

MEMORANDUM

Date: March 31, 2021

To: Patrick Ryan, Napa County Planning, Building, and Environmental Services

From: Matthew S. Bueno, P.E.
Rachel L. Rosasco, E.I.T.

Cc: John McDowell, Napa County Planning, Building, and Environmental Services

Re: Carmelite Vineyard Track I ECP
20 Mt. Carmel Drive, Oakville CA
APN 027-280-006
Hydrologic Analysis

This memo transmits the findings of a hydrologic analysis for the above-referenced Track I Erosion Control Plan (ECP). HydroCAD software was used to estimate pre- and post-project runoff from watersheds containing the proposed development areas. The software uses the Natural Resource Conservation Service (NRCS) TR-20 method to calculate runoff. The analysis uses the Type IA 24-hr storm distribution and includes site-specific National Oceanic and Atmospheric Administration (NOAA) point precipitation data for the ranch.

Four (4) watersheds were delineated for the hydrologic modeling using 2-foot contours generated from a ground survey performed by PPI Engineering and 5-foot contours from Napa County LIDAR data. Watershed 1 encompasses approximately 3.5 acres and drains directly into a drop inlet which is labeled Outlet 1. Watershed 2 is located south of Watershed 1 and contains approximately 1.9 acres that drains into an existing catchment basin. The primary outlet for the basin is a drop inlet and pipe which flows southeast into an existing concrete ditch acting as the northeastern boundary of Watershed 4. During larger storm events the capacity of the primary outlet will be exceeded and runoff will be diverted from the basin into an existing earthen ditch that conveys runoff along the northeastern boundary of Watershed 1. Watershed 3, located south of Watershed 2, is approximately 9.0 acres and drains to a series of drop inlets and an existing swale before entering into the existing concrete ditch previously mentioned. Watershed 4, located to the south of Watershed 3 contains approximately 8.5 acres and also drains into the existing concrete ditch which eventually flows to an existing culvert labeled as Outlet 2. All watersheds, eventually drain to an unnamed tributary of the Napa River to the east of the property. Please see the attached figures for the location of each watershed.

Soils within the watersheds were obtained from the NRCS Web Soil Survey and are classified as the following:

Felton Gravelly Loam, 30-50% Slopes (Map Unit Symbol 136)
Hambright-Rock Outcrop, 2-30% Slopes (Map Unit Symbol 151)

Felton Gravelly Loam is classified as Hydrologic Soil Group (HSG) C. Hambright-Rock Outcrop is classified as HSG D. Please see the attached figures for soil type delineations within the vicinity of each watershed.

Land use areas were initially delineated based on Napa County orthophotos. A site visit was then conducted on July 22, 2020 by Matt Bueno and Rachel Rosasco of PPI Engineering to ground truth the orthophotos and determine the existing land use conditions. An additional site visit was made on September 22, 2020. The land use hydrologic conditions were classified based on the respective covers as poor (less than 50% cover), fair (50%-75% cover), or good (greater than or equal to 75% cover). The HydroCAD software analyzes the land use data along with the corresponding soil HSGs to determine a weighted Curve Number (CN) for runoff calculations. The grassed areas have been historically managed with mowing and landscaping. Consequently, the pre-project condition of the grassed areas that are proposed to be converted to vineyard were classified as Annual Grass in Good condition. The land use classification of Annual Grass is based upon the NRCS Engineering Field Manual Chapter 2, Supplement 1 definition. The post-project condition within the proposed vineyard will be classified as good (based on the proposed cover in the ECP). The Curve Numbers remained the same from pre- to post-project conditions for all watersheds. Please see the attached figures for existing and proposed land use delineations.

The Time of Concentration (Tc) flow path within each watershed was determined using PPI Engineering and Napa County contours. The flow path in each watershed was drafted from the hydrologically most distant point (longest travel time) in the watershed to the watershed outlet per NRCS standards. For modeling purposes, the runoff from Watersheds 2 and 3 were modeled as a series of internal reaches to the appropriate outlets. For all watersheds the Tc did not change from pre- to post-project conditions. The proposed project will not change any of the existing drainage patterns and does not include any surface water conveyance infrastructure. Please see the attached figures for both the pre- and post-project Tc flow paths by watershed.

Pre- and post-project runoff calculations from the HydroCAD models for each individual watershed are summarized in Table 1 below. In Table 2 the runoff calculations for the two modeled outlets are summarized. Runoff was calculated for the 2-, 10-, 50- and 100-year storms respectively for each watershed and for the modeled outlets.

Table 1. Individual Watershed Summary

	Runoff (cfs)											
	Watershed 1			Watershed 2			Watershed 3			Watershed 4		
	Pre-Project	Post-Project	Increase/Decrease	Pre-Project	Post-Project	Increase/Decrease	Pre-Project	Post-Project	Increase/Decrease	Pre-Project	Post-Project	Increase/Decrease
2-Year Storm	1.10	1.10	0.00	0.60	0.60	0.00	2.59	2.59	0.00	2.74	2.74	0.00
10-Year Storm	2.50	2.50	0.00	1.36	1.36	0.00	6.09	6.09	0.00	6.20	6.20	0.00
50-Year Storm	4.11	4.11	0.00	2.23	2.23	0.00	10.15	10.15	0.00	10.17	10.17	0.00
100-Year Storm	4.81	4.81	0.00	2.61	2.61	0.00	11.94	11.94	0.00	11.90	11.90	0.00

Table 2. Outlet Summary

	Runoff (cfs)					
	Outlet 1			Outlet 2		
	Pre-Project	Post-Project	Increase/Decrease	Pre-Project	Post-Project	Increase/Decrease
2-Year Storm	1.10	1.10	0.00	5.87	5.87	0.00
10-Year Storm	2.50	2.50	0.00	13.56	13.56	0.00
50-Year Storm	4.68	4.68	0.00	21.85	21.85	0.00
100-Year Storm	5.76	5.76	0.00	25.37	25.37	0.00

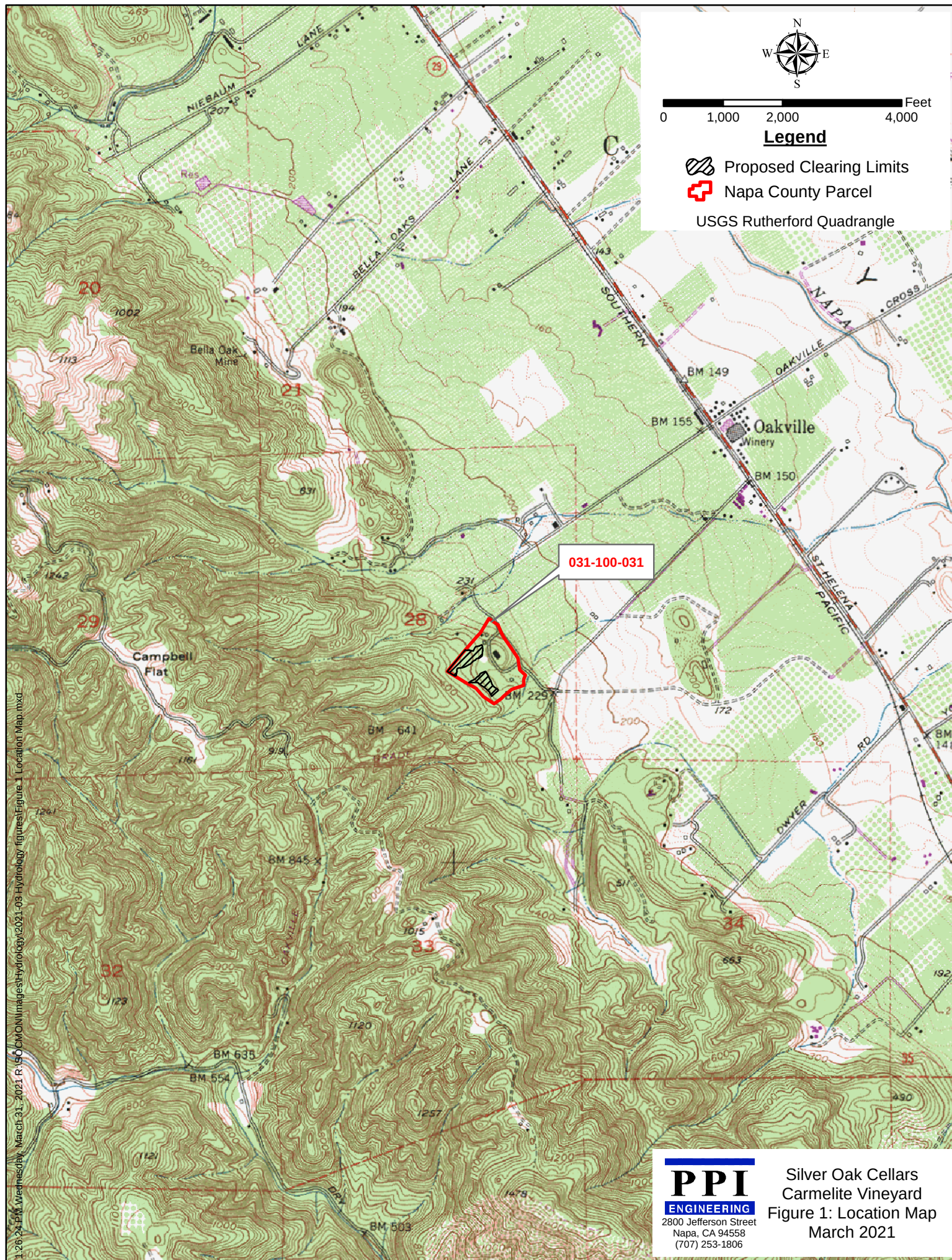
All watersheds modeled show no net change in runoff from pre- to post-project conditions for all storm events.

Please see the attached HydroCAD analyses for inputs, details, and summaries of the hydrologic modeling. Based on our analysis, there are no predicted net runoff increases, and no negative hydrologic impacts are expected as a result of this project. The project as proposed is in compliance with Napa County's General Plan policy requiring no-net-increase in runoff.

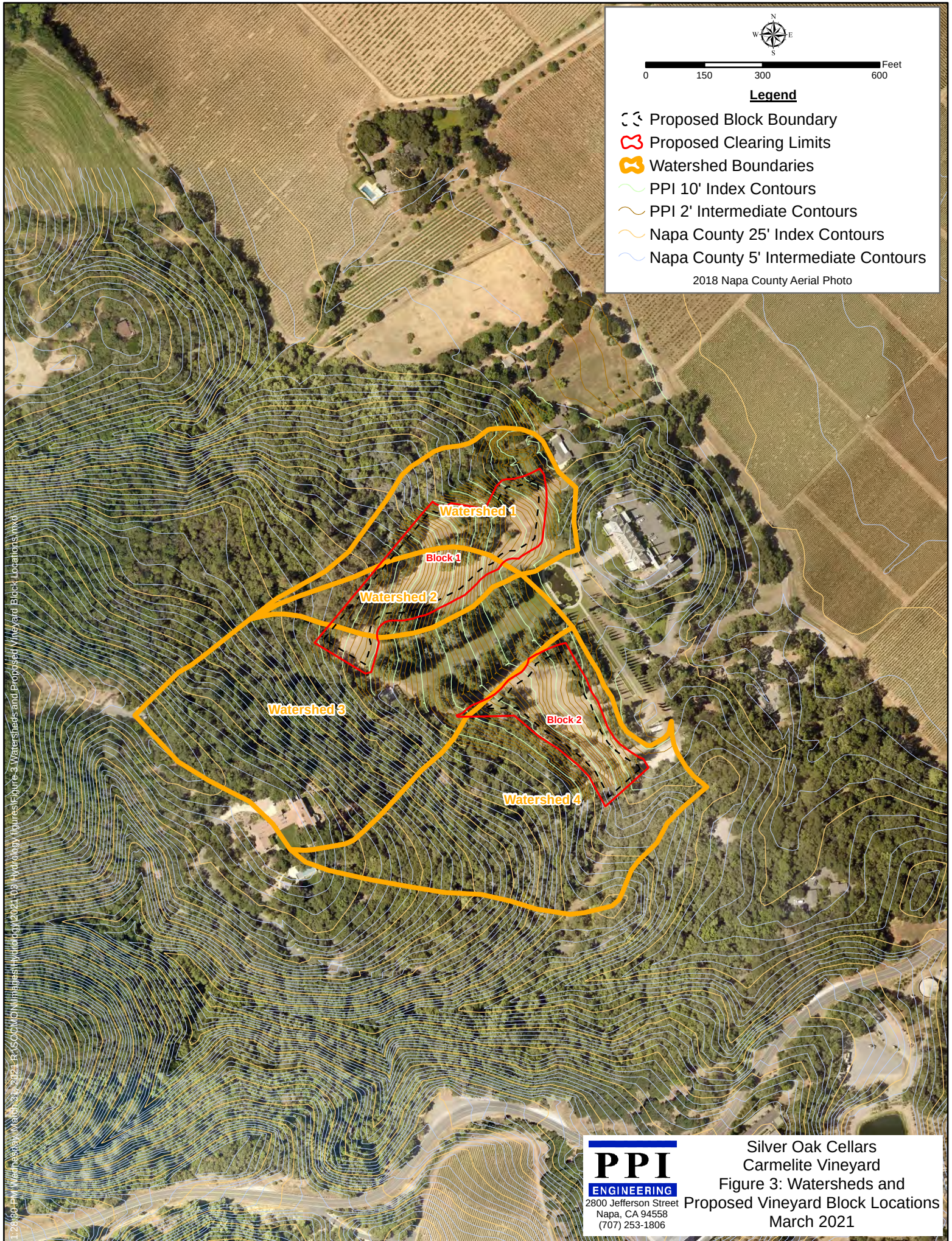


ATTACHMENT A

SUPPORTING FIGURES







0 150 300 600 Feet

Legend

- Proposed Block Boundary
- Proposed Clearing Limits
- Watershed Boundaries
- PPI 10' Index Contours
- PPI 2' Intermediate Contours
- Napa County 25' Index Contours
- Napa County 5' Intermediate Contours

2018 Napa County Aerial Photo

Watershed 1

Block 1

Watershed 2

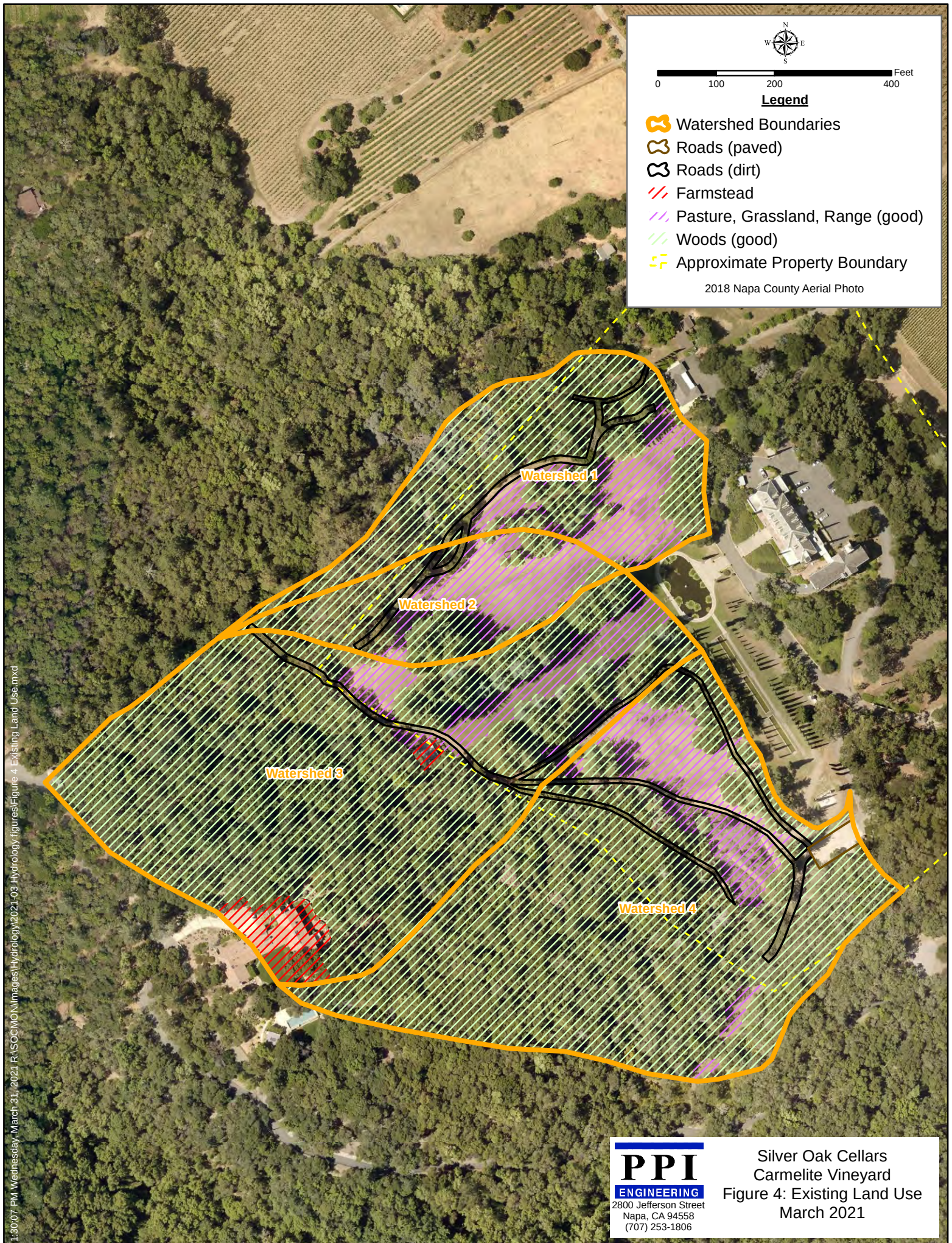
Watershed 3

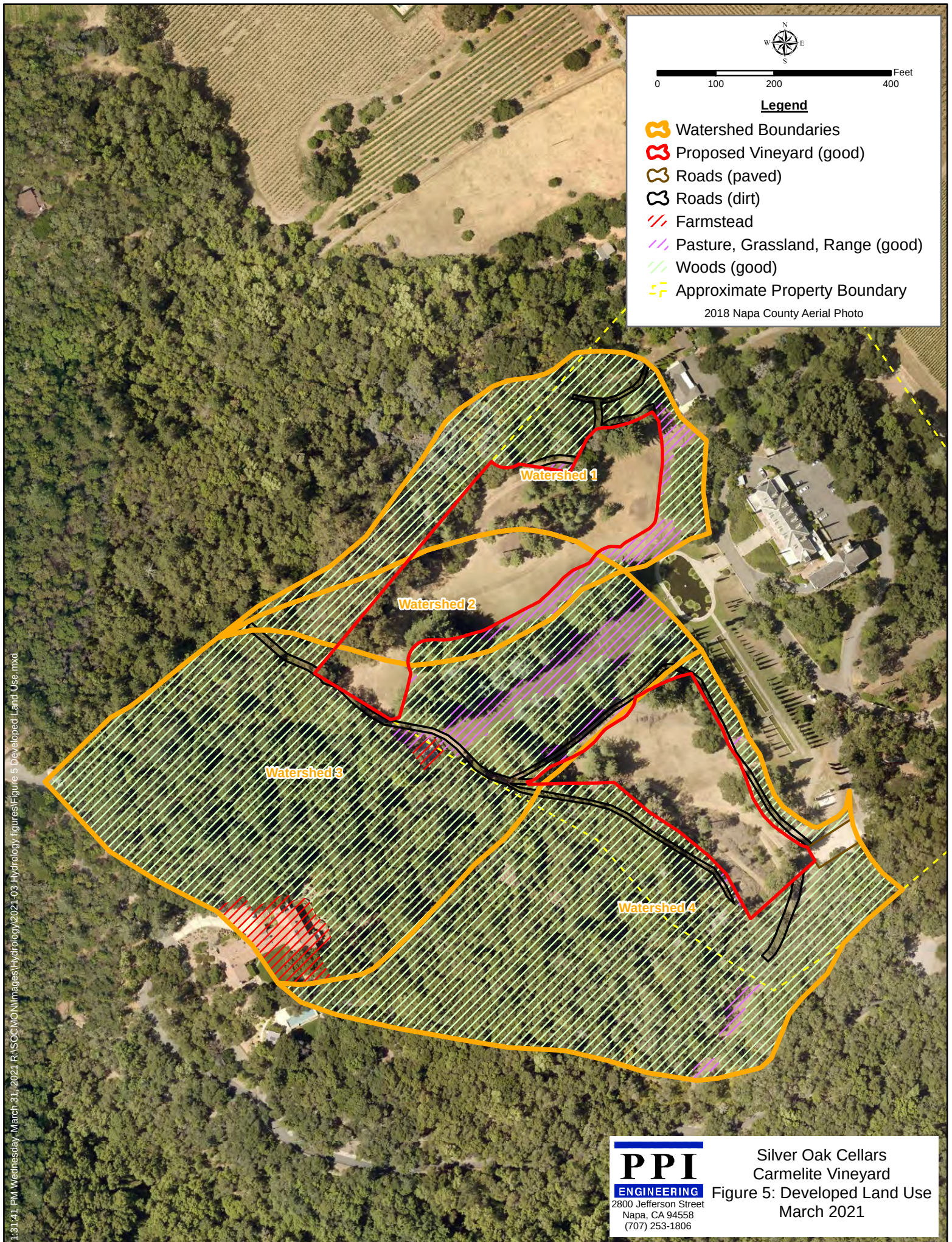
Block 2

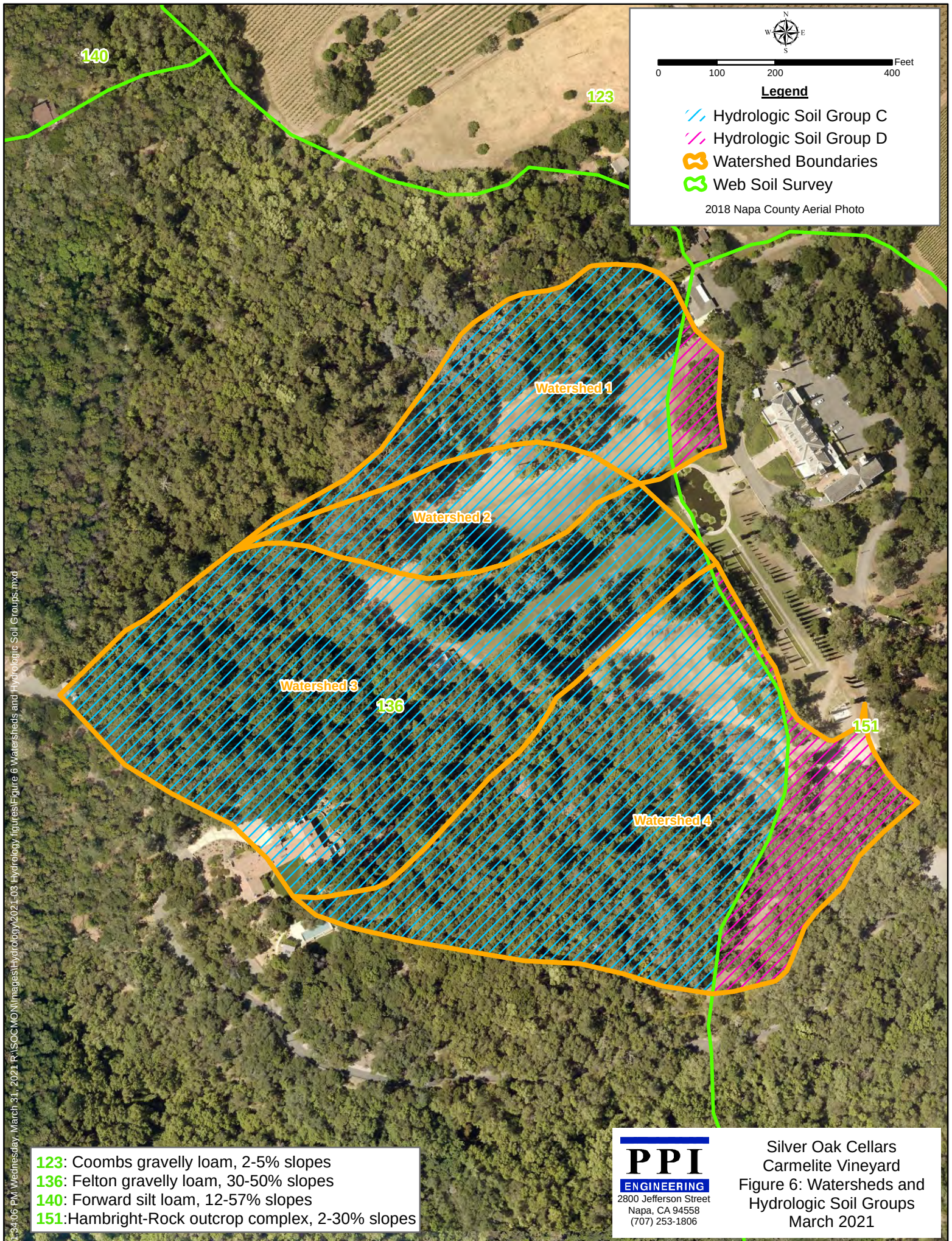
Watershed 4

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Napa, CA 94558
(707) 253-1806

Silver Oak Cellars
Carmelite Vineyard
Figure 3: Watersheds and
Proposed Vineyard Block Locations
March 2021



