Engineering Alliance, Inc.
Civil Engineering & Land Planning Consultants

194 Central Street
Saugus, MA 01906
Tel: (781) 231-1349
Fax: (781) 417-0020

1950 Lafayette Road
Portsmouth, NH 03801
Tel: (603) 610-7100
Fax: (603) 610-7101

September 17, 2020

Lou Taverna, P.E.
Newton City Engineer
1000 Commonwealth Avenue
Newton, MA 02459

Re: EAI Project #: 20-75101
Proposed Garage & Addition
44 Billings Park
Newton, MA

Dear Mr. Taverna:

On behalf of our client, Tiffany Barqawi, Engineering Alliance, Inc. (EAI) is pleased to submit the following information for a proposed garage and one story addition to the single-family dwelling located at 44 Billings Park in Newton, MA. Enclosed for your review please find the following:

- Certified Plot Plan (prepared by Boston Survey, Inc. and dated August 6, 2020)
- Proposed Drainage Plan (11"x17" dated September 17, 2020)
- Watershed Plans (11"x17" dated September 17, 2020)
- Existing Conditions HydroCAD print-outs
- Proposed Conditions HydroCAD print-outs
- NOAA Rainfall Data
- SCS Soils Figure
- Soil Map Unit Description

The project consists of the construction of a new 880 square foot (s.f.) garage, a 60 s.f. one story addition to the existing dwelling, a 140 s.f. expansion of the existing bituminous concrete driveway, and stormwater infiltration system located at 44 Billings Park in Newton, MA. As part of the construction the existing 365 s.f. garage will be demolished and the new garage will be constructed in a similar location.

The proposed project results in a net increase of 770 s.f. of impervious area. As a result, stormwater generated by the proposed 880 s.f. garage will be directed to a proposed 500 gallon drywell surrounded in an envelope of crushed stone and wrapped in filter fabric. The proposed drywell system has been designed to attenuate all storms up to the 100-year storm event for the proposed garage.

A HydroCAD model was created to analyze the pre and post-development drainage conditions on the site. The *Watershed Plan* delineates the boundary of one watershed which ultimately discharges to an offsite low point at the rear of the property (Design Point 1). As described in the model, the groundcover is a mix of landscaped areas, the roof of the existing dwelling, the existing garage and the existing walkways and driveway. In the current condition, roof runoff is discharged at grade.

The existing dwelling will remain in addition to construction of the proposed addition and the proposed garage. The post-development condition will not alter the general hydrologic patterns of the site, so the watershed area delineations have remained the same as in the pre-development condition. Proposed Watershed #1A consists of the Site area excluding the

footprint of the proposed garage area. Proposed Watershed #1B consists of the proposed garage roof area. Proposed Watershed #1A will continue to drain via surface flow as in the existing condition. Proposed Watershed #1B will be routed to the 500 gallon drywell via a 6" PVC roof drain. An infiltration rate of 0.09 in/hr was used in the model which is the Rawls' rate associated with a hydrologic soil group (HSG) D per the SCS Soils Map for Middlesex county.

Technical Release 20 (TR-20) Program for Project Formulation Hydrology developed by the Soil Conservation Service (SCS) was employed to develop pre- and post-development peak flows. Drainage calculations were performed for the pre-development condition for the 2, 10, 25, and 100-year type III 24-hour storm events. Rainfall data for each event was obtained from data provided by the National Oceanic and Atmospheric Administration for the project location. The results are summarized as follows:

Pre-Development Condition Peak Discharge Summary (cfs):

	2-Year Storm (3.25 IN)	10-Year Storm (5.13 IN)	25-Year Storm (6.31 IN)	100-Year Storm (8.12 IN)
Design Point #1	0.49	0.90	1.16	1.55

Post-Development Condition Peak Discharge Summary (cfs):

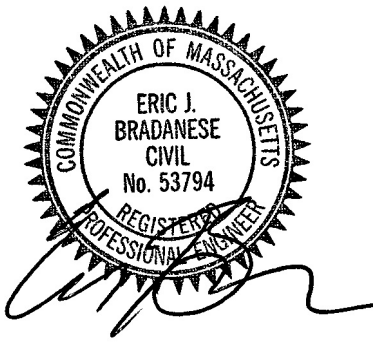
	2-Year Storm (3.25 IN)	10-Year Storm (5.13 IN)	25-Year Storm (6.31 IN)	100-Year Storm (8.12 IN)
Design Point #1	0.48	0.86	1.09	1.45

As indicated by the tables above, the proposed site design and subsurface infiltration system mitigate the impact of the proposed development for all storms up to and including the 100-year storm event.

We trust that this information will be useful in your review of the proposed project. Should you have any questions or require additional information, please feel free to contact this office. As always, thank you for your consideration of this request.

Very Truly Yours,
ENGINEERING ALLIANCE, INC.

Eric Bradanese
Senior Project Manager
Copy to: Tiffany Barqawi, Client
EAI File #: 20-75101



GEORGE C. COLLINS, P.L.S.
UNIT C-4 SHIPWAY PLACE
CHARLESTOWN, MA 02129
(617) 242-1313

I CERTIFY THAT THIS PLAN WAS MADE FROM AN INSTRUMENT SURVEY ON THE GROUND ON THE DATE OF OCTOBER 15, 2019 AND ALL STRUCTURES ARE LOCATED AS SHOWN HEREON.

ACCORDING TO THE FEDERAL EMERGENCY MANAGEMENT AGENCY (F.E.M.A.) MAPS, THE MAJOR IMPROVEMENTS ON THIS PROPERTY FALL IN AN AREA DESIGNATED AS

ZONE:	X
COMMUNITY PANEL:	25017C0556E
EFFECTIVE DATE:	06-04-2010

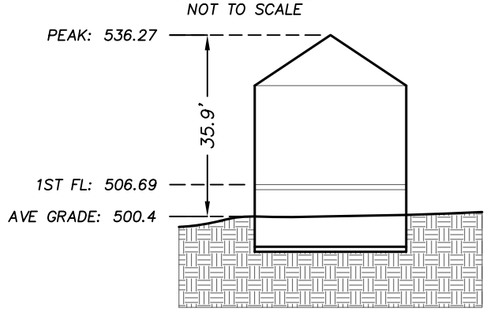
PREPARED FOR:
OWNERS OF RECORD:
SAFI W. BARQAWI
TIFFANY R. BARQAWI
44 BILLINGS PARK
NEWTON, MA 02458

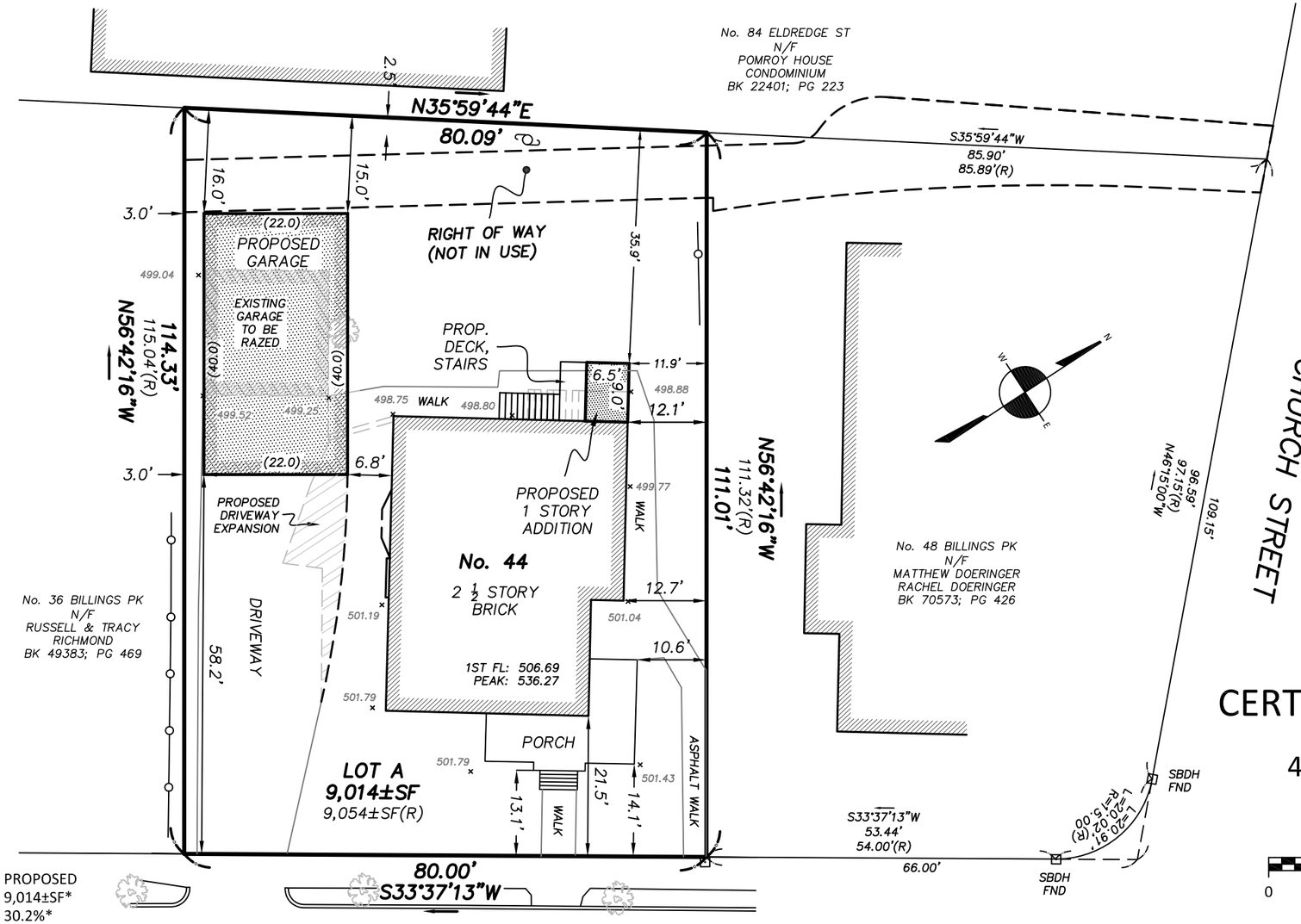
DEED:	BK 70349; PG 527
PLAN:	BK 5360; PG 364 BK 13247; PG 671 BK 14356; PG 83

NOTES:

PROPERTY SBL:	72008 0015
ZONING:	SR2 (OLD)
DATUM:	ASSUMED
AVERAGE GRADE:	500.4 (SEE CALC.)

DWELLING PROFILE
NOT TO SCALE





CERTIFIED PLOT PLAN

LOCATED AT
44 BILLINGS PARK
NEWTON, MA

SCALE: 1.0 INCH = 20.0 FEET

0 20 40

ZONING TABLE:

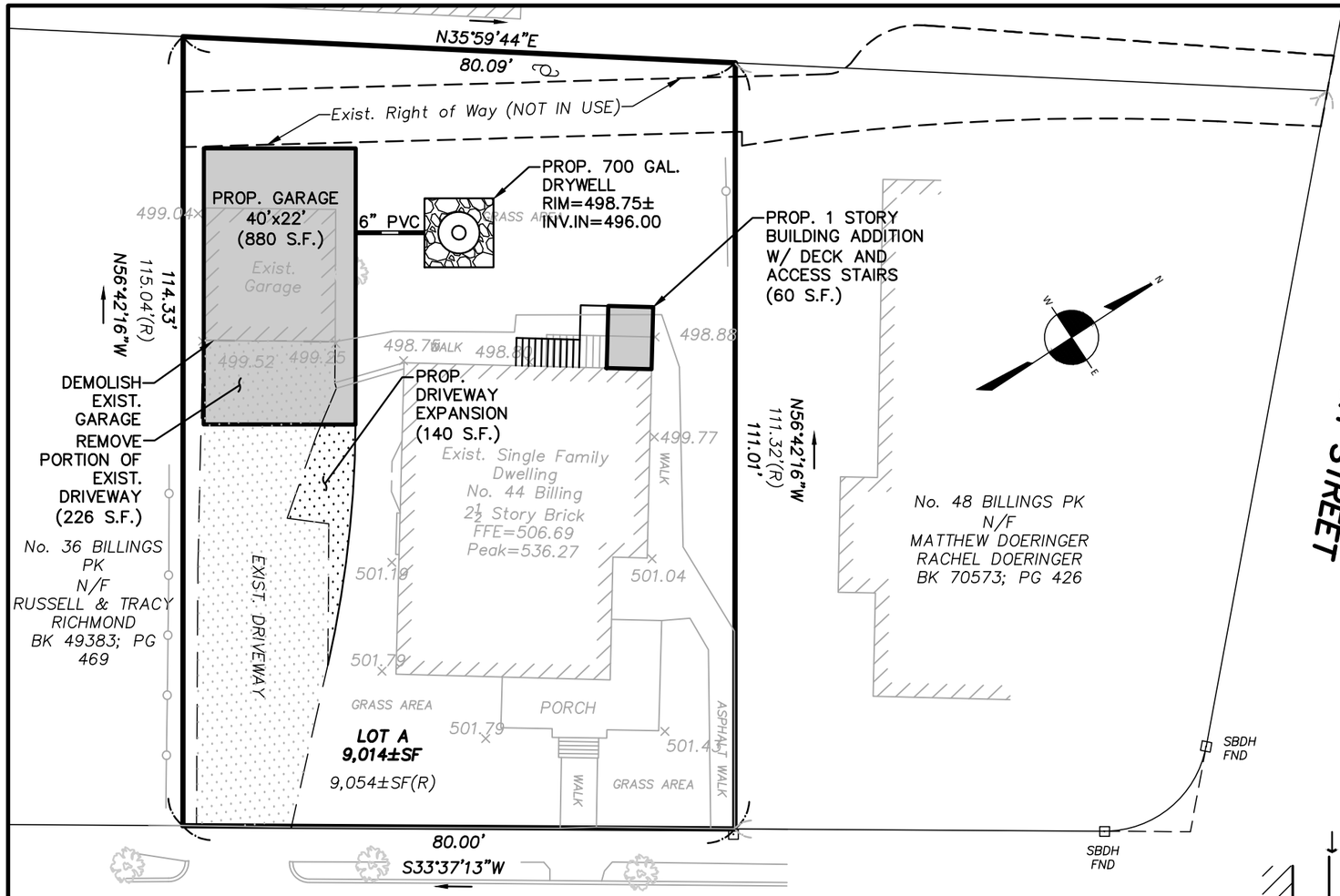
DISTRICT :	SR2(OLD), SLOPED ROOF			
		REQUIRED	EXISTING	PROPOSED
LOT AREA	(MIN.)	10,000 SF	9,014±SF*	9,014±SF*
LOT COVERAGE	(MAX.)	30.0%	23.9%	30.2%*
OPEN SPACE	(MIN.)	50.0%	62.7%	56.9%
LOT FRONTAGE	(MIN.)	80.0'	80.00'	80.00'
BUILD FACTOR	(MAX.)	25.0	18.3	18.3
FRONT SETBACK	(MIN.)	25.0'	21.5'*	58.2'
SIDE SETBACK	(MIN.)	7.5'	12.1'	3.0'*
REAR SETBACK	(MIN.)	15.0'	44.9'	15.0'
HEIGHT, FEET	(MAX.)	36.0'	35.9'	22.3'
HEIGHT, STORIES	(MAX.)	2.5	2.5	2
FAR	(MAX.)	0.40	0.56*	0.69*
IMPERVIOUS AREA			4,113±SF	4,522±SF
IMPERVIOUS COVERAGE			45.6%	50.2%

* = NON-CONFORMING

	Elevation 1	Elevation 2	Average	Length	Average x Length
Segment 1	501.4	501.8	501.6	31.1	15580.0
Segment 2	501.8	498.8	500.3	45.2	22592.2
Segment 3	498.8	498.9	498.8	35.9	17897.5
Segment 4	499.8	501.0	500.4	27.4	13691.1
Segment 5	501.0	501.0	501.0	5.0	2505.2
Segment 6	501.0	501.4	501.2	17.8	8922.0
			Sum of all segements =	81187.9	
		Perimeter (total length of all segments) =		162.3	
			Average grade plane =	**500.4**	

FIELD:	JJH
DRAFT:	JJH, RAP
CHECK:	GCC
DATE:	08/06/20

COMMONWEALTH OF MASSACHUSETTS
GEORGE C. COLLINS
No. 41784
PROFESSIONAL LAND SURVEYOR

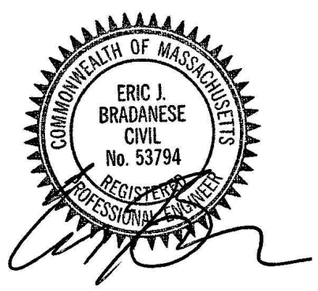


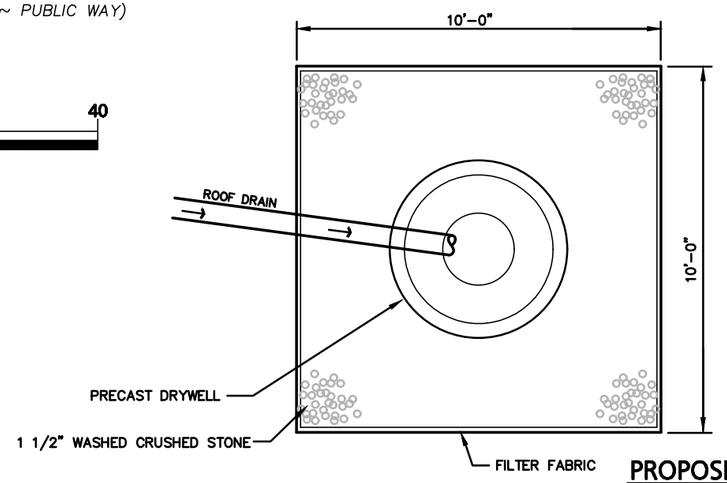
HORIZONTAL SCALE

20 0 10 20 40

(IN FEET)

