DRAINAGE CALCULATIONS
AND
STORMWATER MANAGEMENT PLAN

For The

Multi-Use Building

Located at
272 Tremont Street
(Tax Map C12, Block 0, Lot 9)
Melrose, Massachusetts

Submitted to:
City of Melrose
562 Main Street
Melrose, MA 02176

Prepared for:
Eric Kenworthy
49 Marmion Road
Melrose, MA 02176

Prepared by

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

January 15, 2020

Table of Contents

Executive Summary of Drainage Report
Proposed Multi-Use building
272 Tremont Street
Melrose, MA 02176

Project Description

The project consists of the redevelopment of a single parcel of land comprised of 10,490± S.F. located at 272 Tremont Street (Tax map C12 Block 0 Lot 9). The site is currently occupied by two and a half story residential building with a bituminous concrete driveway and parking area in the rear and some landscaped areas. The project involves the demolition of all existing structures, the construction of the proposed four-story building, bituminous concrete driveway and parking area, utility connections, storm water management system, landscaping and incidental site work. The site abuts residential land to the south, business to the north, railroad tracks to the west and Tremont Street to the east. Access to site will be accessed via Tremont Street.

Site Description

The subject property is currently occupied by a two and a half story building with bituminous concrete driveway, parking area and landscaped areas. The majority of the property is comprised of impervious areas. The topography of the site is relatively flat. The site has well defined drainage patterns consisting of two distinct watershed areas. The western half of the site (EWS-1) drains towards the north-westerly corner offsite (DP-1) while the eastern half of the site (EWS-2) drains to the northeast towards Tremont Street (DP-2).

In the proposed condition, the property will consist of the proposed building, bituminous concrete driveway and landscaped area. Stormwater management facilities will be provided to mitigate the increase in impervious area on the property. The drainage patterns in the proposed condition will mimic those of the existing condition, including two watershed areas draining to the same design points as in the existing condition.

Soils information was obtained from available USDA Soil Conservation Service (SCS) Maps for Middlesex County. The soils on site are classified as Urban land (602). Refer to Figure 5, SCS Soils Map, for a delineation of the boundaries of the soil with respect to the subject parcel and the attached SCS soil description. The Flood Insurance Rate Map for the City of Melrose (Community Panel 25017C0429E with an effective date of June 4, 2010) describes the project as Zone X. Zone X is classified as areas determined to be outside the 0.2% chance floodplain.

All existing conditions information used has been compiled from the plan entitled “Existing Conditions Site Plan of 272 Tremont Street in Melrose, MA,” prepared by P.J.F and Associates and dated March 11, 2018 along with other plans of record obtained from the City of Melrose.

Pre-Development Condition

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. Refer to Appendix A for computer results, soil characteristics, cover descriptions and times of concentrations calculations.

In both the pre-development and post-development stormwater analysis a total of two watershed areas were analyzed. The western half of the site (EWS-1) drains towards the north-westerly corner offsite (DP-1) while the eastern half of the site (EWS-2) drains to the northeast towards Tremont Street (DP-2). Refer to Existing Watershed Plan (EWP) in Appendix A for a delineation of the watershed areas as well as the location of the design points. The same design points were analyzed in both the pre and post development condition.

A summary of the peak rates of the runoff during the Pre-Development Conditions is as follows:

Pre-Development Condition Peak Discharge Summary (in CFS):

	2-Year Storm (3.1 IN)	10-Year Storm (4.6 IN)	25-Year Storm (5.5 IN)	100-Year Storm (6.8 IN)
Design Point #1	0.64	0.96	1.15	1.43
Design Point #2	0.15	0.23	0.28	0.34

Proposed Development

The proposed project includes the demolition of all existing structures, the construction of the proposed four-story building, bituminous concrete driveway and parking area, utility connections, storm water management systems, landscaping and incidental site work.

Storm water runoff generated by the proposed building roof as well as the west side of the driveway, walkways, and landscaped areas will be collected by a double-grated catch basin at the west end of the proposed driveway via a catch basin. This Storm water will ultimately be infiltrated via a subsurface infiltration facility (36" perforated pipe (40 LF) embedded in a 5' x 42' stone field). Storm water generated on the north and east sides of the site will be collected by a catch basin on the east side of the driveway and will ultimately be infiltrated via a subsurface infiltration facility (1 row of 4 Cultec 330XL HD Chambers) located in the east side of the driveway. A water quality inlet (Contech CDS unit) will be installed upstream of each infiltration systems in an effort to further treat stormwater and reduce total suspended solids. The subsurface facilities have been sized to mitigate peak runoff rates of all storms up to and including the 100 year storm event.

Again, drainage calculations were performed for the post-development condition for the 2, 10, 25, and 100-year type III 24-hour storm events. Refer to Appendix B for computer results, soil characteristics, cover descriptions, times of concentration calculations, and the Proposed Watershed Plans (PWP). A summary of the peak rates of runoff during the Post-Development Condition is as follows:

Post-Development Condition Peak Discharge Summary (in CFS):

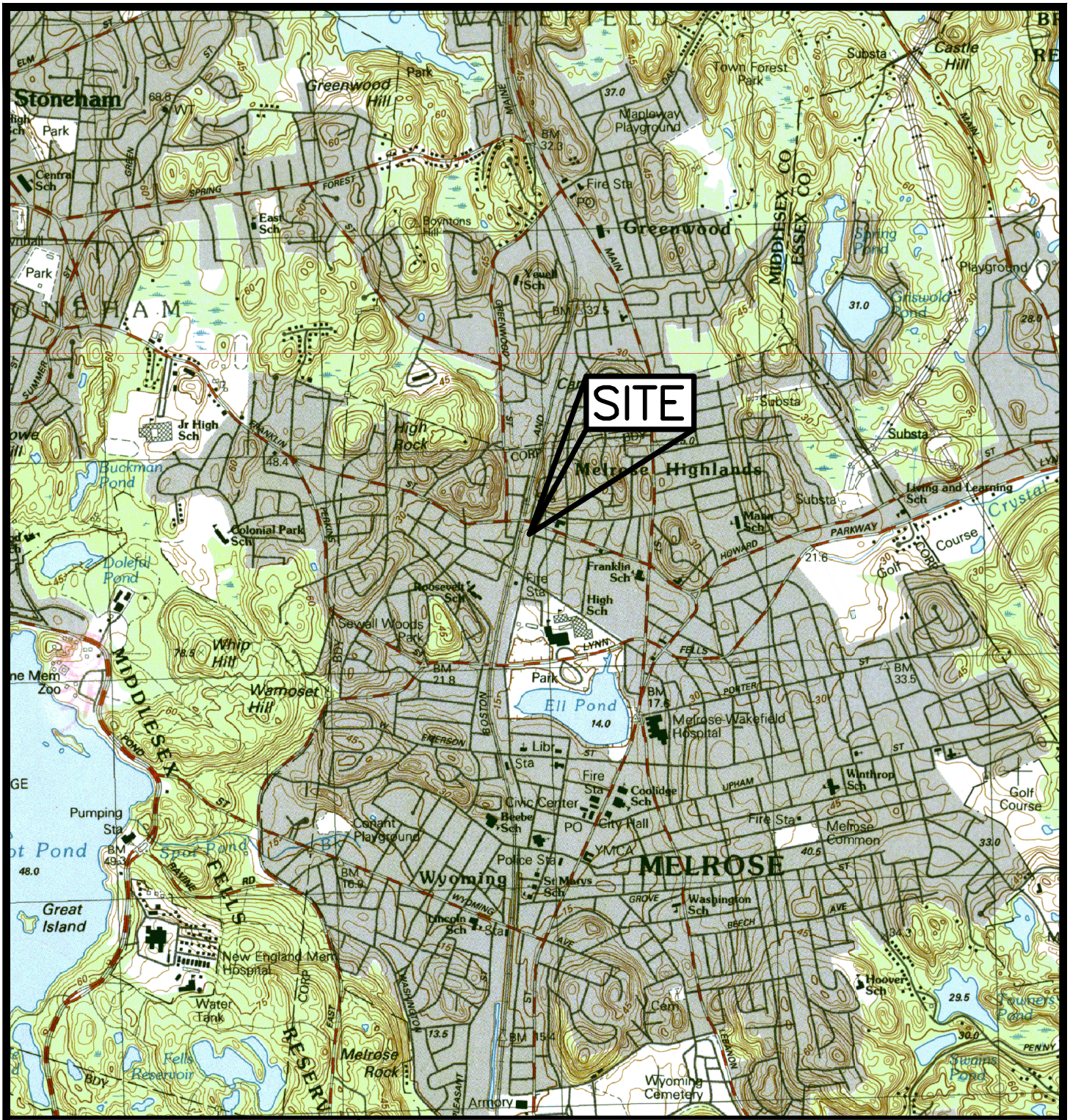
	2-Year Storm (3.1 IN)	10-Year Storm (4.6 IN)	25-Year Storm (5.5 IN)	100-Year Storm (6.8 IN)
Design Point #1	0.62	.94	1.13	1.41
Design Point #2	0.00	0.00	0.11	0.31

Stormwater Management Facilities

The stormwater facilities were design to attenuate peak flows generated by all storm events up to and including the 100-year storm event. An infiltration rate of 2.41 in/hr was used based on the Rawls Rate of saturated hydraulic conductivity for a sandy loam soil type. Refer to Appendix A & B for the Stage Storage Curves and TR-20 computer results for the storage characteristics of the subsurface infiltration facilities. Refer to the Site Plans (attached) for design details.

Erosion and Siltation Control

Haybales and silt fence will be placed at the downhill limit of work prior to the commencement of any construction activity. The integrity of the erosion control devices will be maintained by periodic inspection and replacement as necessary. The straw wattles and silt fence will remain in place until the first course of pavement has been placed and all side slopes have been loamed and seeded and vegetation has been established.



PREPARED BY:

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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:

Plan of Land

272 Tremont Street
(Tax Map C11 Block 0 Lot 9)
Melrose, MA 02176

PROJECT: 19-29908	DATE: January 13, 2020
SCALE: 1:25,000	DWG FILE NAME: Figures.dwg
DESIGNED BY: Garrett Anderson	CHECKED BY: Richard A. Salvo, P.E.

DRAWING TITLE:

FIGURE 1 - USGS LOCUS MAP

PREPARED BY:

Engineering Alliance, Inc.
Civil Engineering & Land Planning Consultants
194 Central Street
Saugus, MA 01906
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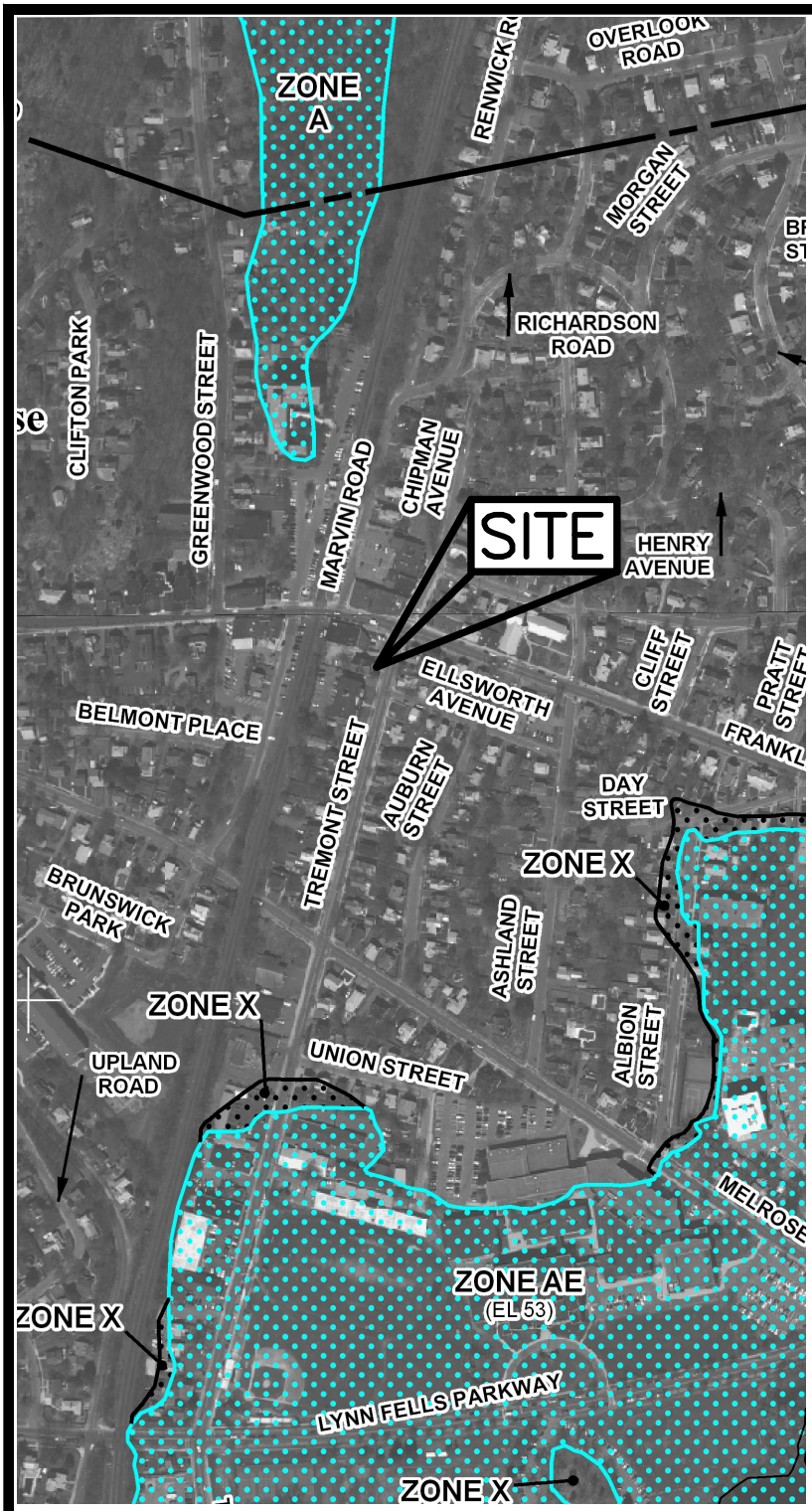
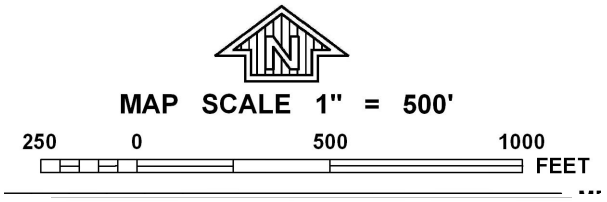
SCALE: 1"=200'	DWG FILE NAME: Figures.dwg
DESIGNED BY: Garrett Anderson	CHECKED BY: Richard A. Salvo, P.E.

DRAWING TITLE:

FIGURE 2 - ORTHO PHOTO





LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Cross section line

Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

2478000mN — 1000-meter Universal Transverse Mercator grid values, zone 19

NATIONAL FLOOD INSURANCE PROGRAM
MIDDLESEX COUNTY

COMMUNITY PANEL NO: 25017C0429E

EFFECTIVE DATE: June 4, 2010

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Fax: (603) 610-7101

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272 Tremont Street
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PROJECT: 19-29908	DATE: January 13, 2020
SCALE: 1"=500'	DWG FILE NAME: Figures.dwg
DESIGNED BY: Garrett Anderson	CHECKED BY: Richard A. Salvo, P.E.

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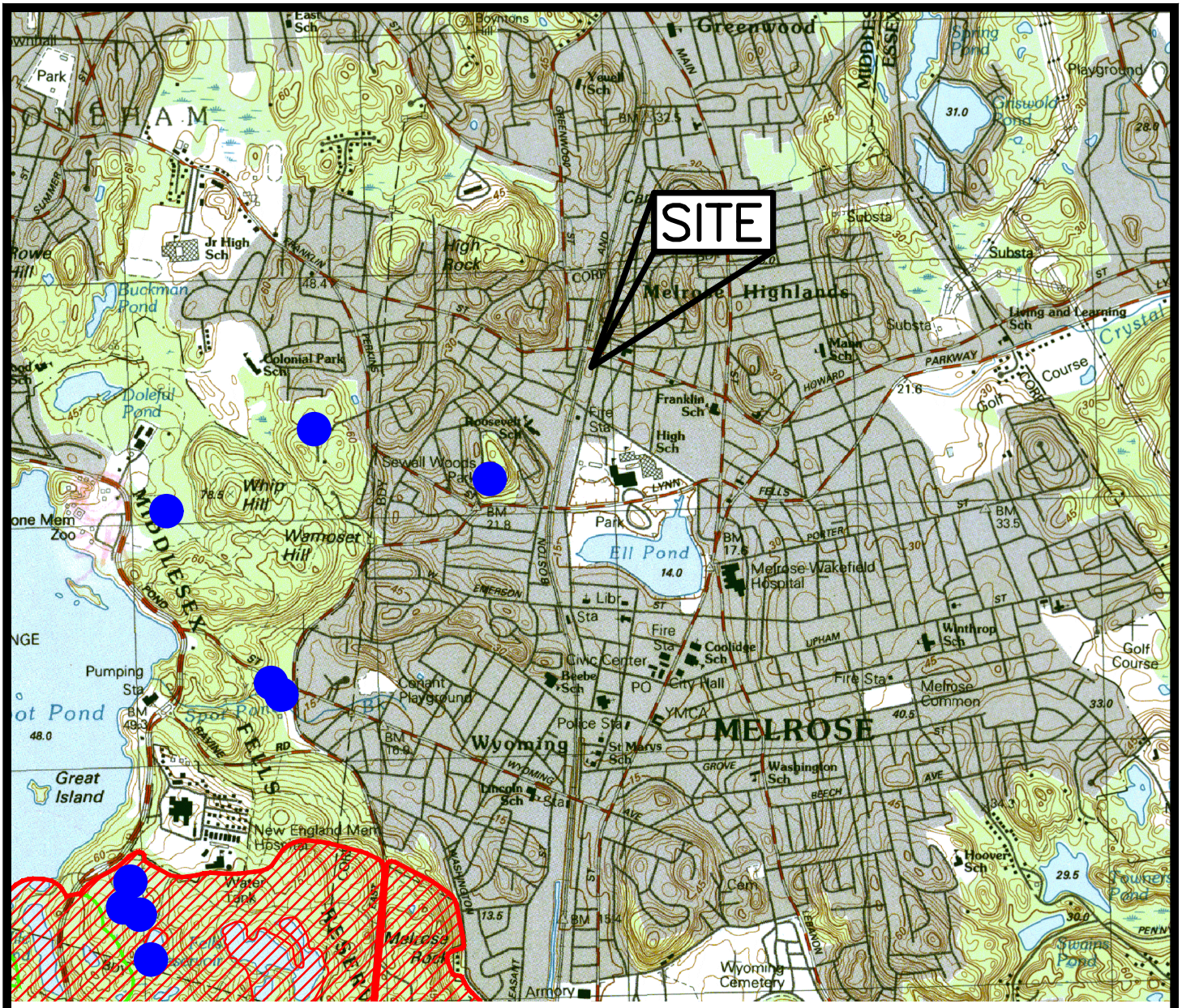
FIGURE 3 - FEMA FLOOD MAP



LEGEND:

- = NHESP ESTIMATED HABITATS OF RARE SPECIES
- = NHESP PRIORITY HABITATS OF RARE SPECIES
- = NHESP CERTIFIED VERNAL POOLS

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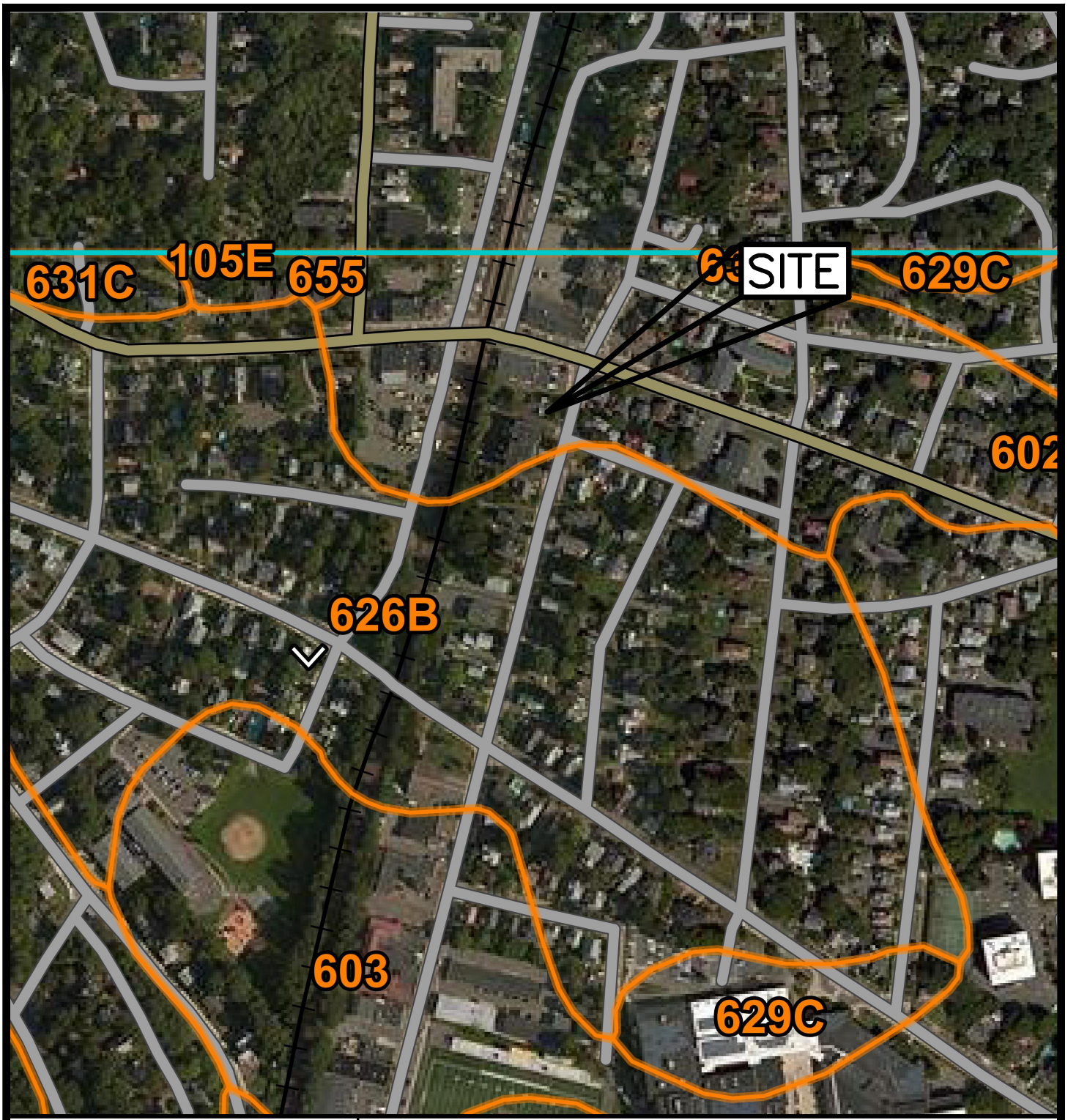
DRAWING TITLE:

FIGURE 4 - NATURAL HERITAGE MAP



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Saugus, MA 01906
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SCALE: 1"=300'	DWG FILE NAME: Figures.dwg
DESIGNED BY: Garrett Anderson	CHECKED BY: Richard A. Salvo, P.E.