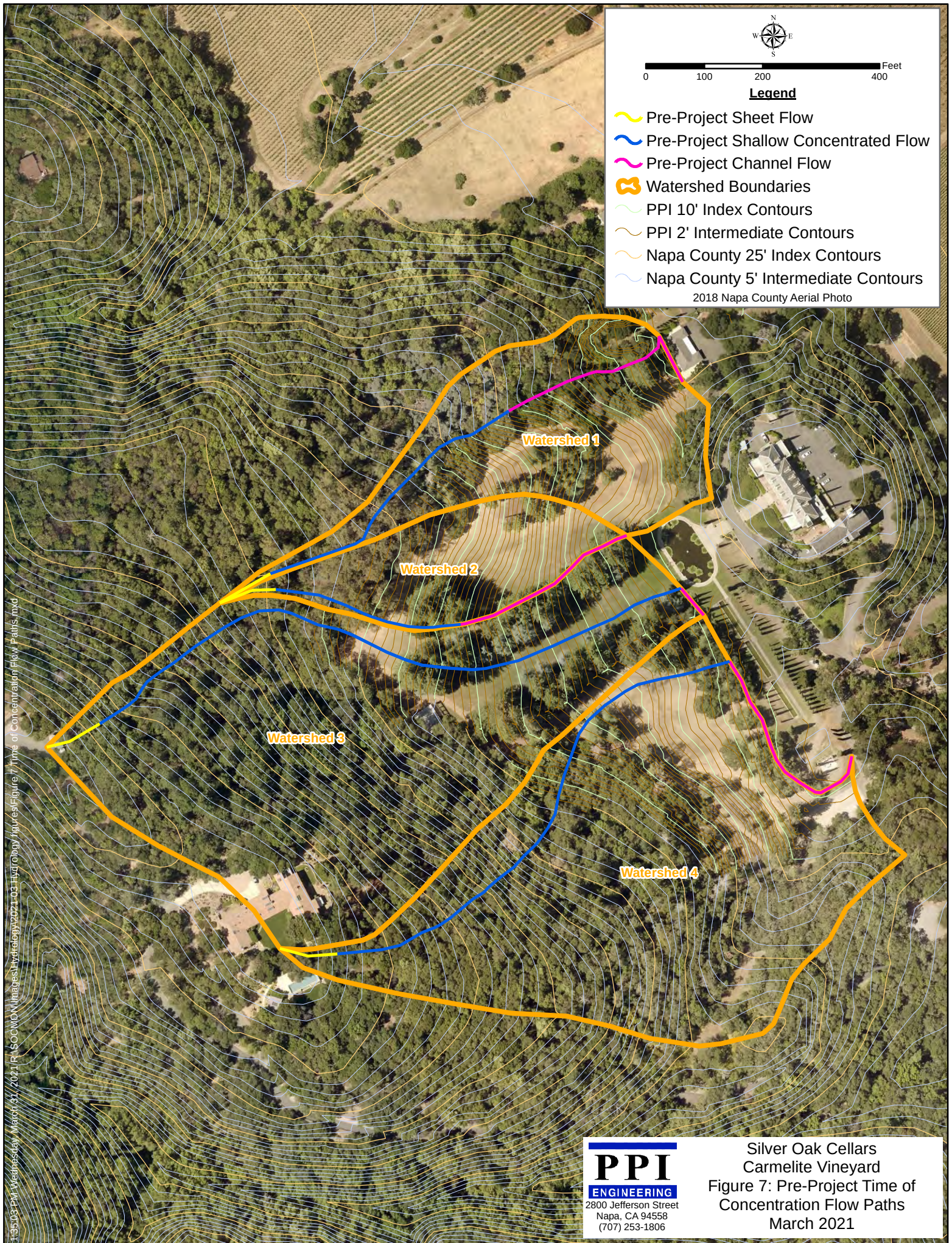


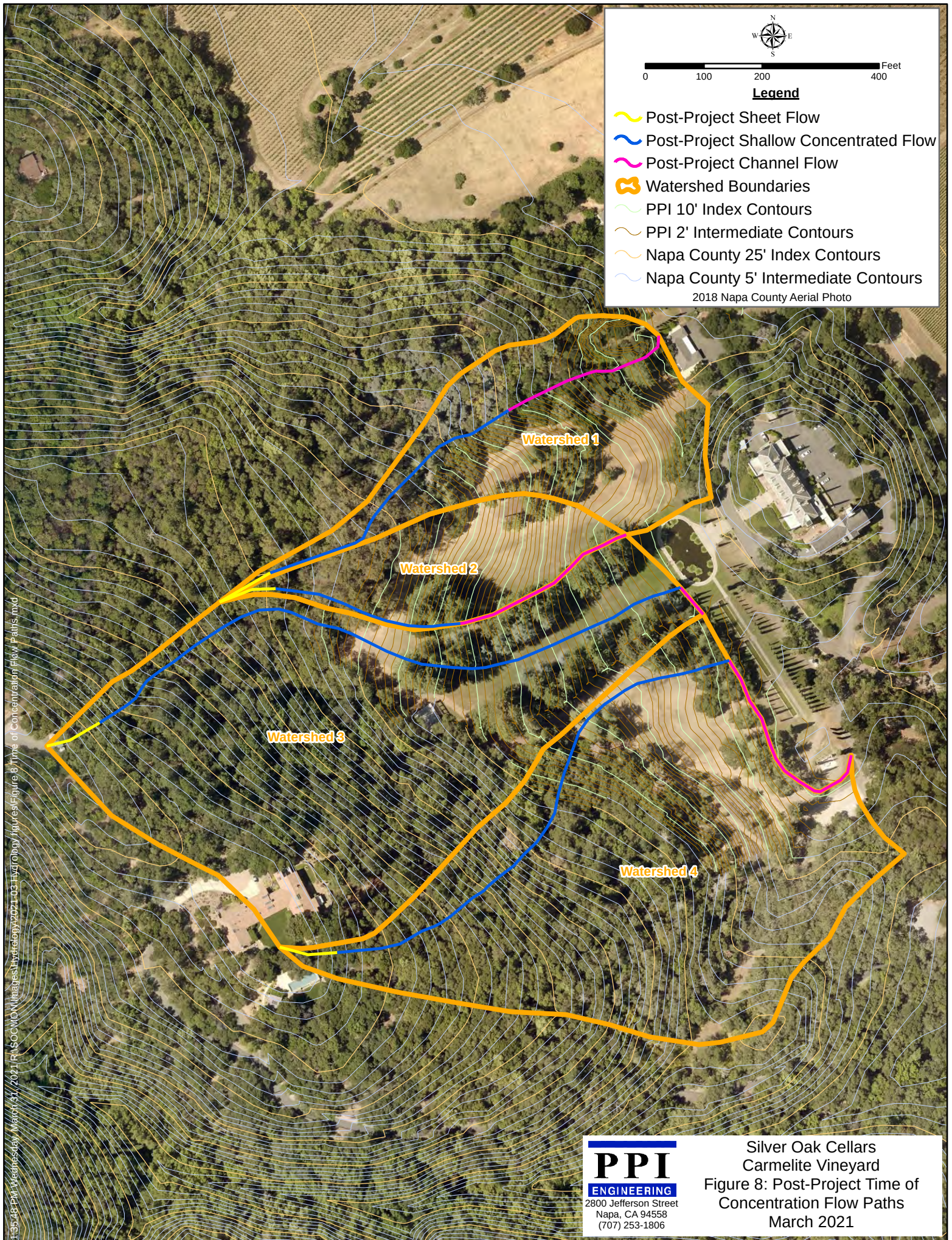


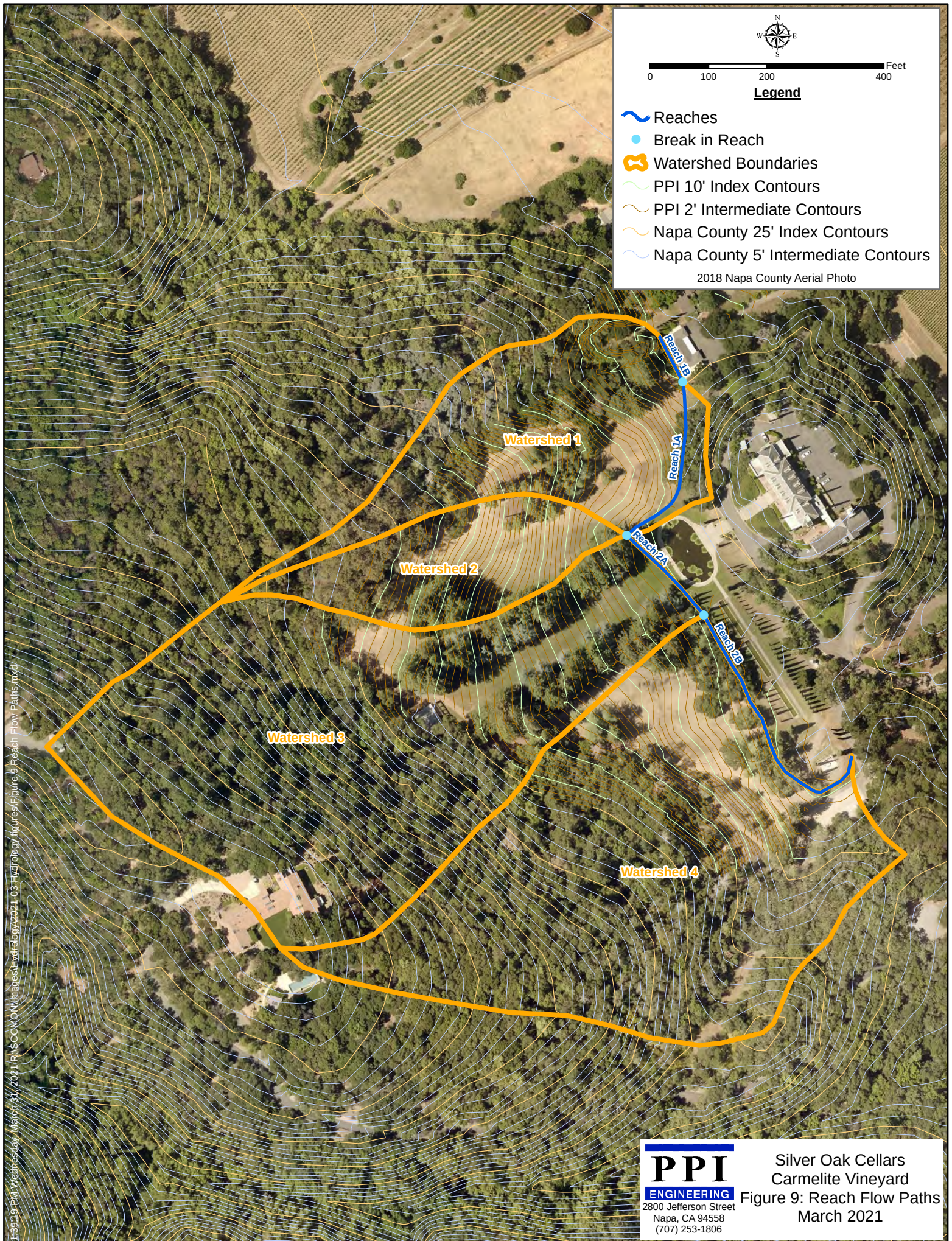
L:\34.06 PM Wednesday, March 31, 2021 R:\SOCWON\Images\Hydrology\2021-03 Hydrology Figures\Figure 6 Watersheds and Hydrologic Soil Groups.mxd

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Silver Oak Cellars
Carmelite Vineyard
Figure 6: Watersheds and
Hydrologic Soil Groups
March 2021

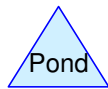
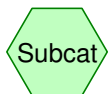
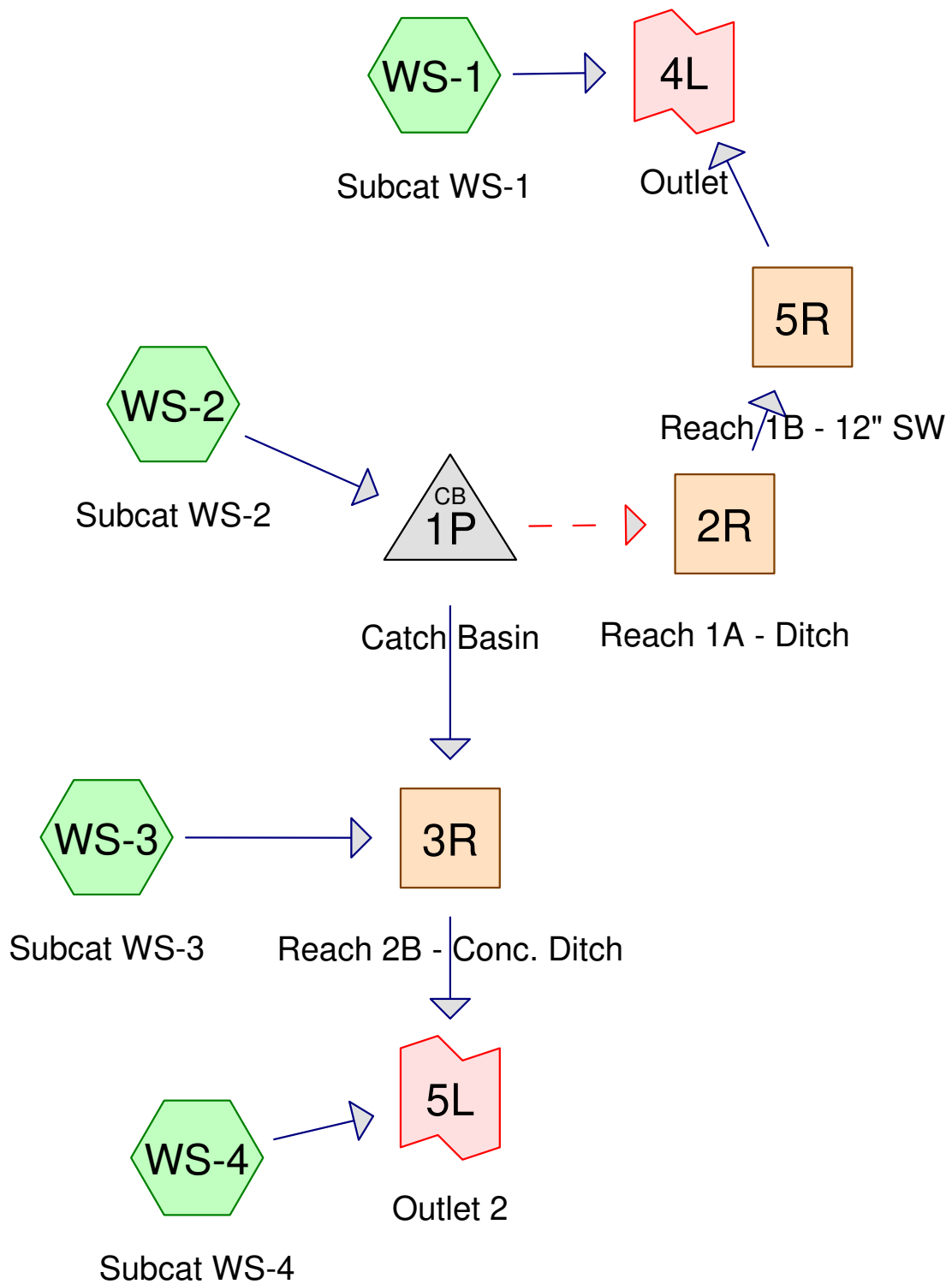






ATTACHMENT B

HYDROCAD ANALYSES



Carmelite Pre-Project

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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 2

Summary for Subcatchment WS-1: Subcat WS-1

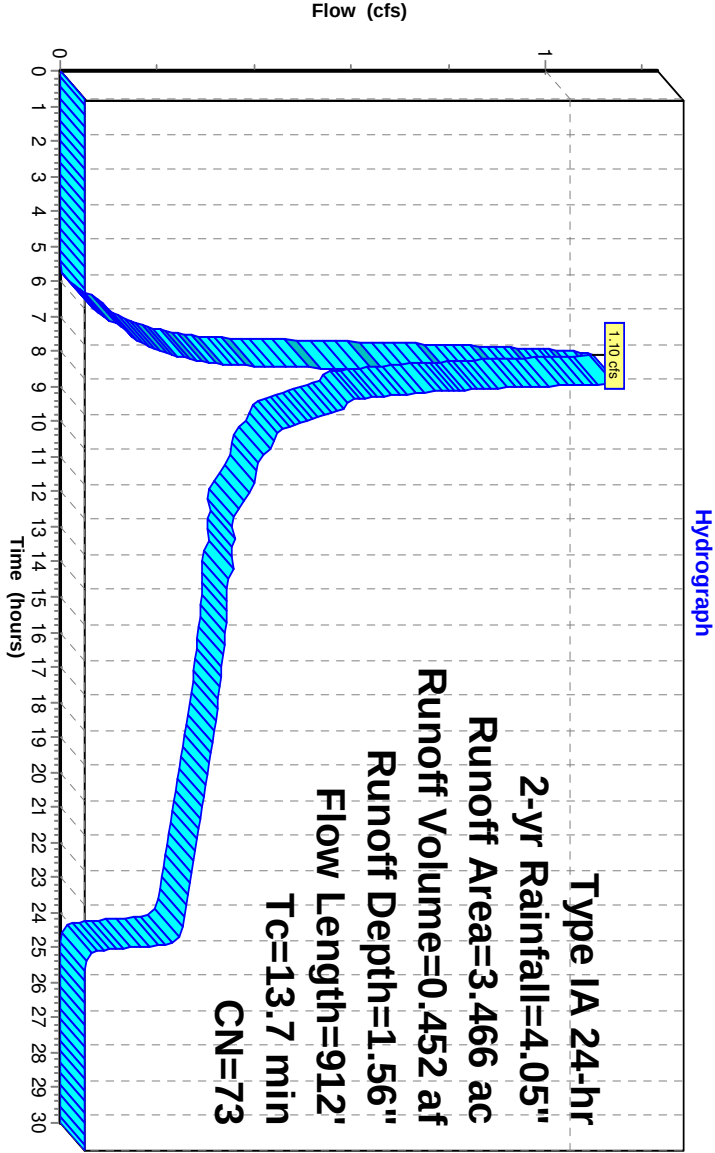
Runoff = 1.10 cfs @ 8.08 hrs, Volume= 0.452 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.681	75	Annual Grass, Good, HSG C
0.158	81	Annual Grass, Good, HSG D
0.176	87	Dirt roads, HSG C
2.200	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

Subcatchment WS-1: Subcat WS-1



Carmelite Pre-Project

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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 4

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.827	75	Annual Grass, Good, HSG C
0.092	87	Dirt roads, HSG C
0.943	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow
					Woods: Dense underbrush n= 0.800 P2= 4.05"
1.8	199	0.1300	1.80		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.6	98	0.1400	2.62		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
11.9	754	Total			

Carmelite Pre-Project

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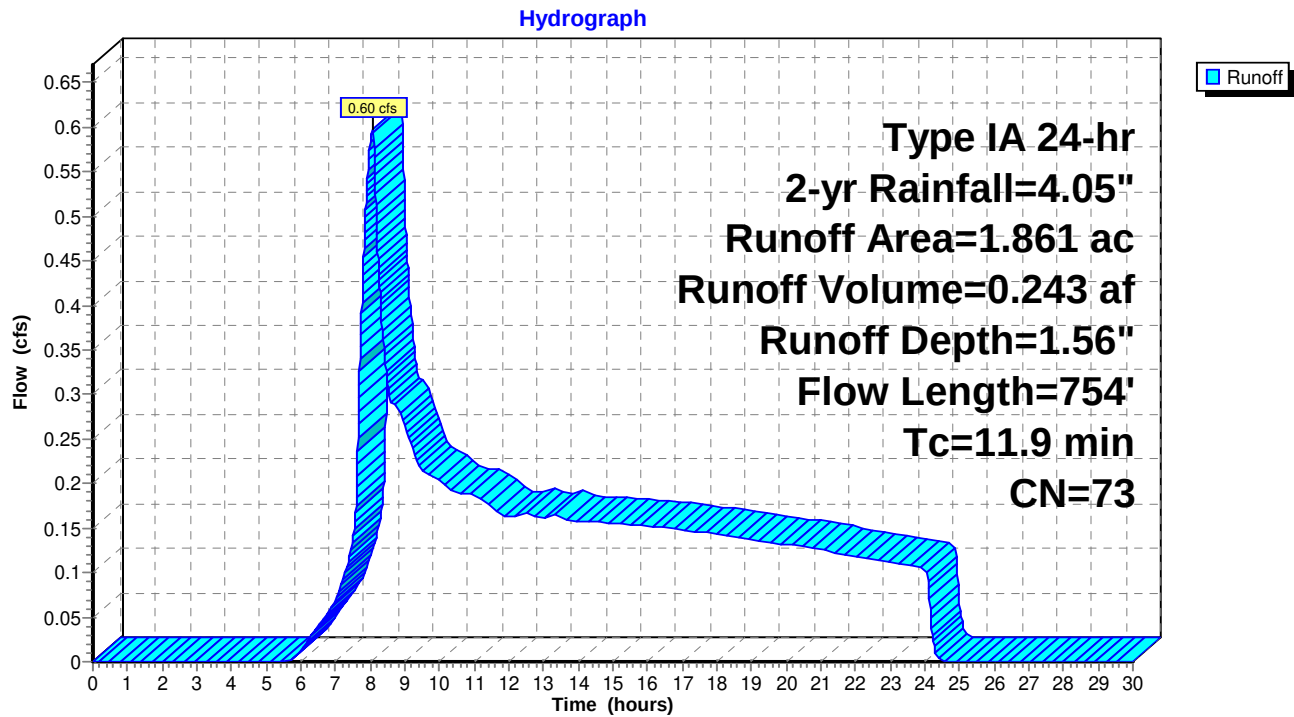
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Page 5

Subcatchment WS-2: Subcat WS-2



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Page 6

Summary for Subcatchment WS-3: Subcat WS-3

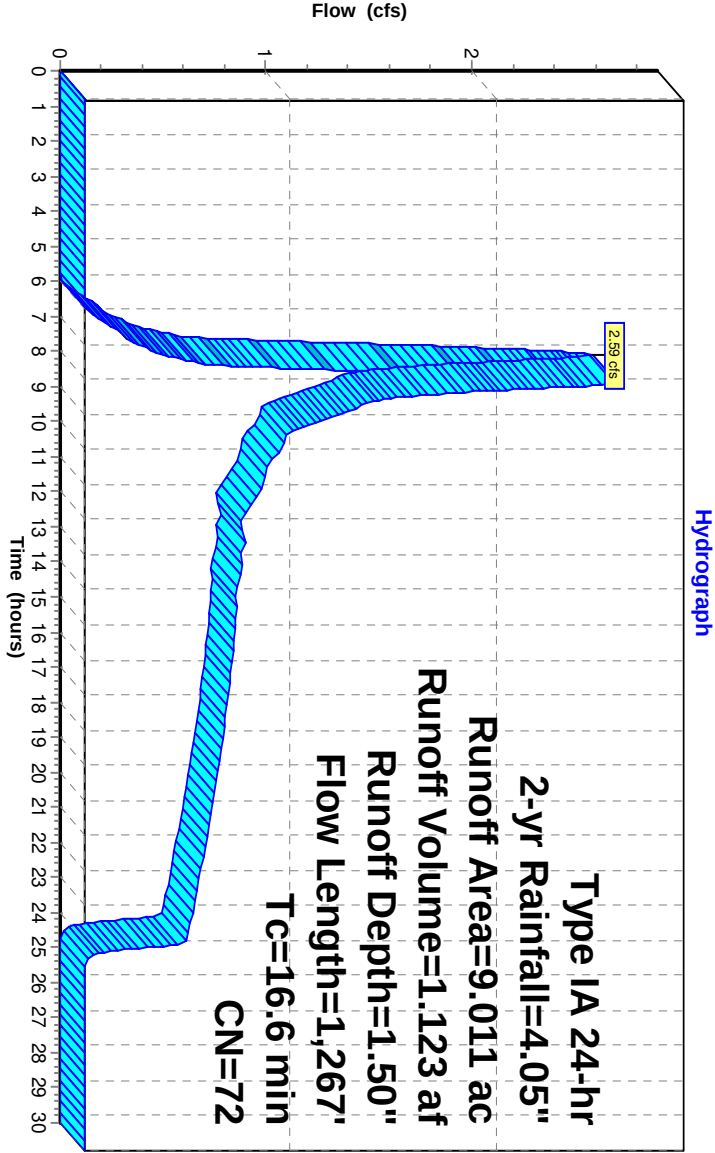
Runoff = 2.59 cfs @ 8.10 hrs, Volume= 1.123 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.816	75	Annual Grass, Good, HSG C
0.207	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
7.472	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.6	521	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.8	127	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.1	128	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

Subcatchment WS-3: Subcat WS-3



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Page 8

Summary for Subcatchment WS-4: Subcat WS-4

Runoff = 2.74 cfs @ 8.06 hrs, Volume= 1.107 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.935	75	Annual Grass, Good, HSG C
0.105	81	Annual Grass, Good, HSG D
0.193	87	Dirt roads, HSG C
0.104	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
5.614	70	Woods, Good, HSG C
1.468	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
1.8	262	0.1200	2.42		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.5	60	0.1500	1.94		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017 Concrete, unfinished
11.8	1,374	Total			

Carmelite Pre-Project

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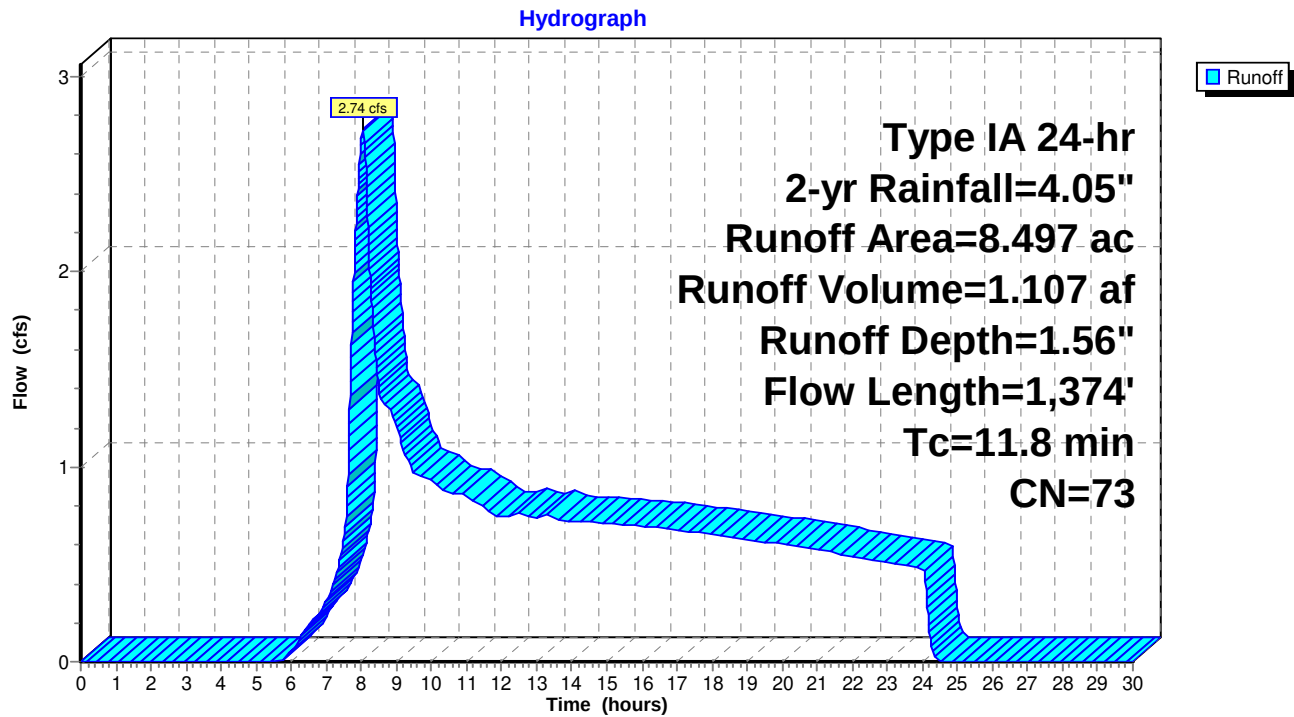
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Page 9

