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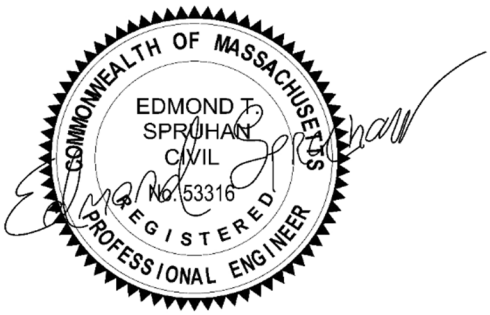
STORMWATER MANAGEMENT REPORT

PROJECT:
11 PARSONS ST NEWTON MA



Prepared by:
Spruhan Engineering, P.C.
March 12, 2025

Contents

1. Introduction

Spruhan Engineering, P.C. ("Spruhan") has prepared this Stormwater Management Report for the proposed development at **11 Parsons St., Newton, Massachusetts** (the "Property"). The scope of the project proposes 4 units in this multi-family lot (the "Proposed Development"). The Property will also be improved with a driveway and landscaped areas.

In accordance with Section 29-148(C)(3) of the City of Newton Ordinances, the Proposed Development requires a "major stormwater management permit" because it will increase the amount of impervious surface at the Property by more than 1,000 square feet. Spruhan has designed the proposed stormwater management system to meet these standards.

2. Existing Conditions

The Property is a 17,678 square foot lot located on Parsons Avenue, between Wiswall Street and Watertown Street. The surrounding neighborhood is residential in character and abutting properties are improved by single-family or two-family dwellings. Table 1 provides a summary of the existing impervious, pervious, and landscaped areas at the Property.

EXISTING AREAS		
LOT AREA	17,678	S.F.
IMPERVIOUS & DEGRADED AREAS		
BUILDING	1,256	S.F.
PORCH	627	S.F.
GRAVEL DRIVEWAY	376	S.F.
STONE WALLS	110	S.F.
PAVED WALKWAY	341	S.F.
BULKHEAD	28	S.F.
TOTAL	***2,738***	***S.F.***
PERVIOUS & DEGRADED AREAS		
WOODEN STEPS & LANDING	47	S.F.
DIRT & STONE WALKWAY	52	S.F.
TOTAL	***99***	***S.F.***
LANDSCAPE	14,841	S.F.

Table 1- Summary of the existing impervious, pervious and landscaped areas at the Property

2.1 Existing Topography and Drainage Infrastructure

The Property has an approximate 6.5% slope that runs from the North (the right of the Property) to the South (the left of the Property). The Property does not have an existing drainage or infiltration system. Consequently, stormwater at the Property currently scours across the surface at grade.

3. Proposed Conditions

3.1 Project Description

The scope of the proposed work involves developing the property with 4 units in this multi-family lot. Table 2 provides details on the proposed impervious, pervious, and landscaped areas at the Property.

PROPOSED AREAS		
LOT AREA	17,678	S.F.
IMPERVIOUS & DEGRADED AREAS		
BUILDINGS	3,452	S.F.
PORCHES	44	S.F.
DRIVEWAY	1,128	S.F.
WALKWAYS	243	S.F.
BULKHEAD	33	S.F.
TOTAL	***4,901***	***S.F.***
PERVIOUS & DEGRADED AREAS		
WOODEN STEPS & LANDINGS	247	S.F.
WINDOW WELL	20	S.F.
TOTAL	***268***	***S.F.***
LANDSCAPE	12,510	S.F.

Table 2- Proposed impervious, pervious, and landscaped areas at the Property

3.2 Soil Information (Summary)

The NRCS Web Soil Survey shows one Map Unit inside our area of interest. This is listed next and the percentages of Area of Interest in the Map unit Legend Table:

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	0.2	100.0%
Totals for Area of Interest		**0.2**	**100.0%**

Map unit **626B** refers to **stratified gravel to very gravelly sand**, these soils have a Hydrological soil group "A".

Also, 2 test pits were performed on the site and the hole logs showed **Gravelly Loamy Sand;** properties for such soils were applied to the HydroCAD software calculations and Drawdown time calculations as well.

Further detailed information is described in Appendix B.

DEEP OBSERVATION HOLE LOG

DEEP OBSERVATION HOLE NUMBER:					TP-1	GROUND ELEVATION:					35.00
Depth (In)	Horizon/ Layer	Matrix: Color-Moist	Redoximorphic Features			Texture (USDA)	Coarse Fragments (Percent by Volume)		Structure	Consistence (Moist)	Other
			Depth (in)	Color	Percent		Gravel	Cobbles & Stones			
0-6 34.50	A	10YR 3 2	–	–	–	SANDY LOAM	<5	<5	MASSIVE	FRIABLE	–
6-32 32.33	FILL	–	–	–	–	–	–	–	–	–	6"-14" ASH
32-84 28.00	C	10YR 6 2	NONE	–	–	GRAVELLY LOAMY SAND	25	20	SINGLE GRAINED	LOOSE	–

NOTES:
1. NO WEEPING OR STANDING WATER OBSERVED.
2. NO REDOX. OBSERVED.
3. NO REFUSAL.
4. LOGGED BY MATTHEW MUI, SE14259 ON 10/23/2024.

DEEP OBSERVATION HOLE LOG

DEEP OBSERVATION HOLE NUMBER:					TP-2	GROUND ELEVATION:					35.00
Depth (in)	Horizon/ Layer	Matrix: Color-Moist	Redoximorphic Features			Texture (USDA)	Coarse Fragments (Percent by Volume)		Structure	Consistence (Moist)	Other
			Depth (In)	Color	Percent		Gravel	Cobbles & Stones			
0-40 31.67	FILL / A	–	–	–	–	–	–	–	–	–	CONSISTING MOSTLY OF LOAM
40-90 27.50	C	10YR 6 2	NONE	–	–	GRAVELLY LOAMY SAND	25	20	SINGLE GRAINED	LOOSE	MANY COBBLES

NOTES:
1. NO WEEPING OR STANDING WATER OBSERVED.
2. NO REDOX. OBSERVED.
3. NO REFUSAL.
4. LOGGED BY MATTHEW MUI, SE14259 ON 10/23/2024.

3.3 Infiltration System

The proposed infiltration system consists of one (01) set of Stormtech Chambers composed by 18 chambers, embedded in a crushed stone pit. The Calculations for such systems are shown next:

Design Criteria:

Proposed post-construction Impervious areas= 4,901 SF
Design for: 2" Rainstorm

Total Storage Required:

V_R = (2"/12) (4,901SF) = **817 CF**

CAPACITY OF PROPOSED INFILTRATION SYSTEM

System #1

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	717 cf	**11.00'W x 68.03'L x 3.50'H Field A** 2,619 cf Overall - 827 cf Embedded = 1,792 cf x 40.0% Voids
#2A	30.50'	827 cf	**ADS_StormTech SC-740 +Cap** x 18 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 18 Chambers in 2 Rows
		1,544 cf	Total Available Storage

Total Storage Provided (**1,544 CF**) > Total Storage Required (**817** CF/D)

The proposed infiltration system complies with the City of Newton Stormwater Management and Erosion Control Rules & Regulations, Section 5: Design Standards Part C.3.a page 6 of 17, where it states: *"Stormwater management systems on new development sites shall be designed to: a) Retain the volume of runoff equivalent to, or greater than, two (2) inches multiplied by the total post-construction impervious surface area on the site…"*

3.4 Drawdown time (Time to empty) Calculations.

Drawdown time (Time to empty) Calculations

$$Time = \frac{rv}{(k)(\text{Inf. System bottom Area})}$$

$rv = Storage\ capacity\ of\ the\ infiltration\ system.$

$k = Rawls\ rate\ based\ on\ soil\ texture\ class\ (\mathbf{2.41}\ \boldsymbol{\frac{in}{hr}}\ \boldsymbol{for\ Gravelly\ Loamy\ Sand}$

System #1

Time $_{drawdown}$= (1544 cf) / [(2.41 in/hr) (1ft/12in) (748 sf)]

Time = 10.28 hr < 72.00hr

3.5 Flowrate & volume of stormwater runoff summary.

The proposed infiltration system designed for this site will control the runoff from the site and substantially improve drainage at the property.

HydroCAD was used to model the site for the existing and proposed conditions for the 2-year, 10-year, 25-year, and 100-year type III storm events based on The NOAA Atlas 14, Volume 10, Version 3, Rain Information for Newton Center, Massachusetts, USA.

Storm Event	Precipitation depths NOAA Atlas 14 (inches)	Precipitation depths used (inches)
2-Year	3.26	3.26
10-Year	5.13	5.13
25-Year	6.30	6.30
100-Year	8.10	8.78**

Table 3- Precipitation depths used for the HydroCAD analysis.

According to the City of Newton Stormwater Management and Erosion Control Rules & Regulations, Section 5: Design Standards Part B.6 page 5 of 17: "*... the 100-year design storm is based on 8.78 inches of precipitation in 24 hours...*". In addition, Section 5: Design Standards Part C.2 page 6 of 17, states: "*Projects shall comply with the Stormwater Standards of the most recent version of Massachusetts Stormwater Management Handbook (Handbook), and the City of Newton General Construction Detail Book and Streets Design Guide. Where an inconsistency exists between the Handbook and these Regulations, the stricter shall apply**".*

Detailed HydroCAD calculations are included in Appendix A. Table 4, below, provides a summary of the existing and proposed conditions as they relate to flowrate and volume of stormwater runoff at the Property

SUMMARY TABLE				
Rainfall Event	**Runoff Flow Rate (cfs)**		**Volume of Runoff (cf)**	
	Existing	**Proposed**	**Existing**	**Proposed**
2-Year	0.00	0.00	121	1
10-Year	0.15	0.02	860	242
25-Year	0.39	0.07	1573	569
100-Year	1.07	0.40	3523	1597

3.6 Low Impact Development (LID)

Low Impact Development (LID) strategies use careful site design and decentralized stormwater management to reduce the environmental footprint of new growth and redevelopment. This approach improves water quality, minimizes the need for expensive pipe and pond stormwater systems, and creates more attractive developments.

The following strategies outline the LID methods that were implemented in this project:

1. **Use of Filter Mitts:**
    a. Erosion control
    b. Detains sediment, absorbs orders and degrades volatile organic compounds allows water by-pass, and is a food resource for beneficial microorganisms, which remediate by metabolizing wood preservatives, petroleum products, pesticides and both chlorinated and non-chlorinated hydrocarbons in stormwater runoff from reaching water resources, prevents erosion and silting on embankments parallel to creeks, lakes, and rivers, prevents erosion and turf loss on roadsides, hillsides, playing fields, and golf courses.

2. **Grass swales:** broad, open channels sown with erosion resistant and flood tolerant grasses.
    a. Management Objectives:
        i. Provide water quality treatment; remove suspended solids; heavy metals, trash.
        ii. Reduce peak discharge rate and total runoff volume.
        iii. Infiltrate water into the ground.
        iv. Provide a location for snow storage.

3. **Infiltration Trenches and Dry Wells.** These are standard stormwater management structures that store water in the void space between crushed stone or gravel; the water slowly percolates downward into the subsoil.
    a. Management Objectives:
        i. Remove suspended solids, heavy metals trash, oil, and grease.
        ii. Reduce peak discharge rate and total runoff volume.
        iii. Provide modest infiltration and recharge.
        iv. Provide snow storage areas.
4. **Grass Filter** Strips are low-angle vegetated slopes designed to treat sheet flow runoff from adjacent impervious areas.
    a. Management Objectives:
        i. Remove suspended solids, heavy metals, trash, oil, and grease.
        ii. Reduce peak discharge rate and total runoff volume.
        iii. Provide modest infiltration and recharge.
        iv. Provide snow storage areas.

5. **Roadway and Parking Lot Design**:
    a. Management Objectives:

i. Remove suspended solids, heavy metals trash, oil, and grease.
ii. Reduce peak discharge rate and total runoff volume.
iii. Provide modest infiltration and recharge.
iv. Provide snow storage areas.

6. Other LID Implementations:
    a. Shared Driveways
    b. Creating long flow paths over landscaped areas.

3.7 Total Suspended Solids (TSS) removal & Total Phosphorus (TP) reduction

According to City of Newton Stormwater Management and Erosion Control Rules & Regulations, Section 5: Design Standards Part:

- C.3.c: Stormwater management systems on **new development** sites shall be designed to:
  a) Remove 90% of the average annual load of Total Suspended Solids generated from the total post-construction impervious area on the site; and
  b) Calculate the existing and proposed average annual Total Phosphorus (TP) load based on the land use(s) and demonstrate 60% reduction of the TP load generated from the total post-construction impervious surface area on the site: and
- C.4.c: Stormwater management systems on **redevelopment** sites shall be designed to:
  a) Remove 80% of the average annual load of Total Suspended Solids generated from the total post-construction impervious area on the site; and
  b) Calculate the existing and proposed average annual Total Phosphorus (TP) load based on the land use(s) and demonstrate 50% reduction of the TP load generated from the total post-construction impervious surface area on the site: and

Therefore, the Stormwater system has been designed to remove ***85%*** the average annual load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site and achieve a total of ***94.36%*** reduction of the average annual Total Phosphorus (TP) load based generated from the total post-construction impervious surface area on the site.

TSS Removal Calculation Worksheet

Location: 11 Parsons St., Newton, MA.

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Trench	0.80	1.00	0.80	0.20
Deep Sump and Hooded Catch Basin	0.25	0.20	0.05	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 11 Parsons St., Newton, MA.
Prepared By: SPRUHAN ENGINEERING
Date: 03.12.25

*Equals remaining load from previous BMP (E) which enters the BMP

PHOSPHORUS LOADS / REDUCTIONS

TP = A*L
Where:
A = Total impervious area of post-development (acres)
L = Load of a pollutant in pounds per acre per year.
Ac = Captured impervious area of post-development (acres)

PRE-DEVELOPMENT PHOSPHORUS LOADING (Lpre)
Tppre = A*L
Tppre = 0.0628 Acres X 1.96 lbs/acre/year
Tppre = **0.123 lbs/year**

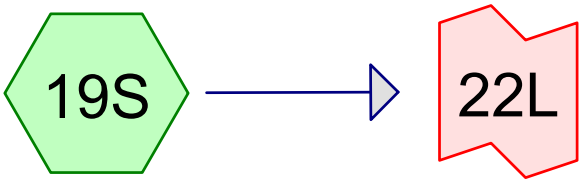
POST-DEVELOPMENT PHOSPHORUS LOADING (Lpost)
TPpost = A*L
TPpost = 0.1125 Acres x 1.96 lbs/acre/year
TPpost = 0.221 lbs/year

REDUCED TP LOAD
REDUCED TP = AC*L
REDUCED TP = 0.1062 Acres x 1.96 lbs/acre/year
REDUCED TP = 0.208 lbs/year

TOTAL PHOSPHORUS REDUCTION % (TP)
TP RED. (%) = 94.36 %

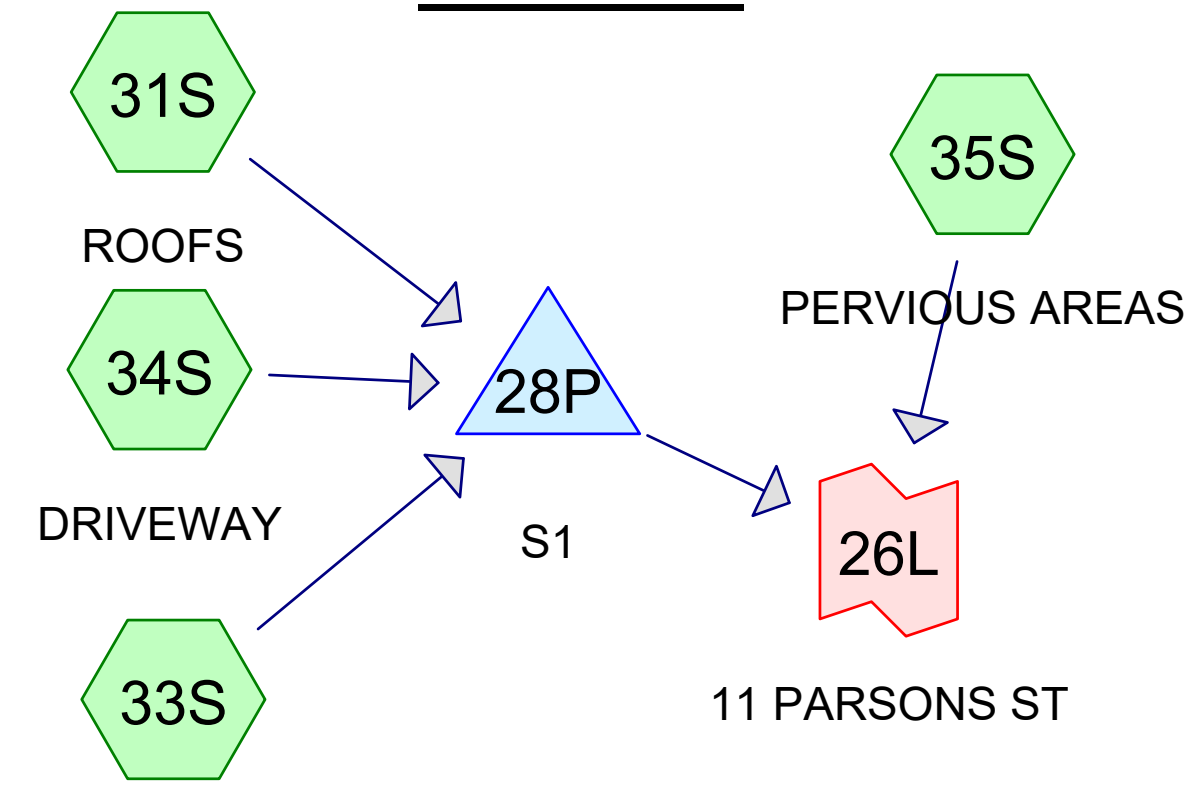
Appendix A – HydroCAD Calculations

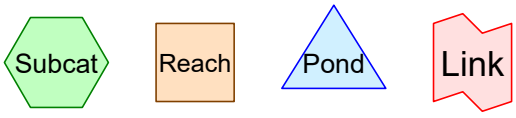
EXISTING



EXISTING AREAS 11 PARSONS ST

PROPOSED





Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
27,697	39	>75% Grass cover, Good, HSG A (19S, 35S)
1,504	98	Paved parking, HSG A (19S, 34S)
5,379	98	Roofs, HSG A (19S, 31S)
775	98	Unconnected pavement, HSG A (19S, 33S, 35S)
35,355	**52**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
35,355	HSG A	19S, 31S, 33S, 34S, 35S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
35,355		**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
27,697	0	0	0	0	27,697	>75% Grass cover, Good	
1,504	0	0	0	0	1,504	Paved parking	
5,379	0	0	0	0	5,379	Roofs	
775	0	0	0	0	775	Unconnected pavement	
35,355	**0**	**0**	**0**	**0**	**35,355**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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 19S: EXISTING AREAS Runoff Area=17,678 sf 15.49% Impervious Runoff Depth=0.08"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.00 cfs 121 cf

Subcatchment 31S: ROOFS Runoff Area=3,496 sf 100.00% Impervious Runoff Depth=3.03"
Tc=5.0 min CN=98 Runoff=0.26 cfs 882 cf

Subcatchment 33S: OTHER IMPER. Runoff Area=276 sf 100.00% Impervious Runoff Depth=3.03"
Tc=5.0 min CN=98 Runoff=0.02 cfs 70 cf

Subcatchment 34S: DRIVEWAY Runoff Area=1,128 sf 100.00% Impervious Runoff Depth=3.03"
Tc=5.0 min CN=98 Runoff=0.08 cfs 285 cf

Subcatchment 35S: PERVIOUS AREAS Runoff Area=12,777 sf 0.16% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 1 cf

Pond 28P: S1 Peak Elev=30.88' Storage=373 cf Inflow=0.37 cfs 1,236 cf
Outflow=0.05 cfs 1,236 cf

Link 22L: 11 PARSONS ST Inflow=0.00 cfs 121 cf
Primary=0.00 cfs 121 cf

Link 26L: 11 PARSONS ST Inflow=0.00 cfs 1 cf
Primary=0.00 cfs 1 cf

Total Runoff Area = 35,355 sf Runoff Volume = 1,358 cf Average Runoff Depth = 0.46"
78.34% Pervious = 27,697 sf 21.66% Impervious = 7,658 sf

Summary for Subcatchment 19S: EXISTING AREAS

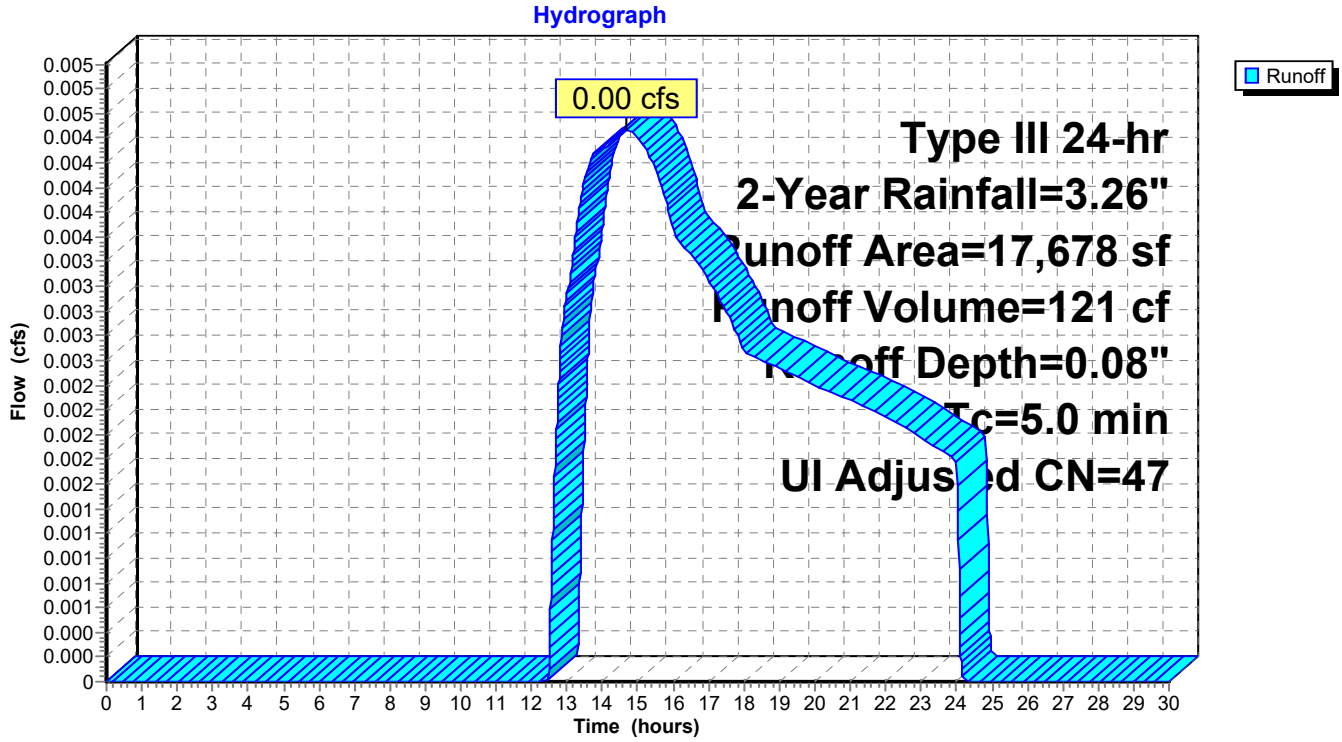
Runoff = 0.00 cfs @ 14.65 hrs, Volume= 121 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.26"

