DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

CIVIL DESIGN
Consultants, Inc.
Survey - Design - Permitting - Construction Administration
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Andover, MA 01810-2611
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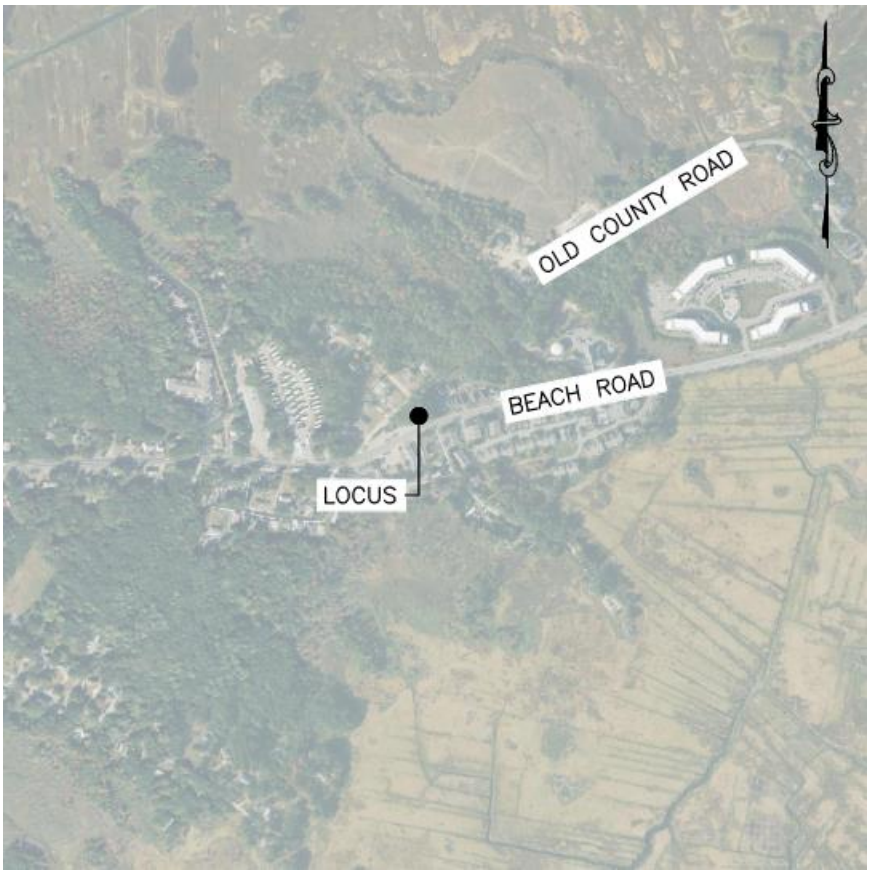
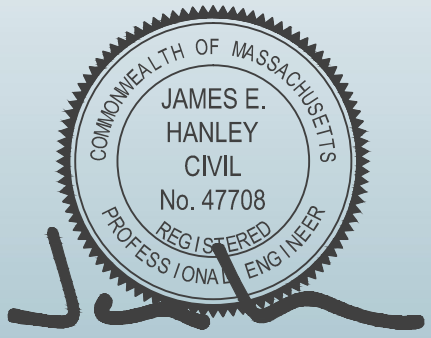




OWNER:
Edward Foote Jr. & Joanne F. Blais
123 Central Street
Salisbury, MA 01952

APPLICANT:
Larkin Real Estate Group, Inc
383 Main Street
Medfield, MA 02052

SUBMITTED TO:
Salisbury Planning Board
5 Beach Road
Salisbury, MA 01952

ISSUED:
June 14, 2022
Revised: June 19, 2023

DRAINAGE REPORT

Drainage Narrative **TAB 1**

Proposed Conditions **TAB 2**
- 2-Yr Storm Event
- 10-Yr Storm Event
- 25-Yr Storm Event
- 50-Yr Storm Event
- 100-Yr Storm Event

Supplemental Information **TAB 3**
- Stormwater Management Calculations
- Proposed Watershed Plan

TAB 1

DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

PROJECT DESCRIPTION

The applicant proposes to re-develop 159 Beach Road in Salisbury, MA into a 19-unit residential development, with 9 duplexes, and a single-family dwelling. The parcel totals approximately 30,310-SF and contains an existing ice cream stand with paved parking and associated appurtenances. The project consists of construction of 19 units, consisting of 9 duplex dwellings, and one single-family dwelling, along with associated infrastructure including driveways, landscaping, drainage facilities, and utilities. Project plans entitled *Site Development Plans for 159 Beach Road*, last revised June 14, 2023, have been prepared by this office and provided for your review. These plans illustrate the proposal in detail including zoning, easements, construction details, and provisions for utilities. Drainage will be collected and routed through best management practices sized to address the MADEP Stormwater Management Standards.

SITE DESCRIPTION

The total lot area of the project site is approximately 30,310-SF and provides frontage on Beach Road and Old County Road. The site is generally flat, with an elevation ranging between 10-FT and 14-FT across the site.

According to the Natural Resource Conservation Service Soil Survey for Middlesex County, Massachusetts soils on the site are mapped as containing Wareham Loamy Sand and Windsor Loamy Sand, both in Hydrologic Soil Group A.

SURFACE DRAINAGE

Pre-Development Condition

The pre-development condition consists of two watershed areas contributing to two design points. Design Point #1 (DP-1) receives runoff from drainage area EWA-1 and consists of overland flow to the south towards Beach Road. Design Point #2 (DP-2) receives runoff from drainage area EWA-2 and consists of overland flow to the north and east, towards the abutting properties along Old County Road and Beach Road. Contributing areas to the Design Points are detailed in the following Table 1.

TABLE 1: EXISTING WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (SF)	Tc (min.)	CN
DP-1	EWA-1	15,898	14.4	73
DP-2	EWA-2	14,413	16.0	30

Post-Development Condition

The proposed project includes the construction of 9 duplex dwellings, and one single-family dwelling. Other components include construction of 3 new driveways along with landscaping, drainage, utilities, and associated appurtenances. The development is less than one acre, therefore, the system has been designed to meet the requirements of the Town of Salisbury Planning Board Rules and Regulations Section III.c.5 – Drainage.

Drainage will be routed through two hydrodynamic separators, subsurface infiltration chambers, and an infiltration trench sized to capture and infiltrate runoff from roofs and driveways for up to and including the 100-year storm event. The drainage design results in all impervious area being captured and treated. This provides a net benefit compared to the existing condition, which had approximately 10,000-SF of untreated impervious area.

The proposed construction results in six watersheds discharging to two Design Points. DP-1 receives flow from PWA-1, which consists of overland flow towards Beach Road. DP-2 receives flow from PWA-2, PWA-3, PWA-4, and PWA-5, all of which consist of overland flow. PWA-3 drains to the proposed infiltration trench which does not overflow. Runoff from PWA-4 and PWA-5 is directed to a subsurface chamber system and is treated using Contech hydrodynamic separators prior to infiltration. The design points are summarized in Table 2 below.

TABLE 2: PROPOSED WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (SF)	Tc (min.)	CN
DP-1	PWA-1	4,471	6.0	39
DP-2	PWA-2	2,858	6.0	39
	PWA-3	1,799	6.0	88
	PWA-4	7,763	6.0	87
	PWA-5	13,517	6.0	81

Peak Discharge Comparison

As illustrated in the following tables, the impact of the proposed improvements has been mitigated through the use of infiltration trenches and subsurface infiltration chambers for up to and including the 100-year, 24-hour storm event.

Design Point #1

Peak Flow:

	2-YR (3.1-IN)	10-YR (4.5-IN)	25-YR (5.3-IN)	50-YR (5.9-IN)	100-YR (6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.3	0.6	0.8	1.0	1.1
Post-Development	0.0	0.0	0.0	0.0	0.0

Design Point #2

Peak Flow:

	2-YR (3.1-IN)	10-YR (4.5-IN)	25-YR (5.3-IN)	50-YR (5.9-IN)	100-YR (6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.0	0.0	0.0	0.0	0.0
Post-Development	0.0	0.0	0.0	0.0	0.0

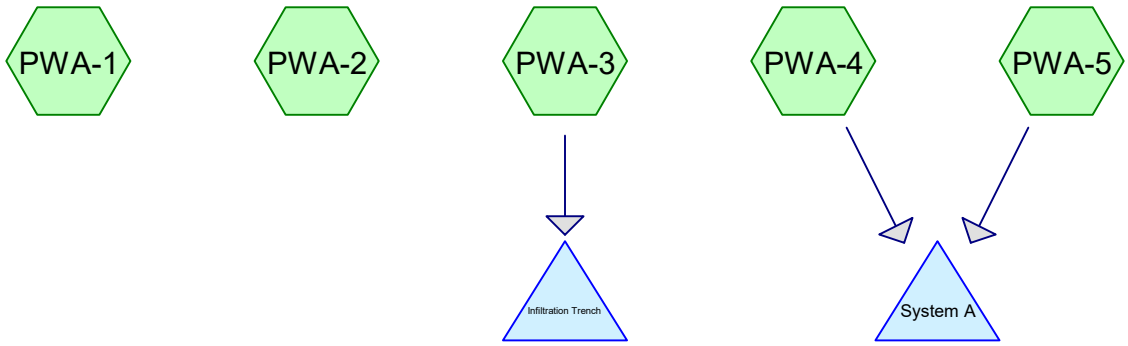
DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

METHODOLOGY

Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS, formerly the Soils Conservation Service. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, 50-YR, and 100-YR Type III 24-hour storm events. Rainfall data corresponds with National Weather Service Technical Paper 40 (TP-40) used in Technical Release 55 (TR-55). Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.

TAB 2



Subcat Reach Pond Link

Drainage Diagram for 21-10254 - Post-R6

Prepared by Civil Design Consultants, Inc., Printed 6/19/2023

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,984	39	>75% Grass cover, Good, HSG A (PWA-1, PWA-2, PWA-3, PWA-4, PWA-5)
6,660	98	Paved parking, HSG A (PWA-3, PWA-4, PWA-5)
10,764	98	Roofs, HSG A (PWA-3, PWA-4, PWA-5)
30,408	73	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
30,408	HSG A	PWA-1, PWA-2, PWA-3, PWA-4, PWA-5
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
30,408		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWA-1: Runoff Area=4,471 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.0 cfs 0 cf

Subcatchment PWA-2: Runoff Area=2,858 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.0 cfs 0 cf

Subcatchment PWA-3: Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=1.91"
Tc=6.0 min CN=88 Runoff=0.1 cfs 286 cf

Subcatchment PWA-4: Runoff Area=7,763 sf 81.08% Impervious Runoff Depth=1.83"
Tc=6.0 min CN=87 Runoff=0.4 cfs 1,182 cf

Subcatchment PWA-5: Runoff Area=13,517 sf 71.28% Impervious Runoff Depth=1.39"
Tc=6.0 min CN=81 Runoff=0.5 cfs 1,567 cf

Pond Infiltration Trench: Peak Elev=10.45' Storage=46 cf Inflow=0.1 cfs 286 cf
Outflow=0.0 cfs 286 cf

Pond System A: Peak Elev=8.27' Storage=476 cf Inflow=0.9 cfs 2,748 cf
Outflow=0.3 cfs 2,748 cf

Total Runoff Area = 30,408 sf Runoff Volume = 3,034 cf Average Runoff Depth = 1.20"
42.70% Pervious = 12,984 sf 57.30% Impervious = 17,424 sf

Summary for Subcatchment PWA-1:

[45] Hint: Runoff=Zero

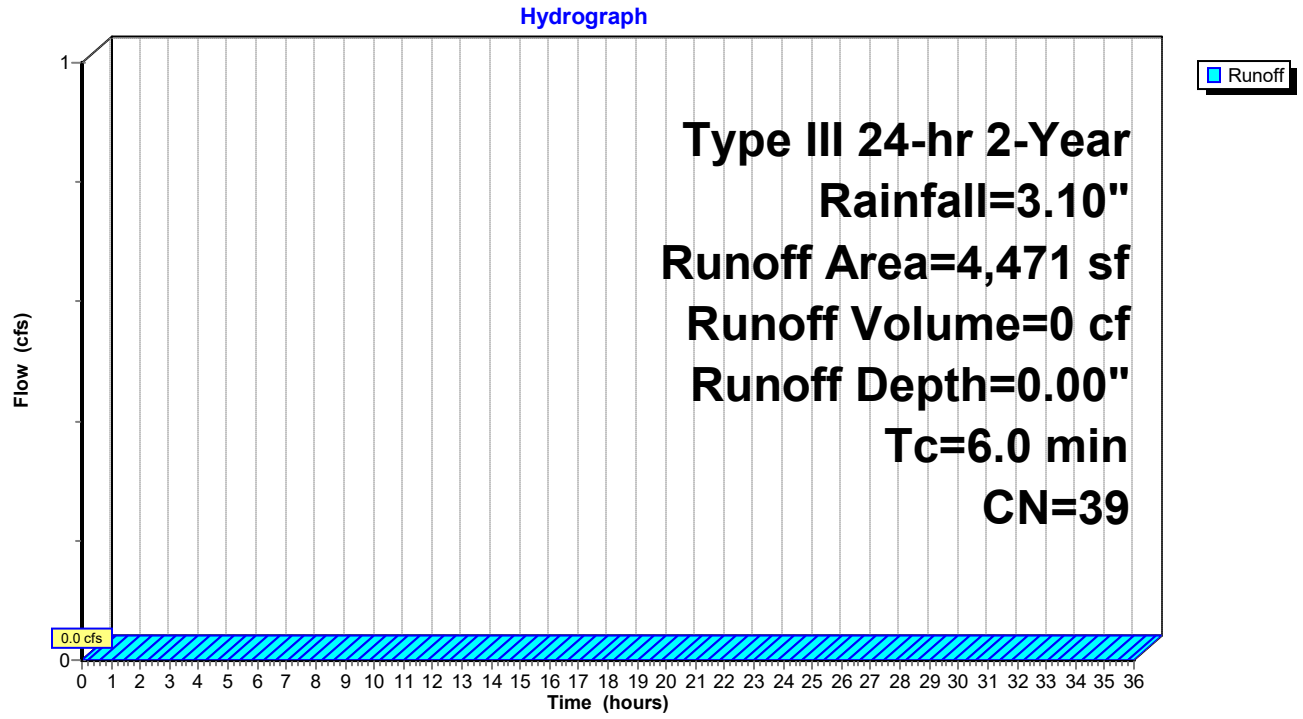
Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
4,471	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,471	39	Weighted Average
4,471		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-1:



Summary for Subcatchment PWA-2:

[45] Hint: Runoff=Zero

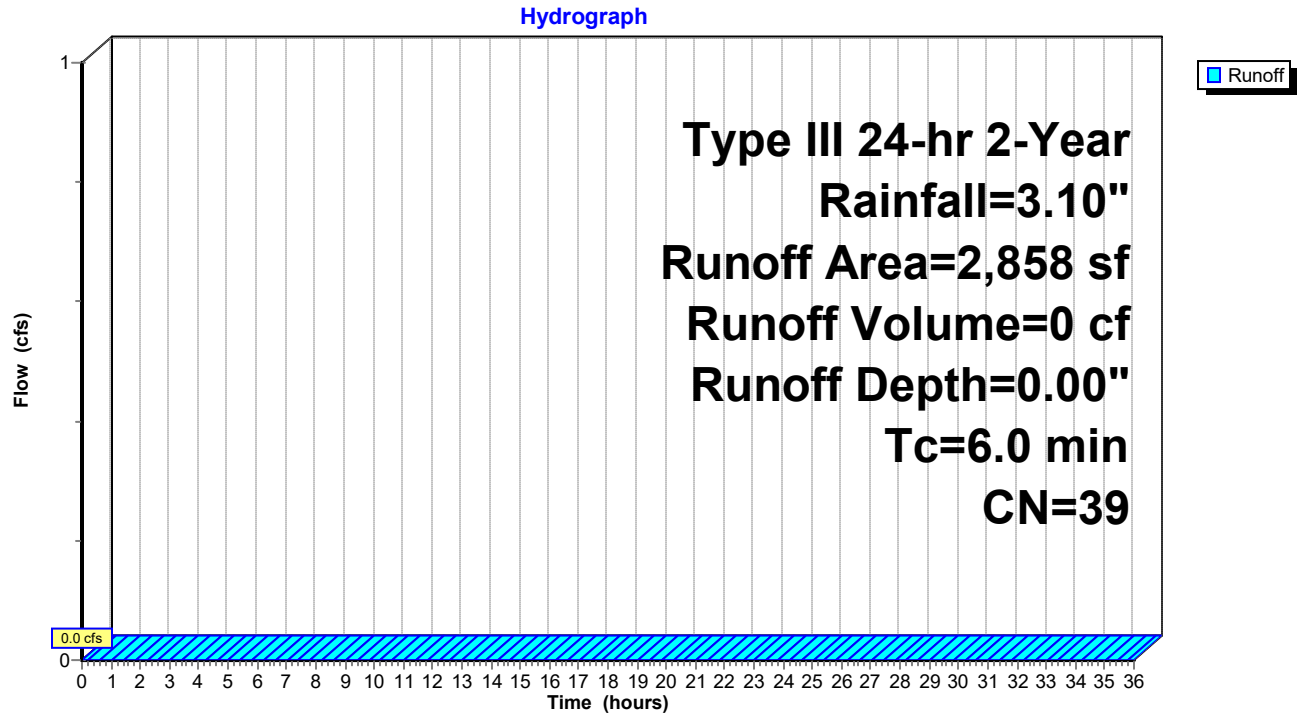
Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
2,858	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,858	39	Weighted Average
2,858		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-2:



Summary for Subcatchment PWA-3:

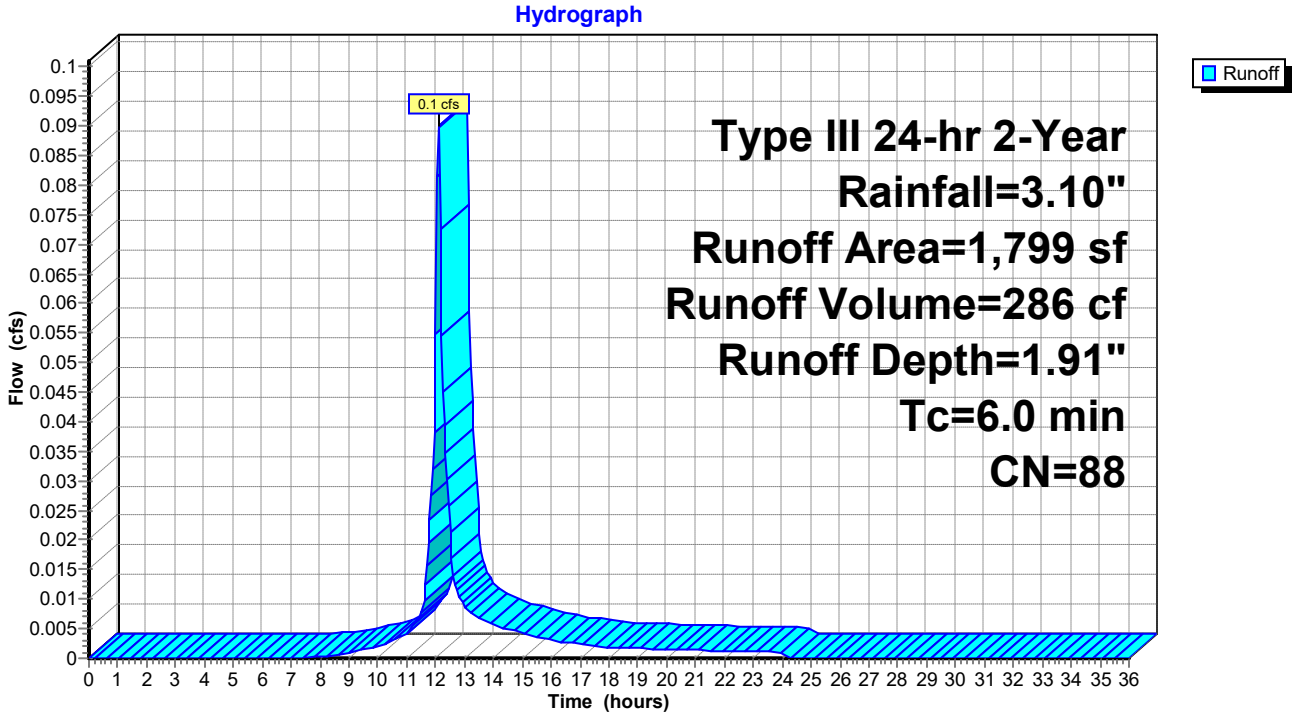
Runoff = 0.1 cfs @ 12.09 hrs, Volume= 286 cf, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-3:



Summary for Subcatchment PWA-4:

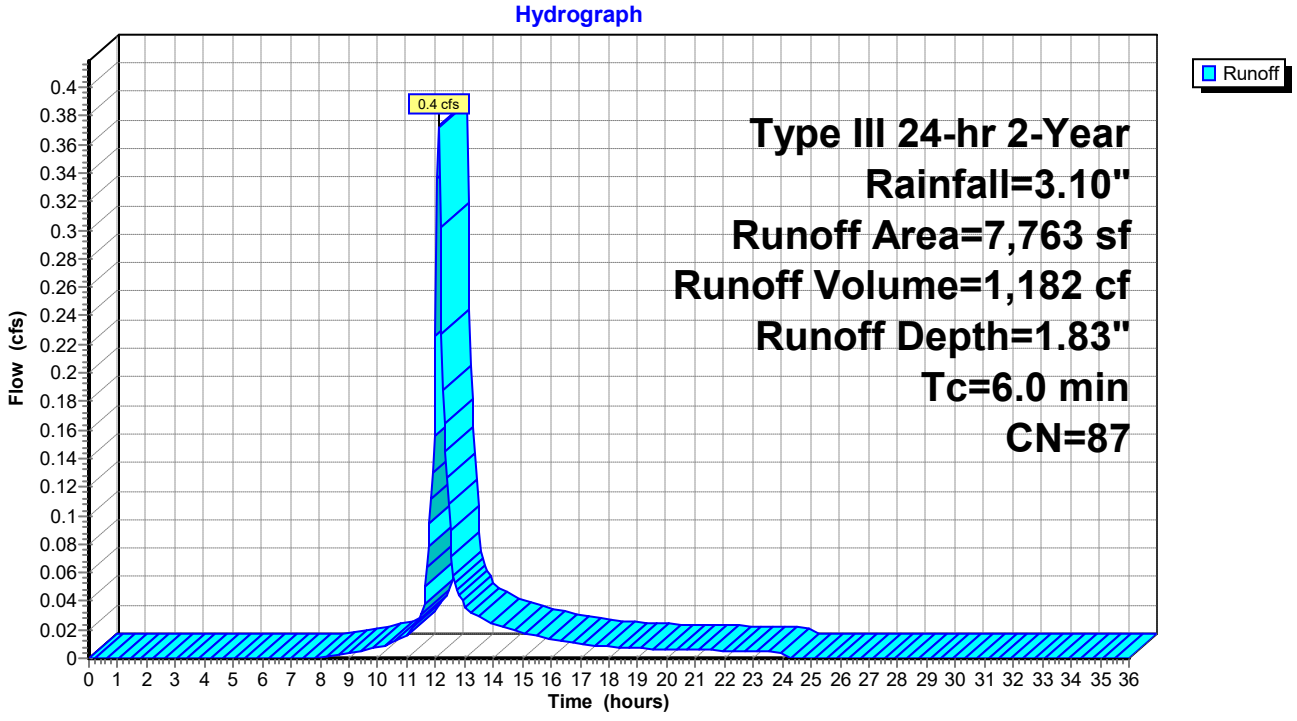
Runoff = 0.4 cfs @ 12.09 hrs, Volume= 1,182 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
3,936	98	Roofs, HSG A
2,358	98	Paved parking, HSG A
1,469	39	>75% Grass cover, Good, HSG A
7,763	87	Weighted Average
1,469		18.92% Pervious Area
6,294		81.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-4:



Summary for Subcatchment PWA-5:

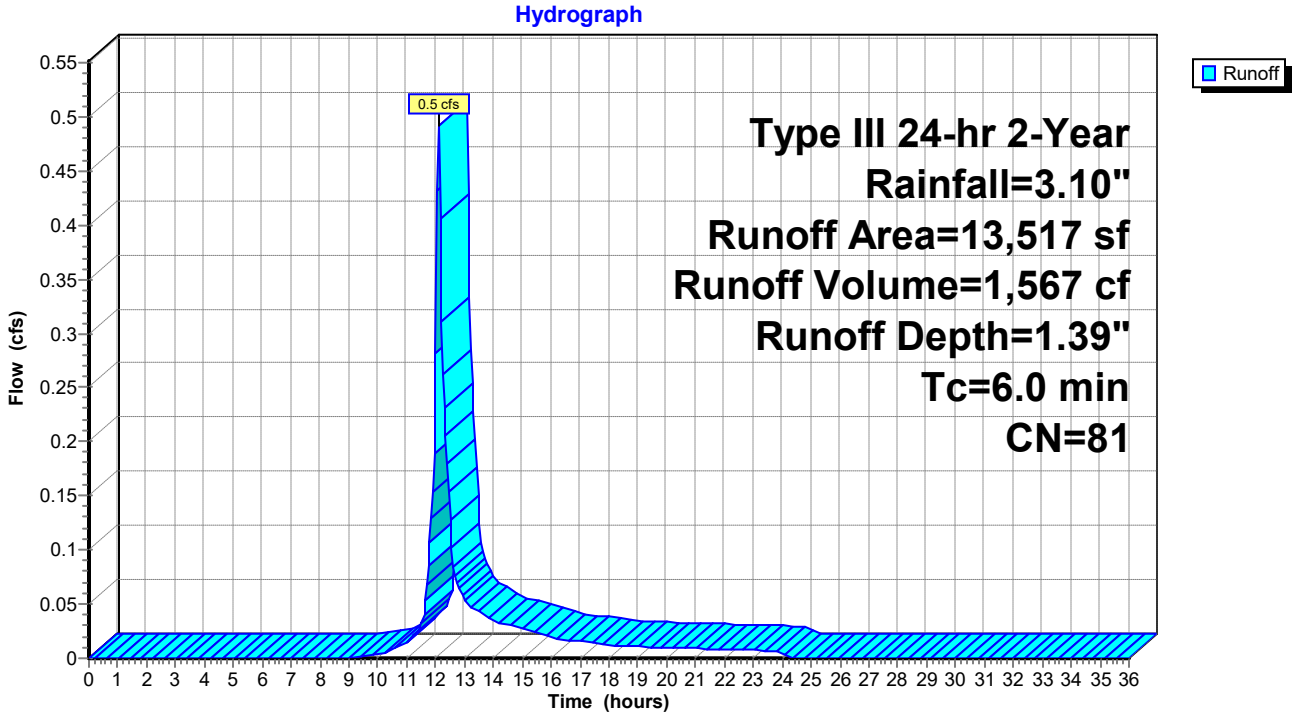
Runoff = 0.5 cfs @ 12.10 hrs, Volume= 1,567 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
3,635	98	Paved parking, HSG A
3,882	39	>75% Grass cover, Good, HSG A
13,517	81	Weighted Average
3,882		28.72% Pervious Area
9,635		71.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-5:



Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 1.91" for 2-Year event
Inflow = 0.1 cfs @ 12.09 hrs, Volume= 286 cf
Outflow = 0.0 cfs @ 12.35 hrs, Volume= 286 cf, Atten= 62%, Lag= 15.8 min
Discarded = 0.0 cfs @ 12.35 hrs, Volume= 286 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.45' @ 12.35 hrs Surf.Area= 122 sf Storage= 46 cf

Plug-Flow detention time= 7.8 min calculated for 286 cf (100% of inflow)
Center-of-Mass det. time= 7.8 min (824.2 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	**3.04'W x 40.00'L x 3.88'H Field A** 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	**ADS N-12 12** x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.0 cfs @ 12.35 hrs HW=10.45' (Free Discharge)
↑**1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

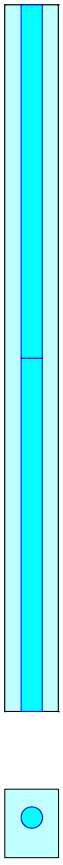
2 Chambers/Row x 20.00' Long = 40.00' Base Length
1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width
20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage
2 Chambers x 20.9 cf = 41.9 cf Displacement

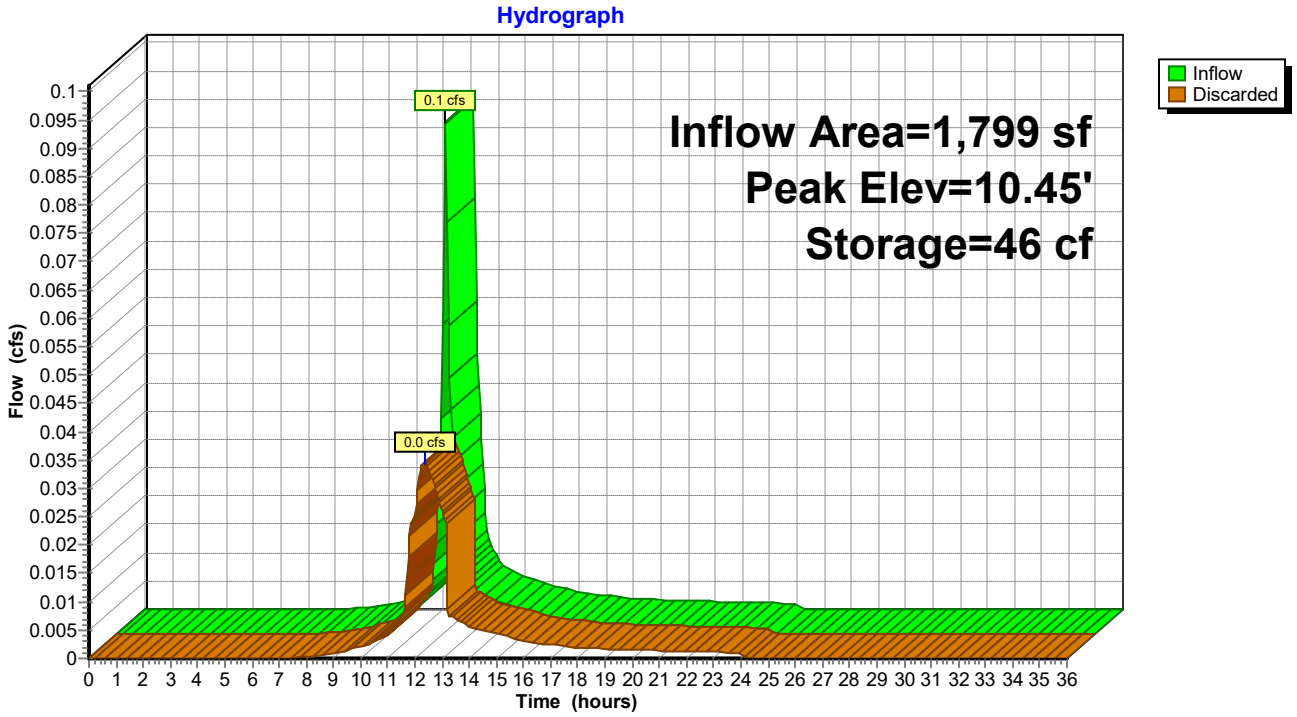
471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

Stone + Chamber Storage = 204.3 cf = 0.005 af

2 Chambers @ $ 0.00 /ea = $ 0.00
17.5 cy Field Excavation @ $ 0.00 /cy = $ 0.00
15.9 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond Infiltration Trench:



Summary for Pond System A:

Inflow Area = 21,280 sf, 74.85% Impervious, Inflow Depth = 1.55" for 2-Year event
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 2,748 cf
Outflow = 0.3 cfs @ 12.41 hrs, Volume= 2,748 cf, Atten= 65%, Lag= 18.8 min
Discarded = 0.3 cfs @ 12.41 hrs, Volume= 2,748 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 8.27' @ 12.41 hrs Surf.Area= 1,129 sf Storage= 476 cf

Plug-Flow detention time= 9.0 min calculated for 2,745 cf (100% of inflow)
Center-of-Mass det. time= 9.0 min (841.1 - 832.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.50'	1,030 cf	**25.25'W x 44.72'L x 3.50'H Field A** 3,952 cf Overall - 1,378 cf Embedded = 2,574 cf x 40.0% Voids
#2A	8.00'	1,378 cf	**StormTech SC-740** x 30 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
		2,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 5.50'

Discarded OutFlow Max=0.3 cfs @ 12.41 hrs HW=8.27' (Free Discharge)
↑**1=Exfiltration** (Controls 0.3 cfs)

Pond System A: - Chamber Wizard Field A

Chamber Model = StormTech SC-740
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

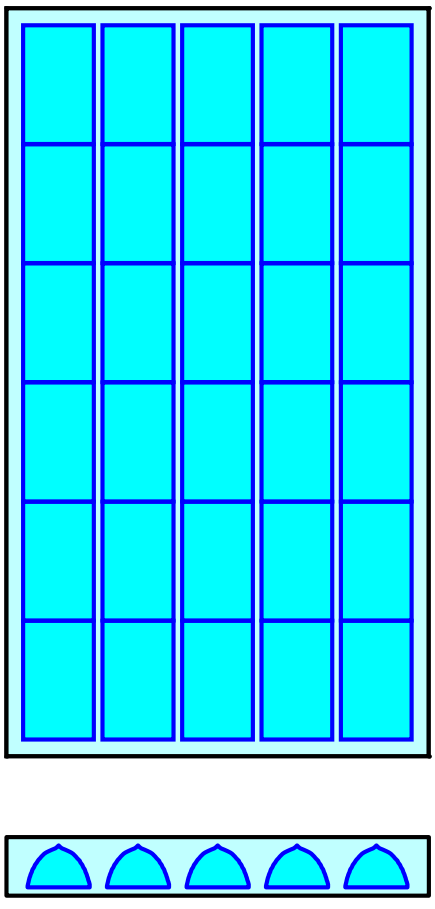
6 Chambers/Row x 7.12' Long = 42.72' + 12.0" End Stone x 2 = 44.72' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

30 Chambers x 45.9 cf = 1,378.2 cf Chamber Storage

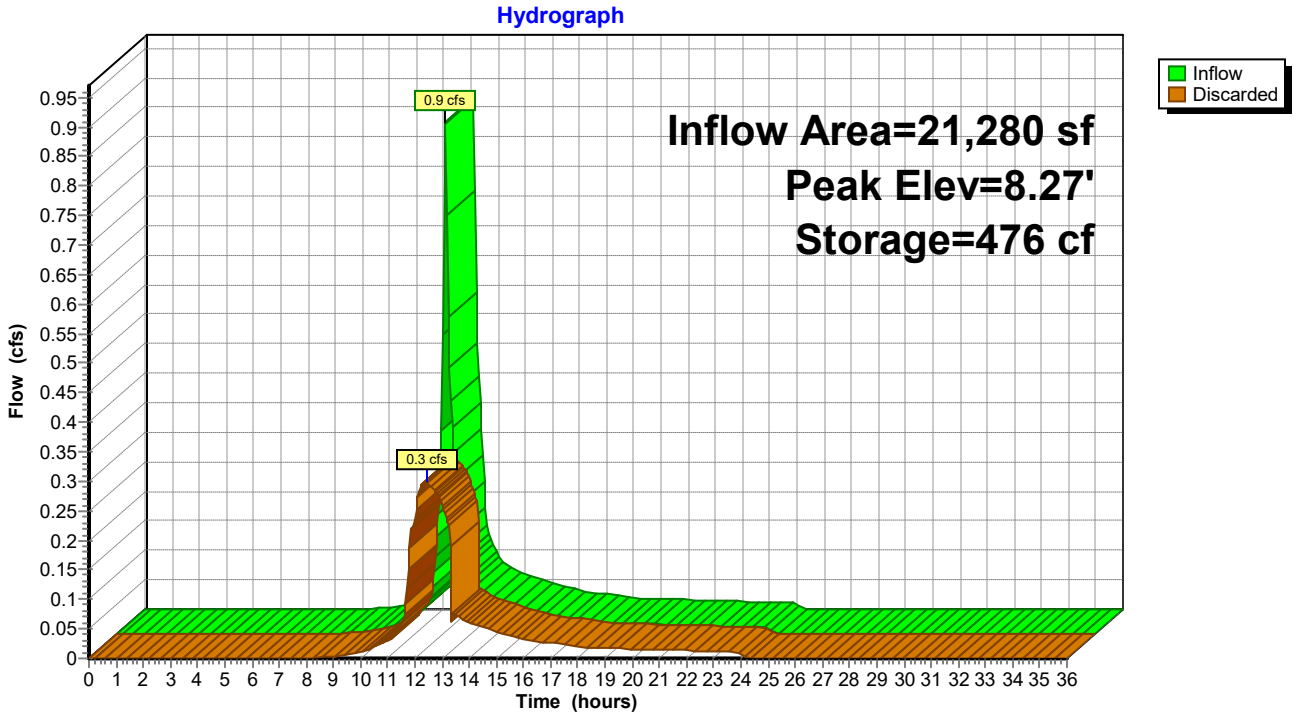
3,952.1 cf Field - 1,378.2 cf Chambers = 2,573.9 cf Stone x 40.0% Voids = 1,029.6 cf Stone Storage

Stone + Chamber Storage = 2,407.8 cf = 0.055 af

30 Chambers @ $ 0.00 /ea = $ 0.00
146.4 cy Field Excavation @ $ 0.00 /cy = $ 0.00
95.3 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond System A:



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWA-1: Runoff Area=4,471 sf 0.00% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=39 Runoff=0.0 cfs 41 cf

Subcatchment PWA-2: Runoff Area=2,858 sf 0.00% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=39 Runoff=0.0 cfs 26 cf

Subcatchment PWA-3: Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=3.20"
Tc=6.0 min CN=88 Runoff=0.1 cfs 479 cf

Subcatchment PWA-4: Runoff Area=7,763 sf 81.08% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=87 Runoff=0.6 cfs 2,005 cf

Subcatchment PWA-5: Runoff Area=13,517 sf 71.28% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=81 Runoff=0.9 cfs 2,870 cf