DRAWING TITLE:

FIGURE 5 - SOILS MAP

602—Urban land

Map Unit Setting

National map unit symbol: 9950
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

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, loamy

Percent of map unit: 5 percent
Hydric soil rating: No

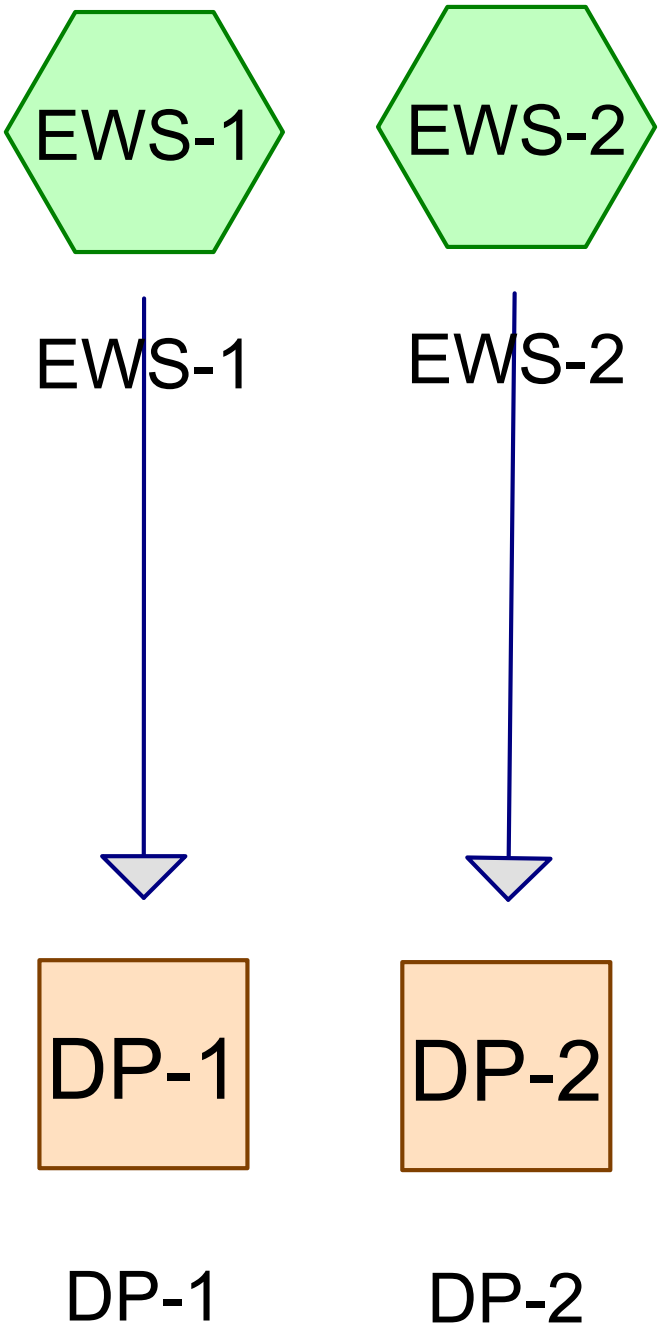
603—Urban land, wet substratum

Map Unit Setting

National map unit symbol: 9951
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

APPENDIX A

Existing Conditions Drainage Calculations
Existing Watershed Plan



Subcat Reach Pond Link

Drainage Diagram for 19-29908-Existing Conditions
Prepared by {enter your company name here}, Printed 1/16/2020
HydroCAD® 9.00 s/n 01924 © 2009 HydroCAD Software Solutions LLC

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: EWS-1 Runoff Area=4,983 sf 82.42% Impervious Runoff Depth>2.31"
Tc=5.0 min CN=94 Runoff=0.32 cfs 960 cf

Subcatchment EWS-2: EWS-2 Runoff Area=5,477 sf 71.44% Impervious Runoff Depth>2.04"
Tc=5.0 min CN=91 Runoff=0.32 cfs 930 cf

Reach DP-1: DP-1 Inflow=0.32 cfs 960 cf
Outflow=0.32 cfs 960 cf

Reach DP-2: DP-2 Inflow=0.32 cfs 930 cf
Outflow=0.32 cfs 930 cf

Total Runoff Area = 10,460 sf Runoff Volume = 1,891 cf Average Runoff Depth = 2.17"
23.33% Pervious = 2,440 sf 76.67% Impervious = 8,020 sf

Summary for Subcatchment EWS-1: EWS-1

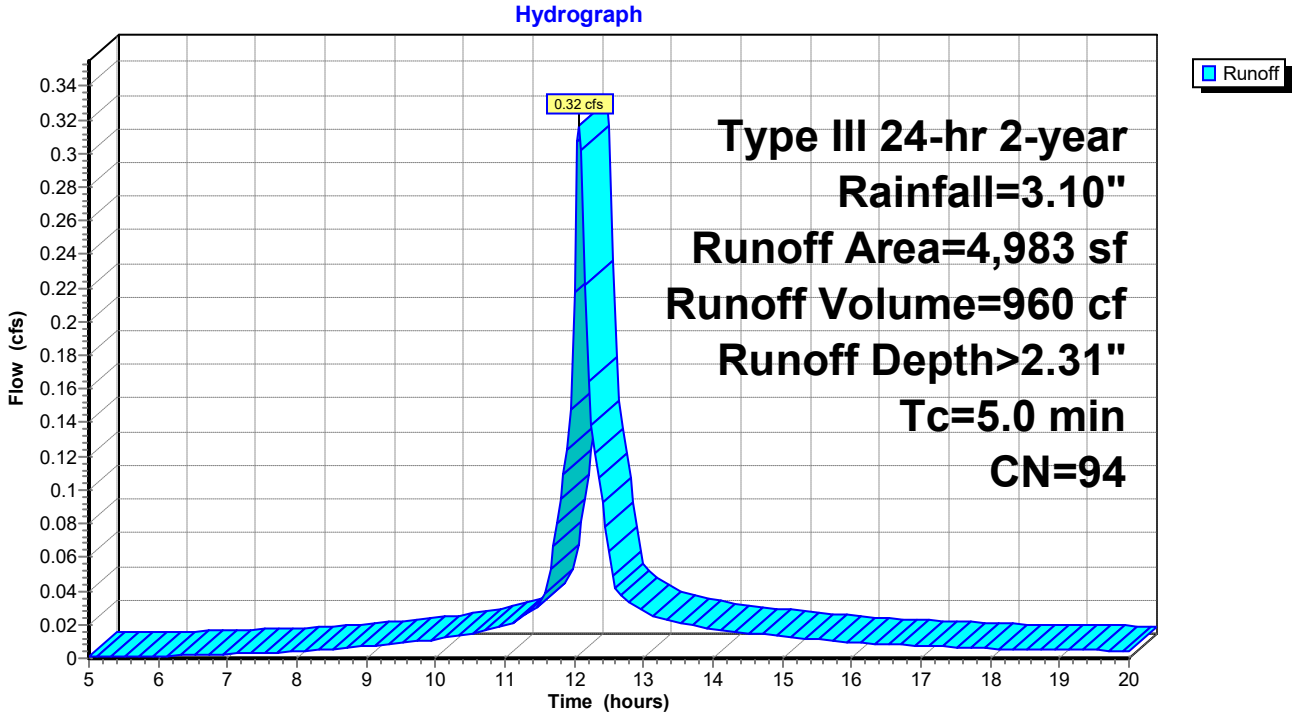
Runoff = 0.32 cfs @ 12.07 hrs, Volume= 960 cf, Depth> 2.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
3,990	98	Paved parking, HSG C
876	74	>75% Grass cover, Good, HSG C
117	98	Roofs, HSG C
4,983	94	Weighted Average
876		17.58% Pervious Area
4,107		82.42% Impervious Area

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

Subcatchment EWS-1: EWS-1



Summary for Subcatchment EWS-2: EWS-2

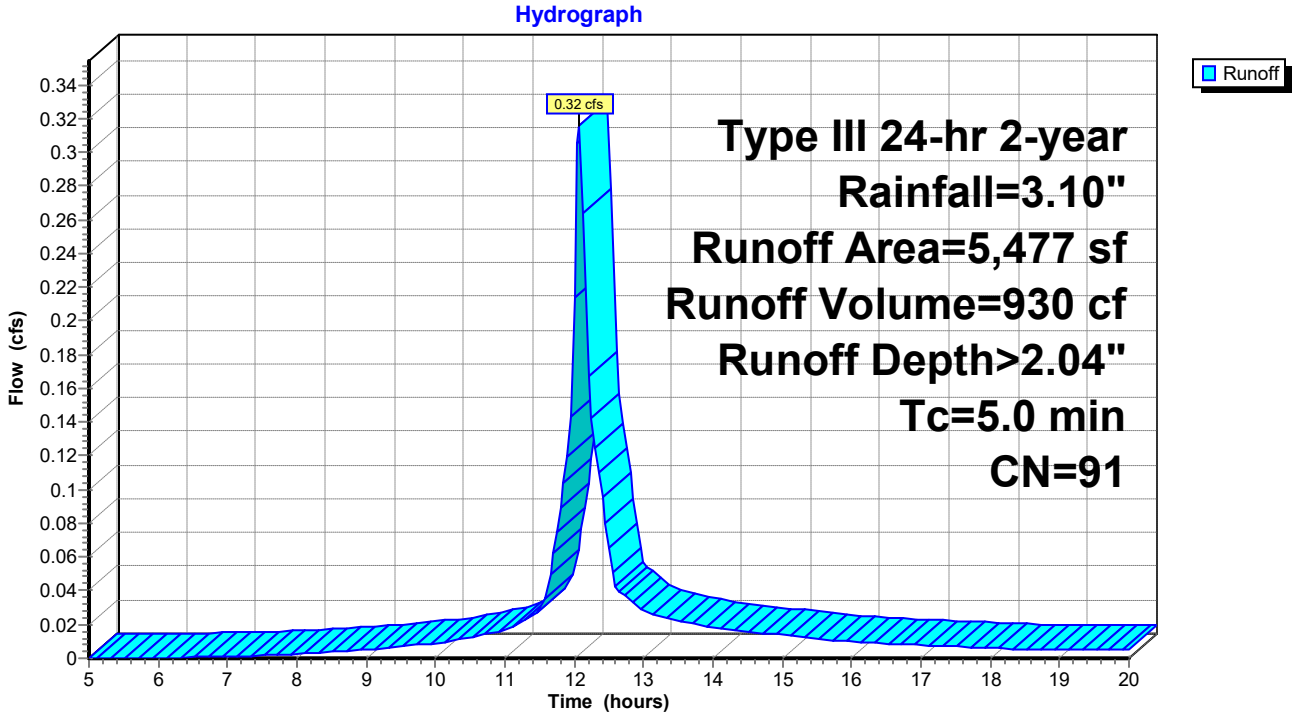
Runoff = 0.32 cfs @ 12.07 hrs, Volume= 930 cf, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
1,666	98	Roofs, HSG C
1,564	74	>75% Grass cover, Good, HSG C
2,247	98	Paved parking, HSG C
5,477	91	Weighted Average
1,564		28.56% Pervious Area
3,913		71.44% Impervious Area

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

Subcatchment EWS-2: EWS-2

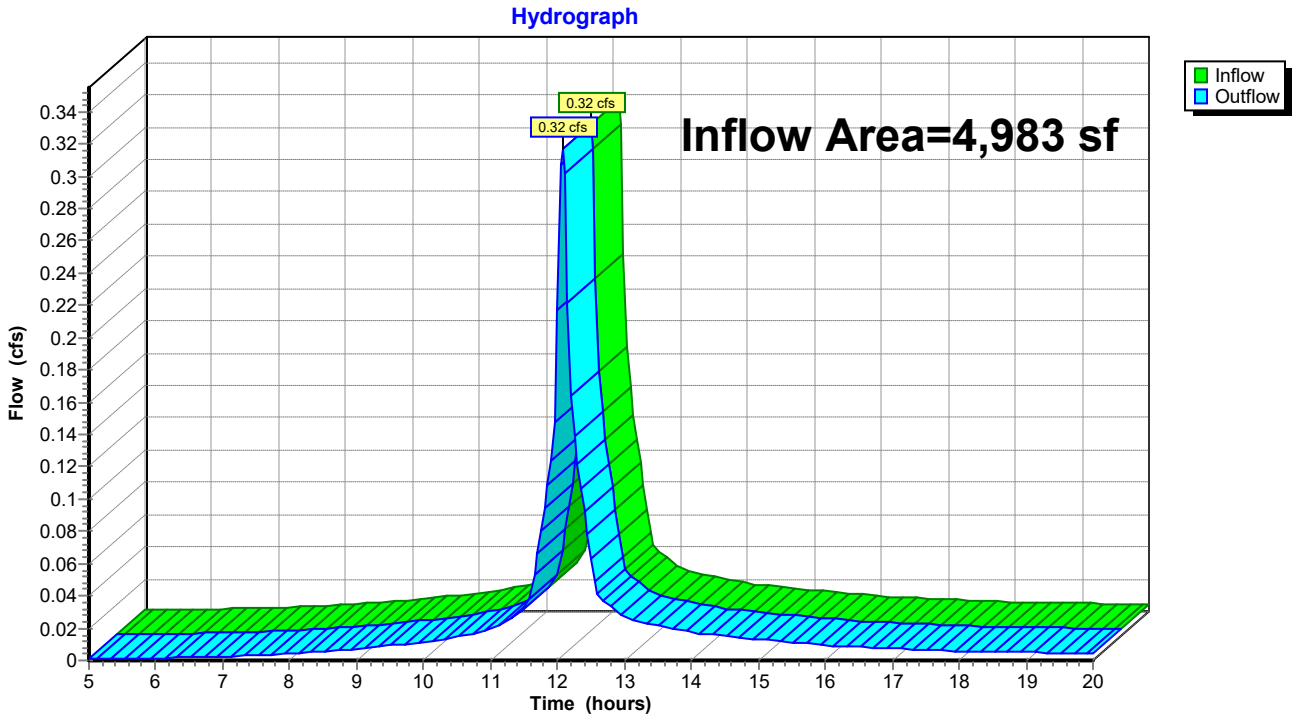


Summary for Reach DP-1: DP-1

Inflow Area = 4,983 sf, 82.42% Impervious, Inflow Depth > 2.31" for 2-year event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 960 cf
Outflow = 0.32 cfs @ 12.07 hrs, Volume= 960 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

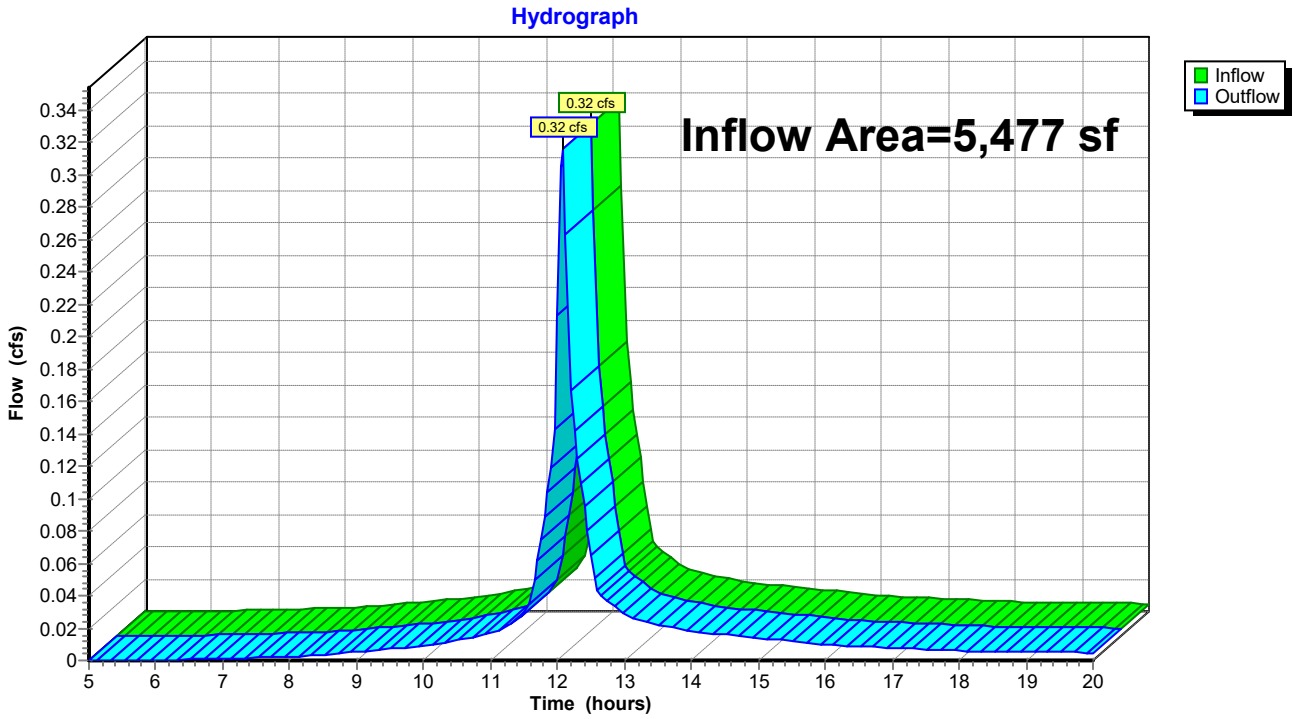


Summary for Reach DP-2: DP-2

Inflow Area = 5,477 sf, 71.44% Impervious, Inflow Depth > 2.04" for 2-year event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 930 cf
Outflow = 0.32 cfs @ 12.07 hrs, Volume= 930 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: EWS-1 Runoff Area=4,983 sf 82.42% Impervious Runoff Depth>3.70"
Tc=5.0 min CN=94 Runoff=0.49 cfs 1,534 cf

Subcatchment EWS-2: EWS-2 Runoff Area=5,477 sf 71.44% Impervious Runoff Depth>3.40"
Tc=5.0 min CN=91 Runoff=0.51 cfs 1,551 cf

Reach DP-1: DP-1 Inflow=0.49 cfs 1,534 cf
Outflow=0.49 cfs 1,534 cf

Reach DP-2: DP-2 Inflow=0.51 cfs 1,551 cf
Outflow=0.51 cfs 1,551 cf

Total Runoff Area = 10,460 sf Runoff Volume = 3,085 cf Average Runoff Depth = 3.54"
23.33% Pervious = 2,440 sf 76.67% Impervious = 8,020 sf

Summary for Subcatchment EWS-1: EWS-1

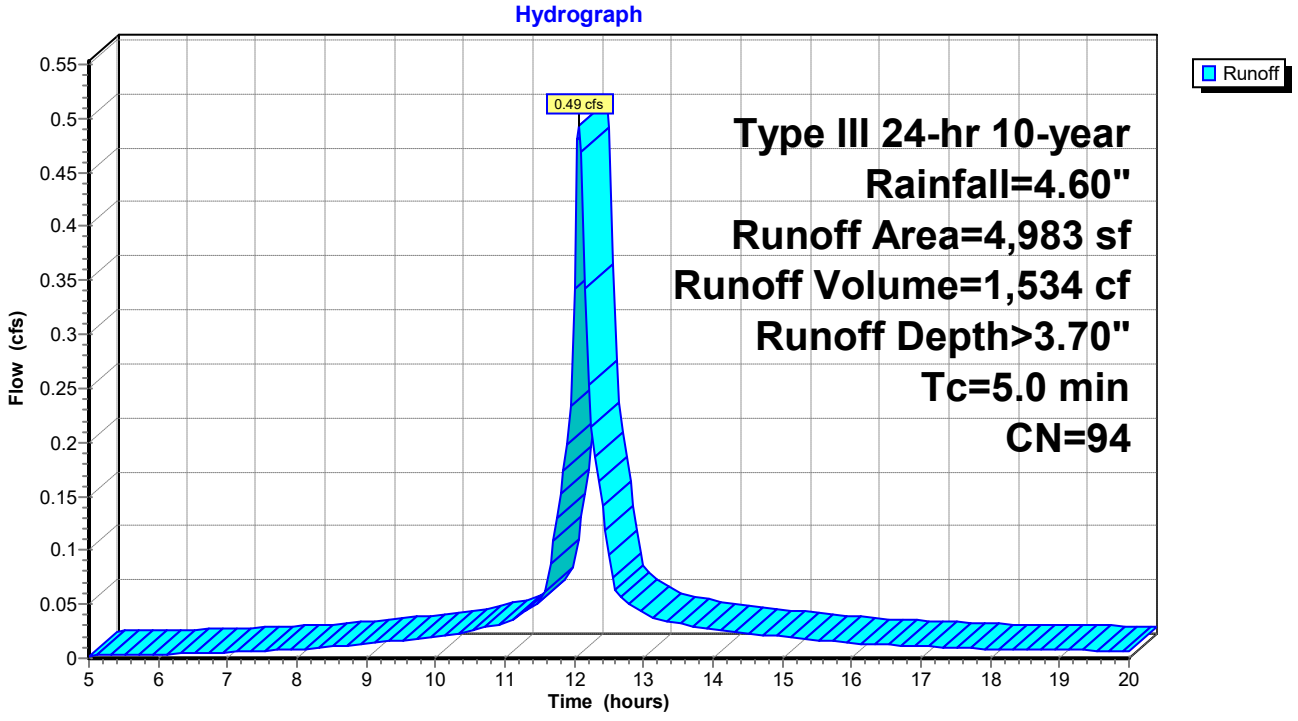
Runoff = 0.49 cfs @ 12.07 hrs, Volume= 1,534 cf, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
3,990	98	Paved parking, HSG C
876	74	>75% Grass cover, Good, HSG C
117	98	Roofs, HSG C
4,983	94	Weighted Average
876		17.58% Pervious Area
4,107		82.42% Impervious Area

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

Subcatchment EWS-1: EWS-1



Summary for Subcatchment EWS-2: EWS-2

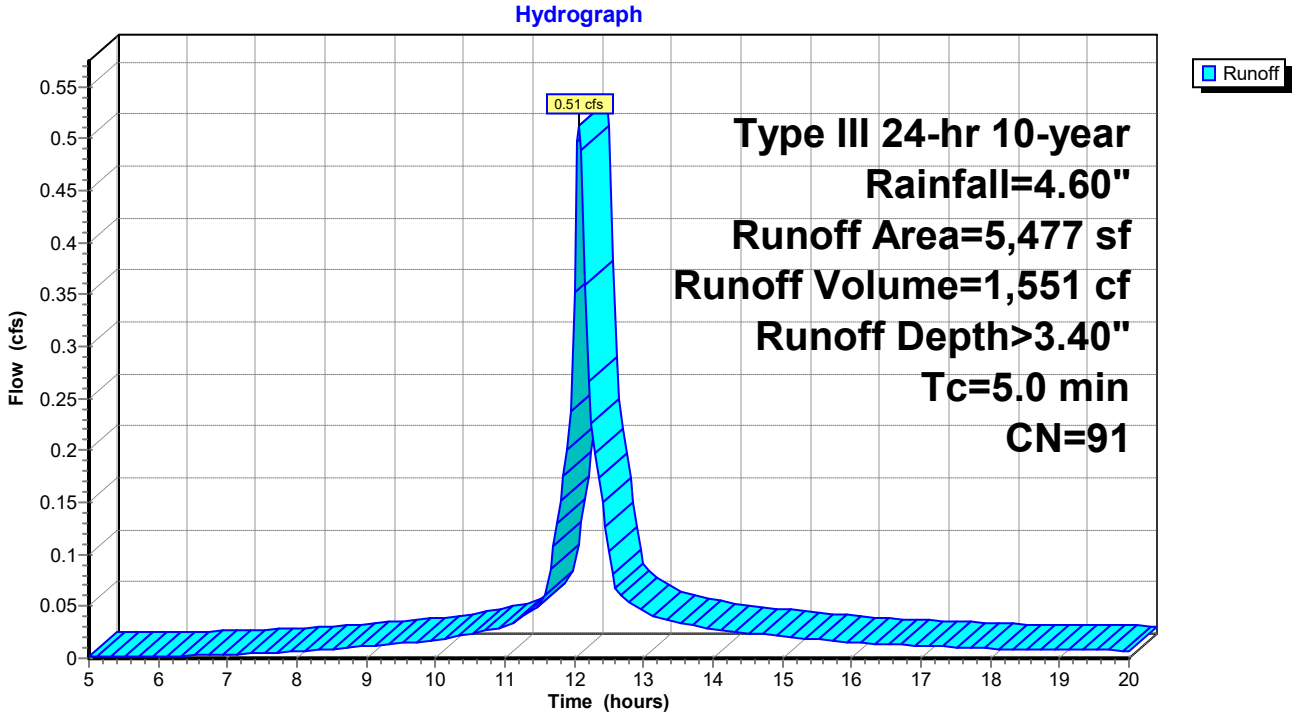
Runoff = 0.51 cfs @ 12.07 hrs, Volume= 1,551 cf, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
1,666	98	Roofs, HSG C
1,564	74	>75% Grass cover, Good, HSG C
2,247	98	Paved parking, HSG C
5,477	91	Weighted Average
1,564		28.56% Pervious Area
3,913		71.44% Impervious Area