	Area (sf)	CN	Adj	Description
	1,256	98		Roofs, HSG A
	627	98		Roofs, HSG A
	376	98		Paved parking, HSG A
	110	98		Unconnected pavement, HSG A
*	341	98		Unconnected pavement, HSG A
*	28	98		Unconnected pavement, HSG A
	47	39		>75% Grass cover, Good, HSG A
	52	39		>75% Grass cover, Good, HSG A
	14,841	39		>75% Grass cover, Good, HSG A
	17,678	48	47	Weighted Average, UI Adjusted
	14,940			84.51% Pervious Area
	2,738			15.49% Impervious Area
	479			17.49% Unconnected

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

Subcatchment 19S: EXISTING AREAS



Summary for Subcatchment 31S: ROOFS

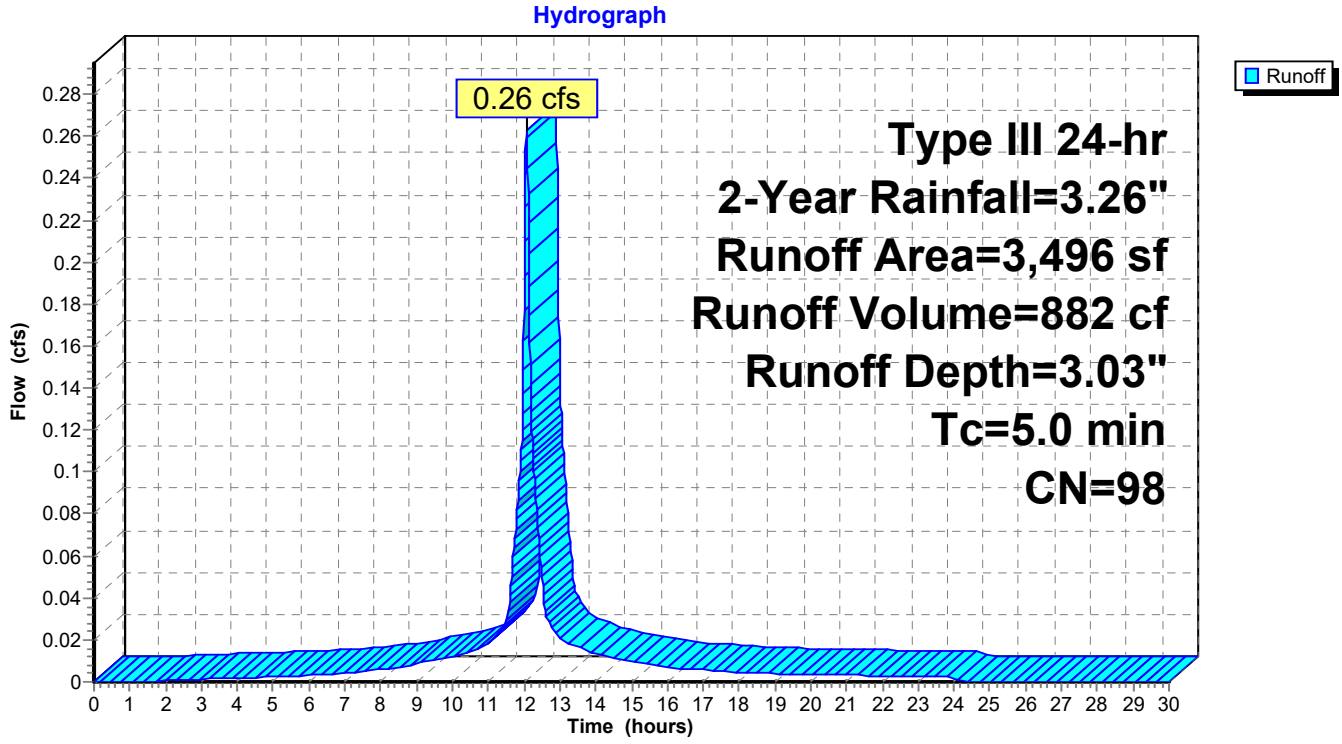
Runoff = 0.26 cfs @ 12.07 hrs, Volume= 882 cf, Depth= 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.26"

	Area (sf)	CN	Description
	3,452	98	Roofs, HSG A
*	44	98	Roofs, HSG A
	3,496	98	Weighted Average
	3,496		100.00% Impervious Area

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

Subcatchment 31S: ROOFS



Summary for Subcatchment 33S: OTHER IMPER.

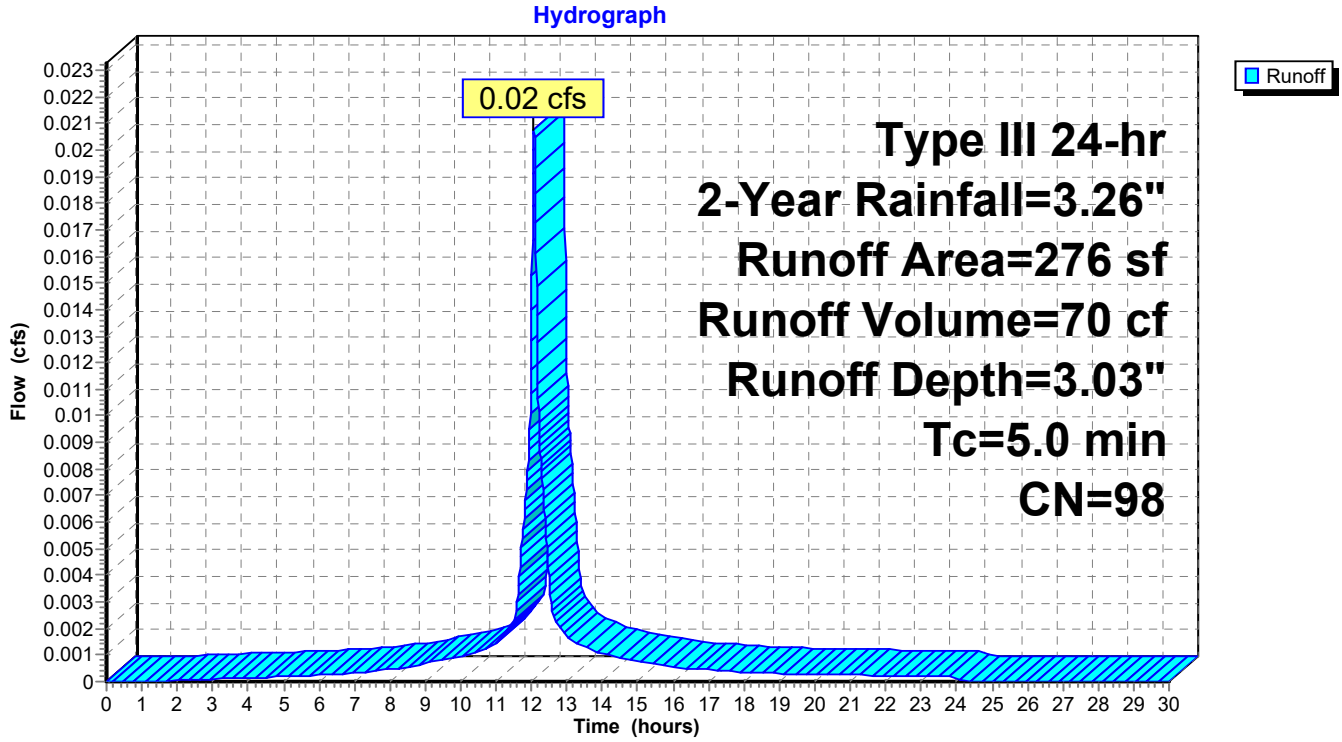
Runoff = 0.02 cfs @ 12.07 hrs, Volume= 70 cf, Depth= 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.26"

	Area (sf)	CN	Description
	243	98	Unconnected pavement, HSG A
*	33	98	Unconnected pavement, HSG A
	276	98	Weighted Average
	276		100.00% Impervious Area
	276		100.00% Unconnected

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

Subcatchment 33S: OTHER IMPER.



Summary for Subcatchment 34S: DRIVEWAY

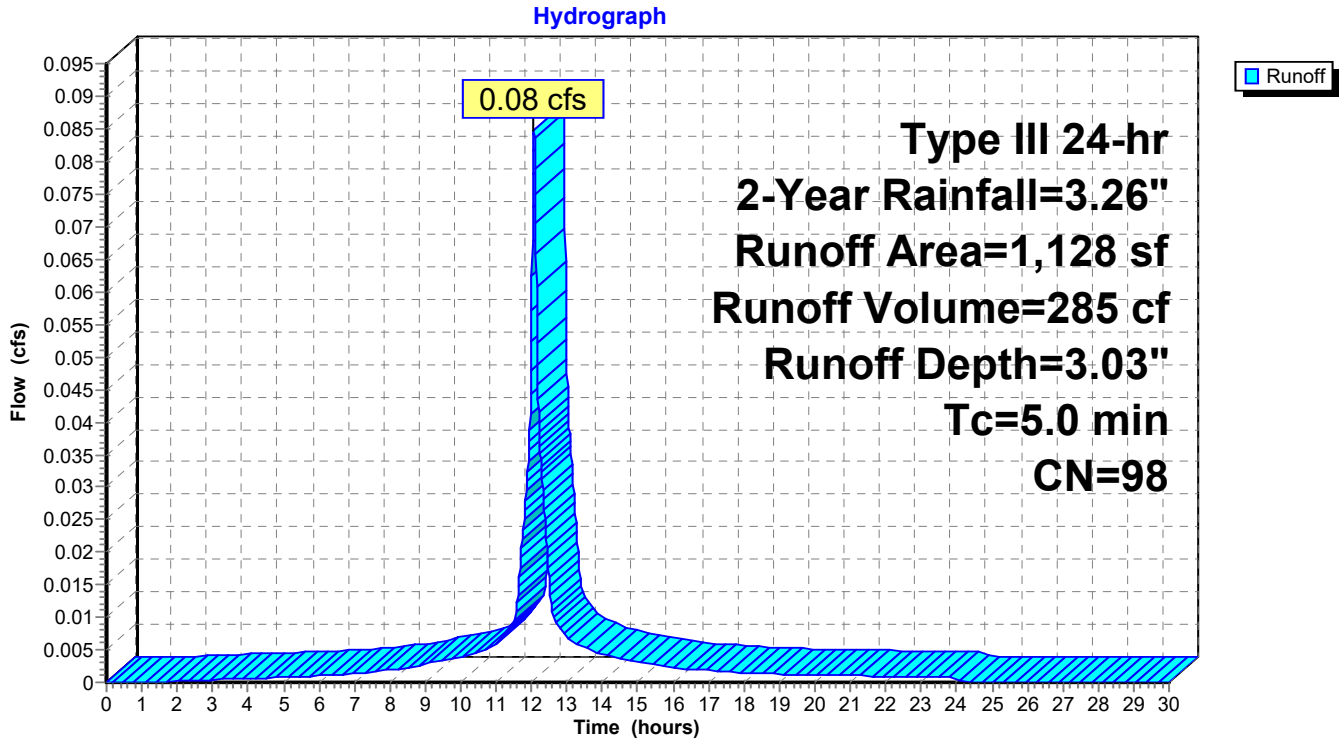
Runoff = 0.08 cfs @ 12.07 hrs, Volume= 285 cf, Depth= 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.26"

Area (sf)	CN	Description
1,128	98	Paved parking, HSG A
1,128		100.00% Impervious Area

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

Subcatchment 34S: DRIVEWAY



Summary for Subcatchment 35S: PERVIOUS AREAS

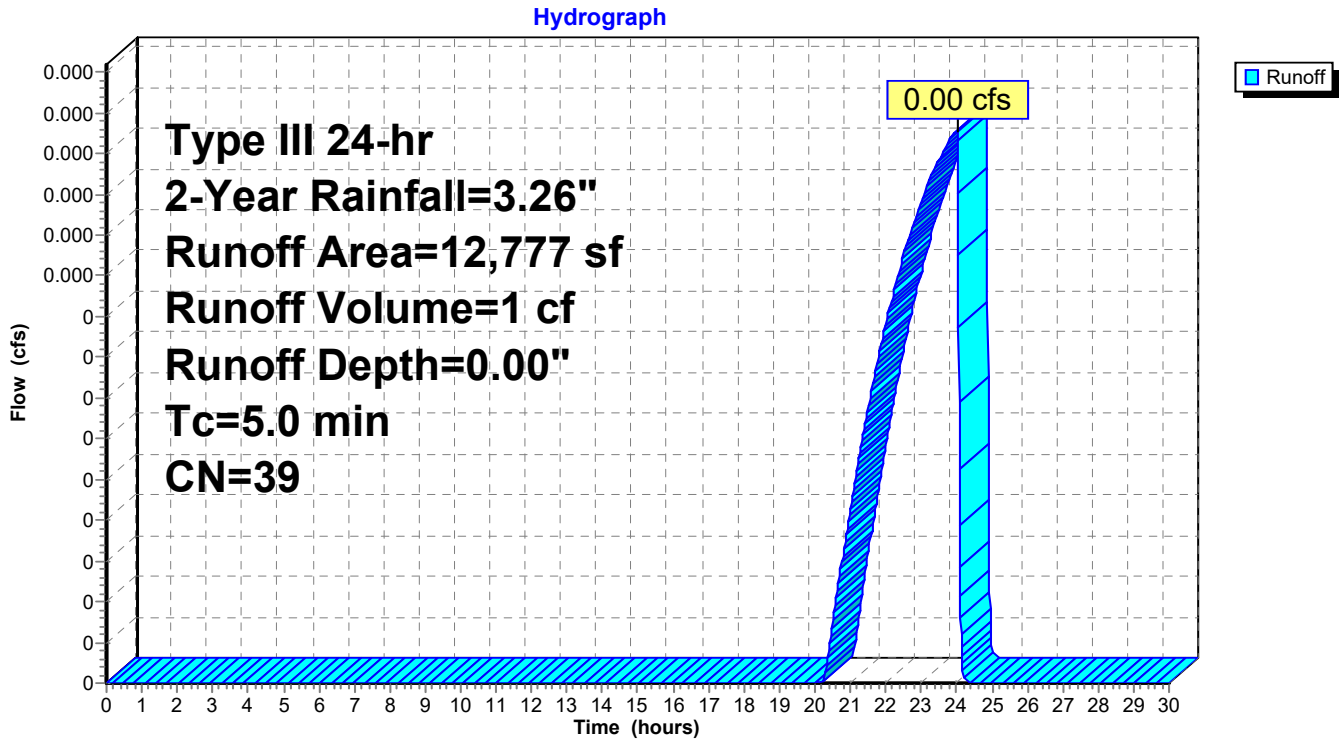
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 1 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.26"

Area (sf)	CN	Description
20	98	Unconnected pavement, HSG A
247	39	>75% Grass cover, Good, HSG A
12,510	39	>75% Grass cover, Good, HSG A
12,777	39	Weighted Average
12,757		99.84% Pervious Area
20		0.16% Impervious Area
20		100.00% Unconnected

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

Subcatchment 35S: PERVIOUS AREAS



Summary for Pond 28P: S1

Inflow Area = 4,900 sf,100.00% Impervious, Inflow Depth = 3.03" for 2-Year event
Inflow = 0.37 cfs @ 12.07 hrs, Volume= 1,236 cf
Outflow = 0.05 cfs @ 12.57 hrs, Volume= 1,236 cf, Atten= 87%, Lag= 29.8 min
Discarded = 0.05 cfs @ 12.57 hrs, Volume= 1,236 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 30.88' @ 12.57 hrs Surf.Area= 748 sf Storage= 373 cf

Plug-Flow detention time= 48.4 min calculated for 1,236 cf (100% of inflow)
Center-of-Mass det. time= 48.3 min (803.4 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	717 cf	**11.00'W x 68.03'L x 3.50'H Field A** 2,619 cf Overall - 827 cf Embedded = 1,792 cf x 40.0% Voids
#2A	30.50'	827 cf	**ADS_StormTech SC-740 +Cap** x 18 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 18 Chambers in 2 Rows
		1,544 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 12.57 hrs HW=30.88' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 28P: S1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

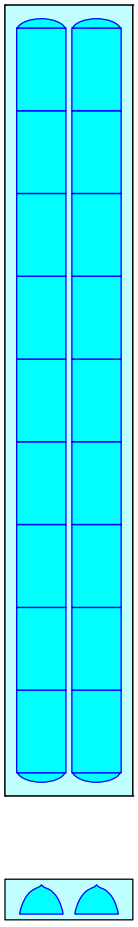
9 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 65.70' Row Length +14.0" End Stone x 2 = 68.03' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

18 Chambers x 45.9 cf = 826.9 cf Chamber Storage

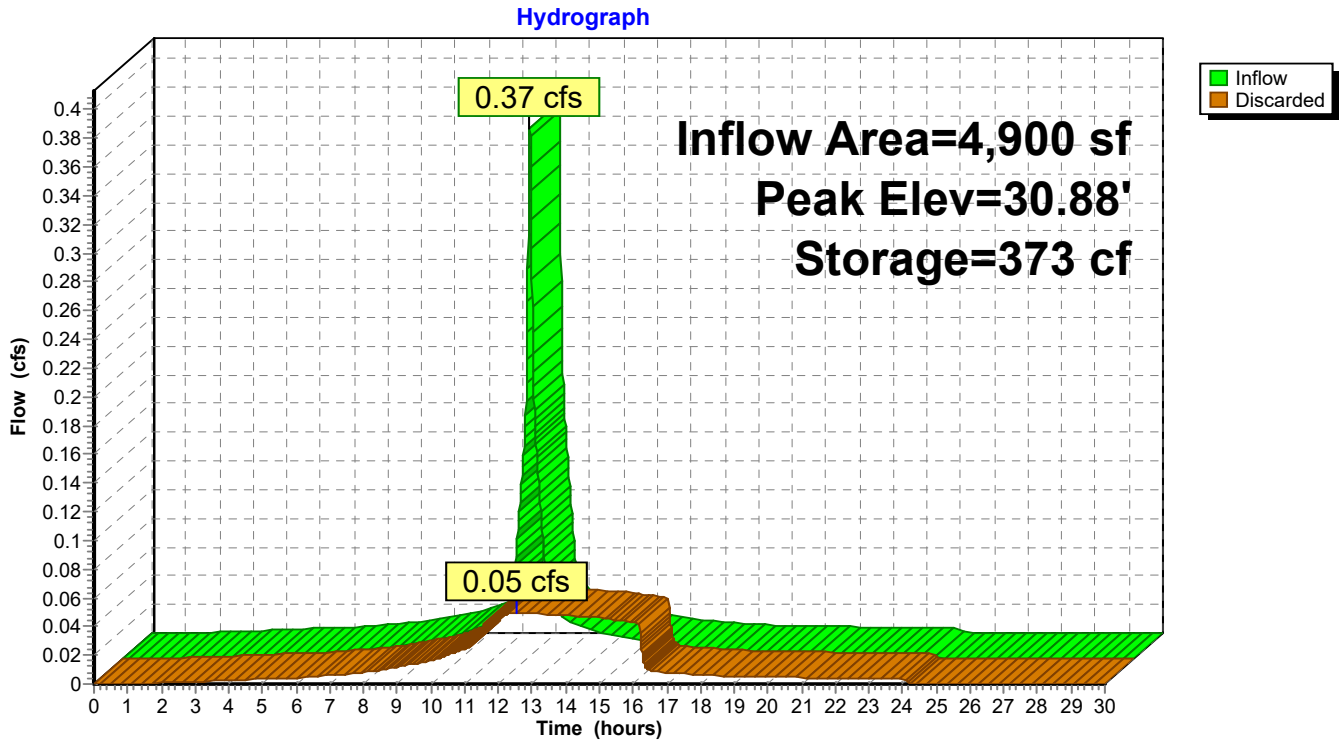
2,619.2 cf Field - 826.9 cf Chambers = 1,792.2 cf Stone x 40.0% Voids = 716.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,543.8 cf = 0.035 af
Overall Storage Efficiency = 58.9%
Overall System Size = 68.03' x 11.00' x 3.50'

18 Chambers
97.0 cy Field
66.4 cy Stone



Pond 28P: S1


Hydrograph
0.37 cfs
0.05 cfs
Inflow Area=4,900 sf
Peak Elev=30.88'
Storage=373 cf
Inflow
Discarded
Flow (cfs)
Time (hours)

