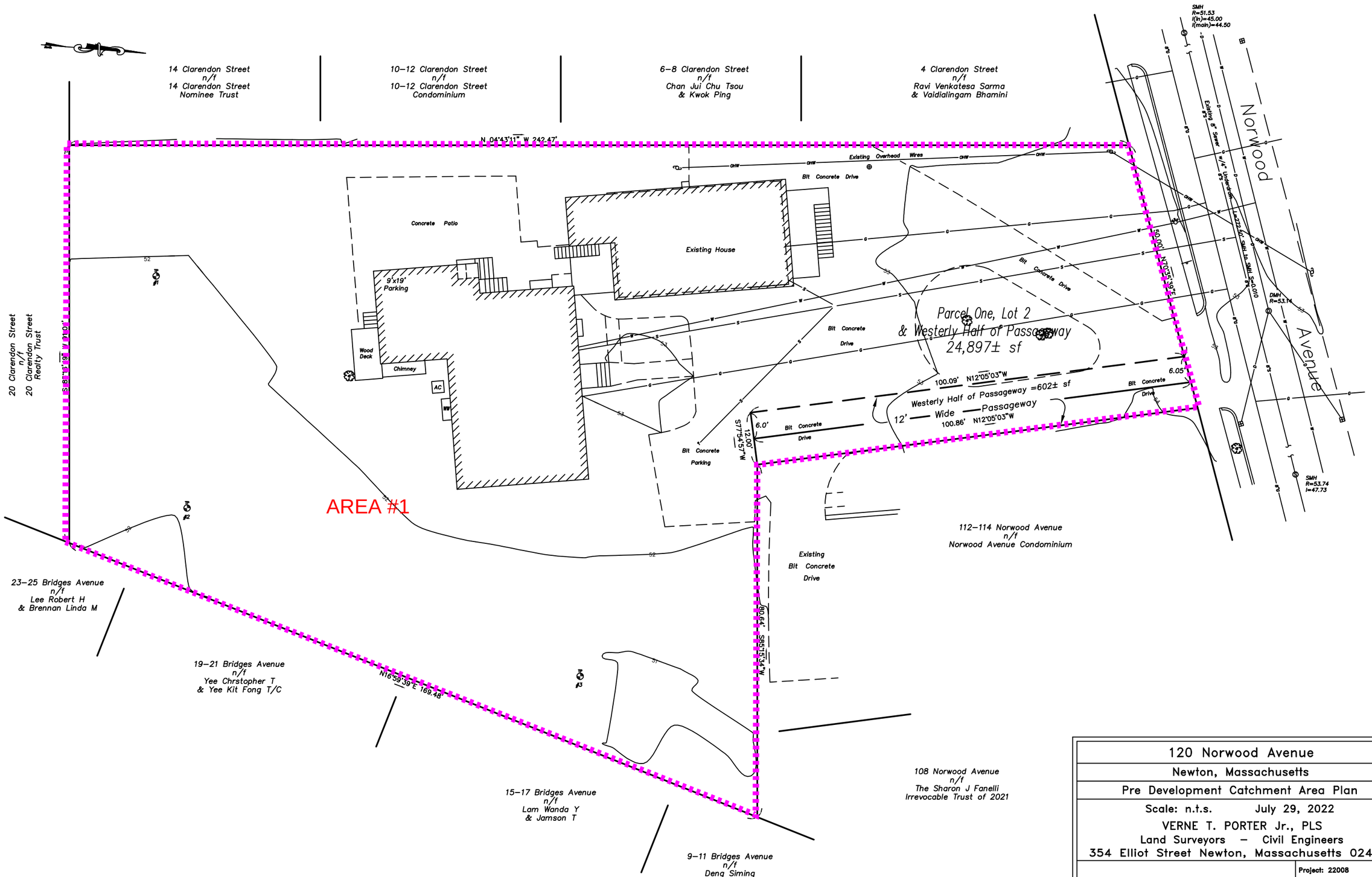
Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex

Across-slope shape: Linear, convex
Hydric soil rating: No

Data Source Information

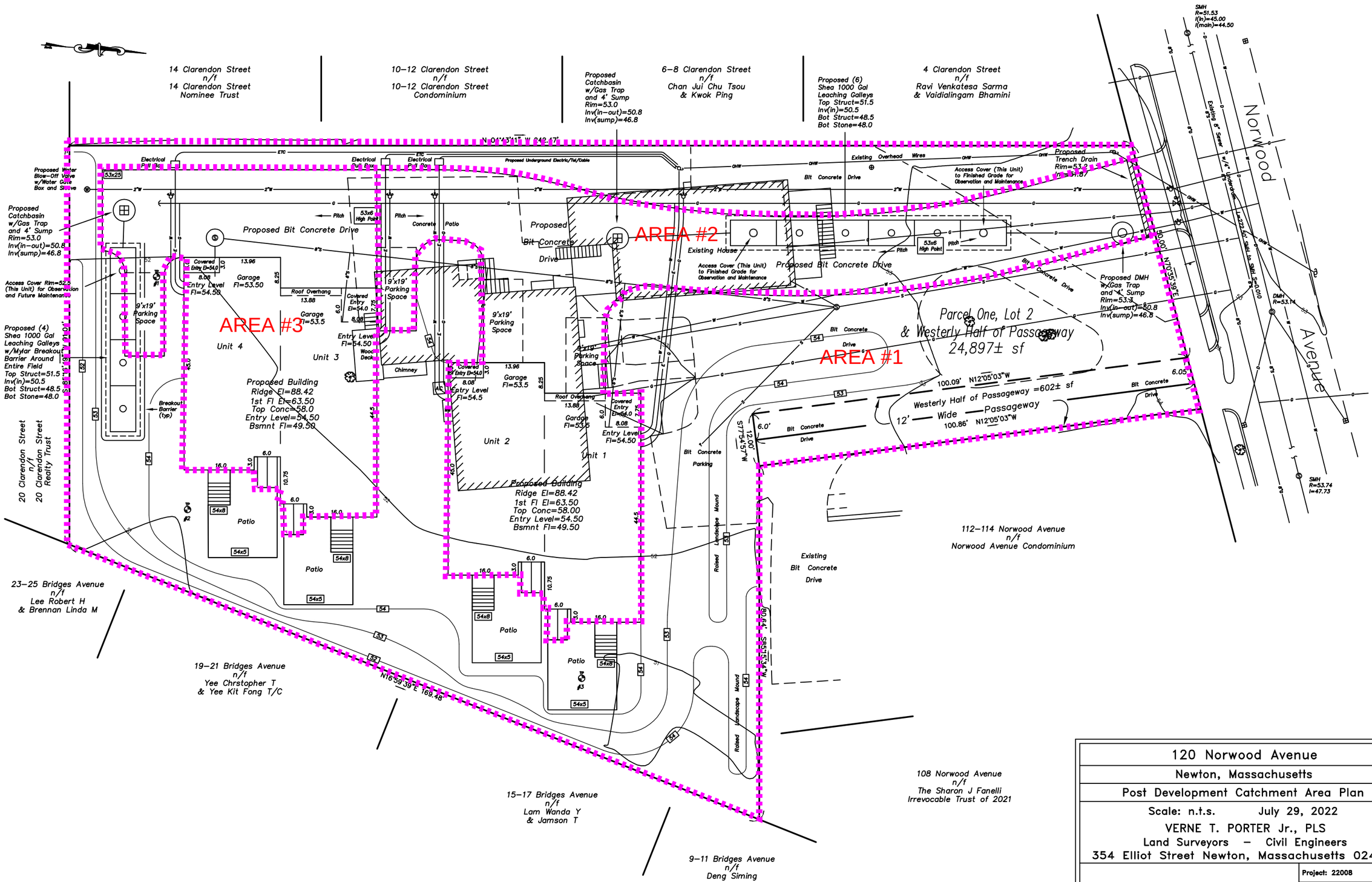
Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

#392-22



120 Norwood Avenue	
Newton, Massachusetts	
Pre Development Catchment Area Plan	
Scale: n.t.s. July 29, 2022 VERNE T. PORTER Jr., PLS Land Surveyors – Civil Engineers 354 Elliot Street Newton, Massachusetts 02464	
Sheet 1 of 2	Project: 22008 Checked By: V. Porter Jr. Drawn By: R. Jardine Jr.

