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Job Number: 2021-1301

DUBLIN SCIOTO HITTING FACILITY

Stormwater Management Plan (SWMP)

Prepared For: Dublin Schools

January 13, 2023

1-13-23

emht.com

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PROJECT SUMMARY

Project:	Dublin Scioto Hitting Facility
Location:	City of Dublin, Franklin County, Ohio
Type:	Stormwater Management Plan
Reviewing Agency:	City of Dublin, Ohio EPA

HYDROLOGIC SUMMARY

Rainfall Data: NOAA Atlas 14, Volume 2, Version 3, 2004

1-yr	2.20”
2-yr	2.63”
5-yr	3.24”
10-yr	3.74”
25-yr	4.44”
50-yr	5.02”
100-yr	5.63”

Rainfall Distribution:	NRCS Type II 24 hour
Detention Policy:	City of Dublin
Water Quality:	City of Dublin, Ohio EPA
Hydrology Modeling Program:	HydroCAD 10.20

DESIGN SUMMARY

Detention:	StormTech MC-3500 Chambers & Pipe Storage
Water Quality:	StormTech MC-3500 Chambers
Receiving Water Body:	City of Dublin MS4 which discharges to the Scioto River

REVISIONS

TABLE OF CONTENTS

TABLES

APPENDICES

1.0 INTRODUCTION

The following report provides a detailed analysis and design of the Stormwater Management Plan for Dublin Scioto Hitting Facility. The proposed site is located north of Hard Road just northeast of the existing school building. The proposed project area involves the development of an open space area into a hitting facility. The Stormwater Management Plan was prepared in accordance with the requirements of both the City of Dublin and the Ohio EPA. The runoff from this site will be routed through a StormTech underground chamber and pipe storage for water quality and quantity control before discharging to the Scioto River to the southwest.

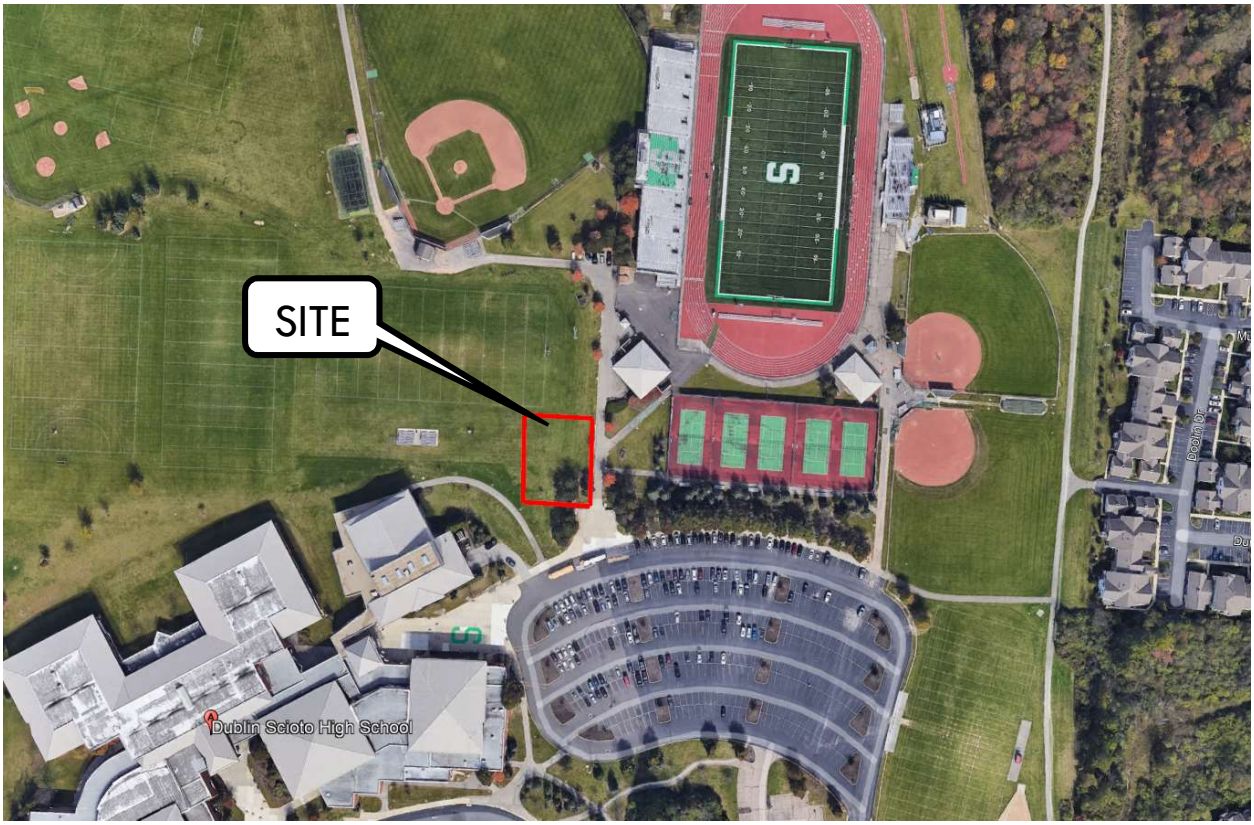


Figure 1 – Site Location Map

2.0 HYDROLOGIC ANALYSIS

Hydrologic parameters such as Runoff Curve Number (RCN) and Time of Concentration were determined using standard Natural Resources Conservation Service (NRCS) methodology. The 1-, 2-, 5-, 10-, 25-, 50-, and 100-year storm event discharge amounts were calculated using the NRCS TR-55 method. This analysis reflects the NRCS Type II distribution, 24-hr storm duration. Rainfall depths were obtained from NOAA Atlas 14, Volume 2, Version 3, 2004. The peak flow rates were computed using the HydroCAD 10.20 computer program.

3.0 PRE-DEVELOPED ANALYSIS

The pre-developed condition, as seen on Exhibit 1 in Appendix E, consists of open space located in Dublin Master Planned Sub-Basins. Pre-developed 01 and Offsite naturally drain to the southwest to the Scioto River. The project area is located within hydrologic soil group D (Blount silt loam).

Pre-developed subarea characteristics are summarized in Table 1. The City of Dublin Master Planned Allowable Release Rates are provided in Table 2. Time of concentration calculations can be found in the HydroCAD 10.20 output in Appendix D.

Table 1 -Pre-developed Subarea Characteristics

Subarea Identifier	Tributary Area (acres)	Land Usage	Runoff Curve Number	% Impervious (%)	Time of Concentration (min)	1-year Runoff Volume (ac-ft)
Pre-developed 01	0.83	Open Space, Impervious Area	82	10%	11.0	0.054
Offsite 01	0.23	Open Space, Impervious Area	81	4%	18.9	-
Total	**1.06**	**-**	**82**	**8%**	**-**	**0.054**

Table 2 -City of Dublin Master Planned Allowable Release Rates

Allowable Release Rates per Acre *Hard Road*

Sub-Basin	1-year	2-year	5-year	10-year	25-year	50-year	100-year
950	0.4	0.5	0.7	0.8	1.1	1.6	2.1
970	0.3	0.4	0.5	0.6	0.8	1.2	1.6

Post-Developed Area per Sub-Basin

Sub-Basin	Area (Acres)
950	0.73
970	0.10
Total	0.83

Allowable Release Rates per Acre *Cramer Creek*

Sub-Basin	1-year	2-year	5-year	10-year	25-year	50-year	100-year
950	0.29	0.37	0.51	0.58	0.80	1.17	1.53
970	0.03	0.04	0.05	0.06	0.08	0.12	0.16
Total	**0.32**	**0.41**	**0.56**	**0.64**	**0.88**	**1.29**	**1.69**

Note: Allowable Release Rates per Acre were taken from the City of Dublin Master Plan. These values were then multiplied by the total acreage in that Sub-Basin to generate the Allowable Release Rates.

4.0 POST-DEVELOPED ANALYSIS

Exhibit 2, provided within Appendix E, shows the post-developed Phase 1 condition. The Dublin Scioto Hitting Facility project will utilize pipe storage to provide water quantity control for the proposed development. Subarea 01 and Offsite 01 will drain to the south to Detention 01, which will discharge to the storm sewer along John Shields Parkway. Detention 01 consists of seven ADS MC-3500 StormTech chambers which will provide water quality treatment in combination with 450-feet of 42-inch storm sewer for additional detention volume. Undetained 01 will drain directly to the existing storm sewer system. The post-developed subarea characteristics are summarized in Table 3. The post-developed allowable release rates and proposed release rates can be found in Table 4.

Table 3 -Post-developed Subarea Characteristics

Subarea Identifier	Tributary Area (acres)	Land Usage	Runoff Curve Number	% Impervious (%)	Time of Concentration (min)	1-year Runoff Volume (ac-ft)
Subarea 01	0.73	Open Space, Impervious cover	87	38%	10.0	0.065
Undetained 01	0.10	Open Space, Impervious Area	98	100%	5.0	0.016
Offsite 01	0.23	Open Space, Impervious Area	81	4%	18.9	-
Total	**1.06**	**-**	**87**	**37%**	**-**	**0.081**

The 1-year runoff volume for the post-developed site increases to 0.081 ac-ft, an increase of 50.00% from the existing condition, which results in 10-year critical storm event.

$$\% \text{ Increase} = [(0.081 - 0.054)/0.054] \times 100 = 50.00\%$$
10-Yr Critical Storm

Table 4 -Allowable Release Rates

Storm Event (yr.)	Pre-developed 01 Peak Flow Rates (cfs)	Onsite Allowable Release Rates [1] (cfs)	Offsite 01 Peak Flow Rates [2] (cfs)	Allowable Release Rates [1] + [2] (feet)
1	0.32	0.32	0.19	**0.51**
2	0.41	0.32	0.27	**0.59**
5	0.56	0.32	0.39	**0.71**
10	0.64	0.32	0.50	**0.82**
25	0.88	0.88	0.66	**1.54**
50	1.29	1.29	0.79	**2.08**
100	1.69	1.69	0.93	**2.62**

Table 5 -Allowable vs. Proposed Release Rates

Storm Event (yr.)	Allowable Release Rates (cfs)	Proposed Release Rates (cfs)	Maximum W.S.E., Lowest Top of Pipe = 904.00 (feet)	Storage Volume Utilized (cu-ft)
1	**0.51**	**0.33**	900.84	2,863
2	**0.59**	**0.39**	901.42	3,994
5	**0.71**	**0.48**	901.73	4,534
10	**0.82**	**0.56**	901.78	4,618
25	**1.54**	**1.45**	901.92	4,853
50	**2.08**	**2.12**	902.20	5,226
100	**2.62**	**2.45**	903.82	5,902

Storage Utilized (100-yr event): 5,902 cu-ft
Storage Provided (Top of System = 904.00 ft.): 5,928 cu-ft

5.0 OUTLET DESIGN

The outlet structure for the pipe storage described below. The location of this structure can be seen on Exhibit 2 in Appendix E.

Detention 01 - Outlet Control Structure

- 500-feet of 42-inch pipe, invert 898.50 ft.
- 7 ADS StormTech MC-3500 chambers
    - Bottom of Stone, invert 898.50 ft.
    - Bottom of Chamber, invert 899.25 ft.
    - Top of Chamber, invert 903.00 ft.
    - Top of Stone, invert 904.00 ft.
    - Minimum Cover Elevation 904.50 ft.
    - Maximum Cover Elevation 911.00 ft.
- 1st stage outlet – 0.50-inch orifice, cut into weir wall, invert at 897.50 ft.
- 2nd stage outlet – 4-foot long weir wall, crest of weir at 901.70 ft.
- Tailwater Control – 6-inch orifice plate on a 12-inch outlet pipe with 0.50% slope, invert at 897.50 ft. (controls 1st through 2nd stage outlets)

6.0 WATER QUALITY

The seven StormTech Chambers that make up part of Detention 01 treat Subarea 01 and Offsite, providing a water quality treatment volume of 0.023 ac-ft meeting the water quality treatment requirement per the City of Dublin SWDM and the Ohio EPA. The water quality volume is treated entirely by the StormTech system.

The Ohio EPA requires that the water quality volume for underground detention systems be detained for a period of 24 hours while not discharging more than the first half of the water quality volume in less than 8 hours.

The StormTech Isolator Row has been approved for a water quality treatment rate of 1 gallon per minute (0.0022 cfs) per square foot per the Ohio EPA. The Rainwater and Land Development Manual Provisional Practices Section outlines the approved flow rate stated above and has been provided in Appendix C for reference. The proposed MC-3500 chambers have a bottom surface area of 43.2 SF per chamber. The proposed site produces a water quality flow of 0.40 cfs. Therefore StormTech system will require 5 chambers of StormTech Isolator Row in order to provide adequate water quality treatment (0.40 CFS/(0.0022 cfs/SF *43.2 SF = 5 chambers). The proposed system will provide 7 Isolator row chambers meeting and exceeding this requirement.

Water quality drawdown for the StormTech system will be provided by Detention 01's 0.50-inch orifice as described in Section 5.0. See Appendix C for the water quality calculations.

Table 1 -Water Quality Calculations

Basin Identifier	Tributary area to StormTech 01 (acres)	Percent Impervious (%)	Required Water Quality Volume (ac-ft)	Provided Water Quality Volume (ac-ft)	Water Quality Elevation (feet)
StormTech 01	0.96	30%	0.023	0.023	899.84

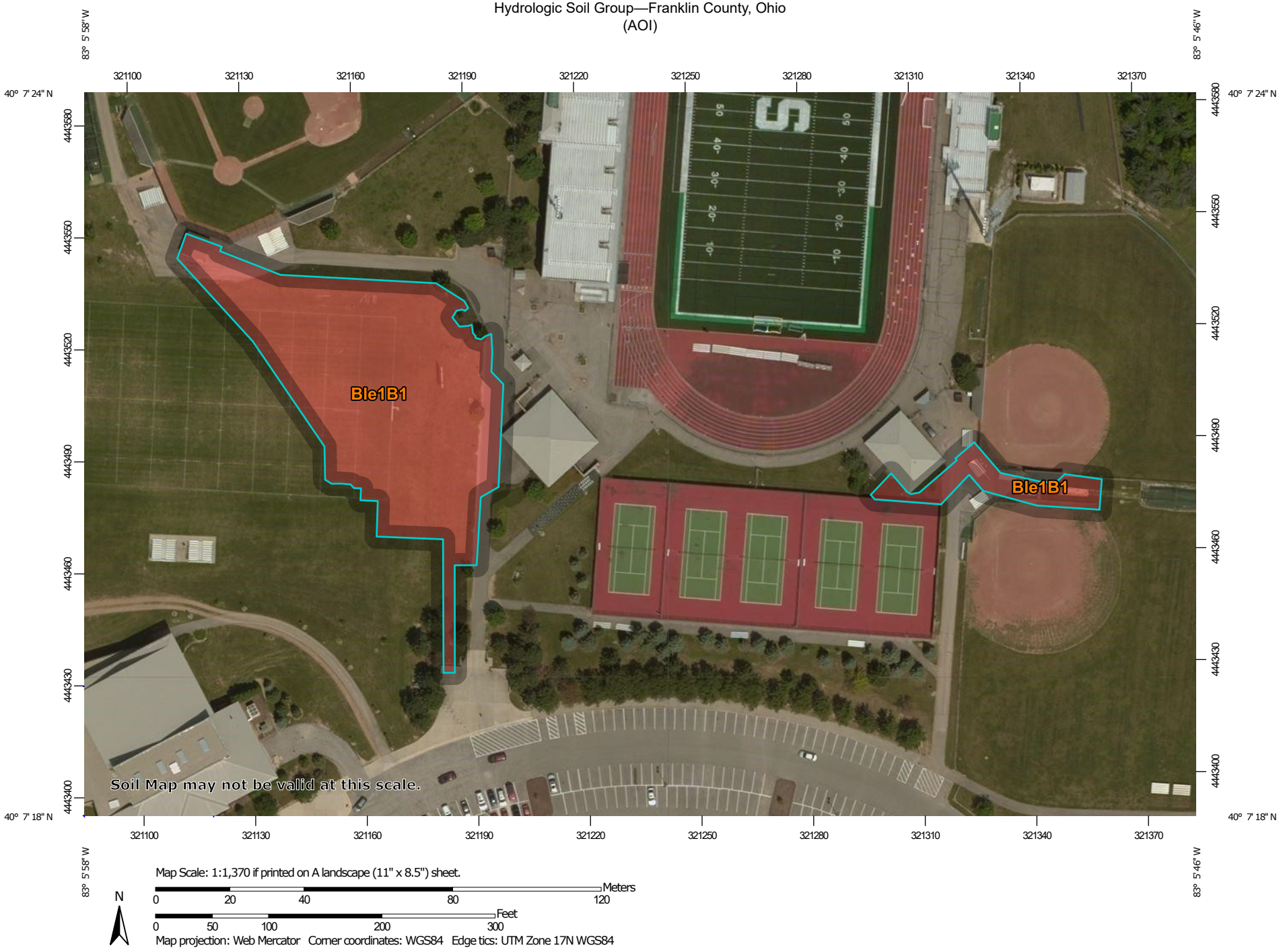
7.0 CONCLUSION

The proposed stormwater management plan for Dublin Scioto Hitting Facility meets all requirements for detention and water quality as set forth by the City of Dublin and the Ohio EPA.

APPENDIX A:

USDA Soils Report

Hydrologic Soil Group—Franklin County, Ohio
(AOI)



Map Scale: 1:1,370 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Franklin County, Ohio
Survey Area Data: Version 21, Sep 8, 2022

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

Date(s) aerial images were photographed: Aug 4, 2014—Aug 27, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ble1B1	Blount silt loam, end moraine, 2 to 4 percent slopes	D	1.1	100.0%
Totals for Area of Interest			**1.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B:

Storm Sewer Calculations

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STORM SEWER COMPUTATION SHEET

SHT 1

Project: **Dublin HS Additions & Renovations**
Job No.: **2021-1301**
Intensity Reference: Columbus

Date: 1/16/23
By: JTW
Checked:

Revised:
Revised:

2 Yr Design Storm n= 0.012

Struc.	Struc. Index	Sta.	Drainage Area				Time		Intensity in/hr	Des Q CFS	Length ft.	Dia. In	Slope%	Vel	Cap. Flowing Full	Status	In	Out	TC	Remarks		5 YEAR HYDRAULIC GRADE LINE				
			Trib	Cumul.	C	Cumul CA	Delta t Min.	Sum t Min.														5 Yr Rainfall Intensity	Discharge Q	Slope %	Minor Losses	5 Yr HGL w/o minor losses
6		1+88.67	0.05	0.05	0.90		10.00	10.00	3.91	0.18							901.00		904.50	1.00	DROP					
			0.00		0.90	0.05					18.68	12	0.40%	3.1	2.4	OK				2.33	ft. cover	4.74	0.21	0.0030	-	902.08
																				3.50	ft. depth					ok
5		1+69.99	0.01	0.14	1.00		0.10	10.10	3.89	0.53							899.93	900.93	904.58	1.00	DROP					
			0.08		1.00	0.14					37.83	12	0.40%	3.1	2.4	OK				2.48	ft. cover	4.72	0.64	0.0272	-	902.08
																				4.65	ft. depth					ok
4		1+32.16	0.00	0.14	1.00		0.20	10.30	3.86	0.52							899.78	899.78	904.30	0.00	DROP					
			0.00		1.00	0.14					90.67	12	0.40%	3.1	2.4	OK				3.35	ft. cover	4.68	0.63	0.0267	-	902.06
																				4.52	ft. depth					ok
3		0+41.49	0.00	0.14	1.00		0.48	10.79	3.78	0.51							899.42	899.42	904.36	0.00	DROP					
			0.00		1.00	0.14					41.49	12	0.40%	3.1	2.4	OK				3.77	ft. cover	4.59	0.62	0.0256	-	902.04
																				4.94	ft. depth					ok
2		0+00.00	0.00	0.14	1.00		0.22	11.01	3.74	0.51								899.25	905.78	0.00	DROP					
			0.00		1.00	0.14														5.36	ft. cover	4.55	0.61	#DIV/0!	-	902.03
																				905.78	ft. depth					ok
7		0+25.64	0.08	0.08	0.90		10.00	10.00	3.91	0.28							900.98		904.50	0.10	DROP					
			0.00		0.90	0.07					25.64	12	0.40%	3.1	2.4	OK				2.35	ft. cover	4.74	0.34	0.0078	-	902.08
																				3.52	ft. depth					ok
5		0+00.00	0.00	0.08	1.00		0.14	10.14	3.88	0.28								900.88	904.58	0.10	DROP					
			0.00		1.00	0.07														2.53	ft. cover	4.72	0.34	#DIV/0!	-	902.08
																				904.58	ft. depth					ok

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Engineers, Surveyors, Planners, Scientists

STORM SEWER COMPUTATION SHEET

SHT 2

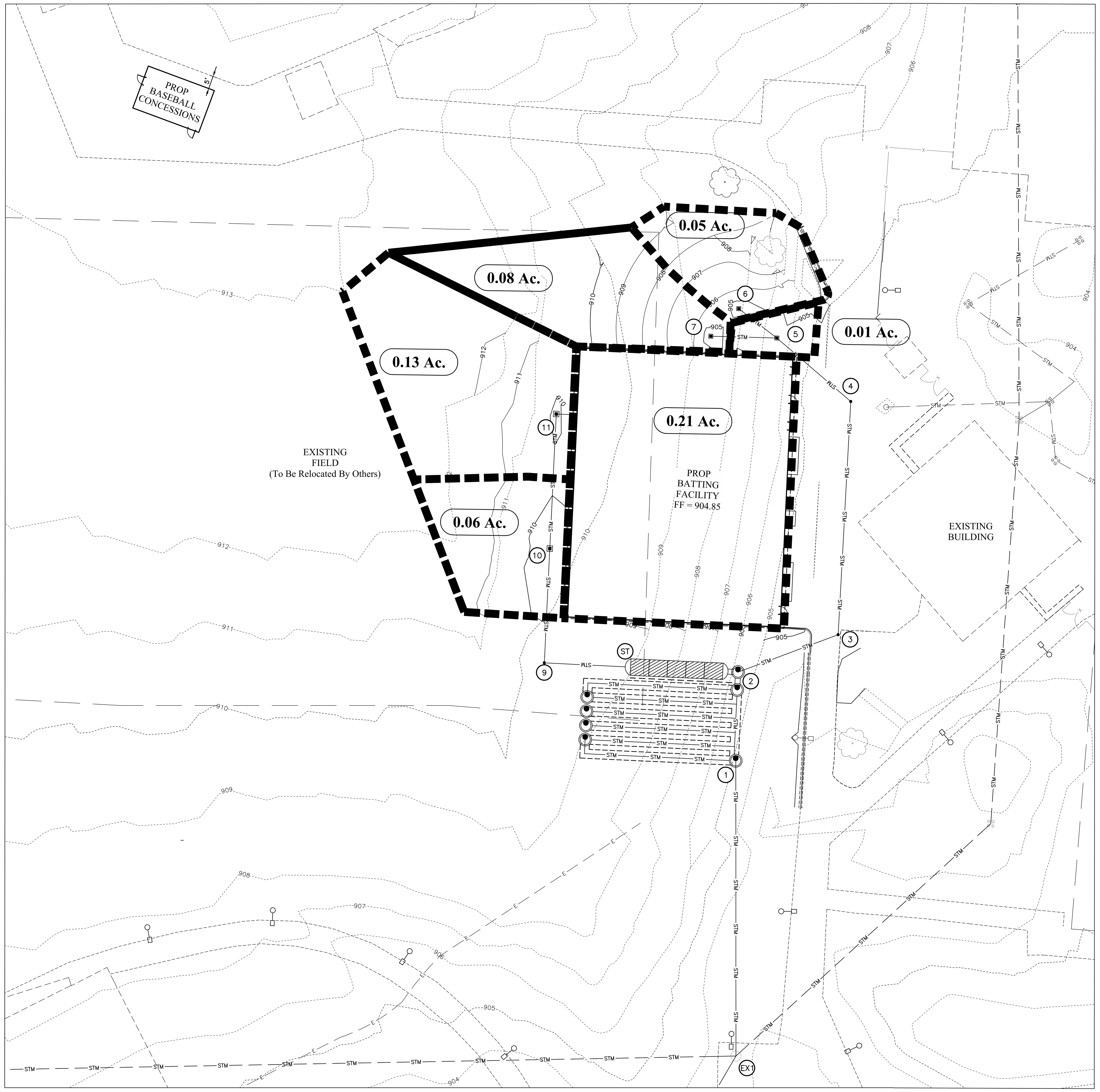
Project: **Dublin HS Additions & Renovations**
Job No.: **2021-1301**
Intensity Reference: Columbus

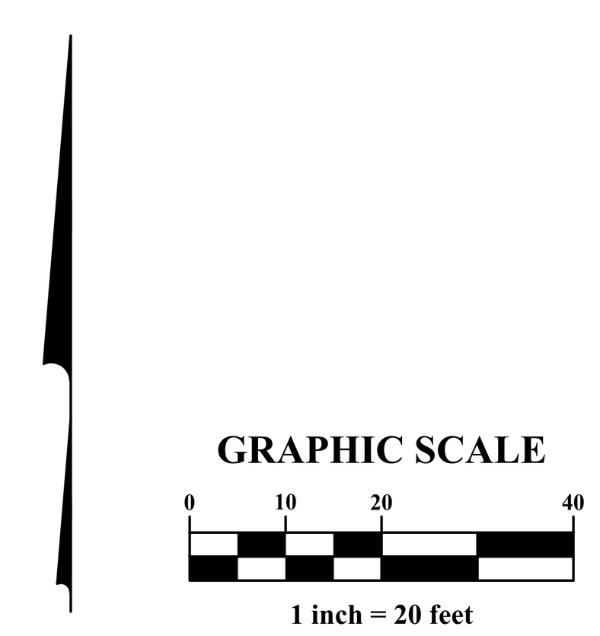
Date: 1/16/23
By: JTW
Checked:

Revised:
Revised:

2 Yr Design Storm n= **0.012**

Struc.	Struc. Index	Sta.	Drainage Area Trib	Drainage Area Cumul.	Drainage Area C	Drainage Area Cumul CA	Time Delta t Min.	Time Sum t Min.	Intensity in/hr	Des Q CFS	Length ft.	Dia. In	Slope%	Vel	Cap. Flowing Full	Status	In	Out	TC	Remarks		5 YEAR HYDRAULIC GRADE LINE: 5 Yr Rainfall Intensity	Discharge Q	Slope %	Minor Losses	5 Yr HGL w/o minor losses
11		1+28.20	0.13	0.34	0.40		10.00	10.00	3.91	0.53							900.57		909.88							
			0.21		0.40	0.14					52.33	12	0.40%	3.1	2.4	OK				8.14	ft. cover	4.74	0.65	0.0278	-	902.07
																				9.31	ft. depth					ok
10		0+75.87	0.06	0.40	0.40		0.28	10.28	3.86	0.62							900.26	900.36	909.45	0.10	DROP					
			0.00		0.40	0.16					44.43	12	0.40%	3.1	2.4	OK				7.92	ft. cover	4.69	0.75	0.0376	-	902.06
																				9.19	ft. depth					ok
9		0+31.44	0.00	0.40	0.40		0.24	10.52	3.82	0.61							899.38	900.08	909.77	0.70	DROP					
			0.00		0.40	0.16					31.44	12	0.40%	3.1	2.4	OK				8.52	ft. cover	4.64	0.74	0.0368	-	902.04
																				10.39	ft. depth					ok
ST		0+00.00	0.00	0.40	0.40		0.17	10.69	3.79	0.61								899.25	909.10	0.10	DROP					
			0.00		0.40	0.16														8.68	ft. cover	4.61	0.74	#DIV/0!	-	902.03
																				909.10	ft. depth					ok





EXISTING

Contours	
Edge Of Pavement	
Curb	
Sidewalk	
Storm Sewer	
Roof Drain	
Fire Hydrant	Manhole
Water Valve	Catch Basin
Light Pole	Curb Inlet
Utility Poles	Signal Pole

PROPOSED

- Contours
- Storm Sewer
- Roof Drain
- Manhole (MH)
- Cleanout

#	DATE	CHANGE DESCRIPTION

DUBLIN HS ADDITIONS & RENOVATIONS
Enter address here
FOR
DUBLIN CITY SCHOOLS

MOODY•NOLAN
300 SPRUCE STREET
SUITE 300
COLUMBUS, OHIO 43215
PHONE: (614) 461-4664
FAX: (614) 280-8881

Perkins&Will
THE WRIGLEY BUILDING
410 NORTH MICHIGAN AVE.
SUITE 1600
CHICAGO, IL 60611
PHONE: (312) 755-0770
FAX: (312) 755-0775

DRAWING TITLE:
Storm Sewer Tributary Map

January 16, 2023
DRAWN BY: JTW | CHECKED BY: KSB
21645.02
1/1

PRINT DATE: 10/24/2022 10:18:14 AM
FILE INFO: BIM 360://21645.02 DCS Scioto/21645.02_DCS Scioto_ARCH.rvt

APPENDIX C:

Water Quality Calculations

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MANGOS PLACE - DUBLIN

STORMTECH ISOLATOR ROW CALCULATION

Subarea 01 Isolator Row

Percent Impervious =	30%	
C =	0.23	$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$
		Where i = fraction of post-construction impervious surface
intensity =	1.85	in/hr (Reference Appendix C from OEPA General Permit)
Water Quality Flow =	0.40	cfs
Chamber Model =	MC-3500	
Flow Per Chamber =	0.10	cfs
Required Chambers =	5	
Provided Chambers =	5	

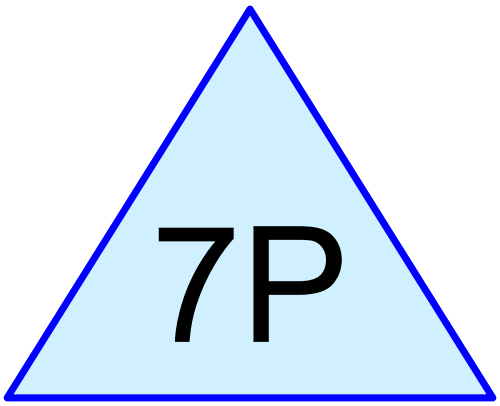
WATER QUALITY VOLUME CALCULATIONS

BMP	Subarea Identifier	Area (acres)	Percent Impervious (%)	Rv	Water Quality Volume (ac-ft)	Water Quality Volume Elevation (feet)
StormTech 01	Subarea 01	0.96	30%	0.32	0.023	-
	Total	**0.96**	**30%**	**0.32**	**0.023**	899.84

Water Quality Volume calculated using the Ohio EPA formula:

$$WQ_v = \frac{R_v \times P \times A}{12}$$

where:
A = area draining into the BMP (acres)
P = 0.90" precipitation depth
Rv = the volumetric runoff coefficient
Rv = 0.05+0.9i
Where i = fraction of post-construction impervious surface



Detention 01 WQ

Subcat Reach Pond Link

Routing Diagram for 2021-1301 (Hitting Facility)
Prepared by EMH&T, Printed 1/13/2023

Summary for Pond 7P: Detention 01 WQ

Inflow	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af
Outflow	=	0.01 cfs @	0.00 hrs,	Volume=	0.023 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.01 cfs @	0.00 hrs,	Volume=	0.023 af

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Starting Elev= 899.84' Surf.Area= 1,679 sf Storage= 1,021 cf
Peak Elev= 899.84' @ 0.00 hrs Surf.Area= 1,679 sf Storage= 1,021 cf

Plug-Flow detention time= (not calculated: no plugs found)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 0.00 hrs HW=899.84' (Free Discharge)
- **1=RCP_Round 12"** (Passes 0.01 cfs of 3.90 cfs potential flow)
  - **2=Orifice Plate** (Passes 0.01 cfs of 1.37 cfs potential flow)
    - **3=WQ Orifice** (Orifice Controls 0.01 cfs @ 7.33 fps)
    - **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Detention 01 WQ - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

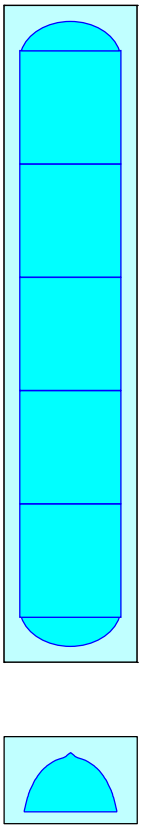
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

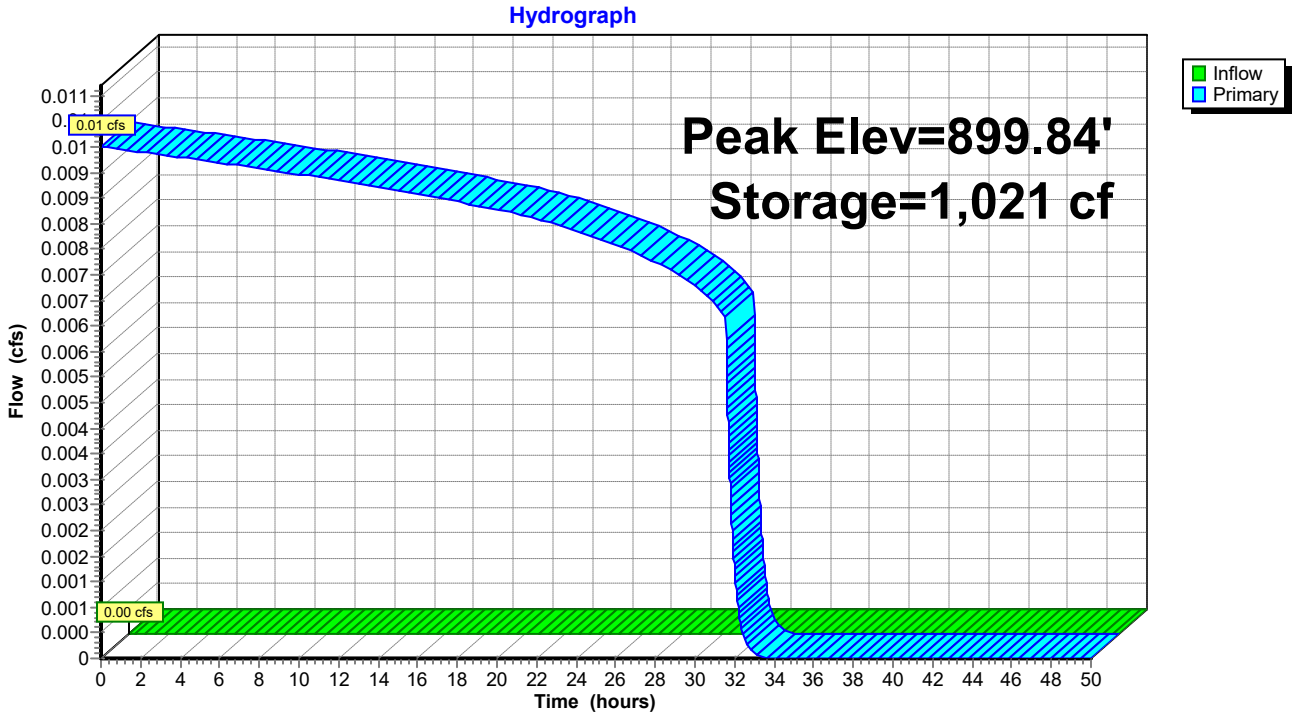
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 7P: Detention 01 WQ



Hydrograph for Pond 7P: Detention 01 WQ

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**1,021**	**899.84**	**0.01**
1.00	0.00	985	899.82	0.01
2.00	0.00	949	899.79	0.01
3.00	0.00	914	899.77	0.01
4.00	0.00	878	899.75	0.01
5.00	0.00	843	899.72	0.01
6.00	0.00	808	899.70	0.01
7.00	0.00	773	899.68	0.01
8.00	0.00	739	899.65	0.01
9.00	0.00	704	899.63	0.01
10.00	0.00	670	899.60	0.01
11.00	0.00	636	899.57	0.01
12.00	0.00	602	899.55	0.01
13.00	0.00	569	899.52	0.01
14.00	0.00	536	899.49	0.01
15.00	0.00	503	899.46	0.01
16.00	0.00	470	899.43	0.01
17.00	0.00	437	899.40	0.01
18.00	0.00	405	899.37	0.01
19.00	0.00	373	899.34	0.01
20.00	0.00	341	899.31	0.01
21.00	0.00	310	899.27	0.01
22.00	0.00	279	899.23	0.01
23.00	0.00	248	899.19	0.01
24.00	0.00	218	899.14	0.01
25.00	0.00	188	899.09	0.01
26.00	0.00	158	899.04	0.01
27.00	0.00	129	898.98	0.01
28.00	0.00	101	898.91	0.01
29.00	0.00	74	898.84	0.01
30.00	0.00	47	898.75	0.01
31.00	0.00	21	898.63	0.01
32.00	0.00	2	898.51	0.00
33.00	0.00	0	898.50	0.00
34.00	0.00	0	898.50	0.00
35.00	0.00	0	898.50	0.00
36.00	0.00	0	898.50	0.00
37.00	0.00	0	898.50	0.00
38.00	0.00	0	898.50	0.00
39.00	0.00	0	898.50	0.00
40.00	0.00	0	898.50	0.00
41.00	0.00	0	898.50	0.00
42.00	0.00	0	898.50	0.00
43.00	0.00	0	898.50	0.00
44.00	0.00	0	898.50	0.00
45.00	0.00	0	898.50	0.00
46.00	0.00	0	898.50	0.00
47.00	0.00	0	898.50	0.00
48.00	0.00	0	898.50	0.00
49.00	0.00	0	898.50	0.00
50.00	0.00	0	898.50	0.00

Events for Pond 7P: Detention 01 WQ

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1 year	**0.00**	**0.01**	**899.84**	**1,021**

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All pipe joints and other connections must be watertight connections.

Design Considerations – Flow Through Treatment Devices

Underground practices should be designed for the appropriate traffic loading and dead loading at the surface.

Consider clearance and accessibility for maintenance.

Underground practices may not be suitable for locations where spill control is necessary.

Maintenance – Flow-Through Treatment Devices

All flow-through treatment devices must be inspected and maintained in accordance with the manufacturer's instructions and/or recommendations.

SUBSURFACE GEOTEXTILE FILTER SYSTEM

Description

A subsurface geotextile filter is a pretreatment practice that combines open-bottom underground storage vaults or chambers with a durable synthetic fabric which serves as a media to filter gross and suspended solids. The geotextile filter bed or area is sized to pass the Water Quality Flow. Solids accumulate on the geotextile surface and must be periodically removed to maintain system performance. These systems are utilized as pretreatment for underground stormwater management systems.

Design Criteria – Subsurface Geotextile Filter System

Geotextile Filter - The filter media shall include a minimum of two layers of woven geotextile (Maine DEP, 2016) meeting AASHTO M288 for Stabilization, Class I, <50% elongation. Geotextile should be placed over an aggregate base without damaging the geotextile. All geotextile ends, seams and splices shall be bound to prevent tearing or short-circuiting.

Geotextile Specifications (AASHTO M288 for Stabilization, Class I, Woven, <50% elongation)			
Test	Test Method	Units	Rating
Grab Strength	ASTM D 4632	lbf.	315
Tear Strength	ASTM D 4533	lbf.	113
Puncture Strength	ASTM D 6241	lbf.	620
Permittivity	ASTM D 4491	sec-1	0.05
Apparent Opening Size (AOS)	ASTM D 4751	mm (US Sieve)	0.43 (40 sieve)

Filter Area – The geotextile filter shall be sized to pass the WQf calculated for the practice's drainage area without bypassing. A maximum design hydraulic loading rate of 1.0 gpm per sq. ft. of filter area

(0.0022 cfs per sq. ft.) shall be used to size the geotextile filter area. The filter area is area of exposed geotextile at the open bottom of the storage vault or chamber.

Filter Outlet - The WQf through the geotextile filter must discharge into the extended detention storage (i.e. prior to the drawdown control device). The hydraulic capacity of any underdrains or manifolds connecting the pretreatment to the USWMS must exceed the capacity of the geotextile filter.

Access – Both the geotextile filter and WQf diversion or routing devices must be readily accessible from the surface for inspection and maintenance. Access points of sufficient size (generally ≥24 inches in diameter) should be located as necessary to remove the accumulated sediment from the entire filter area. An access point at each end of the filter is recommended. If multiple filter areas are used, each separate filter area shall have an access point for maintenance. Observation wells under 18 inches in diameter may be installed as necessary but should not be considered sufficient for maintenance access.

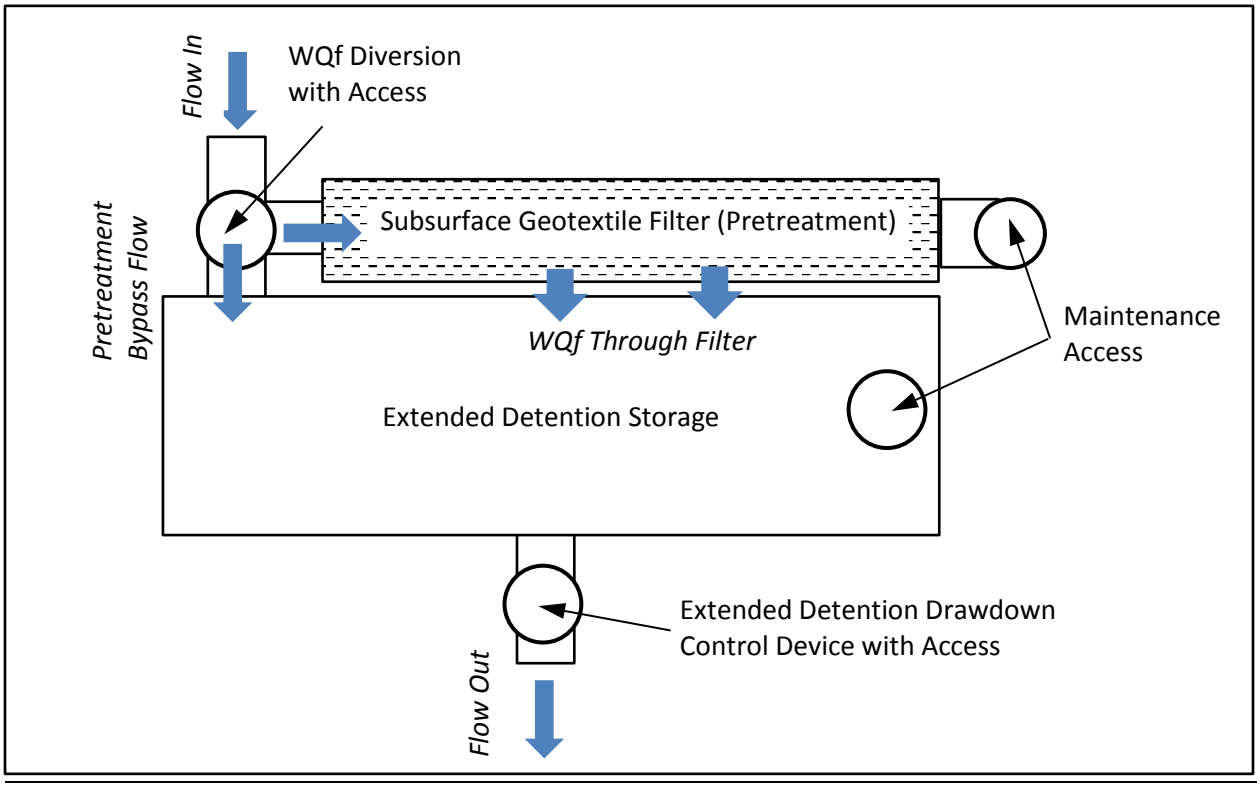


Figure 1: Schematic plan view of a subsurface media filter pretreatment system with a USWMS providing extended detention (after Maine DEP, 2016)

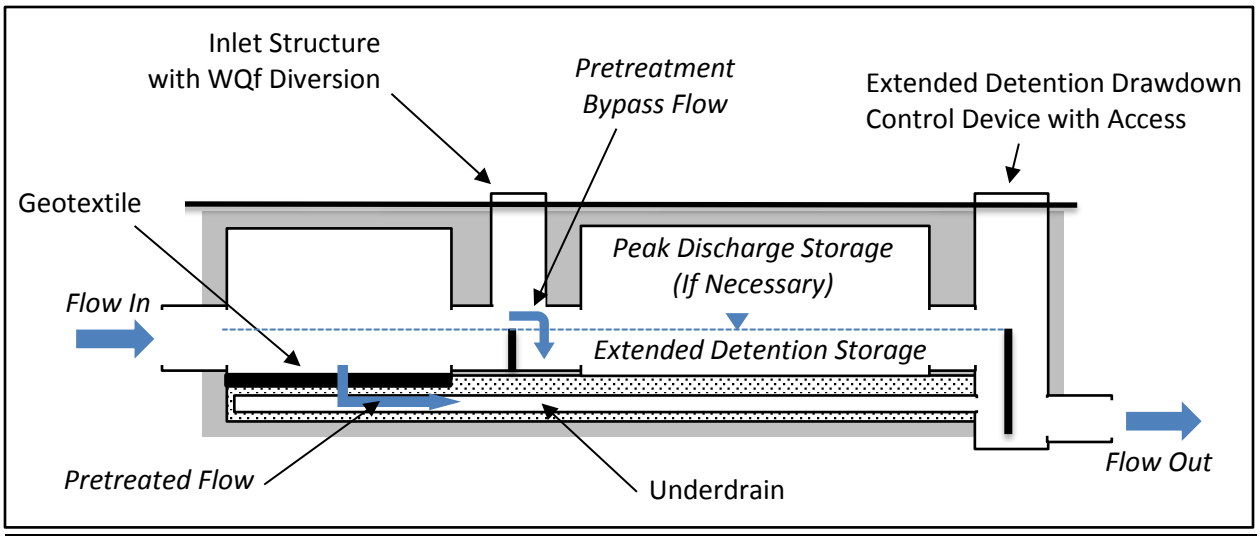


Figure 2: Schematic section of a subsurface media filter pretreatment system for a USWMS providing extended detention

Design Considerations - Subsurface Geotextile Filter System

The design engineer is responsible for the structural integrity of an underground stormwater system and any infrastructure it supports.

Consider the surface clearance and accessibility requirements for maintenance equipment.

Subsurface Geotextile Filter System may have confined entry limitations per Occupational Safety and Health Administration (OSHA) regulations.

The design should prevent reverse flow through the geotextile filter from groundwater or detained stormwater.

Maintenance – Subsurface Geotextile Filter System

An Operation and Maintenance Manual shall be provided for the geotextile filter system that specifies the maintenance procedures and schedule. Annual cleaning and removal of accumulated sediment is recommended and shall occur at least once every five years.

Construction – Subsurface Geotextile Filter System

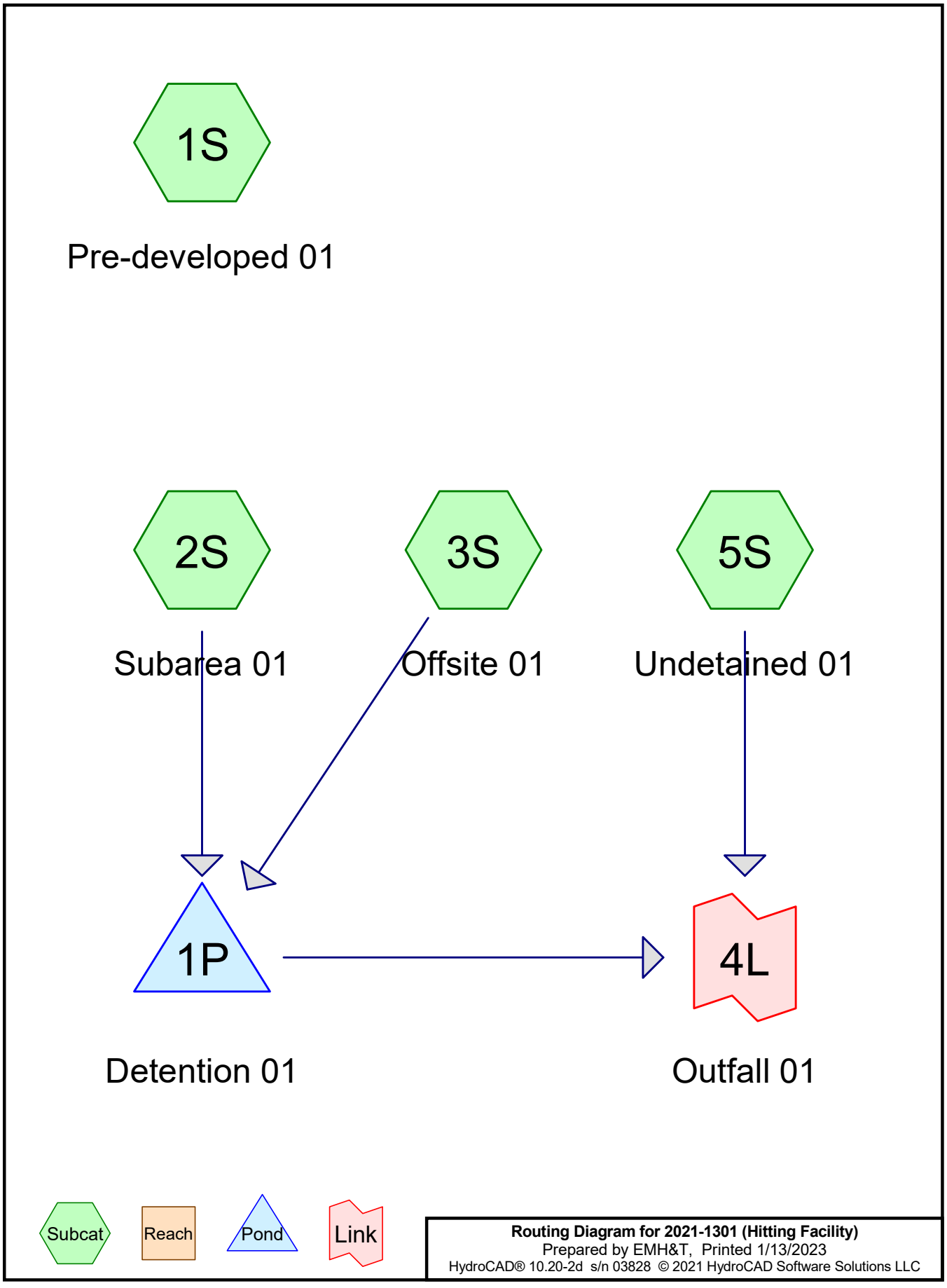
A Subsurface Geotextile Filter Systems USWMS should not be placed into service until major construction activities have ceased and the drainage area has been permanently stabilized.

DEEP SUMP TRAP OR CATCH BASIN

Description

APPENDIX D:

HydroCAD Output



Routing Diagram for 2021-1301 (Hitting Facility)
Prepared by EMH&T, Printed 1/13/2023

Summary for Subcatchment 1S: Pre-developed 01

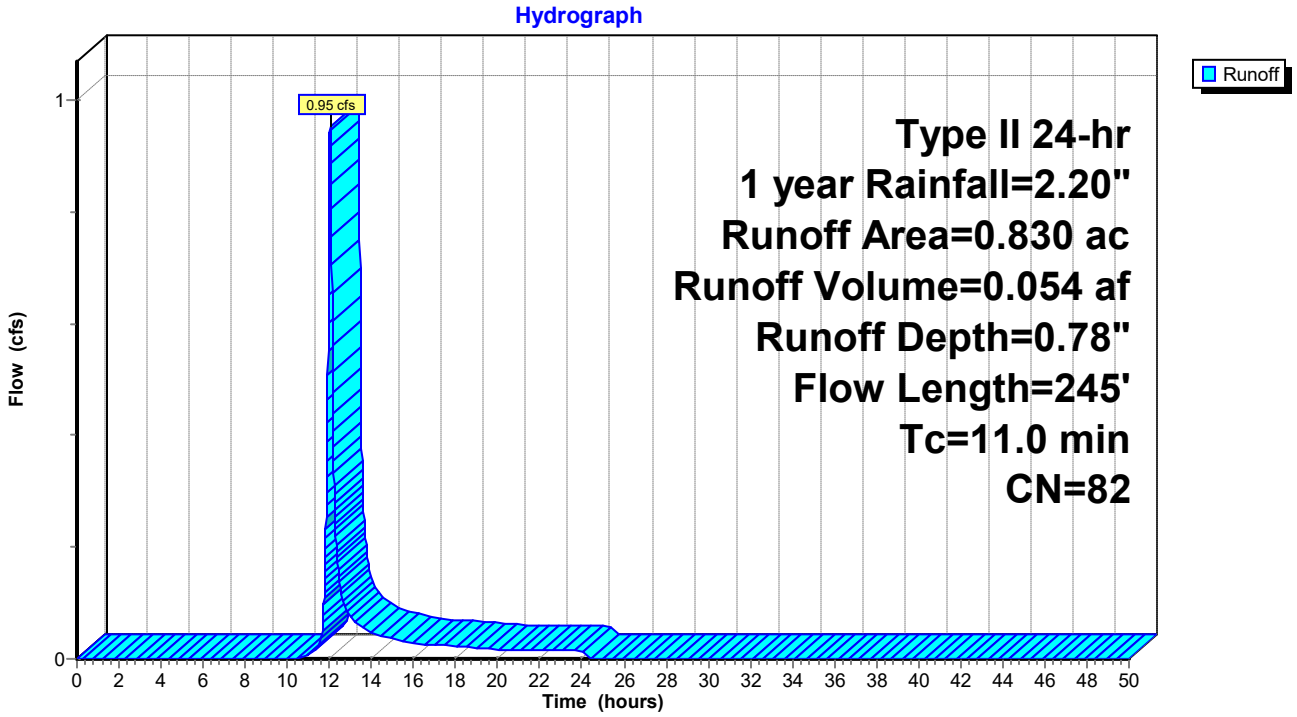
Runoff = 0.95 cfs @ 12.04 hrs, Volume= 0.054 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.20"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

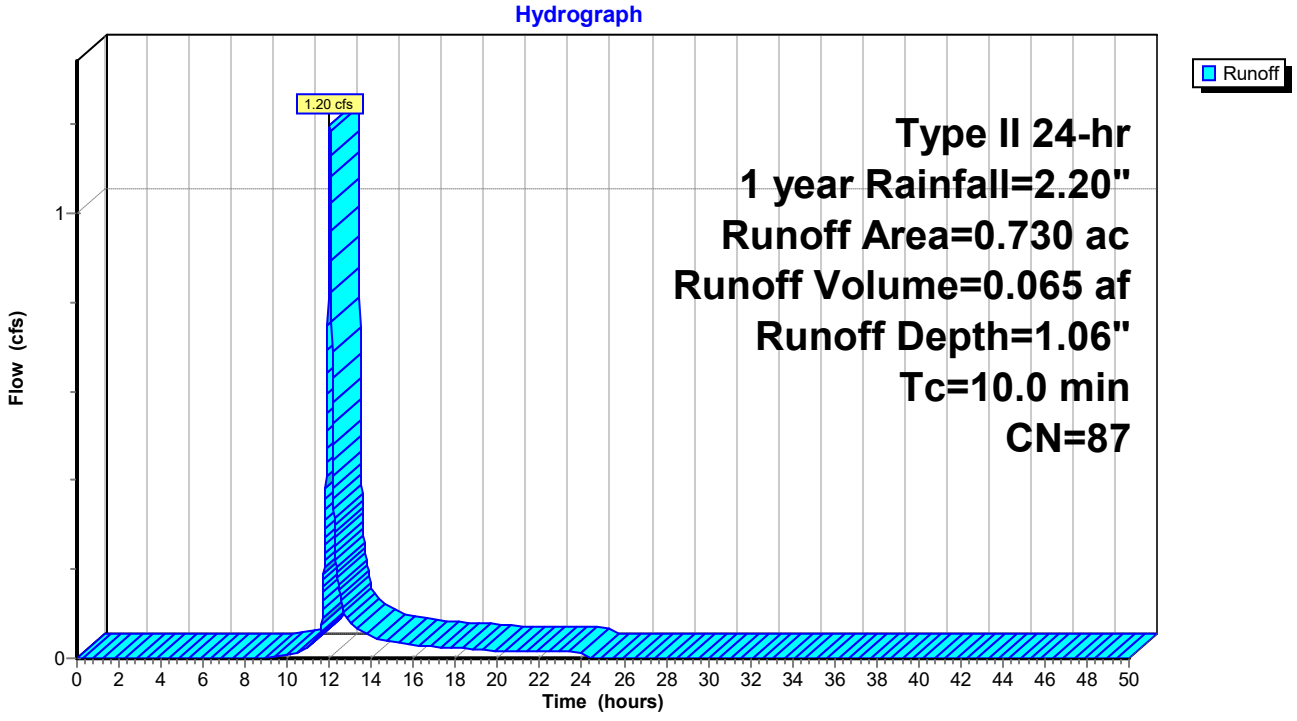
Runoff = 1.20 cfs @ 12.02 hrs, Volume= 0.065 af, Depth= 1.06"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.20"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

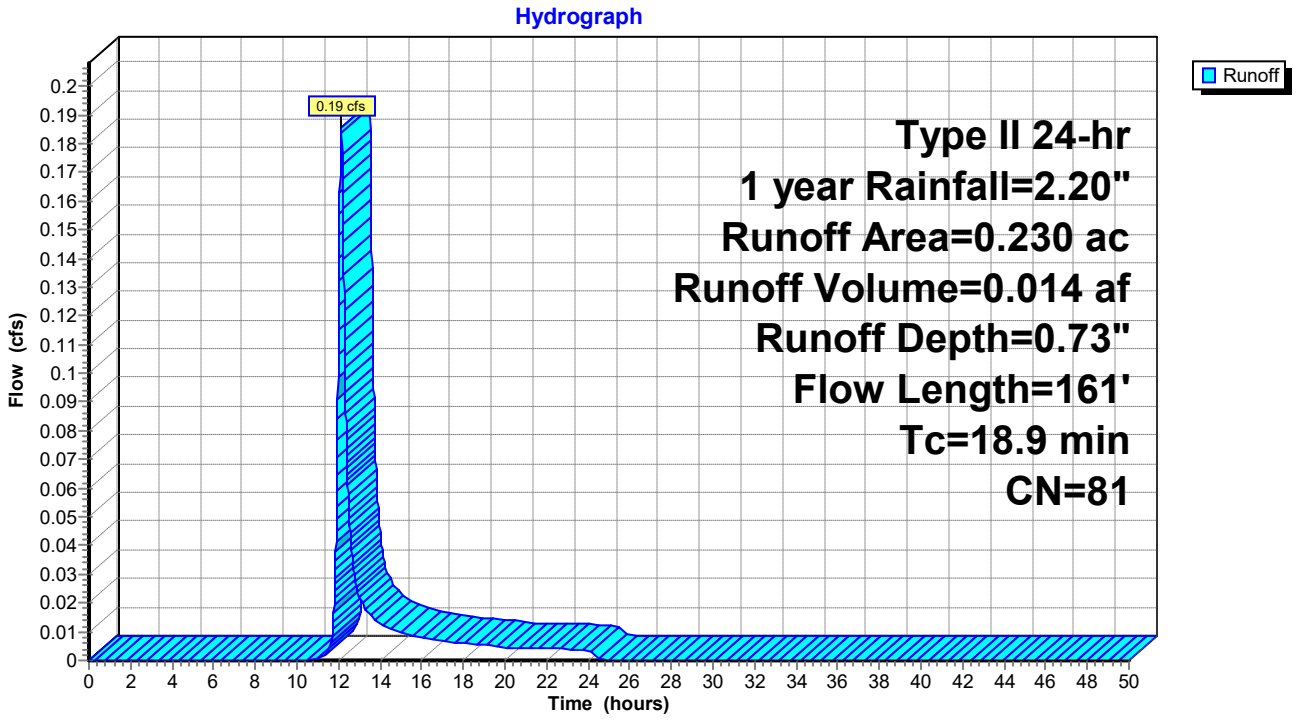
Runoff = 0.19 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 0.73"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.20"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

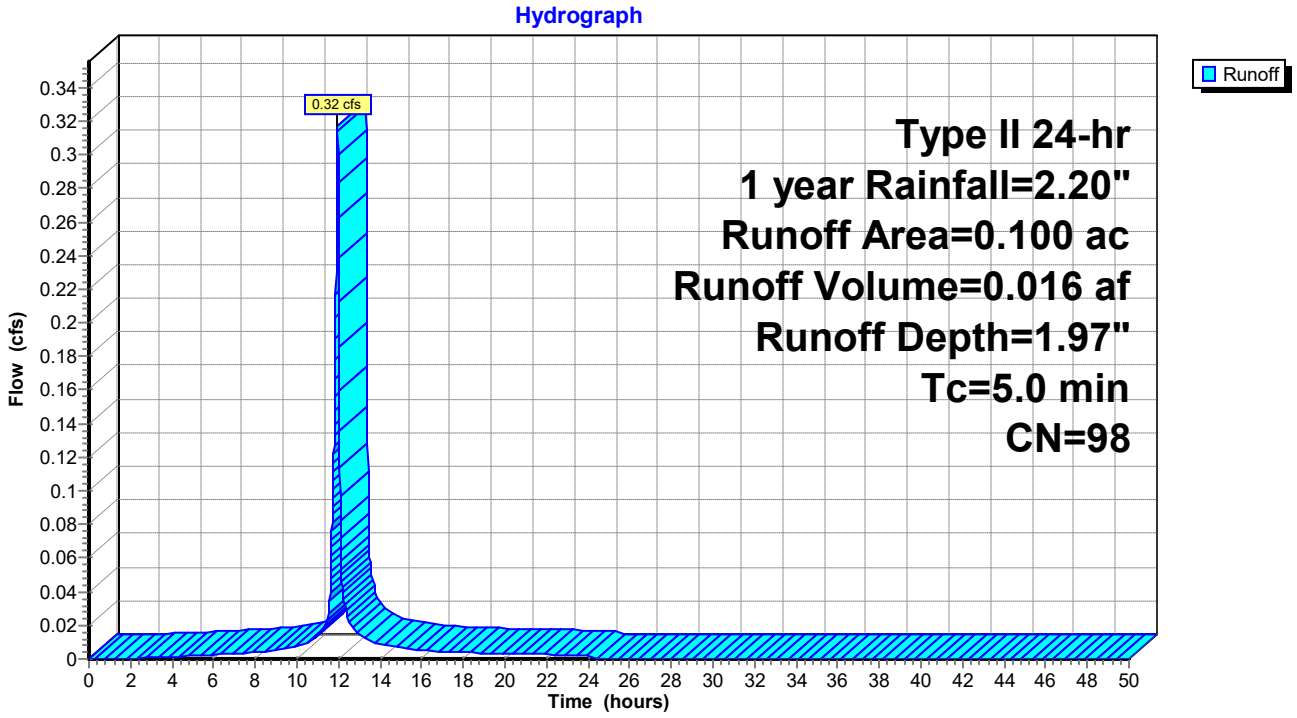
Runoff = 0.32 cfs @ 11.96 hrs, Volume= 0.016 af, Depth= 1.97"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 1 year Rainfall=2.20"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 0.99" for 1 year event
Inflow = 1.33 cfs @ 12.03 hrs, Volume= 0.079 af
Outflow = 0.01 cfs @ 24.13 hrs, Volume= 0.037 af, Atten= 99%, Lag= 726.2 min
Primary = 0.01 cfs @ 24.13 hrs, Volume= 0.037 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 900.84' @ 24.13 hrs Surf.Area= 2,061 sf Storage= 2,863 cf

Plug-Flow detention time= 1,091.9 min calculated for 0.037 af (48% of inflow)
Center-of-Mass det. time= 964.9 min (1,806.9 - 842.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 24.13 hrs HW=900.84' (Free Discharge)
└**1=RCP_Round 12"** (Passes 0.01 cfs of 4.77 cfs potential flow)
└**2=Orifice Plate** (Passes 0.01 cfs of 1.66 cfs potential flow)
└**3=WQ Orifice** (Orifice Controls 0.01 cfs @ 8.77 fps)
└**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

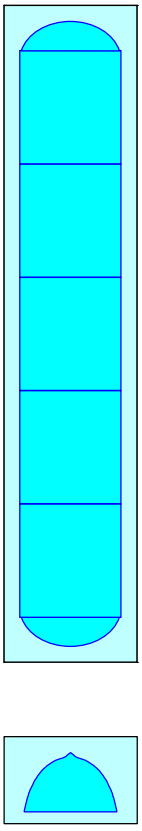
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

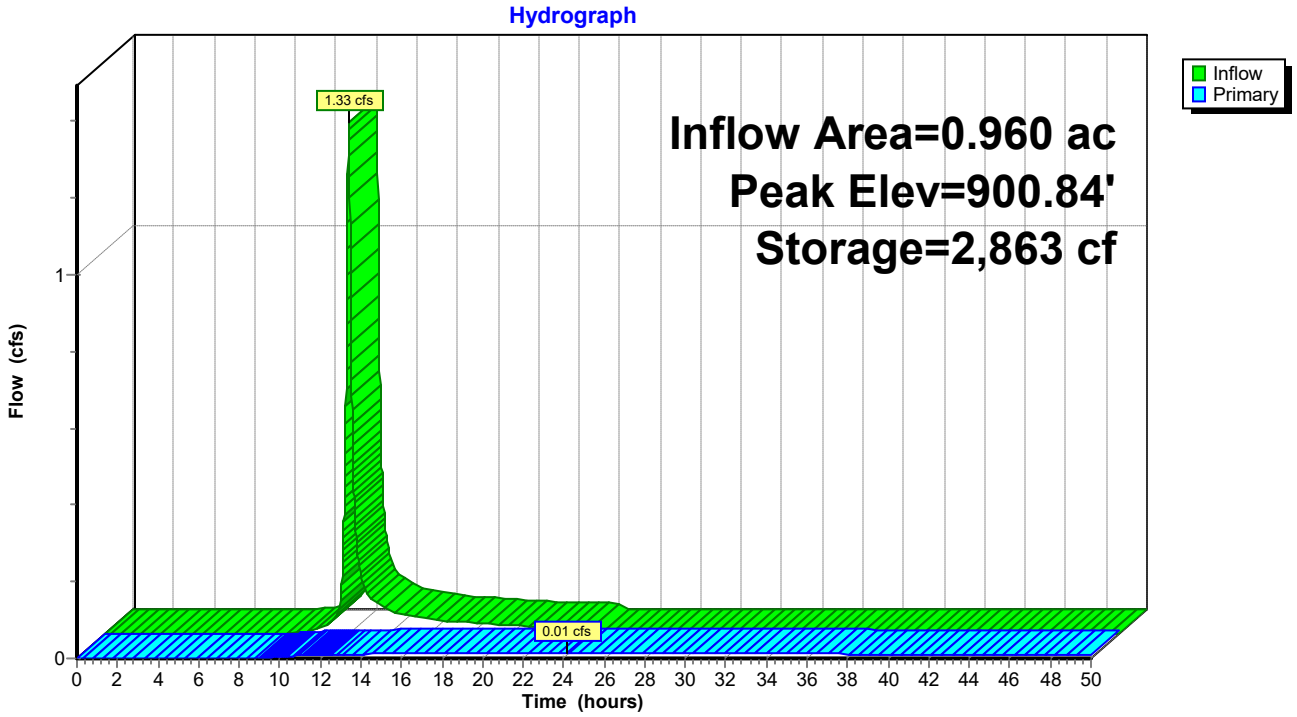
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

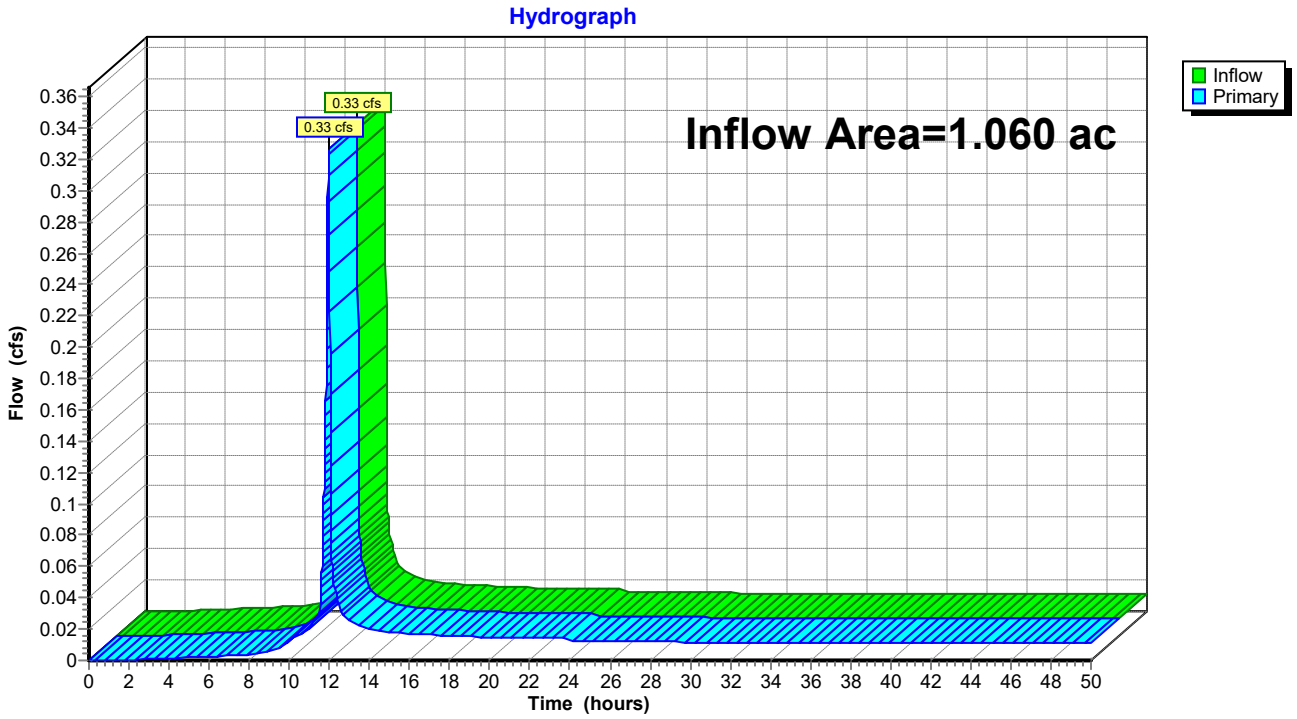


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 0.61" for 1 year event
Inflow = 0.33 cfs @ 11.96 hrs, Volume= 0.054 af
Primary = 0.33 cfs @ 11.96 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Summary for Subcatchment 1S: Pre-developed 01

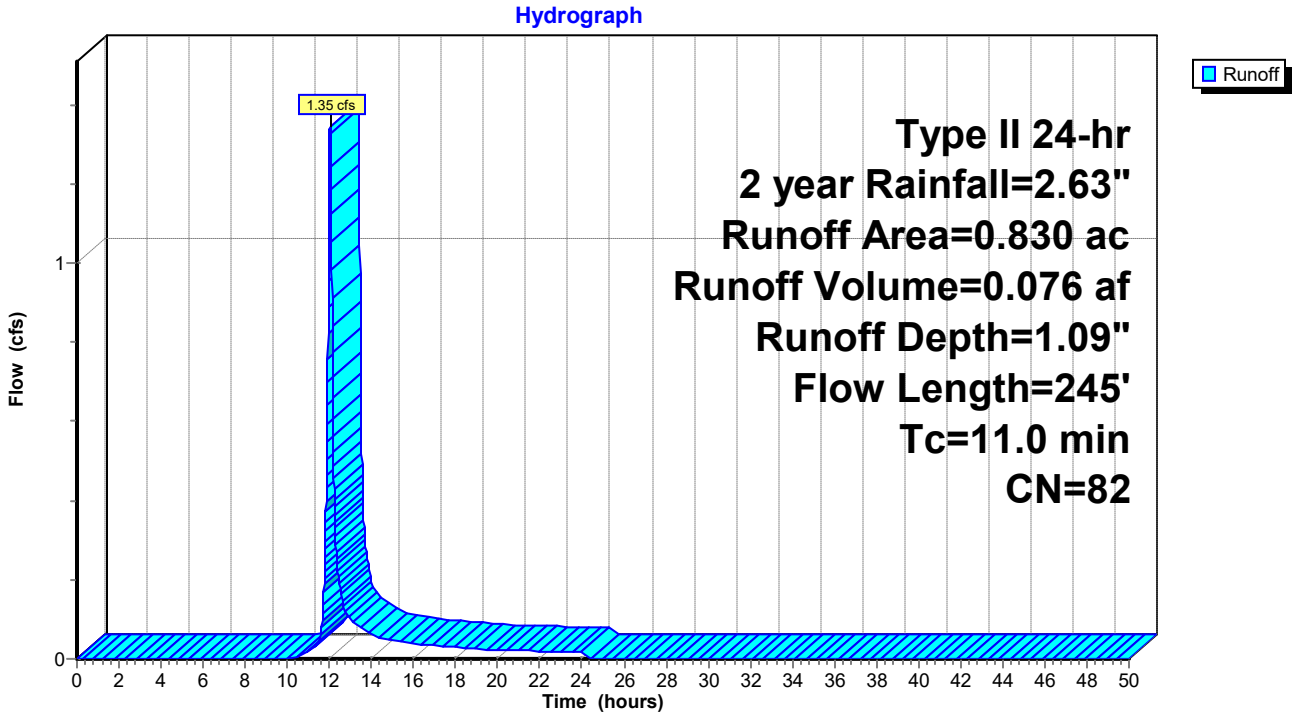
Runoff = 1.35 cfs @ 12.03 hrs, Volume= 0.076 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 2 year Rainfall=2.63"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

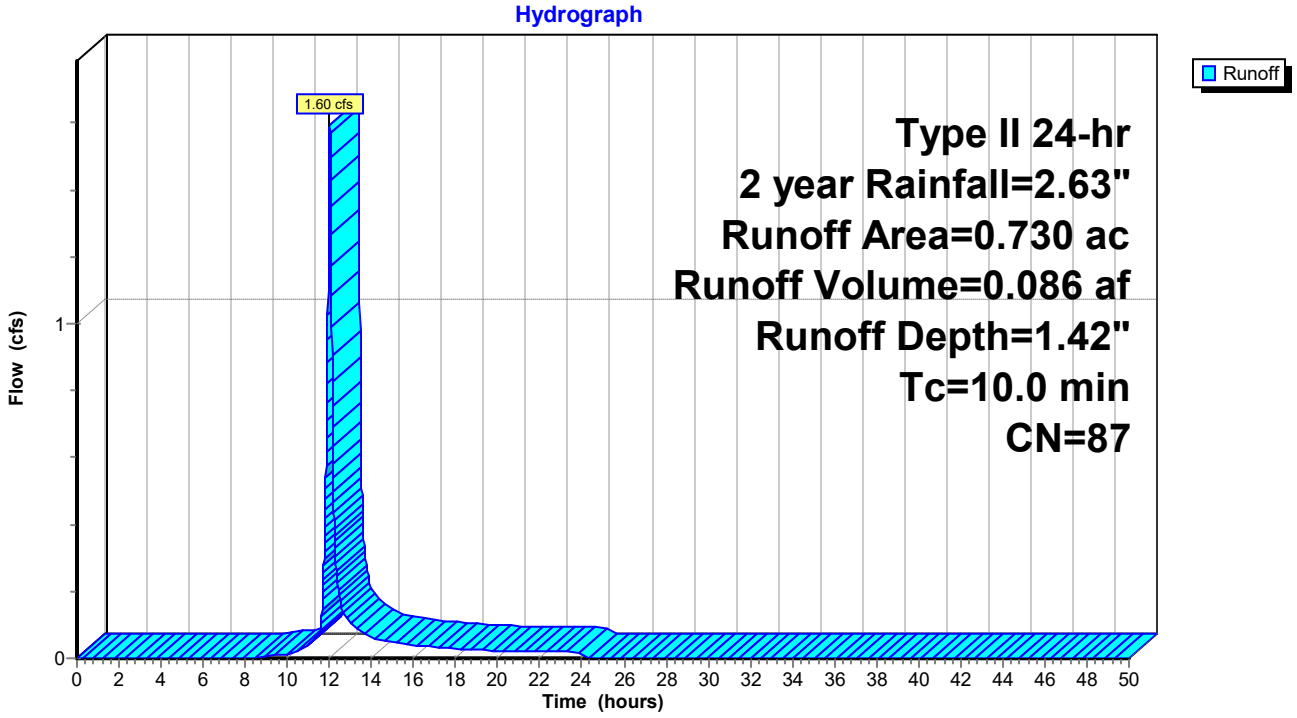
Runoff = 1.60 cfs @ 12.02 hrs, Volume= 0.086 af, Depth= 1.42"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 2 year Rainfall=2.63"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

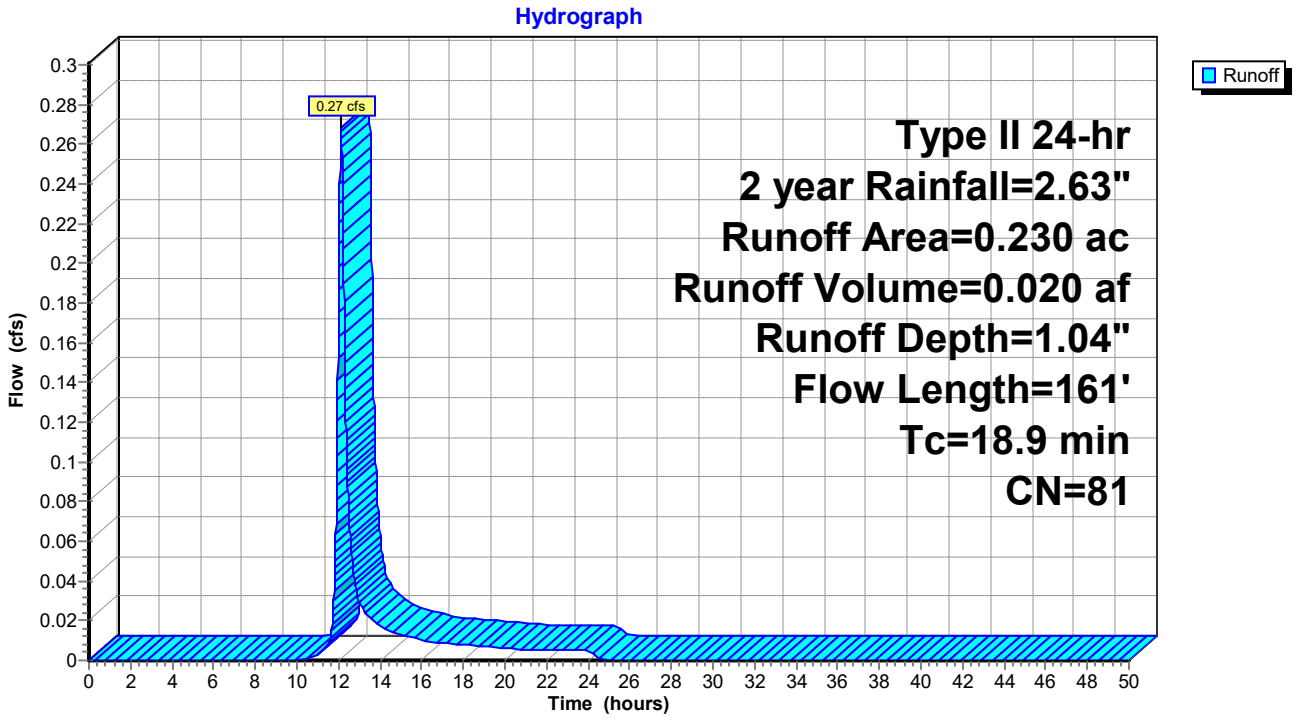
Runoff = 0.27 cfs @ 12.12 hrs, Volume= 0.020 af, Depth= 1.04"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 2 year Rainfall=2.63"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

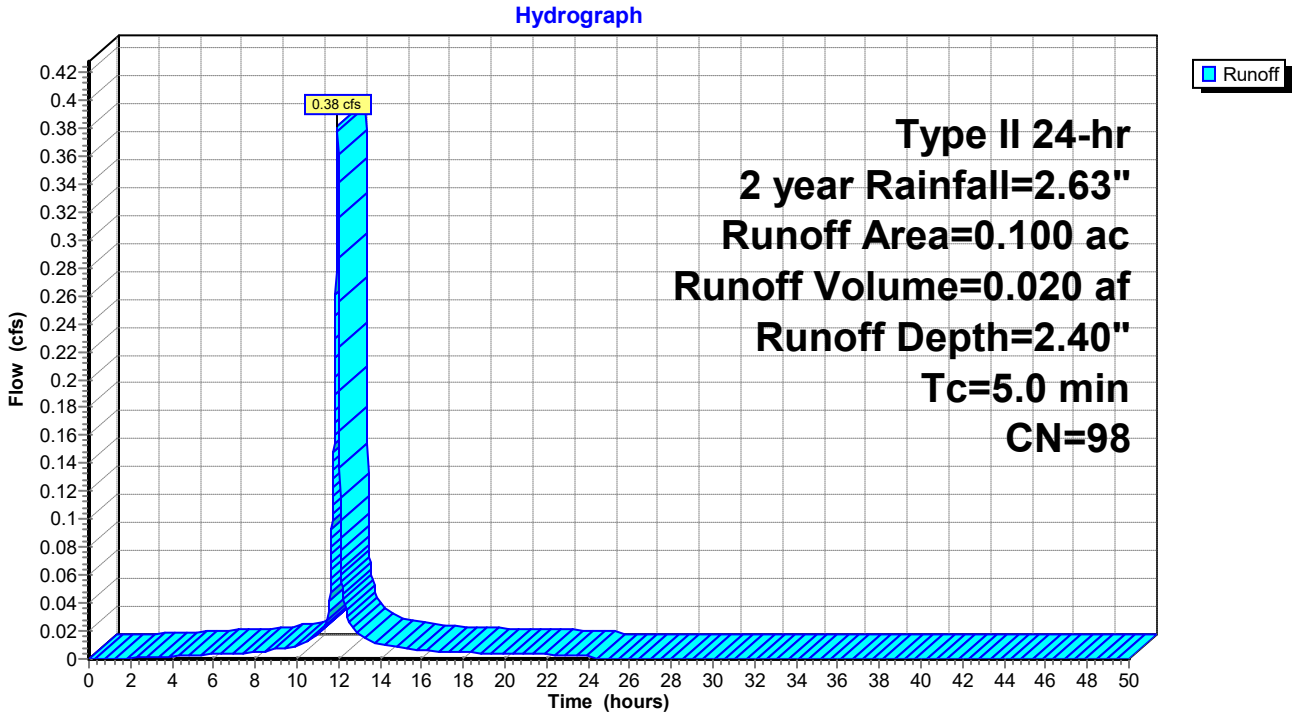
Runoff = 0.38 cfs @ 11.96 hrs, Volume= 0.020 af, Depth= 2.40"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 2 year Rainfall=2.63"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 1.33" for 2 year event
Inflow = 1.79 cfs @ 12.02 hrs, Volume= 0.106 af
Outflow = 0.01 cfs @ 24.15 hrs, Volume= 0.041 af, Atten= 99%, Lag= 727.3 min
Primary = 0.01 cfs @ 24.15 hrs, Volume= 0.041 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 901.42' @ 24.15 hrs Surf.Area= 1,967 sf Storage= 3,994 cf

Plug-Flow detention time= 1,090.4 min calculated for 0.041 af (39% of inflow)
Center-of-Mass det. time= 963.1 min (1,796.8 - 833.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 24.15 hrs HW=901.42' (Free Discharge)
└**1=RCP_Round 12"** (Passes 0.01 cfs of 5.22 cfs potential flow)
└**2=Orifice Plate** (Passes 0.01 cfs of 1.81 cfs potential flow)
└**3=WQ Orifice** (Orifice Controls 0.01 cfs @ 9.51 fps)
└**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

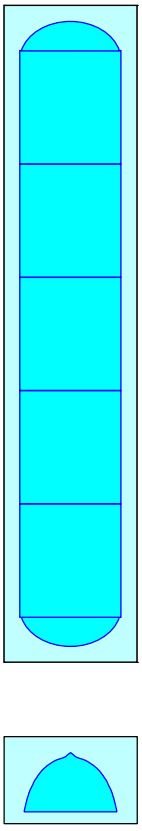
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

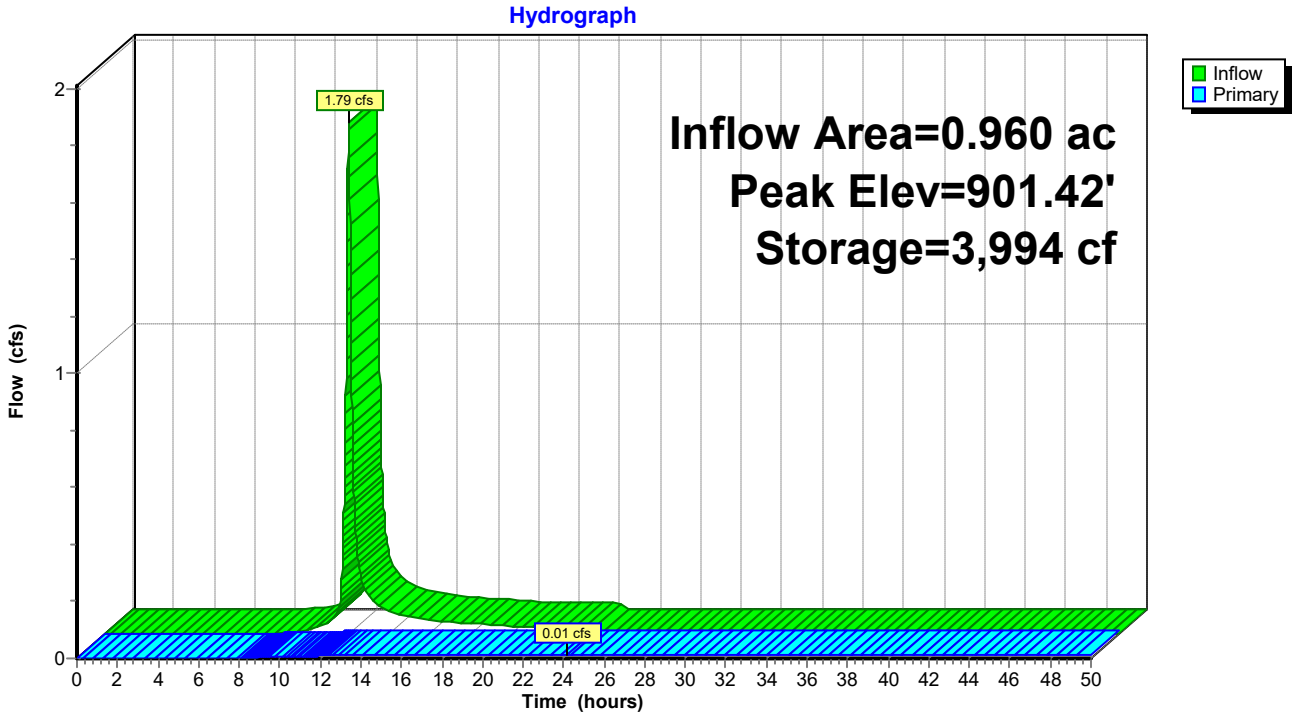
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

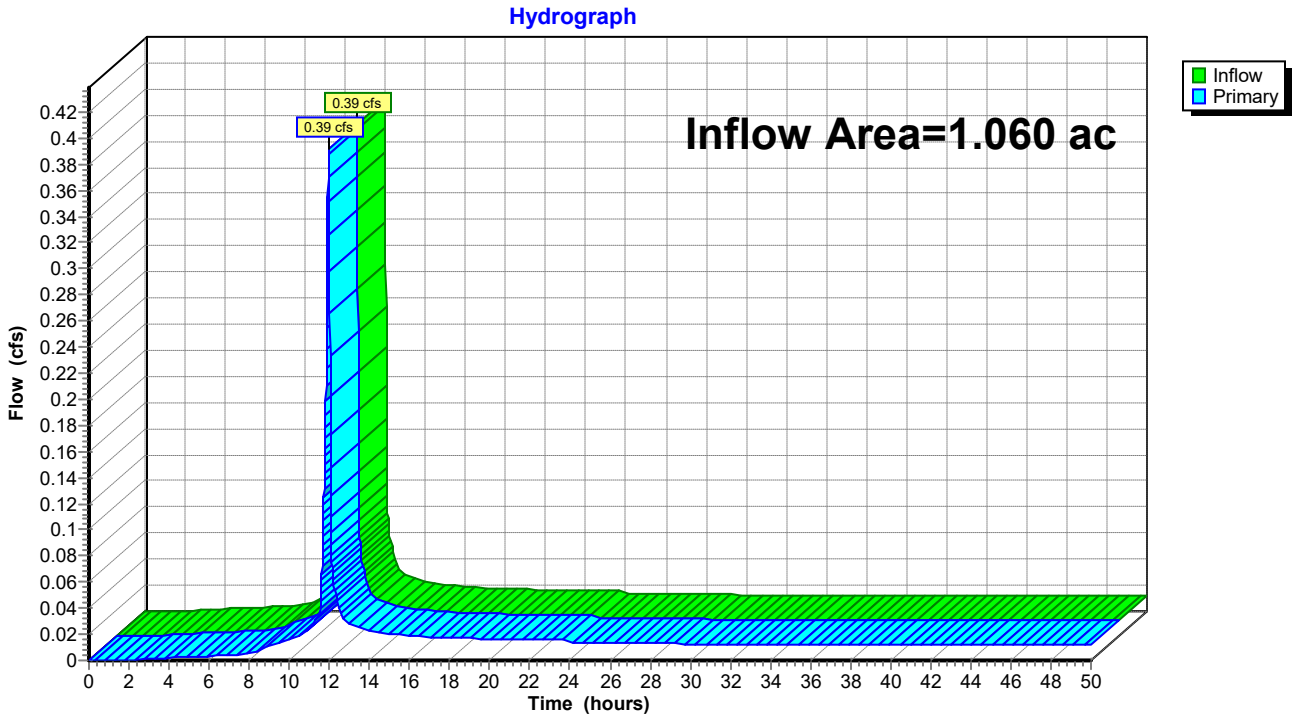


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 0.69" for 2 year event
Inflow = 0.39 cfs @ 11.96 hrs, Volume= 0.061 af
Primary = 0.39 cfs @ 11.96 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Summary for Subcatchment 1S: Pre-developed 01

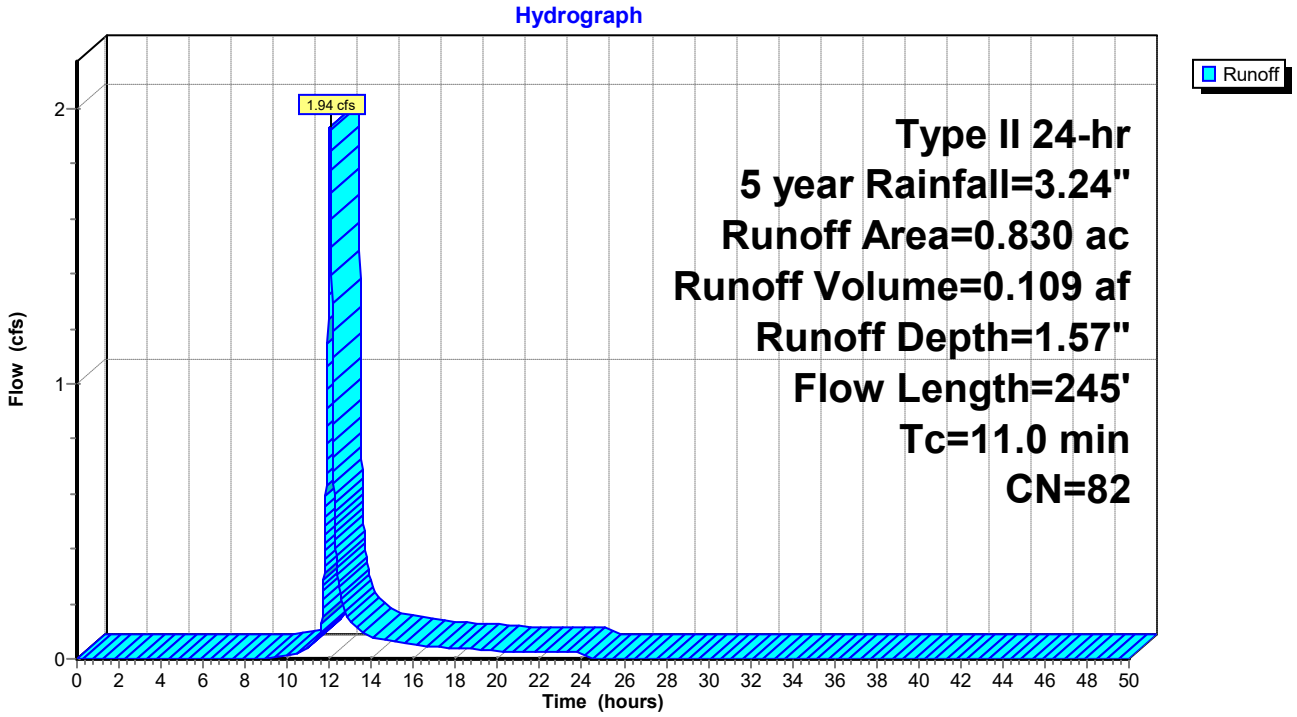
Runoff = 1.94 cfs @ 12.03 hrs, Volume= 0.109 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 5 year Rainfall=3.24"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

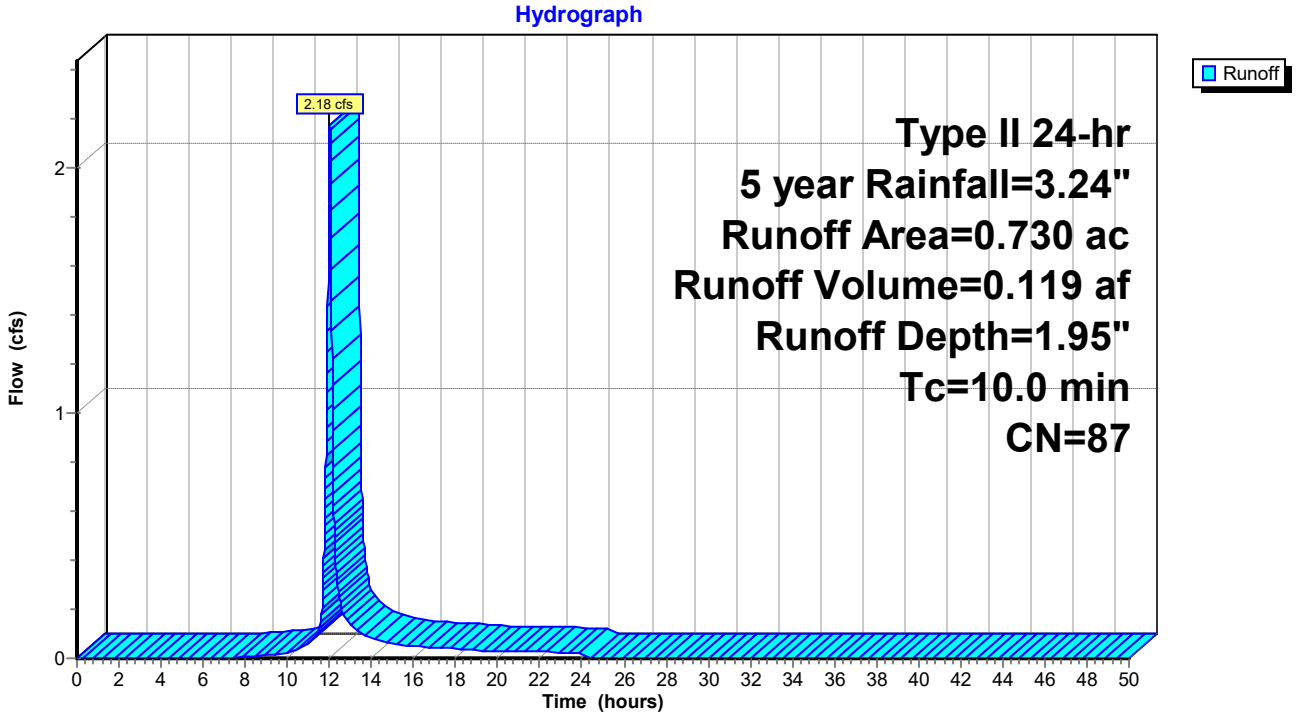
Runoff = 2.18 cfs @ 12.01 hrs, Volume= 0.119 af, Depth= 1.95"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 5 year Rainfall=3.24"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

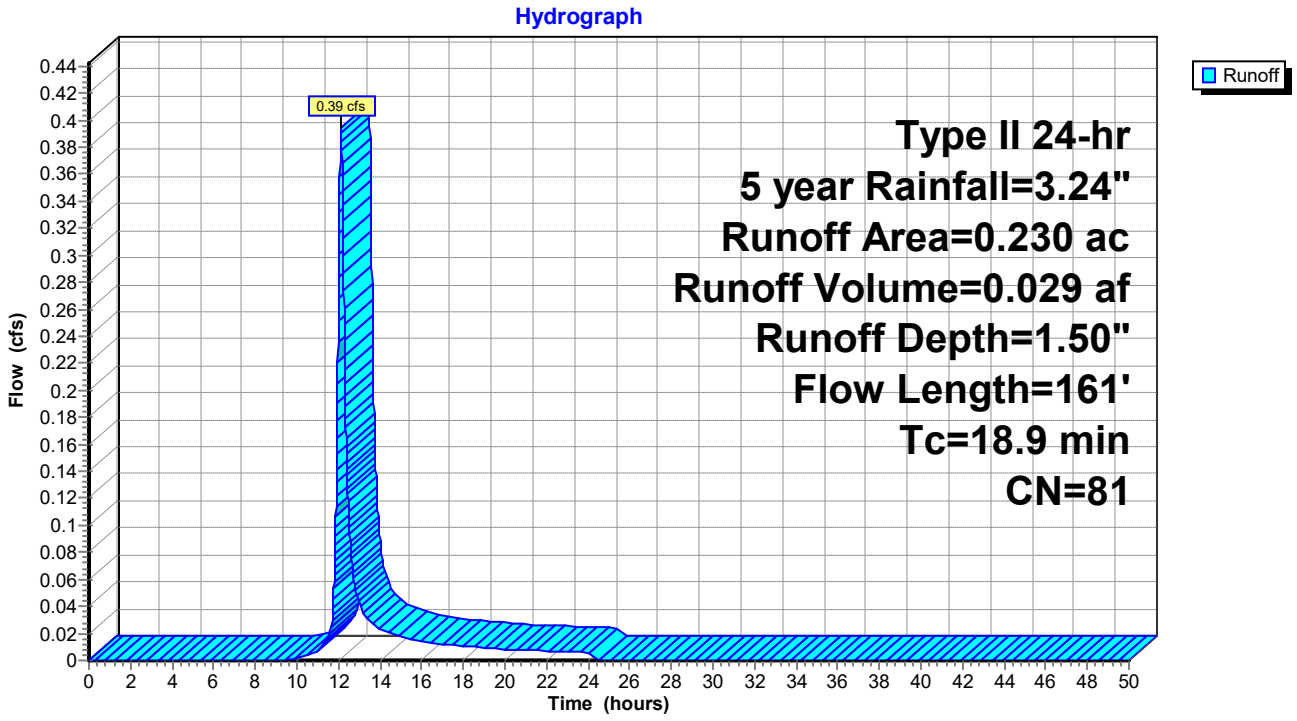
Runoff = 0.39 cfs @ 12.12 hrs, Volume= 0.029 af, Depth= 1.50"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 5 year Rainfall=3.24"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

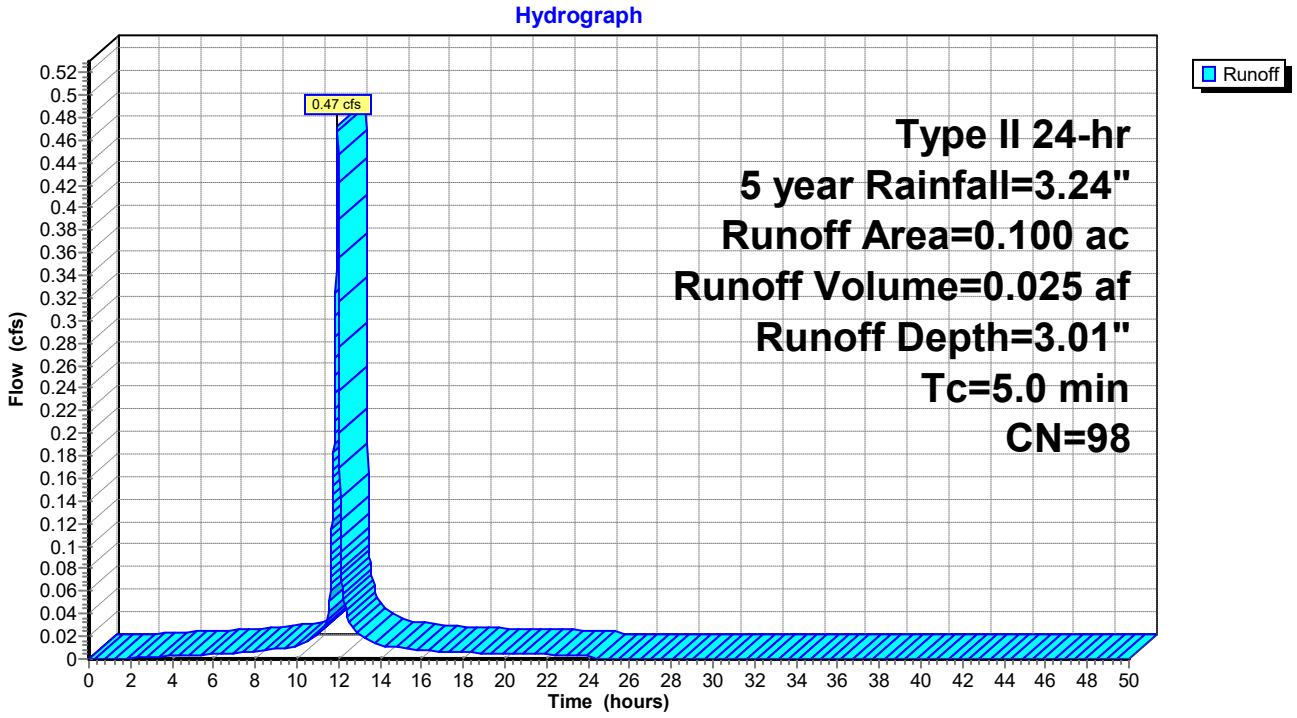
Runoff = 0.47 cfs @ 11.96 hrs, Volume= 0.025 af, Depth= 3.01"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 5 year Rainfall=3.24"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 1.84" for 5 year event
Inflow = 2.47 cfs @ 12.02 hrs, Volume= 0.147 af
Outflow = 0.09 cfs @ 14.75 hrs, Volume= 0.072 af, Atten= 97%, Lag= 163.5 min
Primary = 0.09 cfs @ 14.75 hrs, Volume= 0.072 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 901.73' @ 14.75 hrs Surf.Area= 1,819 sf Storage= 4,534 cf

Plug-Flow detention time= 791.5 min calculated for 0.072 af (49% of inflow)
Center-of-Mass det. time= 672.7 min (1,497.3 - 824.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.07 cfs @ 14.75 hrs HW=901.73' (Free Discharge)
└**1=RCP_Round 12"** (Passes 0.07 cfs of 5.44 cfs potential flow)
└**2=Orifice Plate** (Passes 0.07 cfs of 1.89 cfs potential flow)
└**3=WQ Orifice** (Orifice Controls 0.01 cfs @ 9.87 fps)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.53 fps)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

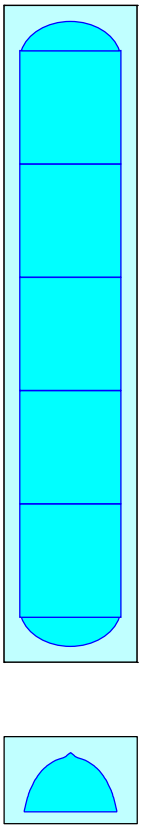
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

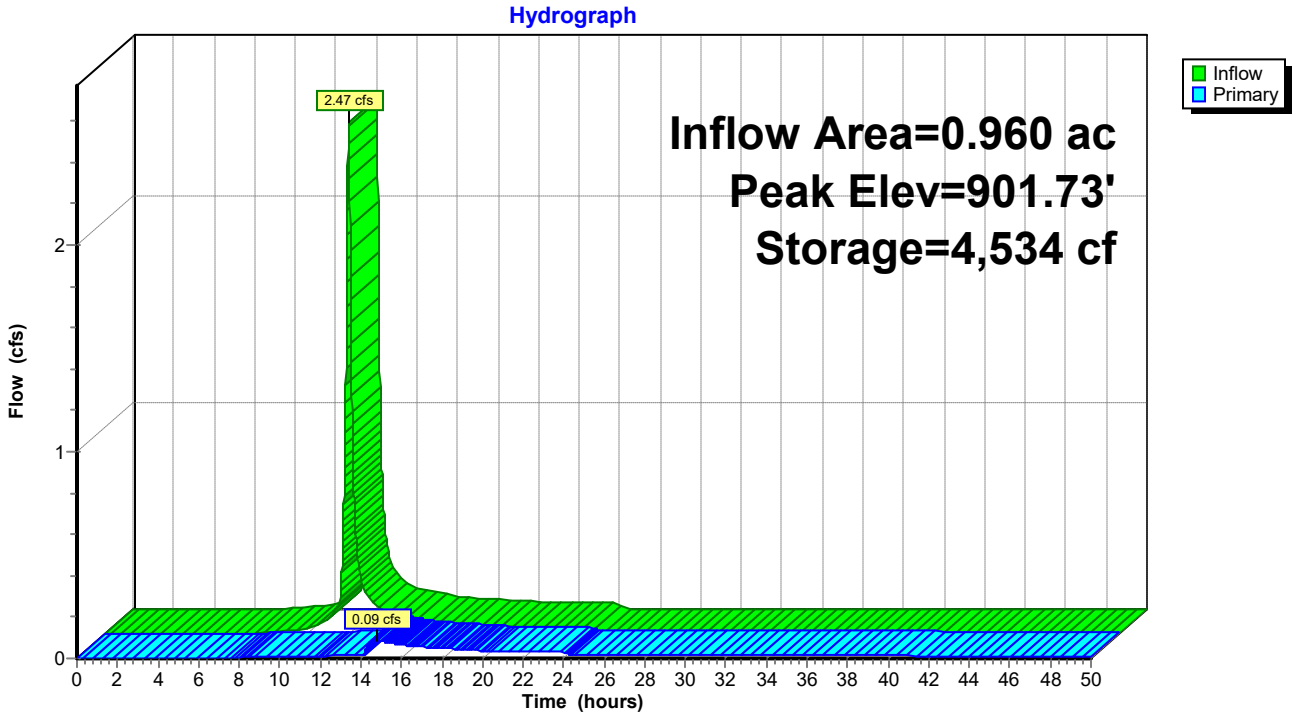
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

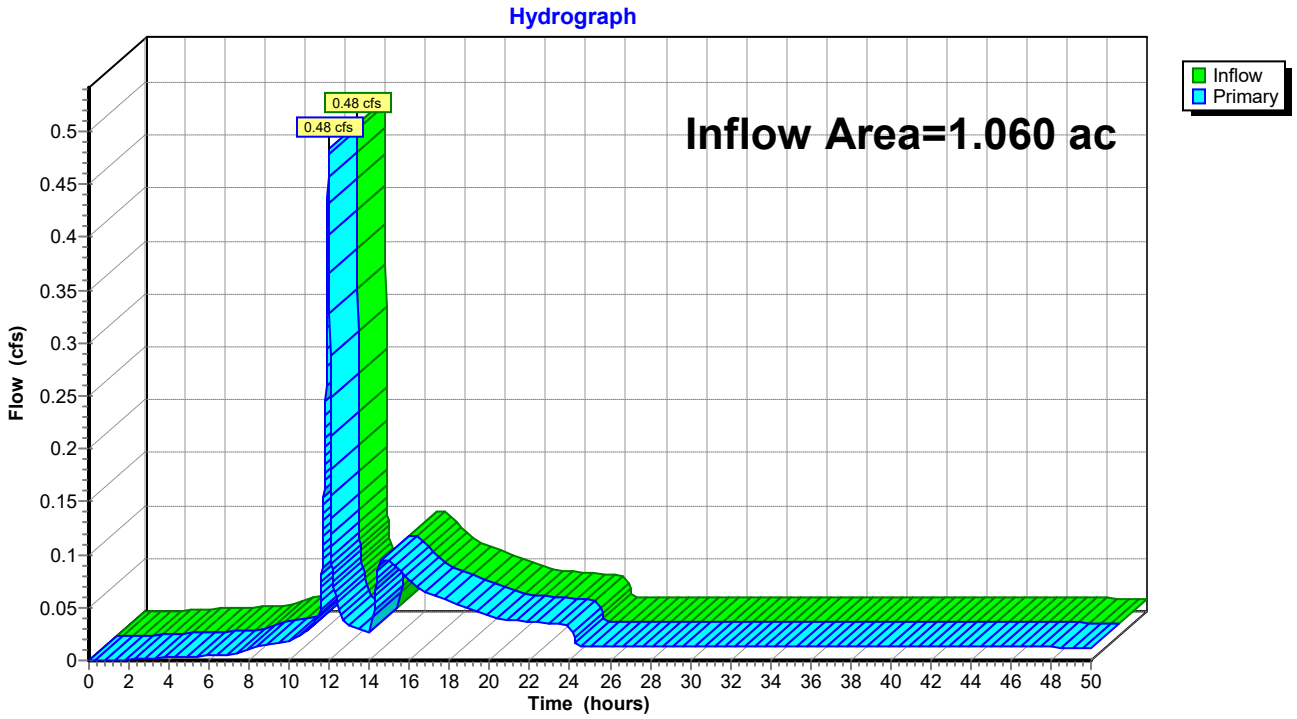


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 1.09" for 5 year event
Inflow = 0.48 cfs @ 11.96 hrs, Volume= 0.097 af
Primary = 0.48 cfs @ 11.96 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Summary for Subcatchment 1S: Pre-developed 01

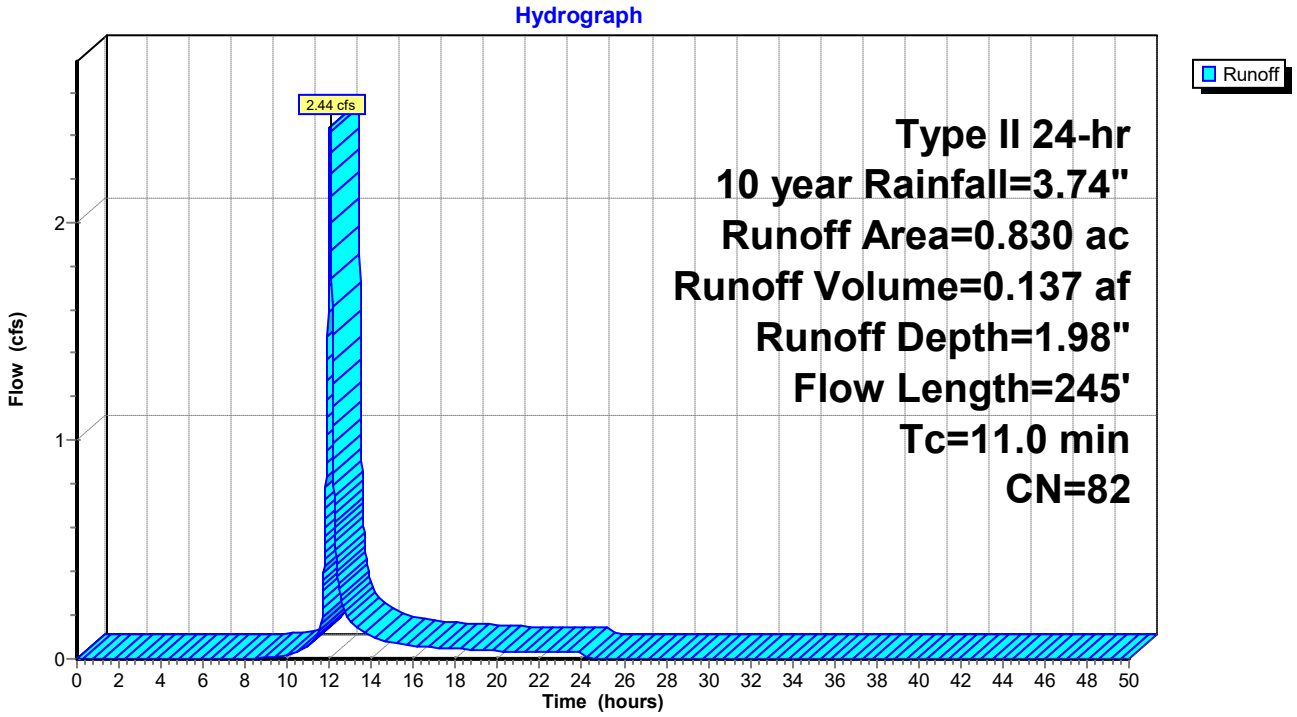
Runoff = 2.44 cfs @ 12.03 hrs, Volume= 0.137 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.74"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

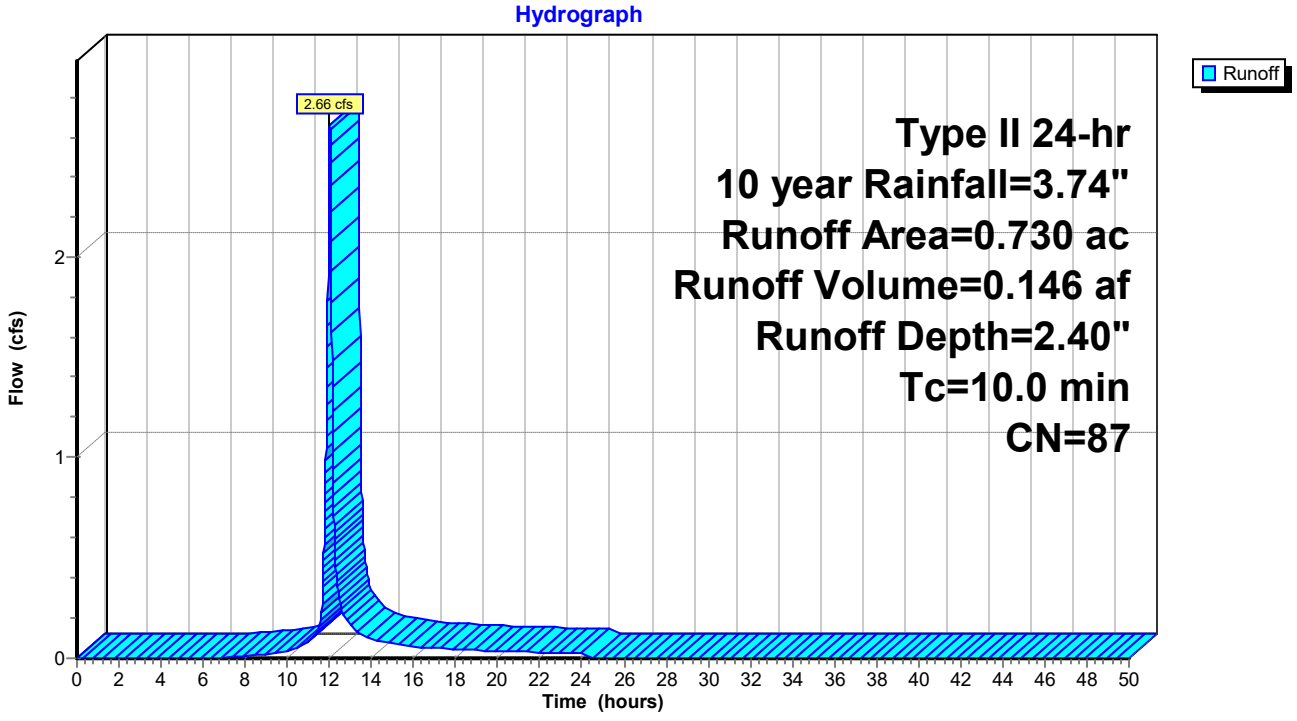
Runoff = 2.66 cfs @ 12.01 hrs, Volume= 0.146 af, Depth= 2.40"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.74"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

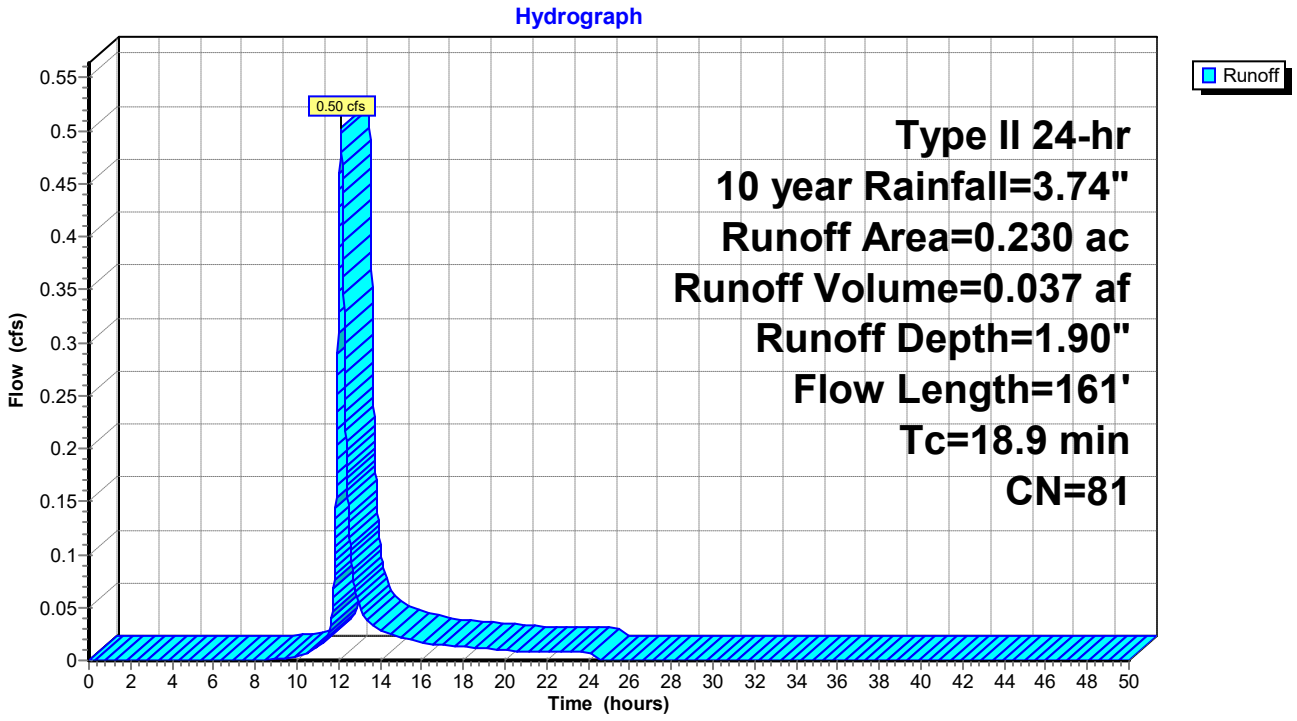
Runoff = 0.50 cfs @ 12.12 hrs, Volume= 0.037 af, Depth= 1.90"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.74"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

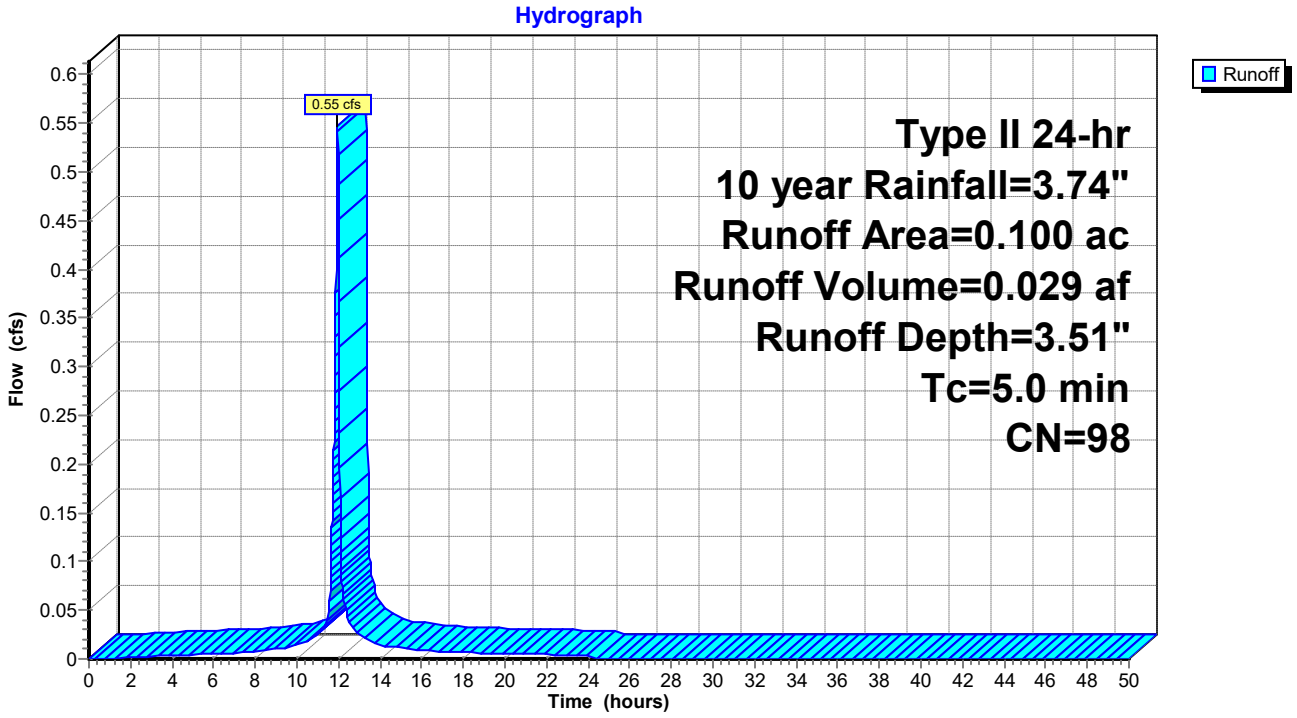
Runoff = 0.55 cfs @ 11.96 hrs, Volume= 0.029 af, Depth= 3.51"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.74"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 2.28" for 10 year event
Inflow = 3.04 cfs @ 12.02 hrs, Volume= 0.182 af
Outflow = 0.30 cfs @ 12.66 hrs, Volume= 0.107 af, Atten= 90%, Lag= 38.4 min
Primary = 0.30 cfs @ 12.66 hrs, Volume= 0.107 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 901.78' @ 12.66 hrs Surf.Area= 1,785 sf Storage= 4,618 cf

Plug-Flow detention time= 579.5 min calculated for 0.107 af (58% of inflow)
Center-of-Mass det. time= 468.1 min (1,286.8 - 818.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.29 cfs @ 12.66 hrs HW=901.78' (Free Discharge)
└**1=RCP_Round 12"** (Passes 0.29 cfs of 5.47 cfs potential flow)
└**2=Orifice Plate** (Passes 0.29 cfs of 1.90 cfs potential flow)
└**3=WQ Orifice** (Orifice Controls 0.01 cfs @ 9.93 fps)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.27 cfs @ 0.90 fps)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

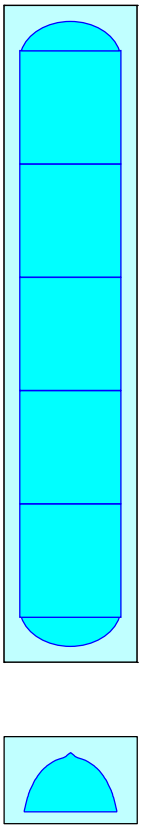
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

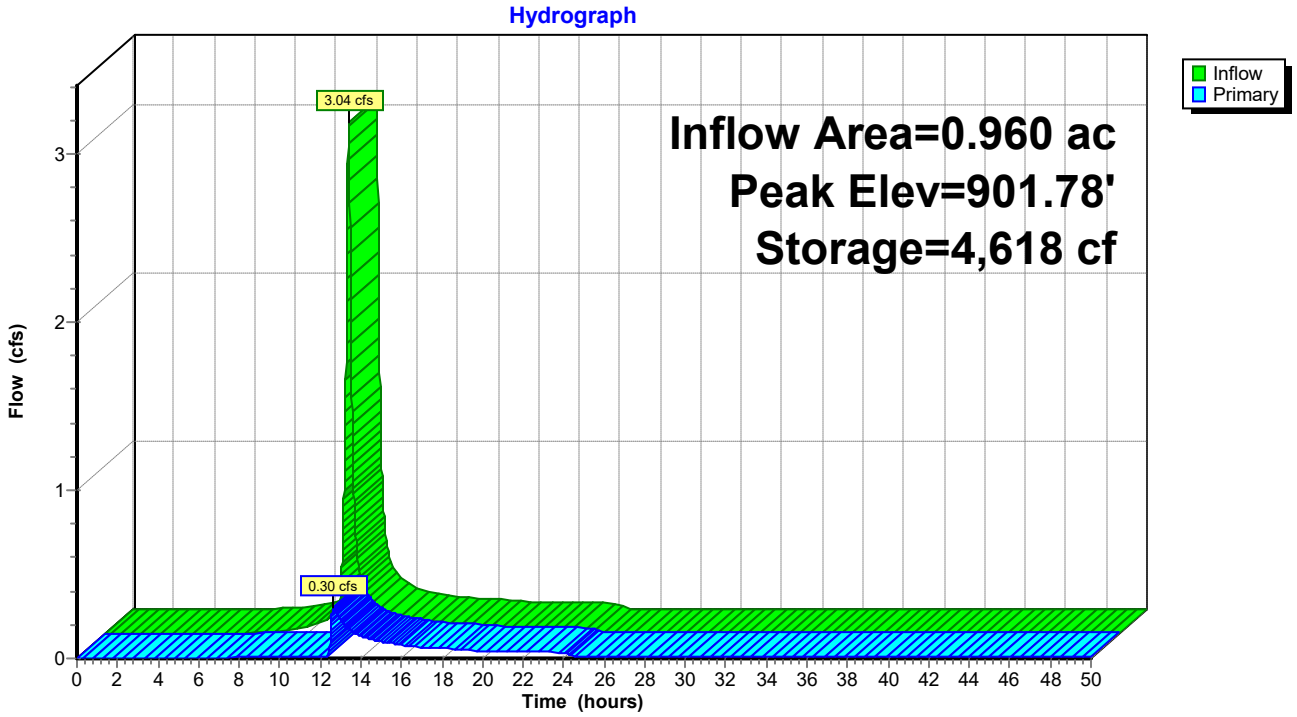
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

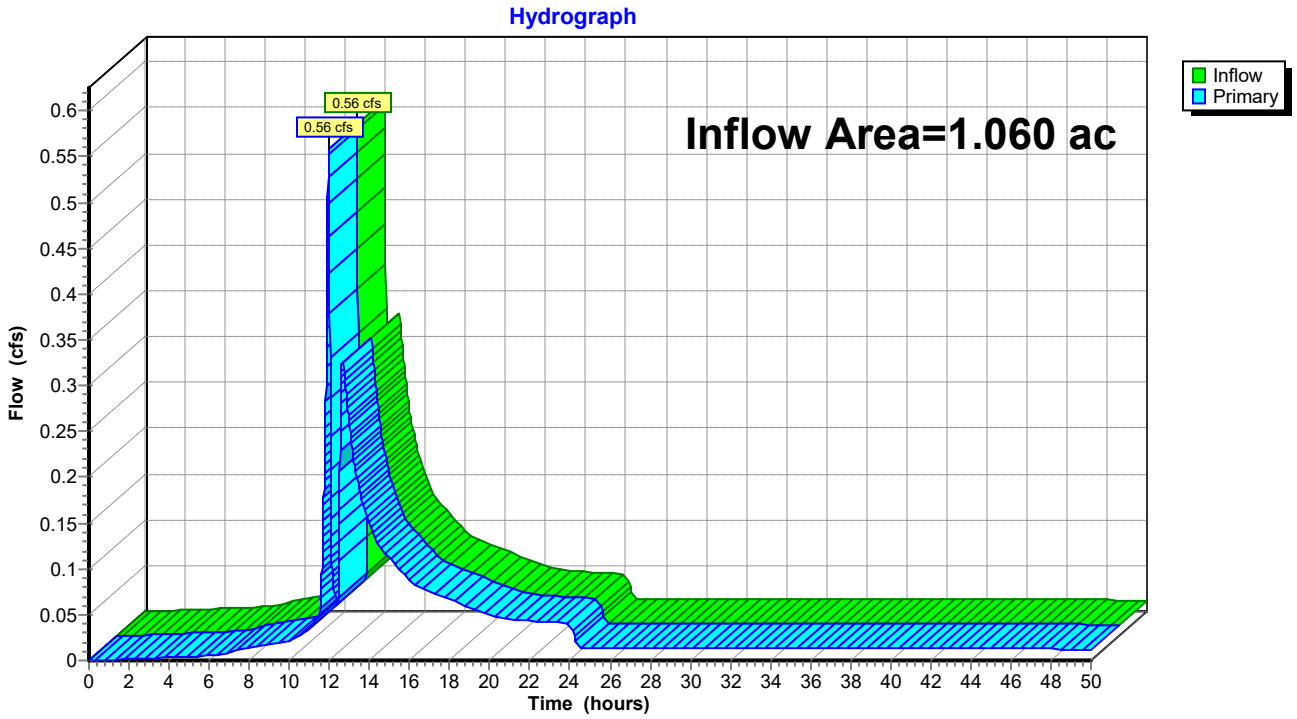


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 1.54" for 10 year event
Inflow = 0.56 cfs @ 11.96 hrs, Volume= 0.136 af
Primary = 0.56 cfs @ 11.96 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Summary for Subcatchment 1S: Pre-developed 01

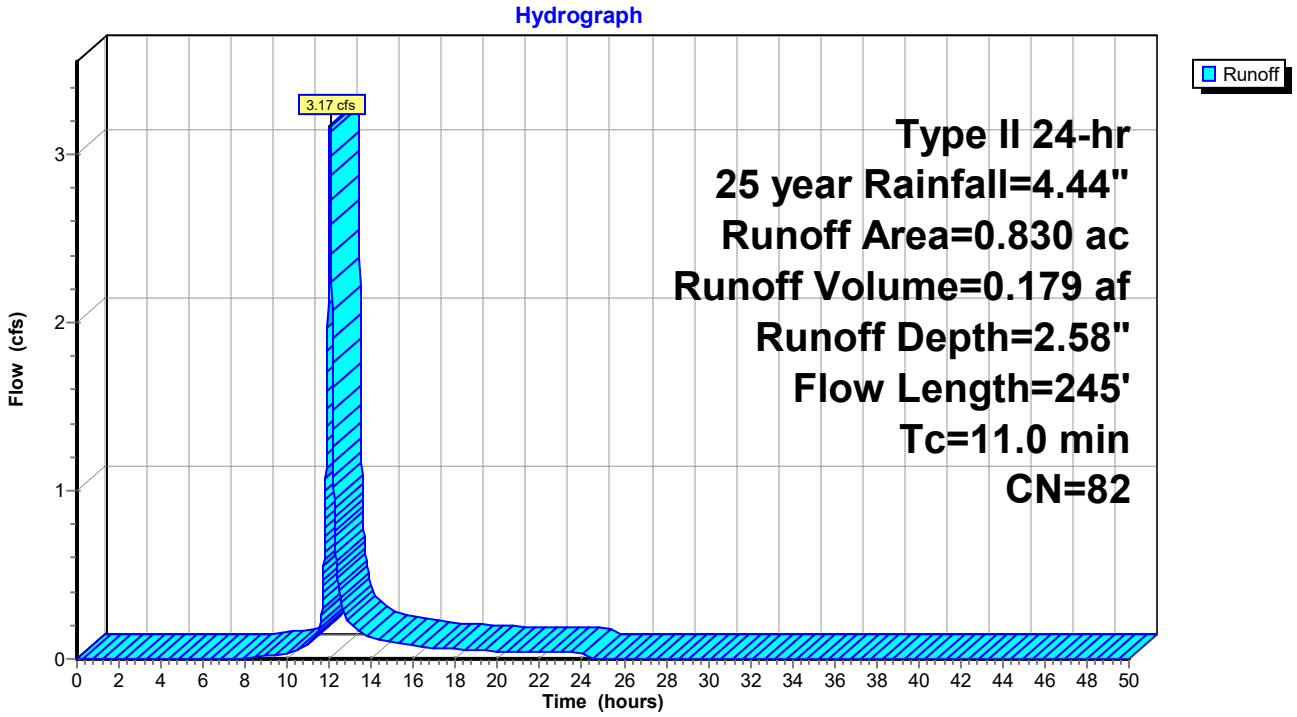
Runoff = 3.17 cfs @ 12.03 hrs, Volume= 0.179 af, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 25 year Rainfall=4.44"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

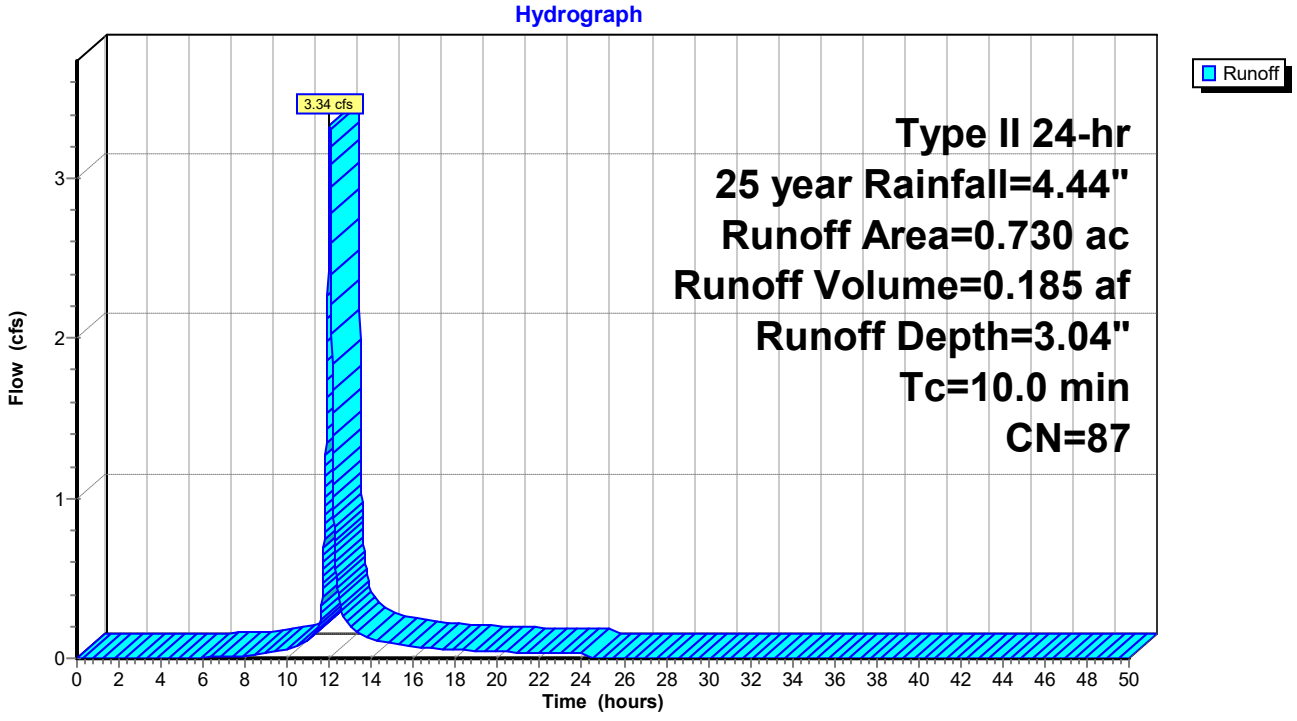
Runoff = 3.34 cfs @ 12.01 hrs, Volume= 0.185 af, Depth= 3.04"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 25 year Rainfall=4.44"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

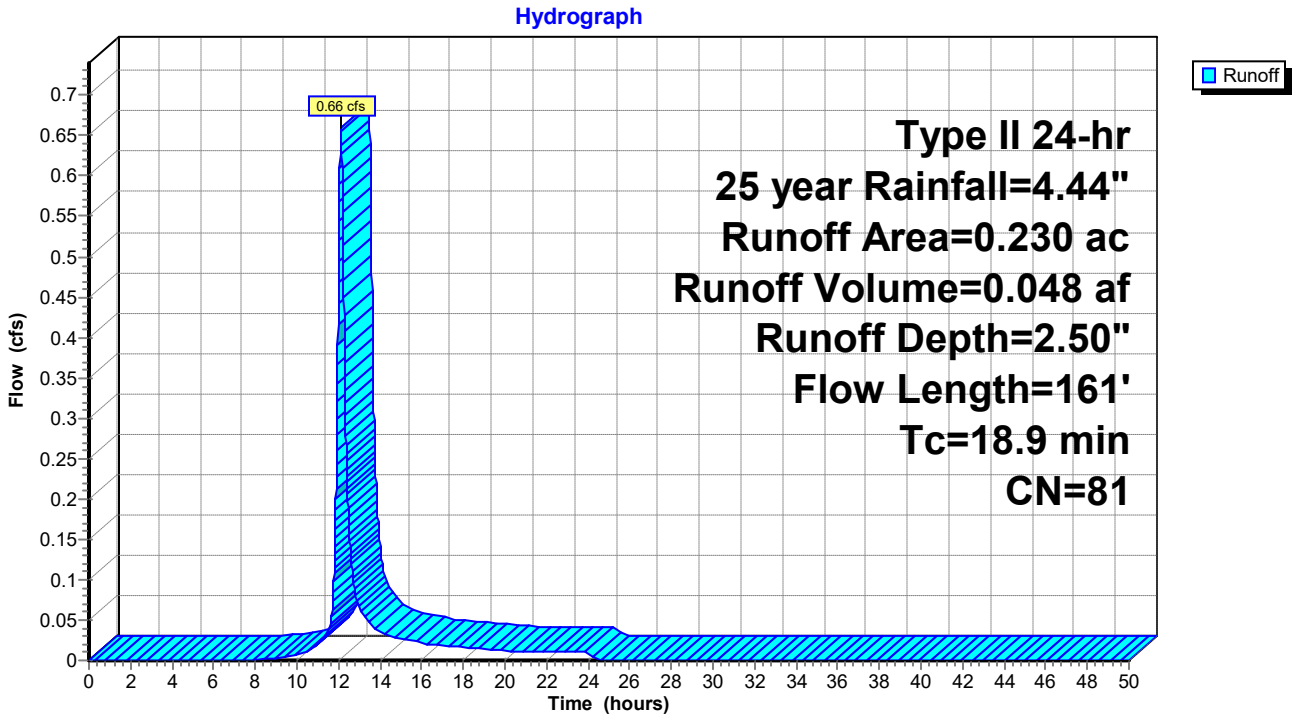
Runoff = 0.66 cfs @ 12.12 hrs, Volume= 0.048 af, Depth= 2.50"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 25 year Rainfall=4.44"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

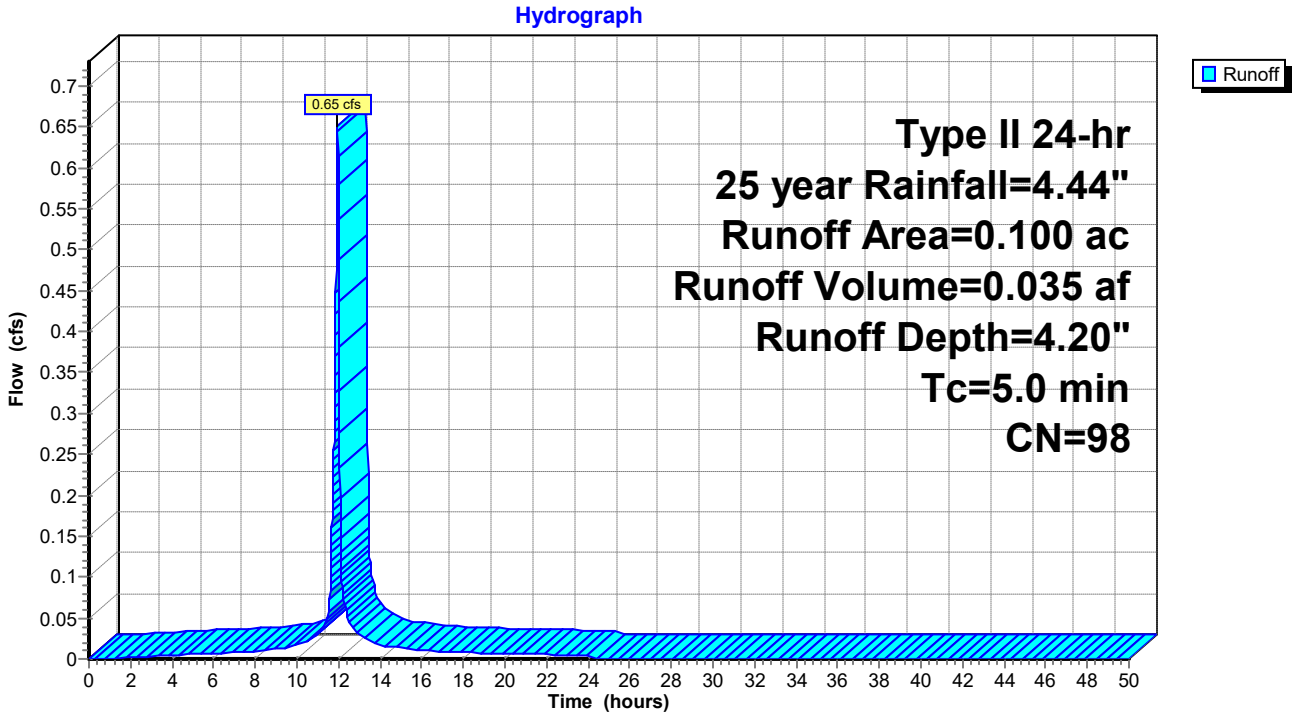
Runoff = 0.65 cfs @ 11.96 hrs, Volume= 0.035 af, Depth= 4.20"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 25 year Rainfall=4.44"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 2.91" for 25 year event
Inflow = 3.85 cfs @ 12.02 hrs, Volume= 0.233 af
Outflow = 1.38 cfs @ 12.21 hrs, Volume= 0.157 af, Atten= 64%, Lag= 11.7 min
Primary = 1.38 cfs @ 12.21 hrs, Volume= 0.157 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 901.92' @ 12.21 hrs Surf.Area= 1,666 sf Storage= 4,853 cf

Plug-Flow detention time= 426.3 min calculated for 0.157 af (67% of inflow)
Center-of-Mass det. time= 324.3 min (1,136.1 - 811.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.37 cfs @ 12.21 hrs HW=901.92' (Free Discharge)
└**1=RCP_Round 12"** (Passes 1.37 cfs of 5.58 cfs potential flow)
└**2=Orifice Plate** (Passes 1.37 cfs of 1.93 cfs potential flow)
└**3=WQ Orifice** (Orifice Controls 0.01 cfs @ 10.10 fps)
└**4=Sharp-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 1.54 fps)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

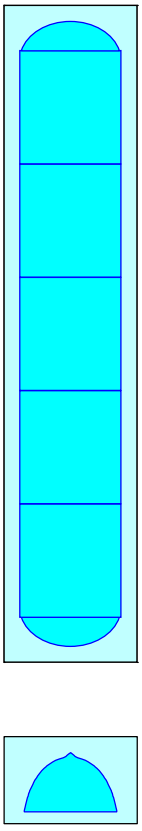
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

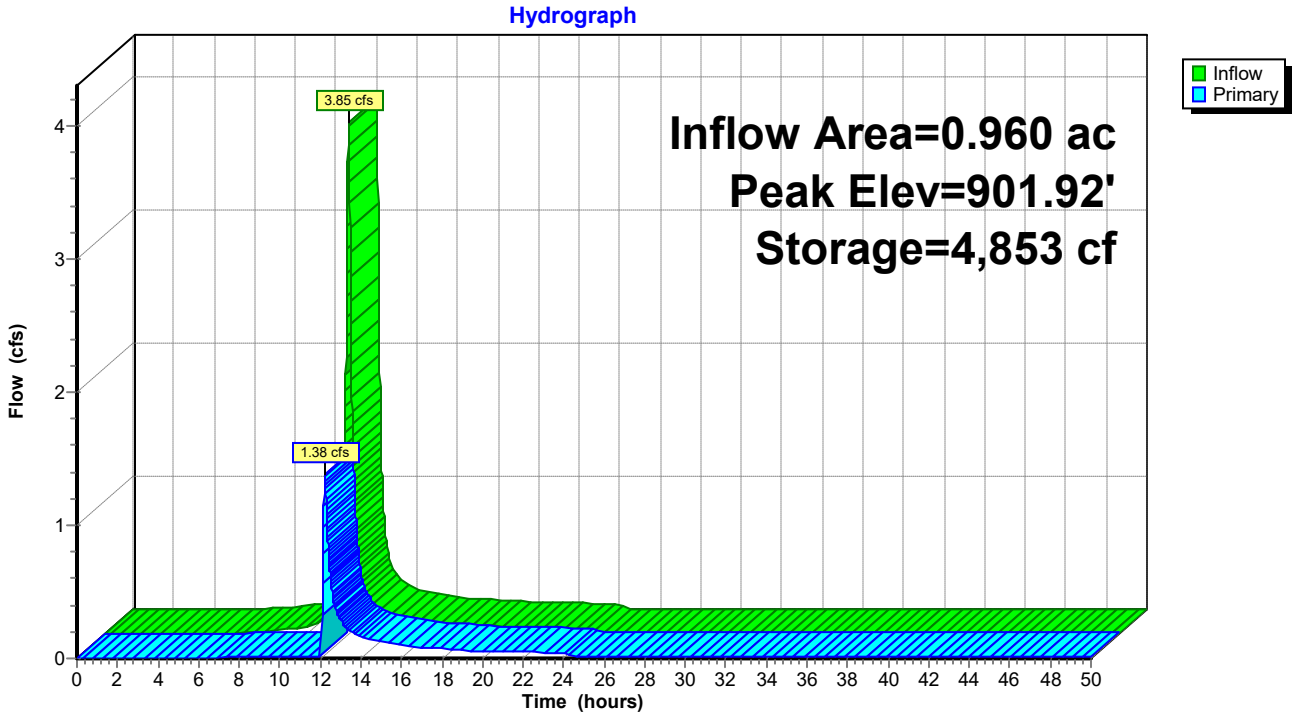
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

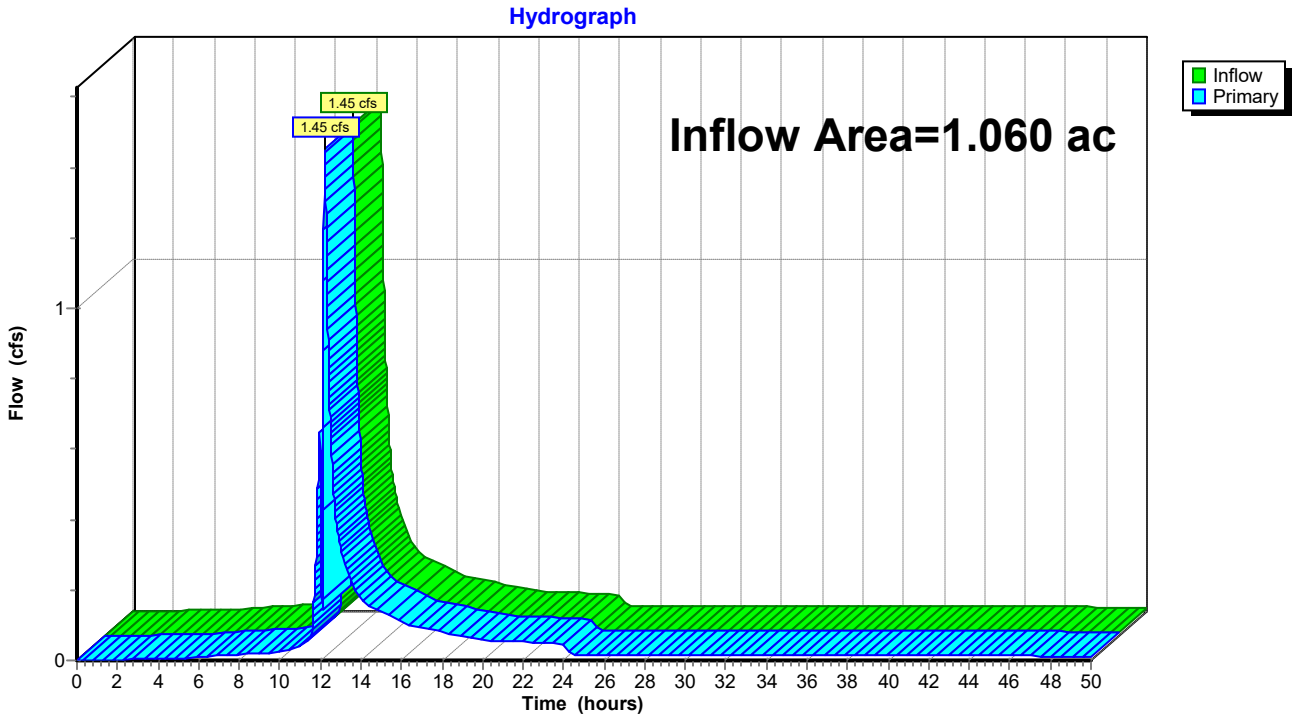


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 2.18" for 25 year event
Inflow = 1.45 cfs @ 12.21 hrs, Volume= 0.192 af
Primary = 1.45 cfs @ 12.21 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Summary for Subcatchment 1S: Pre-developed 01

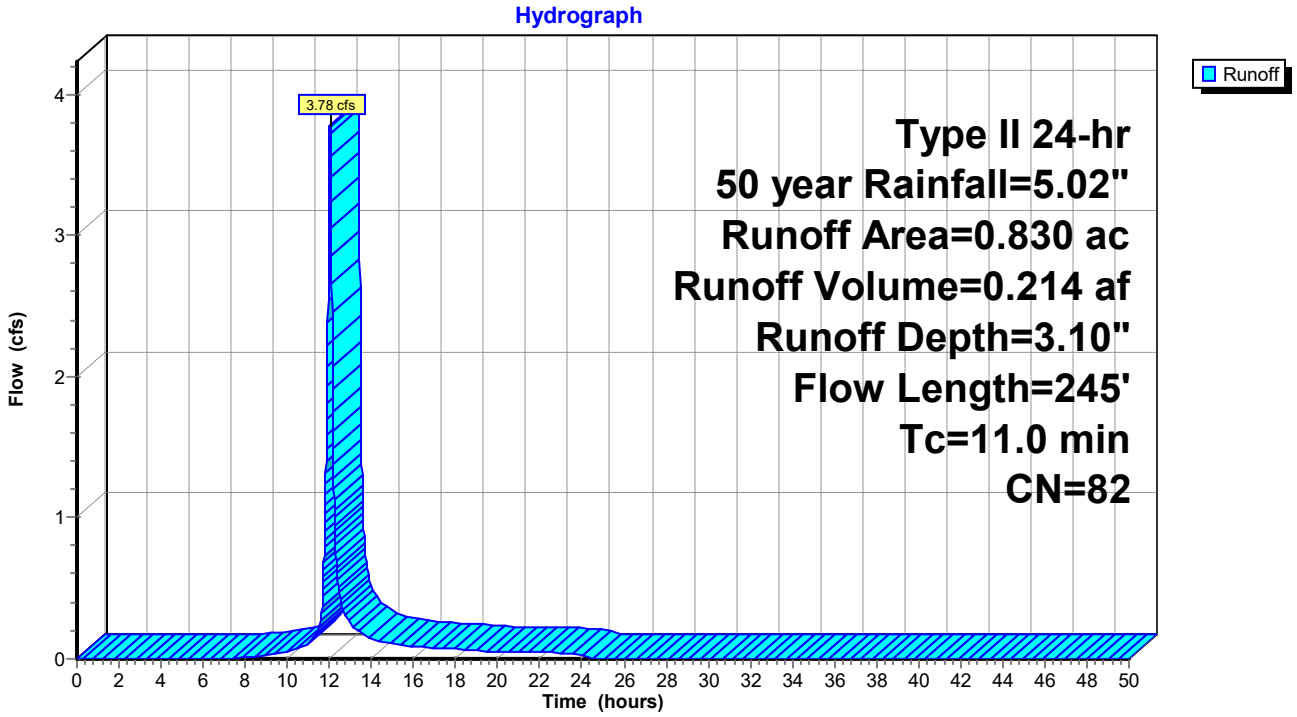
Runoff = 3.78 cfs @ 12.03 hrs, Volume= 0.214 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 50 year Rainfall=5.02"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

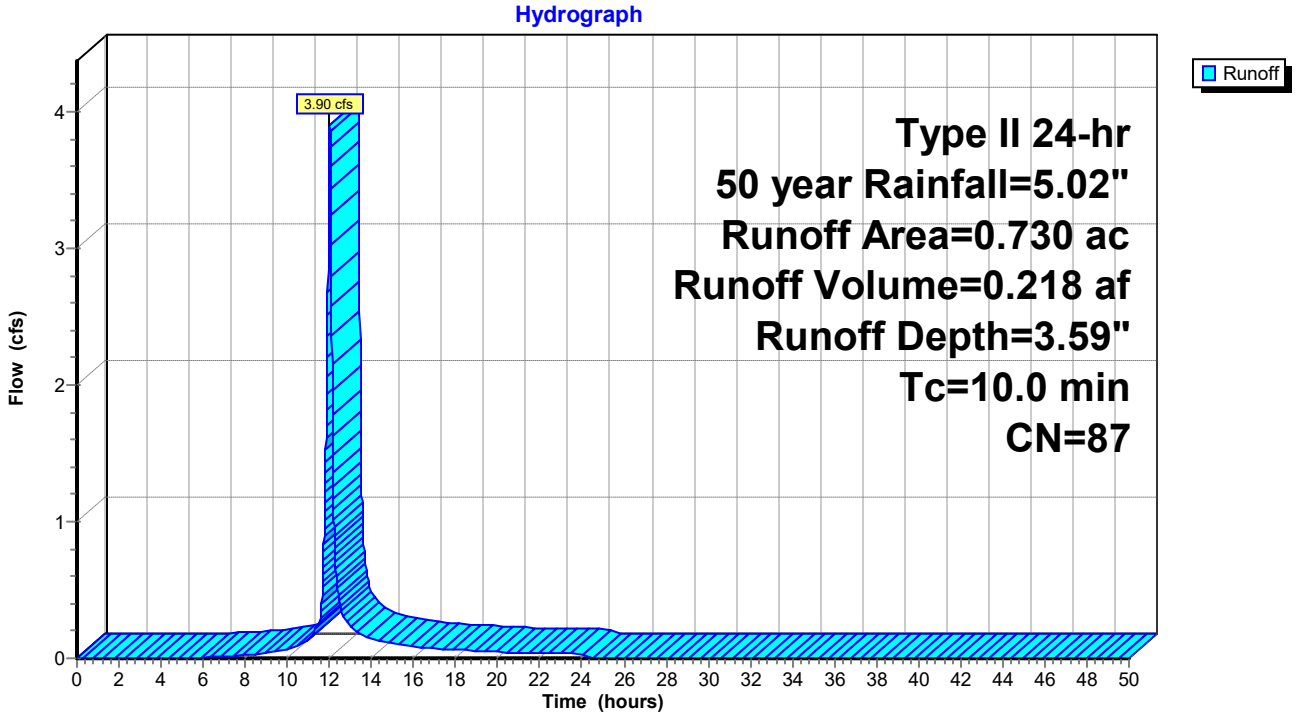
Runoff = 3.90 cfs @ 12.01 hrs, Volume= 0.218 af, Depth= 3.59"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 50 year Rainfall=5.02"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

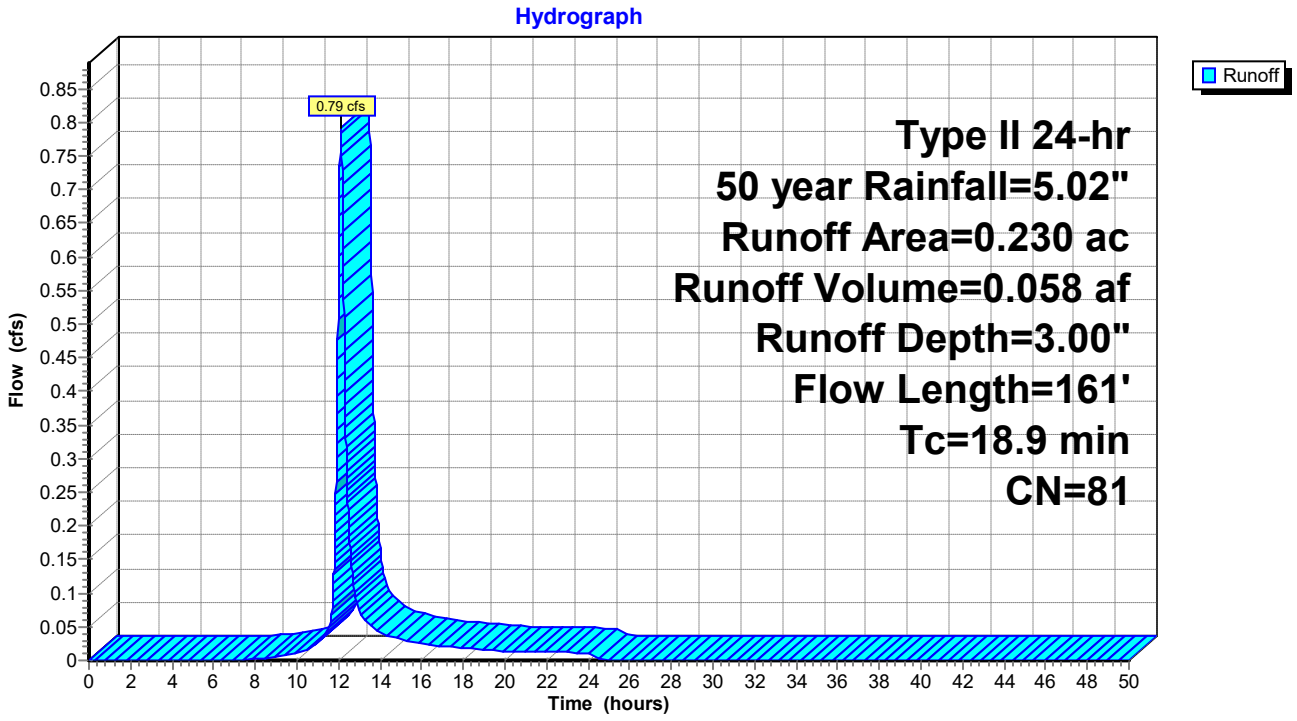
Runoff = 0.79 cfs @ 12.11 hrs, Volume= 0.058 af, Depth= 3.00"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 50 year Rainfall=5.02"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

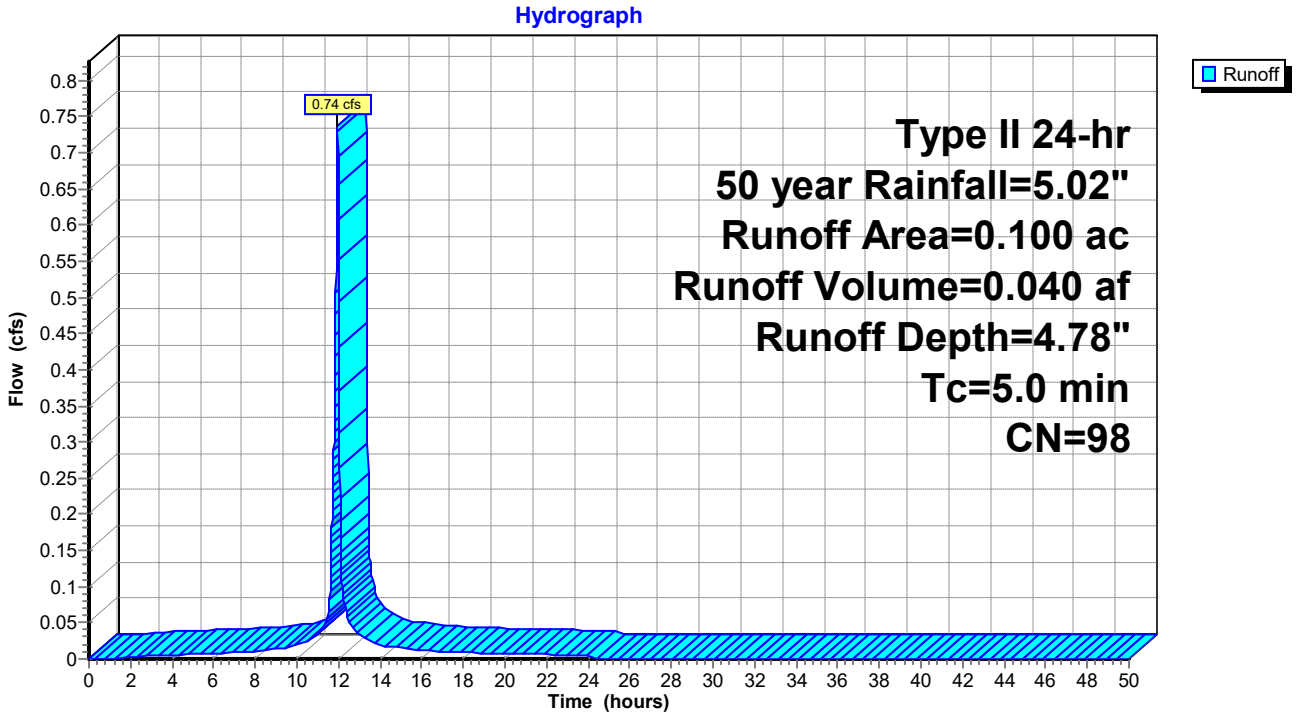
Runoff = 0.74 cfs @ 11.96 hrs, Volume= 0.040 af, Depth= 4.78"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 50 year Rainfall=5.02"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 3.45" for 50 year event
Inflow = 4.52 cfs @ 12.02 hrs, Volume= 0.276 af
Outflow = 1.99 cfs @ 12.18 hrs, Volume= 0.200 af, Atten= 56%, Lag= 9.5 min
Primary = 1.99 cfs @ 12.18 hrs, Volume= 0.200 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 902.20' @ 12.18 hrs Surf.Area= 1,326 sf Storage= 5,226 cf

Plug-Flow detention time= 354.4 min calculated for 0.200 af (72% of inflow)
Center-of-Mass det. time= 259.5 min (1,066.6 - 807.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.99 cfs @ 12.18 hrs HW=902.20' (Free Discharge)
└**1=RCP_Round 12"** (Passes 1.99 cfs of 5.76 cfs potential flow)
└**2=Orifice Plate** (Orifice Controls 1.99 cfs @ 10.15 fps)
└**3=WQ Orifice** (Passes < 0.01 cfs potential flow)
└**4=Sharp-Crested Rectangular Weir** (Passes < 4.45 cfs potential flow)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

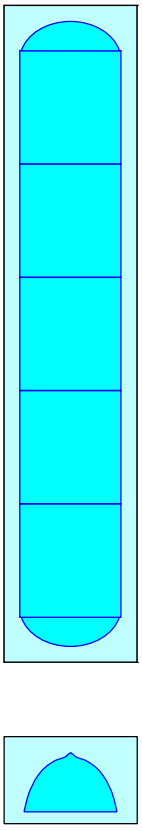
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

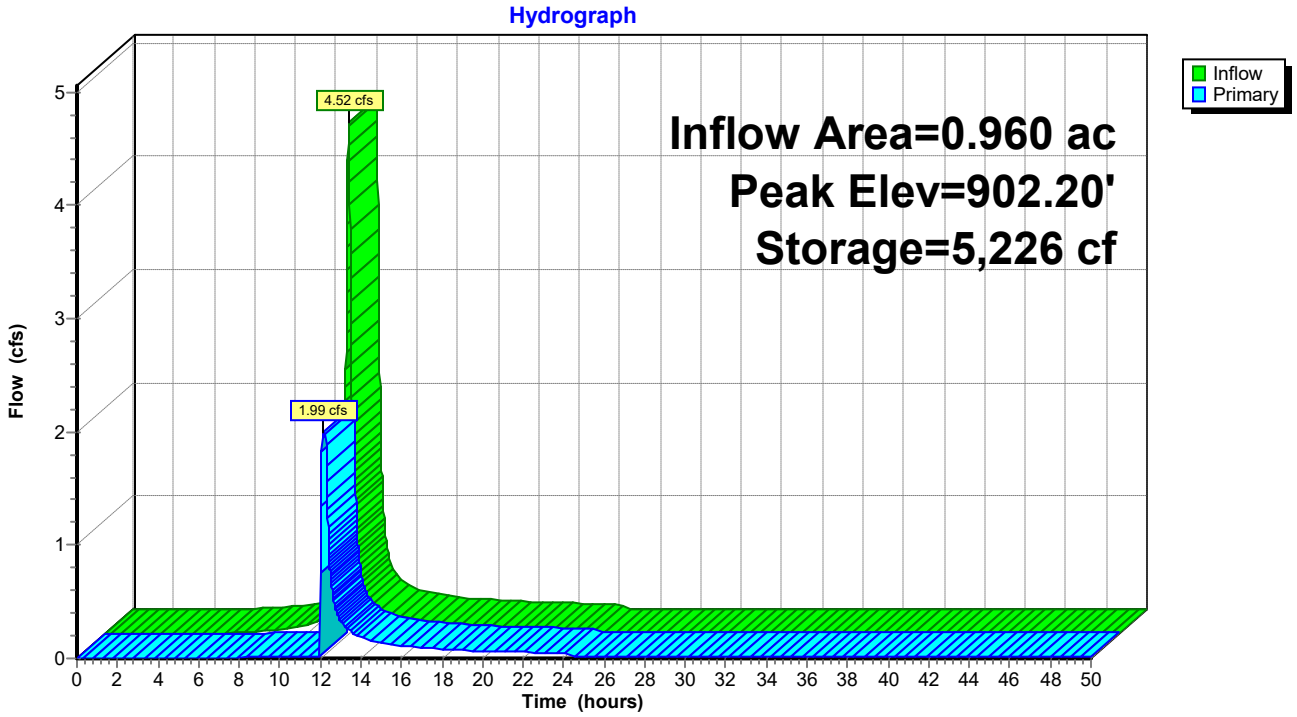
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

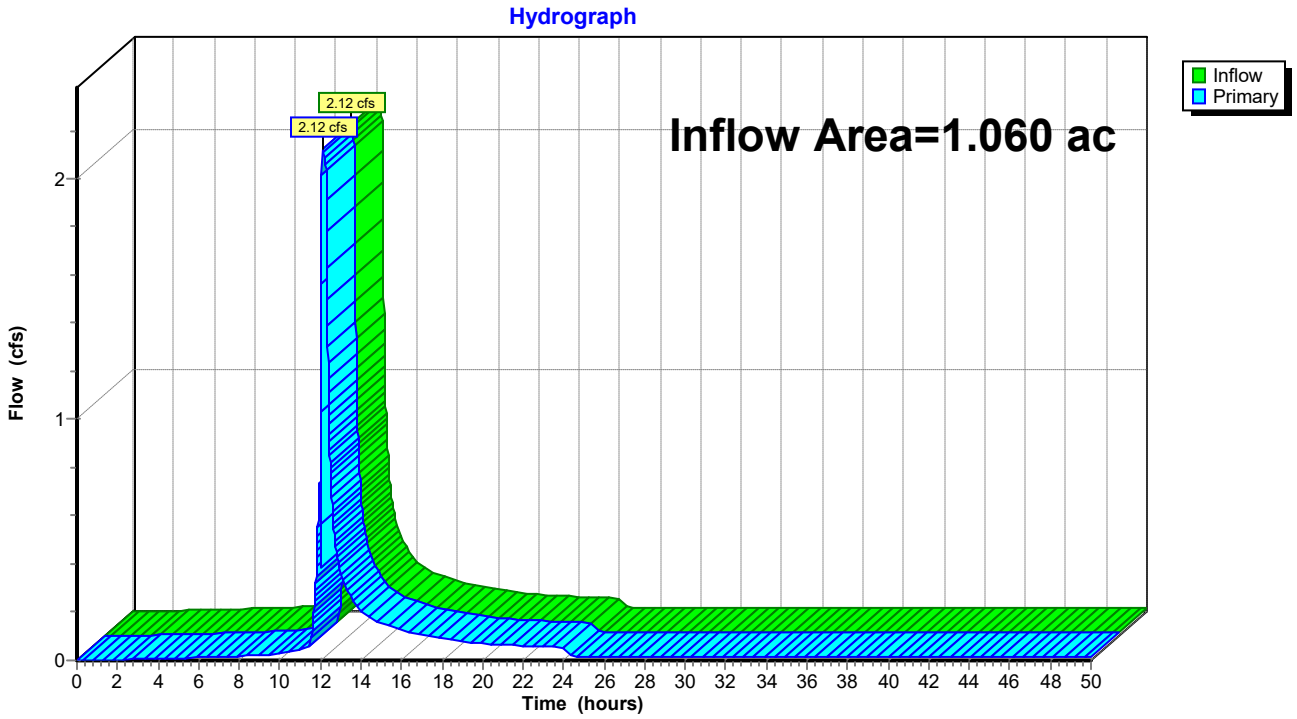


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 2.71" for 50 year event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 0.240 af
Primary = 2.12 cfs @ 12.09 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Summary for Subcatchment 1S: Pre-developed 01

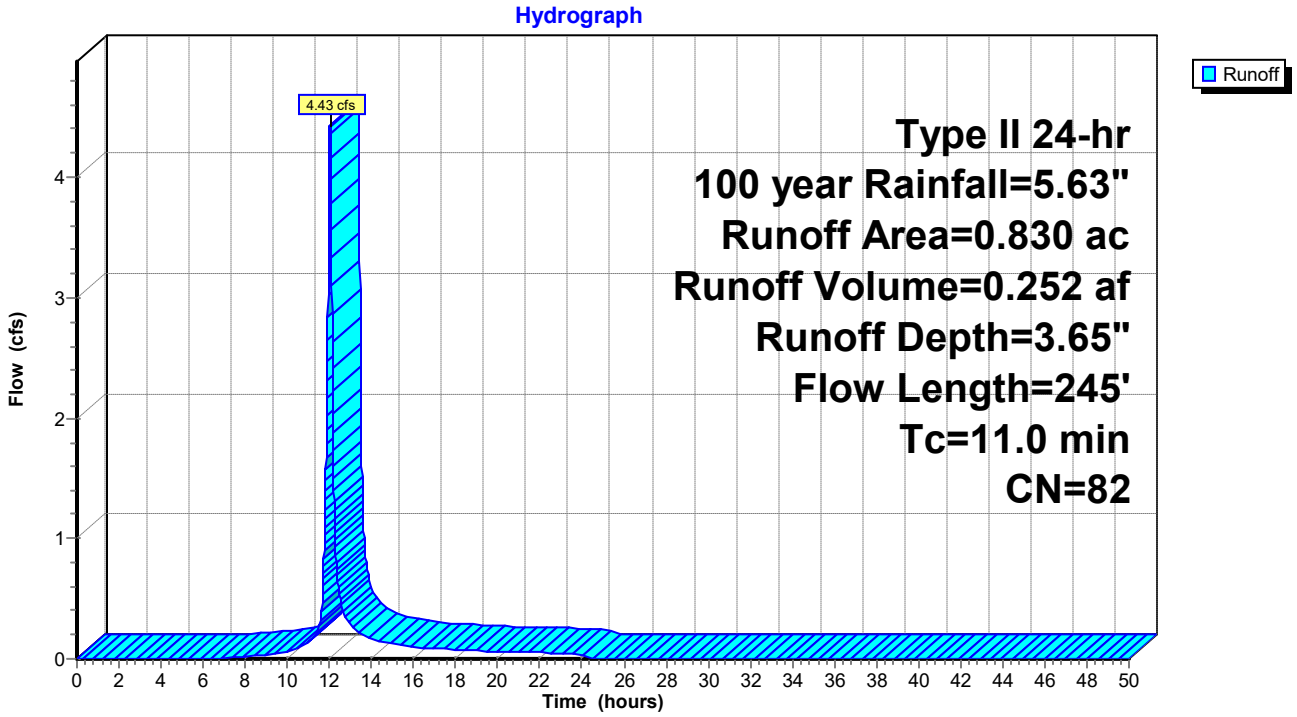
Runoff = 4.43 cfs @ 12.02 hrs, Volume= 0.252 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.63"

Area (ac)	CN	Description
0.750	80	>75% Grass cover, Good, HSG D
0.080	98	Paved parking, HSG D
0.830	82	Weighted Average
0.750		90.36% Pervious Area
0.080		9.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0284	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.6	145	0.0441	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	245	Total			

Subcatchment 1S: Pre-developed 01



Summary for Subcatchment 2S: Subarea 01

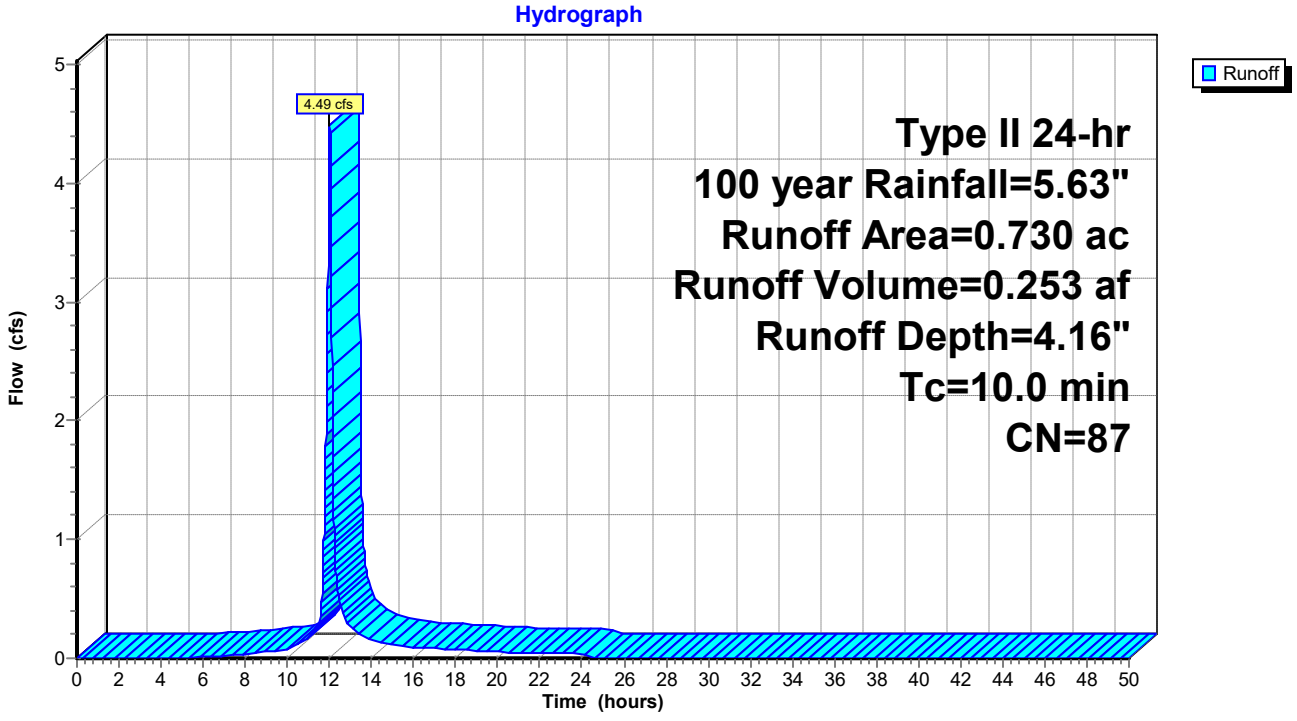
Runoff = 4.49 cfs @ 12.01 hrs, Volume= 0.253 af, Depth= 4.16"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.63"

Area (ac)	CN	Description
0.280	98	Paved parking, HSG D
0.450	80	>75% Grass cover, Good, HSG D
0.730	87	Weighted Average
0.450		61.64% Pervious Area
0.280		38.36% Impervious Area

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

Subcatchment 2S: Subarea 01



Summary for Subcatchment 3S: Offsite 01

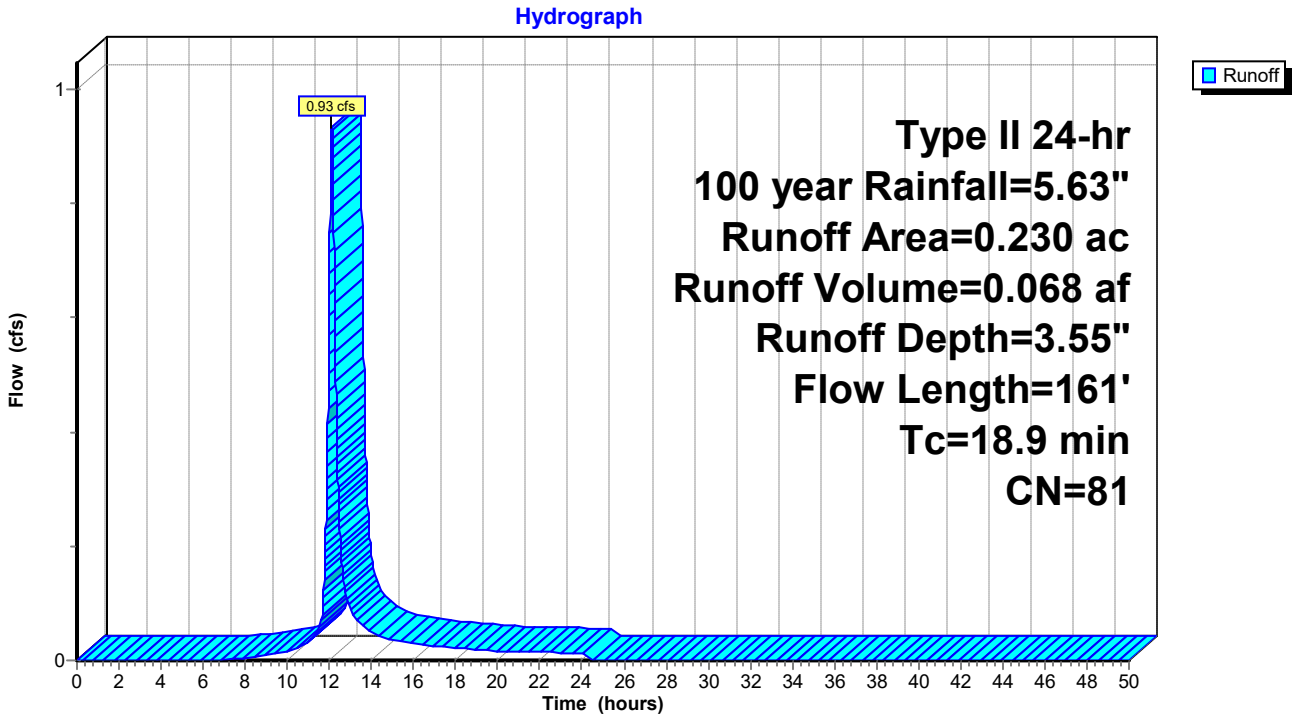
Runoff = 0.93 cfs @ 12.11 hrs, Volume= 0.068 af, Depth= 3.55"
Routed to Pond 1P : Detention 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.63"

Area (ac)	CN	Description
0.220	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.230	81	Weighted Average
0.220		95.65% Pervious Area
0.010		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0060	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.63"
1.4	61	0.0111	0.74		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.9	161	Total			

Subcatchment 3S: Offsite 01



Summary for Subcatchment 5S: Undetained 01

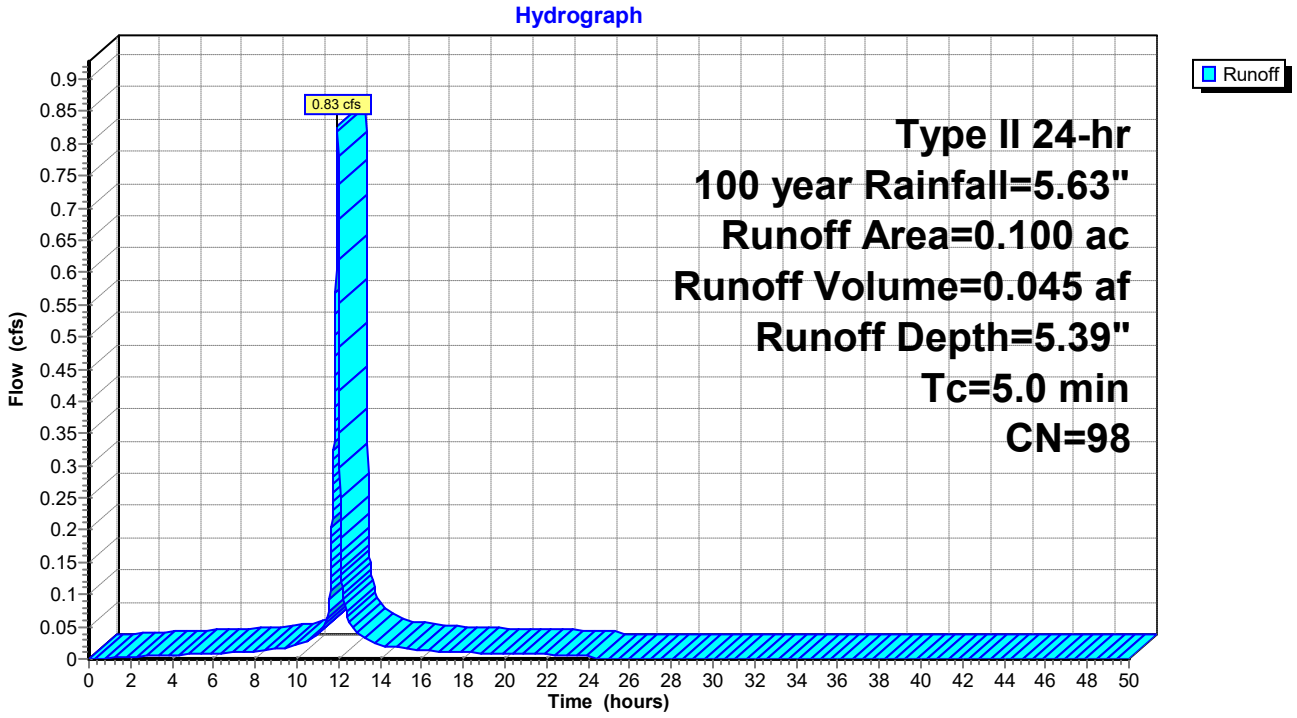
Runoff = 0.83 cfs @ 11.96 hrs, Volume= 0.045 af, Depth= 5.39"
Routed to Link 4L : Outfall 01

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Type II 24-hr 100 year Rainfall=5.63"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG D
0.100		100.00% Impervious Area

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

Subcatchment 5S: Undetained 01



Summary for Pond 1P: Detention 01

Inflow Area = 0.960 ac, 30.21% Impervious, Inflow Depth = 4.02" for 100 year event
Inflow = 5.22 cfs @ 12.02 hrs, Volume= 0.321 af
Outflow = 2.33 cfs @ 12.18 hrs, Volume= 0.245 af, Atten= 55%, Lag= 9.4 min
Primary = 2.33 cfs @ 12.18 hrs, Volume= 0.245 af
Routed to Link 4L : Outfall 01

Routing by Stor-Ind method, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs
Peak Elev= 903.82' @ 12.18 hrs Surf.Area= 350 sf Storage= 5,902 cf

Plug-Flow detention time= 304.5 min calculated for 0.245 af (76% of inflow)
Center-of-Mass det. time= 216.7 min (1,019.6 - 802.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	898.50'	538 cf	**8.42'W x 41.55'L x 5.50'H Field A** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#2	898.50'	4,811 cf	**42.00" Round RCP_Round 42"** L= 500.0' S= 0.0025 '/'
#3A	899.25'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		5,928 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	897.50'	**12.00" Round RCP_Round 12"** L= 118.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 897.50' / 896.85' S= 0.0055 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	897.50'	**6.00" Vert. Orifice Plate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	897.50'	**0.50" Vert. WQ Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	901.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.33 cfs @ 12.18 hrs HW=903.81' (Free Discharge)
└**1=RCP_Round 12"** (Passes 2.33 cfs of 6.75 cfs potential flow)
└**2=Orifice Plate** (Orifice Controls 2.33 cfs @ 11.86 fps)
└**3=WQ Orifice** (Passes < 0.02 cfs potential flow)
└**4=Sharp-Crested Rectangular Weir** (Passes < 35.95 cfs potential flow)

Pond 1P: Detention 01 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf

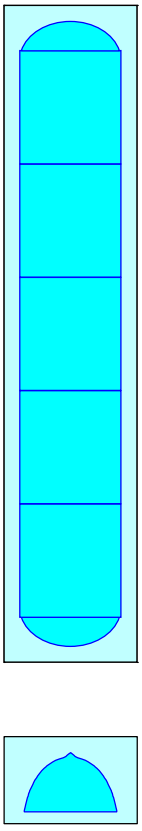
5 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 39.55' Row Length +12.0" End Stone x 2 = 41.55' Base Length
1 Rows x 77.0" Wide + 12.0" Side Stone x 2 = 8.42' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

5 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 1 Rows = 579.6 cf Chamber Storage

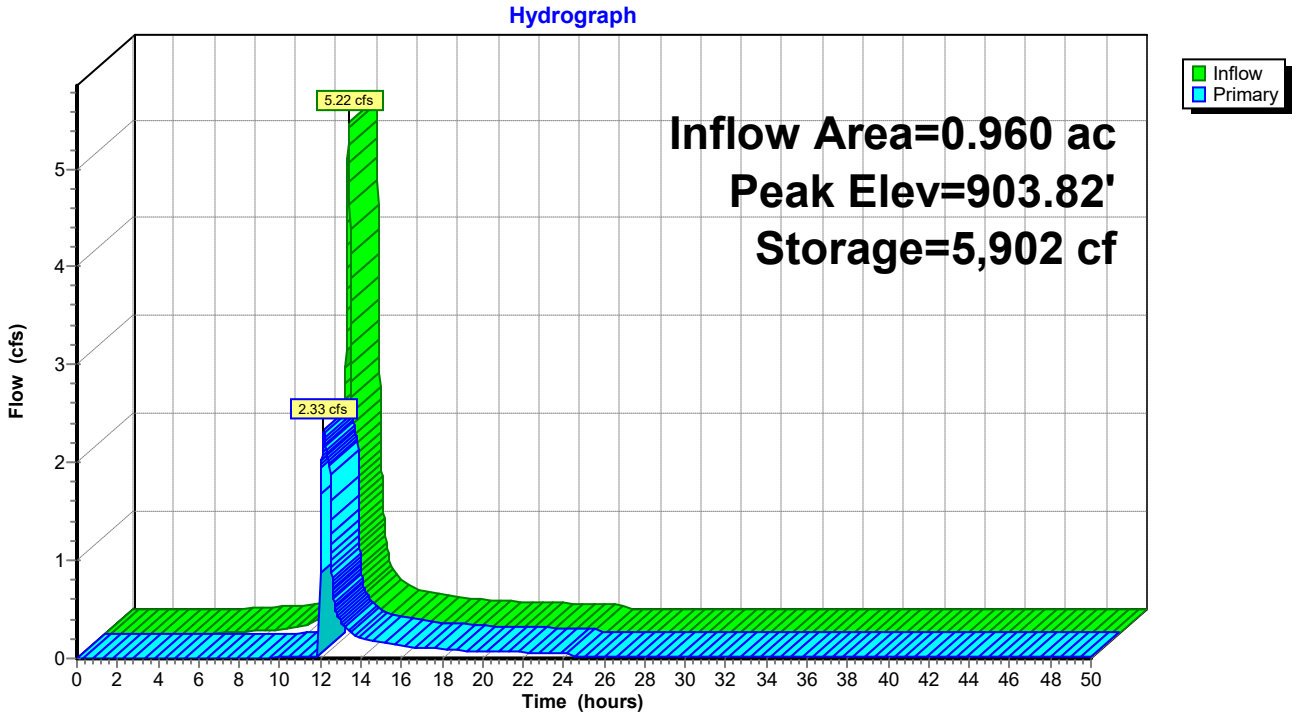
1,923.4 cf Field - 579.6 cf Chambers = 1,343.9 cf Stone x 40.0% Voids = 537.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,117.1 cf = 0.026 af
Overall Storage Efficiency = 58.1%
Overall System Size = 41.55' x 8.42' x 5.50'

5 Chambers
71.2 cy Field
49.8 cy Stone



Pond 1P: Detention 01

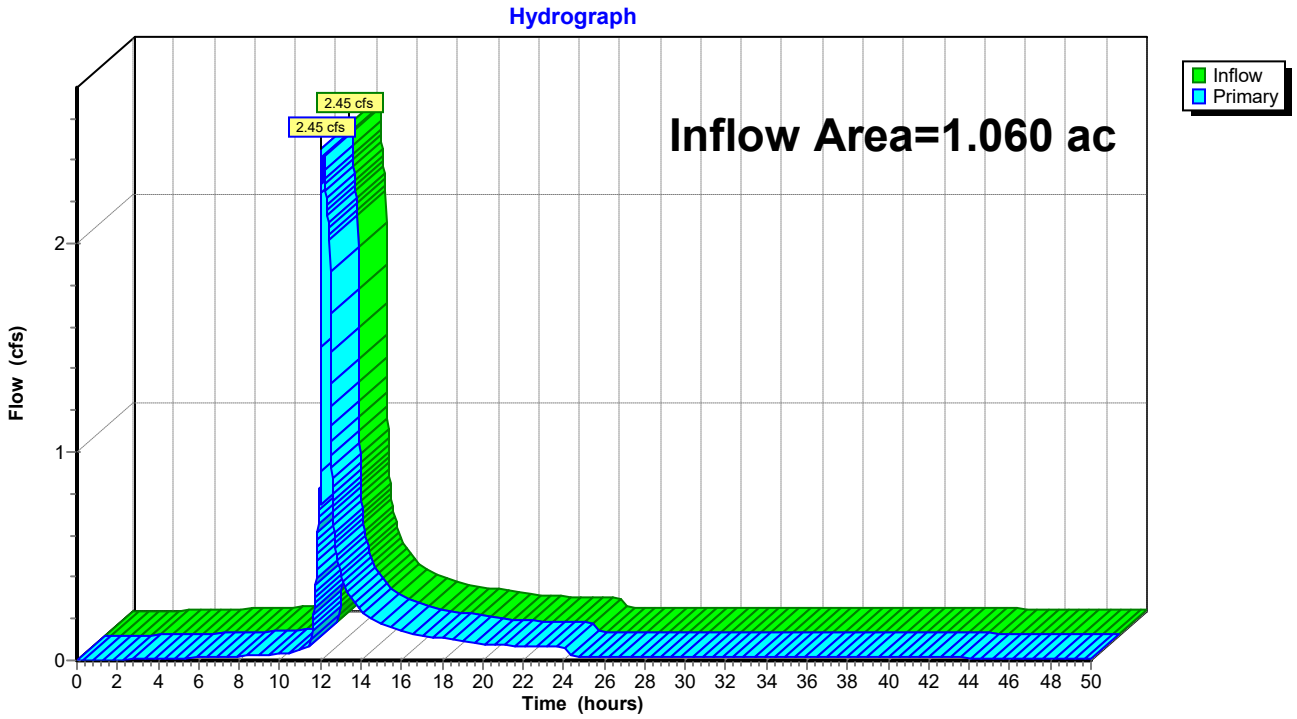


Summary for Link 4L: Outfall 01

Inflow Area = 1.060 ac, 36.79% Impervious, Inflow Depth > 3.29" for 100 year event
Inflow = 2.45 cfs @ 12.03 hrs, Volume= 0.290 af
Primary = 2.45 cfs @ 12.03 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-50.00 hrs, dt= 0.01 hrs

Link 4L: Outfall 01



Events for Subcatchment 1S: Pre-developed 01

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1 year	2.20	0.95	0.054	0.78
2 year	2.63	1.35	0.076	1.09
5 year	3.24	1.94	0.109	1.57
10 year	3.74	2.44	0.137	1.98
25 year	4.44	3.17	0.179	2.58
50 year	5.02	3.78	0.214	3.10
100 year	**5.63**	**4.43**	**0.252**	**3.65**

Events for Subcatchment 2S: Subarea 01

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1 year	2.20	1.20	0.065	1.06
2 year	2.63	1.60	0.086	1.42
5 year	3.24	2.18	0.119	1.95
10 year	3.74	2.66	0.146	2.40
25 year	4.44	3.34	0.185	3.04
50 year	5.02	3.90	0.218	3.59
100 year	**5.63**	**4.49**	**0.253**	**4.16**

Events for Subcatchment 3S: Offsite 01

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1 year	2.20	0.19	0.014	0.73
2 year	2.63	0.27	0.020	1.04
5 year	3.24	0.39	0.029	1.50
10 year	3.74	0.50	0.037	1.90
25 year	4.44	0.66	0.048	2.50
50 year	5.02	0.79	0.058	3.00
100 year	**5.63**	**0.93**	**0.068**	**3.55**

Events for Subcatchment 5S: Undetained 01

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1 year	2.20	0.32	0.016	1.97
2 year	2.63	0.38	0.020	2.40
5 year	3.24	0.47	0.025	3.01
10 year	3.74	0.55	0.029	3.51
25 year	4.44	0.65	0.035	4.20
50 year	5.02	0.74	0.040	4.78
100 year	**5.63**	**0.83**	**0.045**	**5.39**

Events for Pond 1P: Detention 01

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1 year	1.33	0.01	900.84	2,863
2 year	1.79	0.01	901.42	3,994
5 year	2.47	0.09	901.73	4,534
10 year	3.04	0.30	901.78	4,618
25 year	3.85	1.38	901.92	4,853
50 year	4.52	1.99	902.20	5,226
100 year	**5.22**	**2.33**	**903.82**	**5,902**

Events for Link 4L: Outfall 01

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
1 year	0.33	0.33	**0.00**
2 year	0.39	0.39	0.00
5 year	0.48	0.48	0.00
10 year	0.56	0.56	0.00
25 year	1.45	1.45	0.00
50 year	2.12	2.12	0.00
100 year	**2.45**	**2.45**	0.00

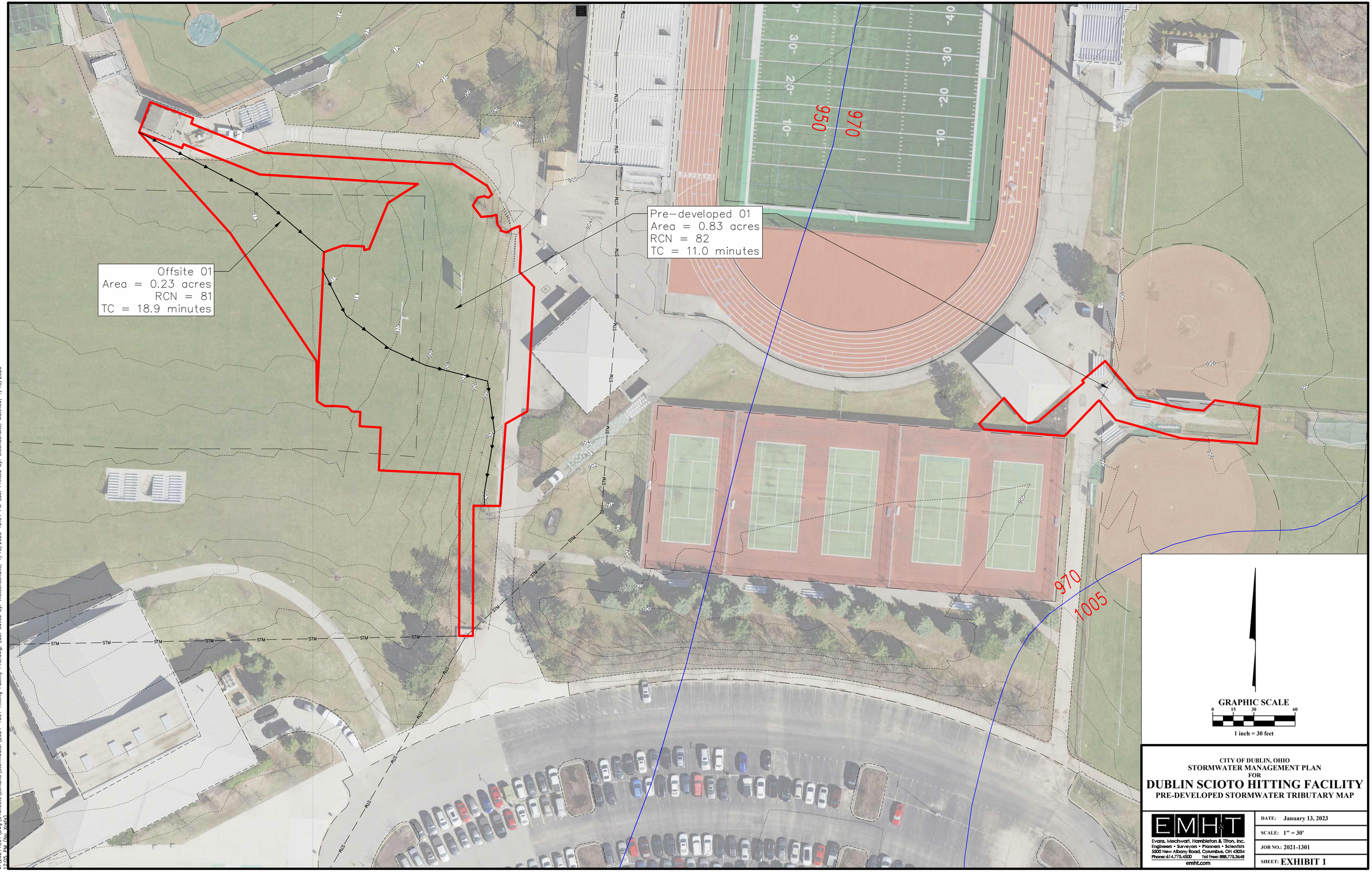
TABLE OF CONTENTS

100 year Event

Multi-Event Tables

APPENDIX E:

Exhibits



GRAPHIC SCALE

0 15 30 60

1 inch = 30 feet

CITY OF DUBLIN, OHIO
STORMWATER MANAGEMENT PLAN
FOR
DUBLIN SCIOTO HITTING FACILITY
PRE-DEVELOPED STORMWATER TRIBUTARY MAP

EMHT
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Toll Free: 888.775.3648
emht.com

DATE: January 13, 2023
SCALE: 1" = 30'
JOB NO.: 2021-1301
SHEET: EXHIBIT 1

Offsite 01
Area = 0.23 acres
RCN = 81
TC = 18.9 minutes

Subarea 01
Area = 0.73 acres
RCN = 87
TC = 10.0 minutes

Undetained 01
Area = 0.10 acres
RCN = 98
TC = 5.0 minutes

Detention 01

GRAPHIC SCALE
0 15 30 60
1 inch = 30 feet

CITY OF DUBLIN, OHIO
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POST-DEVELOPED STORMWATER TRIBUTARY MAP

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5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Toll Free: 888.775.3648
emht.com

DATE: January 9, 2023
SCALE: 1" = 30'
JOB NO.: 2021-1301
SHEET: EXHIBIT 2