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

Subcatchment EWS-2: EWS-2

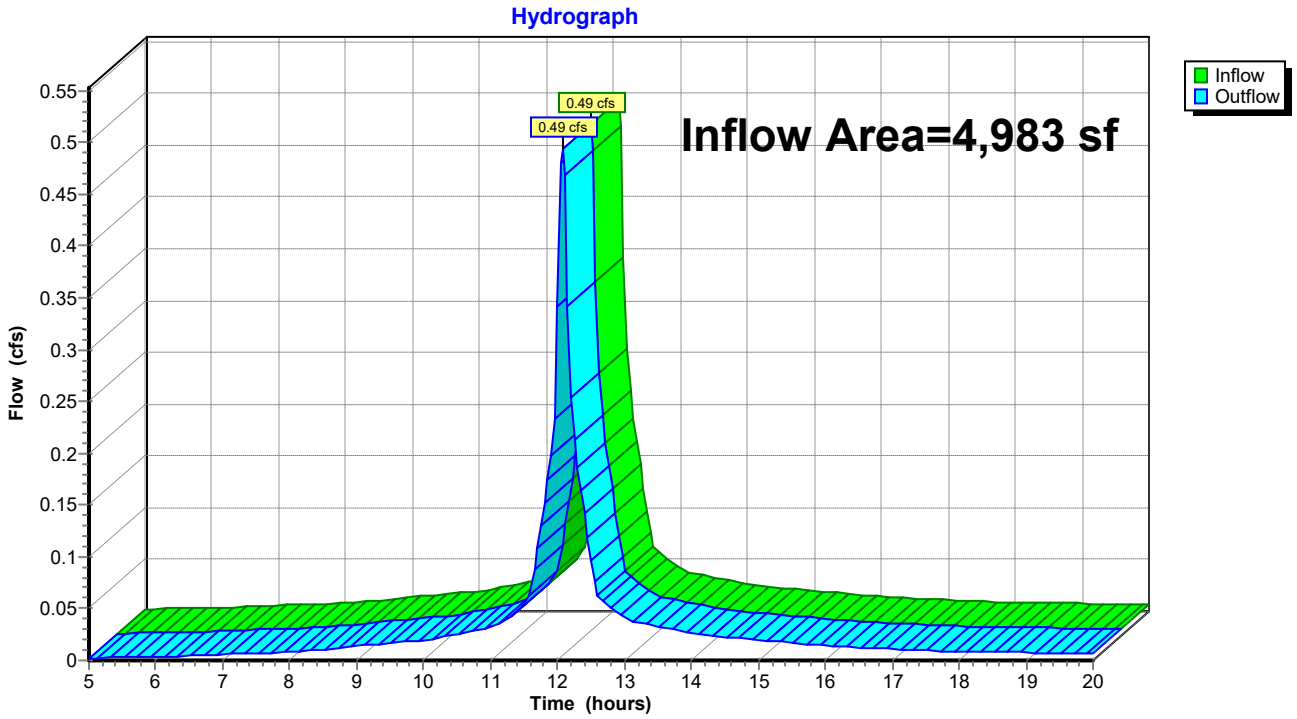


Summary for Reach DP-1: DP-1

Inflow Area = 4,983 sf, 82.42% Impervious, Inflow Depth > 3.70" for 10-year event
Inflow = 0.49 cfs @ 12.07 hrs, Volume= 1,534 cf
Outflow = 0.49 cfs @ 12.07 hrs, Volume= 1,534 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

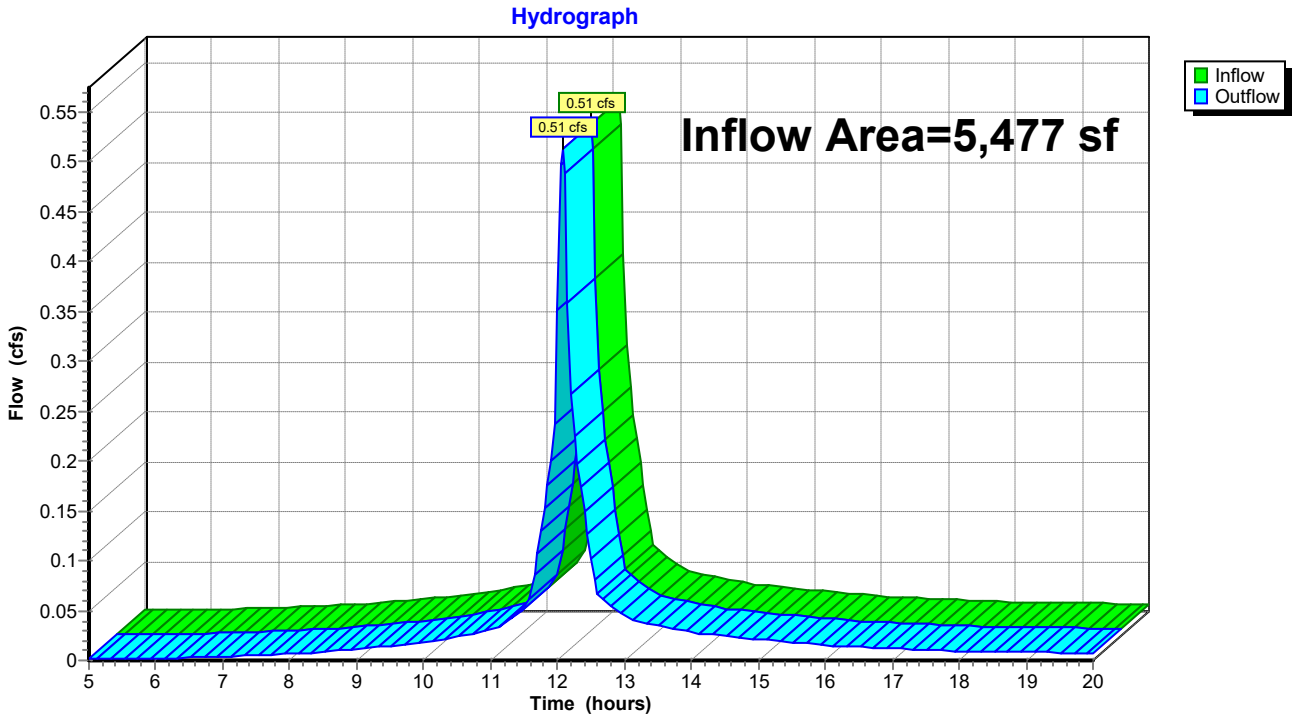


Summary for Reach DP-2: DP-2

Inflow Area = 5,477 sf, 71.44% Impervious, Inflow Depth > 3.40" for 10-year event
Inflow = 0.51 cfs @ 12.07 hrs, Volume= 1,551 cf
Outflow = 0.51 cfs @ 12.07 hrs, Volume= 1,551 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: EWS-1 Runoff Area=4,983 sf 82.42% Impervious Runoff Depth>4.53"
Tc=5.0 min CN=94 Runoff=0.60 cfs 1,880 cf

Subcatchment EWS-2: EWS-2 Runoff Area=5,477 sf 71.44% Impervious Runoff Depth>4.22"
Tc=5.0 min CN=91 Runoff=0.63 cfs 1,928 cf

Reach DP-1: DP-1 Inflow=0.60 cfs 1,880 cf
Outflow=0.60 cfs 1,880 cf

Reach DP-2: DP-2 Inflow=0.63 cfs 1,928 cf
Outflow=0.63 cfs 1,928 cf

Total Runoff Area = 10,460 sf Runoff Volume = 3,808 cf Average Runoff Depth = 4.37"
23.33% Pervious = 2,440 sf 76.67% Impervious = 8,020 sf

Summary for Subcatchment EWS-1: EWS-1

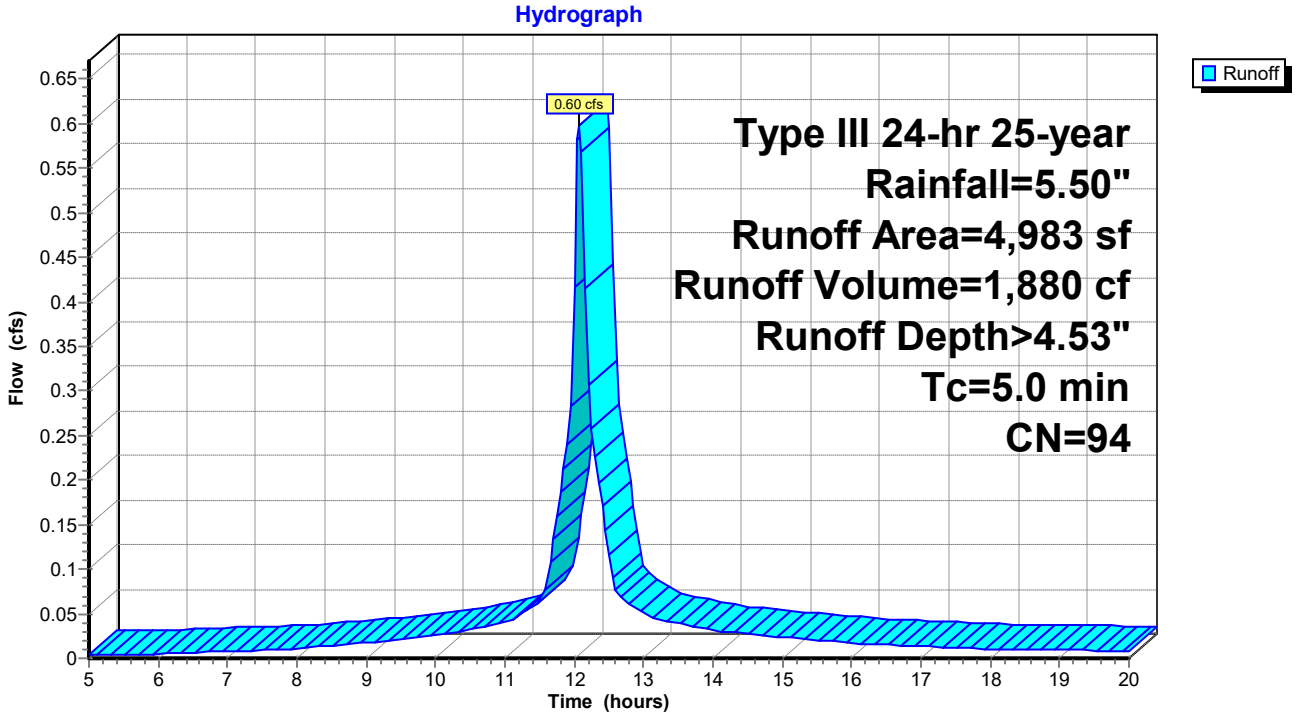
Runoff = 0.60 cfs @ 12.07 hrs, Volume= 1,880 cf, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
3,990	98	Paved parking, HSG C
876	74	>75% Grass cover, Good, HSG C
117	98	Roofs, HSG C
4,983	94	Weighted Average
876		17.58% Pervious Area
4,107		82.42% Impervious Area

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

Subcatchment EWS-1: EWS-1



Summary for Subcatchment EWS-2: EWS-2

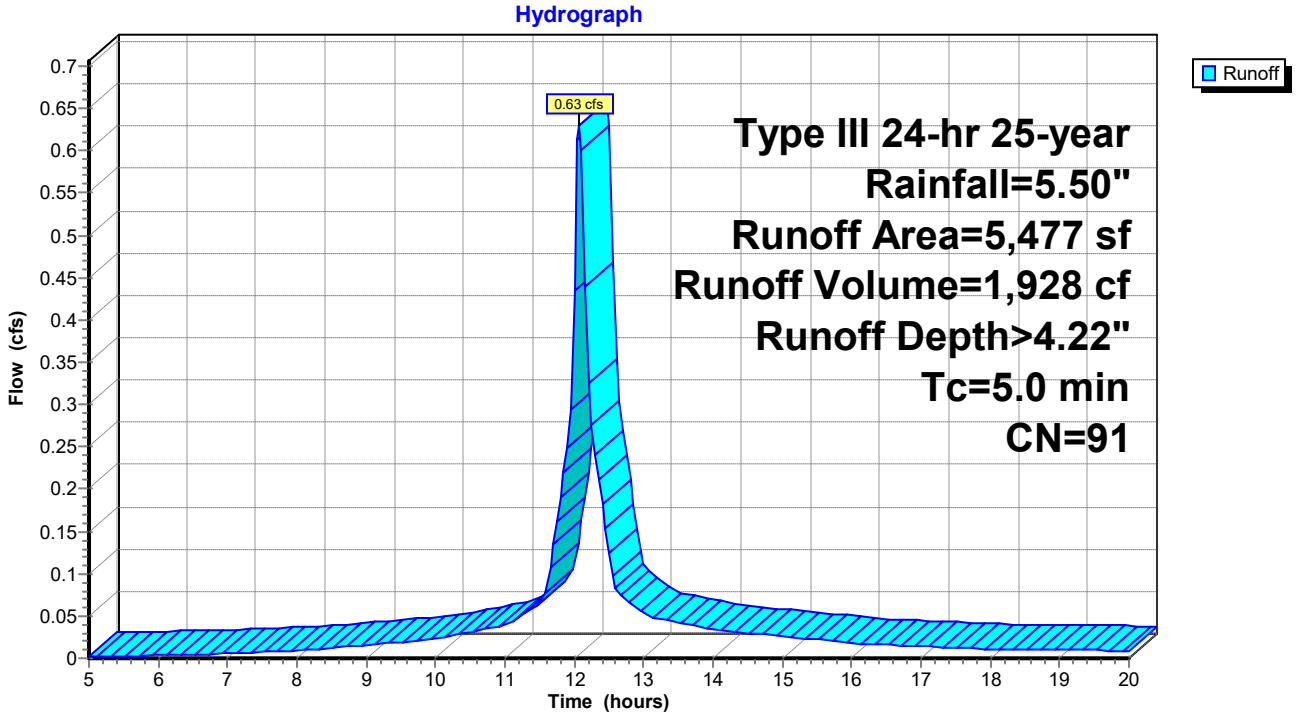
Runoff = 0.63 cfs @ 12.07 hrs, Volume= 1,928 cf, Depth> 4.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
1,666	98	Roofs, HSG C
1,564	74	>75% Grass cover, Good, HSG C
2,247	98	Paved parking, HSG C
5,477	91	Weighted Average
1,564		28.56% Pervious Area
3,913		71.44% Impervious Area

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

Subcatchment EWS-2: EWS-2

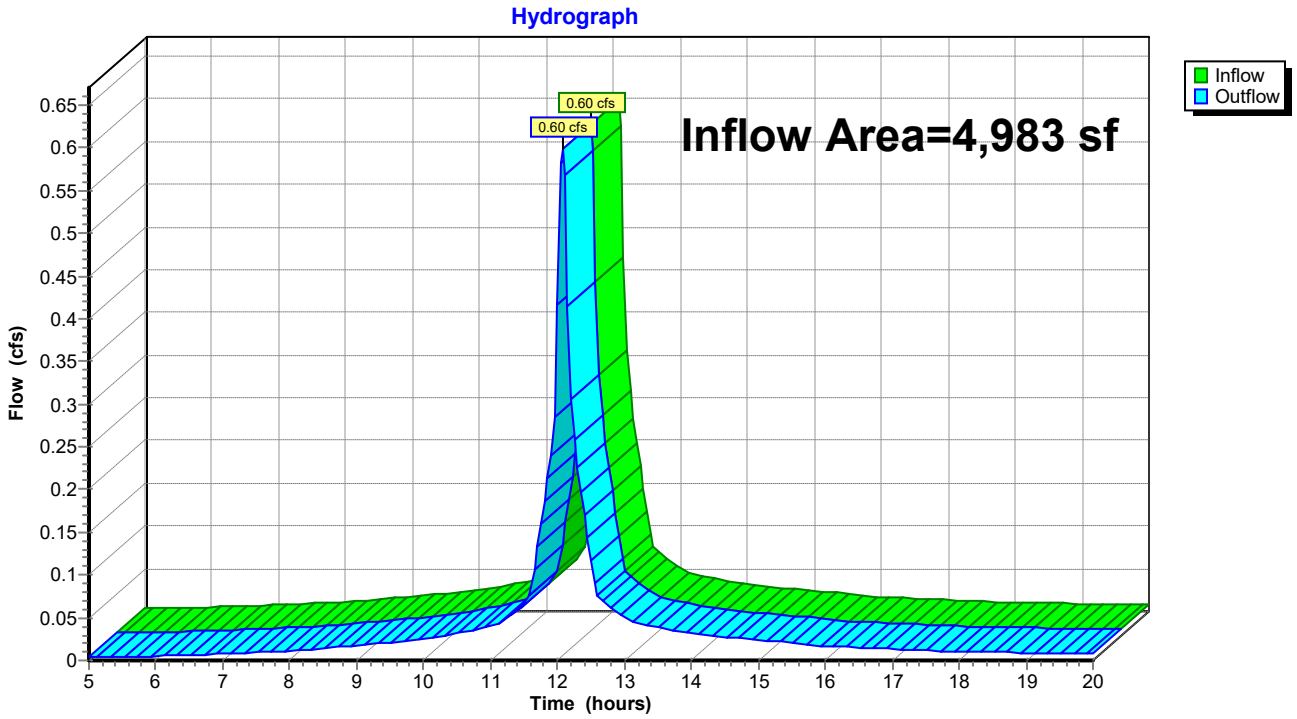


Summary for Reach DP-1: DP-1

Inflow Area = 4,983 sf, 82.42% Impervious, Inflow Depth > 4.53" for 25-year event
Inflow = 0.60 cfs @ 12.07 hrs, Volume= 1,880 cf
Outflow = 0.60 cfs @ 12.07 hrs, Volume= 1,880 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

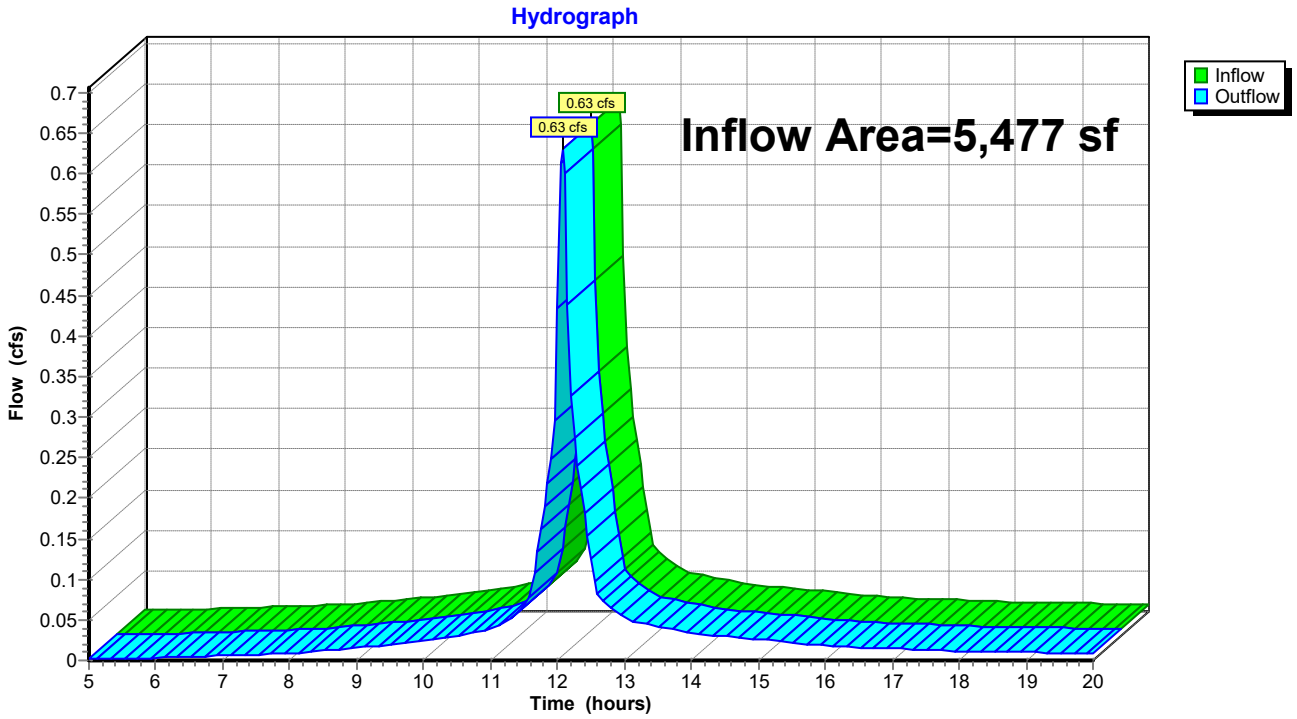


Summary for Reach DP-2: DP-2

Inflow Area = 5,477 sf, 71.44% Impervious, Inflow Depth > 4.22" for 25-year event
Inflow = 0.63 cfs @ 12.07 hrs, Volume= 1,928 cf
Outflow = 0.63 cfs @ 12.07 hrs, Volume= 1,928 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EWS-1: EWS-1 Runoff Area=4,983 sf 82.42% Impervious Runoff Depth>5.73"
Tc=5.0 min CN=94 Runoff=0.75 cfs 2,378 cf

Subcatchment EWS-2: EWS-2 Runoff Area=5,477 sf 71.44% Impervious Runoff Depth>5.42"
Tc=5.0 min CN=91 Runoff=0.80 cfs 2,475 cf

Reach DP-1: DP-1 Inflow=0.75 cfs 2,378 cf
Outflow=0.75 cfs 2,378 cf

Reach DP-2: DP-2 Inflow=0.80 cfs 2,475 cf
Outflow=0.80 cfs 2,475 cf

Total Runoff Area = 10,460 sf Runoff Volume = 4,853 cf Average Runoff Depth = 5.57"
23.33% Pervious = 2,440 sf 76.67% Impervious = 8,020 sf

Summary for Subcatchment EWS-1: EWS-1

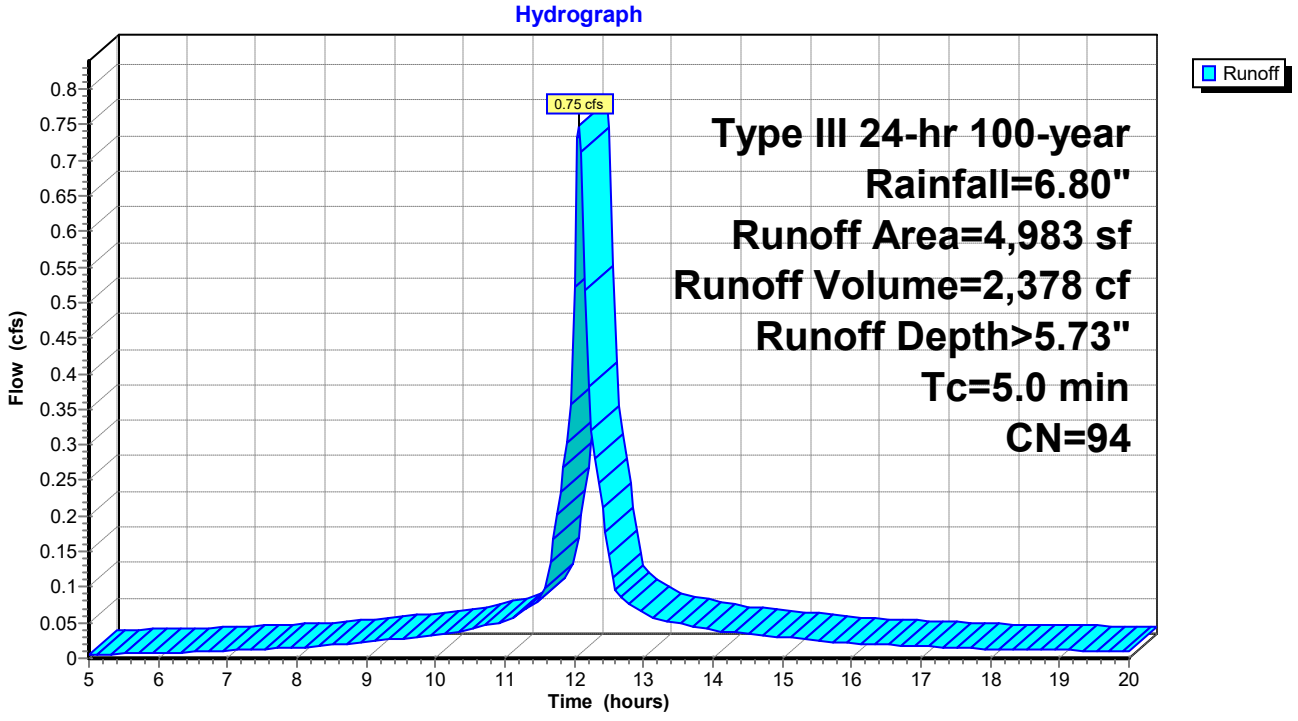
Runoff = 0.75 cfs @ 12.07 hrs, Volume= 2,378 cf, Depth> 5.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
3,990	98	Paved parking, HSG C
876	74	>75% Grass cover, Good, HSG C
117	98	Roofs, HSG C
4,983	94	Weighted Average
876		17.58% Pervious Area
4,107		82.42% Impervious Area