#392-22



120 Norwood Avenue	
Newton, Massachusetts	
Post Development Catchment Area Plan	
Scale: n.t.s. July 29, 2022	
VERNE T. PORTER Jr., PLS Land Surveyors – Civil Engineers 354 Elliot Street Newton, Massachusetts 02464	
	Project: 22008
	Checked By: V. Porter Jr.
Sheet 2 of 2	Drawn By: R. Jardine Jr.

TEST PIT FIELD LOG

#392-22

PROJECT

DESCRIPTION: 120 NORWOOD ACRE
LOCATION: NEWTON

TEST PIT NO.: 1
DATE: 2-17-22
WEATHER: SUNNY 50°
GROUND EL.:
ENGINEER: VERNE T PORTER JR

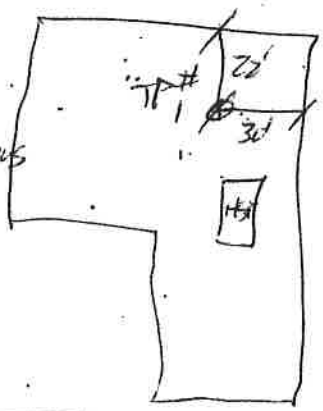
PERCOLATION RESULTS

DEPTH:	TIME:
12"	
11"	
10"	
9"	
8"	
7"	
6"	

REMARKS:

AVERAGE RATE: > 2min/in

DEPTH	SOIL DESCRIPTION	Excav. Effort	Boulder Count	Remar No.
0'	6" SAND LOAM			
1'	18" LOAMY SAND			
2'				
3'	MEDIUM SAND			
4'				
5'	RUST LINE 5.5 ASSUMED SHGW			
6'				
7'	COARSE SAND			
8'				
9'				
10'	OBSERVED WATER 9.5'			
11'	COARSE SAND W/ STONE 1' MARK			
12'	BOTTOM EXCAVATION			
13'				
14'				



REMARKS:

TEST PIT PLAN

LEGEND

Boulder Count
Size Range
Classification
6"-18" --------A
18"-30" --------B

PROPORTIONS USED

Trace (TR)- 0 -10%
Little(LI.)-10-20%
Some (SO) -20-35%

ABBREVIATIONS

F-fine
M-medium
C-coarse
F/M-fine to med.
F/C-fine to coar.
V-very
GR-gray

EXCAVATION EFFORT

Easy	E
Moderate	M
Difficult	D
Groundwater	Gl

TEST PIT FIELD LOG

#392-22

PROJECT

DESCRIPTION: 120 NORWOOD AVE
LOCATION: NEWTON

TEST PIT NO.: 2
DATE: 2-17-22
WEATHER: SUNNY 50°
GROUND EL:
ENGINEER: VERNE T PORTER JR

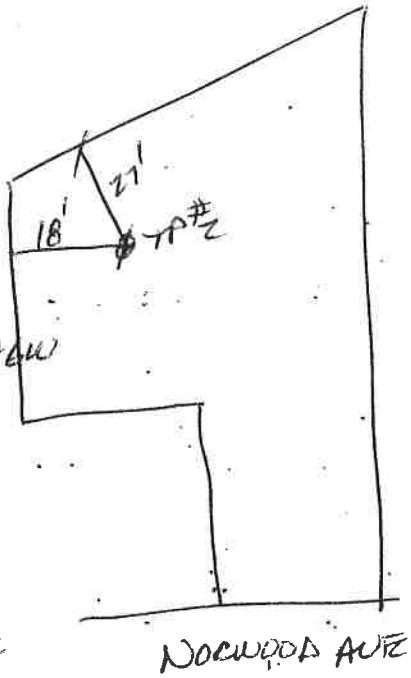
PERCOLATION RESULTS

DEPTH:	TIME:
12"	
11"	
10"	
9"	
8"	
7"	
6"	