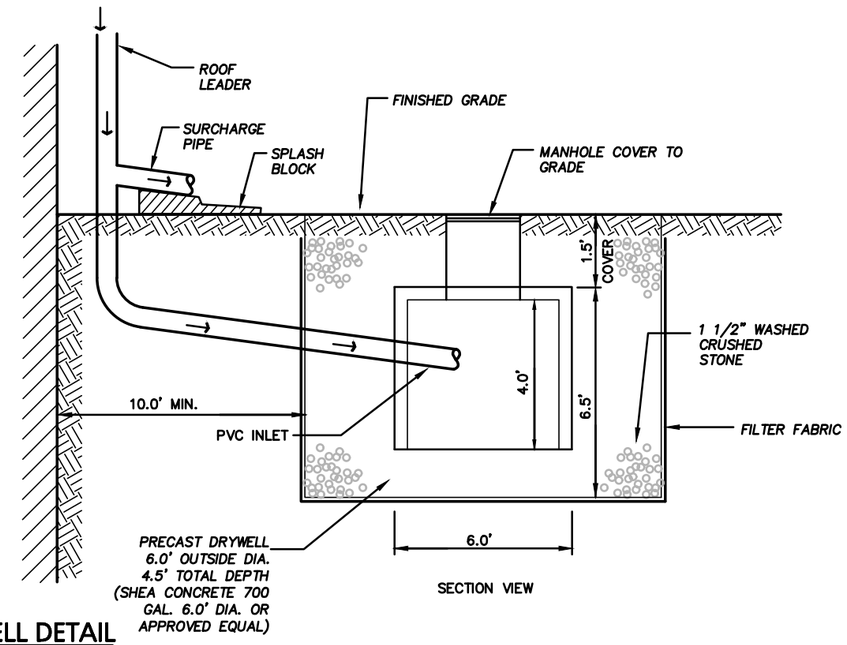
1"=20'





PROPOSED DRYWELL DETAIL

NOT TO SCALE



GENERAL NOTES:

1. EXISTING CONDITIONS SHOWN ON THIS PLAN WERE COMPILED FROM AN ACTUAL FIELD SURVEY PERFORMED BY BOSTON SURVEY, INC. ON OCTOBER 15, 2019.
2. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED UPON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLAN.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL CONTROL POINTS AND BENCHMARKS NECESSARY FOR THE WORK.
4. THE CONTRACTOR SHALL EXCAVATE TEST PITS PRIOR TO COMMENCING WORK TO TO DETERMINE EXISTING SOIL CONDITIONS. THE TEST PITS SHALL BE OBSERVED BY A LICENSED SOIL EVALUATOR AND WITNESSED BY THE CITY OF NEWTON AT THEIR DISCRETION. IF ANY CONDITIONS ALTER FROM THOSE ASSUMED IN THE PROJECT DESIGN, CONDITIONS MUST BE REPORTED TO THE ENGINEER IMMEDIATELY UPON COMPLETION.
5. ALL PROPOSED WORK SHALL BE PERFORMED IN FULL COMPLIANCE WITH THE CITY OF NEWTON, AND IS SUBJECT TO QUALITY CONTROL TESTING AT THE DISCRETION OF THE ENGINEERING DEPT. AT THE EXPENSE OF THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE CITY OF NEWTON D.P.W. PRIOR TO THE COMMENCEMENT OF ANY UTILITY WORK.
6. ANY CHANGE IN THE FIELD CONDITIONS SHOULD BE REPORTED TO THE ENGINEER TO ENSURE THAT ANY MODIFICATIONS TO THE ORIGINAL DESIGN CONFORM TO STANDARD ENGINEERING AND CONSTRUCTION PRACTICES AND ADEQUATE TO SERVE THE PROJECT'S NEEDS AND COMPLY WITH APPLICABLE STANDARDS AND REGULATIONS.
7. THE CONTRACTOR OR OWNER IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ANY PERMITS AND/OR CONNECTION FEES REQUIRED TO PERFORM THE WORK.
8. DISPOSAL OF ALL MATERIALS IS THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE OFF-SITE IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL MUNICIPAL REQUIREMENTS.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SITE RESTORATION AND CLEAN UP UPON COMPLETION OF THE PROJECT & SHALL SUBMIT AN AUTOCAD "AS-BUILT" TO THE ENGINEERING DEPT. UPON COMPLETION OF THE BUILDING & UTILITY WORK.

DESCRIPTION OF REVISION	DATE

PREPARED BY:
Engineering Alliance, Inc.
CMI Engineering & Land Planning Consultants
194 Central Street
Saugus, MA 01906
Tel: (781) 231-1349
Fax: (781) 417-0020
1950 Lafayette Road
Portsmouth, NH 03801
Tel: (603) 610-7100
Fax: (603) 610-7101

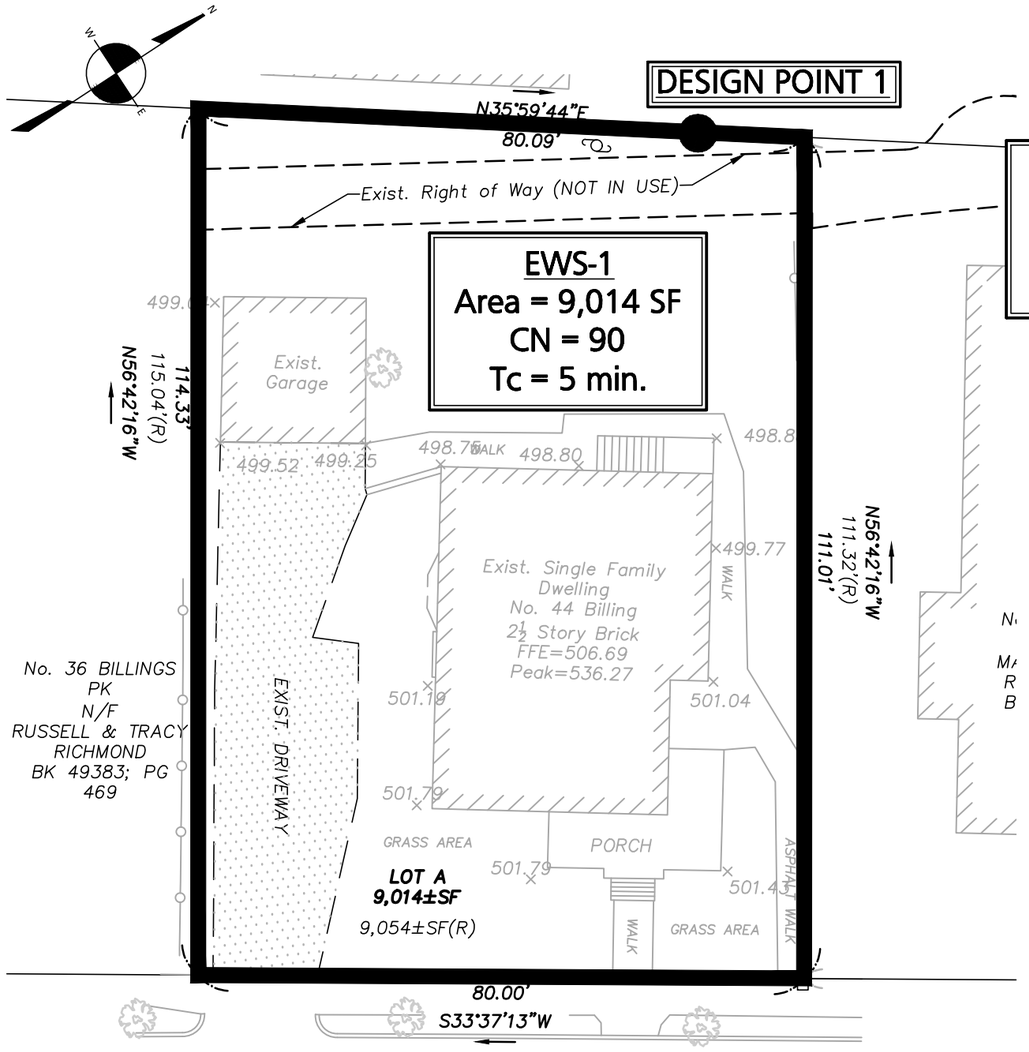
PROJECT: Proposed Site Plan
44 Billings Park
(Property SBL: 72008 0015)
Newton, MA 02459

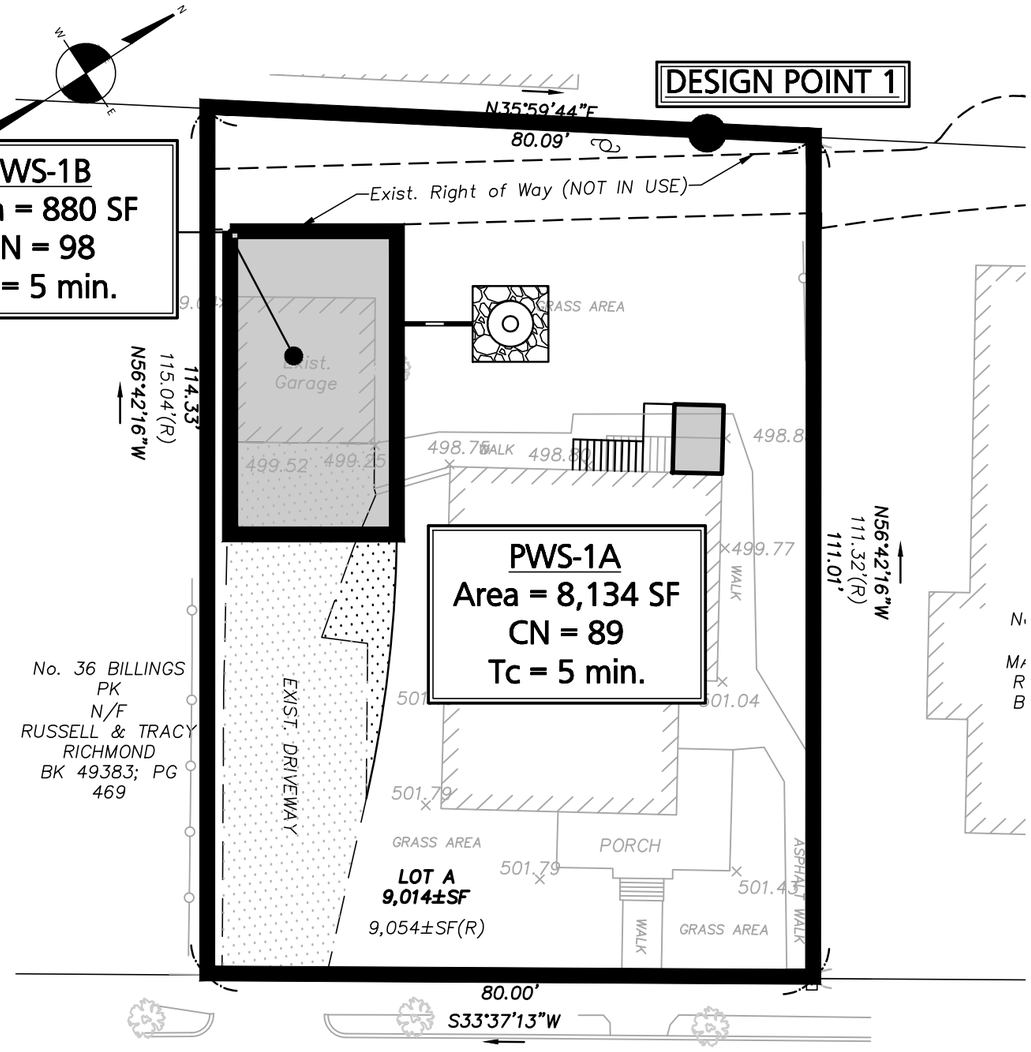
PROJECT #: 20-75101 | DATE: September 17, 2020
SCALE: AS NOTED | DWG FILE NAME: 20-75101.DWG
DESIGN BY: CalvIn Reach | CHECKED BY: Eric Bradanese, P.E.

APPLICANT: Tiffany Barqawi
44 Billings Park
Newton, MA 02459

DRAWING TITLE: Proposed Drainage Plan

DWG. NO. 1of1





BILLINGS PARK

(VARIABLE WIDTH ~ PUBLIC WAY)

EXISTING WATERSHED PLAN

BILLINGS PARK

(VARIABLE WIDTH ~ PUBLIC WAY)

PROPOSED WATERSHED PLAN

HORIZONTAL SCALE

20 0 10 20 40

(IN FEET)

1"=20'

COMMONWEALTH OF MASSACHUSETTS
ERIC J. BRADANESE
CIVIL
No. 53794
REGISTERED PROFESSIONAL ENGINEER

DESCRIPTION OF REVISION	DATE

PREPARED BY:

Engineering Alliance, Inc.
CMI Engineering & Land Planning Consultants
194 Central Street, Saugus, MA 01906, Tel: (781) 231-1349, Fax: (781) 417-0020
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PROJECT: Proposed Site Plan
44 Billings Park
(Property SBL: 72008 0015)
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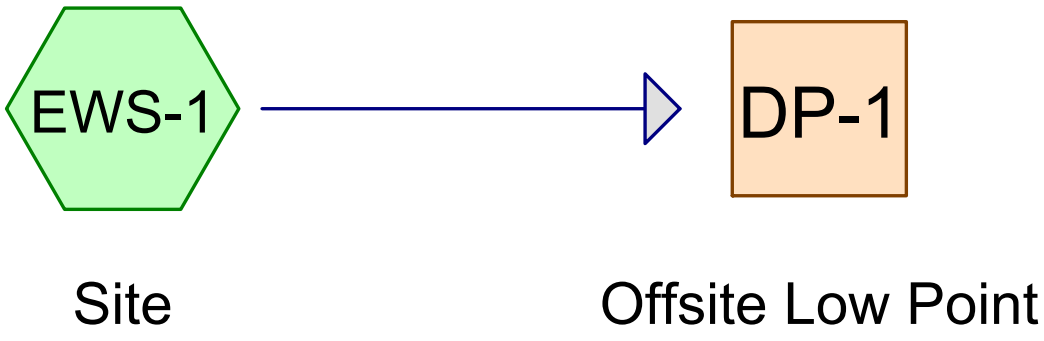
PROJECT #: 20-75101 | DATE: September 17, 2020
SCALE: AS NOTED | DWG FILE NAME: 20-75101.DWG
DESIGN BY: Calvin Reach | CHECKED BY: Eric Bradanese, P.E.

APPLICANT:
Tiffany Barqawi
44 Billings Park
Newton, MA 02459

DRAWING TITLE: Watershed Plans

DWG. NO. 1of1



Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by Engineering Alliance, Inc., Printed 9/17/2020

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.25	2
2	10-year	Type III 24-hr		Default	24.00	1	5.13	2
3	25-year	Type III 24-hr		Default	24.00	1	6.31	2
4	100-year	Type III 24-hr		Default	24.00	1	8.12	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,979	80	>75% Grass cover, Good, HSG D (EWS-1)
668	98	Asphalt Walkways, HSG D (EWS-1)
1,214	98	Paved parking, HSG D (EWS-1)
2,153	98	Roofs, HSG D (EWS-1)
9,014	**88**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	0	4,979	0	4,979	>75% Grass cover, Good	
0	0	0	668	0	668	Asphalt Walkways	
0	0	0	1,214	0	1,214	Paved parking	
0	0	0	2,153	0	2,153	Roofs	
0	**0**	**0**	**9,014**	**0**	**9,014**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 EWS-1: Site Runoff Area=9,014 sf 44.76% Impervious Runoff Depth>2.04"
Tc=5.0 min CN=88 Runoff=0.49 cfs 1,533 cf

Reach DP-1: Offsite Low Point Inflow=0.49 cfs 1,533 cf
Outflow=0.49 cfs 1,533 cf

Total Runoff Area = 9,014 sf Runoff Volume = 1,533 cf Average Runoff Depth = 2.04"
55.24% Pervious = 4,979 sf 44.76% Impervious = 4,035 sf