Subcatchment WS-4: Subcat WS-4



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Page 10

Summary for Reach 2R: Reach 1A - Ditch

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

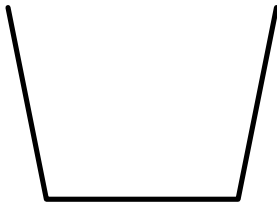
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

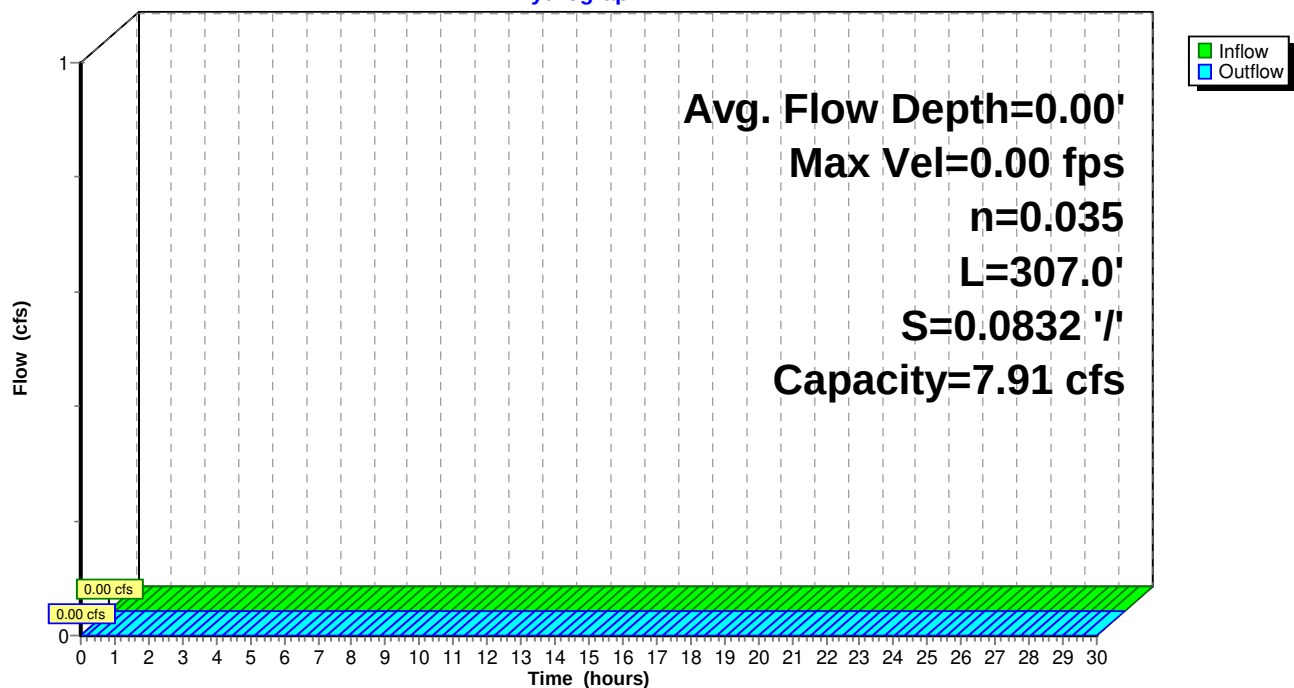
Length= 307.0' Slope= 0.0832 '/'

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



Carmelite Pre-Project

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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 11

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 1.51" for 2-yr event
Inflow = 3.18 cfs @ 8.09 hrs, Volume= 1.365 af
Outflow = 3.17 cfs @ 8.11 hrs, Volume= 1.365 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 6.65 fps, Min. Travel Time= 1.2 min

Avg. Velocity= 4.15 fps, Avg. Travel Time= 1.9 min

Peak Storage= 221 cf @ 8.11 hrs

Average Depth at Peak Storage= 0.44', Surface Width= 1.18'

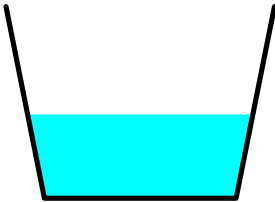
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

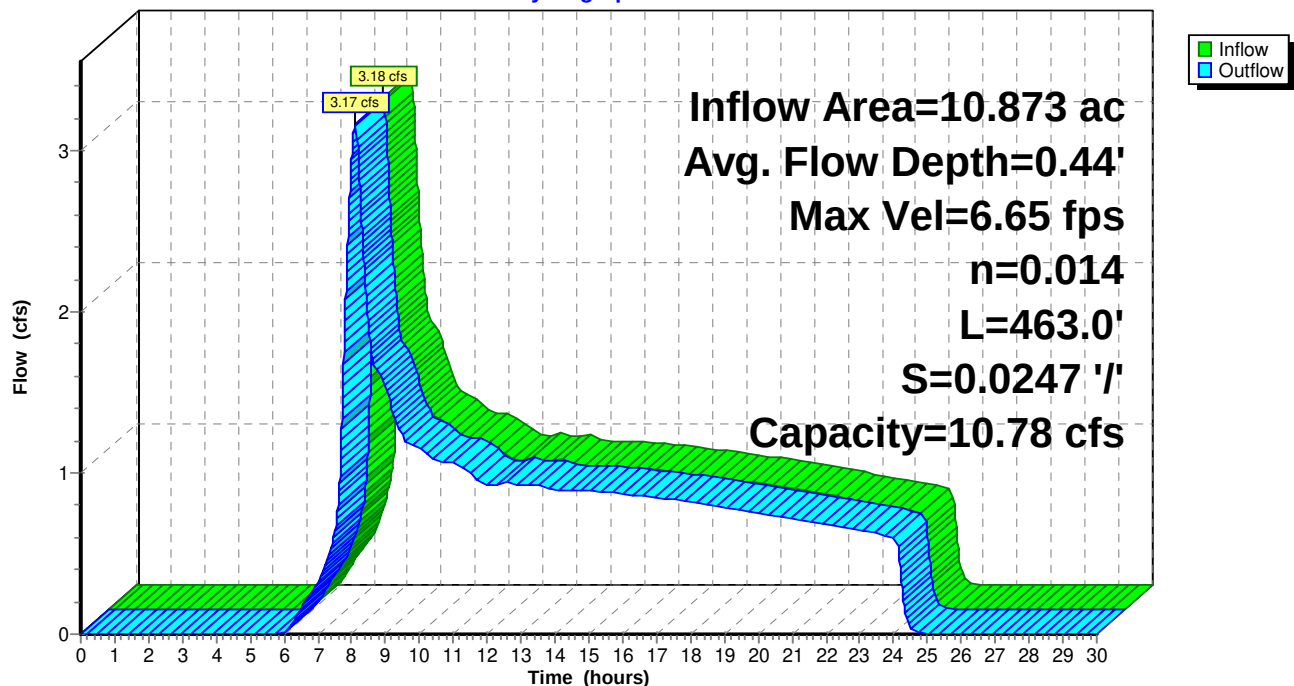
Length= 463.0' Slope= 0.0247 '/'

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



Carmelite Pre-Project

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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 12

Summary for Reach 5R: Reach 1B - 12" SW

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

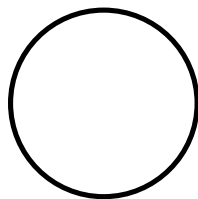
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

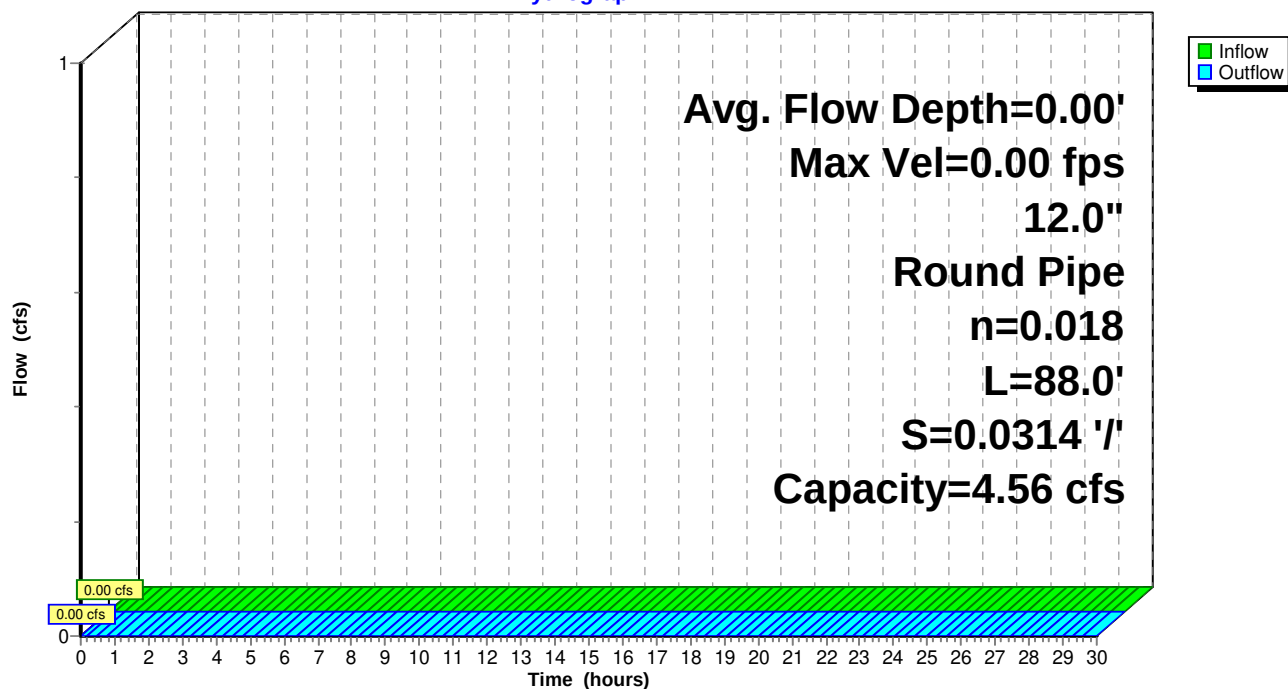
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



Carmelite Pre-Project

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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 13

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 1.56" for 2-yr event
 Inflow = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af
 Outflow = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 273.69' @ 8.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=0.60 cfs @ 8.05 hrs HW=273.69' TW=267.64' (Dynamic Tailwater)

↑**1=Culvert** (Passes 0.60 cfs of 1.64 cfs potential flow)
 ↑**2=Orifice/Grate** (Weir Controls 0.60 cfs @ 0.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=272.11' TW=273.81' (Dynamic Tailwater)↑**3=Custom Weir/Orifice** (Controls 0.00 cfs)

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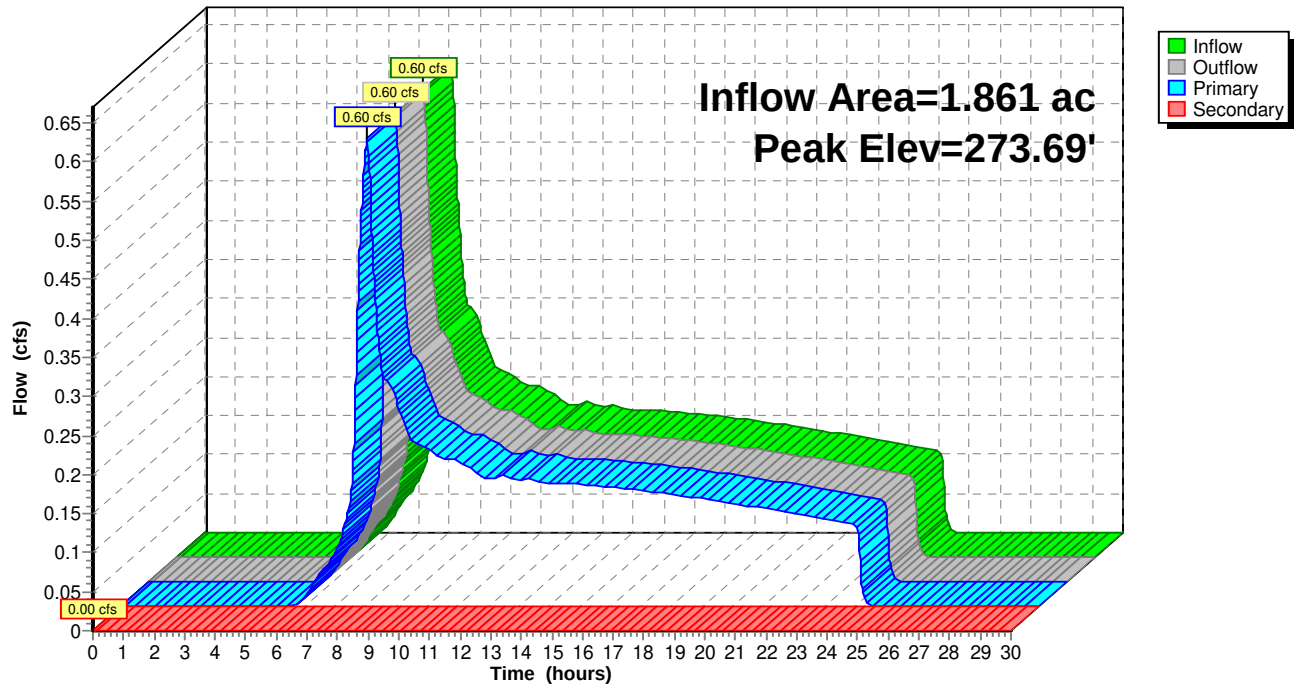
PPI Engineering
Type IA 24-hr 2-yr Rainfall=4.05"

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Page 14

Pond 1P: Catch Basin

Hydrograph



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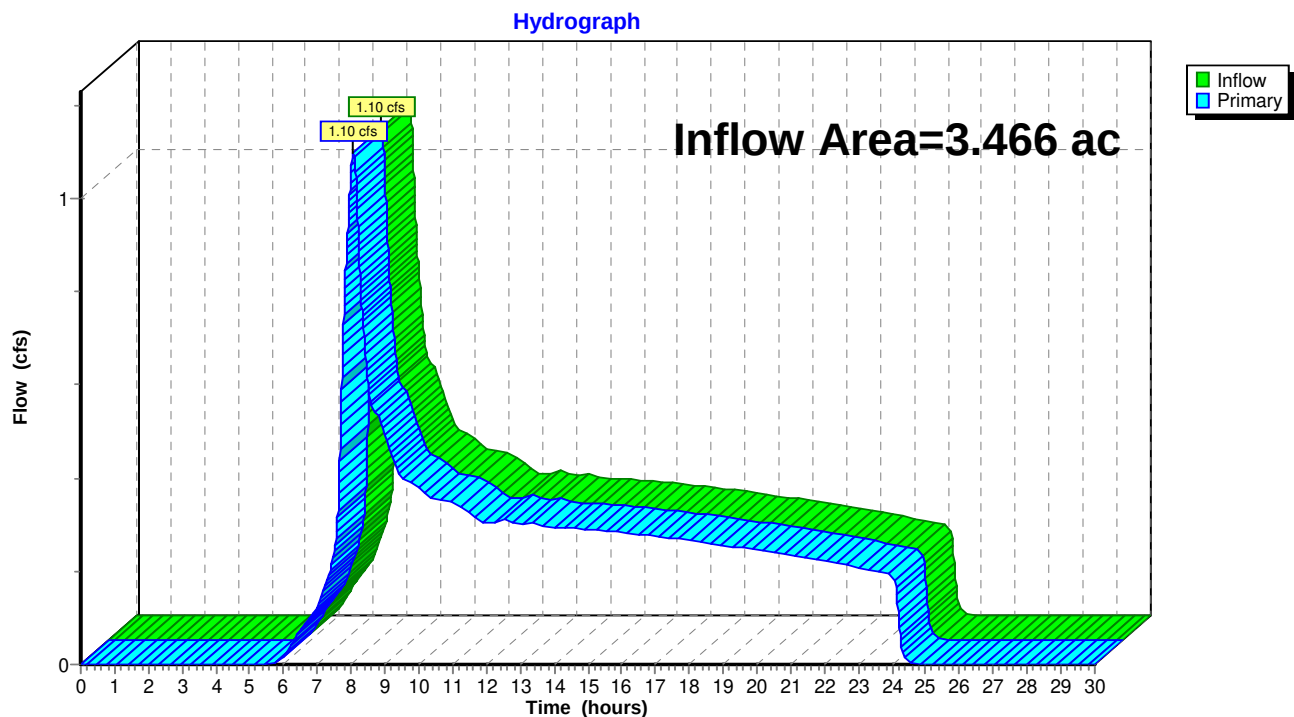
Page 15

Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 1.56" for 2-yr event
Inflow = 1.10 cfs @ 8.08 hrs, Volume= 0.452 af
Primary = 1.10 cfs @ 8.08 hrs, Volume= 0.452 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet



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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 16

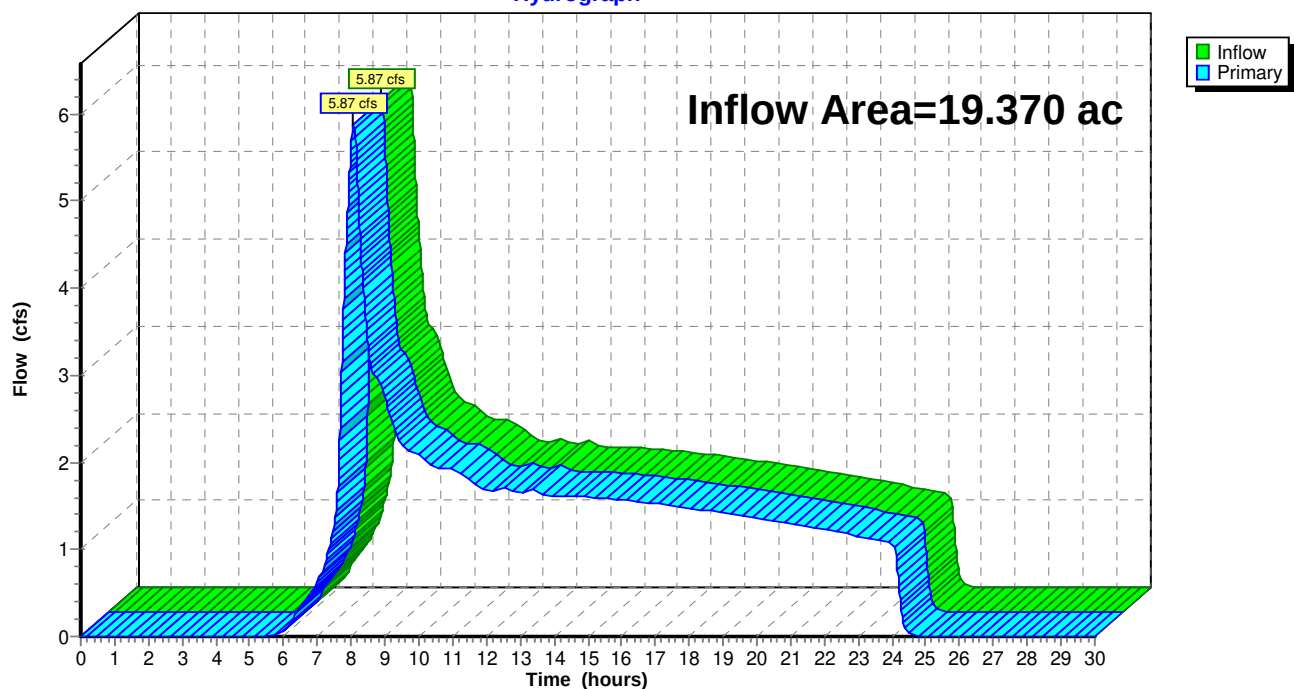
Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 1.53" for 2-yr event
Inflow = 5.87 cfs @ 8.08 hrs, Volume= 2.472 af
Primary = 5.87 cfs @ 8.08 hrs, Volume= 2.472 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

Hydrograph



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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 17

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 2.50 cfs @ 8.05 hrs, Volume= 0.897 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.681	75	Annual Grass, Good, HSG C
0.158	81	Annual Grass, Good, HSG D
0.176	87	Dirt roads, HSG C
2.200	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 ' /' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

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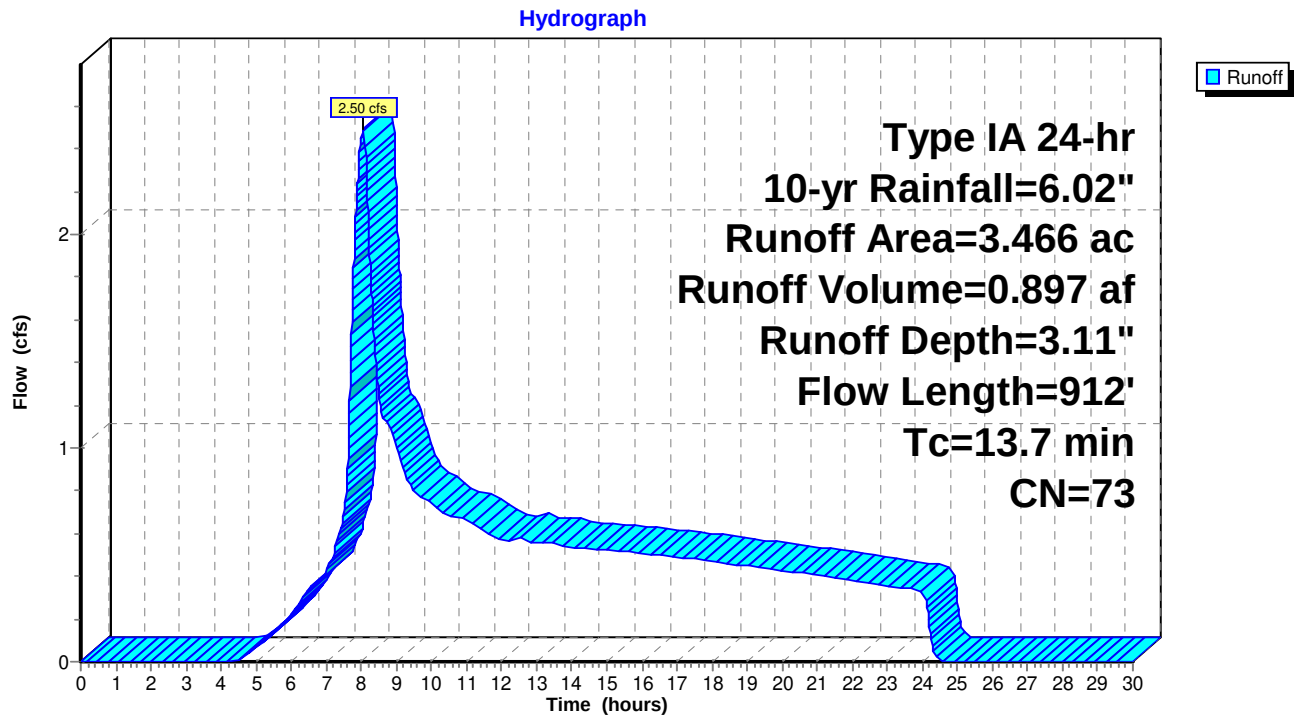
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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 18

Subcatchment WS-1: Subcat WS-1



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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 19

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.827	75	Annual Grass, Good, HSG C
0.092	87	Dirt roads, HSG C
0.943	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow
					Woods: Dense underbrush n= 0.800 P2= 4.05"
1.8	199	0.1300	1.80		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.6	98	0.1400	2.62		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
11.9	754	Total			

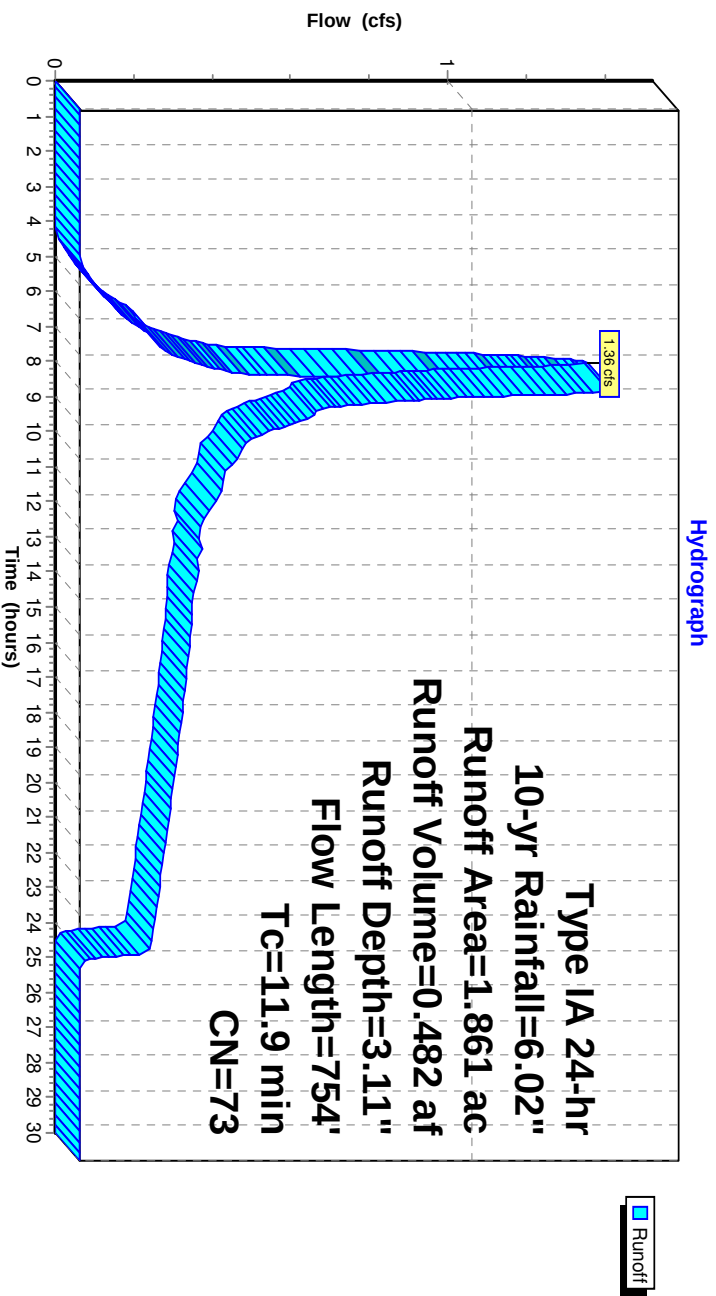
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Page 20