REMARKS:

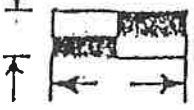
AVERAGE RATE: > 2 min/inch

DEPTH	SOIL DESCRIPTION	Excav. Effort	Boulder Count	Remar No.
0'	12" SAND LOAM			
1'	FILL			
2'				
3'				
4'	MEDIUM SAND			
5'				
6'	RUST LINE 6.0 ASSUME SHALL			
7'				
8'	COARSE SAND			
9'				
10'	OBSERVED WATER 9.75			
11'	COARSE SAND w/STONE BOTTOM EXCAVATION			
12'				
13'				
14'				



REMARKS:

TEST PIT PLAN



LEGEND

Boulder Count
Size Range
Classification
6"-18" --------A
18"-30" --------B

PROPORTIONS USED

Trace (TR)- 0 -10%
Little(LI.)-10-20%
Some (SO) -20-35%

ABBREVIATIONS

F-fine
M-medium
C-coarse
F/M-fine to med.
F/C-fine to coar.
V-very
GR-gray

EXCAVATION EFFORT

Easy	E
Moderate	M
Difficult	D
Groundwater	GI

TEST PIT FIELD LOG

#392-22

PROJECT

DESCRIPTION: 120 NORWOOD AVE
LOCATION: NEWTON

TEST PIT NO.: 3
DATE: 2-17-22
WEATHER: SUNNY 50°
GROUND EL:
ENGINEER: VERNE T PORTER JR

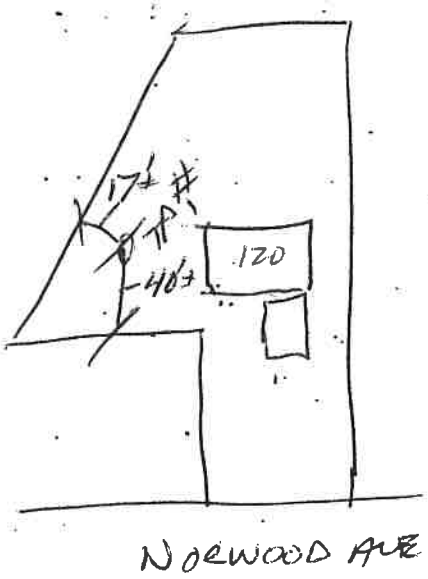
PERCOLATION RESULTS

DEPTH:	TIME:
12"	
11"	
10"	
9"	
8"	
7"	
6"	

REMARKS:

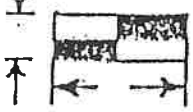
AVERAGE RATE: 7 min/inch

DEPTH	SOIL DESCRIPTION	Excav. Effort	Boulder Count	Remar No.
0'	12" SANDY LOAM			
1'	FILL			
2'				
3'	MEDIUM SAND			
4'				
5'	▽ RUST LINE ASSUME SHGW			
6'				
7'				
8'				
9'	▽ OBSERVED WATER			
10'				
11'				
12'				
13'				
14'				



REMARKS:

TEST PIT PLAN



LEGEND

Boulder Count
Size Range
Classification
6"-18" --------A
18"-30" --------B

PROPORTIONS USED

Trace (TR)- 0 -10%
Little(LI.)-10-20%
Some (SO) -20-35%

ABBREVIATIONS

F-fine
M-medium
C-coarse
F/M-fine to med.
F/C-fine to coar.
V-very
GR-gray

EXCAVATION EFFORT

Easy	E
Moderate	M
Difficult	D
Groundwater	GI