Summary for Subcatchment EWS-1: Site

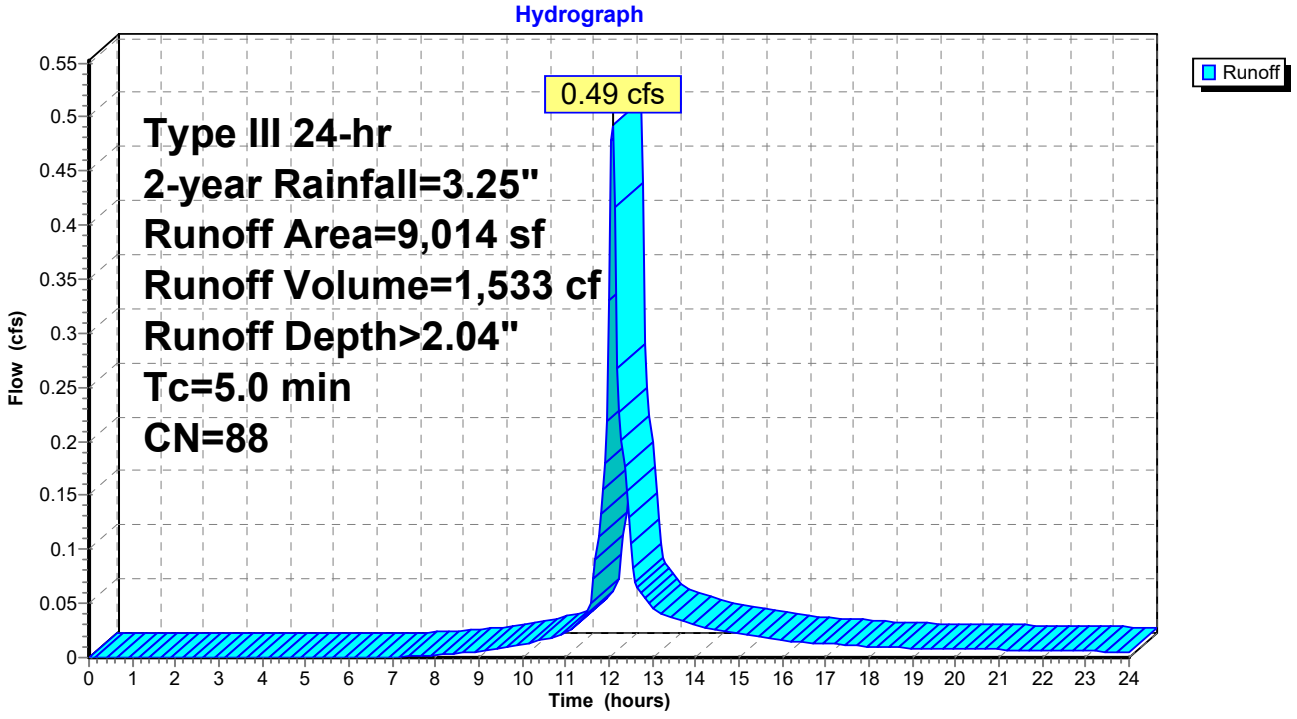
Runoff = 0.49 cfs @ 12.08 hrs, Volume= 1,533 cf, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.25"

	Area (sf)	CN	Description
	2,153	98	Roofs, HSG D
	1,214	98	Paved parking, HSG D
*	668	98	Asphalt Walkways, HSG D
	4,979	80	>75% Grass cover, Good, HSG D
	9,014	88	Weighted Average
	4,979		55.24% Pervious Area
	4,035		44.76% Impervious Area

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

Subcatchment EWS-1: Site

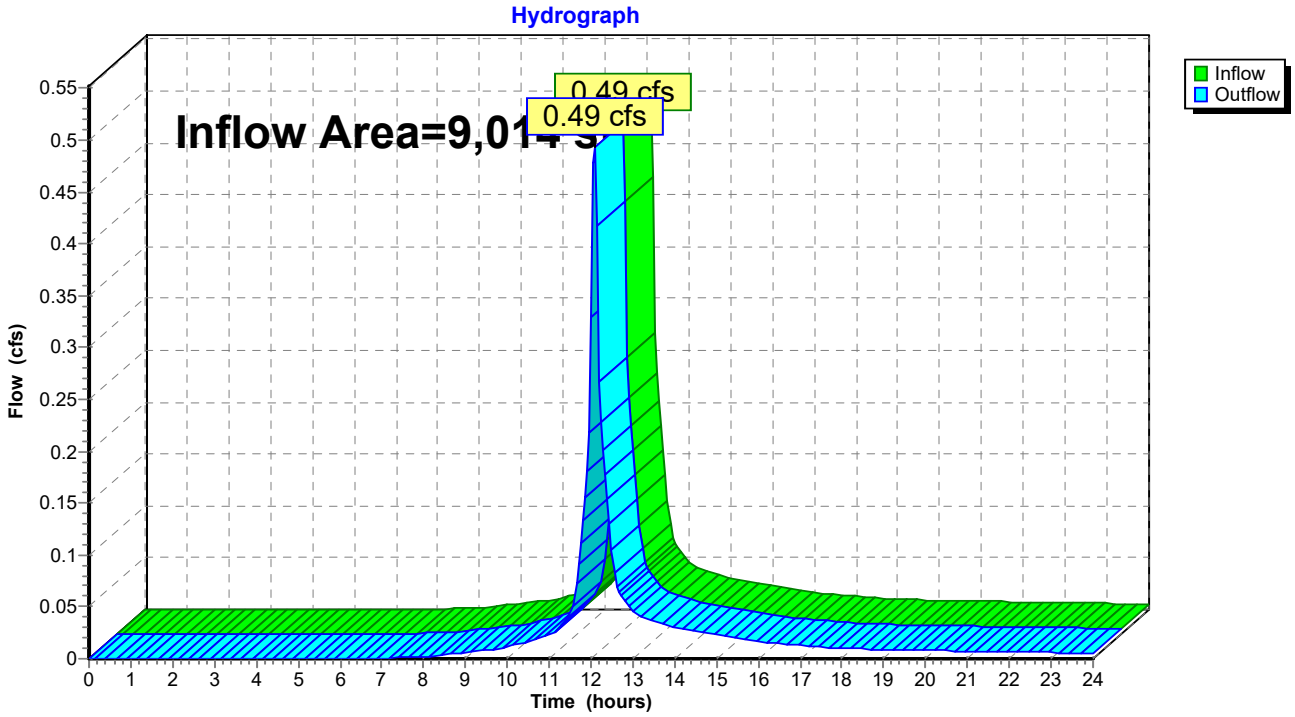


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 44.76% Impervious, Inflow Depth > 2.04" for 2-year event
Inflow = 0.49 cfs @ 12.08 hrs, Volume= 1,533 cf
Outflow = 0.49 cfs @ 12.08 hrs, Volume= 1,533 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Offsite Low Point



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 EWS-1: Site Runoff Area=9,014 sf 44.76% Impervious Runoff Depth>3.79"
Tc=5.0 min CN=88 Runoff=0.90 cfs 2,847 cf

Reach DP-1: Offsite Low Point Inflow=0.90 cfs 2,847 cf
Outflow=0.90 cfs 2,847 cf

Total Runoff Area = 9,014 sf Runoff Volume = 2,847 cf Average Runoff Depth = 3.79"
55.24% Pervious = 4,979 sf 44.76% Impervious = 4,035 sf

Summary for Subcatchment EWS-1: Site

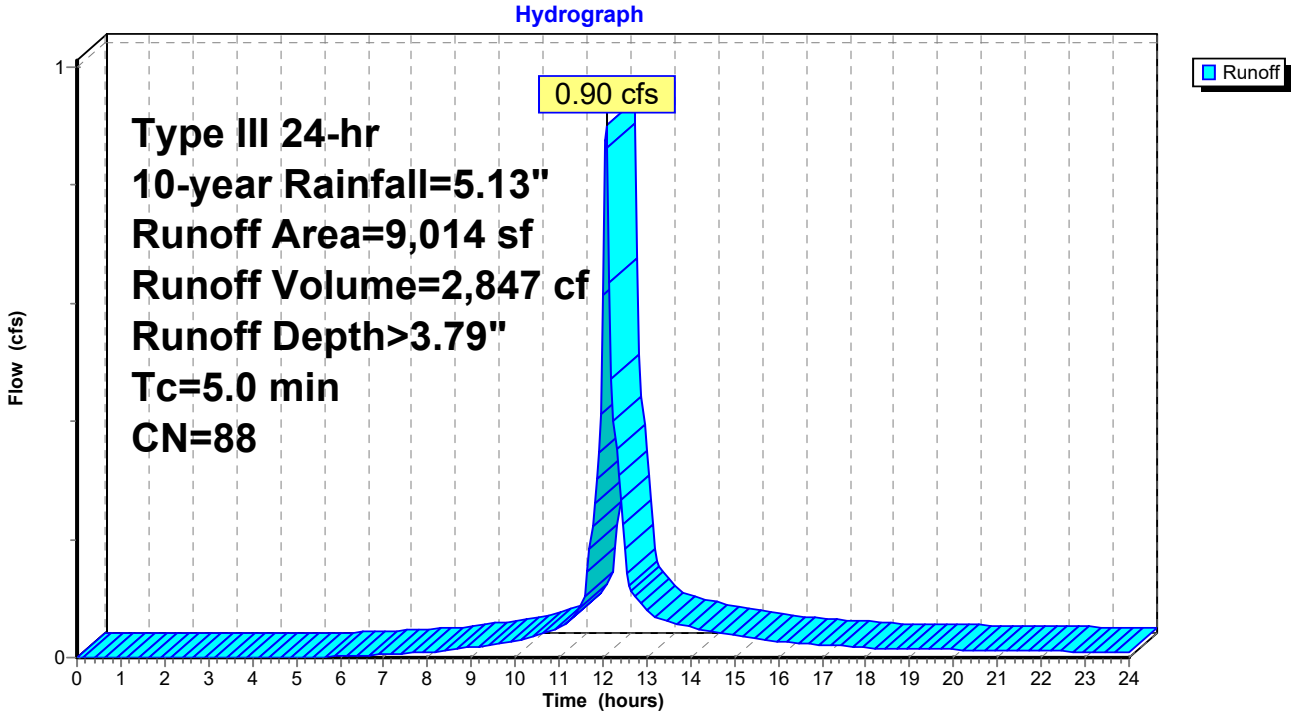
Runoff = 0.90 cfs @ 12.07 hrs, Volume= 2,847 cf, Depth> 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=5.13"

	Area (sf)	CN	Description
	2,153	98	Roofs, HSG D
	1,214	98	Paved parking, HSG D
*	668	98	Asphalt Walkways, HSG D
	4,979	80	>75% Grass cover, Good, HSG D
	9,014	88	Weighted Average
	4,979		55.24% Pervious Area
	4,035		44.76% Impervious Area

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

Subcatchment EWS-1: Site

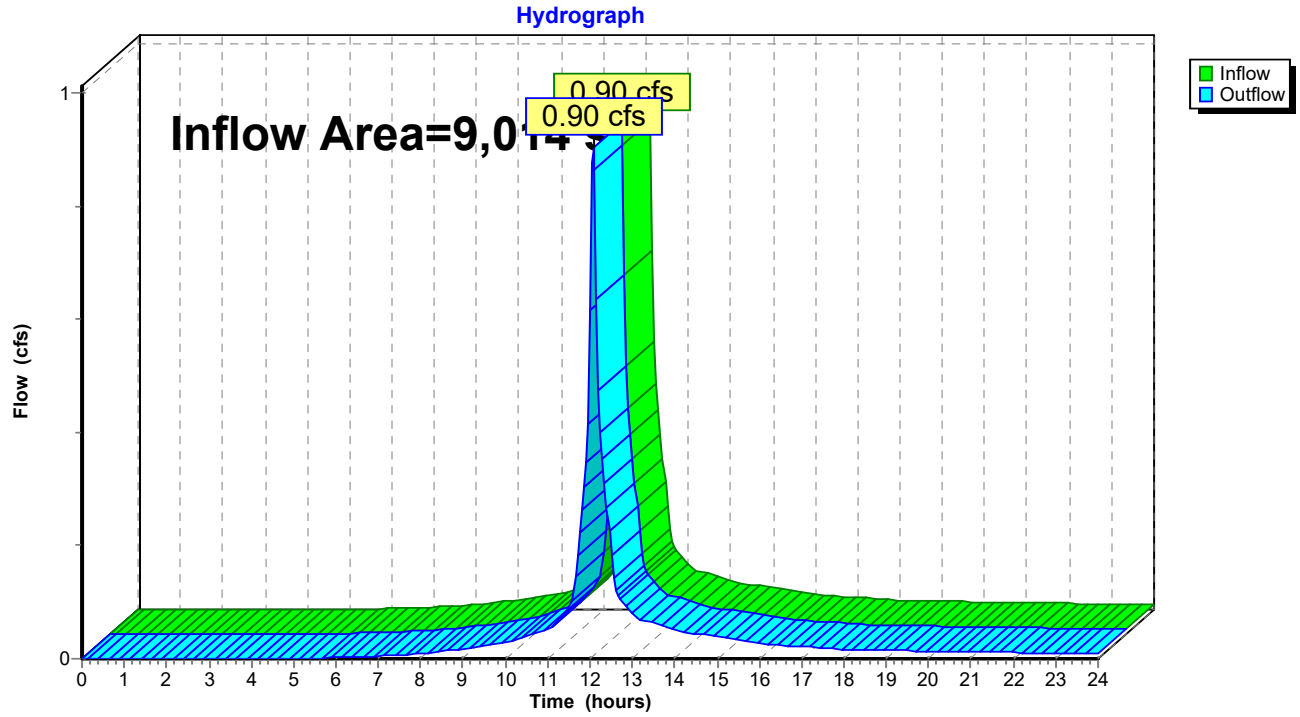


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 44.76% Impervious, Inflow Depth > 3.79" for 10-year event
Inflow = 0.90 cfs @ 12.07 hrs, Volume= 2,847 cf
Outflow = 0.90 cfs @ 12.07 hrs, Volume= 2,847 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Offsite Low Point



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 EWS-1: Site Runoff Area=9,014 sf 44.76% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=88 Runoff=1.16 cfs 3,697 cf

Reach DP-1: Offsite Low Point Inflow=1.16 cfs 3,697 cf
Outflow=1.16 cfs 3,697 cf

Total Runoff Area = 9,014 sf Runoff Volume = 3,697 cf Average Runoff Depth = 4.92"
55.24% Pervious = 4,979 sf 44.76% Impervious = 4,035 sf

Summary for Subcatchment EWS-1: Site

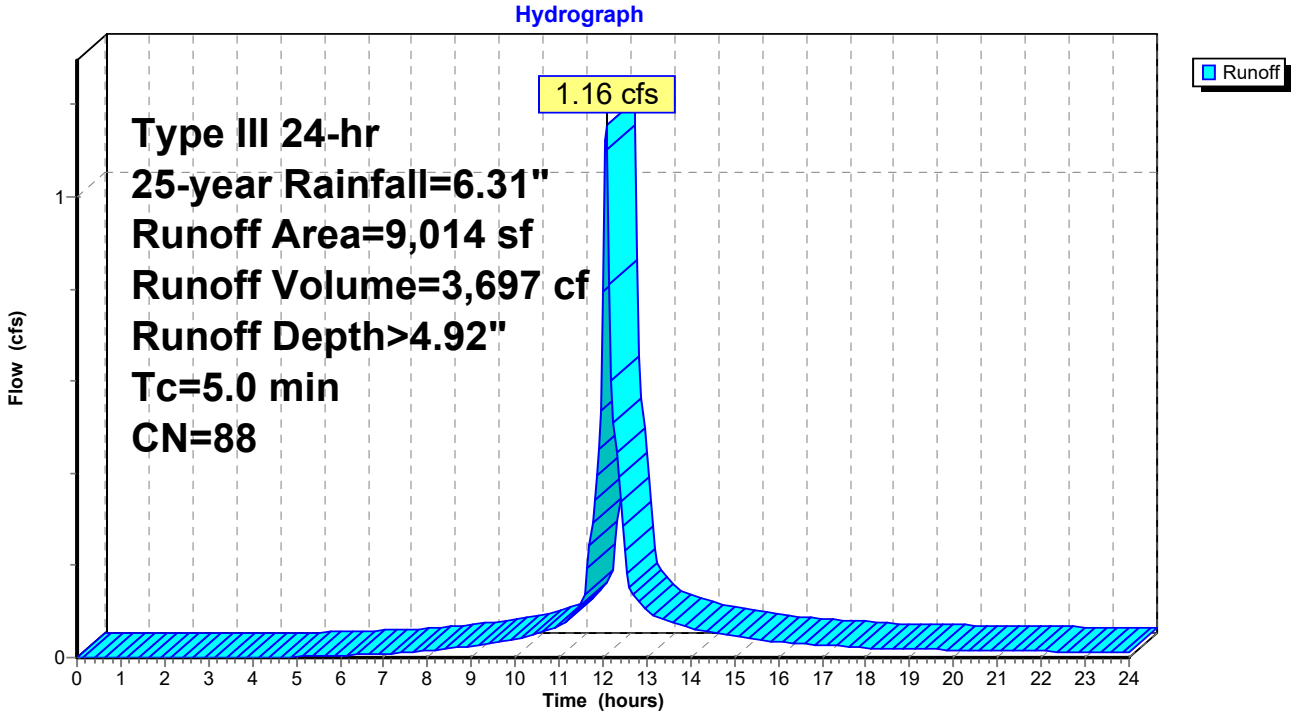
Runoff = 1.16 cfs @ 12.07 hrs, Volume= 3,697 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.31"

	Area (sf)	CN	Description
	2,153	98	Roofs, HSG D
	1,214	98	Paved parking, HSG D
*	668	98	Asphalt Walkways, HSG D
	4,979	80	>75% Grass cover, Good, HSG D
	9,014	88	Weighted Average
	4,979		55.24% Pervious Area
	4,035		44.76% Impervious Area