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

Subcatchment EWS-1: EWS-1



Summary for Subcatchment EWS-2: EWS-2

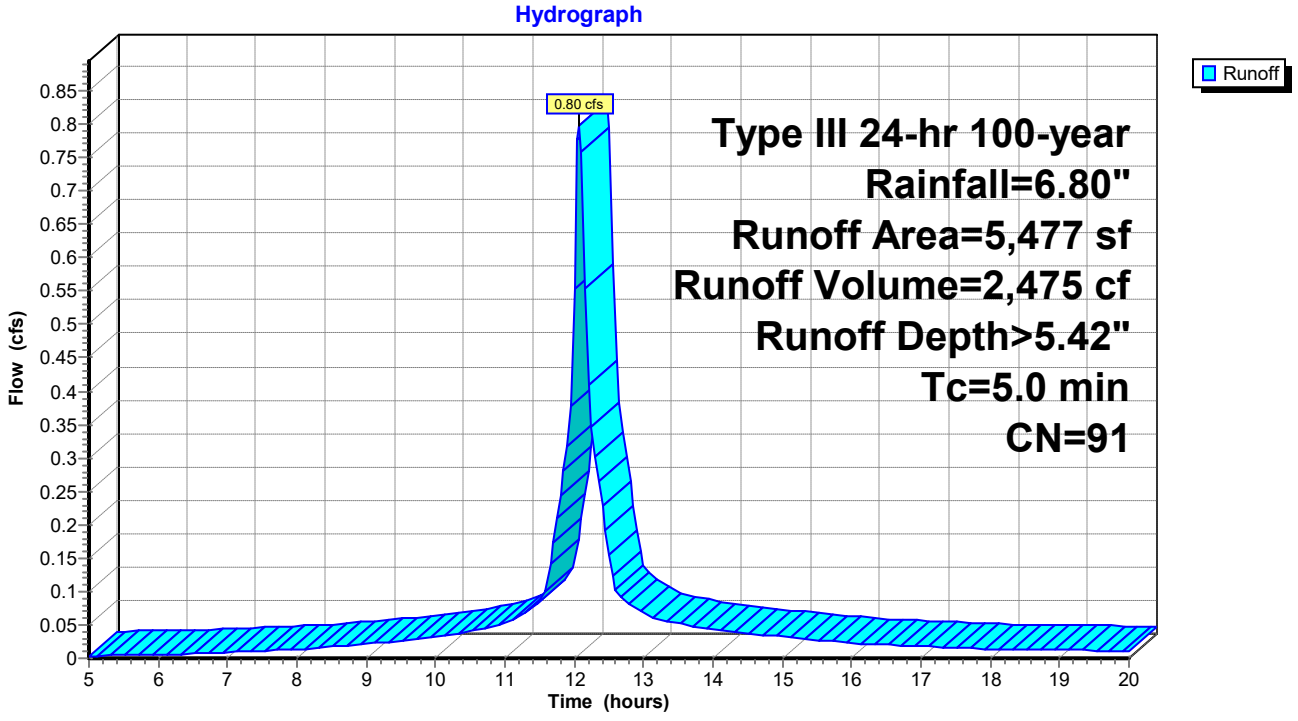
Runoff = 0.80 cfs @ 12.07 hrs, Volume= 2,475 cf, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
1,666	98	Roofs, HSG C
1,564	74	>75% Grass cover, Good, HSG C
2,247	98	Paved parking, HSG C
5,477	91	Weighted Average
1,564		28.56% Pervious Area
3,913		71.44% Impervious Area

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

Subcatchment EWS-2: EWS-2

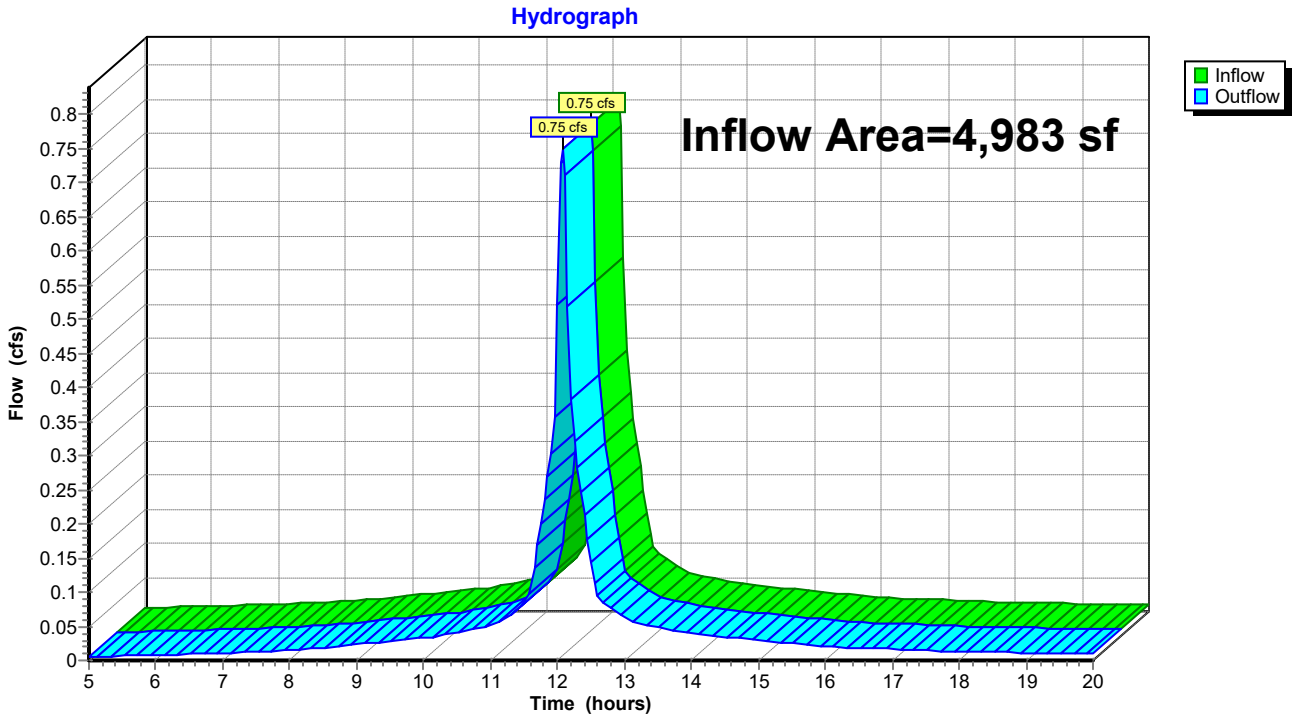


Summary for Reach DP-1: DP-1

Inflow Area = 4,983 sf, 82.42% Impervious, Inflow Depth > 5.73" for 100-year event
Inflow = 0.75 cfs @ 12.07 hrs, Volume= 2,378 cf
Outflow = 0.75 cfs @ 12.07 hrs, Volume= 2,378 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

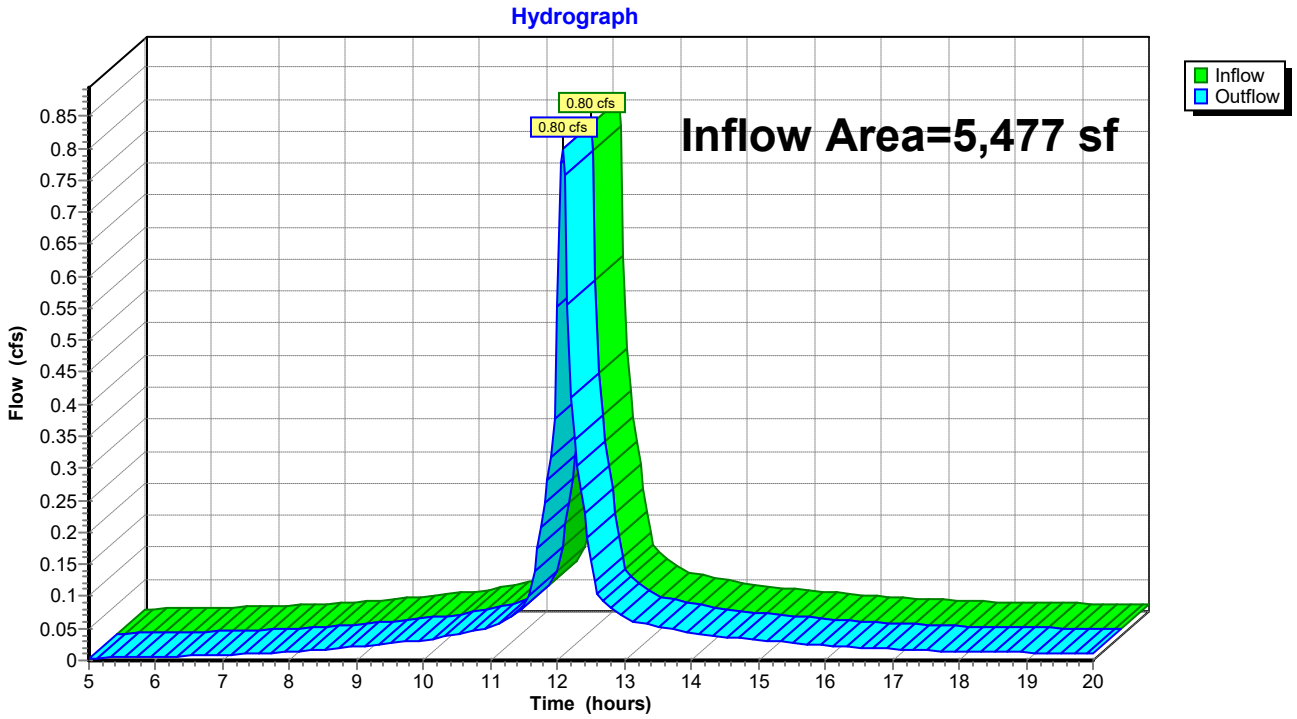


Summary for Reach DP-2: DP-2

Inflow Area = 5,477 sf, 71.44% Impervious, Inflow Depth > 5.42" for 100-year event
Inflow = 0.80 cfs @ 12.07 hrs, Volume= 2,475 cf
Outflow = 0.80 cfs @ 12.07 hrs, Volume= 2,475 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2

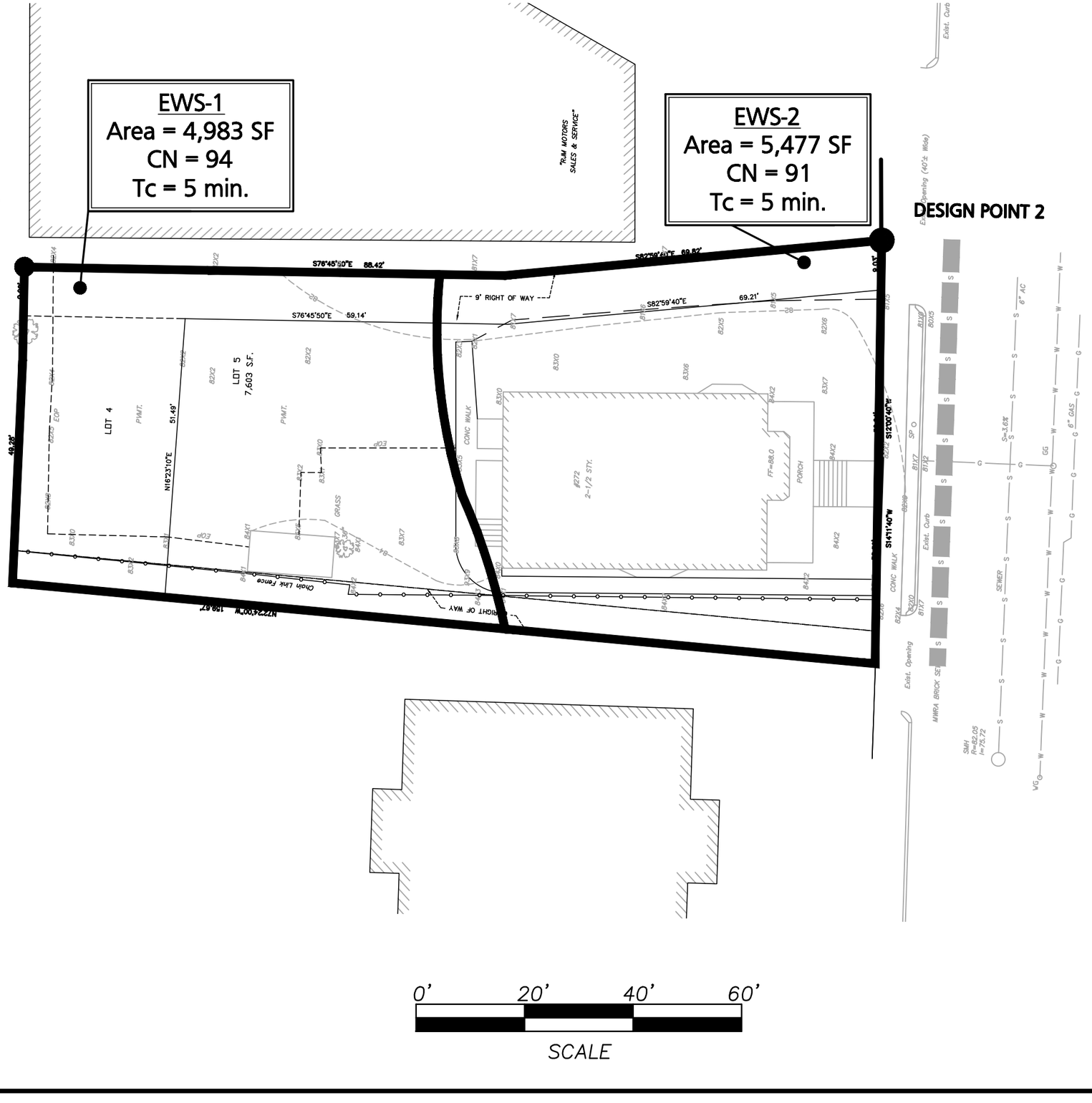


DESIGN POINT 1

EWS-1
Area = 4,983 SF
CN = 94
Tc = 5 min.

EWS-2
Area = 5,477 SF
CN = 91
Tc = 5 min.

DESIGN POINT 2



0' 20' 40' 60'

SCALE

PREPARED BY:
Engineering Alliance, Inc.
Civil Engineering & Land Planning Consultants
194 Central Street 1950 Lafayette Road
Saugus, MA 01906 Portsmouth, NH 03801
Tel: (781) 231-1349 Tel: (603) 610-7100
Fax: (781) 417-0220 Fax: (603) 610-7101

DESCRIPTION OF REVISION	DATE

PROJECT:
Site Plan
272 Tremont Street
(Tax Map C12 Block 0 Lot 9)
Melrose, Massachusetts 02176

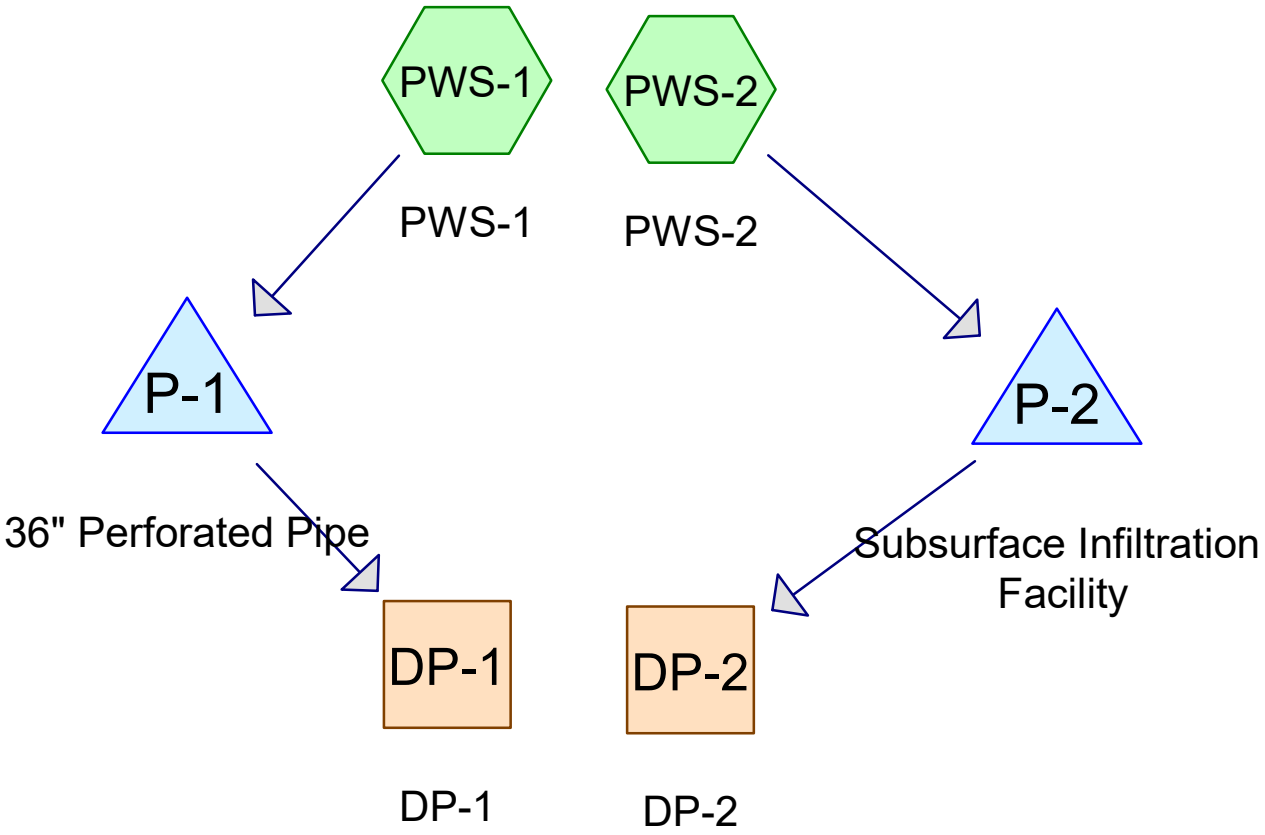
APPLICANT:
Eric Kenworthy
49 Marmion Road
Melrose, MA 02176

PROJECT #: 19-29908 | DATE: January 13, 2020
SCALE: AS NOTED | DWG FILE NAME: 19-29908 REV 1-7-20
DESIGN BY: Garrett Anderson | CHECKED BY: Richard A. Salvo, P.E.

DWG. NO. EWS
DRAWING TITLE: Existing Watershed Plan

APPENDIX B

Proposed Conditions Drainage Calculations
Proposed Watershed Plan



Subcat Reach Pond Link

Drainage Diagram for 19-29908 proposed conditions
Prepared by {enter your company name here}, Printed 1/16/2020
HydroCAD® 9.00 s/n 01924 © 2009 HydroCAD Software Solutions LLC

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: PWS-1 Runoff Area=8,193 sf 95.18% Impervious Runoff Depth>2.60"
Tc=0.0 min CN=97 Runoff=0.64 cfs 1,772 cf

Subcatchment PWS-2: PWS-2 Runoff Area=2,267 sf 85.75% Impervious Runoff Depth>2.41"
Tc=5.0 min CN=95 Runoff=0.15 cfs 455 cf

Reach DP-1: DP-1 Inflow=0.62 cfs 1,566 cf
Outflow=0.62 cfs 1,566 cf

Reach DP-2: DP-2 Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond P-1: 36" Perforated Pipe Peak Elev=78.55' Storage=16 cf Inflow=0.64 cfs 1,772 cf
Discarded=0.01 cfs 206 cf Primary=0.62 cfs 1,566 cf Outflow=0.63 cfs 1,772 cf

Pond P-2: Subsurface Infiltration Facility Peak Elev=14.82' Storage=221 cf Inflow=0.15 cfs 455 cf
Discarded=0.01 cfs 382 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 382 cf

Total Runoff Area = 10,460 sf Runoff Volume = 2,227 cf Average Runoff Depth = 2.56"
6.86% Pervious = 718 sf 93.14% Impervious = 9,742 sf

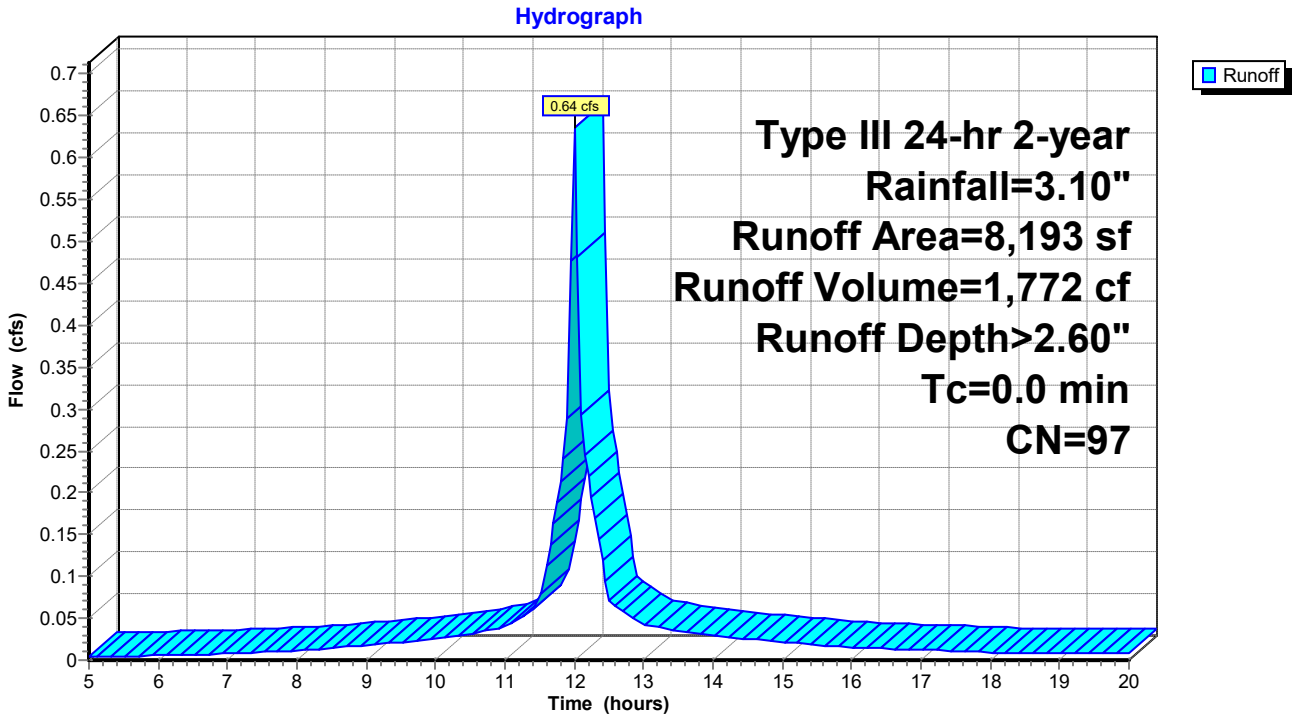
Summary for Subcatchment PWS-1: PWS-1

Runoff = 0.64 cfs @ 12.00 hrs, Volume= 1,772 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
395	74	>75% Grass cover, Good, HSG C
1,814	98	Paved parking, HSG C
5,984	98	Roofs, HSG C
8,193	97	Weighted Average
395		4.82% Pervious Area
7,798		95.18% Impervious Area

Subcatchment PWS-1: PWS-1



Summary for Subcatchment PWS-2: PWS-2

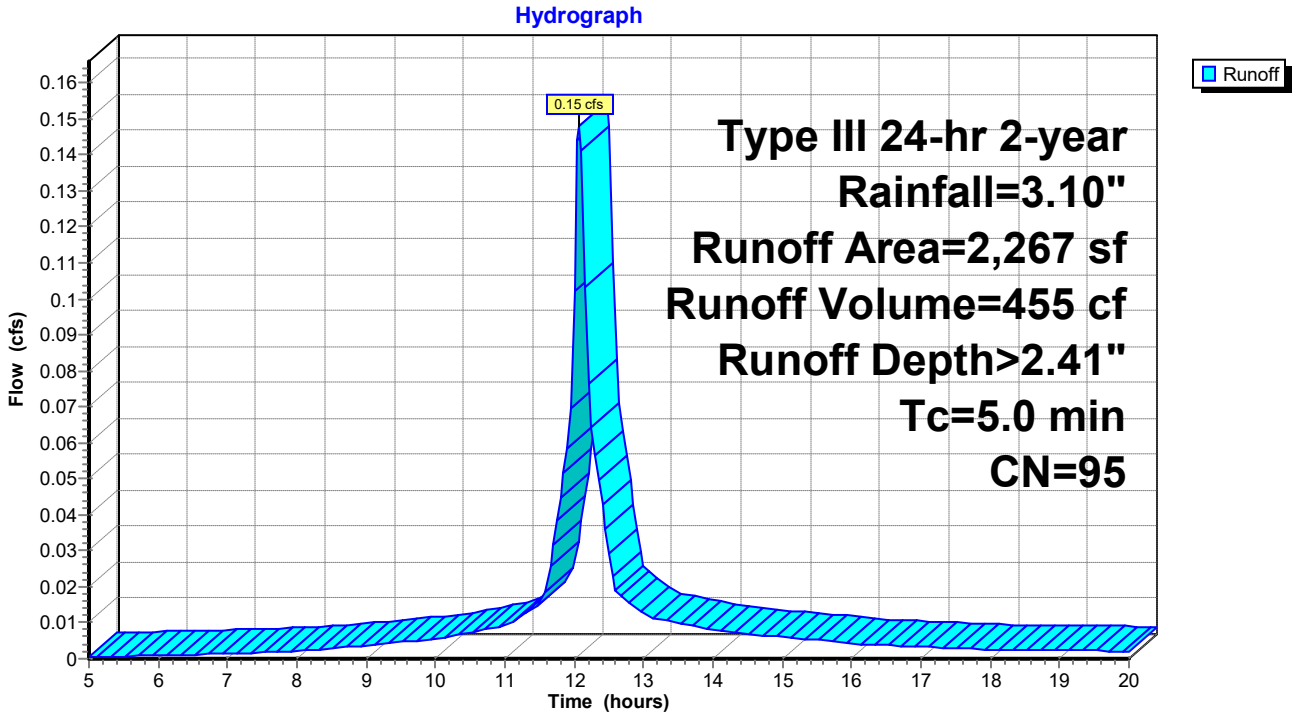
Runoff = 0.15 cfs @ 12.07 hrs, Volume= 455 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
323	74	>75% Grass cover, Good, HSG C
1,944	98	Paved parking, HSG C
2,267	95	Weighted Average
323		14.25% Pervious Area
1,944		85.75% Impervious Area