Pond Infiltration Trench: Peak Elev=11.56' Storage=103 cf Inflow=0.1 cfs 479 cf
Outflow=0.0 cfs 479 cf

Pond System A: Peak Elev=9.11' Storage=1,220 cf Inflow=1.5 cfs 4,875 cf
Outflow=0.4 cfs 4,875 cf

Total Runoff Area = 30,408 sf Runoff Volume = 5,422 cf Average Runoff Depth = 2.14"
42.70% Pervious = 12,984 sf 57.30% Impervious = 17,424 sf

Summary for Subcatchment PWA-1:

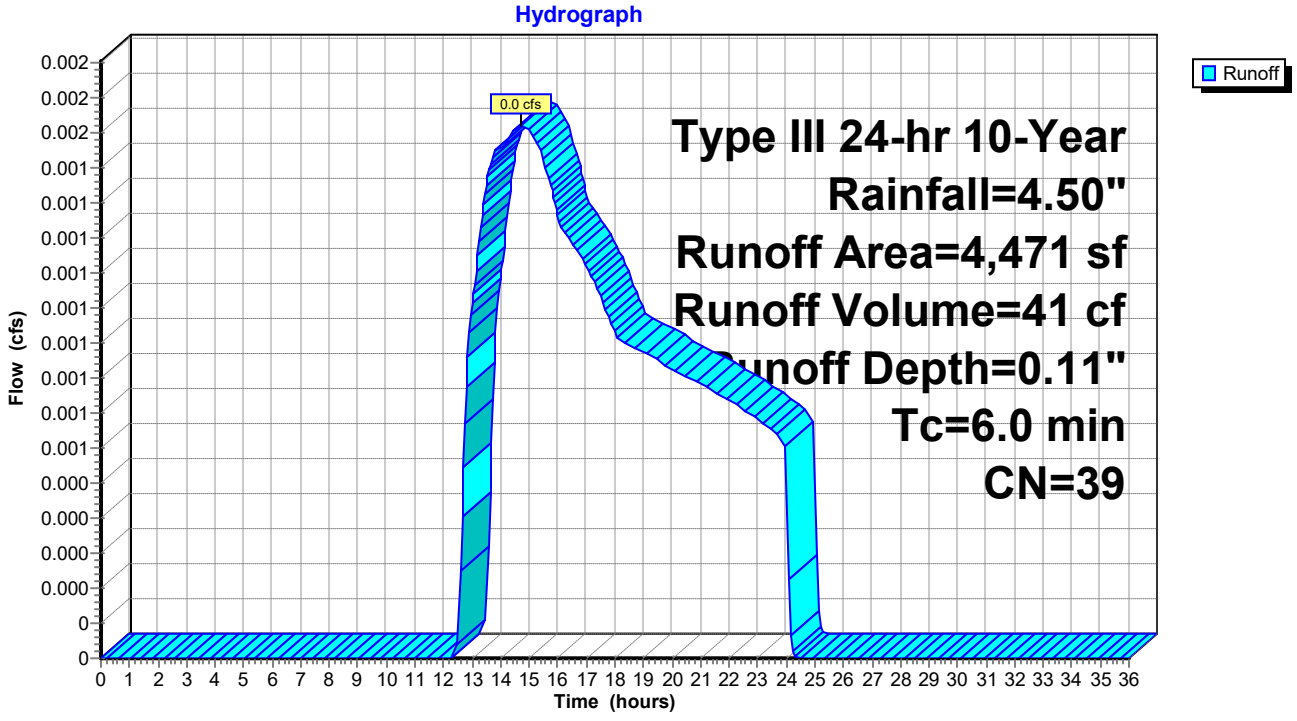
Runoff = 0.0 cfs @ 14.71 hrs, Volume= 41 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
4,471	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,471	39	Weighted Average
4,471		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-1:



Summary for Subcatchment PWA-2:

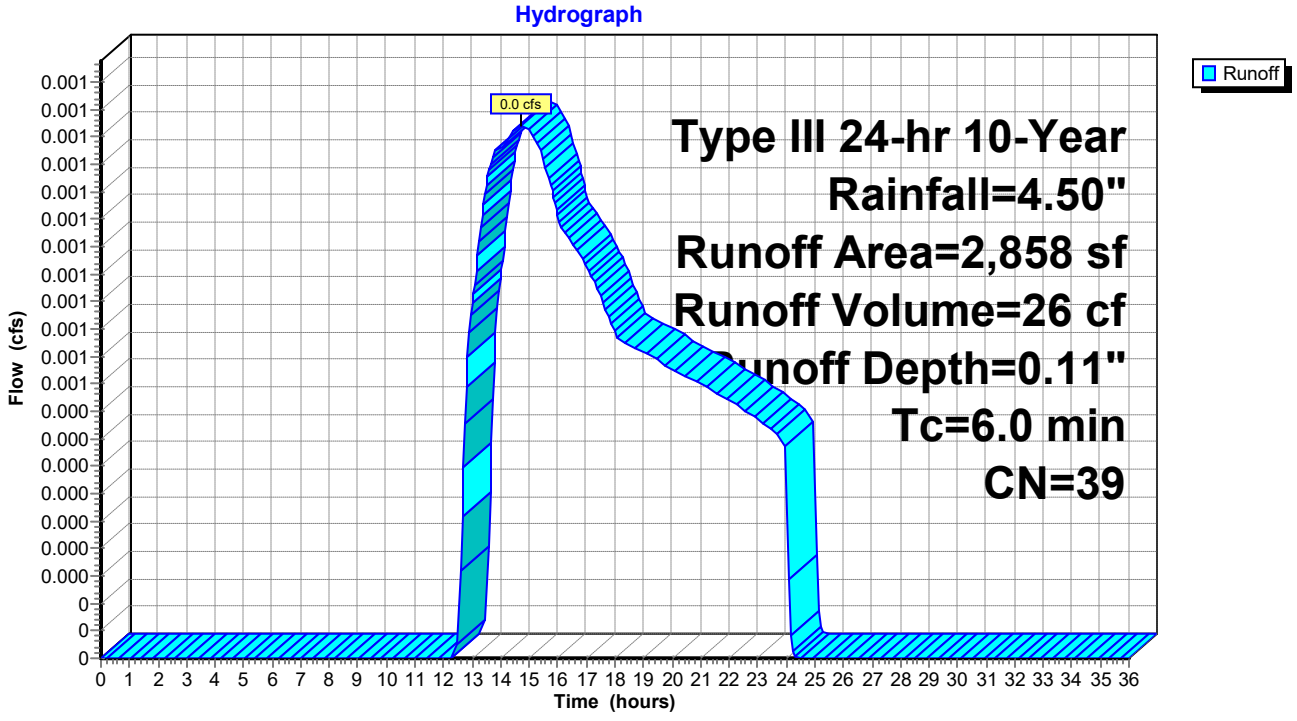
Runoff = 0.0 cfs @ 14.71 hrs, Volume= 26 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
2,858	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,858	39	Weighted Average
2,858		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-2:



Summary for Subcatchment PWA-3:

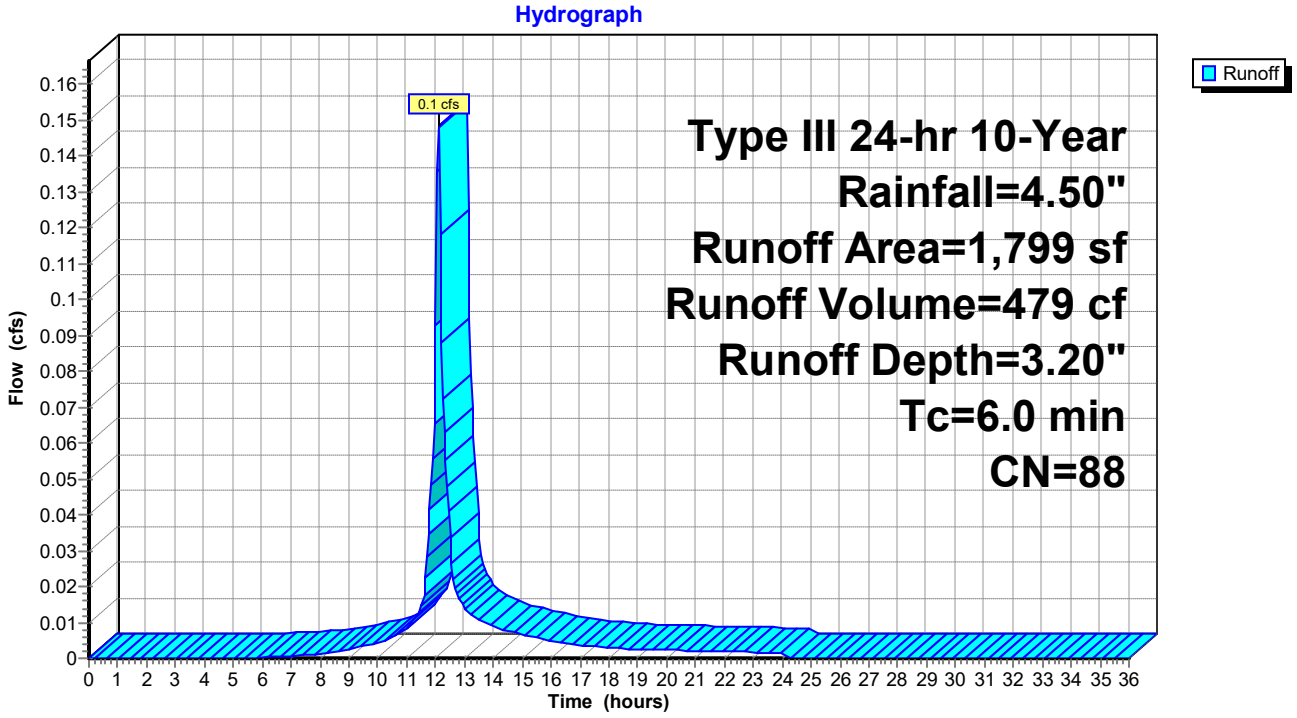
Runoff = 0.1 cfs @ 12.09 hrs, Volume= 479 cf, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-3:



Summary for Subcatchment PWA-4:

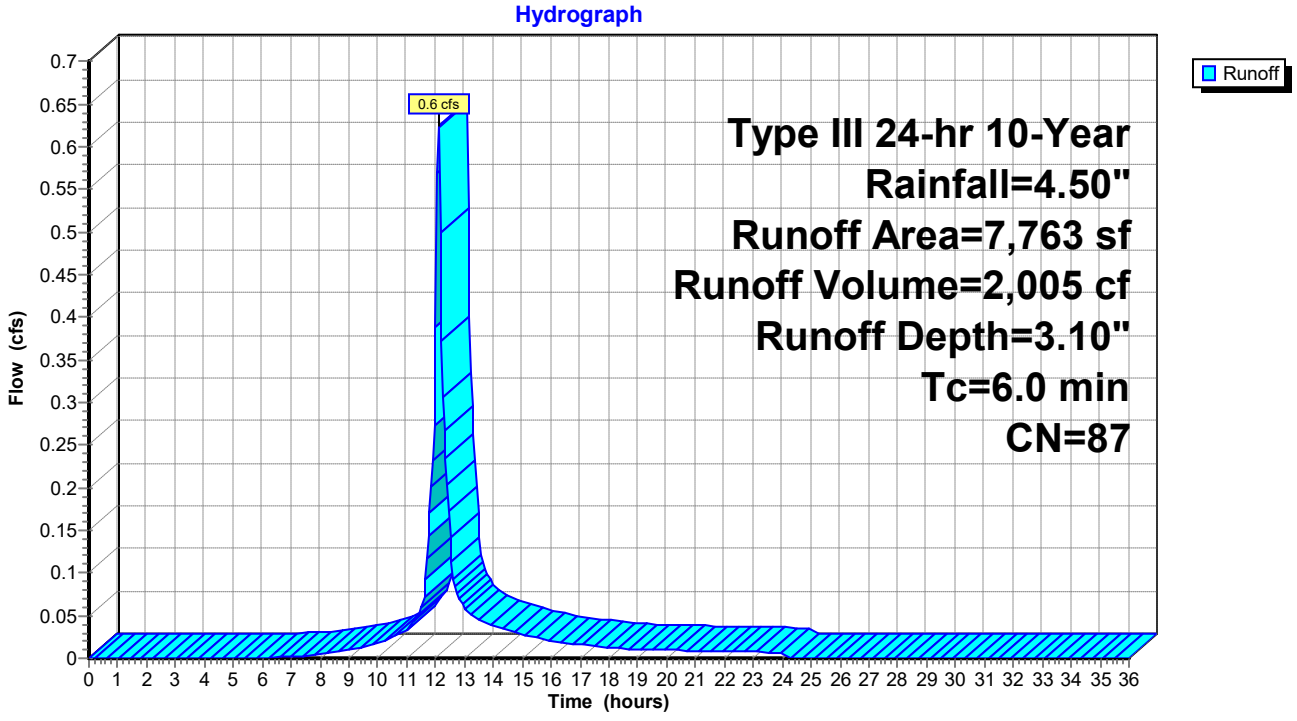
Runoff = 0.6 cfs @ 12.09 hrs, Volume= 2,005 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
3,936	98	Roofs, HSG A
2,358	98	Paved parking, HSG A
1,469	39	>75% Grass cover, Good, HSG A
7,763	87	Weighted Average
1,469		18.92% Pervious Area
6,294		81.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-4:



Summary for Subcatchment PWA-5:

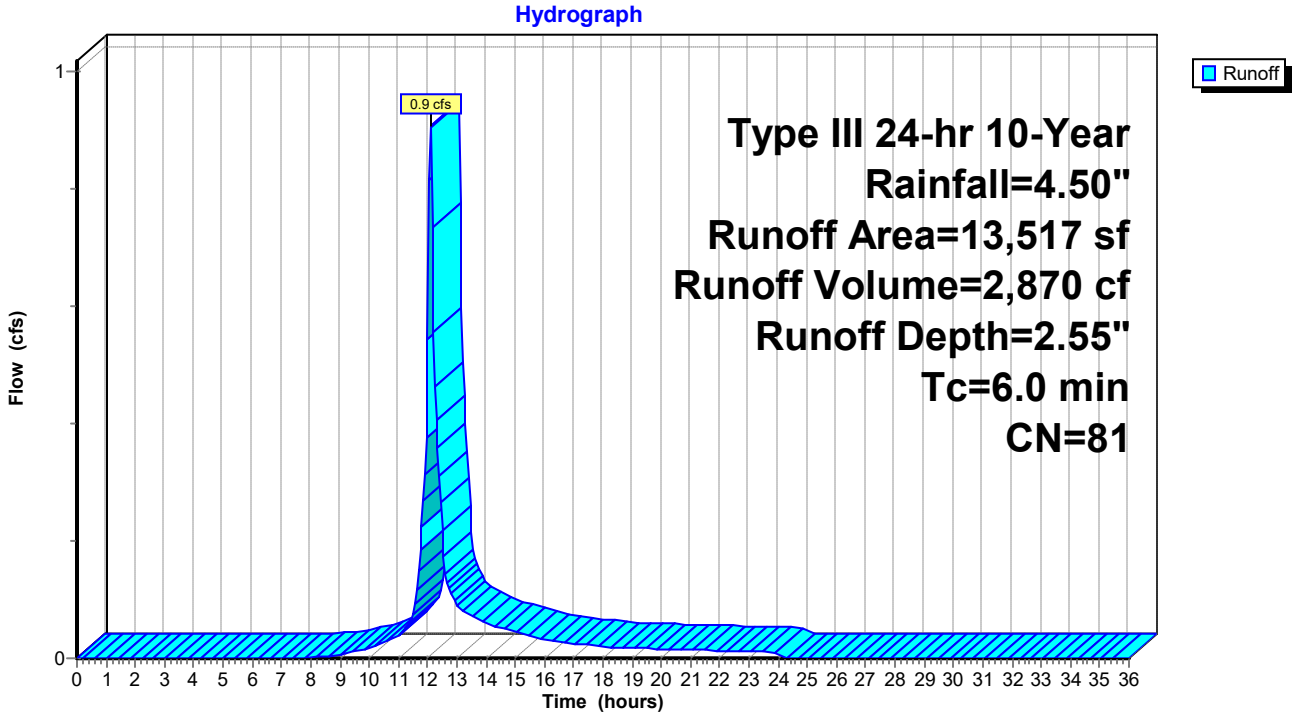
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,870 cf, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
3,635	98	Paved parking, HSG A
3,882	39	>75% Grass cover, Good, HSG A
13,517	81	Weighted Average
3,882		28.72% Pervious Area
9,635		71.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-5:



Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 3.20" for 10-Year event
Inflow = 0.1 cfs @ 12.09 hrs, Volume= 479 cf
Outflow = 0.0 cfs @ 12.41 hrs, Volume= 479 cf, Atten= 68%, Lag= 19.0 min
Discarded = 0.0 cfs @ 12.41 hrs, Volume= 479 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 11.56' @ 12.41 hrs Surf.Area= 122 sf Storage= 103 cf

Plug-Flow detention time= 14.3 min calculated for 479 cf (100% of inflow)
Center-of-Mass det. time= 14.3 min (816.1 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	**3.04'W x 40.00'L x 3.88'H Field A** 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	**ADS N-12 12** x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.0 cfs @ 12.41 hrs HW=11.56' (Free Discharge)
↑**1=Exfiltration** (Controls 0.0 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

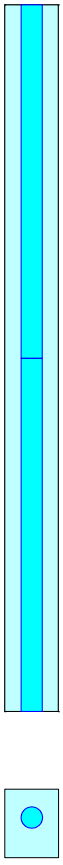
2 Chambers/Row x 20.00' Long = 40.00' Base Length
1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width
20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage
2 Chambers x 20.9 cf = 41.9 cf Displacement