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

Subcatchment EWS-1: Site

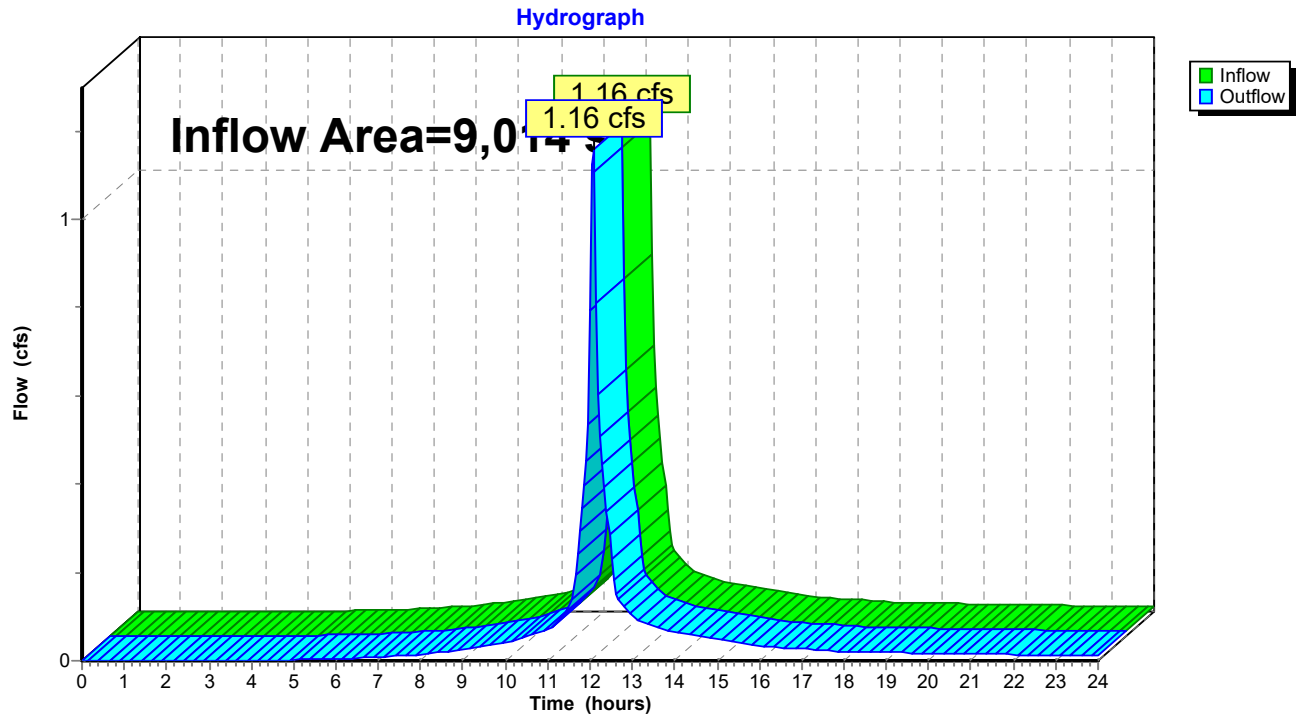


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 44.76% Impervious, Inflow Depth > 4.92" for 25-year event
Inflow = 1.16 cfs @ 12.07 hrs, Volume= 3,697 cf
Outflow = 1.16 cfs @ 12.07 hrs, Volume= 3,697 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Offsite Low Point



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 EWS-1: Site Runoff Area=9,014 sf 44.76% Impervious Runoff Depth>6.68"
Tc=5.0 min CN=88 Runoff=1.55 cfs 5,019 cf

Reach DP-1: Offsite Low Point Inflow=1.55 cfs 5,019 cf
Outflow=1.55 cfs 5,019 cf

Total Runoff Area = 9,014 sf Runoff Volume = 5,019 cf Average Runoff Depth = 6.68"
55.24% Pervious = 4,979 sf 44.76% Impervious = 4,035 sf

Summary for Subcatchment EWS-1: Site

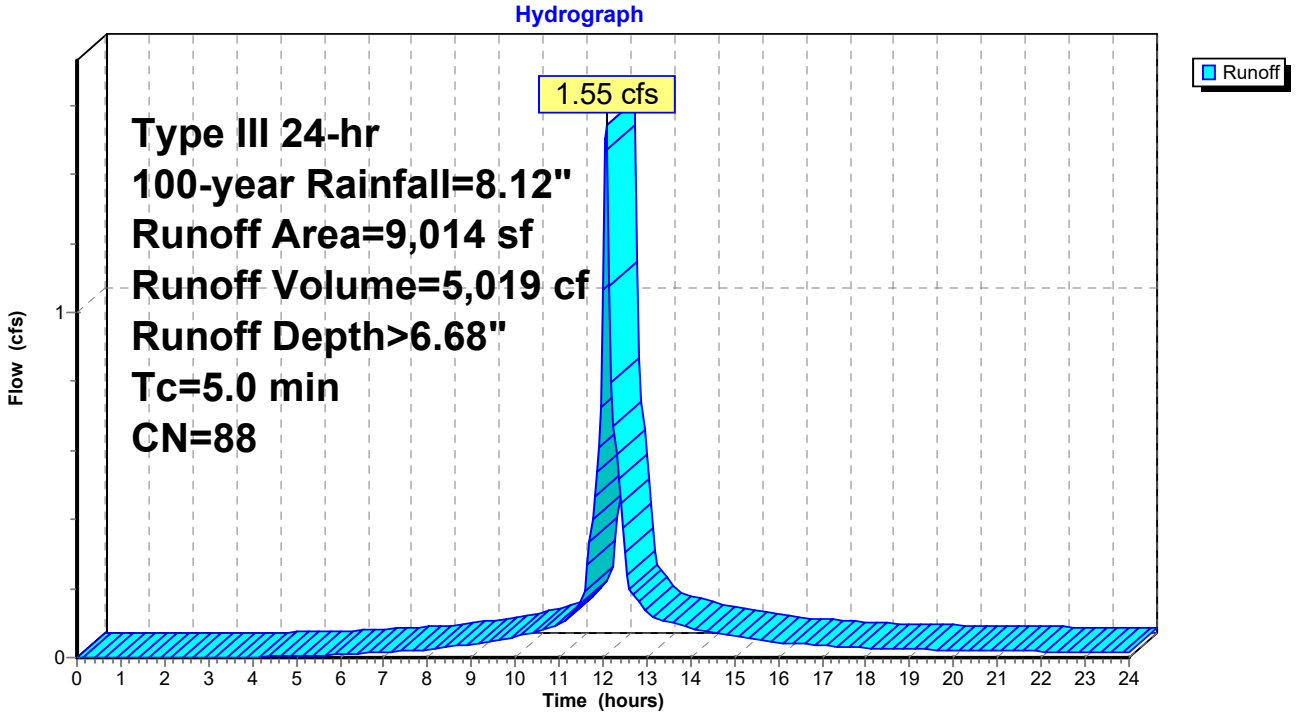
Runoff = 1.55 cfs @ 12.07 hrs, Volume= 5,019 cf, Depth> 6.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.12"

	Area (sf)	CN	Description
	2,153	98	Roofs, HSG D
	1,214	98	Paved parking, HSG D
*	668	98	Asphalt Walkways, HSG D
	4,979	80	>75% Grass cover, Good, HSG D
	9,014	88	Weighted Average
	4,979		55.24% Pervious Area
	4,035		44.76% Impervious Area

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

Subcatchment EWS-1: Site

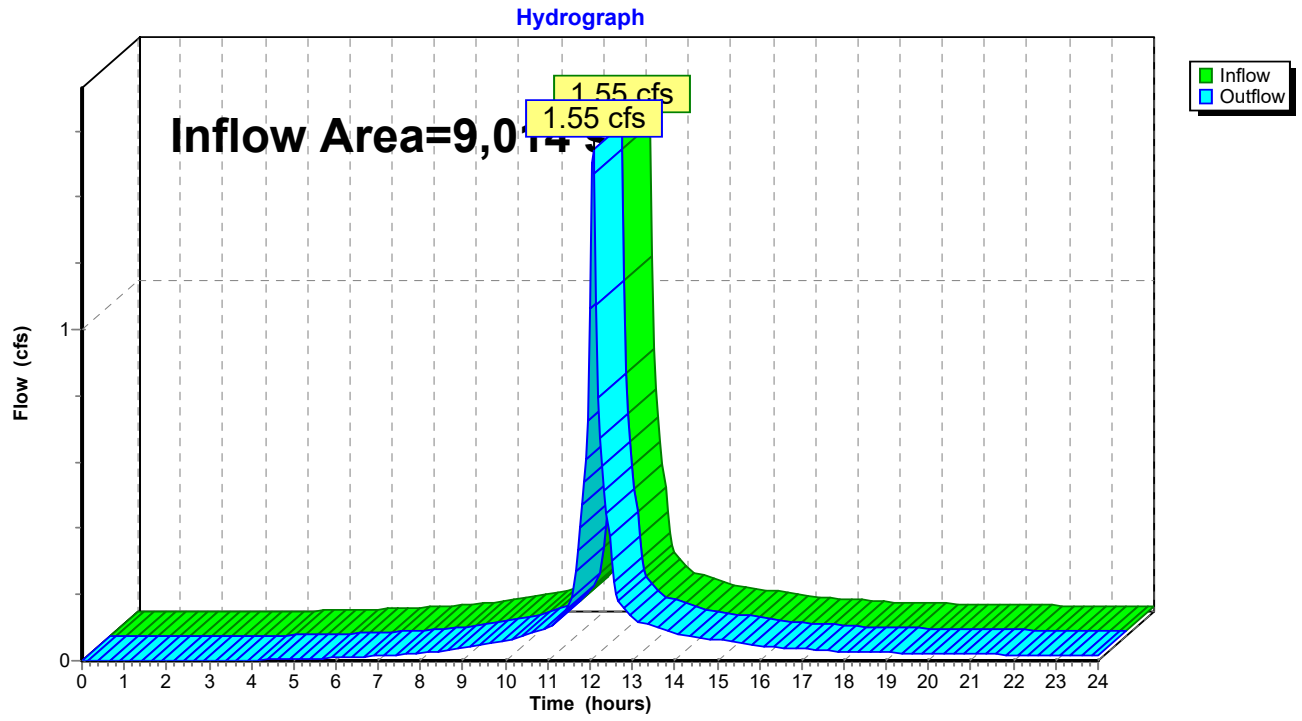


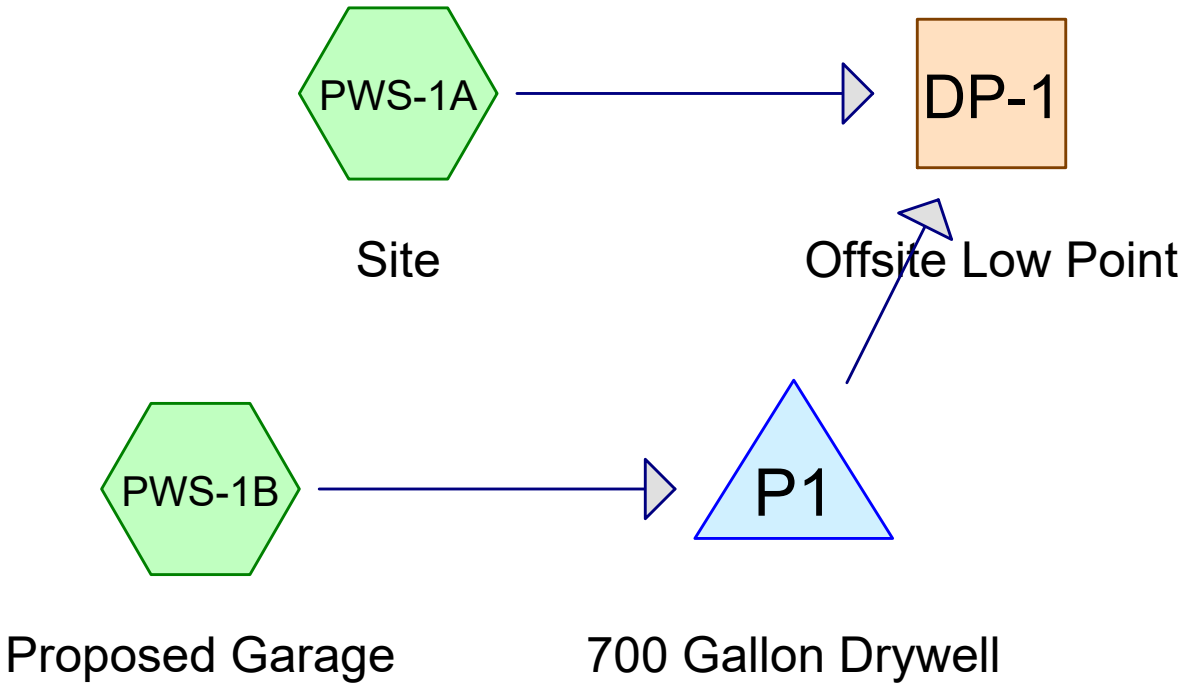
Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 44.76% Impervious, Inflow Depth > 6.68" for 100-year event
Inflow = 1.55 cfs @ 12.07 hrs, Volume= 5,019 cf
Outflow = 1.55 cfs @ 12.07 hrs, Volume= 5,019 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-1: Offsite Low Point





Subcat Reach Pond Link

Routing Diagram for Proposed Conditions
Prepared by Engineering Alliance, Inc., Printed 9/17/2020

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.25	2
2	10-year	Type III 24-hr		Default	24.00	1	5.13	2
3	25-year	Type III 24-hr		Default	24.00	1	6.31	2
4	100-year	Type III 24-hr		Default	24.00	1	8.12	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,209	80	>75% Grass cover, Good, HSG D (PWS-1A)
584	98	Asphalt Walkways, HSG D (PWS-1A)
1,128	98	Paved parking, HSG D (PWS-1A)
3,093	98	Roofs, HSG D (PWS-1A, PWS-1B)
9,014	**90**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	0	4,209	0	4,209	>75% Grass cover, Good	
0	0	0	584	0	584	Asphalt Walkways	
0	0	0	1,128	0	1,128	Paved parking	
0	0	0	3,093	0	3,093	Roofs	
0	**0**	**0**	**9,014**	**0**	**9,014**	**TOTAL AREA**	

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 PWS-1A: Site Runoff Area=8,134 sf 48.25% Impervious Runoff Depth>2.13"
Tc=5.0 min CN=89 Runoff=0.48 cfs 1,441 cf

Subcatchment PWS-1B: Proposed Garage Runoff Area=880 sf 100.00% Impervious Runoff Depth>3.02"
Tc=5.0 min CN=98 Runoff=0.07 cfs 221 cf

Reach DP-1: Offsite Low Point Inflow=0.48 cfs 1,441 cf
Outflow=0.48 cfs 1,441 cf

Pond P1: 700 Gallon Drywell Peak Elev=494.65' Storage=188 cf Inflow=0.07 cfs 221 cf
Discarded=0.00 cfs 33 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 33 cf

Total Runoff Area = 9,014 sf Runoff Volume = 1,662 cf Average Runoff Depth = 2.21"
46.69% Pervious = 4,209 sf 53.31% Impervious = 4,805 sf

Summary for Subcatchment PWS-1A: Site

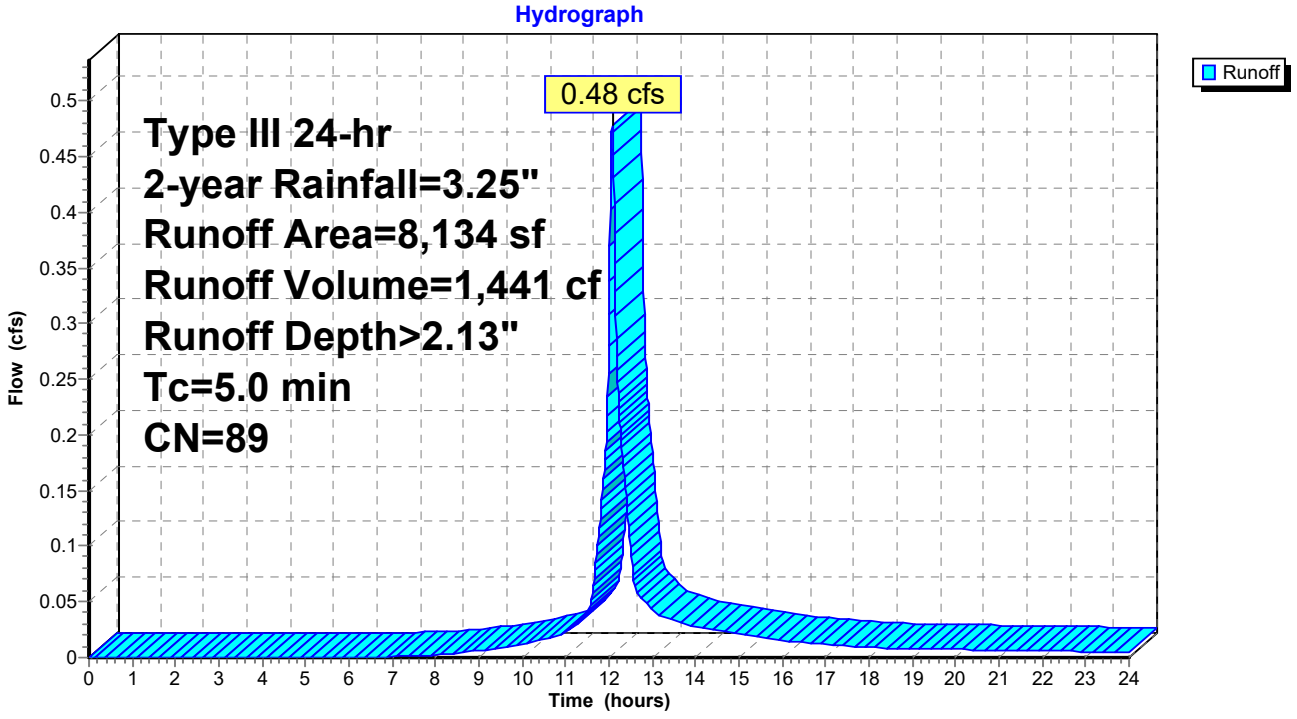
Runoff = 0.48 cfs @ 12.07 hrs, Volume= 1,441 cf, Depth> 2.13"

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-year Rainfall=3.25"

	Area (sf)	CN	Description
	2,213	98	Roofs, HSG D
	1,128	98	Paved parking, HSG D
*	584	98	Asphalt Walkways, HSG D
	4,209	80	>75% Grass cover, Good, HSG D
	8,134	89	Weighted Average
	4,209		51.75% Pervious Area
	3,925		48.25% Impervious Area