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

Subcatchment PWS-2: PWS-2

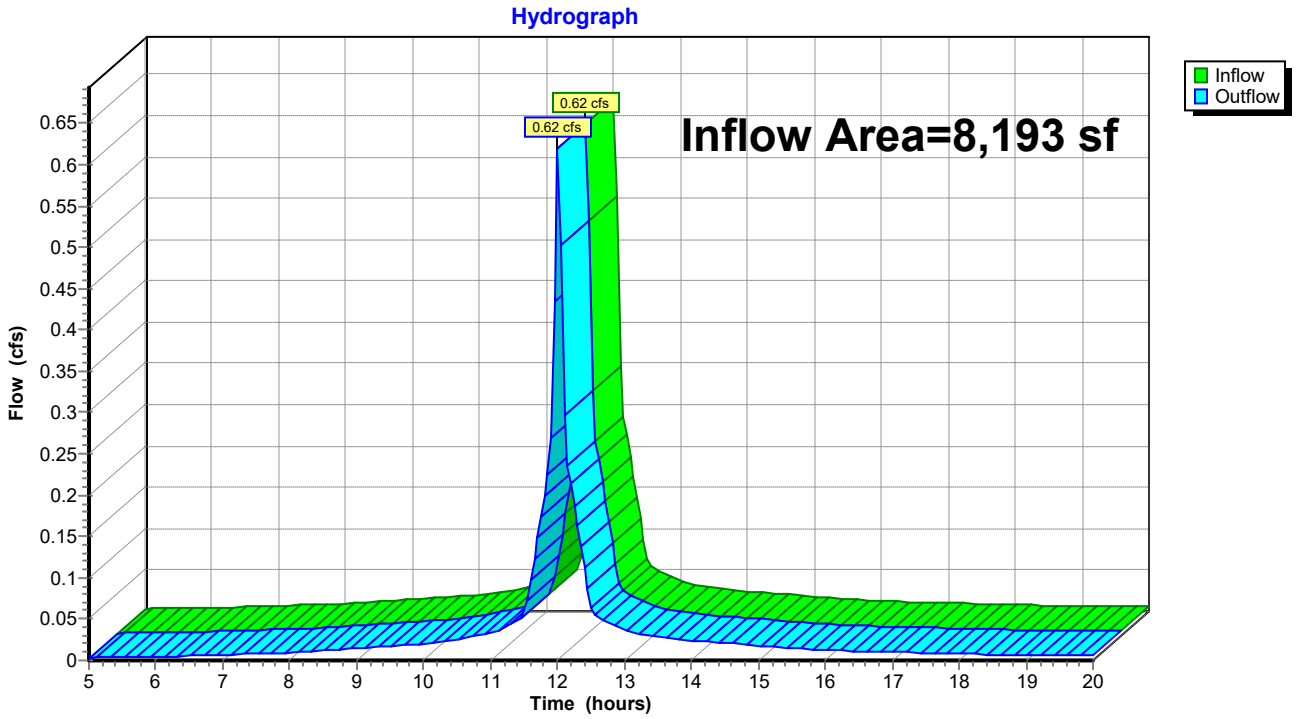


Summary for Reach DP-1: DP-1

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 2.29" for 2-year event
Inflow = 0.62 cfs @ 12.01 hrs, Volume= 1,566 cf
Outflow = 0.62 cfs @ 12.01 hrs, Volume= 1,566 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

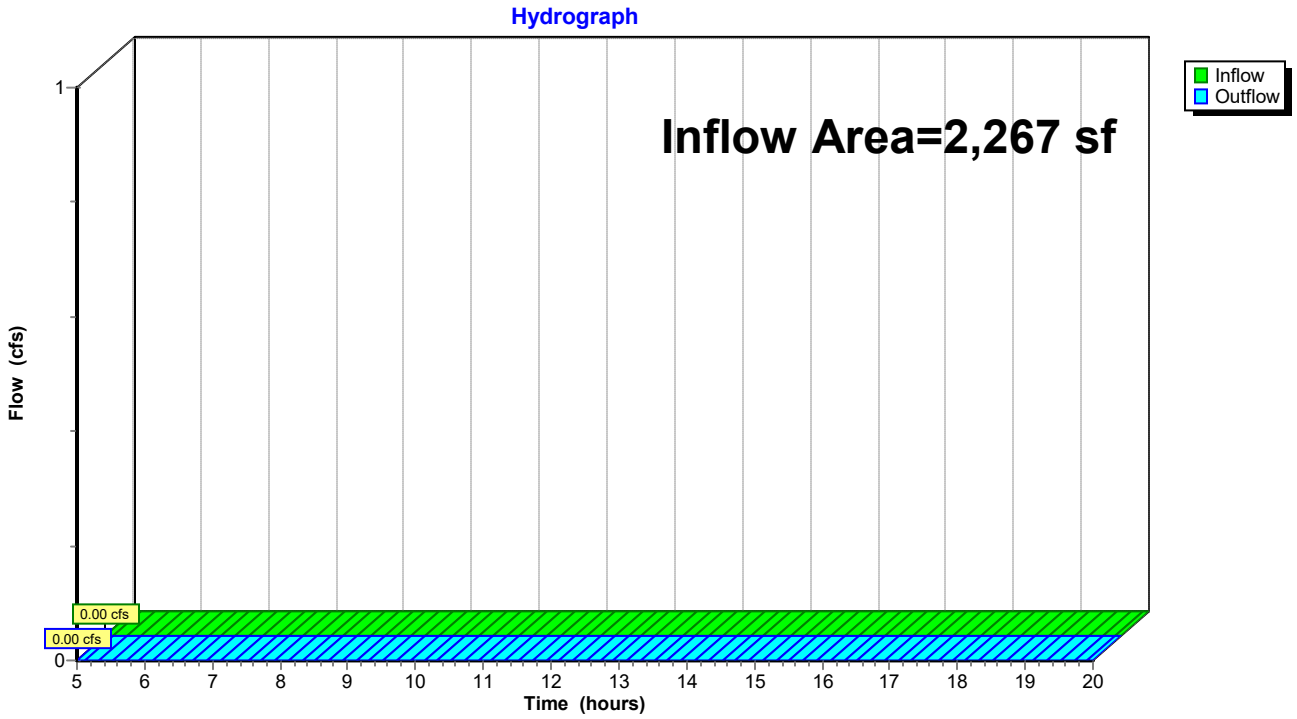


Summary for Reach DP-2: DP-2

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Summary for Pond P-1: 36" Perforated Pipe

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 2.60" for 2-year event
Inflow = 0.64 cfs @ 12.00 hrs, Volume= 1,772 cf
Outflow = 0.63 cfs @ 12.01 hrs, Volume= 1,772 cf, Atten= 1%, Lag= 0.3 min
Discarded = 0.01 cfs @ 11.55 hrs, Volume= 206 cf
Primary = 0.62 cfs @ 12.01 hrs, Volume= 1,566 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.55' @ 12.01 hrs Surf.Area= 210 sf Storage= 16 cf

Plug-Flow detention time= 0.6 min calculated for 1,766 cf (100% of inflow)
Center-of-Mass det. time= 0.5 min (740.0 - 739.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	78.40'	139 cf	**5.00'W x 42.00'L x 3.00'H Field A** 630 cf Overall - 282 cf Embedded = 348 cf x 40.0% Voids
#2A	78.40'	282 cf	**CMP_Round 36** x 2 Inside #1 Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf
		421 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.40'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	78.40'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 11.55 hrs HW=78.44' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.60 cfs @ 12.01 hrs HW=78.55' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.60 cfs @ 1.03 fps)

Pond P-1: 36" Perforated Pipe - Chamber Wizard Field A

Chamber Model = CMP_Round 36
Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf
Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf

36.0" Wide + 0.0" Spacing = 36.0" C-C

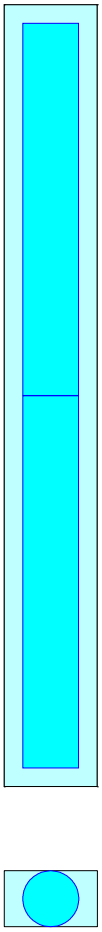
2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length
1 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 5.00' Base Width
36.0" Chamber Height + 0.0" Cover = 3.00' Field Height

2 Chambers x 141.1 cf = 282.3 cf Chamber Storage

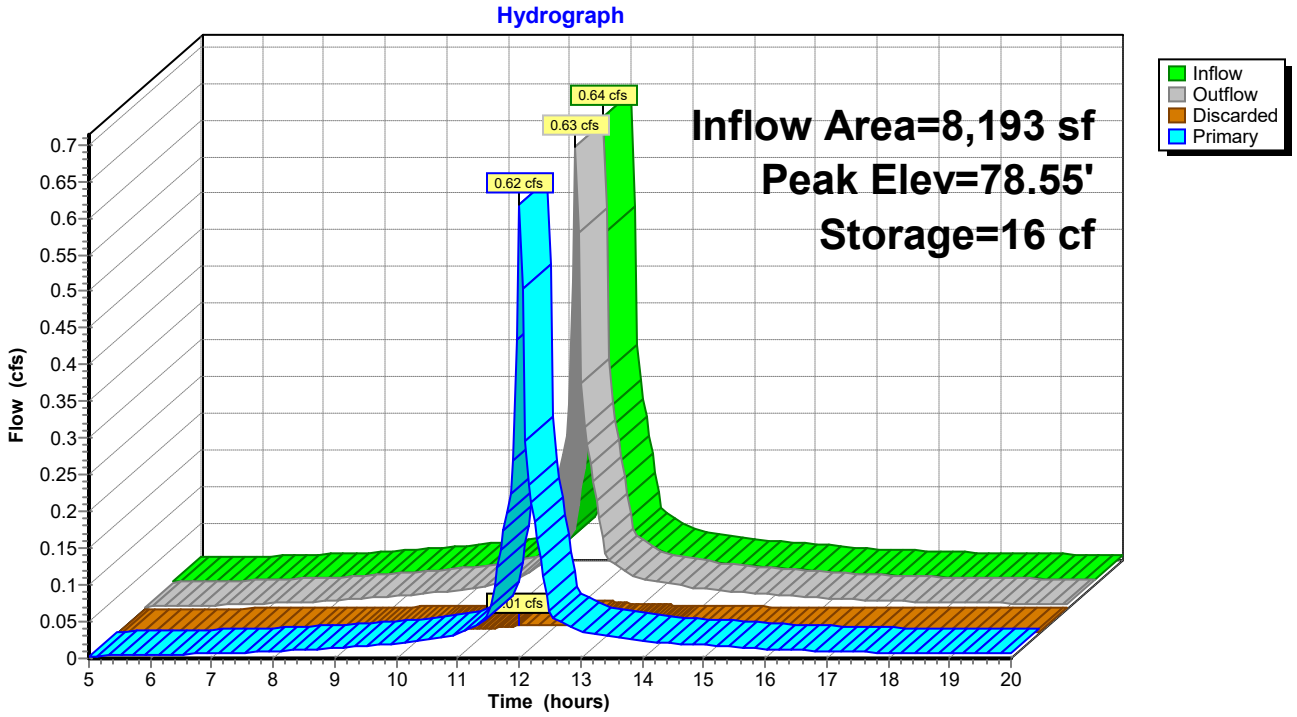
630.0 cf Field - 282.3 cf Chambers = 347.7 cf Stone x 40.0% Voids = 139.1 cf Stone Storage

Stone + Chamber Storage = 421.4 cf = 0.010 af

2 Chambers
23.3 cy Field
12.9 cy Stone



Pond P-1: 36" Perforated Pipe



Summary for Pond P-2: Subsurface Infiltration Facility

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth > 2.41" for 2-year event
Inflow = 0.15 cfs @ 12.07 hrs, Volume= 455 cf
Outflow = 0.01 cfs @ 11.70 hrs, Volume= 382 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.70 hrs, Volume= 382 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 14.82' @ 13.30 hrs Surf.Area= 190 sf Storage= 221 cf

Plug-Flow detention time= 185.4 min calculated for 381 cf (84% of inflow)
Center-of-Mass det. time= 139.2 min (892.5 - 753.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	13.00'	186 cf	**6.33'W x 30.00'L x 3.54'H Field A** 673 cf Overall - 209 cf Embedded = 464 cf x 40.0% Voids
#2A	13.50'	209 cf	**Cultec R-330XL** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
		394 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	13.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 11.70 hrs HW=13.51' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=13.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P-2: Subsurface Infiltration Facility - Chamber Wizard Field A

Chamber Model = Cultec R-330XL
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

52.0" Wide + 6.0" Spacing = 58.0" C-C

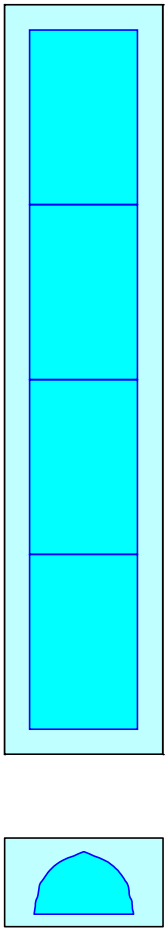
4 Chambers/Row x 7.00' Long = 28.00' + 12.0" End Stone x 2 = 30.00' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

4 Chambers x 52.2 cf = 208.6 cf Chamber Storage

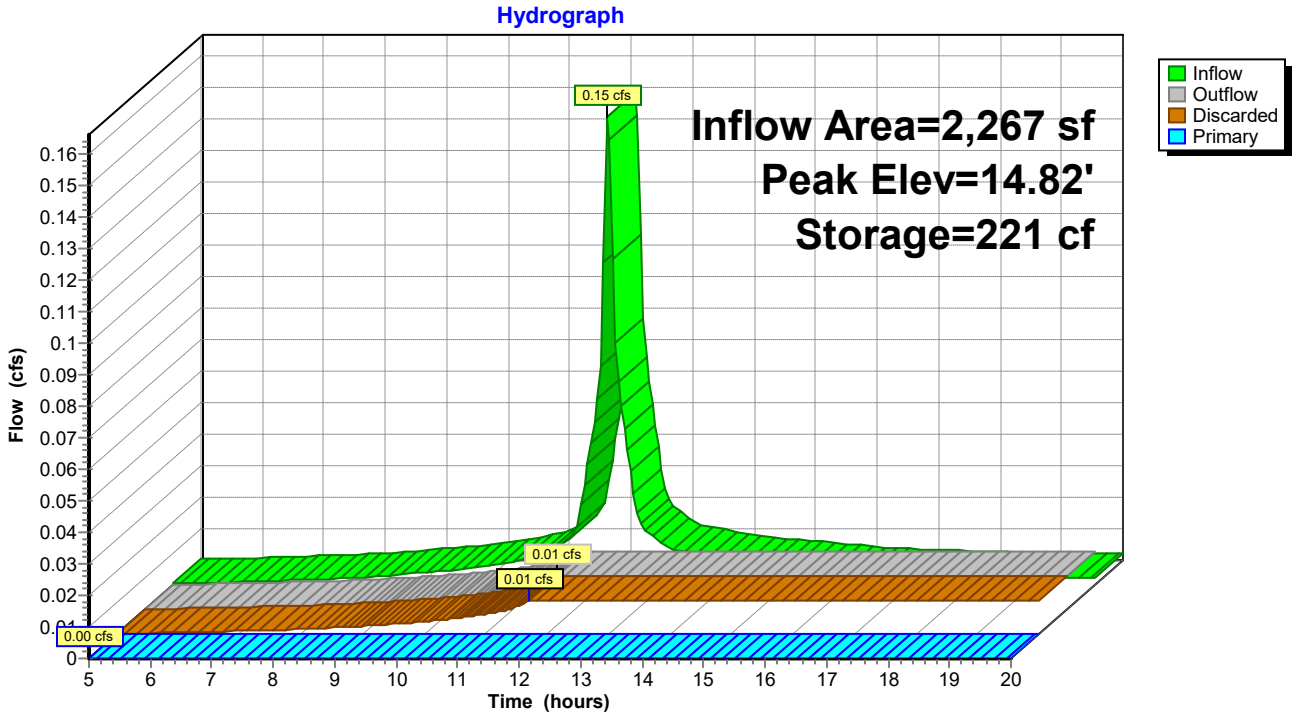
672.9 cf Field - 208.6 cf Chambers = 464.3 cf Stone x 40.0% Voids = 185.7 cf Stone Storage

Stone + Chamber Storage = 394.3 cf = 0.009 af

4 Chambers
24.9 cy Field
17.2 cy Stone



Pond P-2: Subsurface Infiltration Facility



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: PWS-1 Runoff Area=8,193 sf 95.18% Impervious Runoff Depth>3.98"
Tc=0.0 min CN=97 Runoff=0.96 cfs 2,715 cf

Subcatchment PWS-2: PWS-2 Runoff Area=2,267 sf 85.75% Impervious Runoff Depth>3.79"
Tc=5.0 min CN=95 Runoff=0.23 cfs 716 cf

Reach DP-1: DP-1 Inflow=0.94 cfs 2,427 cf
Outflow=0.94 cfs 2,427 cf

Reach DP-2: DP-2 Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond P-1: 36" Perforated Pipe Peak Elev=78.60' Storage=21 cf Inflow=0.96 cfs 2,715 cf
Discarded=0.01 cfs 287 cf Primary=0.94 cfs 2,427 cf Outflow=0.95 cfs 2,714 cf

Pond P-2: Subsurface Infiltration Facility Peak Elev=16.52' Storage=393 cf Inflow=0.23 cfs 716 cf
Discarded=0.01 cfs 427 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 427 cf

Total Runoff Area = 10,460 sf Runoff Volume = 3,431 cf Average Runoff Depth = 3.94"
6.86% Pervious = 718 sf 93.14% Impervious = 9,742 sf

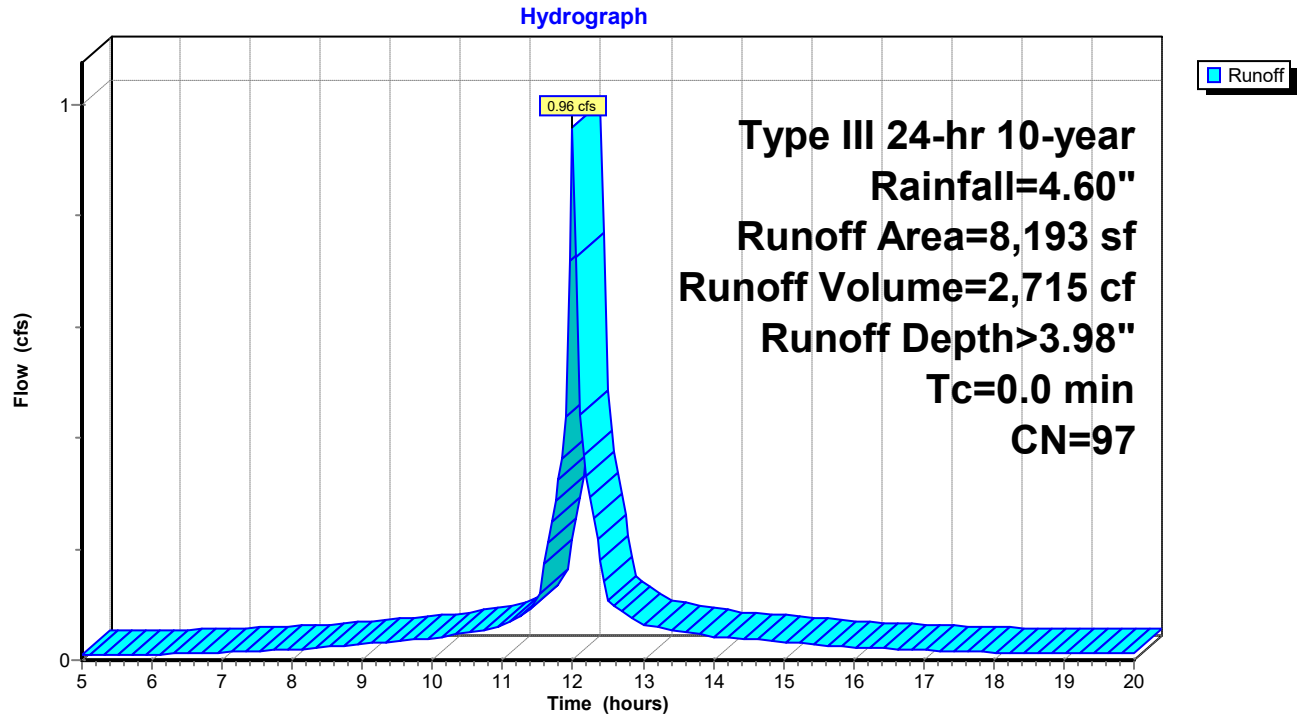
Summary for Subcatchment PWS-1: PWS-1

Runoff = 0.96 cfs @ 12.00 hrs, Volume= 2,715 cf, Depth> 3.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
395	74	>75% Grass cover, Good, HSG C
1,814	98	Paved parking, HSG C
5,984	98	Roofs, HSG C
8,193	97	Weighted Average
395		4.82% Pervious Area
7,798		95.18% Impervious Area

Subcatchment PWS-1: PWS-1



Summary for Subcatchment PWS-2: PWS-2

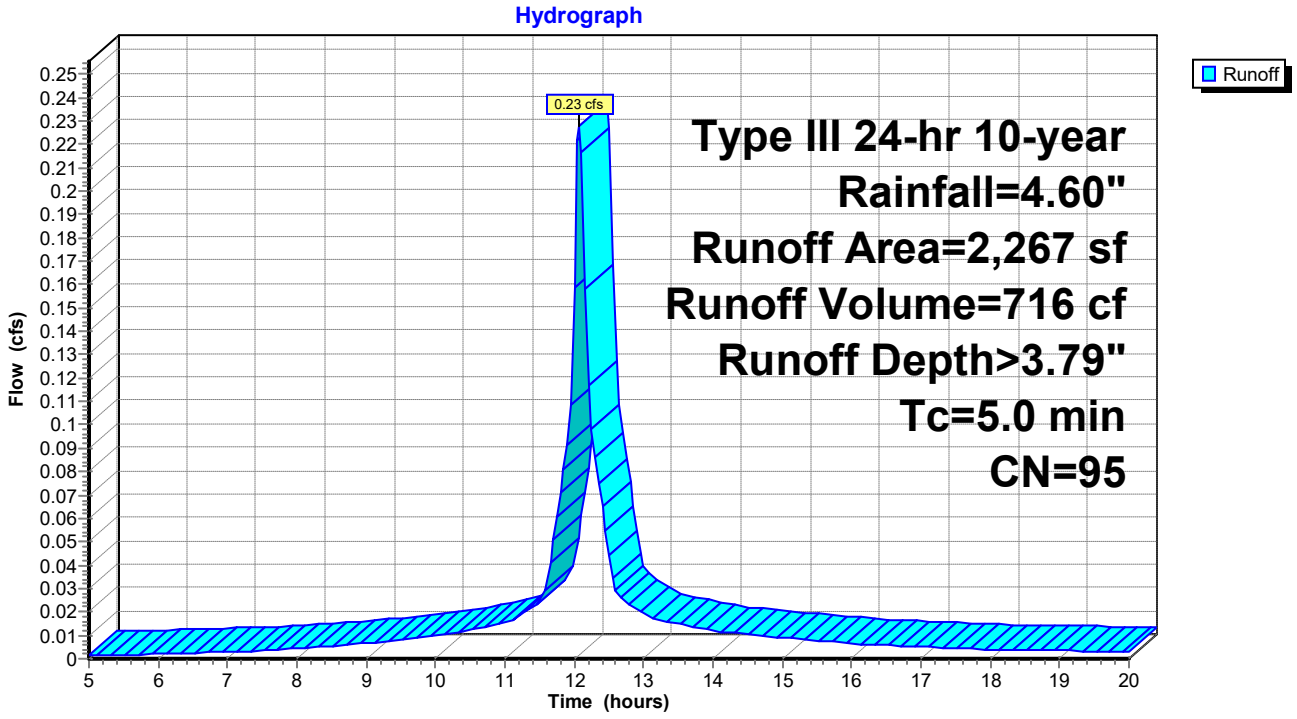
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 716 cf, Depth> 3.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
323	74	>75% Grass cover, Good, HSG C
1,944	98	Paved parking, HSG C
2,267	95	Weighted Average
323		14.25% Pervious Area
1,944		85.75% Impervious Area

