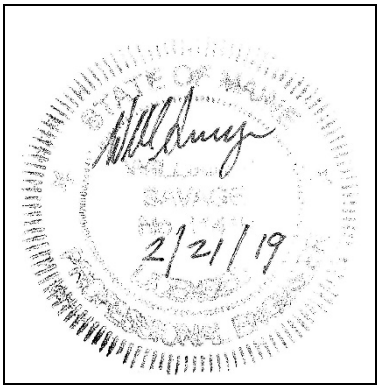
J. STORMWATER MANAGEMENT REPORT

Prepared For:

Portland Museum of Art
Seven Congress Square
Portland, Maine 04101

Prepared By:

Acorn Engineering, Inc.
65 Hanover Street
Portland, Maine 04102



March 2019

INTRODUCTION

Acorn Engineering, Inc. has been retained by the Portland Museum of Art to provide civil engineering services for the proposed visitor parking lot redevelopment at 87 Spring Street. The project proposes improvements to existing pavement, expansion of parking spaces, reuse of existing landscaping features and new stormwater management.

A stormwater analysis has been prepared to demonstrate that the project will meet the following requirements of the City of Portland (the City):

- City of Portland Land Use Ordinance Chapter 14, Article V. Site Plan Section 14-523. Required Approvals and Applicability (E) Level II Site Plan Review.
- City of Portland Technical Manual; Section 5 – Portland Stormwater Management Standards
- Maine DEP Chapter 500 Stormwater Management

EXISTING CONDITIONS

The proposed project is located at 87 Spring Street. A boundary plan has been prepared by Spurwink Surveying, Inc of Scarborough, Maine dated February 7, 2019.

The site resides within the B-3 Business and Downtown Entertainment Overlay zones. Approximately 39% of the site is impervious in the form of pavement, brick or concrete.

The project team is not aware of the presence of any existing significant natural features located on the site. Given the urban setting and existing impervious surfaces, a field inventory of significant natural feature was not undertaken. The project is not located within a watershed classified as an Urban Impaired Stream.

PROPOSED DEVELOPMENT

The proposed project is a redevelopment through expansion of an existing surface parking lot with stormwater improvements. Pedestrian access to the site will be provided via concrete and brick walkways on Spring Street and an existing brick sidewalk within the site. The development will be served by CMP (electric) and Portland Department of Public Works (storm). An additional single-phase electric service will be routed underground.

Proposed parking lot improvements include constructing full depth pavement in the expanded footprint areas. Existing landscaping and granite curbing are to be reused based upon the expanded footprint. The project also proposes to modify water quality treatment measures with the addition of a vegetated underdrain soil filter (VUSF). Locations where existing pavement will be disturbed are at saw cuts for new pavement extents and utility trenching, as shown in the Civil Site Plan, see Sheet C-10.

Stormwater will continue to enter the City's stormwater system within Oak Street through an existing 12" SDR pipe. Please refer to Sheet C-30 for more information.

The project's stormwater system is sized to treat all impervious surface areas on project site. A

summary of surfaces to be improved and remain are as follows:

Table 1 – Surface Treatment Summary	
Surface	Area (SF)
Pavement & Curbing	21,196
Retaining Wall, Walkways and Concrete Pads	1,190
PMA Sign	10
Total Floor Area	**22,396**

The project incorporates Maine DEP approved stormwater Best Management Practices to meet the General and Flooding Standards.

GENERAL STANDARDS – WATER QUALITY

The proposed areas of additional pavement located along the north, northeasterly and northwesterly regions of the parcel will be graded to match existing pavement grades and maintain existing drainage paths to the soil filter.

The pervious concrete surface was sized to meet or exceed the requirements set forth in the MDEP Volume III BMPs Technical Design Manual, Chapter 7.1: "Grassed Underdrained Soil Filters". Grassed Underdrained Soil Filter systems have shown to be effective at filtering and removing a wide range of pollutants, including suspended solids, phosphorus, nitrogen, metals, hydrocarbons and some dissolved pollutants.

Impervious Treatment Area

The VUSF was sized per the standards designated for Grassed Underdrained Soil Filters (Chapter 7.7.1), as displayed in the following paragraphs "Filter Area Size" and "Water Quality Volume."

The stormwater shall be detained within the filter course layer for a minimum of 24 hours and maximum of 48 hours before draining vertically through the crushed stone layer. The treated stormwater shall then be collected within the perforated underdrain pipe and outlet into a proposed catch basin.

When stormwater flows exceed the storage and treatment volume capacity of the system, the excess runoff will be collected by the proposed catch basin, PR. CB-1, located at the top of the filter volume.

Table 2 – Impervious Treatment Area Table				
	Existing Impervious Area (SF)	Proposed Total Impervious Area (SF)	Total Area with Treatment (SF)	Percentage of Overall Total Impervious Area Treated
Vegetated Underdrained Soil Filter	15,000	22,396	22,786	102%

As shown in Table 2, it is anticipated that the VUSF will meet and exceed the Maine DEP required 95% treatment of impervious area.

Filter Area Size

Per the requirements for manmade pervious surfaces, all specifications from Chapter 7: Filtration BMPs apply for sizing the VUSF surface area. As defined in Chapter 7.7.1, the surface area of the filter shall be no less than the sum of 5% of the tributary impervious area and 2% of the tributary landscaped area. The filter area is calculated by the following formula:

Required Filter Area (SF) = [{Impervious Area (SF) x 0.05} + {Landscaped Area (SF) x 0.02}]

The proposed filter area is as follows:

Table 3 – Total Filter Surface Area

	Impervious Area (SF)	Landscaped Area (SF)	Required Filter Area (SF)	Proposed Filter Area (SF)	Percentage of Required Area
Vegetated Underdrained Soil Filter	22,396	16,341	1,447	1,612	111%

The outflow from the VUSF is then tributary to the proposed catch basin before entering an existing 12" SDR pipe leading to an existing manhole within the Oak Street municipal system. As shown, the size of the soil filter area will meet and exceed the surface area requirements. Values from the HydroCAD calculations are attached to this report.

Water Quality Volume

Per the requirements for manmade pervious surfaces, all specifications from Chapter 7: Filtration BMPs apply for sizing the Vegetated Underdrained Soil Filter volume. A water quality volume of 1.0-inch times the tributary impervious area plus 0.4-inch times the tributary landscaped developed area is required to be treated by the VUSF. The water quality volume is calculated by the following formula:

$$\text{Treatment Volume (CF)} = \left\{\frac{Impervious\ Area\ (SF)\ x\ 1.0''}{12''/1'}\right\} + \left\{\frac{Landscaped\ Area\ (SF)\ x\ 0.4''}{12''/1'}\right\}$$

The proposed water quality volume is as follows:

Table 4 – Water Quality Volume Table

	Total Landscaped Area (SF)	Total Impervious Area (SF)	Treatment Volume Required (CF)	Treatment Volume Provided (CF)	Percentage of Required Volume
Subsurface Sand Filter	16,341	22,396	2,411	2,418	100%

As shown, the size of the combined water quality volume will meet the treatment volume requirements. A 1" vertical orifice is modeled in HydroCAD to mimic the permeability rate through the soil filter media. The orifice diameter is the approximate size that would detain the stormwater for an approximate period of 24 hours. A physical 1" orifice will not be installed. Values from the

HydroCAD calculations are included in Attachment D of this report.

FLOODING STANDARDS – WATER QUANTITY

To evaluate the project with respect to Section F. Flooding Standard of MDEP Chapter 500: Stormwater Management, the proposed development was modeled using HydroCAD to verify that post-development drainage conditions do not exceed pre-development conditions. The model applied a 24-hours SCS Type III storm distribution for the 2, 10 and 25-year storm events with the corresponding rainfall amounts of 3.10", 4.6" and 5.8" respectively. Rainfall amounts were accessed from *Appendix H. 24-hours duration rainfalls for various return periods* within Chapter 500: Stormwater Management for SE Cumberland County.

The existing stormwater runoff eventually flows into the Oak Street municipal system. Therefore, both the pre- and post-development conditions model the runoff into Oak Street

Due to the numerous variables and inherent inaccuracies with the modeling programs used to calculated stormwater runoff, it is custom at Acorn Engineering, Inc. to round to the nearest whole number or to the nearest tenth for urban infill projects. Due to the project size, the stormwater runoff shall be rounded to the nearest tenth of a cubic foot per second (cfs).

Time of Concentration (T_c)

A minimum time of concentration duration of 5-minutes was used for the pre- and post-development tributaries. For flow paths with durations longer than 5-minutes, the flow path was modeled as sheet flow when less than 100-feet long.

Curve Number

The stormwater calculations used the following Curve Number (CN) values in the pre- and post-development conditions are as follows:

- Pavement, Concrete, Brick – CN 98
- > 75% Grass Cover – Good, HSG A – CN 39

Pre-Development Calculations

The pre-development conditions were modeled as six subcatchments to determine the net impact of the development.

- Subcatchment 1 – Northwesterly, northerly and northeasterly location, including pavement and curbs, concrete retaining wall, concrete pads brick sidewalk and landscaping. Tributary to existing soil filter and catch basin (Ex. CB-4).
- Subcatchment 2 – Southerly side parallel to Spring Street including landscaping. Tributary to existing catch basin (Ex. CB-1)
- Subcatchment 3 – Southerly side parallel to Spring Street including landscaping. Tributary to existing catch basin (Ex. CB-2)
- Subcatchment 4 – Southerly side parallel to Spring Street including landscaping. Tributary to existing catch basin (Ex. CB-3)

- Subcatchment 5 – Southwesterly side of site at driveway entrance including pavement and brick sidewalk. Tributary to point of interest (POA #1).
- Subcatchment 6 – Easterly side of site at intersection of Oak and Spring Street including landscaping. Tributary to point of interest (POA #1).

A Pre-Development Watershed Map developed for this project can be viewed in Attachment A and a copy of the HydroCAD calculations is included within Attachment D of this report.

Peak flow rates for the storm events are as follows:

Table 5 – Pre-Development Peak Stormwater Flows			
Drainage Area	**2-Year Storm Event (cfs)**	**10-Year Storm Event (cfs)**	**25-Year Storm Event (cfs)**
Oak Street	0.1	1.2	1.9

Post-Development Calculations

The post-development conditions were also modeled as six subcatchments to determine the net impact of the development.

- Subcatchment 1 – Northwesterly, northerly and northeasterly location, including pavement and curbs, concrete retaining wall, concrete pads brick sidewalk and landscaping. Tributary to existing soil filter and proposed catch basin (Pr. CB-1).
- Subcatchment 2 – Southerly side parallel to Spring Street including landscaping. Tributary to existing catch basin (Ex. CB-1)
- Subcatchment 3 – Southerly side parallel to Spring Street including landscaping. Tributary to existing catch basin (Ex. CB-2)
- Subcatchment 4 – Southerly side parallel to Spring Street including landscaping. Tributary to existing catch basin (Ex. CB-3)
- Subcatchment 5 – Southwesterly side of site at driveway entrance including pavement and brick sidewalk. Tributary to point of interest (POA #1).
- Subcatchment 6 – Easterly side of site at intersection of Oak and Spring Street including landscaping. Tributary to point of interest (POA #1).

The post-development calculations include the additional impervious surfaces and compensation provided by the VUSF. The following table displays a comparison of pre- and post-development condition peak runoff rates for the proposed development.

Table 6 – Comparison of Peak Flows						
Drainage Area	**2-Year Storm Event (cfs)**		**10-Year Storm Event (cfs)**		**25-Year Storm Event (cfs)**	
Oak Street	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
	0.1	0.1	1.2	0.3	1.9	1.5

As show in Table 5, the net impact of the post-development peak flows shall remain at or below the pre-development value levels for the 2, 10 and 25-year storm events.

A Post-Development Watershed Map created for this project can be viewed in Attachment B and a copy of the HydroCAD calculations is included within Attached D of this report.

SOILS

Onsite soil information has been gathered from the following resource:

- United States Department of Agriculture (USDA) Web Soil Survey (WSS)

The area within and surrounding the project includes the soil type listed in Table 1 below. The susceptibility of soils to erosion is indicated on a relative "Kw" scale of values over a range of 0.02 to 0.69. Higher "Kw" values indicate more erodible soils. The Kw value listed was derived from the Revised Universal Soil Loss Equation (RUSLE), identified at the end of the report from the USDA's WSS (Attachment C). The soil type used in design was also derived from the USDA's WSS, as visible on Attachment C.

Table 1		
Soils Type	**Depth**	**Kf Value**
Hinckley loamy sand	Whole soil	0.1

Given the soils information listed above, and the fact that the site is currently developed, it is Acorn Engineering's professional opinion that a more intense hydric soil boundary delineation is not required since waiver requirements set forth in Section 7: Soil Survey of the City of Portland Technical Manual (Rev. 6/17/11) are met.

CONCLUSION

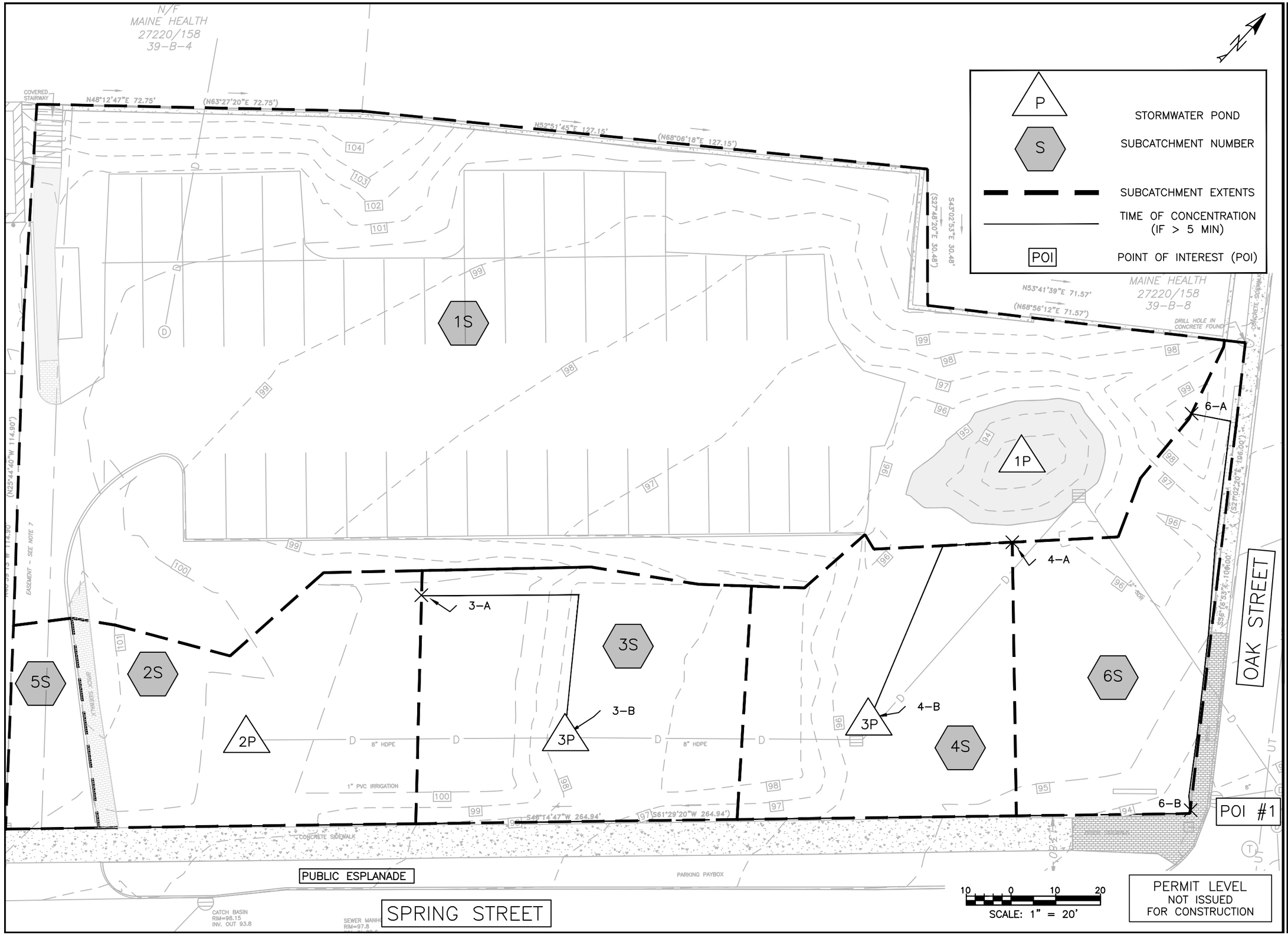
The proposed development was designed to meet the requirements implemented by the MDEP under the Stormwater Management Statute (38 M.R.S.A § 420-D) as well as Section 5: Portland Stormwater Management Standards of the City of Portland Technical Manual. As a result, the design of the proposed development and stormwater system is not anticipated to create erosion, drainage or runoff problems in the development or with respect to adjacent properties.

ATTACHMENTS

Attachment A: Pre-Development Watershed Map
Attachment B: Post-Development Watershed Map
Attachment C: United States Department of Agriculture Web Soil Survey
Attachment D: HydroCAD Calculations

Attachment A

Pre-Development
Watershed Map



PERMIT LEVEL
NOT ISSUED
FOR CONSTRUCTION

ISSUED FOR	BY	DATE
LEVEL II SITE PLAN	WHS	3/1/19

DRAWING NAME: PRE-DEVELOPMENT WATERSHED MAP

PROJECT NAME: PMA VISITOR PARKING LOT PROJECT

CLIENT: PORTLAND AND MUSEUM OF ART
7 CONGRESS SQUARE PORTLAND, ME 04101

ACORN ENGINEERING, INC
P.O. BOX 3372
PORTLAND, MAINE 04102
(207) 775-2655

FILE:	JN_1111
JN:	1111
SCALE:	AS NOTED
DESIGN BY:	FRT
DRAWN BY:	FRT
CHECKED BY:	WHS

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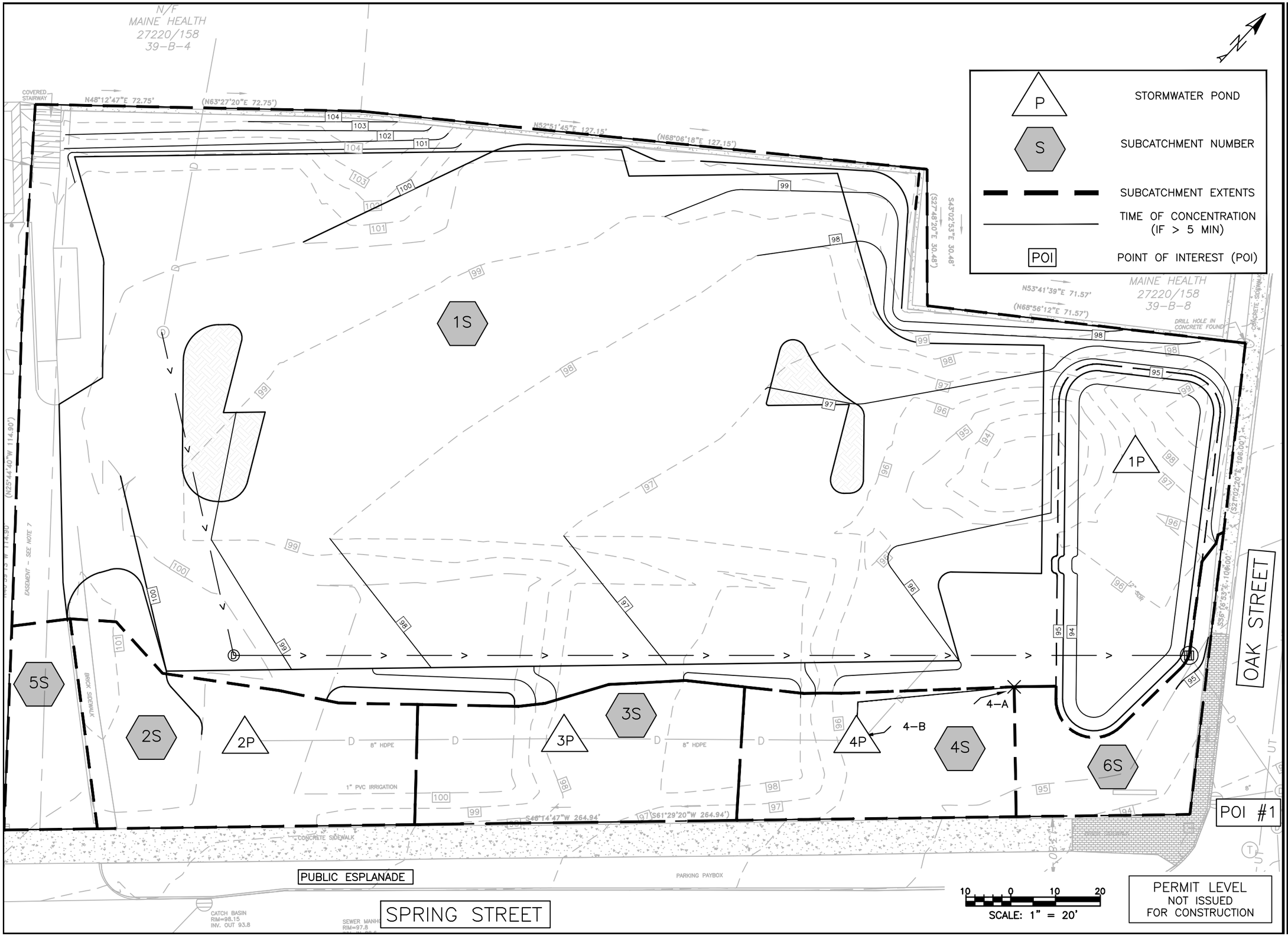
DRAWING NO.
SW-1

Attachment B

Post-Development Watershed Map



PERMIT LEVEL
NOT ISSUED
FOR CONSTRUCTION

ISSUED FOR	BY / DATE
LEVEL II SITE PLAN	WHS 3/1/19

DRAWING NAME: POST-DEVELOPMENT WATERSHED MAP

PROJECT NAME: PMA VISITOR PARKING LOT PROJECT

CLIENT: PORTLAND AND MUSEUM OF ART
7 CONGRESS SQUARE PORTLAND, ME 04101

ACORN ENGINEERING, INC
P.O. BOX 3372
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FILE:	JN_1111
JN:	1111
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DRAWING NO.
SW-2

Attachment C

United States Department of Agriculture Web Soil Survey

Hydrologic Soil Group—Cumberland County and Part of Oxford County, Maine
(PROP BOUNDARY_WSS)

Map Scale: 1:693 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil 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 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 15, Sep 6, 2018

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

Date(s) aerial images were photographed: Data not available.

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
HIB	Hinckley loamy sand, 3 to 8 percent slopes	A	0.9	100.0%
Totals for Area of Interest			**0.9**	**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

K Factor, Whole Soil—Cumberland County and Part of Oxford County, Maine
(PROP BOUNDARY_WSS)

Map Scale: 1:693 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Lines

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
Not rated or not available

Soil Rating Points

.02
.05
.10
.15
.17
.20
.24
.28
.32
.37
.43
.49
.55
.64
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 1:24,000.

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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.

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Survey Area Data: Version 15, Sep 6, 2018

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

Date(s) aerial images were photographed: Data not available.

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K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HIB	Hinckley loamy sand, 3 to 8 percent slopes	.10	0.9	100.0%
Totals for Area of Interest			**0.9**	**100.0%**

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Rating Options

Aggregation Method: Dominant Condition

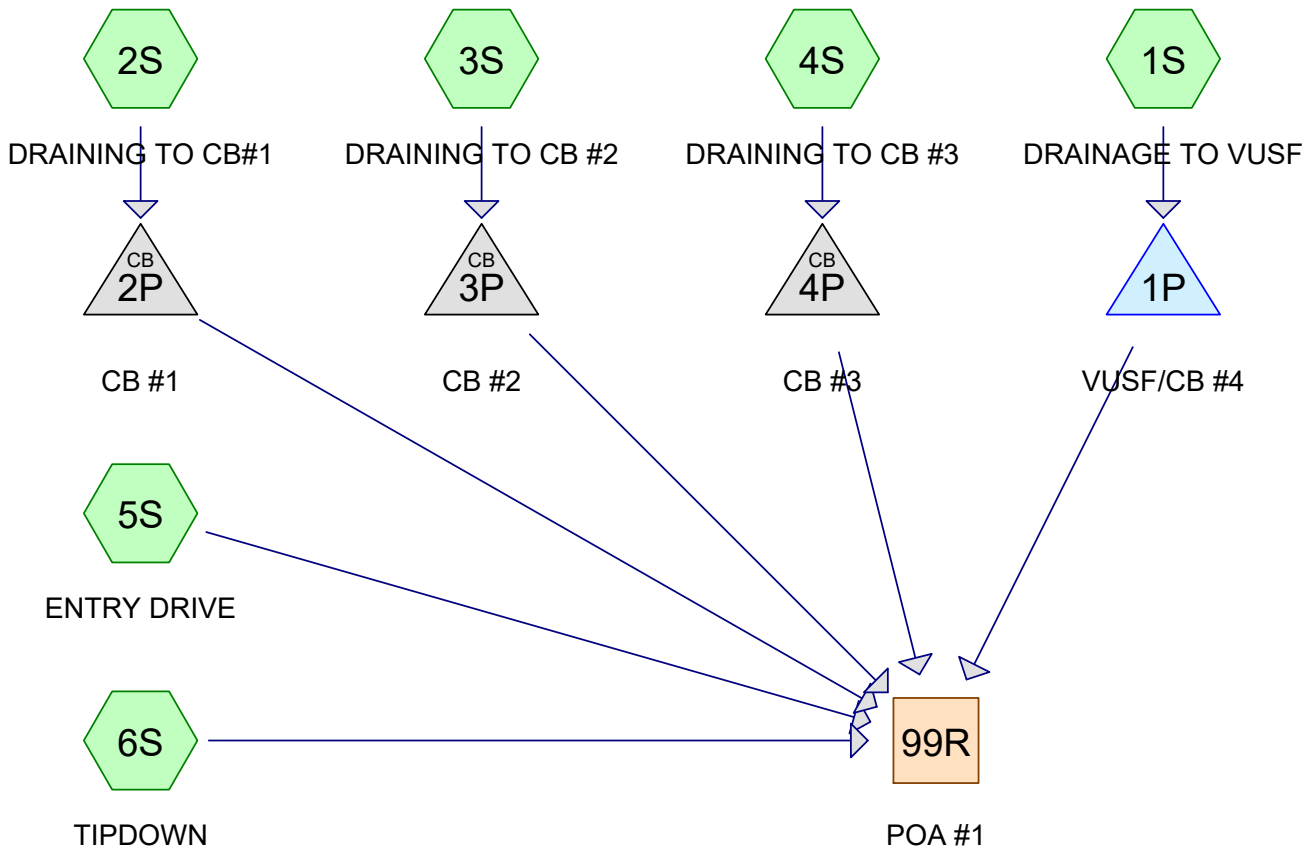
Component Percent Cutoff: None Specified

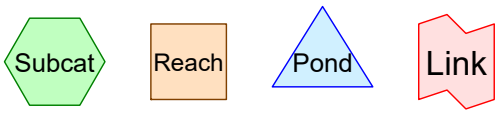
Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)

Attachment D

HydroCAD Calculations





Routing Diagram for PRE
Prepared by {enter your company name here}, Printed 3/1/2019
HydroCAD® 10.00-24 s/n 00620 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.545	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 6S)
0.002	98	BRICK AND CONCRETE SIDEWALK (6S)
0.004	98	BRICK SIDEWALK (2S)
0.018	98	PAVED ENTRY (5S)
0.320	98	PAVEMENT, SIDEWALKS, RETAINING WALL (1S)
0.889	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.545	HSG A	1S, 2S, 3S, 4S, 6S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.344	Other	1S, 2S, 5S, 6S
0.889		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.545	0.000	0.000	0.000	0.000	0.545	>75% Grass cover, Good
0.000	0.000	0.000	0.000	0.002	0.002	BRICK AND CONCRETE SIDEWALK
0.000	0.000	0.000	0.000	0.004	0.004	BRICK SIDEWALK
0.000	0.000	0.000	0.000	0.018	0.018	PAVED ENTRY
0.000	0.000	0.000	0.000	0.320	0.320	PAVEMENT, SIDEWALKS, RETAINING WALL
0.545	**0.000**	**0.000**	**0.000**	**0.344**	**0.889**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	91.00	89.30	76.0	0.0224	0.010	12.0	0.0	0.0
2	2P	95.70	93.40	68.5	0.0336	0.013	8.0	0.0	0.0
3	3P	93.40	91.30	62.5	0.0336	0.013	8.0	0.0	0.0
4	4P	91.30	91.30	70.8	0.0000	0.013	8.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DRAINAGE TO VUSF Runoff Area=23,562 sf 59.17% Impervious Runoff Depth=0.97"
Tc=5.0 min CN=74 Runoff=0.60 cfs 0.044 af

Subcatchment 2S: DRAINING TO CB#1 Runoff Area=3,570 sf 5.21% Impervious Runoff Depth=0.01"
Tc=5.0 min CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: DRAINING TO CB #2 Runoff Area=4,038 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=67' Slope=0.0467 '/' Tc=5.1 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 4S: DRAINING TO CB #3 Runoff Area=3,504 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=58' Slope=0.0100 '/' Tc=8.5 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 5S: ENTRY DRIVE Runoff Area=785 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.004 af

Subcatchment 6S: TIPDOWN Runoff Area=3,270 sf 2.32% Impervious Runoff Depth=0.00"
Flow Length=97' Slope=0.0670 '/' Tc=6.0 min CN=40 Runoff=0.00 cfs 0.000 af

Reach 99R: POA #1 Inflow=0.07 cfs 0.037 af
Outflow=0.07 cfs 0.037 af

Pond 1P: VUSF/CB #4 Peak Elev=94.90' Storage=1,054 cf Inflow=0.60 cfs 0.044 af
Outflow=0.05 cfs 0.032 af

Pond 2P: CB #1 Peak Elev=95.70' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=68.5' S=0.0336 '/' Outflow=0.00 cfs 0.000 af

Pond 3P: CB #2 Peak Elev=93.40' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=62.5' S=0.0336 '/' Outflow=0.00 cfs 0.000 af

Pond 4P: CB #3 Peak Elev=91.30' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=70.8' S=0.0000 '/' Outflow=0.00 cfs 0.000 af

Total Runoff Area = 0.889 ac Runoff Volume = 0.048 af Average Runoff Depth = 0.65"
61.30% Pervious = 0.545 ac 38.70% Impervious = 0.344 ac

Summary for Subcatchment 1S: DRAINAGE TO VUSF

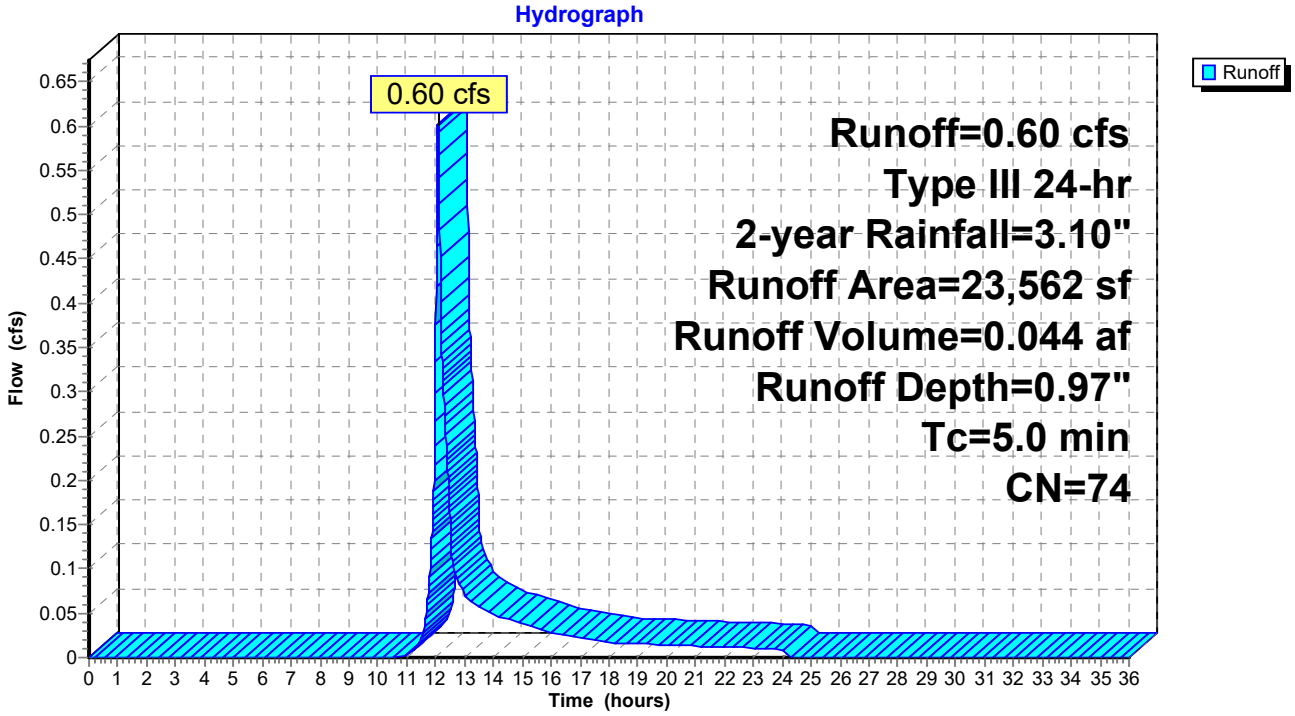
Runoff = 0.60 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	13,942	98	PAVEMENT, SIDEWALKS, RETAINING WALL
	9,620	39	>75% Grass cover, Good, HSG A
	23,562	74	Weighted Average
	9,620		40.83% Pervious Area
	13,942		59.17% Impervious Area