Stage-Area-Storage for Pond 28P: S1

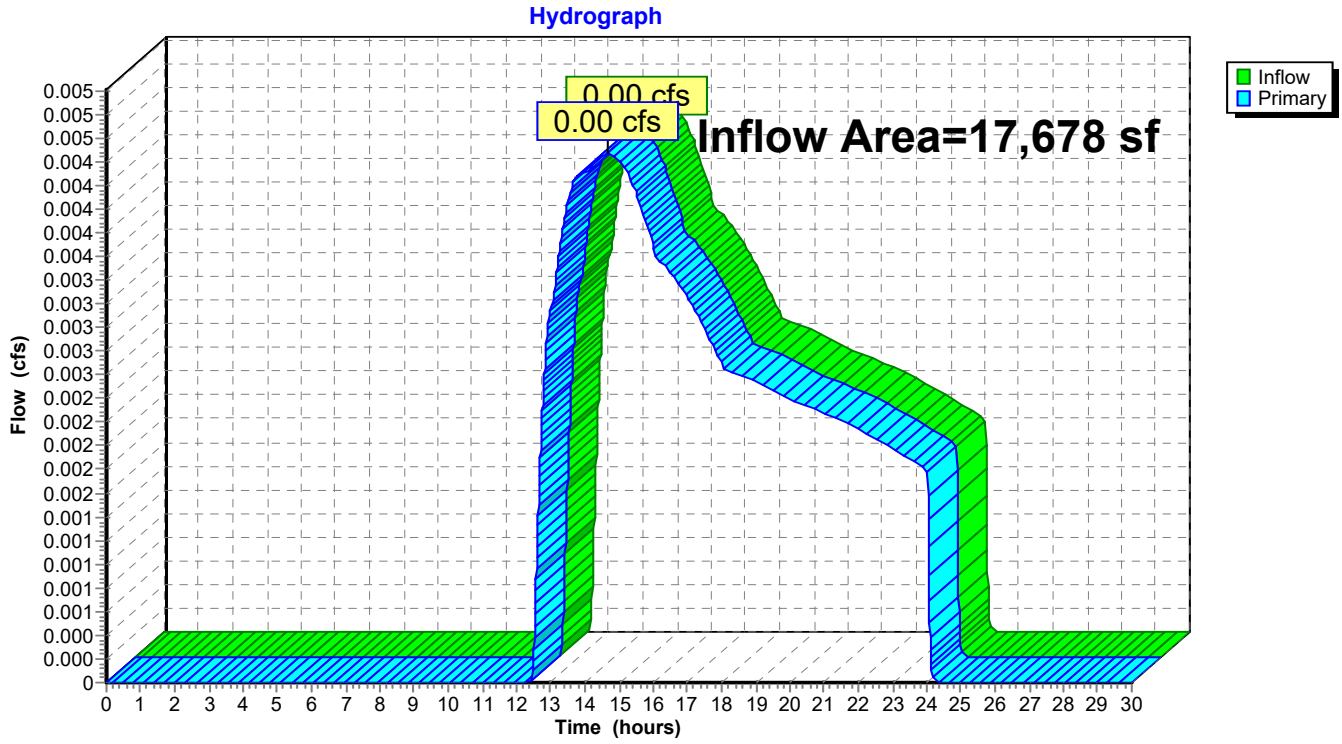
Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	748	0
30.05	756	15
30.10	764	30
30.15	772	45
30.20	780	60
30.25	788	75
30.30	796	90
30.35	804	105
30.40	812	120
30.45	819	135
30.50	827	150
30.55	835	179
30.60	843	208
30.65	851	237
30.70	859	267
30.75	867	296
30.80	875	325
30.85	883	353
30.90	891	382
30.95	898	411
31.00	906	439
31.05	914	468
31.10	922	496
31.15	930	524
31.20	938	552
31.25	946	580
31.30	954	608
31.35	962	636
31.40	970	663
31.45	978	691
31.50	985	718
31.55	993	745
31.60	1,001	772
31.65	1,009	798
31.70	1,017	825
31.75	1,025	851
31.80	1,033	877
31.85	1,041	903
31.90	1,049	929
31.95	1,057	954
32.00	1,064	979
32.05	1,072	1,004
32.10	1,080	1,029
32.15	1,088	1,053
32.20	1,096	1,077
32.25	1,104	1,101
32.30	1,112	1,124
32.35	1,120	1,147
32.40	1,128	1,169
32.45	1,136	1,192
32.50	1,143	1,213
32.55	1,151	1,235
32.60	1,159	1,255
32.65	1,167	1,276
32.70	1,175	1,295
32.75	1,183	1,313
32.80	1,191	1,331
32.85	1,199	1,347
32.90	1,207	1,363
32.95	1,215	1,379
33.00	1,223	1,394
33.05	1,230	1,409
33.10	1,238	1,424
33.15	1,246	1,439
33.20	1,254	1,454
33.25	1,262	1,469
33.30	1,270	1,484
33.35	1,278	1,499
33.40	1,286	1,514
33.45	1,294	1,529
33.50	**1,302**	**1,544**

Summary for Link 22L: 11 PARSONS ST

Inflow Area = 17,678 sf, 15.49% Impervious, Inflow Depth = 0.08" for 2-Year event
Inflow = 0.00 cfs @ 14.65 hrs, Volume= 121 cf
Primary = 0.00 cfs @ 14.65 hrs, Volume= 121 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 22L: 11 PARSONS ST

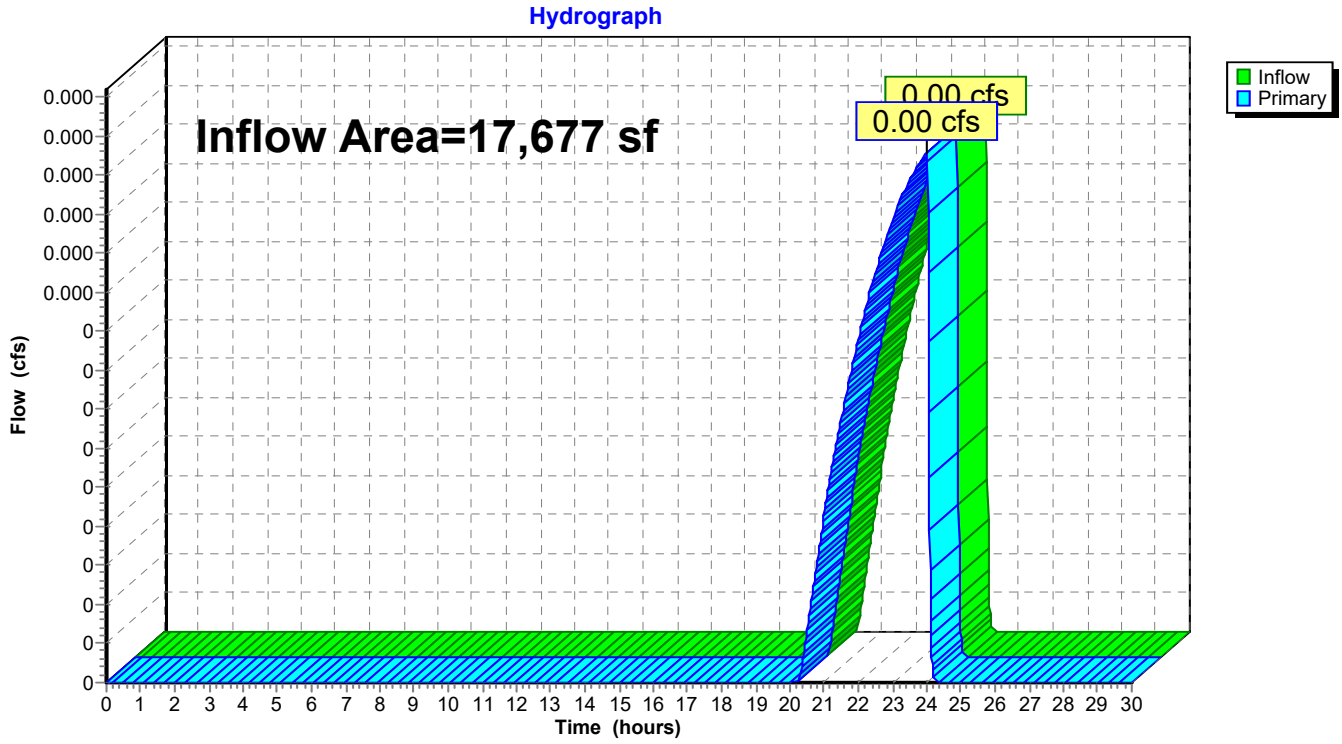


Summary for Link 26L: 11 PARSONS ST

Inflow Area = 17,677 sf, 27.83% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 24.01 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 26L: 11 PARSONS ST



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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 19S: EXISTING AREAS Runoff Area=17,678 sf 15.49% Impervious Runoff Depth=0.58"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.15 cfs 860 cf

Subcatchment 31S: ROOFS Runoff Area=3,496 sf 100.00% Impervious Runoff Depth=4.89"
Tc=5.0 min CN=98 Runoff=0.42 cfs 1,425 cf

Subcatchment 33S: OTHER IMPER. Runoff Area=276 sf 100.00% Impervious Runoff Depth=4.89"
Tc=5.0 min CN=98 Runoff=0.03 cfs 113 cf

Subcatchment 34S: DRIVEWAY Runoff Area=1,128 sf 100.00% Impervious Runoff Depth=4.89"
Tc=5.0 min CN=98 Runoff=0.13 cfs 460 cf

Subcatchment 35S: PERVIOUS AREAS Runoff Area=12,777 sf 0.16% Impervious Runoff Depth=0.23"
Tc=5.0 min CN=39 Runoff=0.02 cfs 242 cf

Pond 28P: S1 Peak Elev=31.47' Storage=703 cf Inflow=0.58 cfs 1,998 cf
Outflow=0.05 cfs 1,998 cf

Link 22L: 11 PARSONS ST Inflow=0.15 cfs 860 cf
Primary=0.15 cfs 860 cf

Link 26L: 11 PARSONS ST Inflow=0.02 cfs 242 cf
Primary=0.02 cfs 242 cf

Total Runoff Area = 35,355 sf Runoff Volume = 3,100 cf Average Runoff Depth = 1.05"
78.34% Pervious = 27,697 sf 21.66% Impervious = 7,658 sf

Summary for Subcatchment 19S: EXISTING AREAS

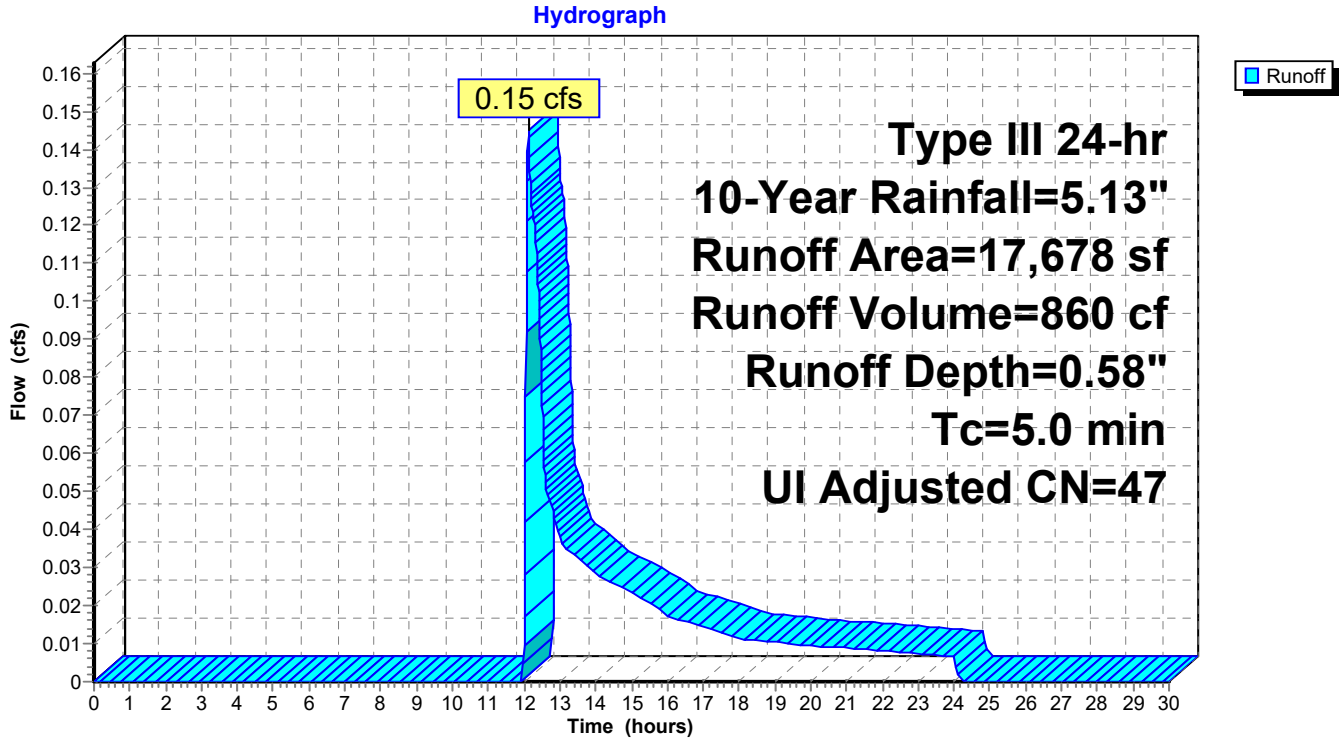
Runoff = 0.15 cfs @ 12.12 hrs, Volume= 860 cf, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.13"

	Area (sf)	CN	Adj	Description
	1,256	98		Roofs, HSG A
	627	98		Roofs, HSG A
	376	98		Paved parking, HSG A
	110	98		Unconnected pavement, HSG A
*	341	98		Unconnected pavement, HSG A
*	28	98		Unconnected pavement, HSG A
	47	39		>75% Grass cover, Good, HSG A
	52	39		>75% Grass cover, Good, HSG A
	14,841	39		>75% Grass cover, Good, HSG A
	17,678	48	47	Weighted Average, UI Adjusted
	14,940			84.51% Pervious Area
	2,738			15.49% Impervious Area
	479			17.49% Unconnected

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

Subcatchment 19S: EXISTING AREAS



Summary for Subcatchment 31S: ROOFS

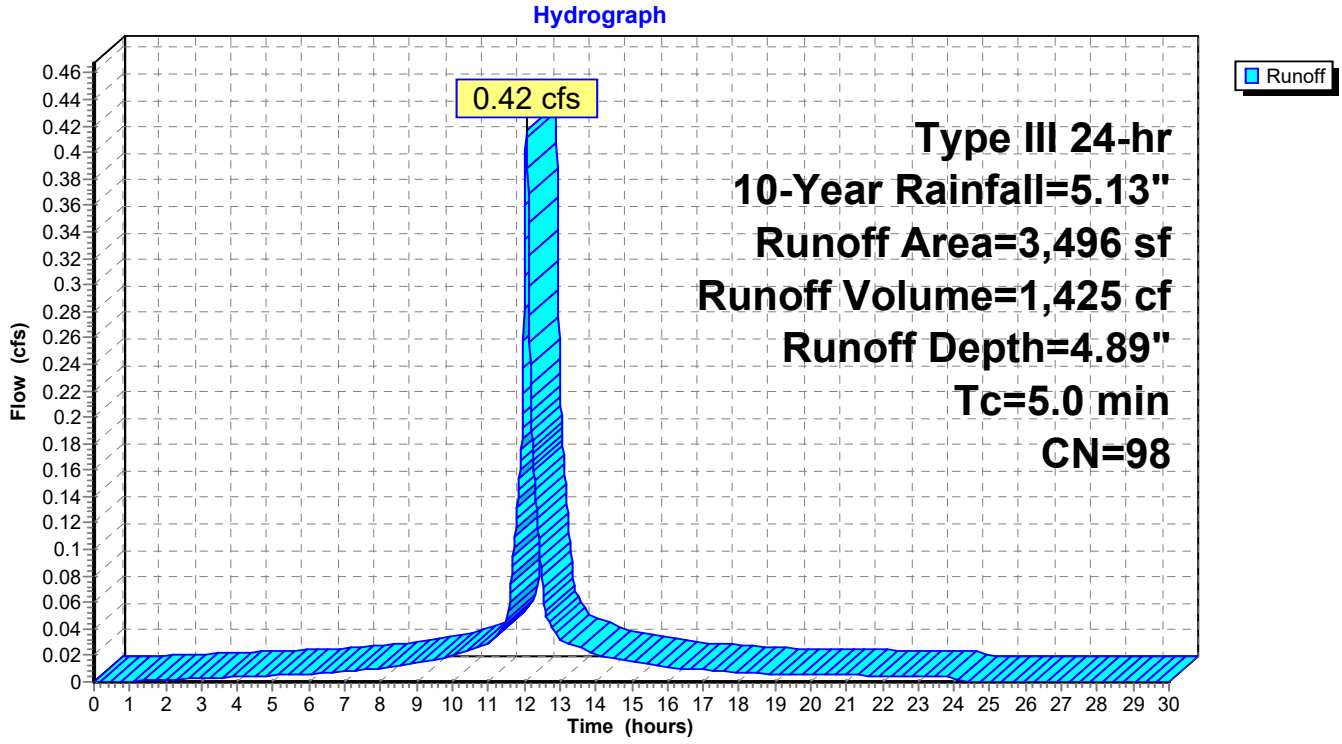
Runoff = 0.42 cfs @ 12.07 hrs, Volume= 1,425 cf, Depth= 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.13"

	Area (sf)	CN	Description
	3,452	98	Roofs, HSG A
*	44	98	Roofs, HSG A
	3,496	98	Weighted Average
	3,496		100.00% Impervious Area

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

Subcatchment 31S: ROOFS



Summary for Subcatchment 33S: OTHER IMPER.

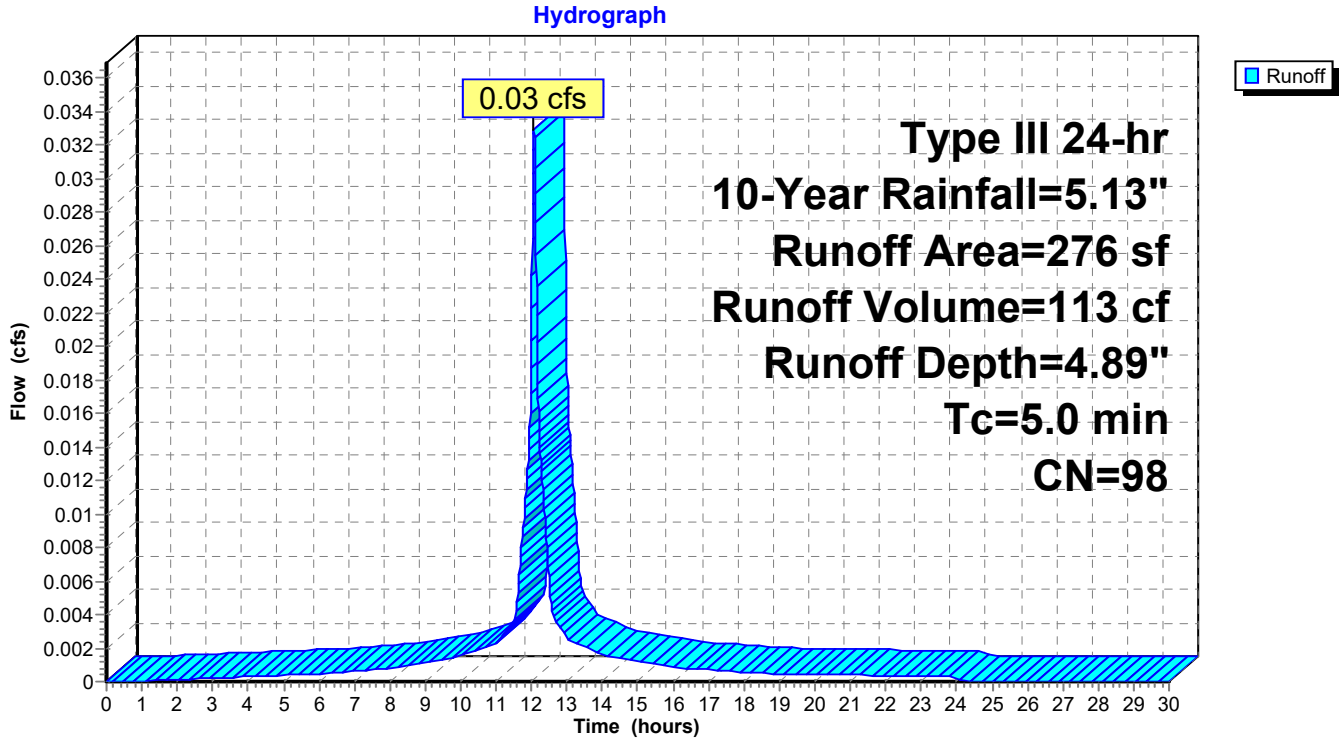
Runoff = 0.03 cfs @ 12.07 hrs, Volume= 113 cf, Depth= 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.13"

	Area (sf)	CN	Description
	243	98	Unconnected pavement, HSG A
*	33	98	Unconnected pavement, HSG A
	276	98	Weighted Average
	276		100.00% Impervious Area
	276		100.00% Unconnected

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

Subcatchment 33S: OTHER IMPER.



Summary for Subcatchment 34S: DRIVEWAY

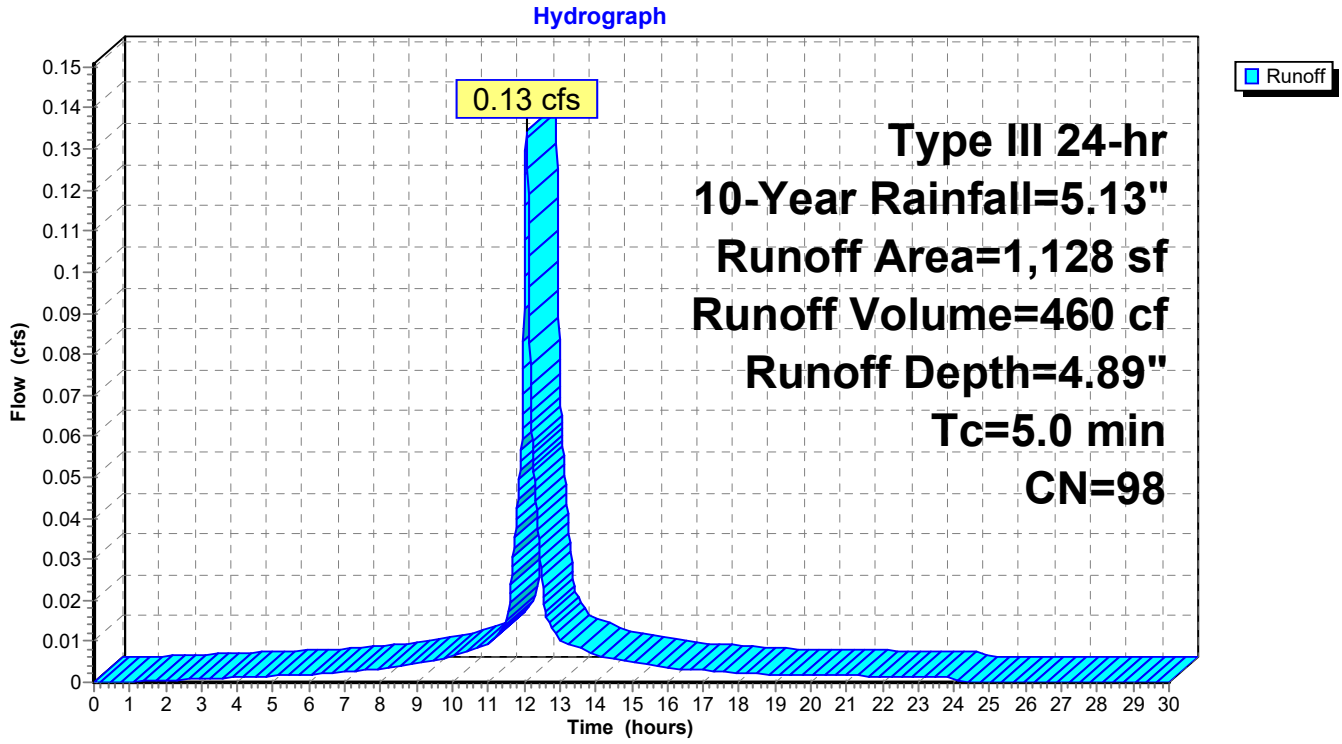
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 460 cf, Depth= 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (sf)	CN	Description
1,128	98	Paved parking, HSG A
1,128		100.00% Impervious Area

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

Subcatchment 34S: DRIVEWAY



Summary for Subcatchment 35S: PERVIOUS AREAS

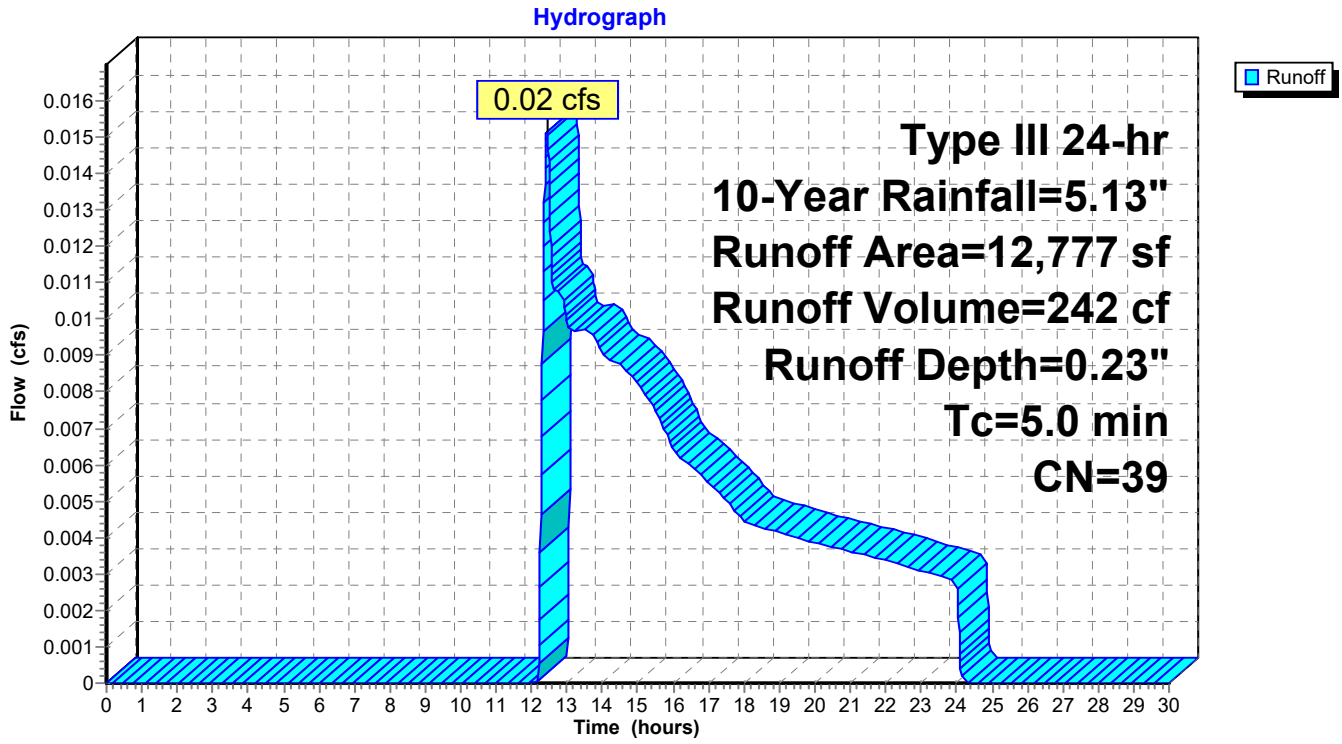
Runoff = 0.02 cfs @ 12.44 hrs, Volume= 242 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (sf)	CN	Description
20	98	Unconnected pavement, HSG A
247	39	>75% Grass cover, Good, HSG A
12,510	39	>75% Grass cover, Good, HSG A
12,777	39	Weighted Average
12,757		99.84% Pervious Area
20		0.16% Impervious Area
20		100.00% Unconnected

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

Subcatchment 35S: PERVIOUS AREAS



Summary for Pond 28P: S1

Inflow Area = 4,900 sf,100.00% Impervious, Inflow Depth = 4.89" for 10-Year event
Inflow = 0.58 cfs @ 12.07 hrs, Volume= 1,998 cf
Outflow = 0.05 cfs @ 12.85 hrs, Volume= 1,998 cf, Atten= 91%, Lag= 46.5 min
Discarded = 0.05 cfs @ 12.85 hrs, Volume= 1,998 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 31.47' @ 12.85 hrs Surf.Area= 748 sf Storage= 703 cf

Plug-Flow detention time= 94.7 min calculated for 1,997 cf (100% of inflow)
Center-of-Mass det. time= 94.7 min (841.3 - 746.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	717 cf	**11.00'W x 68.03'L x 3.50'H Field A** 2,619 cf Overall - 827 cf Embedded = 1,792 cf x 40.0% Voids
#2A	30.50'	827 cf	**ADS_StormTech SC-740 +Cap** x 18 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 18 Chambers in 2 Rows
		1,544 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 12.85 hrs HW=31.47' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 28P: S1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

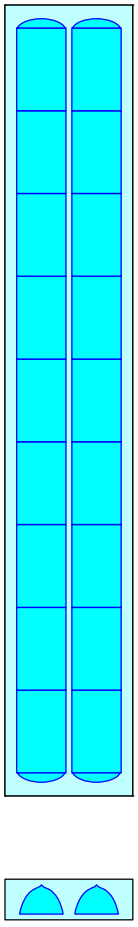
9 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 65.70' Row Length +14.0" End Stone x 2 = 68.03' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

18 Chambers x 45.9 cf = 826.9 cf Chamber Storage

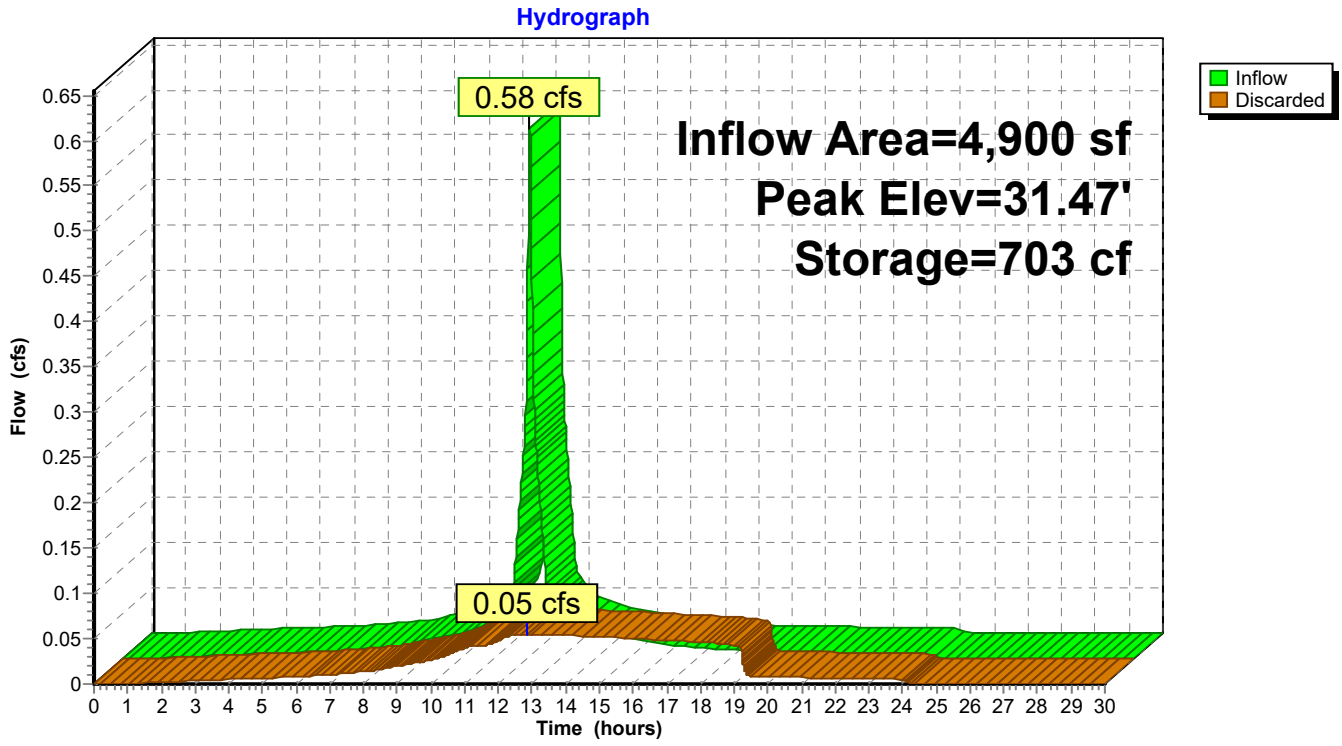
2,619.2 cf Field - 826.9 cf Chambers = 1,792.2 cf Stone x 40.0% Voids = 716.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,543.8 cf = 0.035 af
Overall Storage Efficiency = 58.9%
Overall System Size = 68.03' x 11.00' x 3.50'

18 Chambers
97.0 cy Field
66.4 cy Stone



Pond 28P: S1


Hydrograph
0.58 cfs
0.05 cfs
Inflow Area=4,900 sf
Peak Elev=31.47'
Storage=703 cf
Inflow
Discarded
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Stage-Area-Storage for Pond 28P: S1

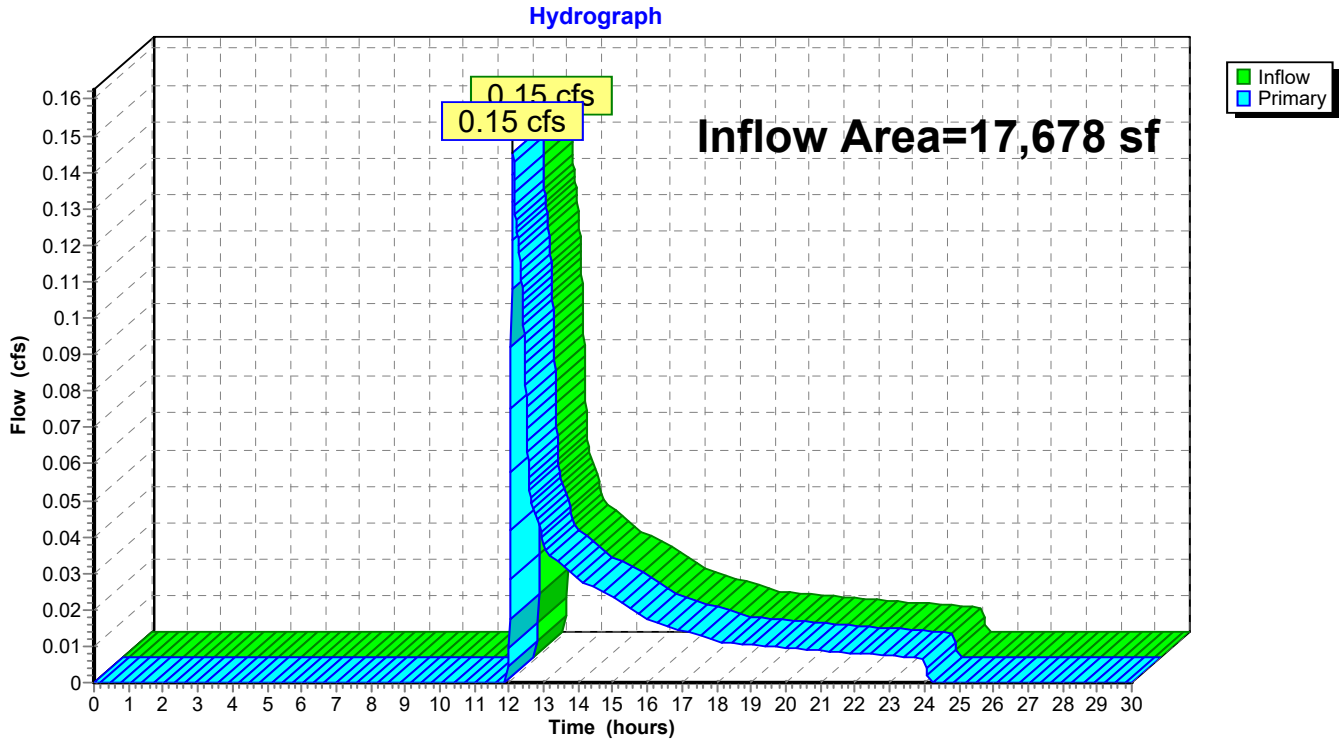
Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	748	0
30.05	756	15
30.10	764	30
30.15	772	45
30.20	780	60
30.25	788	75
30.30	796	90
30.35	804	105
30.40	812	120
30.45	819	135
30.50	827	150
30.55	835	179
30.60	843	208
30.65	851	237
30.70	859	267
30.75	867	296
30.80	875	325
30.85	883	353
30.90	891	382
30.95	898	411
31.00	906	439
31.05	914	468
31.10	922	496
31.15	930	524
31.20	938	552
31.25	946	580
31.30	954	608
31.35	962	636
31.40	970	663
31.45	978	691
31.50	985	718
31.55	993	745
31.60	1,001	772
31.65	1,009	798
31.70	1,017	825
31.75	1,025	851
31.80	1,033	877
31.85	1,041	903
31.90	1,049	929
31.95	1,057	954
32.00	1,064	979
32.05	1,072	1,004
32.10	1,080	1,029
32.15	1,088	1,053
32.20	1,096	1,077
32.25	1,104	1,101
32.30	1,112	1,124
32.35	1,120	1,147
32.40	1,128	1,169
32.45	1,136	1,192
32.50	1,143	1,213
32.55	1,151	1,235
32.60	1,159	1,255
32.65	1,167	1,276
32.70	1,175	1,295
32.75	1,183	1,313
32.80	1,191	1,331
32.85	1,199	1,347
32.90	1,207	1,363
32.95	1,215	1,379
33.00	1,223	1,394
33.05	1,230	1,409
33.10	1,238	1,424
33.15	1,246	1,439
33.20	1,254	1,454
33.25	1,262	1,469
33.30	1,270	1,484
33.35	1,278	1,499
33.40	1,286	1,514
33.45	1,294	1,529
33.50	**1,302**	**1,544**

Summary for Link 22L: 11 PARSONS ST

Inflow Area = 17,678 sf, 15.49% Impervious, Inflow Depth = 0.58" for 10-Year event
Inflow = 0.15 cfs @ 12.12 hrs, Volume= 860 cf
Primary = 0.15 cfs @ 12.12 hrs, Volume= 860 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 22L: 11 PARSONS ST

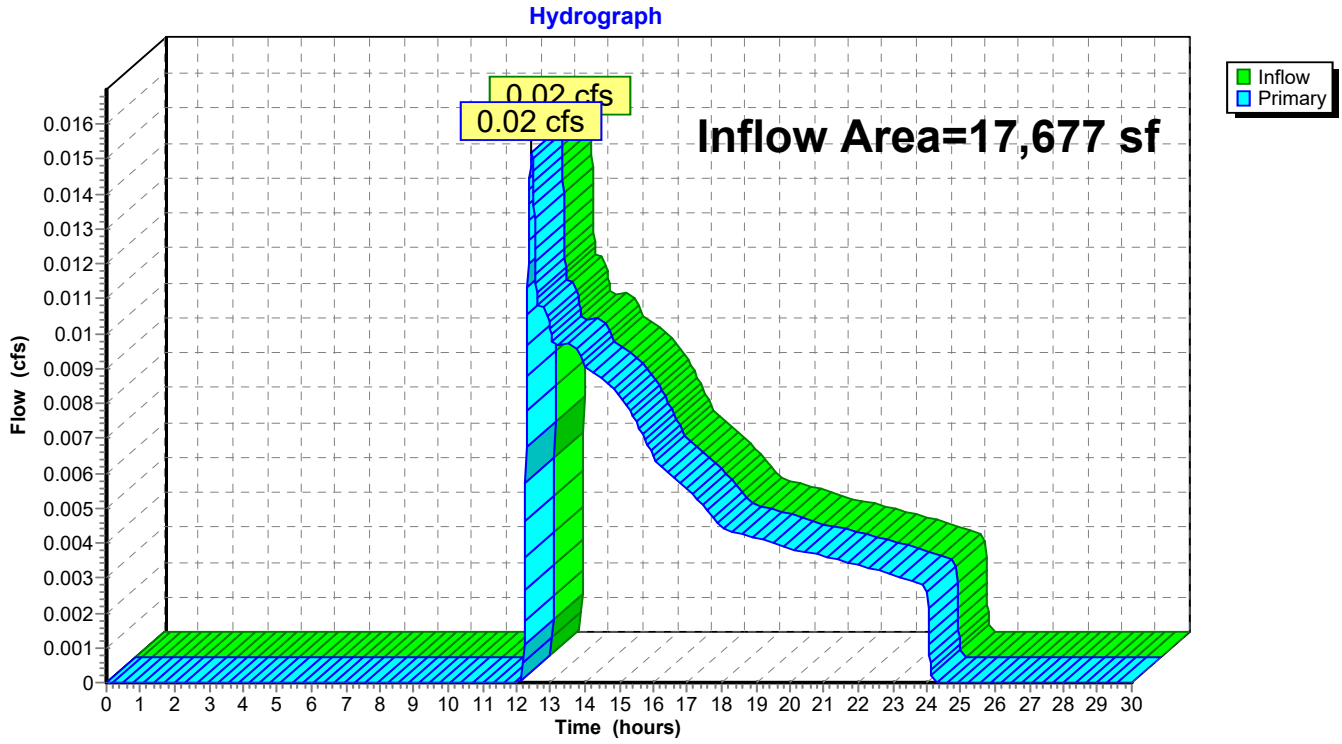


Summary for Link 26L: 11 PARSONS ST

Inflow Area = 17,677 sf, 27.83% Impervious, Inflow Depth = 0.16" for 10-Year event
Inflow = 0.02 cfs @ 12.44 hrs, Volume= 242 cf
Primary = 0.02 cfs @ 12.44 hrs, Volume= 242 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 26L: 11 PARSONS ST



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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 19S: EXISTING AREAS Runoff Area=17,678 sf 15.49% Impervious Runoff Depth=1.07"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.39 cfs 1,573 cf

Subcatchment 31S: ROOFS Runoff Area=3,496 sf 100.00% Impervious Runoff Depth=6.06"
Tc=5.0 min CN=98 Runoff=0.51 cfs 1,766 cf

Subcatchment 33S: OTHER IMPER. Runoff Area=276 sf 100.00% Impervious Runoff Depth=6.06"
Tc=5.0 min CN=98 Runoff=0.04 cfs 139 cf

Subcatchment 34S: DRIVEWAY Runoff Area=1,128 sf 100.00% Impervious Runoff Depth=6.06"
Tc=5.0 min CN=98 Runoff=0.17 cfs 570 cf

Subcatchment 35S: PERVIOUS AREAS Runoff Area=12,777 sf 0.16% Impervious Runoff Depth=0.53"
Tc=5.0 min CN=39 Runoff=0.07 cfs 569 cf

Pond 28P: S1 Peak Elev=31.91' Storage=933 cf Inflow=0.72 cfs 2,475 cf
Outflow=0.06 cfs 2,475 cf

Link 22L: 11 PARSONS ST Inflow=0.39 cfs 1,573 cf
Primary=0.39 cfs 1,573 cf

Link 26L: 11 PARSONS ST Inflow=0.07 cfs 569 cf
Primary=0.07 cfs 569 cf

Total Runoff Area = 35,355 sf Runoff Volume = 4,618 cf Average Runoff Depth = 1.57"
78.34% Pervious = 27,697 sf 21.66% Impervious = 7,658 sf

Summary for Subcatchment 19S: EXISTING AREAS

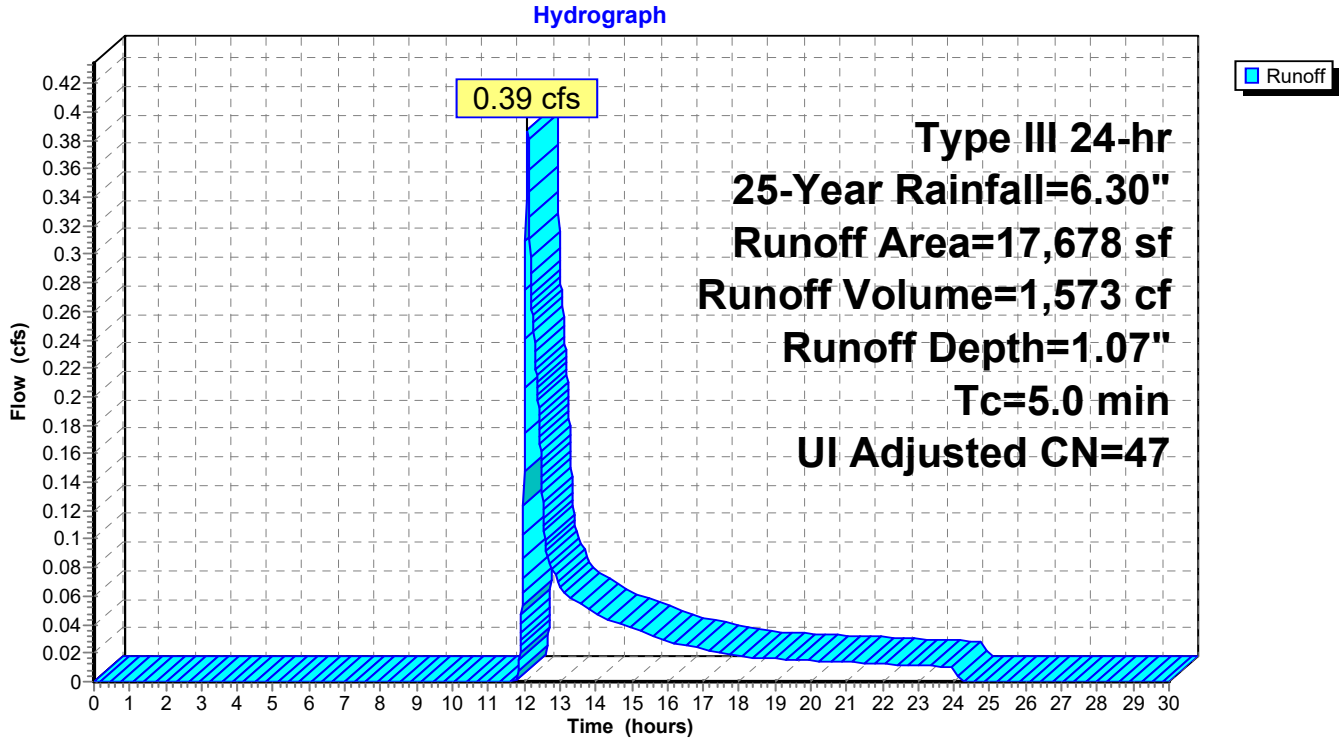
Runoff = 0.39 cfs @ 12.10 hrs, Volume= 1,573 cf, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.30"

	Area (sf)	CN	Adj	Description
	1,256	98		Roofs, HSG A
	627	98		Roofs, HSG A
	376	98		Paved parking, HSG A
	110	98		Unconnected pavement, HSG A
*	341	98		Unconnected pavement, HSG A
*	28	98		Unconnected pavement, HSG A
	47	39		>75% Grass cover, Good, HSG A
	52	39		>75% Grass cover, Good, HSG A
	14,841	39		>75% Grass cover, Good, HSG A
	17,678	48	47	Weighted Average, UI Adjusted
	14,940			84.51% Pervious Area
	2,738			15.49% Impervious Area
	479			17.49% Unconnected

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

Subcatchment 19S: EXISTING AREAS



Summary for Subcatchment 31S: ROOFS

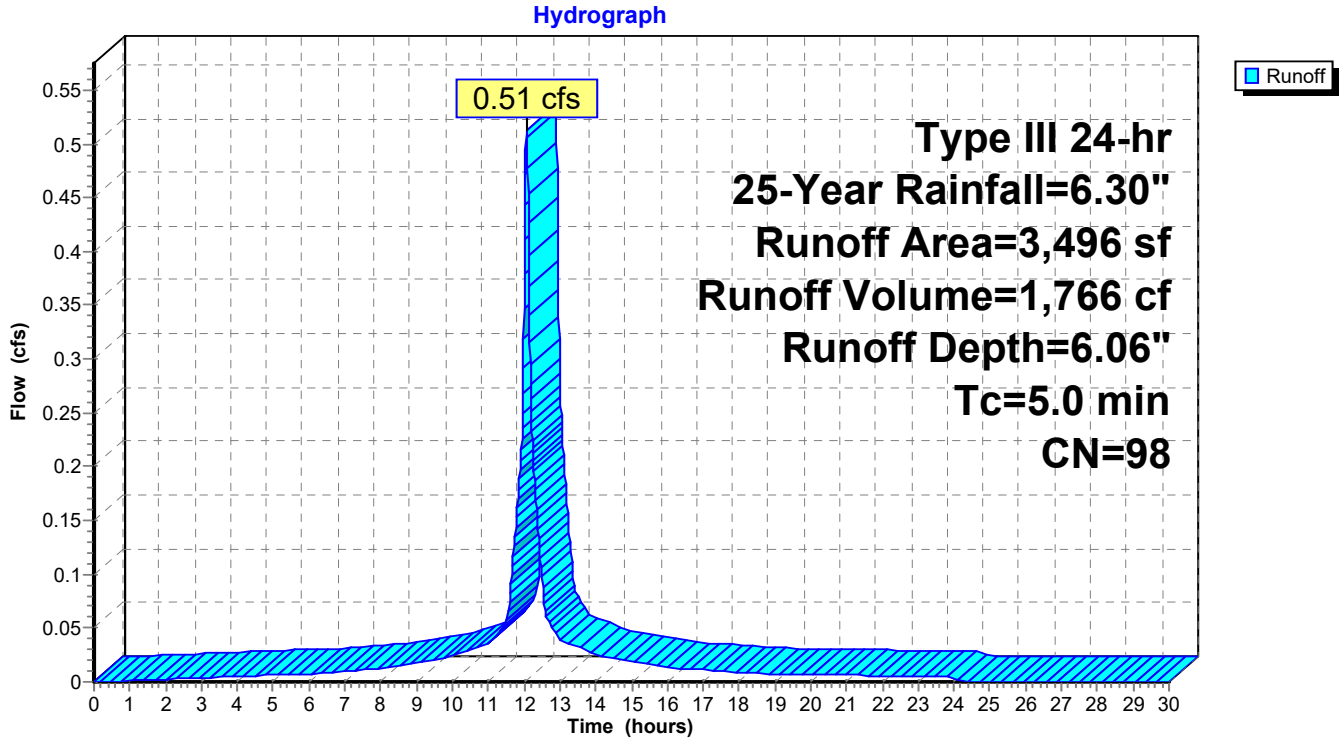
Runoff = 0.51 cfs @ 12.07 hrs, Volume= 1,766 cf, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.30"

	Area (sf)	CN	Description
	3,452	98	Roofs, HSG A
*	44	98	Roofs, HSG A
	3,496	98	Weighted Average
	3,496		100.00% Impervious Area

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

Subcatchment 31S: ROOFS



Summary for Subcatchment 33S: OTHER IMPER.

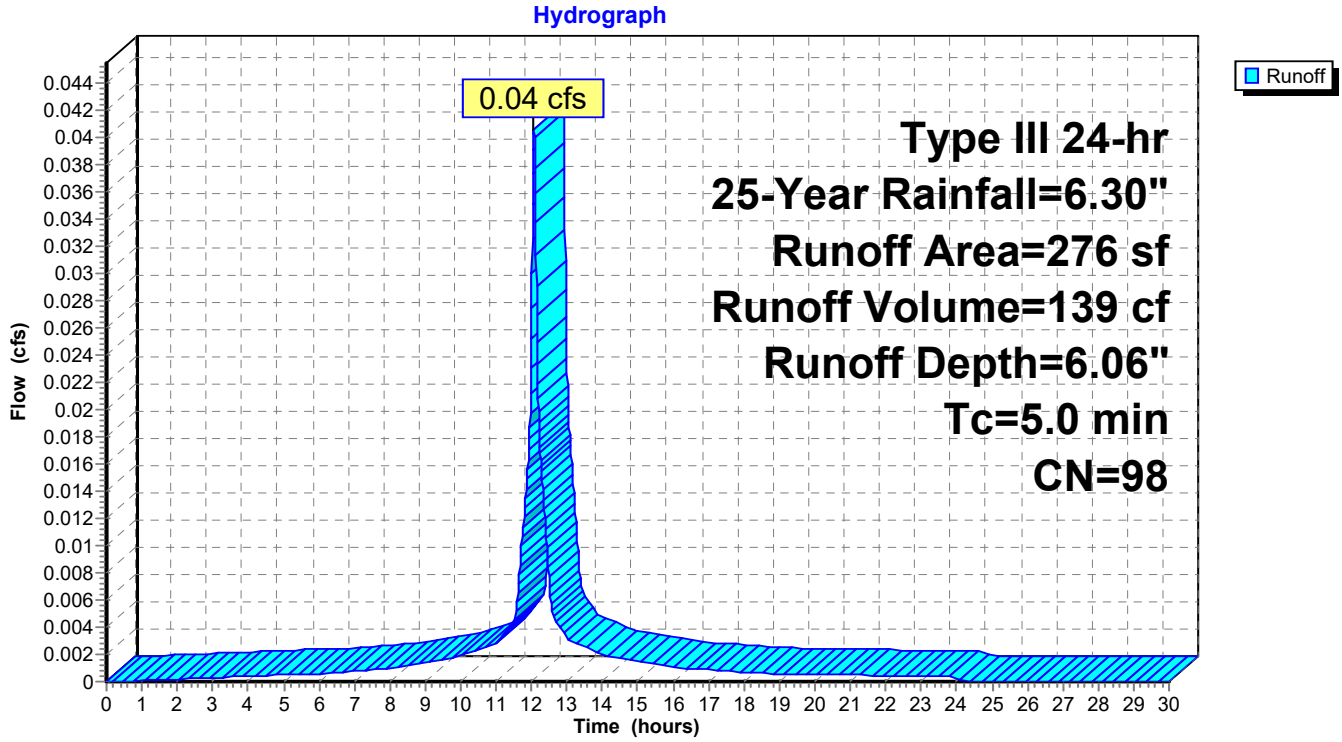
Runoff = 0.04 cfs @ 12.07 hrs, Volume= 139 cf, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.30"

	Area (sf)	CN	Description
	243	98	Unconnected pavement, HSG A
*	33	98	Unconnected pavement, HSG A
	276	98	Weighted Average
	276		100.00% Impervious Area
	276		100.00% Unconnected

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

Subcatchment 33S: OTHER IMPER.



Summary for Subcatchment 34S: DRIVEWAY

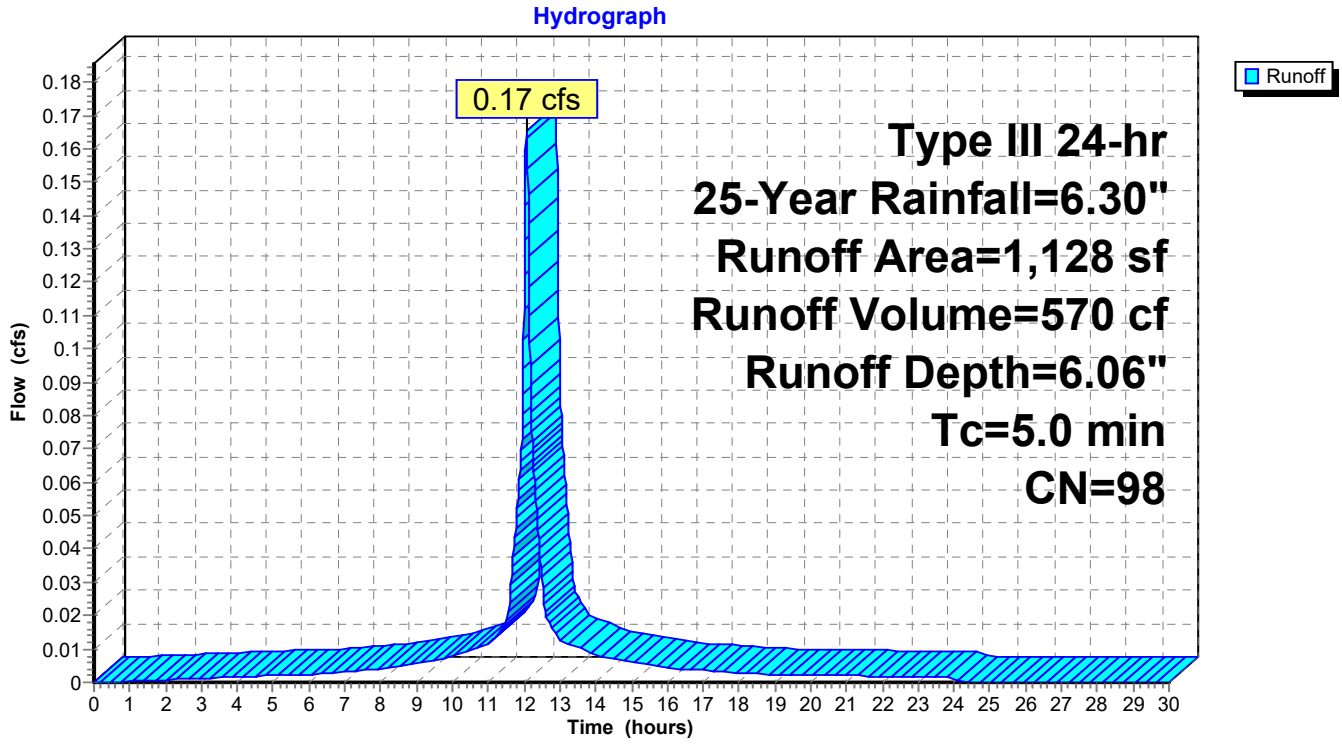
Runoff = 0.17 cfs @ 12.07 hrs, Volume= 570 cf, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.30"

Area (sf)	CN	Description
1,128	98	Paved parking, HSG A
1,128		100.00% Impervious Area

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

Subcatchment 34S: DRIVEWAY



Summary for Subcatchment 35S: PERVIOUS AREAS

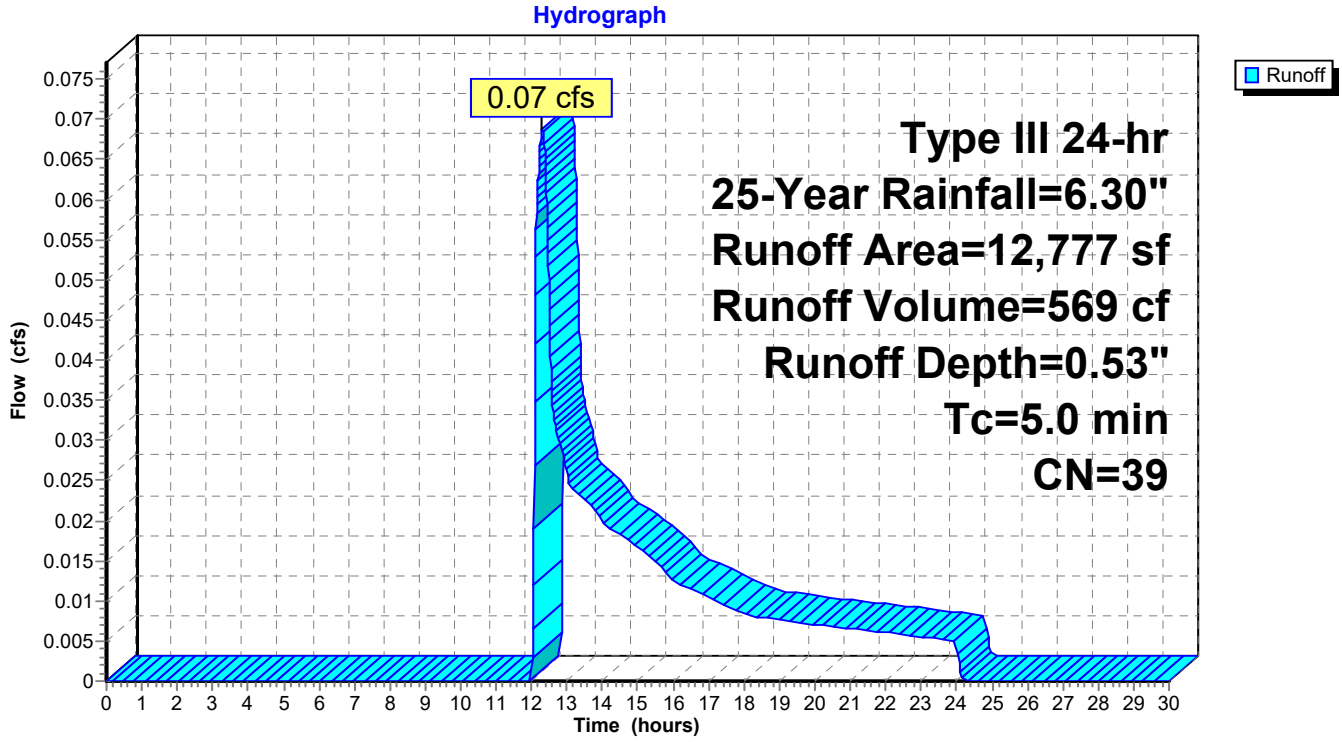
Runoff = 0.07 cfs @ 12.30 hrs, Volume= 569 cf, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.30"

Area (sf)	CN	Description
20	98	Unconnected pavement, HSG A
247	39	>75% Grass cover, Good, HSG A
12,510	39	>75% Grass cover, Good, HSG A
12,777	39	Weighted Average
12,757		99.84% Pervious Area
20		0.16% Impervious Area
20		100.00% Unconnected

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

Subcatchment 35S: PERVIOUS AREAS



Summary for Pond 28P: S1

Inflow Area = 4,900 sf,100.00% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 0.72 cfs @ 12.07 hrs, Volume= 2,475 cf
Outflow = 0.06 cfs @ 12.98 hrs, Volume= 2,475 cf, Atten= 92%, Lag= 54.5 min
Discarded = 0.06 cfs @ 12.98 hrs, Volume= 2,475 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 31.91' @ 12.98 hrs Surf.Area= 748 sf Storage= 933 cf

Plug-Flow detention time= 125.2 min calculated for 2,475 cf (100% of inflow)
Center-of-Mass det. time= 125.2 min (868.7 - 743.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	717 cf	**11.00'W x 68.03'L x 3.50'H Field A** 2,619 cf Overall - 827 cf Embedded = 1,792 cf x 40.0% Voids
#2A	30.50'	827 cf	**ADS_StormTech SC-740 +Cap** x 18 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 18 Chambers in 2 Rows
		1,544 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 12.98 hrs HW=31.91' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 28P: S1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

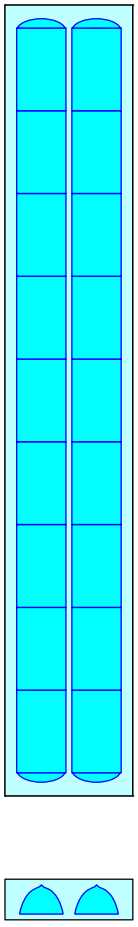
9 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 65.70' Row Length +14.0" End Stone x 2 = 68.03' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

18 Chambers x 45.9 cf = 826.9 cf Chamber Storage

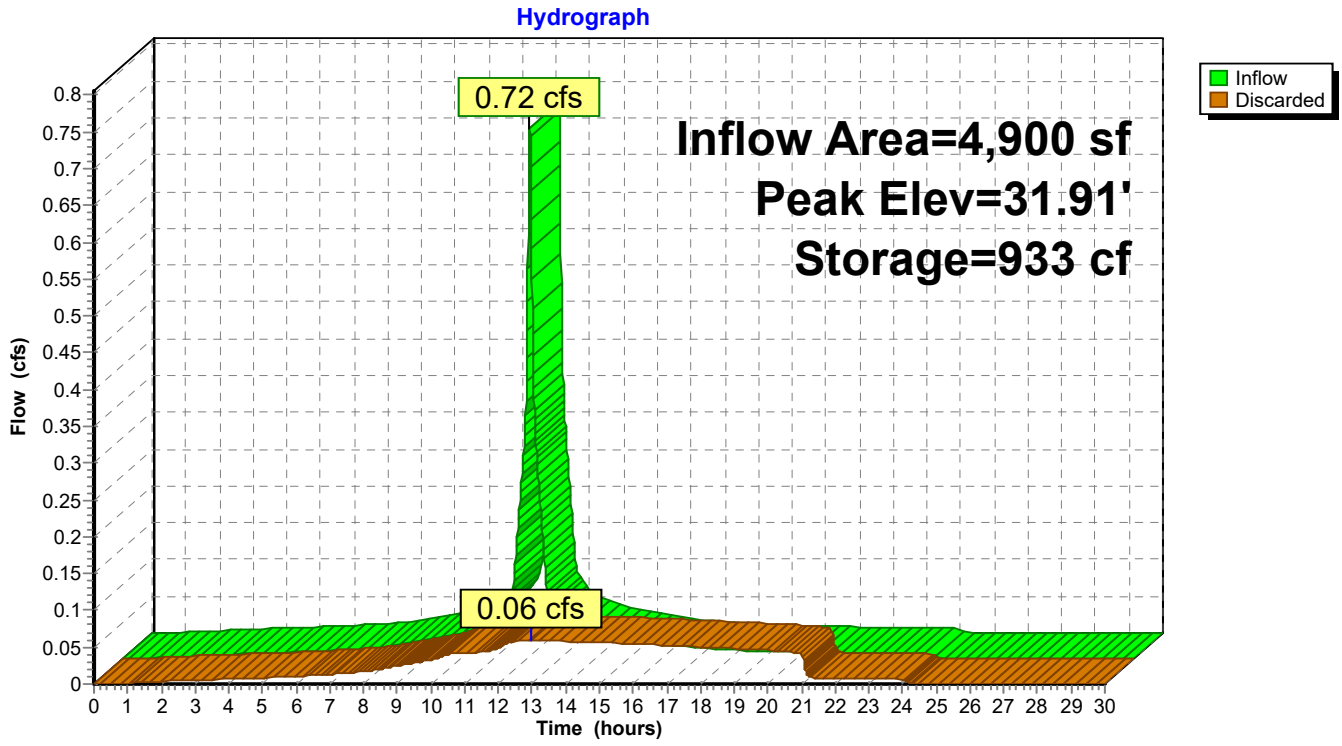
2,619.2 cf Field - 826.9 cf Chambers = 1,792.2 cf Stone x 40.0% Voids = 716.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,543.8 cf = 0.035 af
Overall Storage Efficiency = 58.9%
Overall System Size = 68.03' x 11.00' x 3.50'

18 Chambers
97.0 cy Field
66.4 cy Stone



Pond 28P: S1


Hydrograph
Inflow
Discarded
0.72 cfs
0.06 cfs
Inflow Area=4,900 sf
Peak Elev=31.91'
Storage=933 cf
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75 0.8
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Stage-Area-Storage for Pond 28P: S1

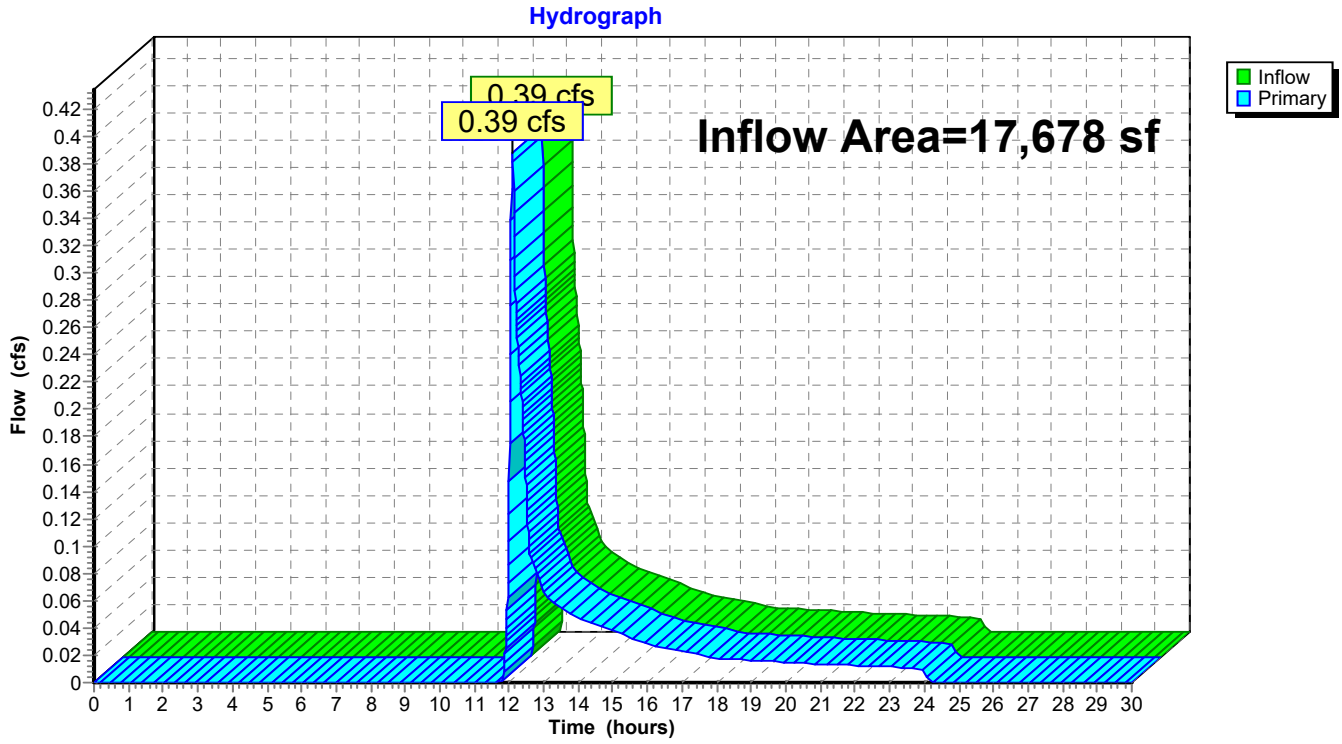
Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	748	0
30.05	756	15
30.10	764	30
30.15	772	45
30.20	780	60
30.25	788	75
30.30	796	90
30.35	804	105
30.40	812	120
30.45	819	135
30.50	827	150
30.55	835	179
30.60	843	208
30.65	851	237
30.70	859	267
30.75	867	296
30.80	875	325
30.85	883	353
30.90	891	382
30.95	898	411
31.00	906	439
31.05	914	468
31.10	922	496
31.15	930	524
31.20	938	552
31.25	946	580
31.30	954	608
31.35	962	636
31.40	970	663
31.45	978	691
31.50	985	718
31.55	993	745
31.60	1,001	772
31.65	1,009	798
31.70	1,017	825
31.75	1,025	851
31.80	1,033	877
31.85	1,041	903
31.90	1,049	929
31.95	1,057	954
32.00	1,064	979
32.05	1,072	1,004
32.10	1,080	1,029
32.15	1,088	1,053
32.20	1,096	1,077
32.25	1,104	1,101
32.30	1,112	1,124
32.35	1,120	1,147
32.40	1,128	1,169
32.45	1,136	1,192
32.50	1,143	1,213
32.55	1,151	1,235
32.60	1,159	1,255
32.65	1,167	1,276
32.70	1,175	1,295
32.75	1,183	1,313
32.80	1,191	1,331
32.85	1,199	1,347
32.90	1,207	1,363
32.95	1,215	1,379
33.00	1,223	1,394
33.05	1,230	1,409
33.10	1,238	1,424
33.15	1,246	1,439
33.20	1,254	1,454
33.25	1,262	1,469
33.30	1,270	1,484
33.35	1,278	1,499
33.40	1,286	1,514
33.45	1,294	1,529
33.50	**1,302**	**1,544**

Summary for Link 22L: 11 PARSONS ST

Inflow Area = 17,678 sf, 15.49% Impervious, Inflow Depth = 1.07" for 25-Year event
Inflow = 0.39 cfs @ 12.10 hrs, Volume= 1,573 cf
Primary = 0.39 cfs @ 12.10 hrs, Volume= 1,573 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 22L: 11 PARSONS ST

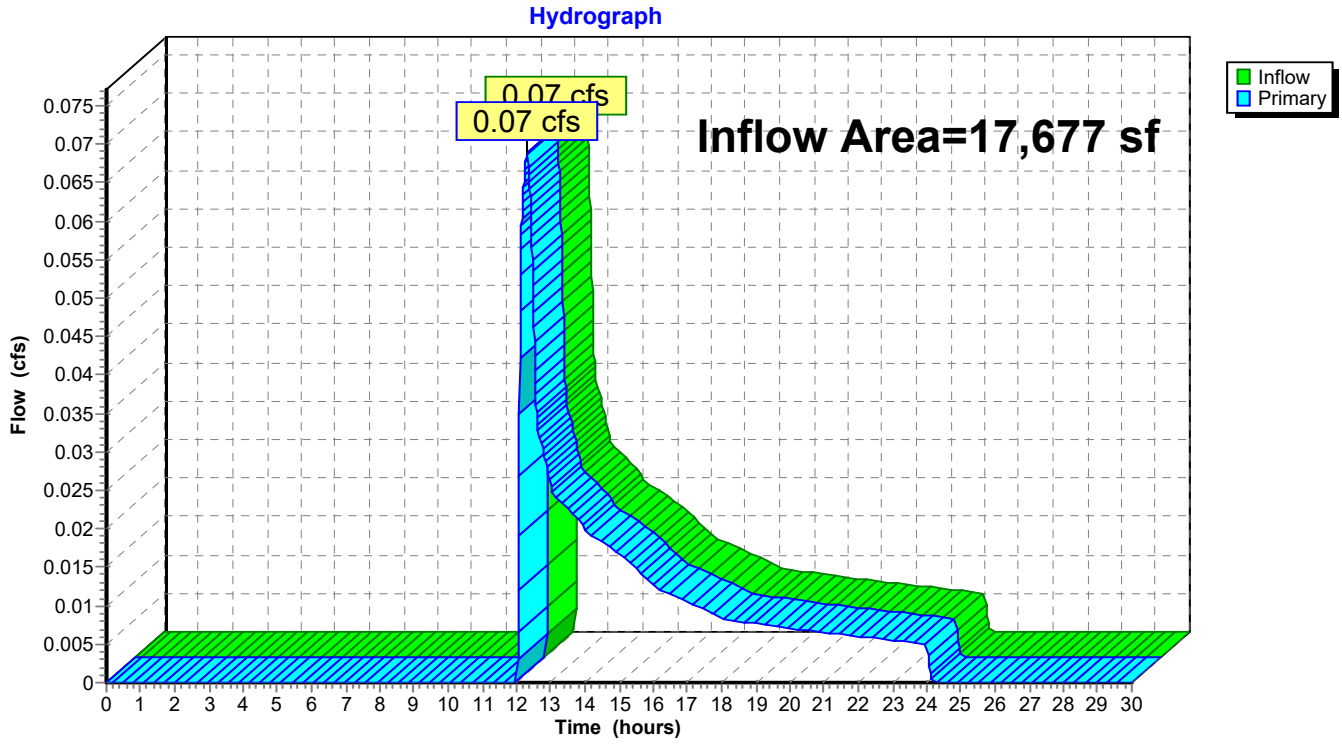


Summary for Link 26L: 11 PARSONS ST

Inflow Area = 17,677 sf, 27.83% Impervious, Inflow Depth = 0.39" for 25-Year event
Inflow = 0.07 cfs @ 12.30 hrs, Volume= 569 cf
Primary = 0.07 cfs @ 12.30 hrs, Volume= 569 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 26L: 11 PARSONS ST



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 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 19S: EXISTING AREAS Runoff Area=17,678 sf 15.49% Impervious Runoff Depth=2.39"
Tc=5.0 min UI Adjusted CN=47 Runoff=1.07 cfs 3,523 cf

Subcatchment 31S: ROOFS Runoff Area=3,496 sf 100.00% Impervious Runoff Depth=8.54"
Tc=5.0 min CN=98 Runoff=0.72 cfs 2,488 cf

Subcatchment 33S: OTHER IMPER. Runoff Area=276 sf 100.00% Impervious Runoff Depth=8.54"
Tc=5.0 min CN=98 Runoff=0.06 cfs 196 cf

Subcatchment 34S: DRIVEWAY Runoff Area=1,128 sf 100.00% Impervious Runoff Depth=8.54"
Tc=5.0 min CN=98 Runoff=0.23 cfs 803 cf

Subcatchment 35S: PERVIOUS AREAS Runoff Area=12,777 sf 0.16% Impervious Runoff Depth=1.50"
Tc=5.0 min CN=39 Runoff=0.40 cfs 1,597 cf

Pond 28P: S1 Peak Elev=33.20' Storage=1,455 cf Inflow=1.00 cfs 3,487 cf
Outflow=0.07 cfs 3,487 cf

Link 22L: 11 PARSONS ST Inflow=1.07 cfs 3,523 cf
Primary=1.07 cfs 3,523 cf

Link 26L: 11 PARSONS ST Inflow=0.40 cfs 1,597 cf
Primary=0.40 cfs 1,597 cf

Total Runoff Area = 35,355 sf Runoff Volume = 8,607 cf Average Runoff Depth = 2.92"
78.34% Pervious = 27,697 sf 21.66% Impervious = 7,658 sf

Summary for Subcatchment 19S: EXISTING AREAS

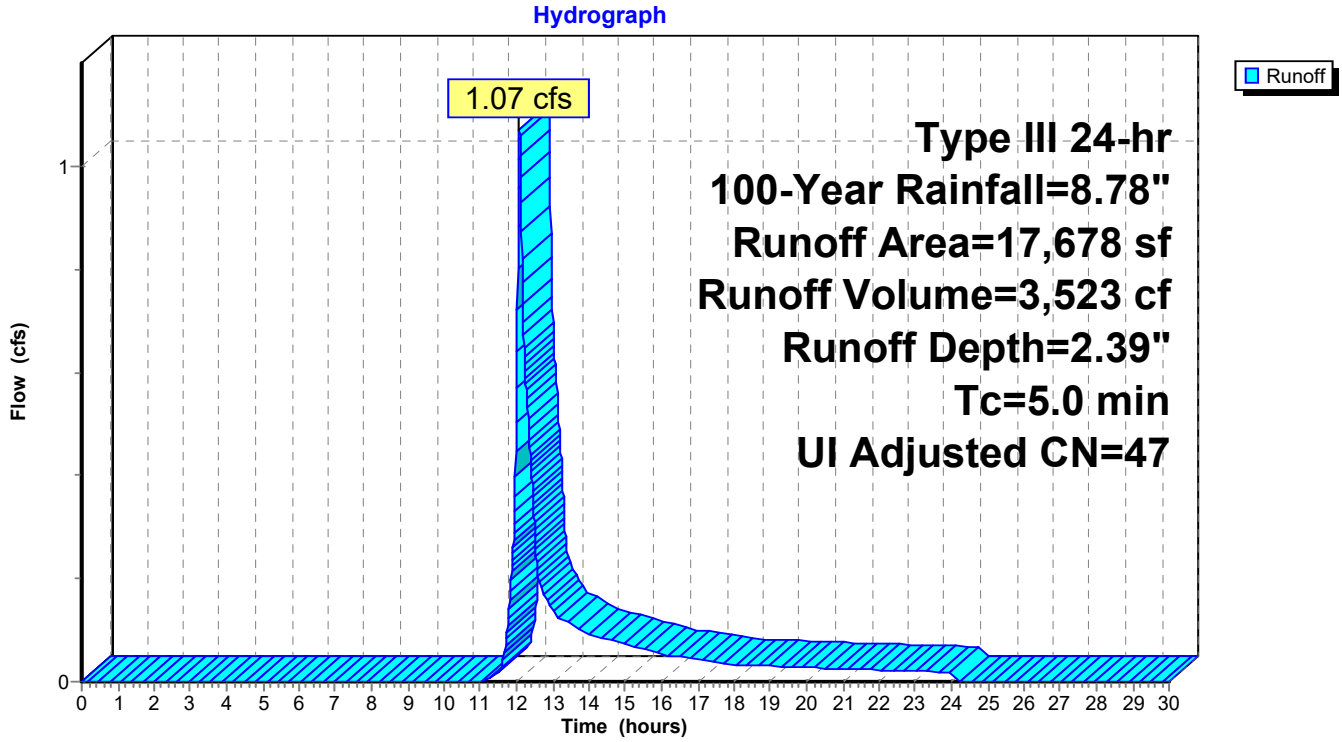
Runoff = 1.07 cfs @ 12.08 hrs, Volume= 3,523 cf, Depth= 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.78"

	Area (sf)	CN	Adj	Description
	1,256	98		Roofs, HSG A
	627	98		Roofs, HSG A
	376	98		Paved parking, HSG A
	110	98		Unconnected pavement, HSG A
*	341	98		Unconnected pavement, HSG A
*	28	98		Unconnected pavement, HSG A
	47	39		>75% Grass cover, Good, HSG A
	52	39		>75% Grass cover, Good, HSG A
	14,841	39		>75% Grass cover, Good, HSG A
	17,678	48	47	Weighted Average, UI Adjusted
	14,940			84.51% Pervious Area
	2,738			15.49% Impervious Area
	479			17.49% Unconnected

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

Subcatchment 19S: EXISTING AREAS



Summary for Subcatchment 31S: ROOFS

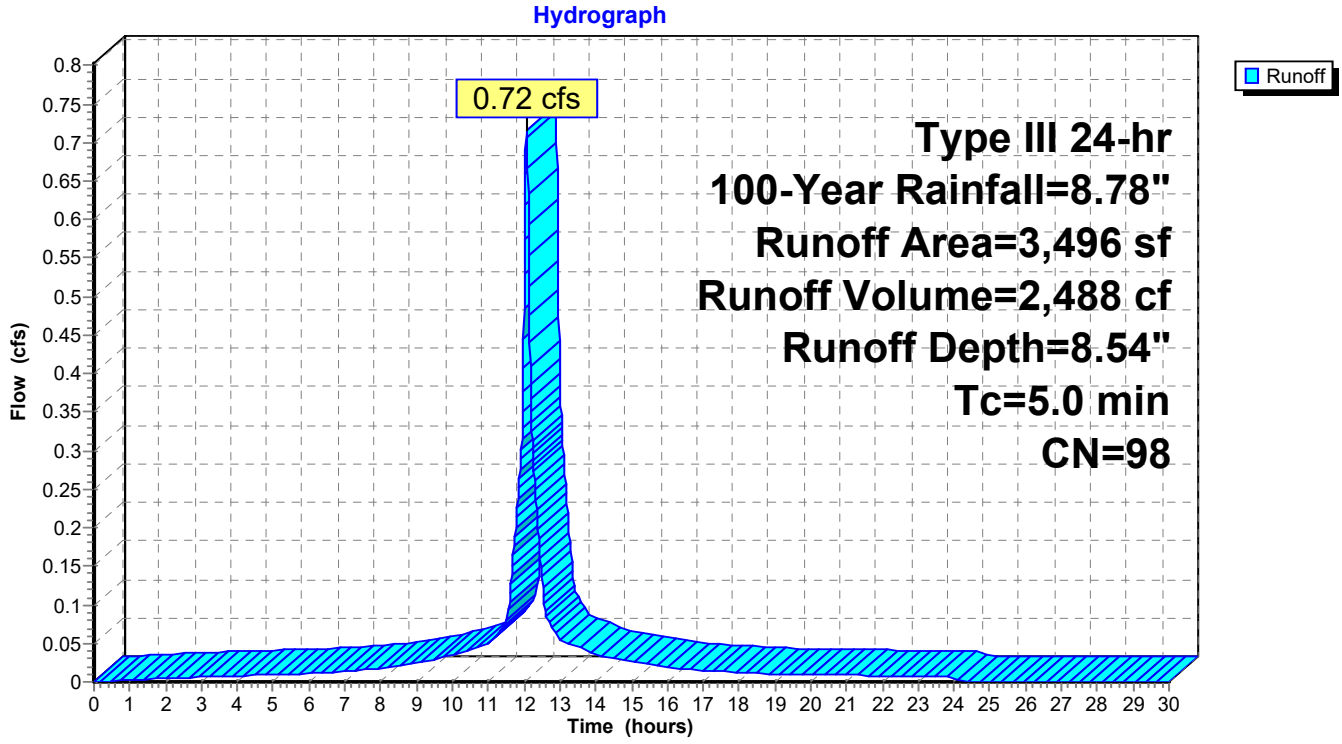
Runoff = 0.72 cfs @ 12.07 hrs, Volume= 2,488 cf, Depth= 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.78"

	Area (sf)	CN	Description
	3,452	98	Roofs, HSG A
*	44	98	Roofs, HSG A
	3,496	98	Weighted Average
	3,496		100.00% Impervious Area

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

Subcatchment 31S: ROOFS



Summary for Subcatchment 33S: OTHER IMPER.

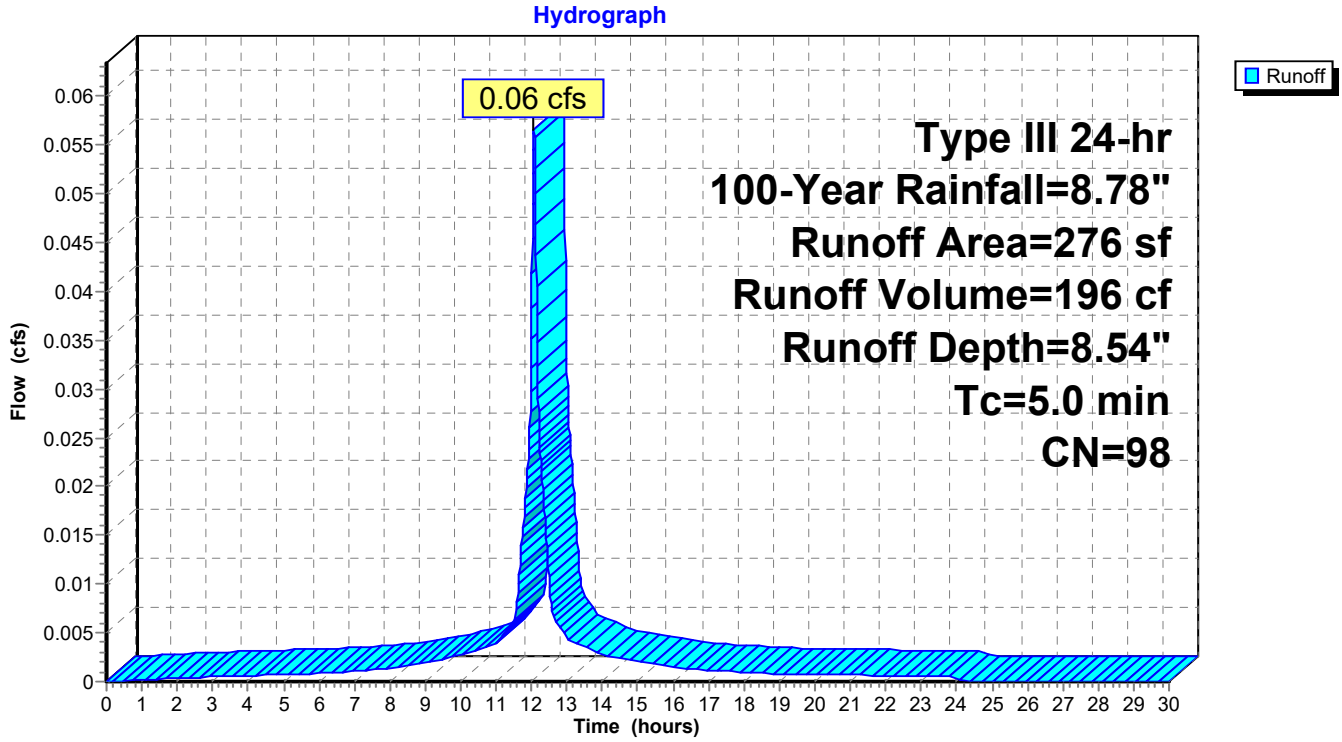
Runoff = 0.06 cfs @ 12.07 hrs, Volume= 196 cf, Depth= 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.78"

	Area (sf)	CN	Description
	243	98	Unconnected pavement, HSG A
*	33	98	Unconnected pavement, HSG A
	276	98	Weighted Average
	276		100.00% Impervious Area
	276		100.00% Unconnected

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

Subcatchment 33S: OTHER IMPER.



Summary for Subcatchment 34S: DRIVEWAY

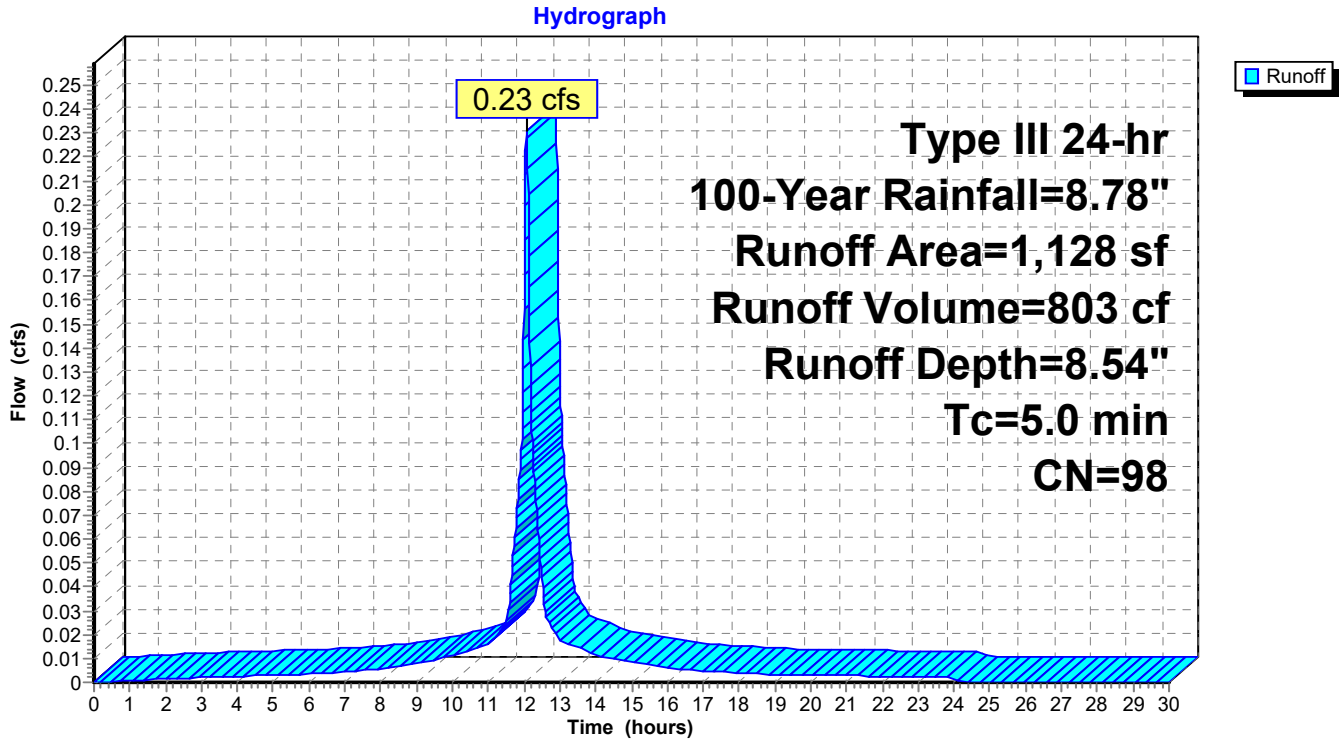
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 803 cf, Depth= 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
1,128	98	Paved parking, HSG A
1,128		100.00% Impervious Area