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

Subcatchment PWS-2: PWS-2

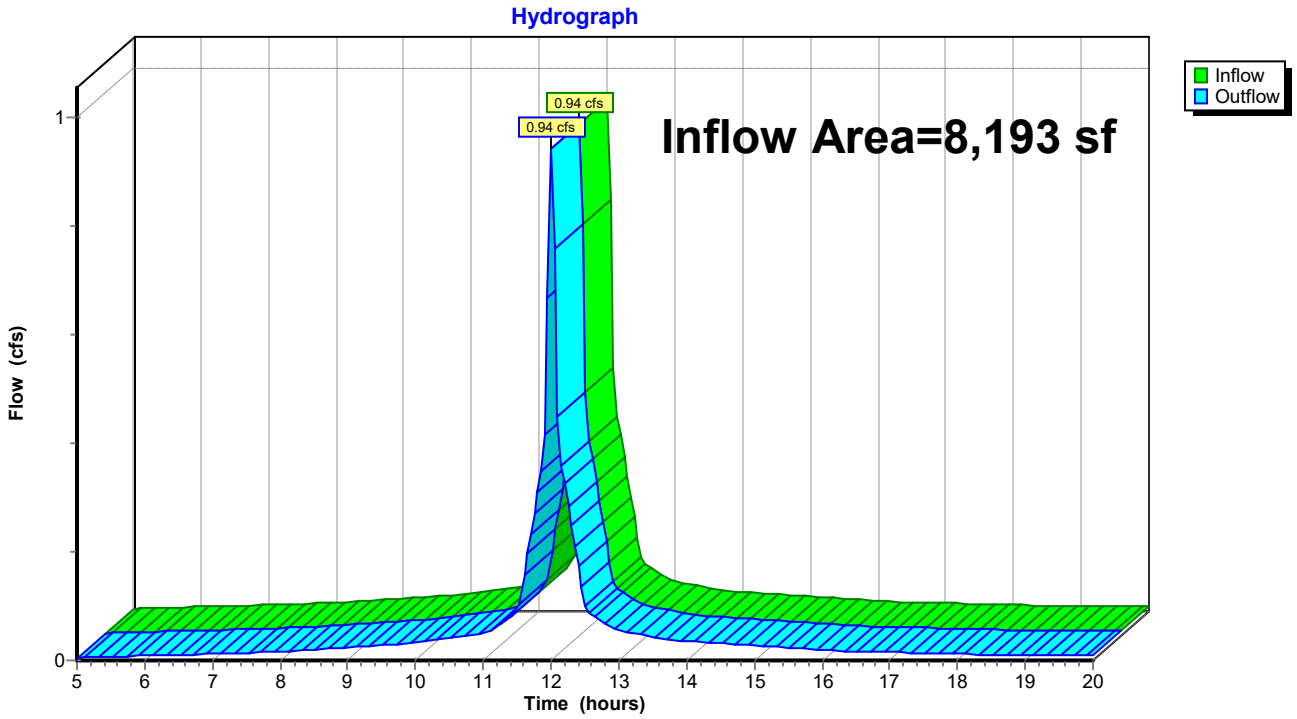


Summary for Reach DP-1: DP-1

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 3.55" for 10-year event
Inflow = 0.94 cfs @ 12.00 hrs, Volume= 2,427 cf
Outflow = 0.94 cfs @ 12.00 hrs, Volume= 2,427 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

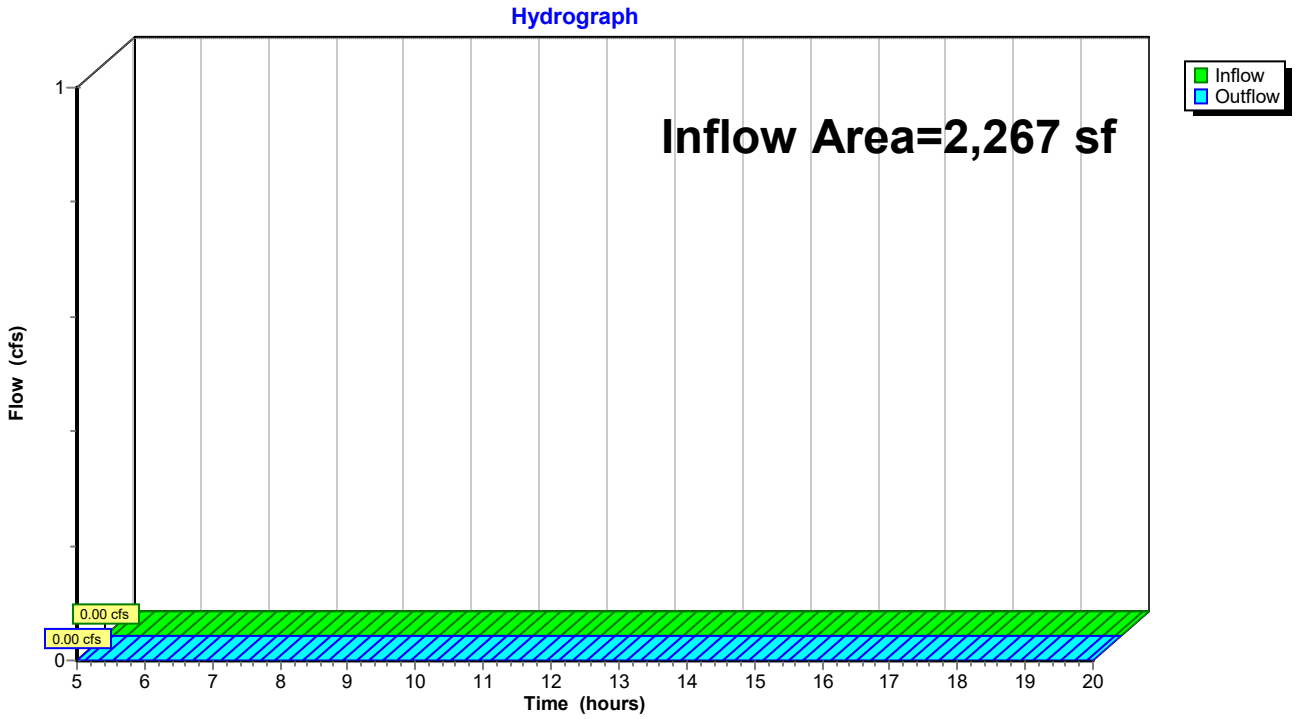


Summary for Reach DP-2: DP-2

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth = 0.00" for 10-year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Summary for Pond P-1: 36" Perforated Pipe

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 3.98" for 10-year event
Inflow = 0.96 cfs @ 12.00 hrs, Volume= 2,715 cf
Outflow = 0.95 cfs @ 12.00 hrs, Volume= 2,714 cf, Atten= 1%, Lag= 0.3 min
Discarded = 0.01 cfs @ 11.15 hrs, Volume= 287 cf
Primary = 0.94 cfs @ 12.00 hrs, Volume= 2,427 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.60' @ 12.01 hrs Surf.Area= 210 sf Storage= 21 cf

Plug-Flow detention time= 0.6 min calculated for 2,714 cf (100% of inflow)
Center-of-Mass det. time= 0.5 min (735.1 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	78.40'	139 cf	**5.00'W x 42.00'L x 3.00'H Field A** 630 cf Overall - 282 cf Embedded = 348 cf x 40.0% Voids
#2A	78.40'	282 cf	**CMP_Round 36** x 2 Inside #1 Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf
		421 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.40'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	78.40'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 11.15 hrs HW=78.43' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.92 cfs @ 12.00 hrs HW=78.59' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.92 cfs @ 1.18 fps)

Pond P-1: 36" Perforated Pipe - Chamber Wizard Field A

Chamber Model = CMP_Round 36
Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf
Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf

36.0" Wide + 0.0" Spacing = 36.0" C-C

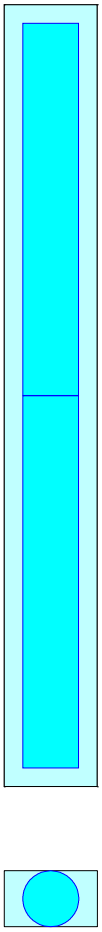
2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length
1 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 5.00' Base Width
36.0" Chamber Height + 0.0" Cover = 3.00' Field Height

2 Chambers x 141.1 cf = 282.3 cf Chamber Storage

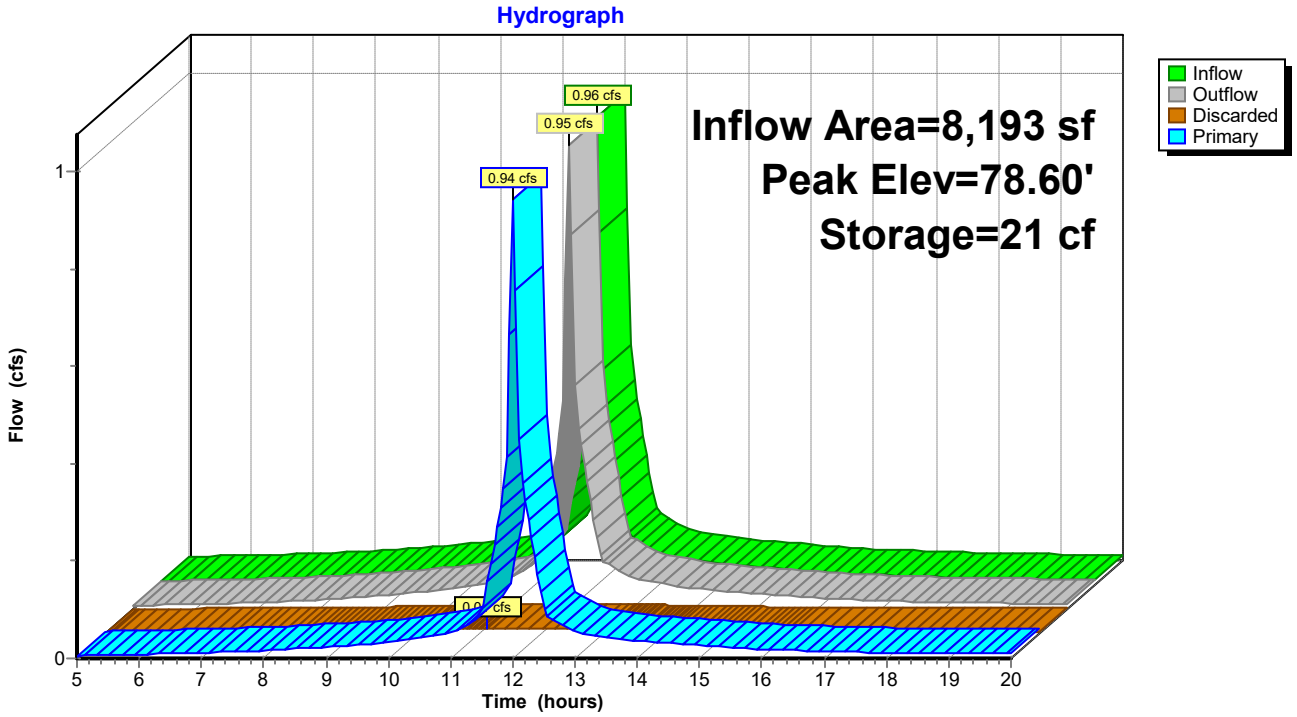
630.0 cf Field - 282.3 cf Chambers = 347.7 cf Stone x 40.0% Voids = 139.1 cf Stone Storage

Stone + Chamber Storage = 421.4 cf = 0.010 af

2 Chambers
23.3 cy Field
12.9 cy Stone



Pond P-1: 36" Perforated Pipe



Summary for Pond P-2: Subsurface Infiltration Facility

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth > 3.79" for 10-year event
Inflow = 0.23 cfs @ 12.07 hrs, Volume= 716 cf
Outflow = 0.01 cfs @ 11.00 hrs, Volume= 427 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.00 hrs, Volume= 427 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 16.52' @ 14.46 hrs Surf.Area= 190 sf Storage= 393 cf

Plug-Flow detention time= 190.3 min calculated for 425 cf (59% of inflow)
Center-of-Mass det. time= 112.4 min (857.9 - 745.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	13.00'	186 cf	**6.33'W x 30.00'L x 3.54'H Field A** 673 cf Overall - 209 cf Embedded = 464 cf x 40.0% Voids
#2A	13.50'	209 cf	**Cultec R-330XL** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
		394 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	13.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 11.00 hrs HW=13.50' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=13.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P-2: Subsurface Infiltration Facility - Chamber Wizard Field A

Chamber Model = Cultec R-330XL
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

52.0" Wide + 6.0" Spacing = 58.0" C-C

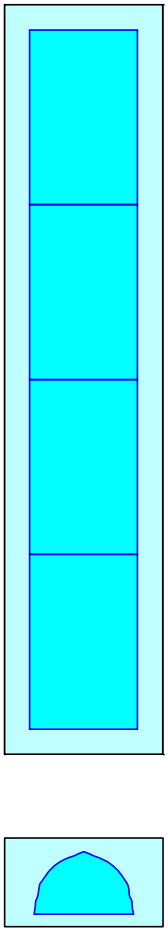
4 Chambers/Row x 7.00' Long = 28.00' + 12.0" End Stone x 2 = 30.00' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

4 Chambers x 52.2 cf = 208.6 cf Chamber Storage

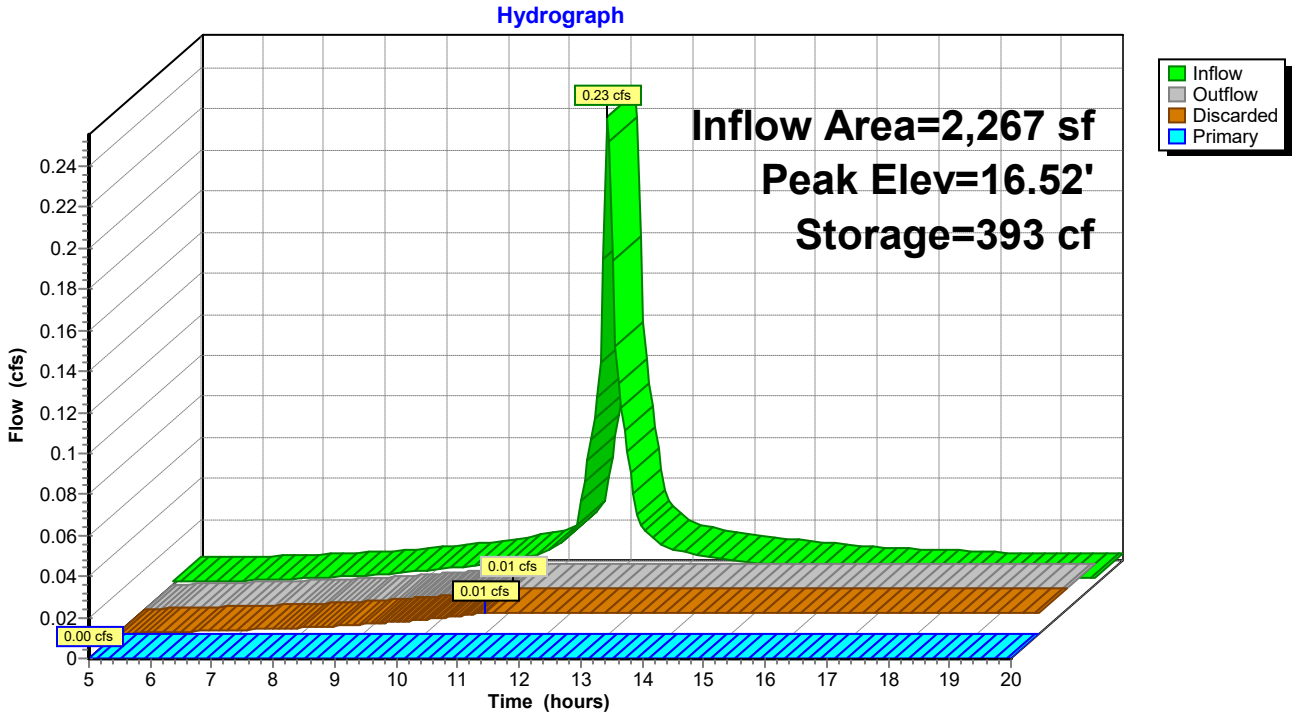
672.9 cf Field - 208.6 cf Chambers = 464.3 cf Stone x 40.0% Voids = 185.7 cf Stone Storage

Stone + Chamber Storage = 394.3 cf = 0.009 af

4 Chambers
24.9 cy Field
17.2 cy Stone



Pond P-2: Subsurface Infiltration Facility



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: PWS-1 Runoff Area=8,193 sf 95.18% Impervious Runoff Depth>4.80"
Tc=0.0 min CN=97 Runoff=1.15 cfs 3,278 cf

Subcatchment PWS-2: PWS-2 Runoff Area=2,267 sf 85.75% Impervious Runoff Depth>4.62"
Tc=5.0 min CN=95 Runoff=0.28 cfs 873 cf

Reach DP-1: DP-1 Inflow=1.13 cfs 2,947 cf
Outflow=1.13 cfs 2,947 cf

Reach DP-2: DP-2 Inflow=0.11 cfs 191 cf
Outflow=0.11 cfs 191 cf

Pond P-1: 36" Perforated Pipe Peak Elev=78.62' Storage=24 cf Inflow=1.15 cfs 3,278 cf
Discarded=0.01 cfs 330 cf Primary=1.13 cfs 2,947 cf Outflow=1.14 cfs 3,277 cf

Pond P-2: Subsurface Infiltration Facility Peak Elev=80.71' Storage=394 cf Inflow=0.28 cfs 873 cf
Discarded=0.01 cfs 448 cf Primary=0.11 cfs 191 cf Outflow=0.12 cfs 639 cf

Total Runoff Area = 10,460 sf Runoff Volume = 4,151 cf Average Runoff Depth = 4.76"
6.86% Pervious = 718 sf 93.14% Impervious = 9,742 sf

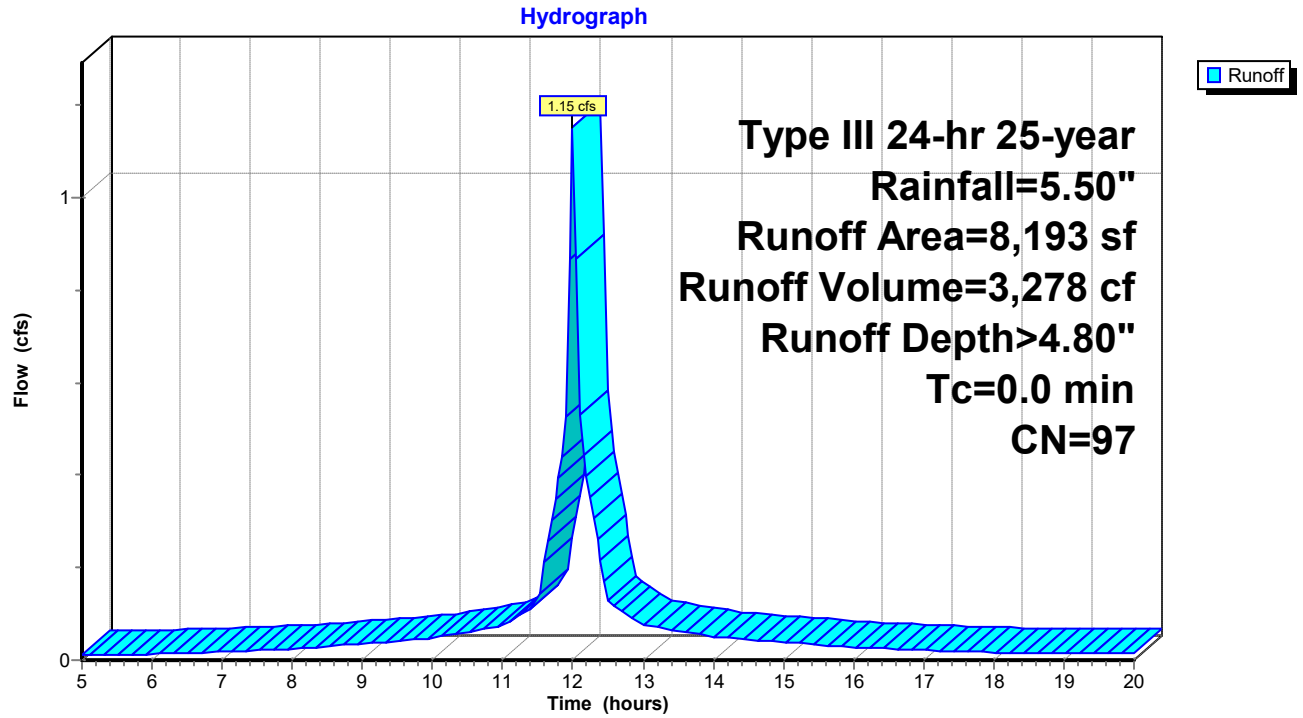
Summary for Subcatchment PWS-1: PWS-1

Runoff = 1.15 cfs @ 12.00 hrs, Volume= 3,278 cf, Depth> 4.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
395	74	>75% Grass cover, Good, HSG C
1,814	98	Paved parking, HSG C
5,984	98	Roofs, HSG C
8,193	97	Weighted Average
395		4.82% Pervious Area
7,798		95.18% Impervious Area

Subcatchment PWS-1: PWS-1



Summary for Subcatchment PWS-2: PWS-2

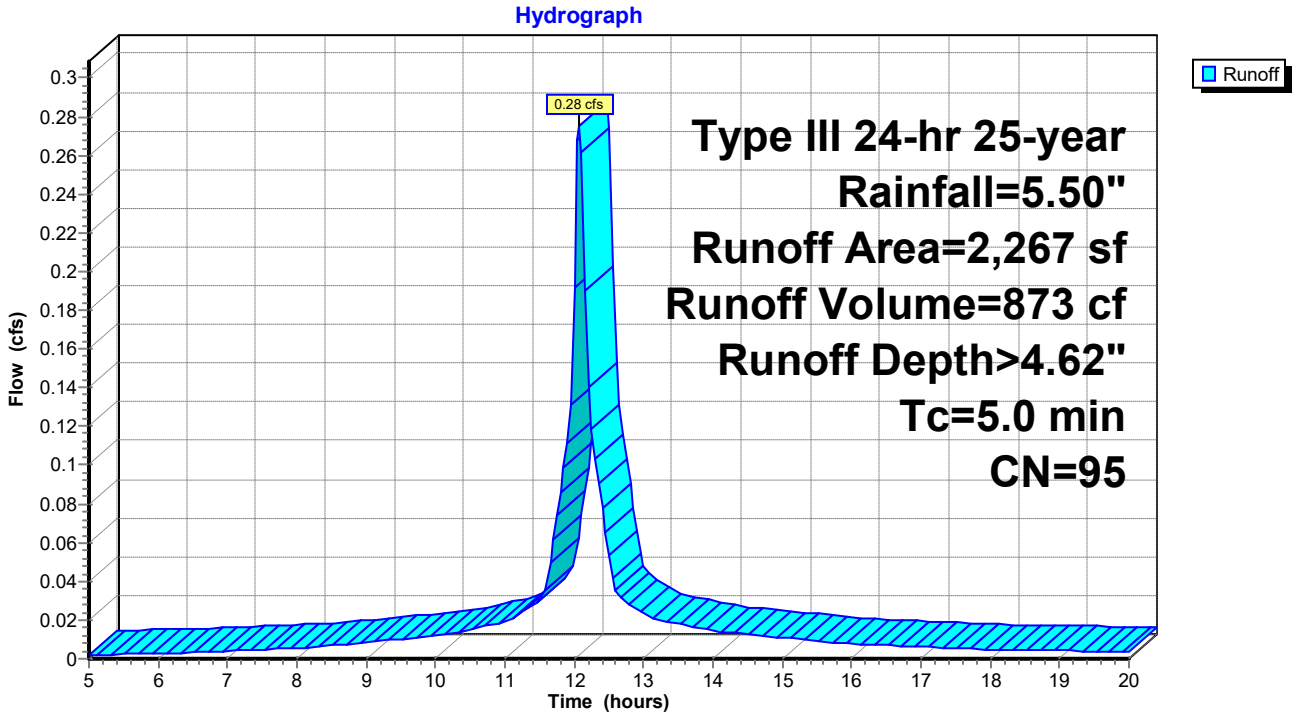
Runoff = 0.28 cfs @ 12.07 hrs, Volume= 873 cf, Depth> 4.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=5.50"

Area (sf)	CN	Description
323	74	>75% Grass cover, Good, HSG C
1,944	98	Paved parking, HSG C
2,267	95	Weighted Average
323		14.25% Pervious Area
1,944		85.75% Impervious Area