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

Subcatchment 1S: DRAINAGE TO VUSF



Summary for Subcatchment 2S: DRAINING TO CB#1

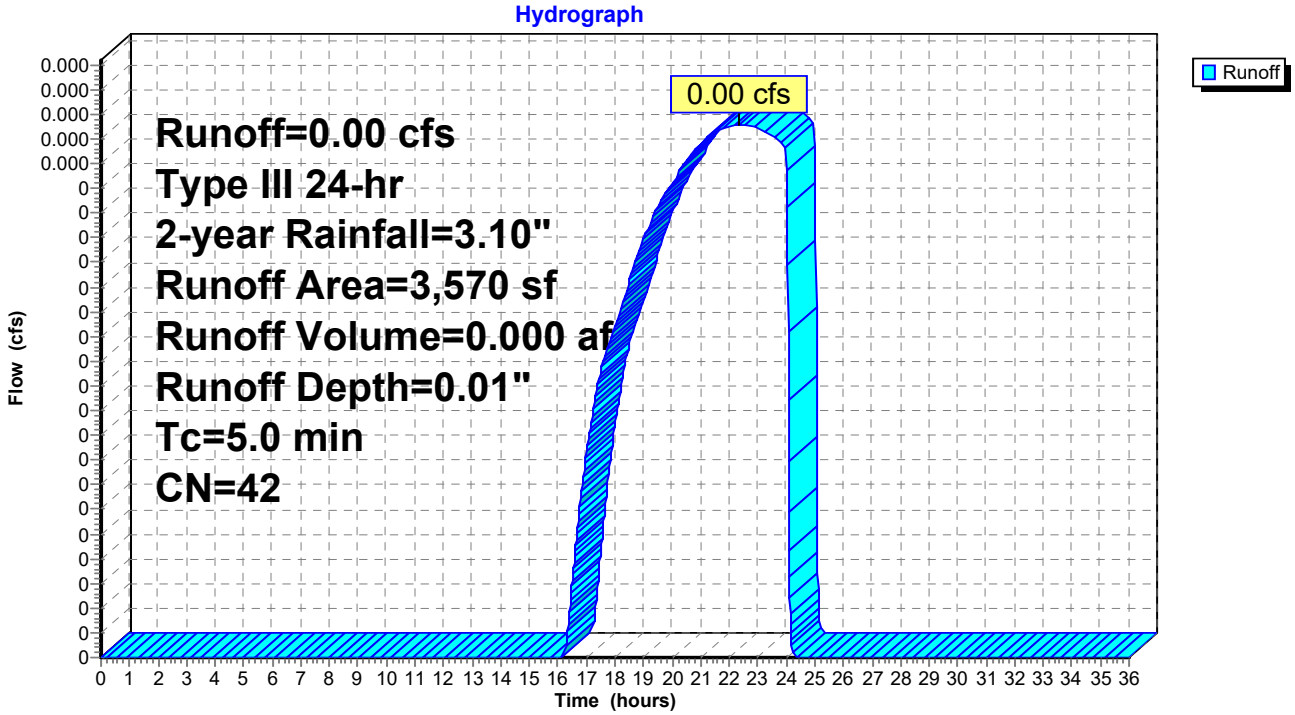
Runoff = 0.00 cfs @ 22.35 hrs, Volume= 0.000 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
	3,384	39	>75% Grass cover, Good, HSG A
*	186	98	BRICK SIDEWALK
	3,570	42	Weighted Average
	3,384		94.79% Pervious Area
	186		5.21% Impervious Area

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

Subcatchment 2S: DRAINING TO CB#1



Summary for Subcatchment 3S: DRAINING TO CB #2

[45] Hint: Runoff=Zero

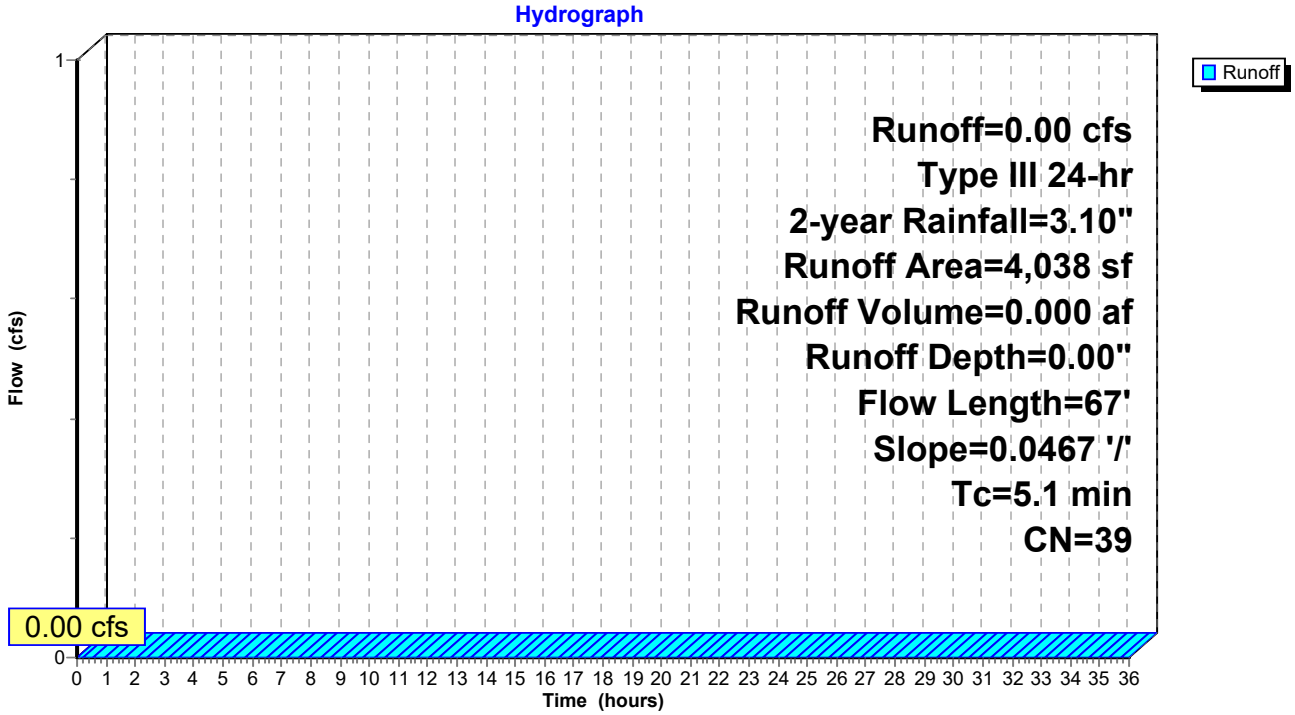
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
4,038	39	>75% Grass cover, Good, HSG A
4,038		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	67	0.0467	0.22		**Sheet Flow, 3A-3B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 3S: DRAINING TO CB #2



Summary for Subcatchment 4S: DRAINING TO CB #3

[45] Hint: Runoff=Zero

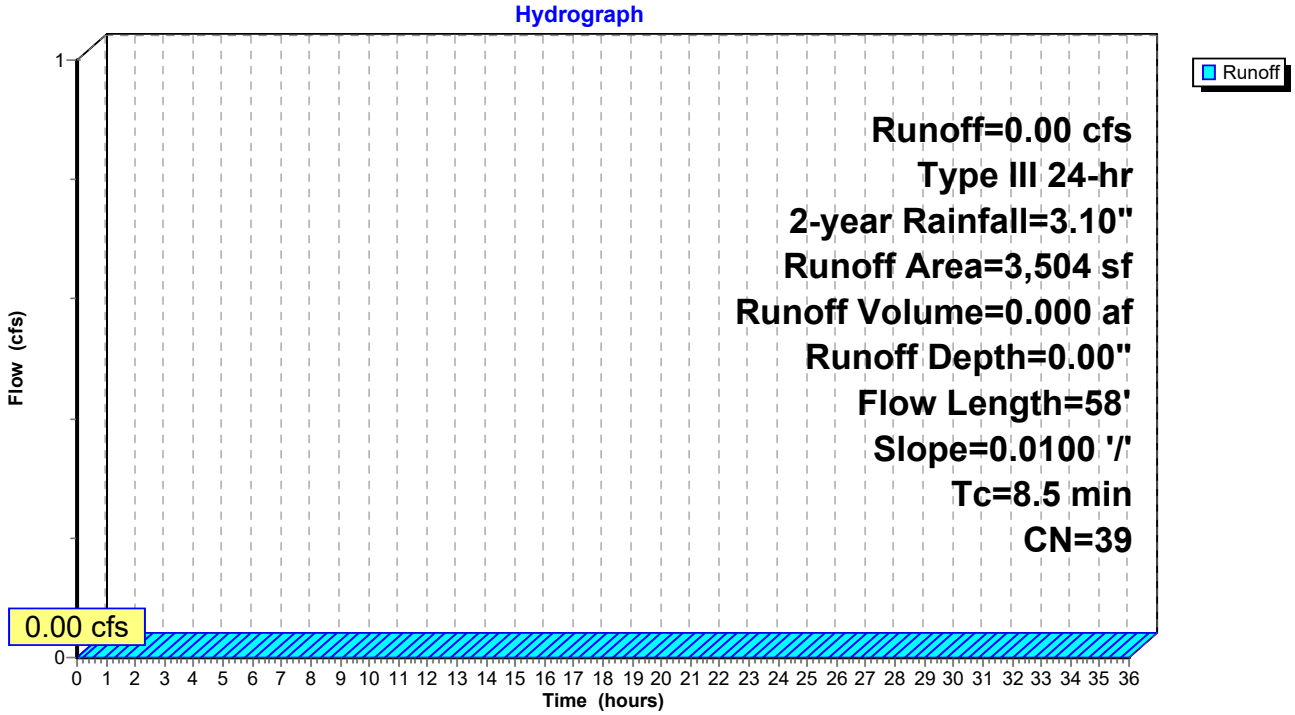
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
3,504	39	>75% Grass cover, Good, HSG A
3,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	58	0.0100	0.11		**Sheet Flow, 4A-4B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 4S: DRAINING TO CB #3



Summary for Subcatchment 5S: ENTRY DRIVE

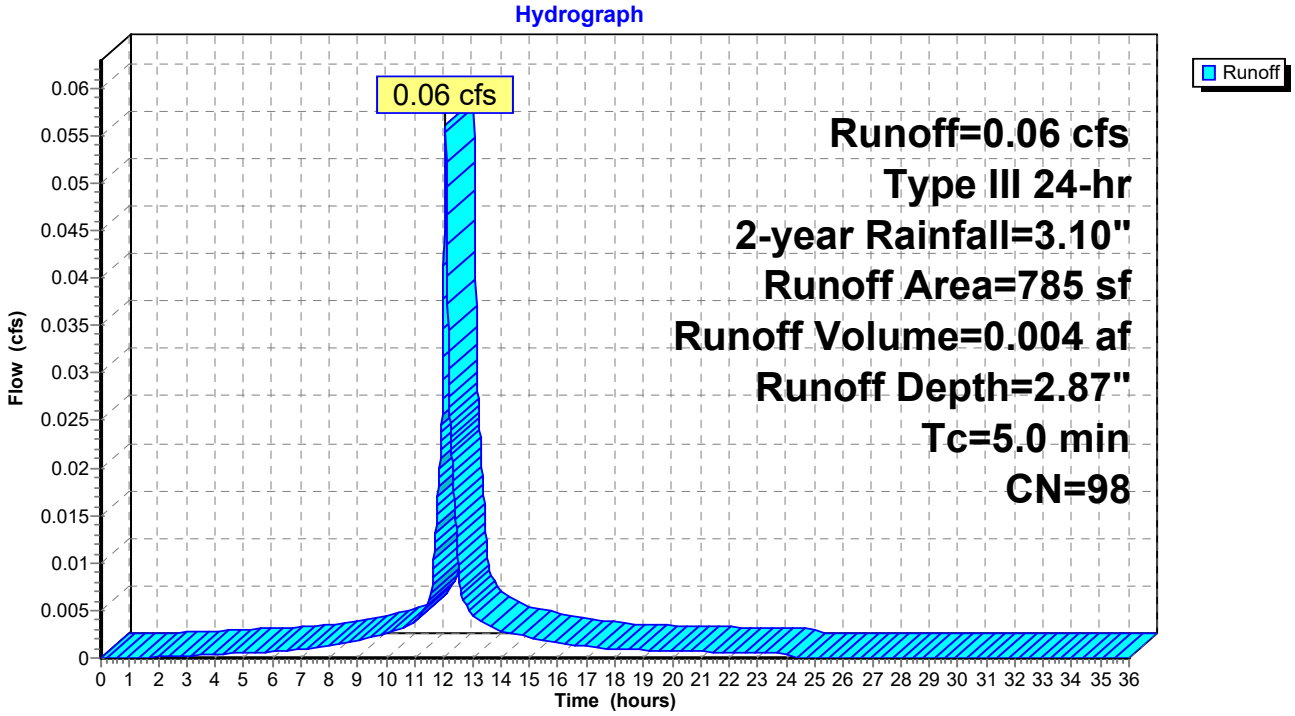
Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	785	98	PAVED ENTRY
	785		100.00% Impervious Area

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

Subcatchment 5S: ENTRY DRIVE



Summary for Subcatchment 6S: TIPDOWN

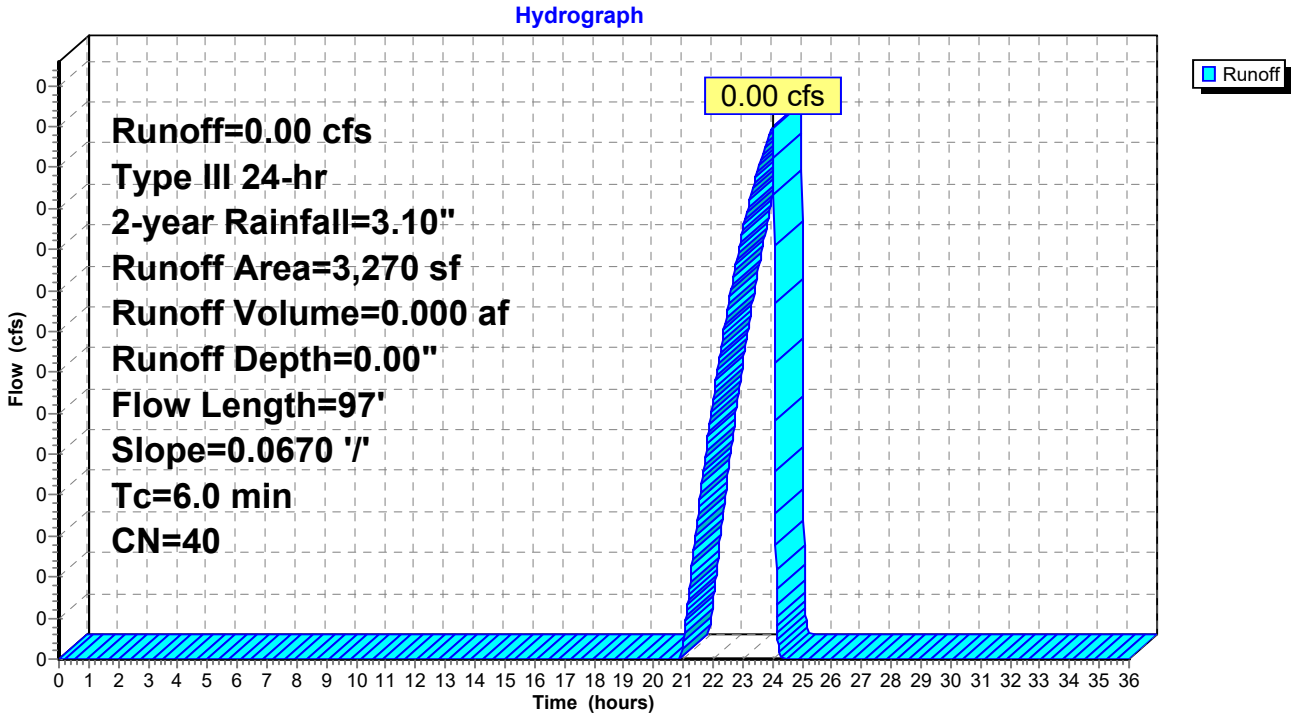
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
	3,194	39	>75% Grass cover, Good, HSG A
*	76	98	BRICK AND CONCRETE SIDEWALK
	3,270	40	Weighted Average
	3,194		97.68% Pervious Area
	76		2.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	97	0.0670	0.27		**Sheet Flow, 6A-6B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 6S: TIPDOWN



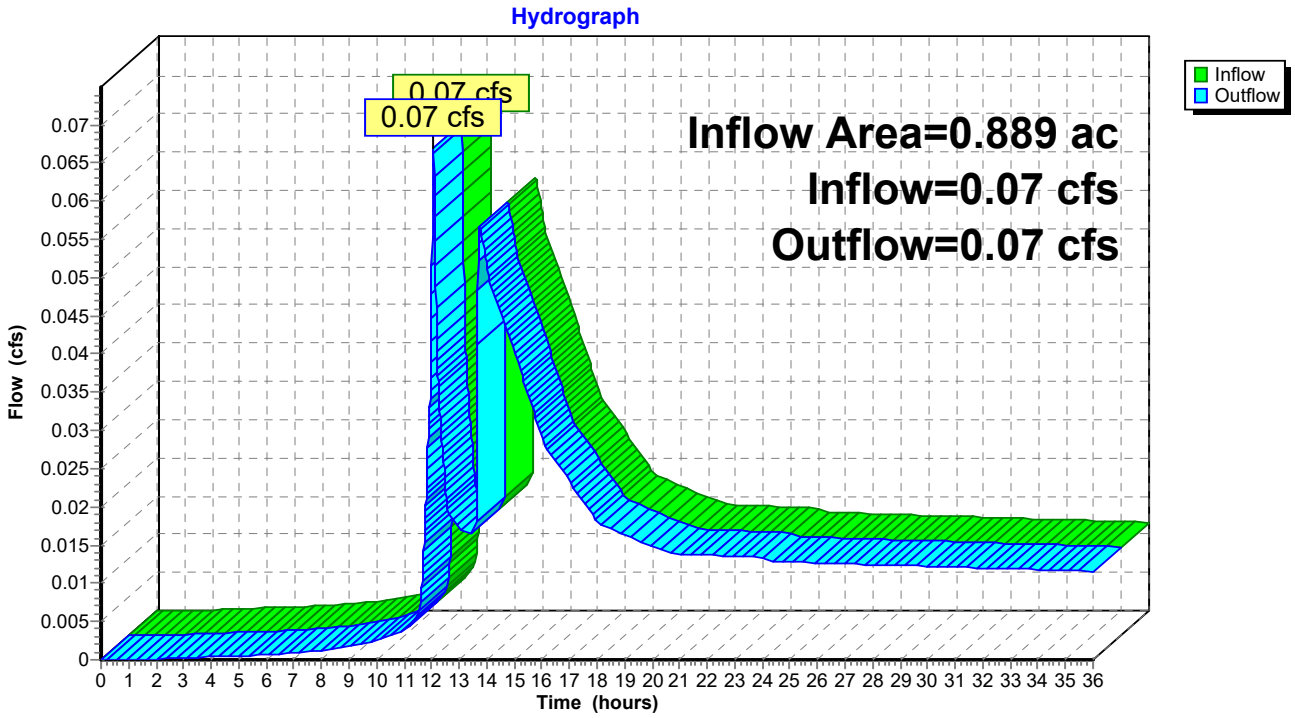
Summary for Reach 99R: POA #1

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

Inflow Area = 0.889 ac, 38.70% Impervious, Inflow Depth > 0.49" for 2-year event
Inflow = 0.07 cfs @ 12.07 hrs, Volume= 0.037 af
Outflow = 0.07 cfs @ 12.07 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: POA #1



Summary for Pond 1P: VUSF/CB #4

Inflow Area = 0.541 ac, 59.17% Impervious, Inflow Depth = 0.97" for 2-year event
Inflow = 0.60 cfs @ 12.08 hrs, Volume= 0.044 af
Outflow = 0.05 cfs @ 13.74 hrs, Volume= 0.032 af, Atten= 91%, Lag= 99.6 min
Primary = 0.05 cfs @ 13.74 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 94.90' @ 13.74 hrs Surf.Area= 1,181 sf Storage= 1,054 cf
Flood Elev= 96.00' Surf.Area= 1,939 sf Storage= 2,381 cf

Plug-Flow detention time= 547.4 min calculated for 0.032 af (73% of inflow)
Center-of-Mass det. time= 449.8 min (1,313.0 - 863.2)

Volume	Invert	Avail.Storage	Storage Description
#1	93.00'	2,277 cf	**Custom Stage Data (Prismatic)** Listed below
#2	91.50'	24 cf	**FILTER MEDIA (Prismatic)** Listed below (Recalc) 240 cf Overall x 10.0% Voids
#3	91.00'	5 cf	**4.0" Round Pipe Storage** Inside #4 L= 60.0'
#4	90.30'	75 cf	**FREE-DRAINING GRAVEL (Prismatic)** Listed below (Recalc) 192 cf Overall - 5 cf Embedded = 187 cf x 40.0% Voids
		2,381 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.00	160	0	0
93.50	305	116	116
94.00	501	202	318
95.00	899	700	1,018
96.00	1,619	1,259	2,277

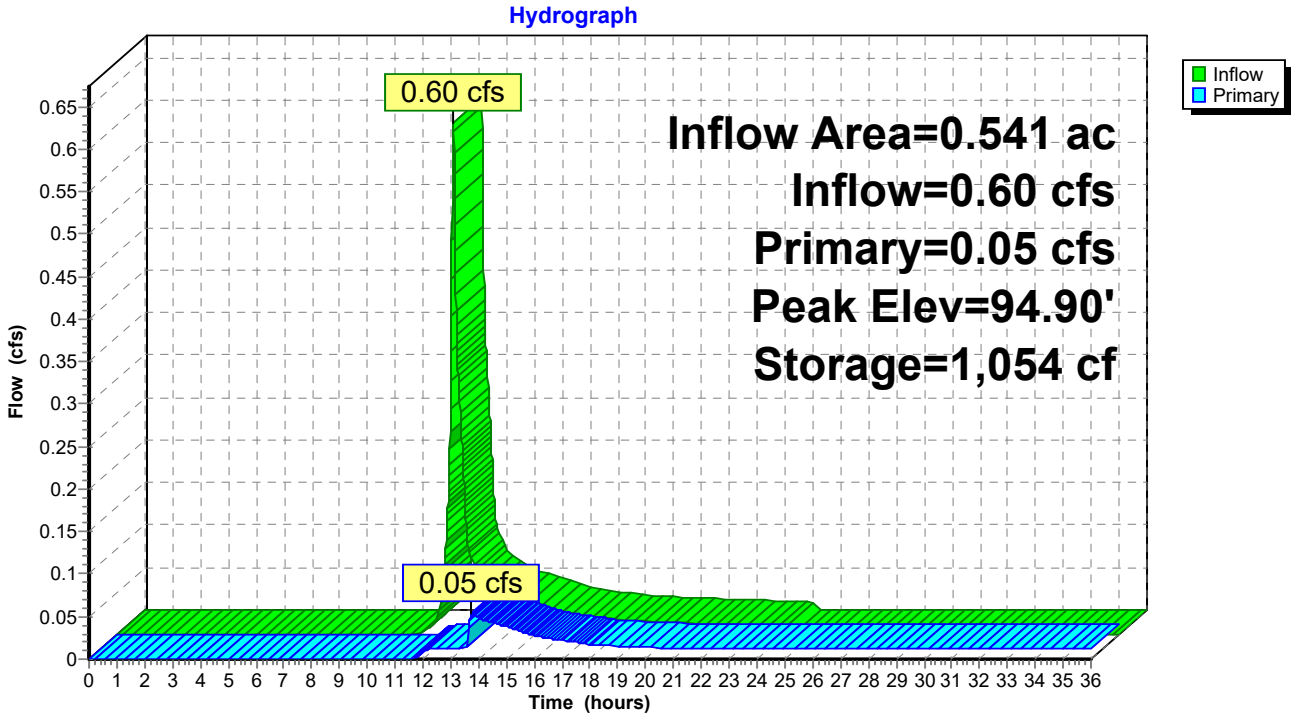
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	160	0	0
93.00	160	240	240

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	160	0	0
91.50	160	192	192

Device	Routing	Invert	Outlet Devices
#1	Device 3	91.00'	**0.5" Vert. WQV** C= 0.600
#2	Device 3	94.90'	**2.0" x 2.0" Horiz. CB OVERFLOW X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Primary	91.00'	**12.0" Round SDR** L= 76.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.00' / 89.30' S= 0.0224 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.03 cfs @ 13.74 hrs HW=94.90' (Free Discharge)
└─**3=SDR** (Passes 0.03 cfs of 5.51 cfs potential flow)
  ├─**1=WQV** (Orifice Controls 0.01 cfs @ 9.49 fps)
  └─**2=CB OVERFLOW** (Weir Controls 0.02 cfs @ 0.21 fps)

Pond 1P: VUSF/CB #4



Summary for Pond 2P: CB #1

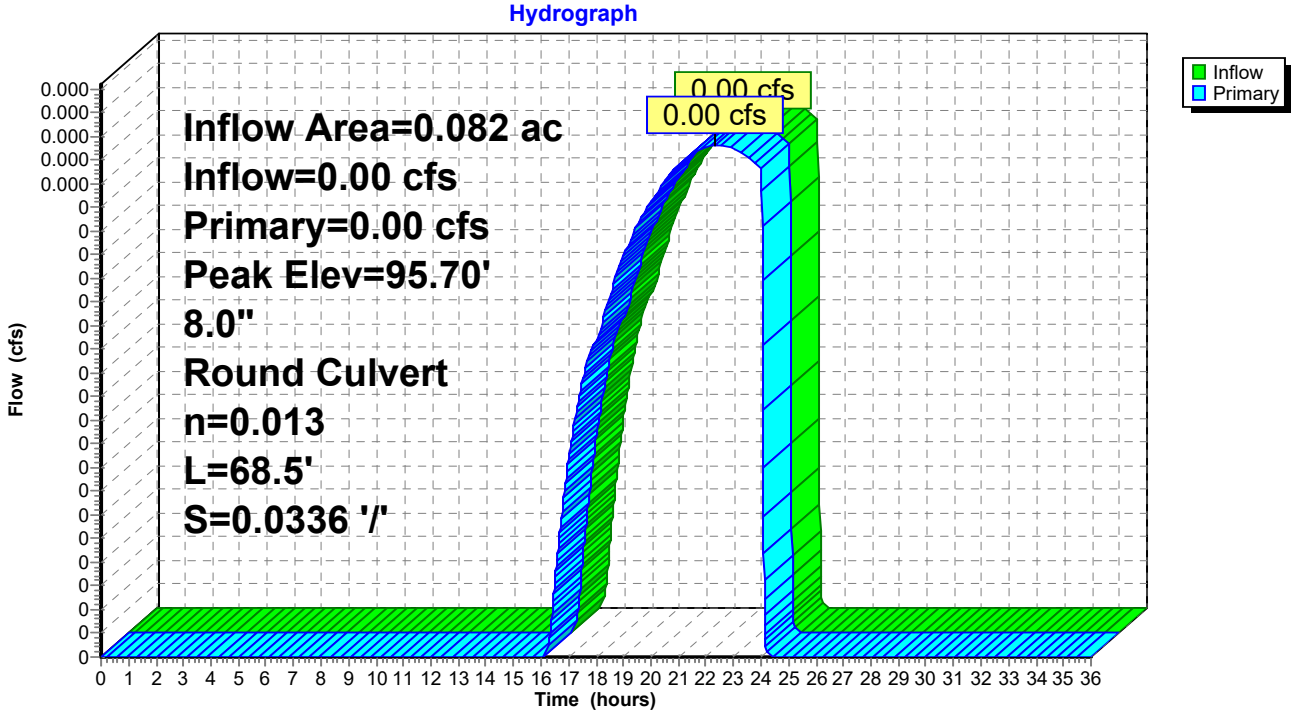
Inflow Area = 0.082 ac, 5.21% Impervious, Inflow Depth = 0.01" for 2-year event
Inflow = 0.00 cfs @ 22.35 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 22.35 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 22.35 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.70' @ 22.35 hrs
Flood Elev= 99.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	**8.0" Round HDPE** L= 68.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 95.70' / 93.40' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 22.35 hrs HW=95.70' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.00 cfs @ 0.08 fps)

Pond 2P: CB #1



Summary for Pond 3P: CB #2

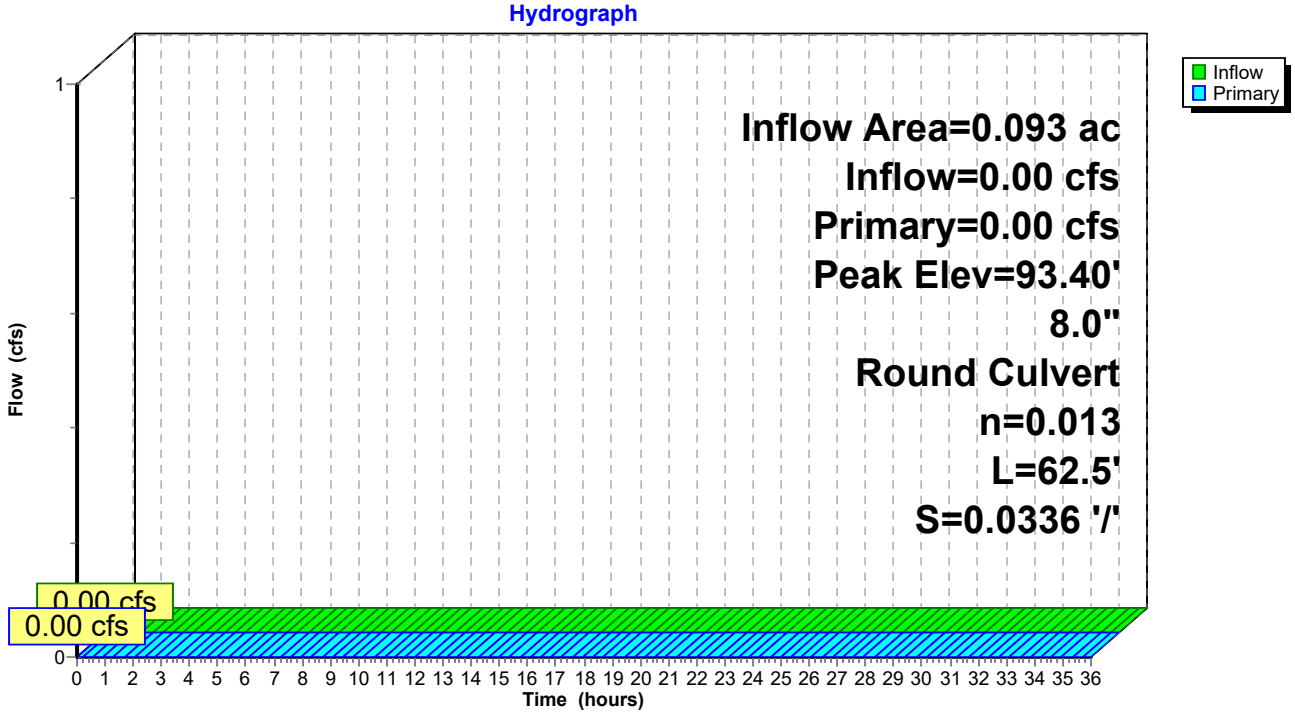
Inflow Area = 0.093 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 93.40' @ 0.00 hrs
Flood Elev= 97.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	93.40'	**8.0" Round HDPE** L= 62.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.40' / 91.30' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.40' (Free Discharge)
└**1=HDPE** (Controls 0.00 cfs)

Pond 3P: CB #2



Summary for Pond 4P: CB #3

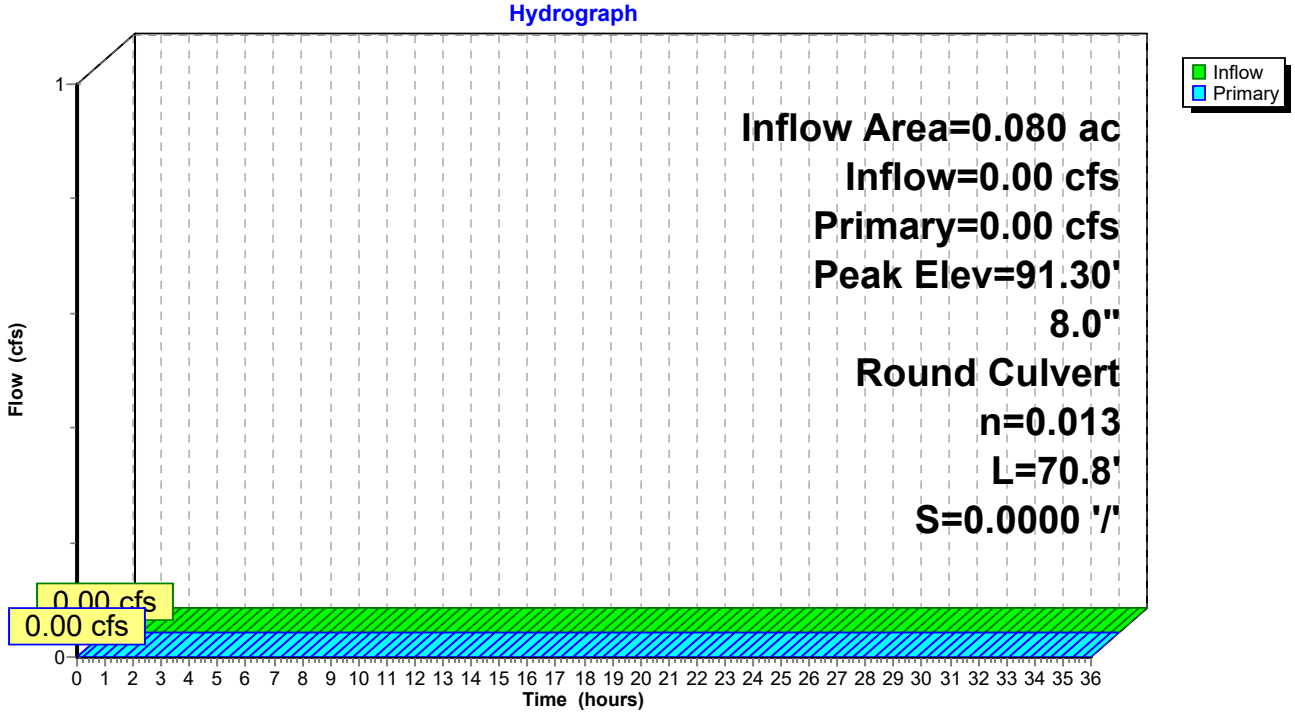
Inflow Area = 0.080 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.30' @ 0.00 hrs
Flood Elev= 95.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	91.30'	**8.0" Round HDPE** L= 70.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.30' / 91.30' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.30' (Free Discharge)
└**1=HDPE** (Controls 0.00 cfs)

Pond 4P: CB #3



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DRAINAGE TO VUSF Runoff Area=23,562 sf 59.17% Impervious Runoff Depth=2.05"
Tc=5.0 min CN=74 Runoff=1.34 cfs 0.092 af

Subcatchment 2S: DRAINING TO CB#1 Runoff Area=3,570 sf 5.21% Impervious Runoff Depth=0.22"
Tc=5.0 min CN=42 Runoff=0.00 cfs 0.001 af

Subcatchment 3S: DRAINING TO CB #2 Runoff Area=4,038 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=67' Slope=0.0467 '/' Tc=5.1 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 4S: DRAINING TO CB #3 Runoff Area=3,504 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=58' Slope=0.0100 '/' Tc=8.5 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 5S: ENTRY DRIVE Runoff Area=785 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=0.08 cfs 0.007 af

Subcatchment 6S: TIPDOWN Runoff Area=3,270 sf 2.32% Impervious Runoff Depth=0.15"
Flow Length=97' Slope=0.0670 '/' Tc=6.0 min CN=40 Runoff=0.00 cfs 0.001 af

Reach 99R: POA #1 Inflow=1.18 cfs 0.091 af
Outflow=1.18 cfs 0.091 af

Pond 1P: VUSF/CB #4 Peak Elev=94.96' Storage=1,096 cf Inflow=1.34 cfs 0.092 af
Outflow=1.11 cfs 0.080 af