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

Subcatchment PWS-1A: Site



Summary for Subcatchment PWS-1B: Proposed Garage

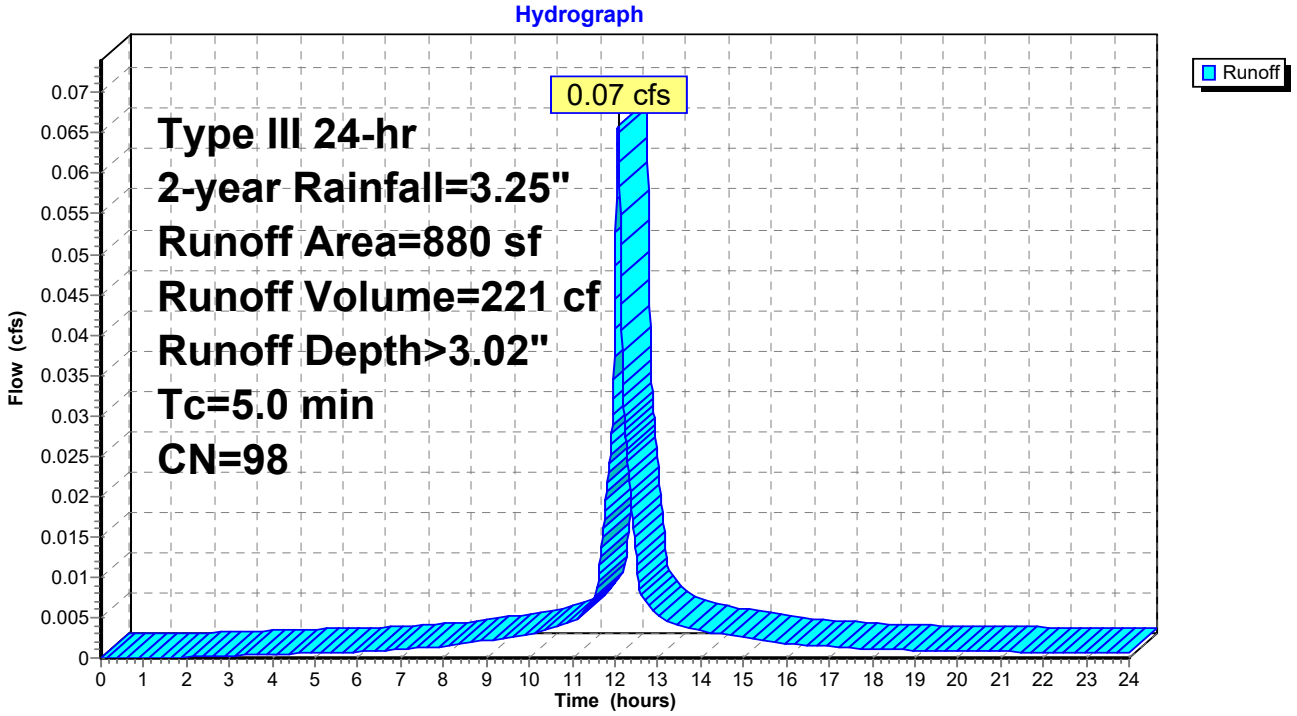
Runoff = 0.07 cfs @ 12.07 hrs, Volume= 221 cf, Depth> 3.02"

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-year Rainfall=3.25"

Area (sf)	CN	Description
880	98	Roofs, HSG D
880		100.00% Impervious Area

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

Subcatchment PWS-1B: Proposed Garage

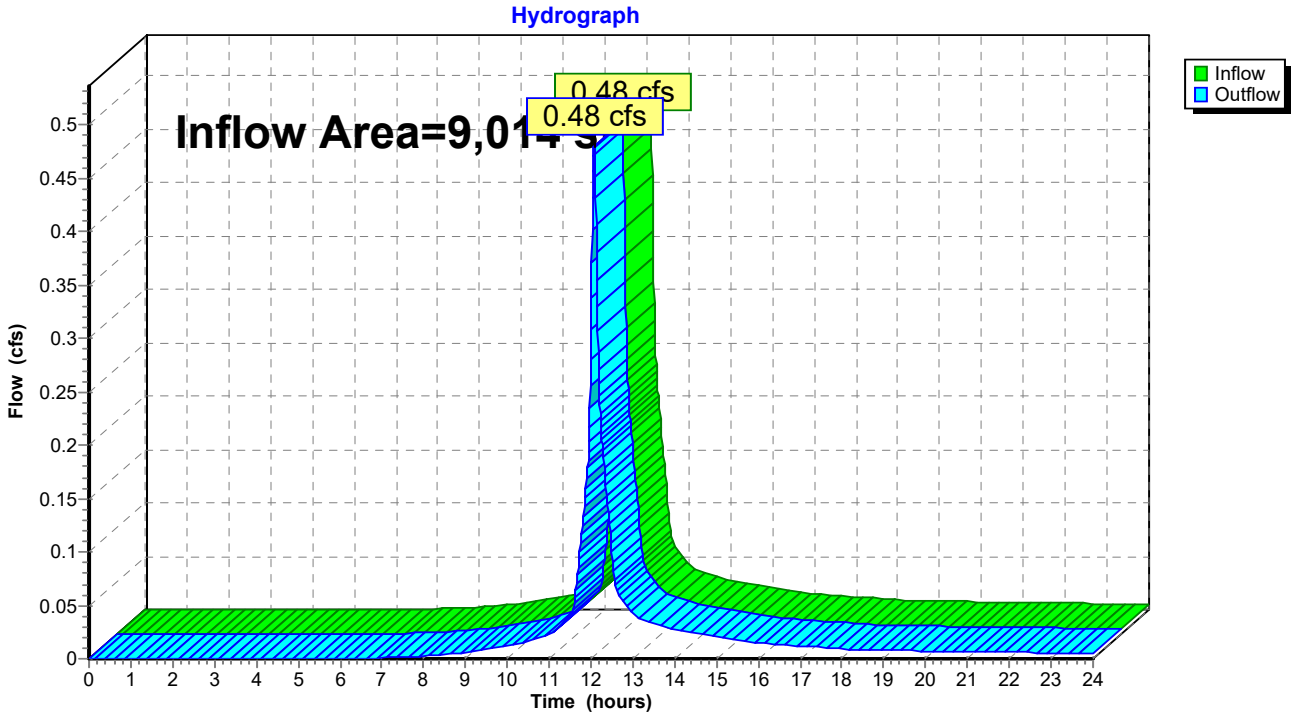


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 53.31% Impervious, Inflow Depth > 1.92" for 2-year event
Inflow = 0.48 cfs @ 12.07 hrs, Volume= 1,441 cf
Outflow = 0.48 cfs @ 12.07 hrs, Volume= 1,441 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: Offsite Low Point



Summary for Pond P1: 700 Gallon Drywell

Inflow Area = 880 sf,100.00% Impervious, Inflow Depth > 3.02" for 2-year event
Inflow = 0.07 cfs @ 12.07 hrs, Volume= 221 cf
Outflow = 0.00 cfs @ 23.36 hrs, Volume= 33 cf, Atten= 99%, Lag= 677.2 min
Discarded = 0.00 cfs @ 23.36 hrs, Volume= 33 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 494.65' @ 23.36 hrs Surf.Area= 100 sf Storage= 188 cf

Plug-Flow detention time= 486.4 min calculated for 33 cf (15% of inflow)
Center-of-Mass det. time= 198.9 min (953.6 - 754.7)

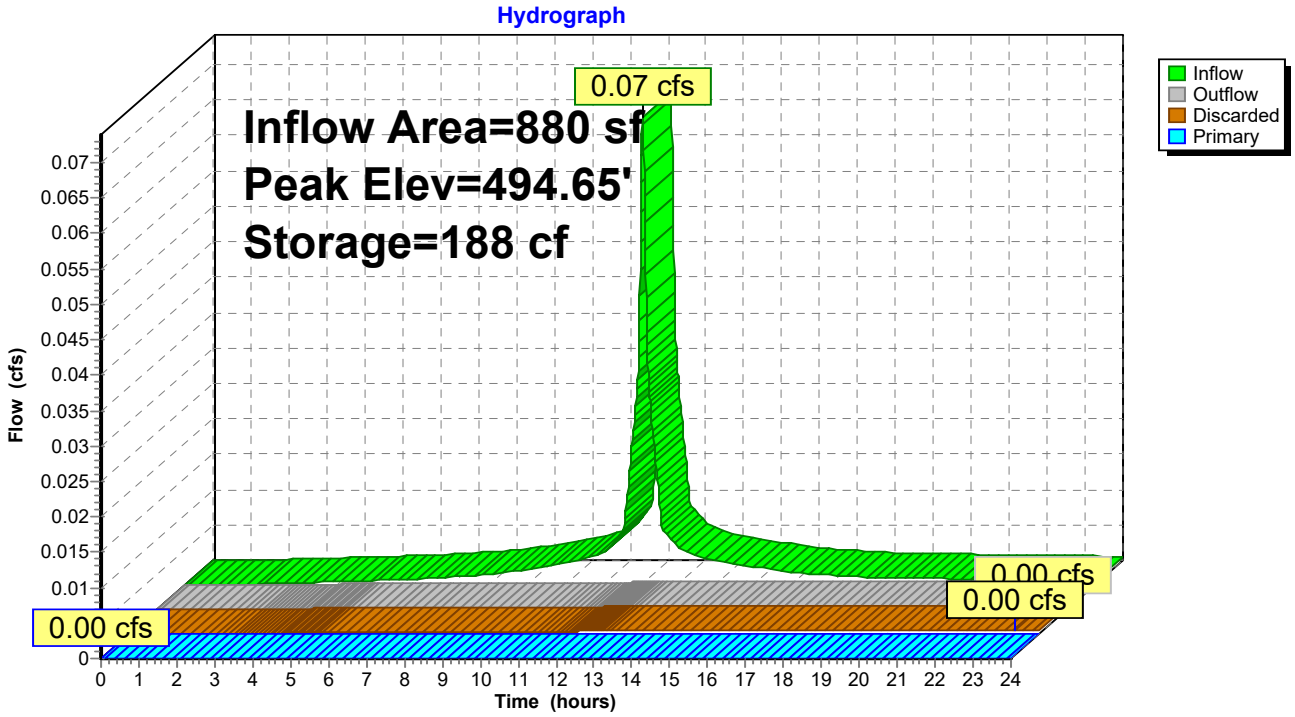
Volume	Invert	Avail.Storage	Storage Description
#1	492.75'	127 cf	**6.00'D x 4.50'H Vertical Cone/Cylinder** Inside #2
#2	490.75'	209 cf	**10.00'W x 10.00'L x 6.50'H Prismatoid** 650 cf Overall - 127 cf Embedded = 523 cf x 40.0% Voids
#3	497.25'	0 cf	**0.50'D x 2.00'H Vertical Cone/Cylinder** -Impervious
		337 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	490.75'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 488.75'
#2	Primary	498.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 23.36 hrs HW=494.65' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=490.75' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: 700 Gallon Drywell



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 PWS-1A: Site Runoff Area=8,134 sf 48.25% Impervious Runoff Depth>3.89"
Tc=5.0 min CN=89 Runoff=0.86 cfs 2,639 cf

Subcatchment PWS-1B: Proposed Garage Runoff Area=880 sf 100.00% Impervious Runoff Depth>4.89"
Tc=5.0 min CN=98 Runoff=0.11 cfs 359 cf

Reach DP-1: Offsite Low Point Inflow=0.86 cfs 2,639 cf
Outflow=0.86 cfs 2,639 cf

Pond P1: 700 Gallon Drywell Peak Elev=496.86' Storage=314 cf Inflow=0.11 cfs 359 cf
Discarded=0.00 cfs 44 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 44 cf

Total Runoff Area = 9,014 sf Runoff Volume = 2,998 cf Average Runoff Depth = 3.99"
46.69% Pervious = 4,209 sf 53.31% Impervious = 4,805 sf

Summary for Subcatchment PWS-1A: Site

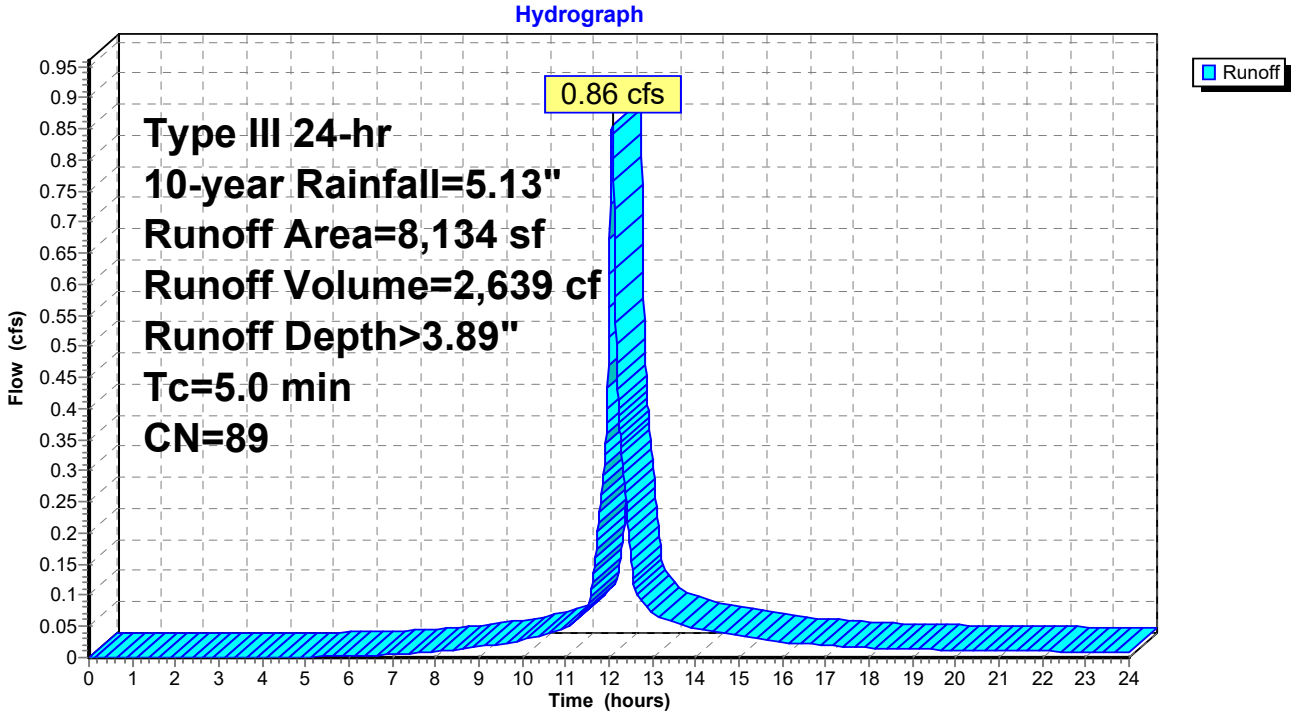
Runoff = 0.86 cfs @ 12.07 hrs, Volume= 2,639 cf, Depth> 3.89"

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-year Rainfall=5.13"

	Area (sf)	CN	Description
	2,213	98	Roofs, HSG D
	1,128	98	Paved parking, HSG D
*	584	98	Asphalt Walkways, HSG D
	4,209	80	>75% Grass cover, Good, HSG D
	8,134	89	Weighted Average
	4,209		51.75% Pervious Area
	3,925		48.25% Impervious Area

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

Subcatchment PWS-1A: Site



Summary for Subcatchment PWS-1B: Proposed Garage

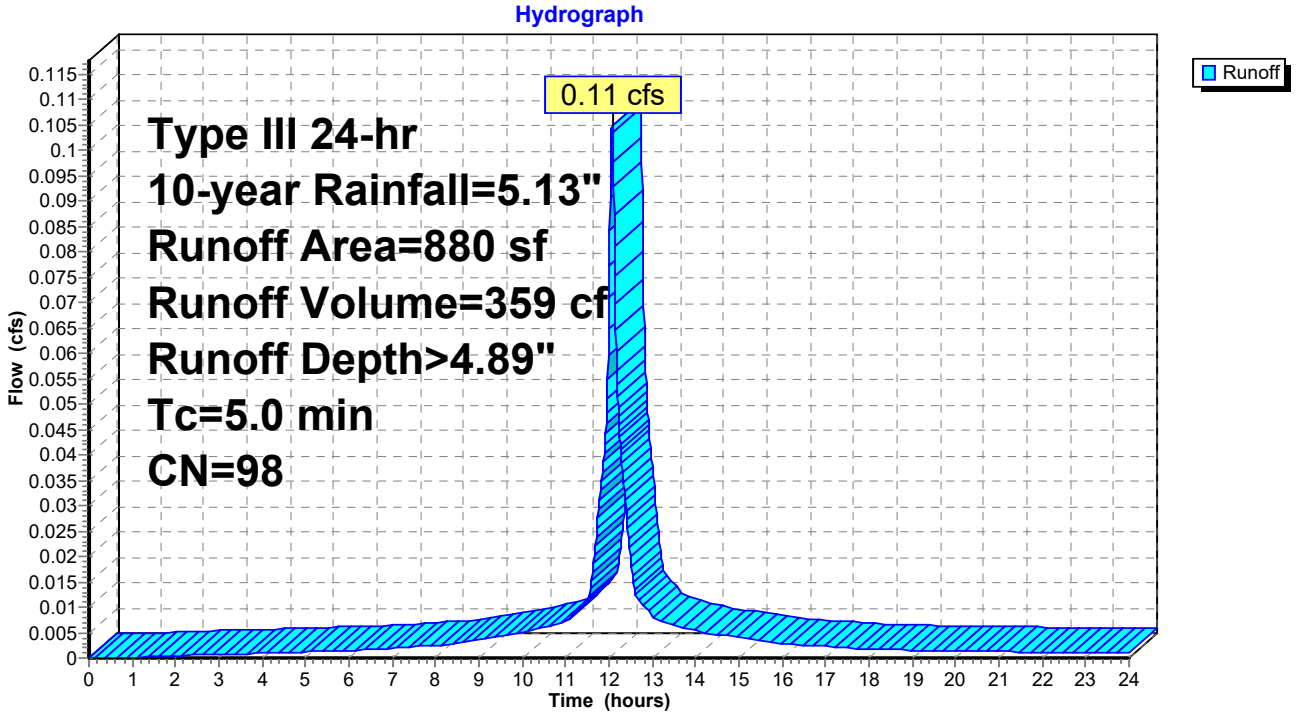
Runoff = 0.11 cfs @ 12.07 hrs, Volume= 359 cf, Depth> 4.89"