Subcatchment WS-2: Subcat WS-2



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Page 21

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 6.09 cfs @ 8.09 hrs, Volume= 2.260 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.816	75	Annual Grass, Good, HSG C
0.207	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
7.472	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.6	521	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.8	127	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.1	128	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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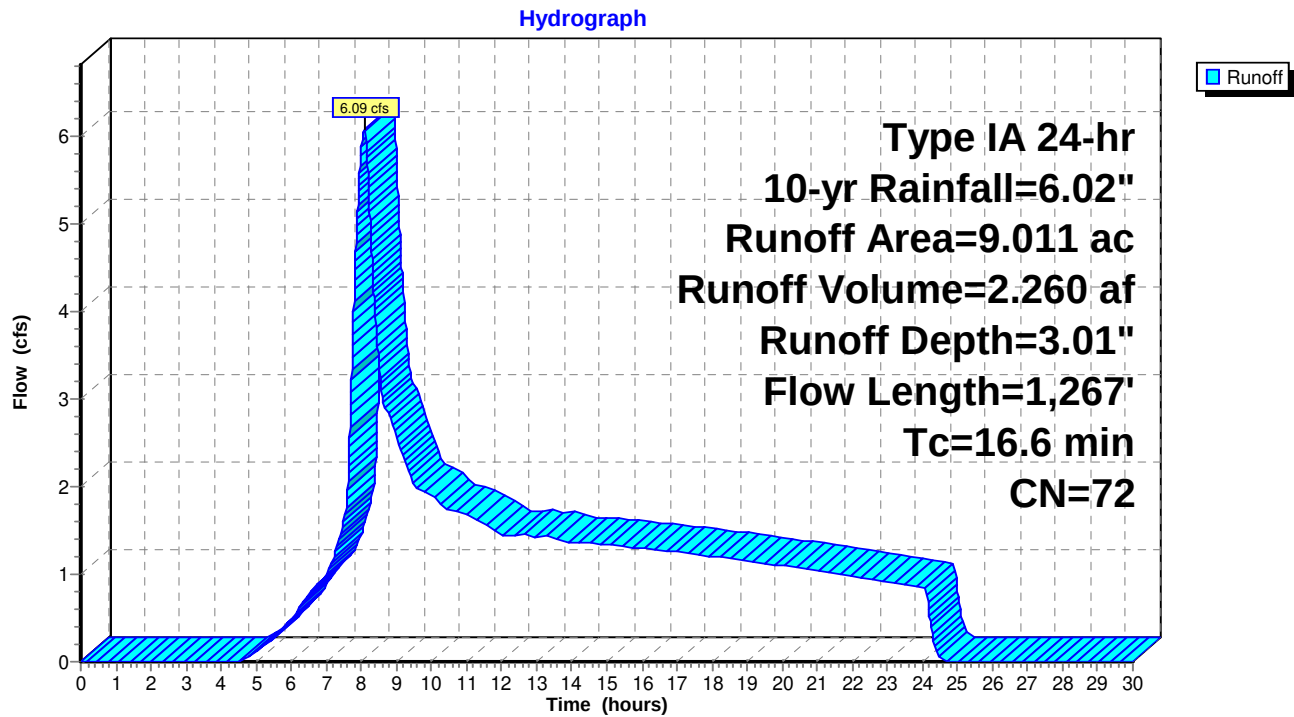
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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 22

Subcatchment WS-3: Subcat WS-3



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Page 23

Summary for Subcatchment WS-4: Subcat WS-4

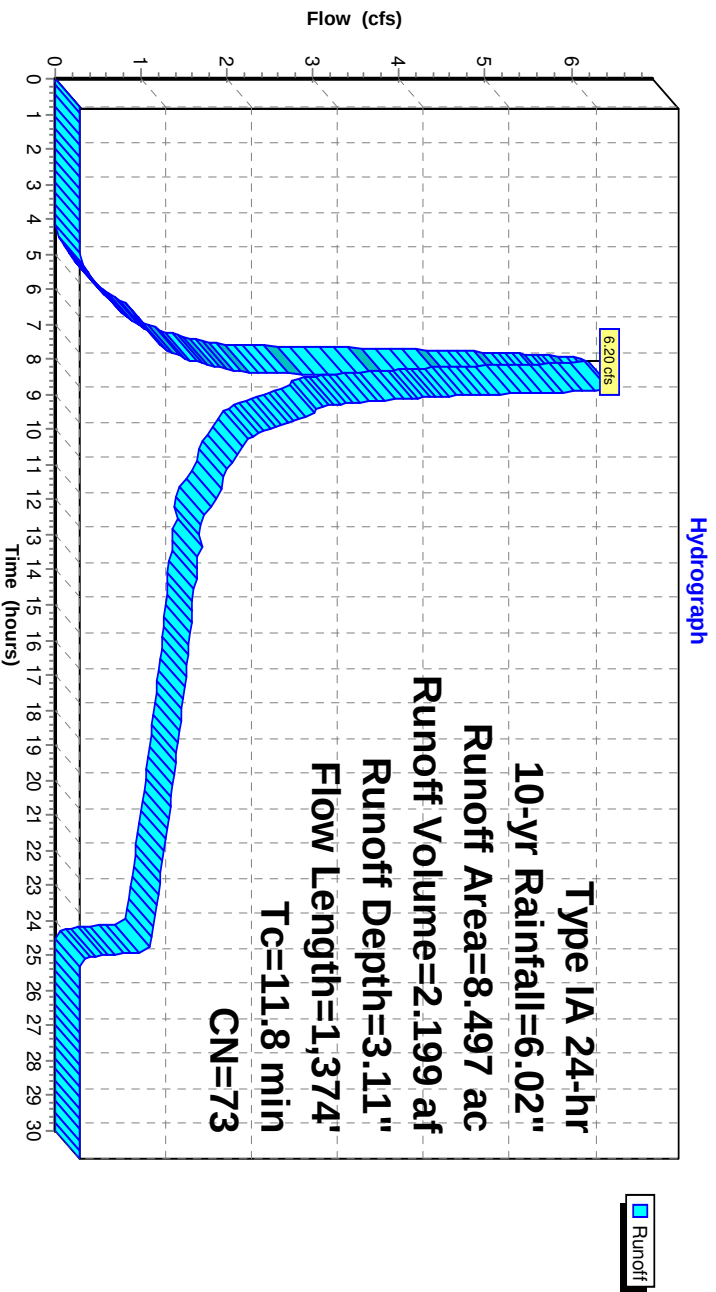
Runoff = 6.20 cfs @ 8.04 hrs, Volume= 2.199 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.935	75	Annual Grass, Good, HSG C
0.105	81	Annual Grass, Good, HSG D
0.193	87	Dirt roads, HSG C
0.104	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
5.614	70	Woods, Good, HSG C
1.468	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
1.8	262	0.1200	2.42		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.5	60	0.1500	1.94		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017 Concrete, unfinished
11.8	1,374	Total			

Subcatchment WS-4: Subcat WS-4



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Page 25

Summary for Reach 2R: Reach 1A - Ditch

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

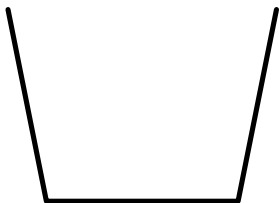
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

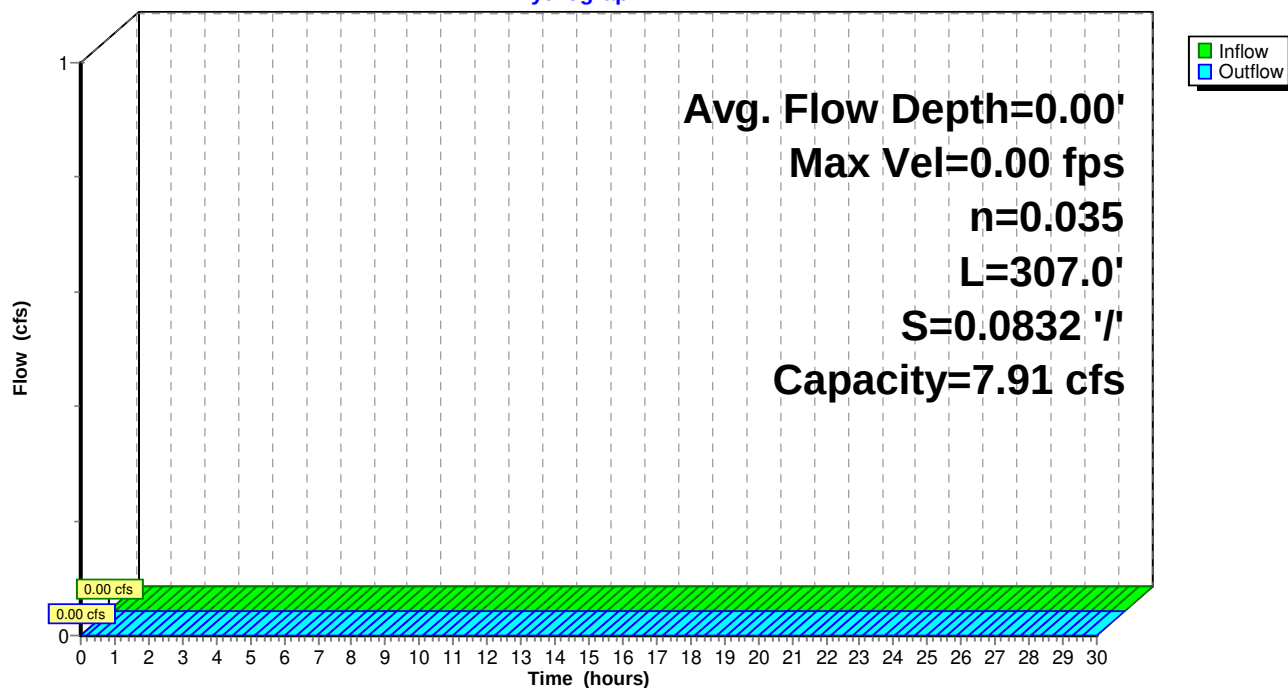
Length= 307.0' Slope= 0.0832 '/'

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 26

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 3.03" for 10-yr event
Inflow = 7.42 cfs @ 8.07 hrs, Volume= 2.742 af
Outflow = 7.42 cfs @ 8.08 hrs, Volume= 2.742 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 8.25 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 4.99 fps, Avg. Travel Time= 1.5 min

Peak Storage= 416 cf @ 8.08 hrs

Average Depth at Peak Storage= 0.78' , Surface Width= 1.31'

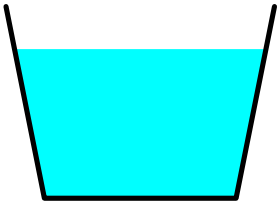
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 ' / ' Top Width= 1.40'

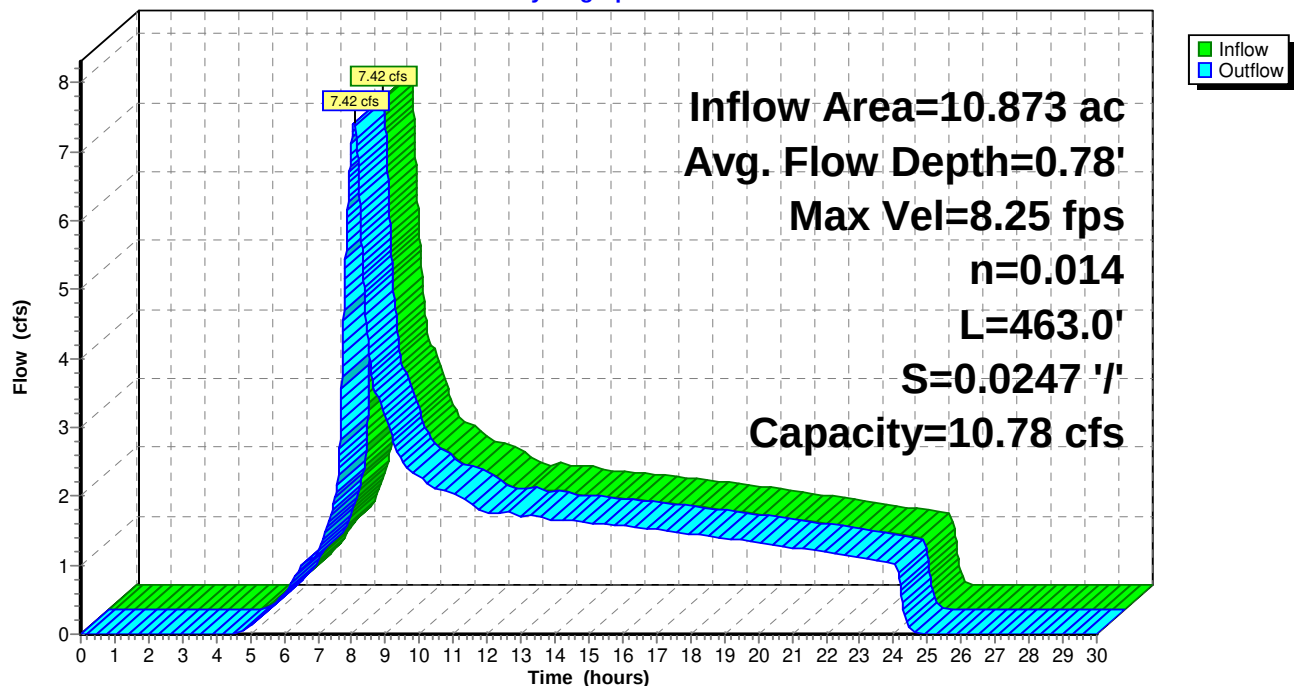
Length= 463.0' Slope= 0.0247 ' / '

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 27

Summary for Reach 5R: Reach 1B - 12" SW

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

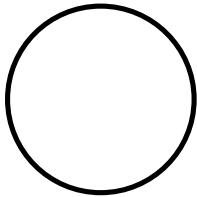
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

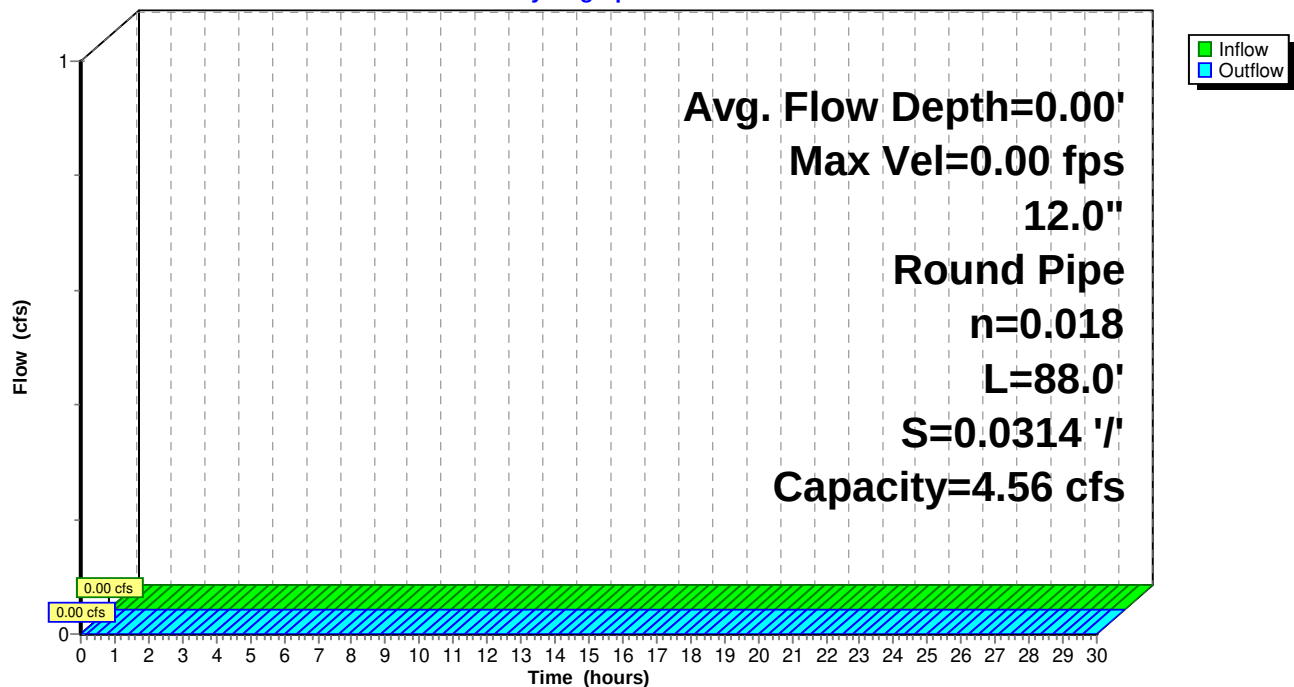
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



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Page 28

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 3.11" for 10-yr event
Inflow = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af
Outflow = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 273.75' @ 8.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=1.36 cfs @ 8.03 hrs HW=273.75' TW=267.98' (Dynamic Tailwater)

↑**1=Culvert** (Passes 1.36 cfs of 1.64 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 1.36 cfs @ 1.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=272.11' TW=273.81' (Dynamic Tailwater)

↑**3=Custom Weir/Orifice** (Controls 0.00 cfs)

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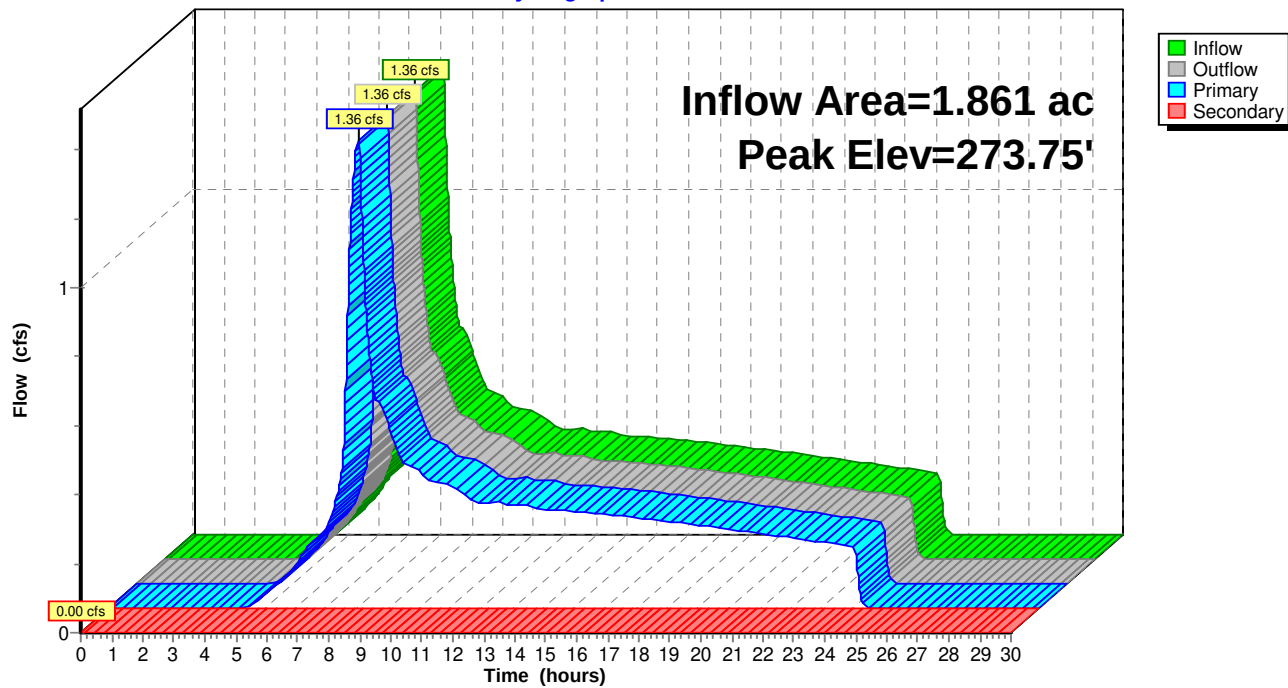
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Page 29

Pond 1P: Catch Basin

Hydrograph



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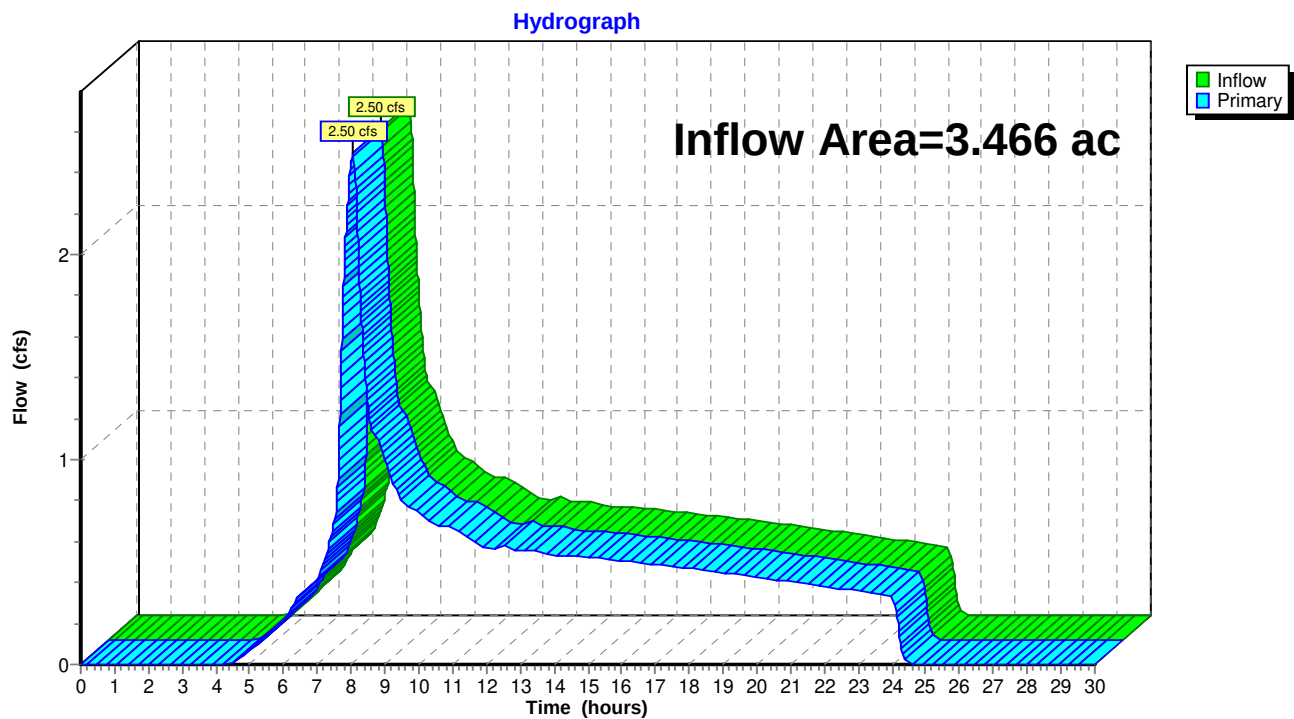
Page 30

Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 3.11" for 10-yr event
Inflow = 2.50 cfs @ 8.05 hrs, Volume= 0.897 af
Primary = 2.50 cfs @ 8.05 hrs, Volume= 0.897 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet



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Page 31

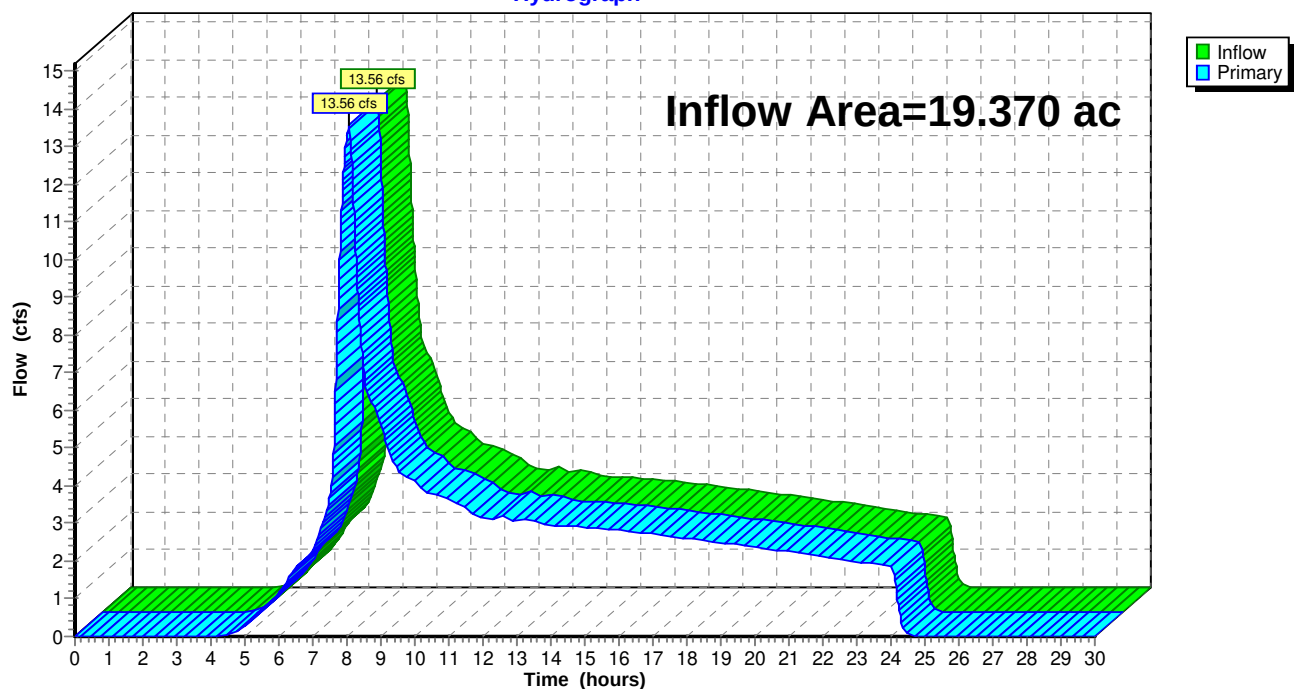
Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 3.06" for 10-yr event
Inflow = 13.56 cfs @ 8.06 hrs, Volume= 4.941 af
Primary = 13.56 cfs @ 8.06 hrs, Volume= 4.941 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 32

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 4.11 cfs @ 8.05 hrs, Volume= 1.399 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.681	75	Annual Grass, Good, HSG C
0.158	81	Annual Grass, Good, HSG D
0.176	87	Dirt roads, HSG C
2.200	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