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

Subcatchment 34S: DRIVEWAY



Summary for Subcatchment 35S: PERVIOUS AREAS

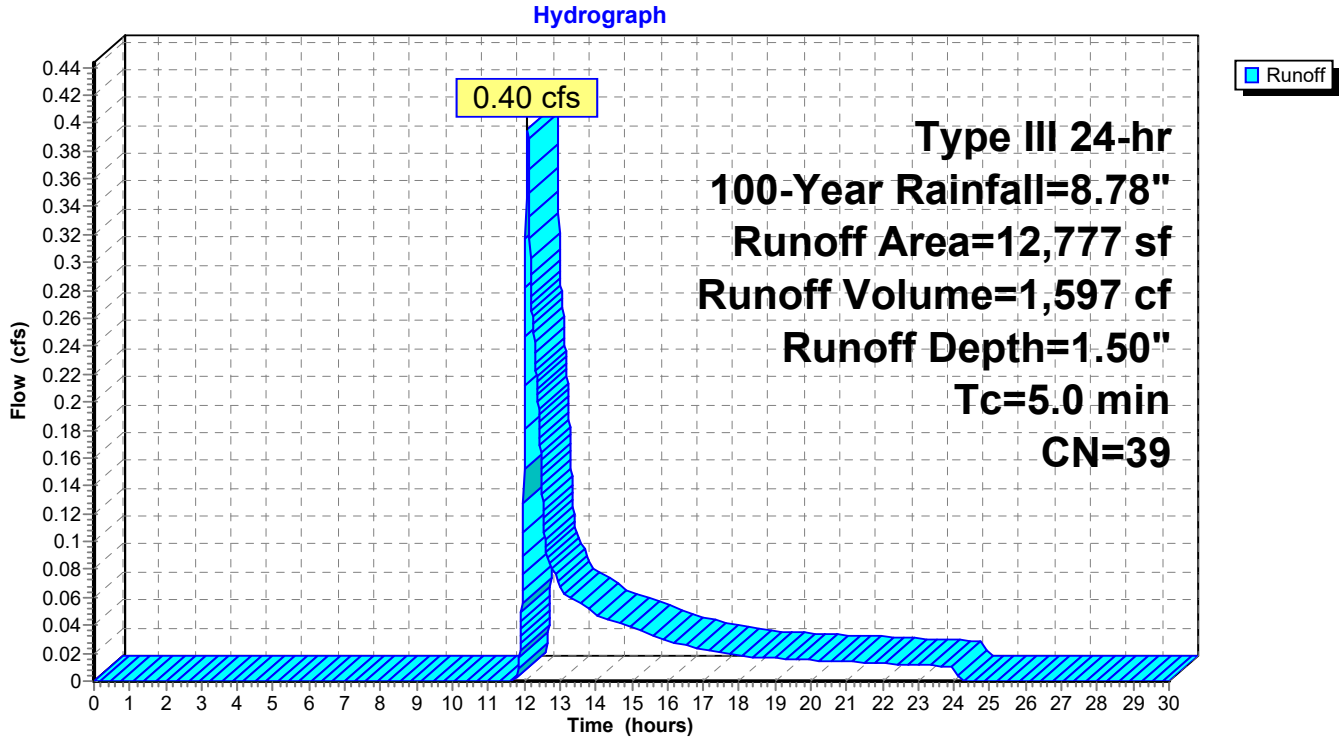
Runoff = 0.40 cfs @ 12.10 hrs, Volume= 1,597 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.78"

Area (sf)	CN	Description
20	98	Unconnected pavement, HSG A
247	39	>75% Grass cover, Good, HSG A
12,510	39	>75% Grass cover, Good, HSG A
12,777	39	Weighted Average
12,757		99.84% Pervious Area
20		0.16% Impervious Area
20		100.00% Unconnected

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

Subcatchment 35S: PERVIOUS AREAS



Summary for Pond 28P: S1

Inflow Area = 4,900 sf,100.00% Impervious, Inflow Depth = 8.54" for 100-Year event
Inflow = 1.00 cfs @ 12.07 hrs, Volume= 3,487 cf
Outflow = 0.07 cfs @ 13.19 hrs, Volume= 3,487 cf, Atten= 93%, Lag= 67.1 min
Discarded = 0.07 cfs @ 13.19 hrs, Volume= 3,487 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 33.20' @ 13.19 hrs Surf.Area= 748 sf Storage= 1,455 cf

Plug-Flow detention time= 186.4 min calculated for 3,486 cf (100% of inflow)
Center-of-Mass det. time= 186.4 min (925.6 - 739.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	30.00'	717 cf	**11.00'W x 68.03'L x 3.50'H Field A** 2,619 cf Overall - 827 cf Embedded = 1,792 cf x 40.0% Voids
#2A	30.50'	827 cf	**ADS_StormTech SC-740 +Cap** x 18 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 18 Chambers in 2 Rows
		1,544 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	30.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.07 cfs @ 13.19 hrs HW=33.20' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 28P: S1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

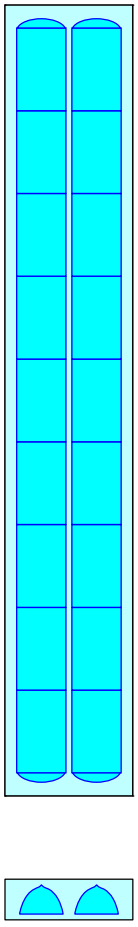
9 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 65.70' Row Length +14.0" End Stone x 2 = 68.03' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

18 Chambers x 45.9 cf = 826.9 cf Chamber Storage

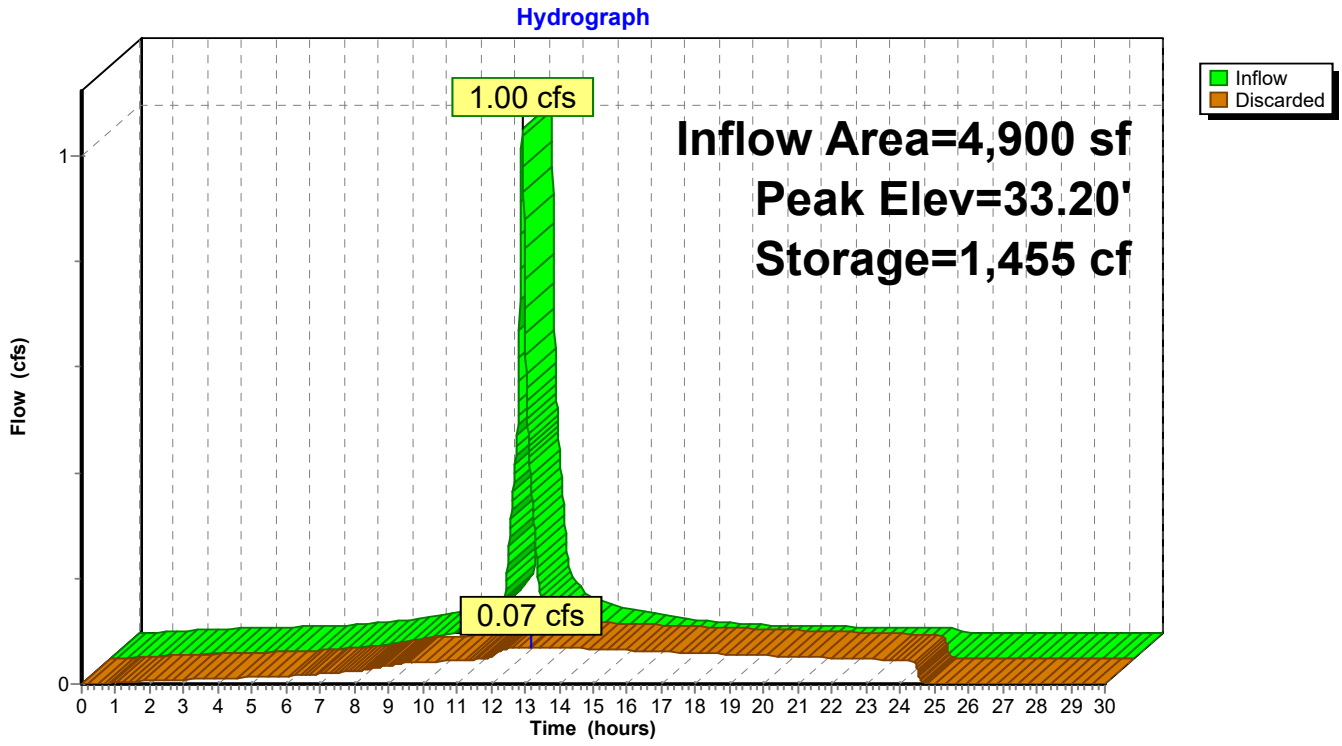
2,619.2 cf Field - 826.9 cf Chambers = 1,792.2 cf Stone x 40.0% Voids = 716.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,543.8 cf = 0.035 af
Overall Storage Efficiency = 58.9%
Overall System Size = 68.03' x 11.00' x 3.50'

18 Chambers
97.0 cy Field
66.4 cy Stone



Pond 28P: S1


Hydrograph
1.00 cfs
0.07 cfs
Inflow Area=4,900 sf
Peak Elev=33.20'
Storage=1,455 cf
Inflow
Discarded
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Stage-Area-Storage for Pond 28P: S1

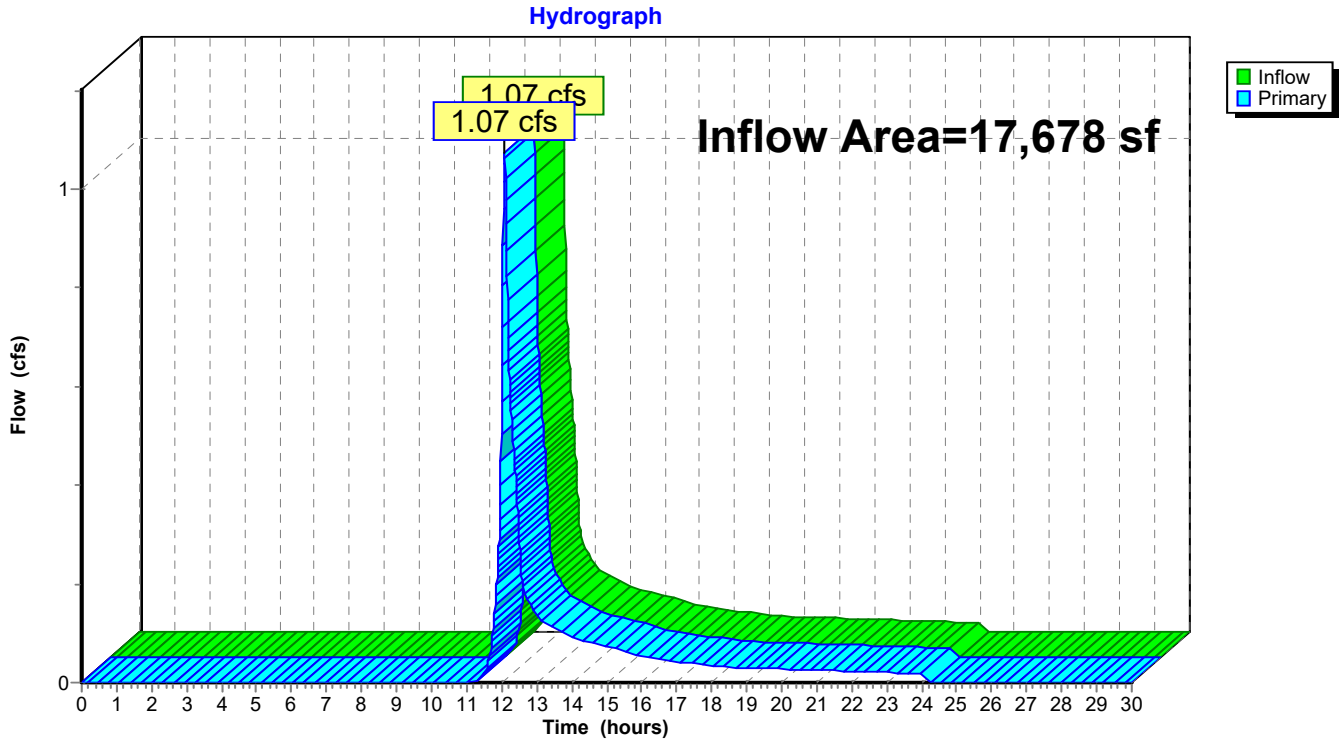
Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
30.00	748	0
30.05	756	15
30.10	764	30
30.15	772	45
30.20	780	60
30.25	788	75
30.30	796	90
30.35	804	105
30.40	812	120
30.45	819	135
30.50	827	150
30.55	835	179
30.60	843	208
30.65	851	237
30.70	859	267
30.75	867	296
30.80	875	325
30.85	883	353
30.90	891	382
30.95	898	411
31.00	906	439
31.05	914	468
31.10	922	496
31.15	930	524
31.20	938	552
31.25	946	580
31.30	954	608
31.35	962	636
31.40	970	663
31.45	978	691
31.50	985	718
31.55	993	745
31.60	1,001	772
31.65	1,009	798
31.70	1,017	825
31.75	1,025	851
31.80	1,033	877
31.85	1,041	903
31.90	1,049	929
31.95	1,057	954
32.00	1,064	979
32.05	1,072	1,004
32.10	1,080	1,029
32.15	1,088	1,053
32.20	1,096	1,077
32.25	1,104	1,101
32.30	1,112	1,124
32.35	1,120	1,147
32.40	1,128	1,169
32.45	1,136	1,192
32.50	1,143	1,213
32.55	1,151	1,235
32.60	1,159	1,255
32.65	1,167	1,276
32.70	1,175	1,295
32.75	1,183	1,313
32.80	1,191	1,331
32.85	1,199	1,347
32.90	1,207	1,363
32.95	1,215	1,379
33.00	1,223	1,394
33.05	1,230	1,409
33.10	1,238	1,424
33.15	1,246	1,439
33.20	1,254	1,454
33.25	1,262	1,469
33.30	1,270	1,484
33.35	1,278	1,499
33.40	1,286	1,514
33.45	1,294	1,529
33.50	**1,302**	**1,544**

Summary for Link 22L: 11 PARSONS ST

Inflow Area = 17,678 sf, 15.49% Impervious, Inflow Depth = 2.39" for 100-Year event
Inflow = 1.07 cfs @ 12.08 hrs, Volume= 3,523 cf
Primary = 1.07 cfs @ 12.08 hrs, Volume= 3,523 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 22L: 11 PARSONS ST

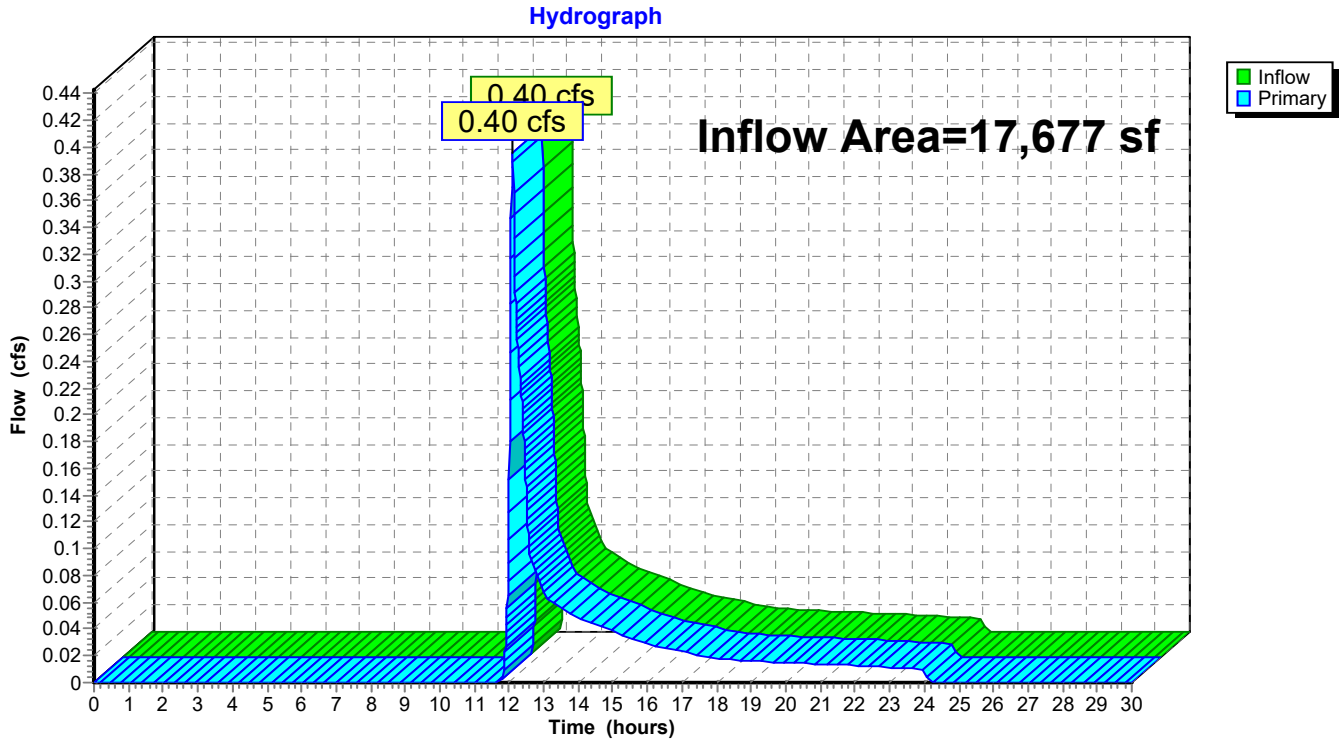


Summary for Link 26L: 11 PARSONS ST

Inflow Area = 17,677 sf, 27.83% Impervious, Inflow Depth = 1.08" for 100-Year event
Inflow = 0.40 cfs @ 12.10 hrs, Volume= 1,597 cf
Primary = 0.40 cfs @ 12.10 hrs, Volume= 1,597 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 26L: 11 PARSONS ST



Appendix B – Soil Information

Custom Soil Resource Report
Soil Map

Map Scale: 1:428 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 1:24,000.

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 24, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Sep 1, 2023

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

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	0.5	100.0%
Totals for Area of Interest		**0.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

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): Summit, shoulder, backslope, footslope
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): Head slope, nose slope, side slope, crest, 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

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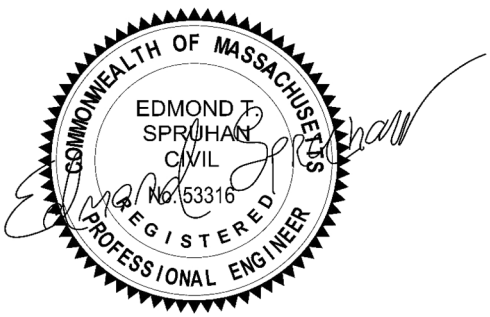
Appendix C - Storm Water Operations & Maintenance Plan

SPRUHAN ENGINEERING, P.C.

OPERATIONS & MAINTENANCE PLAN

11 PARSONS ST NEWTON MA.



Prepared by: Spruhan Engineering, P.C.

March 12, 2025

Operations & Maintenance Plan

Introduction

The following Stormwater Operations & Maintenance plan is for **11 Parsons St., Newton, MA**. All erosion and sediment control measures to be used are to be constructed and installed according to the 'Massachusetts Erosion and Sediment Control Guidelines for Urban and Sub-Urban Areas.'

The plan consists of the following elements:

- Owners' information
- Operation and maintenance guidance – Pre and Post Construction
- Landscape installation and maintenance guidance
- Proposed inspection log

All erosion and sediment control measures must be installed prior to the commencement of any work. All sediment and erosion control measures shall remain in place until the entire site has been stabilized. The site is deemed stabilized when all landscaped areas have been loamed and seeded with vegetation having had the chance to establish itself. Any proposed paved areas shall have their binder course of pavement installed prior to the removal of these control measures.

The long-term operation and maintenance of a stormwater management system is as critical to its performance as its design and construction. Proper operation and maintenance ensure that the BMP will continue to remove pollutants effectively over the long-term, decreases the risk of re-suspending sediment; and therefore, improves water quality. Without proper maintenance, BMPs are likely to fail and no longer provide the necessary stormwater treatment.

The maintenance of the Drainage System is the exclusive responsibility of the Property Owner. Annual reports (example below) shall be submitted to the City Engineer every January for the prior year.

Name and contact information:

Manager: _____
Address: _____
Contact info: _____

Change on ownership: The owner(s) of the stormwater management systems, with the exception of those associated with two-family dwellings, shall notify the Department of Public Works and Conservation Commission of changes in ownership or assignment of financial responsibility.

This plan is valid in perpetuity and any future property owners are solely responsible for the management of the stormwater system on-site in accordance with this O&M Plan .

Operations & Maintenance

The following operations and maintenance plan has been developed in order to preserve the drainage infrastructure that will be constructed and to ensure the drainage and infiltration system continues to function as designed.

- **Before & During Construction Operation and Maintenance Plan:**
    - Significant efforts shall be made to only disturb the minimum amount of area necessary to reduce potential erosion and sediment runoff. The control of dust in disturbed areas shall consist of at the least, wetting of disturbed soil or application of calcium chloride as required to minimize airborne dust.
    - A stabilized construction entrance shall be installed to reduce the tracking of material onto the main road, &, if necessary, a wheel wash station put in place.
    - Hay wattles shall be installed per the site plan to prevent sediment from being washed off site.
    - All drainage structures shall be protected by filter fabric (or approved equal) to prevent sedimentation from entering the drainage system during the construction period.
    - Driveway, pavement, and roadway (if required) areas shall be swept to remove sediments prior to introduction into the storm water management system.
    - Drainage structures shall be inspected daily and cleaned as necessary of all sedimentation and construction materials during the construction period.
    - The contractor is required to contact the engineer of record for drainage system inspection at least 72 hours prior to backfilling in order to receive inspection signoff.
- **Post Construction Operation and Maintenance Plan**

    Once the construction is completed, it is the owner's responsibility to maintain the items outlined below to ensure the efficiency and integrity of the drainage systems. The post construction inspections shall take place at a minimum of once during the Spring (March-May), and a minimum of once during the fall (September – November) and after every major storm.

    - **Pipes** shall be inspected on a minimum on a semi-annual basis. These inspections shall take place during the spring and fall months of the year. The inspector shall take note of any debris/sediment/clogging and shall document the condition of each structure. Based upon the observed condition, the inspector shall make recommendations if any further action is required.

    - **All drainage structures, including manholes trench drains, area drains, cleanouts and catch basins**, shall be inspected four times per year and shall be cleaned of all sand, debris, and sediment four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

    - **Roof Gutters** shall be inspected annually and after major rain events. Remove leaves and sediment as necessary to allow rainwater to flow to system.

- **Storm-tech SC-740 Maintenance procedures:**
  - Storm-tech system shall be inspected at a minimum on a semi-annual basis, or after a major storm event.
  - Remove lid and cap from inspection ports which must be brought to finished grade.
  - Using a flashlight and stadia rod, measure the depth of sediment
  - If sediment is above 3" depth, then cleaning is required
  - A licensed professional shall provide cleanout/ flushing services of all sediment and debris via cleanouts and catch basins located per plans.
  - All caps and covers shall be replaced

Other Activities:

Pavement Sweeping: The paved areas shall be swept every quarter, so four (4) times per year.

Lawn and Landscape Repairs: The lawn and landscaped areas on the site shall be inspected in the spring and fall of each year and the areas shall be restabilized as needed by seeding as lawn or mulching landscaped areas.