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-year Rainfall=5.13"

Area (sf)	CN	Description
880	98	Roofs, HSG D
880		100.00% Impervious Area

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

Subcatchment PWS-1B: Proposed Garage

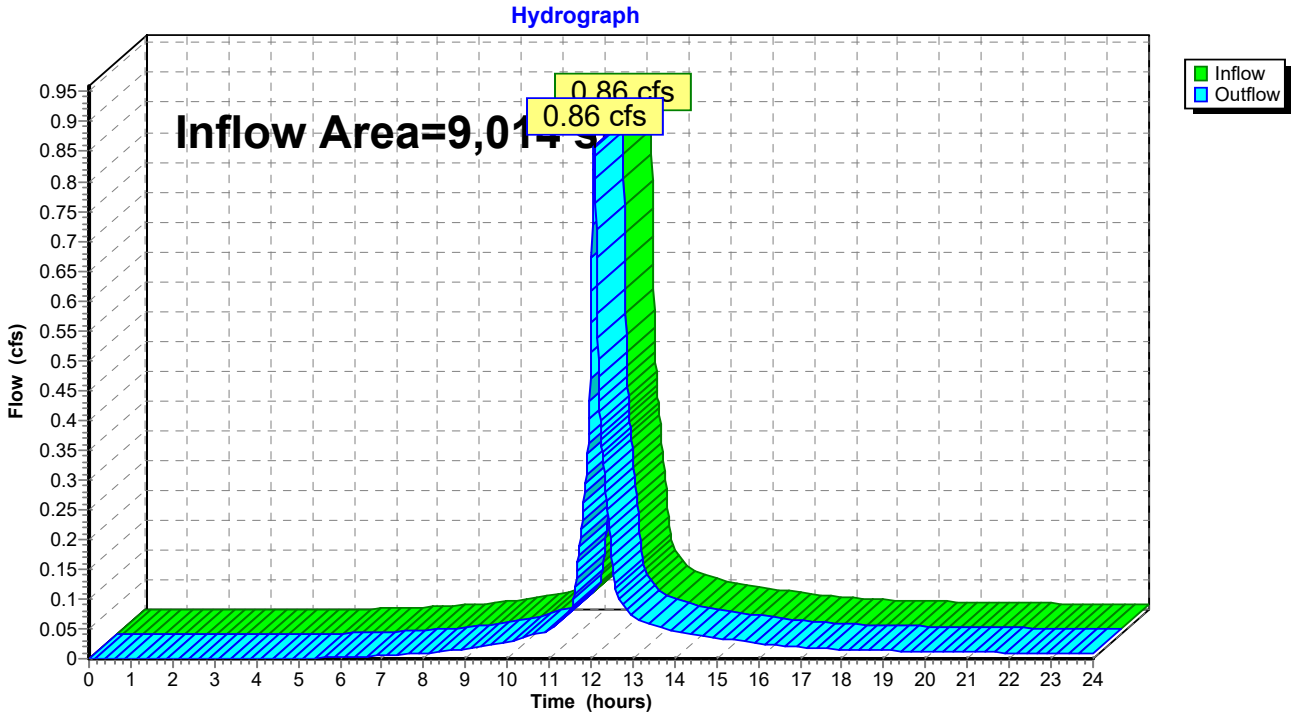


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 53.31% Impervious, Inflow Depth > 3.51" for 10-year event
Inflow = 0.86 cfs @ 12.07 hrs, Volume= 2,639 cf
Outflow = 0.86 cfs @ 12.07 hrs, Volume= 2,639 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: Offsite Low Point



Summary for Pond P1: 700 Gallon Drywell

Inflow Area = 880 sf,100.00% Impervious, Inflow Depth > 4.89" for 10-year event
Inflow = 0.11 cfs @ 12.07 hrs, Volume= 359 cf
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 44 cf, Atten= 99%, Lag= 715.8 min
Discarded = 0.00 cfs @ 24.00 hrs, Volume= 44 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 496.86' @ 24.00 hrs Surf.Area= 100 sf Storage= 314 cf

Plug-Flow detention time= 551.5 min calculated for 44 cf (12% of inflow)
Center-of-Mass det. time= 210.2 min (956.4 - 746.2)

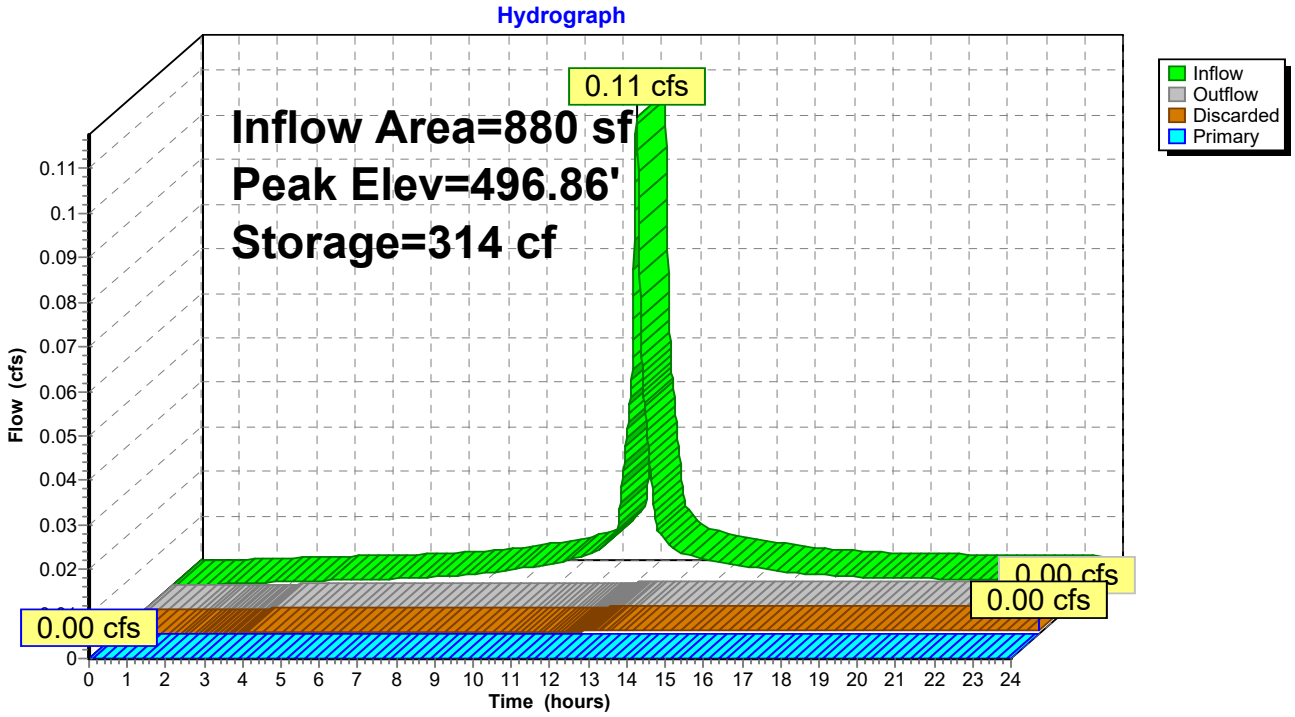
Volume	Invert	Avail.Storage	Storage Description
#1	492.75'	127 cf	**6.00'D x 4.50'H Vertical Cone/Cylinder** Inside #2
#2	490.75'	209 cf	**10.00'W x 10.00'L x 6.50'H Prismatoid** 650 cf Overall - 127 cf Embedded = 523 cf x 40.0% Voids
#3	497.25'	0 cf	**0.50'D x 2.00'H Vertical Cone/Cylinder** -Impervious
		337 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	490.75'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 488.75'
#2	Primary	498.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 24.00 hrs HW=496.86' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=490.75' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: 700 Gallon Drywell



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 PWS-1A: Site Runoff Area=8,134 sf 48.25% Impervious Runoff Depth>5.03"
Tc=5.0 min CN=89 Runoff=1.09 cfs 3,411 cf

Subcatchment PWS-1B: Proposed Garage Runoff Area=880 sf 100.00% Impervious Runoff Depth>6.07"
Tc=5.0 min CN=98 Runoff=0.13 cfs 445 cf

Reach DP-1: Offsite Low Point Inflow=1.09 cfs 3,467 cf
Outflow=1.09 cfs 3,467 cf

Pond P1: 700 Gallon Drywell Peak Elev=498.76' Storage=337 cf Inflow=0.13 cfs 445 cf
Discarded=0.00 cfs 54 cf Primary=0.01 cfs 56 cf Outflow=0.01 cfs 110 cf

Total Runoff Area = 9,014 sf Runoff Volume = 3,856 cf Average Runoff Depth = 5.13"
46.69% Pervious = 4,209 sf 53.31% Impervious = 4,805 sf

Summary for Subcatchment PWS-1A: Site

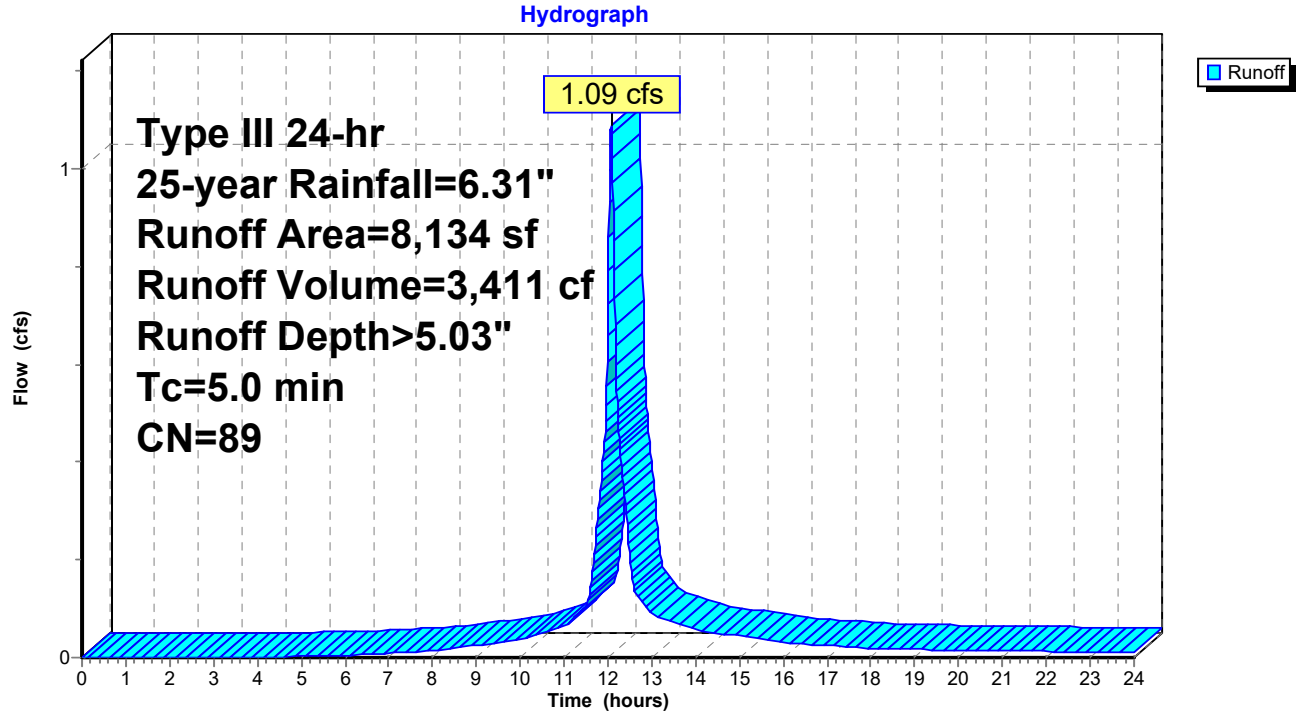
Runoff = 1.09 cfs @ 12.07 hrs, Volume= 3,411 cf, Depth> 5.03"

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-year Rainfall=6.31"

	Area (sf)	CN	Description
	2,213	98	Roofs, HSG D
	1,128	98	Paved parking, HSG D
*	584	98	Asphalt Walkways, HSG D
	4,209	80	>75% Grass cover, Good, HSG D
	8,134	89	Weighted Average
	4,209		51.75% Pervious Area
	3,925		48.25% Impervious Area

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

Subcatchment PWS-1A: Site



Summary for Subcatchment PWS-1B: Proposed Garage

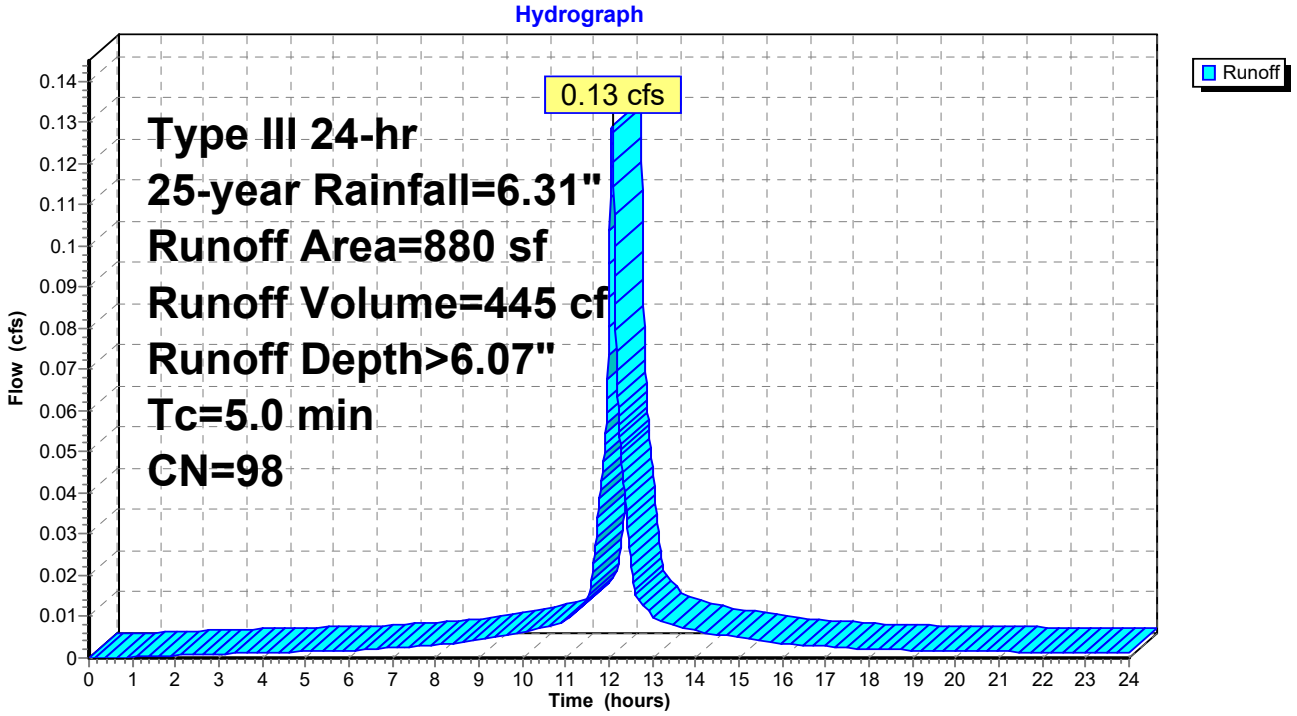
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 445 cf, Depth> 6.07"

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-year Rainfall=6.31"

