Stormwater Management Report

Owner:
Abdo Markethouse
601 Marquette Ave
Suite 100
Minneapolis, MN 55402

Project:
Glen Lake Apartments
14317 Excelsior Blvd
Minnetonka, MN 55345

Engineer's Certification:

All plans and supporting Documentation contained in this report have been reviewed by me and it is hereby certified that to the best of my knowledge the plans comply with the requirements of the ordinance.

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Robert A. Latta P.E.

Registration Number: 59612

Date:
01/31/2022

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2.0 Summary Analysis / Narrative:

2.1 Introduction:

This stormwater management report accompanies the Civil Engineering Plans prepared by Civil Site Group for the subject project dated 01/31/2022. This report includes a summary of the existing and proposed site conditions, the stormwater requirements of relevant regulatory agencies, and proposed design calculations and data to meet the requirements.

2.2 Existing Site Conditions :

Site Description:
The existing site is a single family home. Below is the existing surface area tabulation.

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
EX1	7454	98	37577	39	45031	49
EXOFF	1528	98	5210	39	6738	52

Existing Soils:
A geotechnical exploration has not been completed for the site as of January 2022. Future resubmittals will included boring logs.

Groundwater:
Groundwater observations have not been taken.

2.3 Proposed Site Conditions:

Site Description:
The proposed site is a multi-family residential building with associated underground parking, landscaping, utility and stormwater improvements.

The proposed site surface coverage areas are shown in the table below:

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
PR1	22840	98	13756	39	36596	76
PR2	4114	98	4322	39	8436	68
PROFF1	134	98	6604	39	6738	40

2.4 Stormwater Requirements City (Minnetonka):

The city of Minnetonka defers to Nine Mile Creek Watershed district.

2.5 Stormwater Requirements Watershed District – (Nine Mile Creek Watershed District):

Requirement threshold – A permit is required for projects which disturb 50 cubic yards or more of earth or disturb 5,000 sf of surface area or vegetation.

Rate Control – Limit peak runoff flow rates to existing conditions for two-, 10-, and 100-year frequency storms (nested 24-hour rainfall distribution).

Water Quality – Remove at least 60% of total phosphorus and 90 percent of total suspended solids annually from site runoff.

Volume Retention – Retain 1.1 inches of runoff on-site from applicable impervious surface.
Provide pretreatment of runoff for infiltration or filtration systems
Draw down water levels in infiltration or filtration systems within 48 hours
If site conditions limit or prohibit infiltration, see the volume retention compliance sequencing approach.

2.6 Stormwater Requirements - Minnesota Pollution Control Agency – NPPDES permit (MPCA):

Requirement threshold - A permit is required for projects with a disturbed area over 1 acre in size, Stormwater management is required for a project adding 1-acre of more of NEW impervious surface (reconstructed impervious is not included).
Rate Control – No specific regulation, may not degrade downstream facilities.
Water Quality – Stormwater water quality treatment volume must be provided equal to 1.0" over all new impervious surfaces (includes all newly constructed impervious surfaces only, re-constructed impervious surfaces are not included).
Volume Control – Must consider volume reduction if feasible and not prohibited on site. The required infiltration volume is equal to the water quality volume described above.

3.0 Stormwater Calculations:

3.1 Proposed Stormwater Management Strategy & Facilities Description

This project is disturbing greater than 5000 sf. Nine Mile Creek stormwater rate control requirements apply. Stormwater management on this site is provided by the proposed underground infiltration system.

3.2 Rate Control

Rate control is provided by live storage within the proposed infiltration basin. This information was derived using HydroCAD stormwater modeling software. The existing and proposed runoff rates are shown in the summary table below. The proposed site meets the requirements.

Overall Stormwater Rate Summary

	Existing Conditions Rate (cfs)	Proposed Conditions Rate (cfs)
2-Year Event	0.87	0.40
10-Year Event	1.32	1.17
100-Year Event	3.43	2.73

3.3 Water Quality

Water quality is provided by the proposed infiltration basin and the upstream sumped catch basins. Total phosphorus and TSS requirements are met with the infiltration basin. Although the MIDS model shows that the proposed site does not meet the 90% TSS requirement, we feel that the site is optimized for water quality treatment and that capture of remaining impervious surface runoff from the site is not practical.

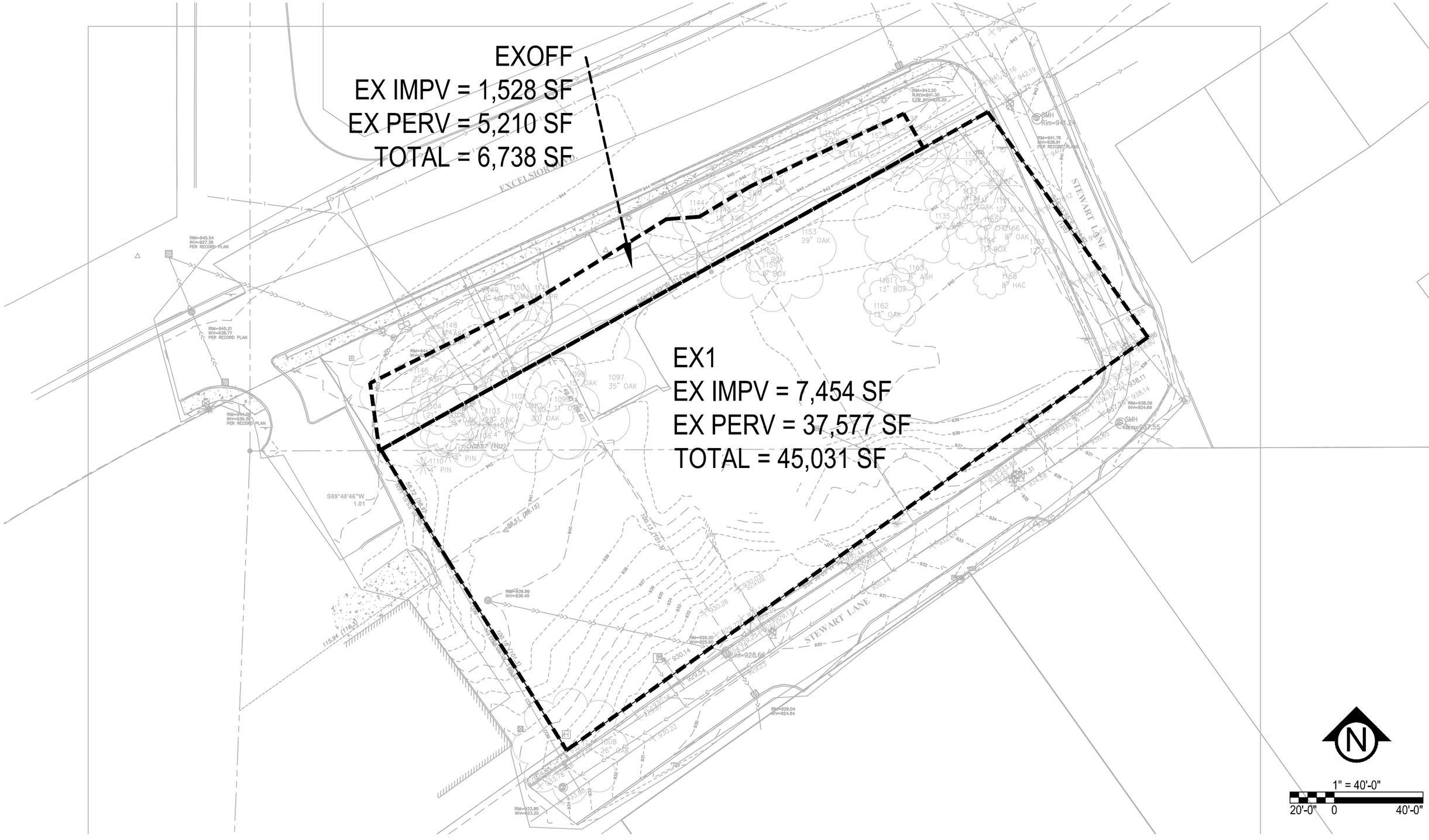
3.4 Volume Control

The infiltration basin meets the 1.1'' abstraction requirement.

Proposed BMP Area	Provided Vol (cf)	Drawdown Time Calculations (0.8"/Hour)		
		Inf. Area (sf)	Assoc. Inf. Height (ft)	Drawdown Time (h)
Infiltration Basin 1	2939	1140	2.58	38.67
TOTAL	2939			

4.0 Conclusions:

To the best of our knowledge, this project meets all State, City and Watershed District stormwater management requirements.



GLEN LAKE APARTMENTS

CivilSite GROUP

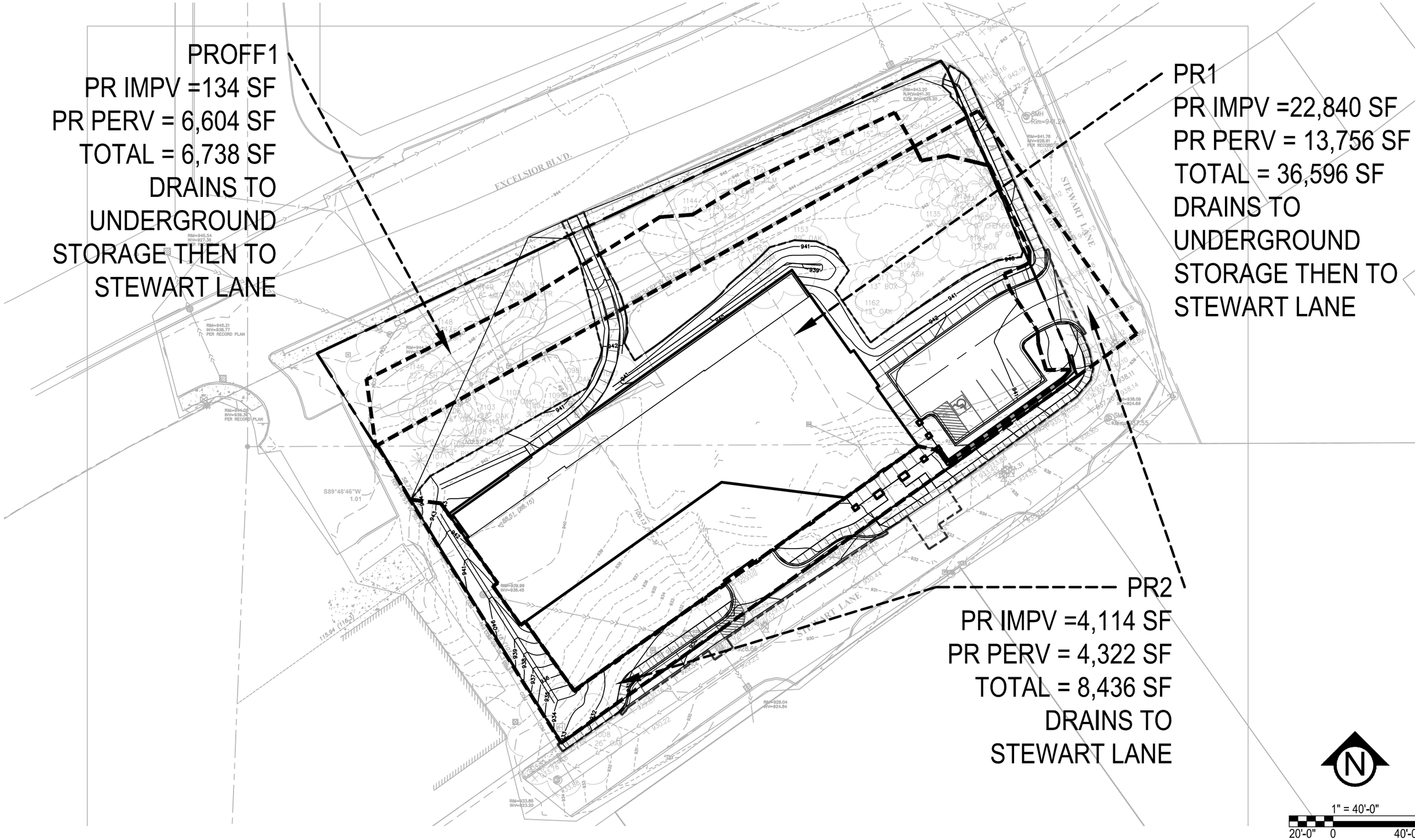
5000 GLENWOOD AVENUE
GOLDEN VALLEY, MN 55422
612-615-0060
www.CivilSiteGroup.com

EXISTING DRAINAGE MAP

14317 EXELSIOR BLVD, MINNETONKA MN, 55345

Project Number:	21476	Revision Number:	.
Issue Date:	01/31/22	Revision Date:	.

DA1



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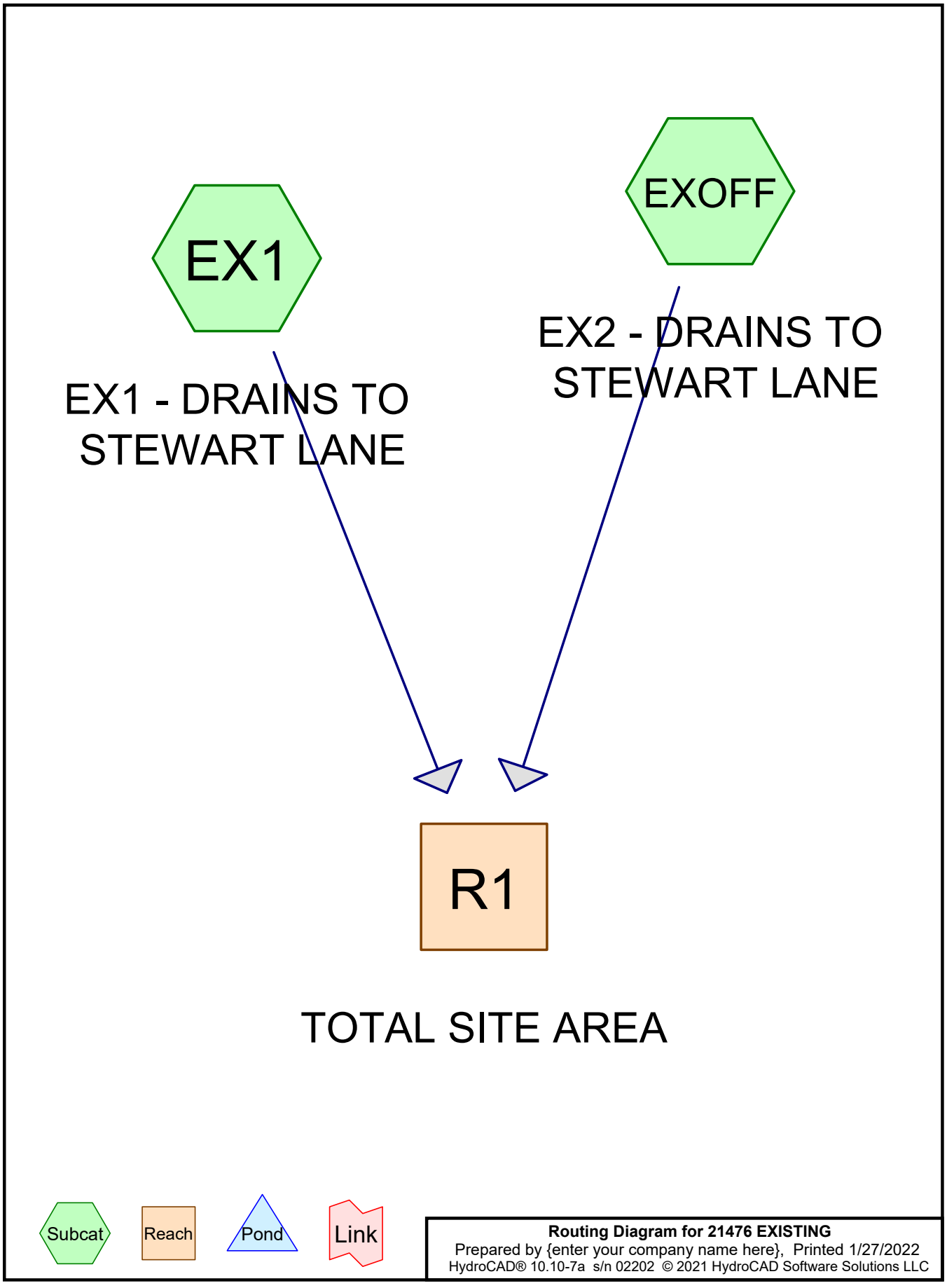
PROPOSED DRAINAGE MAP

14317 EXELSIOR BLVD, MINNETONKA MN, 55345

Project Number:	21476	Revision Number:	.
Issue Date:	01/31/22	Revision Date:	.

DA2



Routing Diagram for 21476 EXISTING
Prepared by {enter your company name here}, Printed 1/27/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2y 24hr AT-14	MSE 24-hr	3	Default	24.00	1	2.87	2
2	10y 24hr AT-14	MSE 24-hr	3	Default	24.00	1	4.29	2
3	100y 24hr AT-14	MSE 24-hr	3	Default	24.00	1	7.43	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.982	39	>75% Grass cover, Good, HSG A (EX1, EXOFF)
0.206	98	Paved parking, HSG A (EX1, EXOFF)
1.188	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.188	HSG A	EX1, EXOFF
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
1.188		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.982	0.000	0.000	0.000	0.000	0.982	>75% Grass cover, Good	EX1, EXOFF
0.206	0.000	0.000	0.000	0.000	0.206	Paved parking	EX1, EXOFF
1.188	**0.000**	**0.000**	**0.000**	**0.000**	**1.188**	**TOTAL AREA**	

Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 - DRAINS TO Runoff Area=45,031 sf 16.55% Impervious Runoff Depth=0.44"
Tc=6.0 min CN=WQ Runoff=0.72 cfs 0.038 af

Subcatchment EXOFF: EX2 - DRAINS TO Runoff Area=6,738 sf 22.68% Impervious Runoff Depth=0.60"
Tc=6.0 min CN=WQ Runoff=0.15 cfs 0.008 af

Reach R1: TOTAL SITE AREA Inflow=0.87 cfs 0.045 af
Outflow=0.87 cfs 0.045 af

Total Runoff Area = 1.188 ac Runoff Volume = 0.045 af Average Runoff Depth = 0.46"
82.65% Pervious = 0.982 ac 17.35% Impervious = 0.206 ac

Summary for Subcatchment EX1: EX1 - DRAINS TO STEWART LANE

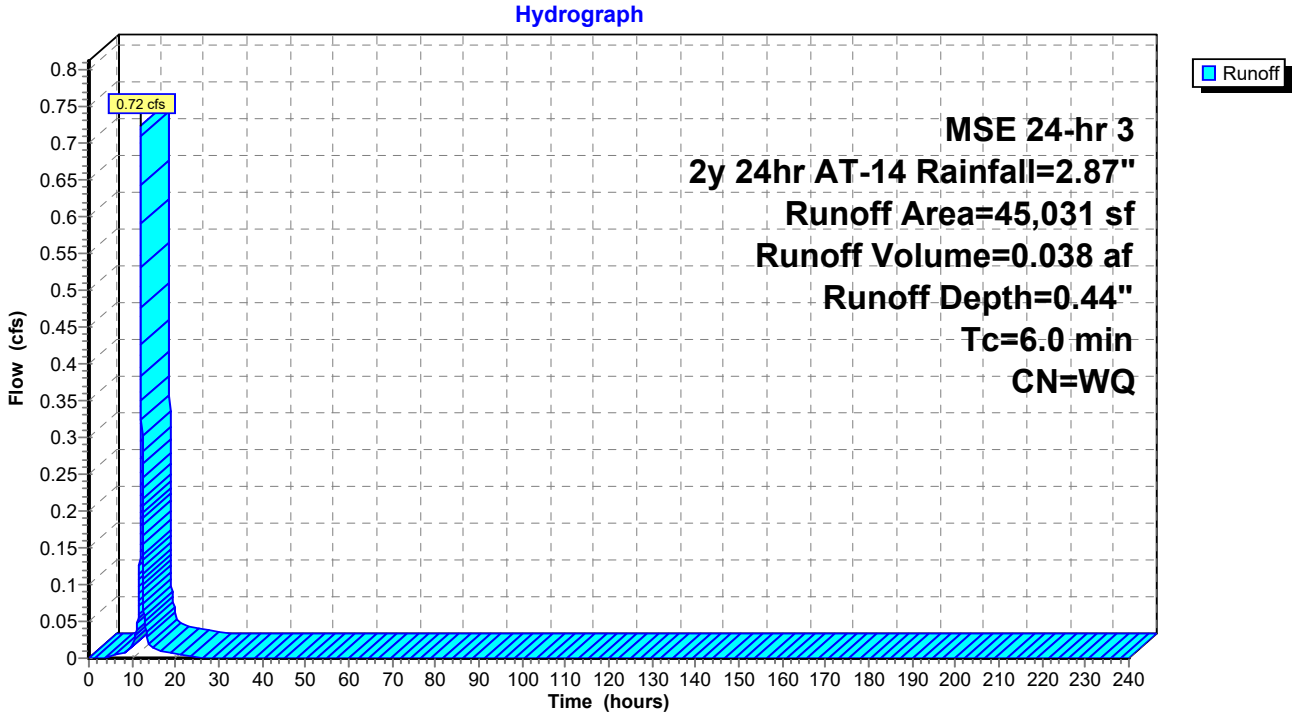
Runoff = 0.72 cfs @ 12.13 hrs, Volume= 0.038 af, Depth= 0.44"
Routed to Reach R1 : TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2y 24hr AT-14 Rainfall=2.87"

Area (sf)	CN	Description
7,454	98	Paved parking, HSG A
37,577	39	>75% Grass cover, Good, HSG A
45,031		Weighted Average
37,577		83.45% Pervious Area
7,454		16.55% Impervious Area

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

Subcatchment EX1: EX1 - DRAINS TO STEWART LANE



Summary for Subcatchment EXOFF: EX2 - DRAINS TO STEWART LANE

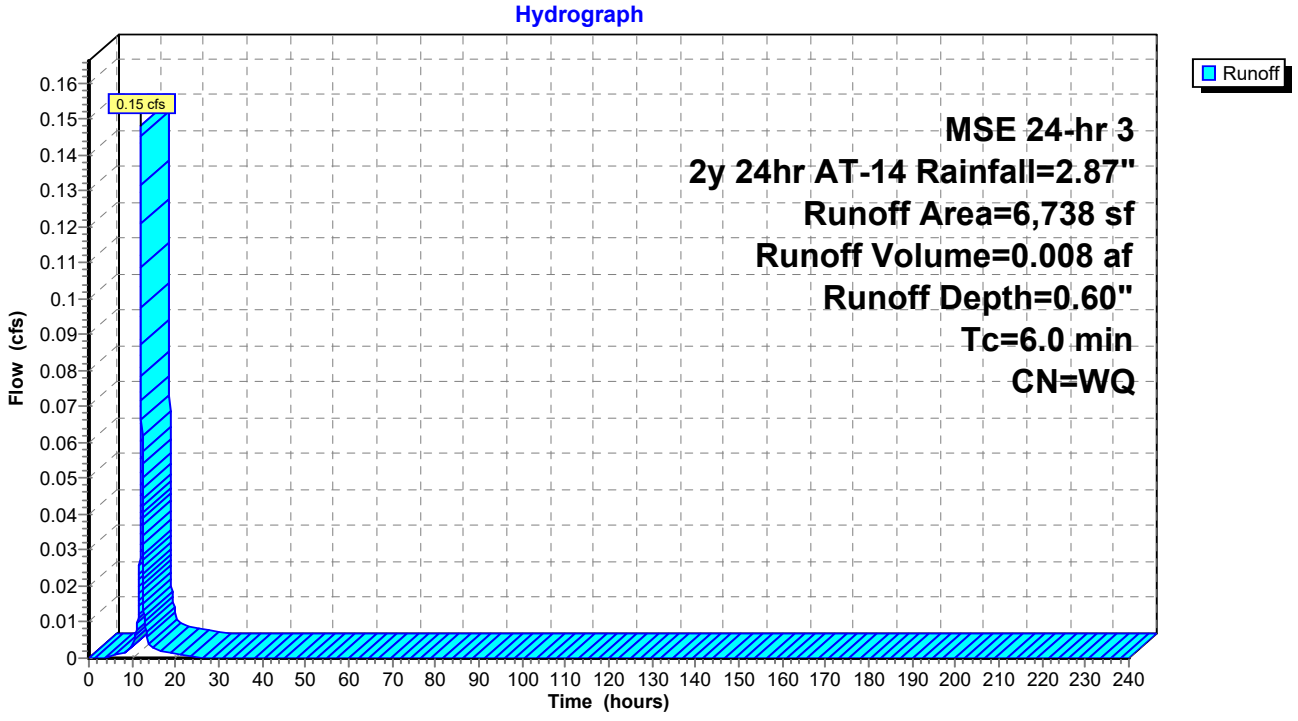
Runoff = 0.15 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 0.60"
Routed to Reach R1 : TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2y 24hr AT-14 Rainfall=2.87"

Area (sf)	CN	Description
1,528	98	Paved parking, HSG A
5,210	39	>75% Grass cover, Good, HSG A
6,738		Weighted Average
5,210		77.32% Pervious Area
1,528		22.68% Impervious Area

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

Subcatchment EXOFF: EX2 - DRAINS TO STEWART LANE



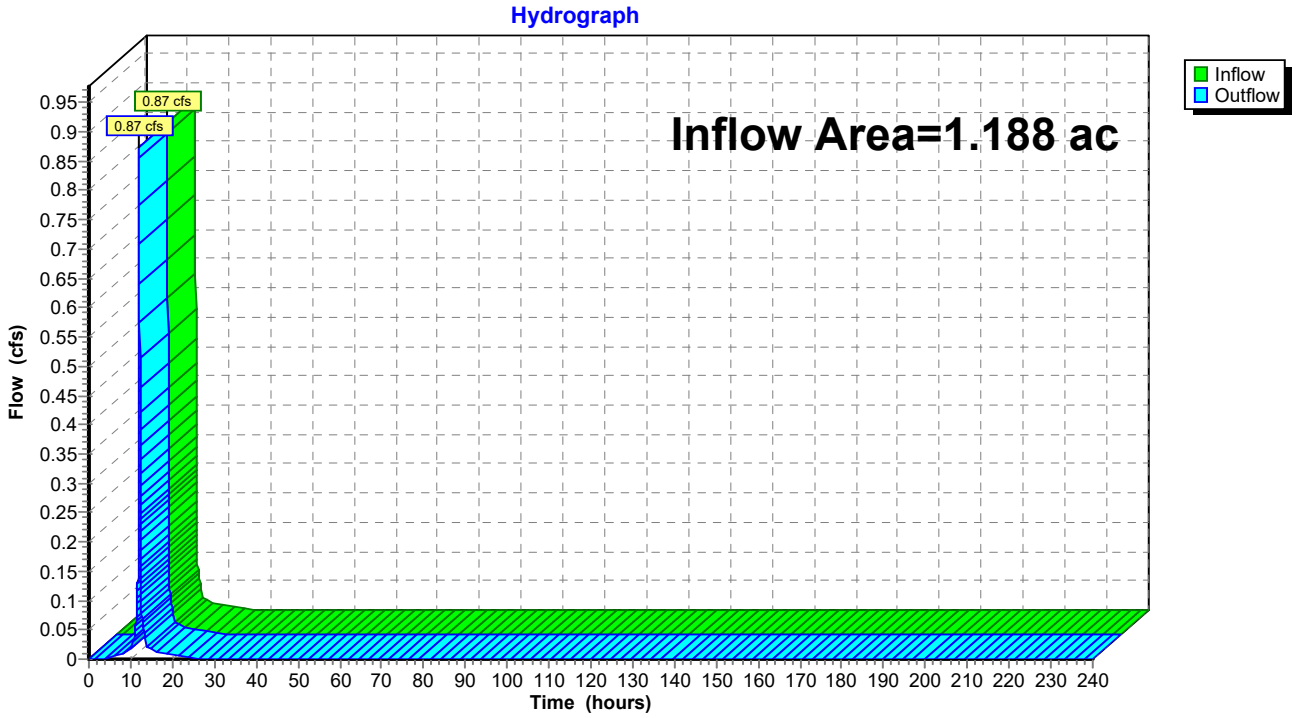
Summary for Reach R1: TOTAL SITE AREA

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.188 ac, 17.35% Impervious, Inflow Depth = 0.46" for 2y 24hr AT-14 event
Inflow = 0.87 cfs @ 12.13 hrs, Volume= 0.045 af
Outflow = 0.87 cfs @ 12.13 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach R1: TOTAL SITE AREA



Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 - DRAINS TO Runoff Area=45,031 sf 16.55% Impervious Runoff Depth=0.74"
Tc=6.0 min CN=WQ Runoff=1.09 cfs 0.064 af

Subcatchment EXOFF: EX2 - DRAINS TO Runoff Area=6,738 sf 22.68% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=WQ Runoff=0.22 cfs 0.013 af

Reach R1: TOTAL SITE AREA Inflow=1.32 cfs 0.076 af
Outflow=1.32 cfs 0.076 af

Total Runoff Area = 1.188 ac Runoff Volume = 0.076 af Average Runoff Depth = 0.77"
82.65% Pervious = 0.982 ac 17.35% Impervious = 0.206 ac

Summary for Subcatchment EX1: EX1 - DRAINS TO STEWART LANE

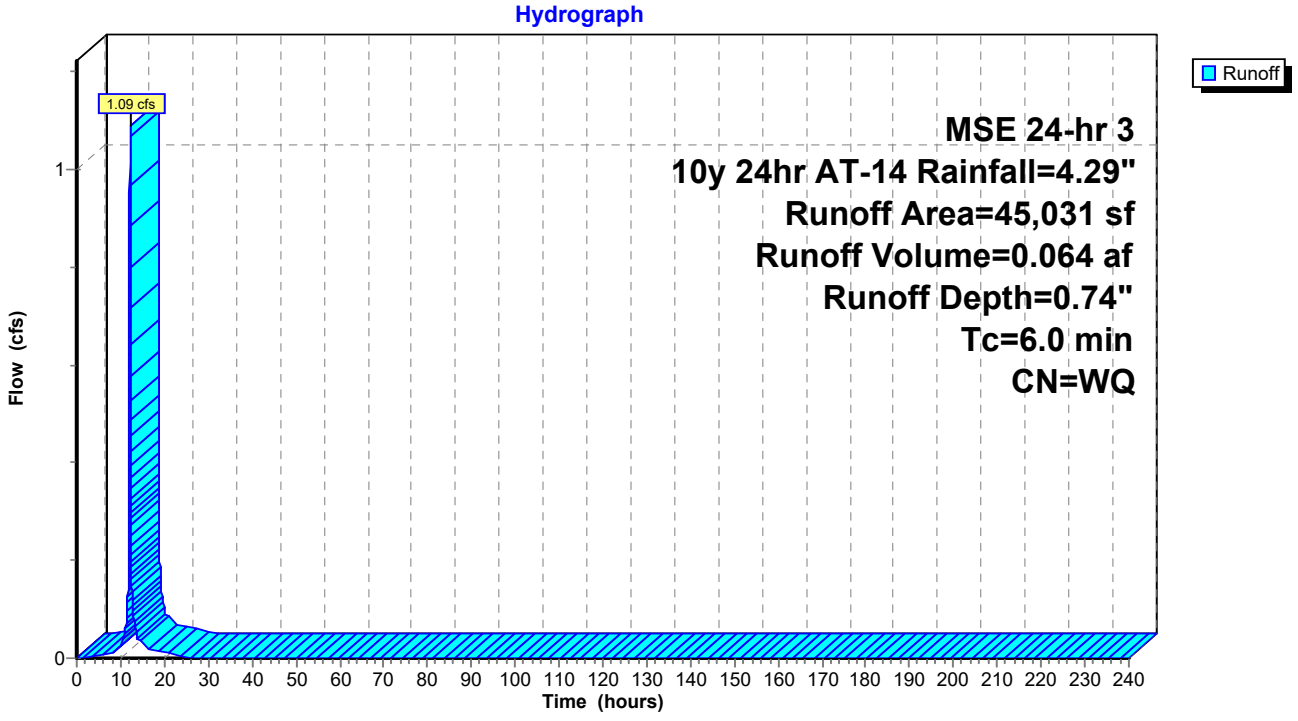
Runoff = 1.09 cfs @ 12.13 hrs, Volume= 0.064 af, Depth= 0.74"
Routed to Reach R1 : TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10y 24hr AT-14 Rainfall=4.29"

Area (sf)	CN	Description
7,454	98	Paved parking, HSG A
37,577	39	>75% Grass cover, Good, HSG A
45,031		Weighted Average
37,577		83.45% Pervious Area
7,454		16.55% Impervious Area

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

Subcatchment EX1: EX1 - DRAINS TO STEWART LANE



Summary for Subcatchment EXOFF: EX2 - DRAINS TO STEWART LANE

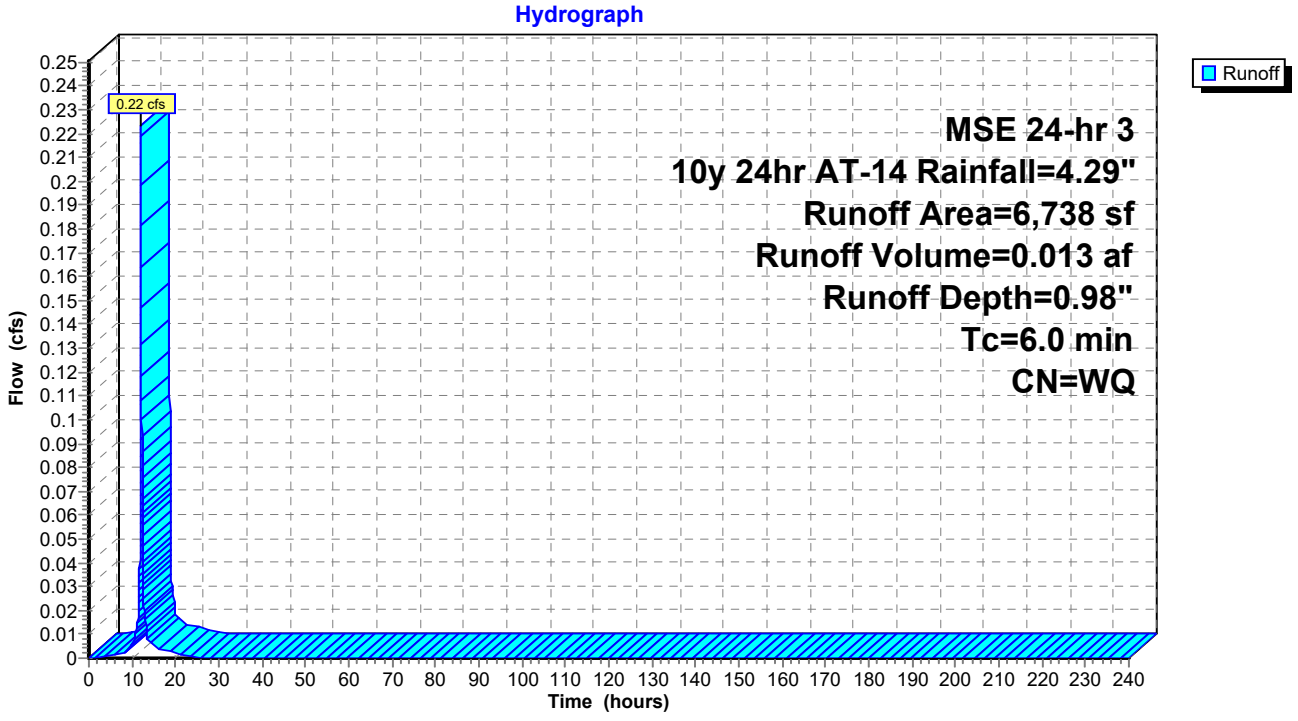
Runoff = 0.22 cfs @ 12.13 hrs, Volume= 0.013 af, Depth= 0.98"
Routed to Reach R1 : TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10y 24hr AT-14 Rainfall=4.29"

Area (sf)	CN	Description
1,528	98	Paved parking, HSG A
5,210	39	>75% Grass cover, Good, HSG A
6,738		Weighted Average
5,210		77.32% Pervious Area
1,528		22.68% Impervious Area

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

Subcatchment EXOFF: EX2 - DRAINS TO STEWART LANE



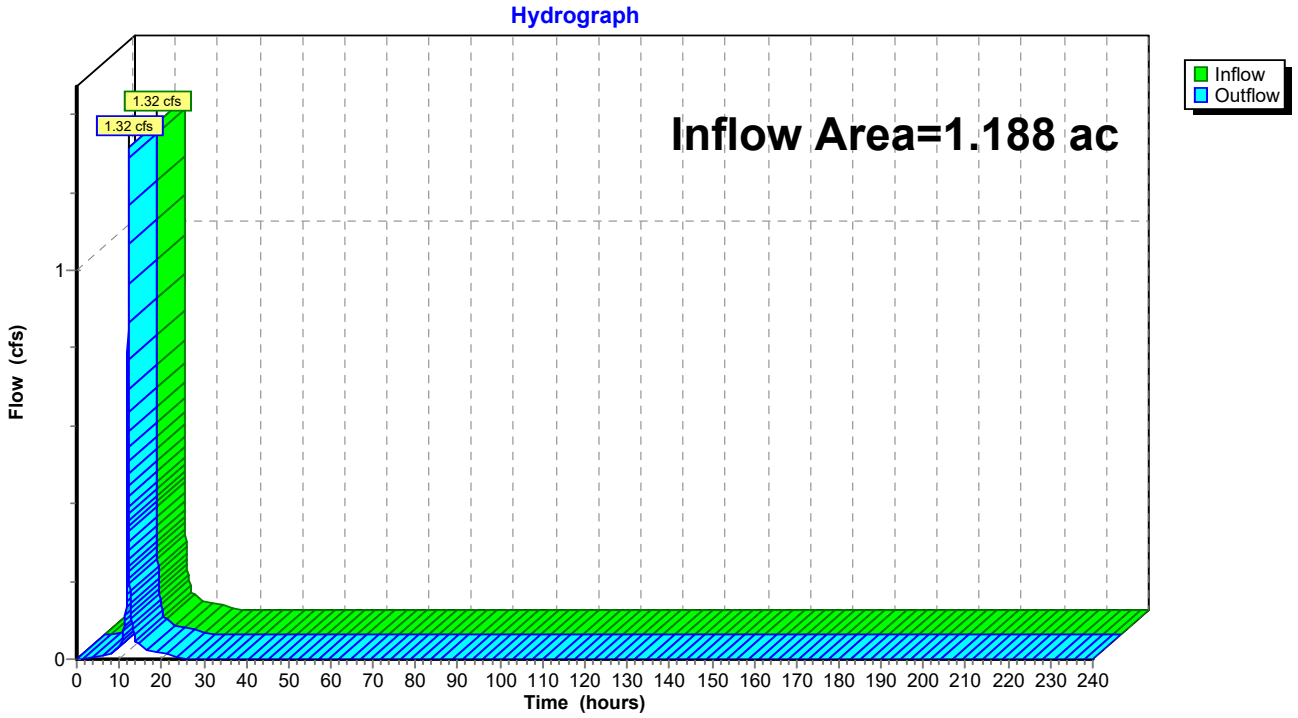
Summary for Reach R1: TOTAL SITE AREA

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.188 ac, 17.35% Impervious, Inflow Depth = 0.77" for 10y 24hr AT-14 event
Inflow = 1.32 cfs @ 12.13 hrs, Volume= 0.076 af
Outflow = 1.32 cfs @ 12.13 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach R1: TOTAL SITE AREA



Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX1: EX1 - DRAINS TO Runoff Area=45,031 sf 16.55% Impervious Runoff Depth=1.96"
Tc=6.0 min CN=WQ Runoff=2.90 cfs 0.169 af

Subcatchment EXOFF: EX2 - DRAINS TO Runoff Area=6,738 sf 22.68% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=WQ Runoff=0.53 cfs 0.030 af

Reach R1: TOTAL SITE AREA Inflow=3.43 cfs 0.200 af
Outflow=3.43 cfs 0.200 af

Total Runoff Area = 1.188 ac Runoff Volume = 0.200 af Average Runoff Depth = 2.01"
82.65% Pervious = 0.982 ac 17.35% Impervious = 0.206 ac

Summary for Subcatchment EX1: EX1 - DRAINS TO STEWART LANE

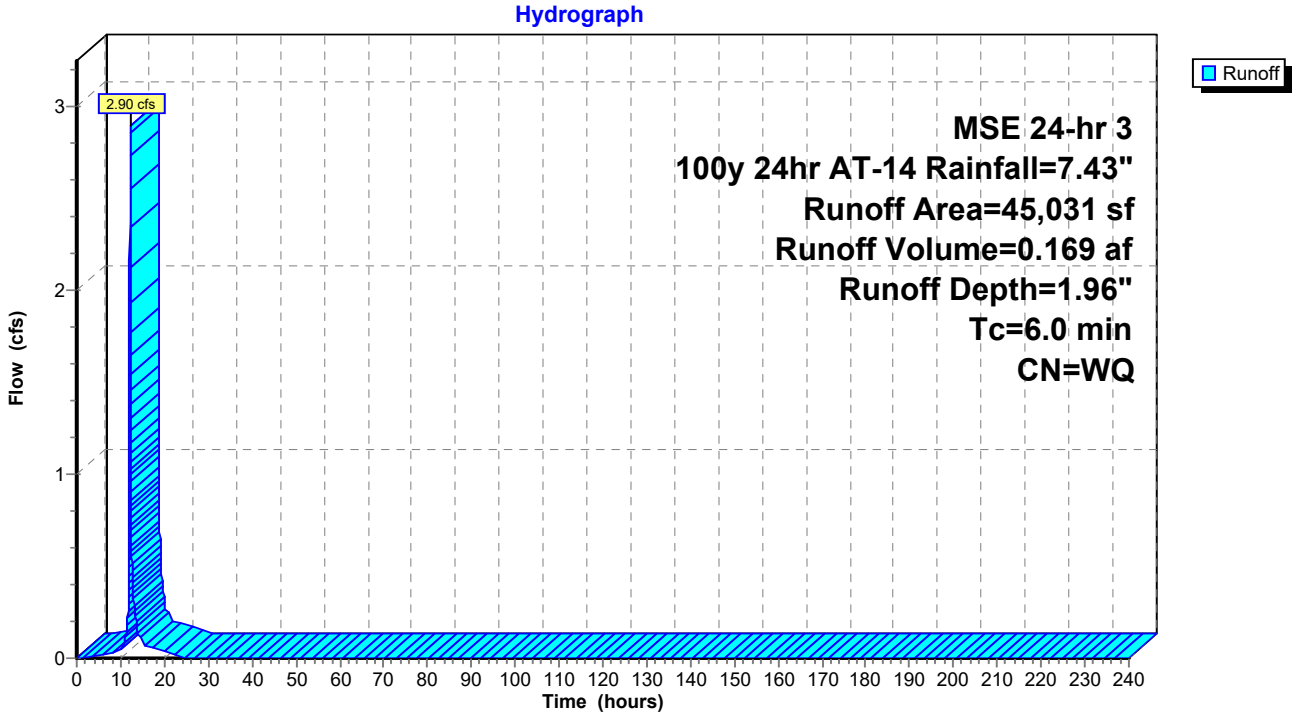
Runoff = 2.90 cfs @ 12.14 hrs, Volume= 0.169 af, Depth= 1.96"
Routed to Reach R1 : TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100y 24hr AT-14 Rainfall=7.43"

Area (sf)	CN	Description
7,454	98	Paved parking, HSG A
37,577	39	>75% Grass cover, Good, HSG A
45,031		Weighted Average
37,577		83.45% Pervious Area
7,454		16.55% Impervious Area

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

Subcatchment EX1: EX1 - DRAINS TO STEWART LANE



Summary for Subcatchment EXOFF: EX2 - DRAINS TO STEWART LANE

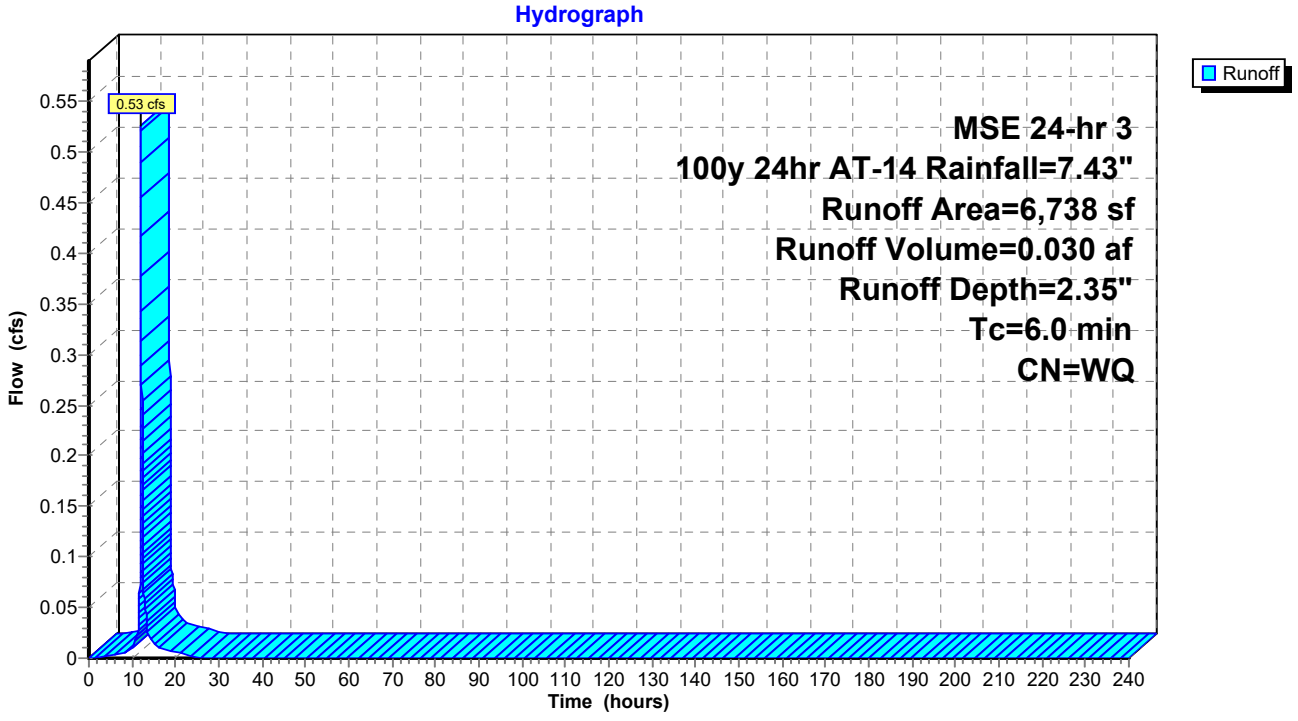
Runoff = 0.53 cfs @ 12.14 hrs, Volume= 0.030 af, Depth= 2.35"
Routed to Reach R1 : TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100y 24hr AT-14 Rainfall=7.43"

Area (sf)	CN	Description
1,528	98	Paved parking, HSG A
5,210	39	>75% Grass cover, Good, HSG A
6,738		Weighted Average
5,210		77.32% Pervious Area
1,528		22.68% Impervious Area

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

Subcatchment EXOFF: EX2 - DRAINS TO STEWART LANE



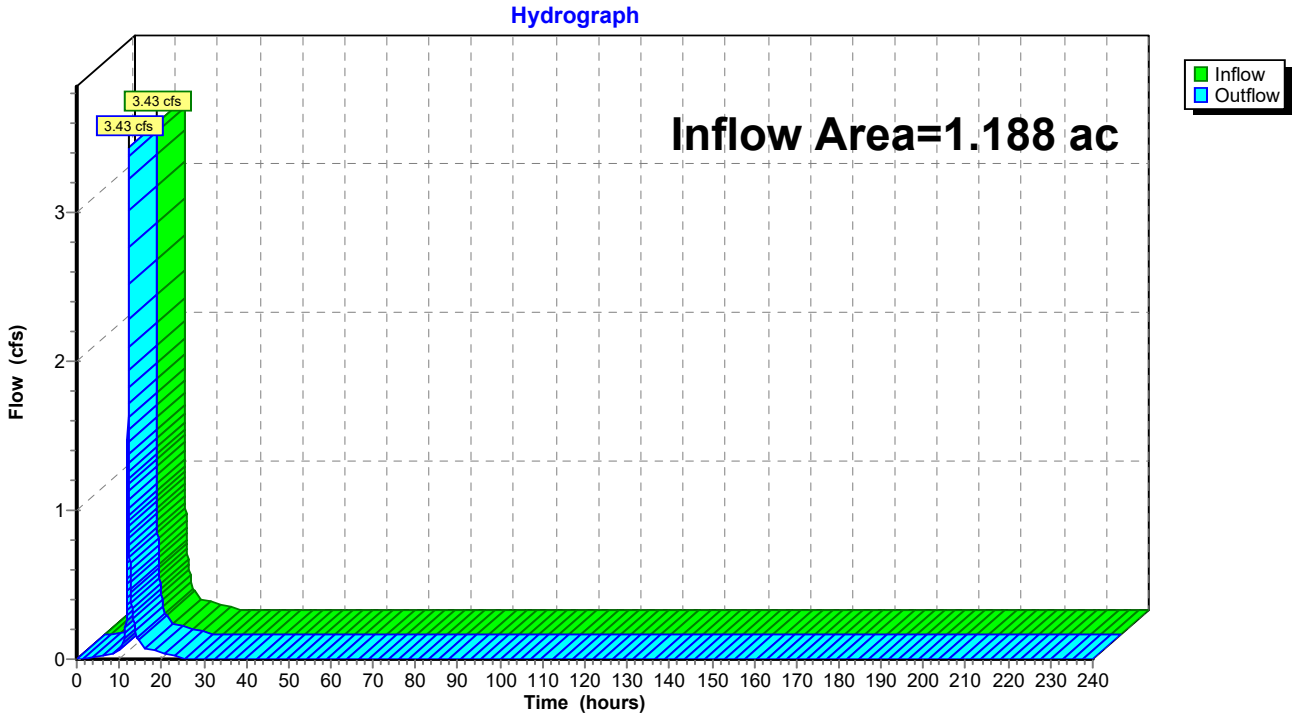
Summary for Reach R1: TOTAL SITE AREA

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.188 ac, 17.35% Impervious, Inflow Depth = 2.01" for 100y 24hr AT-14 event
Inflow = 3.43 cfs @ 12.14 hrs, Volume= 0.200 af
Outflow = 3.43 cfs @ 12.14 hrs, Volume= 0.200 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach R1: TOTAL SITE AREA



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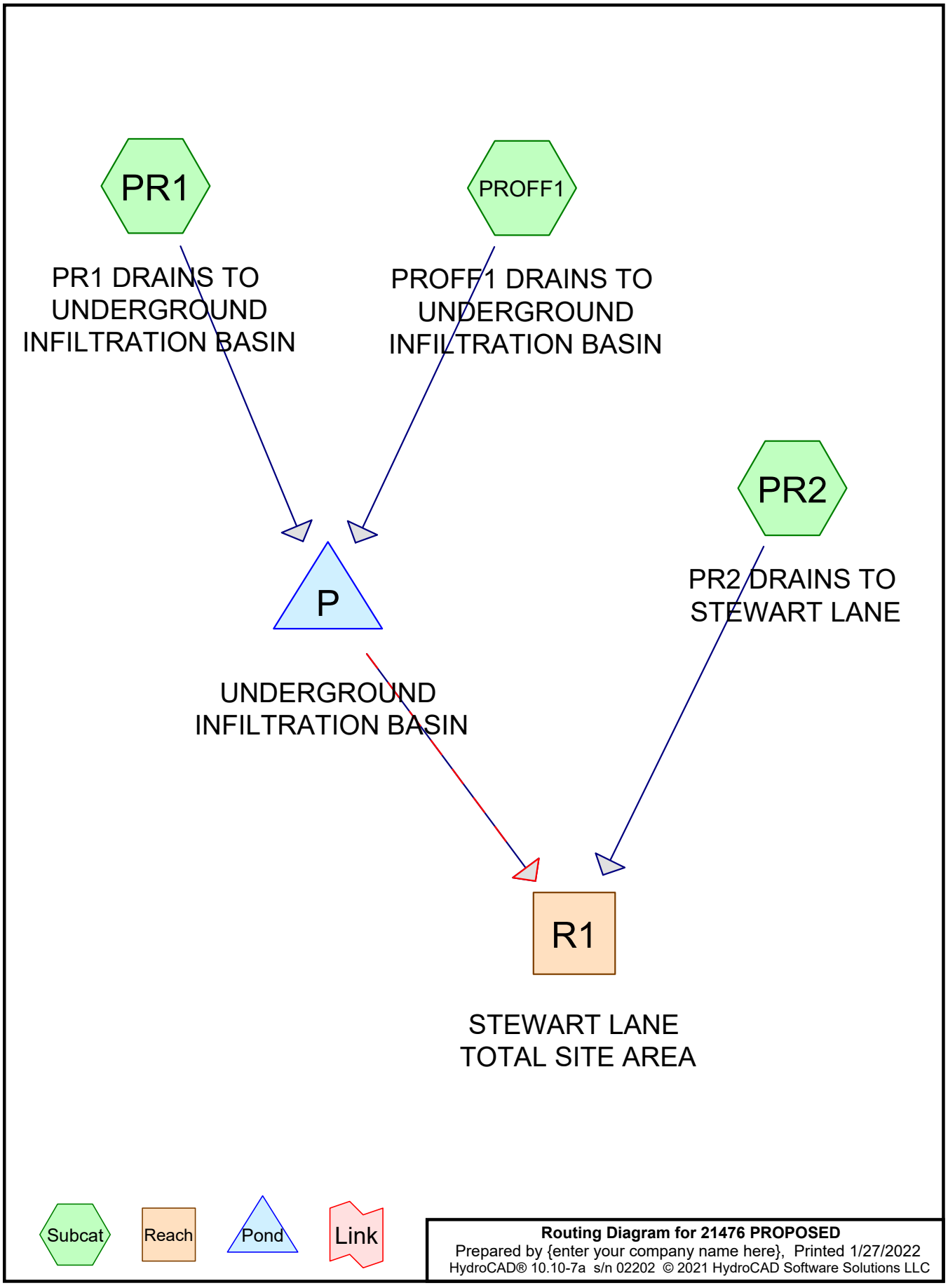


Routing Diagram for 21476 PROPOSED
Prepared by {enter your company name here}, Printed 1/27/2022
HydroCAD® 10.10-7a s/n 02202 © 2021 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2y 24hr AT-14	MSE 24-hr	3	Default	24.00	1	2.87	2
2	10y 24hr AT-14	MSE 24-hr	3	Default	24.00	1	4.29	2
3	100y 24hr AT-14	MSE 24-hr	3	Default	24.00	1	7.43	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.567	39	>75% Grass cover, Good, HSG A (PR1, PR2, PROFF1)
0.622	98	Paved parking, HSG A (PR1, PR2, PROFF1)
1.188	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.188	HSG A	PR1, PR2, PROFF1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
1.188		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.567	0.000	0.000	0.000	0.000	0.567	>75% Grass cover, Good	PR1, PR2, PROFF1
0.622	0.000	0.000	0.000	0.000	0.622	Paved parking	PR1, PR2, PROFF1
1.188	**0.000**	**0.000**	**0.000**	**0.000**	**1.188**	**TOTAL AREA**	

Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PR1: PR1 DRAINS TO Runoff Area=36,596 sf 62.41% Impervious Runoff Depth=1.65"
Tc=6.0 min CN=WQ Runoff=2.22 cfs 0.115 af

Subcatchment PR2: PR2 DRAINS TO Runoff Area=8,436 sf 48.77% Impervious Runoff Depth=1.29"
Tc=6.0 min CN=WQ Runoff=0.40 cfs 0.021 af

Subcatchment PROFF1: PROFF1 DRAINS Runoff Area=6,738 sf 1.99% Impervious Runoff Depth=0.05"
Tc=6.0 min CN=WQ Runoff=0.01 cfs 0.001 af

Reach R1: STEWART LANE TOTAL SITE AREA Inflow=0.40 cfs 0.042 af
Outflow=0.40 cfs 0.042 af

Pond P: UNDERGROUND INFILTRATION Peak Elev=931.93' Storage=3,167 cf Inflow=2.23 cfs 0.116 af
Discarded=0.02 cfs 0.095 af Primary=0.15 cfs 0.021 af Outflow=0.17 cfs 0.116 af

Total Runoff Area = 1.188 ac Runoff Volume = 0.137 af Average Runoff Depth = 1.38"
47.68% Pervious = 0.567 ac 52.32% Impervious = 0.622 ac

Summary for Subcatchment PR1: PR1 DRAINS TO UNDERGROUND INFILTRATION BASIN

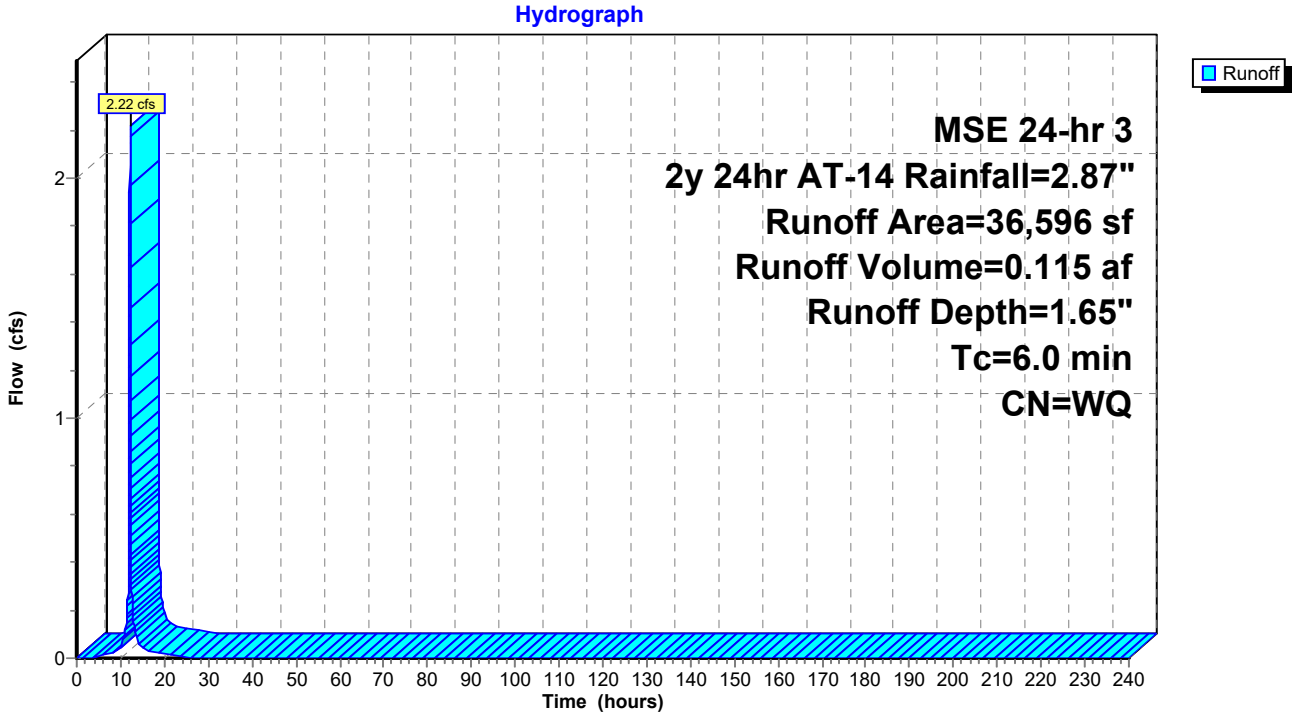
Runoff = 2.22 cfs @ 12.13 hrs, Volume= 0.115 af, Depth= 1.65"
Routed to Pond P : UNDERGROUND INFILTRATION BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2y 24hr AT-14 Rainfall=2.87"

Area (sf)	CN	Description
22,840	98	Paved parking, HSG A
13,756	39	>75% Grass cover, Good, HSG A
36,596		Weighted Average
13,756		37.59% Pervious Area
22,840		62.41% Impervious Area

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

Subcatchment PR1: PR1 DRAINS TO UNDERGROUND INFILTRATION BASIN



Summary for Subcatchment PR2: PR2 DRAINS TO STEWART LANE

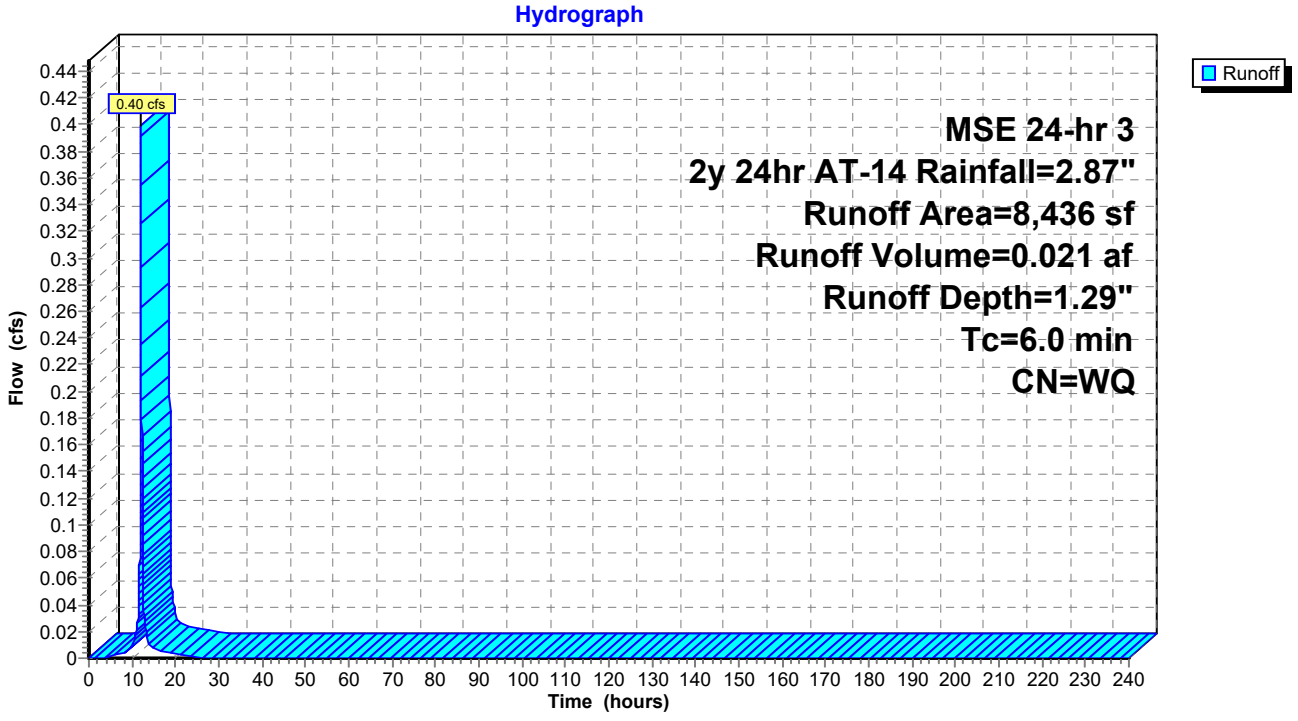
Runoff = 0.40 cfs @ 12.13 hrs, Volume= 0.021 af, Depth= 1.29"
Routed to Reach R1 : STEWART LANE TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2y 24hr AT-14 Rainfall=2.87"

Area (sf)	CN	Description
4,114	98	Paved parking, HSG A
4,322	39	>75% Grass cover, Good, HSG A
8,436		Weighted Average
4,322		51.23% Pervious Area
4,114		48.77% Impervious Area

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

Subcatchment PR2: PR2 DRAINS TO STEWART LANE



Summary for Subcatchment PROFF1: PROFF1 DRAINS TO UNDERGROUND INFILTRATION BASIN

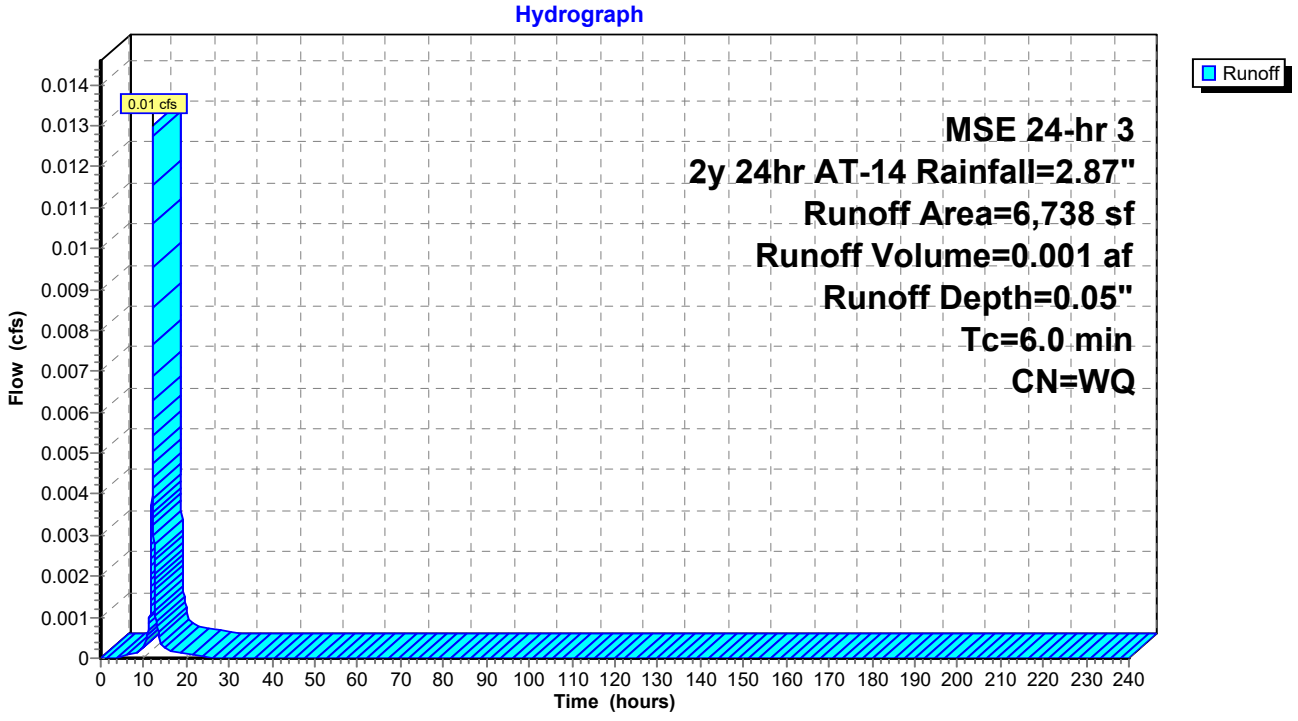
Runoff = 0.01 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 0.05"
Routed to Pond P : UNDERGROUND INFILTRATION BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2y 24hr AT-14 Rainfall=2.87"

Area (sf)	CN	Description
134	98	Paved parking, HSG A
6,604	39	>75% Grass cover, Good, HSG A
6,738		Weighted Average
6,604		98.01% Pervious Area
134		1.99% Impervious Area

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

Subcatchment PROFF1: PROFF1 DRAINS TO UNDERGROUND INFILTRATION BASIN



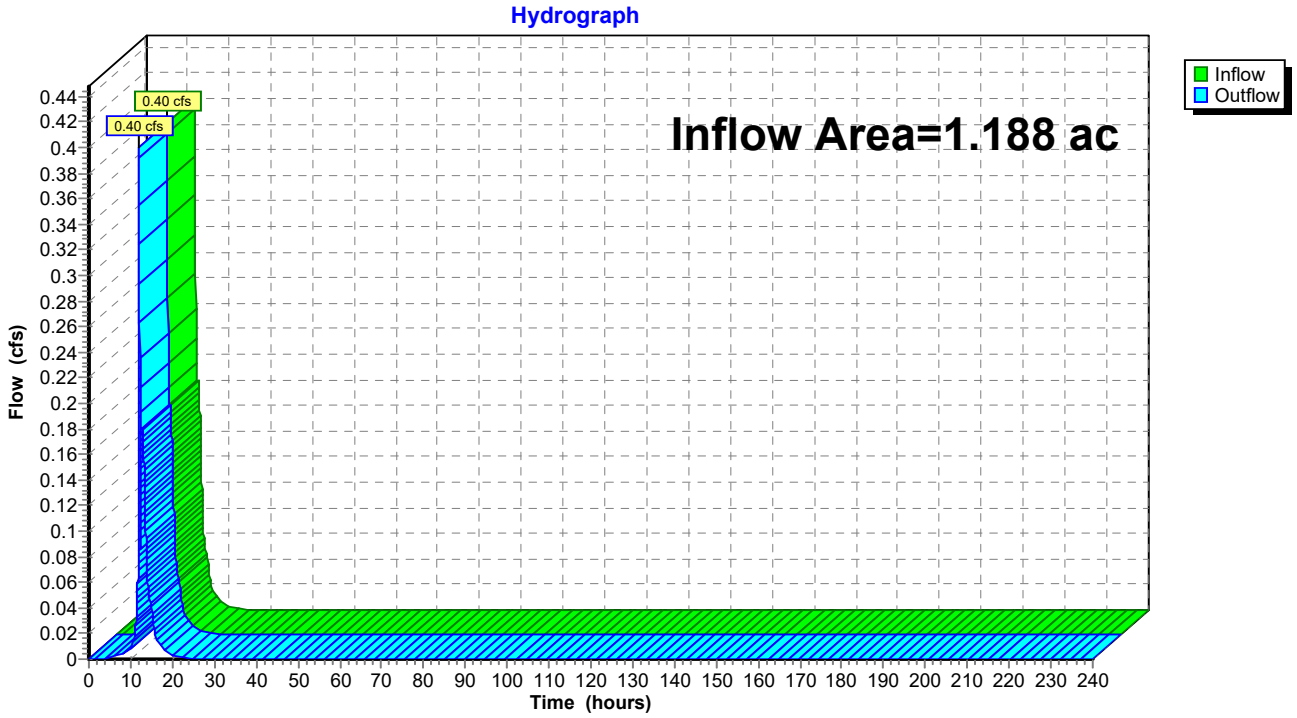
Summary for Reach R1: STEWART LANE TOTAL SITE AREA

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.188 ac, 52.32% Impervious, Inflow Depth = 0.42" for 2y 24hr AT-14 event
Inflow = 0.40 cfs @ 12.13 hrs, Volume= 0.042 af
Outflow = 0.40 cfs @ 12.13 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach R1: STEWART LANE TOTAL SITE AREA



Summary for Pond P: UNDERGROUND INFILTRATION BASIN

Inflow Area = 0.995 ac, 53.02% Impervious, Inflow Depth = 1.40" for 2y 24hr AT-14 event
Inflow = 2.23 cfs @ 12.13 hrs, Volume= 0.116 af
Outflow = 0.17 cfs @ 12.81 hrs, Volume= 0.116 af, Atten= 92%, Lag= 41.0 min
Discarded = 0.02 cfs @ 8.68 hrs, Volume= 0.095 af
Primary = 0.15 cfs @ 12.81 hrs, Volume= 0.021 af
Routed to Reach R1 : STEWART LANE TOTAL SITE AREA

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 931.93' @ 12.81 hrs Surf.Area= 1,140 sf Storage= 3,167 cf

Plug-Flow detention time= 1,039.0 min calculated for 0.116 af (100% of inflow)
Center-of-Mass det. time= 1,039.1 min (1,792.7 - 753.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	928.00'	1,826 cf	**20.00'W x 57.00'L x 8.50'H Field A** 9,690 cf Overall - 5,125 cf Embedded = 4,565 cf x 40.0% Voids
#2A	928.50'	5,125 cf	**CMP Round 90** x 4 Inside #1 Effective Size= 90.0"W x 90.0"H => 44.18 sf x 20.00'L = 883.6 cf Overall Size= 90.0"W x 90.0"H x 20.00'L 4 Chambers in 2 Rows 18.00' Header x 44.18 sf x 2 = 1,590.4 cf Inside
		6,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	928.00'	**0.800 in/hr Exfiltration over Surface area**
#2	Device 3	931.70'	**12.0" Vert. 12" outlet pipe to mh** C= 0.600 Limited to weir flow at low heads
#3	Device 5	931.70'	**6.0" Vert. 6" orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 5	936.15'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Primary	931.70'	**12.0" Vert. 12" oulet pipe from mh** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 8.68 hrs HW=928.09' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.15 cfs @ 12.81 hrs HW=931.93' (Free Discharge)
└**5=12" oulet pipe from mh** (Passes 0.15 cfs of 0.23 cfs potential flow)
  ├**3=6" orifice** (Orifice Controls 0.15 cfs @ 1.65 fps)
  │ └**2=12" outlet pipe to mh** (Passes 0.15 cfs of 0.23 cfs potential flow)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P: UNDERGROUND INFILTRATION BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 90 (Round Corrugated Metal Pipe)
Effective Size= 90.0"W x 90.0"H => 44.18 sf x 20.00'L = 883.6 cf
Overall Size= 90.0"W x 90.0"H x 20.00'L

90.0" Wide + 36.0" Spacing = 126.0" C-C Row Spacing

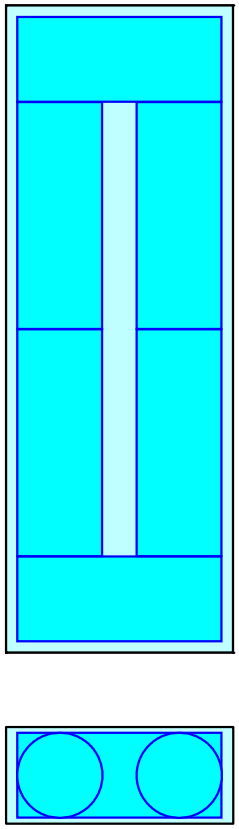
2 Chambers/Row x 20.00' Long +7.50' Header x 2 = 55.00' Row Length +12.0" End Stone x 2 = 57.00' Base Length
2 Rows x 90.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 20.00' Base Width
6.0" Stone Base + 90.0" Chamber Height + 6.0" Stone Cover = 8.50' Field Height

4 Chambers x 883.6 cf + 18.00' Header x 44.18 sf x 2 = 5,124.7 cf Chamber Storage

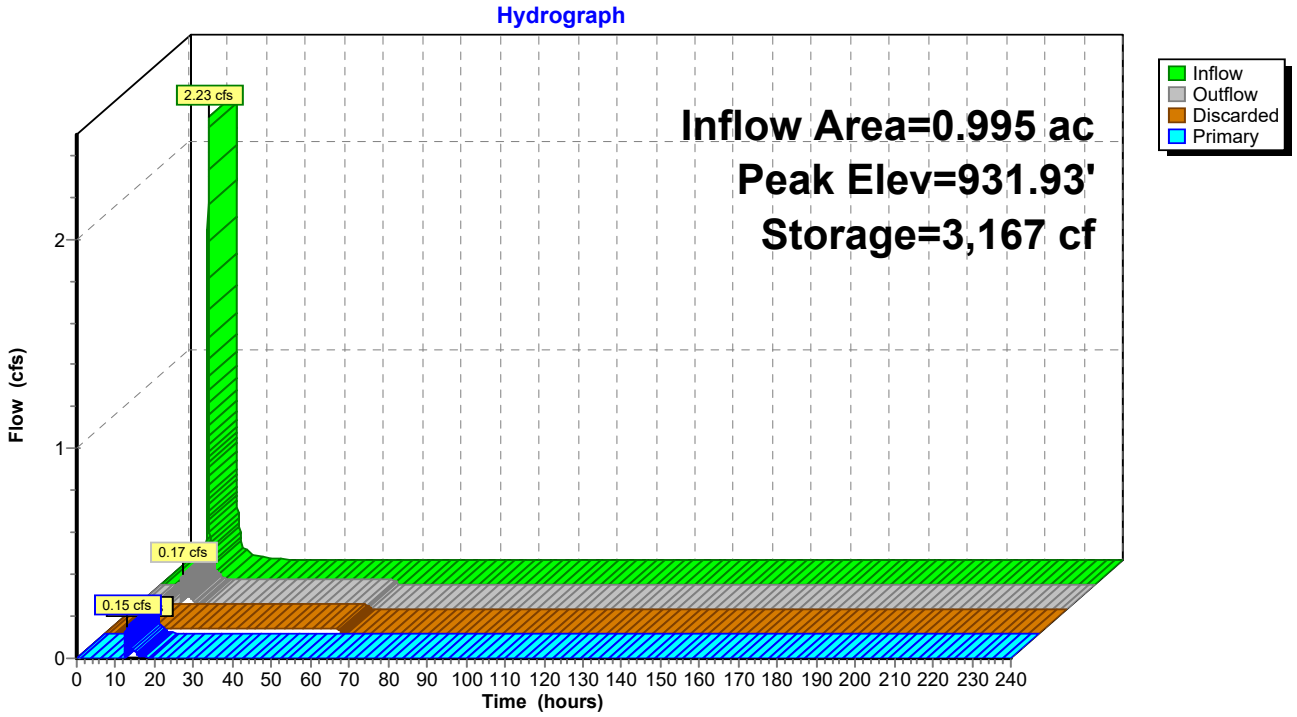
9,690.0 cf Field - 5,124.7 cf Chambers = 4,565.3 cf Stone x 40.0% Voids = 1,826.1 cf Stone Storage

Chamber Storage + Stone Storage = 6,950.8 cf = 0.160 af
Overall Storage Efficiency = 71.7%
Overall System Size = 57.00' x 20.00' x 8.50'

4 Chambers
358.9 cy Field
169.1 cy Stone



Pond P: UNDERGROUND INFILTRATION BASIN



Stage-Area-Storage for Pond P: UNDERGROUND INFILTRATION BASIN

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
928.00	**1,140**	0
928.10	1,140	46
928.20	1,140	91
928.30	1,140	137
928.40	1,140	182
928.50	1,140	228
928.60	1,140	282
928.70	1,140	342
928.80	1,140	406
928.90	1,140	474
929.00	1,140	544
929.10	1,140	617
929.20	1,140	692
929.30	1,140	769
929.40	1,140	847
929.50	1,140	928
929.60	1,140	1,010
929.70	1,140	1,093
929.80	1,140	1,177
929.90	1,140	1,263
930.00	1,140	1,350
930.10	1,140	1,438
930.20	1,140	1,527
930.30	1,140	1,616
930.40	1,140	1,707
930.50	1,140	1,798
930.60	1,140	1,890
930.70	1,140	1,983
930.80	1,140	2,077
930.90	1,140	2,171
931.00	1,140	2,265
931.10	1,140	2,360
931.20	1,140	2,456
931.30	1,140	2,552
931.40	1,140	2,648
931.50	1,140	2,745
931.60	1,140	2,841
931.70	1,140	2,939
931.80	1,140	3,036
931.90	1,140	3,133
932.00	1,140	3,231
932.10	1,140	3,329
932.20	1,140	3,427
932.30	1,140	3,524
932.40	1,140	3,622
932.50	1,140	3,720
932.60	1,140	3,817
932.70	1,140	3,915
932.80	1,140	4,012
932.90	1,140	4,109
933.00	1,140	4,206
933.10	1,140	4,303
933.20	1,140	4,399
933.30	1,140	4,495
933.40	1,140	4,591
933.50	1,140	4,686
933.60	1,140	4,780
933.70	1,140	4,874
933.80	1,140	4,968
933.90	1,140	5,060
934.00	1,140	5,153
934.10	1,140	5,244
934.20	1,140	5,335
934.30	1,140	5,424
934.40	1,140	5,513
934.50	1,140	5,601
934.60	1,140	5,688
934.70	1,140	5,774
934.80	1,140	5,858
934.90	1,140	5,941
935.00	1,140	6,023
935.10	1,140	6,103
935.20	1,140	6,182
935.30	1,140	6,259
935.40	1,140	6,334
935.50	1,140	6,407
935.60	1,140	6,477
935.70	1,140	6,545
935.80	1,140	6,609
935.90	1,140	6,669
936.00	1,140	6,723
936.10	1,140	6,768
936.20	1,140	6,814
936.30	1,140	6,860
936.40	1,140	6,905
936.50	1,140	**6,951**

Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PR1: PR1 DRAINS TO Runoff Area=36,596 sf 62.41% Impervious Runoff Depth=2.56"
Tc=6.0 min CN=WQ Runoff=3.34 cfs 0.179 af

Subcatchment PR2: PR2 DRAINS TO Runoff Area=8,436 sf 48.77% Impervious Runoff Depth=2.02"
Tc=6.0 min CN=WQ Runoff=0.60 cfs 0.033 af

Subcatchment PROFF1: PROFF1 DRAINS Runoff Area=6,738 sf 1.99% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=WQ Runoff=0.02 cfs 0.002 af

Reach R1: STEWART LANE TOTAL SITE AREA Inflow=1.17 cfs 0.113 af
Outflow=1.17 cfs 0.113 af

Pond P: UNDERGROUND INFILTRATION Peak Elev=932.82' Storage=4,029 cf Inflow=3.36 cfs 0.181 af
Discarded=0.02 cfs 0.100 af Primary=0.88 cfs 0.081 af Outflow=0.90 cfs 0.181 af

Total Runoff Area = 1.188 ac Runoff Volume = 0.214 af Average Runoff Depth = 2.16"
47.68% Pervious = 0.567 ac 52.32% Impervious = 0.622 ac

Summary for Subcatchment PR1: PR1 DRAINS TO UNDERGROUND INFILTRATION BASIN

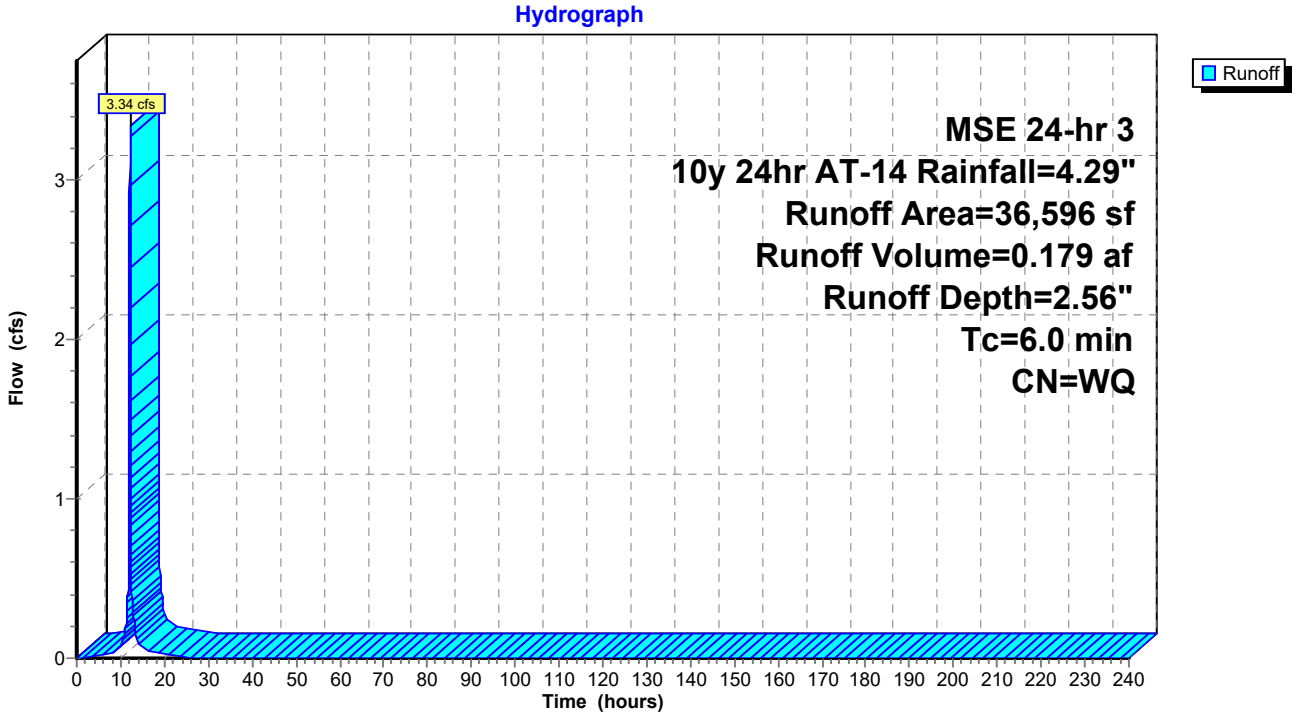
Runoff = 3.34 cfs @ 12.13 hrs, Volume= 0.179 af, Depth= 2.56"
Routed to Pond P : UNDERGROUND INFILTRATION BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10y 24hr AT-14 Rainfall=4.29"

Area (sf)	CN	Description
22,840	98	Paved parking, HSG A
13,756	39	>75% Grass cover, Good, HSG A
36,596		Weighted Average
13,756		37.59% Pervious Area
22,840		62.41% Impervious Area

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

Subcatchment PR1: PR1 DRAINS TO UNDERGROUND INFILTRATION BASIN



Summary for Subcatchment PR2: PR2 DRAINS TO STEWART LANE

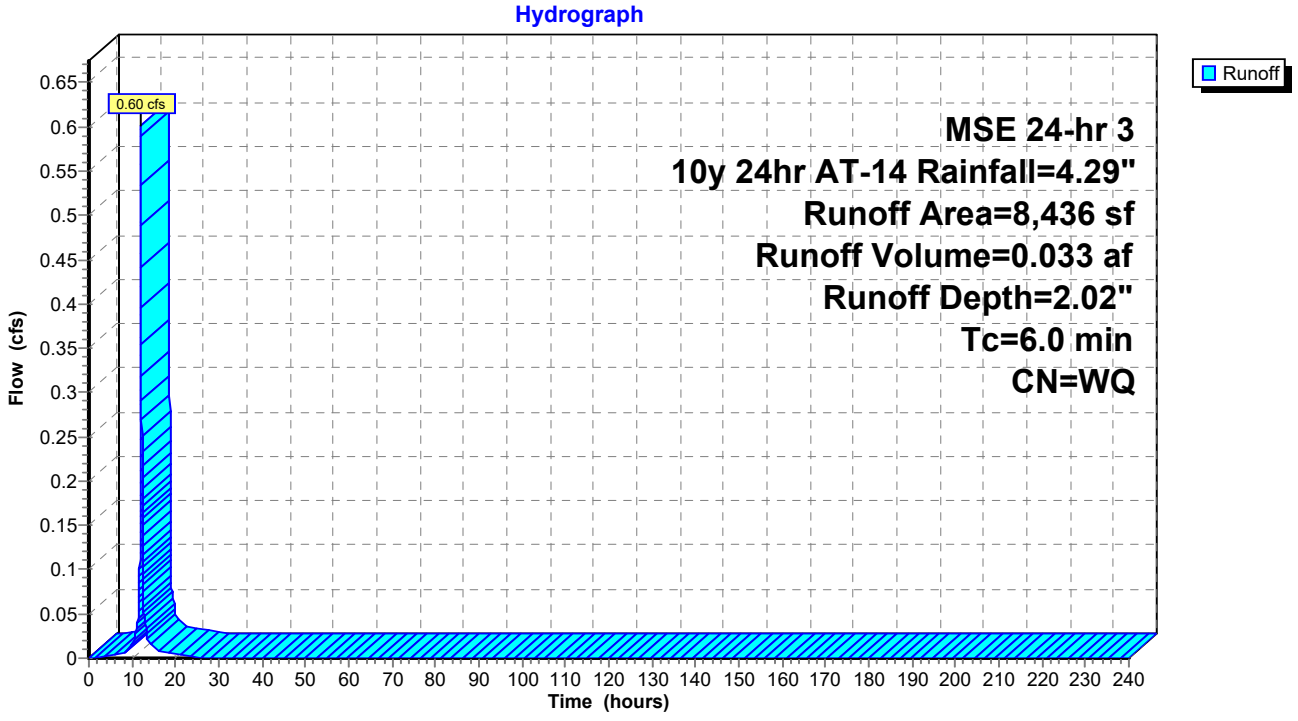
Runoff = 0.60 cfs @ 12.13 hrs, Volume= 0.033 af, Depth= 2.02"
Routed to Reach R1 : STEWART LANE TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10y 24hr AT-14 Rainfall=4.29"

Area (sf)	CN	Description
4,114	98	Paved parking, HSG A
4,322	39	>75% Grass cover, Good, HSG A
8,436		Weighted Average
4,322		51.23% Pervious Area
4,114		48.77% Impervious Area

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

Subcatchment PR2: PR2 DRAINS TO STEWART LANE



Summary for Subcatchment PROFF1: PROFF1 DRAINS TO UNDERGROUND INFILTRATION BASIN

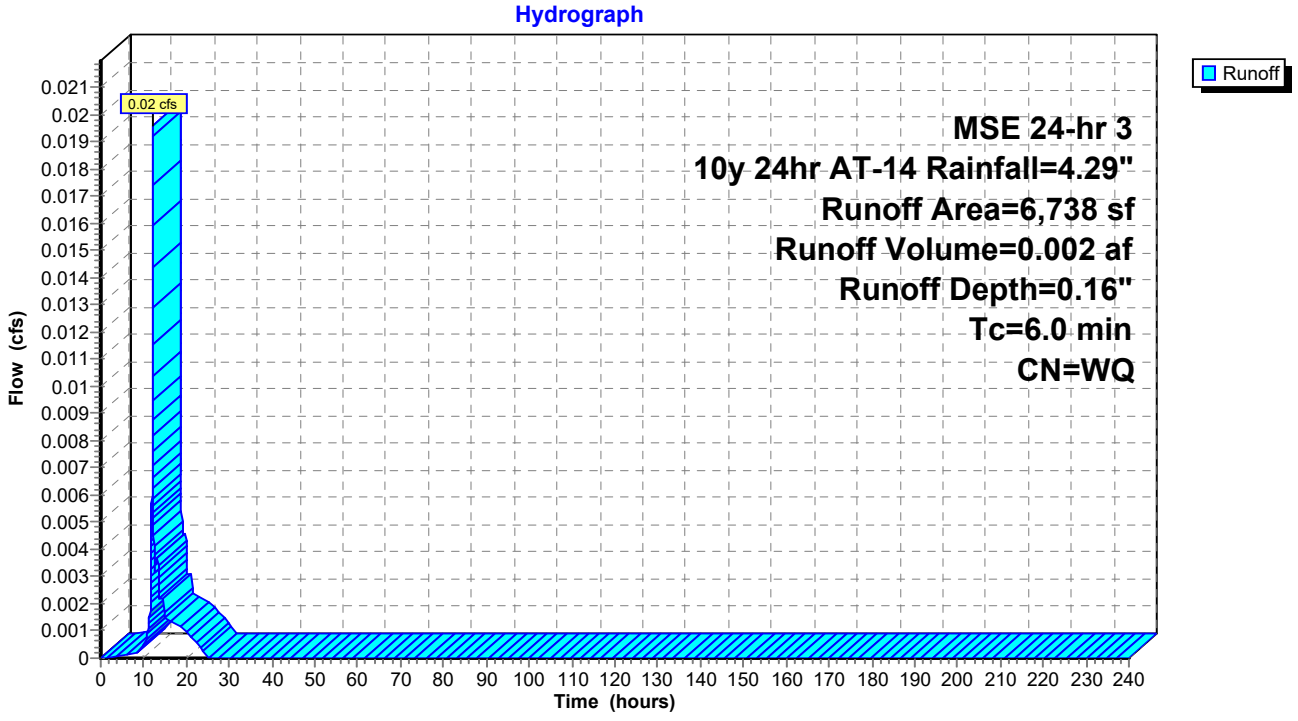
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 0.002 af, Depth= 0.16"
Routed to Pond P : UNDERGROUND INFILTRATION BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10y 24hr AT-14 Rainfall=4.29"

Area (sf)	CN	Description
134	98	Paved parking, HSG A
6,604	39	>75% Grass cover, Good, HSG A
6,738		Weighted Average
6,604		98.01% Pervious Area
134		1.99% Impervious Area

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

Subcatchment PROFF1: PROFF1 DRAINS TO UNDERGROUND INFILTRATION BASIN



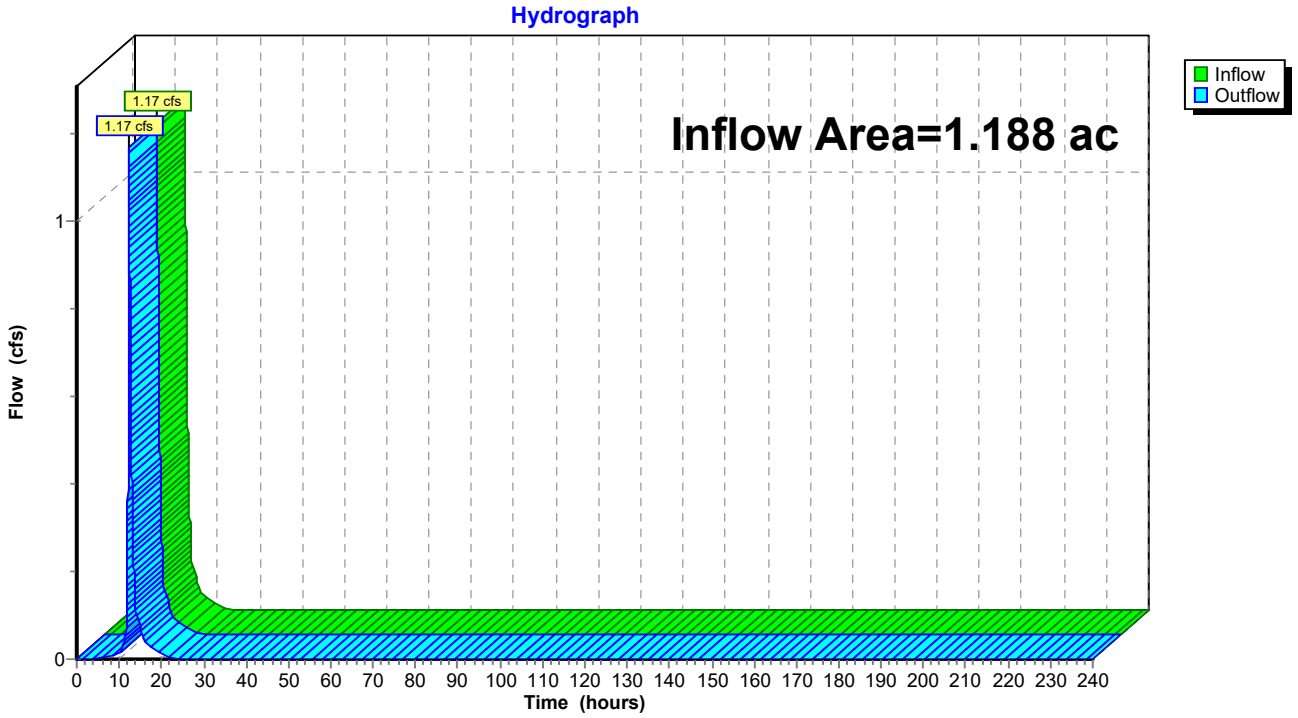
Summary for Reach R1: STEWART LANE TOTAL SITE AREA

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.188 ac, 52.32% Impervious, Inflow Depth = 1.15" for 10y 24hr AT-14 event
Inflow = 1.17 cfs @ 12.17 hrs, Volume= 0.113 af
Outflow = 1.17 cfs @ 12.17 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach R1: STEWART LANE TOTAL SITE AREA



Summary for Pond P: UNDERGROUND INFILTRATION BASIN

Inflow Area = 0.995 ac, 53.02% Impervious, Inflow Depth = 2.19" for 10y 24hr AT-14 event
Inflow = 3.36 cfs @ 12.13 hrs, Volume= 0.181 af
Outflow = 0.90 cfs @ 12.31 hrs, Volume= 0.181 af, Atten= 73%, Lag= 11.1 min
Discarded = 0.02 cfs @ 6.23 hrs, Volume= 0.100 af
Primary = 0.88 cfs @ 12.31 hrs, Volume= 0.081 af
Routed to Reach R1 : STEWART LANE TOTAL SITE AREA

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 932.82' @ 12.31 hrs Surf.Area= 1,140 sf Storage= 4,029 cf

Plug-Flow detention time= 713.3 min calculated for 0.181 af (100% of inflow)
Center-of-Mass det. time= 713.4 min (1,465.2 - 751.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	928.00'	1,826 cf	**20.00'W x 57.00'L x 8.50'H Field A** 9,690 cf Overall - 5,125 cf Embedded = 4,565 cf x 40.0% Voids
#2A	928.50'	5,125 cf	**CMP Round 90** x 4 Inside #1 Effective Size= 90.0"W x 90.0"H => 44.18 sf x 20.00'L = 883.6 cf Overall Size= 90.0"W x 90.0"H x 20.00'L 4 Chambers in 2 Rows 18.00' Header x 44.18 sf x 2 = 1,590.4 cf Inside
		6,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	928.00'	**0.800 in/hr Exfiltration over Surface area**
#2	Device 3	931.70'	**12.0" Vert. 12" outlet pipe to mh** C= 0.600 Limited to weir flow at low heads
#3	Device 5	931.70'	**6.0" Vert. 6" orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 5	936.15'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Primary	931.70'	**12.0" Vert. 12" oulet pipe from mh** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 6.23 hrs HW=928.09' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.88 cfs @ 12.31 hrs HW=932.82' (Free Discharge)
└**5=12" oulet pipe from mh** (Passes 0.88 cfs of 2.97 cfs potential flow)
  ├**3=6" orifice** (Orifice Controls 0.88 cfs @ 4.48 fps)
  │ └**2=12" outlet pipe to mh** (Passes 0.88 cfs of 2.97 cfs potential flow)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P: UNDERGROUND INFILTRATION BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 90 (Round Corrugated Metal Pipe)
Effective Size= 90.0"W x 90.0"H => 44.18 sf x 20.00'L = 883.6 cf
Overall Size= 90.0"W x 90.0"H x 20.00'L

90.0" Wide + 36.0" Spacing = 126.0" C-C Row Spacing

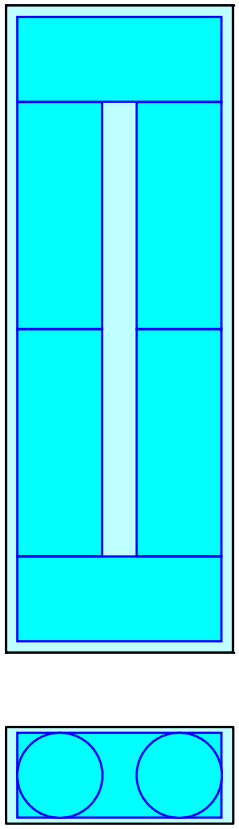
2 Chambers/Row x 20.00' Long +7.50' Header x 2 = 55.00' Row Length +12.0" End Stone x 2 = 57.00' Base Length
2 Rows x 90.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 20.00' Base Width
6.0" Stone Base + 90.0" Chamber Height + 6.0" Stone Cover = 8.50' Field Height

4 Chambers x 883.6 cf + 18.00' Header x 44.18 sf x 2 = 5,124.7 cf Chamber Storage

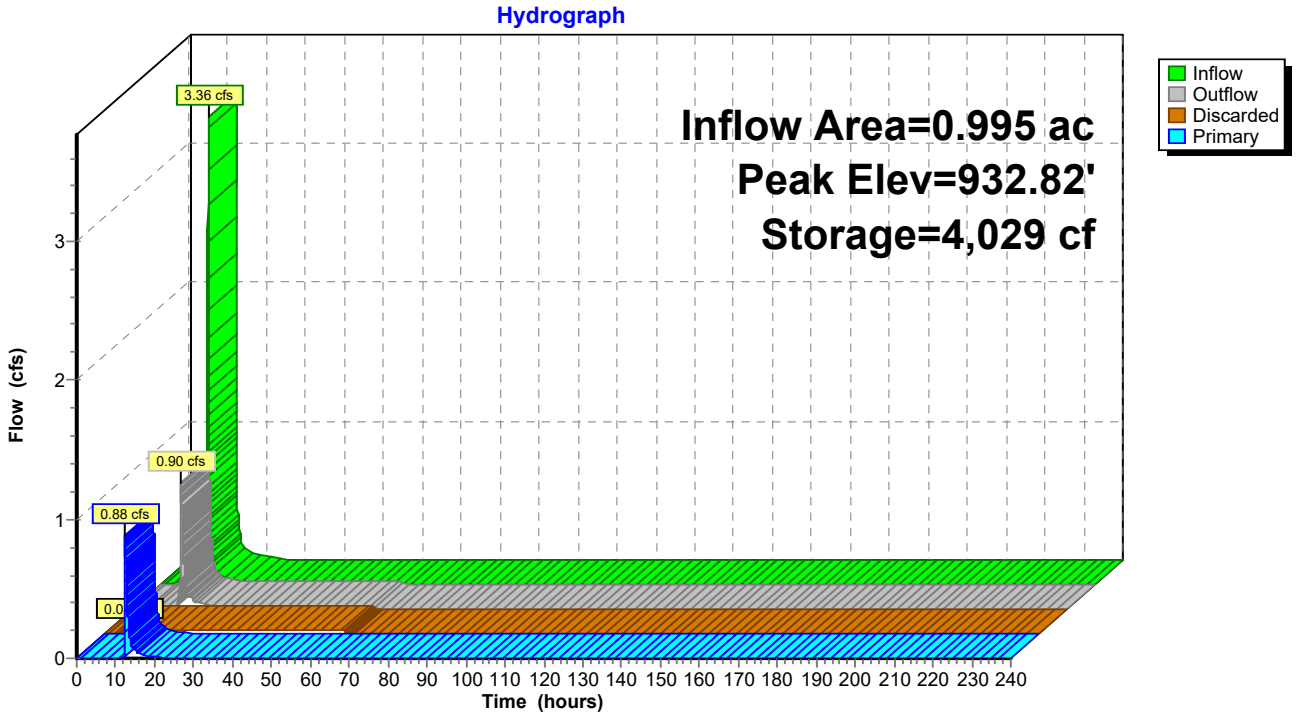
9,690.0 cf Field - 5,124.7 cf Chambers = 4,565.3 cf Stone x 40.0% Voids = 1,826.1 cf Stone Storage

Chamber Storage + Stone Storage = 6,950.8 cf = 0.160 af
Overall Storage Efficiency = 71.7%
Overall System Size = 57.00' x 20.00' x 8.50'

4 Chambers
358.9 cy Field
169.1 cy Stone



Pond P: UNDERGROUND INFILTRATION BASIN



Stage-Area-Storage for Pond P: UNDERGROUND INFILTRATION BASIN

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
928.00	**1,140**	0
928.10	1,140	46
928.20	1,140	91
928.30	1,140	137
928.40	1,140	182
928.50	1,140	228
928.60	1,140	282
928.70	1,140	342
928.80	1,140	406
928.90	1,140	474
929.00	1,140	544
929.10	1,140	617
929.20	1,140	692
929.30	1,140	769
929.40	1,140	847
929.50	1,140	928
929.60	1,140	1,010
929.70	1,140	1,093
929.80	1,140	1,177
929.90	1,140	1,263
930.00	1,140	1,350
930.10	1,140	1,438
930.20	1,140	1,527
930.30	1,140	1,616
930.40	1,140	1,707
930.50	1,140	1,798
930.60	1,140	1,890
930.70	1,140	1,983
930.80	1,140	2,077
930.90	1,140	2,171
931.00	1,140	2,265
931.10	1,140	2,360
931.20	1,140	2,456
931.30	1,140	2,552
931.40	1,140	2,648
931.50	1,140	2,745
931.60	1,140	2,841
931.70	1,140	2,939
931.80	1,140	3,036
931.90	1,140	3,133
932.00	1,140	3,231
932.10	1,140	3,329
932.20	1,140	3,427
932.30	1,140	3,524
932.40	1,140	3,622
932.50	1,140	3,720
932.60	1,140	3,817
932.70	1,140	3,915
932.80	1,140	4,012
932.90	1,140	4,109
933.00	1,140	4,206
933.10	1,140	4,303
933.20	1,140	4,399
933.30	1,140	4,495
933.40	1,140	4,591
933.50	1,140	4,686
933.60	1,140	4,780
933.70	1,140	4,874
933.80	1,140	4,968
933.90	1,140	5,060
934.00	1,140	5,153
934.10	1,140	5,244
934.20	1,140	5,335
934.30	1,140	5,424
934.40	1,140	5,513
934.50	1,140	5,601
934.60	1,140	5,688
934.70	1,140	5,774
934.80	1,140	5,858
934.90	1,140	5,941
935.00	1,140	6,023
935.10	1,140	6,103
935.20	1,140	6,182
935.30	1,140	6,259
935.40	1,140	6,334
935.50	1,140	6,407
935.60	1,140	6,477
935.70	1,140	6,545
935.80	1,140	6,609
935.90	1,140	6,669
936.00	1,140	6,723
936.10	1,140	6,768
936.20	1,140	6,814
936.30	1,140	6,860
936.40	1,140	6,905
936.50	1,140	**6,951**

Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PR1: PR1 DRAINS TO Runoff Area=36,596 sf 62.41% Impervious Runoff Depth=4.84"
Tc=6.0 min CN=WQ Runoff=6.17 cfs 0.339 af

Subcatchment PR2: PR2 DRAINS TO Runoff Area=8,436 sf 48.77% Impervious Runoff Depth=3.98"
Tc=6.0 min CN=WQ Runoff=1.16 cfs 0.064 af

Subcatchment PROFF1: PROFF1 DRAINS Runoff Area=6,738 sf 1.99% Impervious Runoff Depth=1.05"
Tc=6.0 min CN=WQ Runoff=0.22 cfs 0.014 af

Reach R1: STEWART LANE TOTAL SITE AREA Inflow=2.73 cfs 0.312 af
Outflow=2.73 cfs 0.312 af

Pond P: UNDERGROUND INFILTRATION Peak Elev=936.14' Storage=6,786 cf Inflow=6.37 cfs 0.352 af
Discarded=0.02 cfs 0.105 af Primary=1.93 cfs 0.247 af Outflow=1.96 cfs 0.352 af

Total Runoff Area = 1.188 ac Runoff Volume = 0.416 af Average Runoff Depth = 4.20"
47.68% Pervious = 0.567 ac 52.32% Impervious = 0.622 ac

Summary for Subcatchment PR1: PR1 DRAINS TO UNDERGROUND INFILTRATION BASIN

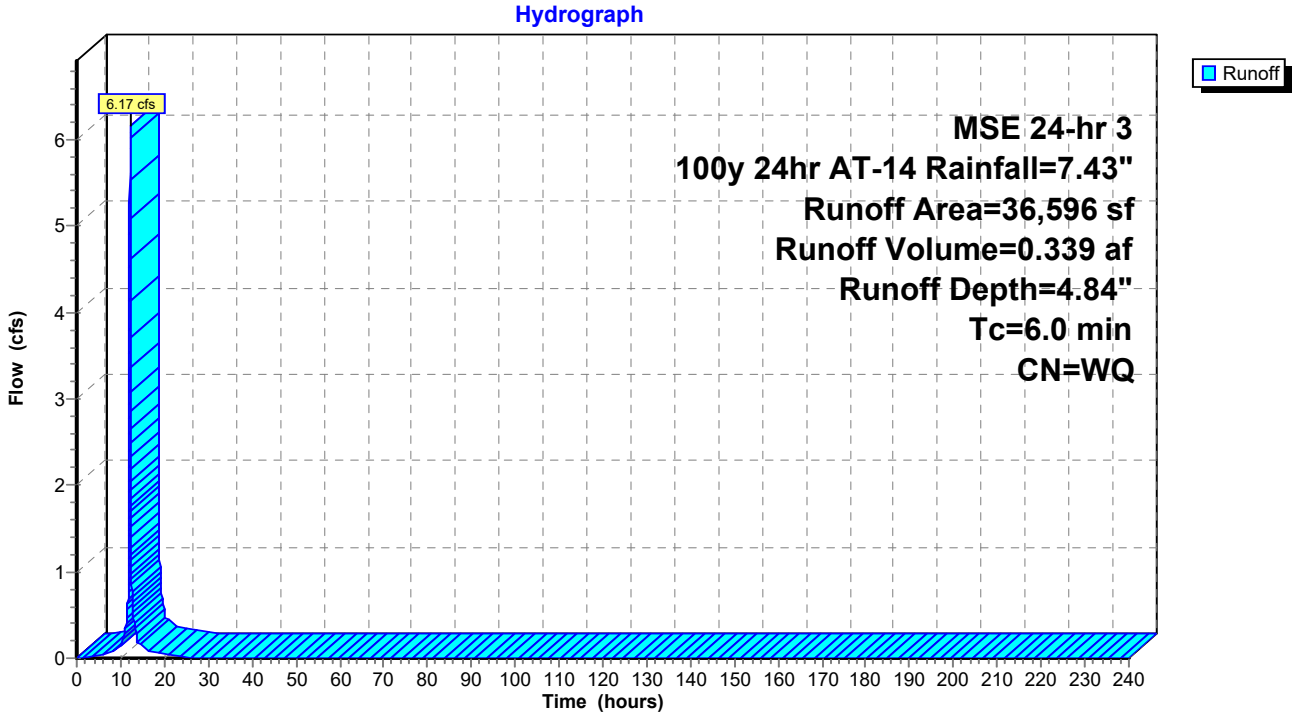
Runoff = 6.17 cfs @ 12.13 hrs, Volume= 0.339 af, Depth= 4.84"
Routed to Pond P : UNDERGROUND INFILTRATION BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100y 24hr AT-14 Rainfall=7.43"

Area (sf)	CN	Description
22,840	98	Paved parking, HSG A
13,756	39	>75% Grass cover, Good, HSG A
36,596		Weighted Average
13,756		37.59% Pervious Area
22,840		62.41% Impervious Area

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

Subcatchment PR1: PR1 DRAINS TO UNDERGROUND INFILTRATION BASIN



Summary for Subcatchment PR2: PR2 DRAINS TO STEWART LANE

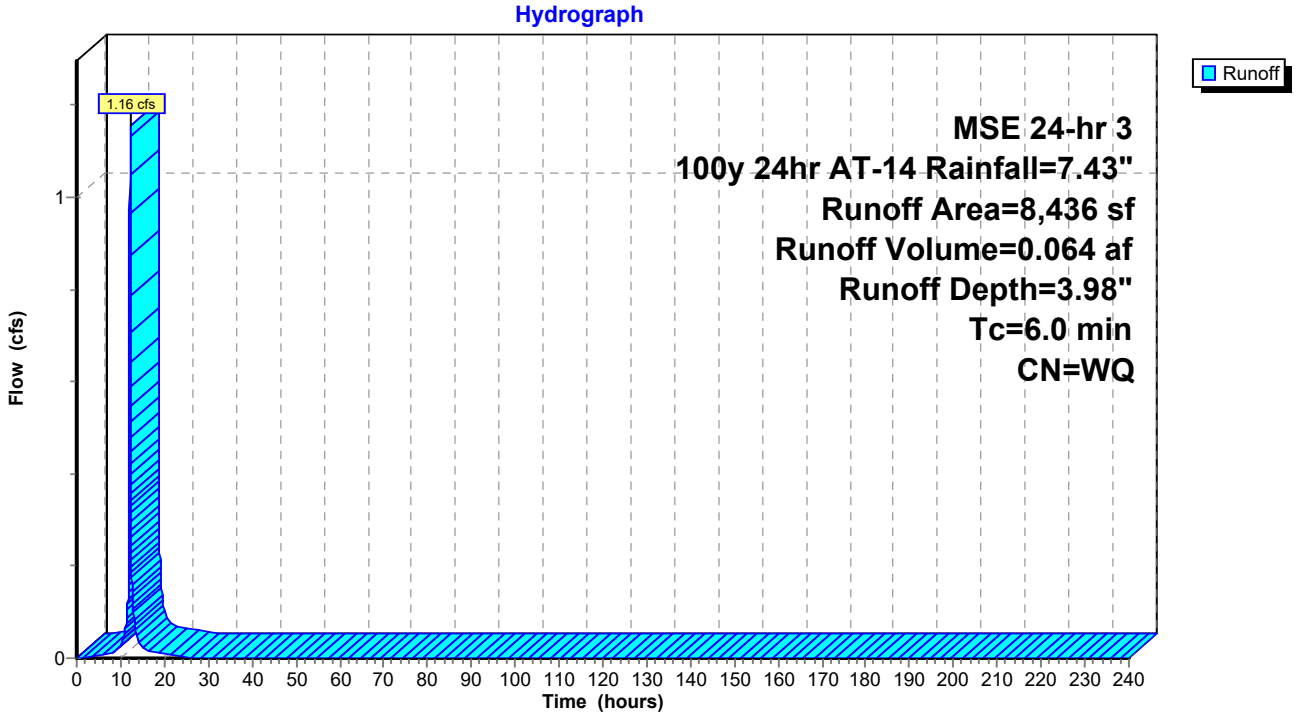
Runoff = 1.16 cfs @ 12.13 hrs, Volume= 0.064 af, Depth= 3.98"
Routed to Reach R1 : STEWART LANE TOTAL SITE AREA

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100y 24hr AT-14 Rainfall=7.43"

Area (sf)	CN	Description
4,114	98	Paved parking, HSG A
4,322	39	>75% Grass cover, Good, HSG A
8,436		Weighted Average
4,322		51.23% Pervious Area
4,114		48.77% Impervious Area

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

Subcatchment PR2: PR2 DRAINS TO STEWART LANE



Summary for Subcatchment PROFF1: PROFF1 DRAINS TO UNDERGROUND INFILTRATION BASIN

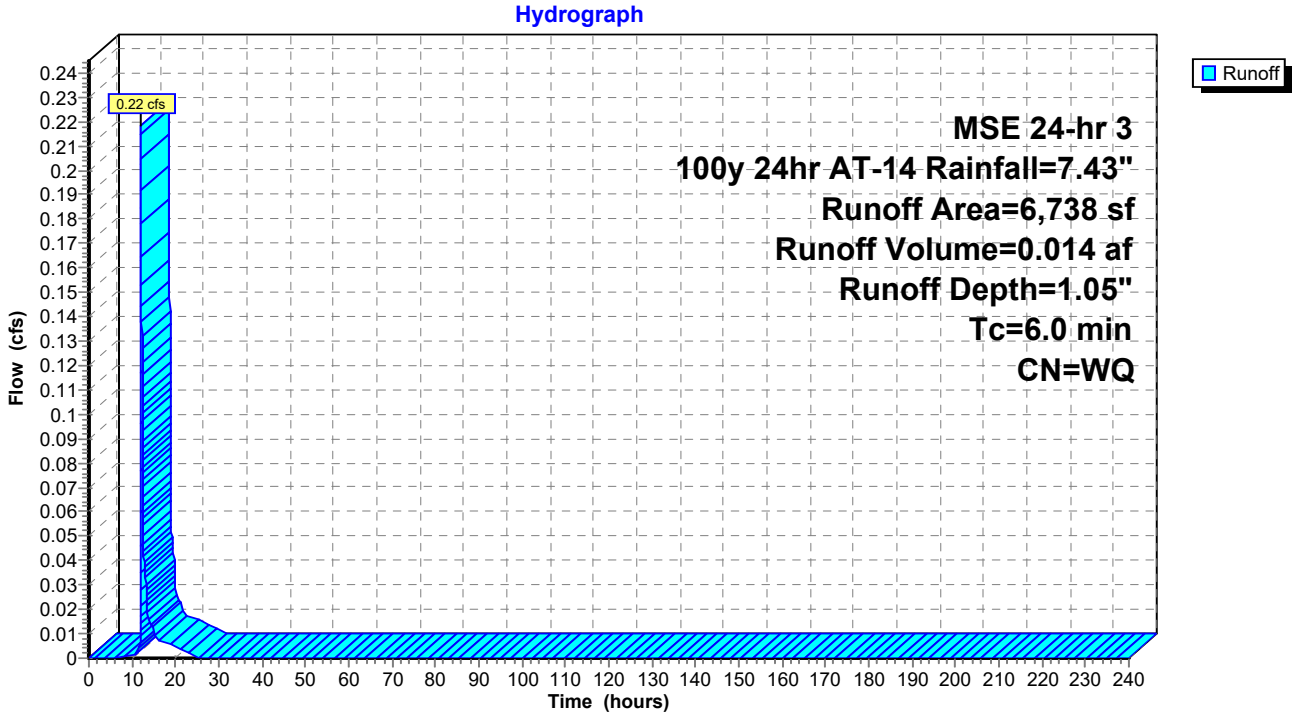
Runoff = 0.22 cfs @ 12.15 hrs, Volume= 0.014 af, Depth= 1.05"
Routed to Pond P : UNDERGROUND INFILTRATION BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100y 24hr AT-14 Rainfall=7.43"

Area (sf)	CN	Description
134	98	Paved parking, HSG A
6,604	39	>75% Grass cover, Good, HSG A
6,738		Weighted Average
6,604		98.01% Pervious Area
134		1.99% Impervious Area

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

Subcatchment PROFF1: PROFF1 DRAINS TO UNDERGROUND INFILTRATION BASIN



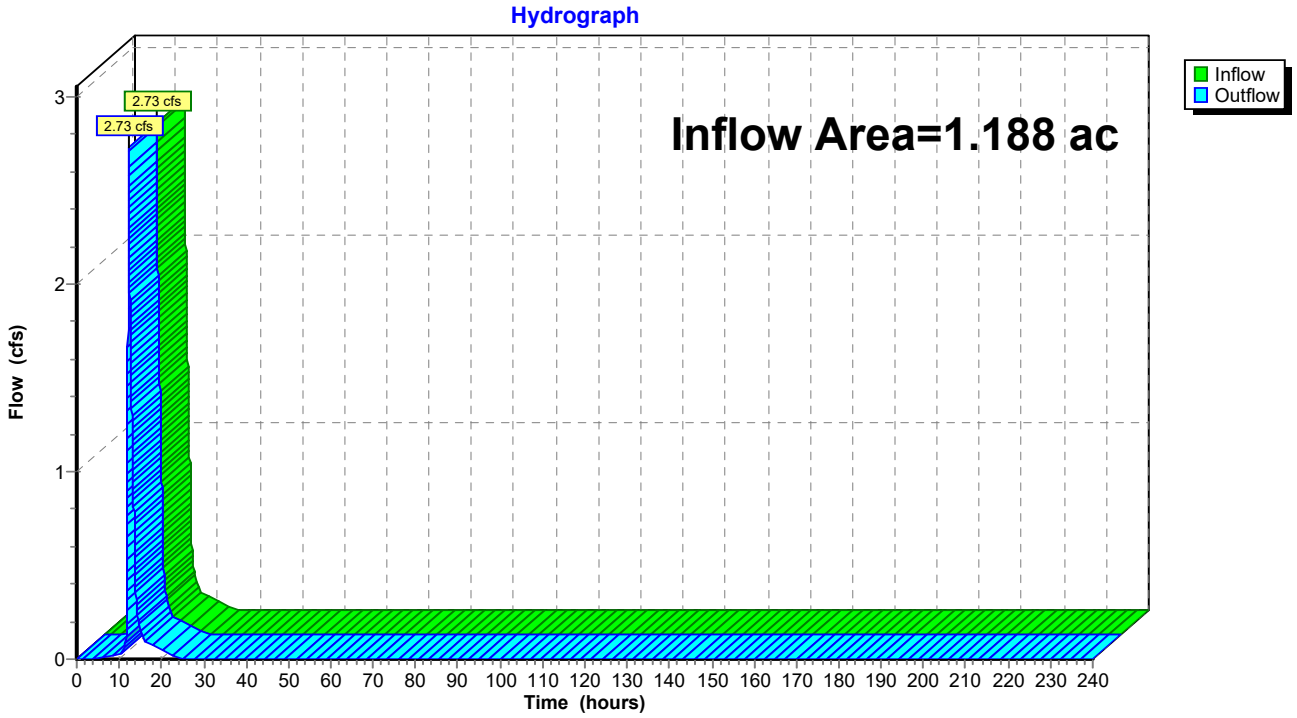
Summary for Reach R1: STEWART LANE TOTAL SITE AREA

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.188 ac, 52.32% Impervious, Inflow Depth = 3.15" for 100y 24hr AT-14 event
Inflow = 2.73 cfs @ 12.15 hrs, Volume= 0.312 af
Outflow = 2.73 cfs @ 12.15 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach R1: STEWART LANE TOTAL SITE AREA



Summary for Pond P: UNDERGROUND INFILTRATION BASIN

Inflow Area = 0.995 ac, 53.02% Impervious, Inflow Depth = 4.25" for 100y 24hr AT-14 event
Inflow = 6.37 cfs @ 12.13 hrs, Volume= 0.352 af
Outflow = 1.96 cfs @ 12.30 hrs, Volume= 0.352 af, Atten= 69%, Lag= 10.1 min
Discarded = 0.02 cfs @ 4.00 hrs, Volume= 0.105 af
Primary = 1.93 cfs @ 12.30 hrs, Volume= 0.247 af
Routed to Reach R1 : STEWART LANE TOTAL SITE AREA

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 936.14' @ 12.30 hrs Surf.Area= 1,140 sf Storage= 6,786 cf

Plug-Flow detention time= 406.6 min calculated for 0.352 af (100% of inflow)
Center-of-Mass det. time= 406.7 min (1,160.8 - 754.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	928.00'	1,826 cf	**20.00'W x 57.00'L x 8.50'H Field A** 9,690 cf Overall - 5,125 cf Embedded = 4,565 cf x 40.0% Voids
#2A	928.50'	5,125 cf	**CMP Round 90** x 4 Inside #1 Effective Size= 90.0"W x 90.0"H => 44.18 sf x 20.00'L = 883.6 cf Overall Size= 90.0"W x 90.0"H x 20.00'L 4 Chambers in 2 Rows 18.00' Header x 44.18 sf x 2 = 1,590.4 cf Inside
		6,951 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	928.00'	**0.800 in/hr Exfiltration over Surface area**
#2	Device 3	931.70'	**12.0" Vert. 12" outlet pipe to mh** C= 0.600 Limited to weir flow at low heads
#3	Device 5	931.70'	**6.0" Vert. 6" orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 5	936.15'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Primary	931.70'	**12.0" Vert. 12" oulet pipe from mh** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 4.00 hrs HW=928.09' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.93 cfs @ 12.30 hrs HW=936.14' (Free Discharge)
└**5=12" oulet pipe from mh** (Passes 1.93 cfs of 7.50 cfs potential flow)
  ├**3=6" orifice** (Orifice Controls 1.93 cfs @ 9.85 fps)
  │ └**2=12" outlet pipe to mh** (Passes 1.93 cfs of 7.50 cfs potential flow)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P: UNDERGROUND INFILTRATION BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 90 (Round Corrugated Metal Pipe)
Effective Size= 90.0"W x 90.0"H => 44.18 sf x 20.00'L = 883.6 cf
Overall Size= 90.0"W x 90.0"H x 20.00'L

90.0" Wide + 36.0" Spacing = 126.0" C-C Row Spacing

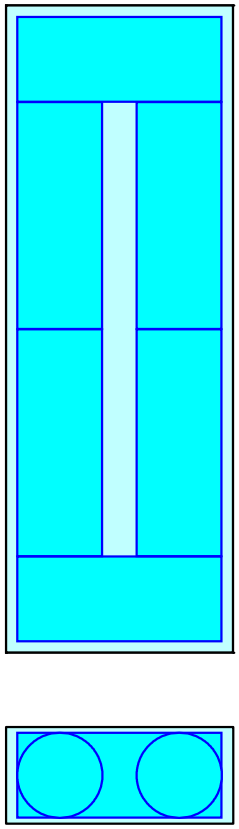
2 Chambers/Row x 20.00' Long +7.50' Header x 2 = 55.00' Row Length +12.0" End Stone x 2 = 57.00' Base Length
2 Rows x 90.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 20.00' Base Width
6.0" Stone Base + 90.0" Chamber Height + 6.0" Stone Cover = 8.50' Field Height

4 Chambers x 883.6 cf + 18.00' Header x 44.18 sf x 2 = 5,124.7 cf Chamber Storage

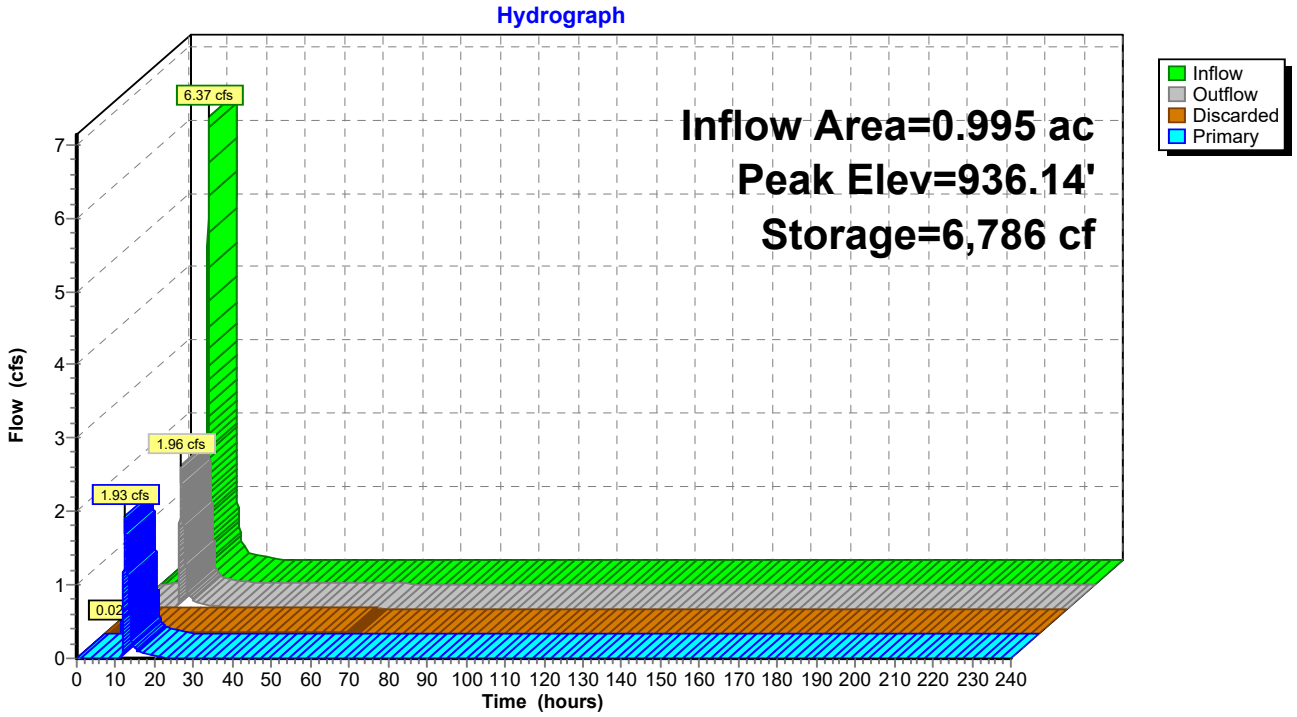
9,690.0 cf Field - 5,124.7 cf Chambers = 4,565.3 cf Stone x 40.0% Voids = 1,826.1 cf Stone Storage

Chamber Storage + Stone Storage = 6,950.8 cf = 0.160 af
Overall Storage Efficiency = 71.7%
Overall System Size = 57.00' x 20.00' x 8.50'

4 Chambers
358.9 cy Field
169.1 cy Stone



Pond P: UNDERGROUND INFILTRATION BASIN



Stage-Area-Storage for Pond P: UNDERGROUND INFILTRATION BASIN

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
928.00	**1,140**	0
928.10	1,140	46
928.20	1,140	91
928.30	1,140	137
928.40	1,140	182
928.50	1,140	228
928.60	1,140	282
928.70	1,140	342
928.80	1,140	406
928.90	1,140	474
929.00	1,140	544
929.10	1,140	617
929.20	1,140	692
929.30	1,140	769
929.40	1,140	847
929.50	1,140	928
929.60	1,140	1,010
929.70	1,140	1,093
929.80	1,140	1,177
929.90	1,140	1,263
930.00	1,140	1,350
930.10	1,140	1,438
930.20	1,140	1,527
930.30	1,140	1,616
930.40	1,140	1,707
930.50	1,140	1,798
930.60	1,140	1,890
930.70	1,140	1,983
930.80	1,140	2,077
930.90	1,140	2,171
931.00	1,140	2,265
931.10	1,140	2,360
931.20	1,140	2,456
931.30	1,140	2,552
931.40	1,140	2,648
931.50	1,140	2,745
931.60	1,140	2,841
931.70	1,140	2,939
931.80	1,140	3,036
931.90	1,140	3,133
932.00	1,140	3,231
932.10	1,140	3,329
932.20	1,140	3,427
932.30	1,140	3,524
932.40	1,140	3,622
932.50	1,140	3,720
932.60	1,140	3,817
932.70	1,140	3,915
932.80	1,140	4,012
932.90	1,140	4,109
933.00	1,140	4,206
933.10	1,140	4,303
933.20	1,140	4,399
933.30	1,140	4,495
933.40	1,140	4,591
933.50	1,140	4,686
933.60	1,140	4,780
933.70	1,140	4,874
933.80	1,140	4,968
933.90	1,140	5,060
934.00	1,140	5,153
934.10	1,140	5,244
934.20	1,140	5,335
934.30	1,140	5,424
934.40	1,140	5,513
934.50	1,140	5,601
934.60	1,140	5,688
934.70	1,140	5,774
934.80	1,140	5,858
934.90	1,140	5,941
935.00	1,140	6,023
935.10	1,140	6,103
935.20	1,140	6,182
935.30	1,140	6,259
935.40	1,140	6,334
935.50	1,140	6,407
935.60	1,140	6,477
935.70	1,140	6,545
935.80	1,140	6,609
935.90	1,140	6,669
936.00	1,140	6,723
936.10	1,140	6,768
936.20	1,140	6,814
936.30	1,140	6,860
936.40	1,140	6,905
936.50	1,140	**6,951**

TABLE OF CONTENTS

Glen Lake Apartments
Civil Site Group - Stormwater Calculations

Existing Conditions

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
EX1	7454	98	37577	39	45031	49
EXOFF	1528	98	5210	39	6738	52

Proposed Conditions

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
PR1	22840	98	13756	39	36596	76
PR2	4114	98	4322	39	8436	68
PROFF1	134	98	6604	39	6738	40

Site Area Summary

	Impervious [SF]	Impervious [AC]	Pervious [SF]	Pervious [AC]	Total [SF]	Total [AC]
Existing Site	8982	0.21	42787	0.98	51769	1.19
Proposed Site	27088	0.62	24682	0.57	51770	1.19

Stormwater Rate Summary

Drainage Area	Existing Rate (cfs)		
	2-YR [2.87"]	10-YR [4.29"]	100-YR [7.43"]
EX1	0.72	1.09	2.90
EXOFF	0.15	0.22	0.53
TOTAL	0.87	1.32	3.43

Drainage Area	Proposed Conditions Rate (cfs)		
	2-YR [2.94"]	10-YR [4.47"]	100-YR [7.81"]
PR1	2.22	3.34	6.17
PR2	0.40	0.60	1.16
PROFF1	0.01	0.02	0.22
TOTAL	0.40	1.17	2.73

Overall Stormwater Rate Summary

	Existing Conditions Rate (cfs)	Proposed Conditions Rate (cfs)
2-Year Event	0.87	0.40
10-Year Event	1.32	1.17
100-Year Event	3.43	2.73

Stormwater Water Quality and Volume Summary

Drainage Area	Required Infiltration Vol. Summary	
	New Impv. Area (sf)	Required Volume (cf)
PR1	22840	2094
PR2	4114	377
TOTAL	26954	2471

Infiltration Volume = 1.1"*Dist. Impv. Area

Proposed BMP Area	Provided Vol (cf)	Drawdown Time Calculations (0.8"/Hour)		
		Inf. Area (sf)	Assoc. Inf. Height (ft)	Drawdown Time (h)
Infiltration Basin 1	2939	1140	2.58	38.67
TOTAL	2939			

Project Information

Calculator Version:	Version 4: July 2020
Project Name:	Glen Lake Apartments
User Name / Company Name:	Robbie Latta - Civil Site Group
Date:	01/31/2022
Project Description:	Demolition of a single family home and construction of a multifamily building with associated underground parking, utilities, landscaping, etc.
Construction Permit?:	No

Site Information

Retention Requirement (inches):	1.1
Site's Zip Code:	55345
Annual Rainfall (inches):	30.2
Phosphorus EMC (mg/l):	0.3
TSS EMC (mg/l):	54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed	0				0
			Impervious Area (acres)		0.587
				Total Area (acres)	0.587

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed					0
			Impervious Area (acres)		0.522
				Total Area (acres)	0.522

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	2344	ft3
Volume removed by BMPs towards performance goal:	2084	ft^3
Percent volume removed towards performance goal	**89**	**%**

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	1.2631	acre-ft
Annual runoff volume removed by BMPs:	1.1113	acre-ft
Percent annual runoff volume removed:	**88**	**%**
Post development annual particulate P load:	0.5669	lbs
Annual particulate P removed by BMPs:	0.499	lbs
Post development annual dissolved P load:	0.464	lbs
Annual dissolved P removed by BMPs:	0.408	lbs
Total P removed by BMPs	0.907	lbs
Percent annual total phosphorus removed:	**88**	**%**
Post development annual TSS load:	187.2	lbs
Annual TSS removed by BMPs:	164.7	lbs
Percent annual TSS removed:	**88**	**%**

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft3)	Volume Recieved (ft3)	Volume Retained (ft3)	Volume Outflow (ft3)	Percent Retained (%)
1 - Underground infiltration	3167	2084	2084	0	100

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
1 - Underground infiltration	1.1232	0	1.1113	0.0119	99

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	0.5041	0	0.4987	0.0054	99

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	0.4124	0	0.408	0.0044	99

Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	0.9165	0	0.9067	0.0098	99

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	166.51	0	164.74	1.7699999999	99

BMP Schematic

1 - Underground infiltration