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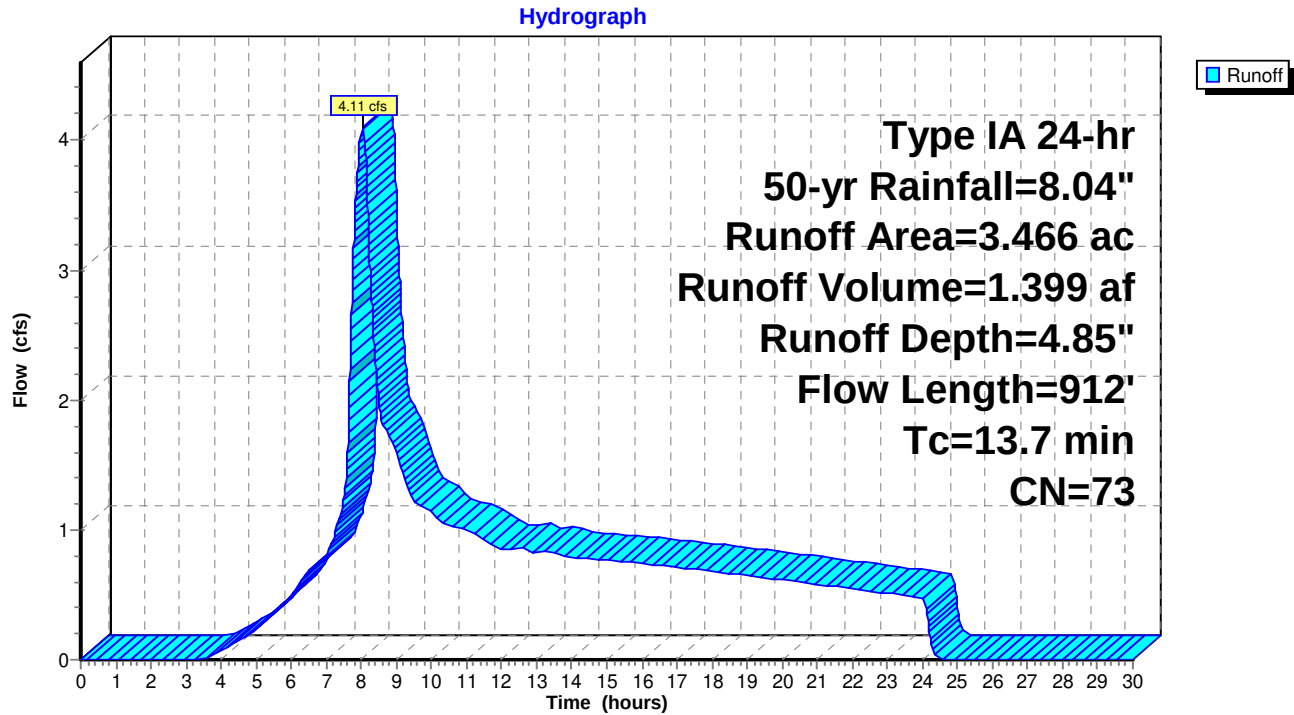
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Page 33

Subcatchment WS-1: Subcat WS-1



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Page 34

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 2.23 cfs @ 8.03 hrs, Volume= 0.752 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.827	75	Annual Grass, Good, HSG C
0.092	87	Dirt roads, HSG C
0.943	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow
					Woods: Dense underbrush n= 0.800 P2= 4.05"
1.8	199	0.1300	1.80		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.6	98	0.1400	2.62		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
11.9	754	Total			

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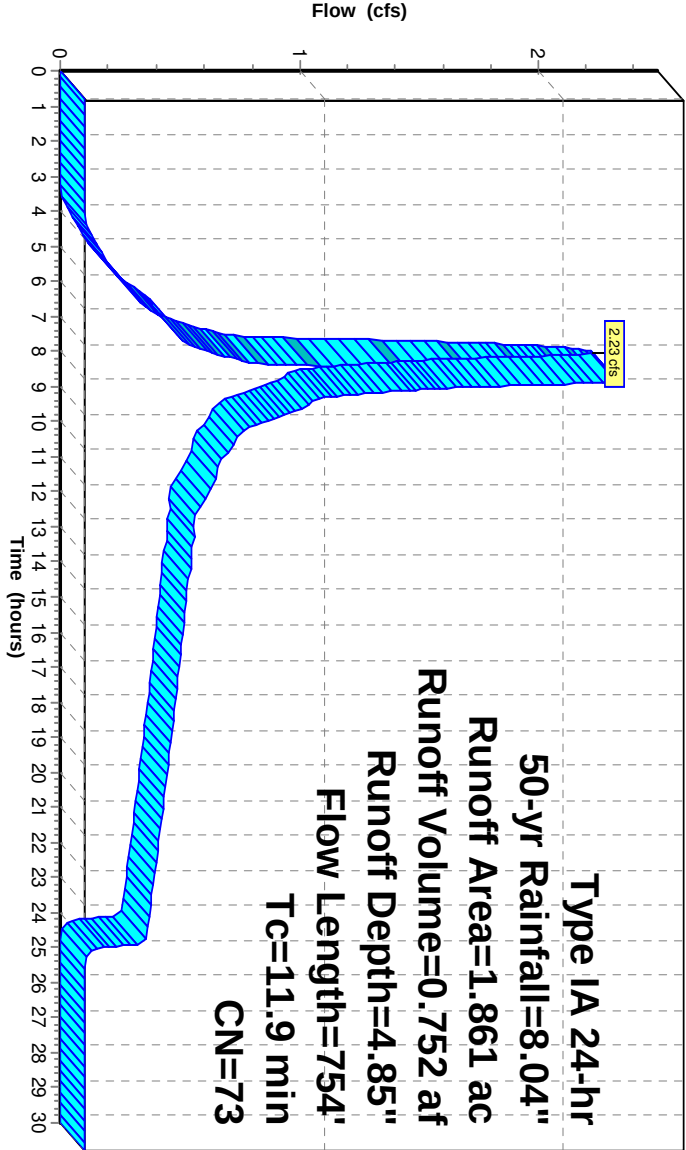
Type IA 24-hr 50-yr Rainfall=8.04"

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Page 35

Subcatchment WS-2: Subcat WS-2

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 36

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 10.15 cfs @ 8.07 hrs, Volume= 3.552 af, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.816	75	Annual Grass, Good, HSG C
0.207	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
7.472	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.6	521	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.8	127	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.1	128	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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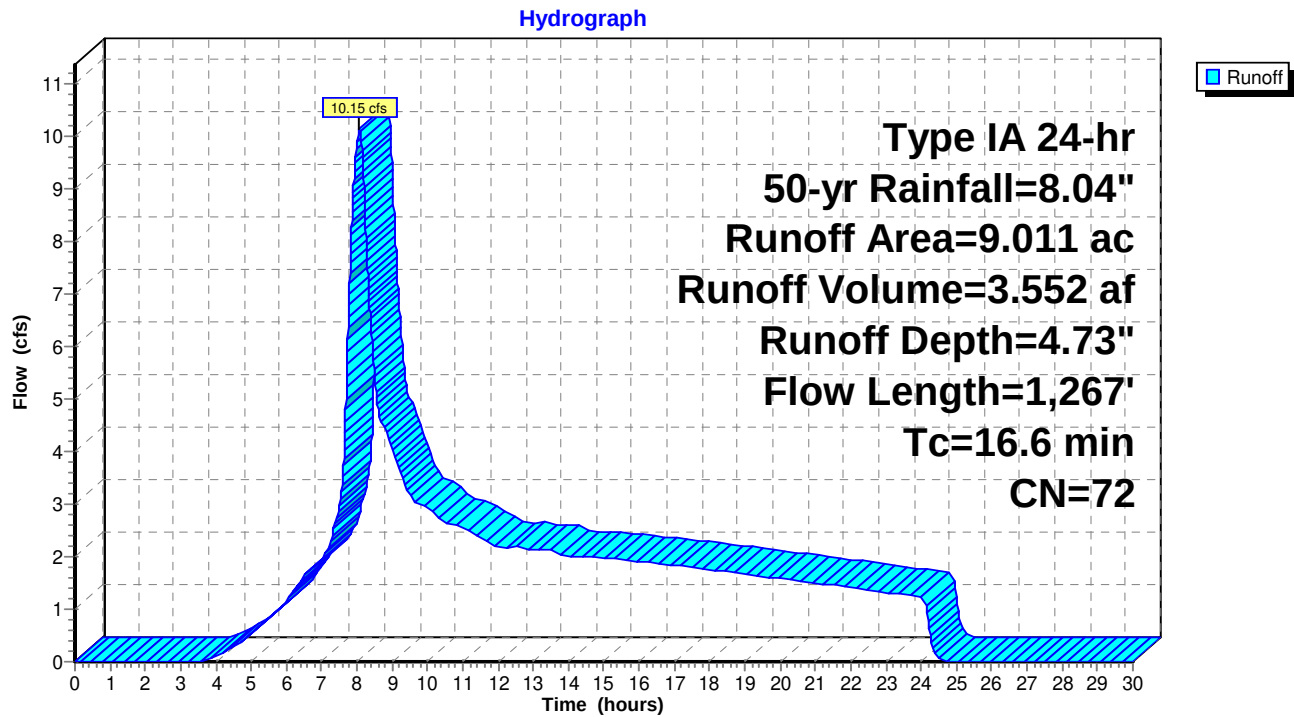
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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 37

Subcatchment WS-3: Subcat WS-3



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 38

Summary for Subcatchment WS-4: Subcat WS-4

Runoff = 10.17 cfs @ 8.03 hrs, Volume= 3.431 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.935	75	Annual Grass, Good, HSG C
0.105	81	Annual Grass, Good, HSG D
0.193	87	Dirt roads, HSG C
0.104	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
5.614	70	Woods, Good, HSG C
1.468	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
1.8	262	0.1200	2.42		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.5	60	0.1500	1.94		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017 Concrete, unfinished
11.8	1,374	Total			

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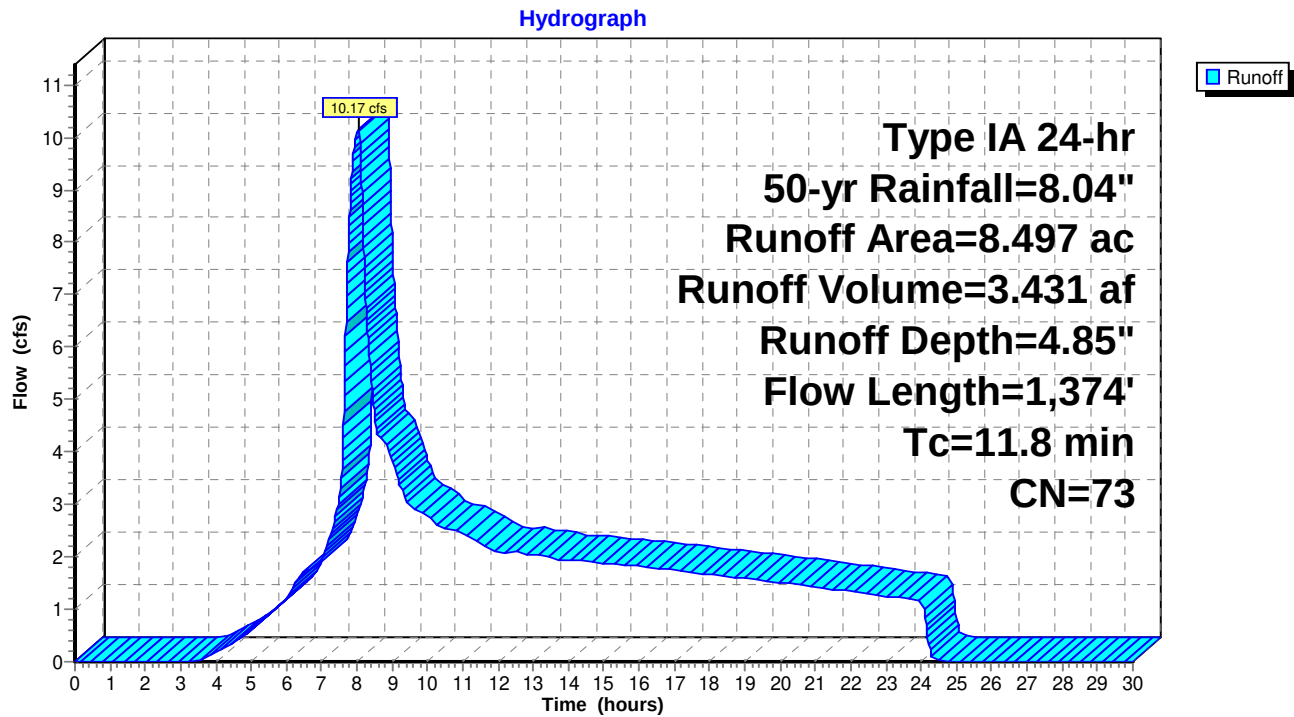
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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 39

Subcatchment WS-4: Subcat WS-4



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Page 40

Summary for Reach 2R: Reach 1A - Ditch

Inflow = 0.57 cfs @ 8.03 hrs, Volume= 0.015 af
Outflow = 0.57 cfs @ 8.04 hrs, Volume= 0.015 af, Atten= 1%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.18 fps, Min. Travel Time= 1.6 min

Avg. Velocity= 1.33 fps, Avg. Travel Time= 3.9 min

Peak Storage= 55 cf @ 8.04 hrs

Average Depth at Peak Storage= 0.17', Surface Width= 1.07'

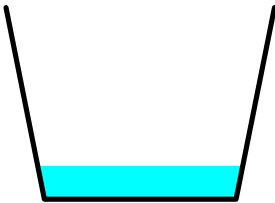
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

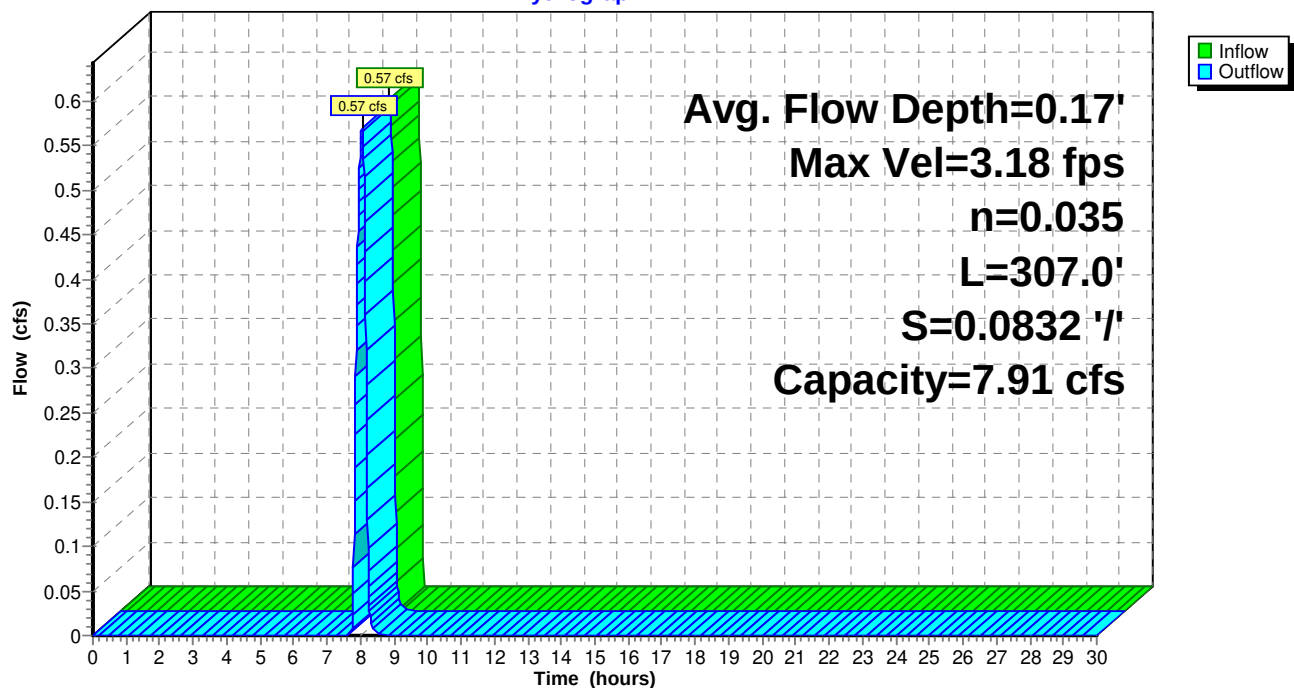
Length= 307.0' Slope= 0.0832 '/'

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 41

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 4.73" for 50-yr event
Inflow = 11.80 cfs @ 8.07 hrs, Volume= 4.289 af
Outflow = 11.79 cfs @ 8.08 hrs, Volume= 4.289 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 9.15 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 5.60 fps, Avg. Travel Time= 1.4 min

Peak Storage= 596 cf @ 8.08 hrs

Average Depth at Peak Storage= 1.06' , Surface Width= 1.43'

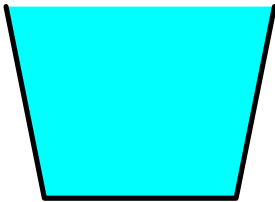
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

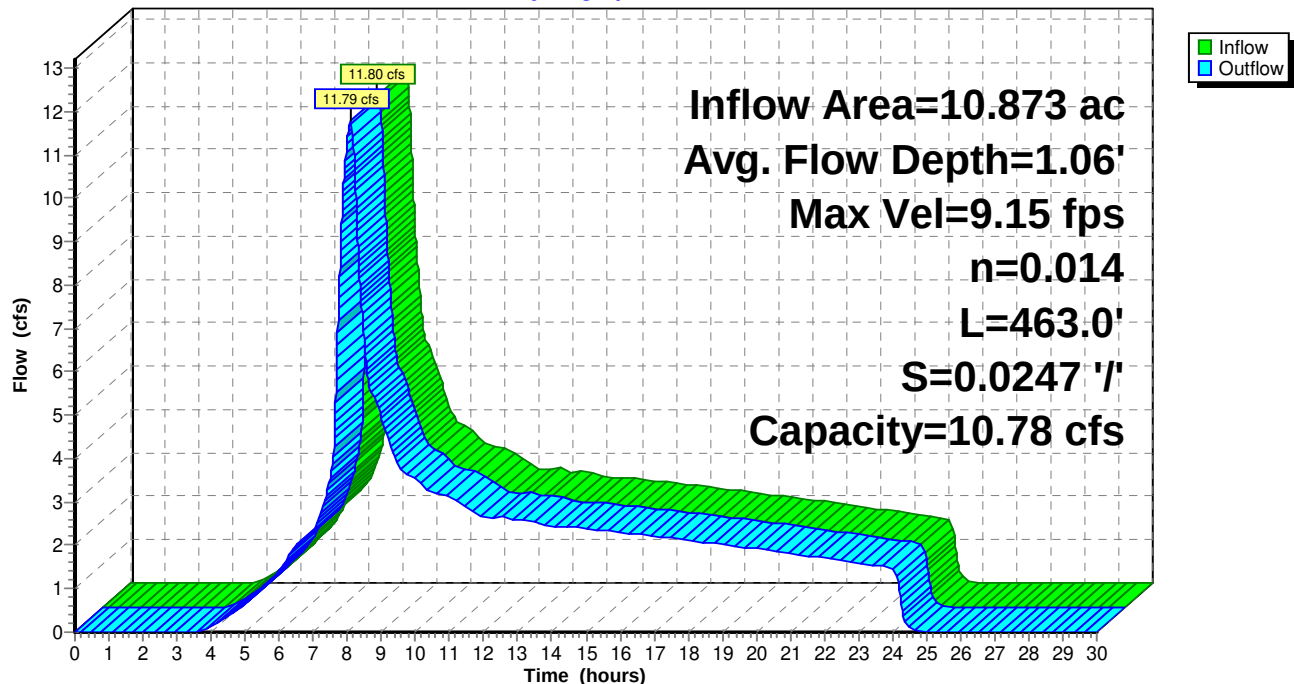
Length= 463.0' Slope= 0.0247 '/'

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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Summary for Reach 5R: Reach 1B - 12" SW

Inflow	=	0.57 cfs @	8.04 hrs,	Volume=	0.015 af
Outflow	=	0.57 cfs @	8.05 hrs,	Volume=	0.015 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.96 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 1.63 fps, Avg. Travel Time= 0.9 min

Peak Storage= 13 cf @ 8.05 hrs

Average Depth at Peak Storage= 0.24' , Surface Width= 0.85'

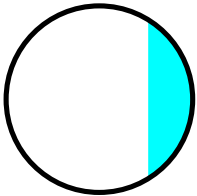
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

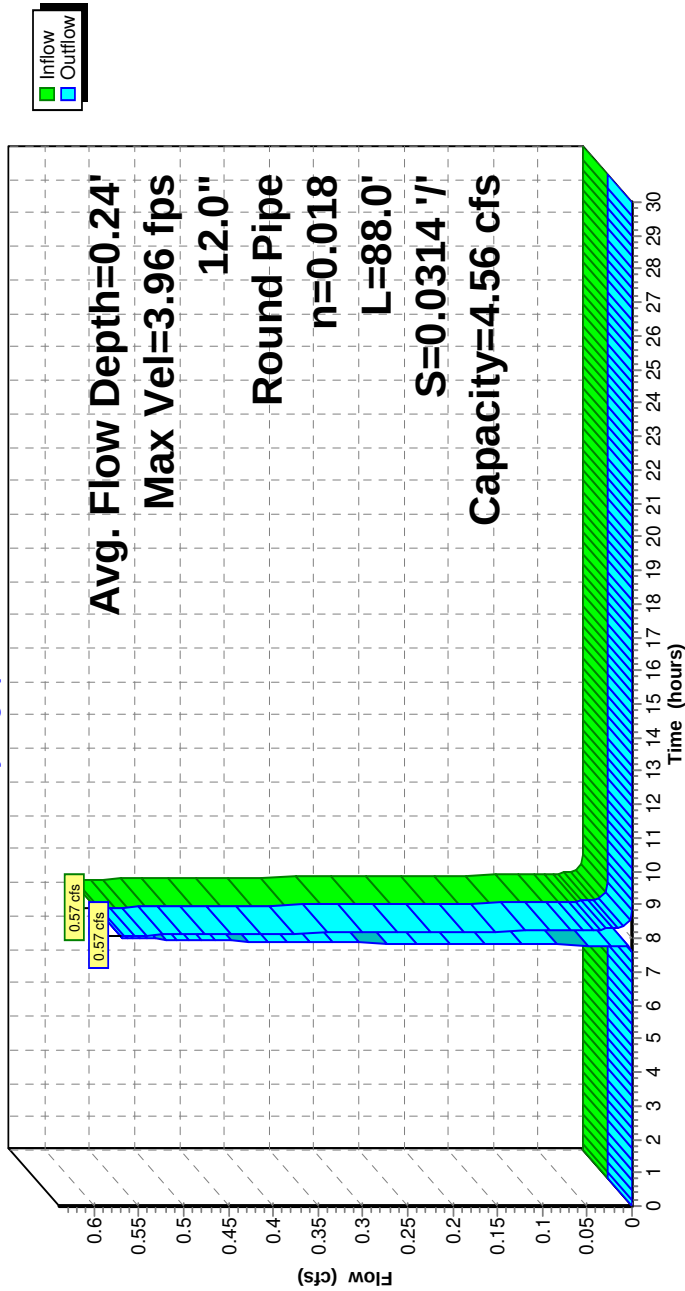
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



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Page 43

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 4.85" for 50-yr event
 Inflow = 2.23 cfs @ 8.03 hrs, Volume= 0.752 af
 Outflow = 2.23 cfs @ 8.03 hrs, Volume= 0.752 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.66 cfs @ 7.87 hrs, Volume= 0.737 af
 Secondary = 0.57 cfs @ 8.03 hrs, Volume= 0.015 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 274.15' @ 8.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=1.65 cfs @ 7.87 hrs HW=274.07' TW=268.16' (Dynamic Tailwater)

1=Culvert (Outlet Controls 1.65 cfs @ 4.74 fps)

2=Orifice/Grate (Passes 1.65 cfs of 4.73 cfs potential flow)
Secondary OutFlow Max=0.57 cfs @ 8.03 hrs HW=274.15' TW=273.98' (Dynamic Tailwater)

3=Custom Weir/Orifice (Weir Controls 0.57 cfs @ 1.68 fps)

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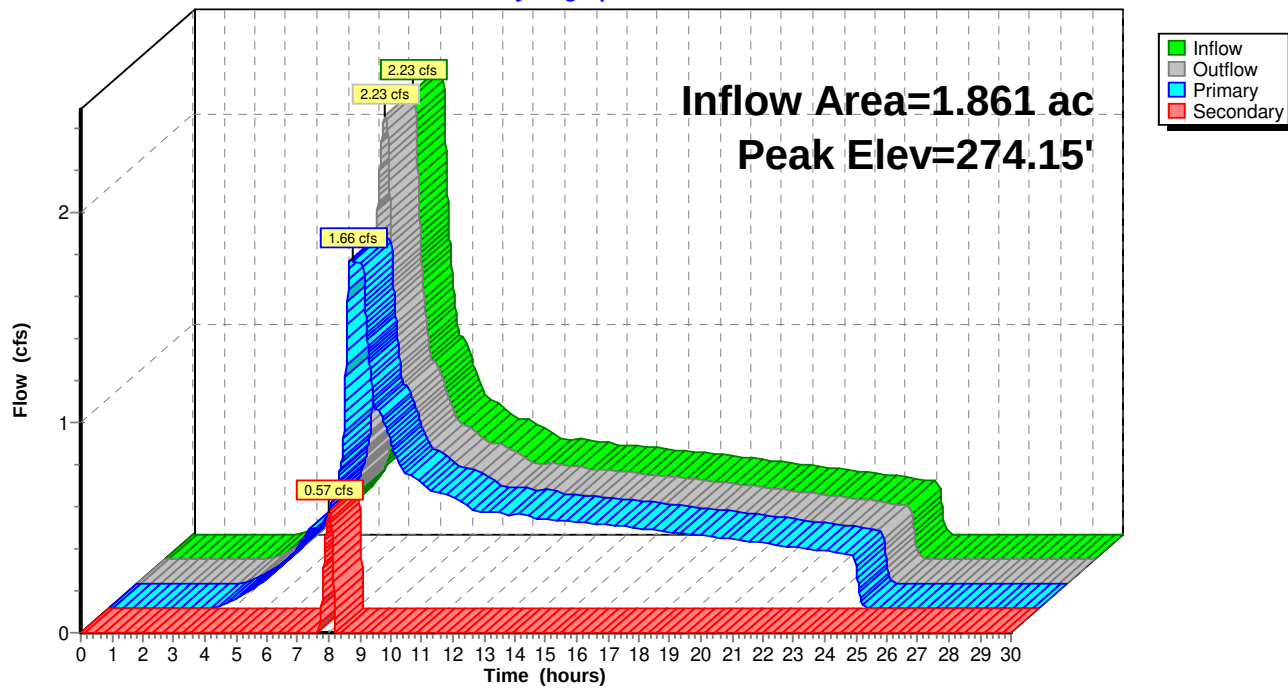
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Page 44