An INSPECTION LOG example format is shown below on Table B.1. This must be filled every time an inspection or maintenance activity is performed on any element of the stormwater management on site, included but not limited to:

- Pretreatment devices.
- Vegetation or filter media.
- Control structures.
- Embankments and slopes.
- Inlet and outlet channels and structures.
- Underground drainage.
- Sediment and debris accumulation in storage and forebay areas (including catch basins).
- Any nonstructural practices.
- Any other item that could affect the proper function of the stormwater management system

FINAL IMPORTANT NOTES:

- **PROVISIONS MUST EXIST ALLOWING THE CITY OF NEWTON OR ITS DESIGNEE TO ENTER THE PROPERTY AT REASONABLE TIMES AND IN A REASONABLE MANNER FOR THE PURPOSE OF INSPECTION.**

- **ANNUAL INSPECTION LOGS SHALL BE SUBMITTED TO THE DPW ENGINEERING DIVISION AS REQUIRED TO MAINTAIN CERTIFICATION OF COMPLIANCE UNDER NEWTON'S NPDES MS4 PERMIT.**

_____

PROPERTY OWNER

ATTACHMENT A. LOG SHEET AND TABLES

OPERATION & MAINTENANCE PLAN
LOG SHEET
11 PARSONS ST., NEWTON, MA

INSPECTION REPORT:

Inspection Firm:_____

Inspector's Name:_____Date:_____

Components Inspected: _____

Signed: _____

SYSTEM MAINTENANCE:

Maintenance Firm:_____Date:_____

Catch Basin Cleaned: Yes_____No_____Comments:_____

_____

Manhole & Sumps Cleaned: Yes____No_____Comments:_____

_____

Drain Lines Inspected: Yes_____No_____Comments:_____

_____

Stormwater unit System Cleaned: Yes___No_____Comments:_____

_____

Estimate of Material Removed: _____

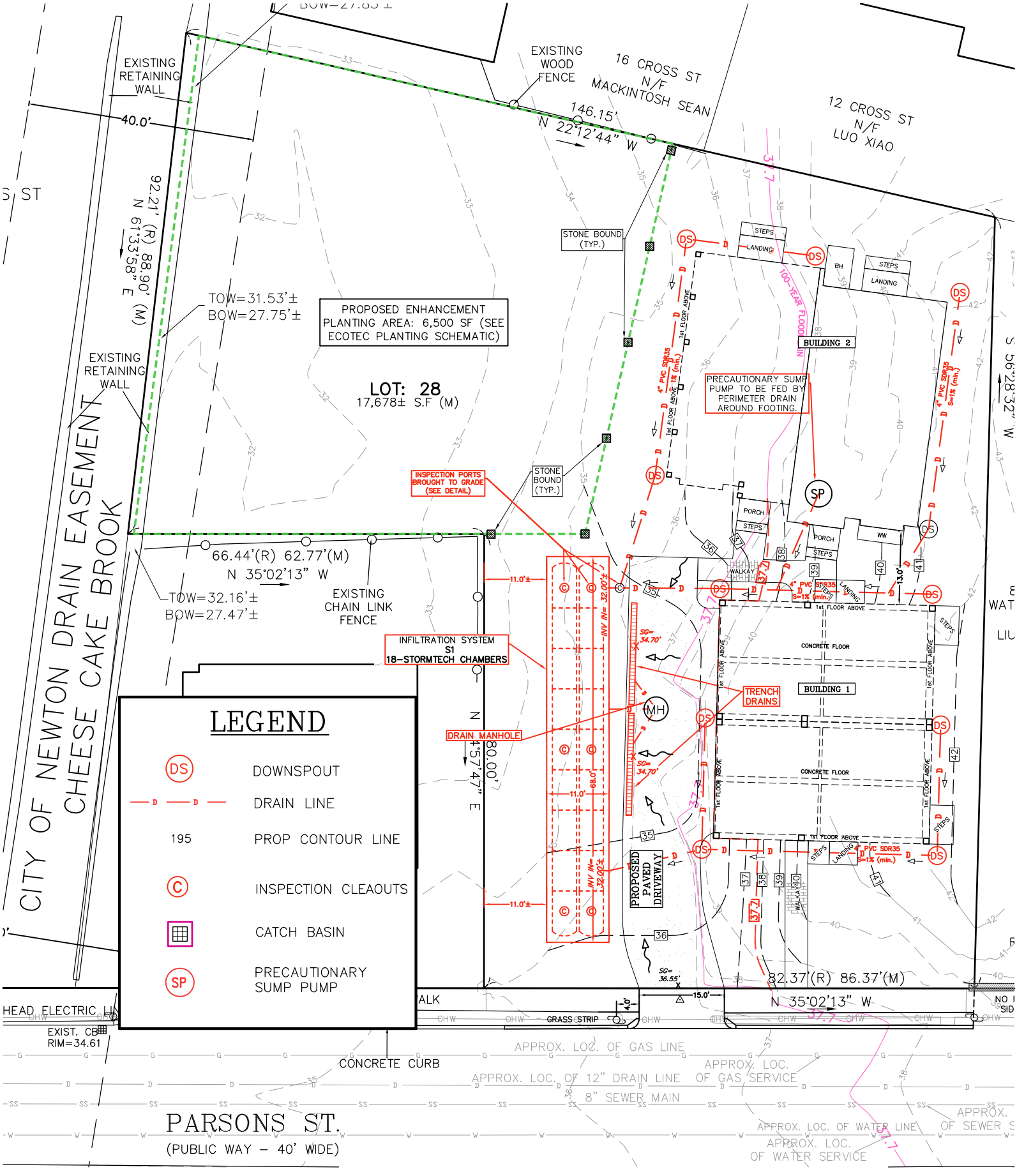
Other Comments: _____

Signed: _____

Table 1 - Inspection log for BMP's

STORMWATER MANAGEMENT SYSTEMS INSPECTION LOG						
DATE	NAME OF INSPECTOR	NAME/TYPE OF BMP INSPECTED	CONDITION OF BMP OBSERVED	DESCRIPTION OF NEED FOR MAINTENANCE	OBSERVATIONS OF ANY PHYSICAL CHANGES TO SYSTEM COMPARED TO AS BUILT PLAN	ANNUAL SUBMISSION TO DPW

ATTACHMENT B. BMP MAP


EXISTING RETAINING WALL
40.0'
92.21'(R) 88.90'(M)
N 61°33'58" E
EXISTING WOOD FENCE
16 CROSS ST
N/F
MACKINTOSH SEAN
146.15'
N 22°12'44" W
12 CROSS ST
N/F
LUO XIAO
STONE BOUND (TYP.)
TOW=31.53'±
BOW=27.75'±
PROPOSED ENHANCEMENT PLANTING AREA: 6,500 SF (SEE ECOTEC PLANTING SCHEMATIC)
LOT: 28
17,678± S.F (M)
EXISTING RETAINING WALL
CITY OF NEWTON DRAIN EASEMENT
CHEESE CAKE BROOK
INSPECTION PORTS BROUGHT TO GRADE (SEE DETAIL)
STONE BOUND (TYP.)
66.44'(R) 62.77'(M)
N 35°02'13" W
TOW=32.16'±
BOW=27.47'±
EXISTING CHAIN LINK FENCE
INFILTRATION SYSTEM S1
18-STORMTECH CHAMBERS
DRAIN MANHOLE
N 45°57'47" E
80.00'
PROPOSED PAVED DRIVEWAY
BUILDING 2
BUILDING 1
PRECAUTIONARY SUMP PUMP TO BE FED BY PERIMETER DRAIN AROUND FOOTING.
TRENCH DRAINS
100-YEAR FLOOD LINE
CONCRETE FLOOR
1st FLOOR ABOVE
STEPS
LANDING
PORCH
WALKWAY
WW
BH
MH
SP
DS
4" PVC SDR35 S=1% (min.)
82.37'(R) 86.37'(M)
N 35°02'13" W
15.0'
4.0'
GRASS STRIP
CONCRETE CURB
EXIST. CB RIM=34.61
APPROX. LOC. OF GAS LINE
APPROX. LOC. OF 12" DRAIN LINE
APPROX. LOC. OF GAS SERVICE
8" SEWER MAIN
APPROX. LOC. OF WATER LINE
APPROX. LOC. OF WATER SERVICE
PARSONS ST.
(PUBLIC WAY – 40' WIDE)
S 56°28'32" W
LEGEND
DS DOWNSPOUT
DRAIN LINE
195 PROP CONTOUR LINE
C INSPECTION CLEAOUTS
CATCH BASIN
SP PRECAUTIONARY SUMP PUMP

Appendix D
Precipitation Frequency Estimates for Newton (NOAA Atlas 14 Volume 10 V3)

11 Parsons St., Newton, MA.

NOAA Atlas 14, Volume 10, Version 3
Location name: Newton Center, Massachusetts, USA*
Latitude: 42.3385°, Longitude: -71.2071°
Elevation: 96 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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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	**0.302** (0.239-0.383)	**0.373** (0.294-0.473)	**0.489** (0.384-0.623)	**0.585** (0.457-0.750)	**0.717** (0.542-0.968)	**0.816** (0.604-1.13)	**0.921** (0.662-1.33)	**1.04** (0.705-1.54)	**1.23** (0.795-1.88)	**1.38** (0.872-2.16)
10-min	**0.428** (0.338-0.543)	**0.529** (0.417-0.671)	**0.693** (0.544-0.882)	**0.829** (0.647-1.06)	**1.02** (0.768-1.37)	**1.16** (0.856-1.60)	**1.30** (0.938-1.89)	**1.48** (0.999-2.18)	**1.74** (1.12-2.66)	**1.95** (1.24-3.06)
15-min	**0.504** (0.398-0.638)	**0.622** (0.490-0.789)	**0.815** (0.640-1.04)	**0.975** (0.762-1.25)	**1.20** (0.903-1.61)	**1.36** (1.01-1.88)	**1.54** (1.10-2.22)	**1.74** (1.18-2.57)	**2.04** (1.32-3.13)	**2.30** (1.45-3.60)
30-min	**0.687** (0.543-0.871)	**0.849** (0.669-1.08)	**1.11** (0.875-1.42)	**1.33** (1.04-1.71)	**1.63** (1.23-2.21)	**1.86** (1.38-2.57)	**2.10** (1.51-3.04)	**2.38** (1.61-3.52)	**2.81** (1.82-4.31)	**3.18** (2.01-4.97)
60-min	**0.871** (0.688-1.10)	**1.08** (0.848-1.36)	**1.41** (1.11-1.79)	**1.69** (1.32-2.16)	**2.07** (1.57-2.80)	**2.35** (1.74-3.26)	**2.66** (1.92-3.86)	**3.02** (2.04-4.46)	**3.58** (2.32-5.49)	**4.06** (2.57-6.35)
2-hr	**1.13** (0.900-1.43)	**1.40** (1.11-1.76)	**1.84** (1.45-2.32)	**2.20** (1.73-2.80)	**2.70** (2.06-3.63)	**3.07** (2.29-4.24)	**3.47** (2.53-5.03)	**3.97** (2.69-5.81)	**4.75** (3.09-7.22)	**5.43** (3.45-8.42)
3-hr	**1.32** (1.05-1.66)	**1.63** (1.30-2.05)	**2.14** (1.70-2.69)	**2.56** (2.02-3.24)	**3.14** (2.40-4.21)	**3.56** (2.67-4.91)	**4.03** (2.95-5.82)	**4.62** (3.13-6.72)	**5.54** (3.61-8.38)	**6.35** (4.04-9.79)
6-hr	**1.71** (1.37-2.13)	**2.10** (1.69-2.63)	**2.75** (2.20-3.44)	**3.28** (2.60-4.13)	**4.02** (3.09-5.34)	**4.56** (3.44-6.22)	**5.15** (3.78-7.37)	**5.89** (4.02-8.50)	**7.06** (4.61-10.6)	**8.07** (5.15-12.3)
12-hr	**2.18** (1.76-2.70)	**2.68** (2.16-3.32)	**3.48** (2.80-4.33)	**4.15** (3.32-5.19)	**5.07** (3.92-6.69)	**5.75** (4.36-7.78)	**6.49** (4.78-9.19)	**7.40** (5.07-10.6)	**8.81** (5.78-13.1)	**10.0** (6.42-15.2)
24-hr	**2.63** (2.14-3.23)	**3.26** (2.65-4.01)	**4.28** (3.46-5.29)	**5.13** (4.13-6.37)	**6.30** (4.90-8.26)	**7.16** (5.46-9.63)	**8.10** (6.01-11.4)	**9.28** (6.38-13.2)	**11.1** (7.31-16.3)	**12.7** (8.15-19.0)
2-day	**3.01** (2.46-3.67)	**3.79** (3.10-4.63)	**5.08** (4.14-6.23)	**6.14** (4.97-7.58)	**7.61** (5.96-9.93)	**8.68** (6.67-11.6)	**9.87** (7.40-13.9)	**11.4** (7.86-16.0)	**13.9** (9.16-20.2)	**16.1** (10.3-23.8)
3-day	**3.30** (2.71-4.02)	**4.15** (3.41-5.05)	**5.54** (4.53-6.77)	**6.69** (5.44-8.22)	**8.28** (6.52-10.8)	**9.44** (7.28-12.6)	**10.7** (8.07-15.0)	**12.4** (8.57-17.3)	**15.1** (10.0-21.9)	**17.5** (11.3-25.9)
4-day	**3.58** (2.95-4.34)	**4.46** (3.67-5.41)	**5.90** (4.83-7.18)	**7.09** (5.77-8.68)	**8.73** (6.89-11.3)	**9.93** (7.68-13.2)	**11.3** (8.49-15.7)	**13.0** (9.00-18.1)	**15.8** (10.5-22.8)	**18.3** (11.8-26.9)
7-day	**4.33** (3.59-5.22)	**5.25** (4.34-6.34)	**6.75** (5.56-8.17)	**7.99** (6.54-9.73)	**9.70** (7.68-12.5)	**10.9** (8.49-14.4)	**12.3** (9.32-17.0)	**14.1** (9.82-19.5)	**17.0** (11.3-24.3)	**19.6** (12.7-28.5)
10-day	**5.03** (4.18-6.04)	**5.97** (4.96-7.18)	**7.51** (6.21-9.06)	**8.78** (7.21-10.7)	**10.5** (8.36-13.4)	**11.8** (9.18-15.4)	**13.2** (9.98-18.1)	**15.0** (10.5-20.7)	**17.9** (11.9-25.4)	**20.4** (13.2-29.5)
20-day	**7.05** (5.90-8.42)	**8.07** (6.74-9.63)	**9.73** (8.10-11.7)	**11.1** (9.18-13.4)	**13.0** (10.3-16.3)	**14.4** (11.2-18.5)	**15.9** (11.9-21.2)	**17.6** (12.4-23.9)	**20.1** (13.5-28.3)	**22.2** (14.4-31.8)
30-day	**8.72** (7.33-10.4)	**9.79** (8.22-11.6)	**11.5** (9.64-13.8)	**13.0** (10.8-15.6)	**15.0** (11.9-18.7)	**16.5** (12.8-21.0)	**18.1** (13.5-23.7)	**19.7** (13.9-26.6)	**22.0** (14.8-30.6)	**23.7** (15.4-33.8)
45-day	**10.8** (9.11-12.8)	**11.9** (10.1-14.1)	**13.8** (11.6-16.4)	**15.3** (12.8-18.3)	**17.4** (13.9-21.5)	**19.1** (14.8-24.0)	**20.7** (15.4-26.7)	**22.3** (15.7-29.8)	**24.2** (16.4-33.6)	**25.7** (16.8-36.4)
60-day	**12.5** (10.6-14.8)	**13.7** (11.6-16.2)	**15.6** (13.2-18.5)	**17.2** (14.4-20.5)	**19.4** (15.5-23.9)	**21.2** (16.4-26.4)	**22.8** (16.9-29.2)	**24.3** (17.3-32.5)	**26.2** (17.7-36.2)	**27.5** (18.0-38.7)

[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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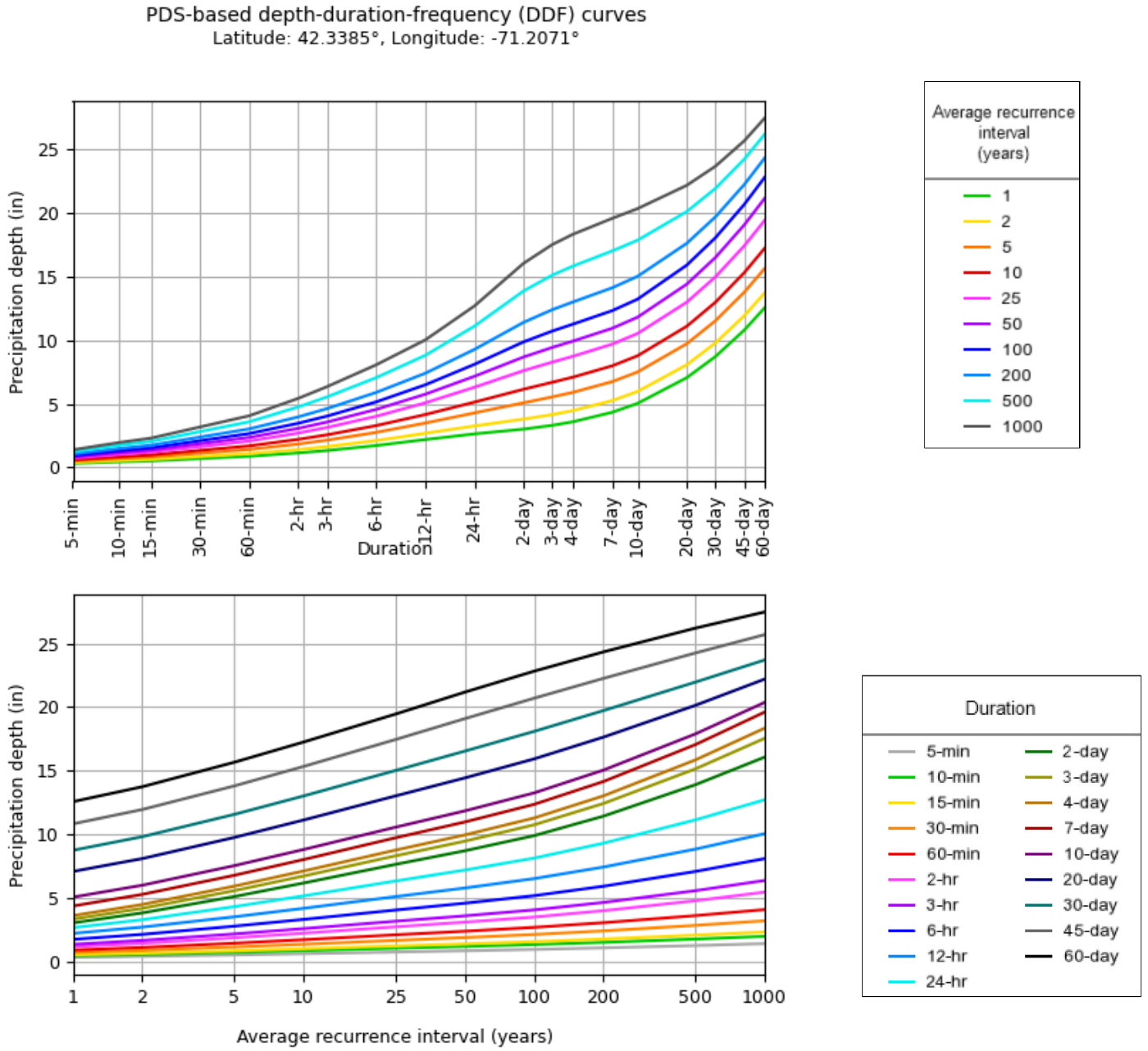
PF graphical

11 Parsons St., Newton, MA.



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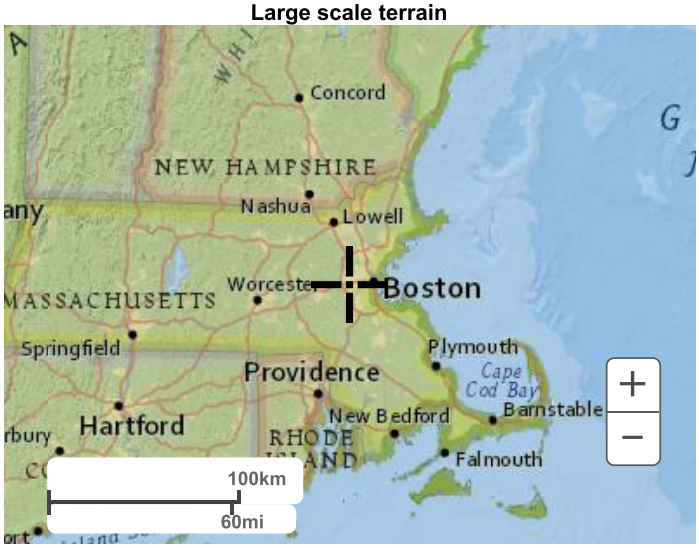
Maps & aerials

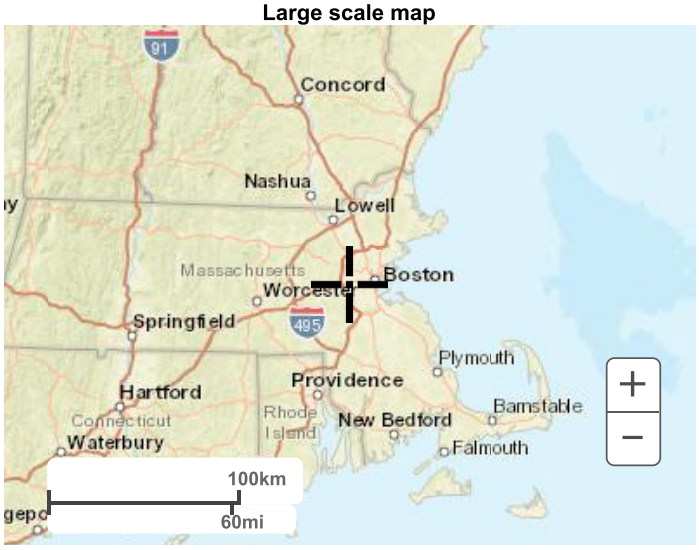
Small scale terrain

11 Parsons St., Newton, MA.

Large scale terrain

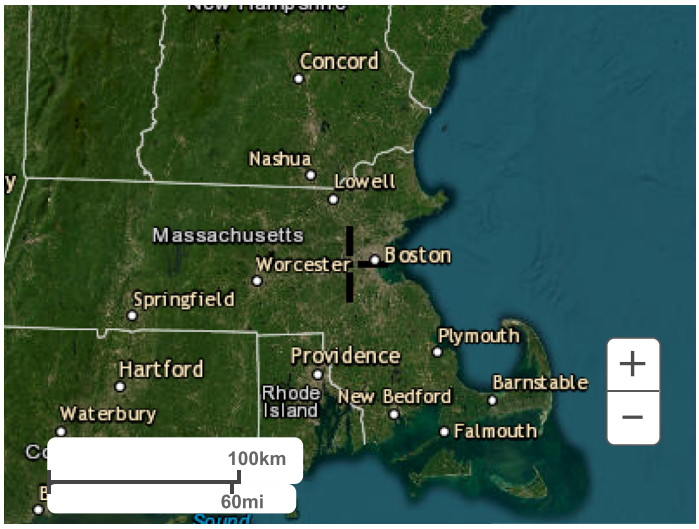


Large scale map



Large scale aerial

11 Parsons St., Newton, MA.



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