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

Subcatchment PWS-2: PWS-2

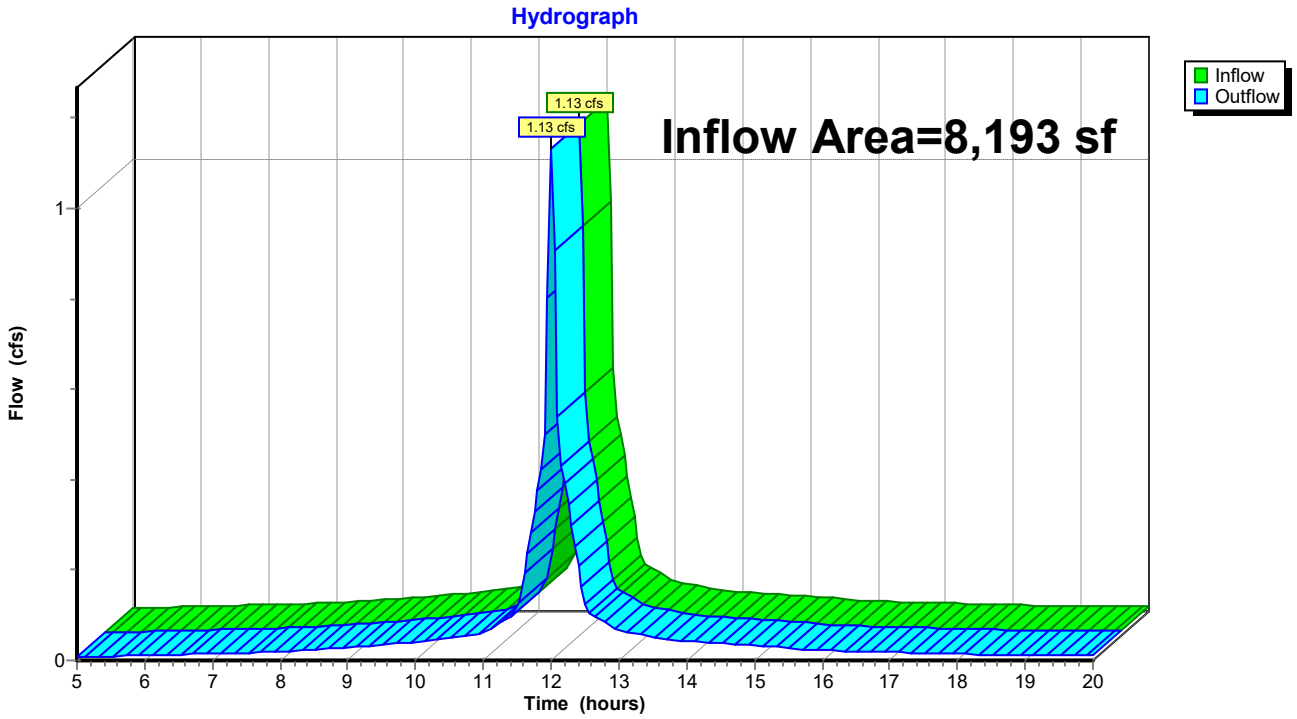


Summary for Reach DP-1: DP-1

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 4.32" for 25-year event
Inflow = 1.13 cfs @ 12.00 hrs, Volume= 2,947 cf
Outflow = 1.13 cfs @ 12.00 hrs, Volume= 2,947 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

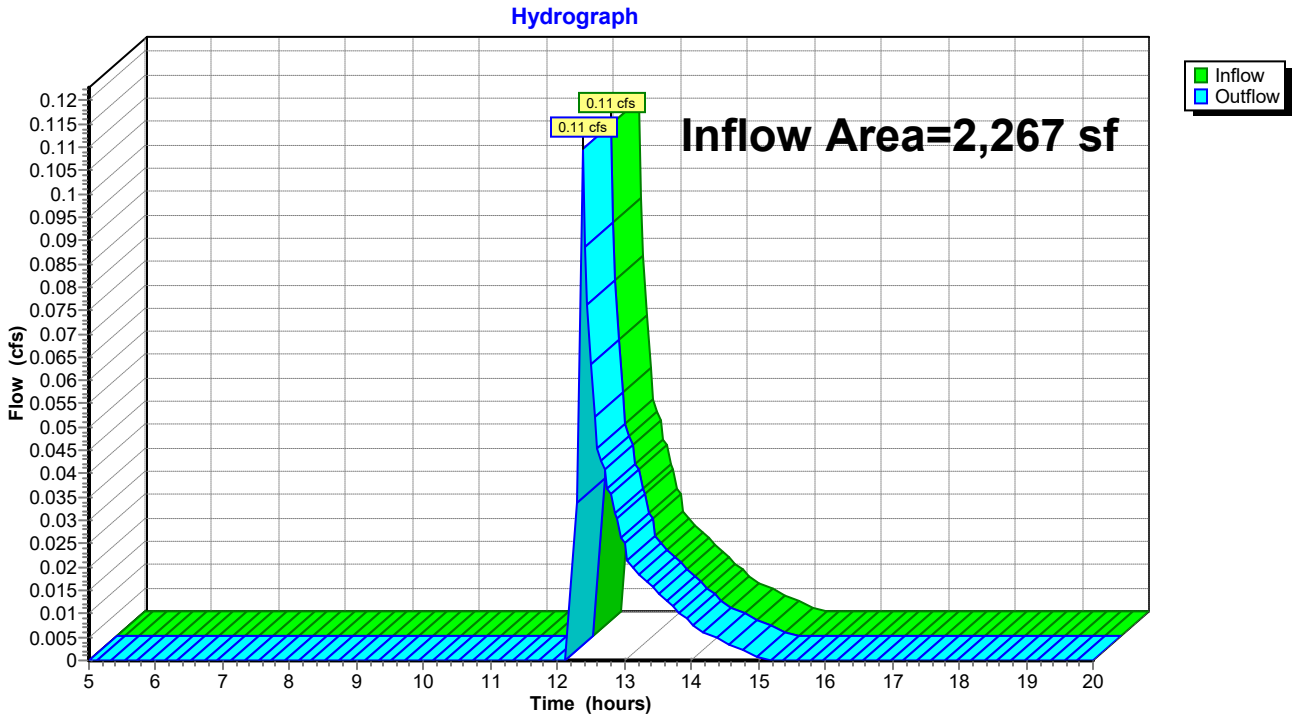


Summary for Reach DP-2: DP-2

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth = 1.01" for 25-year event
Inflow = 0.11 cfs @ 12.37 hrs, Volume= 191 cf
Outflow = 0.11 cfs @ 12.37 hrs, Volume= 191 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Summary for Pond P-1: 36" Perforated Pipe

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 4.80" for 25-year event
Inflow = 1.15 cfs @ 12.00 hrs, Volume= 3,278 cf
Outflow = 1.14 cfs @ 12.00 hrs, Volume= 3,277 cf, Atten= 1%, Lag= 0.3 min
Discarded = 0.01 cfs @ 10.80 hrs, Volume= 330 cf
Primary = 1.13 cfs @ 12.00 hrs, Volume= 2,947 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.62' @ 12.00 hrs Surf.Area= 210 sf Storage= 24 cf

Plug-Flow detention time= 0.6 min calculated for 3,266 cf (100% of inflow)
Center-of-Mass det. time= 0.5 min (733.4 - 732.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	78.40'	139 cf	**5.00'W x 42.00'L x 3.00'H Field A** 630 cf Overall - 282 cf Embedded = 348 cf x 40.0% Voids
#2A	78.40'	282 cf	**CMP_Round 36** x 2 Inside #1 Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf
		421 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.40'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	78.40'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 10.80 hrs HW=78.43' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.11 cfs @ 12.00 hrs HW=78.62' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.11 cfs @ 1.26 fps)

Pond P-1: 36" Perforated Pipe - Chamber Wizard Field A

Chamber Model = CMP_Round 36
Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf
Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf

36.0" Wide + 0.0" Spacing = 36.0" C-C

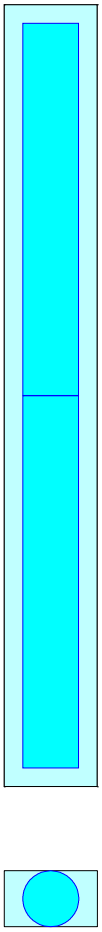
2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length
1 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 5.00' Base Width
36.0" Chamber Height + 0.0" Cover = 3.00' Field Height

2 Chambers x 141.1 cf = 282.3 cf Chamber Storage

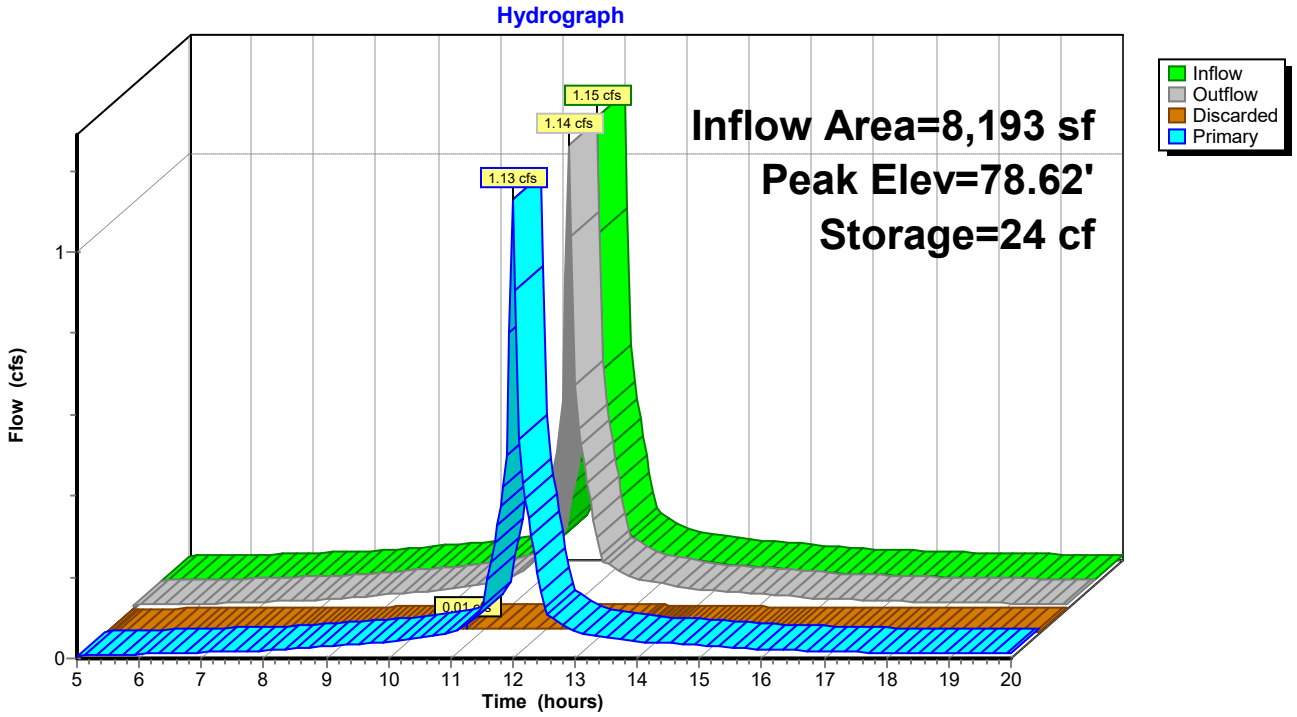
630.0 cf Field - 282.3 cf Chambers = 347.7 cf Stone x 40.0% Voids = 139.1 cf Stone Storage

Stone + Chamber Storage = 421.4 cf = 0.010 af

2 Chambers
23.3 cy Field
12.9 cy Stone



Pond P-1: 36" Perforated Pipe



Summary for Pond P-2: Subsurface Infiltration Facility

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth > 4.62" for 25-year event
Inflow = 0.28 cfs @ 12.07 hrs, Volume= 873 cf
Outflow = 0.12 cfs @ 12.37 hrs, Volume= 639 cf, Atten= 56%, Lag= 17.9 min
Discarded = 0.01 cfs @ 10.50 hrs, Volume= 448 cf
Primary = 0.11 cfs @ 12.37 hrs, Volume= 191 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 80.71' @ 12.35 hrs Surf.Area= 190 sf Storage= 394 cf

Plug-Flow detention time= 142.9 min calculated for 637 cf (73% of inflow)
Center-of-Mass det. time= 80.1 min (822.8 - 742.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	13.00'	186 cf	**6.33'W x 30.00'L x 3.54'H Field A** 673 cf Overall - 209 cf Embedded = 464 cf x 40.0% Voids
#2A	13.50'	209 cf	**Cultec R-330XL** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
		394 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	13.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 10.50 hrs HW=13.50' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 12.37 hrs HW=80.71' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.28 fps)

Pond P-2: Subsurface Infiltration Facility - Chamber Wizard Field A

Chamber Model = Cultec R-330XL
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

52.0" Wide + 6.0" Spacing = 58.0" C-C

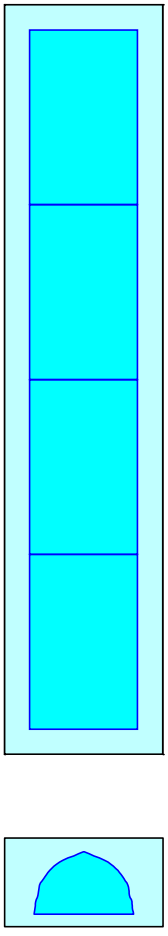
4 Chambers/Row x 7.00' Long = 28.00' + 12.0" End Stone x 2 = 30.00' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

4 Chambers x 52.2 cf = 208.6 cf Chamber Storage

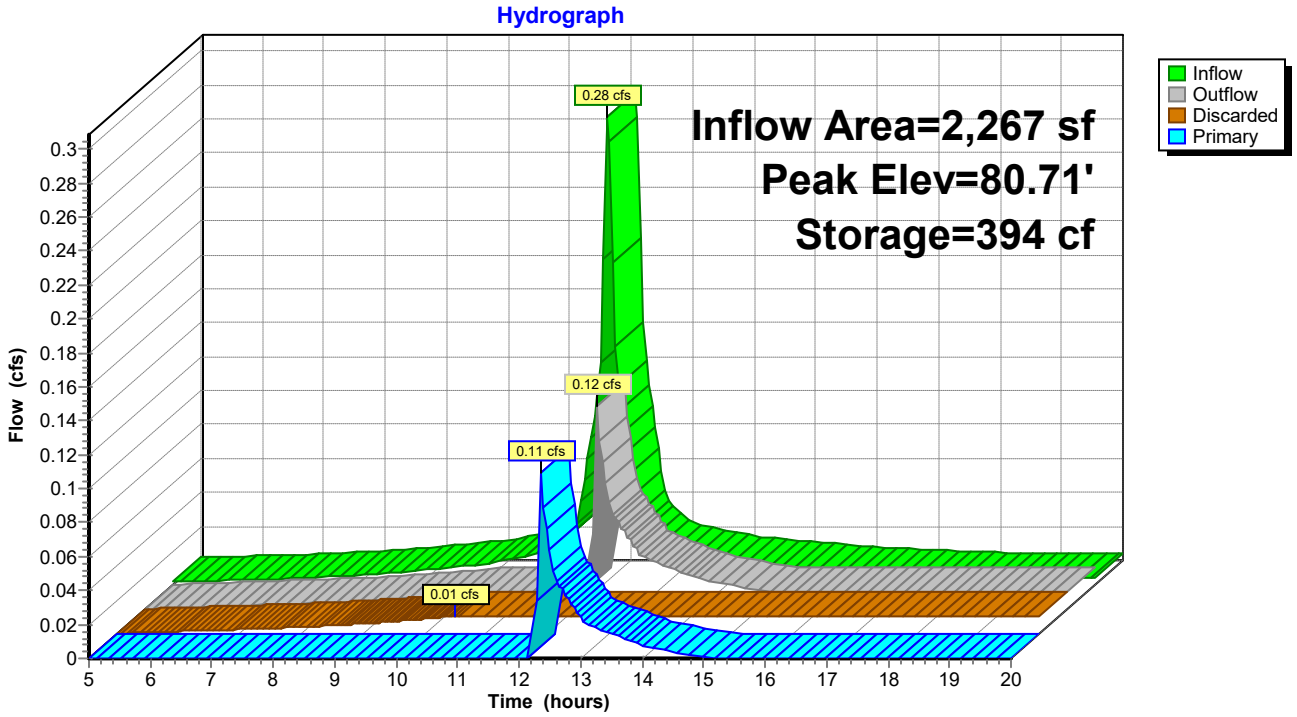
672.9 cf Field - 208.6 cf Chambers = 464.3 cf Stone x 40.0% Voids = 185.7 cf Stone Storage

Stone + Chamber Storage = 394.3 cf = 0.009 af

4 Chambers
24.9 cy Field
17.2 cy Stone



Pond P-2: Subsurface Infiltration Facility



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWS-1: PWS-1 Runoff Area=8,193 sf 95.18% Impervious Runoff Depth>5.99"
Tc=0.0 min CN=97 Runoff=1.43 cfs 4,089 cf

Subcatchment PWS-2: PWS-2 Runoff Area=2,267 sf 85.75% Impervious Runoff Depth>5.82"
Tc=5.0 min CN=95 Runoff=0.34 cfs 1,099 cf

Reach DP-1: DP-1 Inflow=1.41 cfs 3,707 cf
Outflow=1.41 cfs 3,707 cf

Reach DP-2: DP-2 Inflow=0.31 cfs 484 cf
Outflow=0.31 cfs 484 cf

Pond P-1: 36" Perforated Pipe Peak Elev=78.66' Storage=29 cf Inflow=1.43 cfs 4,089 cf
Discarded=0.01 cfs 381 cf Primary=1.41 cfs 3,707 cf Outflow=1.42 cfs 4,088 cf

Pond P-2: Subsurface Infiltration Facility Peak Elev=80.73' Storage=394 cf Inflow=0.34 cfs 1,099 cf
Discarded=0.01 cfs 473 cf Primary=0.31 cfs 484 cf Outflow=0.32 cfs 957 cf

Total Runoff Area = 10,460 sf Runoff Volume = 5,188 cf Average Runoff Depth = 5.95"
6.86% Pervious = 718 sf 93.14% Impervious = 9,742 sf

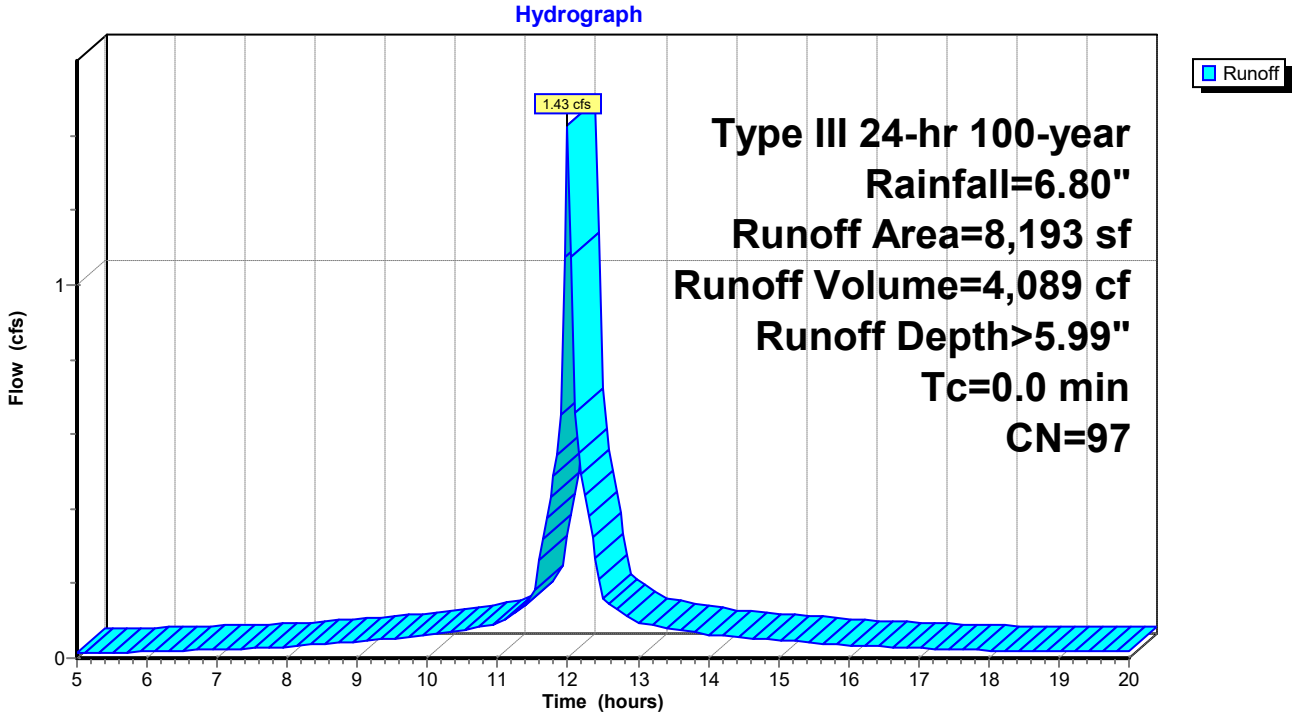
Summary for Subcatchment PWS-1: PWS-1

Runoff = 1.43 cfs @ 12.00 hrs, Volume= 4,089 cf, Depth> 5.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
395	74	>75% Grass cover, Good, HSG C
1,814	98	Paved parking, HSG C
5,984	98	Roofs, HSG C
8,193	97	Weighted Average
395		4.82% Pervious Area
7,798		95.18% Impervious Area

Subcatchment PWS-1: PWS-1



Summary for Subcatchment PWS-2: PWS-2

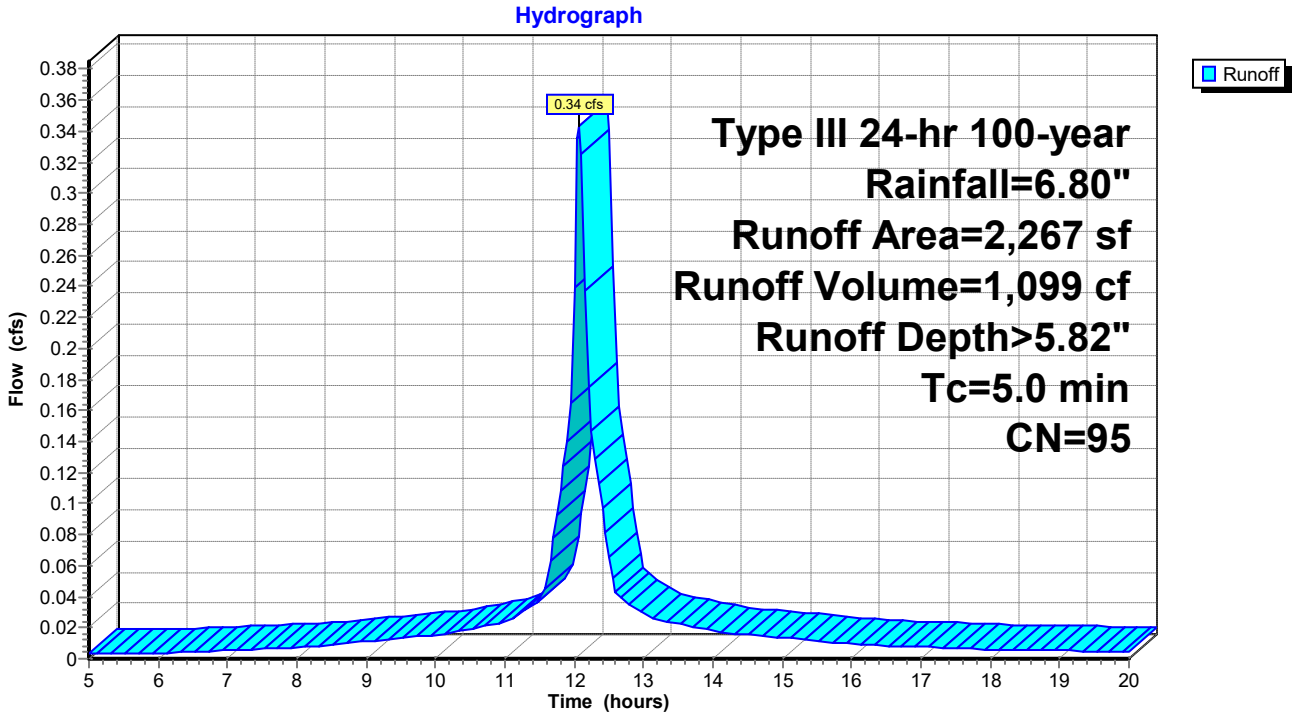
Runoff = 0.34 cfs @ 12.07 hrs, Volume= 1,099 cf, Depth> 5.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
323	74	>75% Grass cover, Good, HSG C
1,944	98	Paved parking, HSG C
2,267	95	Weighted Average
323		14.25% Pervious Area
1,944		85.75% Impervious Area