Pond 1P: Catch Basin

Hydrograph



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Page 45

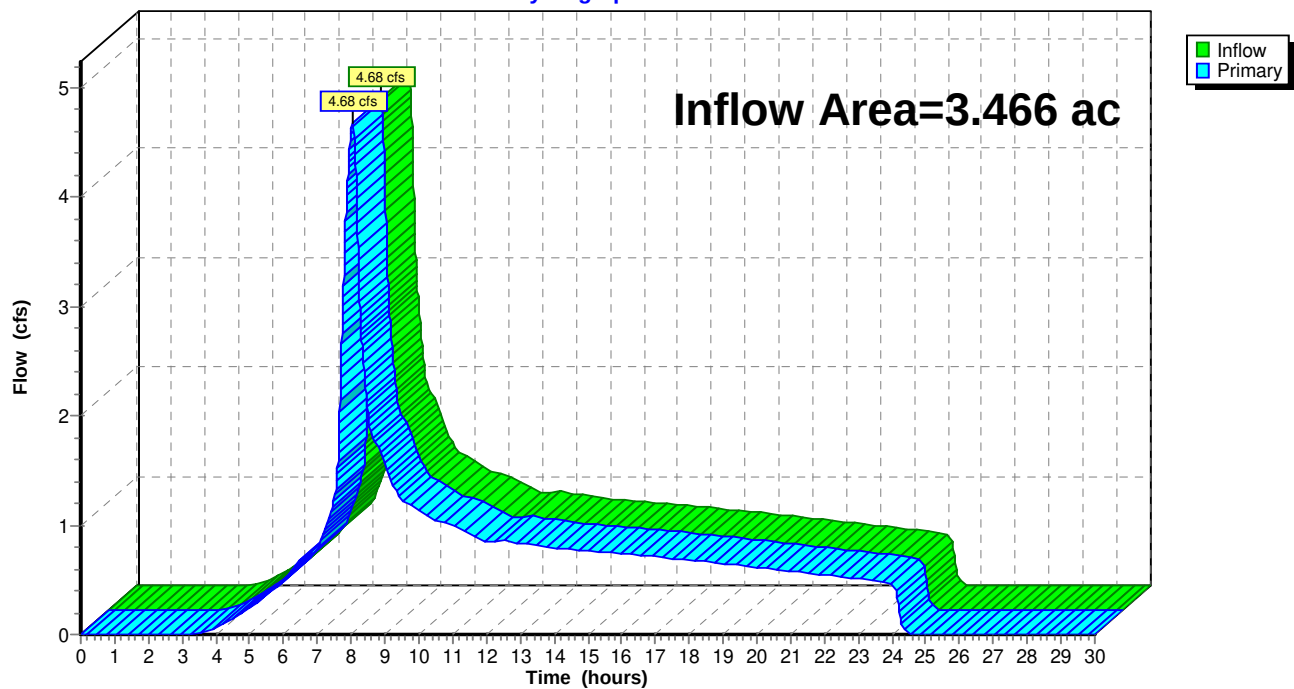
Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 4.90" for 50-yr event
Inflow = 4.68 cfs @ 8.05 hrs, Volume= 1.414 af
Primary = 4.68 cfs @ 8.05 hrs, Volume= 1.414 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 46

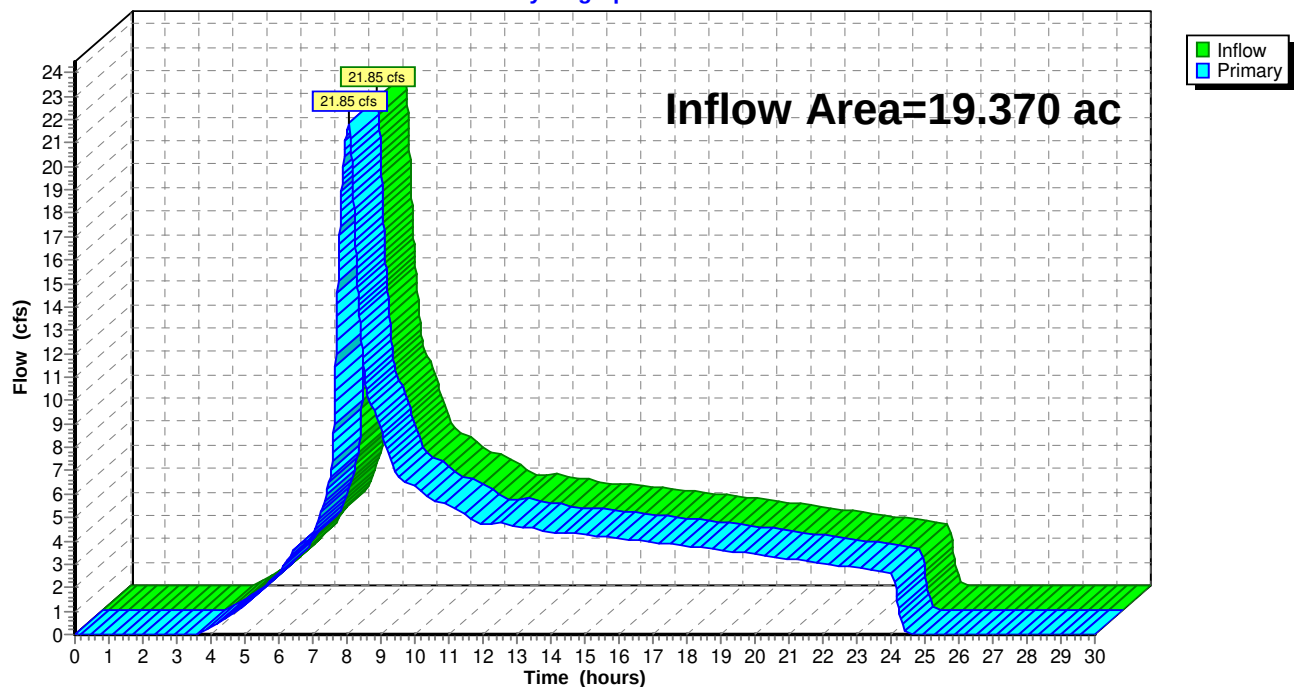
Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 4.78" for 50-yr event
Inflow = 21.85 cfs @ 8.06 hrs, Volume= 7.720 af
Primary = 21.85 cfs @ 8.06 hrs, Volume= 7.720 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

Hydrograph



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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 47

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 4.81 cfs @ 8.05 hrs, Volume= 1.619 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.681	75	Annual Grass, Good, HSG C
0.158	81	Annual Grass, Good, HSG D
0.176	87	Dirt roads, HSG C
2.200	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

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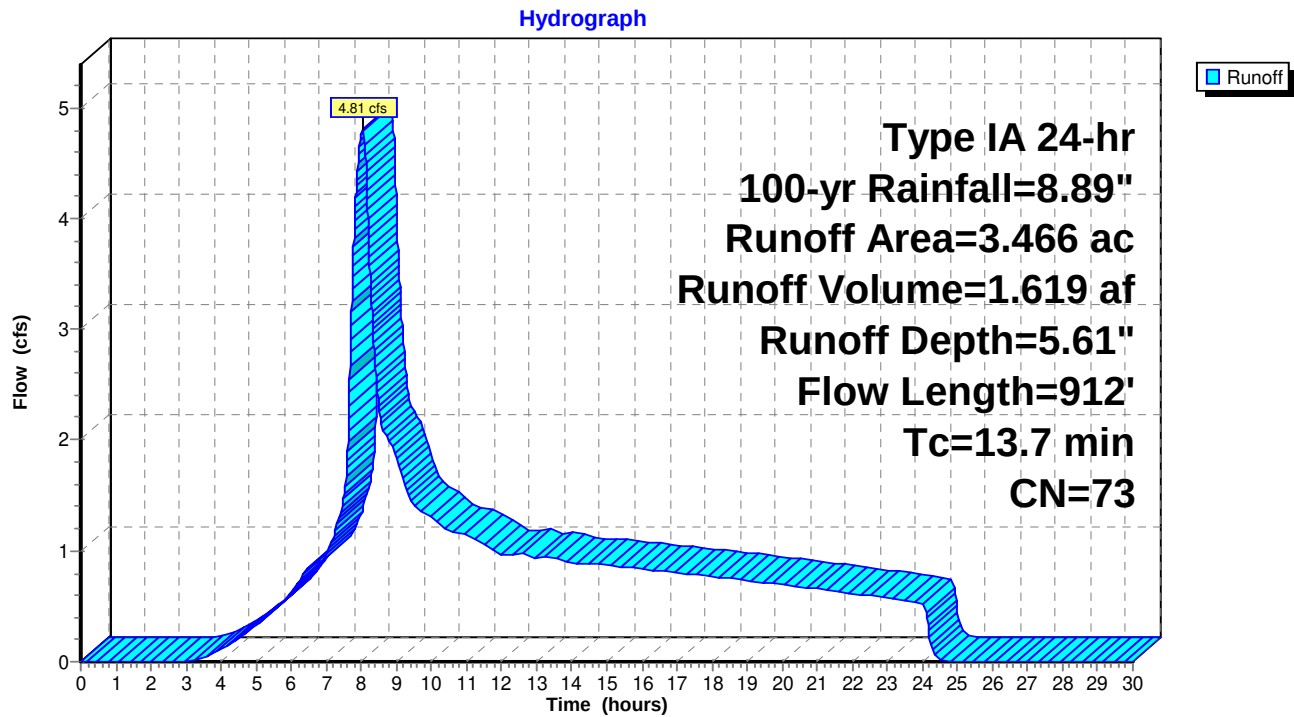
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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 48

Subcatchment WS-1: Subcat WS-1



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Page 49

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 2.61 cfs @ 8.02 hrs, Volume= 0.870 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.827	75	Annual Grass, Good, HSG C
0.092	87	Dirt roads, HSG C
0.943	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

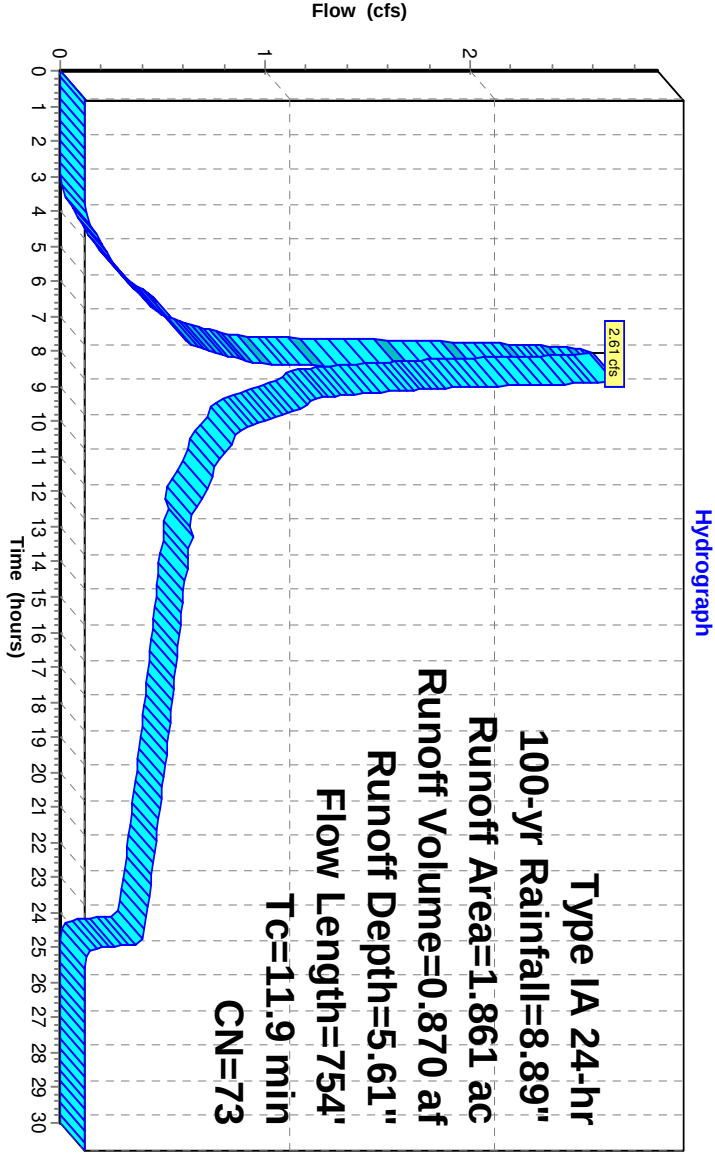
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow
					Woods: Dense underbrush n= 0.800 P2= 4.05"
1.8	199	0.1300	1.80		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.6	98	0.1400	2.62		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
11.9	754	Total			

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Subcatchment WS-2: Subcat WS-2



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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 51

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 11.94 cfs @ 8.06 hrs, Volume= 4.118 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.816	75	Annual Grass, Good, HSG C
0.207	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
7.472	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.6	521	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
0.8	127	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.1	128	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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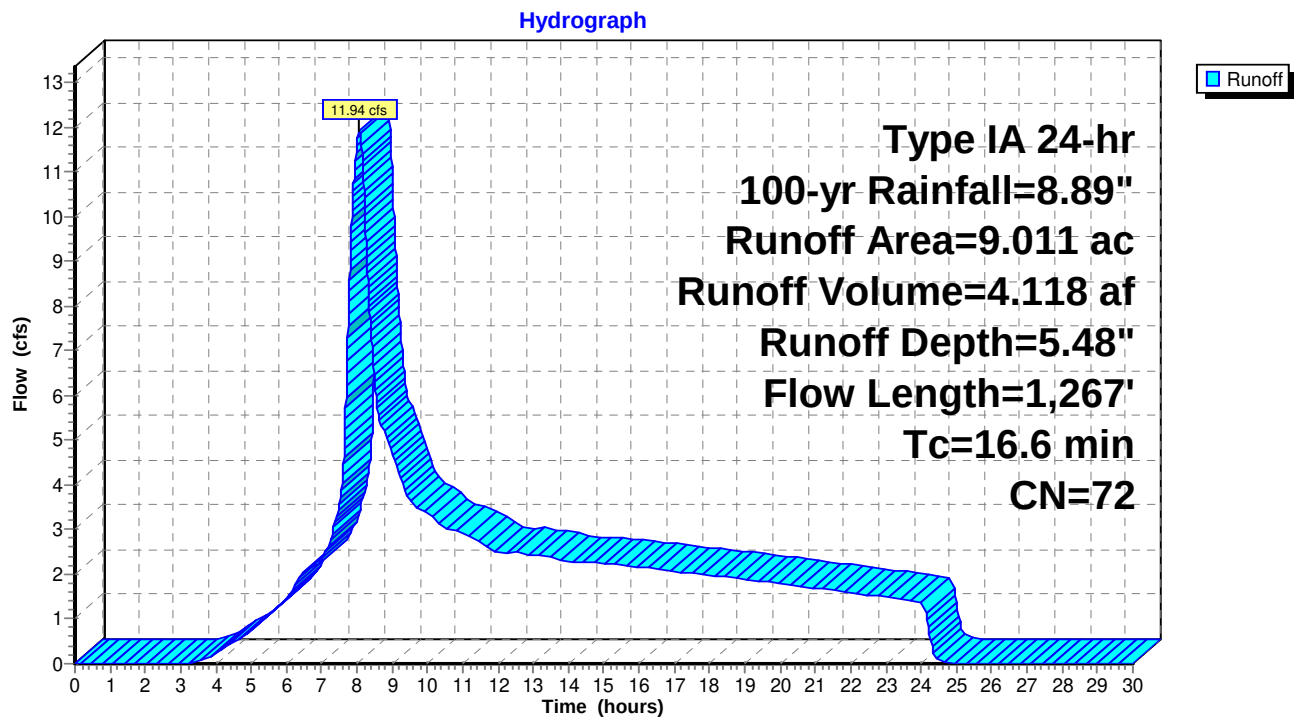
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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 52

Subcatchment WS-3: Subcat WS-3



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Page 53

Summary for Subcatchment WS-4: Subcat WS-4

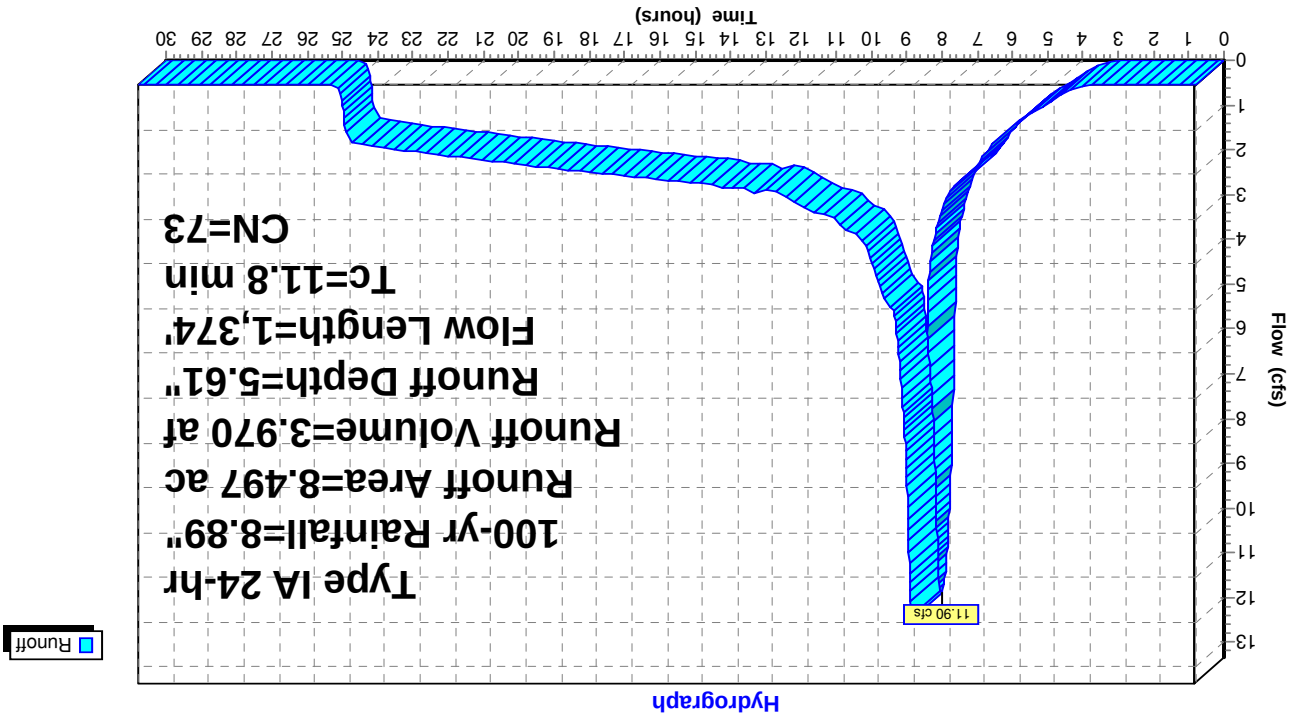
Runoff = 11.90 cfs @ 8.01 hrs, Volume= 3.970 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.935	75	Annual Grass, Good, HSG C
0.105	81	Annual Grass, Good, HSG D
0.193	87	Dirt roads, HSG C
0.104	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
5.614	70	Woods, Good, HSG C
1.468	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
1.8	262	0.1200	2.42		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.5	60	0.1500	1.94		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017 Concrete, unfinished
11.8	1,374	Total			

Subcatchment WS-4: Subcat WS-4



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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 55

Summary for Reach 2R: Reach 1A - Ditch

Inflow = 0.95 cfs @ 8.03 hrs, Volume= 0.030 af
Outflow = 0.95 cfs @ 8.04 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.75 fps, Min. Travel Time= 1.4 min

Avg. Velocity= 1.62 fps, Avg. Travel Time= 3.1 min

Peak Storage= 78 cf @ 8.04 hrs

Average Depth at Peak Storage= 0.24' , Surface Width= 1.10'

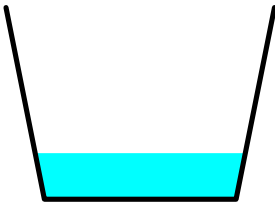
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 ' / ' Top Width= 1.40'

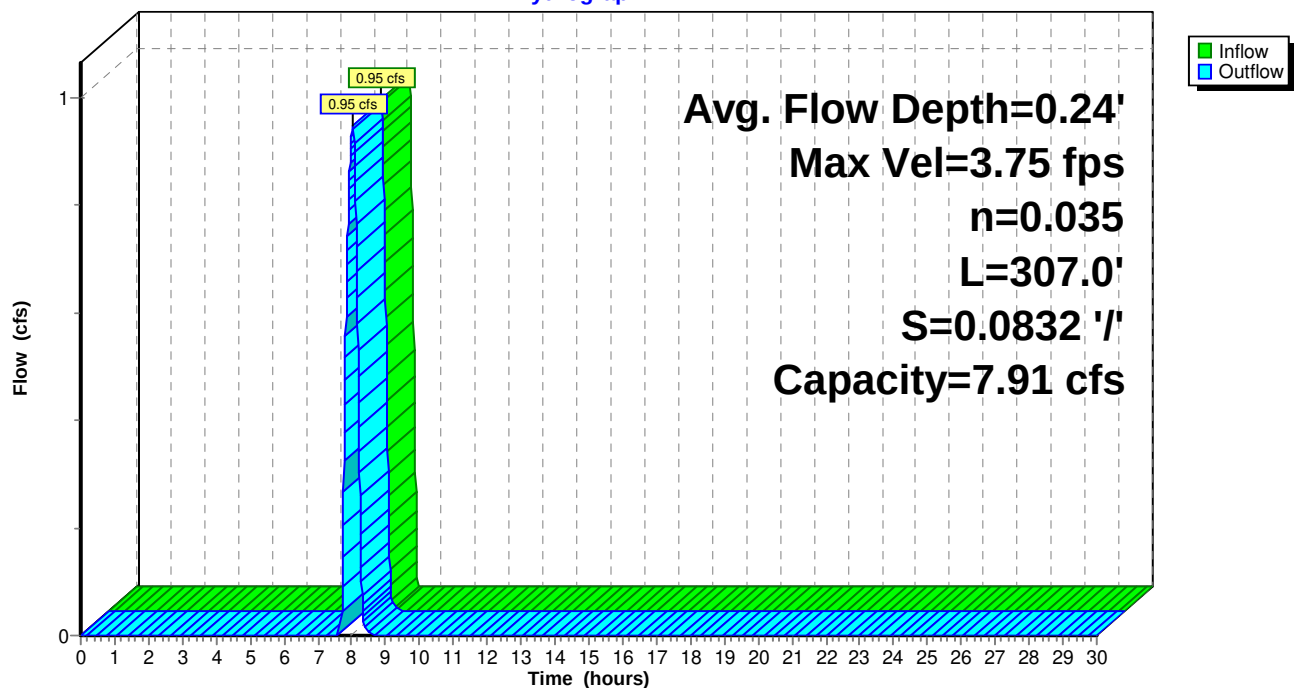
Length= 307.0' Slope= 0.0832 ' / '

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 56

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 5.47" for 100-yr event
Inflow = 13.59 cfs @ 8.06 hrs, Volume= 4.958 af
Outflow = 13.58 cfs @ 8.08 hrs, Volume= 4.958 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 9.41 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 5.81 fps, Avg. Travel Time= 1.3 min

Peak Storage= 668 cf @ 8.08 hrs

Average Depth at Peak Storage= 1.17', Surface Width= 1.47'

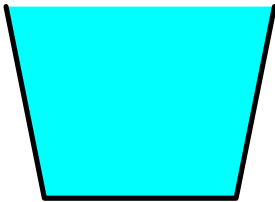
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

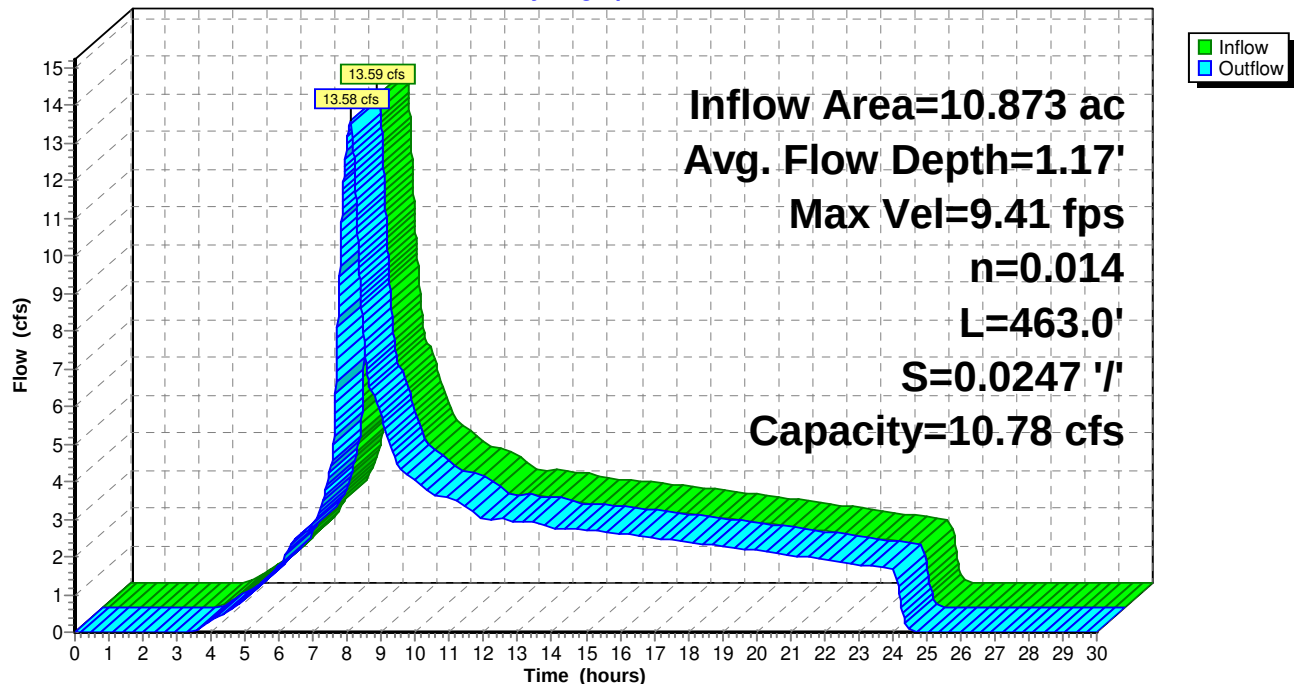
Length= 463.0' Slope= 0.0247 '/'

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 57

Summary for Reach 5R: Reach 1B - 12" SW

Inflow = 0.95 cfs @ 8.04 hrs, Volume= 0.030 af
Outflow = 0.95 cfs @ 8.04 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 4.58 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.96 fps, Avg. Travel Time= 0.7 min

Peak Storage= 18 cf @ 8.04 hrs

Average Depth at Peak Storage= 0.31', Surface Width= 0.92'

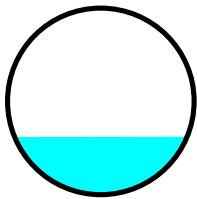
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

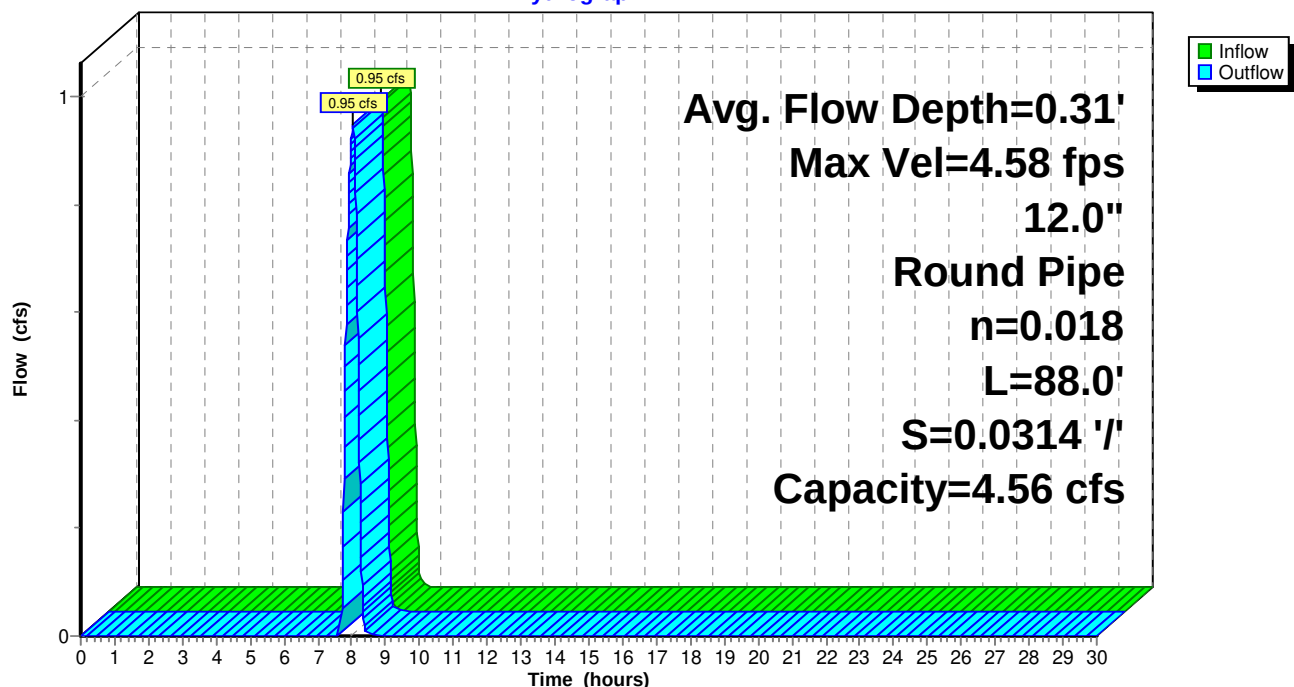
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



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Page 58

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 5.61" for 100-yr event
 Inflow = 2.61 cfs @ 8.02 hrs, Volume= 0.870 af
 Outflow = 2.61 cfs @ 8.02 hrs, Volume= 0.870 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.66 cfs @ 7.79 hrs, Volume= 0.840 af
 Secondary = 0.95 cfs @ 8.03 hrs, Volume= 0.030 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 274.29' @ 8.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=1.66 cfs @ 7.79 hrs HW=274.12' TW=268.16' (Dynamic Tailwater)

1=Culvert (Outlet Controls 1.66 cfs @ 4.76 fps)

2=Orifice/Grate (Passes 1.66 cfs of 4.97 cfs potential flow)
Secondary OutFlow Max=0.95 cfs @ 8.03 hrs HW=274.29' TW=274.05' (Dynamic Tailwater)

3=Custom Weir/Orifice (Weir Controls 0.95 cfs @ 1.99 fps)

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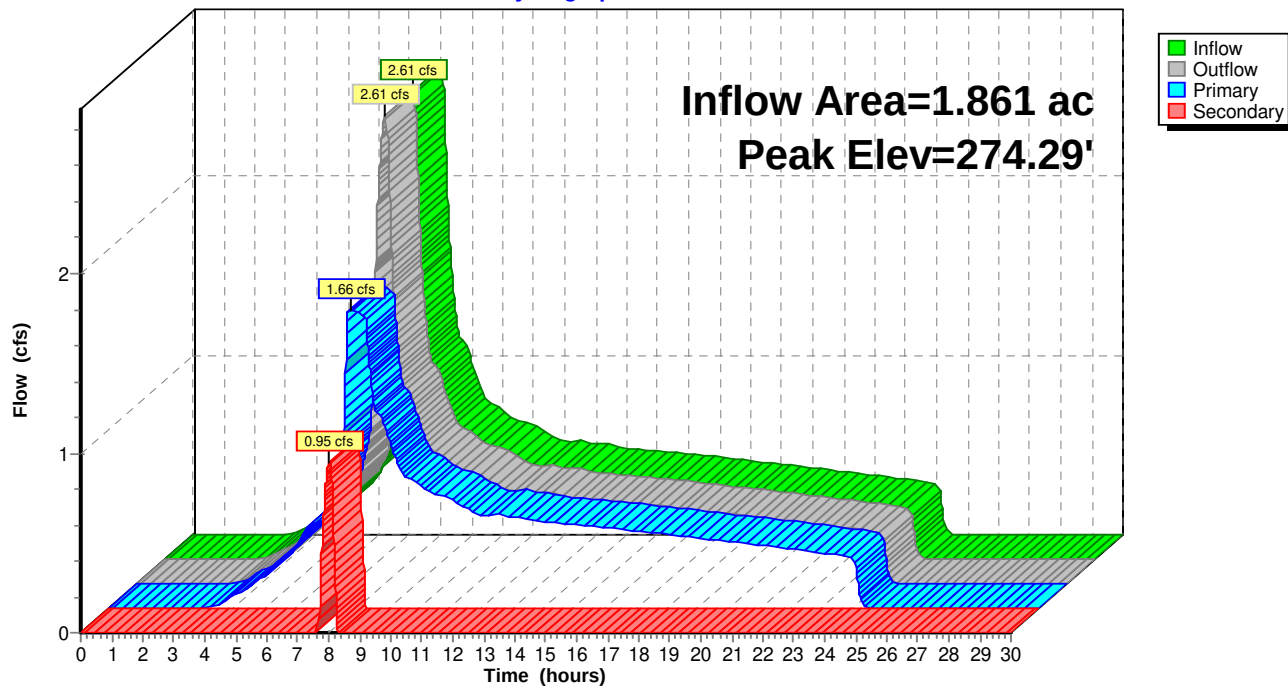
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Page 59

Pond 1P: Catch Basin

Hydrograph



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Page 60

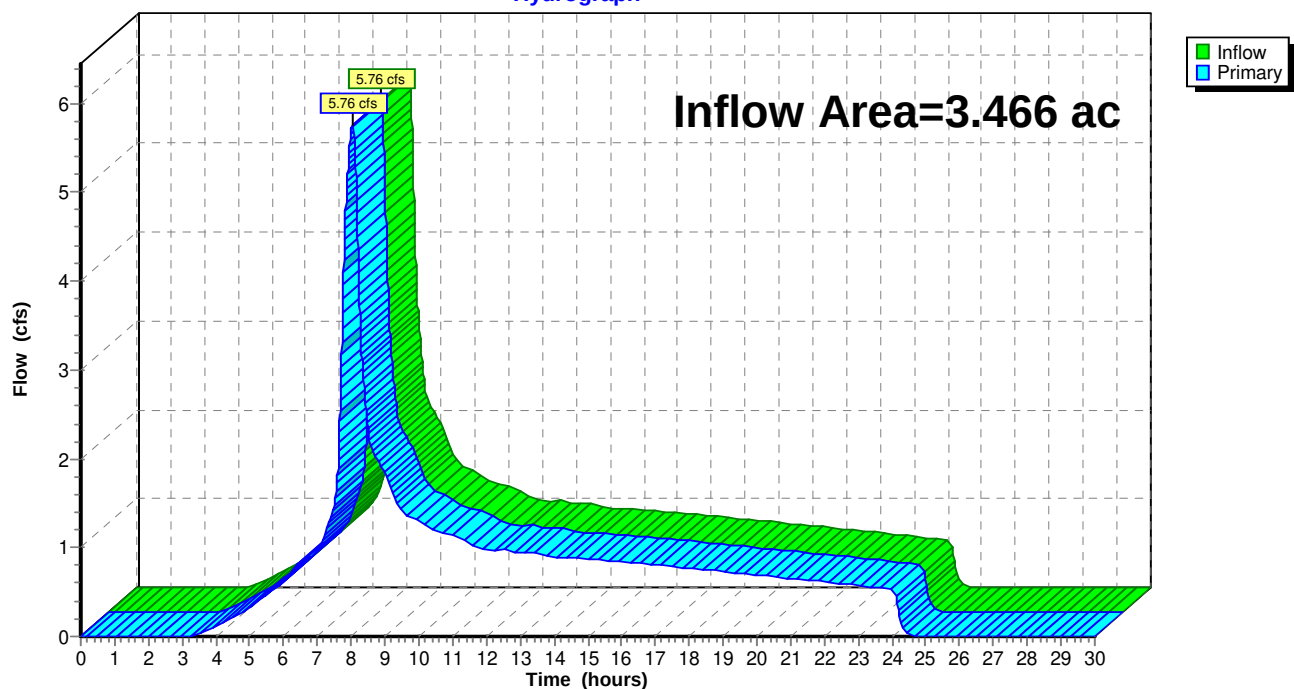
Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 5.71" for 100-yr event
Inflow = 5.76 cfs @ 8.05 hrs, Volume= 1.649 af
Primary = 5.76 cfs @ 8.05 hrs, Volume= 1.649 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet

Hydrograph



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Page 61

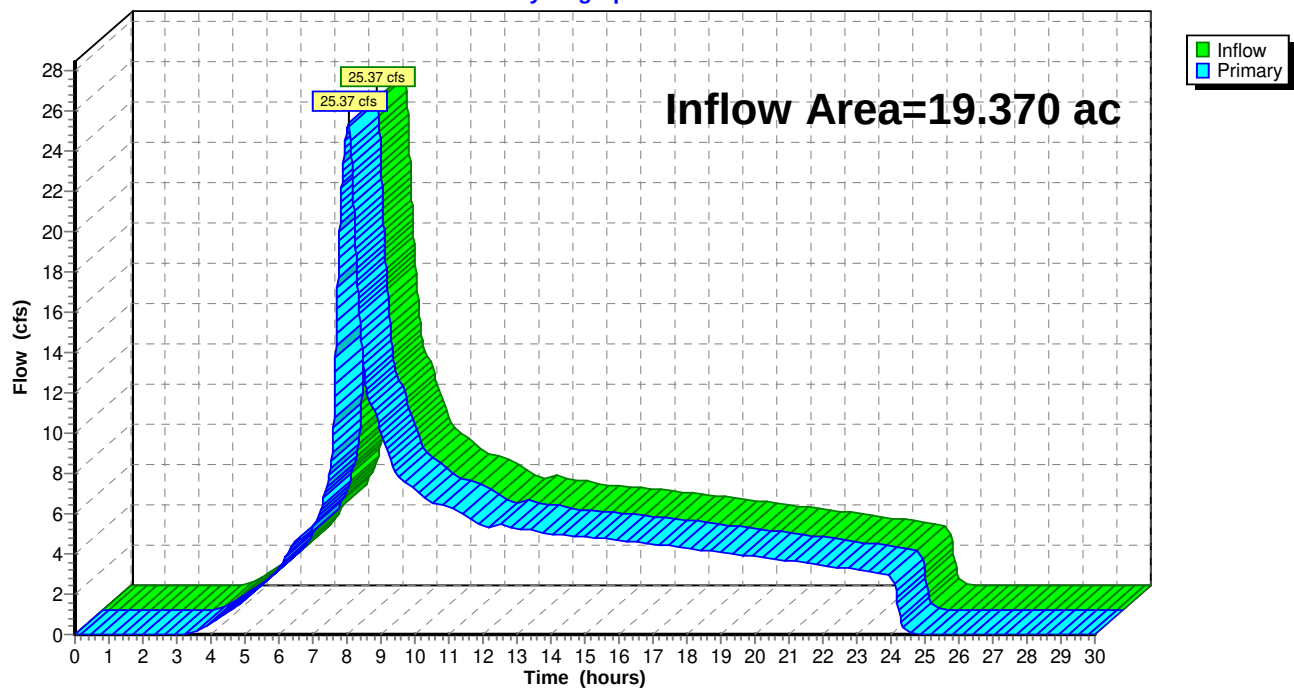
Summary for Link 5L: Outlet 2

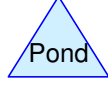
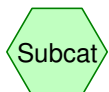
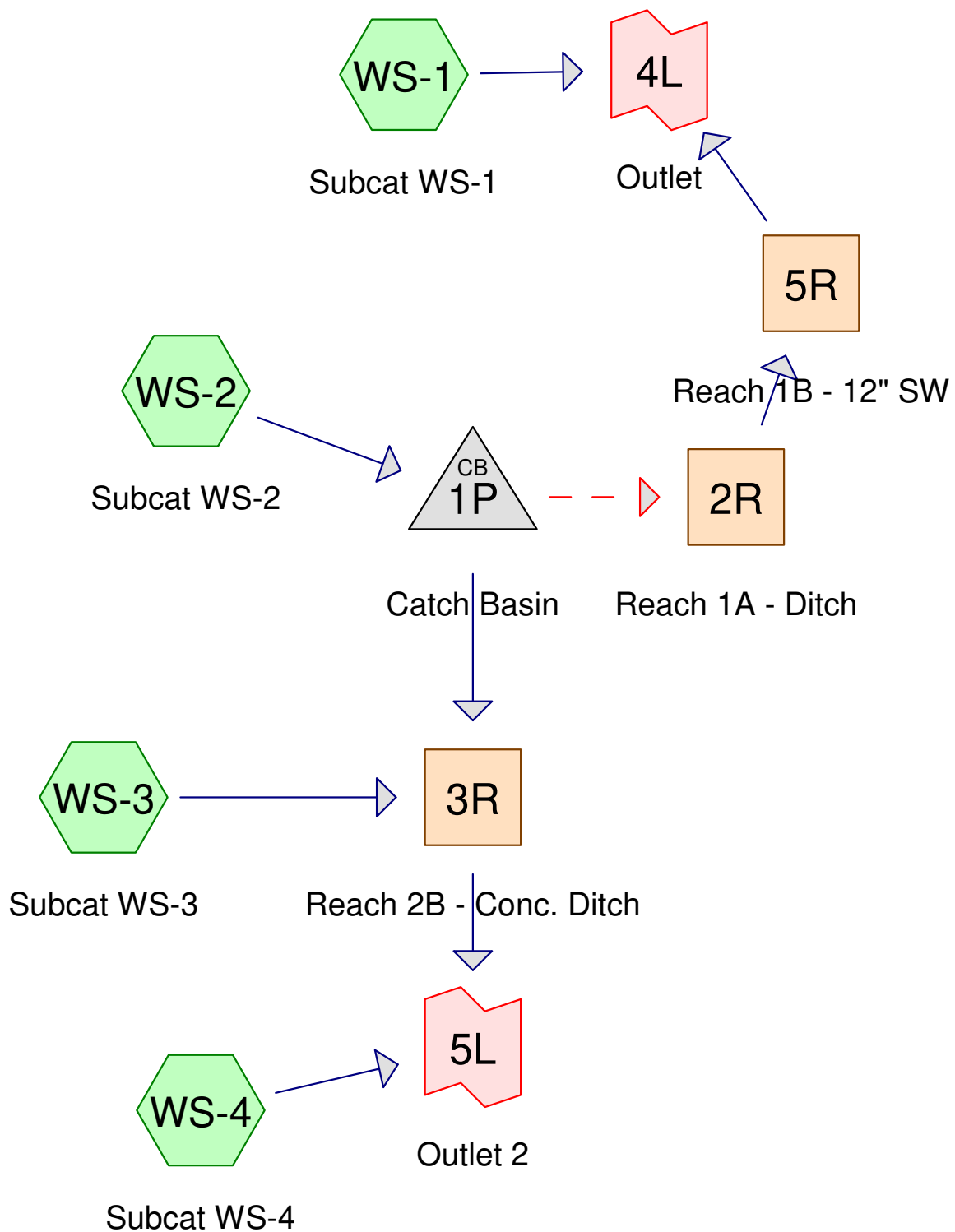
Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 5.53" for 100-yr event
Inflow = 25.37 cfs @ 8.04 hrs, Volume= 8.927 af
Primary = 25.37 cfs @ 8.04 hrs, Volume= 8.927 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

Hydrograph





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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 63

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 1.10 cfs @ 8.08 hrs, Volume= 0.452 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.117	75	Annual Grass, Good, HSG C
0.134	81	Annual Grass, Good, HSG D
0.086	87	Dirt roads, HSG C
1.180	75	Vineyard, Good, HSG C
0.025	81	Vineyard, Good, HSG D
1.674	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

Carmelite Post-Project

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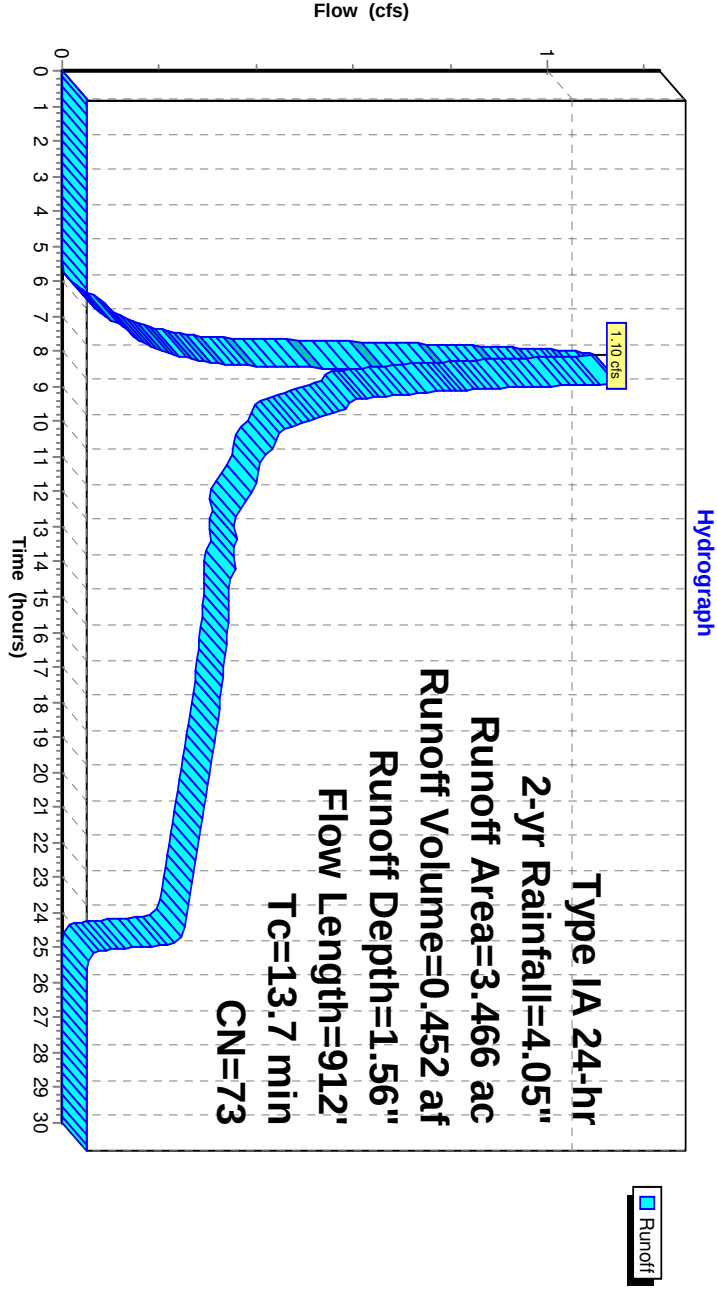
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Subcatchment WS-1: Subcat WS-1



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Page 65

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.102	75	Annual Grass, Good, HSG C
0.004	87	Dirt roads, HSG C
1.187	75	Vineyard, Good, HSG C
0.569	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow Woods: Dense underbrush n= 0.800 P2= 4.05"
1.6	178	0.1400	1.87		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
0.8	119	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
11.9	754	Total			

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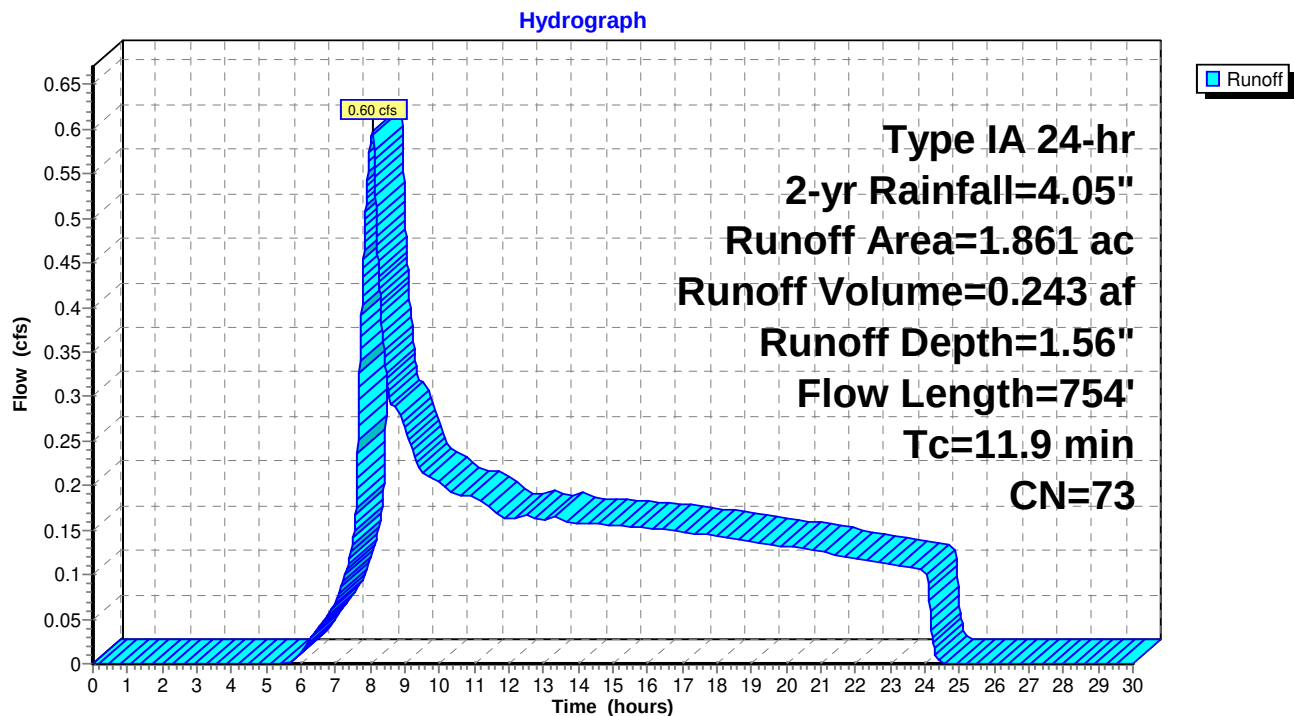
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Page 66

Subcatchment WS-2: Subcat WS-2



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Page 67

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 2.59 cfs @ 8.10 hrs, Volume= 1.123 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.639	75	Annual Grass, Good, HSG C
0.190	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
0.289	75	Vineyard, Good, HSG C
7.377	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.5	499	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
1.0	152	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.0	125	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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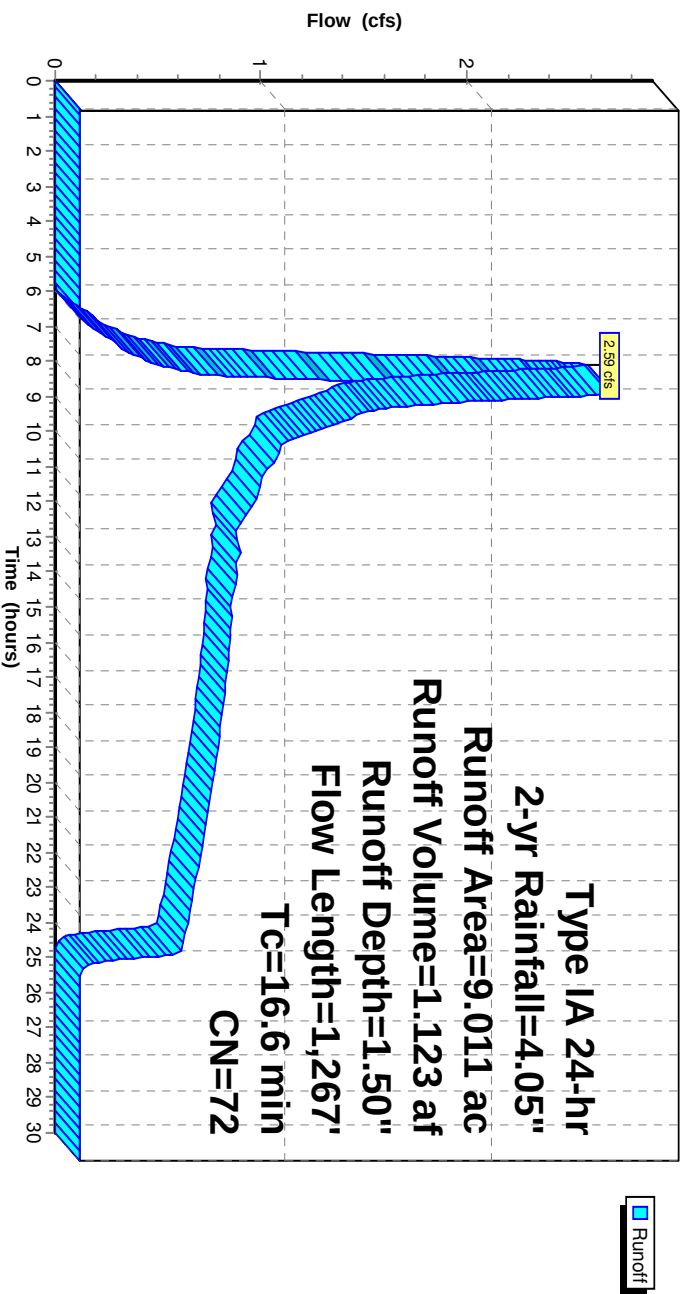
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Page 68

Subcatchment WS-3: Subcat WS-3

Hydrograph



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Page 69

Summary for Subcatchment WS-4: Subcat WS-4

Runoff = 2.74 cfs @ 8.06 hrs, Volume= 1.107 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-yr Rainfall=4.05"