Area (sf)	CN	Description
880	98	Roofs, HSG D
880		100.00% Impervious Area

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

Subcatchment PWS-1B: Proposed Garage

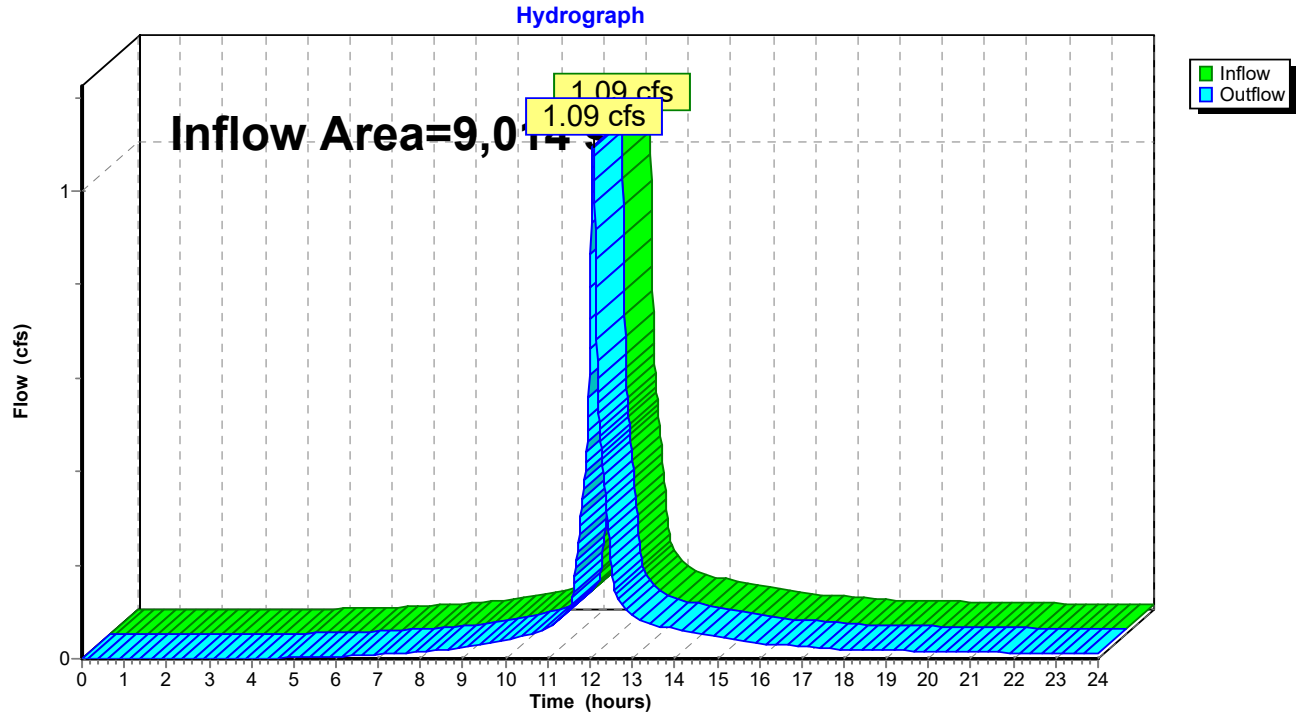


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 53.31% Impervious, Inflow Depth > 4.62" for 25-year event
Inflow = 1.09 cfs @ 12.07 hrs, Volume= 3,467 cf
Outflow = 1.09 cfs @ 12.07 hrs, Volume= 3,467 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: Offsite Low Point



Summary for Pond P1: 700 Gallon Drywell

Inflow Area = 880 sf,100.00% Impervious, Inflow Depth > 6.07" for 25-year event
Inflow = 0.13 cfs @ 12.07 hrs, Volume= 445 cf
Outflow = 0.01 cfs @ 13.87 hrs, Volume= 110 cf, Atten= 92%, Lag= 108.0 min
Discarded = 0.00 cfs @ 13.87 hrs, Volume= 54 cf
Primary = 0.01 cfs @ 13.87 hrs, Volume= 56 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 498.76' @ 13.87 hrs Surf.Area= 100 sf Storage= 337 cf

Plug-Flow detention time= 462.1 min calculated for 110 cf (25% of inflow)
Center-of-Mass det. time= 228.3 min (971.3 - 743.0)

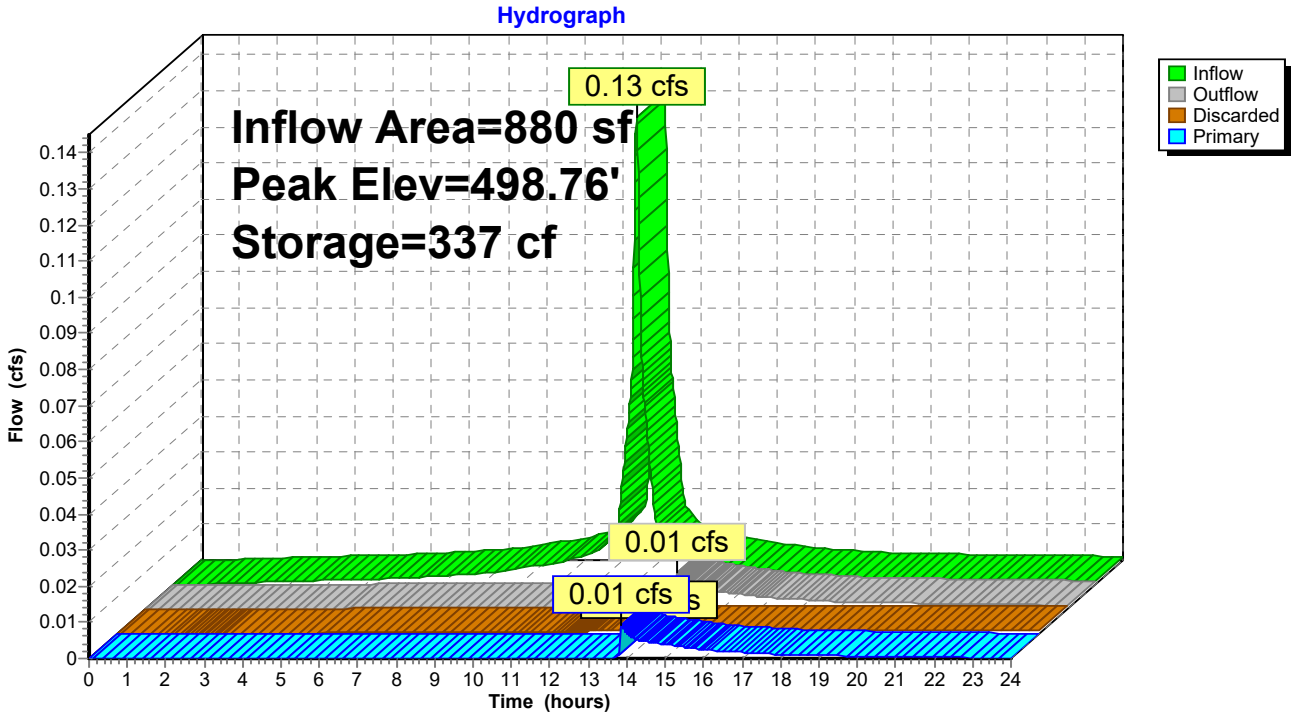
Volume	Invert	Avail.Storage	Storage Description
#1	492.75'	127 cf	**6.00'D x 4.50'H Vertical Cone/Cylinder** Inside #2
#2	490.75'	209 cf	**10.00'W x 10.00'L x 6.50'H Prismatoid** 650 cf Overall - 127 cf Embedded = 523 cf x 40.0% Voids
#3	497.25'	0 cf	**0.50'D x 2.00'H Vertical Cone/Cylinder** -Impervious
		337 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	490.75'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 488.75'
#2	Primary	498.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 13.87 hrs HW=498.76' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 13.87 hrs HW=498.76' (Free Discharge)
↑└**2=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.27 fps)

Pond P1: 700 Gallon Drywell



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 PWS-1A: Site Runoff Area=8,134 sf 48.25% Impervious Runoff Depth>6.80"
Tc=5.0 min CN=89 Runoff=1.45 cfs 4,609 cf

Subcatchment PWS-1B: Proposed Garage Runoff Area=880 sf 100.00% Impervious Runoff Depth>7.88"
Tc=5.0 min CN=98 Runoff=0.17 cfs 578 cf

Reach DP-1: Offsite Low Point Inflow=1.45 cfs 4,798 cf
Outflow=1.45 cfs 4,798 cf

Pond P1: 700 Gallon Drywell Peak Elev=498.80' Storage=337 cf Inflow=0.17 cfs 578 cf
Discarded=0.00 cfs 57 cf Primary=0.08 cfs 189 cf Outflow=0.09 cfs 246 cf

Total Runoff Area = 9,014 sf Runoff Volume = 5,187 cf Average Runoff Depth = 6.90"
46.69% Pervious = 4,209 sf 53.31% Impervious = 4,805 sf

Summary for Subcatchment PWS-1A: Site

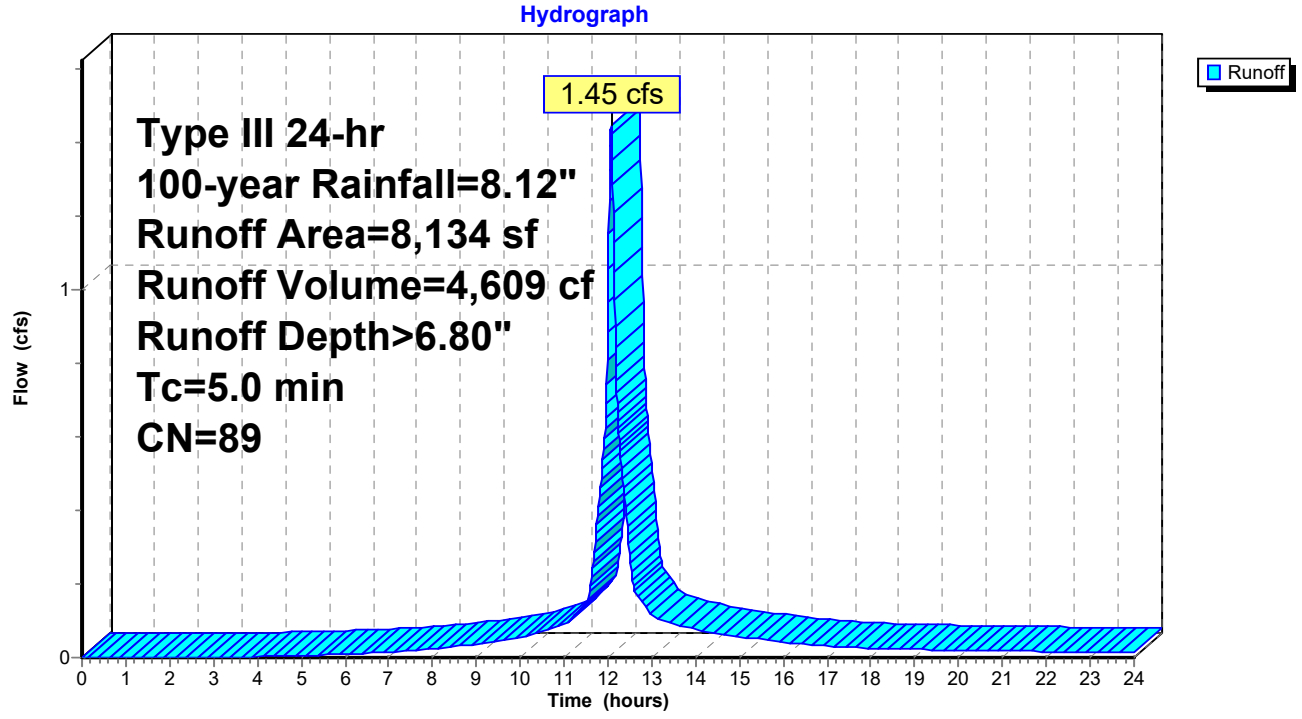
Runoff = 1.45 cfs @ 12.07 hrs, Volume= 4,609 cf, Depth> 6.80"

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-year Rainfall=8.12"

	Area (sf)	CN	Description
	2,213	98	Roofs, HSG D
	1,128	98	Paved parking, HSG D
*	584	98	Asphalt Walkways, HSG D
	4,209	80	>75% Grass cover, Good, HSG D
	8,134	89	Weighted Average
	4,209		51.75% Pervious Area
	3,925		48.25% Impervious Area

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

Subcatchment PWS-1A: Site



Summary for Subcatchment PWS-1B: Proposed Garage

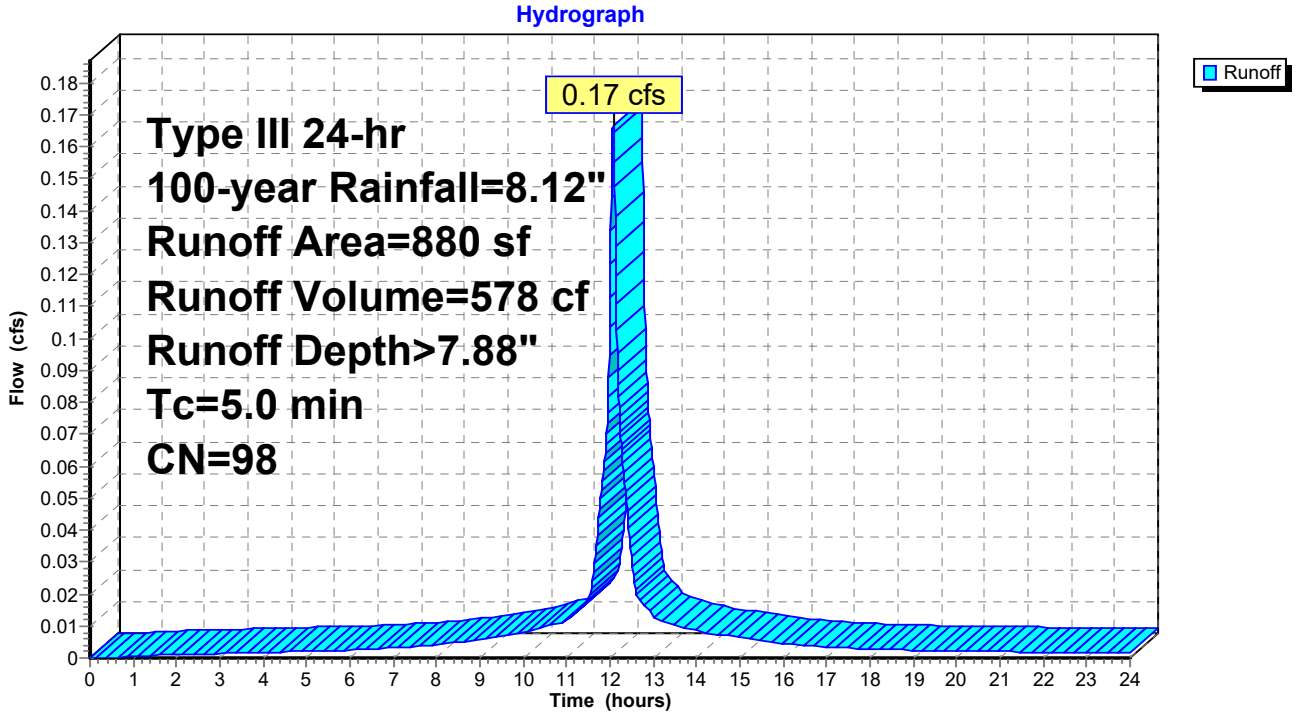
Runoff = 0.17 cfs @ 12.07 hrs, Volume= 578 cf, Depth> 7.88"

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-year Rainfall=8.12"

Area (sf)	CN	Description
880	98	Roofs, HSG D
880		100.00% Impervious Area

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

Subcatchment PWS-1B: Proposed Garage

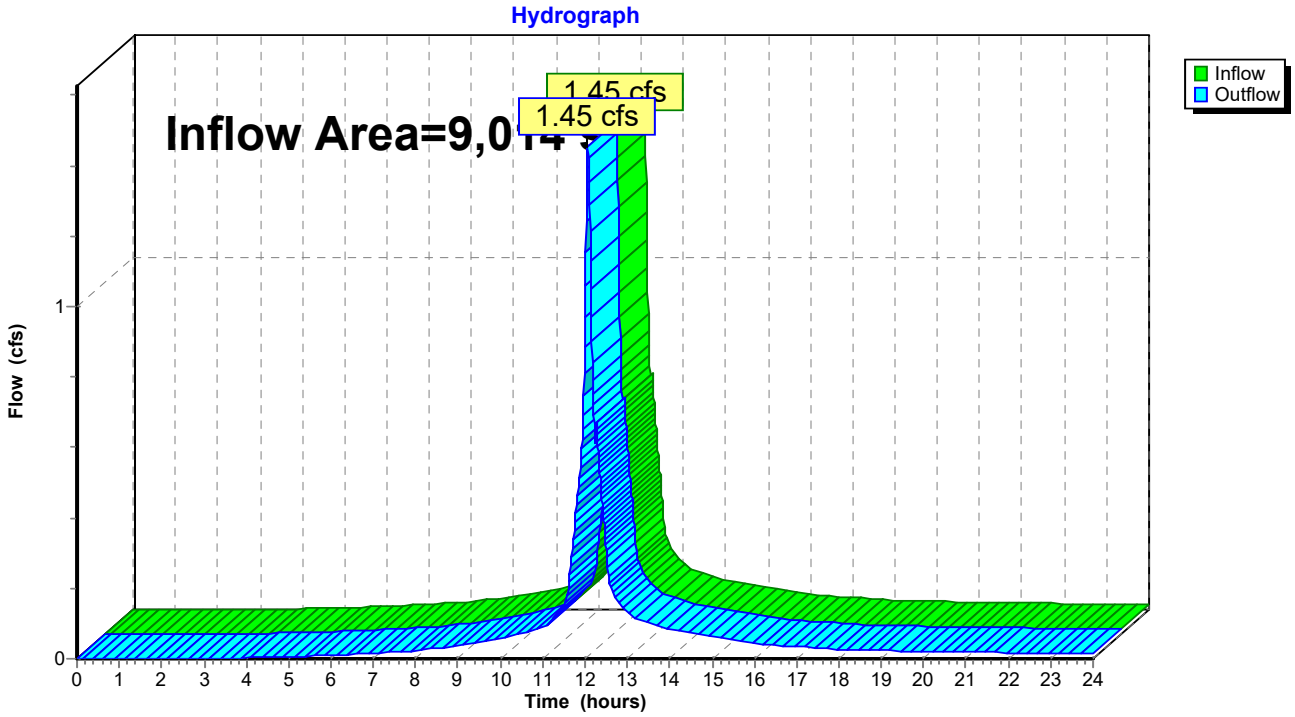


Summary for Reach DP-1: Offsite Low Point

Inflow Area = 9,014 sf, 53.31% Impervious, Inflow Depth > 6.39" for 100-year event
Inflow = 1.45 cfs @ 12.07 hrs, Volume= 4,798 cf
Outflow = 1.45 cfs @ 12.07 hrs, Volume= 4,798 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: Offsite Low Point