Pond 2P: CB #1 Peak Elev=95.74' Inflow=0.00 cfs 0.001 af
8.0" Round Culvert n=0.013 L=68.5' S=0.0336 '/' Outflow=0.00 cfs 0.001 af

Pond 3P: CB #2 Peak Elev=93.42' Inflow=0.00 cfs 0.001 af
8.0" Round Culvert n=0.013 L=62.5' S=0.0336 '/' Outflow=0.00 cfs 0.001 af

Pond 4P: CB #3 Peak Elev=91.35' Inflow=0.00 cfs 0.001 af
8.0" Round Culvert n=0.013 L=70.8' S=0.0000 '/' Outflow=0.00 cfs 0.001 af

Total Runoff Area = 0.889 ac Runoff Volume = 0.103 af Average Runoff Depth = 1.39"
61.30% Pervious = 0.545 ac 38.70% Impervious = 0.344 ac

Summary for Subcatchment 1S: DRAINAGE TO VUSF

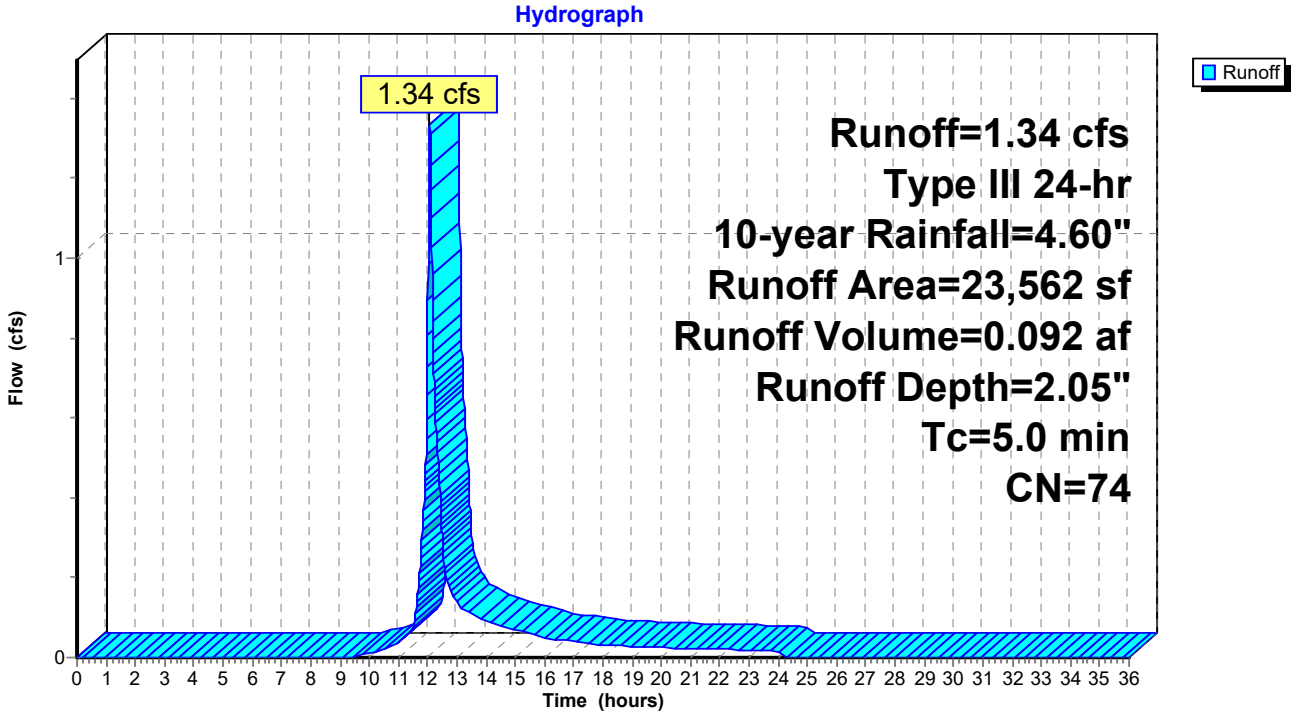
Runoff = 1.34 cfs @ 12.08 hrs, Volume= 0.092 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	13,942	98	PAVEMENT, SIDEWALKS, RETAINING WALL
	9,620	39	>75% Grass cover, Good, HSG A
	23,562	74	Weighted Average
	9,620		40.83% Pervious Area
	13,942		59.17% Impervious Area

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

Subcatchment 1S: DRAINAGE TO VUSF



Summary for Subcatchment 2S: DRAINING TO CB#1

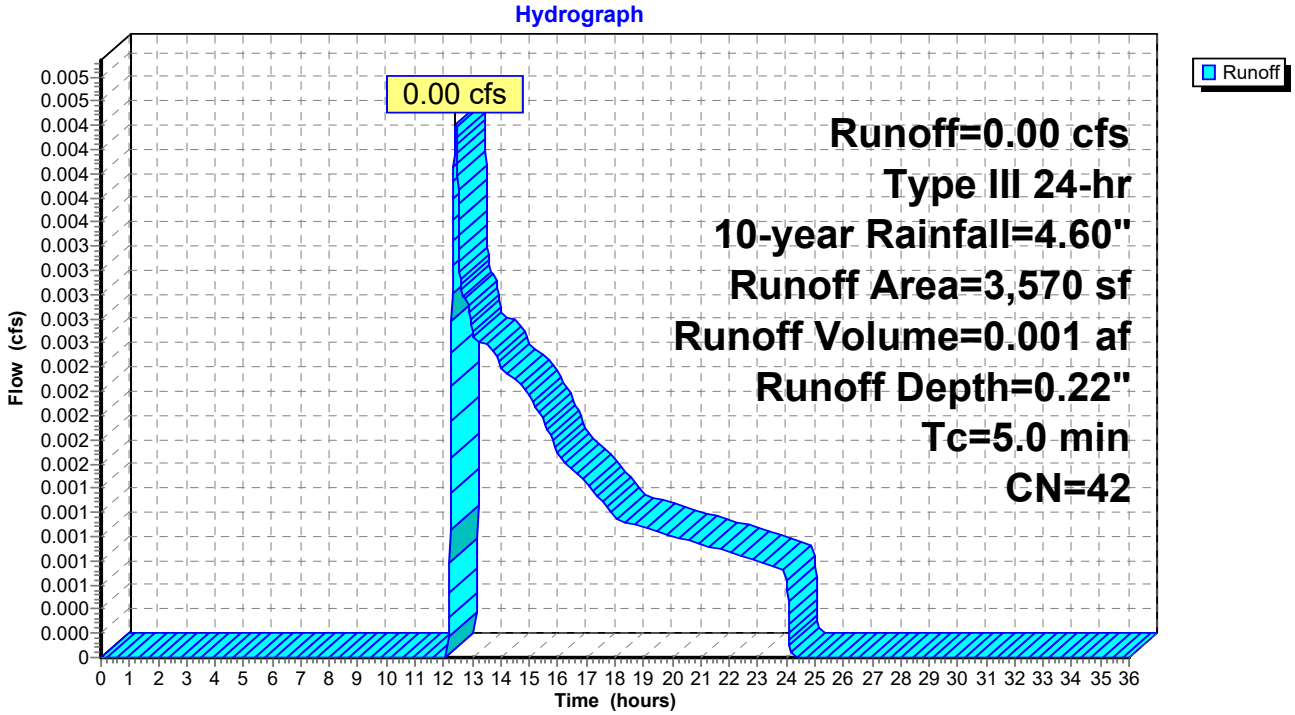
Runoff = 0.00 cfs @ 12.42 hrs, Volume= 0.001 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
	3,384	39	>75% Grass cover, Good, HSG A
*	186	98	BRICK SIDEWALK
	3,570	42	Weighted Average
	3,384		94.79% Pervious Area
	186		5.21% Impervious Area

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

Subcatchment 2S: DRAINING TO CB#1



Summary for Subcatchment 3S: DRAINING TO CB #2

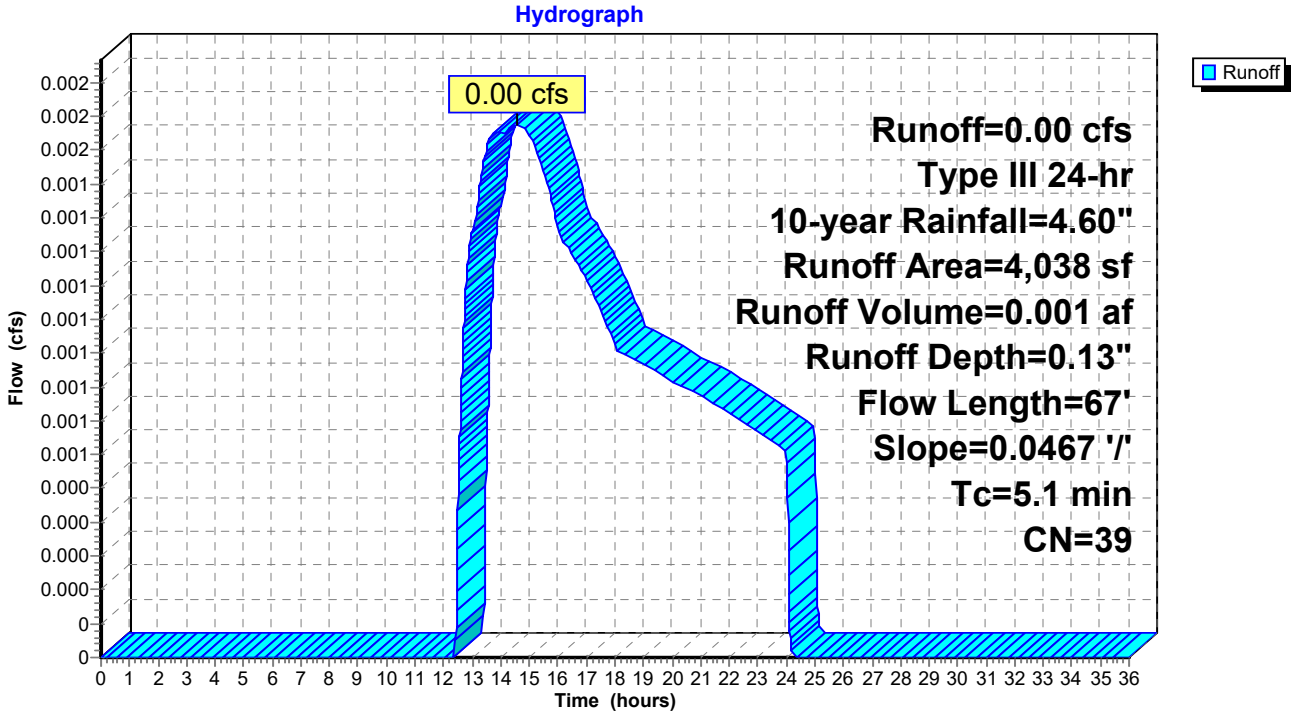
Runoff = 0.00 cfs @ 14.57 hrs, Volume= 0.001 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
4,038	39	>75% Grass cover, Good, HSG A
4,038		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	67	0.0467	0.22		**Sheet Flow, 3A-3B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 3S: DRAINING TO CB #2



Summary for Subcatchment 4S: DRAINING TO CB #3

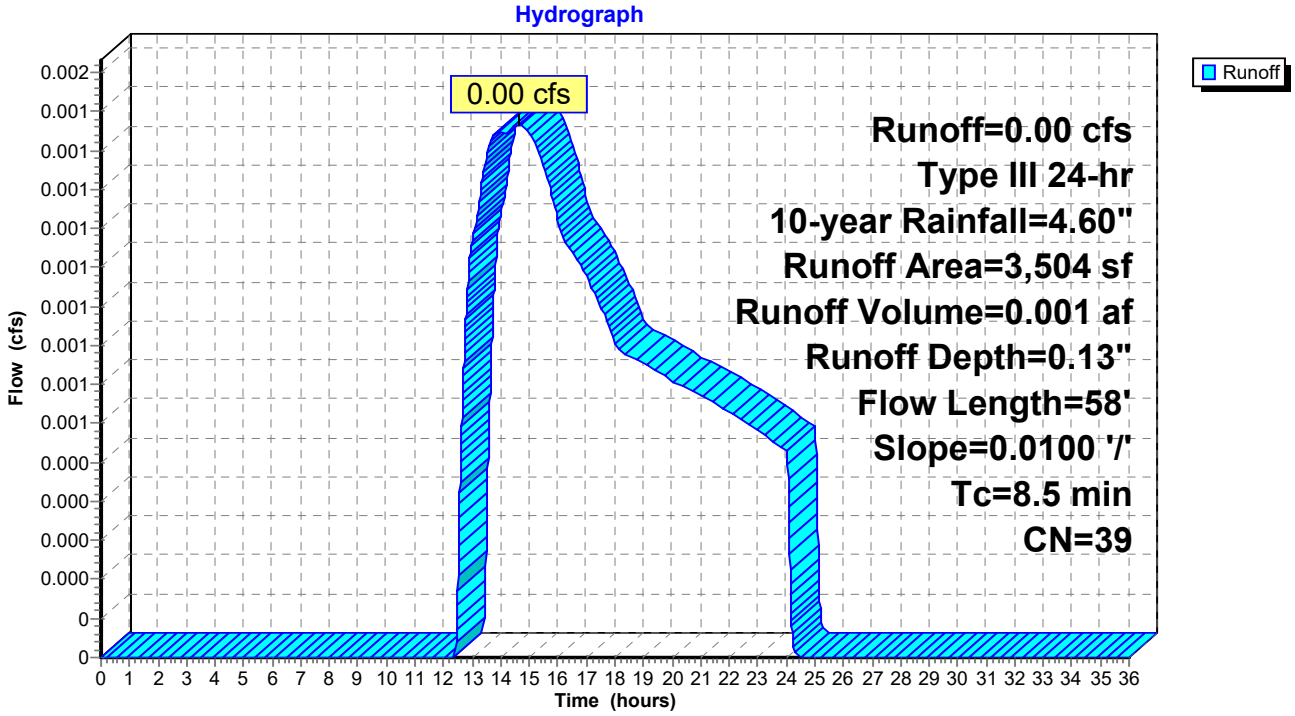
Runoff = 0.00 cfs @ 14.61 hrs, Volume= 0.001 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
3,504	39	>75% Grass cover, Good, HSG A
3,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	58	0.0100	0.11		**Sheet Flow, 4A-4B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 4S: DRAINING TO CB #3



Summary for Subcatchment 5S: ENTRY DRIVE

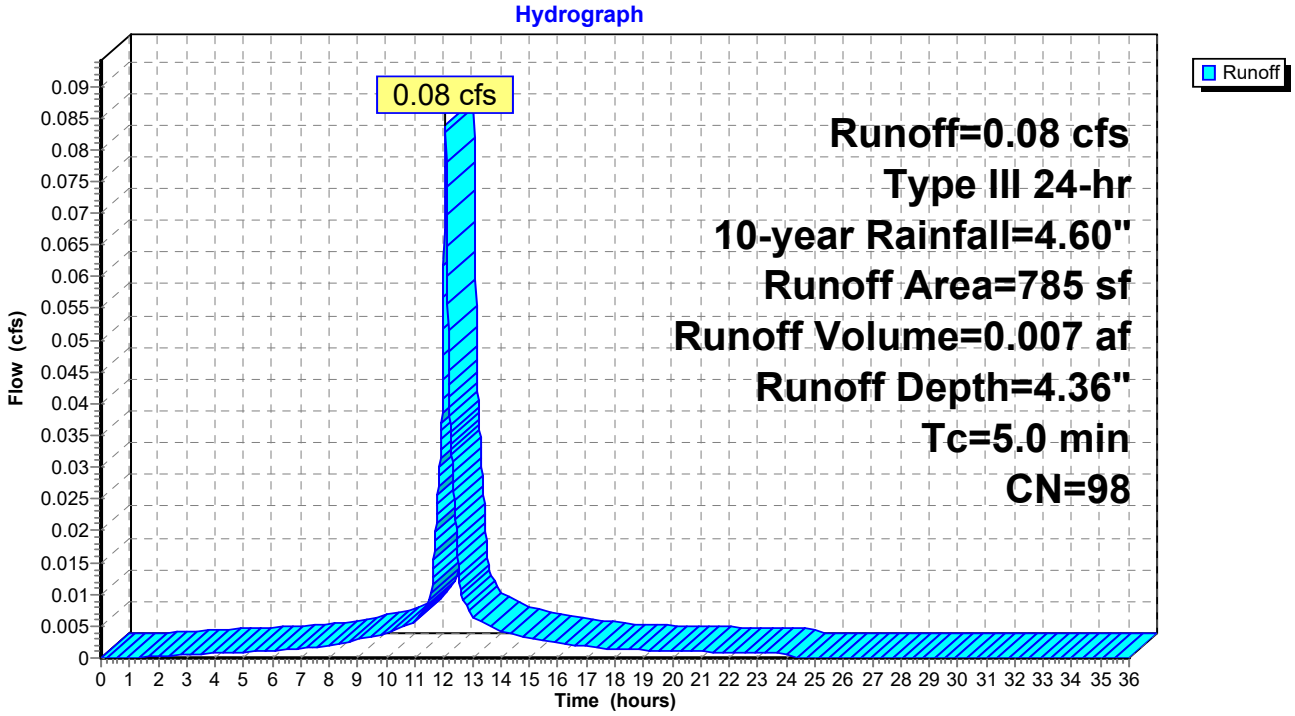
Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	785	98	PAVED ENTRY
	785		100.00% Impervious Area

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

Subcatchment 5S: ENTRY DRIVE



Summary for Subcatchment 6S: TIPDOWN

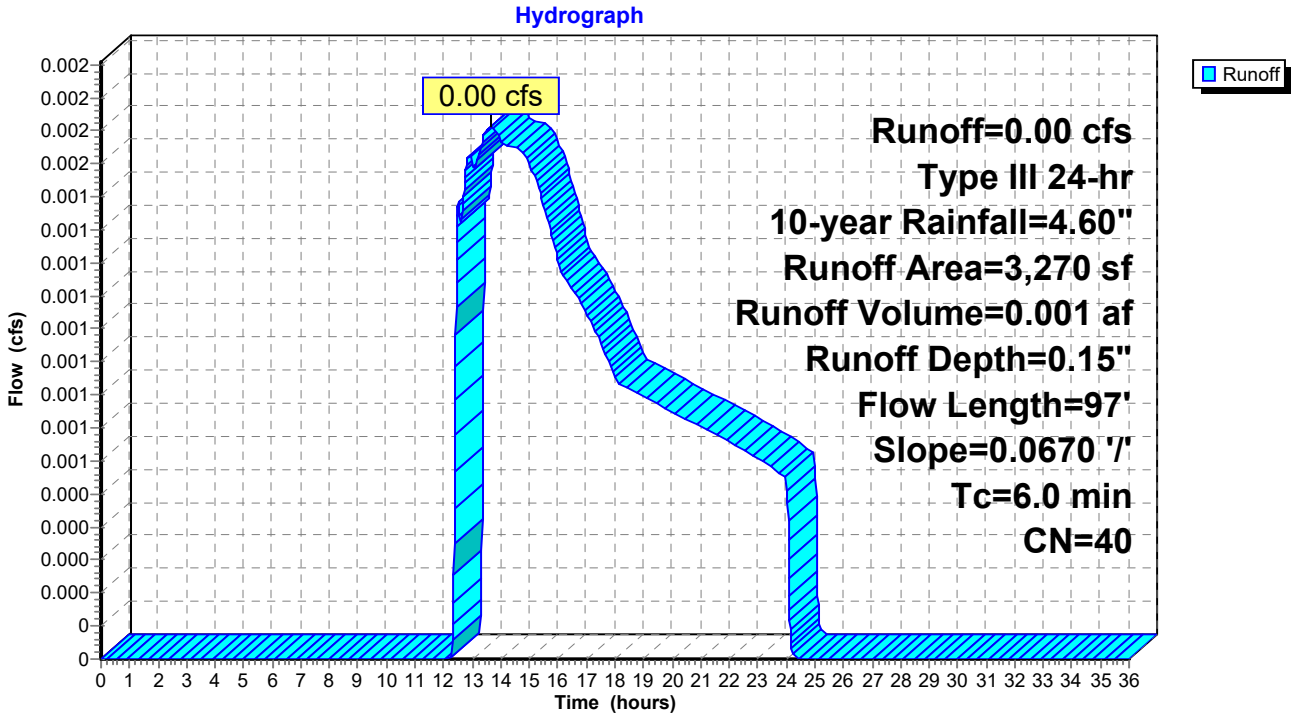
Runoff = 0.00 cfs @ 13.66 hrs, Volume= 0.001 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
	3,194	39	>75% Grass cover, Good, HSG A
*	76	98	BRICK AND CONCRETE SIDEWALK
	3,270	40	Weighted Average
	3,194		97.68% Pervious Area
	76		2.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	97	0.0670	0.27		**Sheet Flow, 6A-6B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 6S: TIPDOWN



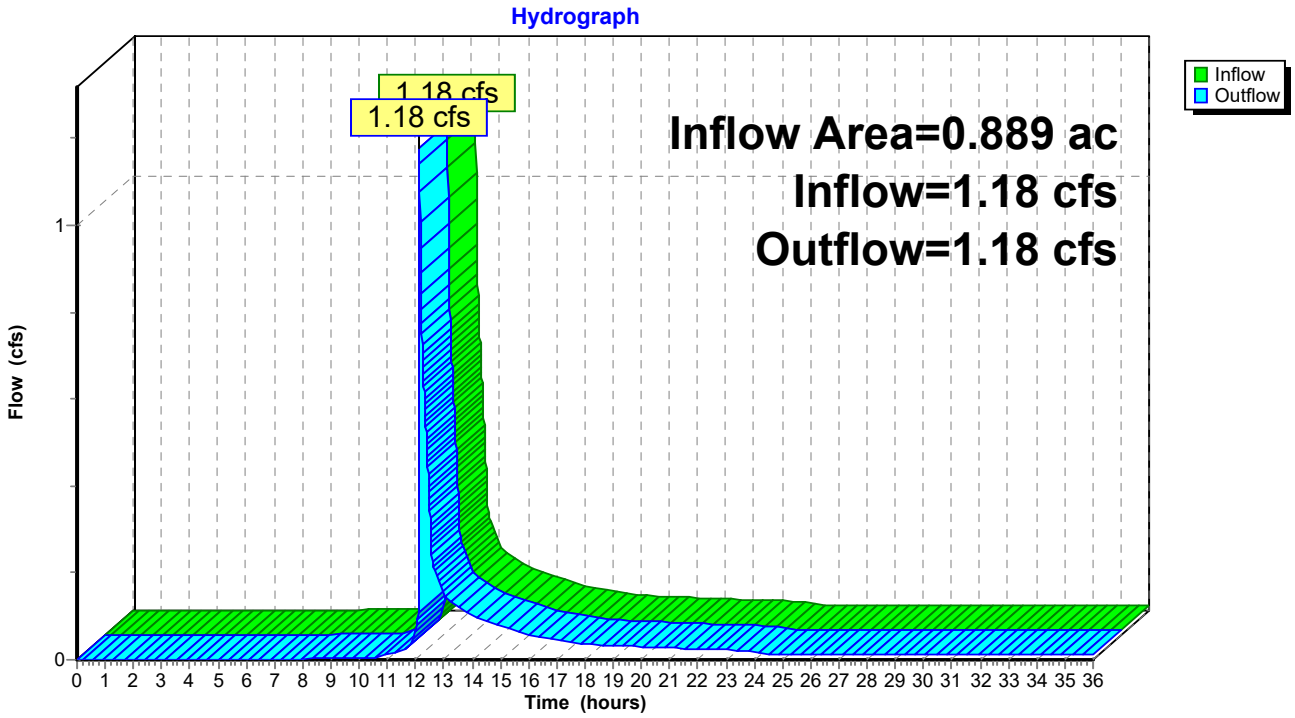
Summary for Reach 99R: POA #1

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

Inflow Area = 0.889 ac, 38.70% Impervious, Inflow Depth > 1.23" for 10-year event
Inflow = 1.18 cfs @ 12.13 hrs, Volume= 0.091 af
Outflow = 1.18 cfs @ 12.13 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: POA #1



Summary for Pond 1P: VUSF/CB #4

Inflow Area = 0.541 ac, 59.17% Impervious, Inflow Depth = 2.05" for 10-year event
Inflow = 1.34 cfs @ 12.08 hrs, Volume= 0.092 af
Outflow = 1.11 cfs @ 12.13 hrs, Volume= 0.080 af, Atten= 17%, Lag= 3.2 min
Primary = 1.11 cfs @ 12.13 hrs, Volume= 0.080 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 94.96' @ 12.13 hrs Surf.Area= 1,204 sf Storage= 1,096 cf
Flood Elev= 96.00' Surf.Area= 1,939 sf Storage= 2,381 cf

Plug-Flow detention time= 244.3 min calculated for 0.080 af (87% of inflow)
Center-of-Mass det. time= 184.8 min (1,025.5 - 840.7)

Volume	Invert	Avail.Storage	Storage Description
#1	93.00'	2,277 cf	**Custom Stage Data (Prismatic)** Listed below
#2	91.50'	24 cf	**FILTER MEDIA (Prismatic)** Listed below (Recalc) 240 cf Overall x 10.0% Voids
#3	91.00'	5 cf	**4.0" Round Pipe Storage** Inside #4 L= 60.0'
#4	90.30'	75 cf	**FREE-DRAINING GRAVEL (Prismatic)** Listed below (Recalc) 192 cf Overall - 5 cf Embedded = 187 cf x 40.0% Voids
		2,381 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.00	160	0	0
93.50	305	116	116
94.00	501	202	318
95.00	899	700	1,018
96.00	1,619	1,259	2,277

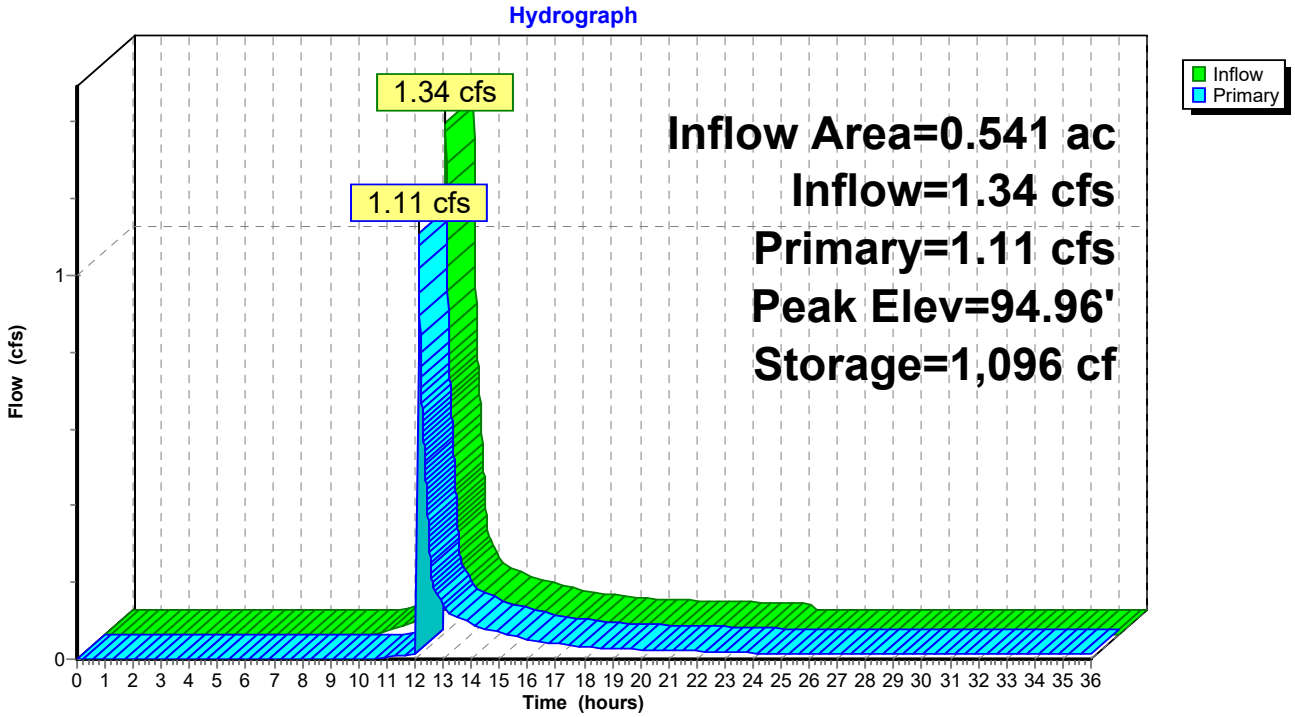
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	160	0	0
93.00	160	240	240

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	160	0	0
91.50	160	192	192

Device	Routing	Invert	Outlet Devices
#1	Device 3	91.00'	**0.5" Vert. WQV** C= 0.600
#2	Device 3	94.90'	**2.0" x 2.0" Horiz. CB OVERFLOW X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Primary	91.00'	**12.0" Round SDR** L= 76.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.00' / 89.30' S= 0.0224 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.23 cfs @ 12.13 hrs HW=94.96' (Free Discharge)
└─**3=SDR** (Passes 1.23 cfs of 5.56 cfs potential flow)
  ├─**1=WQV** (Orifice Controls 0.01 cfs @ 9.56 fps)
  └─**2=CB OVERFLOW** (Orifice Controls 1.21 cfs @ 1.21 fps)

Pond 1P: VUSF/CB #4



Summary for Pond 2P: CB #1

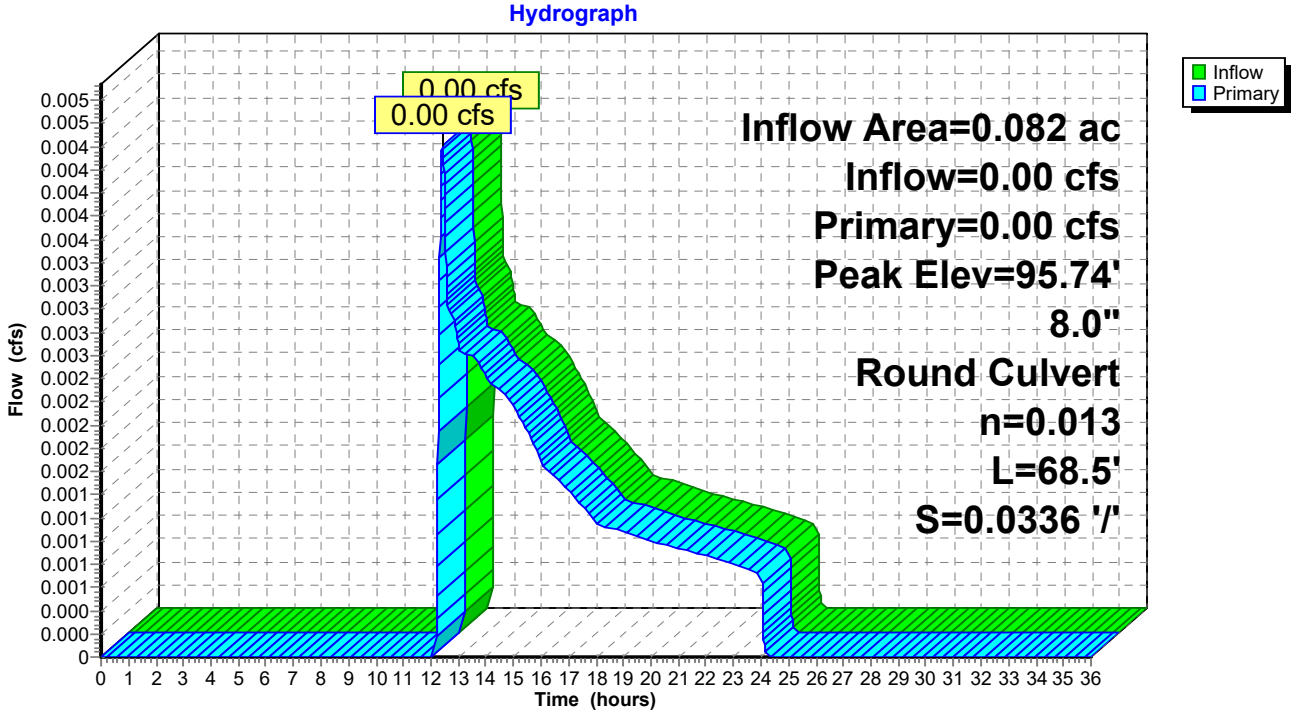
Inflow Area =	0.082 ac,	5.21% Impervious,	Inflow Depth =	0.22"	for 10-year event
Inflow =	0.00 cfs @	12.42 hrs,	Volume=	0.001 af	
Outflow =	0.00 cfs @	12.42 hrs,	Volume=	0.001 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @	12.42 hrs,	Volume=	0.001 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.74' @ 12.42 hrs
Flood Elev= 99.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	**8.0" Round HDPE** L= 68.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 95.70' / 93.40' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 12.42 hrs HW=95.74' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.00 cfs @ 0.53 fps)

Pond 2P: CB #1



Summary for Pond 3P: CB #2

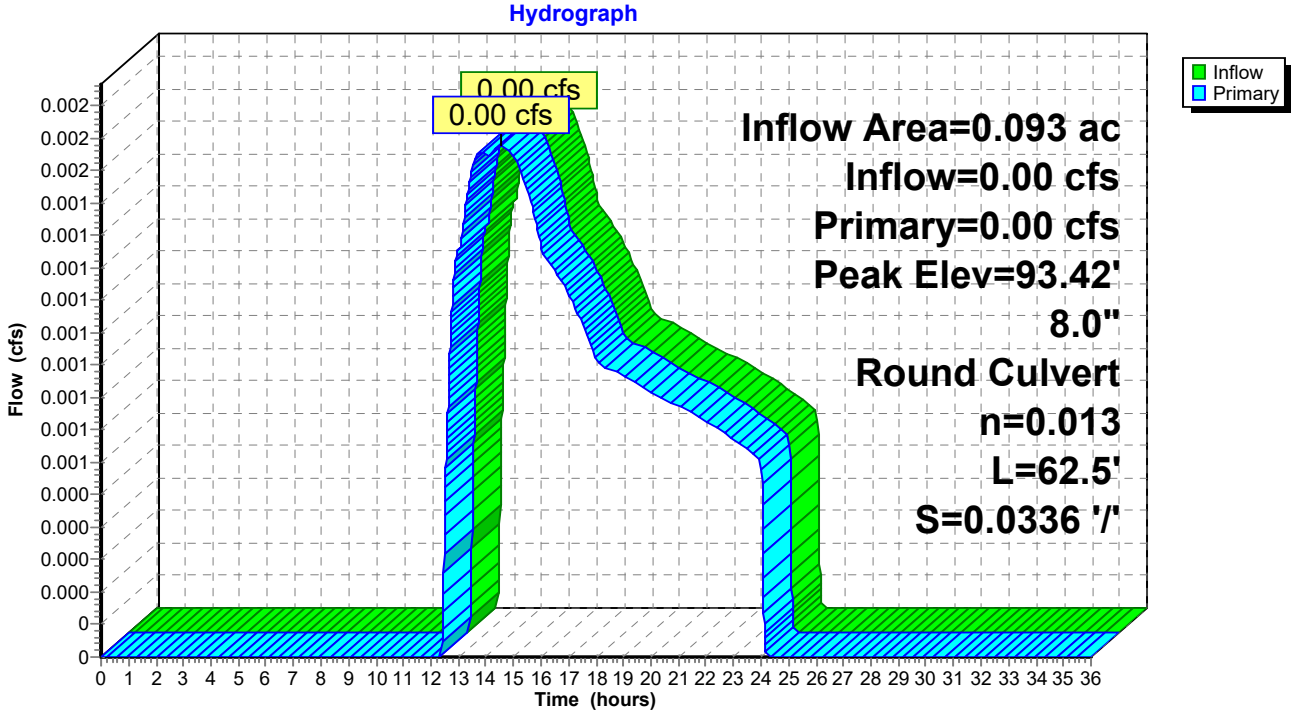
Inflow Area = 0.093 ac, 0.00% Impervious, Inflow Depth = 0.13" for 10-year event
Inflow = 0.00 cfs @ 14.57 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 14.57 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 14.57 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 93.42' @ 14.57 hrs
Flood Elev= 97.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	93.40'	**8.0" Round HDPE** L= 62.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.40' / 91.30' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 14.57 hrs HW=93.42' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.00 cfs @ 0.33 fps)

Pond 3P: CB #2



Summary for Pond 4P: CB #3

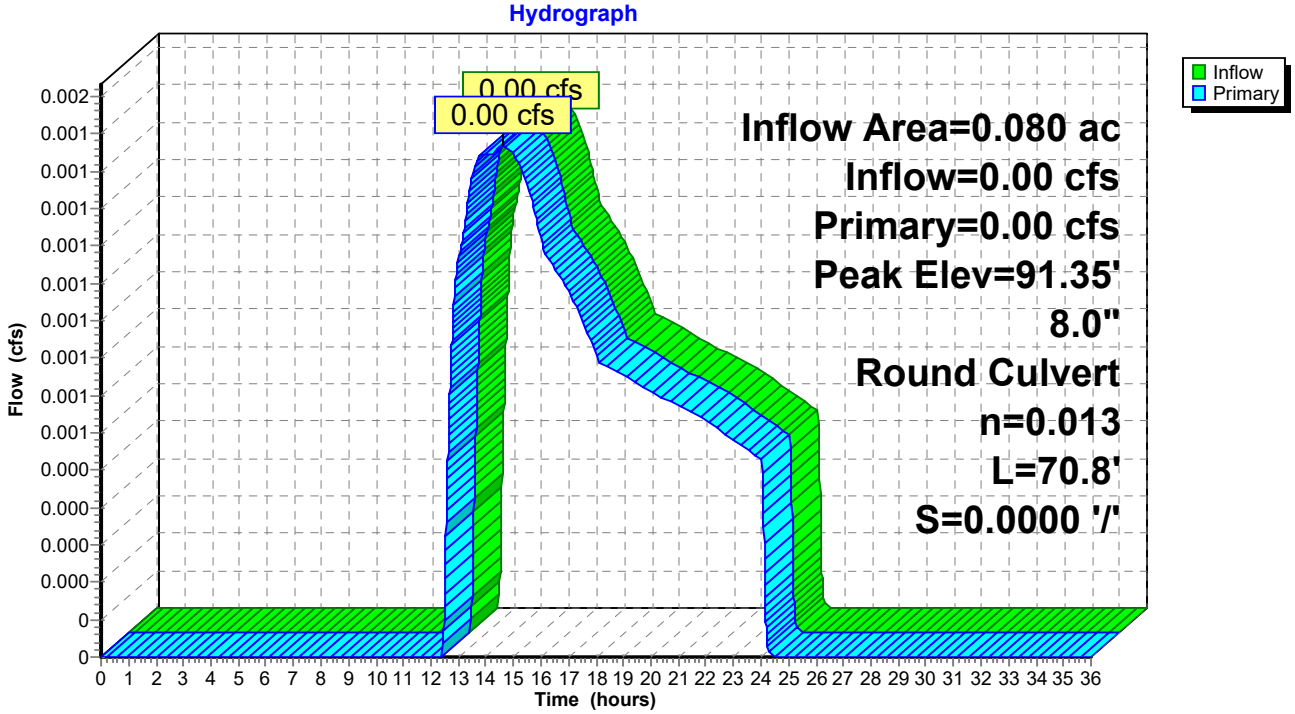
Inflow Area = 0.080 ac, 0.00% Impervious, Inflow Depth = 0.13" for 10-year event
Inflow = 0.00 cfs @ 14.61 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 14.61 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 14.61 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.35' @ 14.61 hrs
Flood Elev= 95.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	91.30'	**8.0" Round HDPE** L= 70.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.30' / 91.30' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 14.61 hrs HW=91.35' (Free Discharge)
└**1=HDPE** (Barrel Controls 0.00 cfs @ 0.13 fps)

Pond 4P: CB #3



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DRAINAGE TO VUSF Runoff Area=23,562 sf 59.17% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=74 Runoff=1.98 cfs 0.136 af

Subcatchment 2S: DRAINING TO CB#1 Runoff Area=3,570 sf 5.21% Impervious Runoff Depth=0.55"
Tc=5.0 min CN=42 Runoff=0.02 cfs 0.004 af

Subcatchment 3S: DRAINING TO CB #2 Runoff Area=4,038 sf 0.00% Impervious Runoff Depth=0.39"
Flow Length=67' Slope=0.0467 '/' Tc=5.1 min CN=39 Runoff=0.01 cfs 0.003 af

Subcatchment 4S: DRAINING TO CB #3 Runoff Area=3,504 sf 0.00% Impervious Runoff Depth=0.39"
Flow Length=58' Slope=0.0100 '/' Tc=8.5 min CN=39 Runoff=0.01 cfs 0.003 af

Subcatchment 5S: ENTRY DRIVE Runoff Area=785 sf 100.00% Impervious Runoff Depth=5.56"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment 6S: TIPDOWN Runoff Area=3,270 sf 2.32% Impervious Runoff Depth=0.44"
Flow Length=97' Slope=0.0670 '/' Tc=6.0 min CN=40 Runoff=0.01 cfs 0.003 af

Reach 99R: POA #1 Inflow=1.93 cfs 0.144 af
Outflow=1.93 cfs 0.144 af

Pond 1P: VUSF/CB #4 Peak Elev=95.04' Storage=1,173 cf Inflow=1.98 cfs 0.136 af
Outflow=1.81 cfs 0.124 af

Pond 2P: CB #1 Peak Elev=95.79' Inflow=0.02 cfs 0.004 af
8.0" Round Culvert n=0.013 L=68.5' S=0.0336 '/' Outflow=0.02 cfs 0.004 af

Pond 3P: CB #2 Peak Elev=93.47' Inflow=0.01 cfs 0.003 af
8.0" Round Culvert n=0.013 L=62.5' S=0.0336 '/' Outflow=0.01 cfs 0.003 af

Pond 4P: CB #3 Peak Elev=91.43' Inflow=0.01 cfs 0.003 af
8.0" Round Culvert n=0.013 L=70.8' S=0.0000 '/' Outflow=0.01 cfs 0.003 af

Total Runoff Area = 0.889 ac Runoff Volume = 0.156 af Average Runoff Depth = 2.11"
61.30% Pervious = 0.545 ac 38.70% Impervious = 0.344 ac

Summary for Subcatchment 1S: DRAINAGE TO VUSF

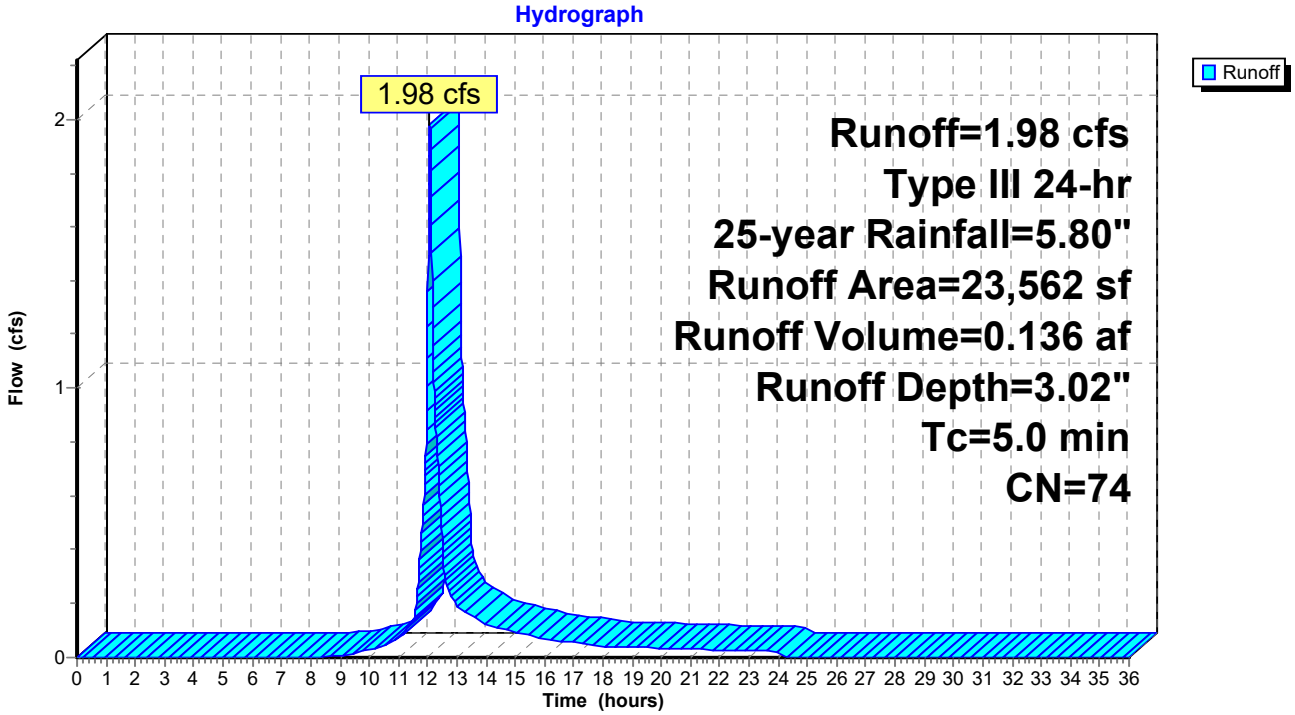
Runoff = 1.98 cfs @ 12.08 hrs, Volume= 0.136 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	13,942	98	PAVEMENT, SIDEWALKS, RETAINING WALL
	9,620	39	>75% Grass cover, Good, HSG A
	23,562	74	Weighted Average
	9,620		40.83% Pervious Area
	13,942		59.17% Impervious Area

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

Subcatchment 1S: DRAINAGE TO VUSF



Summary for Subcatchment 2S: DRAINING TO CB#1

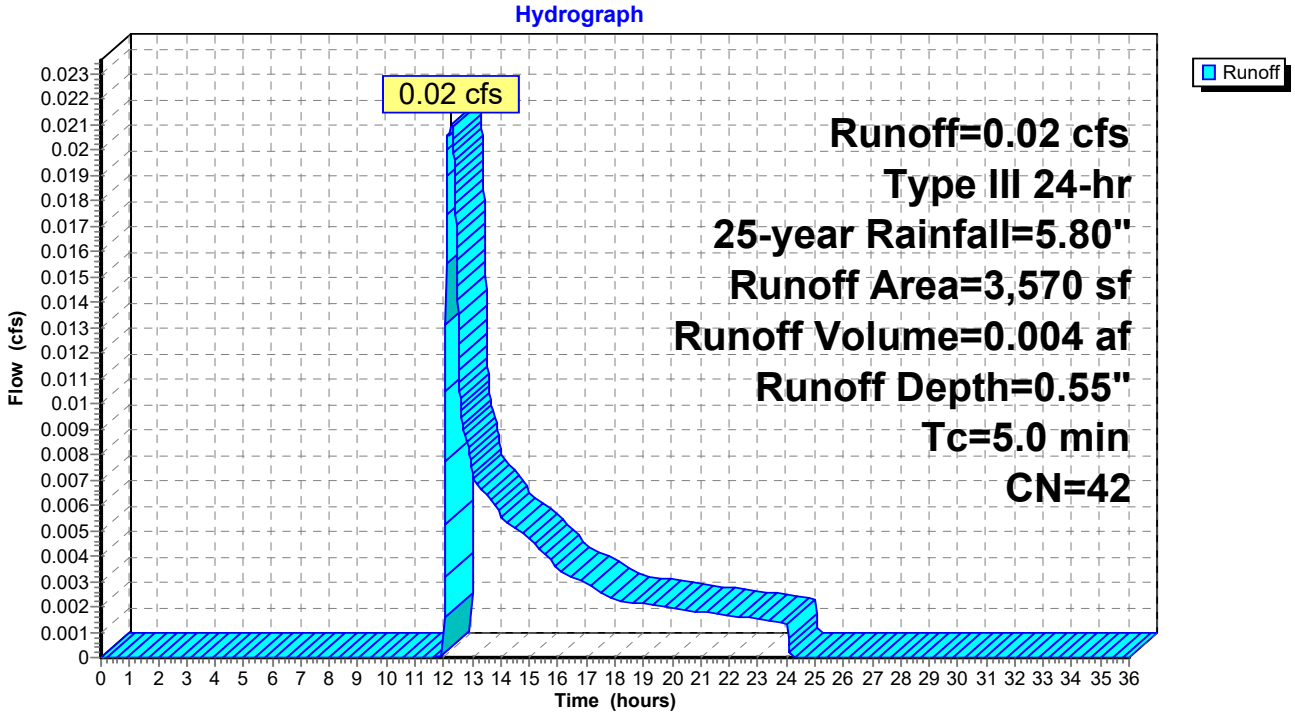
Runoff = 0.02 cfs @ 12.27 hrs, Volume= 0.004 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
	3,384	39	>75% Grass cover, Good, HSG A
*	186	98	BRICK SIDEWALK
	3,570	42	Weighted Average
	3,384		94.79% Pervious Area
	186		5.21% Impervious Area

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

Subcatchment 2S: DRAINING TO CB#1



Summary for Subcatchment 3S: DRAINING TO CB #2

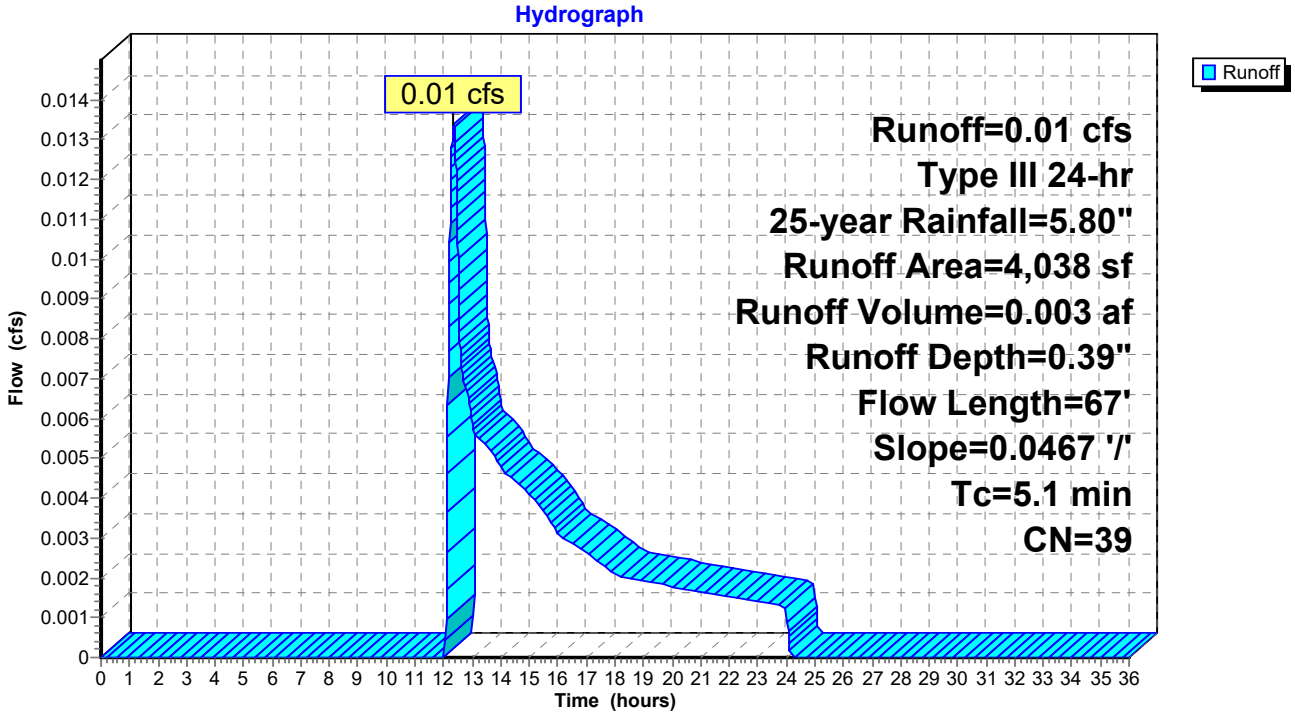
Runoff = 0.01 cfs @ 12.35 hrs, Volume= 0.003 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

Area (sf)	CN	Description
4,038	39	>75% Grass cover, Good, HSG A
4,038		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	67	0.0467	0.22		**Sheet Flow, 3A-3B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 3S: DRAINING TO CB #2



Summary for Subcatchment 4S: DRAINING TO CB #3

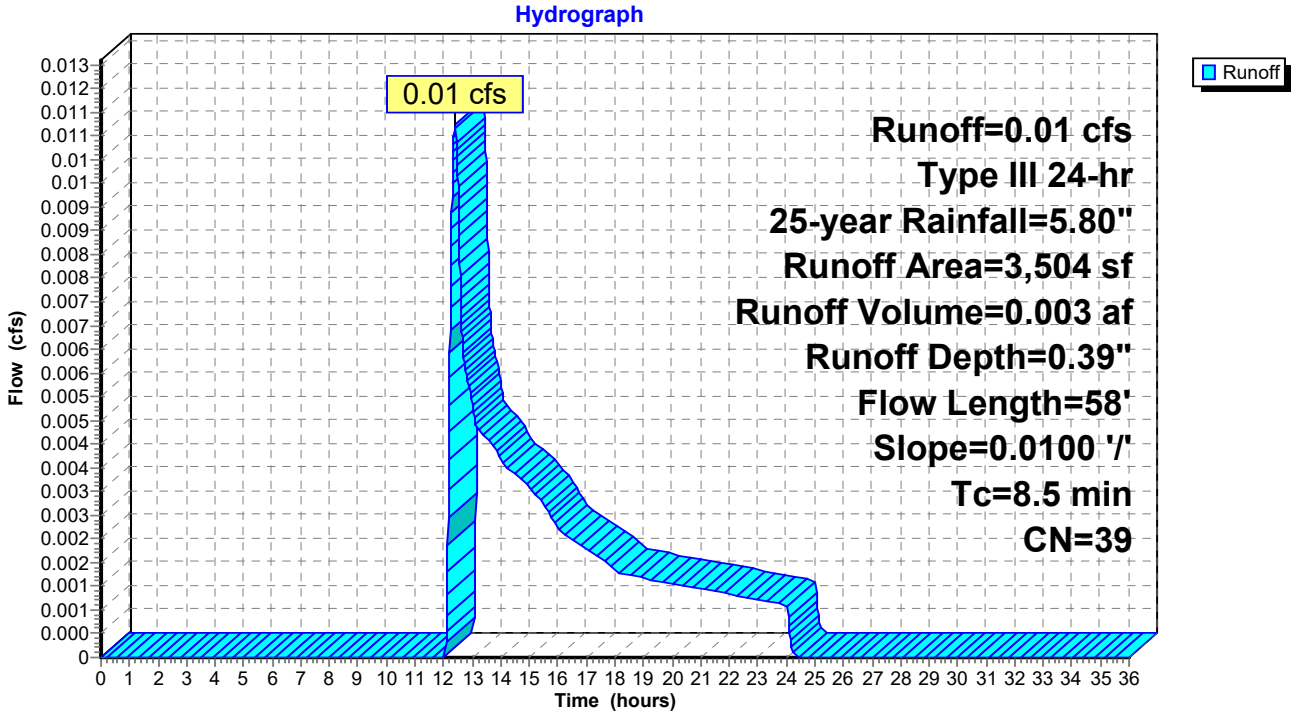
Runoff = 0.01 cfs @ 12.40 hrs, Volume= 0.003 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

Area (sf)	CN	Description
3,504	39	>75% Grass cover, Good, HSG A
3,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	58	0.0100	0.11		**Sheet Flow, 4A-4B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 4S: DRAINING TO CB #3



Summary for Subcatchment 5S: ENTRY DRIVE

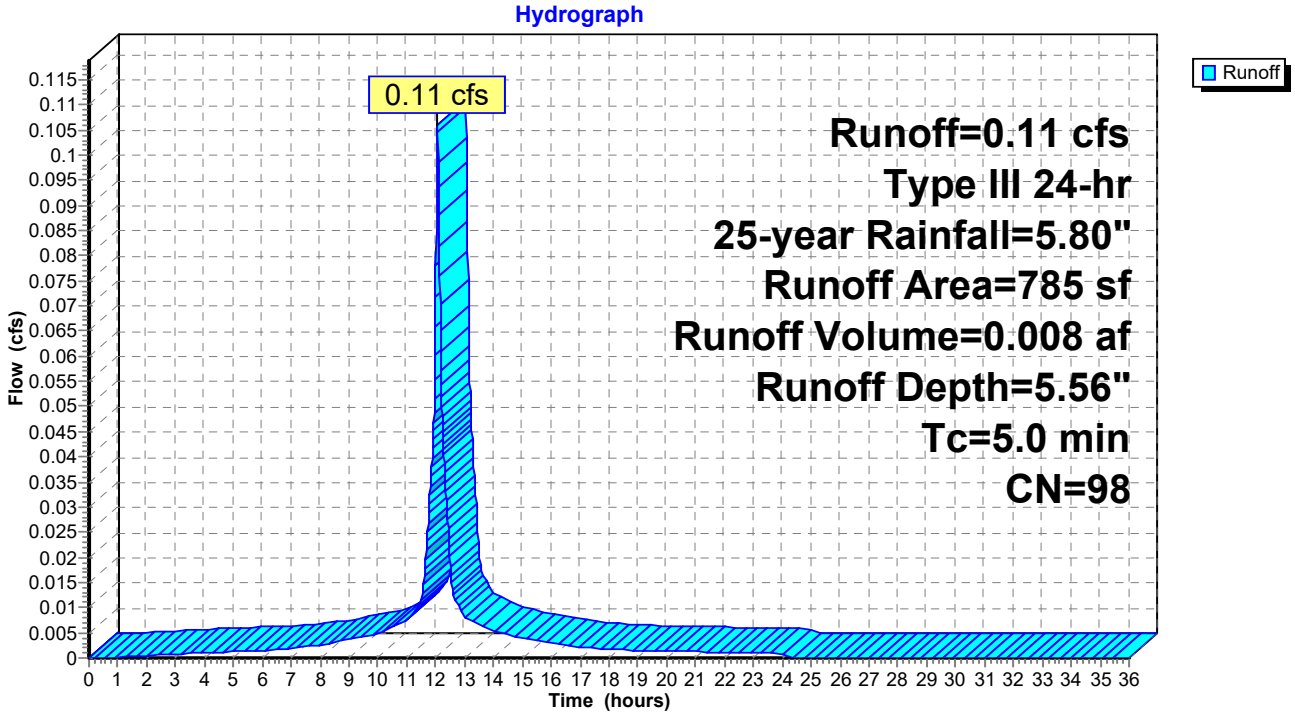
Runoff = 0.11 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	785	98	PAVED ENTRY
	785		100.00% Impervious Area

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

Subcatchment 5S: ENTRY DRIVE



Summary for Subcatchment 6S: TIPDOWN

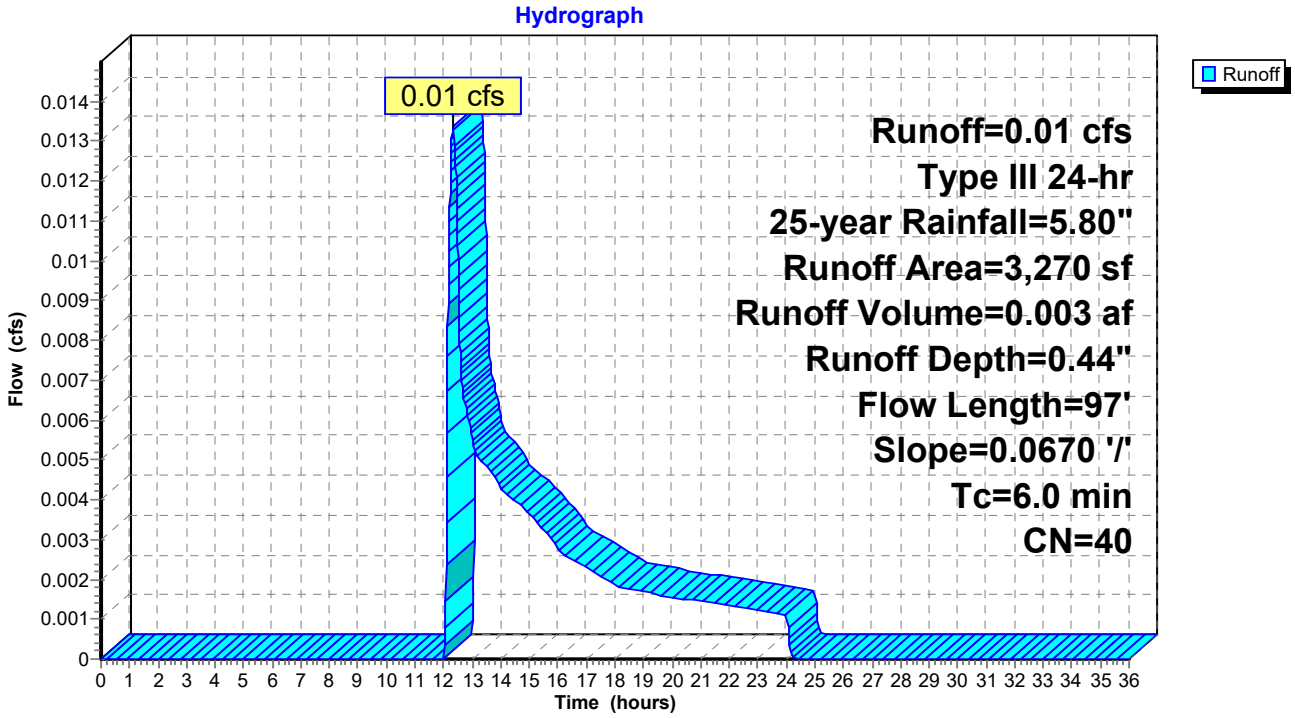
Runoff = 0.01 cfs @ 12.34 hrs, Volume= 0.003 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
	3,194	39	>75% Grass cover, Good, HSG A
*	76	98	BRICK AND CONCRETE SIDEWALK
	3,270	40	Weighted Average
	3,194		97.68% Pervious Area
	76		2.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	97	0.0670	0.27		**Sheet Flow, 6A-6B** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 6S: TIPDOWN



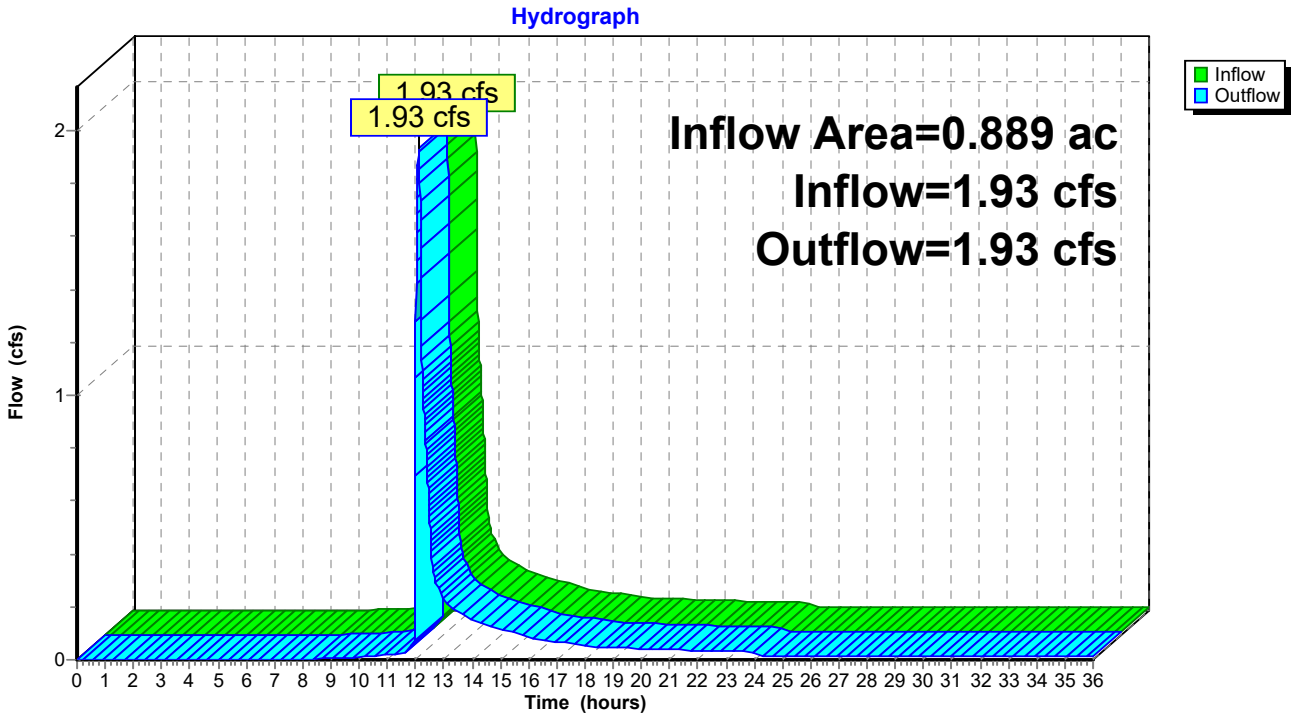
Summary for Reach 99R: POA #1

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

Inflow Area = 0.889 ac, 38.70% Impervious, Inflow Depth > 1.95" for 25-year event
Inflow = 1.93 cfs @ 12.11 hrs, Volume= 0.144 af
Outflow = 1.93 cfs @ 12.11 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: POA #1



Summary for Pond 1P: VUSF/CB #4

Inflow Area = 0.541 ac, 59.17% Impervious, Inflow Depth = 3.02" for 25-year event
Inflow = 1.98 cfs @ 12.08 hrs, Volume= 0.136 af
Outflow = 1.81 cfs @ 12.11 hrs, Volume= 0.124 af, Atten= 9%, Lag= 2.0 min
Primary = 1.81 cfs @ 12.11 hrs, Volume= 0.124 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.04' @ 12.11 hrs Surf.Area= 1,248 sf Storage= 1,173 cf
Flood Elev= 96.00' Surf.Area= 1,939 sf Storage= 2,381 cf

Plug-Flow detention time= 167.1 min calculated for 0.124 af (91% of inflow)
Center-of-Mass det. time= 123.0 min (952.5 - 829.4)

Volume	Invert	Avail.Storage	Storage Description
#1	93.00'	2,277 cf	**Custom Stage Data (Prismatic)** Listed below
#2	91.50'	24 cf	**FILTER MEDIA (Prismatic)** Listed below (Recalc) 240 cf Overall x 10.0% Voids
#3	91.00'	5 cf	**4.0" Round Pipe Storage** Inside #4 L= 60.0'
#4	90.30'	75 cf	**FREE-DRAINING GRAVEL (Prismatic)** Listed below (Recalc) 192 cf Overall - 5 cf Embedded = 187 cf x 40.0% Voids
		2,381 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.00	160	0	0
93.50	305	116	116
94.00	501	202	318
95.00	899	700	1,018
96.00	1,619	1,259	2,277

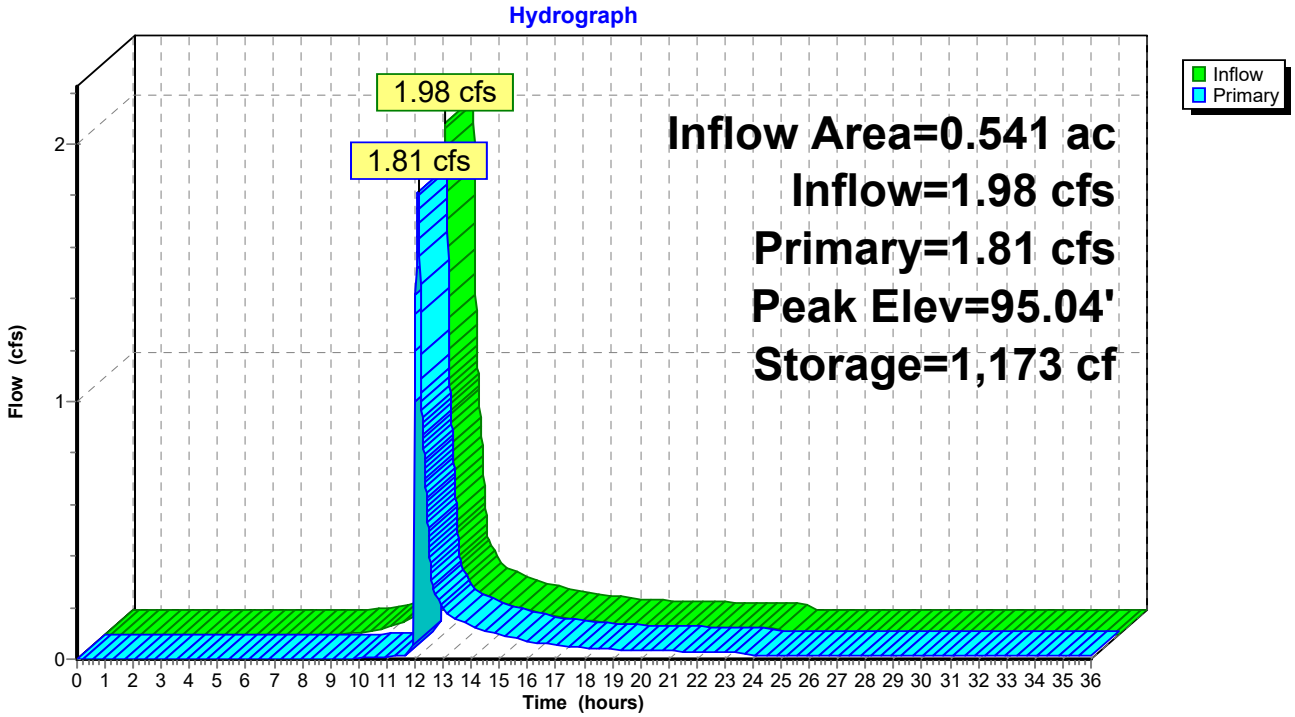
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.50	160	0	0
93.00	160	240	240

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.30	160	0	0
91.50	160	192	192

Device	Routing	Invert	Outlet Devices
#1	Device 3	91.00'	**0.5" Vert. WQV** C= 0.600
#2	Device 3	94.90'	**2.0" x 2.0" Horiz. CB OVERFLOW X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Primary	91.00'	**12.0" Round SDR** L= 76.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.00' / 89.30' S= 0.0224 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.82 cfs @ 12.11 hrs HW=95.04' (Free Discharge)
└─**3=SDR** (Passes 1.82 cfs of 5.62 cfs potential flow)
  └─**1=WQV** (Orifice Controls 0.01 cfs @ 9.65 fps)
  └─**2=CB OVERFLOW** (Orifice Controls 1.80 cfs @ 1.80 fps)

Pond 1P: VUSF/CB #4



Summary for Pond 2P: CB #1

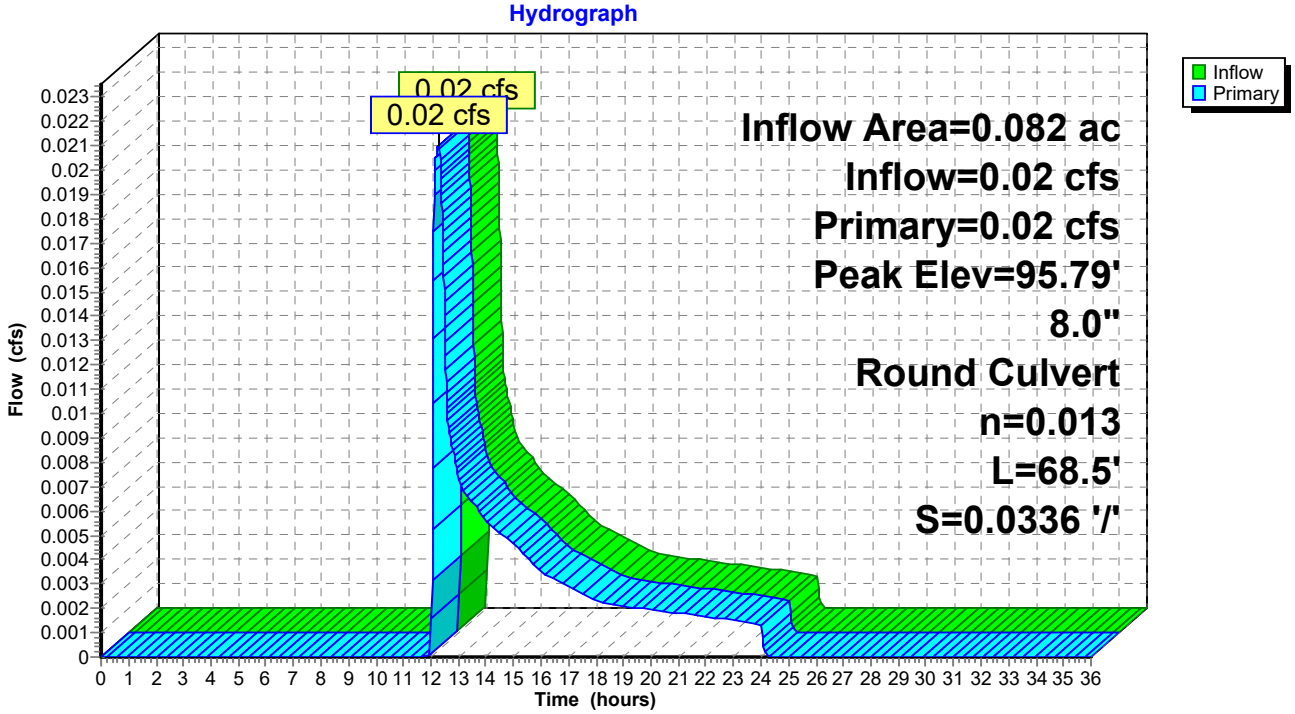
Inflow Area =	0.082 ac,	5.21% Impervious,	Inflow Depth =	0.55"	for 25-year event
Inflow =	0.02 cfs @	12.27 hrs,	Volume=	0.004 af	
Outflow =	0.02 cfs @	12.27 hrs,	Volume=	0.004 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.02 cfs @	12.27 hrs,	Volume=	0.004 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.79' @ 12.27 hrs
Flood Elev= 99.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	**8.0" Round HDPE** L= 68.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 95.70' / 93.40' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.02 cfs @ 12.27 hrs HW=95.79' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.02 cfs @ 0.78 fps)

Pond 2P: CB #1



Summary for Pond 3P: CB #2

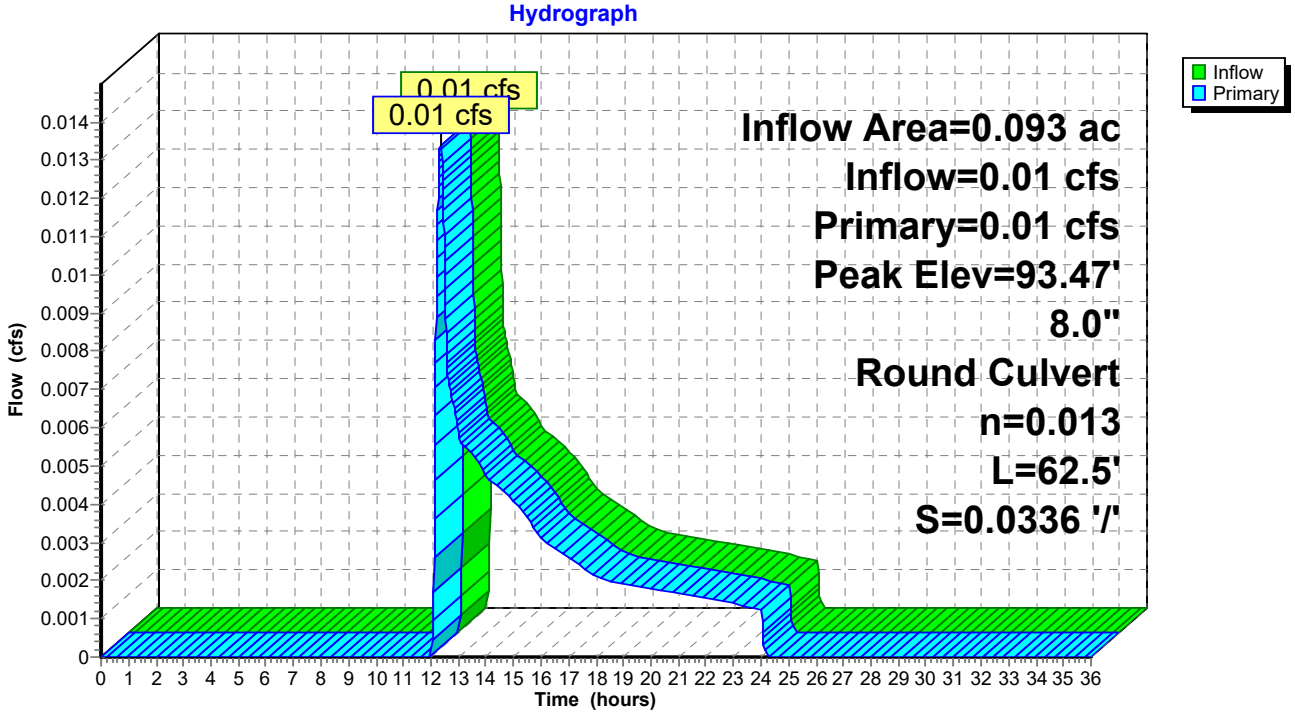
Inflow Area =	0.093 ac,	0.00% Impervious,	Inflow Depth =	0.39"	for 25-year event
Inflow =	0.01 cfs @	12.35 hrs,	Volume=	0.003 af	
Outflow =	0.01 cfs @	12.35 hrs,	Volume=	0.003 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.01 cfs @	12.35 hrs,	Volume=	0.003 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 93.47' @ 12.35 hrs
Flood Elev= 97.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	93.40'	**8.0" Round HDPE** L= 62.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.40' / 91.30' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.01 cfs @ 12.35 hrs HW=93.47' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.01 cfs @ 0.70 fps)

Pond 3P: CB #2



Summary for Pond 4P: CB #3

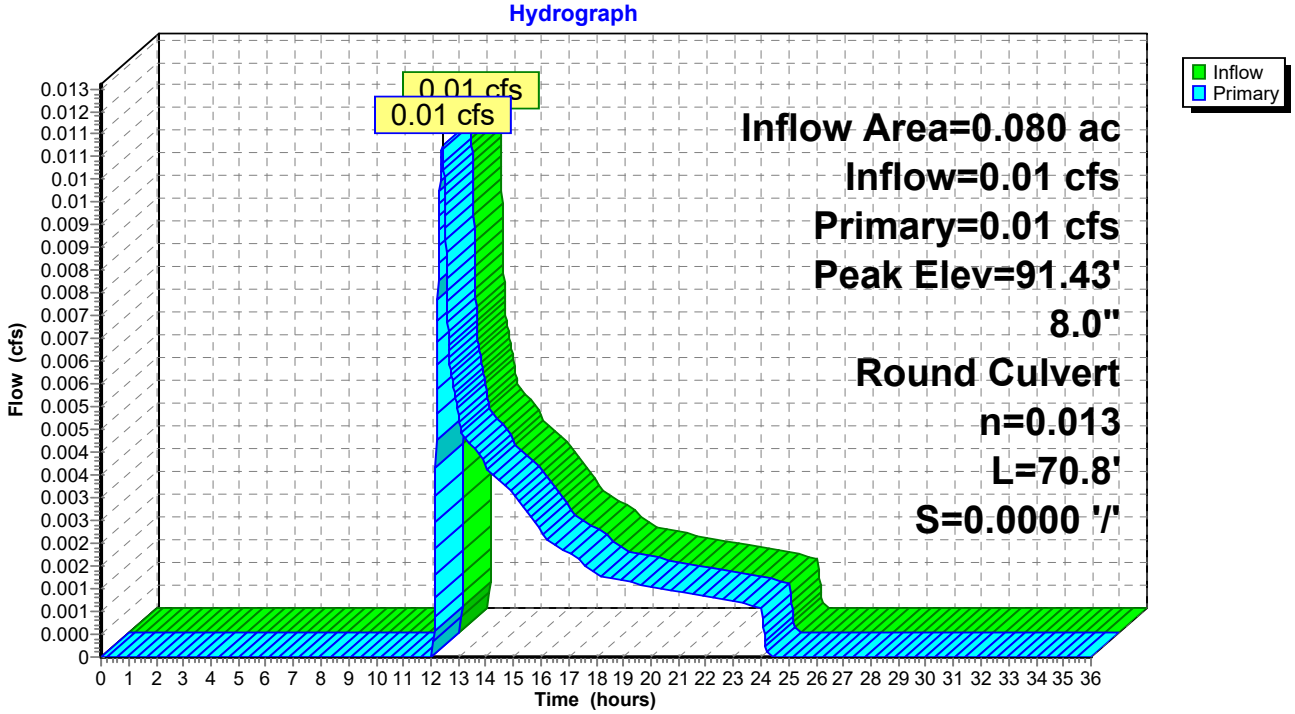
Inflow Area =	0.080 ac,	0.00% Impervious,	Inflow Depth =	0.39"	for 25-year event
Inflow =	0.01 cfs @	12.40 hrs,	Volume=	0.003 af	
Outflow =	0.01 cfs @	12.40 hrs,	Volume=	0.003 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.01 cfs @	12.40 hrs,	Volume=	0.003 af	

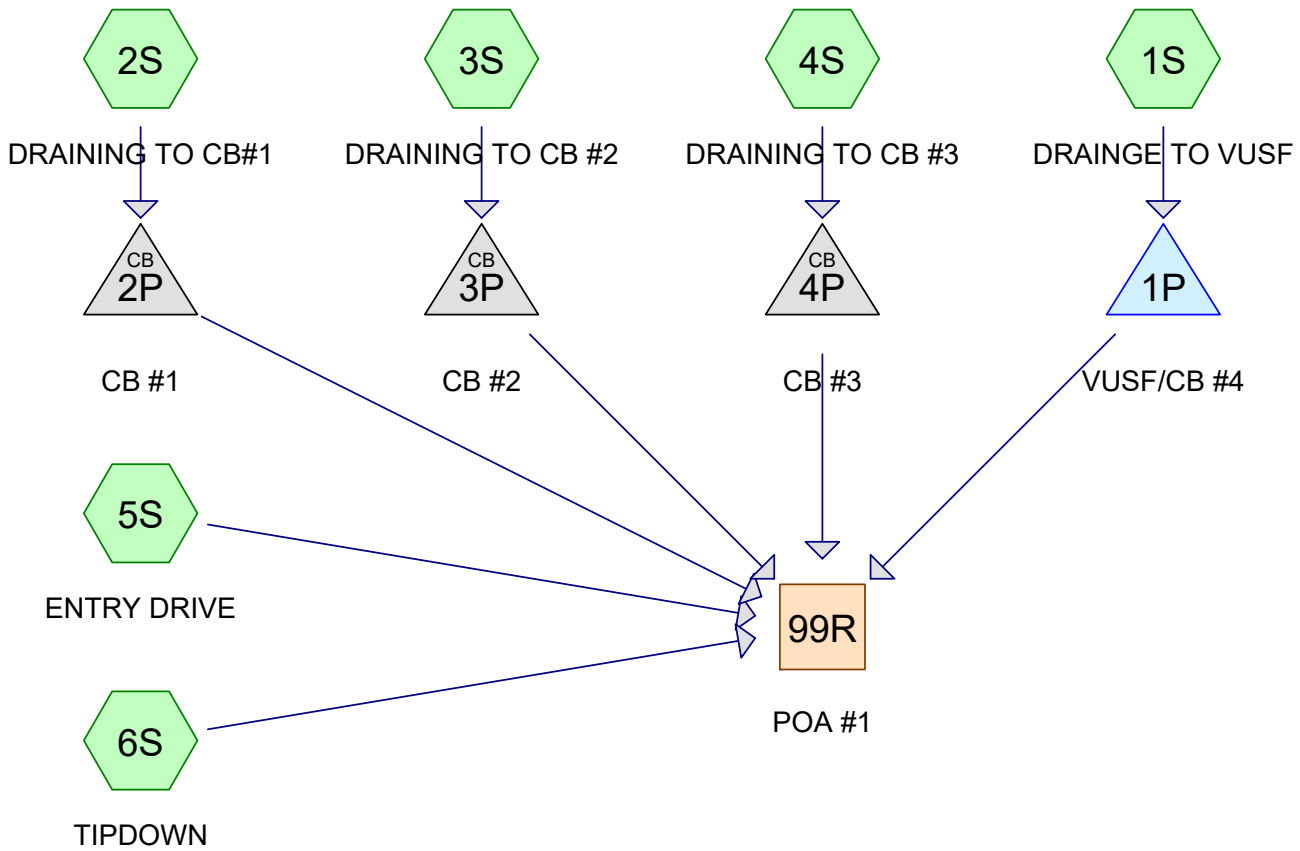
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.43' @ 12.40 hrs
Flood Elev= 95.10'

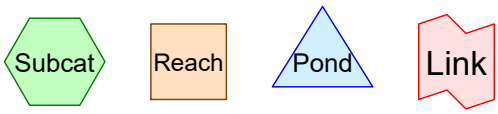
Device	Routing	Invert	Outlet Devices
#1	Primary	91.30'	**8.0" Round HDPE** L= 70.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.30' / 91.30' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.01 cfs @ 12.40 hrs HW=91.43' (Free Discharge)
└**1=HDPE** (Barrel Controls 0.01 cfs @ 0.35 fps)

Pond 4P: CB #3







Routing Diagram for POST
Prepared by {enter your company name here}, Printed 3/1/2019
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.343	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 6S)
0.001	98	BRICK AND CONCRETE SIDEWALK (6S)
0.004	98	BRICK SIDEWALK (2S)
0.018	98	PAVED ENTRY (5S)
0.523	98	PAVEMENT, SIDEWALKS, RETAINING WALL (1S)
0.889	**75**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.343	HSG A	1S, 2S, 3S, 4S, 6S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.547	Other	1S, 2S, 5S, 6S
0.889		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.343	0.000	0.000	0.000	0.000	0.343	>75% Grass cover, Good
0.000	0.000	0.000	0.000	0.001	0.001	BRICK AND CONCRETE SIDEWALK
0.000	0.000	0.000	0.000	0.004	0.004	BRICK SIDEWALK
0.000	0.000	0.000	0.000	0.018	0.018	PAVED ENTRY
0.000	0.000	0.000	0.000	0.523	0.523	PAVEMENT, SIDEWALKS, RETAINING WALL
0.343	**0.000**	**0.000**	**0.000**	**0.547**	**0.889**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	90.05	89.30	34.8	0.0216	0.010	12.0	0.0	0.0
2	2P	95.70	93.40	68.5	0.0336	0.013	8.0	0.0	0.0
3	3P	93.40	91.30	62.5	0.0336	0.013	8.0	0.0	0.0
4	4P	91.30	91.23	25.3	0.0028	0.013	8.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DRAINGE TO VUSF Runoff Area=30,526 sf 74.64% Impervious Runoff Depth=1.53"
Tc=5.0 min CN=83 Runoff=1.30 cfs 0.089 af

Subcatchment 2S: DRAINING TO CB#1 Runoff Area=2,452 sf 7.71% Impervious Runoff Depth=0.02"
Tc=5.0 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: DRAINING TO CB #2 Runoff Area=2,079 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 4S: DRAINING TO CB #3 Runoff Area=1,754 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=44' Slope=0.0100 '/' Tc=6.8 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 5S: ENTRY DRIVE Runoff Area=785 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.004 af

Subcatchment 6S: TIPDOWN Runoff Area=1,135 sf 4.14% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=41 Runoff=0.00 cfs 0.000 af

Reach 99R: POA #1 Inflow=0.10 cfs 0.084 af
Outflow=0.10 cfs 0.084 af

Pond 1P: VUSF/CB #4 Peak Elev=94.80' Storage=2,449 cf Inflow=1.30 cfs 0.089 af
Outflow=0.05 cfs 0.080 af

Pond 2P: CB #1 Peak Elev=95.70' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=68.5' S=0.0336 '/' Outflow=0.00 cfs 0.000 af

Pond 3P: CB #2 Peak Elev=93.40' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=62.5' S=0.0336 '/' Outflow=0.00 cfs 0.000 af

Pond 4P: CB #3 Peak Elev=91.30' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=25.3' S=0.0028 '/' Outflow=0.00 cfs 0.000 af

Total Runoff Area = 0.889 ac Runoff Volume = 0.094 af Average Runoff Depth = 1.26"
38.53% Pervious = 0.343 ac 61.47% Impervious = 0.547 ac

Summary for Subcatchment 1S: DRAINGE TO VUSF

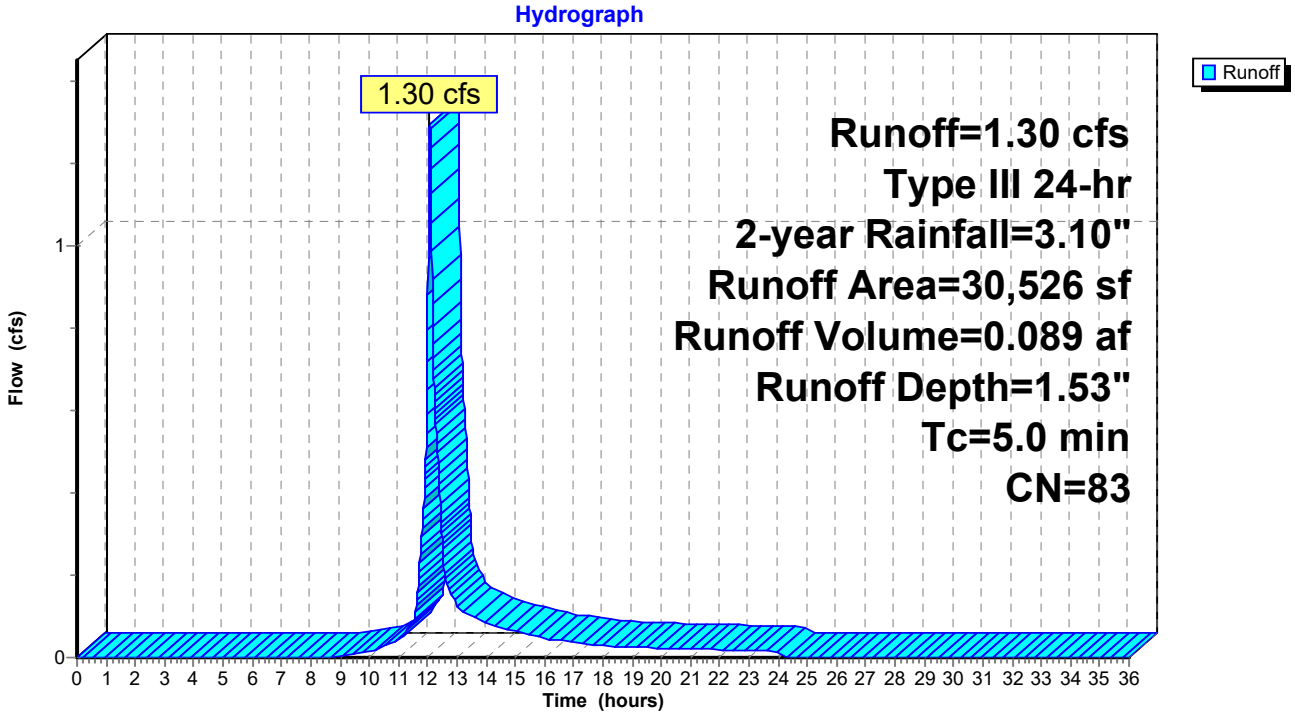
Runoff = 1.30 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	22,786	98	PAVEMENT, SIDEWALKS, RETAINING WALL
	7,740	39	>75% Grass cover, Good, HSG A
	30,526	83	Weighted Average
	7,740		25.36% Pervious Area
	22,786		74.64% Impervious Area

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

Subcatchment 1S: DRAINGE TO VUSF



Summary for Subcatchment 2S: DRAINING TO CB#1

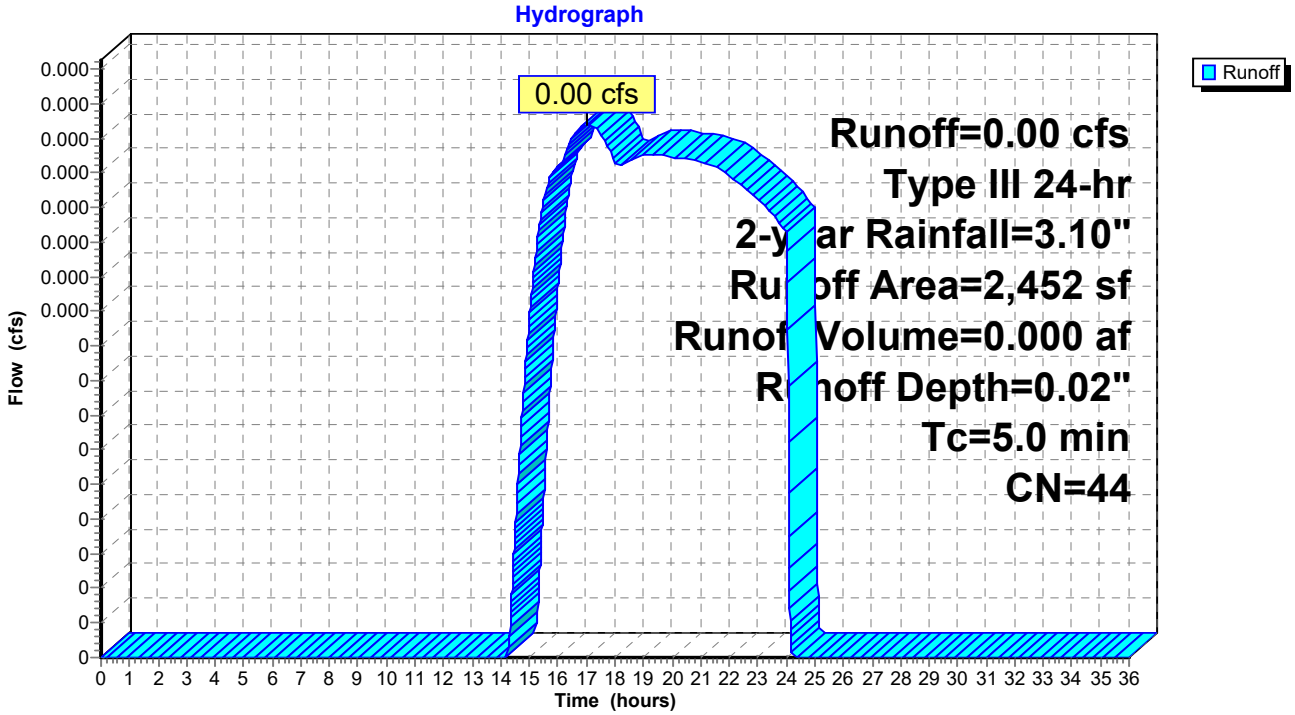
Runoff = 0.00 cfs @ 17.05 hrs, Volume= 0.000 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
	2,263	39	>75% Grass cover, Good, HSG A
*	189	98	BRICK SIDEWALK
	2,452	44	Weighted Average
	2,263		92.29% Pervious Area
	189		7.71% Impervious Area

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

Subcatchment 2S: DRAINING TO CB#1



Summary for Subcatchment 3S: DRAINING TO CB #2

[45] Hint: Runoff=Zero

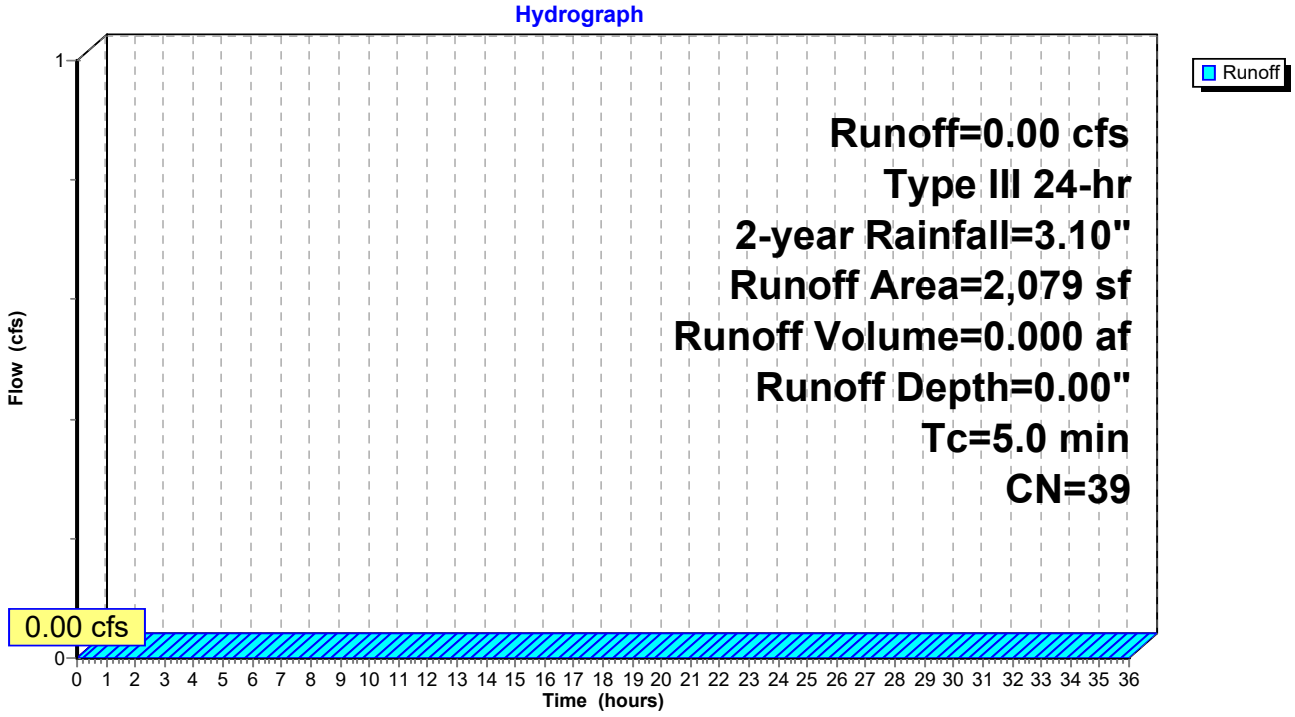
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
2,079	39	>75% Grass cover, Good, HSG A
2,079		100.00% Pervious Area

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

Subcatchment 3S: DRAINING TO CB #2



Summary for Subcatchment 4S: DRAINING TO CB #3

[45] Hint: Runoff=Zero

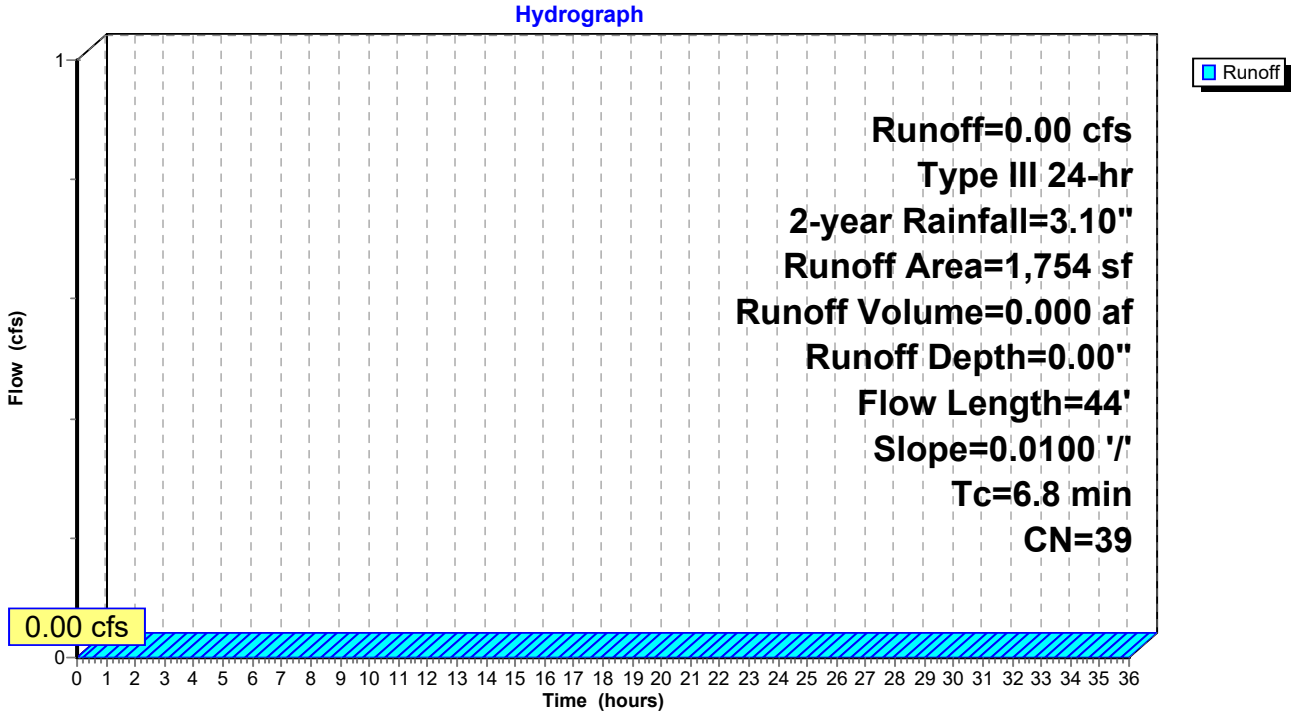
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
1,754	39	>75% Grass cover, Good, HSG A
1,754		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	44	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 4S: DRAINING TO CB #3



Summary for Subcatchment 5S: ENTRY DRIVE

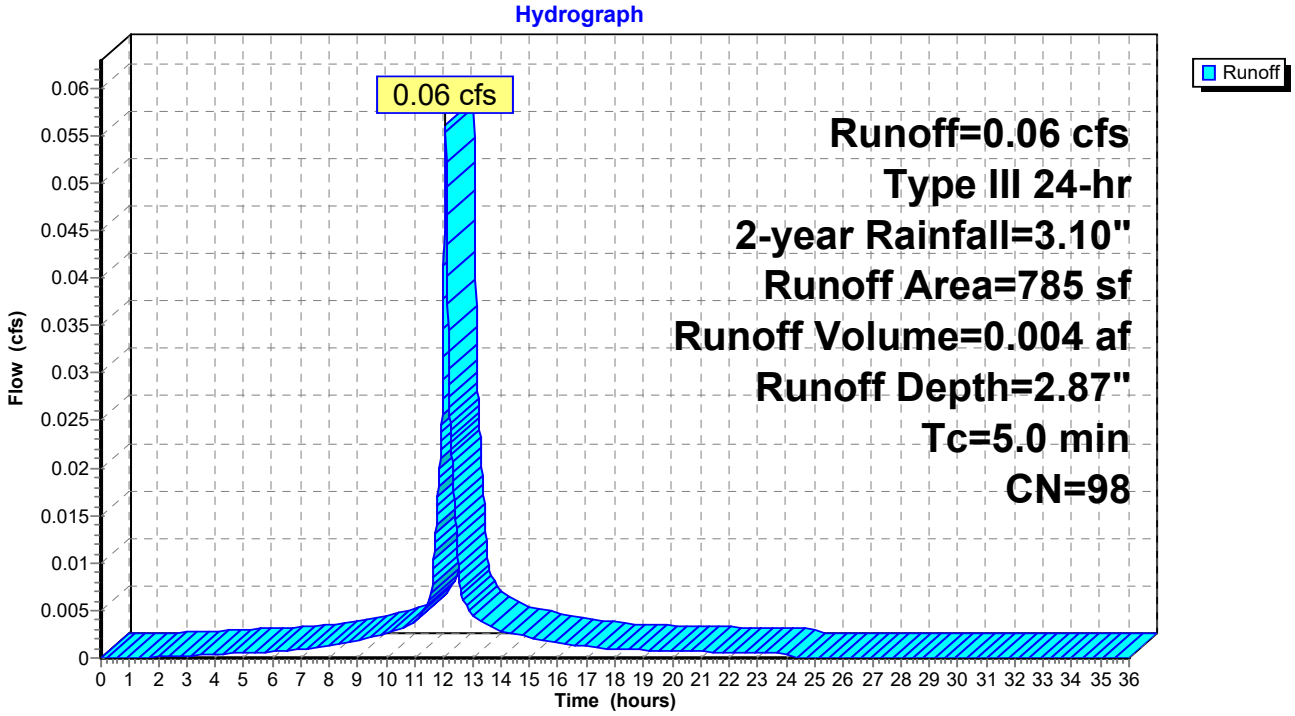
Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	785	98	PAVED ENTRY
	785		100.00% Impervious Area

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

Subcatchment 5S: ENTRY DRIVE



Summary for Subcatchment 6S: TIPDOWN

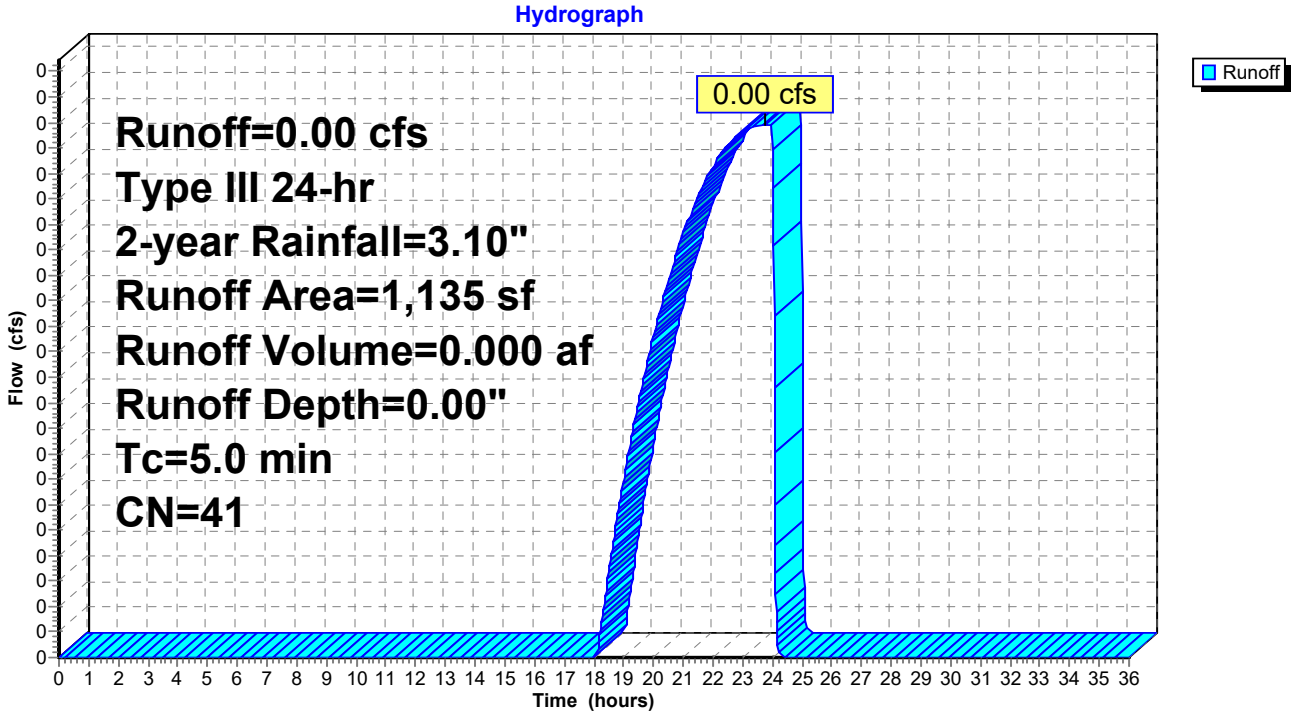
Runoff = 0.00 cfs @ 23.75 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
	1,088	39	>75% Grass cover, Good, HSG A
*	47	98	BRICK AND CONCRETE SIDEWALK
	1,135	41	Weighted Average
	1,088		95.86% Pervious Area
	47		4.14% Impervious Area

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

Subcatchment 6S: TIPDOWN



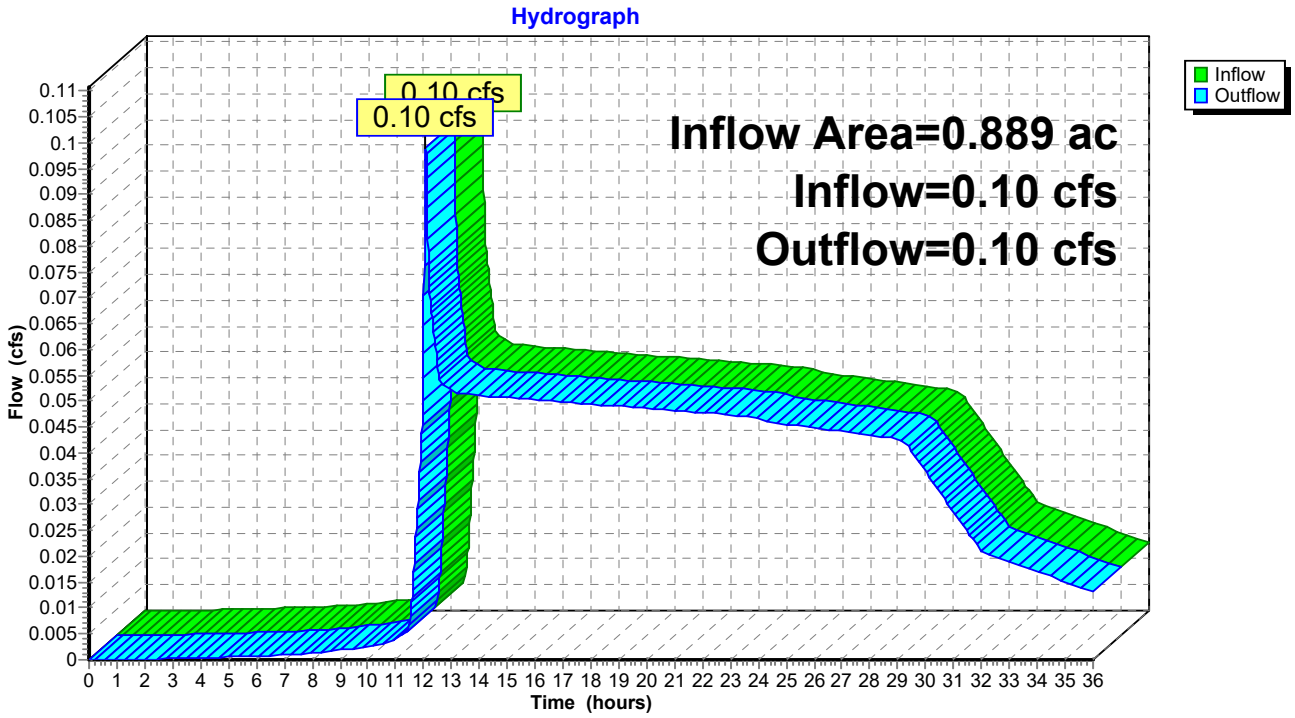
Summary for Reach 99R: POA #1

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

Inflow Area = 0.889 ac, 61.47% Impervious, Inflow Depth > 1.14" for 2-year event
Inflow = 0.10 cfs @ 12.07 hrs, Volume= 0.084 af
Outflow = 0.10 cfs @ 12.07 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: POA #1



Summary for Pond 1P: VUSF/CB #4

Inflow Area = 0.701 ac, 74.64% Impervious, Inflow Depth = 1.53" for 2-year event
Inflow = 1.30 cfs @ 12.08 hrs, Volume= 0.089 af
Outflow = 0.05 cfs @ 15.86 hrs, Volume= 0.080 af, Atten= 96%, Lag= 227.2 min
Primary = 0.05 cfs @ 15.86 hrs, Volume= 0.080 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 94.80' @ 15.86 hrs Surf.Area= 8,518 sf Storage= 2,449 cf
Flood Elev= 95.50' Surf.Area= 8,938 sf Storage= 4,040 cf

Plug-Flow detention time= 553.2 min calculated for 0.080 af (89% of inflow)
Center-of-Mass det. time= 502.6 min (1,336.2 - 833.5)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	4,658 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	93.50'	81 cf	**Transition Layer (Prismatic)** Listed below (Recalc) 806 cf Overall x 10.0% Voids
#3	92.50'	161 cf	**SOIL FILTER (Prismatic)** Listed below (Recalc) 1,612 cf Overall x 10.0% Voids
#4	92.00'	81 cf	**COURSE GRAVEL (Prismatic)** Listed below (Recalc) 806 cf Overall x 10.0% Voids
#5	91.33'	11 cf	**4.0" Round Pipe Storage** Inside #6 L= 127.0'
#6	91.00'	640 cf	**CRUSHED STONE UD BEDDING (Prismatic)** Listed below (Recalc) 1,612 cf Overall - 11 cf Embedded = 1,601 cf x 40.0% Voids
		5,632 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.00	1,612	0	0
95.00	2,183	1,898	1,898
95.50	2,490	1,168	3,066
96.00	3,878	1,592	4,658

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.50	1,612	0	0
94.00	1,612	806	806

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	1,612	0	0
93.50	1,612	1,612	1,612

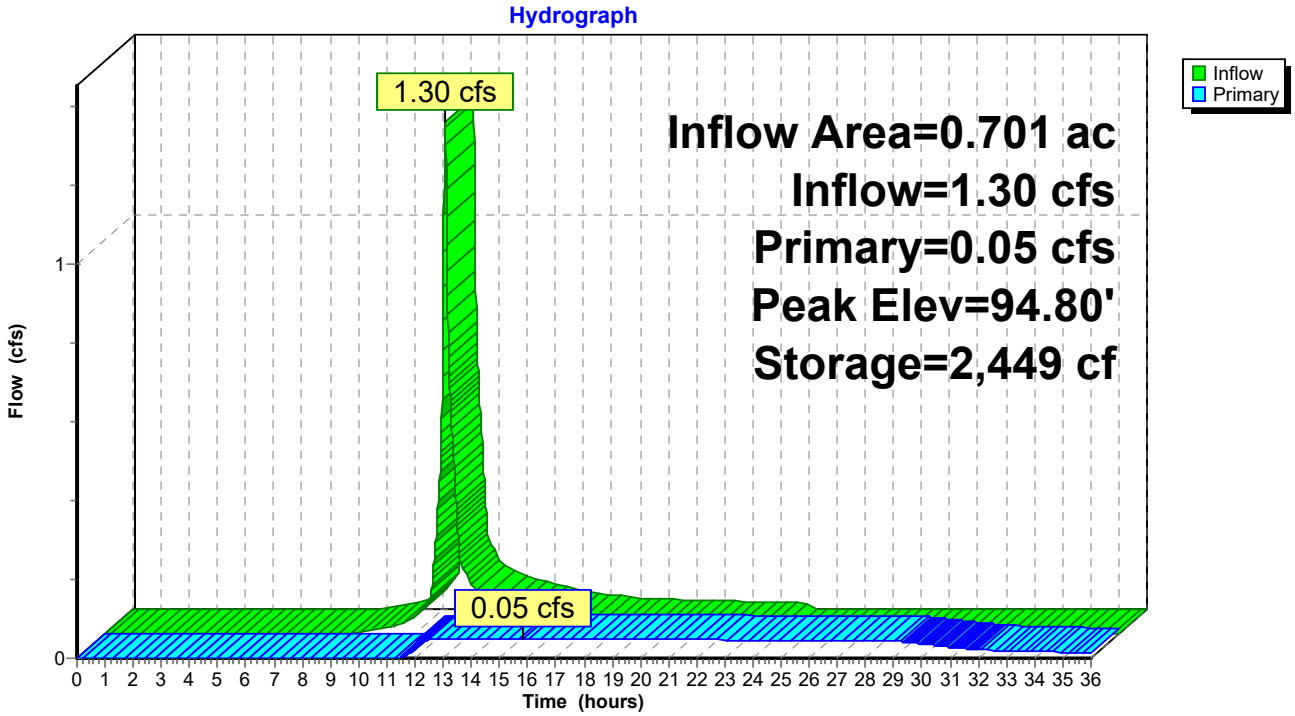
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.00	1,612	0	0
92.50	1,612	806	806

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.00	1,612	0	0
92.00	1,612	1,612	1,612

Device	Routing	Invert	Outlet Devices
#1	Primary	90.05'	**12.0" Round 12" SDR** L= 34.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.05' / 89.30' S= 0.0216 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.50'	**2.0" x 2.0" Horiz. CB OVERFLOW X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Device 1	91.33'	**1.0" Vert. WQV** C= 0.600

Primary OutFlow Max=0.05 cfs @ 15.86 hrs HW=94.80' (Free Discharge)
└─**1=12" SDR** (Passes 0.05 cfs of 6.16 cfs potential flow)
  ├─**2=CB OVERFLOW** (Controls 0.00 cfs)
  └─**3=WQV** (Orifice Controls 0.05 cfs @ 8.92 fps)

Pond 1P: VUSF/CB #4



Summary for Pond 2P: CB #1

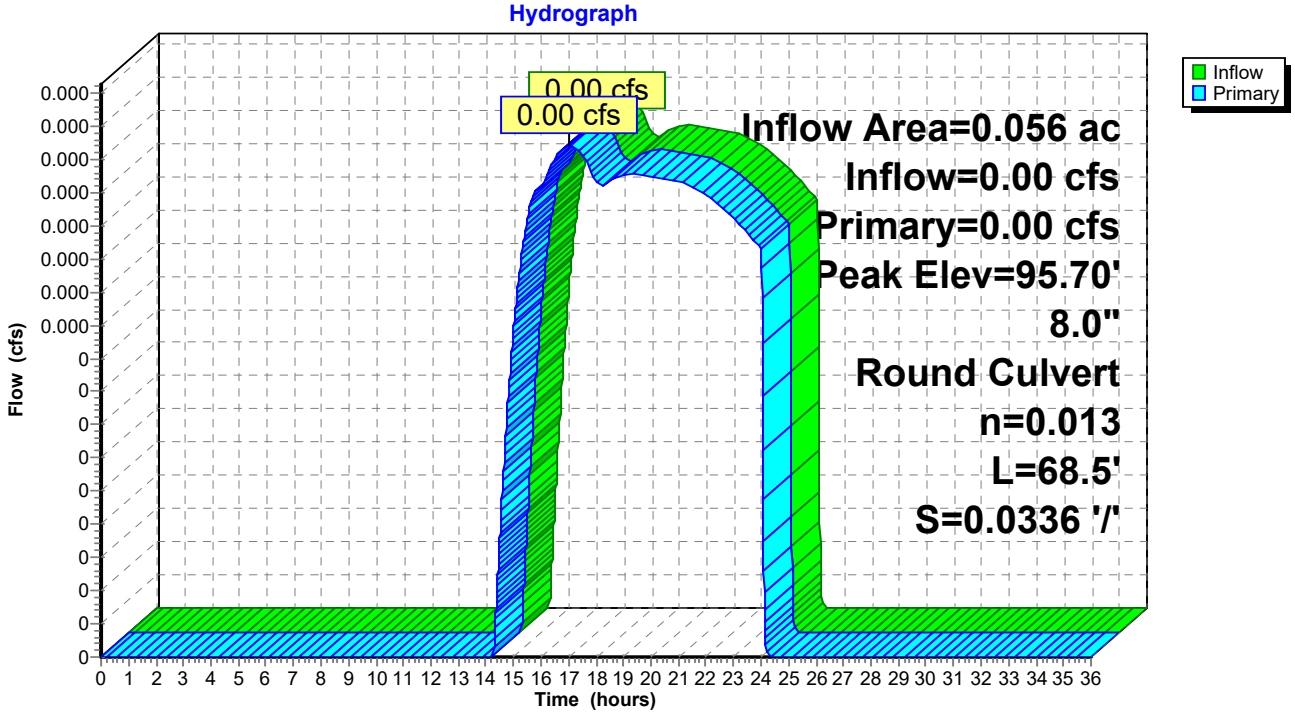
Inflow Area = 0.056 ac, 7.71% Impervious, Inflow Depth = 0.02" for 2-year event
Inflow = 0.00 cfs @ 17.05 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 17.05 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 17.05 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.70' @ 17.05 hrs
Flood Elev= 99.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	**8.0" Round HDPE** L= 68.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 95.70' / 93.40' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 17.05 hrs HW=95.70' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.00 cfs @ 0.10 fps)

Pond 2P: CB #1



Summary for Pond 3P: CB #2

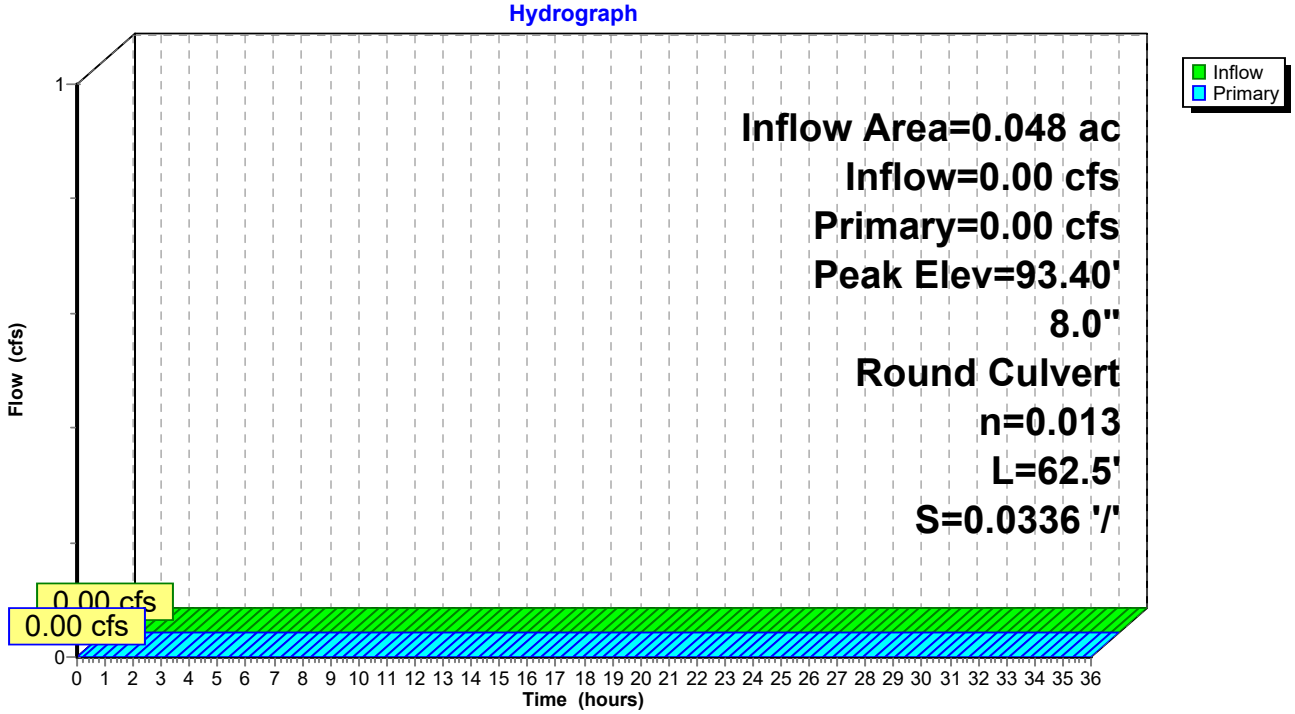
Inflow Area = 0.048 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 93.40' @ 0.00 hrs
Flood Elev= 97.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	93.40'	**8.0" Round HDPE** L= 62.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.40' / 91.30' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.40' (Free Discharge)
└**1=HDPE** (Controls 0.00 cfs)

Pond 3P: CB #2



Summary for Pond 4P: CB #3

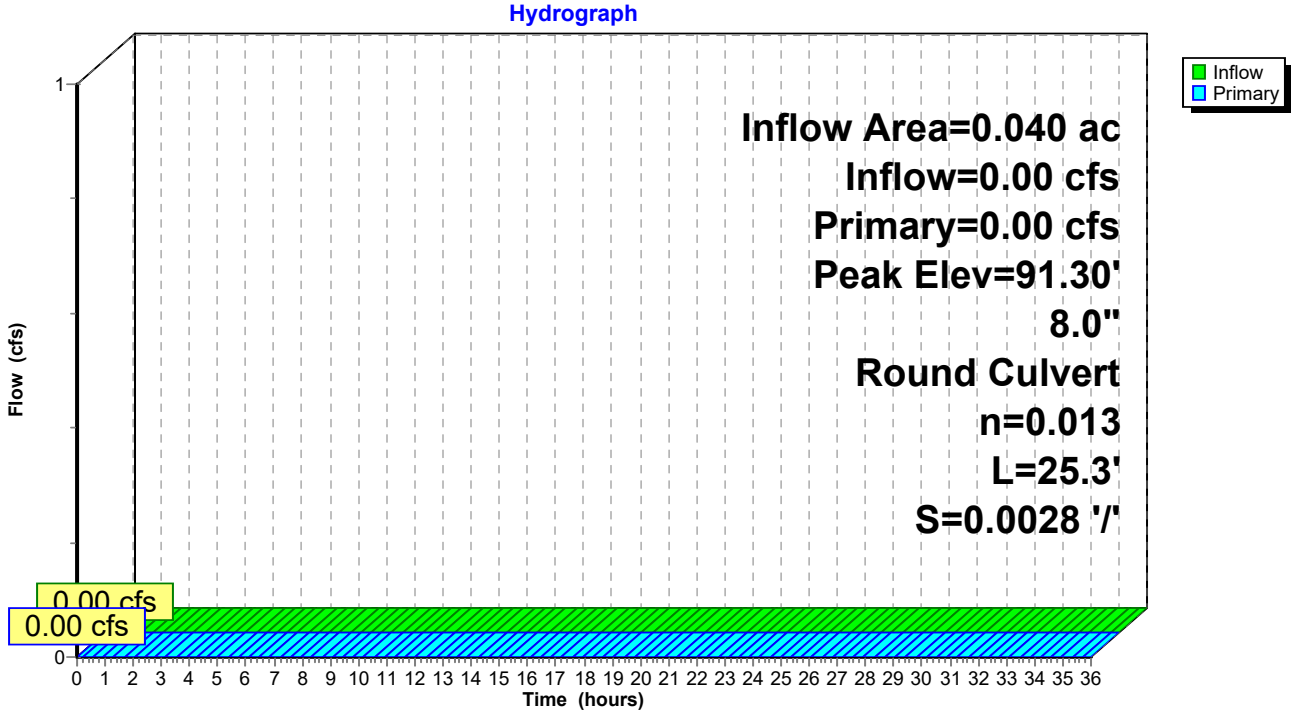
Inflow Area = 0.040 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.30' @ 0.00 hrs
Flood Elev= 95.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	91.30'	**8.0" Round HDPE** L= 25.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.30' / 91.23' S= 0.0028 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.30' (Free Discharge)
└**1=HDPE** (Controls 0.00 cfs)

Pond 4P: CB #3



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DRAINGE TO VUSF Runoff Area=30,526 sf 74.64% Impervious Runoff Depth=2.81"
Tc=5.0 min CN=83 Runoff=2.39 cfs 0.164 af

Subcatchment 2S: DRAINING TO CB#1 Runoff Area=2,452 sf 7.71% Impervious Runoff Depth=0.29"
Tc=5.0 min CN=44 Runoff=0.01 cfs 0.001 af

Subcatchment 3S: DRAINING TO CB #2 Runoff Area=2,079 sf 0.00% Impervious Runoff Depth=0.13"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 4S: DRAINING TO CB #3 Runoff Area=1,754 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=44' Slope=0.0100 '/' Tc=6.8 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 5S: ENTRY DRIVE Runoff Area=785 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=0.08 cfs 0.007 af

Subcatchment 6S: TIPDOWN Runoff Area=1,135 sf 4.14% Impervious Runoff Depth=0.18"
Tc=5.0 min CN=41 Runoff=0.00 cfs 0.000 af

Reach 99R: POA #1 Inflow=0.27 cfs 0.138 af
Outflow=0.27 cfs 0.138 af

Pond 1P: VUSF/CB #4 Peak Elev=95.51' Storage=4,069 cf Inflow=2.39 cfs 0.164 af
Outflow=0.26 cfs 0.129 af

Pond 2P: CB #1 Peak Elev=95.74' Inflow=0.01 cfs 0.001 af
8.0" Round Culvert n=0.013 L=68.5' S=0.0336 '/' Outflow=0.01 cfs 0.001 af

Pond 3P: CB #2 Peak Elev=93.41' Inflow=0.00 cfs 0.001 af
8.0" Round Culvert n=0.013 L=62.5' S=0.0336 '/' Outflow=0.00 cfs 0.001 af

Pond 4P: CB #3 Peak Elev=91.31' Inflow=0.00 cfs 0.000 af
8.0" Round Culvert n=0.013 L=25.3' S=0.0028 '/' Outflow=0.00 cfs 0.000 af

Total Runoff Area = 0.889 ac Runoff Volume = 0.174 af Average Runoff Depth = 2.34"
38.53% Pervious = 0.343 ac 61.47% Impervious = 0.547 ac

Summary for Subcatchment 1S: DRAINGE TO VUSF

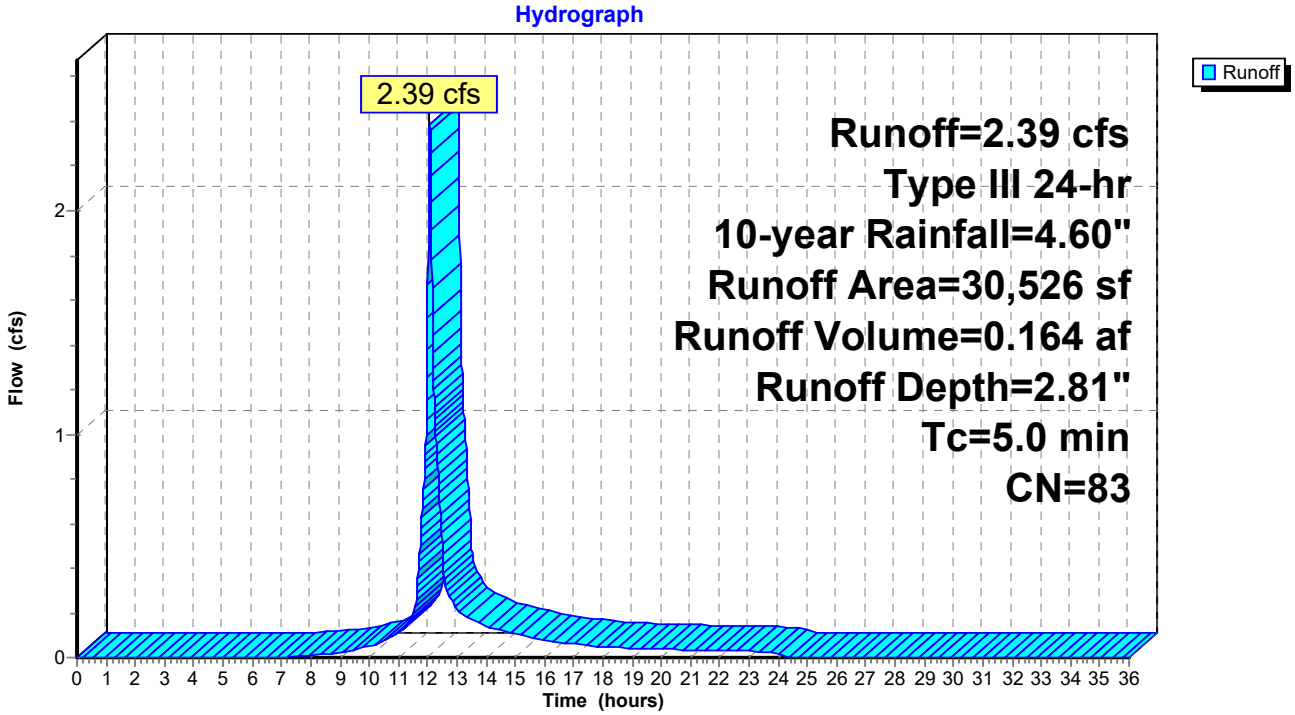
Runoff = 2.39 cfs @ 12.07 hrs, Volume= 0.164 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	22,786	98	PAVEMENT, SIDEWALKS, RETAINING WALL
	7,740	39	>75% Grass cover, Good, HSG A
	30,526	83	Weighted Average
	7,740		25.36% Pervious Area
	22,786		74.64% Impervious Area

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

Subcatchment 1S: DRAINGE TO VUSF



Summary for Subcatchment 2S: DRAINING TO CB#1

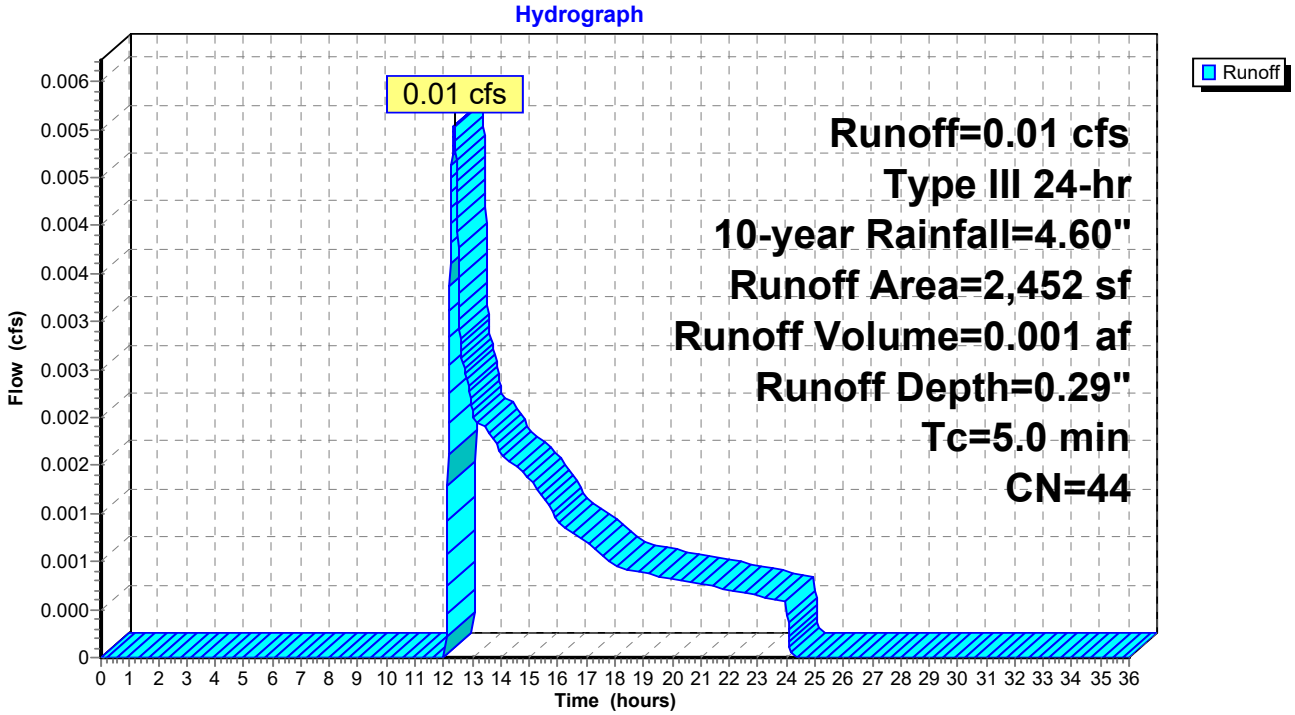
Runoff = 0.01 cfs @ 12.36 hrs, Volume= 0.001 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
	2,263	39	>75% Grass cover, Good, HSG A
*	189	98	BRICK SIDEWALK
	2,452	44	Weighted Average
	2,263		92.29% Pervious Area
	189		7.71% Impervious Area

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

Subcatchment 2S: DRAINING TO CB#1



Summary for Subcatchment 3S: DRAINING TO CB #2

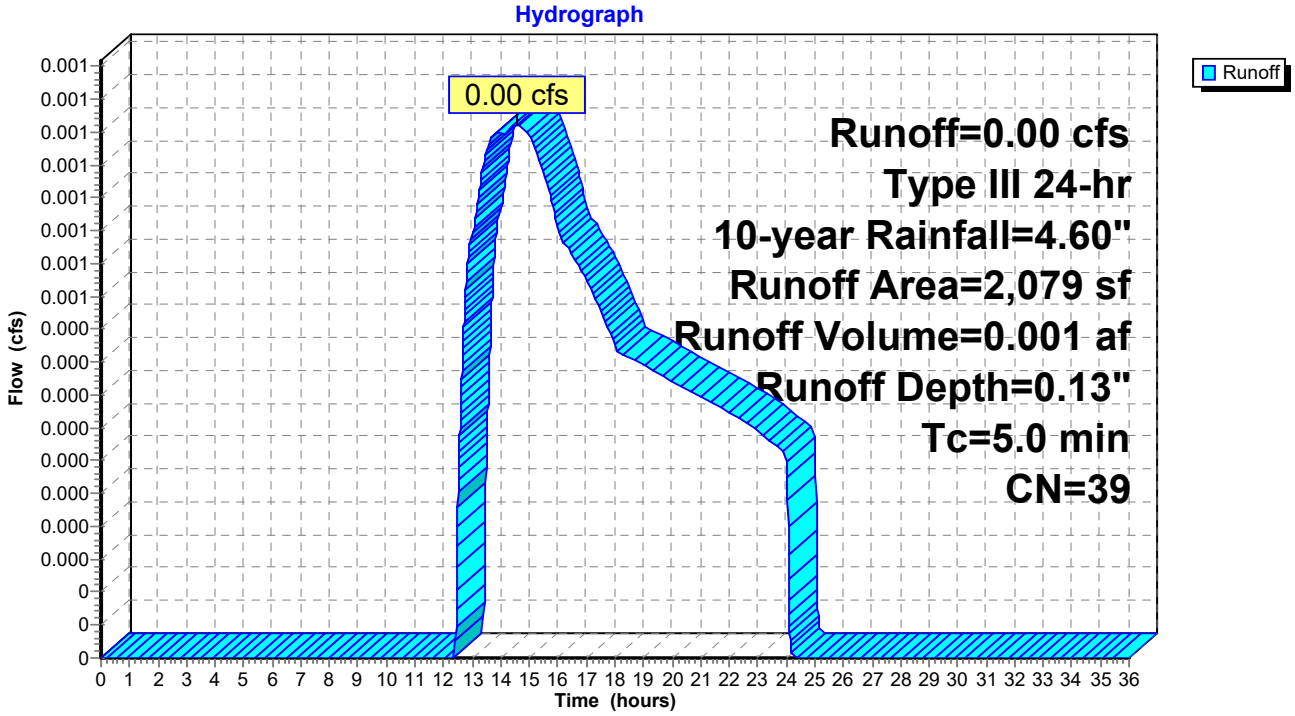
Runoff = 0.00 cfs @ 14.55 hrs, Volume= 0.001 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
2,079	39	>75% Grass cover, Good, HSG A
2,079		100.00% Pervious Area

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

Subcatchment 3S: DRAINING TO CB #2



Summary for Subcatchment 4S: DRAINING TO CB #3

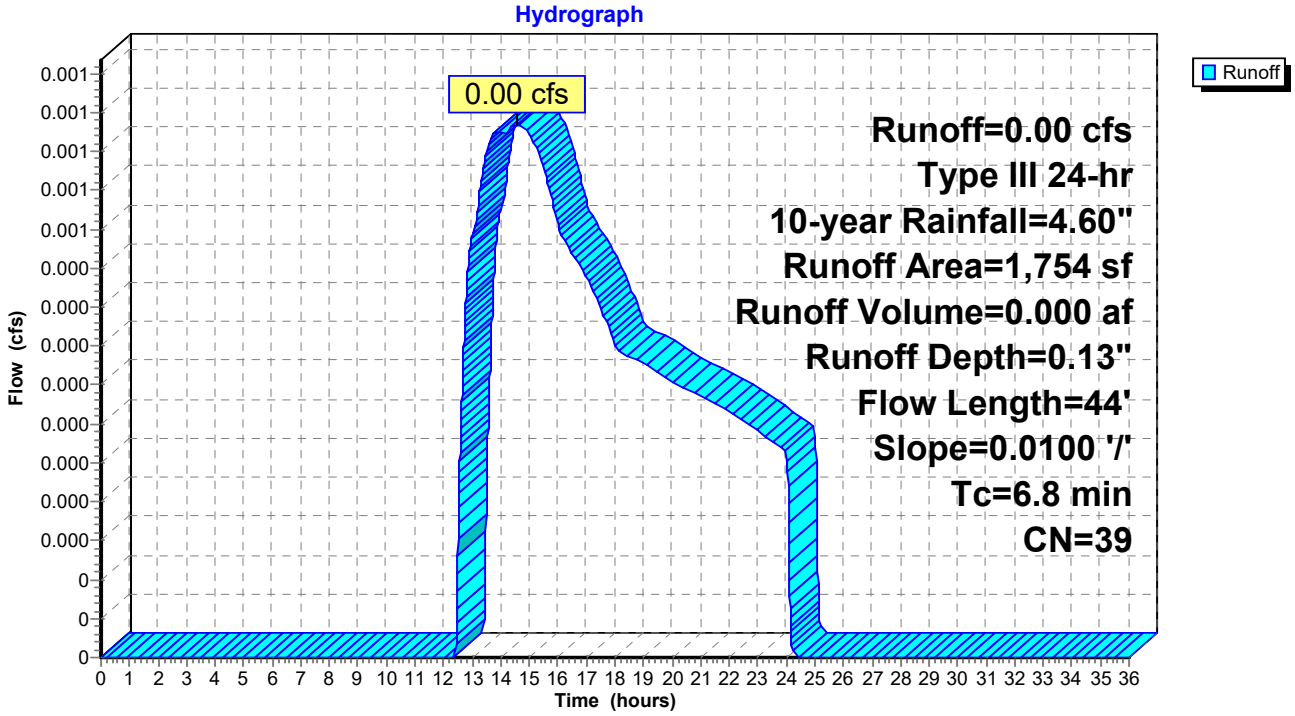
Runoff = 0.00 cfs @ 14.59 hrs, Volume= 0.000 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
1,754	39	>75% Grass cover, Good, HSG A
1,754		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	44	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 4S: DRAINING TO CB #3



Summary for Subcatchment 5S: ENTRY DRIVE

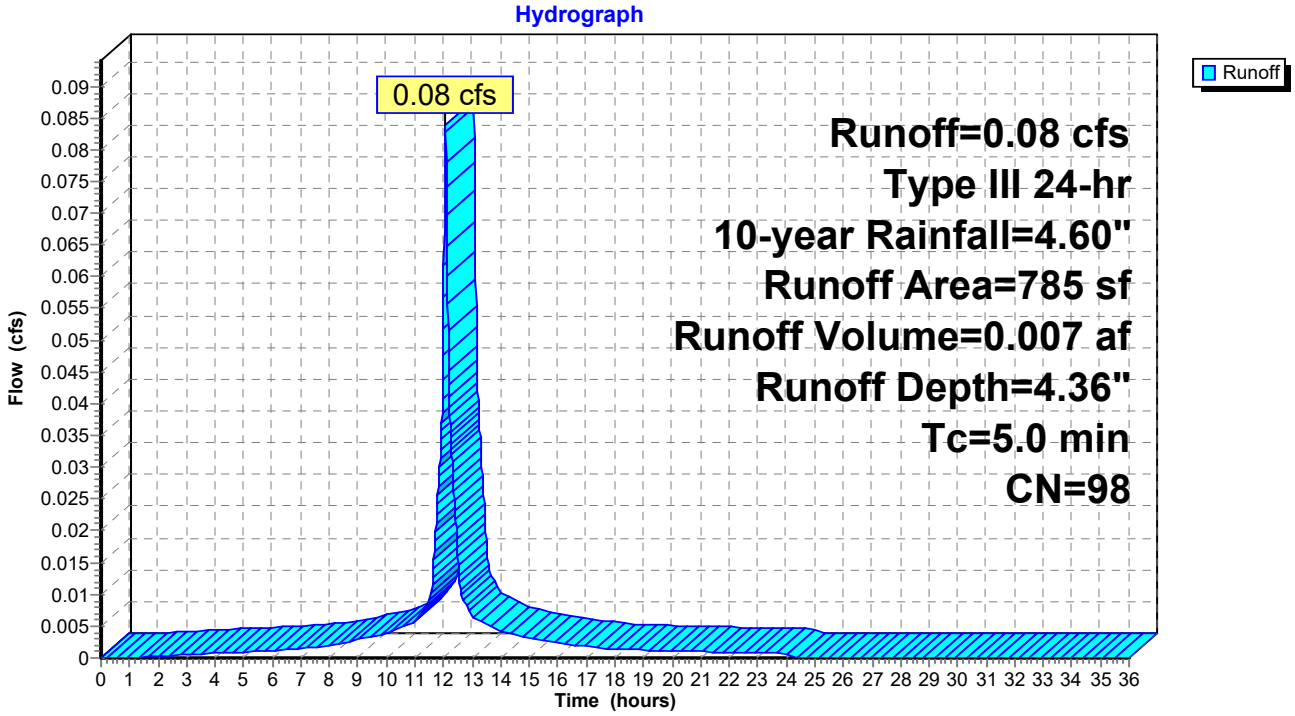
Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	785	98	PAVED ENTRY
	785		100.00% Impervious Area

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

Subcatchment 5S: ENTRY DRIVE



Summary for Subcatchment 6S: TIPDOWN

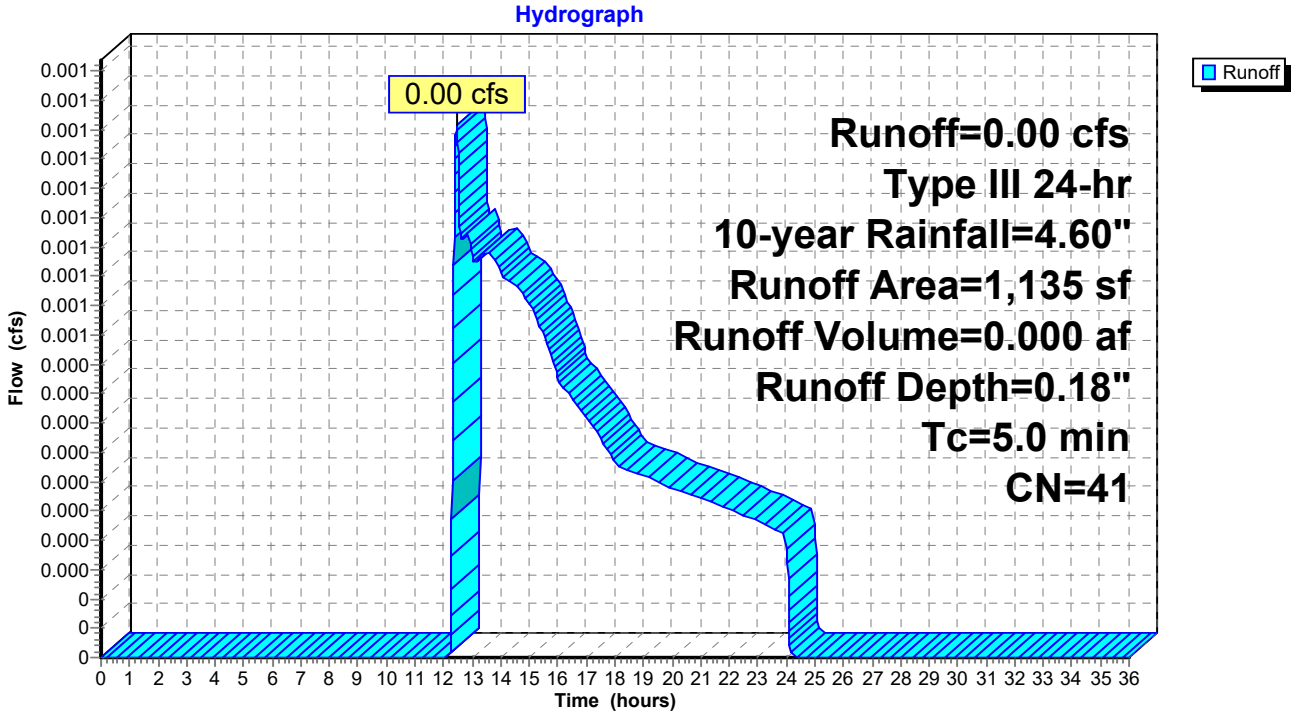
Runoff = 0.00 cfs @ 12.46 hrs, Volume= 0.000 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
	1,088	39	>75% Grass cover, Good, HSG A
*	47	98	BRICK AND CONCRETE SIDEWALK
	1,135	41	Weighted Average
	1,088		95.86% Pervious Area
	47		4.14% Impervious Area

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

Subcatchment 6S: TIPDOWN



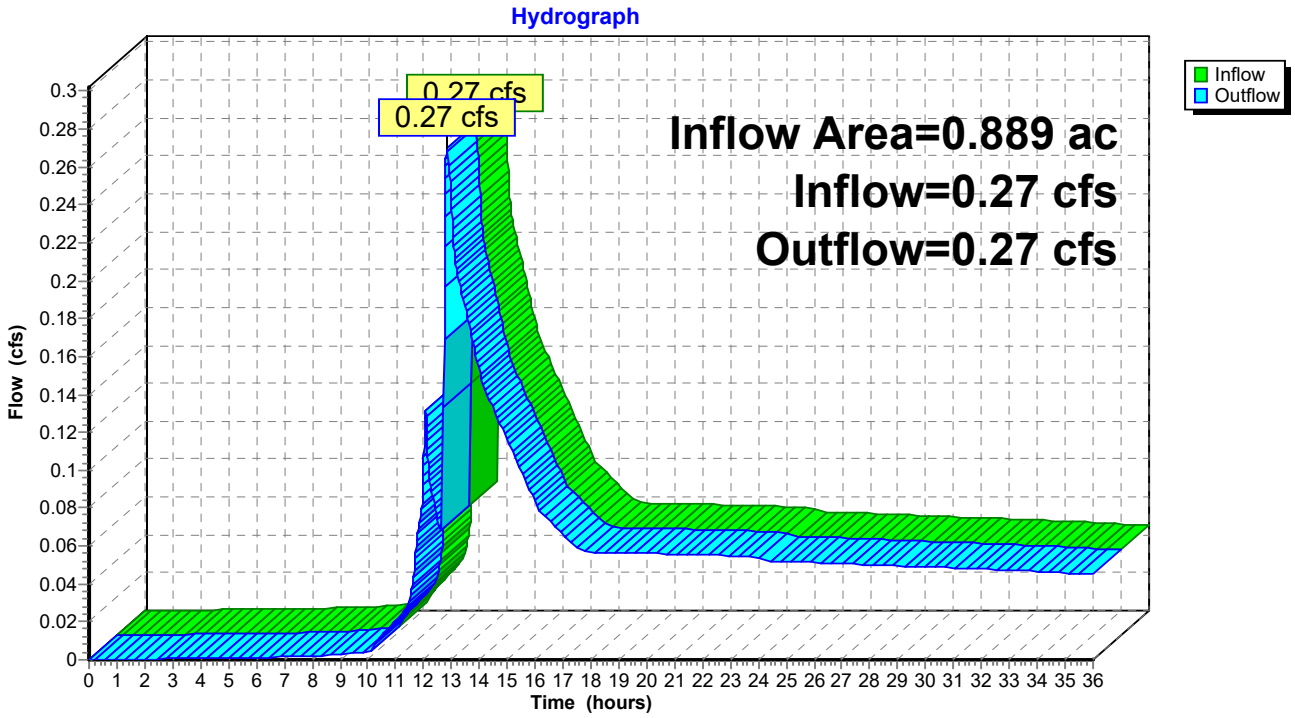
Summary for Reach 99R: POA #1

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

Inflow Area = 0.889 ac, 61.47% Impervious, Inflow Depth > 1.87" for 10-year event
Inflow = 0.27 cfs @ 12.84 hrs, Volume= 0.138 af
Outflow = 0.27 cfs @ 12.84 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: POA #1



Summary for Pond 1P: VUSF/CB #4

[58] Hint: Peaked 0.01' above defined flood level

Inflow Area = 0.701 ac, 74.64% Impervious, Inflow Depth = 2.81" for 10-year event
Inflow = 2.39 cfs @ 12.07 hrs, Volume= 0.164 af
Outflow = 0.26 cfs @ 12.84 hrs, Volume= 0.129 af, Atten= 89%, Lag= 45.8 min
Primary = 0.26 cfs @ 12.84 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.51' @ 12.84 hrs Surf.Area= 8,970 sf Storage= 4,069 cf
Flood Elev= 95.50' Surf.Area= 8,938 sf Storage= 4,040 cf

Plug-Flow detention time= 556.3 min calculated for 0.129 af (79% of inflow)
Center-of-Mass det. time= 476.2 min (1,292.2 - 815.9)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	4,658 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	93.50'	81 cf	**Transition Layer (Prismatic)** Listed below (Recalc) 806 cf Overall x 10.0% Voids
#3	92.50'	161 cf	**SOIL FILTER (Prismatic)** Listed below (Recalc) 1,612 cf Overall x 10.0% Voids
#4	92.00'	81 cf	**COURSE GRAVEL (Prismatic)** Listed below (Recalc) 806 cf Overall x 10.0% Voids
#5	91.33'	11 cf	**4.0" Round Pipe Storage** Inside #6 L= 127.0'
#6	91.00'	640 cf	**CRUSHED STONE UD BEDDING (Prismatic)** Listed below (Recalc) 1,612 cf Overall - 11 cf Embedded = 1,601 cf x 40.0% Voids
		5,632 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.00	1,612	0	0
95.00	2,183	1,898	1,898
95.50	2,490	1,168	3,066
96.00	3,878	1,592	4,658

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.50	1,612	0	0
94.00	1,612	806	806

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	1,612	0	0
93.50	1,612	1,612	1,612

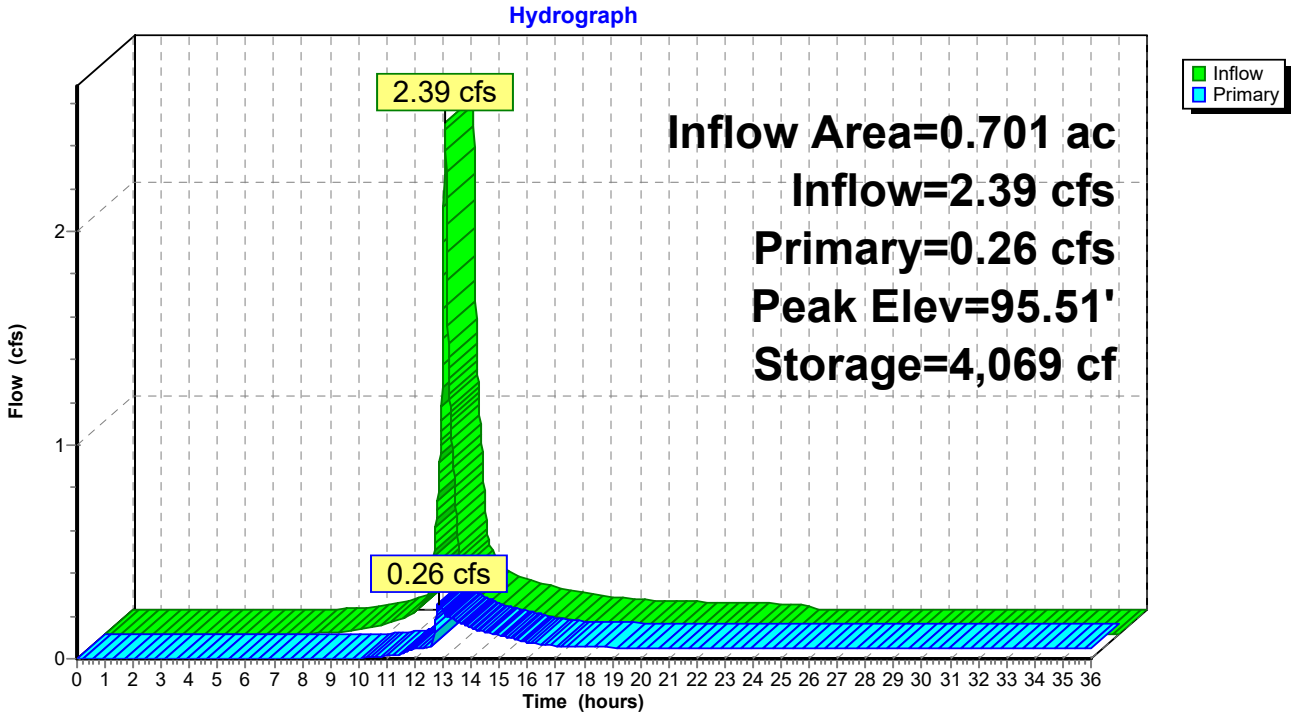
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.00	1,612	0	0
92.50	1,612	806	806

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.00	1,612	0	0
92.00	1,612	1,612	1,612

Device	Routing	Invert	Outlet Devices
#1	Primary	90.05'	**12.0" Round 12" SDR** L= 34.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.05' / 89.30' S= 0.0216 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.50'	**2.0" x 2.0" Horiz. CB OVERFLOW X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Device 1	91.33'	**1.0" Vert. WQV** C= 0.600

Primary OutFlow Max=0.15 cfs @ 12.84 hrs HW=95.51' (Free Discharge)
└─**1=12" SDR** (Passes 0.15 cfs of 6.65 cfs potential flow)
  ├─**2=CB OVERFLOW** (Weir Controls 0.10 cfs @ 0.35 fps)
  └─**3=WQV** (Orifice Controls 0.05 cfs @ 9.80 fps)

Pond 1P: VUSF/CB #4



Summary for Pond 2P: CB #1

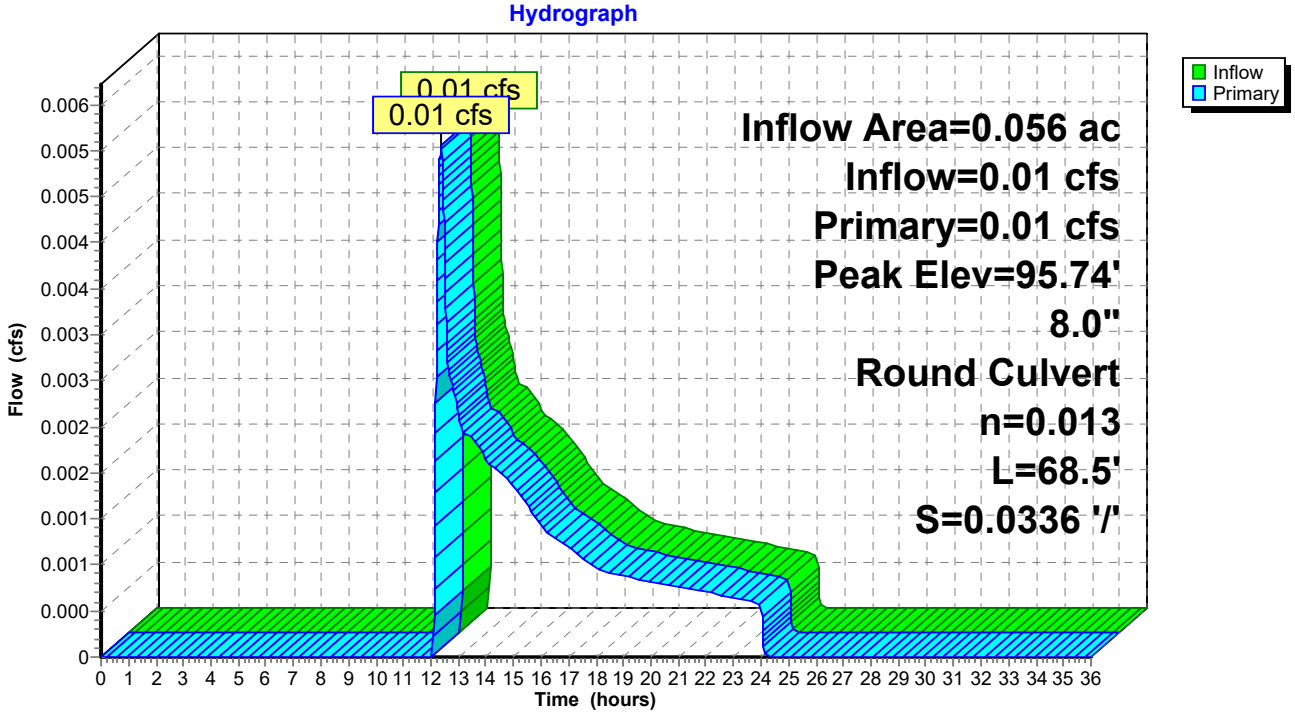
Inflow Area = 0.056 ac, 7.71% Impervious, Inflow Depth = 0.29" for 10-year event
Inflow = 0.01 cfs @ 12.36 hrs, Volume= 0.001 af
Outflow = 0.01 cfs @ 12.36 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.36 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.74' @ 12.36 hrs
Flood Elev= 99.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	**8.0" Round HDPE** L= 68.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 95.70' / 93.40' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.01 cfs @ 12.36 hrs HW=95.74' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.01 cfs @ 0.55 fps)

Pond 2P: CB #1



Summary for Pond 3P: CB #2

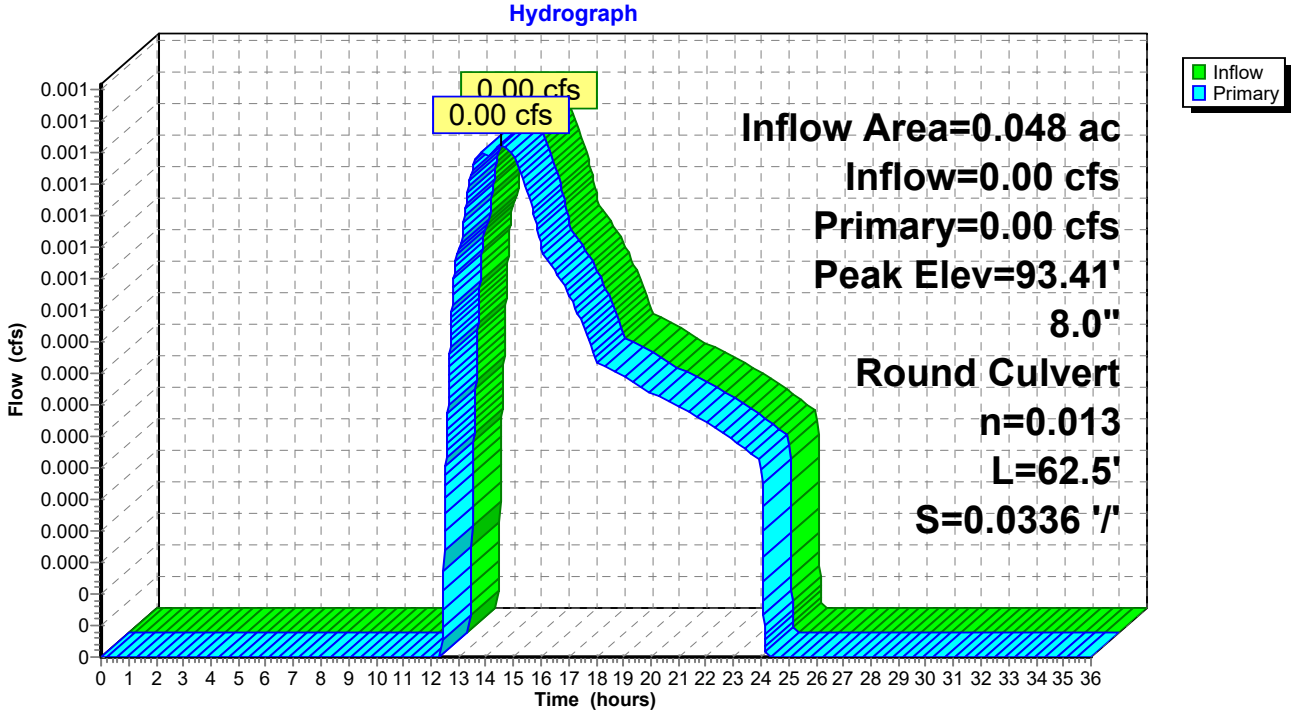
Inflow Area = 0.048 ac, 0.00% Impervious, Inflow Depth = 0.13" for 10-year event
Inflow = 0.00 cfs @ 14.55 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 14.55 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 14.55 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 93.41' @ 14.55 hrs
Flood Elev= 97.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	93.40'	**8.0" Round HDPE** L= 62.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.40' / 91.30' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 14.55 hrs HW=93.41' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.00 cfs @ 0.24 fps)

Pond 3P: CB #2



Summary for Pond 4P: CB #3

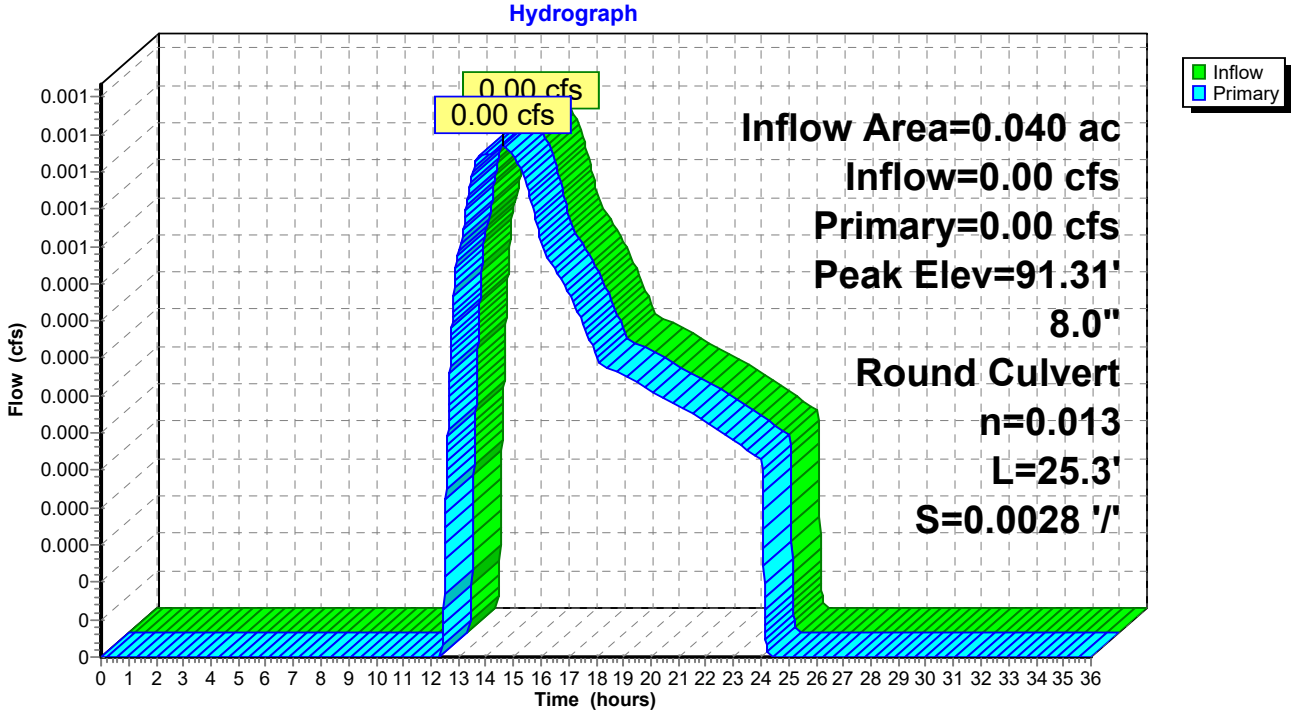
Inflow Area = 0.040 ac, 0.00% Impervious, Inflow Depth = 0.13" for 10-year event
Inflow = 0.00 cfs @ 14.59 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 14.59 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 14.59 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.31' @ 14.59 hrs
Flood Elev= 95.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	91.30'	**8.0" Round HDPE** L= 25.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.30' / 91.23' S= 0.0028 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 14.59 hrs HW=91.31' (Free Discharge)
└**1=HDPE** (Barrel Controls 0.00 cfs @ 0.20 fps)

Pond 4P: CB #3



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DRAINGE TO VUSF Runoff Area=30,526 sf 74.64% Impervious Runoff Depth=3.91"
Tc=5.0 min CN=83 Runoff=3.29 cfs 0.228 af

Subcatchment 2S: DRAINING TO CB#1 Runoff Area=2,452 sf 7.71% Impervious Runoff Depth=0.66"
Tc=5.0 min CN=44 Runoff=0.02 cfs 0.003 af

Subcatchment 3S: DRAINING TO CB #2 Runoff Area=2,079 sf 0.00% Impervious Runoff Depth=0.39"
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.002 af

Subcatchment 4S: DRAINING TO CB #3 Runoff Area=1,754 sf 0.00% Impervious Runoff Depth=0.39"
Flow Length=44' Slope=0.0100 '/' Tc=6.8 min CN=39 Runoff=0.01 cfs 0.001 af

Subcatchment 5S: ENTRY DRIVE Runoff Area=785 sf 100.00% Impervious Runoff Depth=5.56"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment 6S: TIPDOWN Runoff Area=1,135 sf 4.14% Impervious Runoff Depth=0.49"
Tc=5.0 min CN=41 Runoff=0.01 cfs 0.001 af

Reach 99R: POA #1 Inflow=1.46 cfs 0.204 af
Outflow=1.46 cfs 0.204 af

Pond 1P: VUSF/CB #4 Peak Elev=95.58' Storage=4,261 cf Inflow=3.29 cfs 0.228 af
Outflow=1.38 cfs 0.189 af

Pond 2P: CB #1 Peak Elev=95.79' Inflow=0.02 cfs 0.003 af
8.0" Round Culvert n=0.013 L=68.5' S=0.0336 '/' Outflow=0.02 cfs 0.003 af

Pond 3P: CB #2 Peak Elev=93.45' Inflow=0.01 cfs 0.002 af
8.0" Round Culvert n=0.013 L=62.5' S=0.0336 '/' Outflow=0.01 cfs 0.002 af

Pond 4P: CB #3 Peak Elev=91.36' Inflow=0.01 cfs 0.001 af
8.0" Round Culvert n=0.013 L=25.3' S=0.0028 '/' Outflow=0.01 cfs 0.001 af

Total Runoff Area = 0.889 ac Runoff Volume = 0.244 af Average Runoff Depth = 3.29"
38.53% Pervious = 0.343 ac 61.47% Impervious = 0.547 ac

Summary for Subcatchment 1S: DRAINGE TO VUSF

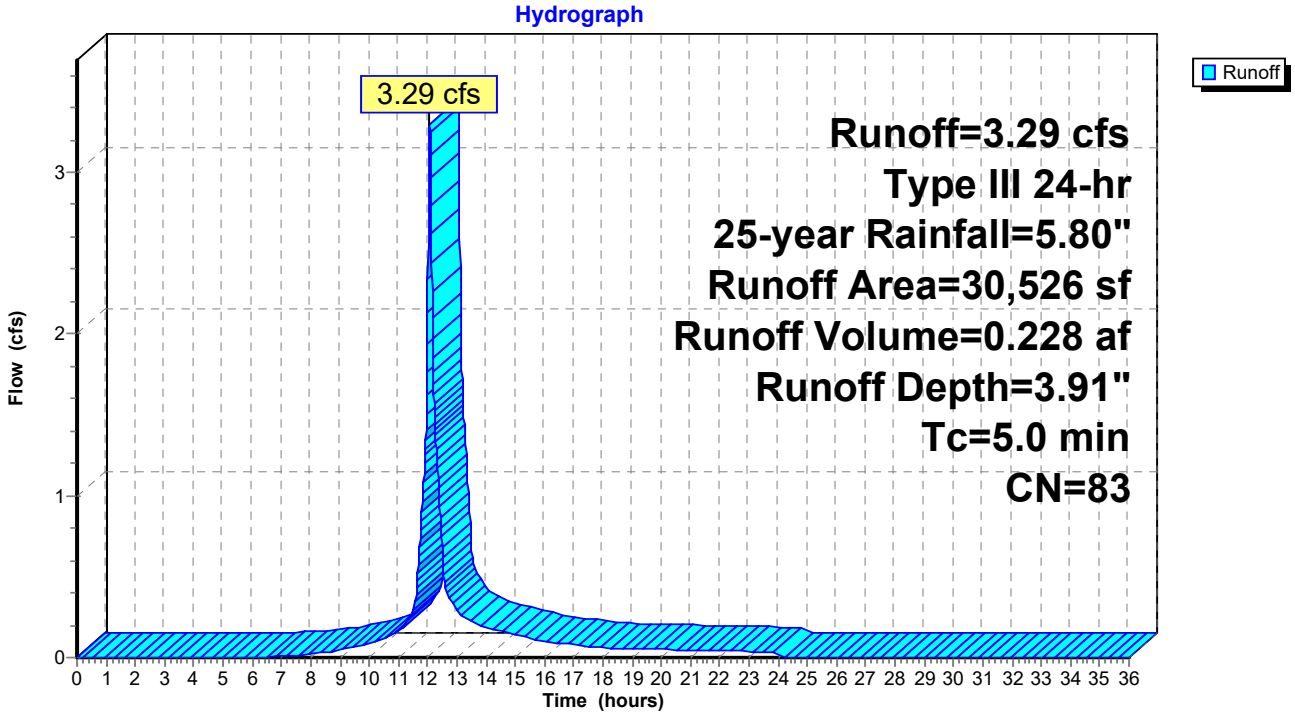
Runoff = 3.29 cfs @ 12.07 hrs, Volume= 0.228 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	22,786	98	PAVEMENT, SIDEWALKS, RETAINING WALL
	7,740	39	>75% Grass cover, Good, HSG A
	30,526	83	Weighted Average
	7,740		25.36% Pervious Area
	22,786		74.64% Impervious Area

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

Subcatchment 1S: DRAINGE TO VUSF



Summary for Subcatchment 2S: DRAINING TO CB#1

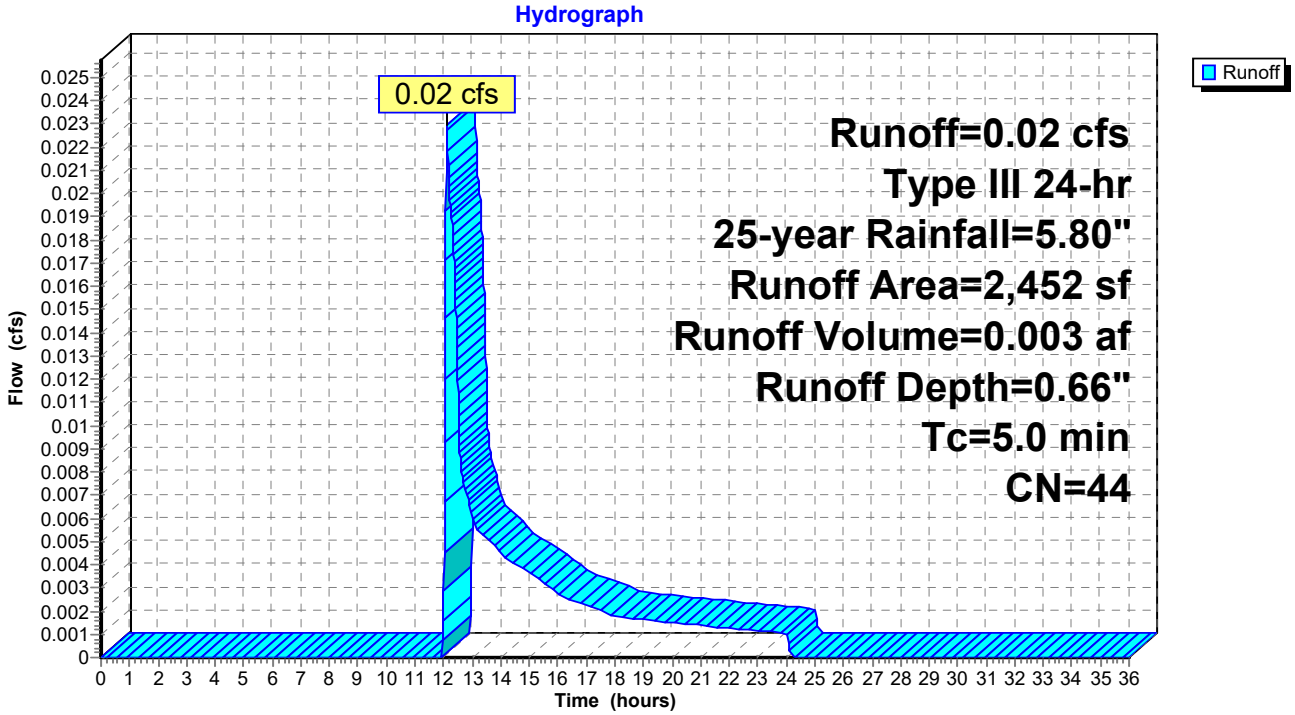
Runoff = 0.02 cfs @ 12.12 hrs, Volume= 0.003 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
	2,263	39	>75% Grass cover, Good, HSG A
*	189	98	BRICK SIDEWALK
	2,452	44	Weighted Average
	2,263		92.29% Pervious Area
	189		7.71% Impervious Area

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

Subcatchment 2S: DRAINING TO CB#1



Summary for Subcatchment 3S: DRAINING TO CB #2

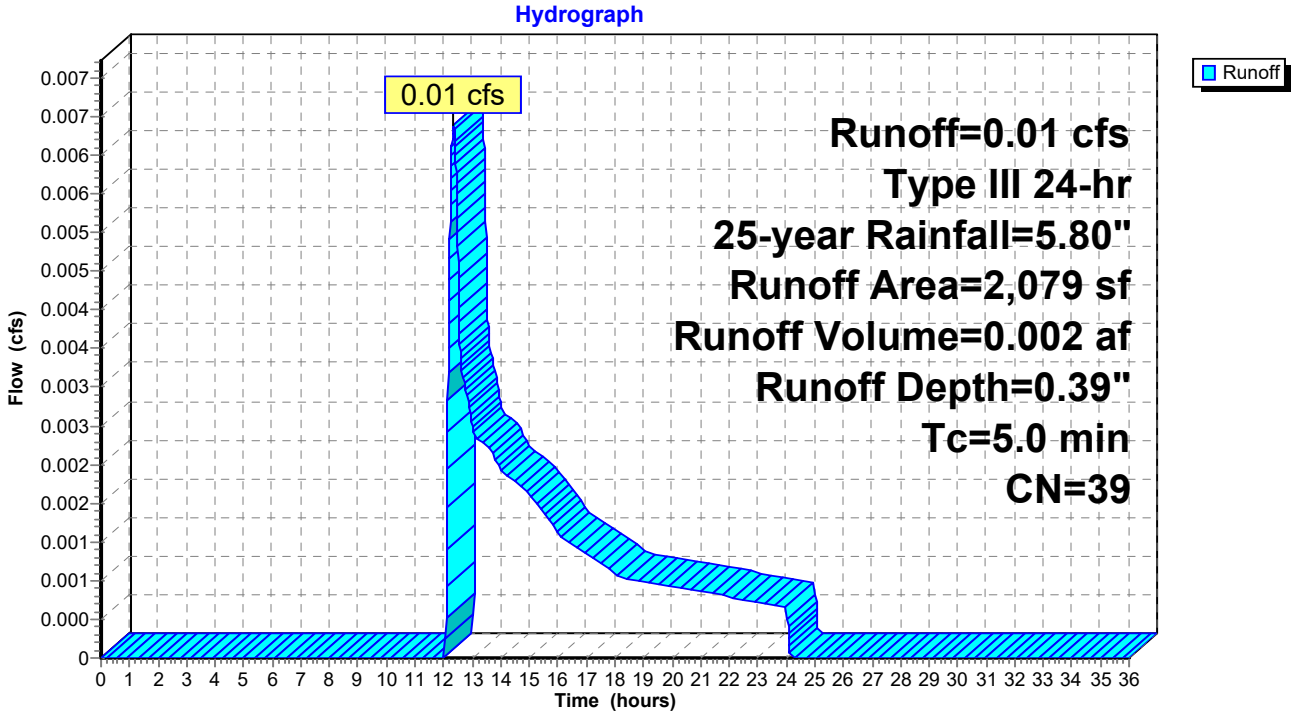
Runoff = 0.01 cfs @ 12.35 hrs, Volume= 0.002 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

Area (sf)	CN	Description
2,079	39	>75% Grass cover, Good, HSG A
2,079		100.00% Pervious Area

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

Subcatchment 3S: DRAINING TO CB #2



Summary for Subcatchment 4S: DRAINING TO CB #3

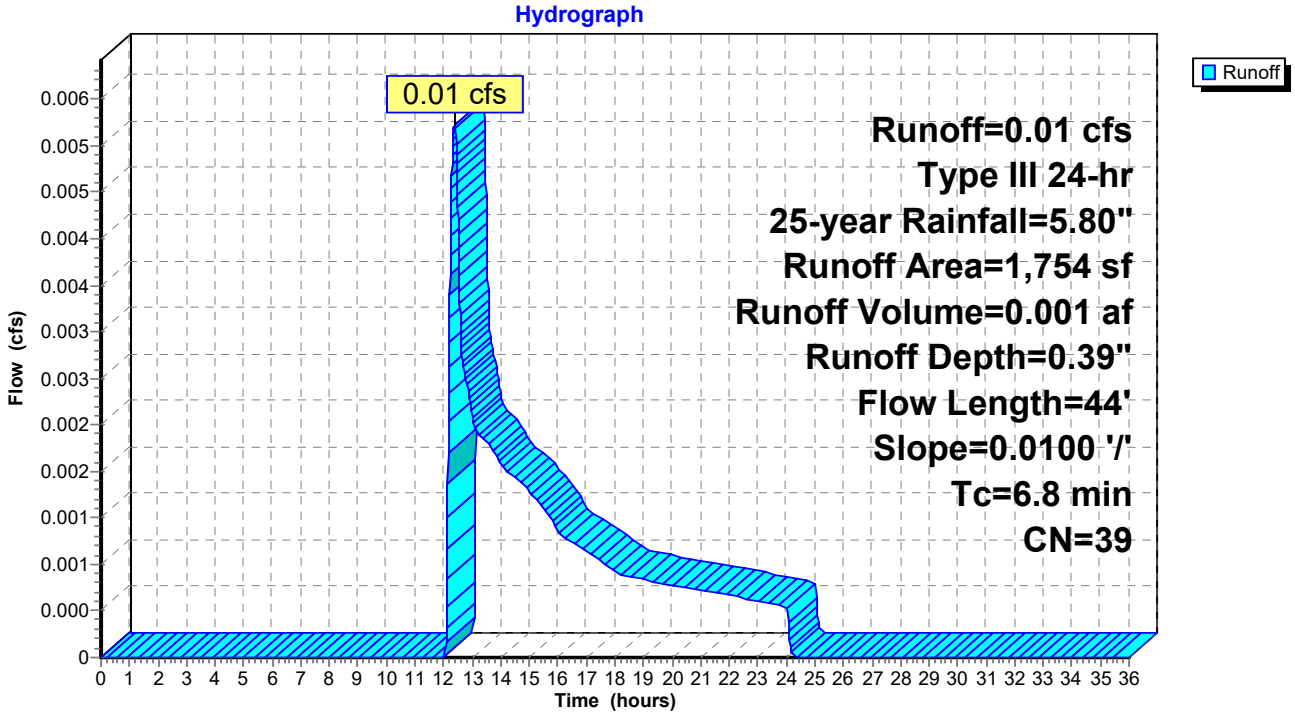
Runoff = 0.01 cfs @ 12.38 hrs, Volume= 0.001 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

Area (sf)	CN	Description
1,754	39	>75% Grass cover, Good, HSG A
1,754		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	44	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"

Subcatchment 4S: DRAINING TO CB #3



Summary for Subcatchment 5S: ENTRY DRIVE

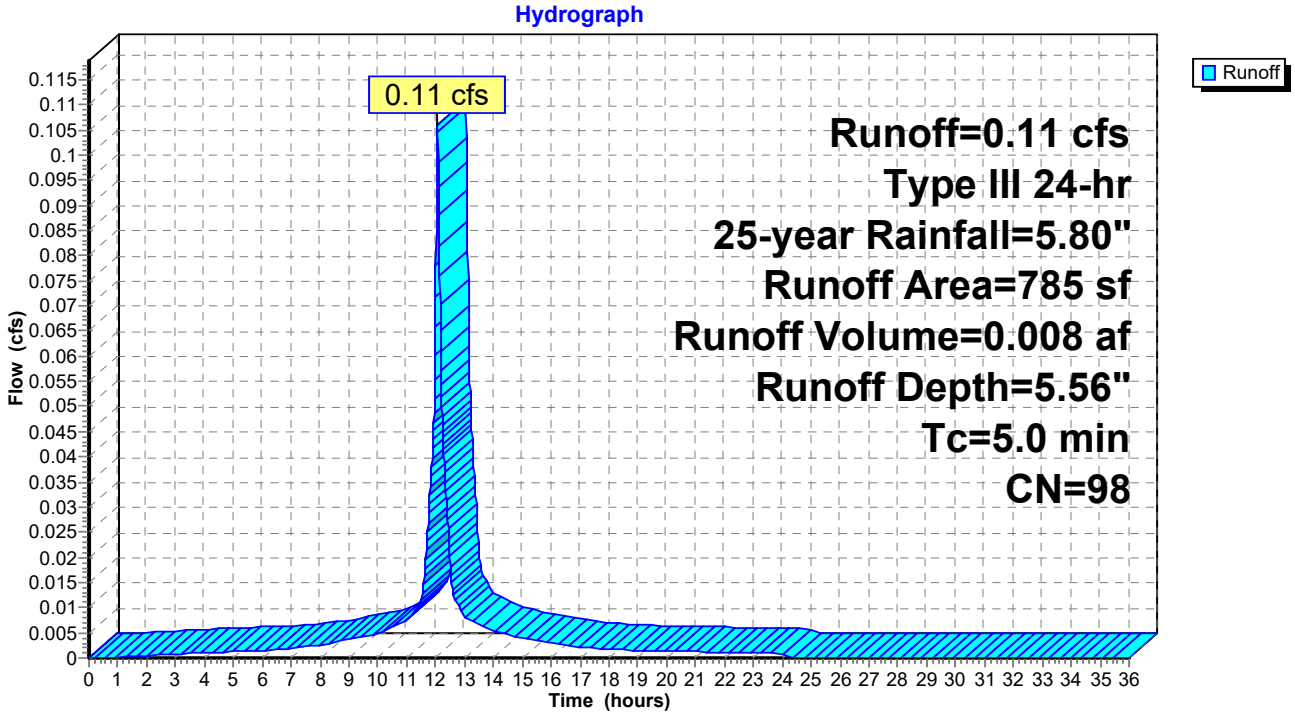
Runoff = 0.11 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	785	98	PAVED ENTRY
	785		100.00% Impervious Area

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

Subcatchment 5S: ENTRY DRIVE



Summary for Subcatchment 6S: TIPDOWN

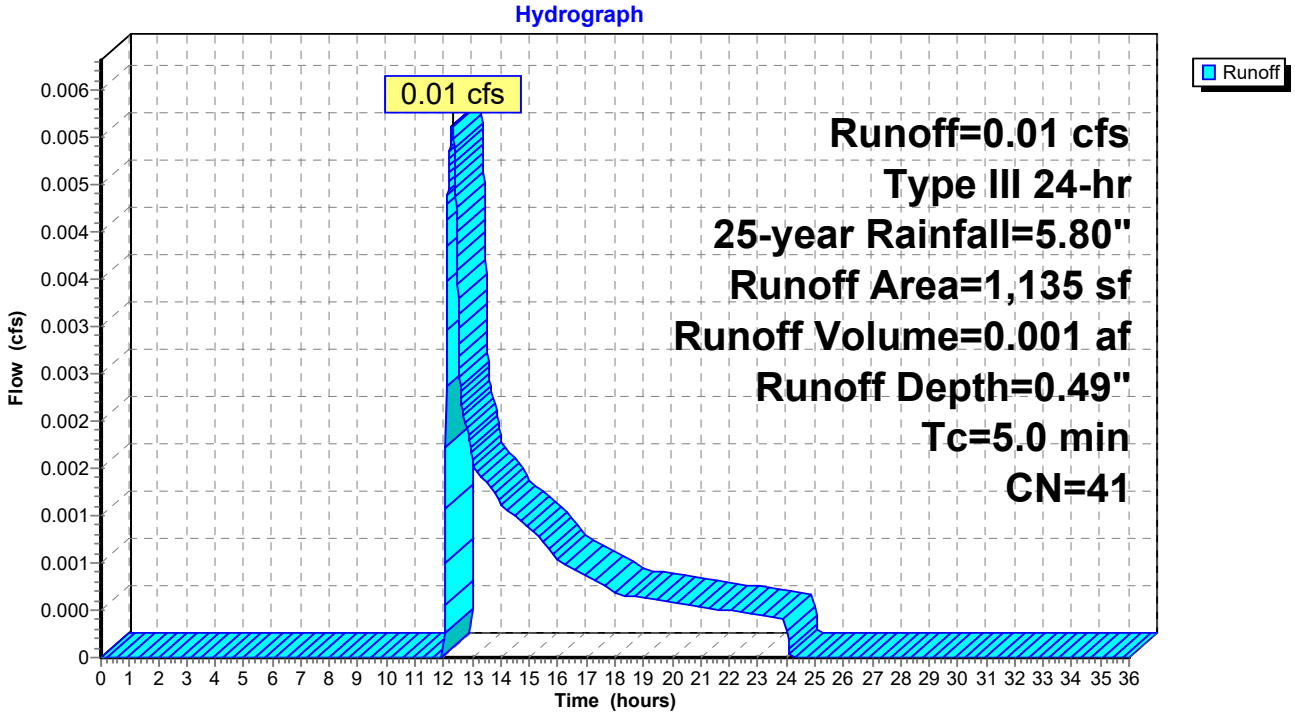
Runoff = 0.01 cfs @ 12.30 hrs, Volume= 0.001 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
	1,088	39	>75% Grass cover, Good, HSG A
*	47	98	BRICK AND CONCRETE SIDEWALK
	1,135	41	Weighted Average
	1,088		95.86% Pervious Area
	47		4.14% Impervious Area

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

Subcatchment 6S: TIPDOWN



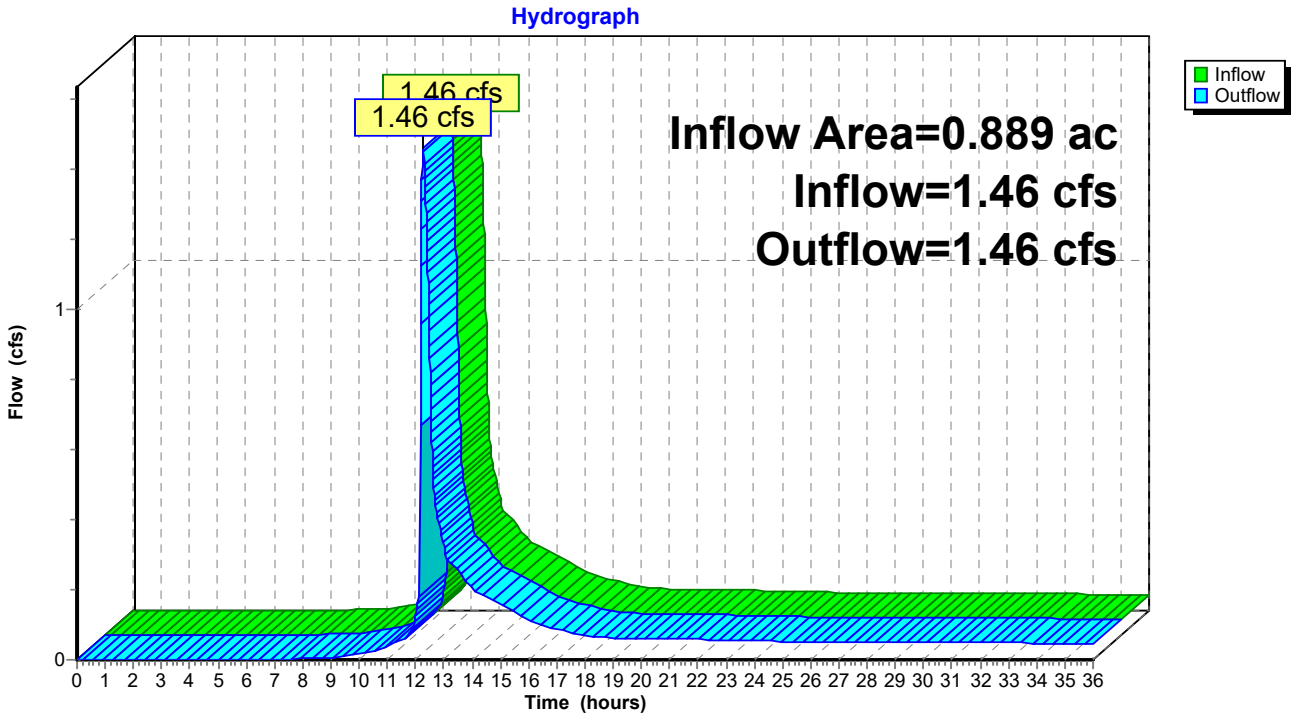
Summary for Reach 99R: POA #1

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

Inflow Area = 0.889 ac, 61.47% Impervious, Inflow Depth > 2.75" for 25-year event
Inflow = 1.46 cfs @ 12.27 hrs, Volume= 0.204 af
Outflow = 1.46 cfs @ 12.27 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 99R: POA #1



Summary for Pond 1P: VUSF/CB #4

[58] Hint: Peaked 0.08' above defined flood level

Inflow Area = 0.701 ac, 74.64% Impervious, Inflow Depth = 3.91" for 25-year event
Inflow = 3.29 cfs @ 12.07 hrs, Volume= 0.228 af
Outflow = 1.38 cfs @ 12.27 hrs, Volume= 0.189 af, Atten= 58%, Lag= 11.7 min
Primary = 1.38 cfs @ 12.27 hrs, Volume= 0.189 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.58' @ 12.27 hrs Surf.Area= 9,173 sf Storage= 4,261 cf
Flood Elev= 95.50' Surf.Area= 8,938 sf Storage= 4,040 cf

Plug-Flow detention time= 397.4 min calculated for 0.189 af (83% of inflow)
Center-of-Mass det. time= 327.2 min (1,133.8 - 806.6)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	4,658 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	93.50'	81 cf	**Transition Layer (Prismatic)** Listed below (Recalc) 806 cf Overall x 10.0% Voids
#3	92.50'	161 cf	**SOIL FILTER (Prismatic)** Listed below (Recalc) 1,612 cf Overall x 10.0% Voids
#4	92.00'	81 cf	**COURSE GRAVEL (Prismatic)** Listed below (Recalc) 806 cf Overall x 10.0% Voids
#5	91.33'	11 cf	**4.0" Round Pipe Storage** Inside #6 L= 127.0'
#6	91.00'	640 cf	**CRUSHED STONE UD BEDDING (Prismatic)** Listed below (Recalc) 1,612 cf Overall - 11 cf Embedded = 1,601 cf x 40.0% Voids
		5,632 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
94.00	1,612	0	0
95.00	2,183	1,898	1,898
95.50	2,490	1,168	3,066
96.00	3,878	1,592	4,658

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
93.50	1,612	0	0
94.00	1,612	806	806

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.50	1,612	0	0
93.50	1,612	1,612	1,612

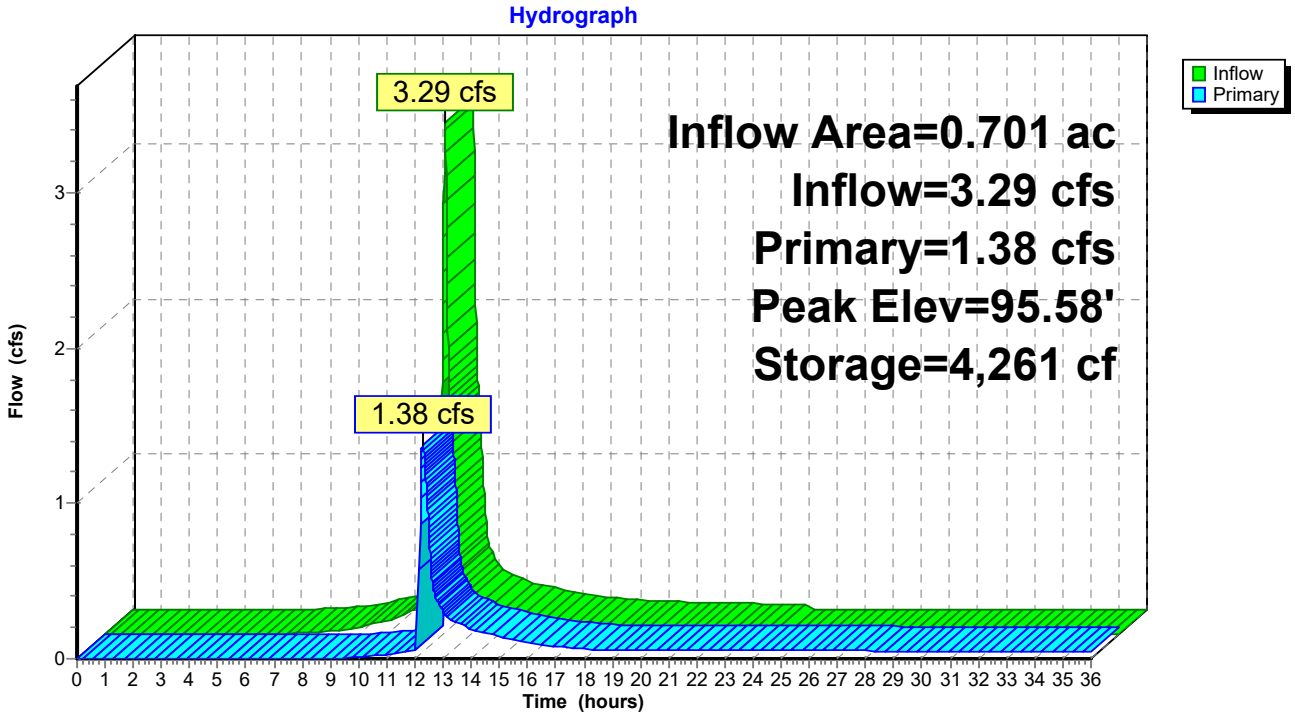
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.00	1,612	0	0
92.50	1,612	806	806

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
91.00	1,612	0	0
92.00	1,612	1,612	1,612

Device	Routing	Invert	Outlet Devices
#1	Primary	90.05'	**12.0" Round 12" SDR** L= 34.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 90.05' / 89.30' S= 0.0216 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.50'	**2.0" x 2.0" Horiz. CB OVERFLOW X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#3	Device 1	91.33'	**1.0" Vert. WQV** C= 0.600

Primary OutFlow Max=1.46 cfs @ 12.27 hrs HW=95.58' (Free Discharge)
└─**1=12" SDR** (Passes 1.46 cfs of 6.70 cfs potential flow)
  ├─**2=CB OVERFLOW** (Orifice Controls 1.40 cfs @ 1.40 fps)
  └─**3=WQV** (Orifice Controls 0.05 cfs @ 9.88 fps)

Pond 1P: VUSF/CB #4



Summary for Pond 2P: CB #1

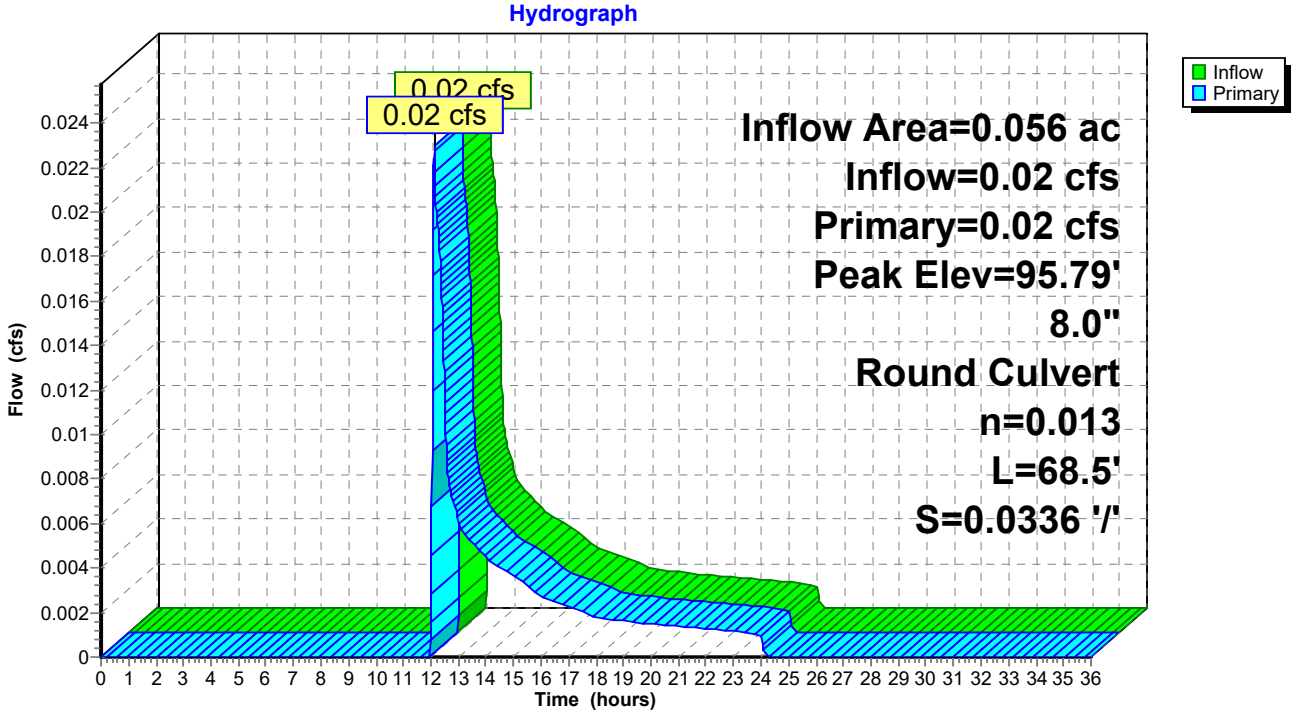
Inflow Area = 0.056 ac, 7.71% Impervious, Inflow Depth = 0.66" for 25-year event
Inflow = 0.02 cfs @ 12.12 hrs, Volume= 0.003 af
Outflow = 0.02 cfs @ 12.12 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 12.12 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.79' @ 12.12 hrs
Flood Elev= 99.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	**8.0" Round HDPE** L= 68.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 95.70' / 93.40' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.02 cfs @ 12.12 hrs HW=95.79' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.02 cfs @ 0.80 fps)

Pond 2P: CB #1



Summary for Pond 3P: CB #2

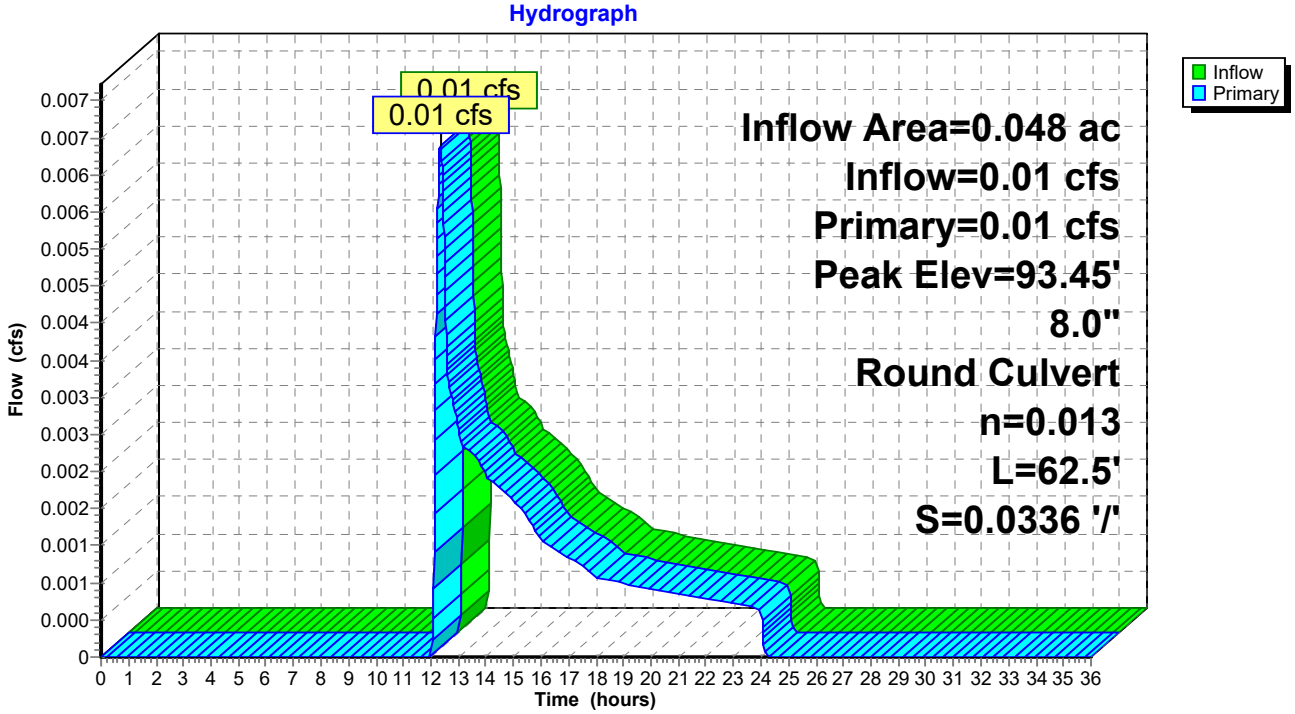
Inflow Area = 0.048 ac, 0.00% Impervious, Inflow Depth = 0.39" for 25-year event
Inflow = 0.01 cfs @ 12.35 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 12.35 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.35 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 93.45' @ 12.35 hrs
Flood Elev= 97.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	93.40'	**8.0" Round HDPE** L= 62.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.40' / 91.30' S= 0.0336 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.01 cfs @ 12.35 hrs HW=93.45' (Free Discharge)
└**1=HDPE** (Inlet Controls 0.01 cfs @ 0.58 fps)

Pond 3P: CB #2

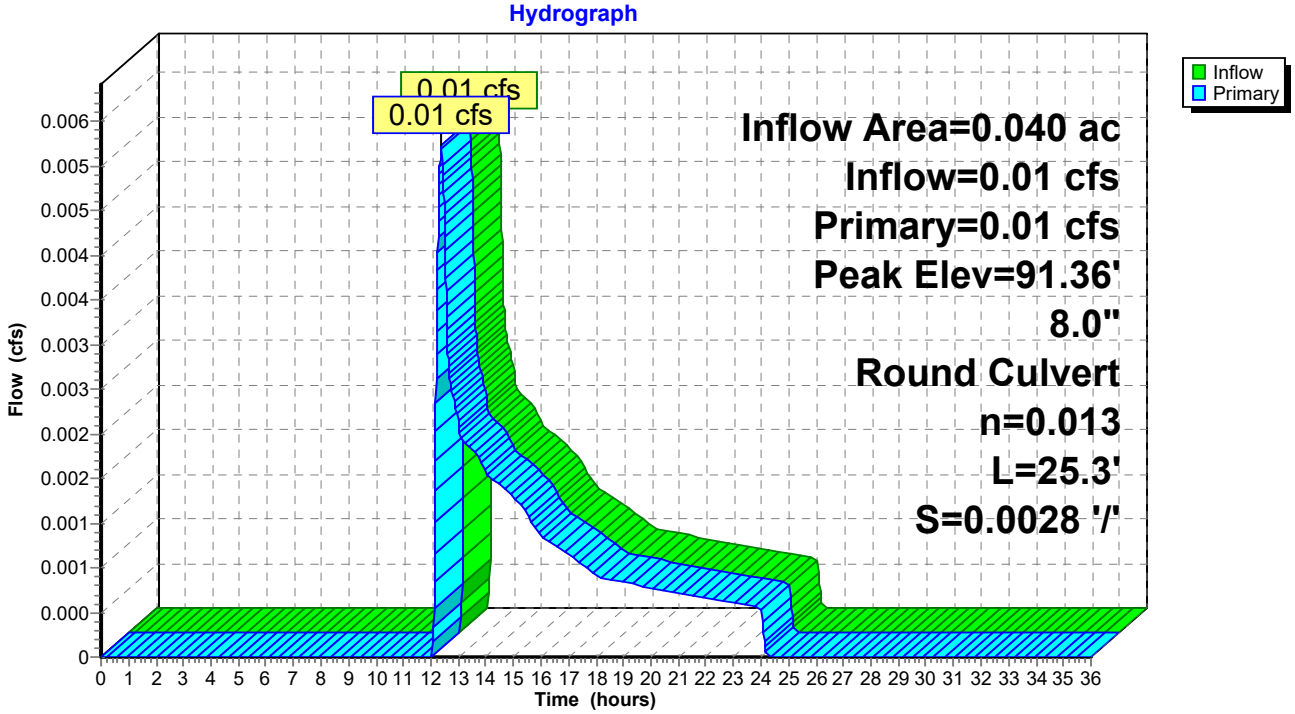


Summary for Pond 4P: CB #3

Inflow Area = 0.040 ac, 0.00% Impervious, Inflow Depth = 0.39" for 25-year event
Inflow = 0.01 cfs @ 12.38 hrs, Volume= 0.001 af
Outflow = 0.01 cfs @ 12.38 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.38 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.36' @ 12.38 hrs
Flood Elev= 95.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	91.30'	**8.0" Round HDPE** L= 25.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 91.30' / 91.23' S= 0.0028 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.01 cfs @ 12.38 hrs HW=91.36' (Free Discharge)
└**1=HDPE** (Barrel Controls 0.01 cfs @ 0.56 fps)

Pond 4P: CB #3