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

Subcatchment PWS-2: PWS-2

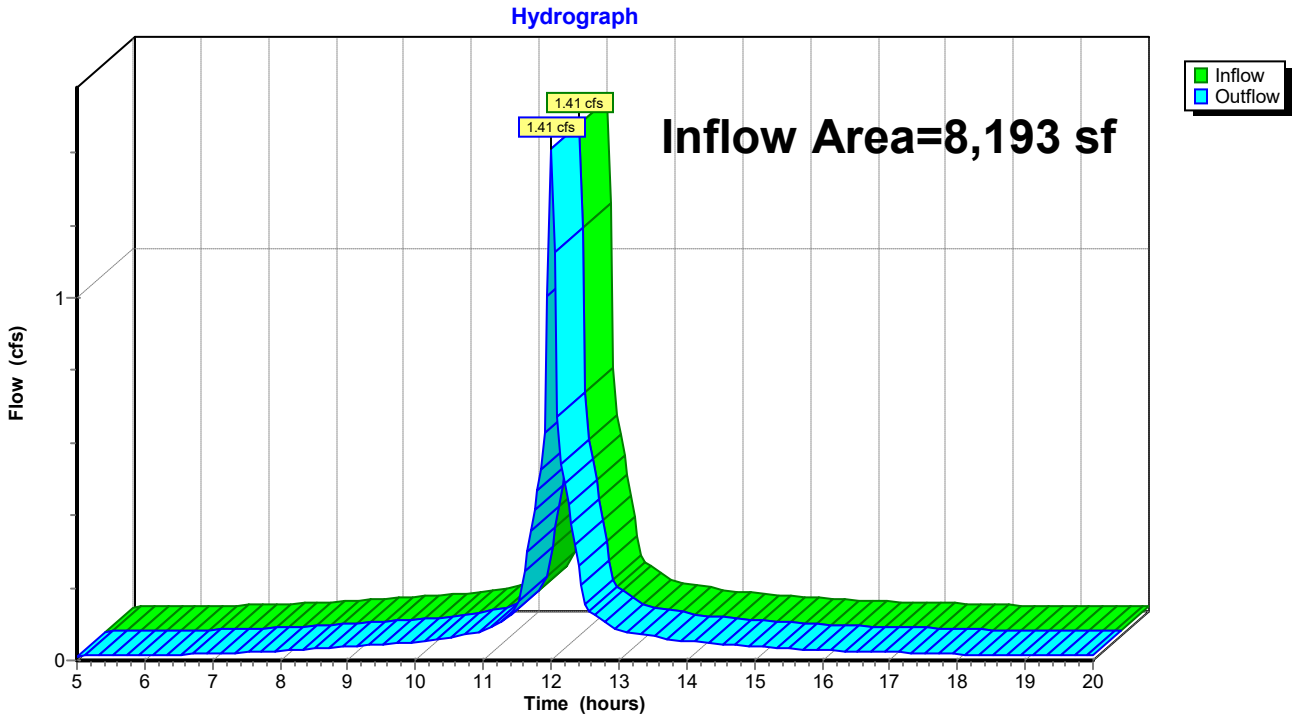


Summary for Reach DP-1: DP-1

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 5.43" for 100-year event
Inflow = 1.41 cfs @ 12.00 hrs, Volume= 3,707 cf
Outflow = 1.41 cfs @ 12.00 hrs, Volume= 3,707 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: DP-1

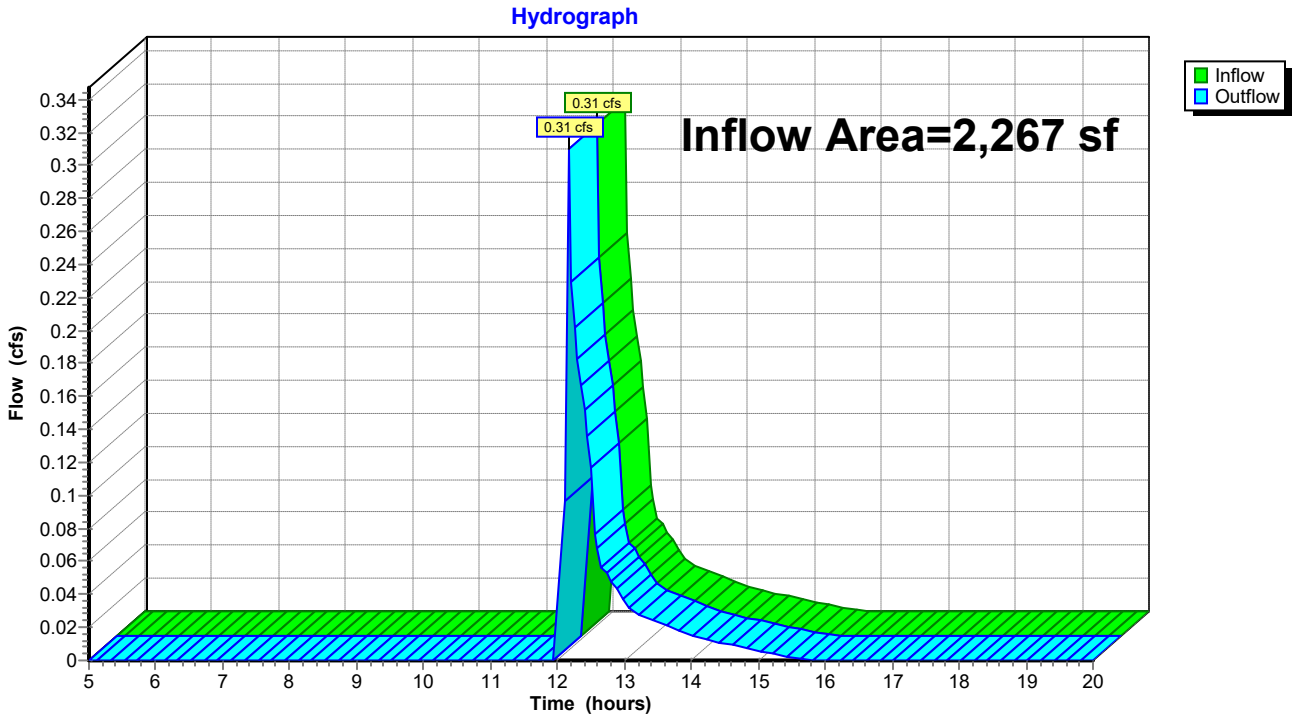


Summary for Reach DP-2: DP-2

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth = 2.56" for 100-year event
Inflow = 0.31 cfs @ 12.17 hrs, Volume= 484 cf
Outflow = 0.31 cfs @ 12.17 hrs, Volume= 484 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: DP-2



Summary for Pond P-1: 36" Perforated Pipe

Inflow Area = 8,193 sf, 95.18% Impervious, Inflow Depth > 5.99" for 100-year event
Inflow = 1.43 cfs @ 12.00 hrs, Volume= 4,089 cf
Outflow = 1.42 cfs @ 12.00 hrs, Volume= 4,088 cf, Atten= 1%, Lag= 0.3 min
Discarded = 0.01 cfs @ 10.25 hrs, Volume= 381 cf
Primary = 1.41 cfs @ 12.00 hrs, Volume= 3,707 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.66' @ 12.00 hrs Surf.Area= 210 sf Storage= 29 cf

Plug-Flow detention time= 0.6 min calculated for 4,074 cf (100% of inflow)
Center-of-Mass det. time= 0.5 min (731.8 - 731.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	78.40'	139 cf	**5.00'W x 42.00'L x 3.00'H Field A** 630 cf Overall - 282 cf Embedded = 348 cf x 40.0% Voids
#2A	78.40'	282 cf	**CMP_Round 36** x 2 Inside #1 Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf
		421 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.40'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	78.40'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.01 cfs @ 10.25 hrs HW=78.43' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.38 cfs @ 12.00 hrs HW=78.65' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.38 cfs @ 1.36 fps)

Pond P-1: 36" Perforated Pipe - Chamber Wizard Field A

Chamber Model = CMP_Round 36
Inside= 36.0"W x 35.5"H => 7.06 sf x 20.00'L = 141.1 cf
Outside= 36.0"W x 36.0"H => 7.06 sf x 20.00'L = 141.1 cf

36.0" Wide + 0.0" Spacing = 36.0" C-C

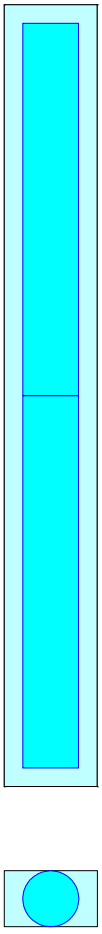
2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length
1 Rows x 36.0" Wide + 12.0" Side Stone x 2 = 5.00' Base Width
36.0" Chamber Height + 0.0" Cover = 3.00' Field Height

2 Chambers x 141.1 cf = 282.3 cf Chamber Storage

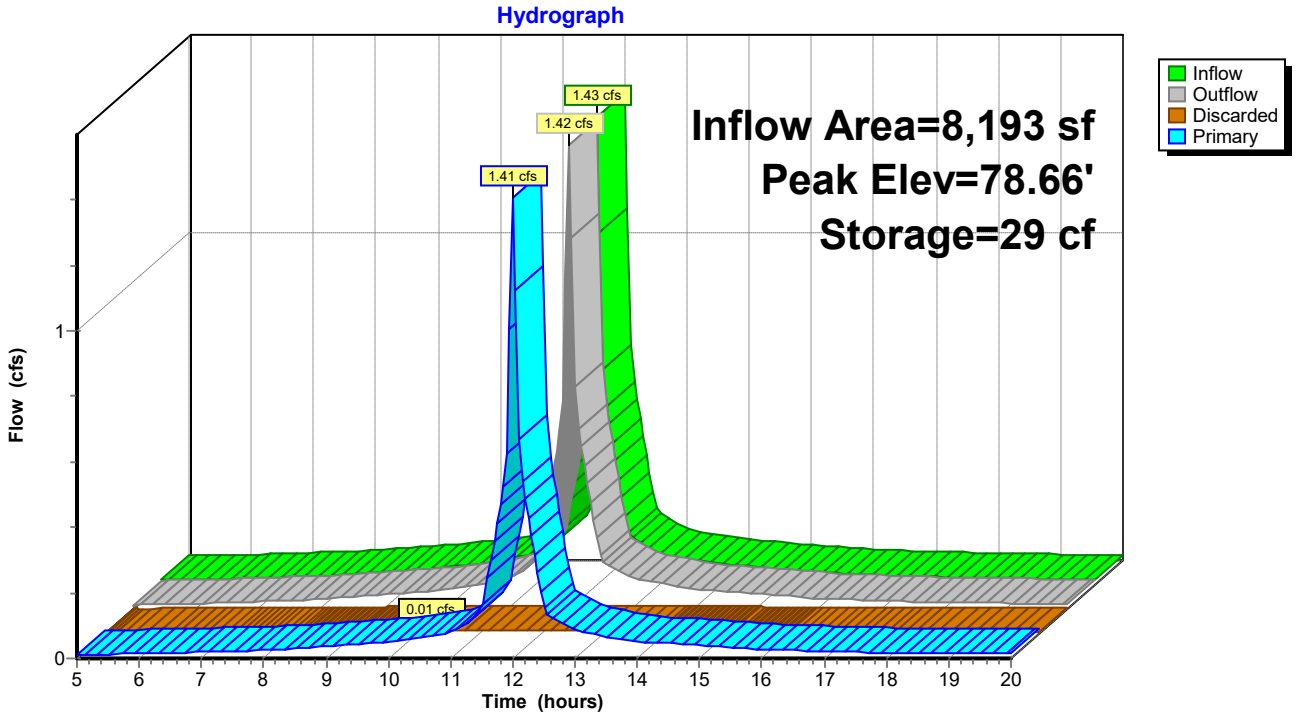
630.0 cf Field - 282.3 cf Chambers = 347.7 cf Stone x 40.0% Voids = 139.1 cf Stone Storage

Stone + Chamber Storage = 421.4 cf = 0.010 af

2 Chambers
23.3 cy Field
12.9 cy Stone



Pond P-1: 36" Perforated Pipe



Summary for Pond P-2: Subsurface Infiltration Facility

Inflow Area = 2,267 sf, 85.75% Impervious, Inflow Depth > 5.82" for 100-year event
Inflow = 0.34 cfs @ 12.07 hrs, Volume= 1,099 cf
Outflow = 0.32 cfs @ 12.17 hrs, Volume= 957 cf, Atten= 7%, Lag= 5.7 min
Discarded = 0.01 cfs @ 9.75 hrs, Volume= 473 cf
Primary = 0.31 cfs @ 12.17 hrs, Volume= 484 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 80.73' @ 12.15 hrs Surf.Area= 190 sf Storage= 394 cf

Plug-Flow detention time= 95.8 min calculated for 954 cf (87% of inflow)
Center-of-Mass det. time= 55.5 min (795.4 - 739.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	13.00'	186 cf	**6.33'W x 30.00'L x 3.54'H Field A** 673 cf Overall - 209 cf Embedded = 464 cf x 40.0% Voids
#2A	13.50'	209 cf	**Cultec R-330XL** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
		394 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**4.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	13.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 9.75 hrs HW=13.50' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.05 cfs @ 12.17 hrs HW=80.73' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.46 fps)

Pond P-2: Subsurface Infiltration Facility - Chamber Wizard Field A

Chamber Model = Cultec R-330XL
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

52.0" Wide + 6.0" Spacing = 58.0" C-C

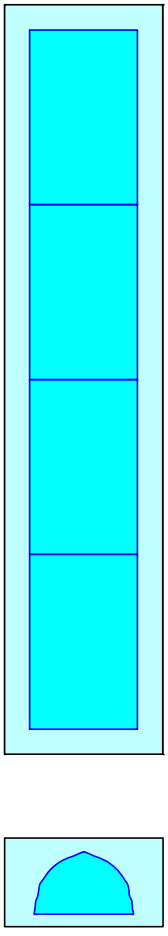
4 Chambers/Row x 7.00' Long = 28.00' + 12.0" End Stone x 2 = 30.00' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

4 Chambers x 52.2 cf = 208.6 cf Chamber Storage

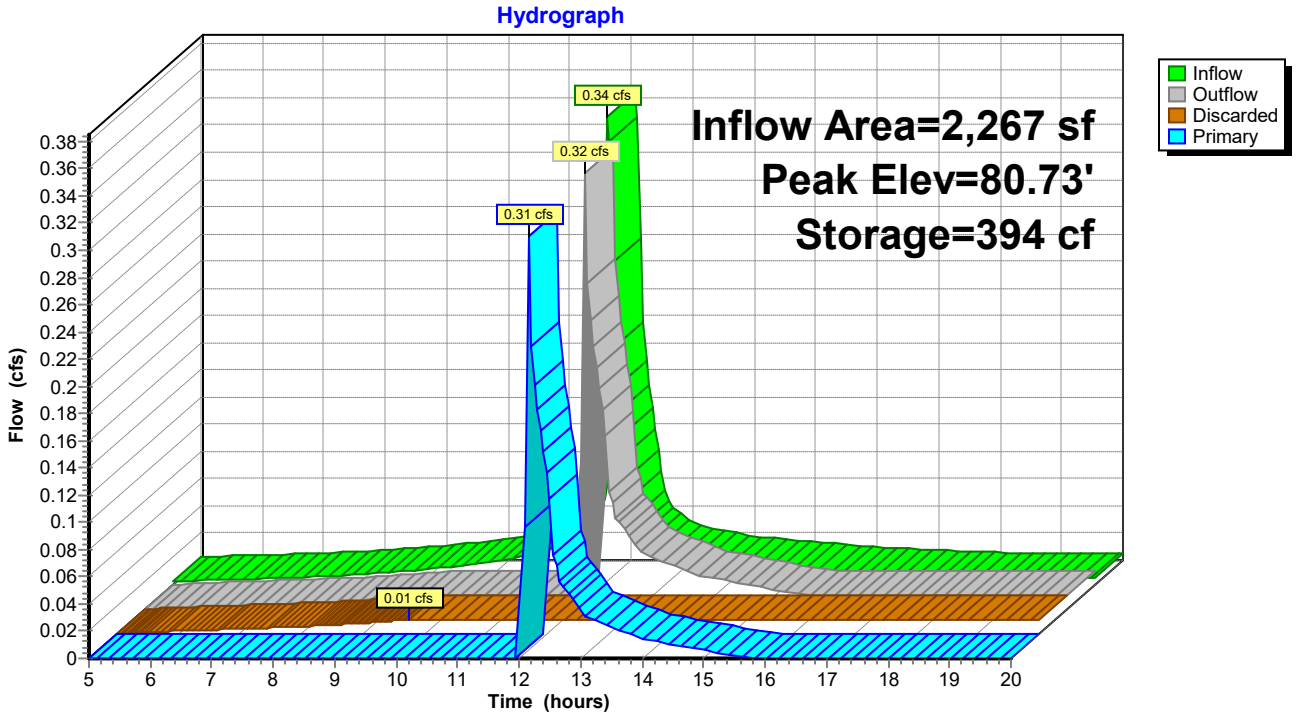
672.9 cf Field - 208.6 cf Chambers = 464.3 cf Stone x 40.0% Voids = 185.7 cf Stone Storage

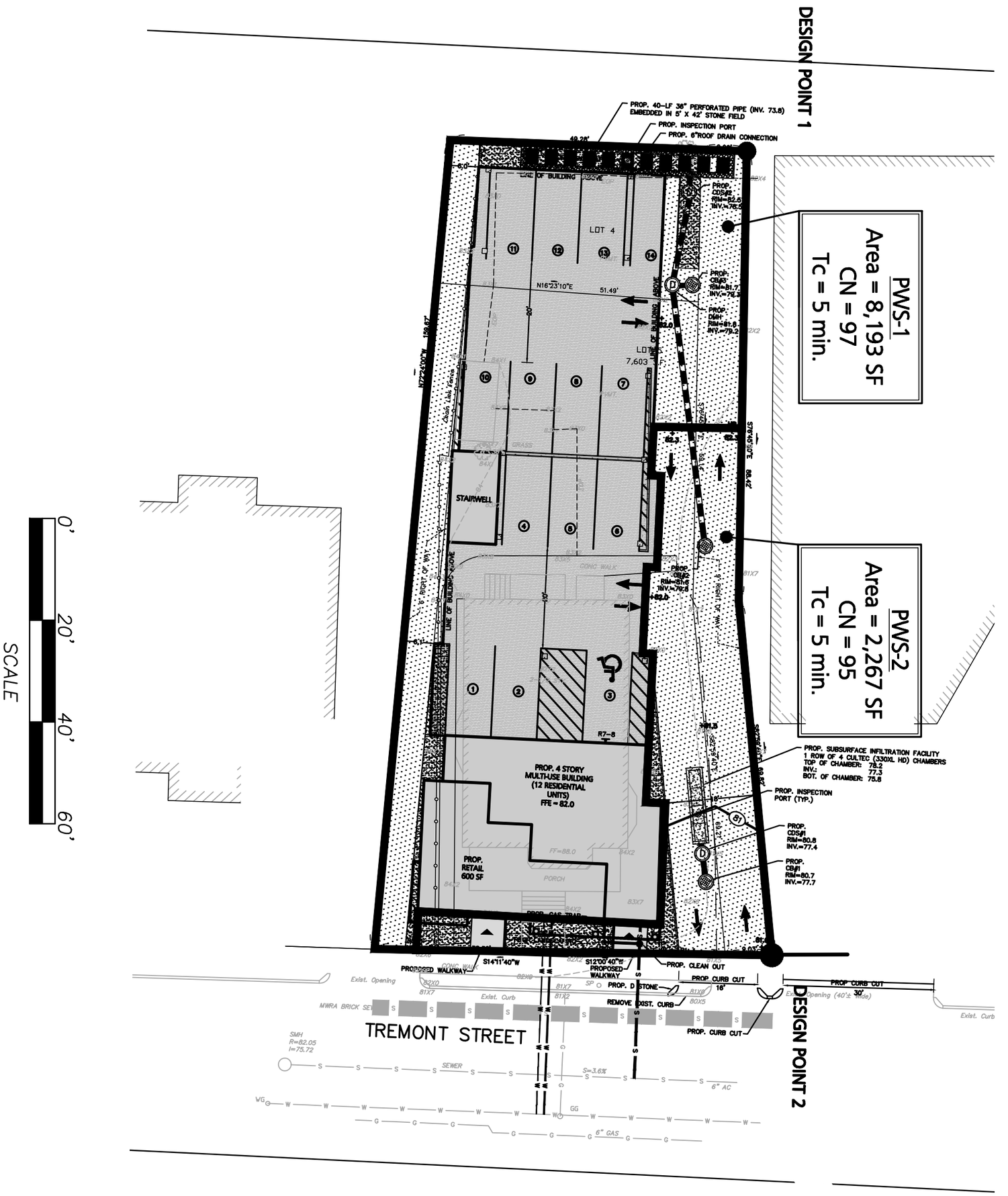
Stone + Chamber Storage = 394.3 cf = 0.009 af

4 Chambers
24.9 cy Field
17.2 cy Stone



Pond P-2: Subsurface Infiltration Facility





APPLICANT: Eric Kenworthy, 49 Marmion Road, Melrose, MA 02176	PROJECT: Site Plan, 272 Tremont Street, (Tax Map C12 Block 0 Lot 9), Melrose, Massachusetts 02176	PREPARED BY: 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	DATE / DESCRIPTION OF REVISION
DWG. NO.: PWS — DRAWING TITLE: Proposed Watershed Plan	PROJECT #: 19-29908	DATE: January 13, 2020	
	SCALE: AS NOTED	DWG FILE NAME: 19-29908 REV 1-7-20	
	DESIGN BY: Garrett Anderson	CHECKED BY: Richard A. Salvo, P.E.	

APPENDIX C

Best Management Practices Maintenance Plan

BEST MANAGEMENT PRACTICES MAINTENANCE PLAN

For

Proposed Multifamily Dwelling

Located at
272 Tremont Street
(Tax Map C12, Block 0, Lot 9)
Melrose, Massachusetts

Submitted to:
City of Melrose
562 Main Street
Melrose, MA 02176

Prepared for:
Eric Kenworthy
49 Marmion Road
Melrose, MA 02176

Prepared by:

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

January 15, 2020

BEST MANAGEMENT PRACTICES MANAGEMENT PLAN

An Operations and Maintenance Plan is summarized below and will be incorporated into the construction documents for this project.

In accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP), Engineering Alliance, Inc. has prepared the following operation and maintenance plan for the proposed development located at 272 Tremont Street (Tax Map C12 Block 0 Lot 9) in Melrose, Massachusetts. This plan is broken into two major sections. The first section is construction-related erosion and sedimentation controls. The second section is devoted to a post-development operation and maintenance plan.

Basic Information

Owner: Eric Kenworthy
49 Marmion Road
Melrose, MA 02176

Section 1 Construction Activities

1. Contact the Melrose Planning Department at least three (3) days prior to start of construction.

2. A stabilized construction entrance shall be established prior to construction. Vehicle wash down shall occur on the gravel surface that is adjacent to or part of the stabilized construction entrance.

3. Install straw waddles and silt fence around the proposed work zone to prevent sediment from leaving the subject property.

4. The contractor shall only disturb the minimum area necessary.

5. Proper erosion and sediment control must be employed around all material stockpile areas. Regular provisions for dust control must be used, via a water truck or other acceptable method.

6. The entire project area shall be swept upon completion of construction and prior to removal of the erosion control devices.

Section 2 Post-Development Activities

1. Paved Areas - Paved areas shall be swept by street sweepers periodically during dry weather to remove excess sediments, reducing the amount of sediments that the drainage system will have to remove from the runoff. Salt for de-icing on the paved areas during the winter months should be limited as much as possible, as this will reduce the need for removal and treatment. However, difficulties may arise in the enforcement of such restrictions. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

2. Catch Basins & Particle Separators - Catch basin grates shall be checked monthly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of properly. Deep sump catch basins and particle separators shall be inspected and cleaned semi-annually of all accumulated sediments. Catch basins with hoods shall be inspected quarterly to check oil build-up and outlet obstructions. Material shall be removed from catch basins and disposed of in accordance with all applicable regulations.

3. Detention Facilities - The detention facility shall be inspected at least once per year and immediately after heavy rainfall events to ensure that it is operating as intended. Accumulated debris within the detention basin shall be removed as soon as possible.

4. Snow removal and storage - Plowed snow shall be placed in the pervious area located along the roadway, where it can slowly infiltrate. Sediments shall be removed from this area every spring.

When the amount of snow exceeds the capacity of the snow storage areas, it shall be removed from the site and disposed of properly immediately after each storm at the owner's expense.

5. Pesticides, Herbicides, and Fertilizers **-** Pesticides and herbicides shall not be used within the limits of the 100-foot buffer zone to any wetland resource areas as defined under 310 CMR 10.00. In addition, fertilizers that are used within this zone should be restricted to the use of organic fertilizers only.

6. Maintenance Responsibilities **-** All post construction maintenance activities should be documented and kept on file and made available to the Conservation Commission upon request. All post construction maintenance activities shall survive the Order of Conditions and shall run with the title of the property.

All structural BMP's as identified on the site plans will be owned and maintained by the owner of the property until such time that a homeowner's association is created to manage the maintenance responsibilities.