Summary for Pond P1: 700 Gallon Drywell

Inflow Area = 880 sf,100.00% Impervious, Inflow Depth > 7.88" for 100-year event
Inflow = 0.17 cfs @ 12.07 hrs, Volume= 578 cf
Outflow = 0.09 cfs @ 12.26 hrs, Volume= 246 cf, Atten= 49%, Lag= 11.7 min
Discarded = 0.00 cfs @ 12.26 hrs, Volume= 57 cf
Primary = 0.08 cfs @ 12.26 hrs, Volume= 189 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 498.80' @ 12.26 hrs Surf.Area= 100 sf Storage= 337 cf

Plug-Flow detention time= 298.9 min calculated for 246 cf (43% of inflow)
Center-of-Mass det. time= 145.4 min (885.0 - 739.7)

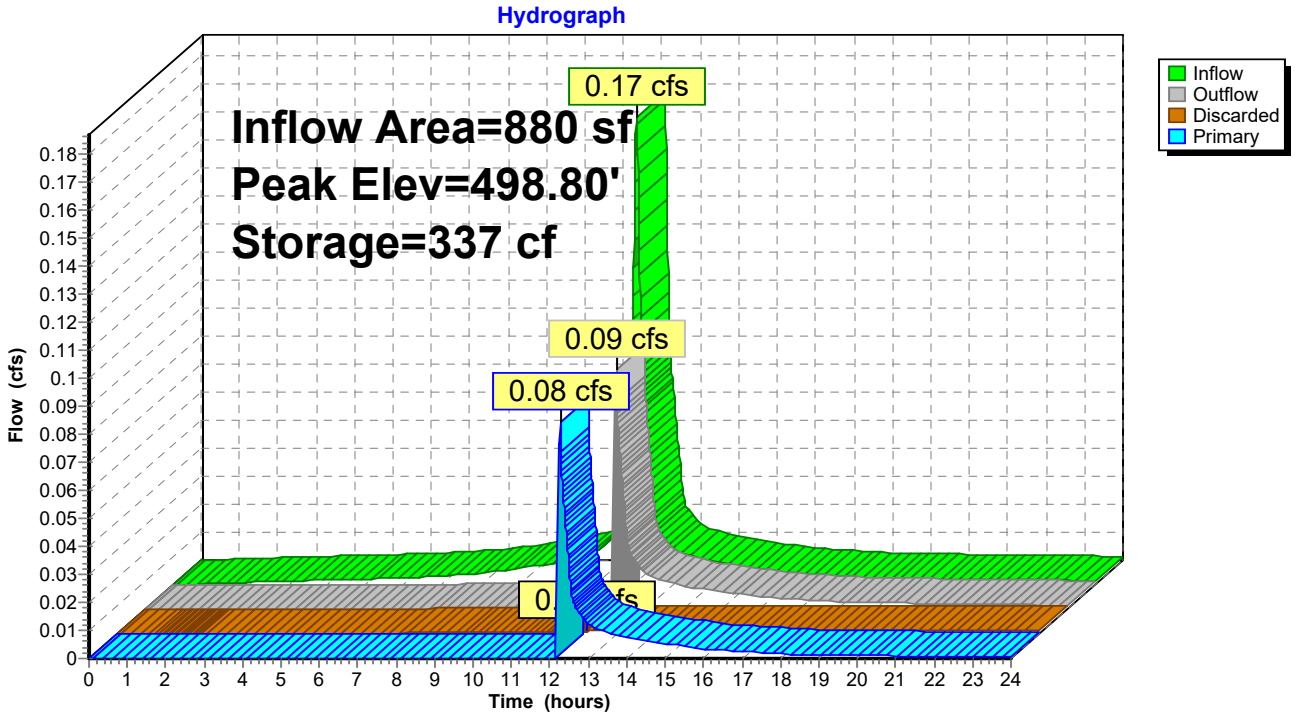
Volume	Invert	Avail.Storage	Storage Description
#1	492.75'	127 cf	**6.00'D x 4.50'H Vertical Cone/Cylinder** Inside #2
#2	490.75'	209 cf	**10.00'W x 10.00'L x 6.50'H Prismatoid** 650 cf Overall - 127 cf Embedded = 523 cf x 40.0% Voids
#3	497.25'	0 cf	**0.50'D x 2.00'H Vertical Cone/Cylinder** -Impervious
		337 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	490.75'	**0.090 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 488.75'
#2	Primary	498.75'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.26 hrs HW=498.80' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.06 cfs @ 12.26 hrs HW=498.80' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 0.06 cfs @ 0.75 fps)

Pond P1: 700 Gallon Drywell



NOAA Atlas 14, Volume 10, Version 3
Location name: Newton, Massachusetts, USA*
Latitude: 42.3523°, Longitude: -71.1837°
Elevation: 52.79 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.299** (0.238-0.377)	**0.370** (0.294-0.467)	**0.486** (0.385-0.616)	**0.582** (0.458-0.742)	**0.715** (0.543-0.963)	**0.814** (0.605-1.13)	**0.919** (0.664-1.33)	**1.04** (0.705-1.54)	**1.23** (0.797-1.88)	**1.38** (0.875-2.17)
10-min	**0.424** (0.337-0.534)	**0.524** (0.416-0.662)	**0.688** (0.544-0.872)	**0.825** (0.649-1.05)	**1.01** (0.770-1.37)	**1.15** (0.857-1.59)	**1.30** (0.941-1.88)	**1.48** (1.00-2.18)	**1.74** (1.13-2.67)	**1.96** (1.24-3.07)
15-min	**0.499** (0.396-0.629)	**0.617** (0.490-0.779)	**0.810** (0.641-1.03)	**0.971** (0.763-1.24)	**1.19** (0.905-1.61)	**1.36** (1.01-1.88)	**1.53** (1.11-2.22)	**1.74** (1.18-2.57)	**2.05** (1.33-3.14)	**2.30** (1.46-3.62)
30-min	**0.680** (0.541-0.857)	**0.842** (0.669-1.06)	**1.11** (0.876-1.40)	**1.33** (1.04-1.69)	**1.63** (1.24-2.20)	**1.85** (1.38-2.57)	**2.10** (1.52-3.04)	**2.39** (1.61-3.52)	**2.82** (1.83-4.33)	**3.20** (2.02-5.01)
60-min	**0.861** (0.685-1.09)	**1.07** (0.847-1.35)	**1.40** (1.11-1.78)	**1.68** (1.32-2.15)	**2.07** (1.57-2.79)	**2.35** (1.75-3.26)	**2.66** (1.93-3.87)	**3.03** (2.05-4.48)	**3.60** (2.34-5.53)	**4.09** (2.59-6.41)
2-hr	**1.12** (0.898-1.41)	**1.39** (1.11-1.74)	**1.83** (1.46-2.30)	**2.19** (1.74-2.78)	**2.70** (2.07-3.62)	**3.06** (2.30-4.23)	**3.47** (2.54-5.03)	**3.98** (2.70-5.82)	**4.77** (3.10-7.25)	**5.46** (3.47-8.48)
3-hr	**1.31** (1.05-1.63)	**1.62** (1.30-2.02)	**2.13** (1.70-2.67)	**2.55** (2.03-3.22)	**3.13** (2.41-4.19)	**3.56** (2.68-4.89)	**4.03** (2.96-5.82)	**4.62** (3.14-6.72)	**5.56** (3.62-8.40)	**6.37** (4.05-9.84)
6-hr	**1.70** (1.37-2.11)	**2.09** (1.69-2.60)	**2.74** (2.20-3.41)	**3.27** (2.61-4.10)	**4.01** (3.10-5.32)	**4.55** (3.45-6.20)	**5.14** (3.79-7.35)	**5.89** (4.02-8.49)	**7.06** (4.62-10.6)	**8.07** (5.15-12.3)
12-hr	**2.17** (1.77-2.67)	**2.67** (2.17-3.29)	**3.47** (2.81-4.30)	**4.14** (3.33-5.16)	**5.06** (3.93-6.65)	**5.74** (4.37-7.74)	**6.48** (4.79-9.15)	**7.39** (5.07-10.6)	**8.80** (5.78-13.0)	**10.0** (6.41-15.1)
24-hr	**2.62** (2.15-3.21)	**3.25** (2.66-3.98)	**4.28** (3.49-5.26)	**5.13** (4.15-6.35)	**6.31** (4.93-8.23)	**7.17** (5.49-9.61)	**8.12** (6.04-11.4)	**9.30** (6.40-13.2)	**11.1** (7.33-16.3)	**12.7** (8.16-19.0)
2-day	**3.01** (2.48-3.66)	**3.80** (3.13-4.62)	**5.10** (4.18-6.22)	**6.17** (5.03-7.58)	**7.65** (6.03-9.95)	**8.73** (6.74-11.7)	**9.94** (7.47-13.9)	**11.5** (7.93-16.1)	**14.0** (9.23-20.3)	**16.2** (10.4-24.0)
3-day	**3.32** (2.74-4.01)	**4.17** (3.45-5.05)	**5.58** (4.59-6.78)	**6.74** (5.51-8.24)	**8.34** (6.60-10.8)	**9.51** (7.37-12.7)	**10.8** (8.17-15.1)	**12.5** (8.66-17.5)	**15.3** (10.1-22.1)	**17.7** (11.4-26.1)
4-day	**3.60** (2.99-4.34)	**4.49** (3.72-5.42)	**5.94** (4.90-7.20)	**7.14** (5.86-8.71)	**8.80** (6.98-11.4)	**10.0** (7.78-13.3)	**11.4** (8.60-15.8)	**13.1** (9.10-18.2)	**16.0** (10.6-23.0)	**18.5** (12.0-27.2)
7-day	**4.36** (3.64-5.23)	**5.29** (4.41-6.35)	**6.80** (5.64-8.19)	**8.05** (6.64-9.76)	**9.78** (7.79-12.5)	**11.0** (8.61-14.5)	**12.4** (9.43-17.1)	**14.3** (9.93-19.7)	**17.2** (11.4-24.5)	**19.8** (12.8-28.8)
10-day	**5.06** (4.24-6.05)	**6.01** (5.03-7.19)	**7.56** (6.30-9.08)	**8.85** (7.32-10.7)	**10.6** (8.47-13.5)	**11.9** (9.30-15.5)	**13.3** (10.1-18.2)	**15.2** (10.6-20.8)	**18.1** (12.0-25.6)	**20.6** (13.3-29.8)
20-day	**7.09** (5.98-8.42)	**8.12** (6.83-9.65)	**9.79** (8.21-11.7)	**11.2** (9.30-13.4)	**13.1** (10.5-16.4)	**14.5** (11.3-18.5)	**16.0** (12.0-21.2)	**17.8** (12.5-24.1)	**20.3** (13.6-28.4)	**22.4** (14.6-32.0)
30-day	**8.76** (7.42-10.4)	**9.84** (8.32-11.6)	**11.6** (9.77-13.8)	**13.1** (10.9-15.6)	**15.1** (12.1-18.7)	**16.6** (13.0-21.0)	**18.2** (13.6-23.7)	**19.9** (14.0-26.7)	**22.1** (14.9-30.8)	**23.9** (15.6-33.9)
45-day	**10.8** (9.21-12.8)	**12.0** (10.2-14.1)	**13.8** (11.7-16.4)	**15.4** (12.9-18.3)	**17.5** (14.1-21.5)	**19.2** (15.0-24.0)	**20.8** (15.5-26.8)	**22.4** (15.9-29.9)	**24.4** (16.5-33.7)	**25.9** (16.9-36.5)
60-day	**12.6** (10.7-14.8)	**13.8** (11.7-16.2)	**15.7** (13.3-18.5)	**17.3** (14.6-20.5)	**19.5** (15.7-23.9)	**21.3** (16.6-26.4)	**22.9** (17.1-29.3)	**24.5** (17.4-32.5)	**26.4** (17.8-36.2)	**27.7** (18.1-38.9)

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

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

Please refer to NOAA Atlas 14 document for more information.

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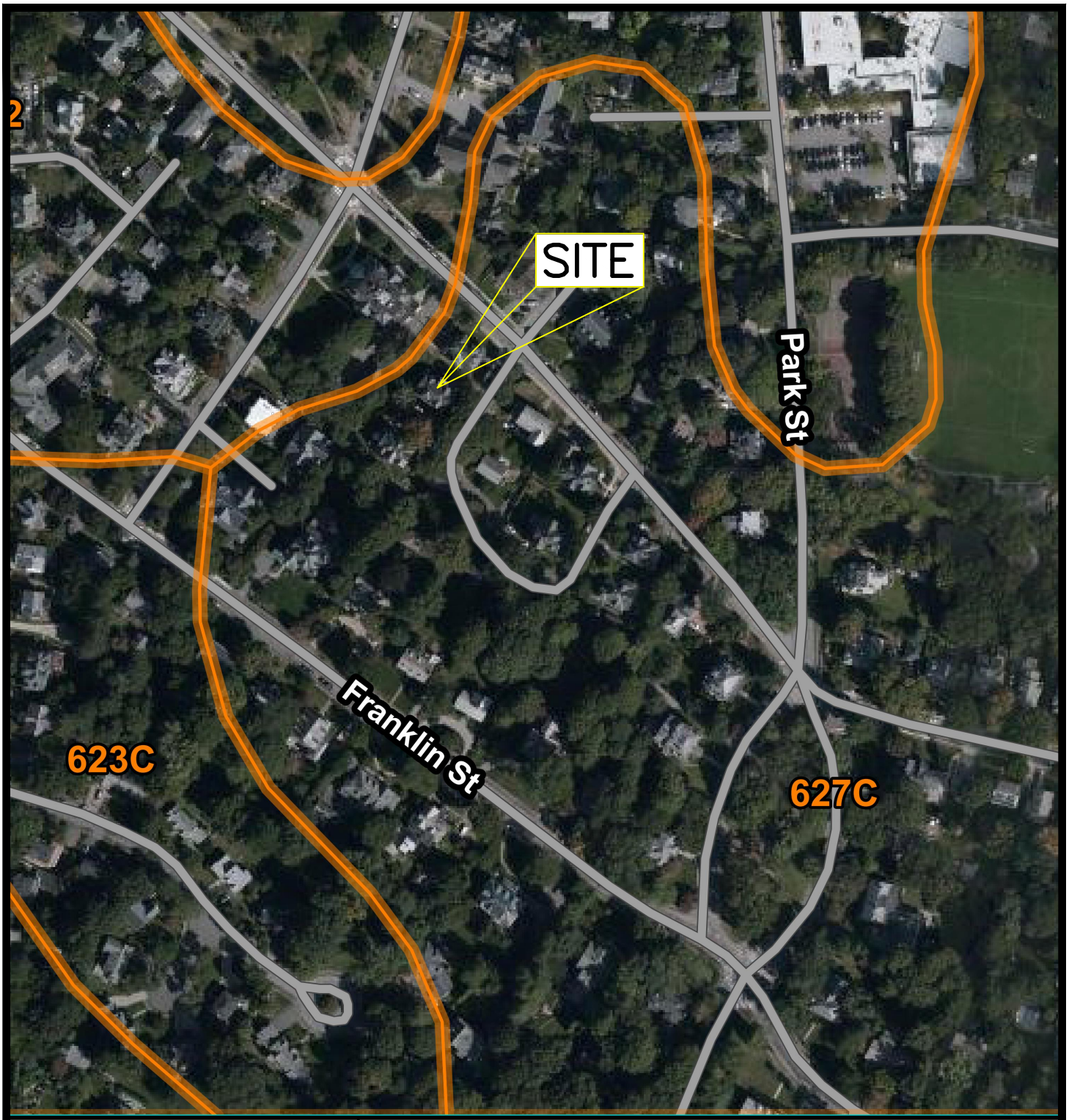
PF graphical



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PROJECT:

Proposed Garage

44 Billings Park
(Property SBL: 72008 0015)
Newton, Massachusetts 02458

PROJECT: 20-75101	DATE: September 17, 2020
SCALE: 1"=300'	DWG FILE NAME: Soil Map.dwg
DESIGNED BY: Calvin Reach	CHECKED BY: Eric Bradanese, P.E.

DRAWING TITLE:

SCS SOILS MAP

Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Paxton

Percent of map unit: 9 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 5 percent
Landform: Drumlins, drainageways, hills, ground moraines, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

627C—Newport-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9958
Elevation: 20 to 380 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Newport 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 Newport

Setting

Landform: Moraines, drumlins, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy basal till over dense loamy lodgment till derived from phyllite

Typical profile

H1 - 0 to 8 inches: channery fine sandy loam
H2 - 8 to 18 inches: channery silt loam
H3 - 18 to 24 inches: channery sandy loam
H4 - 24 to 65 inches: channery fine sandy loam

Properties and qualities

Slope: 8 to 20 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Description of Urban Land

Setting

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

Minor Components

Udorthents, loamy

Percent of map unit: 10 percent
Hydric soil rating: No

Pittstown

Percent of map unit: 3 percent
Landform: Depressions, drumlins
Landform position (two-dimensional): Toeslope, backslope, shoulder
Landform position (three-dimensional): Base slope, nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Paxton

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

654—Udorthents, loamy

Map Unit Setting

National map unit symbol: vr1l
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, loamy, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Udorthents, sandy

Percent of map unit: 10 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: Yes

Urban land

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear