Storm Drainage Report
Distinctive Tree Care
591 & 595 Nutmeg Road North
South Windsor, CT

Prepared by:

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21 Jeffrey Drive
South Windsor, CT 06074

March 2, 2021

Table of Contents

Introduction

Distinctive Tree Care proposing to develop two parcels located at 591 & 595 Nutmeg Road North. Lot 1 (595 Nutmeg Road North ~ 7.82 acre lot) will include the construction of 2 buildings; one to be 13,955 sf and the other to be 7,200 sf foot building. Lot 2 (591 Nutmeg Road North ~ 1.44 acre lot) will include construction of a 4,621 square foot building. Both buildings will have its own driveway access to Nutmeg Road North and associated site improvements to include but not be limited to new access driveways, parking areas for vehicles, sidewalks, landscaping, lighting, utilities, common access drive, and stormwater management BMP's.

The total combined tract area is 9.26 acres. The total expected disturbance during construction for Lot 1 and Lot 2 is 5.50 acres and 1.0 acres, respectively. For more information, please refer to the plans entitled "Distinctive Tree Care ~ Site Plan Modification ~ 591 & 595 Nutmeg Road North ~ South Windsor, CT" prepared by Design Professionals, Inc., and dated March 2, 2021, as amended.

Existing Site Conditions

Lot 1

During the October 2011 blizzard, the existing building collapsed and was subsequently razed. The site still has in place the existing paved driveway, parking areas, and underground utilities. In general, the developed portion of the property grades down from north to south. The majority of paved surface runs off into a subsurface storm sewer collection system consisting of catchbasins and reinforced concrete pipe. The system and most all other overland runoff is collected by the site's detention basin. The detention basin's outlet structure is a 24 inch outlet that does not appear to provide any stormwater attenuation. Following discharge from the detention basin, flow ultimately enters the upper reach of Stoughton Brook. Stoughton Brook is tributary to the Connecticut River.

Other than paved surfaces, the surficial characteristics of the site can primarily be classified as a compilation of woodlands and overgrown vegetation. The property is relatively flat with topographical relief at approximately 10 feet.

Lot 2

The area is 1.44 acres and located at the southeast corner of the parent lot. In general, the land slopes down from southeast to northwest. The majority of stormwater runoff enters the site's detention pond. The ground's surface is best characterized as woods.

In order to establish a hydrologic comparison between existing and proposed conditions, an evaluation was performed to quantify the peak rate of stormwater discharge to downstream waters. Methods outlined in the U.S.D.A. National Resources Conservation Service's Technical Release 55 (Urban Hydrology for Small Watersheds), were followed

in estimating runoff and times of concentration. Hydraflow Hydrographs (version 2012) computer modeling software was used as application.

The peak rate of stormwater runoff discharging to downstream waters was estimated for the 2-, 10-, 25-, 50-, and 100 year storm events. Refer to **Appendix A** for the existing conditions watershed computations. A map depicting the existing condition's storm drainage runoff patterns (Sheet DA-1) is provided in **Appendix F**.

Proposed Site Conditions

Lot 1

Distinctive Tree proposes to erect a new building in approximately the same location as the existing building whose roof collapsed in 2011.

The existing storm sewer system and its watershed area will remain approximately unchanged. The final downstream length of pipe will be reduced to include a Barracuda hydrodynamic separator to treat flow from the existing catchbasins. All other developed portions of the lot will runoff into stilling basins. The purpose of the stilling basins is threefold; they serve to attenuate peak discharge of stormwater, dissipate energy of receiving flow, and improve water quality.

The intent of the proposed storm drainage system design was to reduce the peak rate of flow into downstream waters to a level below that which occurs under existing conditions. A net reduction of peak discharge into the downstream waters will occur as a result of the proposed site development as compared to existing conditions following the 2-, 10-, 25-, 50-, and 100 year storm events. Refer to Table 1 below.

Reach		2 year	10 year	25 year	50 year	100 year
DP#1 – South West Wetland Boundary	**Pre**	2.76	3.62	4.38	5.03	5.92
	Post	1.69	2.43	2.99	3.49	4.09

Storm Sewer Collection System

The proposed subsurface stormwater collection and conveyance system was designed to adequately convey proposed runoff under 10- year storm event conditions. The design of the storm sewers followed the guidelines set forth in the Connecticut Department of Transportation's Drainage Manual. It is estimated that during a 10-year storm event, all proposed subsurface culverts will convey storm runoff without resulting in any unacceptable flooding conditions. The computations are included as **Appendix D**.

Water Quality

2~ADS Barracuda water quality units are proposed to address water quality for all flows from the site. Water quality units were sized based on the determined water quality flow

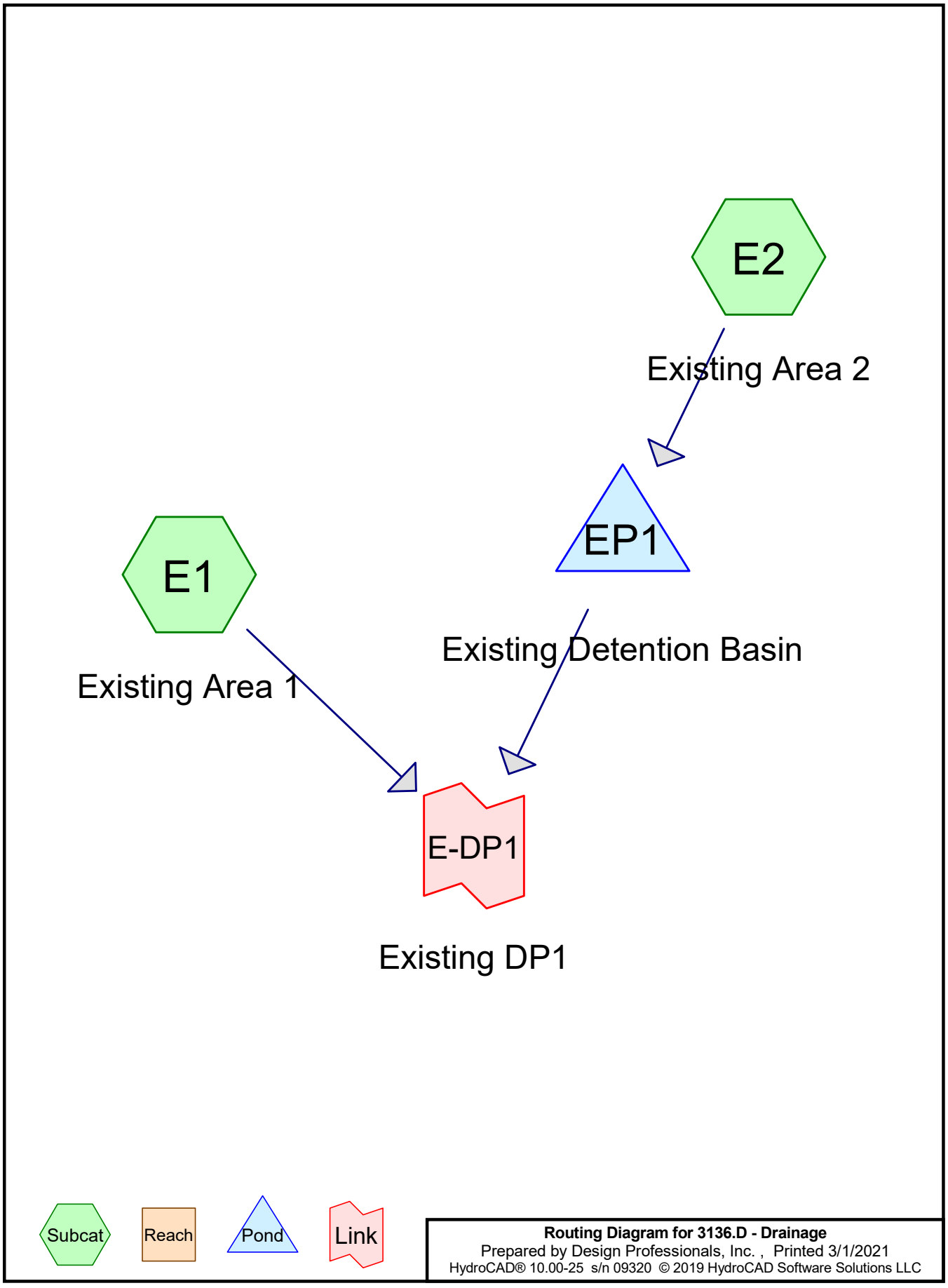
for the area draining to them. See **Appendix E** for water quality flow calculations, and ADS Barracuda manufacturer's sizing.

All other developed areas on the site not contributing watershed to the existing subsurface storm collection system will be graded such that runoff will be directed into one of three stilling basins. The stilling basins will be approximately two to four feet deep and planted with a 'seasonally flooded wildlife food mix'. The growth demand of the plantings (resulting from the wildlife food mix) typically consumes nutrients such as nitrogen and phosphorous which would otherwise discharge into downstream waters. Other benefits provided by the stilling basins include energy dissipation for control of erosion, removal of heavy metals, and facilitation of groundwater infiltration. The proposed plantings will also result in a more diverse environment in terms of flora and fauna. See **Appendix E** for water quality volume calculations.

Conclusion

It is our opinion that the proposed stormwater management design as presented herein and on the accompanying site plans, will not pose any significant detrimental impacts to the environment surrounding the site. The proposed design will likely benefit the quality of downstream waters as compared to existing (pre-developed) conditions.

APPENDIX A
Watershed Computations
(Pre-Development Drainage HydroCAD Report)



Routing Diagram for 3136.D - Drainage
Prepared by Design Professionals, Inc. , Printed 3/1/2021

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 E1: Existing Area 1 Runoff Area=2.907 ac 4.51% Impervious Runoff Depth=0.00"
Tc=15.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment E2: Existing Area 2 Runoff Area=5.329 ac 39.63% Impervious Runoff Depth=1.15"
Tc=7.0 min CN=77 Runoff=6.74 cfs 0.513 af

Pond EP1: Existing Detention Basin Peak Elev=65.42' Storage=3,738 cf Inflow=6.74 cfs 0.513 af
Outflow=2.76 cfs 0.513 af

Link E-DP1: Existing DP1 Inflow=2.76 cfs 0.513 af
Primary=2.76 cfs 0.513 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 E1: Existing Area 1 Runoff Area=2.907 ac 4.51% Impervious Runoff Depth=0.19"
Tc=15.0 min CN=39 Runoff=0.08 cfs 0.046 af

Subcatchment E2: Existing Area 2 Runoff Area=5.329 ac 39.63% Impervious Runoff Depth=2.58"
Tc=7.0 min CN=77 Runoff=15.54 cfs 1.146 af

Pond EP1: Existing Detention Basin Peak Elev=66.94' Storage=13,857 cf Inflow=15.54 cfs 1.146 af
Outflow=3.55 cfs 1.146 af

Link E-DP1: Existing DP1 Inflow=3.62 cfs 1.192 af
Primary=3.62 cfs 1.192 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 E1: Existing Area 1 Runoff Area=2.907 ac 4.51% Impervious Runoff Depth=0.47"
Tc=15.0 min CN=39 Runoff=0.51 cfs 0.115 af

Subcatchment E2: Existing Area 2 Runoff Area=5.329 ac 39.63% Impervious Runoff Depth=3.57"
Tc=7.0 min CN=77 Runoff=21.48 cfs 1.584 af

Pond EP1: Existing Detention Basin Peak Elev=67.69' Storage=21,848 cf Inflow=21.48 cfs 1.584 af
Outflow=3.88 cfs 1.584 af

Link E-DP1: Existing DP1 Inflow=4.38 cfs 1.699 af
Primary=4.38 cfs 1.699 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 E1: Existing Area 1 Runoff Area=2.907 ac 4.51% Impervious Runoff Depth=0.75"
Tc=15.0 min CN=39 Runoff=1.02 cfs 0.181 af

Subcatchment E2: Existing Area 2 Runoff Area=5.329 ac 39.63% Impervious Runoff Depth=4.31"
Tc=7.0 min CN=77 Runoff=25.90 cfs 1.915 af

Pond EP1: Existing Detention Basin Peak Elev=68.13' Storage=28,209 cf Inflow=25.90 cfs 1.915 af
Outflow=4.06 cfs 1.915 af

Link E-DP1: Existing DP1 Inflow=5.03 cfs 2.096 af
Primary=5.03 cfs 2.096 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 E1: Existing Area 1 Runoff Area=2.907 ac 4.51% Impervious Runoff Depth=1.10"
Tc=15.0 min CN=39 Runoff=1.80 cfs 0.266 af

Subcatchment E2: Existing Area 2 Runoff Area=5.329 ac 39.63% Impervious Runoff Depth=5.15"
Tc=7.0 min CN=77 Runoff=30.79 cfs 2.285 af

Pond EP1: Existing Detention Basin Peak Elev=68.58' Storage=35,583 cf Inflow=30.79 cfs 2.285 af
Outflow=4.24 cfs 2.285 af

Link E-DP1: Existing DP1 Inflow=5.92 cfs 2.552 af
Primary=5.92 cfs 2.552 af

Summary for Subcatchment E1: Existing Area 1

[45] Hint: Runoff=Zero

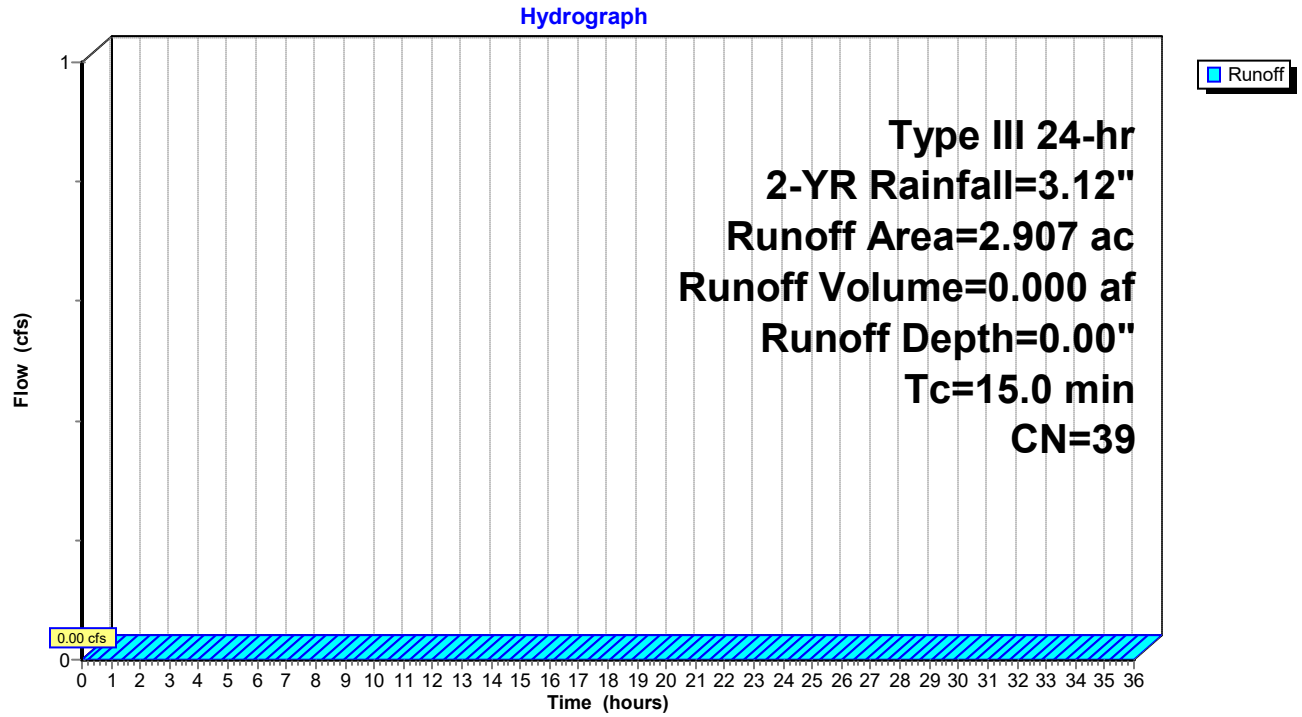
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	1.989	30	Woods, Good, HSG A
	0.631	55	Woods, Good, HSG B
*	0.034	66	Woods, Good, HSG B/D
	0.122	39	>75% Grass cover, Good, HSG A
*	0.131	98	IMPERVIOUS
	2.907	39	Weighted Average
	2.776		95.49% Pervious Area
	0.131		4.51% Impervious Area

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

Subcatchment E1: Existing Area 1



Summary for Subcatchment E2: Existing Area 2

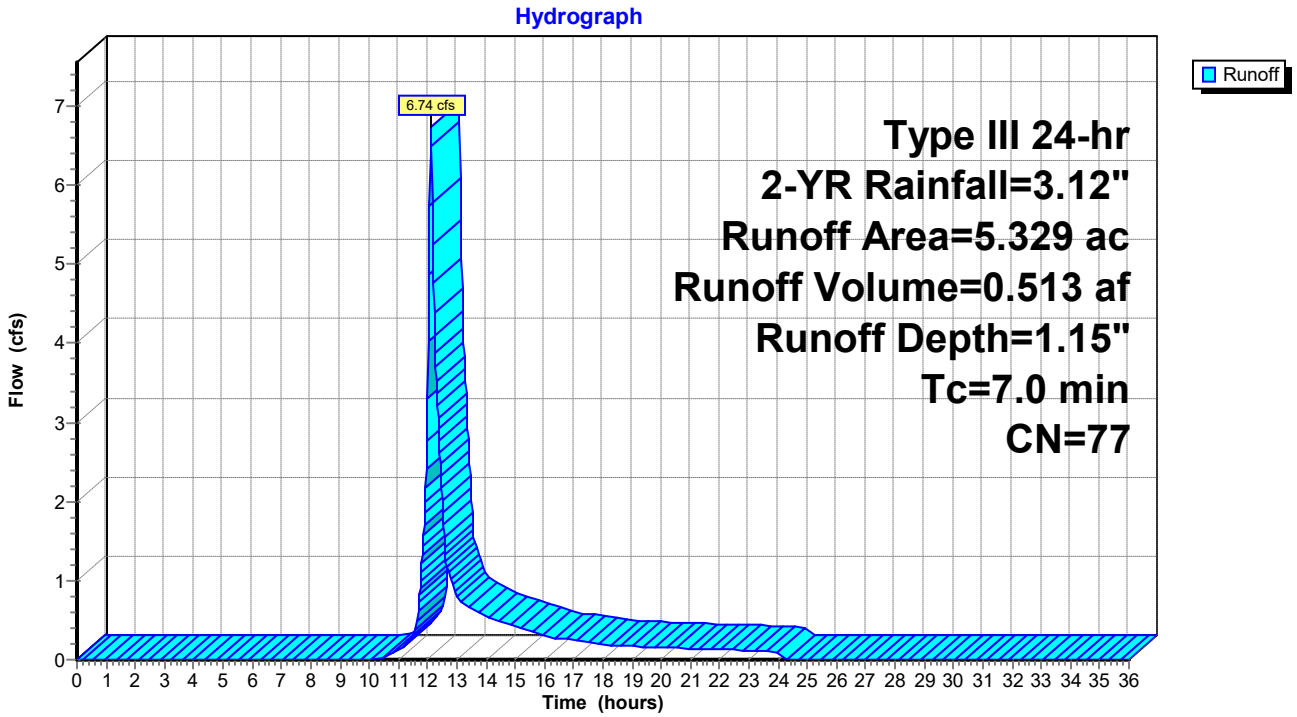
Runoff = 6.74 cfs @ 12.11 hrs, Volume= 0.513 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.009	30	Woods, Good, HSG A
	0.490	55	Woods, Good, HSG B
*	1.878	66	Woods, Good, HSG B/D
	0.039	39	>75% Grass cover, Good, HSG A
	0.599	61	>75% Grass cover, Good, HSG B
*	0.202	71	>75% Grass cover, Good, HSG B/D
*	2.112	98	IMPERVIOUS
	5.329	77	Weighted Average
	3.217		60.37% Pervious Area
	2.112		39.63% Impervious Area

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

Subcatchment E2: Existing Area 2



Summary for Pond EP1: Existing Detention Basin

Inflow Area = 5.329 ac, 39.63% Impervious, Inflow Depth = 1.15" for 2-YR event
Inflow = 6.74 cfs @ 12.11 hrs, Volume= 0.513 af
Outflow = 2.76 cfs @ 12.40 hrs, Volume= 0.513 af, Atten= 59%, Lag= 17.7 min
Primary = 2.76 cfs @ 12.40 hrs, Volume= 0.513 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 65.42' @ 12.40 hrs Surf.Area= 3,891 sf Storage= 3,738 cf

Plug-Flow detention time= 9.5 min calculated for 0.513 af (100% of inflow)
Center-of-Mass det. time= 9.5 min (864.2 - 854.7)

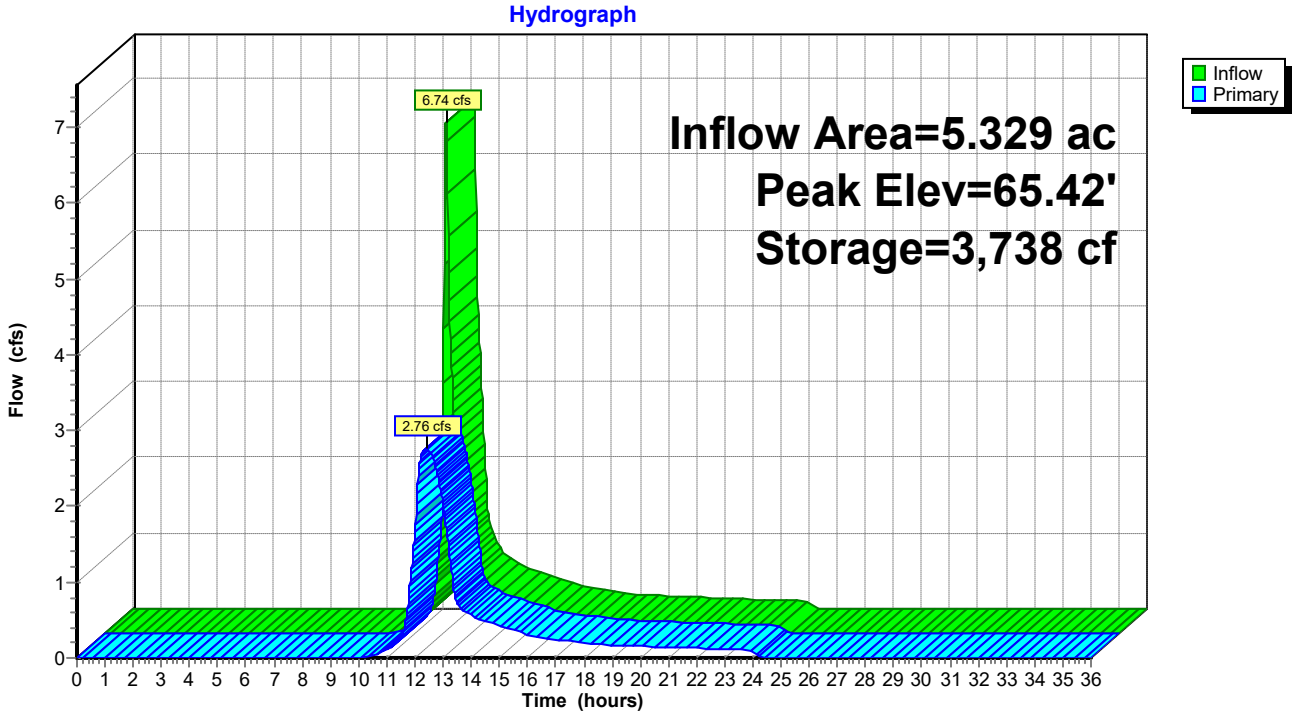
Volume	Invert	Avail.Storage	Storage Description
#1	62.70'	65,684 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.70	12	0	0
65.00	2,144	2,479	2,479
66.00	6,333	4,239	6,718
67.00	8,951	7,642	14,360
68.00	14,691	11,821	26,181
69.00	19,951	17,321	43,502
70.00	24,414	22,183	65,684

Device	Routing	Invert	Outlet Devices
#1	Primary	62.66'	**24.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.66' / 62.33' S= 0.0066 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	62.70'	**6.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.76 cfs @ 12.40 hrs HW=65.42' (Free Discharge)
↑—**1=Culvert** (Passes 2.76 cfs of 18.44 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 2.76 cfs @ 7.36 fps)

Pond EP1: Existing Detention Basin

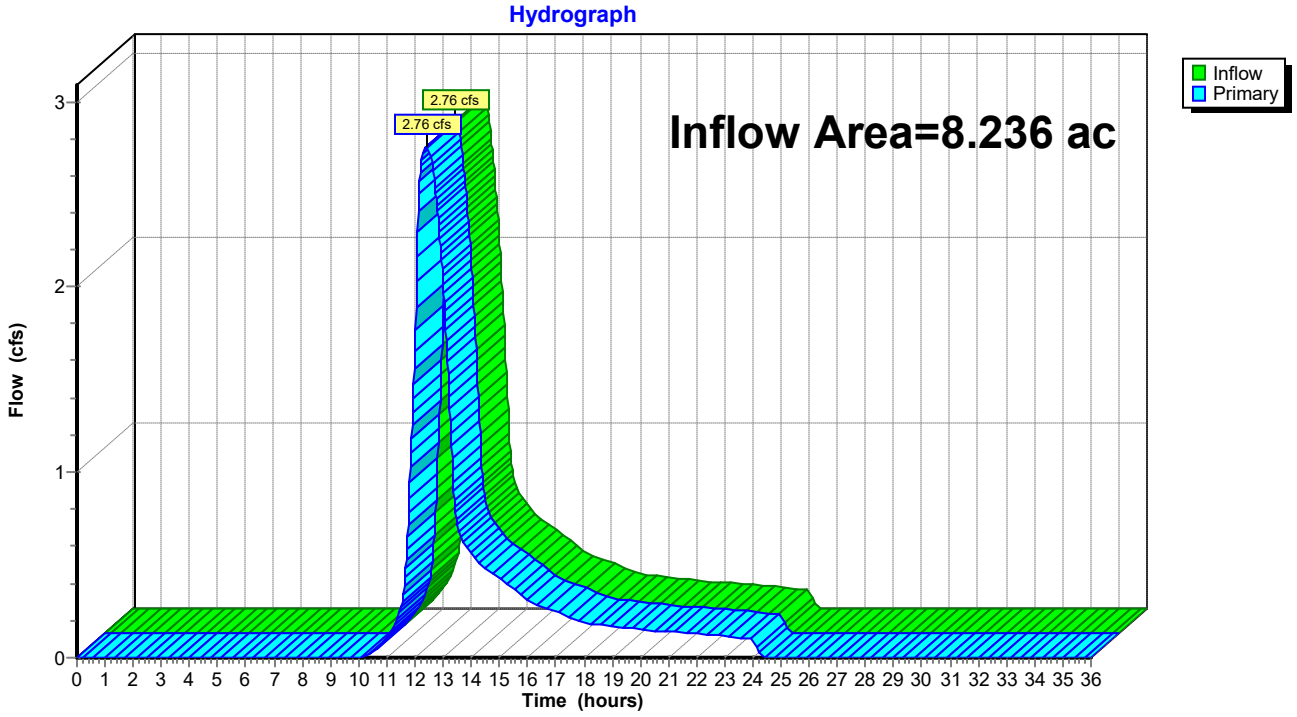


Summary for Link E-DP1: Existing DP1

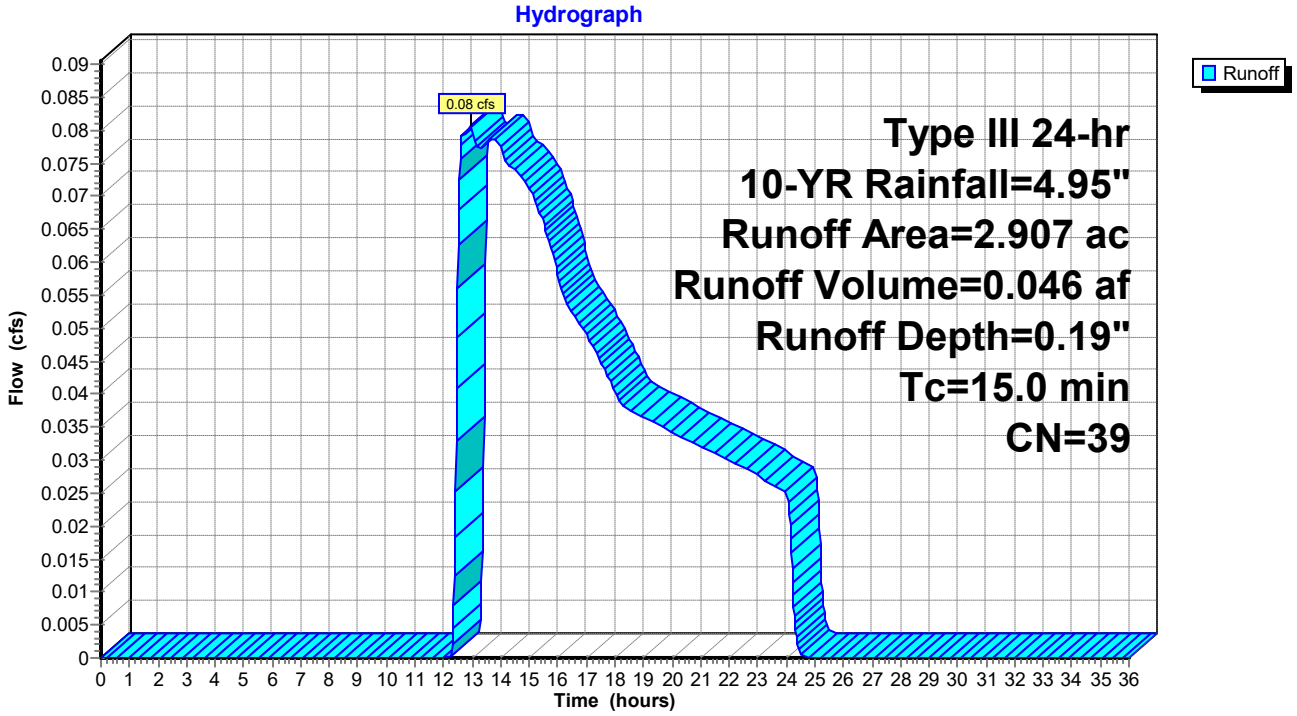
Inflow Area = 8.236 ac, 27.23% Impervious, Inflow Depth = 0.75" for 2-YR event
Inflow = 2.76 cfs @ 12.40 hrs, Volume= 0.513 af
Primary = 2.76 cfs @ 12.40 hrs, Volume= 0.513 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

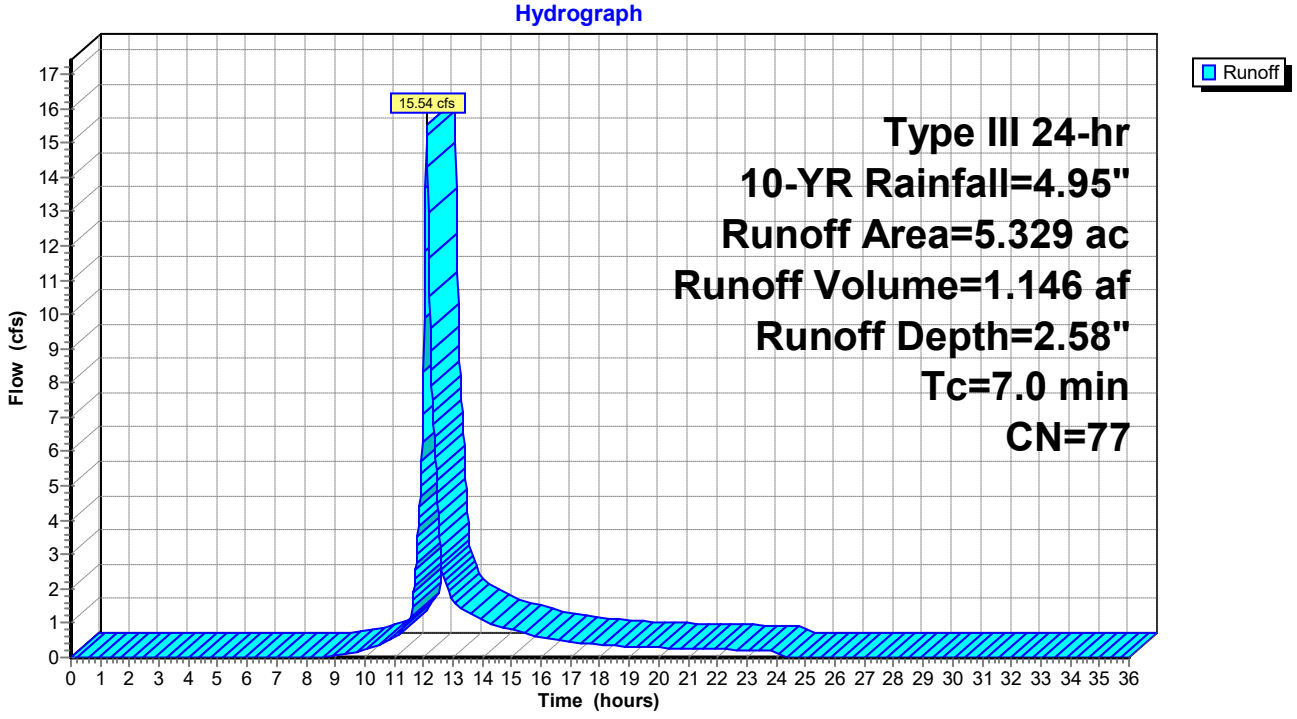
Link E-DP1: Existing DP1



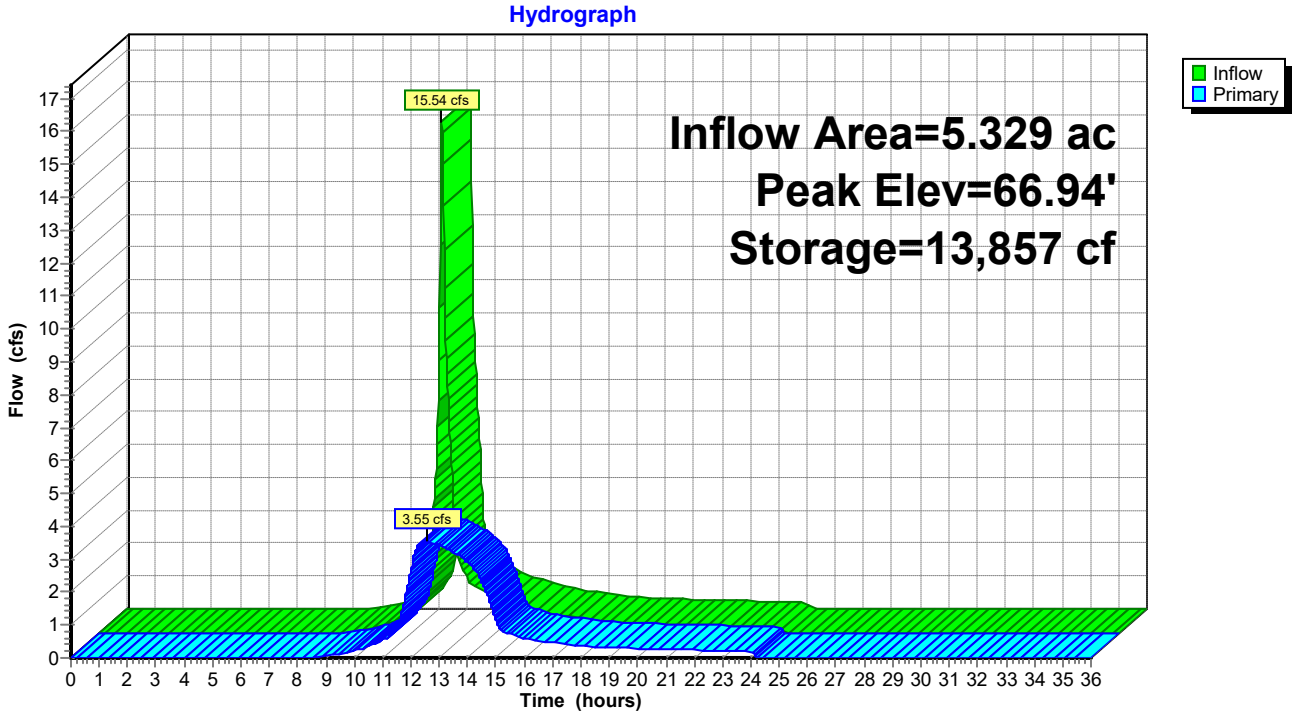
Subcatchment E1: Existing Area 1



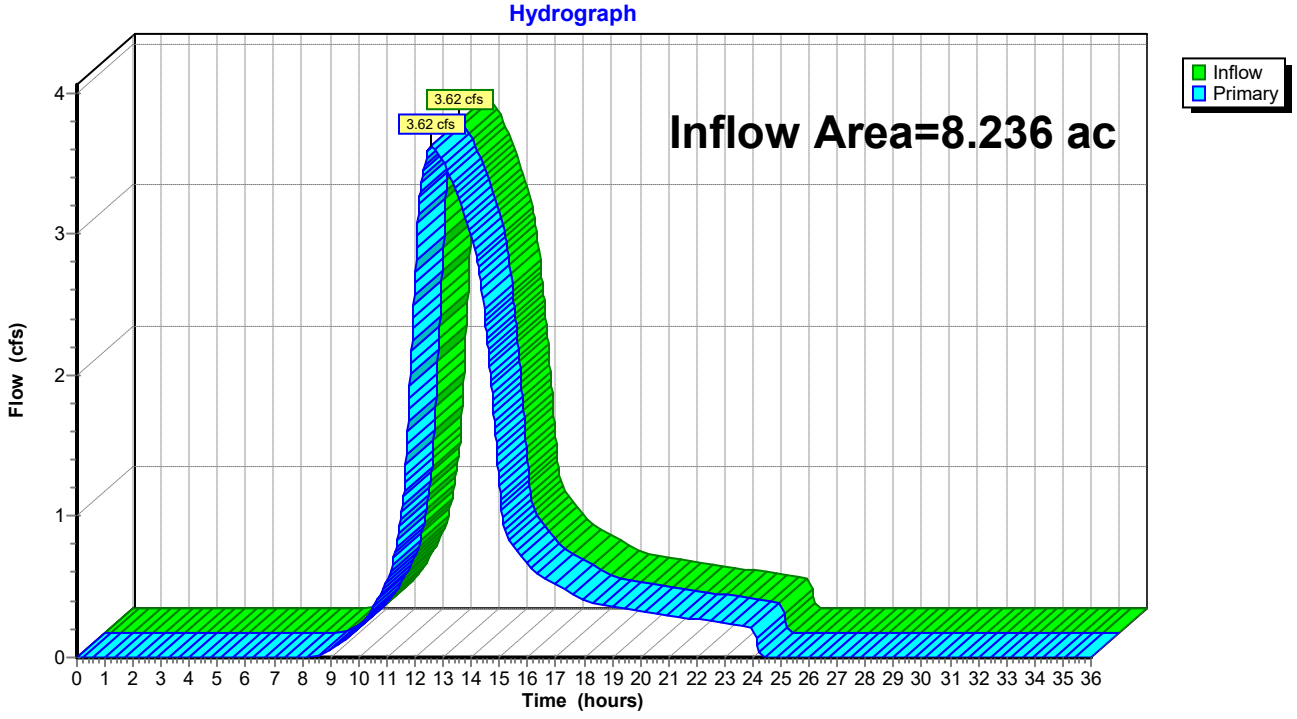
Subcatchment E2: Existing Area 2



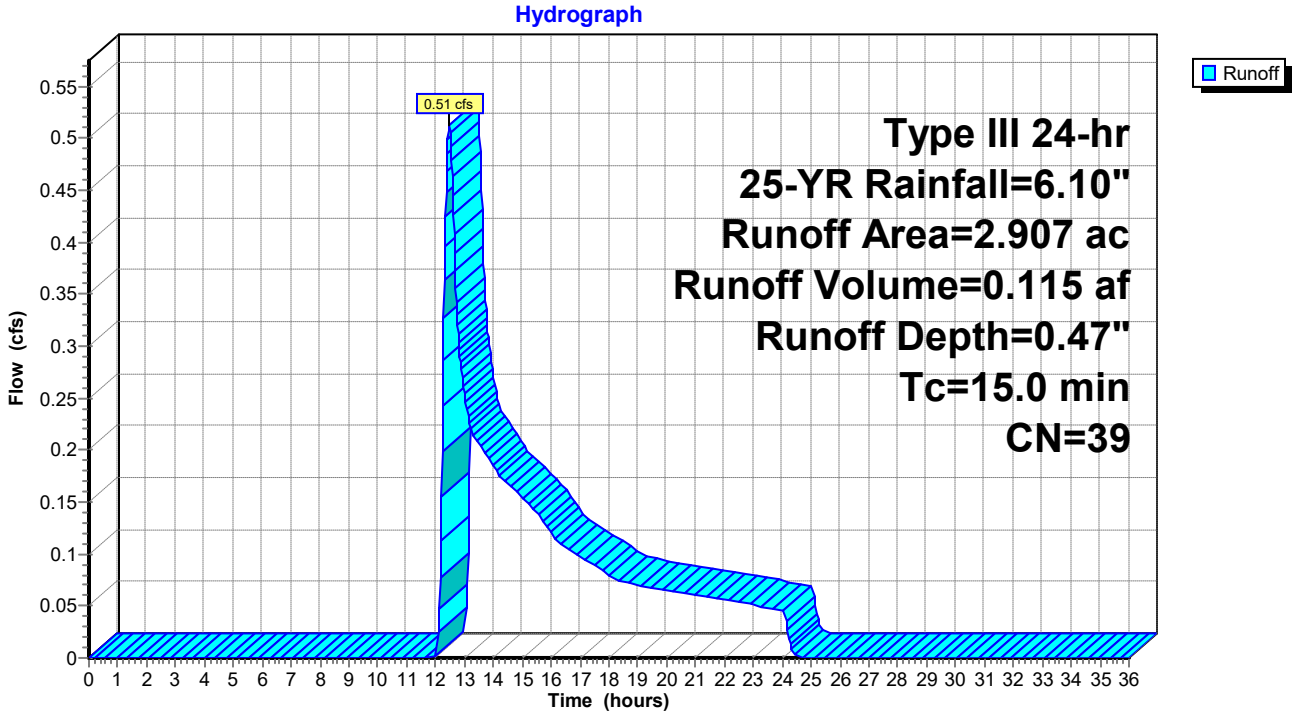
Pond EP1: Existing Detention Basin



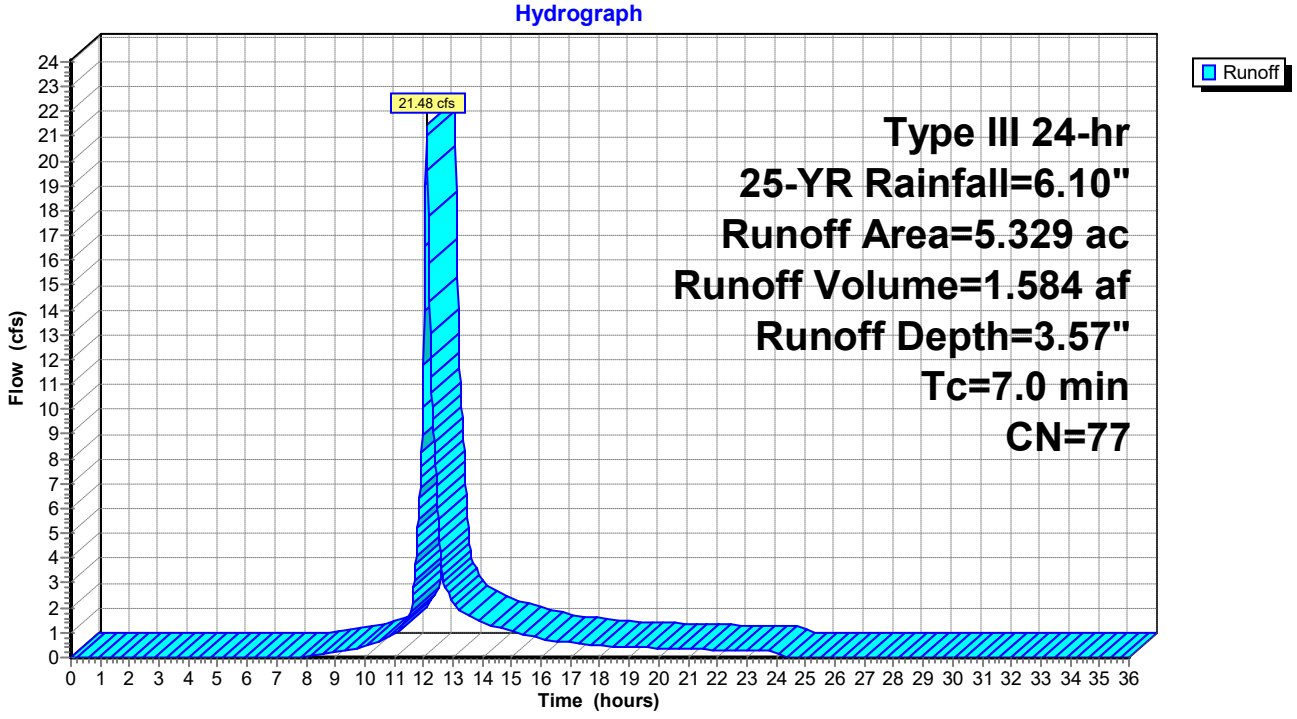
Link E-DP1: Existing DP1



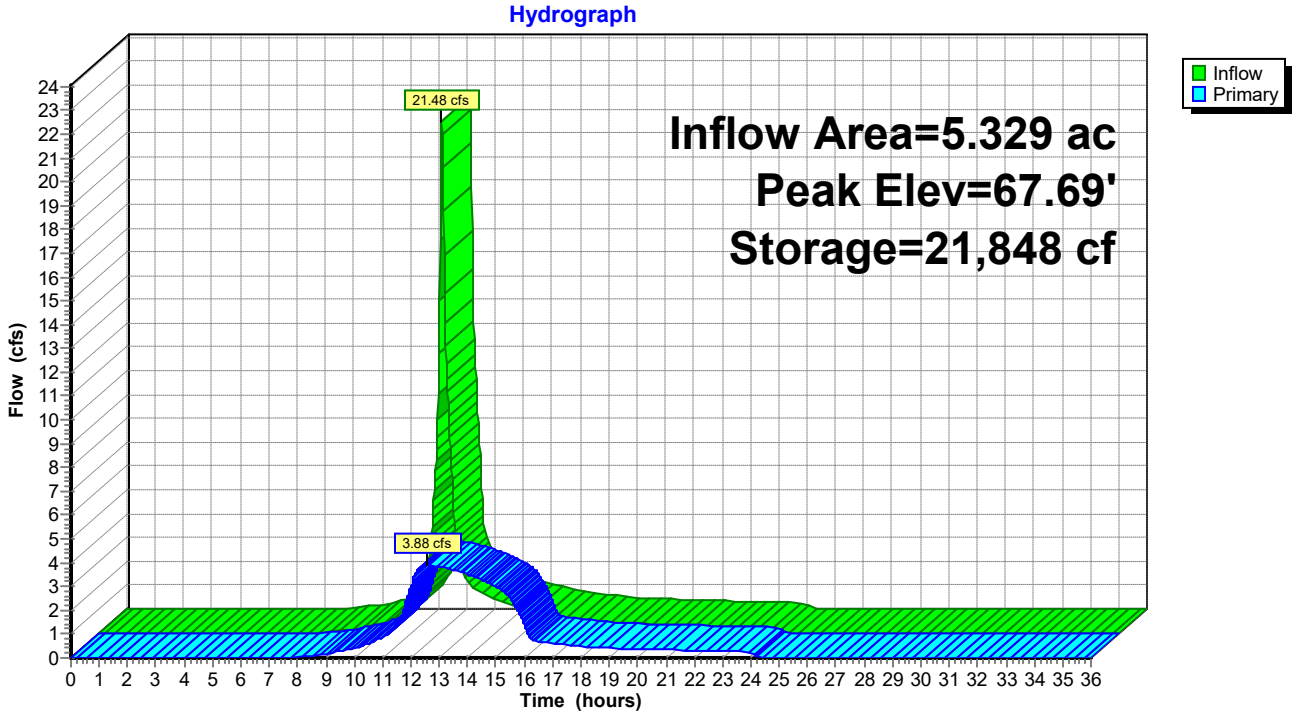
Subcatchment E1: Existing Area 1



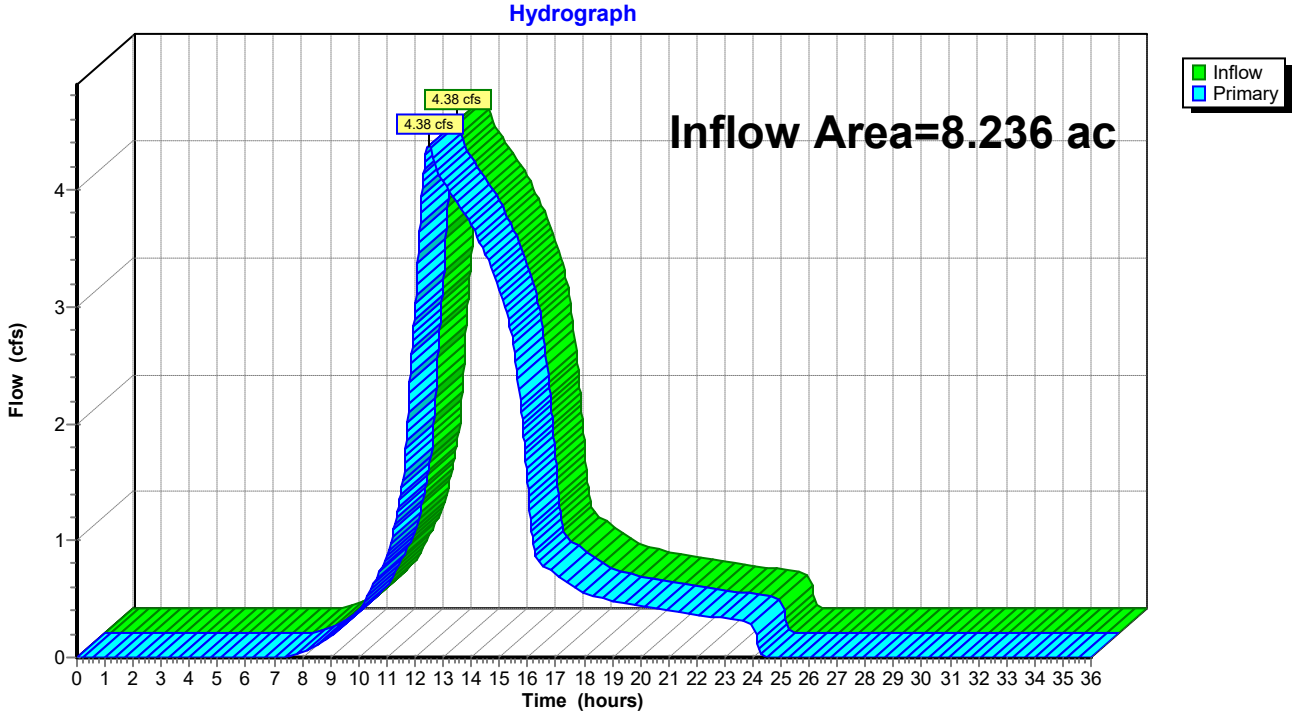
Subcatchment E2: Existing Area 2



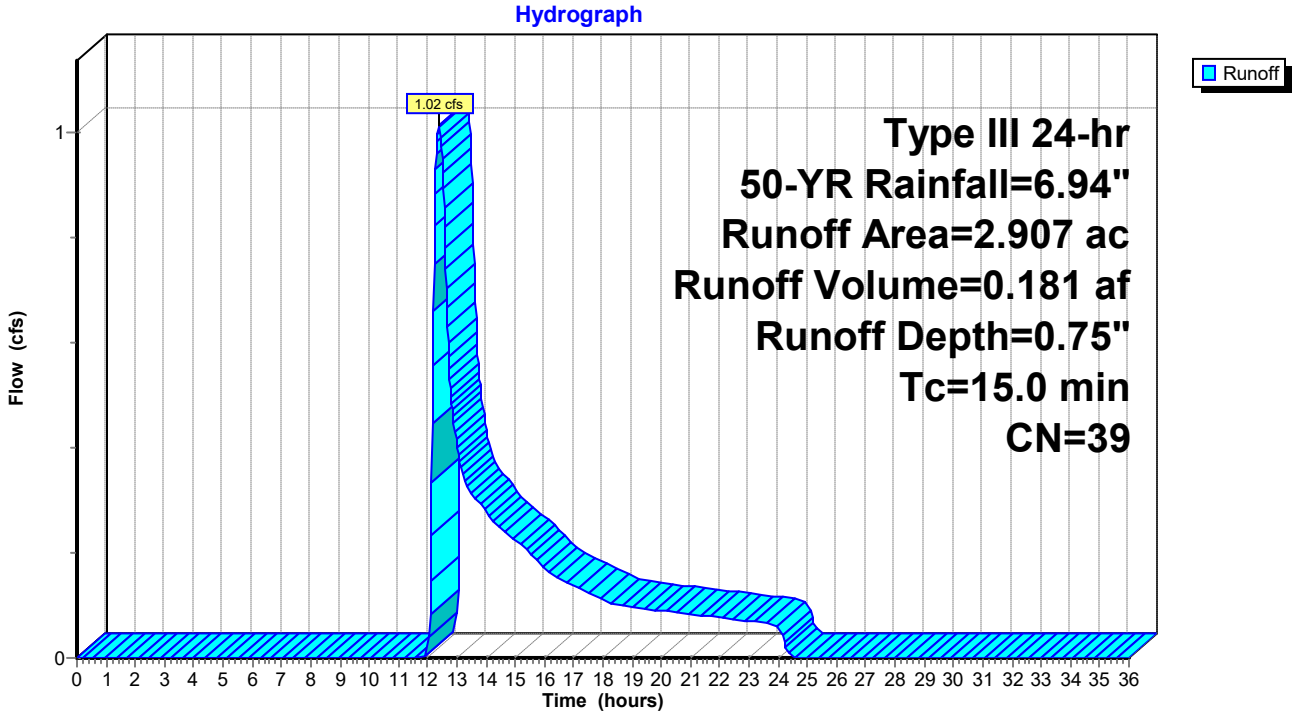
Pond EP1: Existing Detention Basin



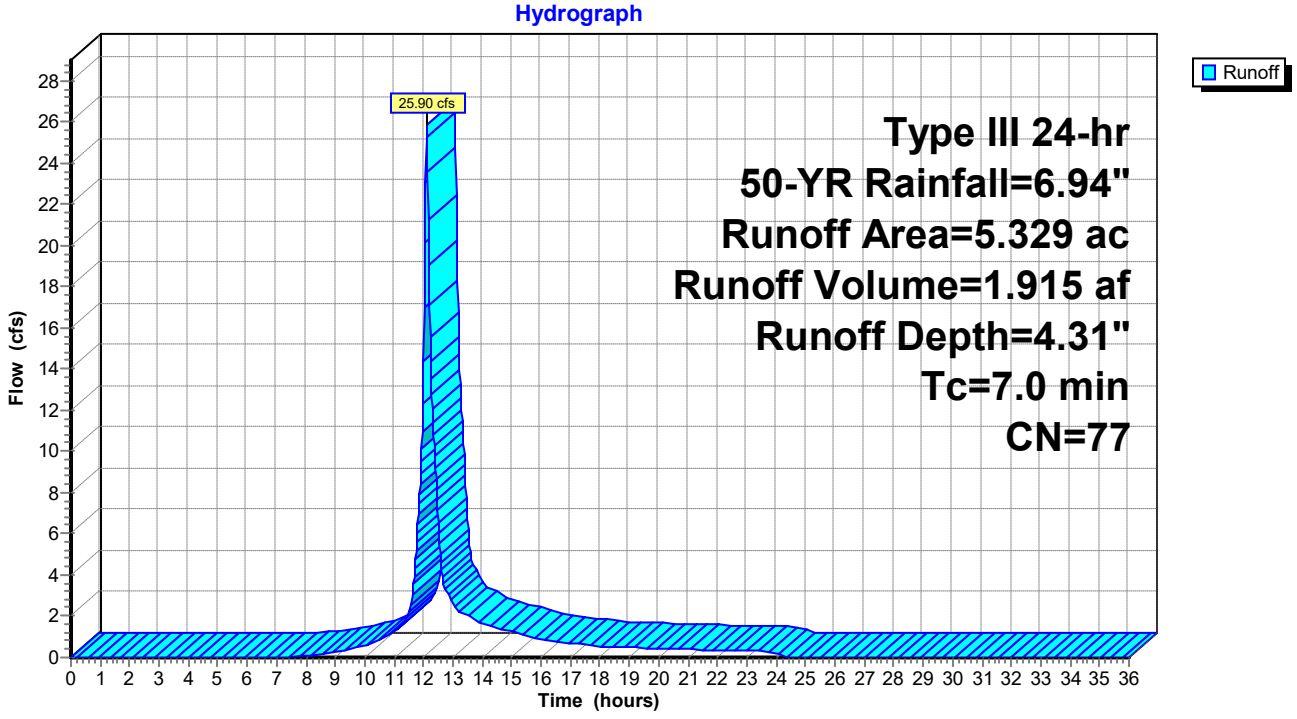
Link E-DP1: Existing DP1



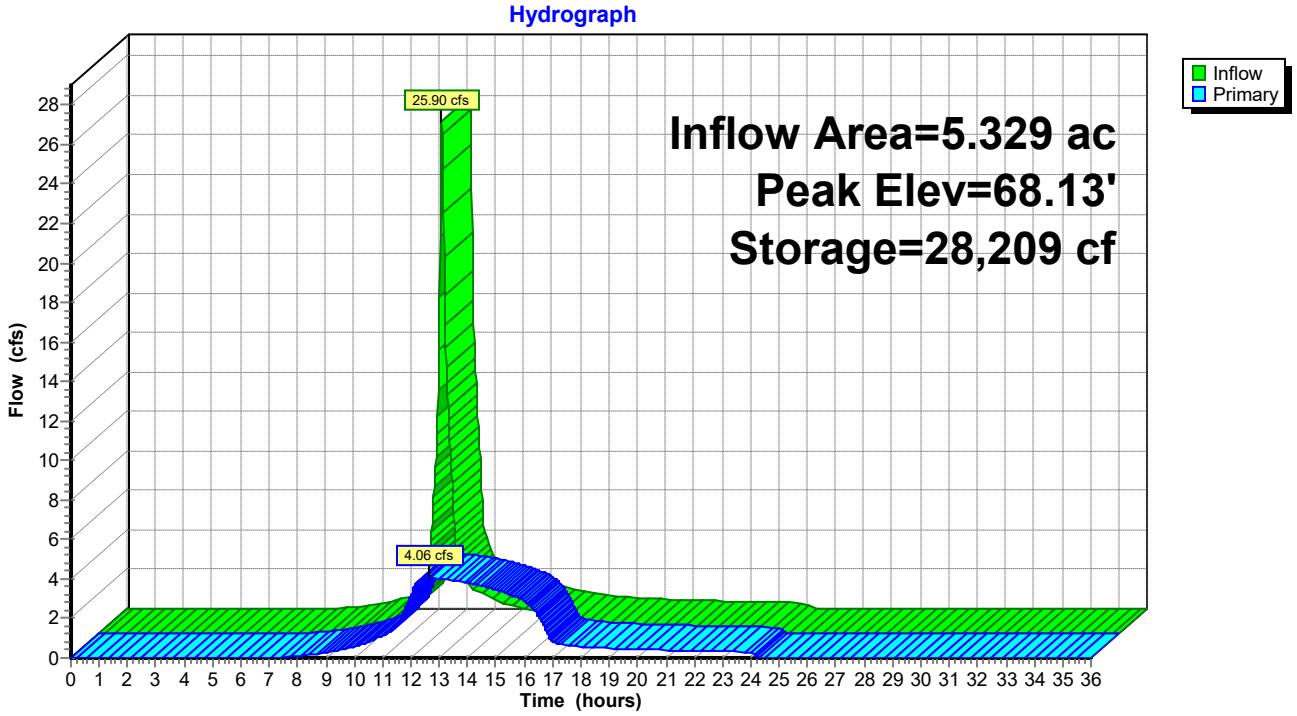
Subcatchment E1: Existing Area 1



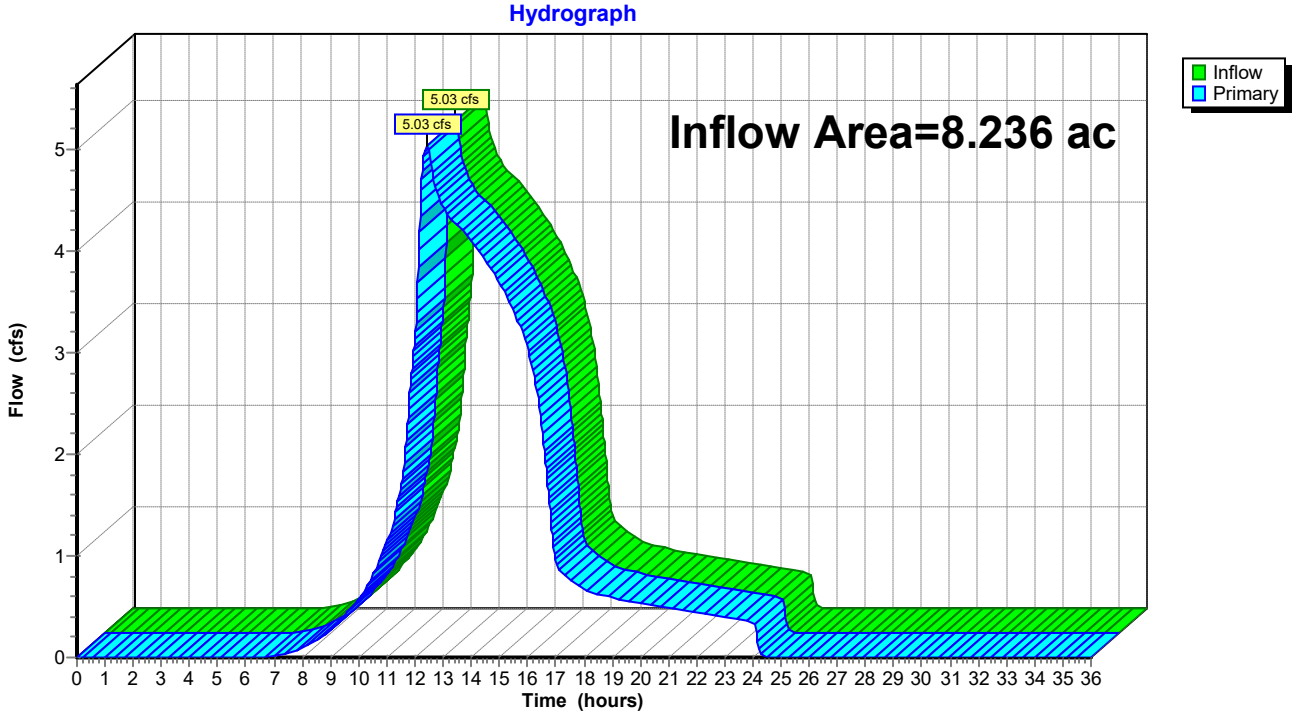
Subcatchment E2: Existing Area 2



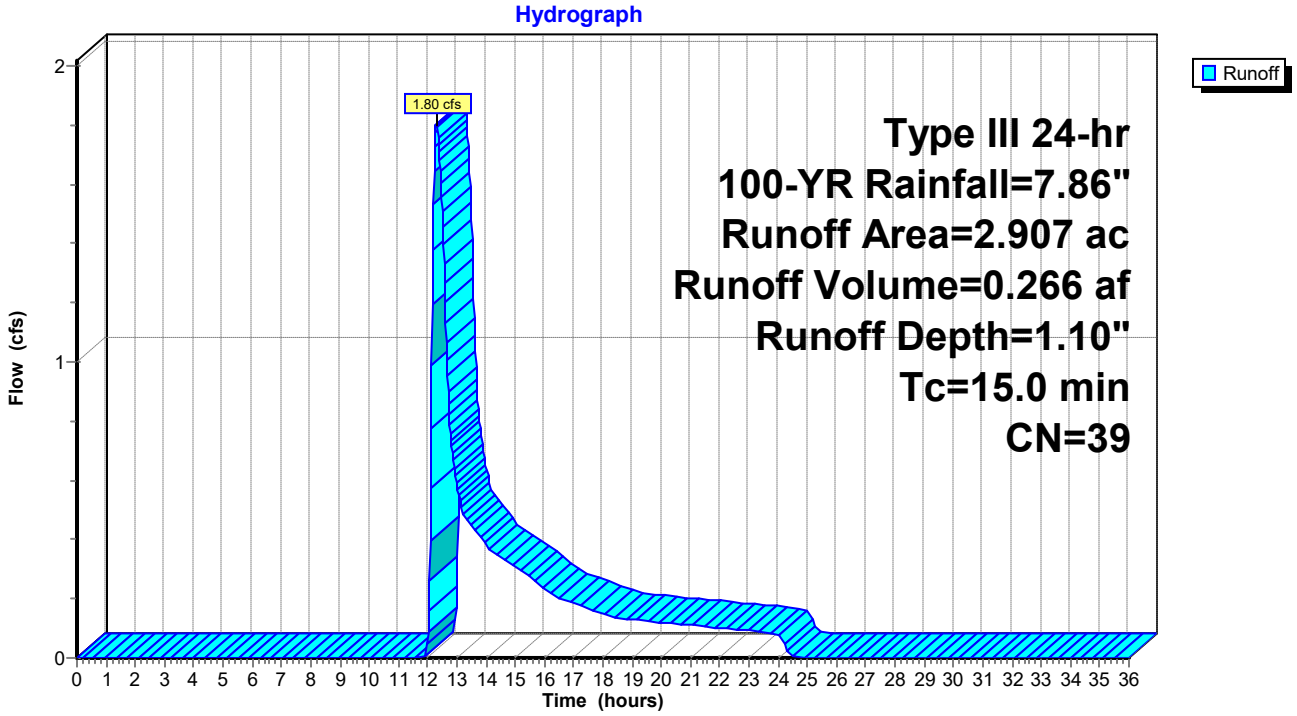
Pond EP1: Existing Detention Basin



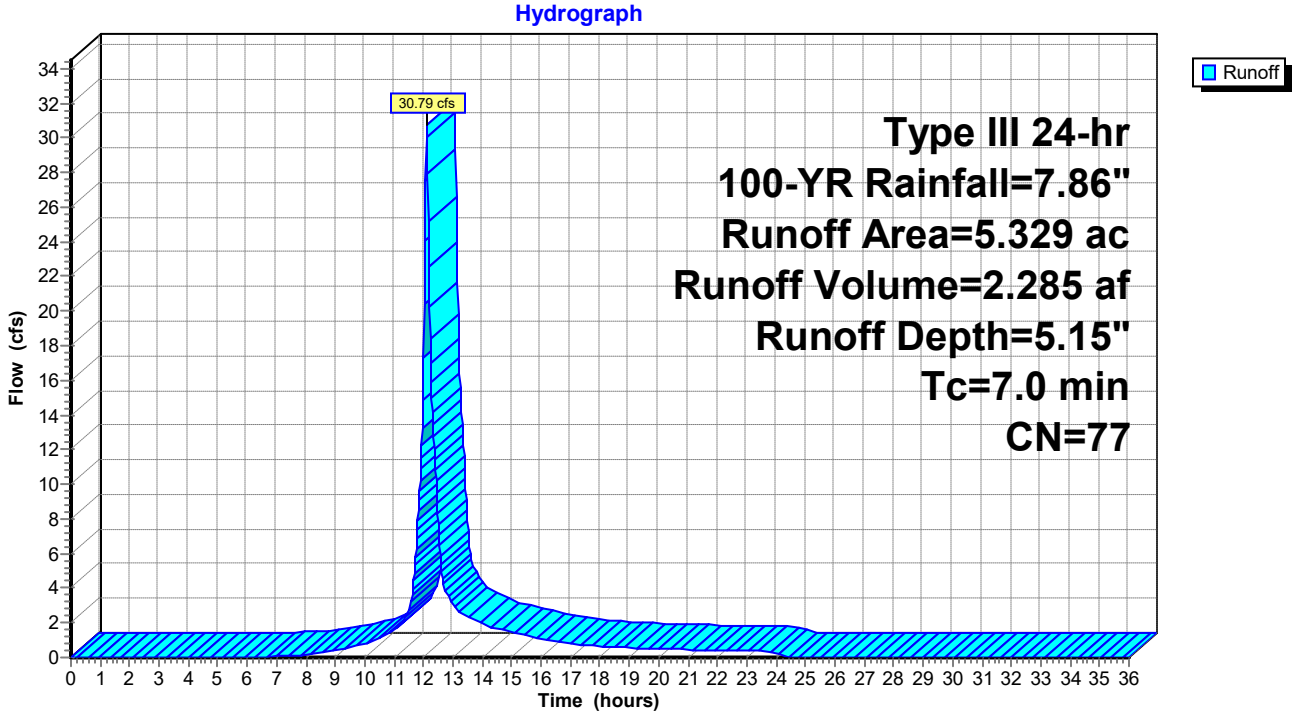
Link E-DP1: Existing DP1



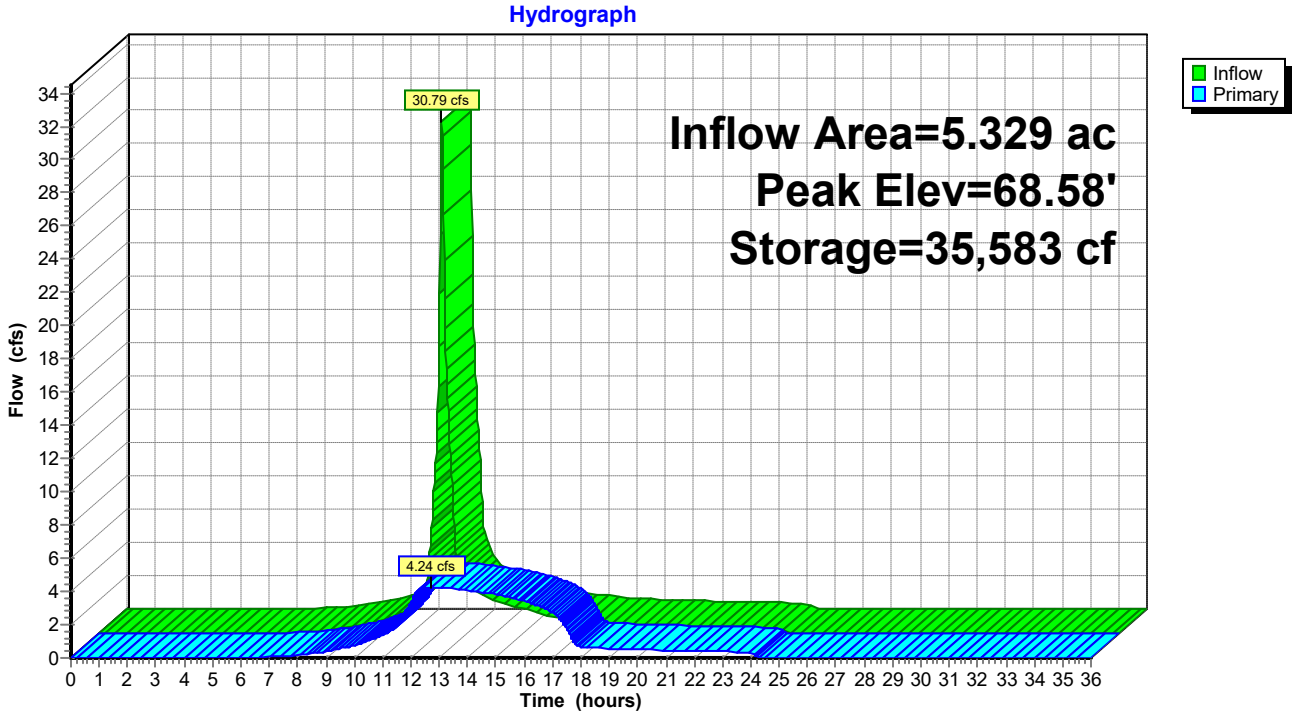
Subcatchment E1: Existing Area 1



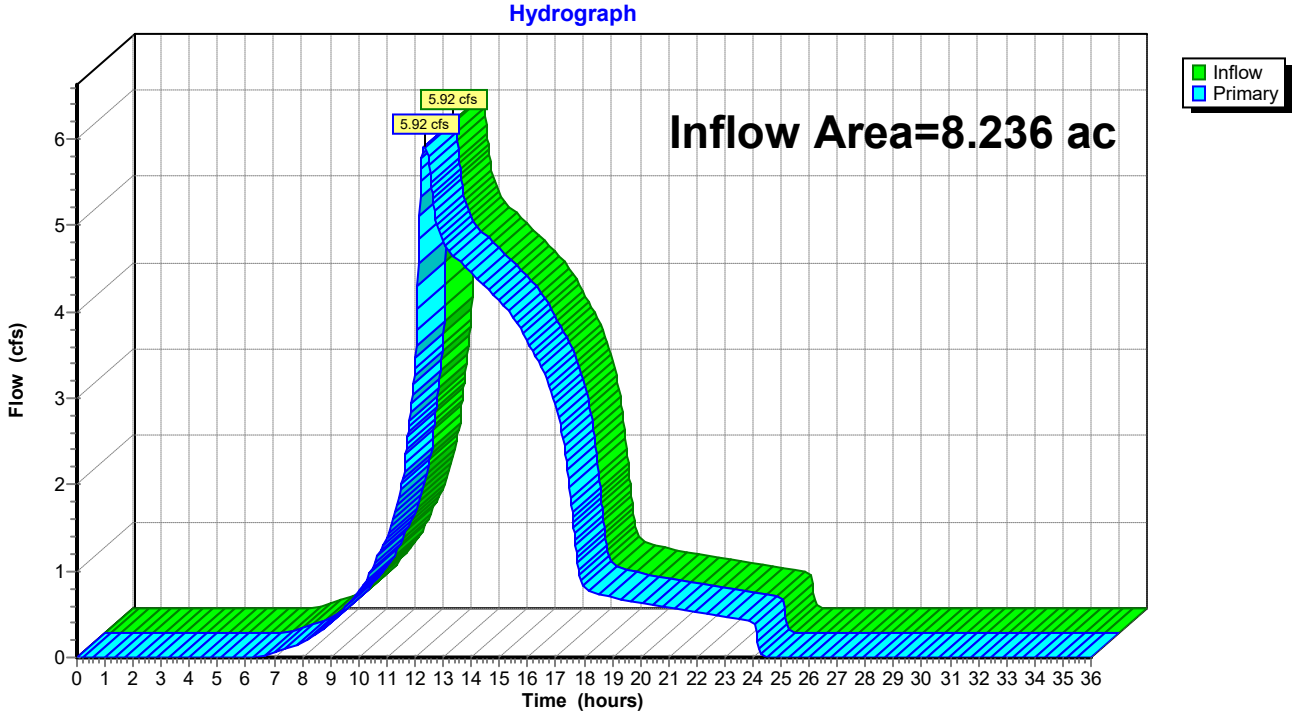
Subcatchment E2: Existing Area 2



Pond EP1: Existing Detention Basin



Link E-DP1: Existing DP1



Summary for Pond EP1: Existing Detention Basin

Inflow Area = 5.329 ac, 39.63% Impervious, Inflow Depth = 5.15" for 100-YR event
Inflow = 30.79 cfs @ 12.10 hrs, Volume= 2.285 af
Outflow = 4.24 cfs @ 12.67 hrs, Volume= 2.285 af, Atten= 86%, Lag= 34.5 min
Primary = 4.24 cfs @ 12.67 hrs, Volume= 2.285 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 68.58' @ 12.67 hrs Surf.Area= 17,741 sf Storage= 35,583 cf

Plug-Flow detention time= 69.1 min calculated for 2.284 af (100% of inflow)
Center-of-Mass det. time= 69.1 min (880.4 - 811.4)

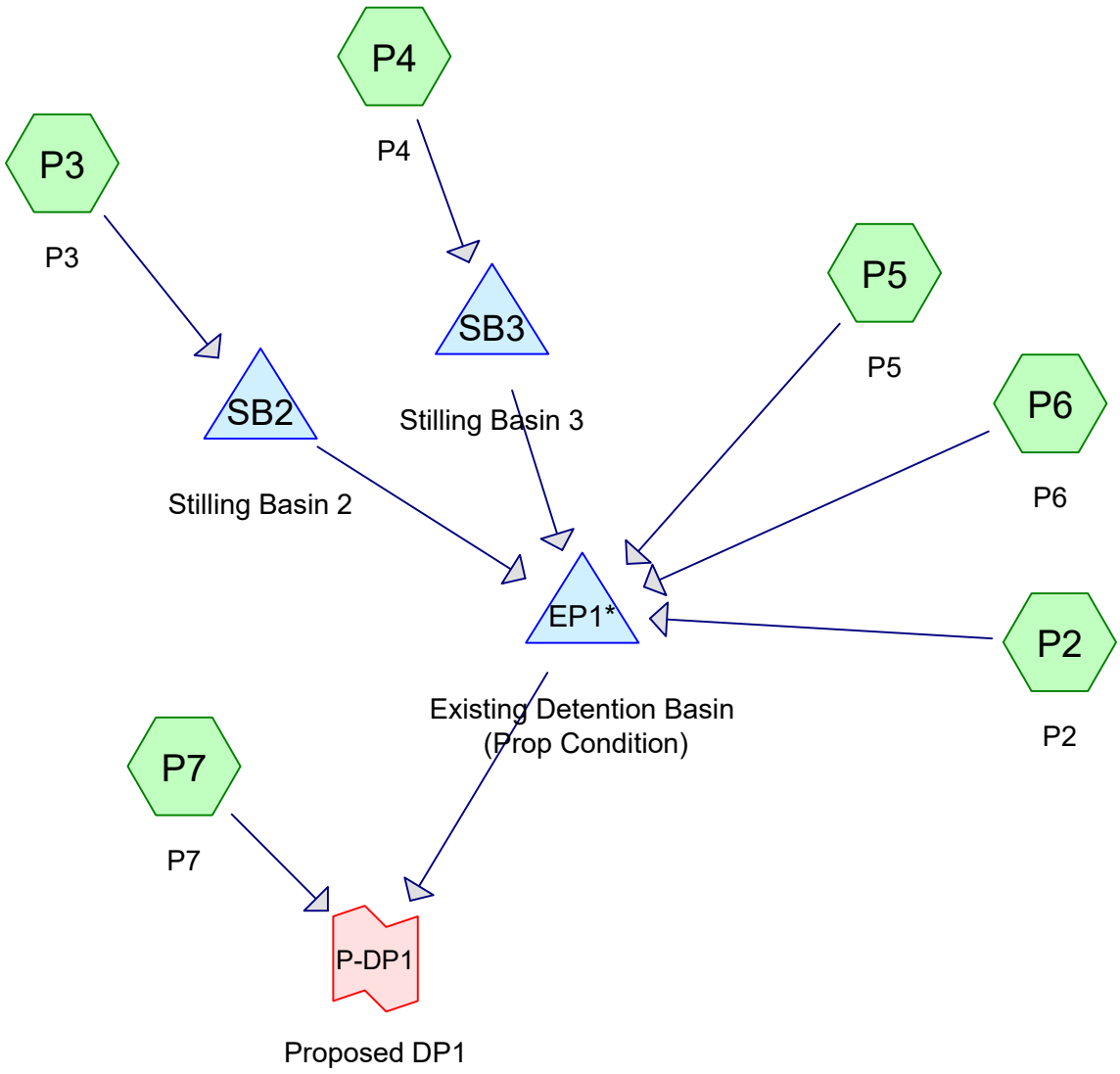
Volume	Invert	Avail.Storage	Storage Description
#1	62.70'	65,684 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.70	12	0	0
65.00	2,144	2,479	2,479
66.00	6,333	4,239	6,718
67.00	8,951	7,642	14,360
68.00	14,691	11,821	26,181
69.00	19,951	17,321	43,502
70.00	24,414	22,183	65,684

Device	Routing	Invert	Outlet Devices
#1	Primary	62.66'	**24.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.66' / 62.33' S= 0.0066 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	62.70'	**6.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=4.24 cfs @ 12.67 hrs HW=68.58' (Free Discharge)
↑**1=Culvert** (Passes 4.24 cfs of 33.55 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 4.24 cfs @ 11.29 fps)

APPENDIX B
Watershed Computations
(Post-Development Drainage HydroCAD Report)



Subcat Reach Pond Link

Routing Diagram for 3136.D - Drainage
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Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 P2: P2 Runoff Area=1.480 ac 77.03% Impervious Runoff Depth=2.01"
Tc=6.0 min CN=89 Runoff=3.46 cfs 0.248 af

Subcatchment P3: P3 Runoff Area=0.317 ac 84.54% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=93 Runoff=0.85 cfs 0.063 af

Subcatchment P4: P4 Runoff Area=0.664 ac 53.16% Impervious Runoff Depth=1.62"
Tc=8.0 min CN=84 Runoff=1.17 cfs 0.089 af

Subcatchment P5: P5 Runoff Area=1.283 ac 12.39% Impervious Runoff Depth=0.83"
Flow Length=100' Slope=0.0530 '/' Tc=9.8 min CN=71 Runoff=0.98 cfs 0.089 af

Subcatchment P6: P6 Runoff Area=0.668 ac 91.62% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=96 Runoff=1.95 cfs 0.149 af

Subcatchment P7: P7 Runoff Area=1.083 ac 1.20% Impervious Runoff Depth=0.08"
Flow Length=100' Slope=0.0500 '/' Tc=15.1 min CN=48 Runoff=0.01 cfs 0.007 af

Pond EP1*: Existing Detention Basin (Prop Peak Elev=66.03' Storage=6,522 cf Inflow=6.20 cfs 0.537 af
Outflow=1.69 cfs 0.537 af

Pond SB2: Stilling Basin 2 Peak Elev=69.58' Storage=1,251 cf Inflow=0.85 cfs 0.063 af
Outflow=0.50 cfs 0.035 af

Pond SB3: Stilling Basin 3 Peak Elev=69.51' Storage=3,206 cf Inflow=1.17 cfs 0.089 af
Outflow=0.04 cfs 0.016 af

Link P-DP1: Proposed DP1 Inflow=1.69 cfs 0.544 af
Primary=1.69 cfs 0.544 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 P2: P2 Runoff Area=1.480 ac 77.03% Impervious Runoff Depth=3.72"
Tc=6.0 min CN=89 Runoff=6.27 cfs 0.459 af

Subcatchment P3: P3 Runoff Area=0.317 ac 84.54% Impervious Runoff Depth=4.15"
Tc=6.0 min CN=93 Runoff=1.45 cfs 0.110 af

Subcatchment P4: P4 Runoff Area=0.664 ac 53.16% Impervious Runoff Depth=3.22"
Tc=8.0 min CN=84 Runoff=2.32 cfs 0.178 af

Subcatchment P5: P5 Runoff Area=1.283 ac 12.39% Impervious Runoff Depth=2.08"
Flow Length=100' Slope=0.0530 '/' Tc=9.8 min CN=71 Runoff=2.70 cfs 0.222 af

Subcatchment P6: P6 Runoff Area=0.668 ac 91.62% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=96 Runoff=3.18 cfs 0.250 af

Subcatchment P7: P7 Runoff Area=1.083 ac 1.20% Impervious Runoff Depth=0.57"
Flow Length=100' Slope=0.0500 '/' Tc=15.1 min CN=48 Runoff=0.30 cfs 0.051 af

Pond EP1*: Existing Detention Basin (Prop Peak Elev=67.36' Storage=17,080 cf Inflow=13.19 cfs 1.119 af
Outflow=2.17 cfs 1.119 af

Pond SB2: Stilling Basin 2 Peak Elev=69.66' Storage=1,309 cf Inflow=1.45 cfs 0.110 af
Outflow=1.42 cfs 0.082 af

Pond SB3: Stilling Basin 3 Peak Elev=69.65' Storage=3,450 cf Inflow=2.32 cfs 0.178 af
Outflow=1.14 cfs 0.105 af

Link P-DP1: Proposed DP1 Inflow=2.43 cfs 1.170 af
Primary=2.43 cfs 1.170 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 P2: P2 Runoff Area=1.480 ac 77.03% Impervious Runoff Depth=4.83"
Tc=6.0 min CN=89 Runoff=8.03 cfs 0.596 af

Subcatchment P3: P3 Runoff Area=0.317 ac 84.54% Impervious Runoff Depth=5.28"
Tc=6.0 min CN=93 Runoff=1.82 cfs 0.140 af

Subcatchment P4: P4 Runoff Area=0.664 ac 53.16% Impervious Runoff Depth=4.29"
Tc=8.0 min CN=84 Runoff=3.06 cfs 0.237 af

Subcatchment P5: P5 Runoff Area=1.283 ac 12.39% Impervious Runoff Depth=2.98"
Flow Length=100' Slope=0.0530 '/' Tc=9.8 min CN=71 Runoff=3.92 cfs 0.319 af

Subcatchment P6: P6 Runoff Area=0.668 ac 91.62% Impervious Runoff Depth=5.63"
Tc=6.0 min CN=96 Runoff=3.94 cfs 0.313 af

Subcatchment P7: P7 Runoff Area=1.083 ac 1.20% Impervious Runoff Depth=1.05"
Flow Length=100' Slope=0.0500 '/' Tc=15.1 min CN=48 Runoff=0.73 cfs 0.095 af

Pond EP1*: Existing Detention Basin (Prop Peak Elev=68.03' Storage=25,444 cf Inflow=18.57 cfs 1.504 af
Outflow=2.38 cfs 1.504 af

Pond SB2: Stilling Basin 2 Peak Elev=69.68' Storage=1,328 cf Inflow=1.82 cfs 0.140 af
Outflow=1.79 cfs 0.112 af

Pond SB3: Stilling Basin 3 Peak Elev=69.75' Storage=3,652 cf Inflow=3.06 cfs 0.237 af
Outflow=2.62 cfs 0.164 af

Link P-DP1: Proposed DP1 Inflow=2.99 cfs 1.599 af
Primary=2.99 cfs 1.599 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 P2: P2 Runoff Area=1.480 ac 77.03% Impervious Runoff Depth=5.65"
Tc=6.0 min CN=89 Runoff=9.31 cfs 0.697 af

Subcatchment P3: P3 Runoff Area=0.317 ac 84.54% Impervious Runoff Depth=6.11"
Tc=6.0 min CN=93 Runoff=2.09 cfs 0.161 af

Subcatchment P4: P4 Runoff Area=0.664 ac 53.16% Impervious Runoff Depth=5.08"
Tc=8.0 min CN=84 Runoff=3.60 cfs 0.281 af

Subcatchment P5: P5 Runoff Area=1.283 ac 12.39% Impervious Runoff Depth=3.67"
Flow Length=100' Slope=0.0530 '/' Tc=9.8 min CN=71 Runoff=4.85 cfs 0.393 af

Subcatchment P6: P6 Runoff Area=0.668 ac 91.62% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=96 Runoff=4.50 cfs 0.360 af

Subcatchment P7: P7 Runoff Area=1.083 ac 1.20% Impervious Runoff Depth=1.46"
Flow Length=100' Slope=0.0500 '/' Tc=15.1 min CN=48 Runoff=1.14 cfs 0.132 af

Pond EP1*: Existing Detention Basin (Prop Peak Elev=68.45' Storage=31,927 cf Inflow=23.11 cfs 1.791 af
Outflow=2.50 cfs 1.791 af

Pond SB2: Stilling Basin 2 Peak Elev=69.70' Storage=1,342 cf Inflow=2.09 cfs 0.161 af
Outflow=2.06 cfs 0.134 af

Pond SB3: Stilling Basin 3 Peak Elev=69.80' Storage=3,743 cf Inflow=3.60 cfs 0.281 af
Outflow=3.40 cfs 0.208 af

Link P-DP1: Proposed DP1 Inflow=3.49 cfs 1.923 af
Primary=3.49 cfs 1.923 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 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 P2: P2 Runoff Area=1.480 ac 77.03% Impervious Runoff Depth=6.55"
Tc=6.0 min CN=89 Runoff=10.70 cfs 0.808 af

Subcatchment P3: P3 Runoff Area=0.317 ac 84.54% Impervious Runoff Depth=7.02"
Tc=6.0 min CN=93 Runoff=2.38 cfs 0.186 af

Subcatchment P4: P4 Runoff Area=0.664 ac 53.16% Impervious Runoff Depth=5.96"
Tc=8.0 min CN=84 Runoff=4.20 cfs 0.330 af

Subcatchment P5: P5 Runoff Area=1.283 ac 12.39% Impervious Runoff Depth=4.46"
Flow Length=100' Slope=0.0530 '/' Tc=9.8 min CN=71 Runoff=5.89 cfs 0.477 af

Subcatchment P6: P6 Runoff Area=0.668 ac 91.62% Impervious Runoff Depth=7.38"
Tc=6.0 min CN=96 Runoff=5.11 cfs 0.411 af

Subcatchment P7: P7 Runoff Area=1.083 ac 1.20% Impervious Runoff Depth=1.96"
Flow Length=100' Slope=0.0500 '/' Tc=15.1 min CN=48 Runoff=1.64 cfs 0.177 af

Pond EP1*: Existing Detention Basin (Prop Peak Elev=68.87' Storage=39,337 cf Inflow=27.01 cfs 2.110 af
Outflow=2.61 cfs 2.110 af

Pond SB2: Stilling Basin 2 Peak Elev=69.72' Storage=1,355 cf Inflow=2.38 cfs 0.186 af
Outflow=2.35 cfs 0.158 af

Pond SB3: Stilling Basin 3 Peak Elev=69.83' Storage=3,808 cf Inflow=4.20 cfs 0.330 af
Outflow=4.01 cfs 0.257 af

Link P-DP1: Proposed DP1 Inflow=4.09 cfs 2.287 af
Primary=4.09 cfs 2.287 af

Summary for Subcatchment P2: P2

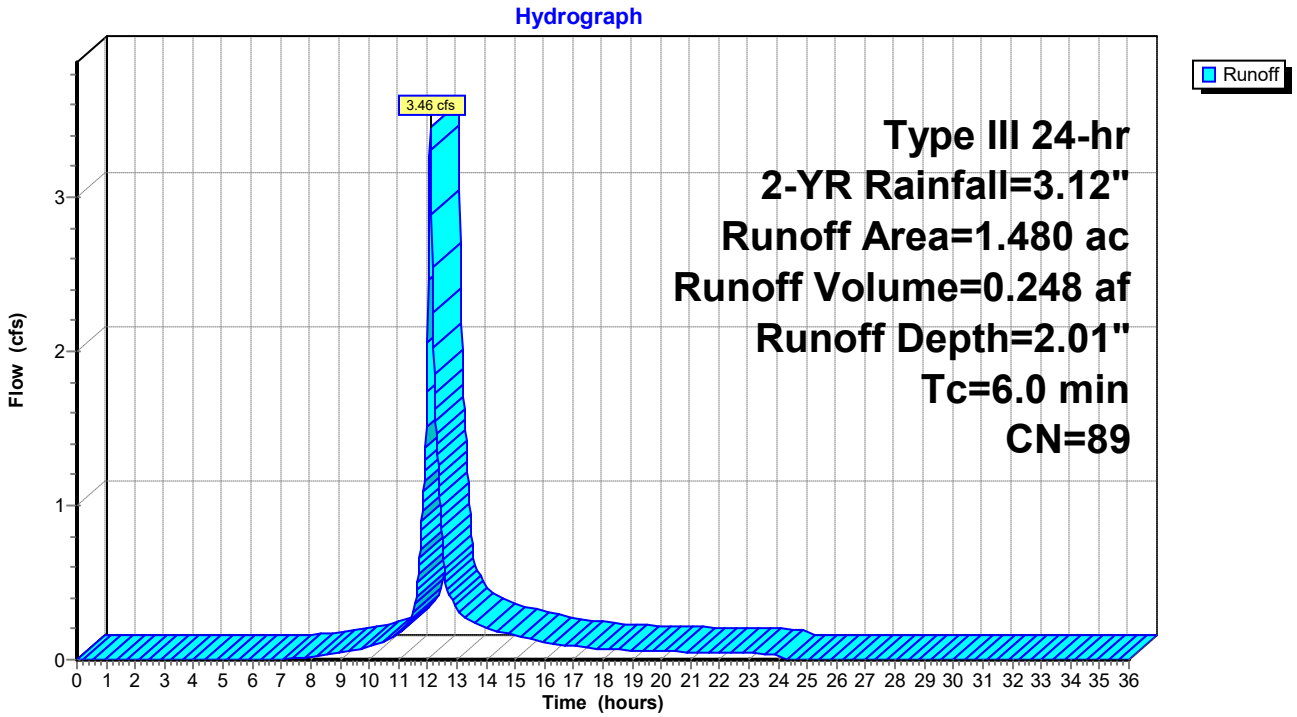
Runoff = 3.46 cfs @ 12.09 hrs, Volume= 0.248 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.014	39	>75% Grass cover, Good, HSG A
	0.149	61	>75% Grass cover, Good, HSG B
*	0.066	71	>75% Grass cover, Good, HSG B/D
*	1.140	98	IMPERVIOUS
	0.012	30	Woods, Good, HSG A
	0.085	55	Woods, Good, HSG B
*	0.014	66	Woods, Good, HSG B/D
	1.480	89	Weighted Average
	0.340		22.97% Pervious Area
	1.140		77.03% Impervious Area

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

Subcatchment P2: P2



Summary for Subcatchment P3: P3

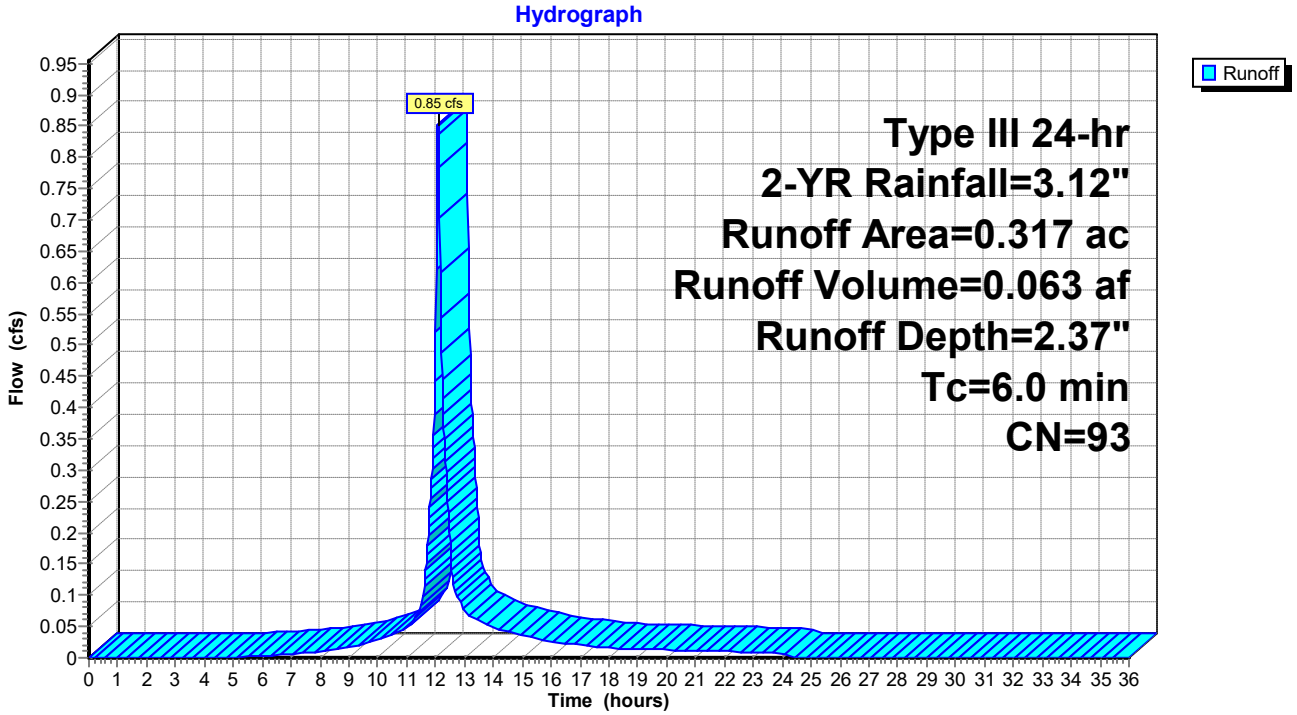
Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.028	61	>75% Grass cover, Good, HSG B
*	0.021	71	>75% Grass cover, Good, HSG B/D
*	0.268	98	IMPERVIOUS
	0.317	93	Weighted Average
	0.049		15.46% Pervious Area
	0.268		84.54% Impervious Area

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

Subcatchment P3: P3



Summary for Subcatchment P4: P4

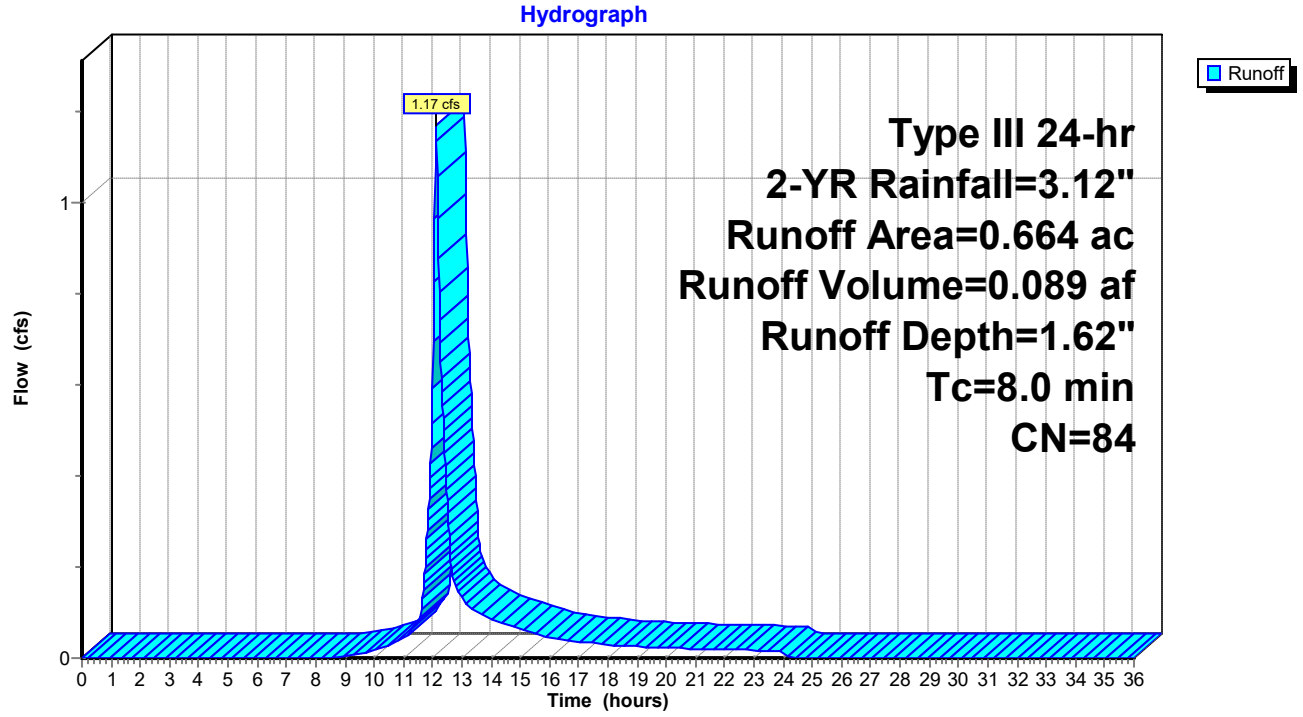
Runoff = 1.17 cfs @ 12.12 hrs, Volume= 0.089 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.089	61	>75% Grass cover, Good, HSG B
*	0.175	71	>75% Grass cover, Good, HSG B/D
*	0.353	98	IMPERVIOUS
*	0.047	66	Woods, Good, HSG B/D
	0.664	84	Weighted Average
	0.311		46.84% Pervious Area
	0.353		53.16% Impervious Area

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

Subcatchment P4: P4



Summary for Subcatchment P5: P5

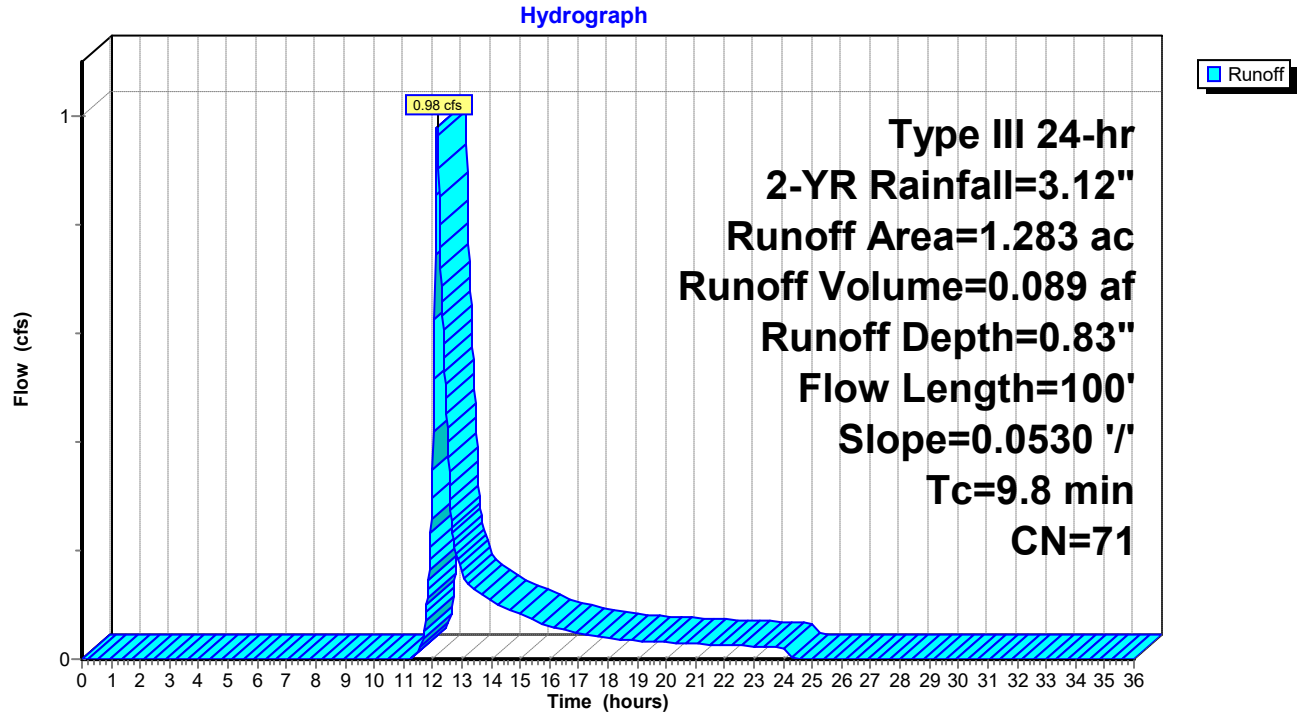
Runoff = 0.98 cfs @ 12.15 hrs, Volume= 0.089 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.117	61	>75% Grass cover, Good, HSG B
*	0.534	71	>75% Grass cover, Good, HSG B/D
*	0.159	98	IMPERVIOUS
	0.040	55	Woods, Good, HSG B
*	0.433	66	Woods, Good, HSG B/D
	1.283	71	Weighted Average
	1.124		87.61% Pervious Area
	0.159		12.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0530	0.17		**Sheet Flow, Grass SF** Grass: Dense n= 0.240 P2= 3.12"

Subcatchment P5: P5



Summary for Subcatchment P6: P6

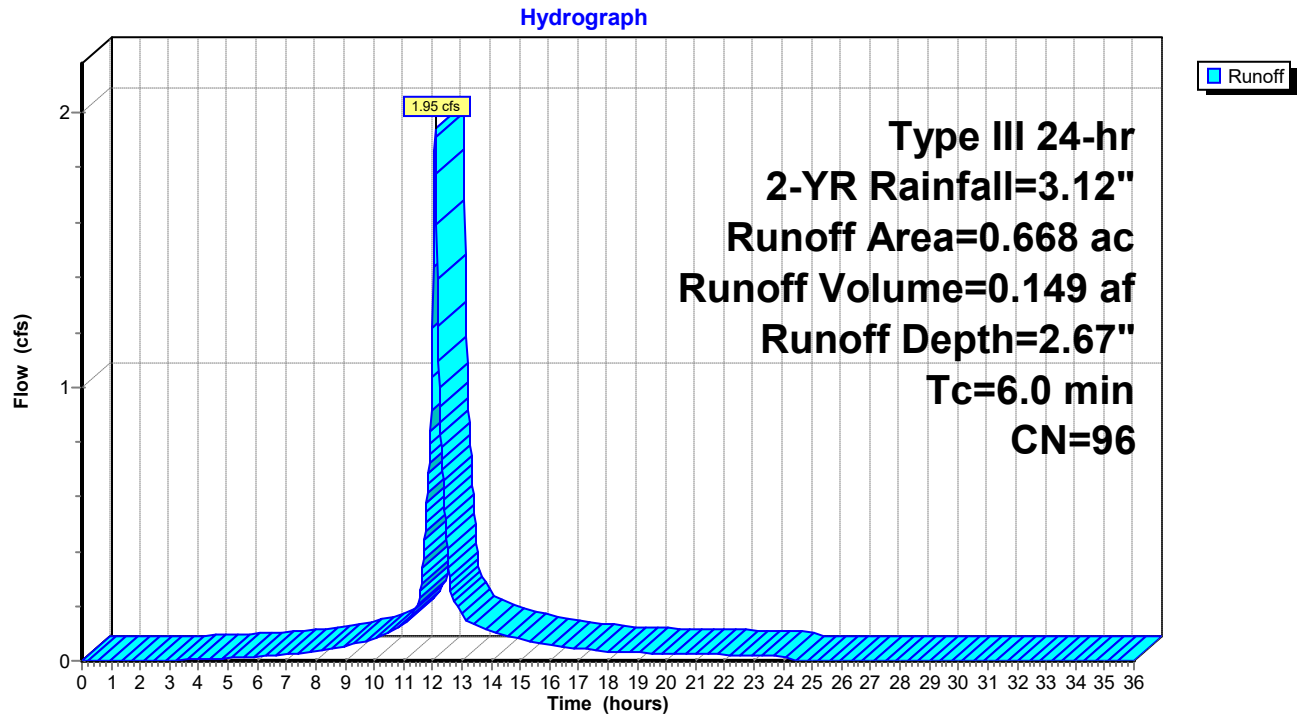
Runoff = 1.95 cfs @ 12.08 hrs, Volume= 0.149 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.011	61	>75% Grass cover, Good, HSG B
*	0.045	71	>75% Grass cover, Good, HSG B/D
*	0.612	98	IMPERVIOUS
	0.668	96	Weighted Average
	0.056		8.38% Pervious Area
	0.612		91.62% Impervious Area

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

Subcatchment P6: P6



Summary for Subcatchment P7: P7

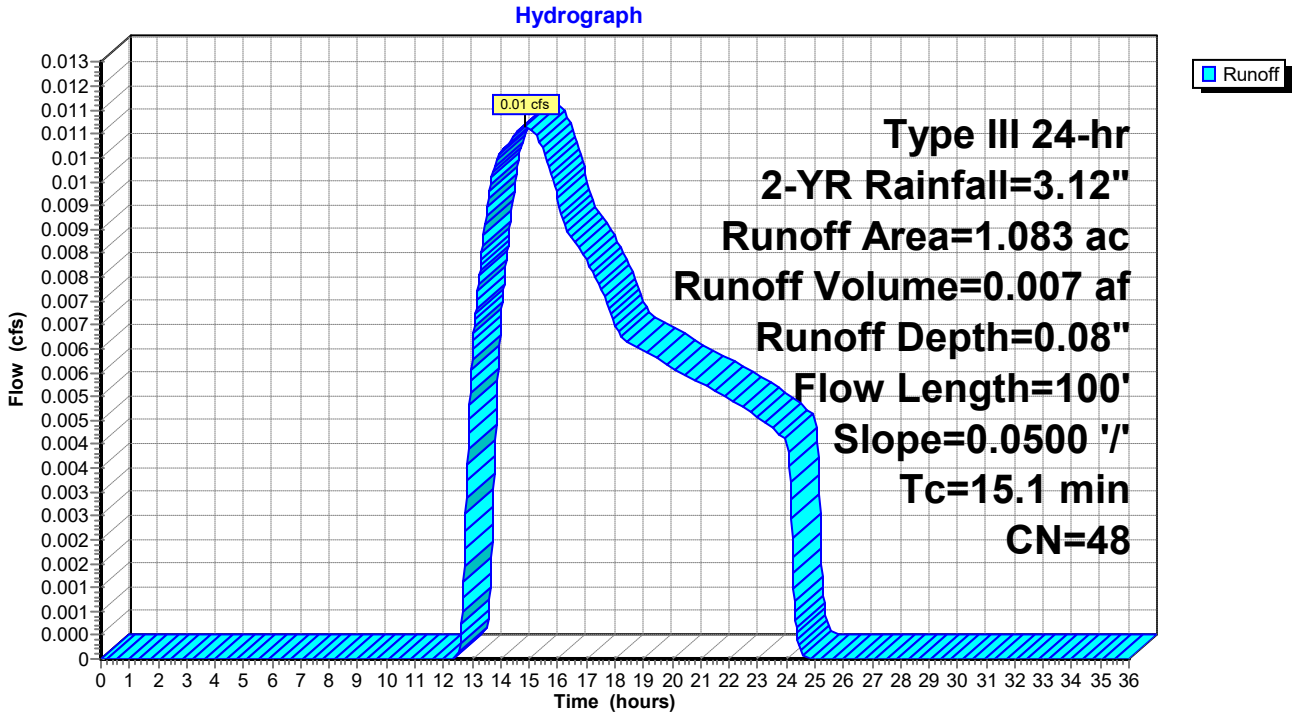
Runoff = 0.01 cfs @ 14.88 hrs, Volume= 0.007 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-YR Rainfall=3.12"

	Area (ac)	CN	Description
	0.062	39	>75% Grass cover, Good, HSG A
	0.182	61	>75% Grass cover, Good, HSG B
*	0.074	71	>75% Grass cover, Good, HSG B/D
*	0.013	98	IMPERVIOUS
	0.393	30	Woods, Good, HSG A
	0.348	55	Woods, Good, HSG B
*	0.011	66	Woods, Good, HSG B/D
	1.083	48	Weighted Average
	1.070		98.80% Pervious Area
	0.013		1.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"

Subcatchment P7: P7



Summary for Pond EP1*: Existing Detention Basin (Prop Condition)

Inflow Area = 4.412 ac, 57.39% Impervious, Inflow Depth = 1.46" for 2-YR event
Inflow = 6.20 cfs @ 12.09 hrs, Volume= 0.537 af
Outflow = 1.69 cfs @ 12.52 hrs, Volume= 0.537 af, Atten= 73%, Lag= 25.6 min
Primary = 1.69 cfs @ 12.52 hrs, Volume= 0.537 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 66.03' @ 12.52 hrs Surf.Area= 6,130 sf Storage= 6,522 cf

Plug-Flow detention time= 42.2 min calculated for 0.536 af (100% of inflow)
Center-of-Mass det. time= 42.2 min (870.9 - 828.7)

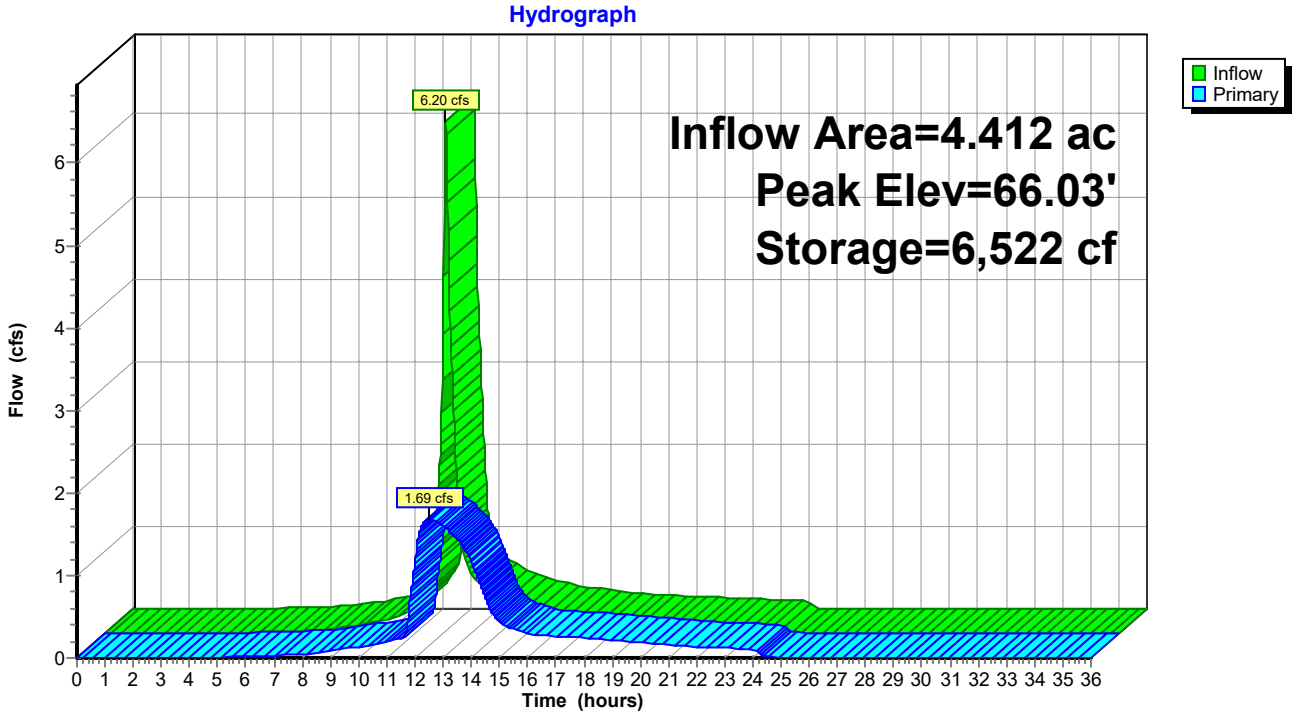
Volume	Invert	Avail.Storage	Storage Description
#1	62.70'	63,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.70	112	0	0
65.00	1,917	2,333	2,333
66.00	6,043	3,980	6,313
67.00	8,580	7,312	13,625
68.00	14,230	11,405	25,030
69.00	19,351	16,791	41,820
70.00	23,308	21,330	63,150

Device	Routing	Invert	Outlet Devices
#1	Primary	62.70'	**24.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.70' / 62.33' S= 0.0082 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	62.70'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	64.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.69 cfs @ 12.52 hrs HW=66.03' (Free Discharge)
└**1=Culvert** (Passes 1.69 cfs of 23.11 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.42 cfs @ 8.63 fps)
  └**3=Orifice/Grate** (Orifice Controls 1.26 cfs @ 6.43 fps)

Pond EP1*: Existing Detention Basin (Prop Condition)



Summary for Pond SB2: Stilling Basin 2

Inflow Area = 0.317 ac, 84.54% Impervious, Inflow Depth = 2.37" for 2-YR event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.50 cfs @ 12.20 hrs, Volume= 0.035 af, Atten= 42%, Lag= 7.0 min
Primary = 0.50 cfs @ 12.20 hrs, Volume= 0.035 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 69.58' @ 12.20 hrs Surf.Area= 725 sf Storage= 1,251 cf

Plug-Flow detention time= 203.2 min calculated for 0.035 af (56% of inflow)
Center-of-Mass det. time= 96.7 min (890.2 - 793.5)

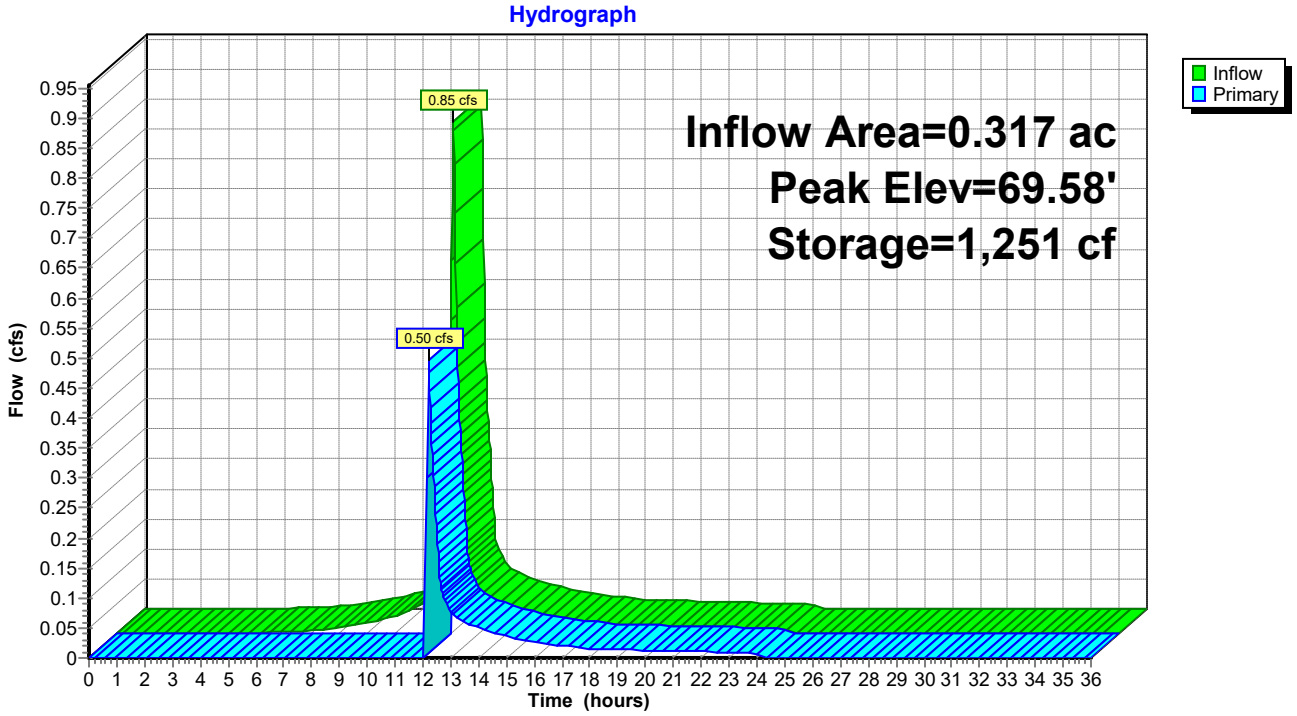
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	1,665 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	5	0	0
68.00	377	382	382
70.00	818	1,195	1,577
70.10	944	88	1,665

Device	Routing	Invert	Outlet Devices
#1	Primary	69.50'	**9.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.49 cfs @ 12.20 hrs HW=69.58' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.49 cfs @ 0.70 fps)

Pond SB2: Stilling Basin 2



Summary for Pond SB3: Stilling Basin 3

Inflow Area = 0.664 ac, 53.16% Impervious, Inflow Depth = 1.62" for 2-YR event
Inflow = 1.17 cfs @ 12.12 hrs, Volume= 0.089 af
Outflow = 0.04 cfs @ 16.62 hrs, Volume= 0.016 af, Atten= 97%, Lag= 270.0 min
Primary = 0.04 cfs @ 16.62 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 69.51' @ 16.62 hrs Surf.Area= 1,790 sf Storage= 3,206 cf

Plug-Flow detention time= 487.6 min calculated for 0.016 af (18% of inflow)
Center-of-Mass det. time= 341.1 min (1,173.7 - 832.6)

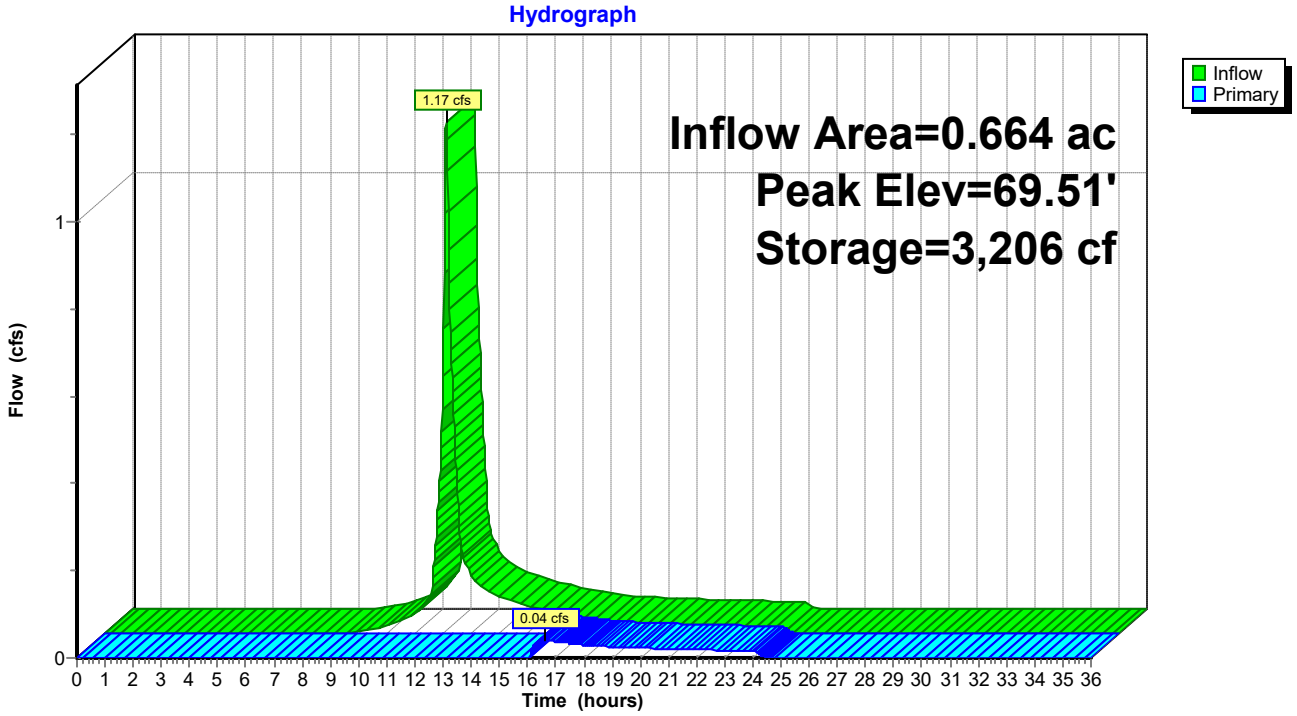
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	4,353 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	5	0	0
68.00	1,052	1,057	1,057
70.00	2,028	3,080	4,137
70.10	2,287	216	4,353

Device	Routing	Invert	Outlet Devices
#1	Primary	69.50'	**8.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.03 cfs @ 16.62 hrs HW=69.51' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.28 fps)

Pond SB3: Stilling Basin 3

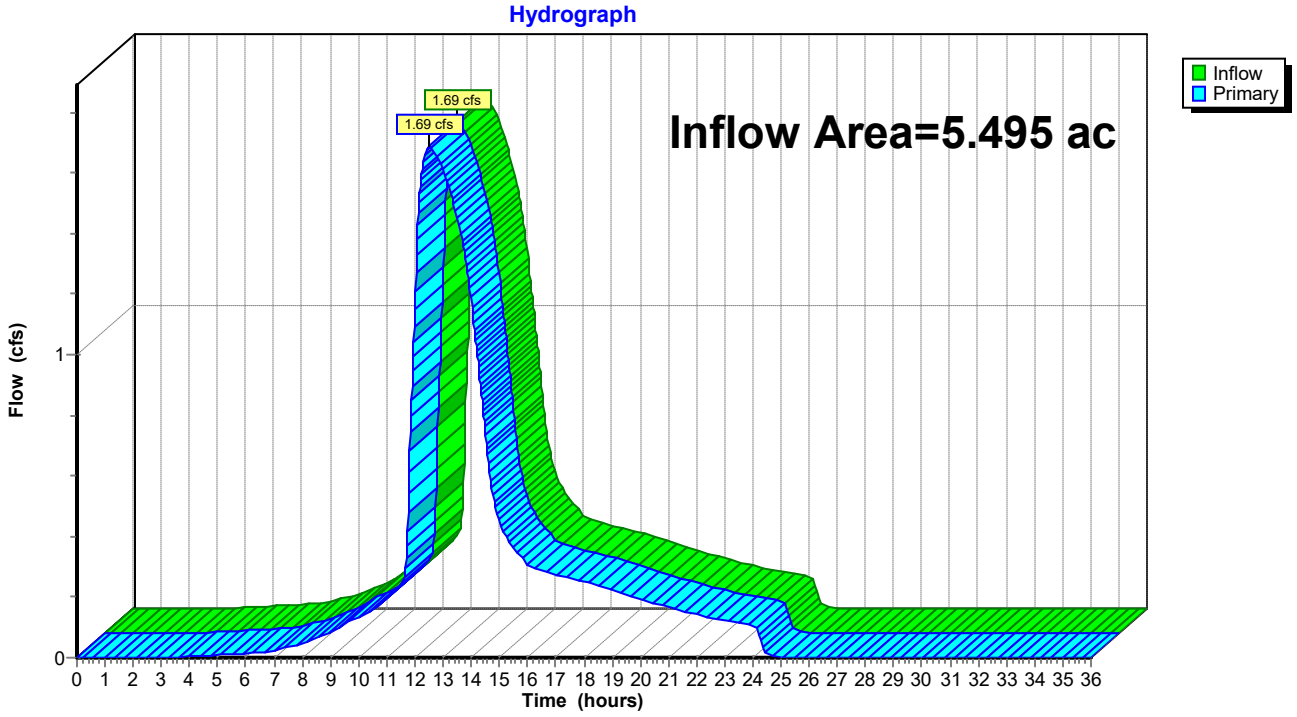


Summary for Link P-DP1: Proposed DP1

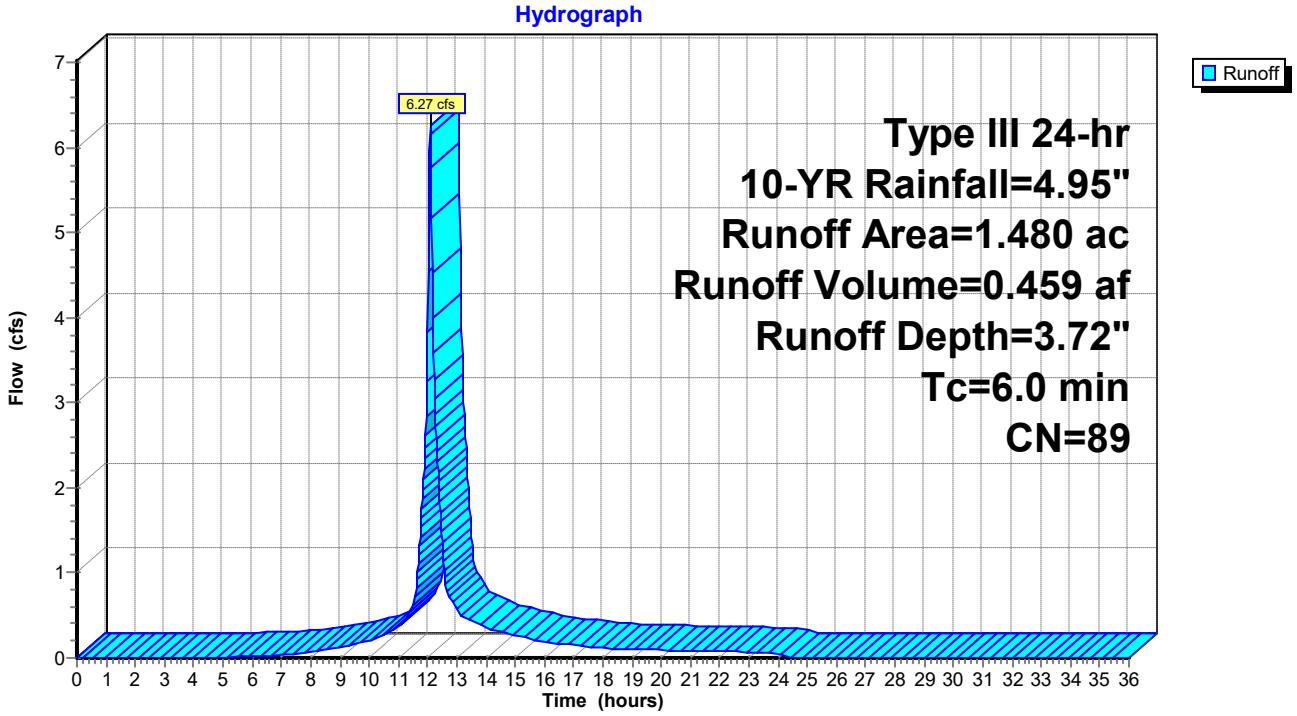
Inflow Area = 5.495 ac, 46.31% Impervious, Inflow Depth = 1.19" for 2-YR event
Inflow = 1.69 cfs @ 12.52 hrs, Volume= 0.544 af
Primary = 1.69 cfs @ 12.52 hrs, Volume= 0.544 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

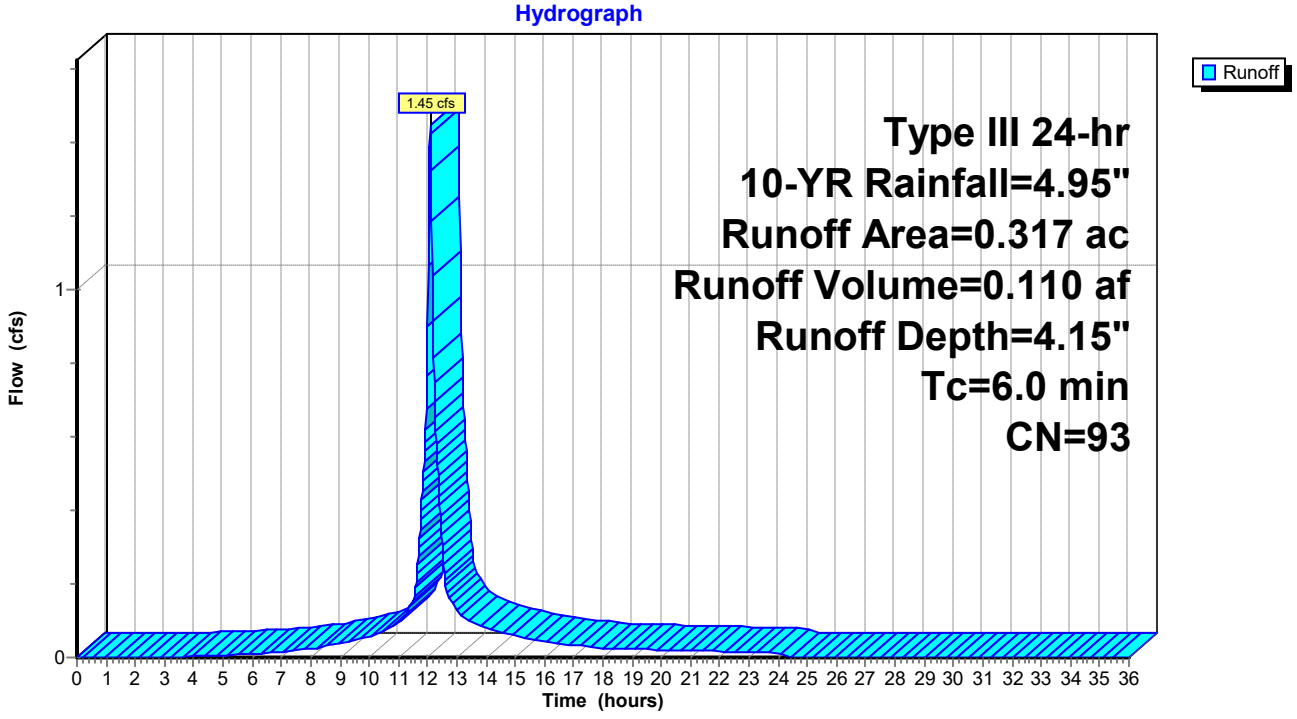
Link P-DP1: Proposed DP1



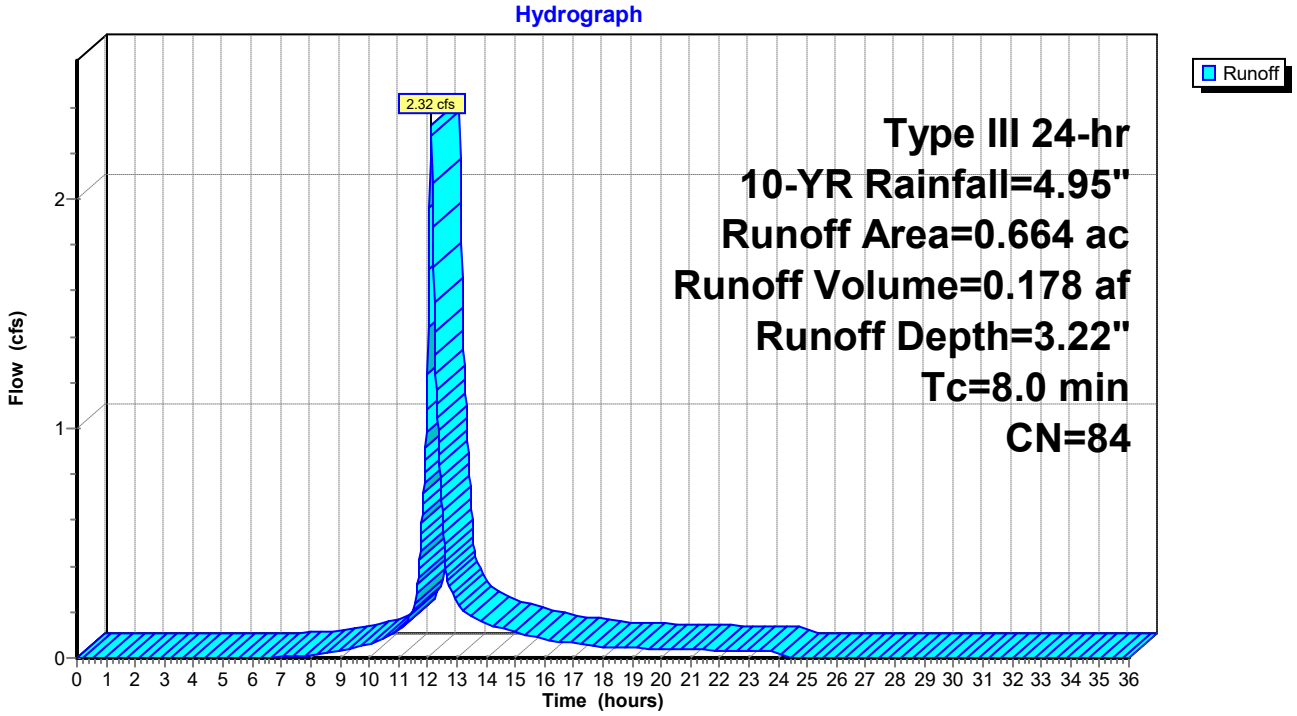
Subcatchment P2: P2



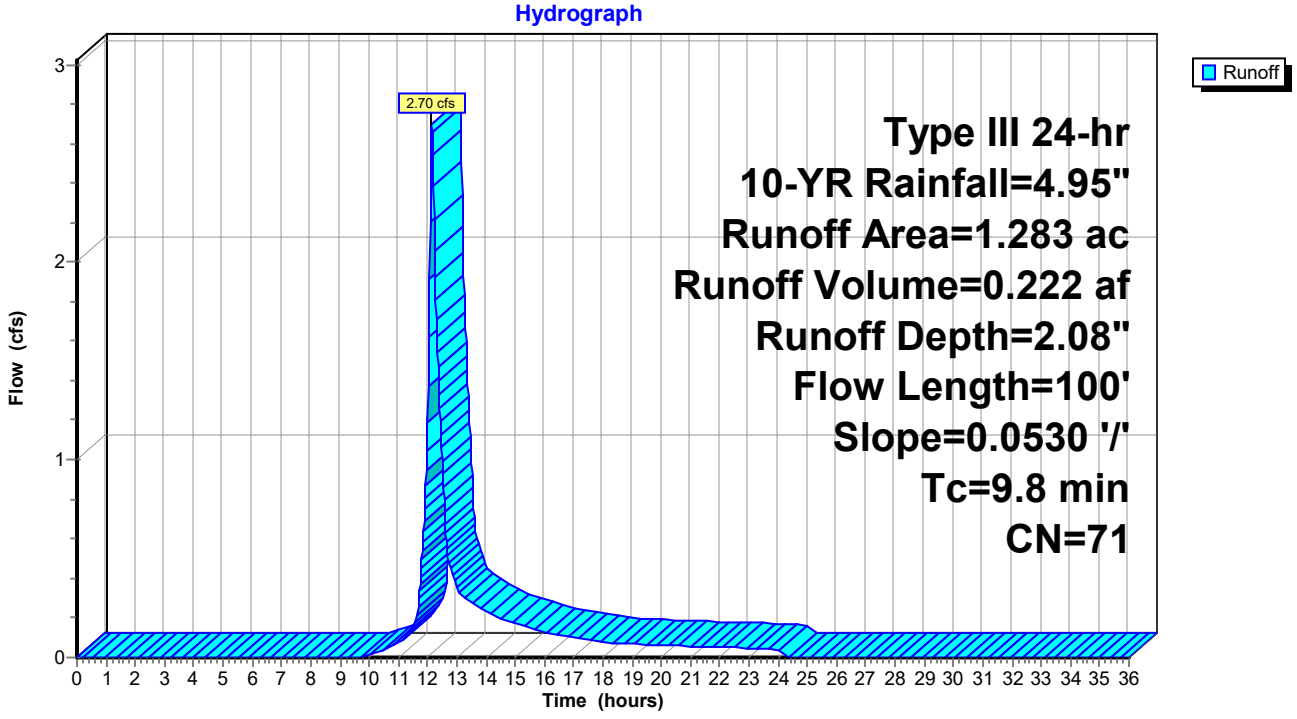
Subcatchment P3: P3



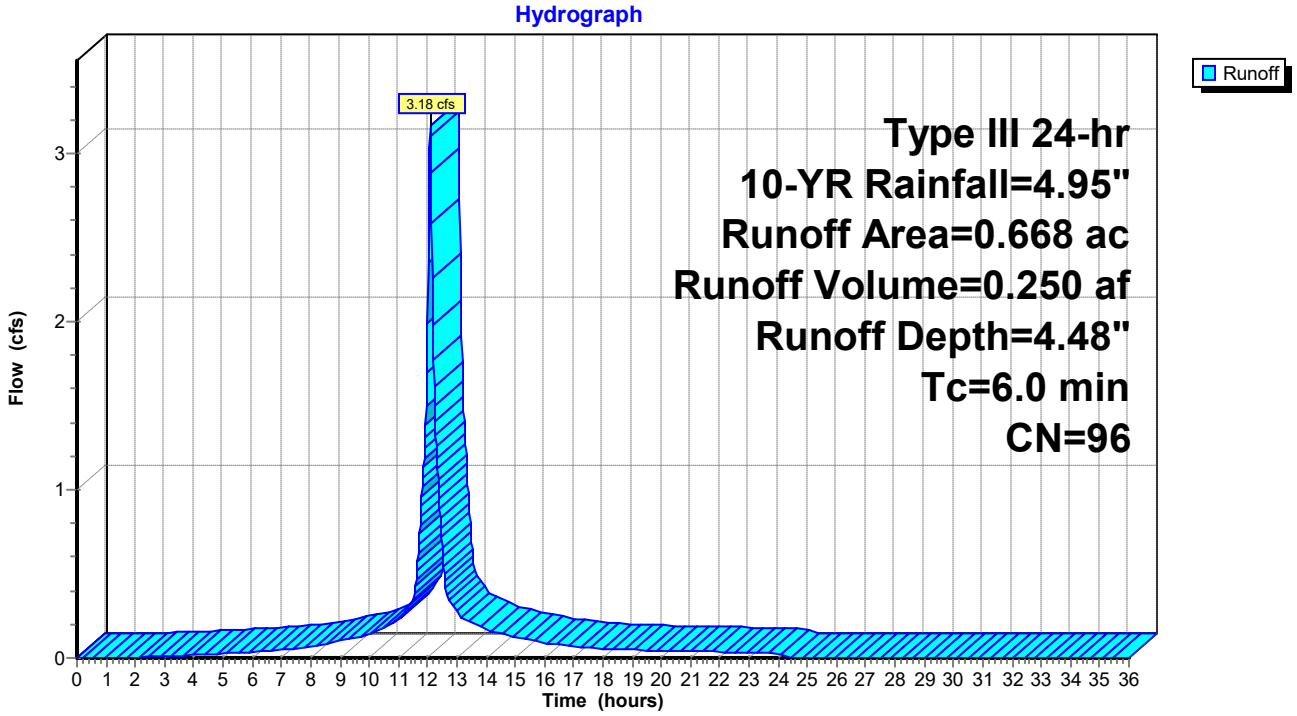
Subcatchment P4: P4



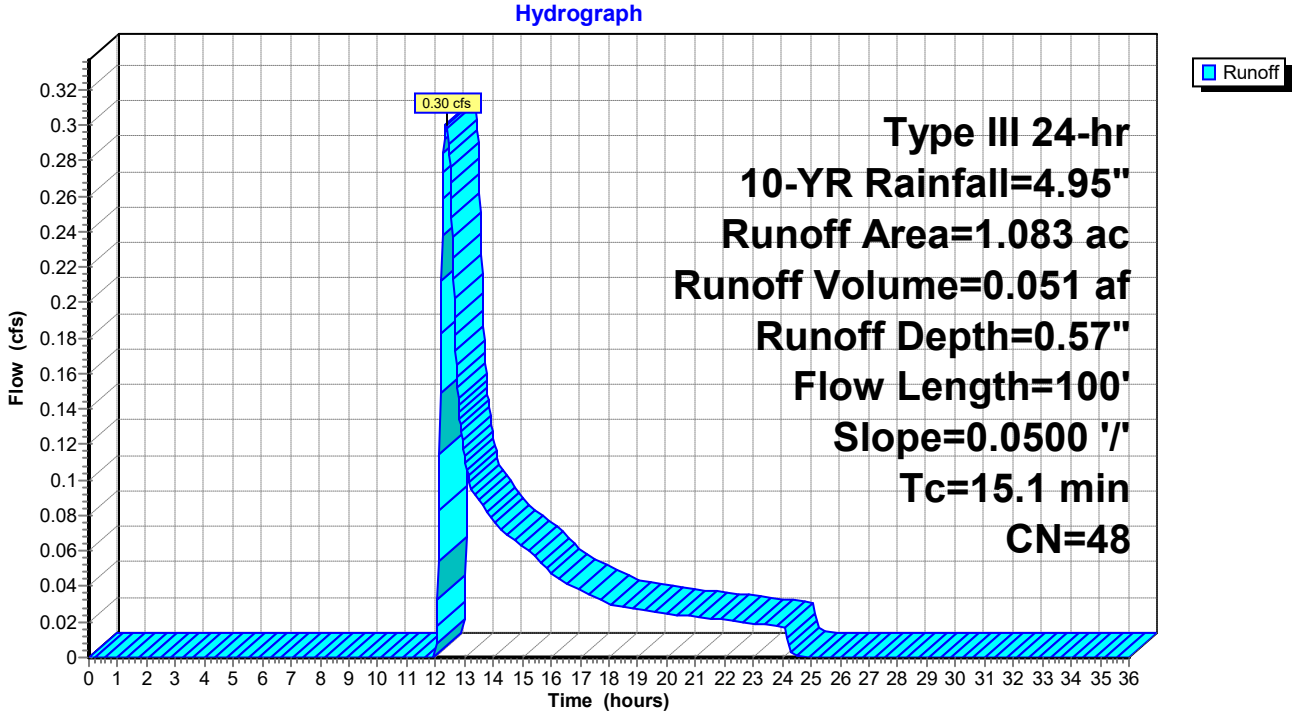
Subcatchment P5: P5



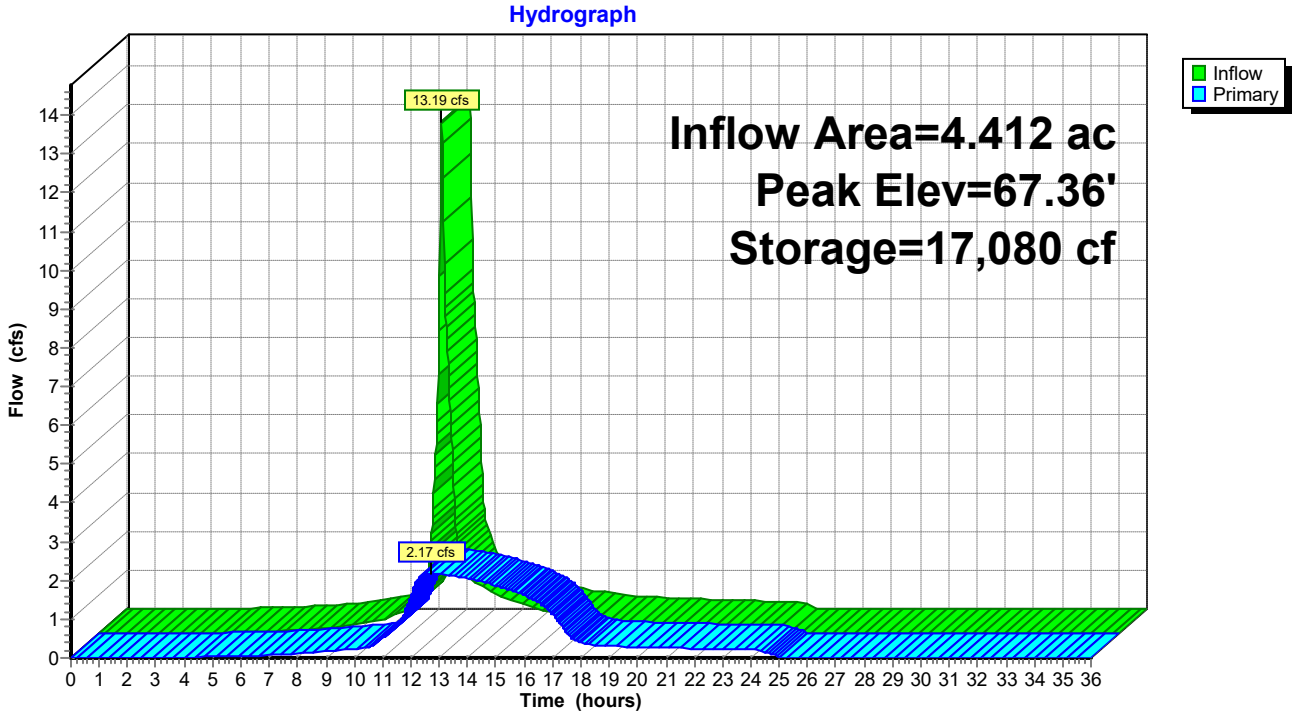
Subcatchment P6: P6



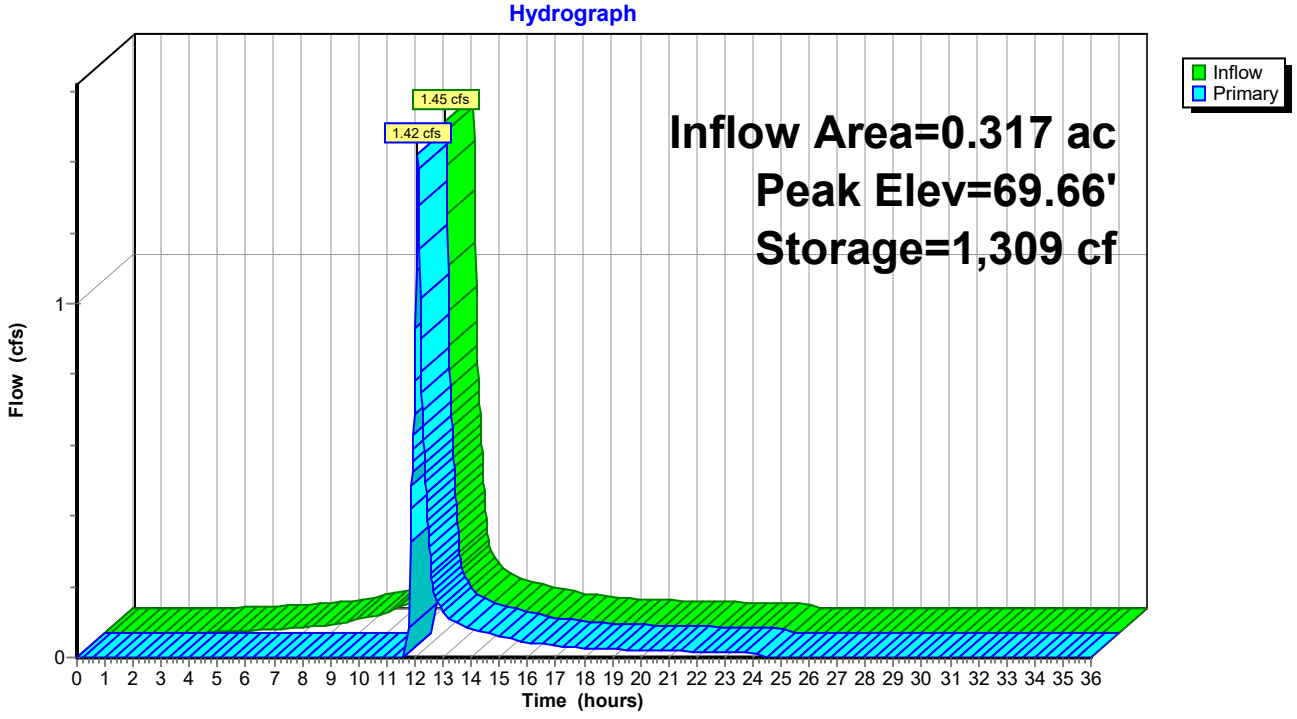
Subcatchment P7: P7



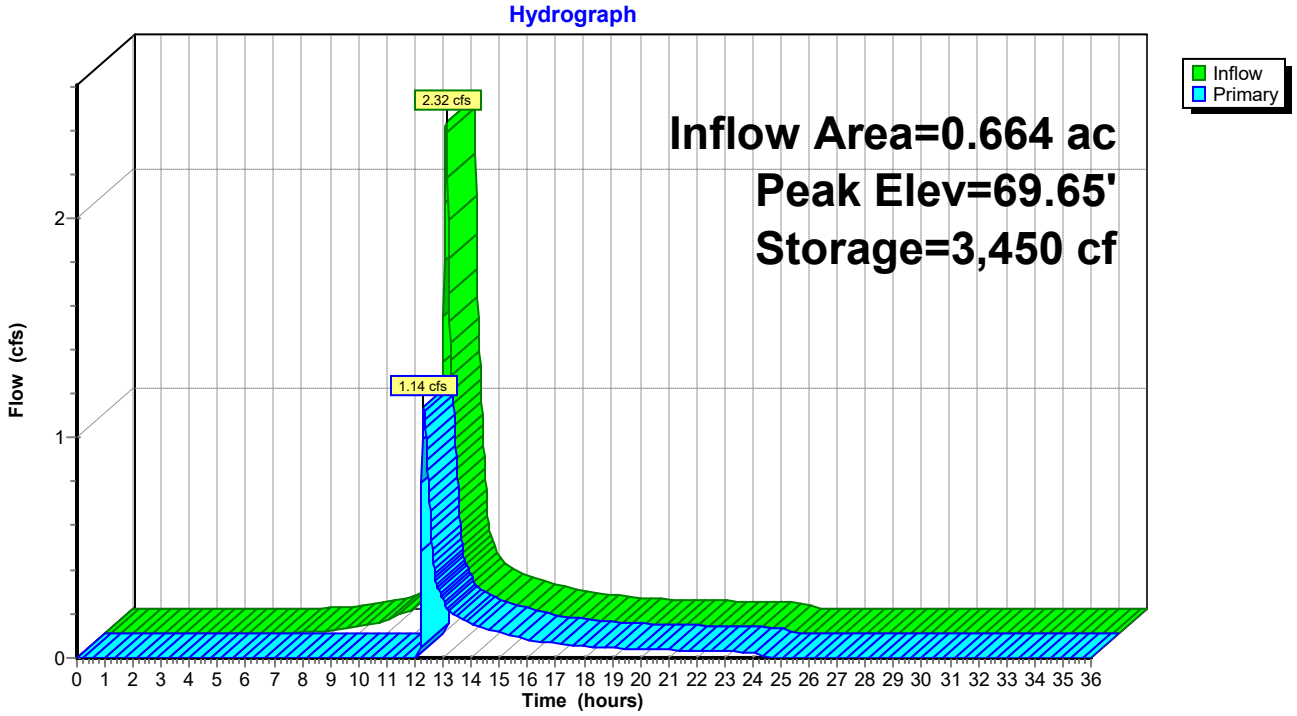
Pond EP1*: Existing Detention Basin (Prop Condition)



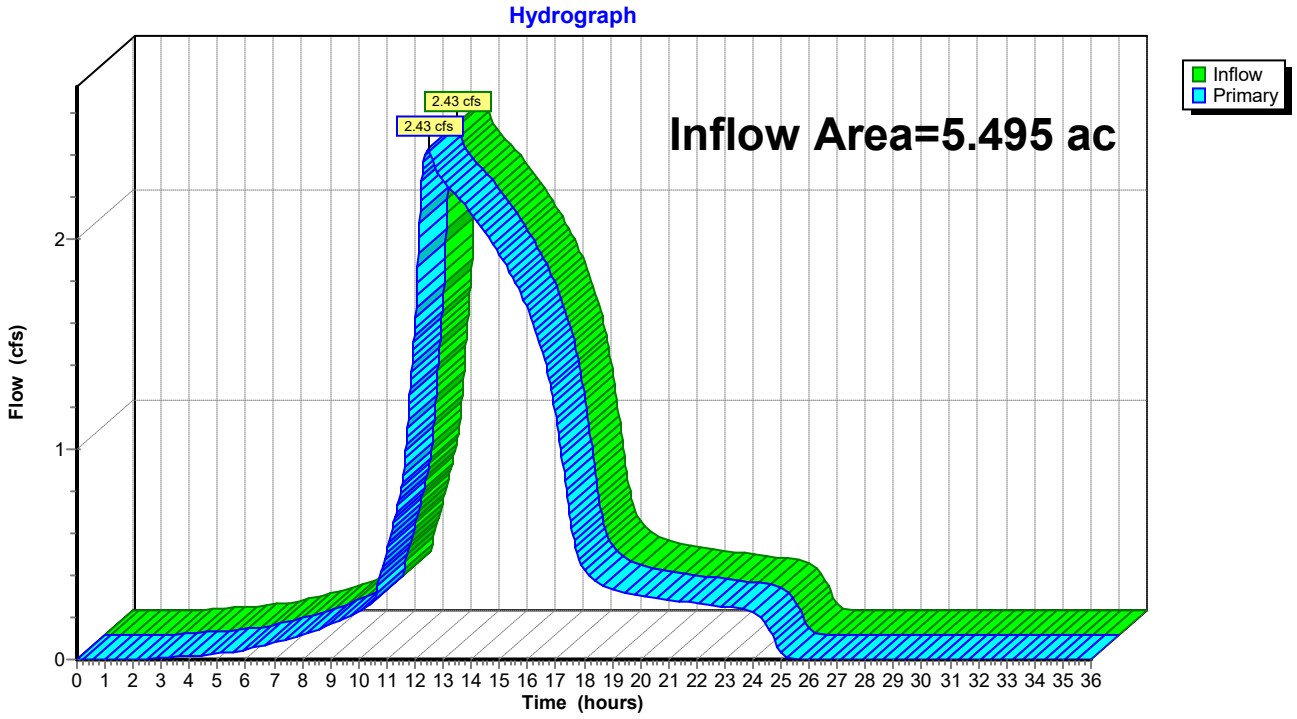
Pond SB2: Stilling Basin 2



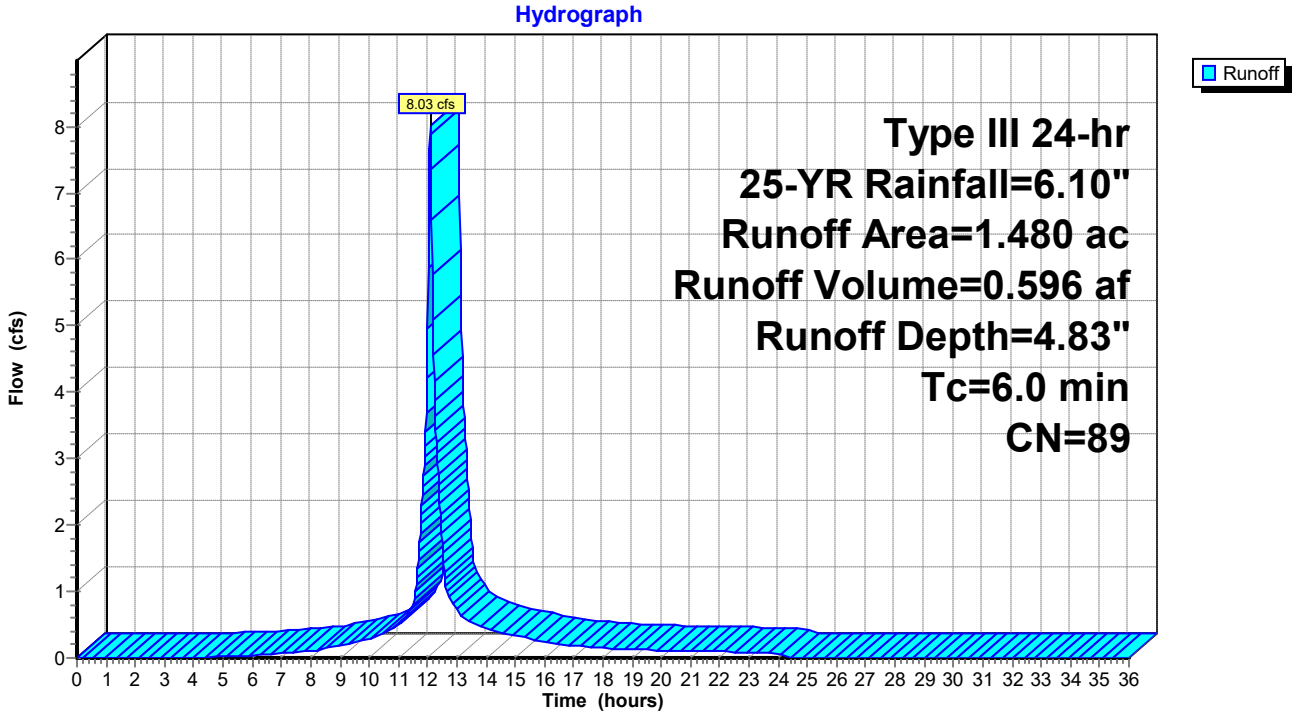
Pond SB3: Stilling Basin 3



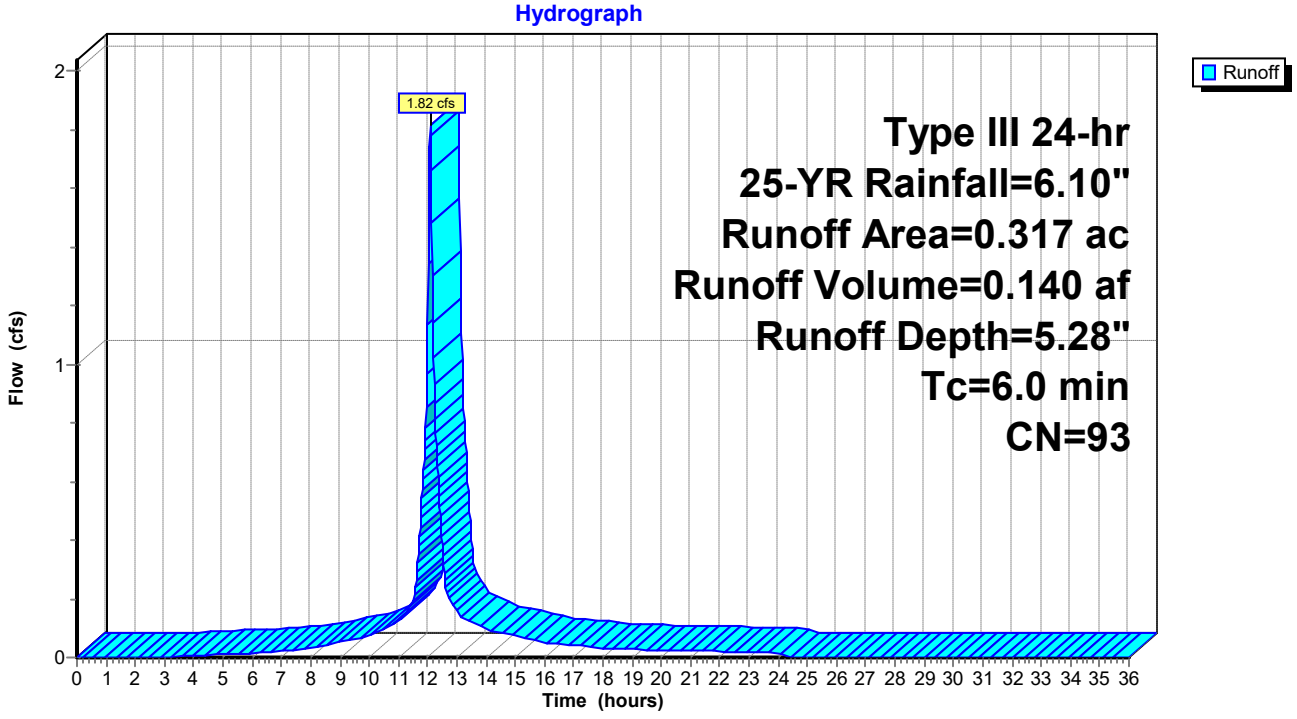
Link P-DP1: Proposed DP1



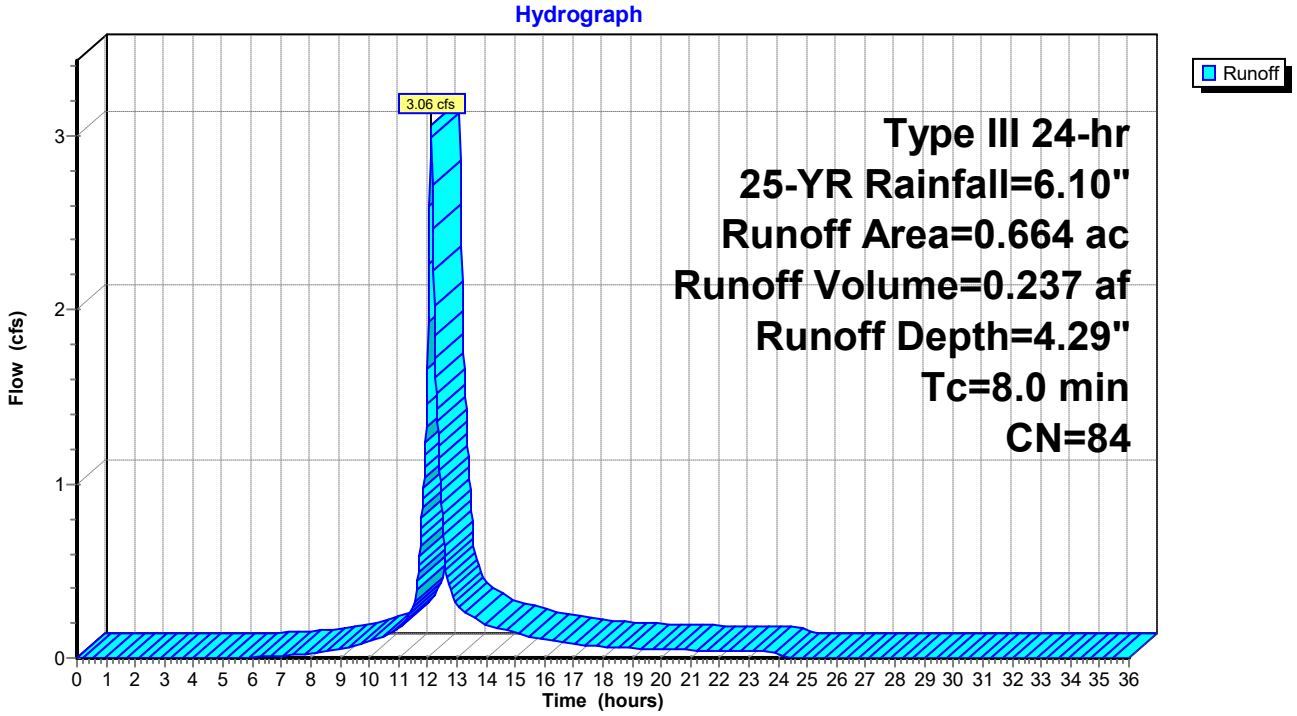
Subcatchment P2: P2



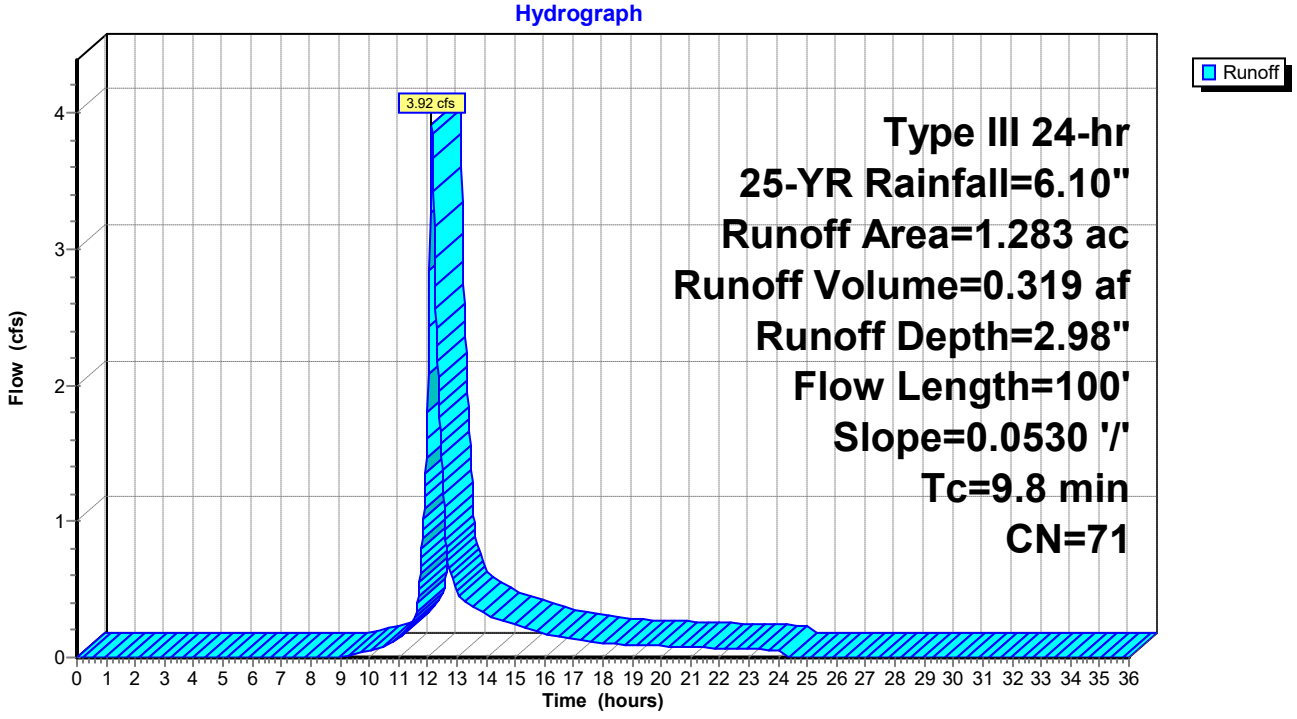
Subcatchment P3: P3



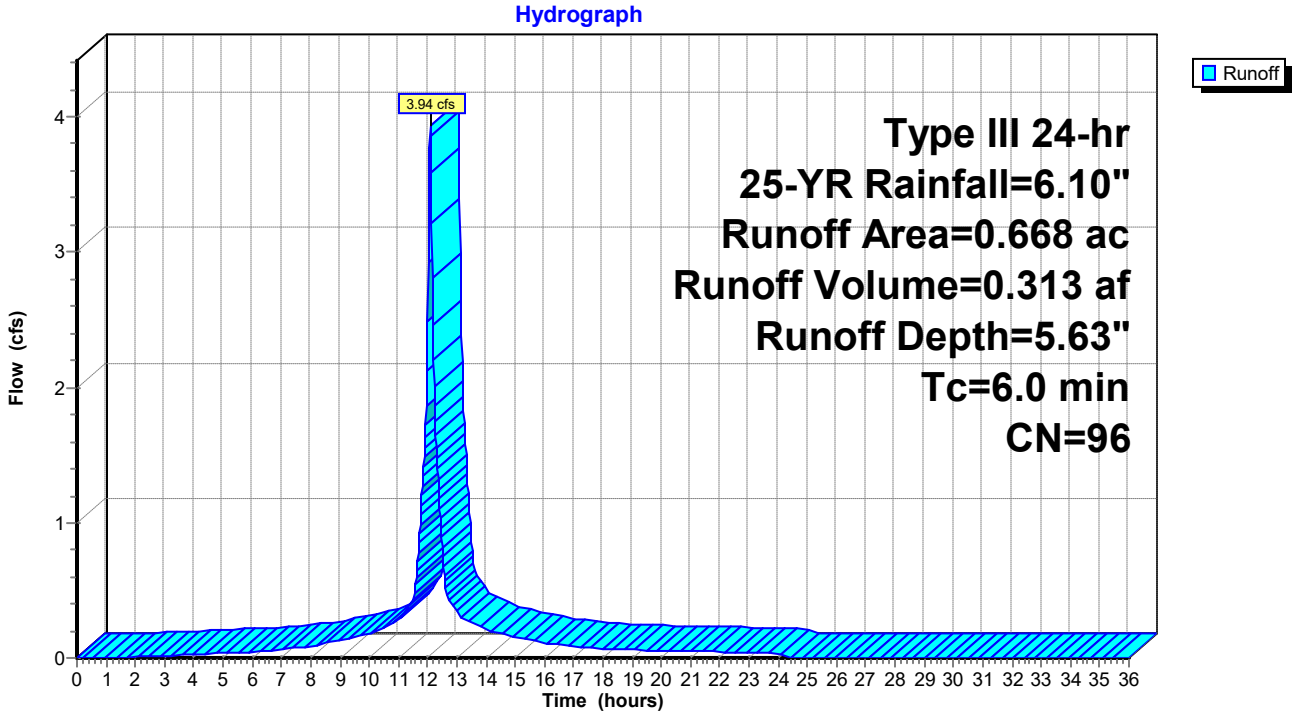
Subcatchment P4: P4



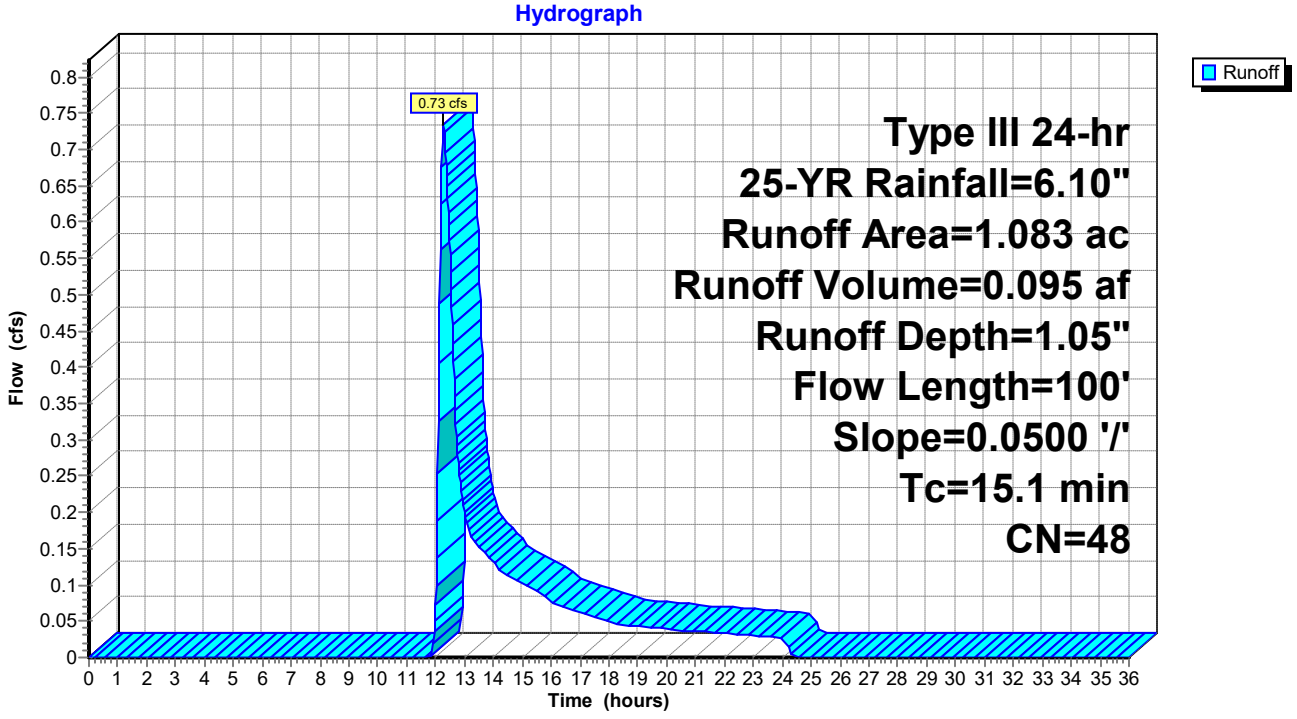
Subcatchment P5: P5



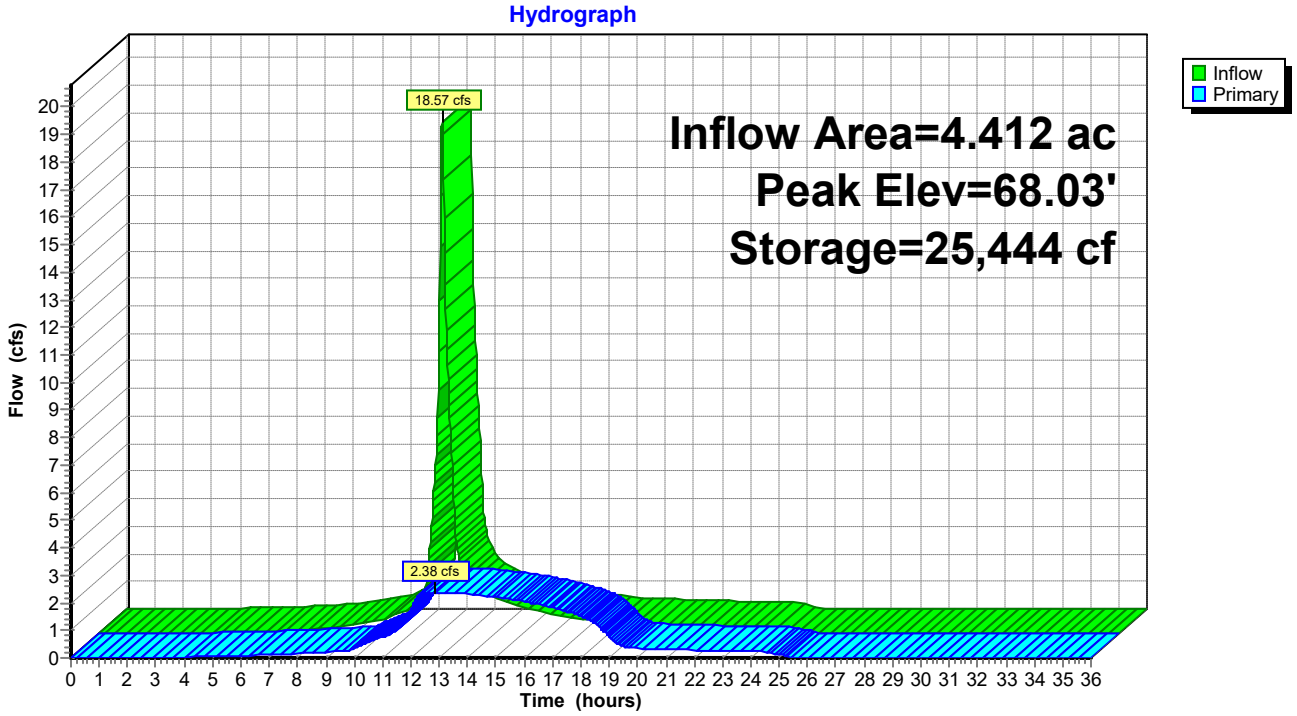
Subcatchment P6: P6



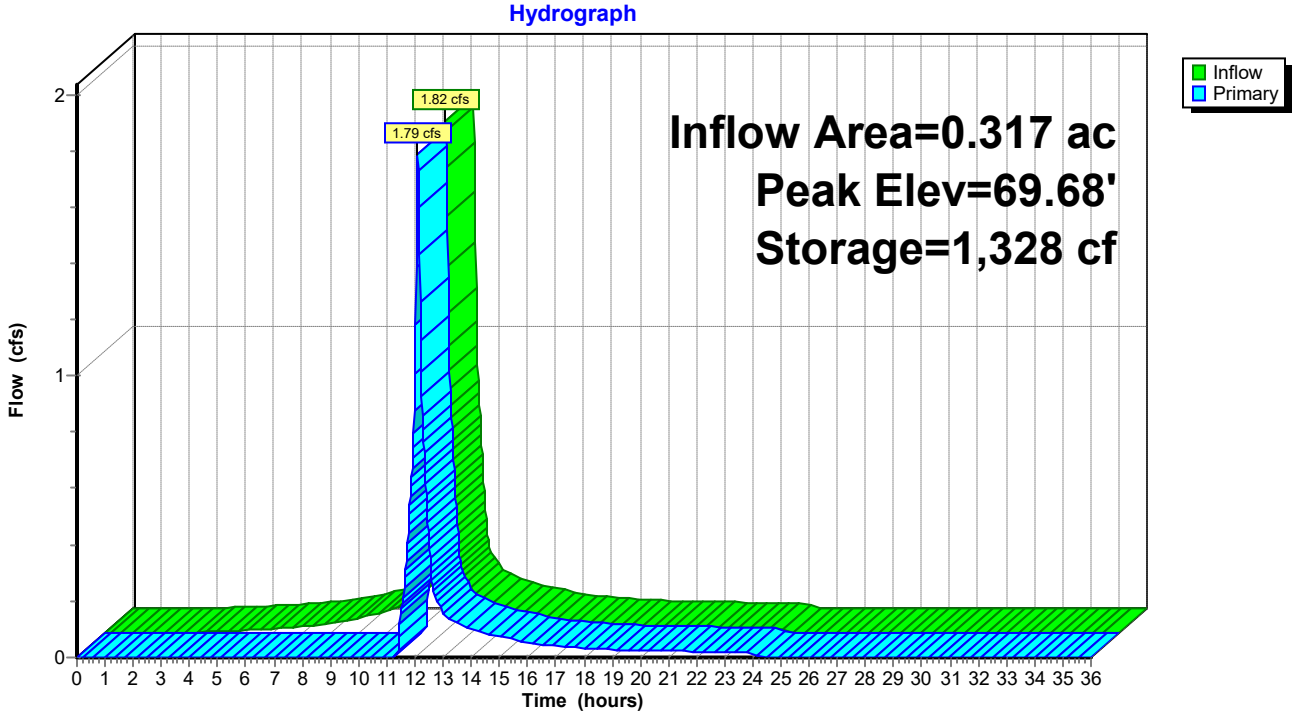
Subcatchment P7: P7



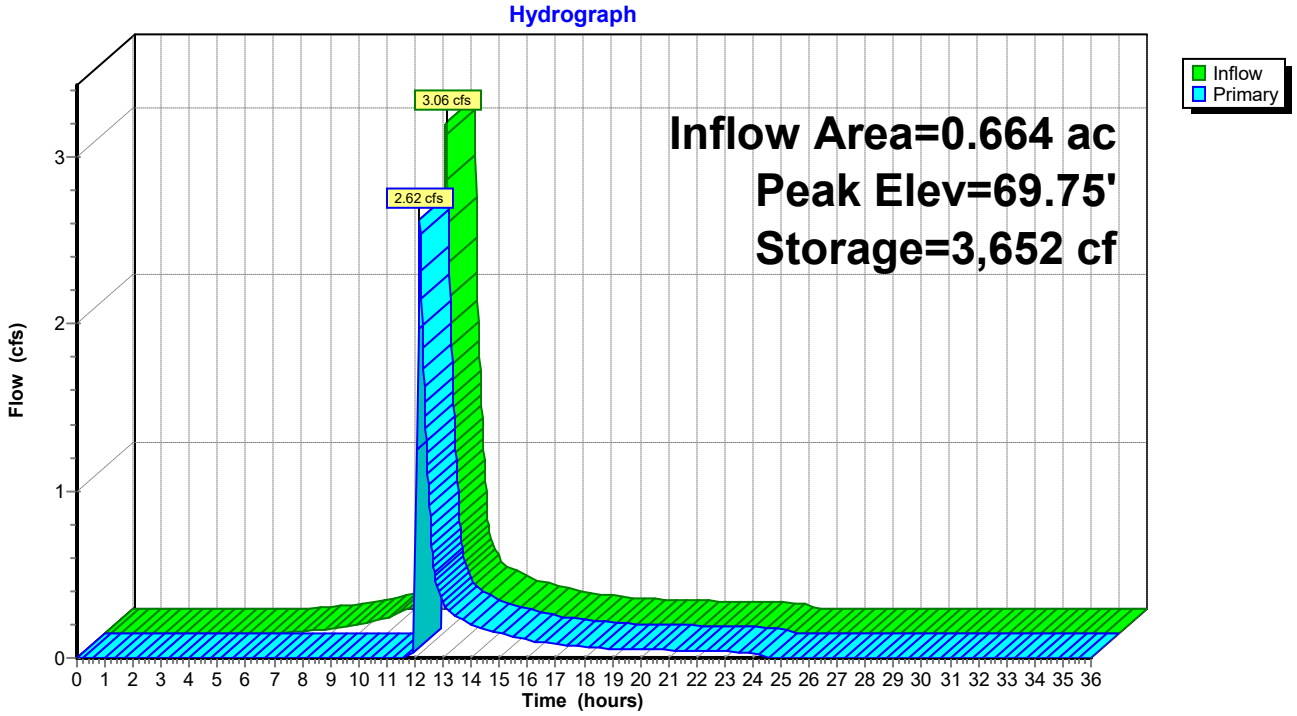
Pond EP1*: Existing Detention Basin (Prop Condition)



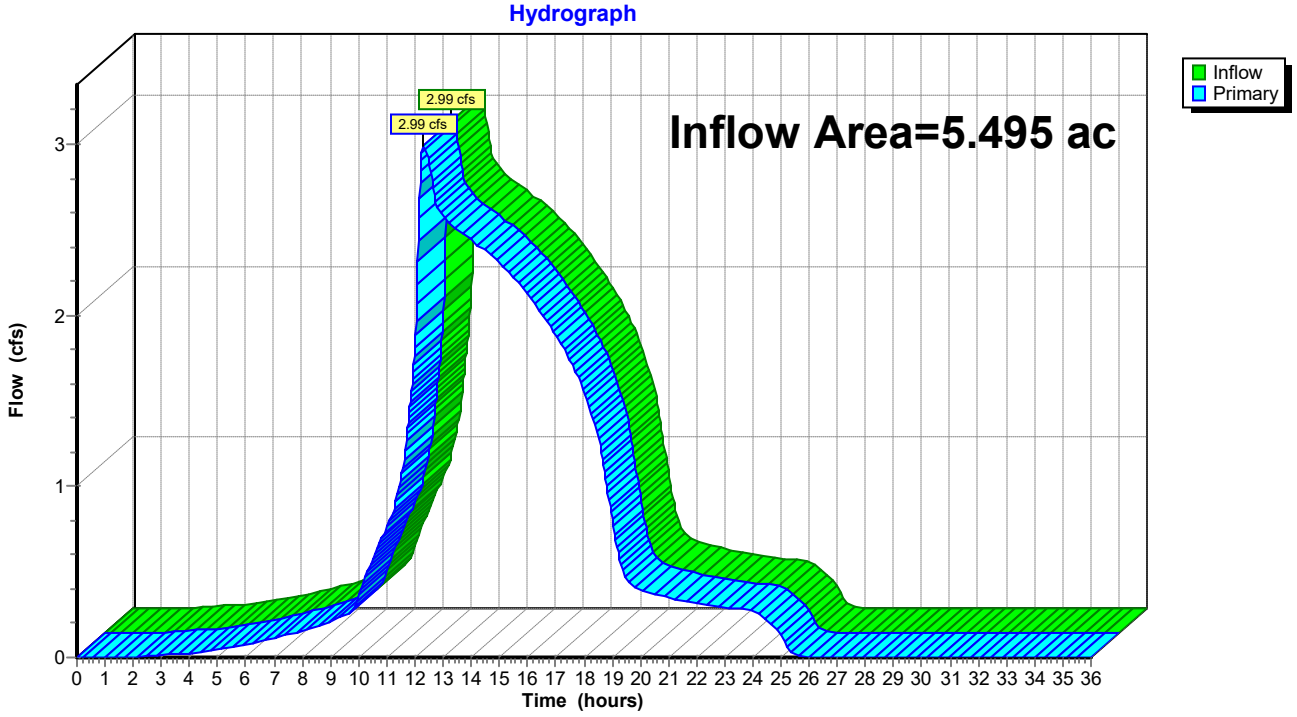
Pond SB2: Stilling Basin 2



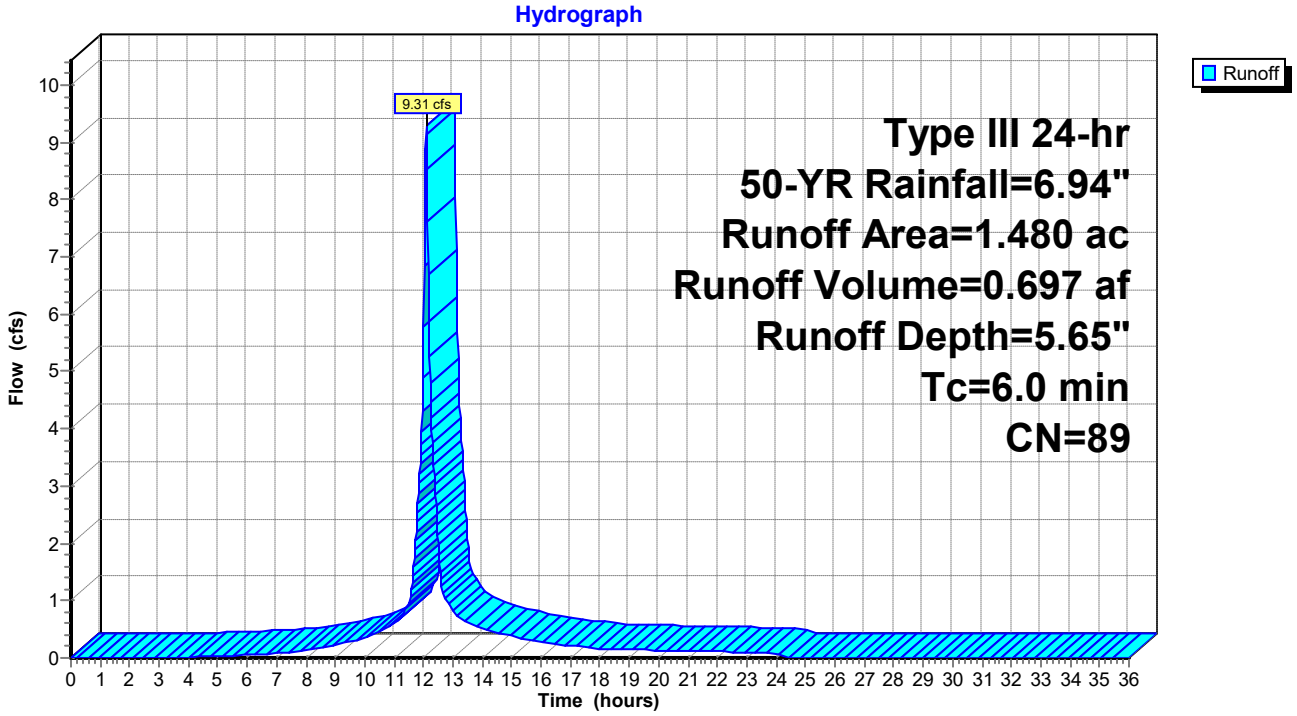
Pond SB3: Stilling Basin 3



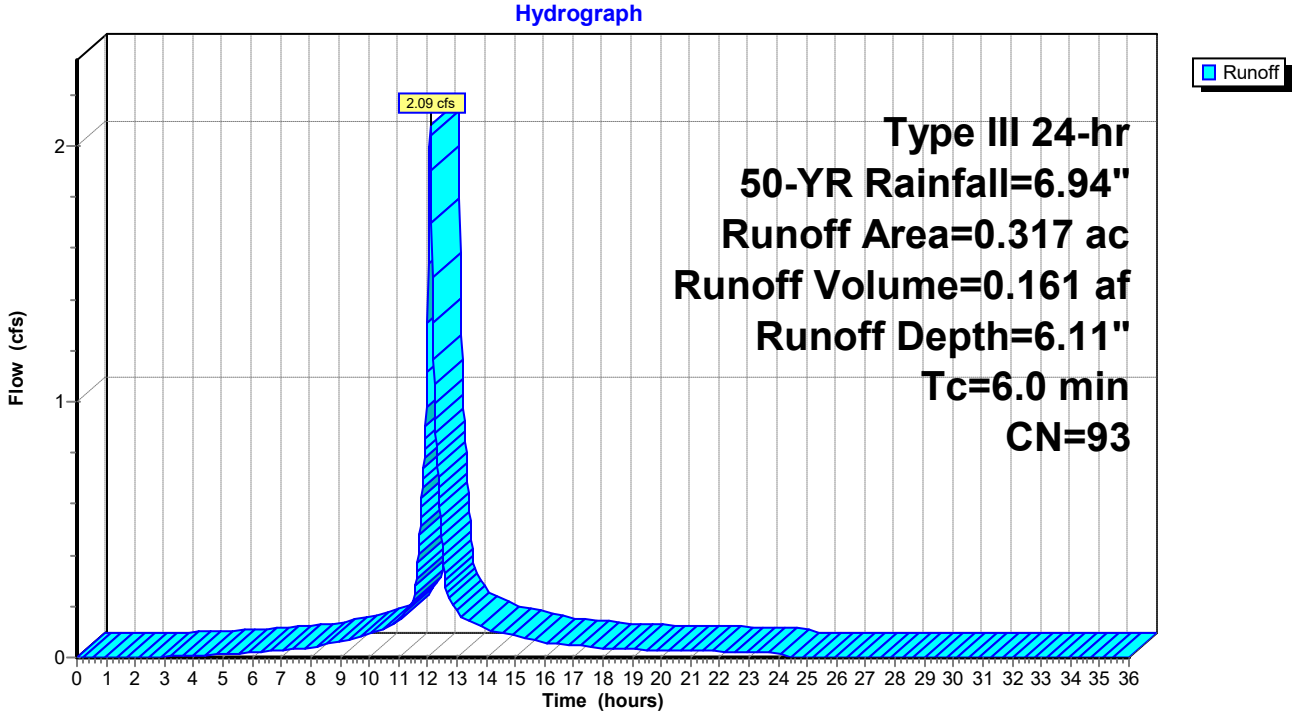
Link P-DP1: Proposed DP1



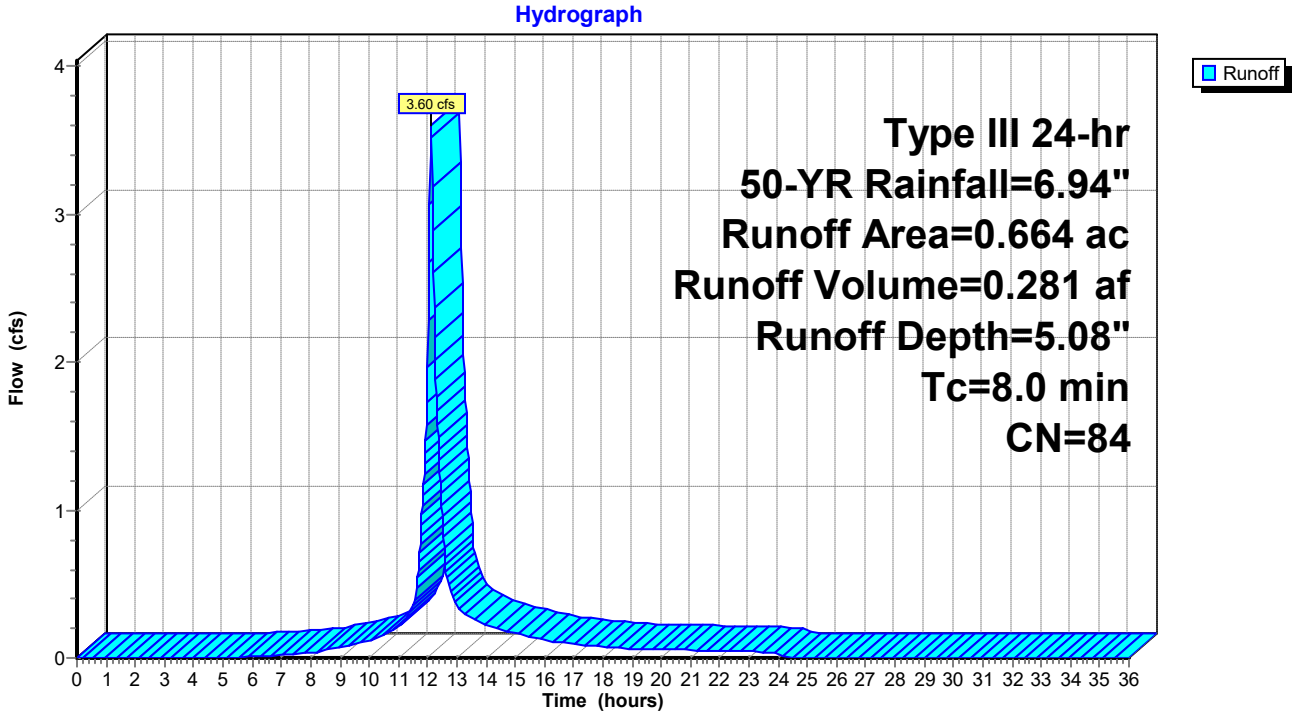
Subcatchment P2: P2



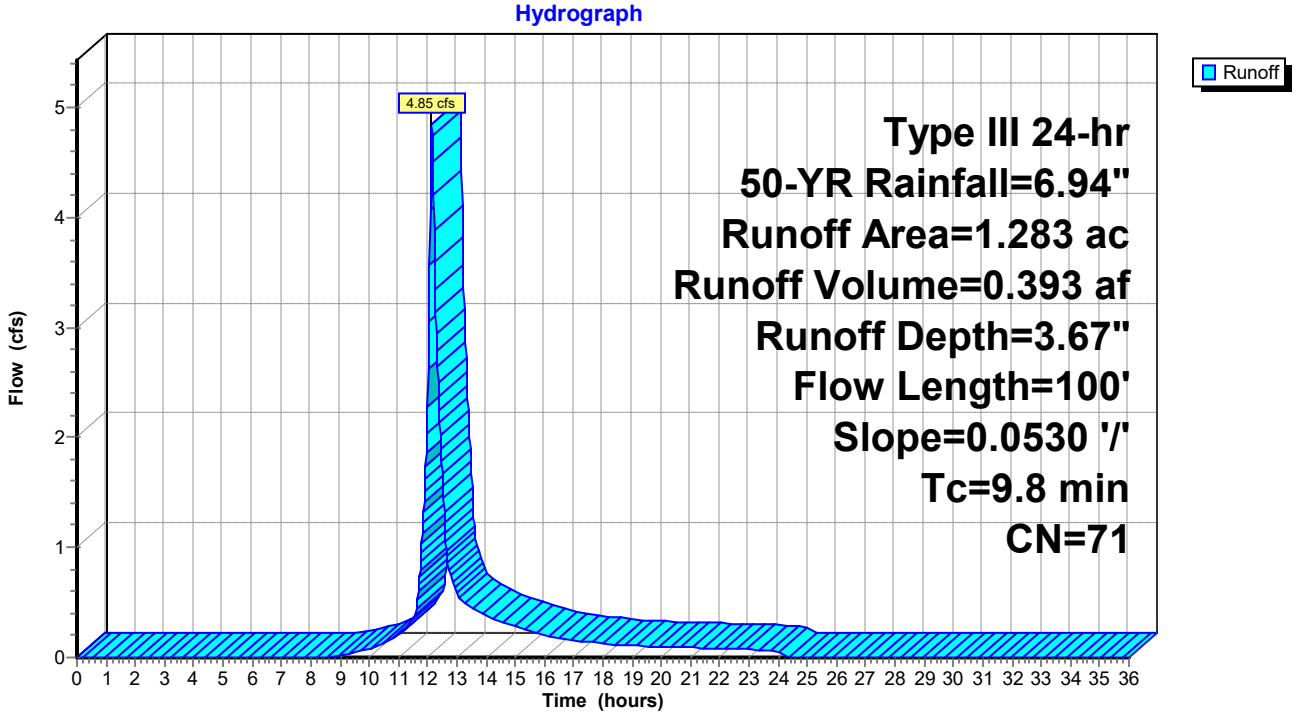
Subcatchment P3: P3



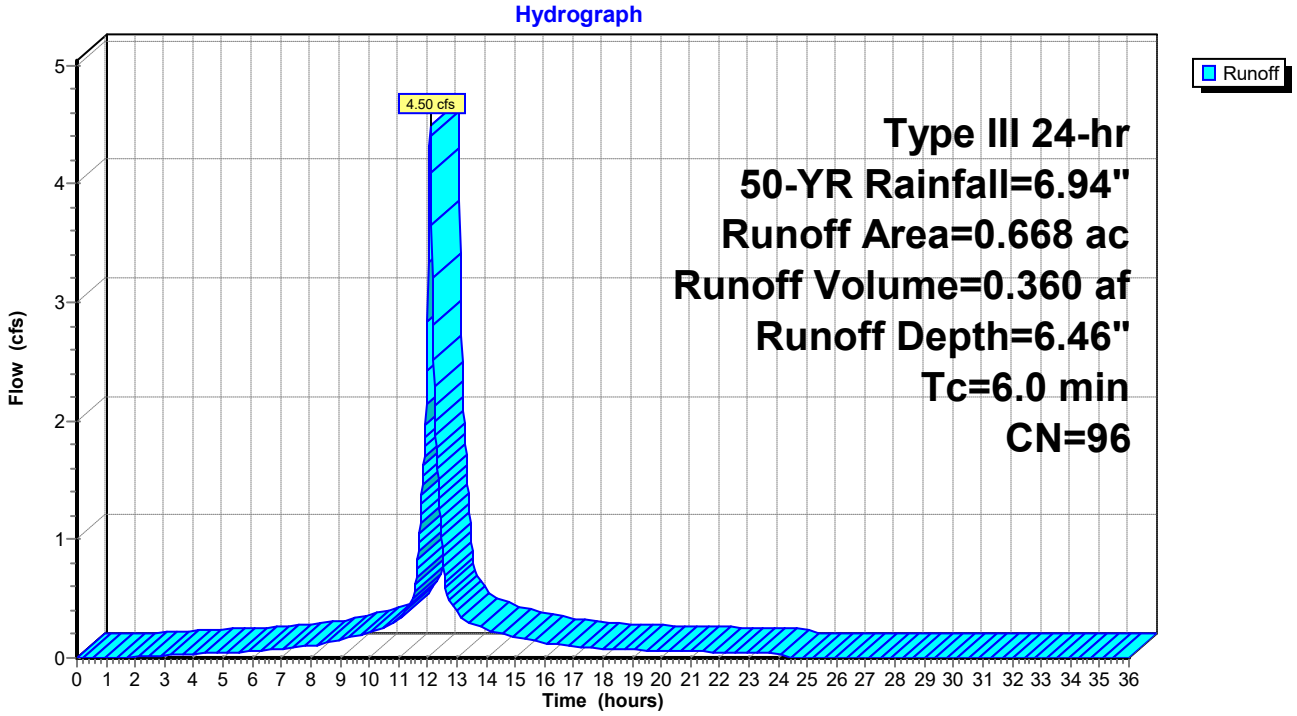
Subcatchment P4: P4



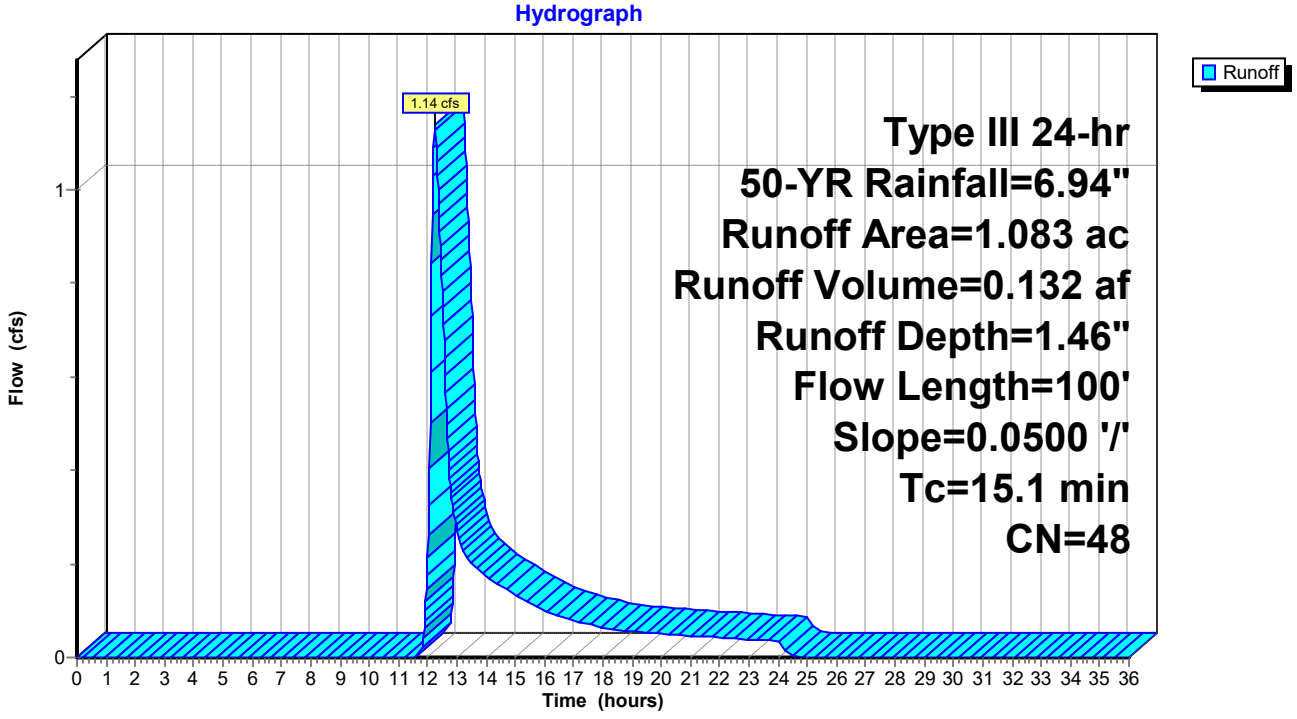
Subcatchment P5: P5



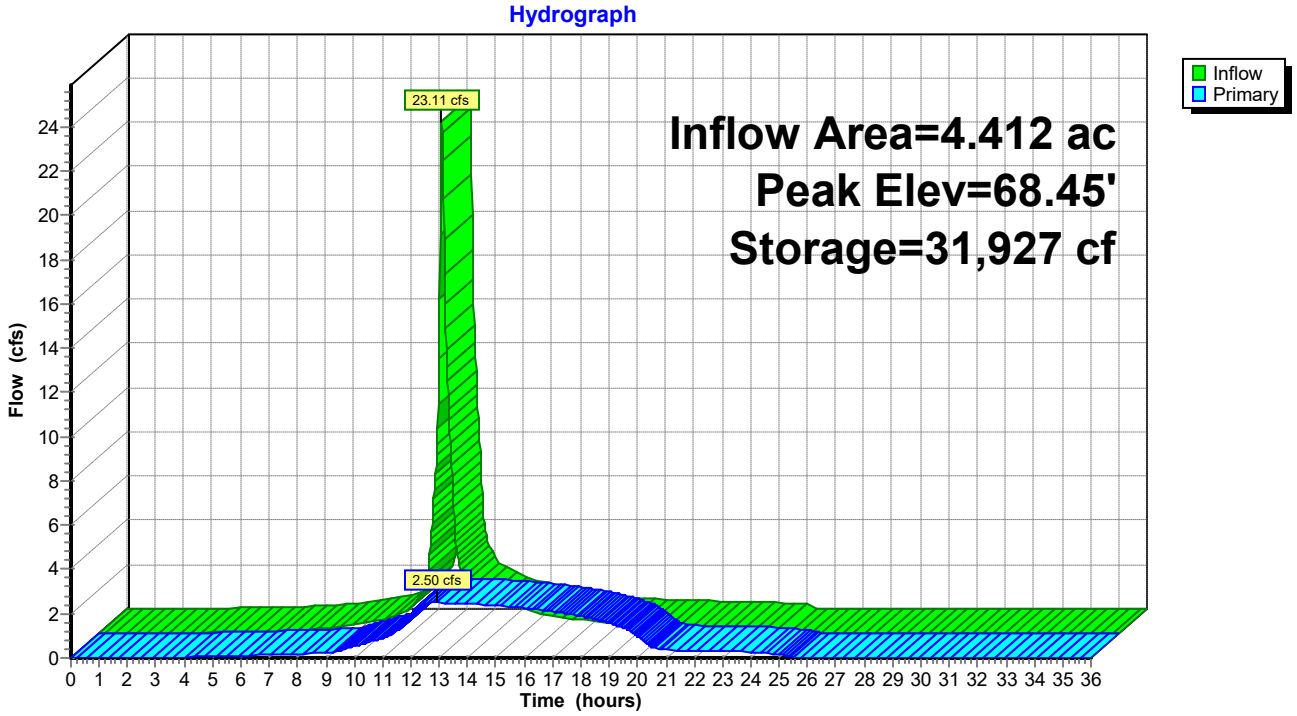
Subcatchment P6: P6



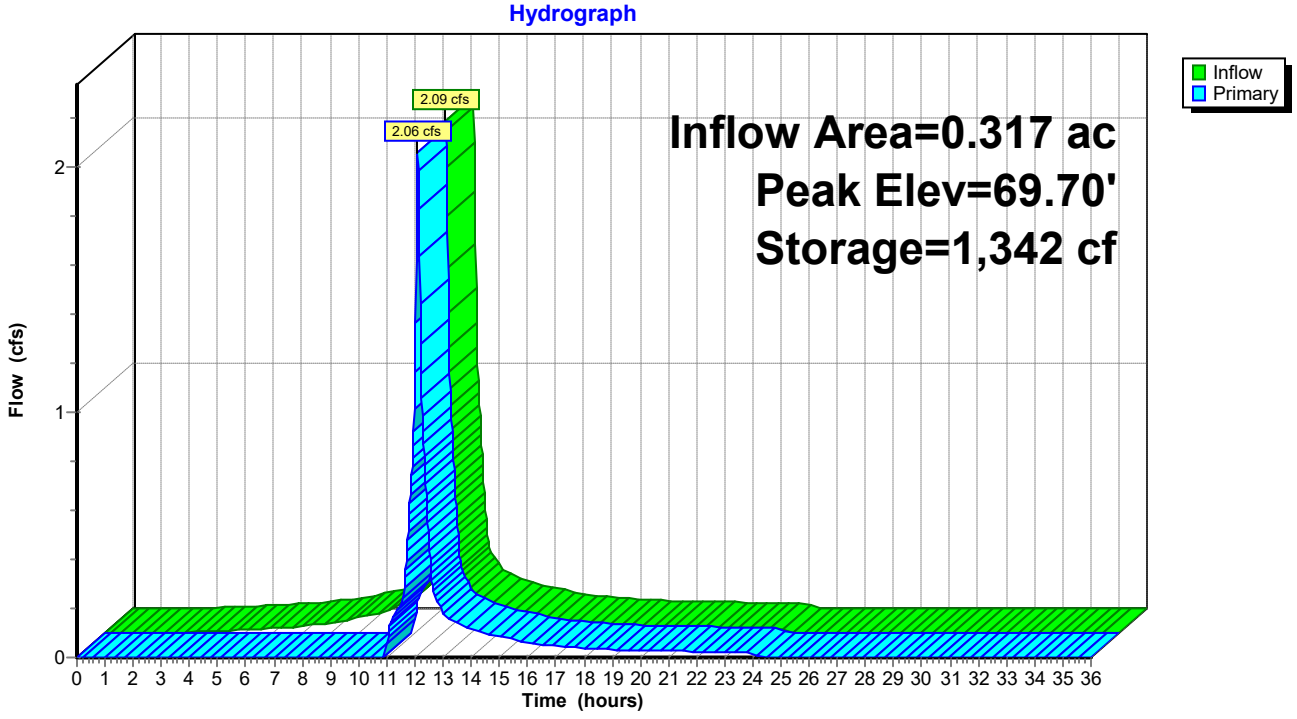
Subcatchment P7: P7



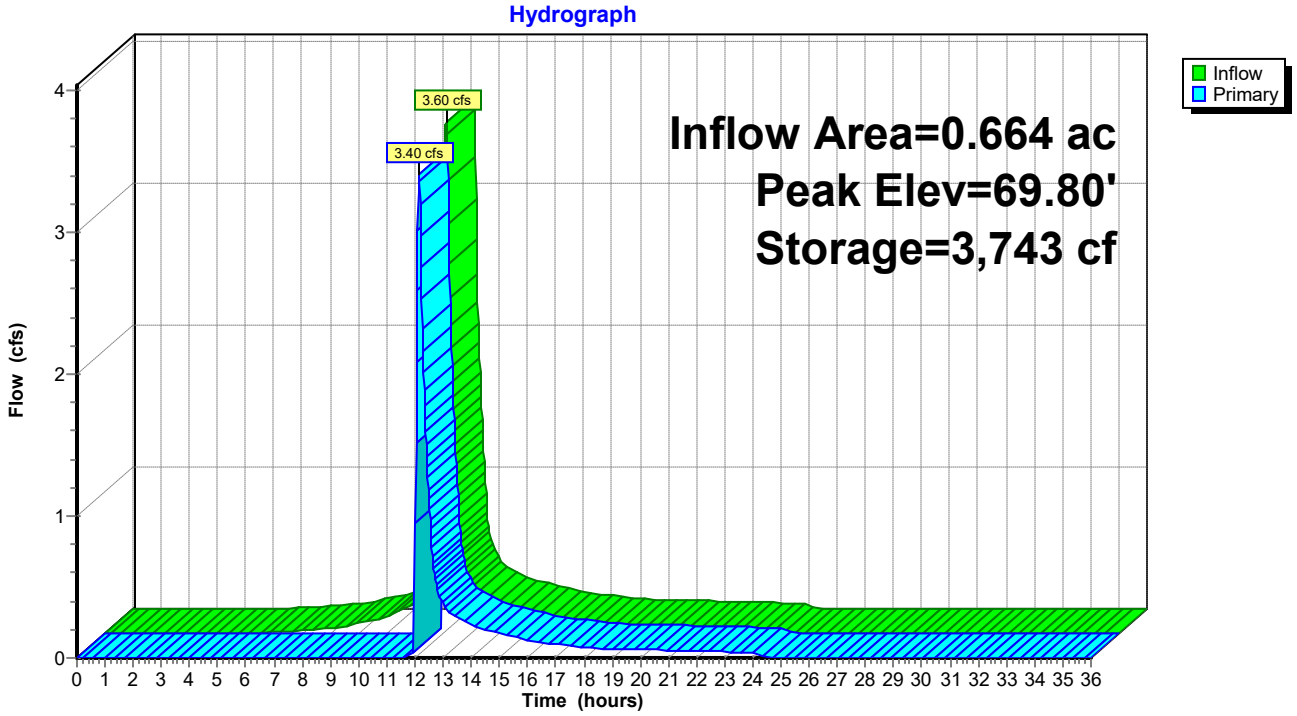
Pond EP1*: Existing Detention Basin (Prop Condition)



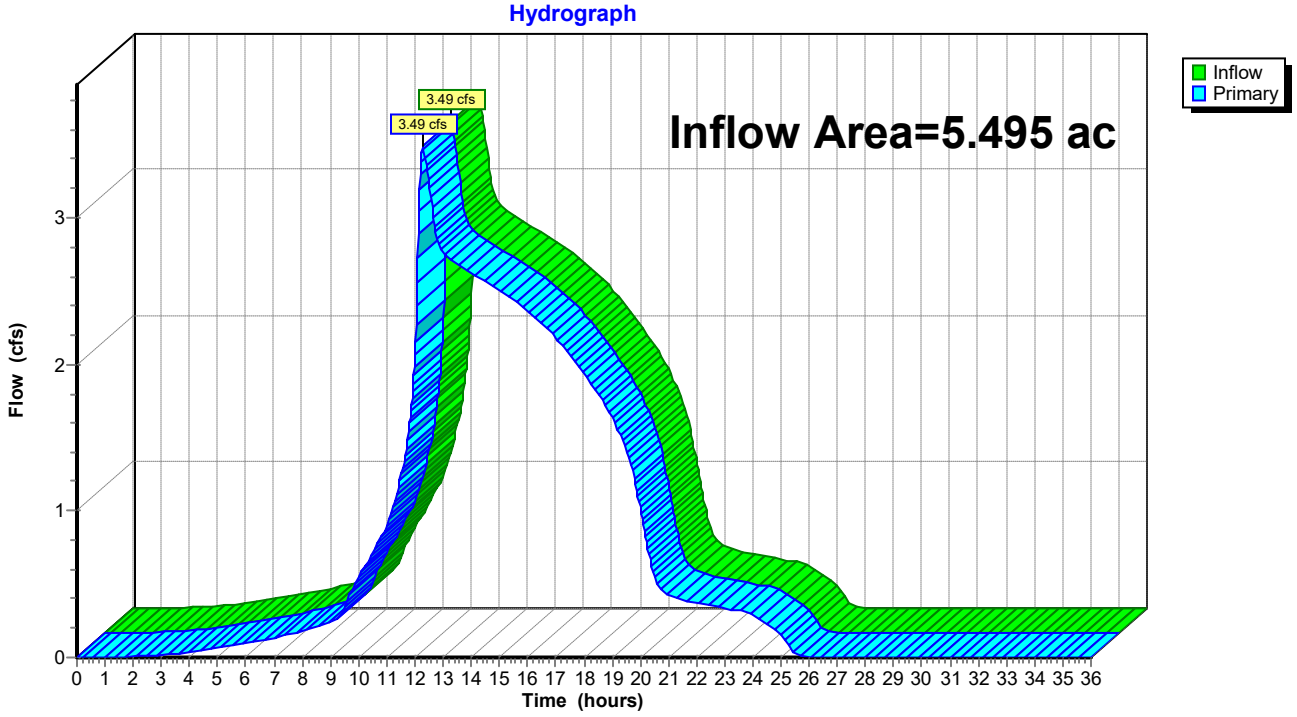
Pond SB2: Stilling Basin 2



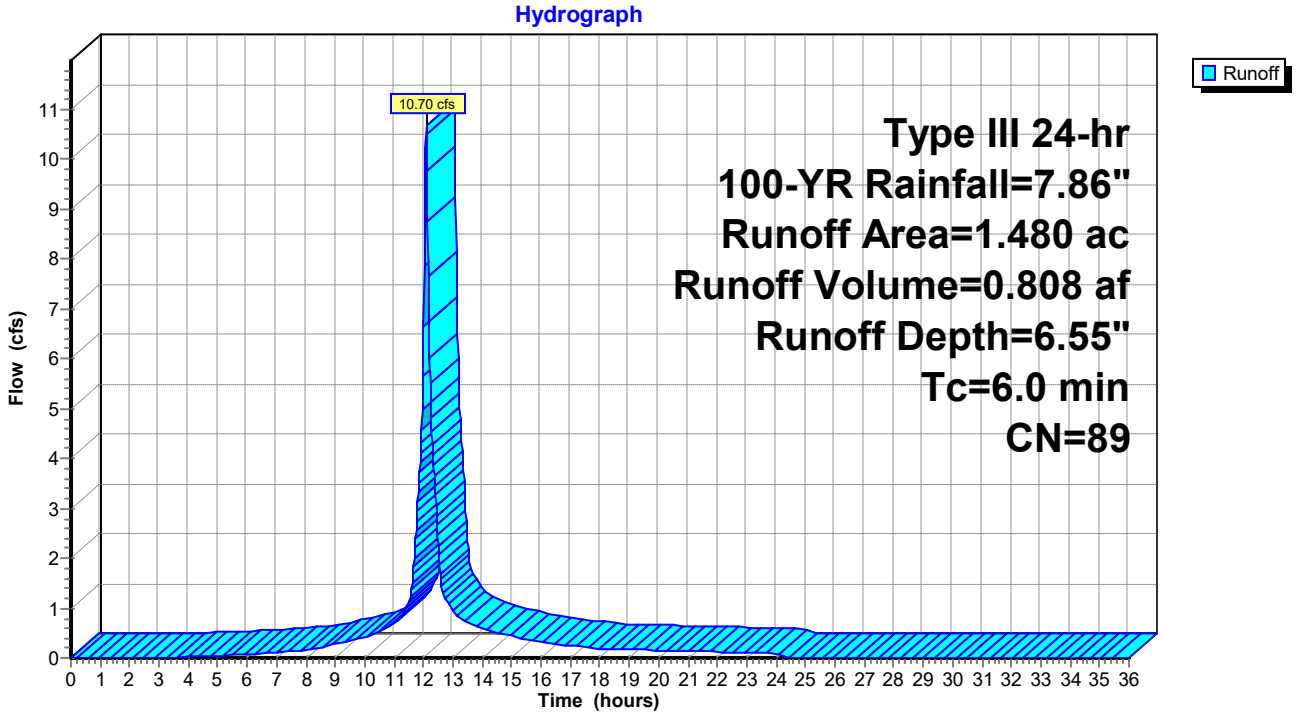
Pond SB3: Stilling Basin 3



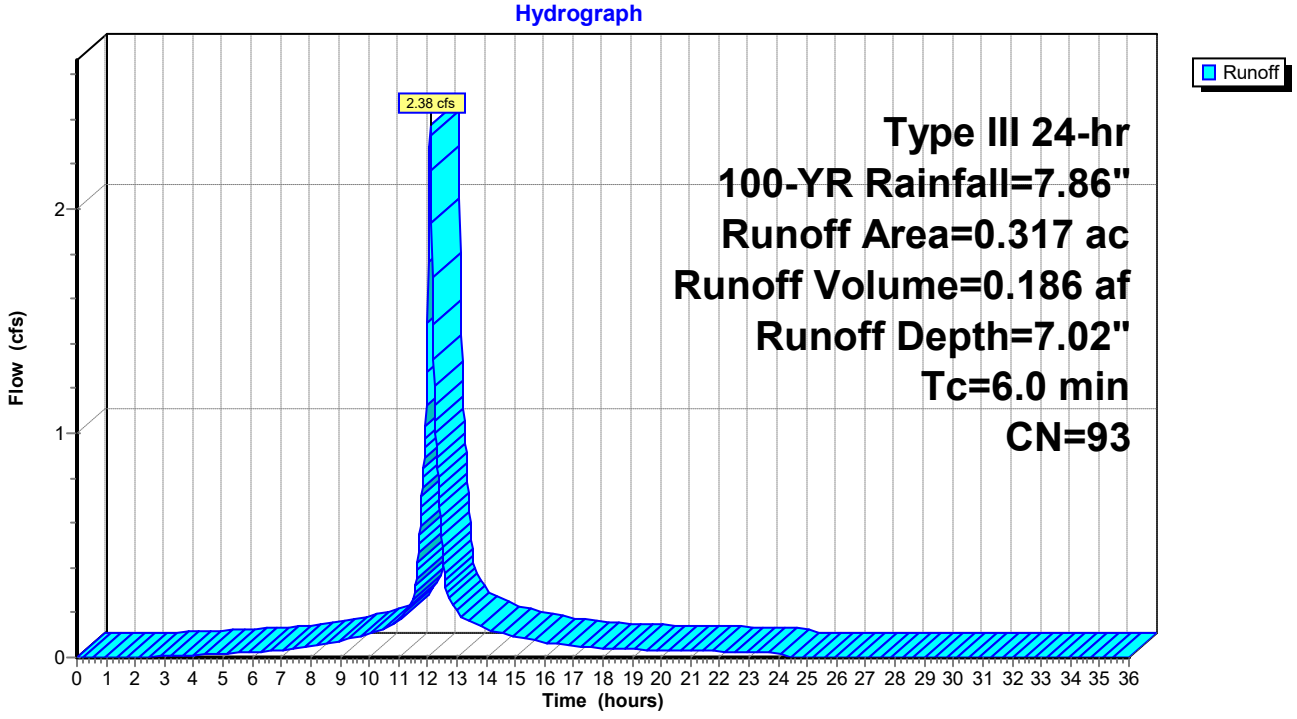
Link P-DP1: Proposed DP1



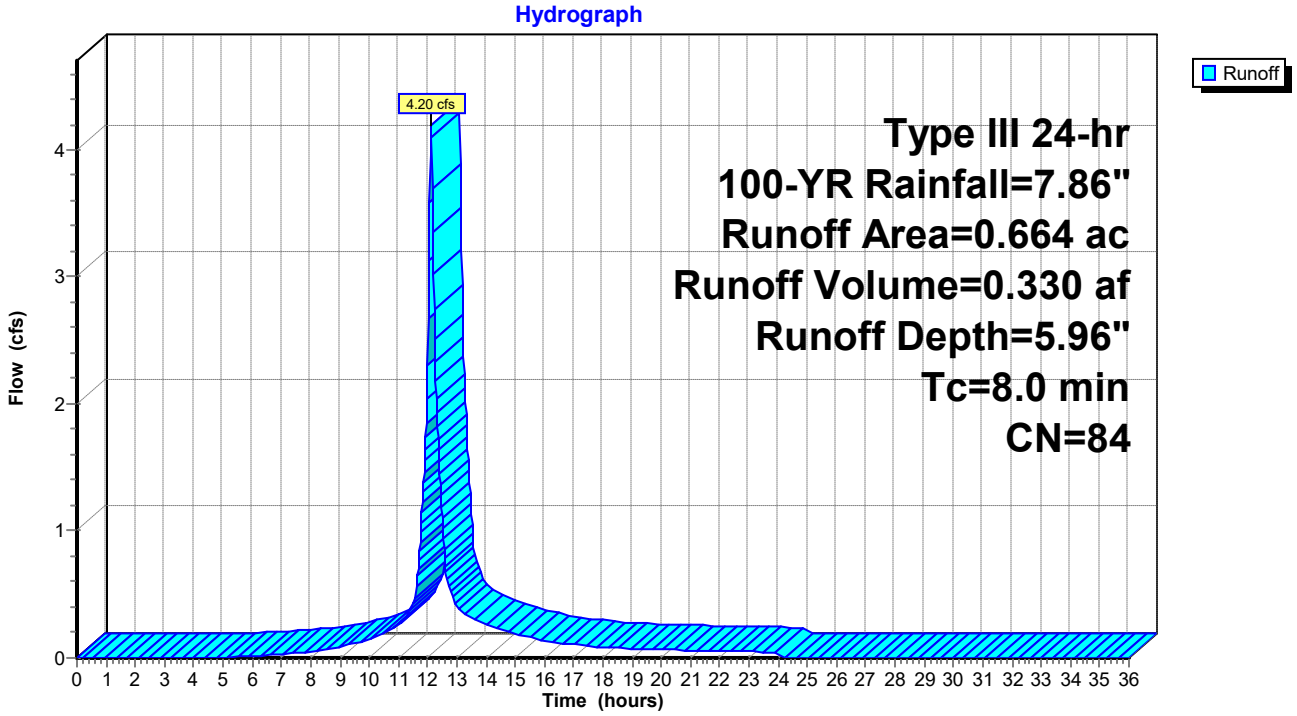
Subcatchment P2: P2



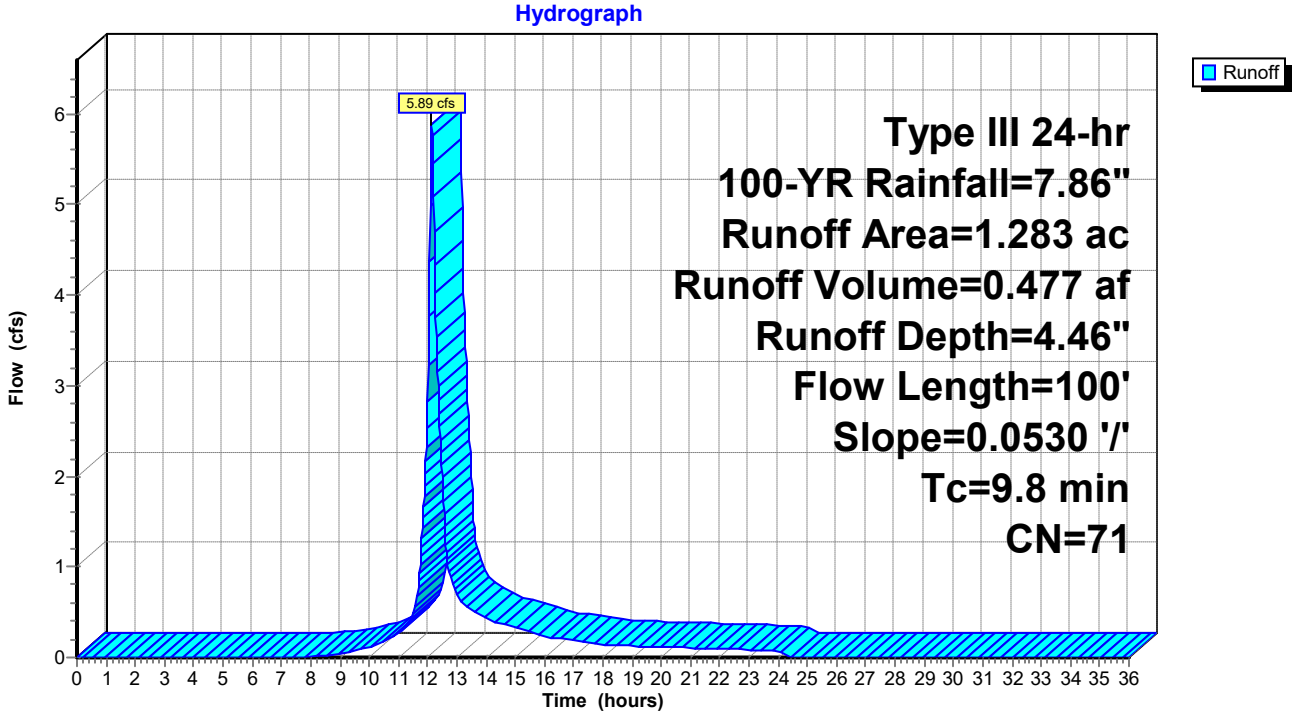
Subcatchment P3: P3



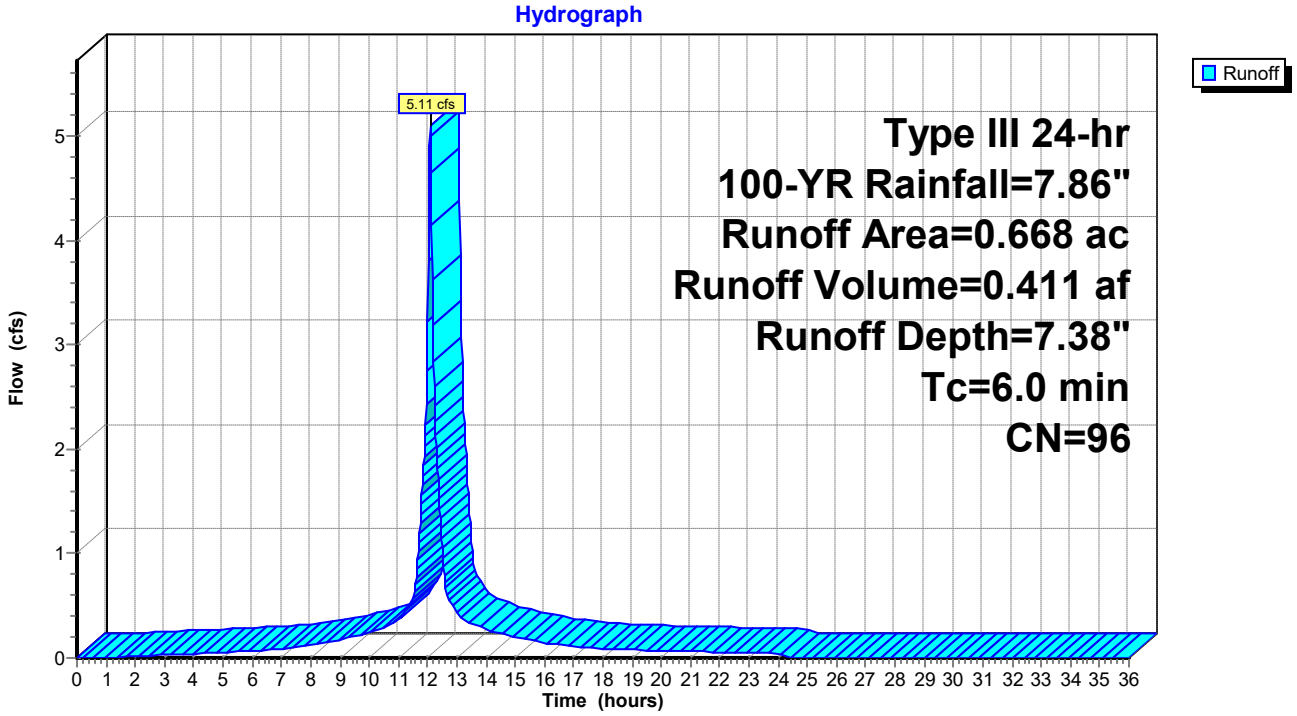
Subcatchment P4: P4



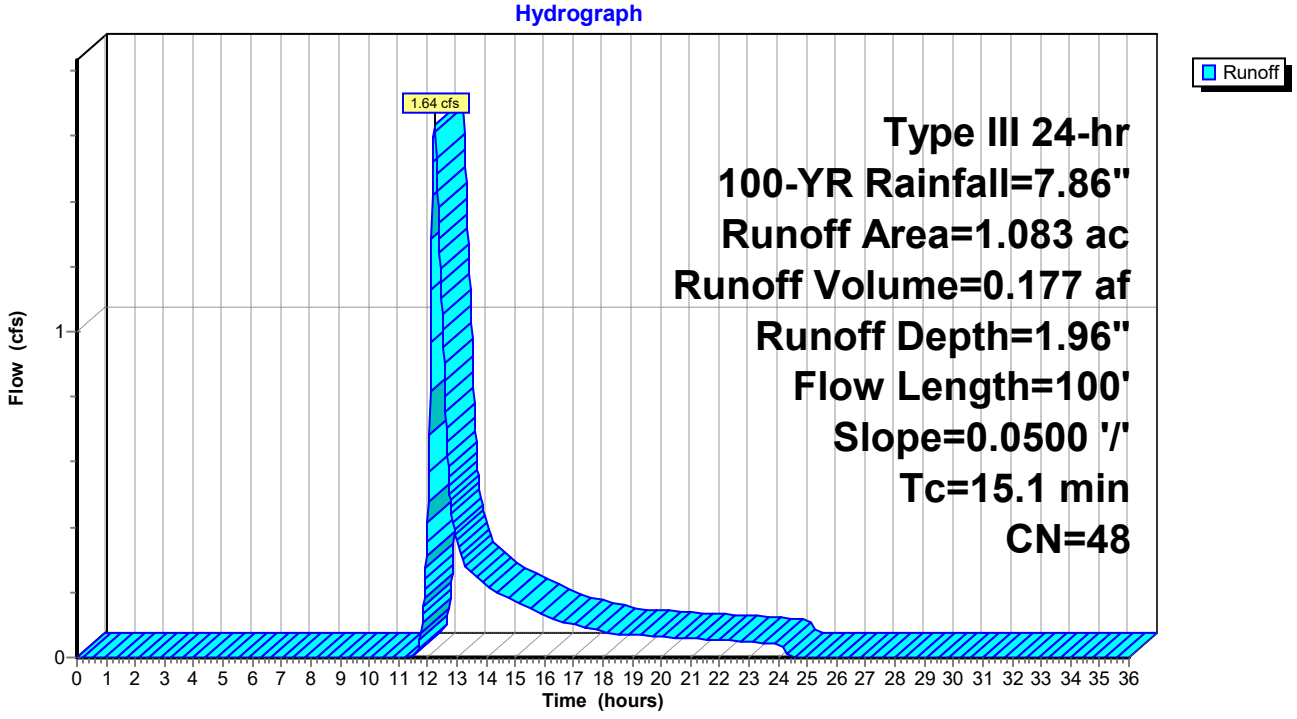
Subcatchment P5: P5



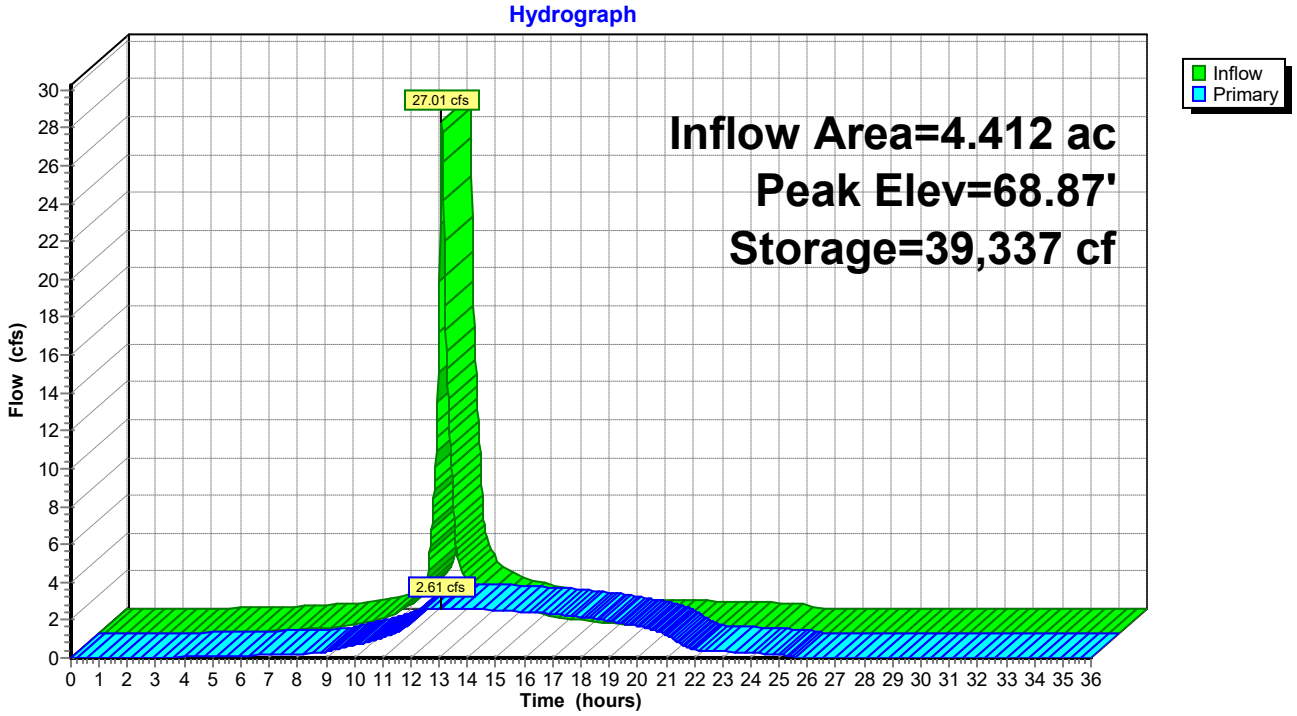
Subcatchment P6: P6



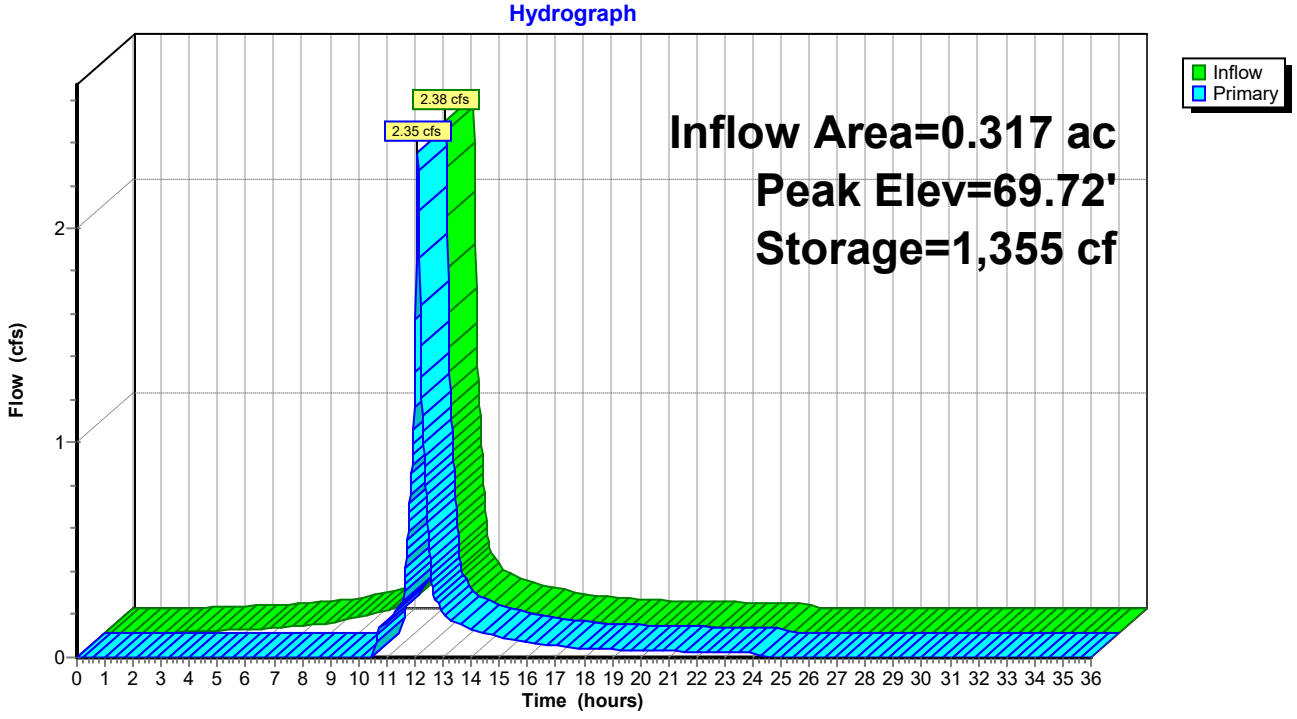
Subcatchment P7: P7



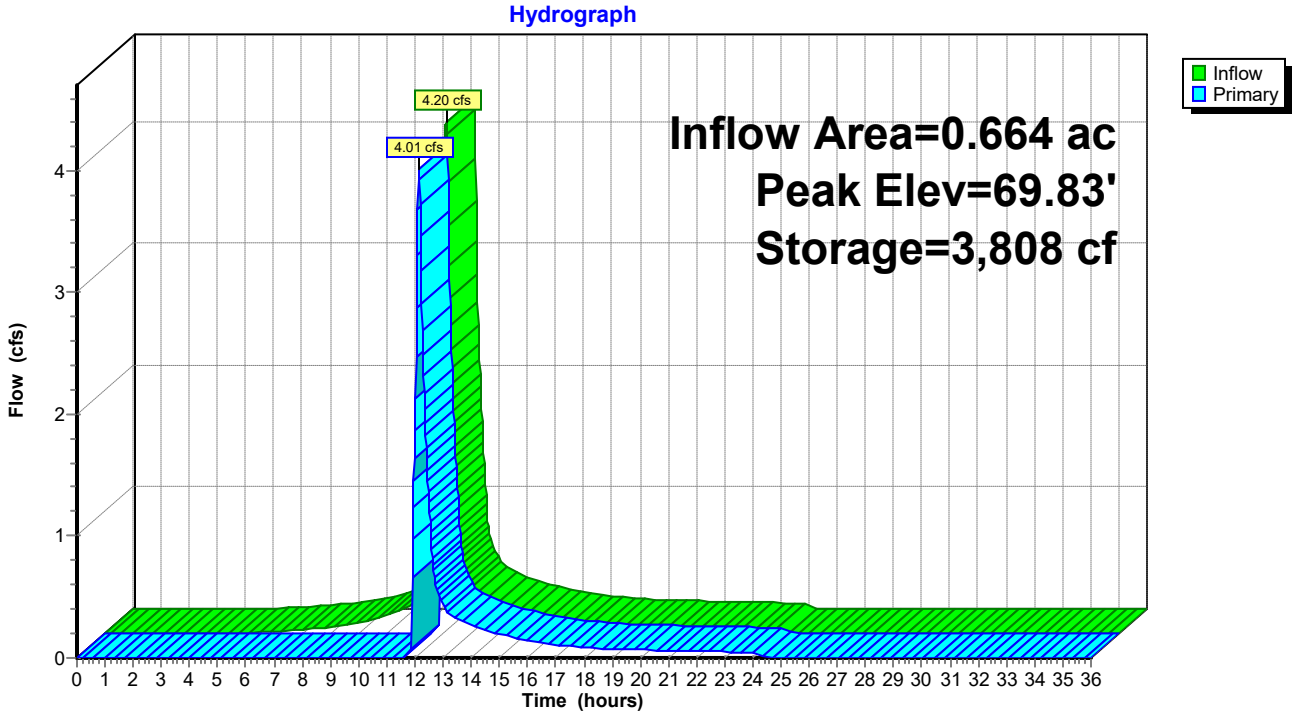
Pond EP1*: Existing Detention Basin (Prop Condition)



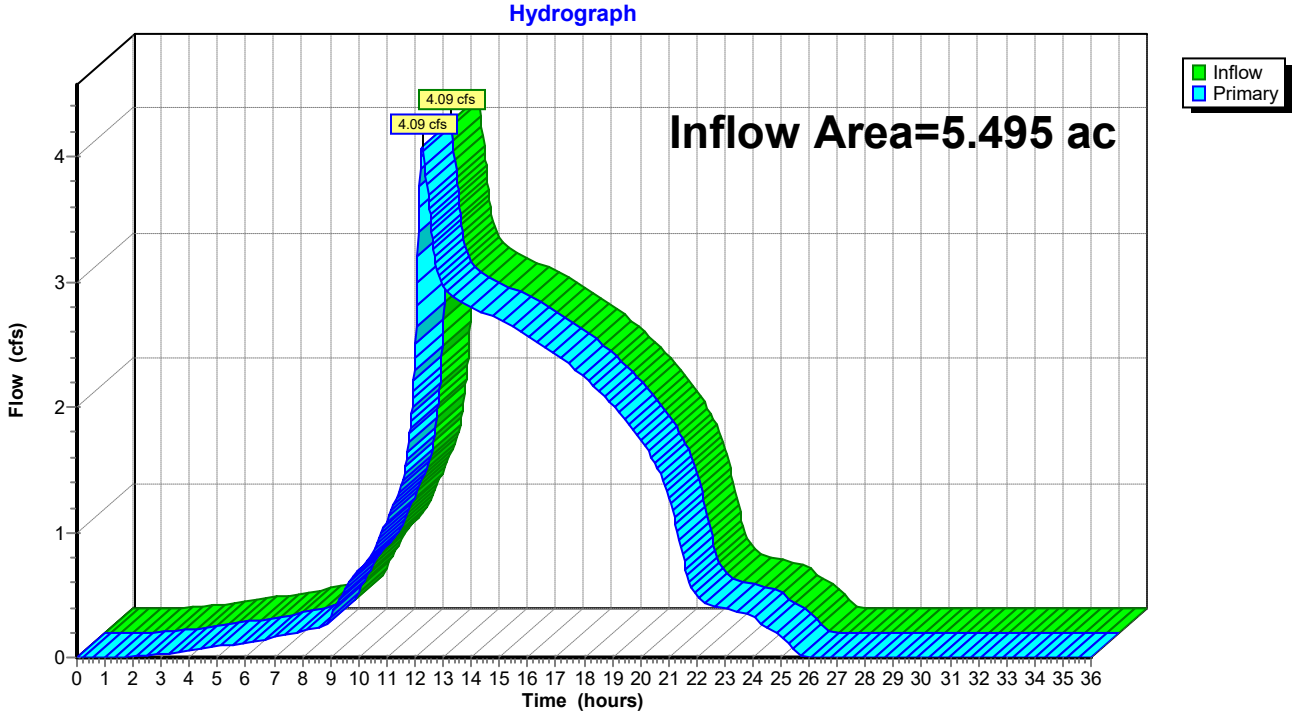
Pond SB2: Stilling Basin 2



Pond SB3: Stilling Basin 3



Link P-DP1: Proposed DP1



Summary for Pond EP1*: Existing Detention Basin (Prop Condition)

Inflow Area = 4.412 ac, 57.39% Impervious, Inflow Depth = 5.74" for 100-YR event
Inflow = 27.01 cfs @ 12.10 hrs, Volume= 2.110 af
Outflow = 2.61 cfs @ 13.03 hrs, Volume= 2.110 af, Atten= 90%, Lag= 55.9 min
Primary = 2.61 cfs @ 13.03 hrs, Volume= 2.110 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 68.87' @ 13.03 hrs Surf.Area= 18,682 sf Storage= 39,337 cf

Plug-Flow detention time= 146.2 min calculated for 2.110 af (100% of inflow)
Center-of-Mass det. time= 146.1 min (942.1 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1	62.70'	63,150 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
62.70	112	0	0
65.00	1,917	2,333	2,333
66.00	6,043	3,980	6,313
67.00	8,580	7,312	13,625
68.00	14,230	11,405	25,030
69.00	19,351	16,791	41,820
70.00	23,308	21,330	63,150

Device	Routing	Invert	Outlet Devices
#1	Primary	62.70'	**24.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 62.70' / 62.33' S= 0.0082 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	62.70'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	64.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.61 cfs @ 13.03 hrs HW=68.87' (Free Discharge)
└─**1=Culvert** (Passes 2.61 cfs of 34.39 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.58 cfs @ 11.84 fps)
  └─**3=Orifice/Grate** (Orifice Controls 2.03 cfs @ 10.35 fps)

Summary for Pond SB1: Infiltration Swale/Stilling Basin 1

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	69.00'	10,885 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
69.00	4,470	0	0
70.50	10,043	10,885	10,885

Device	Routing	Invert	Outlet Devices
#1	Primary	70.50'	**20.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

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

Summary for Pond SB2: Stilling Basin 2

Inflow Area = 0.317 ac, 84.54% Impervious, Inflow Depth = 7.02" for 100-YR event
Inflow = 2.38 cfs @ 12.08 hrs, Volume= 0.186 af
Outflow = 2.35 cfs @ 12.10 hrs, Volume= 0.158 af, Atten= 1%, Lag= 0.8 min
Primary = 2.35 cfs @ 12.10 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 69.72' @ 12.10 hrs Surf.Area= 756 sf Storage= 1,355 cf

Plug-Flow detention time= 111.5 min calculated for 0.158 af (85% of inflow)
Center-of-Mass det. time= 48.1 min (813.9 - 765.8)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	1,665 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	5	0	0
68.00	377	382	382
70.00	818	1,195	1,577
70.10	944	88	1,665

Device	Routing	Invert	Outlet Devices
#1	Primary	69.50'	**9.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=2.33 cfs @ 12.10 hrs HW=69.72' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 2.33 cfs @ 1.19 fps)

Summary for Pond SB3: Stilling Basin 3

Inflow Area = 0.664 ac, 53.16% Impervious, Inflow Depth = 5.96" for 100-YR event
Inflow = 4.20 cfs @ 12.11 hrs, Volume= 0.330 af
Outflow = 4.01 cfs @ 12.14 hrs, Volume= 0.257 af, Atten= 4%, Lag= 1.7 min
Primary = 4.01 cfs @ 12.14 hrs, Volume= 0.257 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 69.83' @ 12.14 hrs Surf.Area= 1,947 sf Storage= 3,808 cf

Plug-Flow detention time= 131.9 min calculated for 0.257 af (78% of inflow)
Center-of-Mass det. time= 52.5 min (848.0 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	4,353 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	5	0	0
68.00	1,052	1,057	1,057
70.00	2,028	3,080	4,137
70.10	2,287	216	4,353

Device	Routing	Invert	Outlet Devices
#1	Primary	69.50'	**8.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=4.00 cfs @ 12.14 hrs HW=69.83' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.00 cfs @ 1.50 fps)

Hydrograph Report

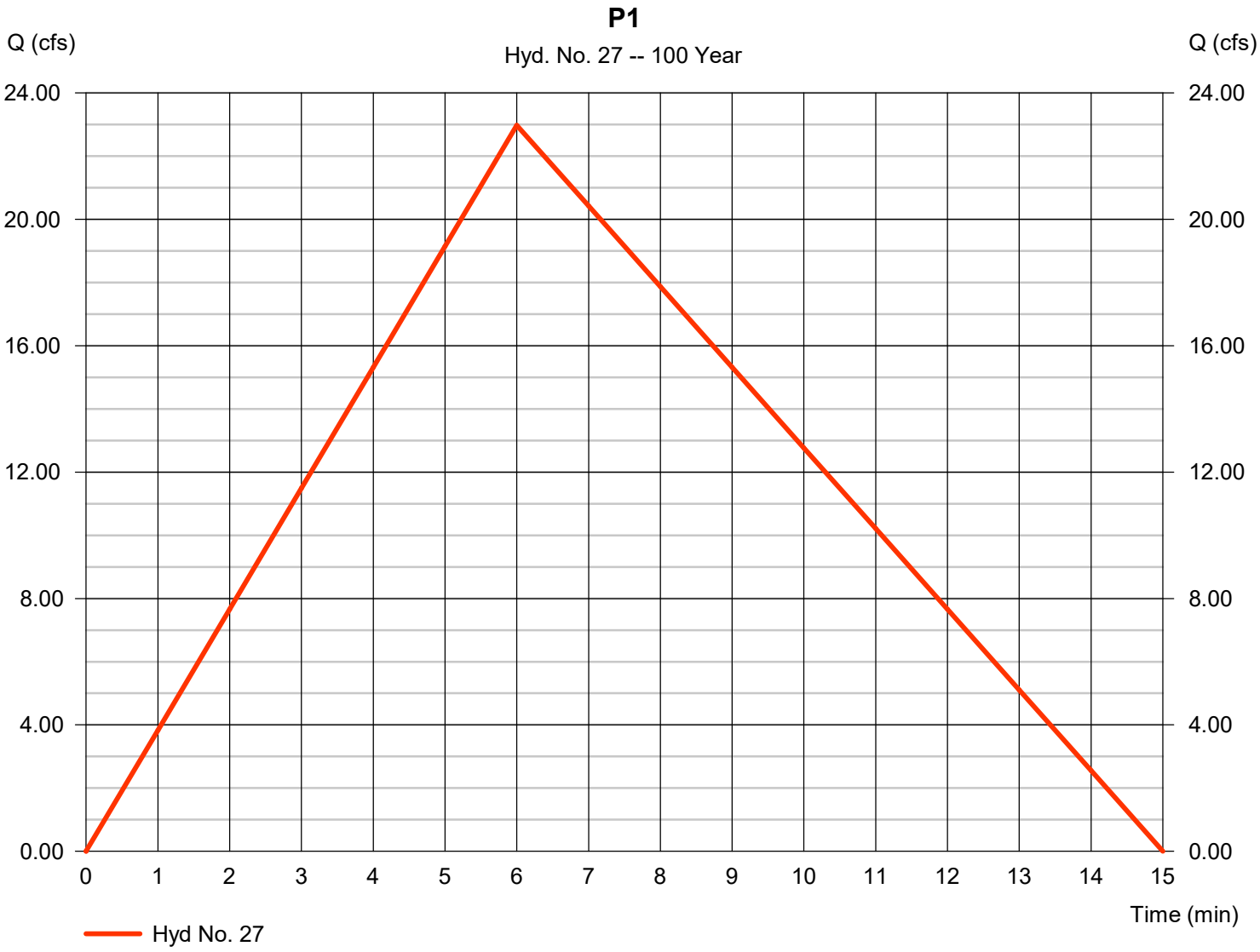
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Tuesday, 03 / 2 / 2021

Hyd. No. 27

P1

Hydrograph type	=	Rational	Peak discharge	=	22.98 cfs
Storm frequency	=	100 yrs	Time to peak	=	6 min
Time interval	=	1 min	Hyd. volume	=	10,341 cuft
Drainage area	=	2.780 ac	Runoff coeff.	=	0.78*
Intensity	=	10.598 in/hr	Tc by User	=	6.00 min
IDF Curve	=	Connecticut IDF.idf	Asc/Rec limb fact	=	1/1.5

* Composite (Area/C) = [(0.060 x 0.15) + (0.430 x 0.25) + (2.290 x 0.90)] / 2.780



APPENDIX C
NRCS Soil Map & Data

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut

March 2, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,040 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:12,000.

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: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Aug 24, 2019—Oct 24, 2019

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
13	Walpole sandy loam, 0 to 3 percent slopes	3.7	9.7%
23A	Sudbury sandy loam, 0 to 5 percent slopes	1.5	3.9%
36A	Windsor loamy sand, 0 to 3 percent slopes	0.2	0.5%
36B	Windsor loamy sand, 3 to 8 percent slopes	3.5	9.1%
36C	Windsor loamy sand, 8 to 15 percent slopes	1.8	4.8%
304	Udorthents, loamy, very steep	0.2	0.6%
306	Udorthents-Urban land complex	27.1	70.6%
307	Urban land	0.3	0.8%
Totals for Area of Interest		**38.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor

components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Connecticut

13—Walpole sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkl
Elevation: 0 to 1,020 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Walpole and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walpole

Setting

Landform: Outwash terraces, outwash plains, depressions, deltas, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Typical profile

Oe - 0 to 1 inches: mucky peat
A - 1 to 7 inches: sandy loam
Bg - 7 to 21 inches: sandy loam
BC - 21 to 25 inches: gravelly sandy loam
C - 25 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Sudbury

Percent of map unit: 10 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Scarboro

Percent of map unit: 10 percent
Landform: Outwash terraces, deltas, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

23A—Sudbury sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 9lkv
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sudbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Terraces, outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: sandy loam
Bw1 - 5 to 17 inches: gravelly sandy loam
Bw2 - 17 to 25 inches: sandy loam
2C - 25 to 60 inches: stratified gravel to sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Agawam

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ninigret

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Tisbury

Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Walpole

Percent of map unit: 2 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

36A—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg
Elevation: 0 to 990 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash terraces, outwash plains, dunes, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

36B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash terraces, deltas, outwash plains, dunes
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Eskers, kames, deltas, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

36C—Windsor loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svkq
Elevation: 0 to 1,260 feet
Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: — error in exists on —
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Ap - 1 to 11 inches: loamy sand
Bw - 11 to 31 inches: loamy sand
C - 31 to 65 inches: sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Deltas, outwash plains, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Hydric soil rating: No

Deerfield

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

304—Udorthents, loamy, very steep

Map Unit Setting

National map unit symbol: 9lmd
Elevation: 0 to 1,200 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Escarpments
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Glaciolacustrine deposits

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 25 to 70 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Shaker

Percent of map unit: 3 percent
Landform: Terraces, depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scitico

Percent of map unit: 3 percent
Landform: Drainageways, terraces, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Maybid

Percent of map unit: 2 percent
Landform: Drainageways, terraces, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Raynham

Percent of map unit: 1 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, frequently flooded

Percent of map unit: 1 percent
Landform: Drainageways
Hydric soil rating: Yes

306—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Typical profile

H - 0 to 6 inches: material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 8 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear

Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: No

307—Urban land

Map Unit Setting

National map unit symbol: 9lmh
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Typical profile

H - 0 to 6 inches: material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 10 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 10 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.


72° 36' 15" W
72° 35' 46" W
41° 50' 21" N
41° 50' 7" N
698950
699020
699090
699160
699230
699300
699370
699440
699510
699580
4634710
4634640
4634570
4634500
4634430
4634360
4634290
304
5
36C
36B
307
306
13
23A
36A
John Fitch Blvd
Nutmeg Rd N
Soil Map may not be valid at this scale.
Map Scale: 1:3,040 if printed on A landscape (11" x 8.5") sheet.
Meters
0 45 90 180 270
Feet
0 100 200 400 600
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:12,000.

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: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Aug 24, 2019—Oct 24, 2019

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
13	Walpole sandy loam, 0 to 3 percent slopes	B/D	3.7	9.7%
23A	Sudbury sandy loam, 0 to 5 percent slopes	B	1.5	3.9%
36A	Windsor loamy sand, 0 to 3 percent slopes	A	0.2	0.5%
36B	Windsor loamy sand, 3 to 8 percent slopes	A	3.5	9.1%
36C	Windsor loamy sand, 8 to 15 percent slopes	A	1.8	4.8%
304	Udorthents, loamy, very steep	B	0.2	0.6%
306	Udorthents-Urban land complex	B	27.1	70.6%
307	Urban land	D	0.3	0.8%
Totals for Area of Interest			**38.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX D
Storm Sewer Analysis Results

Subbasin Summary

Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
Sub-CB-1 TYPE C-L	0.22	0.8300	0.68	0.56	0.12	1.22	0 00:06:00
Sub-CB-2	0.21	0.8000	0.68	0.54	0.12	1.16	0 00:06:00
Sub-CB-3	0.23	0.8500	0.68	0.57	0.13	1.35	0 00:06:00

Link Summary

From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow Velocity	Peak Flow Depth	Total Time Surcharged
		(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)	(ft/sec)	(ft)	(min)
WQU-2	FE-3	16.00	65.08	65.00	0.5100	15.000	0.0120	3.52	4.99	4.41	0.77	0.00
CB-1 TYPE C-L	CB-2	155.00	70.70	69.10	1.0300	12.000	0.0120	1.19	3.92	6.98	0.38	0.00
CB-2	CB-3	178.00	69.00	66.00	1.6900	12.000	0.0120	2.27	5.01	6.31	0.47	0.00
CB-3	WQU-2	23.00	65.90	65.08	3.5700	12.000	0.0120	3.52	7.28	9.19	0.49	0.00

Junction Input

Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)
CB-1 TYPE C-L	70.70	73.10
CB-2	69.00	71.50
CB-3	65.90	69.00
WQU-2	65.08	69.50

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Min Freeboard Attained	Time of Max HGL Occurrence
	(cfs)	(cfs)	(ft)	(ft)	(days hh:mm)
CB-1 TYPE C-L	1.22	1.22	71.08	2.02	0 00:06
CB-2	2.30	1.16	69.48	2.02	0 00:06
CB-3	3.52	1.35	66.47	2.53	0 00:06
WQU-2	3.52	0.00	65.86	3.64	0 00:06

APPENDIX E
Water Quality Calculations

Distinctive Tree Care - DPI No.3136.D
March 2, 2021

Water Quality Volume Calculations
Per 2004 Connecticut Stormwater Quality Manual, Section 7.4.1:

Areas for Calculation: Infiltration Swale / Stilling Basin #1 (P1),

	Area (acres)
	P1
Impervious	2.290
Pervious	0.49
Total Area	2.780
%Impervious	82.4%

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = unitless volumetric runoff coefficient = 0.05 + 0.009(I), where:
I = percent impervious cover of drainage area = 82.4%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(82.4)
R = 0.792

A = drainage area in acres = 2.78 acres

WQV = (1")(R)(A acres)/12 inches per foot
WQV = (1")(0.792)(2.78 acres)/12 inches per foot
WQV = 0.183 acre-feet required = 7,992.38 cft

Proposed BMP
The Stilling Basin #1 proposed to provide **10,885 cft** (below spillway at Elev. 70.5) of water quality storage, more than 100% of the calculated water quality volume.

Water Quality Volume Calculations
Per 2004 Connecticut Stormwater Quality Manual, Section 7.4.1:

Areas for Calculation: Stilling Basin #2 (P3),

	Area (acres)
	P3
Impervious	0.268
Pervious	0.049
Total Area	0.317
%Impervious	84.54%

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = unitless volumetric runoff coefficient = 0.05 + 0.009(I), where:
I = percent impervious cover of drainage area = 84.54%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(84.54)
R = 0.811

A = drainage area in acres = 0.317 acres

WQV = (1")(R)(A acres)/12 inches per foot
WQV = (1")(0.811)(0.317 acres)/12 inches per foot
WQV = 0.021 acre-feet required = 933.23 cft

Proposed BMP
The Stilling Basin #2 proposed to provide **1,196 cft** (below spillway at Elev. 69.5) of water quality storage, more than 100% of the calculated water quality volume.

Water Quality Volume Calculations

Per 2004 Connecticut Stormwater Quality Manual, Section 7.4.1:

Areas for Calculation: Stilling Basin #3 (P4),

	Area (acres)
	P4
Impervious	0.353
Pervious	0.311
Total Area	0.664
%Impervious	53.16%

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = unitless volumetric runoff coefficient = 0.05 + 0.009(I), where:
I = percent impervious cover of drainage area = 53.16%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(53.16)
R = 0.528

A = drainage area in acres = 0.664 acres

WQV = (1")(R)(A acres)/12 inches per foot
WQV = (1")(0.528)(0.664 acres)/12 inches per foot
WQV = 0.029 acre-feet required = 1,263.24 cft

Proposed BMP

The Stilling Basin #3 proposed to provide **3,184 cft** (below spillway at Elev. 69.5) of water quality storage, more than 100% of the calculated water quality volume.

Distinctive Tree Care - DPI No.3136.D
March 2, 2021

Water Quality Flow Calculations
Per 2004 Connecticut Stormwater Quality Manual
Per Appendix B page B-3:
Water Quality Flow (WQF) = (qu)(A)(Q), where:
qu = unit peak discharge (cfs/mi^2/inch) per Exhibit 4-III
A = drainage area (mi^2)
Q = runoff depth (in watershed inches)
= [Water Quality Volume (WQV) (in acre-feet)] x [12 inches/foot] / drainage area (acres)

Water Quality Unit 1 - P2 (Existing CB 1 - 5)
To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:
Time of Concentration (Tc):
6 mins = 0.10 hours
Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:
Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)
CN = 89
Ia = 0.247 inches
Design Precipitation (P) = 1" for water quality storms per Appendix B
Ia/P = 0.247
Unit Peak Discharge qu = 625 cfs/mi^2/inch

Drainage Area A = 64,468.8 sf = 1.48 acres = 0.0023 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:
R = volumetric runoff coefficient
= 0.05 + 0.009(I), where I = percent impervious cover = 77.03%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(77.03)
R = 0.743

A = drainage area in acres = 1.48 acres

WQV = (1")(R)(A)/12
WQV = (1")(0.743)(1.48 acres) / 12 in/ft
WQV = 0.092 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area
Q = (0.092 acre-feet x 12 in/ft) / 1.48 acres
Q = 0.746 in

WQF = qu x A x Q
WQF = 625 cfs/mi^2/inch x 0.0023 mi^2 x 0.746 in
WQF = **1.07 cfs required**

Proposed
As shown on the enclosed water quality unit sizing report, the proposed **BaySaver Barracuda S4** is rated for 80% TSS removal for the required **1.07 cfs** water quality flow and Bypass the expected during 6.27cfs for during the 10 yr storm. See Barracuda sizing chart included in Appendix.

Water Quality Unit 2 – P6 (CB 1 - 3)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

6 mins = 0.10 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 96

Ia = 0.083 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.083

Unit Peak Discharge qu = 700 cfs/mi^2/inch

Drainage Area A = 29,185.2 sf = 0.668 acres = 0.001 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 91.62%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(91.62)

R = 0.875

A = drainage area in acres = 0.668 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.875)(0.668 acres) / 12 in/ft

WQV = 0.049 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.049 acre-feet x 12 in/ft) / 0.668 acres

Q = 0.880 in

WQF = qu x A x Q

WQF = 700 cfs/mi^2/inch x 0.001 mi^2 x 0.880 in

WQF = **0.61 cfs required**

Proposed

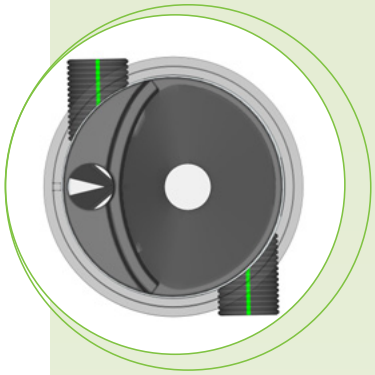
As shown on the enclosed water quality unit sizing report, the proposed **BaySaver Barracuda S4** is rated for 80% TSS removal for the required **0.61 cfs** water quality flow and Bypass the expected during 6.27cfs for during the 10 yr storm. See Barracuda sizing chart included in Appendix.

BAYSAVER TECHNOLOGIES®

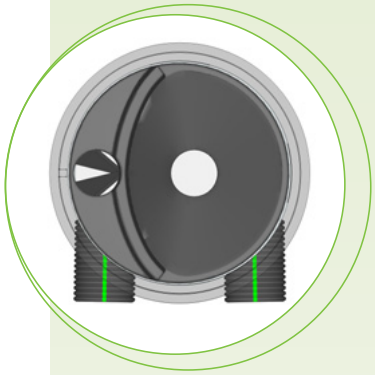
ADS®

Barracuda S4

The Barracuda S4 is a market-changing stormwater quality technology. This high performance vortex hydrodynamic separator is designed to remove total suspended solids in order to protect our precious receiving waters. The Barracuda is also an outstanding value that offers multiple pipe configurations, and quick installation.



Inline Configuration



Offline Configuration

FEATURES:

- Single manhole design
- No elevation loss between the inlet and outlet
- Flexible inlet/outlet positions (not just 180 degree orientation)
- Internal bypass for inline installation (where applicable)
- Revolutionary, patent pending “teeth” mitigate turbulence in the sump area to prevent resuspension of captured contaminants.

BENEFITS:

- Internal components are in stock for quick delivery.
- The S4 can be provided within a 48” ADS HP Manhole, to be factory fabricated and delivered complete to the jobsite.
- The S4 can also be installed in a standard 48” precast manhole. The Barracuda “teeth” apparatus is fabricated and designed for quick and easy field assembly.
- Designed for easy maintenance using a vacuum truck or similar equipment.
- Inspection and maintenance are performed from the surface with no confined space entry.

ADS Service: ADS representatives are committed to providing you with the answers to all your questions, including specifications, installation and more.

BARRACUDA S4 SPECIFICATION

MATERIALS AND DESIGN

- Concrete Structures: Designed for H-20 traffic loading and applicable soil loads or as otherwise determined by a Licensed Professional Engineer. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.
- 48" HP Manhole Structures: Made from an impact modified copolymer polypropylene meeting the material requirements of ASTM F2764. The eccentric cone reducer shall be manufactured from polyethylene material meeting ASTM D3350 cell class 213320C. Gaskets shall be made of material meeting the requirements of ASTM F477.
- Separator internals shall be substantially constructed of stainless steel, polyethylene or other thermoplastic material approved by the manufacturer.

PERFORMANCE

- The stormwater treatment unit shall be an inline unit capable of conveying 100% of the design peak flow. If peak flow rates exceed maximum hydraulic rate, the unit shall be installed offline.

- The Barracuda unit shall be designed to remove at least 80% of the suspended solids on an annual aggregate removal basis. Said removal shall be based on full-scale third party testing using OK-110 media gradation or equivalent and 300 mg/L influent concentration. Said full scale testing shall have included sediment capture based on actual total mass collected by the stormwater treatment unit.

  - OR -

  The Barracuda unit shall be designed to remove at least 50% of TSS using a media mix with d_{50}=75 micron and 200 mg/L influent concentration.

  - OR -

  The Barracuda unit shall be designed to remove at least 50% of TSS per current NJDEP/NJCAT HDS protocol .

- The stormwater treatment unit internals shall consist of (1) separator cone assembly, and (1) sump assembly which includes (4) legs with "teeth".

	Manhole Diameter	80% Removal OK-110	50% TSS per NJCAT	Max Hydraulic Rate
Barracuda S4	48"	1.08 CFS	1.25 CFS	6.25 CFS

INSTALLATION

Installation of the stormwater treatment unit(s) shall be performed per manufacturer's installation instructions. Such instructions can be obtained by calling Advanced Drainage Systems at (800) 821-6710 or by logging on to www.ads-pipe.com or www.baysaver.com.

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

BOGGS ENVIRONMENTAL CONSULTANTS

Middletown, MD & Morgantown, WV

Administrative Office:
200 W Main Street
Middletown, Maryland 21769

Office (301) 694-5687
Fax (301) 694-9799

BaySaver Technologies, LLC
1030 Deer Hollow Drive
Mount Airy, MD 21771
(301) 679-0640; dfigola@ads-pipe.com

November 1, 2017

ATTENTION: Daniel Figola, General Manager
REFERENCE: Third Party Review of Testing Procedures for Barracuda™ Separator at the Mid Atlantic Storm Water Research Center, 1207 Park Ridge Drive, Mount Airy, MD 21771

SUMMARY

Boggs Environmental Consultants, Inc. (BEC) was hired by Advanced Drainage Systems (ADS) in August of 2017, to serve as independent third-party oversight of the BaySaver Barracuda S4 Separator test unit for removal of sediment with equivalent particle size distribution to the industry standard OK-110. The BaySaver Barracuda S4 is a storm water treatment device with a Maximum Treatment Flow Rate (MTFR) of approximately 1.08 cubic feet per second (cfs) that removes suspended solids from storm water runoff, with an average removal efficiency of 80% at the MTFR and a feed concentration of 300 mg/L. The device is an insert that can be installed in either Polypropylene plastic pipe or concrete vault, and consists of a cone (vortex separator) and baffles ("teeth").

SCALED RESULTS

Testing flow rates ranged from 0.31 to 1.61 cfs, with a feed OK-110 concentration of 300 mg/L. Based upon New Jersey scaling methodology, the table below represents treatment and device information for the S4, S6, and S8 units.

Table 1: MTFR's and Sizing for BaySaver Barracuda Models

Model[1]	Man-hole Diam-eter[1] (ft)	OK110 80% TSS Maximum Treatment Flow Rate (cfs)	Treat-ment Area (ft^2)	Hydraulic Loading rate (gpm/ft^2)	Chamber Depth (ft)	Wet Volume (ft^3)	50% Maximum Sediment Storage[2] (ft^3)
Barracuda S4	4	1.08	12.57	38.6	6.83	75.4	10.47
Barracuda S6	6	2.43	28.27	38.6	6.83	169.7	23.56
Barracuda S8	8	4.32	50.27	38.6	11.03	512.7	41.89

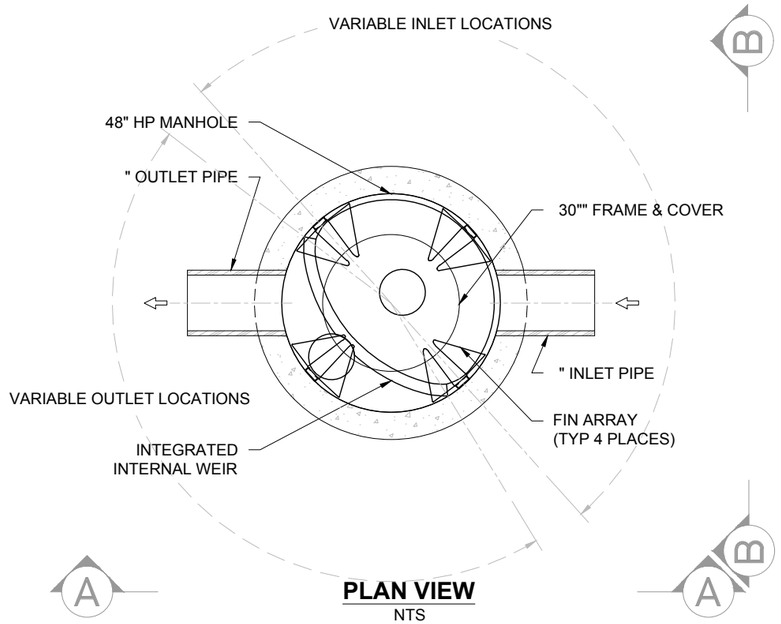
Notes:
1. In some areas, Barracuda units are available in additional diameters. Units not listed here are sized not to exceed 38.6 gpm/ft^2 of effective treatment during the peak water quality flow.
2. 50% Sediment Storage Capacity is equal to manhole diameter x 10 inches of sediment depth. Each Barracuda unit has a 20 inches deep sediment sump.

Should you have any questions, contact our office at your earliest convenience.

Sincerely,
BOGGS ENVIRONMENTAL CONSULTANTS, INC.

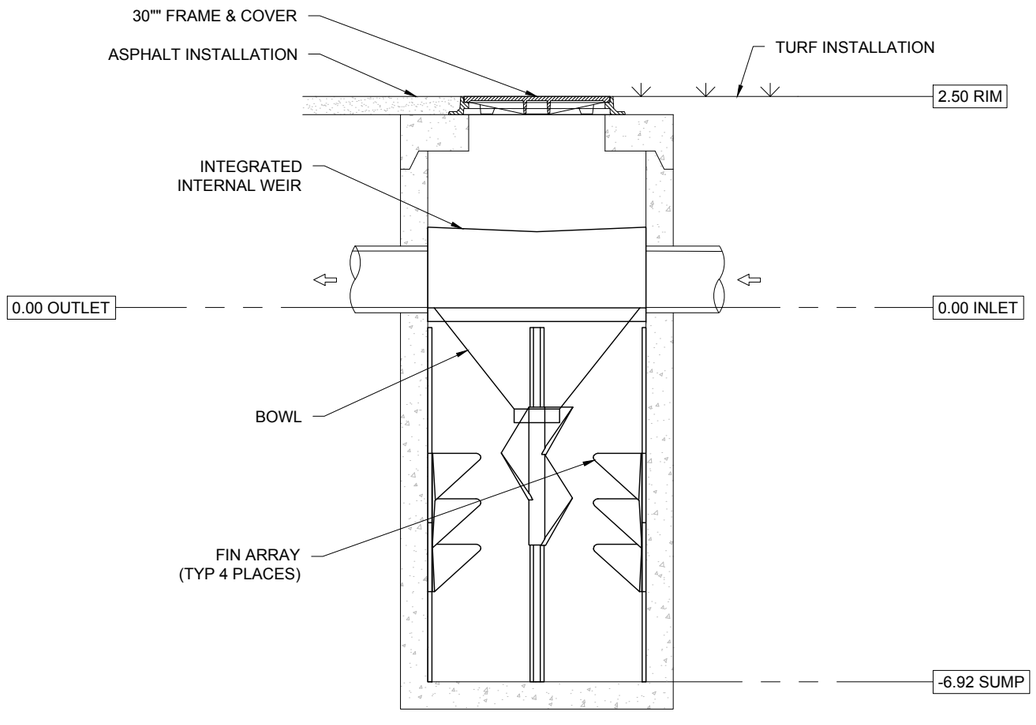
William R. Warfel
Principal Environmental Scientist

Robin J. Maliszewskyj
Chemical Engineer

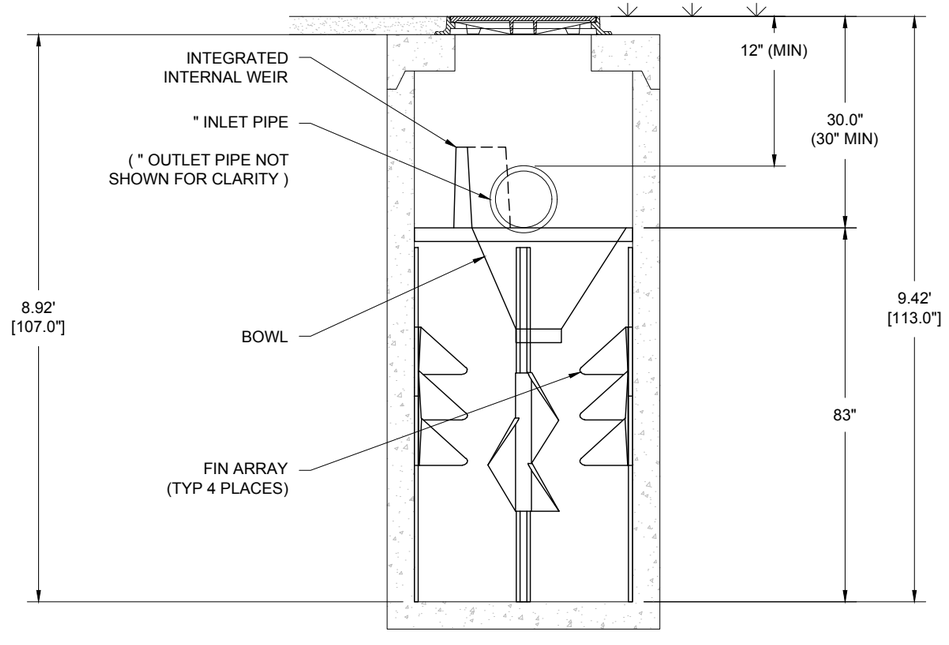


PLAN VIEW
NTS

BARRACUDA S4	
UNIT ID	BMP#1
PEAK FLOW RATE (CFS)	
TREATMENT FLOW RATE (CFS)	1.25 CFS



SECTION VIEW A-A
NTS



SECTION VIEW B-B
NTS

BARRACUDA S4
STANDARD DETAIL

DATE: 10/20/17
DRAWN: EKH
PROJECT #:
CHECKED: ----

REV	DWN	CKD	DESCRIPTION

1030 Deer Hollow Drive
Mount Airy, MD 21771
1-800-BAYSAVER
1-800-229-7283
barracuda

4640 TRUEMAN BLVD
HILLIARD, OH 43026
ADS
ADVANCED DRAINAGE SYSTEMS, INC.

NOT TO SCALE

Maintenance Guide

BaySaver Barracuda™

July 2017

One of the advantages of the BaySaver Barracuda is the ease of maintenance. Like any system that collects pollutants, the BaySaver Barracuda must be maintained for continued effectiveness. Maintenance is a simple procedure performed using a vacuum truck or similar equipment. The systems were designed to minimize the volume of water removed during routine maintenance, reducing disposal costs.

Contractors can access the pollutants stored in the manhole through the manhole cover. This allows them to gain vacuum hose access to the bottom of the manhole to remove sediment and trash. There is no confined space entry necessary for inspection or maintenance.

The entire maintenance procedure typically takes from 2 to 4 hours, depending on the size of the system, the captured material, and the capacity of the vacuum truck.

Local regulations may apply to the maintenance procedure. Safe and legal disposal of pollutants is the responsibility of the maintenance contractor. Maintenance should be performed only by a qualified contractor.

Inspection and Cleaning Cycle

Periodic inspection is needed to determine the need for and frequency of maintenance. You should begin inspecting as soon as construction is complete and thereafter on an annual basis. Typically, the system needs to be cleaned every 1-3 years.

Excessive oils, fuels or sediments may reduce the maintenance cycle. Periodic inspection is important.

Determining When to Clean

To determine the sediment depth, the maintenance contractor should lower a stadia rod into the manhole until it contacts the top of the captured sediment and mark that spot on the rod. Then push the probe through to the bottom of the sump and mark that spot to determine sediment depth.

Maintenance should occur when the sediment has reached the levels indicated in the Storage Capacity Chart.

BaySaver Barracuda Storage Capacities

Model	Manhole Diameter	Treatment Chamber Capacity	Standard Sediment Capacity (20" depth)	NJDEP Sediment Capacity (50% of standard depth)
S3	36"	212 gallons	0.44 cubic yards	0.22 cubic yards
S4	48"	564 gallons	0.78 cubic yards	0.39 cubic yards
S5	60"	881 gallons	1.21 cubic yards	0.61 cubic yards
S6	72"	1269 gallons	1.75 cubic yards	0.88 cubic yards
S8	96"	3835 gallons	3.10 cubic yards	1.55 cubic yards
S10	120"	7496 gallons	4.85 cubic yards	2.43 cubic yards

Maintenance Instructions

1. Remove the manhole cover to provide access to the pollutant storage. Pollutants are stored in the sump, below the bowl assembly visible from the surface. You'll access this area through the 10" diameter access cylinder.

2. Use a vacuum truck or other similar equipment to remove all water, debris, oils and sediment. See figure 1.
3. Use a high pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the water.
4. Fill the cleaned manhole with water until the level reaches the invert of the outlet pipe.
5. Replace the manhole cover.
6. Dispose of the polluted water, oils, sediment and trash at an approved facility.
   - Local regulations prohibit the discharge of solid material into the sanitary system. Check with the local sewer authority for authority to discharge the liquid.
   - Some localities treat the pollutants as leachate. Check with local regulators about disposal requirements.
   - Additional local regulations may apply to the maintenance procedure.

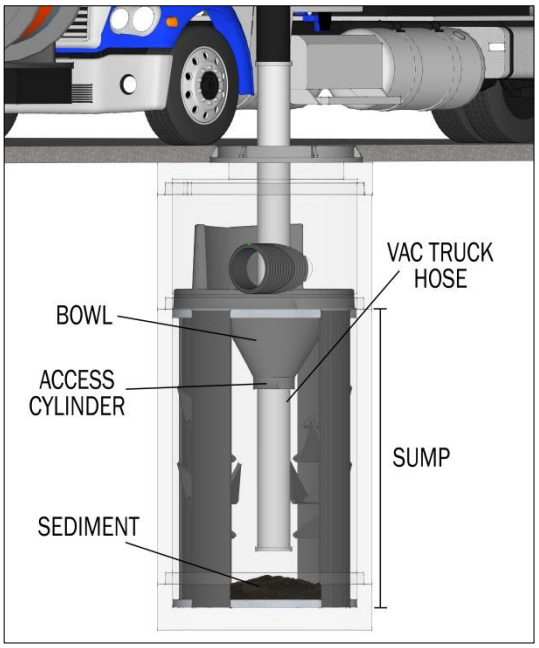


Figure 1

TECHNICAL NOTE

Barracuda® Maximum Hydraulic Rates and Required Rim to Outlet Invert Difference

TN 1.09
January 2020

Introduction

The Barracuda is a single manhole hydrodynamic separator designed to remove total suspended solids and other contaminants from stormwater. The device employs a cone structure with a vertical weir wall separating the inlet(s) and outlet pipes. This weir wall allows the unit to bypass excessive stormwater flows internally once the inletting rates exceed the designed treatment rate. This document describes the maximum hydraulic rate (MHR), or bypass capacity of the device based on unit size and rim to invert elevation difference. MHR should not be confused with Maximum Treatment Rate (MTR) which would be the flow rate at which the device meets prescribed treatment criteria.

Maximum Hydraulic Rate & Rim to Outlet Invert Difference

The maximum hydraulic rate (bypass) is governed in part by the space between the outlet invert elevation and the rim elevation of the structure, accounting for freeboard (air space). The inlet(s) and outlet invert for Barracudas are typically at the same elevation. The table below assumes a 4” tall frame mounted on an 8” thick top slab. Contact Application Engineering for applications that require rim to invert differences shallower than the minimums shown in Table 1, or for bypass rates higher than the maximums listed in Table 1.

The Barracuda can also be configured as an offline system utilizing a diversion structure for higher bypass flow rates, or at the design engineer’s discretion to meet design objectives or to minimize resuspension.

Figure 1
Barracuda Standard Detail

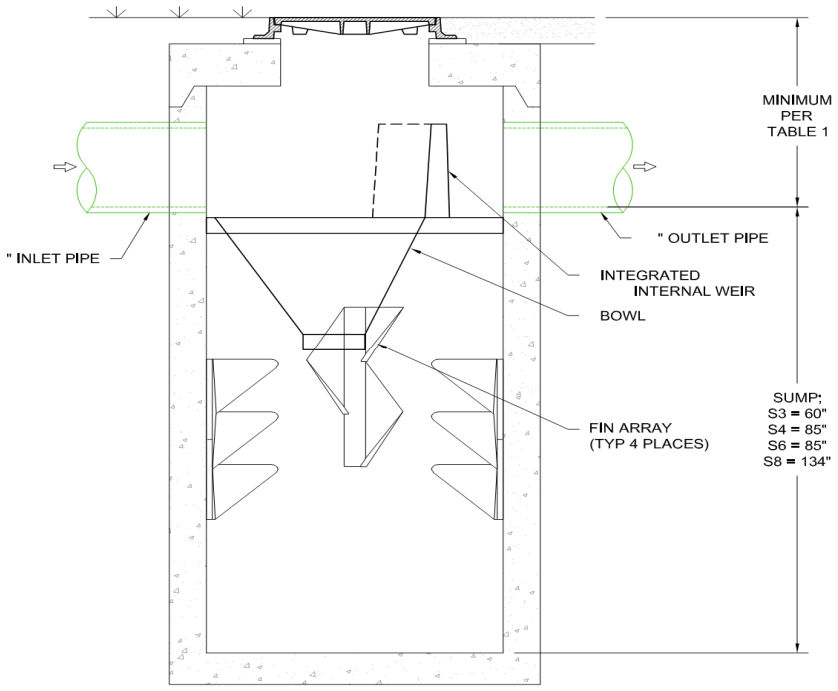


Table 1
Maximum Hydraulic Rate & Rim to Outlet Invert Difference

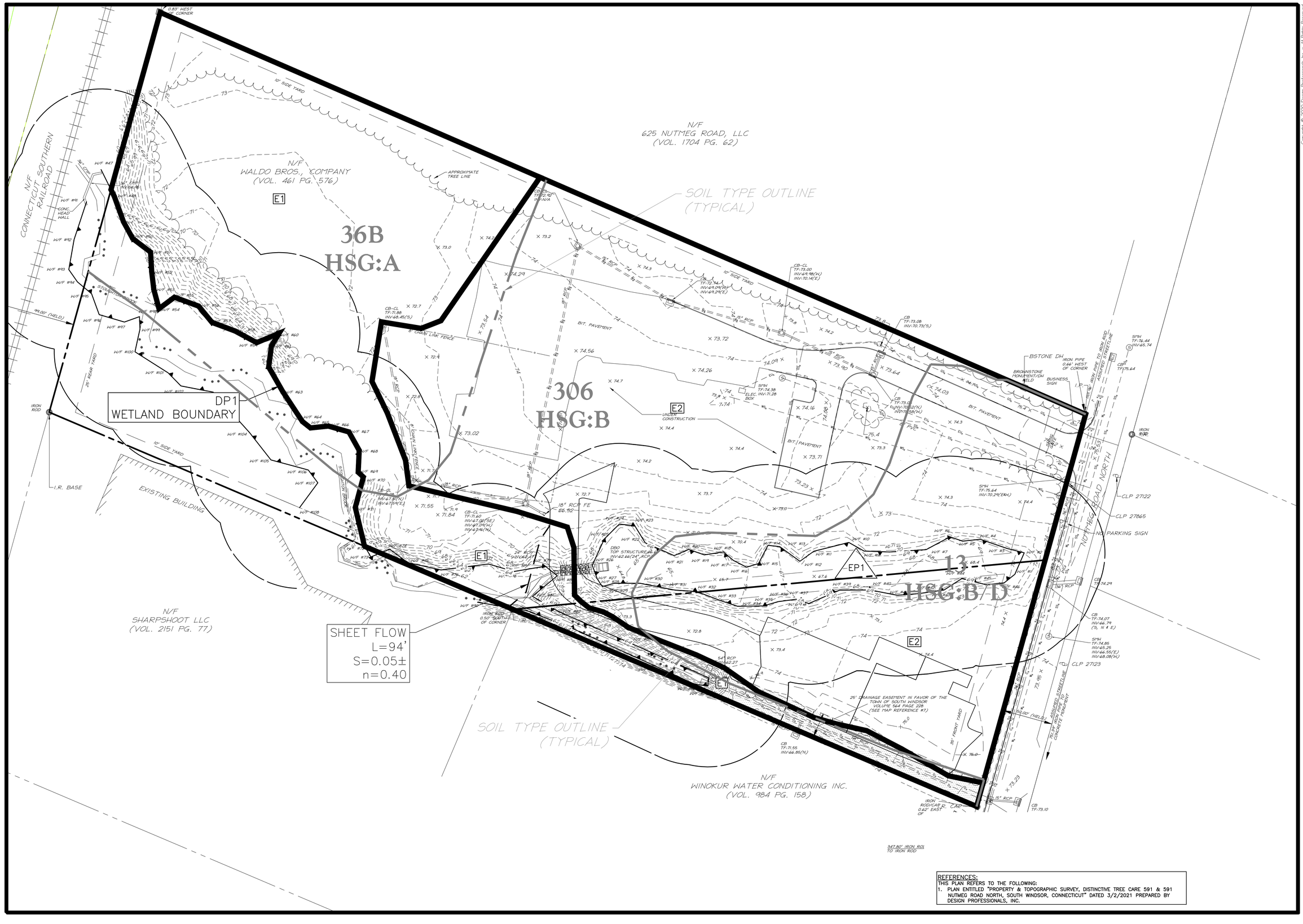
Barracuda S3 (36” Manhole)	
Maximum Hydraulic Rate (Bypass) cfs (L/s)	Required Rim to Outlet Invert Difference in (mm)
1.4 (39.6)	36 (914)
3.7 (104.8)	40 (1016)
5.5 (155.7)	42 (1066)
8.0 (226.5)	44 (1117)

Barracuda S4 (48” Manhole)	
Maximum Hydraulic Rate (Bypass) cfs (L/s)	Required Rim to Outlet Invert Difference in (mm)
3.5 (99.1)	36 (914)
5.0 (141.5)	40 (1016)
7.75 (219.4)	42 (1066)
10.5 (297.3)	44 (1117)

Barracuda S6 (72” Manhole)	
Maximum Hydraulic Rate (Bypass) cfs (L/s)	Required Rim to Outlet Invert Difference in (mm)
9.5 (269.0)	39 (990)
12.5 (353.9)	41 (1041)
16.0 (453.0)	43 (1092)
20.0 (566.3)	45 (1143)

Barracuda S8 (96” Manhole)	
Maximum Hydraulic Rate (Bypass) cfs (L/s)	Required Rim to Outlet Invert Difference in (mm)
13.0 (368.1)	41 (1041)
15.5 (438.9)	44 (1117)
21.0 (594.6)	46 (1168)
28.0 (792.8)	48 (1219)

APPENDIX F
Drainage Area Maps



REFERENCES:
THIS PLAN REFERS TO THE FOLLOWING:
1. PLAN ENTITLED "PROPERTY & TOPOGRAPHIC SURVEY, DISTINCTIVE TREE CARE 591 & 591 NUTMEG ROAD NORTH, SOUTH WINDSOR, CONNECTICUT" DATED 3/2/2021 PREPARED BY DESIGN PROFESSIONALS, INC.

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860-291-8757 – F
www.designprofessionals.com
design professionals
CIVIL & TRAFFIC ENGINEERS / LAND SURVEYORS
PLANNERS / LANDSCAPE ARCHITECTS

PREPARED FOR:
DISTINCTIVE TREE CARE
48 PATRIA ROAD
SOUTH WINDSOR, CT
06074
(860) 528-8733

PROJECT NO.: 3136.D
DATE: 03/02/21
DRAWN BY: DHJ
CHKD BY: CWM
APPROVED BY: DHJ/SPC

NO | DATE | REVISIONS | BY

DISTINCTIVE TREE CARE

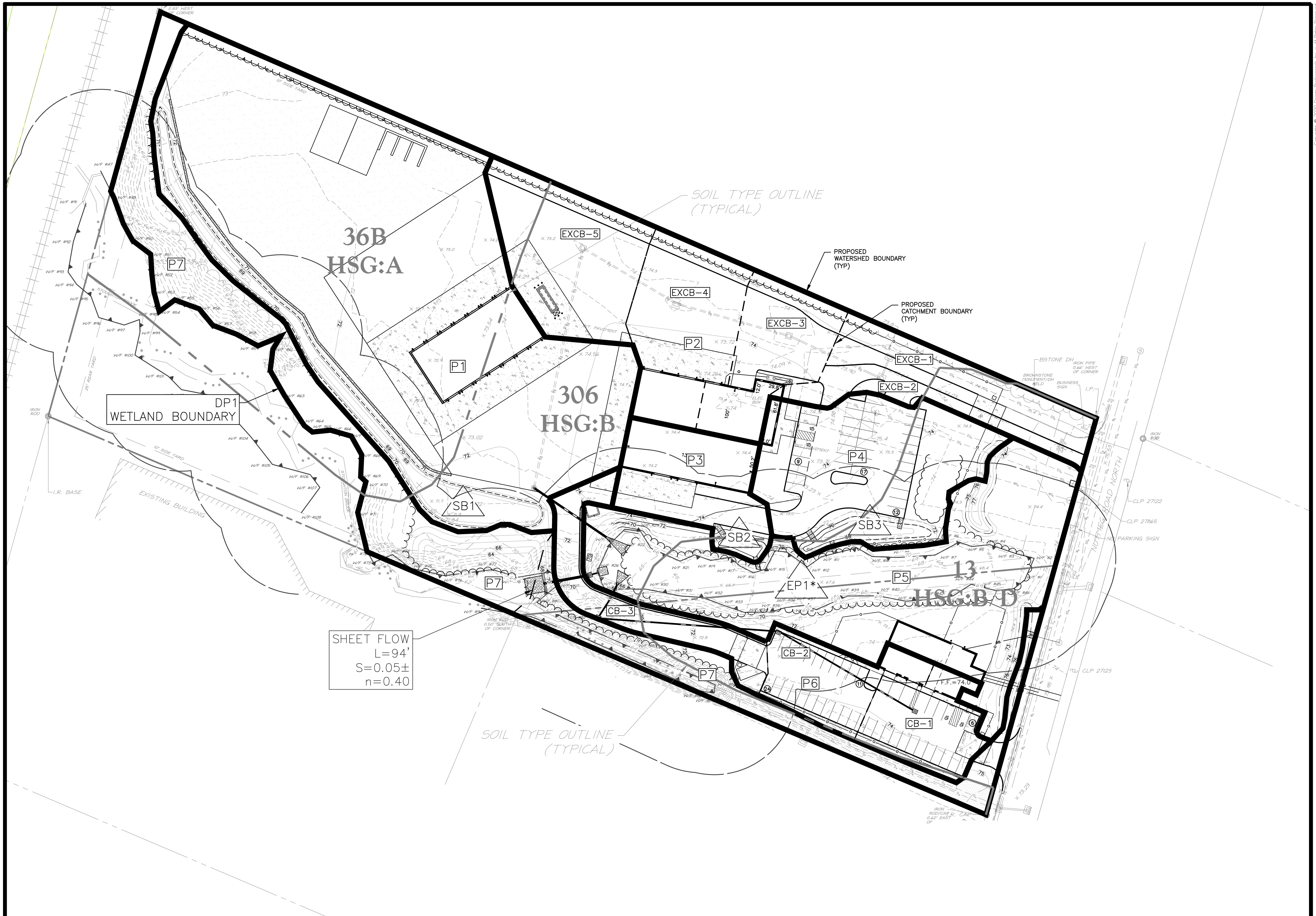
595 NUTMEG ROAD NORTH
SOUTH WINDSOR, CONNECTICUT

EXISTING DRAINAGE AREA MAP

SCALE: 1" = 40'
0 20' 40' 80'

SHEET
C-DA1
SHEET 1 OF 2

File: C:\jobs\3136\3136D\Engineering\Stormwater\3136D – Drainage Mapping Layout: 01 C-DA1 Plotted: 3/2/2021 2:23 PM Last Saved: 3/2/2021 2:19 PM Last Saved By: DanielJameson



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PROJECT NO.: 3136D
DATE: 03/02/21
DESIGN BY: DHJ
DRAWN BY: CAM
CHECKED BY: DHJ/SPC

DISTINCTIVE TREE CARE
595 NUTMEG ROAD NORTH
SOUTH WINDSOR, CONNECTICUT

NO.	DATE	REVISIONS	BY

PROPOSED DRAINAGE AREA MAP

SCALE: 1" = 100'

SHEET
C-DA2
SHEET 2 OF 2

File: C:\jobs\3136\3136D\Engineering\Stormwater\3136D - Drainage Map.dwg Layout: 02 C-DA2 Plotted: 3/2/2021 2:23 PM Last Saved: 3/2/2021 2:19 PM Last Saved By: DanielJameson