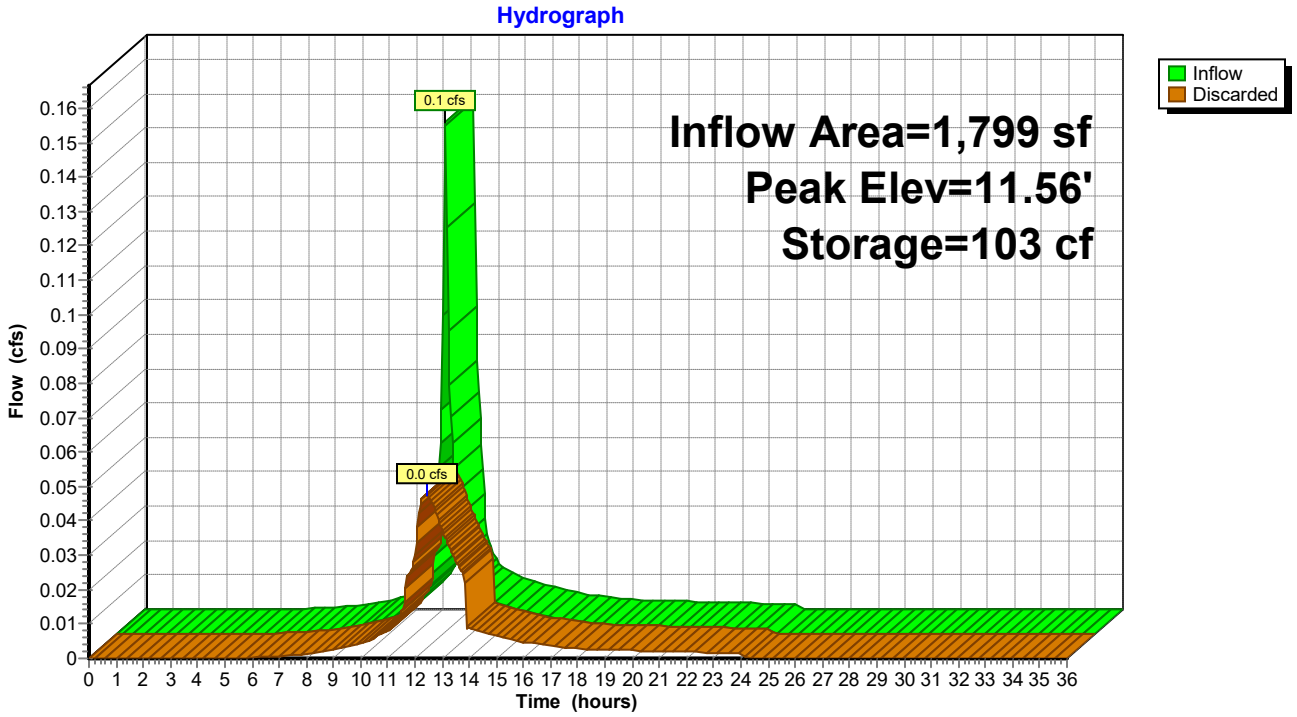
471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

Stone + Chamber Storage = 204.3 cf = 0.005 af

2 Chambers @ $ 0.00 /ea = $ 0.00
17.5 cy Field Excavation @ $ 0.00 /cy = $ 0.00
15.9 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond Infiltration Trench:



Summary for Pond System A:

Inflow Area = 21,280 sf, 74.85% Impervious, Inflow Depth = 2.75" for 10-Year event
Inflow = 1.5 cfs @ 12.09 hrs, Volume= 4,875 cf
Outflow = 0.4 cfs @ 12.48 hrs, Volume= 4,875 cf, Atten= 75%, Lag= 23.4 min
Discarded = 0.4 cfs @ 12.48 hrs, Volume= 4,875 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 9.11' @ 12.48 hrs Surf.Area= 1,129 sf Storage= 1,220 cf

Plug-Flow detention time= 20.9 min calculated for 4,868 cf (100% of inflow)
Center-of-Mass det. time= 20.9 min (836.9 - 816.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.50'	1,030 cf	**25.25'W x 44.72'L x 3.50'H Field A** 3,952 cf Overall - 1,378 cf Embedded = 2,574 cf x 40.0% Voids
#2A	8.00'	1,378 cf	**StormTech SC-740** x 30 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
		2,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 5.50'

Discarded OutFlow Max=0.4 cfs @ 12.48 hrs HW=9.11' (Free Discharge)
↑**1=Exfiltration** (Controls 0.4 cfs)

Pond System A: - Chamber Wizard Field A

Chamber Model = StormTech SC-740
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

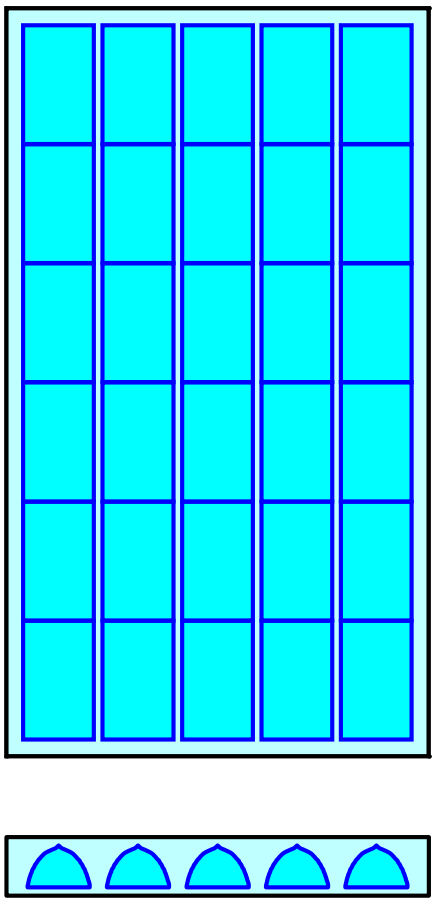
6 Chambers/Row x 7.12' Long = 42.72' + 12.0" End Stone x 2 = 44.72' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

30 Chambers x 45.9 cf = 1,378.2 cf Chamber Storage

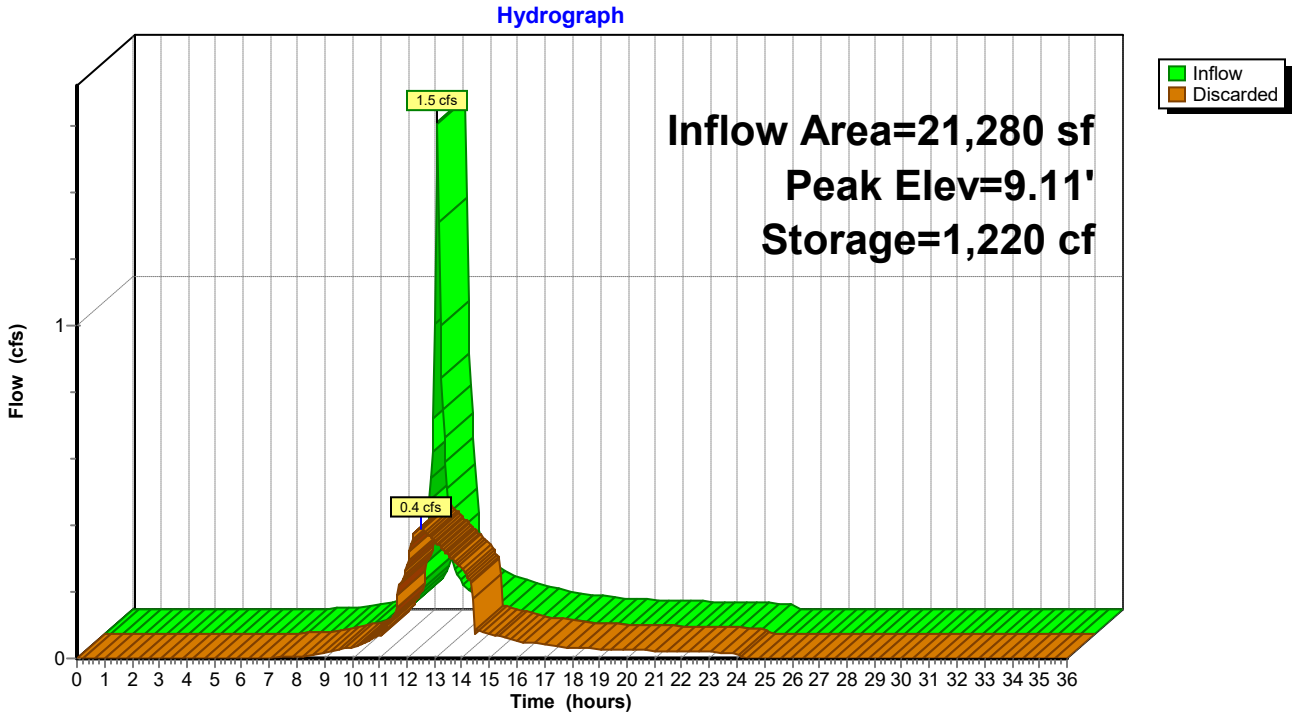
3,952.1 cf Field - 1,378.2 cf Chambers = 2,573.9 cf Stone x 40.0% Voids = 1,029.6 cf Stone Storage

Stone + Chamber Storage = 2,407.8 cf = 0.055 af

30 Chambers @ $ 0.00 /ea = $ 0.00
146.4 cy Field Excavation @ $ 0.00 /cy = $ 0.00
95.3 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond System A:



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWA-1: Runoff Area=4,471 sf 0.00% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=39 Runoff=0.0 cfs 99 cf

Subcatchment PWA-2: Runoff Area=2,858 sf 0.00% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=39 Runoff=0.0 cfs 63 cf

Subcatchment PWA-3: Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=3.95"
Tc=6.0 min CN=88 Runoff=0.2 cfs 593 cf

Subcatchment PWA-4: Runoff Area=7,763 sf 81.08% Impervious Runoff Depth=3.85"
Tc=6.0 min CN=87 Runoff=0.8 cfs 2,491 cf

Subcatchment PWA-5: Runoff Area=13,517 sf 71.28% Impervious Runoff Depth=3.25"
Tc=6.0 min CN=81 Runoff=1.2 cfs 3,663 cf

Pond Infiltration Trench: Peak Elev=12.07' Storage=140 cf Inflow=0.2 cfs 593 cf
Outflow=0.1 cfs 593 cf

Pond System A: Peak Elev=9.68' Storage=1,680 cf Inflow=1.9 cfs 6,154 cf
Outflow=0.5 cfs 6,154 cf

Total Runoff Area = 30,408 sf Runoff Volume = 6,909 cf Average Runoff Depth = 2.73"
42.70% Pervious = 12,984 sf 57.30% Impervious = 17,424 sf

Summary for Subcatchment PWA-1:

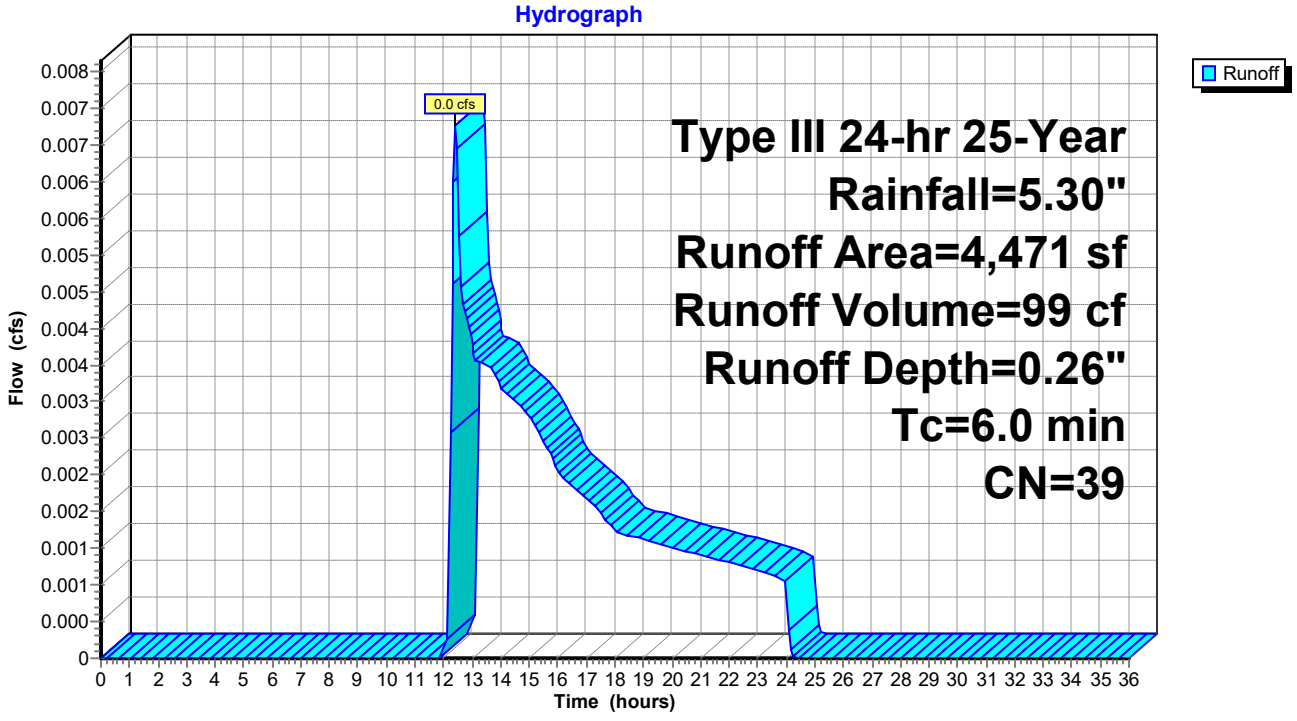
Runoff = 0.0 cfs @ 12.43 hrs, Volume= 99 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
4,471	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,471	39	Weighted Average
4,471		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-1:



Summary for Subcatchment PWA-2:

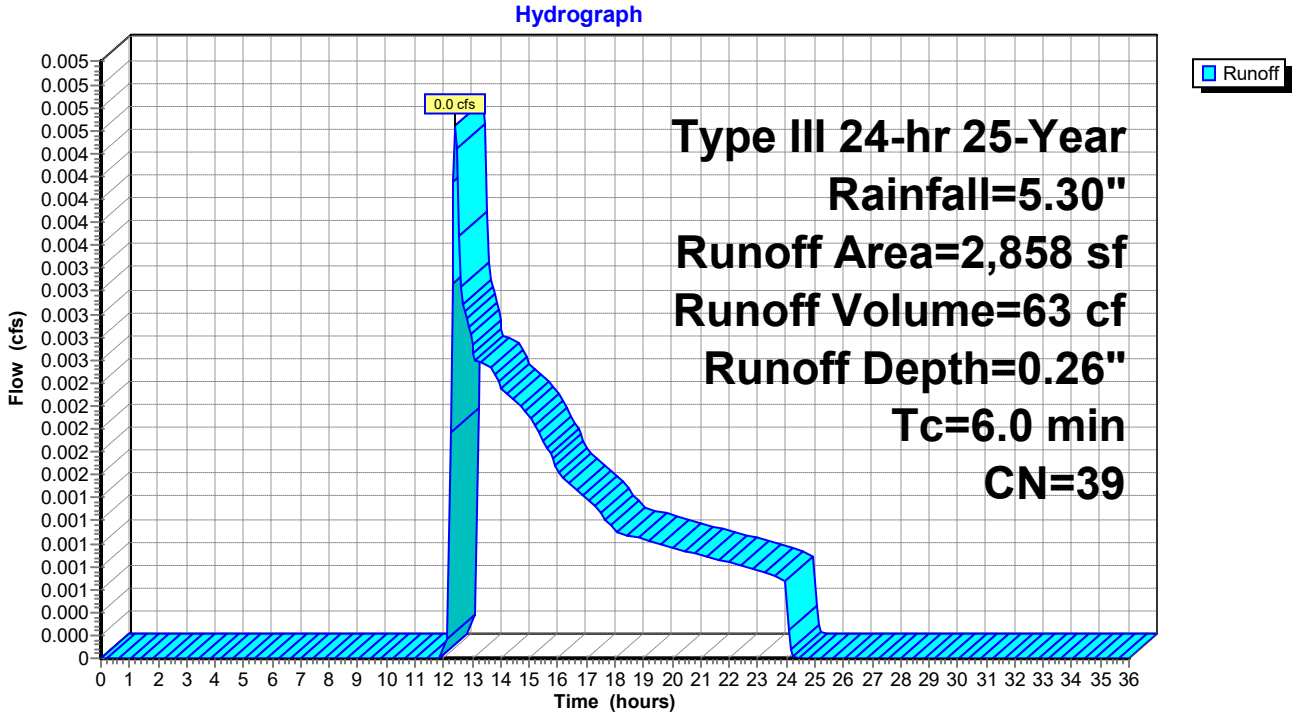
Runoff = 0.0 cfs @ 12.43 hrs, Volume= 63 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
2,858	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,858	39	Weighted Average
2,858		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-2:



Summary for Subcatchment PWA-3:

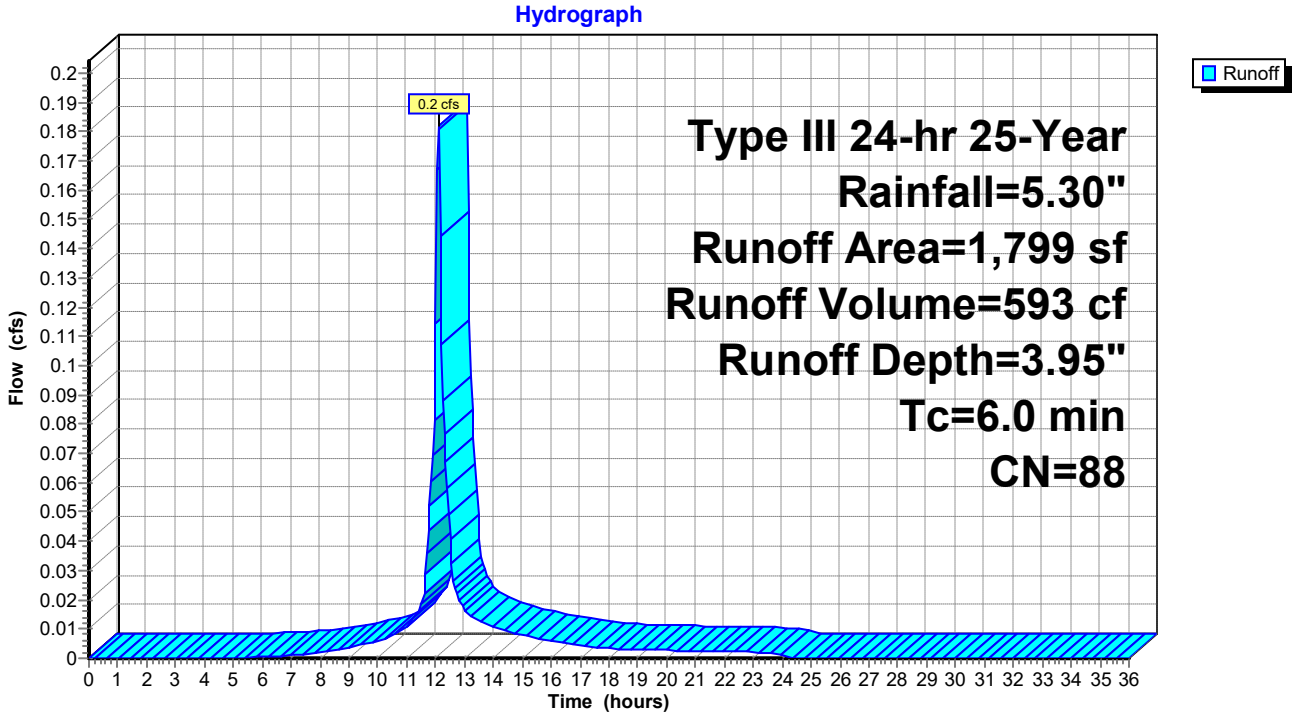
Runoff = 0.2 cfs @ 12.09 hrs, Volume= 593 cf, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-3:



Summary for Subcatchment PWA-4:

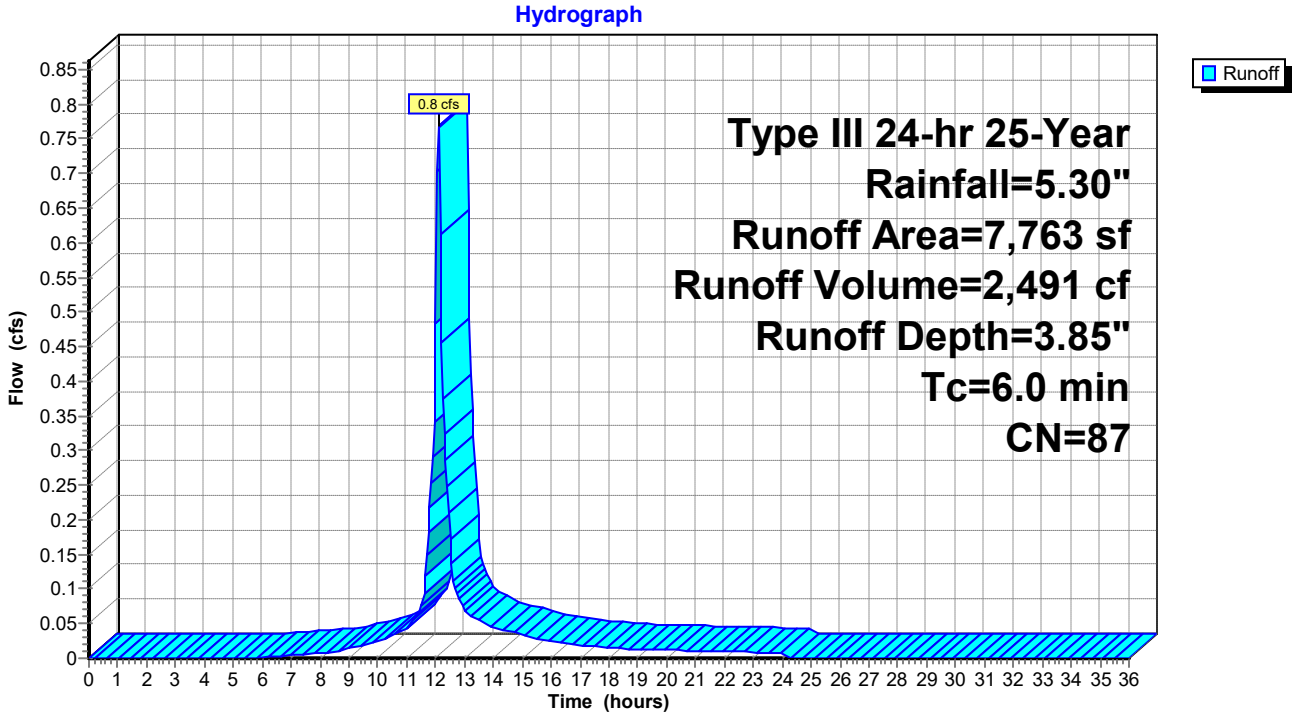
Runoff = 0.8 cfs @ 12.09 hrs, Volume= 2,491 cf, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
3,936	98	Roofs, HSG A
2,358	98	Paved parking, HSG A
1,469	39	>75% Grass cover, Good, HSG A
7,763	87	Weighted Average
1,469		18.92% Pervious Area
6,294		81.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-4:



Summary for Subcatchment PWA-5:

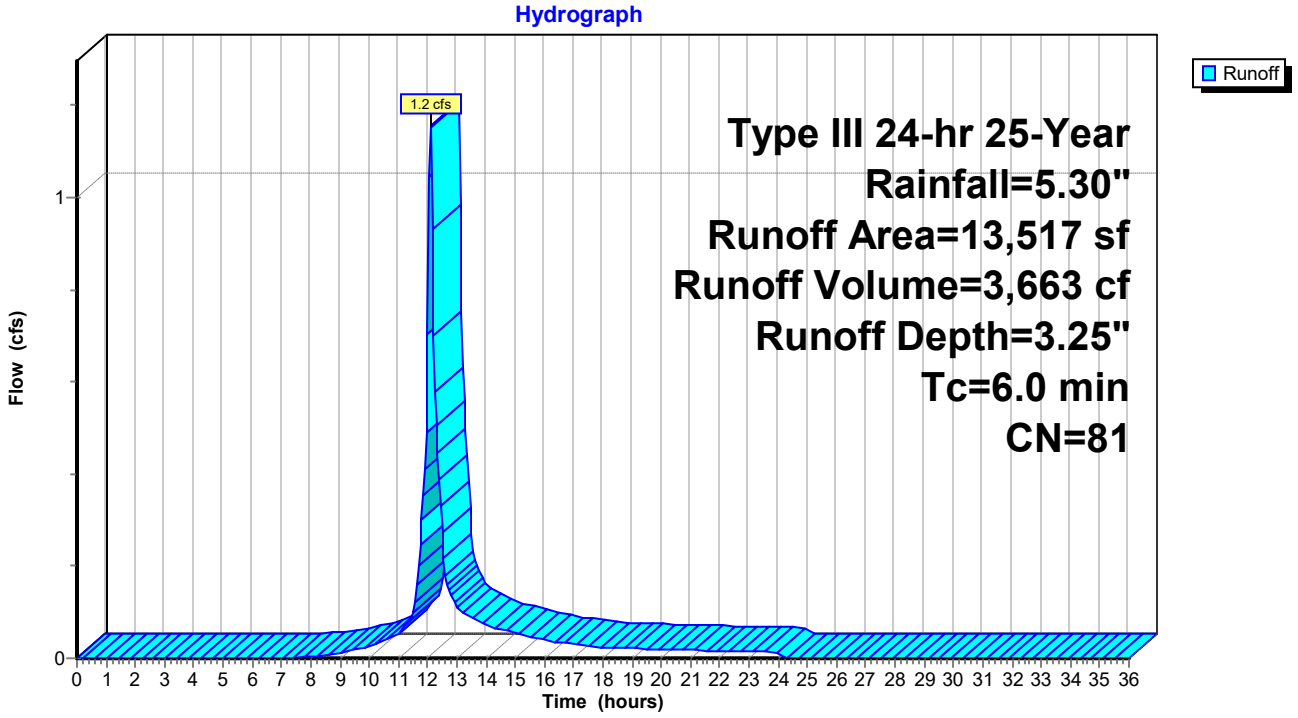
Runoff = 1.2 cfs @ 12.09 hrs, Volume= 3,663 cf, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
3,635	98	Paved parking, HSG A
3,882	39	>75% Grass cover, Good, HSG A
13,517	81	Weighted Average
3,882		28.72% Pervious Area
9,635		71.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-5:



Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 3.95" for 25-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 593 cf
Outflow = 0.1 cfs @ 12.43 hrs, Volume= 593 cf, Atten= 71%, Lag= 20.3 min
Discarded = 0.1 cfs @ 12.43 hrs, Volume= 593 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 12.07' @ 12.43 hrs Surf.Area= 122 sf Storage= 140 cf

Plug-Flow detention time= 17.7 min calculated for 592 cf (100% of inflow)
Center-of-Mass det. time= 17.7 min (813.5 - 795.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	**3.04'W x 40.00'L x 3.88'H Field A** 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	**ADS N-12 12** x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=12.07' (Free Discharge)
1=Exfiltration (Controls 0.1 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

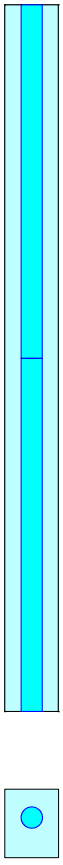
2 Chambers/Row x 20.00' Long = 40.00' Base Length
1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width
20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage
2 Chambers x 20.9 cf = 41.9 cf Displacement

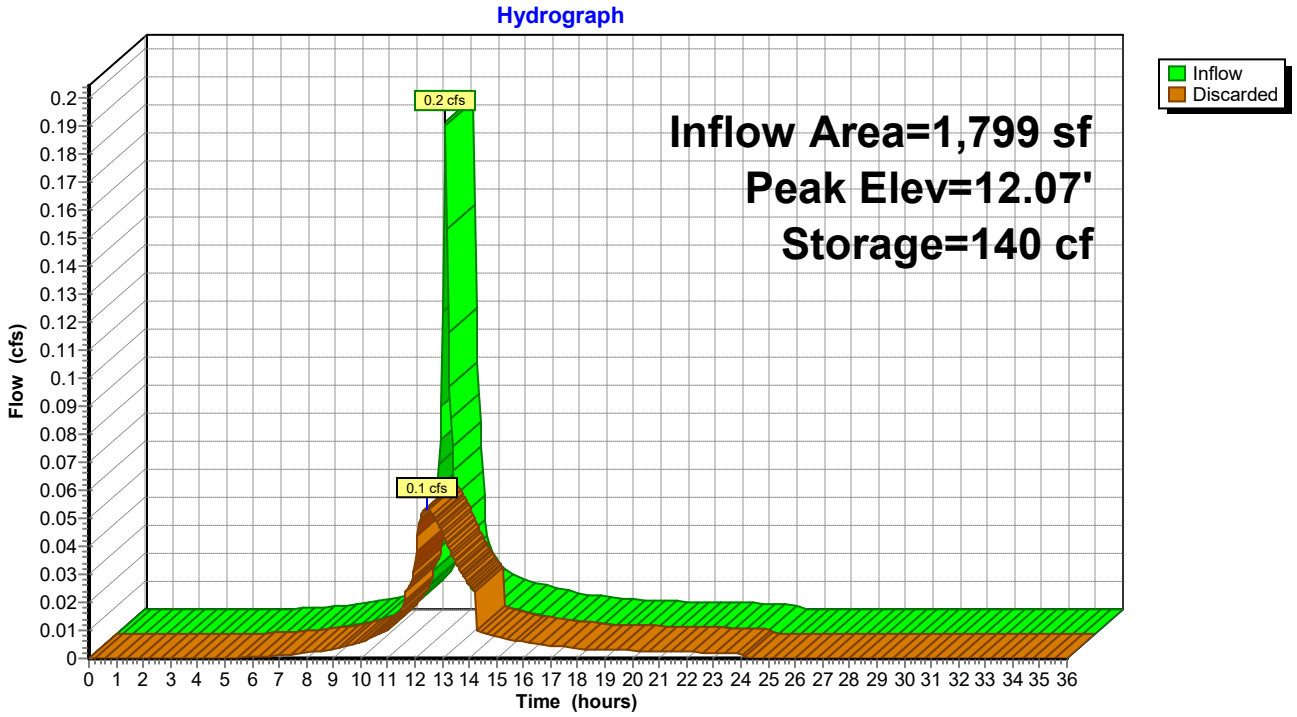
471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

Stone + Chamber Storage = 204.3 cf = 0.005 af

2 Chambers @ $ 0.00 /ea = $ 0.00
17.5 cy Field Excavation @ $ 0.00 /cy = $ 0.00
15.9 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond Infiltration Trench:



Summary for Pond System A:

Inflow Area = 21,280 sf, 74.85% Impervious, Inflow Depth = 3.47" for 25-Year event
Inflow = 1.9 cfs @ 12.09 hrs, Volume= 6,154 cf
Outflow = 0.5 cfs @ 12.50 hrs, Volume= 6,154 cf, Atten= 77%, Lag= 24.4 min
Discarded = 0.5 cfs @ 12.50 hrs, Volume= 6,154 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 9.68' @ 12.50 hrs Surf.Area= 1,129 sf Storage= 1,680 cf

Plug-Flow detention time= 26.9 min calculated for 6,145 cf (100% of inflow)
Center-of-Mass det. time= 26.9 min (836.4 - 809.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.50'	1,030 cf	**25.25'W x 44.72'L x 3.50'H Field A** 3,952 cf Overall - 1,378 cf Embedded = 2,574 cf x 40.0% Voids
#2A	8.00'	1,378 cf	**StormTech SC-740** x 30 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
		2,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 5.50'

Discarded OutFlow Max=0.5 cfs @ 12.50 hrs HW=9.68' (Free Discharge)
↑**1=Exfiltration** (Controls 0.5 cfs)

Pond System A: - Chamber Wizard Field A

Chamber Model = StormTech SC-740
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

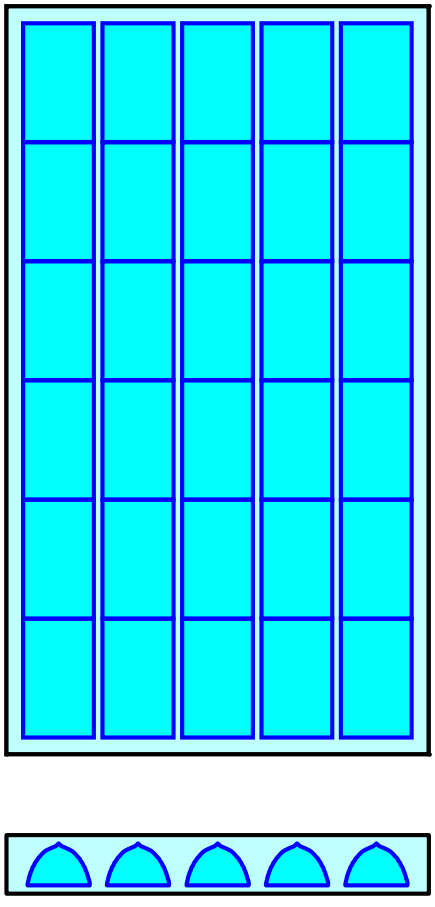
6 Chambers/Row x 7.12' Long = 42.72' + 12.0" End Stone x 2 = 44.72' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

30 Chambers x 45.9 cf = 1,378.2 cf Chamber Storage

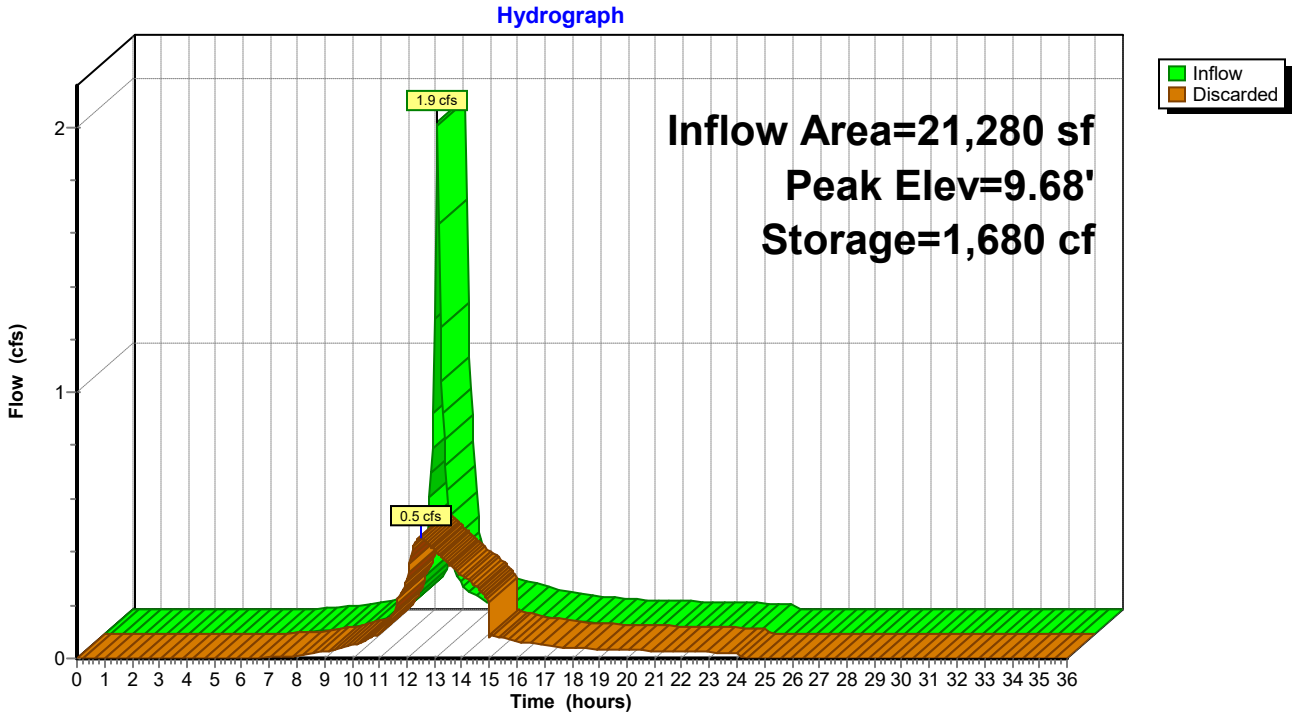
3,952.1 cf Field - 1,378.2 cf Chambers = 2,573.9 cf Stone x 40.0% Voids = 1,029.6 cf Stone Storage

Stone + Chamber Storage = 2,407.8 cf = 0.055 af

30 Chambers @ $ 0.00 /ea = $ 0.00
146.4 cy Field Excavation @ $ 0.00 /cy = $ 0.00
95.3 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond System A:



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWA-1: Runoff Area=4,471 sf 0.00% Impervious Runoff Depth=0.42"
Tc=6.0 min CN=39 Runoff=0.0 cfs 155 cf

Subcatchment PWA-2: Runoff Area=2,858 sf 0.00% Impervious Runoff Depth=0.42"
Tc=6.0 min CN=39 Runoff=0.0 cfs 99 cf

Subcatchment PWA-3: Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=4.53"
Tc=6.0 min CN=88 Runoff=0.2 cfs 679 cf

Subcatchment PWA-4: Runoff Area=7,763 sf 81.08% Impervious Runoff Depth=4.42"
Tc=6.0 min CN=87 Runoff=0.9 cfs 2,860 cf

Subcatchment PWA-5: Runoff Area=13,517 sf 71.28% Impervious Runoff Depth=3.79"
Tc=6.0 min CN=81 Runoff=1.3 cfs 4,272 cf

Pond Infiltration Trench: Peak Elev=12.60' Storage=166 cf Inflow=0.2 cfs 679 cf
Outflow=0.1 cfs 679 cf

Pond System A: Peak Elev=10.19' Storage=2,027 cf Inflow=2.2 cfs 7,133 cf
Outflow=0.5 cfs 7,133 cf

Total Runoff Area = 30,408 sf Runoff Volume = 8,066 cf Average Runoff Depth = 3.18"
42.70% Pervious = 12,984 sf 57.30% Impervious = 17,424 sf

Summary for Subcatchment PWA-1:

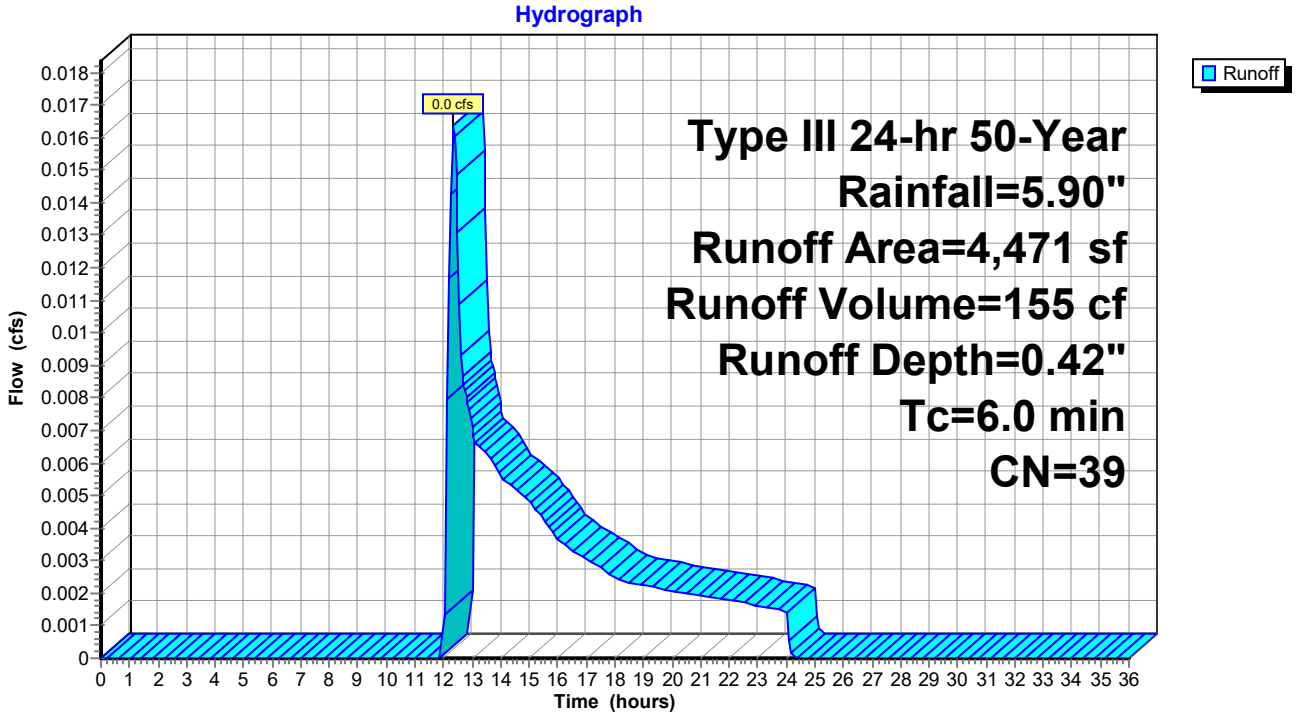
Runoff = 0.0 cfs @ 12.36 hrs, Volume= 155 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
4,471	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,471	39	Weighted Average
4,471		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-1:



Summary for Subcatchment PWA-2:

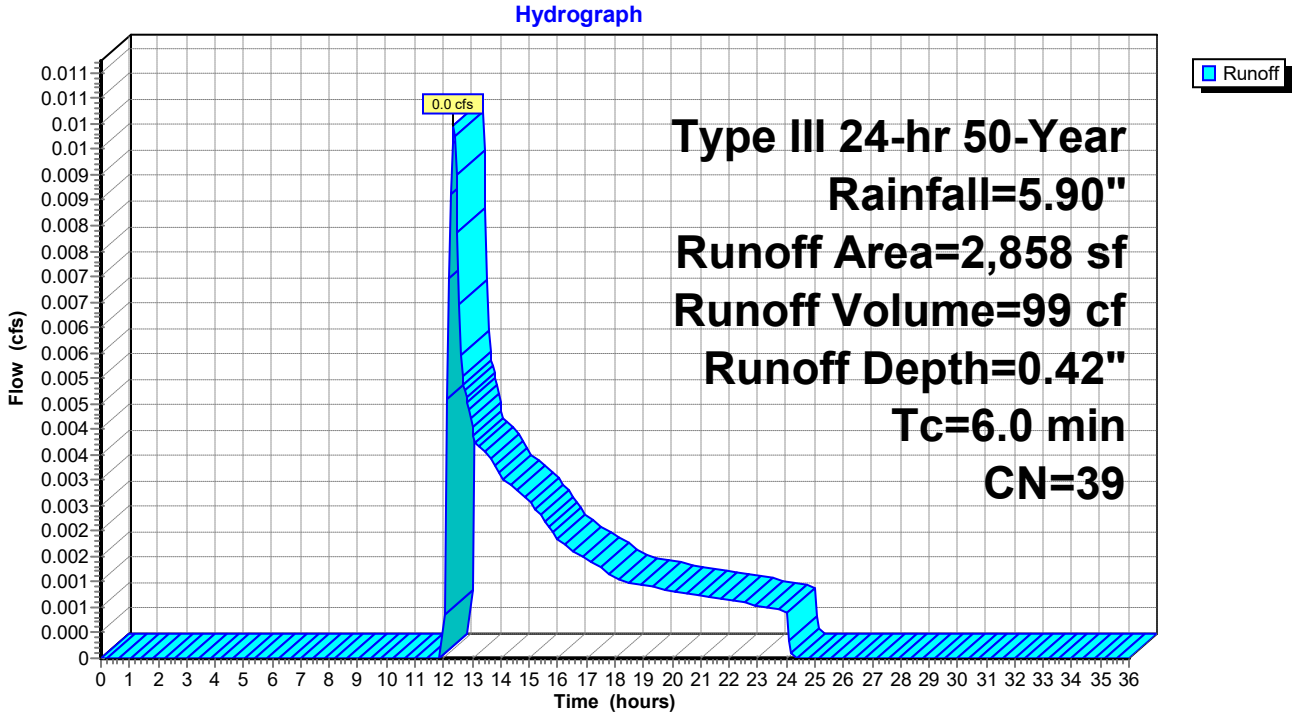
Runoff = 0.0 cfs @ 12.36 hrs, Volume= 99 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
2,858	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,858	39	Weighted Average
2,858		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-2:



Summary for Subcatchment PWA-3:

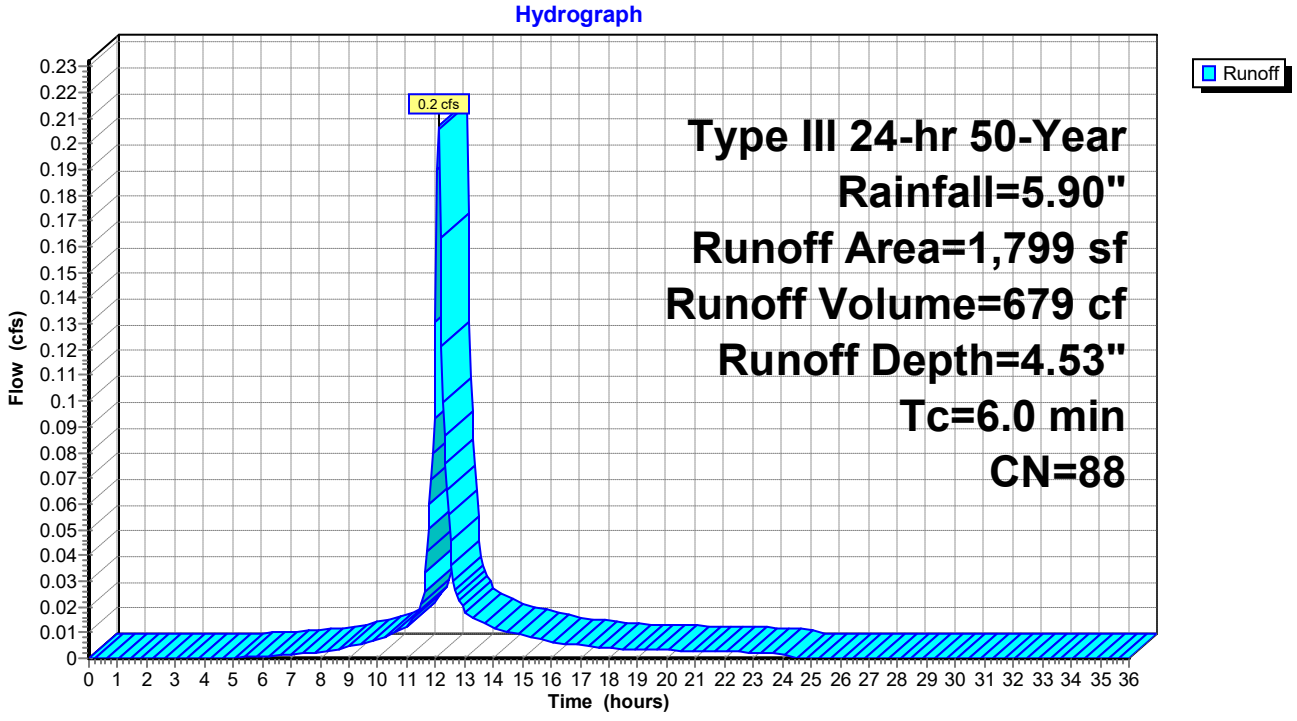
Runoff = 0.2 cfs @ 12.09 hrs, Volume= 679 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-3:



Summary for Subcatchment PWA-4:

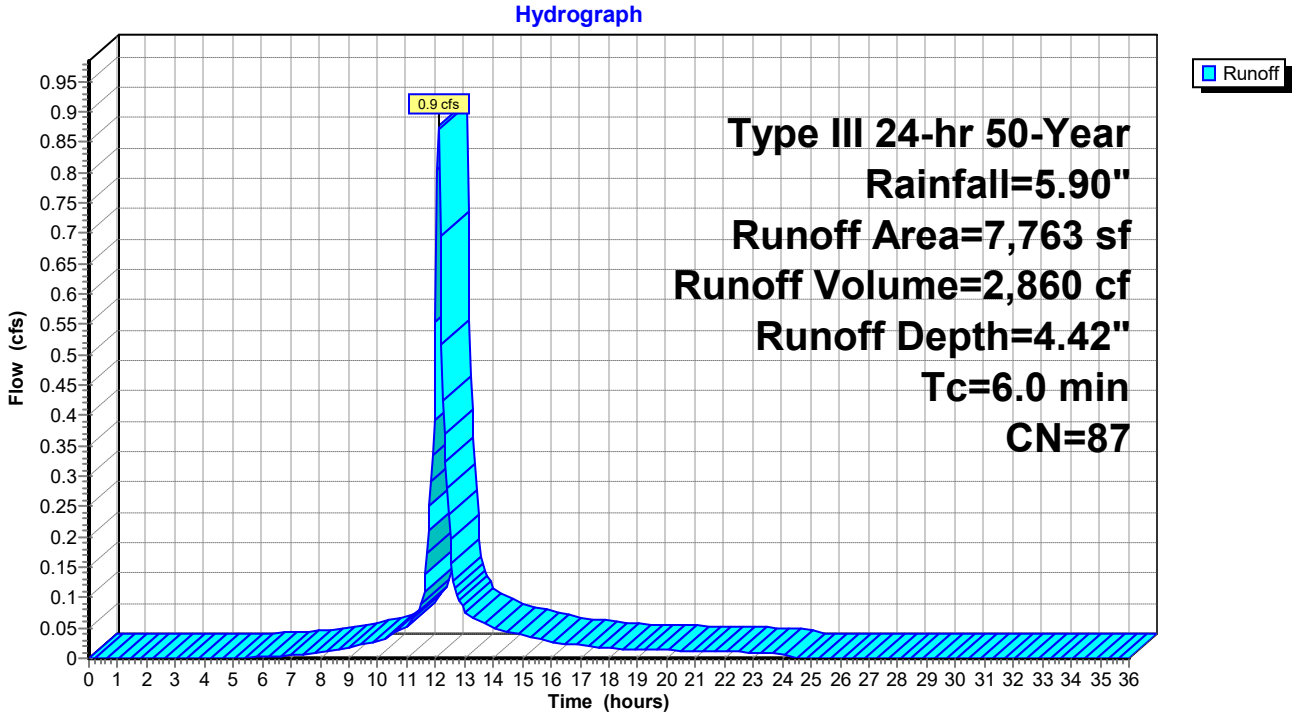
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,860 cf, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
3,936	98	Roofs, HSG A
2,358	98	Paved parking, HSG A
1,469	39	>75% Grass cover, Good, HSG A
7,763	87	Weighted Average
1,469		18.92% Pervious Area
6,294		81.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-4:



Summary for Subcatchment PWA-5:

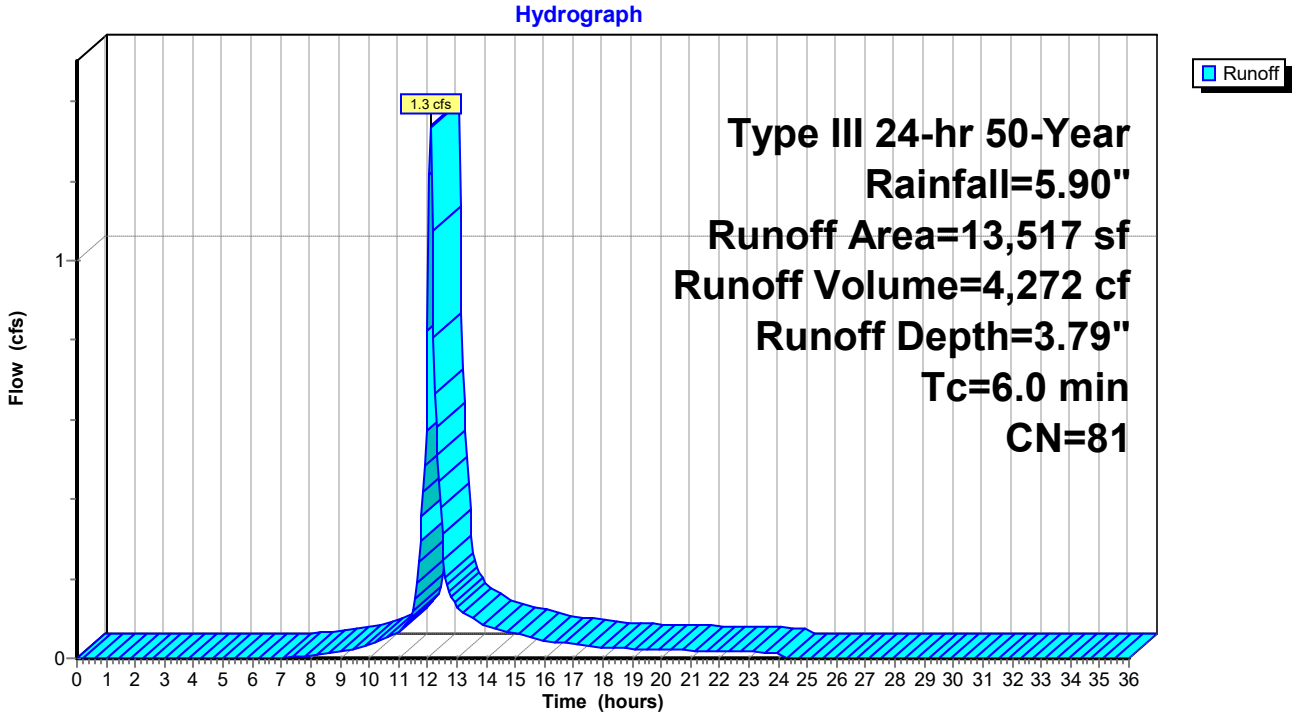
Runoff = 1.3 cfs @ 12.09 hrs, Volume= 4,272 cf, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
3,635	98	Paved parking, HSG A
3,882	39	>75% Grass cover, Good, HSG A
13,517	81	Weighted Average
3,882		28.72% Pervious Area
9,635		71.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-5:



Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 4.53" for 50-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 679 cf
Outflow = 0.1 cfs @ 12.43 hrs, Volume= 679 cf, Atten= 71%, Lag= 20.6 min
Discarded = 0.1 cfs @ 12.43 hrs, Volume= 679 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 12.60' @ 12.43 hrs Surf.Area= 122 sf Storage= 166 cf

Plug-Flow detention time= 19.9 min calculated for 678 cf (100% of inflow)
Center-of-Mass det. time= 19.9 min (811.9 - 792.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	**3.04'W x 40.00'L x 3.88'H Field A** 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	**ADS N-12 12** x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=12.59' (Free Discharge)
↑**1=Exfiltration** (Controls 0.1 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

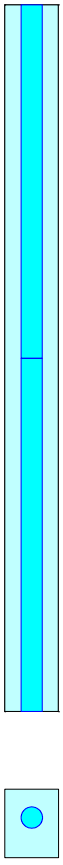
2 Chambers/Row x 20.00' Long = 40.00' Base Length
1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width
20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage
2 Chambers x 20.9 cf = 41.9 cf Displacement

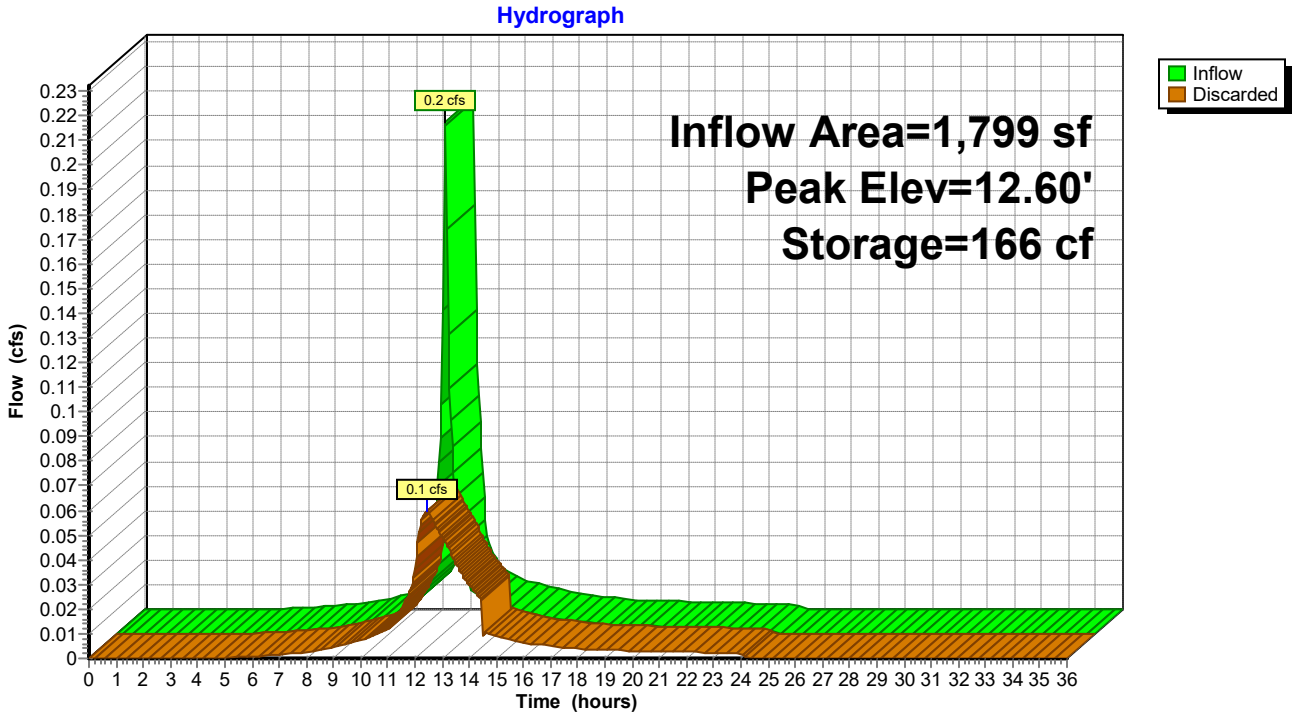
471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

Stone + Chamber Storage = 204.3 cf = 0.005 af

2 Chambers @ $ 0.00 /ea = $ 0.00
17.5 cy Field Excavation @ $ 0.00 /cy = $ 0.00
15.9 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond Infiltration Trench:



Summary for Pond System A:

Inflow Area = 21,280 sf, 74.85% Impervious, Inflow Depth = 4.02" for 50-Year event
Inflow = 2.2 cfs @ 12.09 hrs, Volume= 7,133 cf
Outflow = 0.5 cfs @ 12.50 hrs, Volume= 7,133 cf, Atten= 77%, Lag= 24.6 min
Discarded = 0.5 cfs @ 12.50 hrs, Volume= 7,133 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.19' @ 12.50 hrs Surf.Area= 1,129 sf Storage= 2,027 cf

Plug-Flow detention time= 30.7 min calculated for 7,123 cf (100% of inflow)
Center-of-Mass det. time= 30.6 min (836.1 - 805.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.50'	1,030 cf	**25.25'W x 44.72'L x 3.50'H Field A** 3,952 cf Overall - 1,378 cf Embedded = 2,574 cf x 40.0% Voids
#2A	8.00'	1,378 cf	**StormTech SC-740** x 30 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
		2,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 5.50'

Discarded OutFlow Max=0.5 cfs @ 12.50 hrs HW=10.19' (Free Discharge)
↑**1=Exfiltration** (Controls 0.5 cfs)

Pond System A: - Chamber Wizard Field A

Chamber Model = StormTech SC-740
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

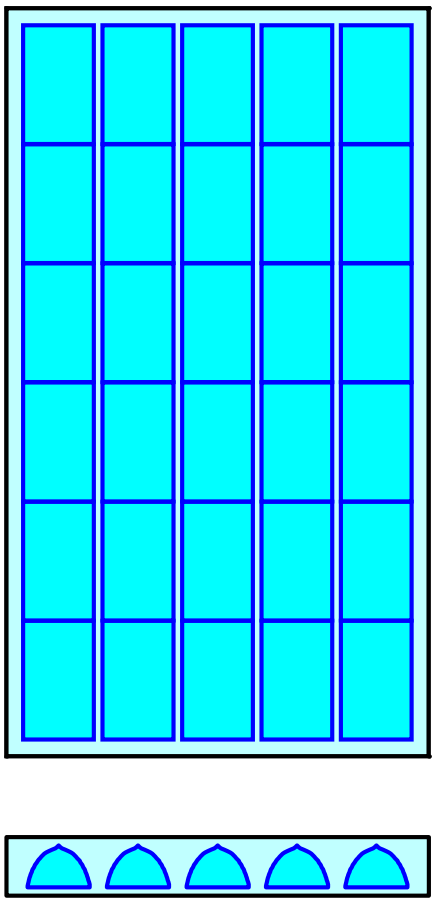
6 Chambers/Row x 7.12' Long = 42.72' + 12.0" End Stone x 2 = 44.72' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

30 Chambers x 45.9 cf = 1,378.2 cf Chamber Storage

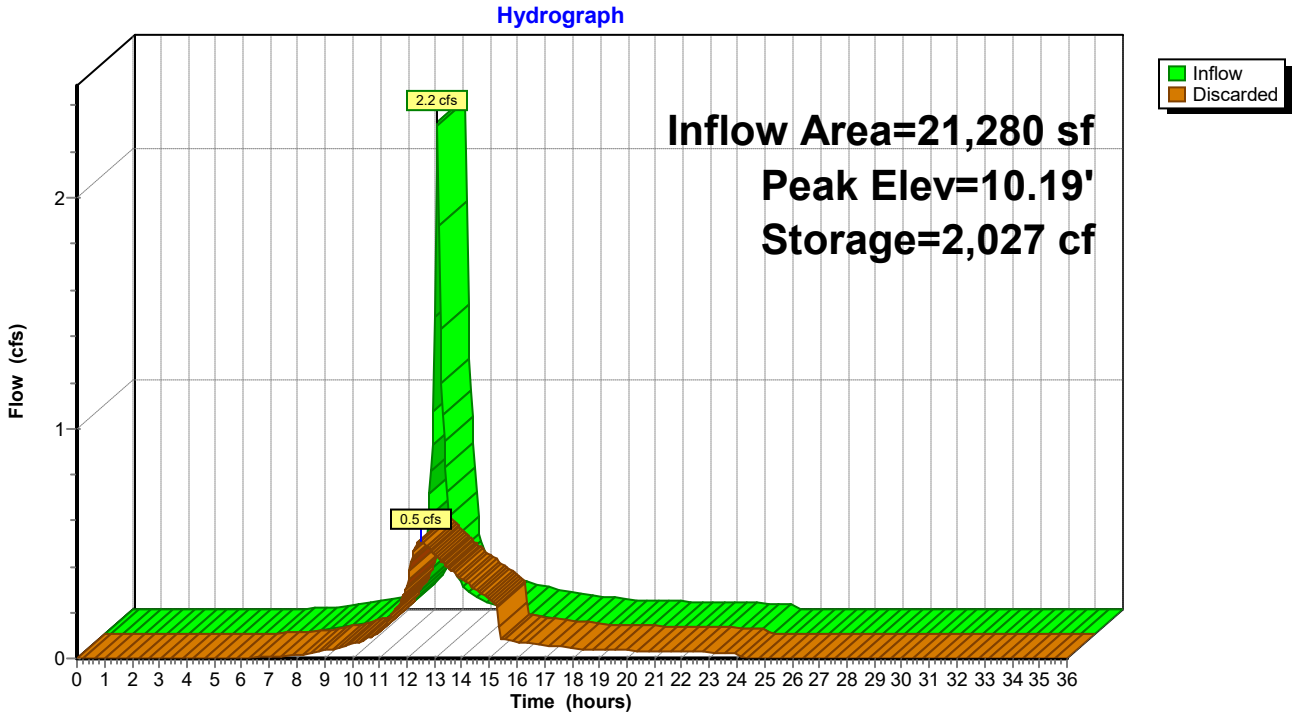
3,952.1 cf Field - 1,378.2 cf Chambers = 2,573.9 cf Stone x 40.0% Voids = 1,029.6 cf Stone Storage

Stone + Chamber Storage = 2,407.8 cf = 0.055 af

30 Chambers @ $ 0.00 /ea = $ 0.00
146.4 cy Field Excavation @ $ 0.00 /cy = $ 0.00
95.3 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond System A:



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PWA-1: Runoff Area=4,471 sf 0.00% Impervious Runoff Depth=0.60"
Tc=6.0 min CN=39 Runoff=0.0 cfs 223 cf

Subcatchment PWA-2: Runoff Area=2,858 sf 0.00% Impervious Runoff Depth=0.60"
Tc=6.0 min CN=39 Runoff=0.0 cfs 142 cf

Subcatchment PWA-3: Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=5.11"
Tc=6.0 min CN=88 Runoff=0.2 cfs 766 cf

Subcatchment PWA-4: Runoff Area=7,763 sf 81.08% Impervious Runoff Depth=5.00"
Tc=6.0 min CN=87 Runoff=1.0 cfs 3,233 cf

Subcatchment PWA-5: Runoff Area=13,517 sf 71.28% Impervious Runoff Depth=4.34"
Tc=6.0 min CN=81 Runoff=1.5 cfs 4,891 cf

Pond Infiltration Trench: Peak Elev=13.14' Storage=193 cf Inflow=0.2 cfs 766 cf
Outflow=0.1 cfs 766 cf

Pond System A: Peak Elev=10.90' Storage=2,365 cf Inflow=2.5 cfs 8,124 cf
Outflow=0.6 cfs 8,124 cf

Total Runoff Area = 30,408 sf Runoff Volume = 9,255 cf Average Runoff Depth = 3.65"
42.70% Pervious = 12,984 sf 57.30% Impervious = 17,424 sf

Summary for Subcatchment PWA-1:

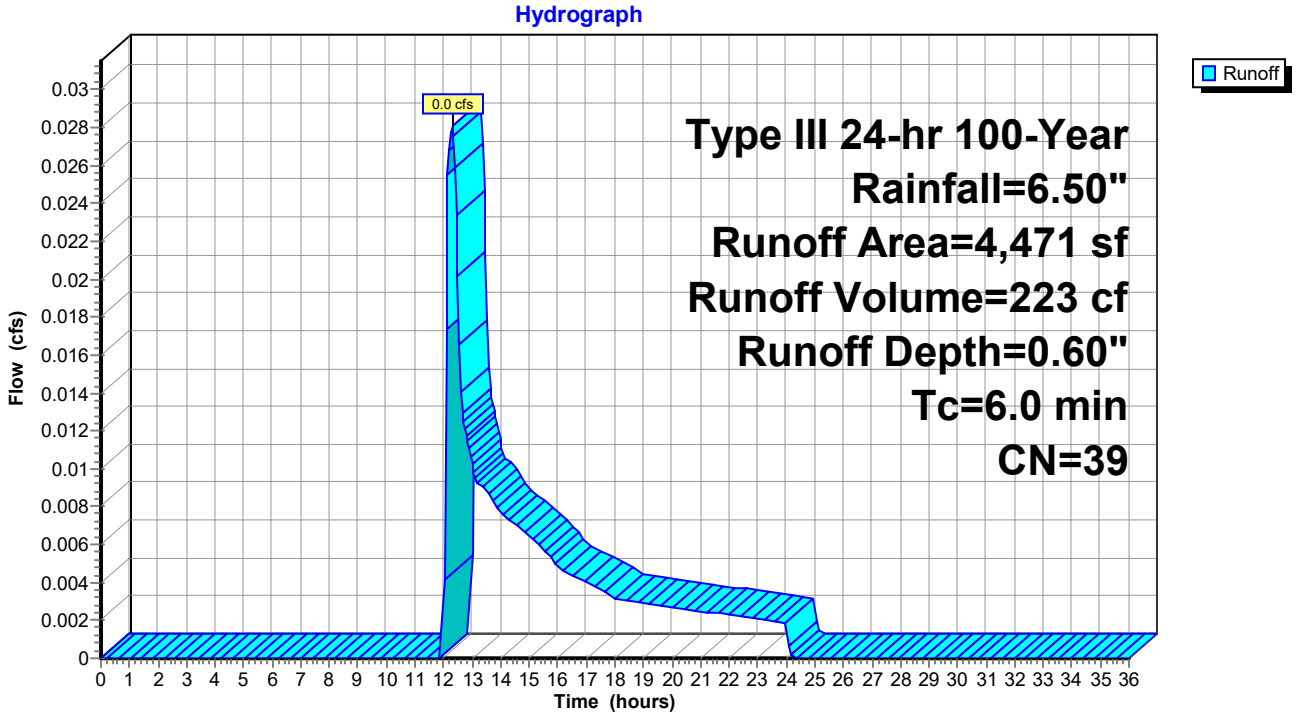
Runoff = 0.0 cfs @ 12.29 hrs, Volume= 223 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
4,471	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,471	39	Weighted Average
4,471		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-1:



Summary for Subcatchment PWA-2:

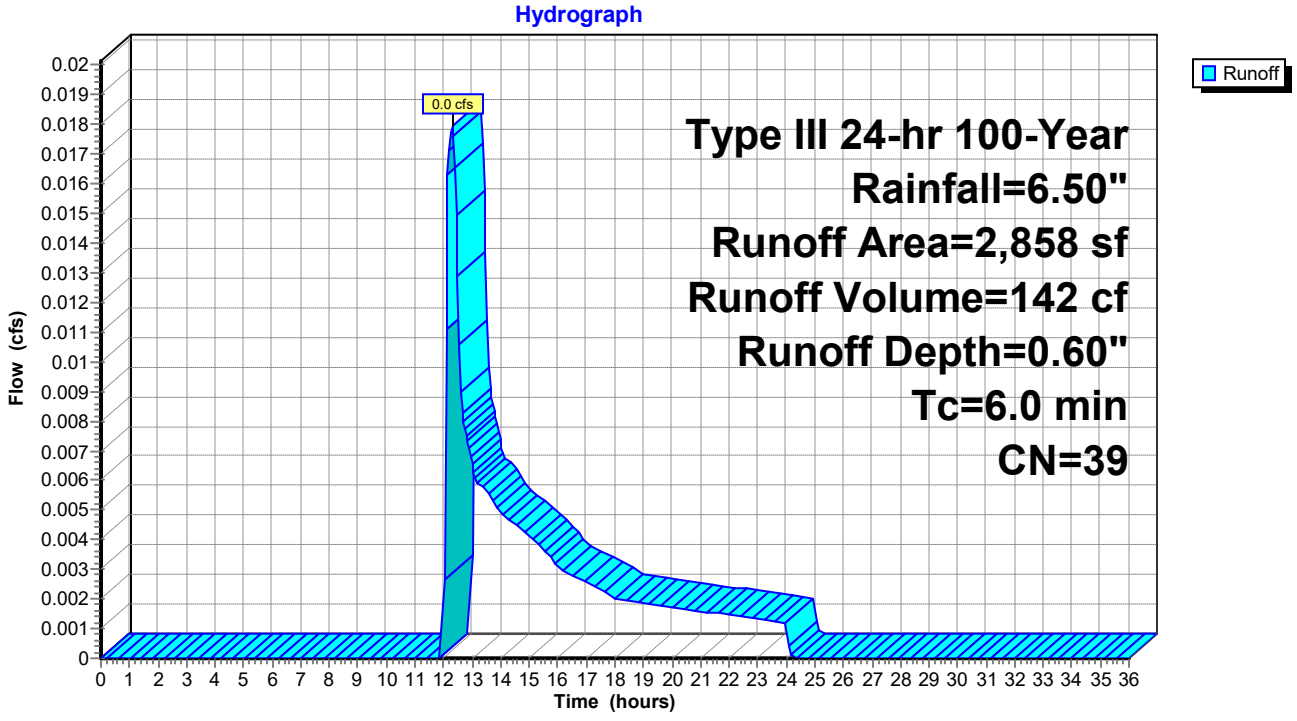
Runoff = 0.0 cfs @ 12.29 hrs, Volume= 142 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
2,858	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,858	39	Weighted Average
2,858		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-2:



Summary for Subcatchment PWA-3:

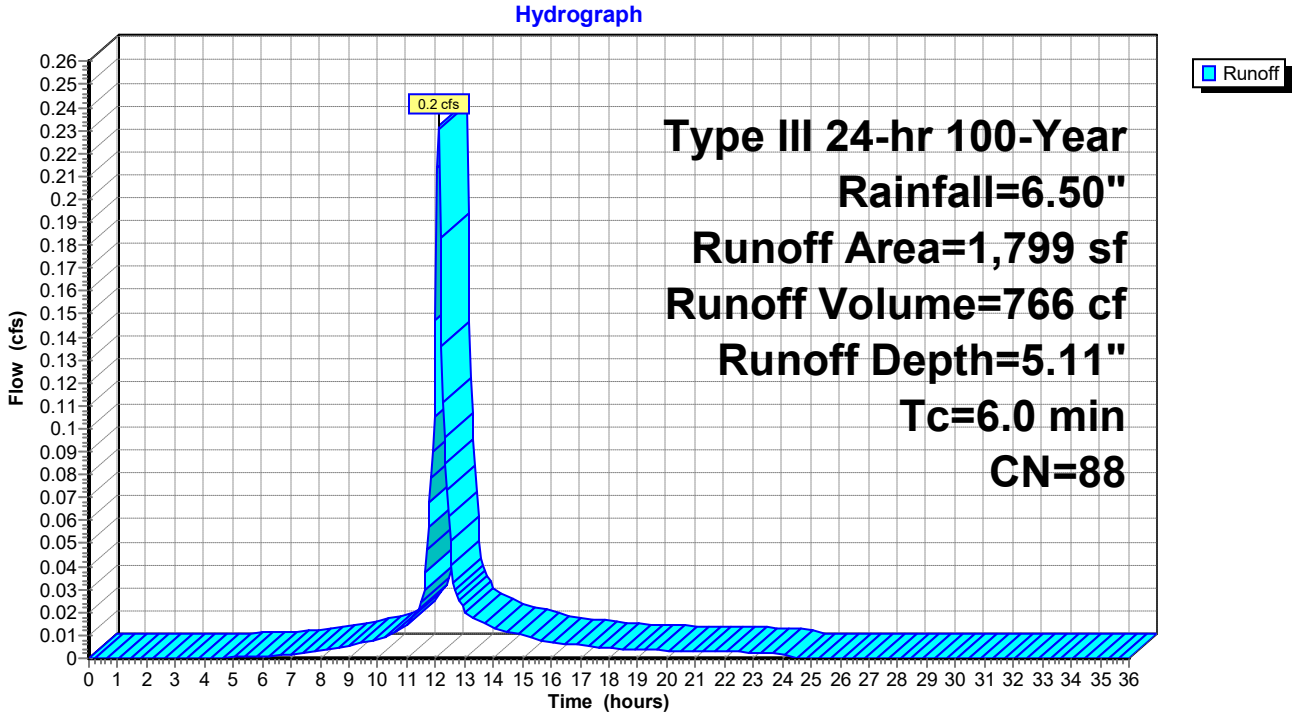
Runoff = 0.2 cfs @ 12.09 hrs, Volume= 766 cf, Depth= 5.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-3:



Summary for Subcatchment PWA-4:

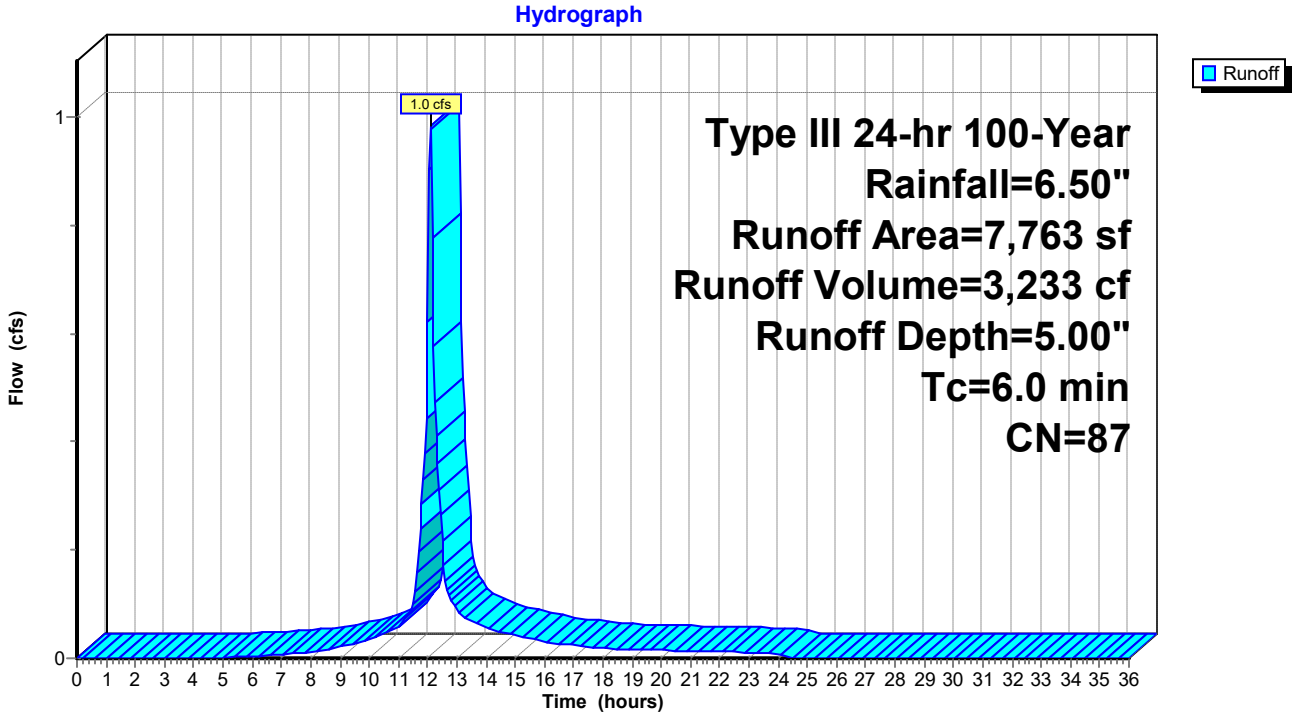
Runoff = 1.0 cfs @ 12.09 hrs, Volume= 3,233 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
3,936	98	Roofs, HSG A
2,358	98	Paved parking, HSG A
1,469	39	>75% Grass cover, Good, HSG A
7,763	87	Weighted Average
1,469		18.92% Pervious Area
6,294		81.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-4:



Summary for Subcatchment PWA-5:

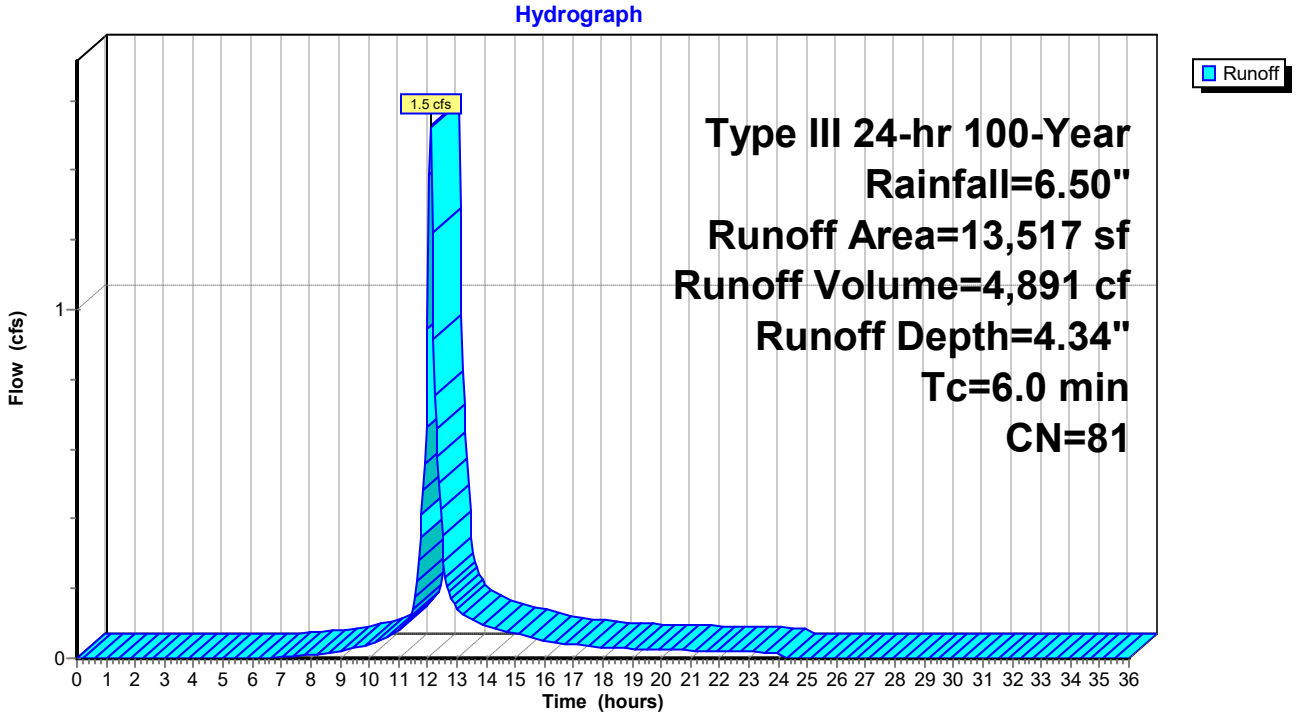
Runoff = 1.5 cfs @ 12.09 hrs, Volume= 4,891 cf, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
3,635	98	Paved parking, HSG A
3,882	39	>75% Grass cover, Good, HSG A
13,517	81	Weighted Average
3,882		28.72% Pervious Area
9,635		71.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6**

Subcatchment PWA-5:



Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 5.11" for 100-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 766 cf
Outflow = 0.1 cfs @ 12.43 hrs, Volume= 766 cf, Atten= 72%, Lag= 20.7 min
Discarded = 0.1 cfs @ 12.43 hrs, Volume= 766 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 13.14' @ 12.43 hrs Surf.Area= 122 sf Storage= 193 cf

Plug-Flow detention time= 21.7 min calculated for 765 cf (100% of inflow)
Center-of-Mass det. time= 21.6 min (810.4 - 788.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	**3.04'W x 40.00'L x 3.88'H Field A** 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	**ADS N-12 12** x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=13.14' (Free Discharge)
↑**1=Exfiltration** (Controls 0.1 cfs)

Pond Infiltration Trench: - Chamber Wizard Field A

Chamber Model = ADS N-12 12
Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf
Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

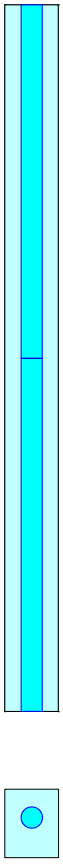
2 Chambers/Row x 20.00' Long = 40.00' Base Length
1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width
20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage
2 Chambers x 20.9 cf = 41.9 cf Displacement

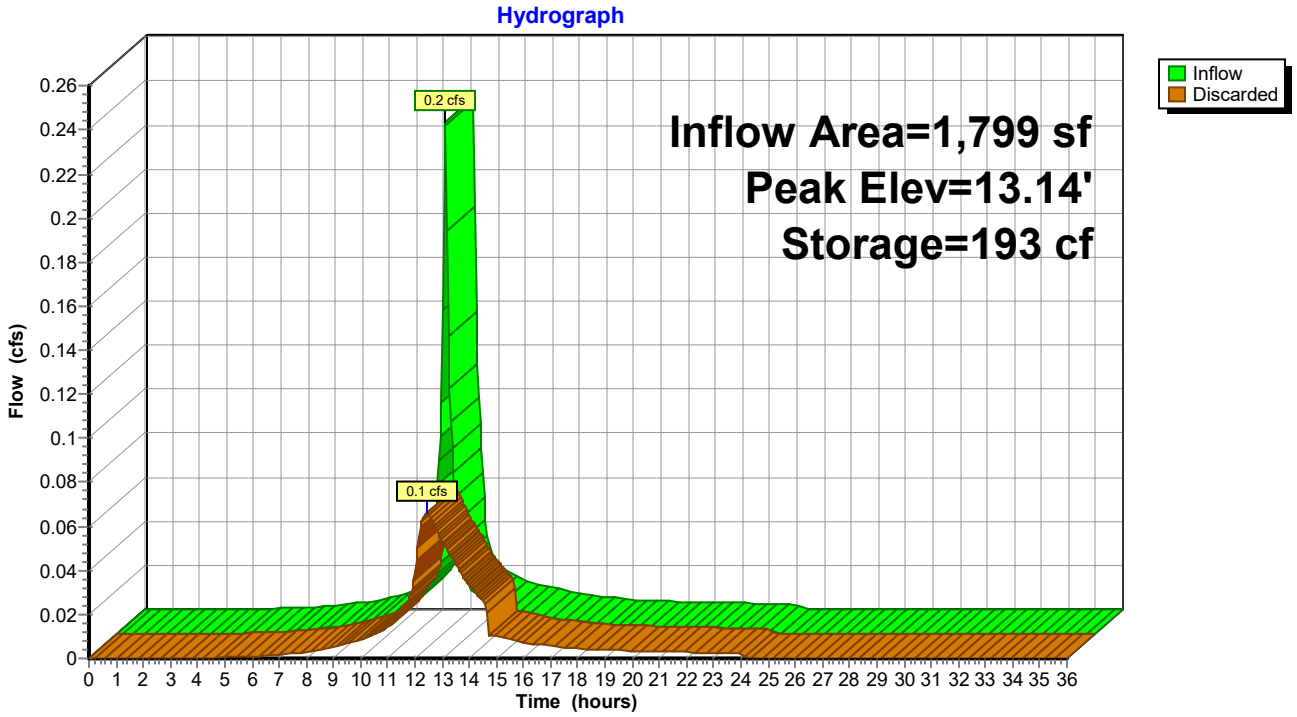
471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

Stone + Chamber Storage = 204.3 cf = 0.005 af

2 Chambers @ $ 0.00 /ea = $ 0.00
17.5 cy Field Excavation @ $ 0.00 /cy = $ 0.00
15.9 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond Infiltration Trench:



Summary for Pond System A:

Inflow Area = 21,280 sf, 74.85% Impervious, Inflow Depth = 4.58" for 100-Year event
Inflow = 2.5 cfs @ 12.09 hrs, Volume= 8,124 cf
Outflow = 0.6 cfs @ 12.49 hrs, Volume= 8,124 cf, Atten= 77%, Lag= 24.3 min
Discarded = 0.6 cfs @ 12.49 hrs, Volume= 8,124 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.90' @ 12.49 hrs Surf.Area= 1,129 sf Storage= 2,365 cf

Plug-Flow detention time= 33.5 min calculated for 8,112 cf (100% of inflow)
Center-of-Mass det. time= 33.5 min (835.3 - 801.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.50'	1,030 cf	**25.25'W x 44.72'L x 3.50'H Field A** 3,952 cf Overall - 1,378 cf Embedded = 2,574 cf x 40.0% Voids
#2A	8.00'	1,378 cf	**StormTech SC-740** x 30 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
		2,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 5.50'

Discarded OutFlow Max=0.6 cfs @ 12.49 hrs HW=10.90' (Free Discharge)
↑**1=Exfiltration** (Controls 0.6 cfs)

Pond System A: - Chamber Wizard Field A

Chamber Model = StormTech SC-740
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

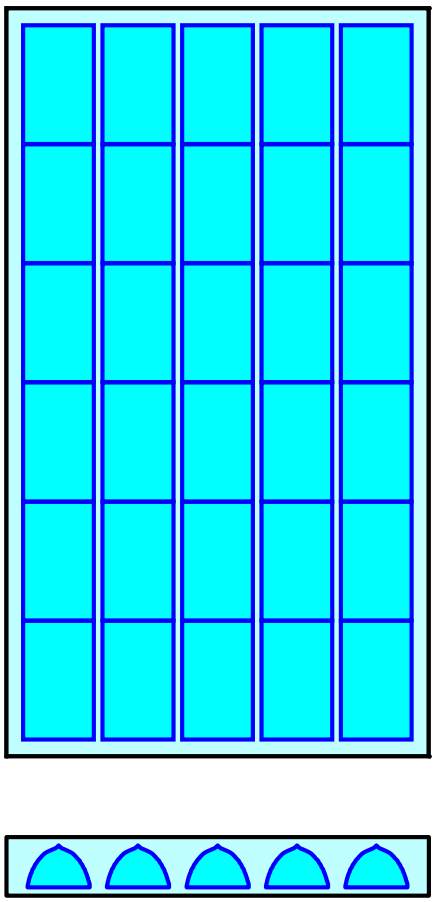
6 Chambers/Row x 7.12' Long = 42.72' + 12.0" End Stone x 2 = 44.72' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

30 Chambers x 45.9 cf = 1,378.2 cf Chamber Storage

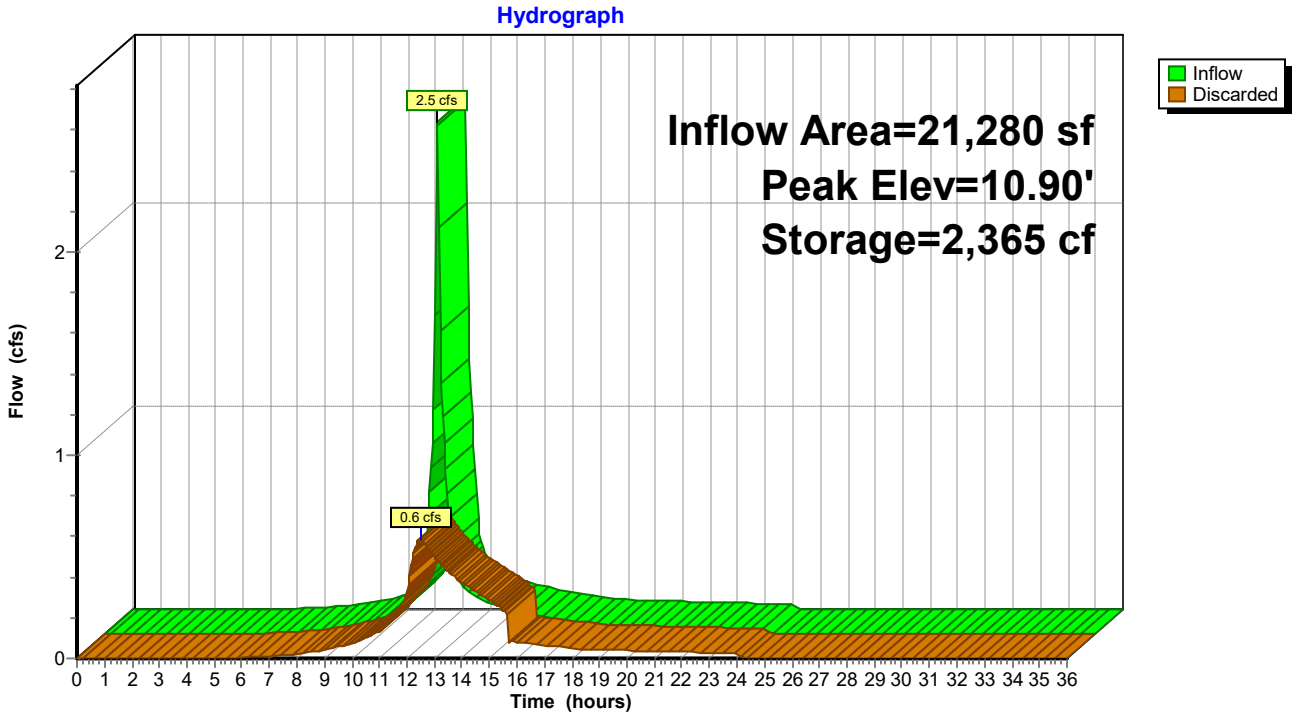
3,952.1 cf Field - 1,378.2 cf Chambers = 2,573.9 cf Stone x 40.0% Voids = 1,029.6 cf Stone Storage

Stone + Chamber Storage = 2,407.8 cf = 0.055 af

30 Chambers @ $ 0.00 /ea = $ 0.00
146.4 cy Field Excavation @ $ 0.00 /cy = $ 0.00
95.3 cy Stone @ $ 0.00 /cy = $ 0.00
Total Cost = $ 0.00



Pond System A:



TAB 3

Project: 159 Beach Road
Location: Salisbury, MA
Client: Larkin Real Estate Group, Inc.

Project Number: 21-10254
Prepared By: William Hall, P.E.
Date: June 19, 2023

STORMWATER MANAGEMENT STANDARDS CALCULATIONS

Standard 1: Velocity & Rip-Rap Apron Sizing and Gradation Calculations

- Not Applicable, no outlets proposed.

Conclusion: No stormwater discharges are proposed, the Stormwater Management System conforms to Standard 1.

Standard 2: Peak Discharge Summary (CFS)

Design Point 1	2-Year (3.1-IN)	10-Year (4.5-IN)	25-Year (5.3-IN)	50-Year (5.9-IN)	100-Year (6.5-IN)
Pre-Development Conditions:	0.3	0.6	0.8	1.0	1.1
Post Development Conditions:	0.0	0.0	0.0	0.0	0.0

Design Point 2	2-Year (3.1-IN)	10-Year (4.5-IN)	25-Year (5.3-IN)	50-Year (5.9-IN)	100-Year (6.5-IN)
Pre-Development Conditions:	0.0	0.0	0.0	0.0	0.0
Post Development Conditions:	0.0	0.0	0.0	0.0	0.0

Conclusion: The Stormwater Management System conforms to Standard 2.

Standard 3: Recharge Calculations (Static Method)

Subsurface Chamber System A

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	0.40	0.00	0.00	0.00	0.40	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	871	0	0	0	871	CF

Volume Provided: 2,408 CF

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate): 8.27 IN/HR
Bottom Area of Infiltration Basin: 1,129 SF
Drawdown Time: 3.1 HRS

Infiltration Trench

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	0.03	0.00	0.00	0.00	0.03	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	75	0	0	0	75	CF

Volume Provided: 201 CF

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27	IN/HR
Bottom Area of Infiltration Basin:	122	SF
Drawdown Time:	2.4	HRS

Conclusion: The volume provided exceeds the minimum recharge volume required. In addition, the BMPs drain within 72-HRS to comply with DEP regulations. The Stormwater Management System conforms to Standard 3.

Standard 4: Water Quality Volume Calculations

Subsurface Chamber System A

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	0.40	Acres
Required Water Quality Volume:	1,452	CF
Provided Water Quality Volume:	2,408	CF

Infiltration Trench

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	0.03	Acres
Required Water Quality Volume:	125	CF
Provided Water Quality Volume:	201	CF

TSS Removal Rate Calculations

Treatment Provided From Subsurface Chamber Systems A & B

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Hydrodynamic Separators	90%	1.00	0.90	0.10
Subsurface Chambers	80%	0.10	0.08	0.02
TSS Removed through BMPs:				98.0%

Treatment Provided From Infiltration Trench

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Infiltration Trench with Filter Strip:	80%	1.00	0.80	0.20
TSS Removed through Infiltration Trench:				80.0%

Conclusion: The volume provided by the infiltration structures exceeds the Water Quality Volume, therefore the TSS Removal Rate meets 80%. The Stormwater Management System conforms to Standard 4.

Standard 5: Land Uses With Higher Potential Pollutant Loads

Conclusion: The proposed use is not considered a Land Use with Higher Potential Pollutant Loads. This Standard is NOT Applicable.

Standard 6: Critical Areas

Conclusion: The proposal is not located within a Critical Area. This Standard is NOT Applicable.

Standard 7: Redevelopment

Conclusion: The development does not meet the criteria for Redevelopment.

Standard 8: Construction Period Controls

Conclusion: The project is not covered by a NPDES Construction General Permit. An erosion and sedimentation control plan has been submitted to address construction period pollution prevention measures and to reduce the potential for erosion and sedimentation. The Stormwater Management System Conforms to Standard 8.

Standard 9: Operations and Maintenance Plan

Conclusion: An Operations and Maintenance Plan has been prepared and provided with this summary. The Stormwater Management System Conforms to Standard 9.

Standard 10: Illicit Discharges to Drainage System

Conclusion: All off-site discharges are comprised entirely of stormwater. The Stormwater Management System Conforms to Standard 10.