Area (ac)	CN	Description
0.033	75	Annual Grass, Good, HSG C
0.084	81	Annual Grass, Good, HSG D
0.116	87	Dirt roads, HSG C
0.075	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
1.469	75	Vineyard, Good, HSG C
0.128	81	Vineyard, Good, HSG D
5.124	70	Woods, Good, HSG C
1.390	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
2.0	285	0.1200	2.42		Shallow Concentrated Flow, Shallow - Short Grass Short Grass Pasture Kv= 7.0 fps
0.3	36	0.1700	2.06		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017
11.8	1,373	Total			

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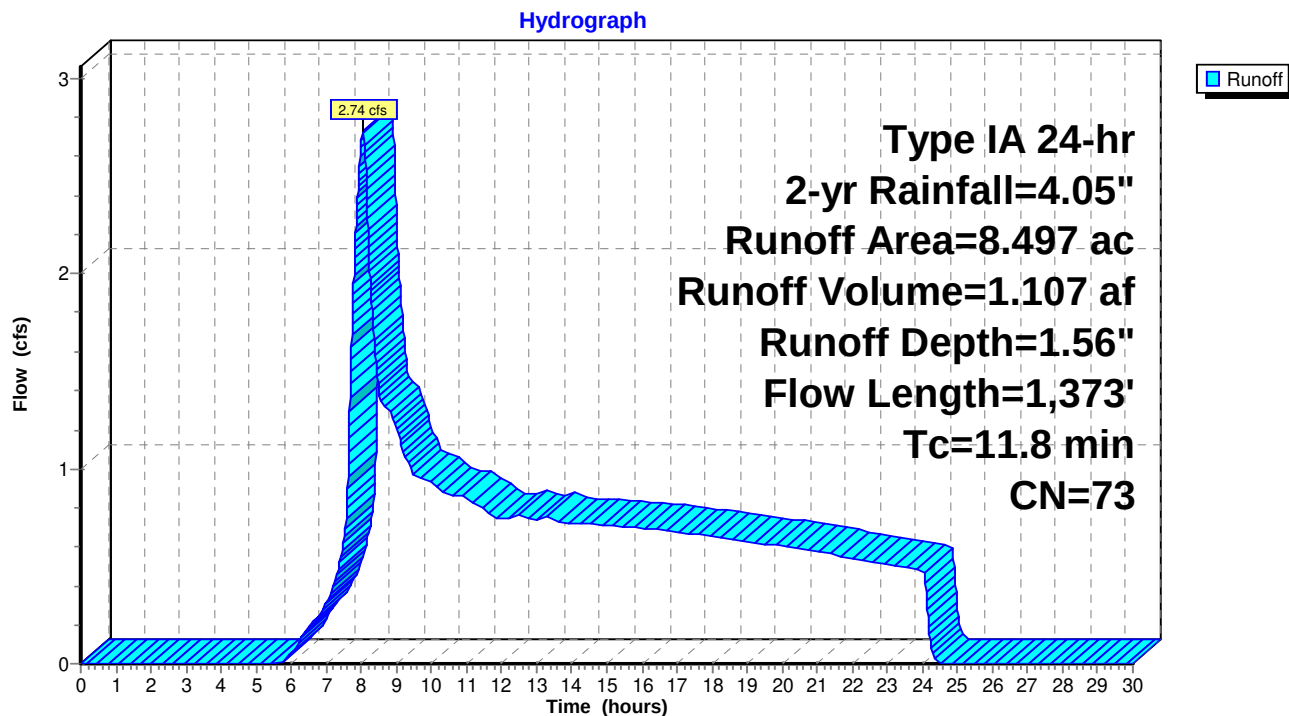
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Page 70

Subcatchment WS-4: Subcat WS-4



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Page 71

Summary for Reach 2R: Reach 1A - Ditch

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

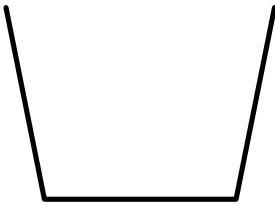
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

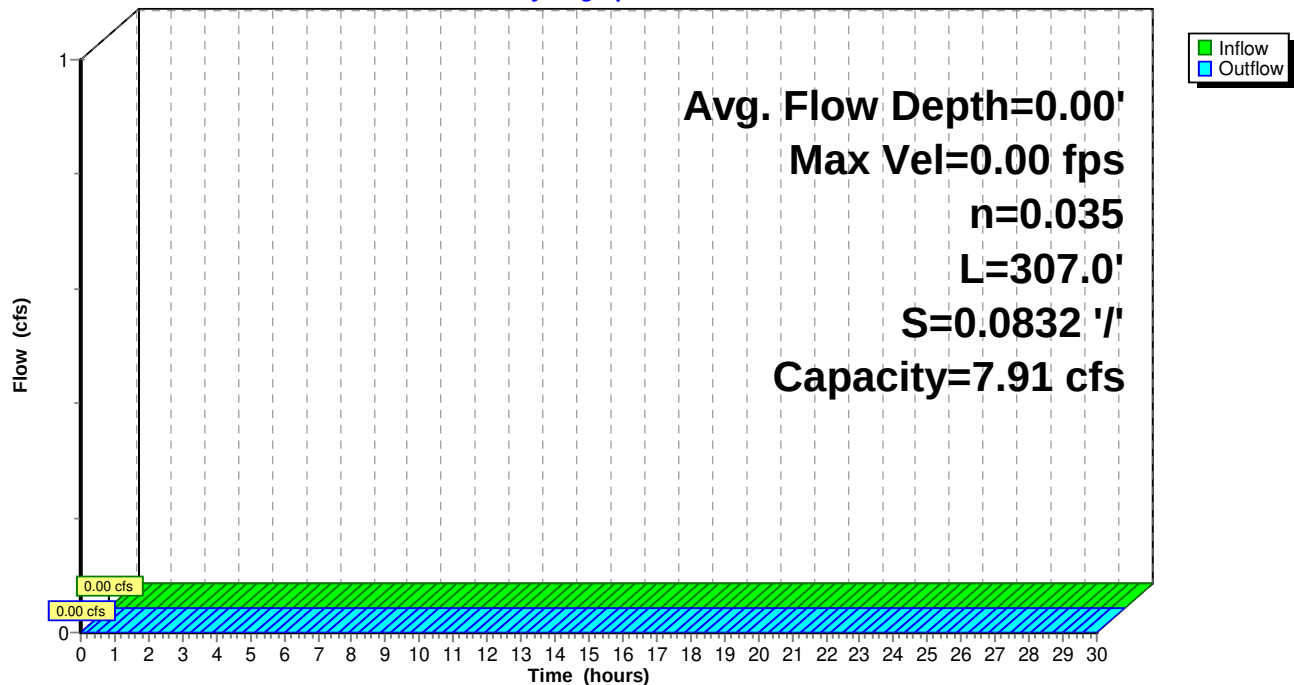
Length= 307.0' Slope= 0.0832 '/'

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 72

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 1.51" for 2-yr event
Inflow = 3.18 cfs @ 8.09 hrs, Volume= 1.365 af
Outflow = 3.17 cfs @ 8.11 hrs, Volume= 1.365 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 6.65 fps, Min. Travel Time= 1.2 min

Avg. Velocity= 4.15 fps, Avg. Travel Time= 1.9 min

Peak Storage= 221 cf @ 8.11 hrs

Average Depth at Peak Storage= 0.44', Surface Width= 1.18'

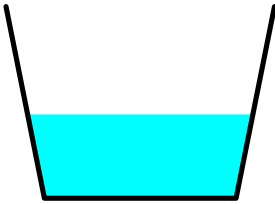
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

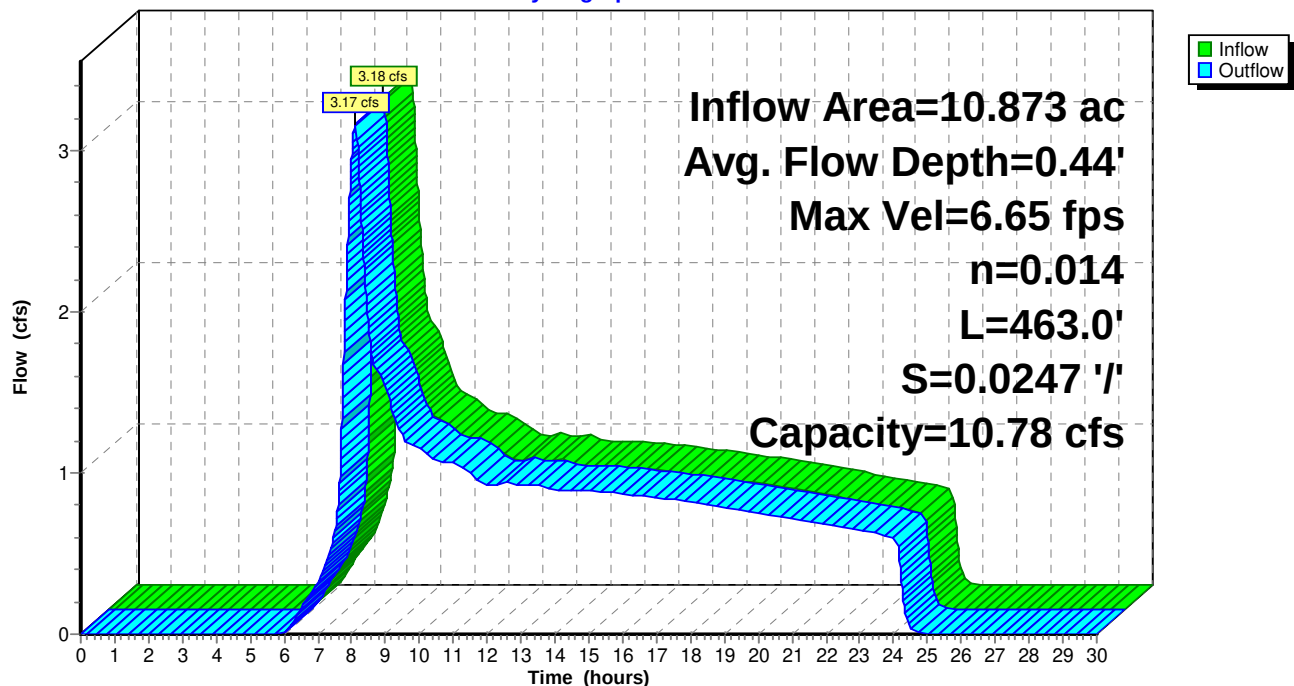
Length= 463.0' Slope= 0.0247 '/'

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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Page 73

Summary for Reach 5R: Reach 1B - 12" SW

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

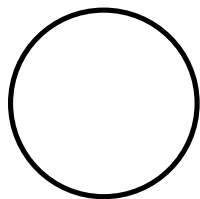
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

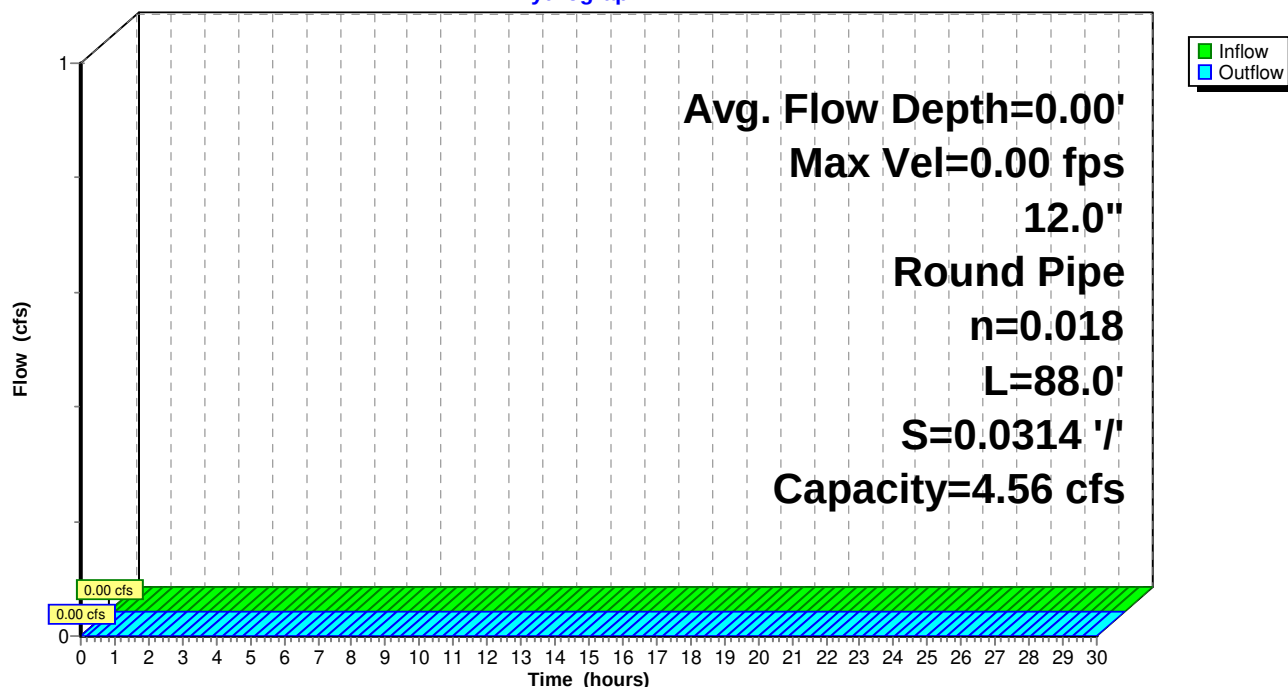
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



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Type IA 24-hr 2-yr Rainfall=4.05"

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Page 74

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 1.56" for 2-yr event
 Inflow = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af
 Outflow = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.60 cfs @ 8.05 hrs, Volume= 0.243 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 273.69' @ 8.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=0.60 cfs @ 8.05 hrs HW=273.69' TW=267.64' (Dynamic Tailwater)↑ **1=Culvert** (Passes 0.60 cfs of 1.64 cfs potential flow)↑ **2=Orifice/Grate** (Weir Controls 0.60 cfs @ 0.93 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=272.11' TW=273.81' (Dynamic Tailwater)↑ **3=Custom Weir/Orifice** (Controls 0.00 cfs)

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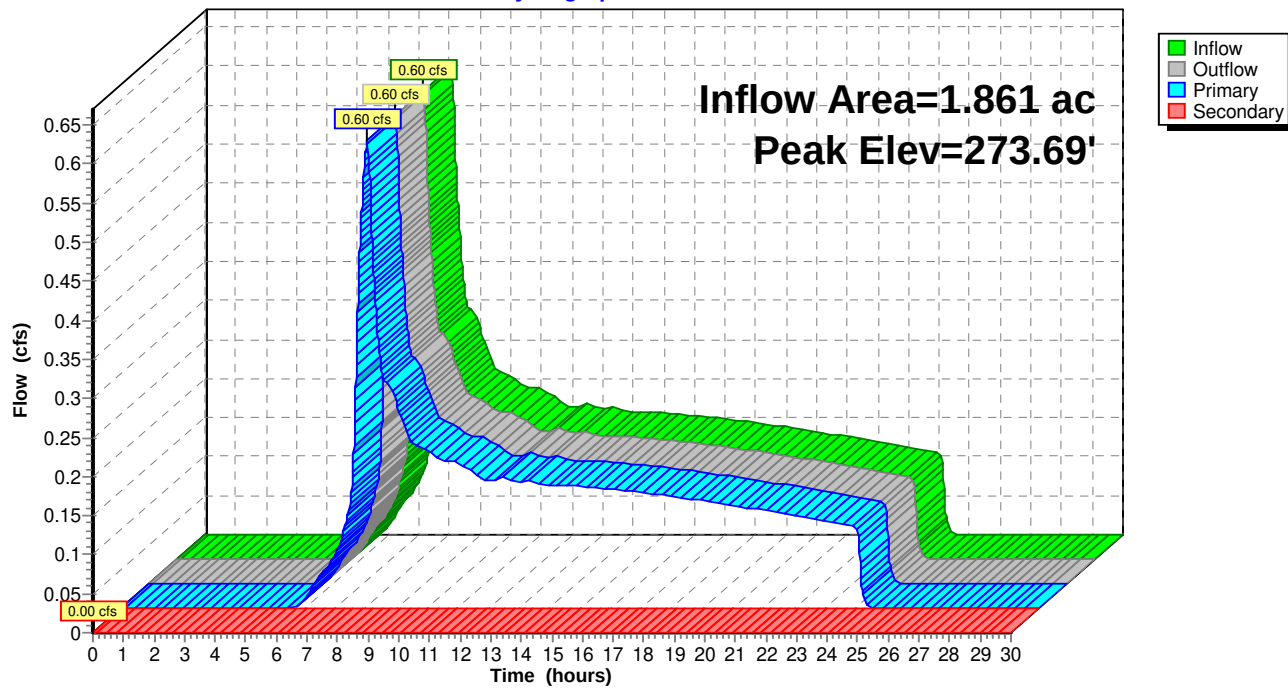
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Page 75

Pond 1P: Catch Basin

Hydrograph



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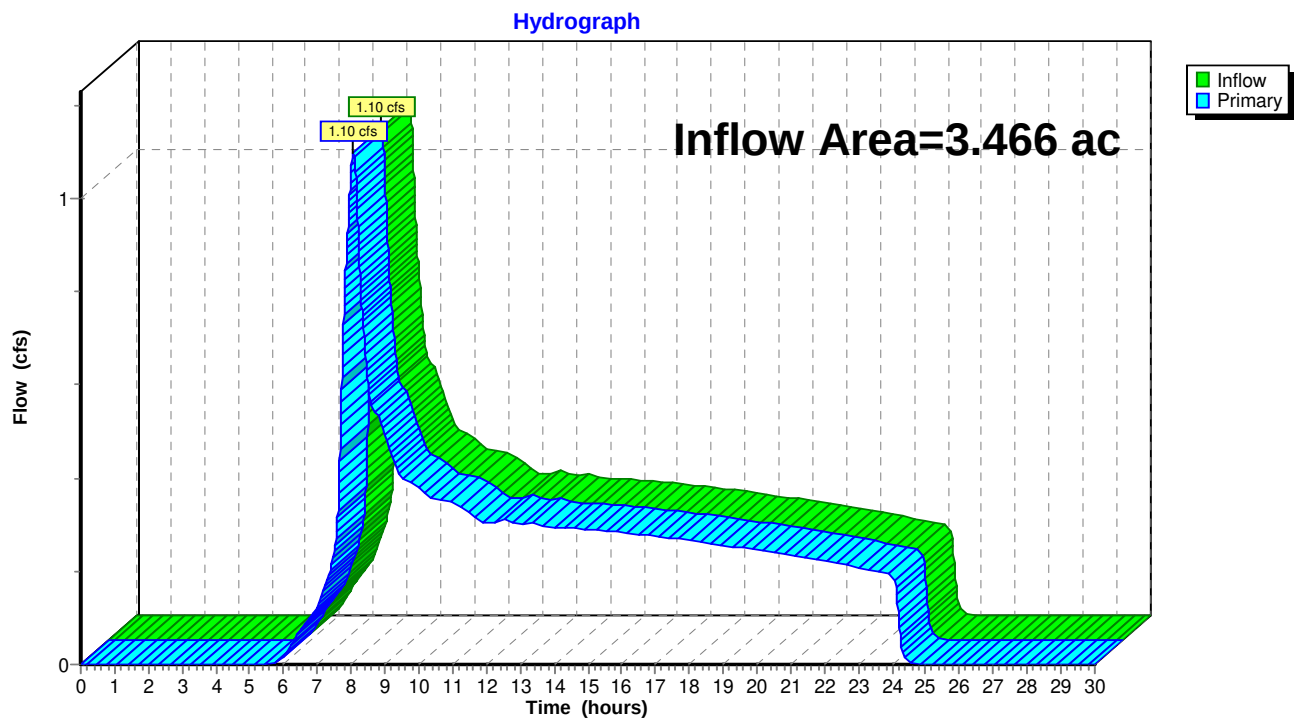
Page 76

Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 1.56" for 2-yr event
Inflow = 1.10 cfs @ 8.08 hrs, Volume= 0.452 af
Primary = 1.10 cfs @ 8.08 hrs, Volume= 0.452 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet



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Page 77

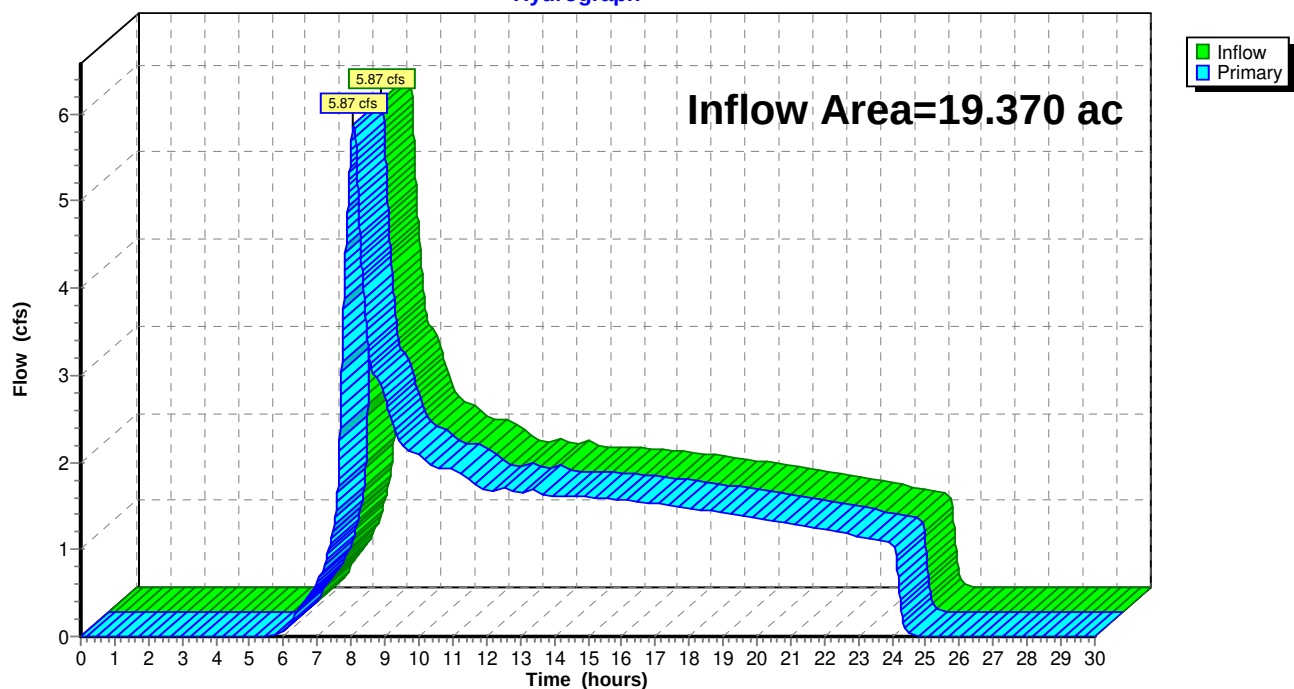
Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 1.53" for 2-yr event
Inflow = 5.87 cfs @ 8.08 hrs, Volume= 2.472 af
Primary = 5.87 cfs @ 8.08 hrs, Volume= 2.472 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

Hydrograph



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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 78

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 2.50 cfs @ 8.05 hrs, Volume= 0.897 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.117	75	Annual Grass, Good, HSG C
0.134	81	Annual Grass, Good, HSG D
0.086	87	Dirt roads, HSG C
1.180	75	Vineyard, Good, HSG C
0.025	81	Vineyard, Good, HSG D
1.674	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

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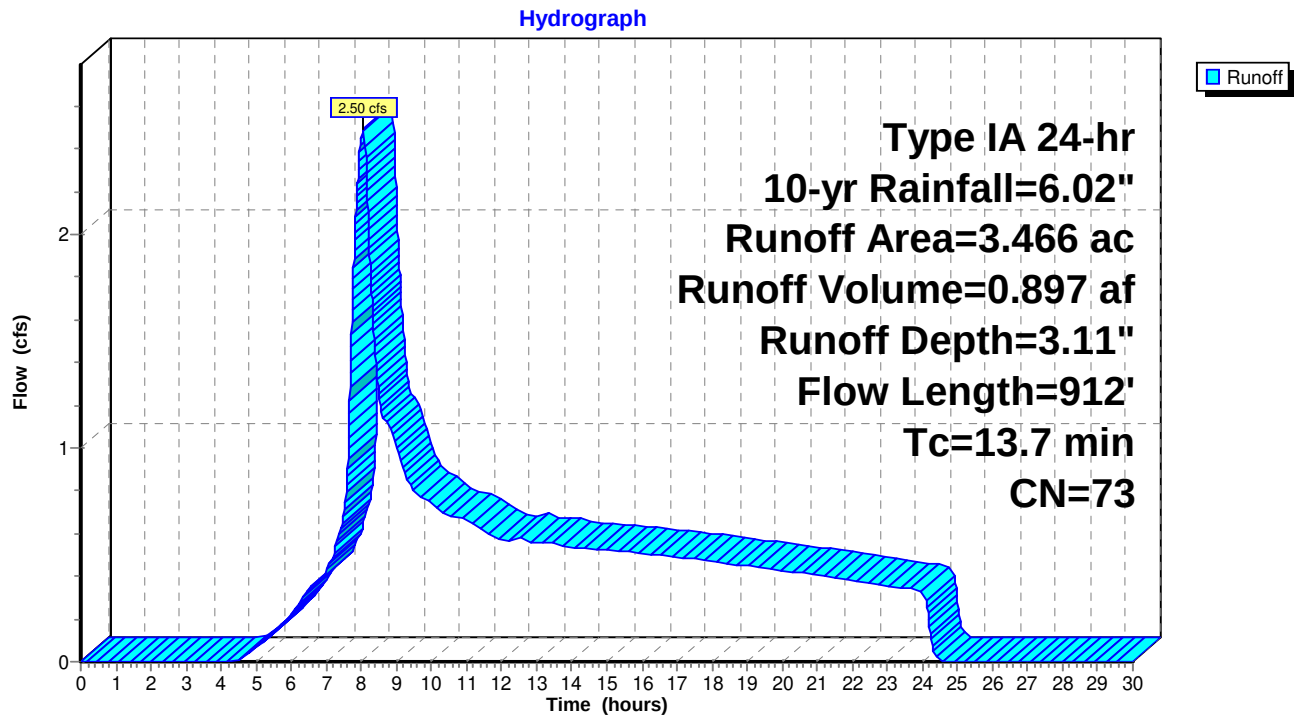
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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 79

Subcatchment WS-1: Subcat WS-1



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Page 80

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.102	75	Annual Grass, Good, HSG C
0.004	87	Dirt roads, HSG C
1.187	75	Vineyard, Good, HSG C
0.569	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow Woods: Dense underbrush n= 0.800 P2= 4.05"
1.6	178	0.1400	1.87		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
0.8	119	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
11.9	754	Total			

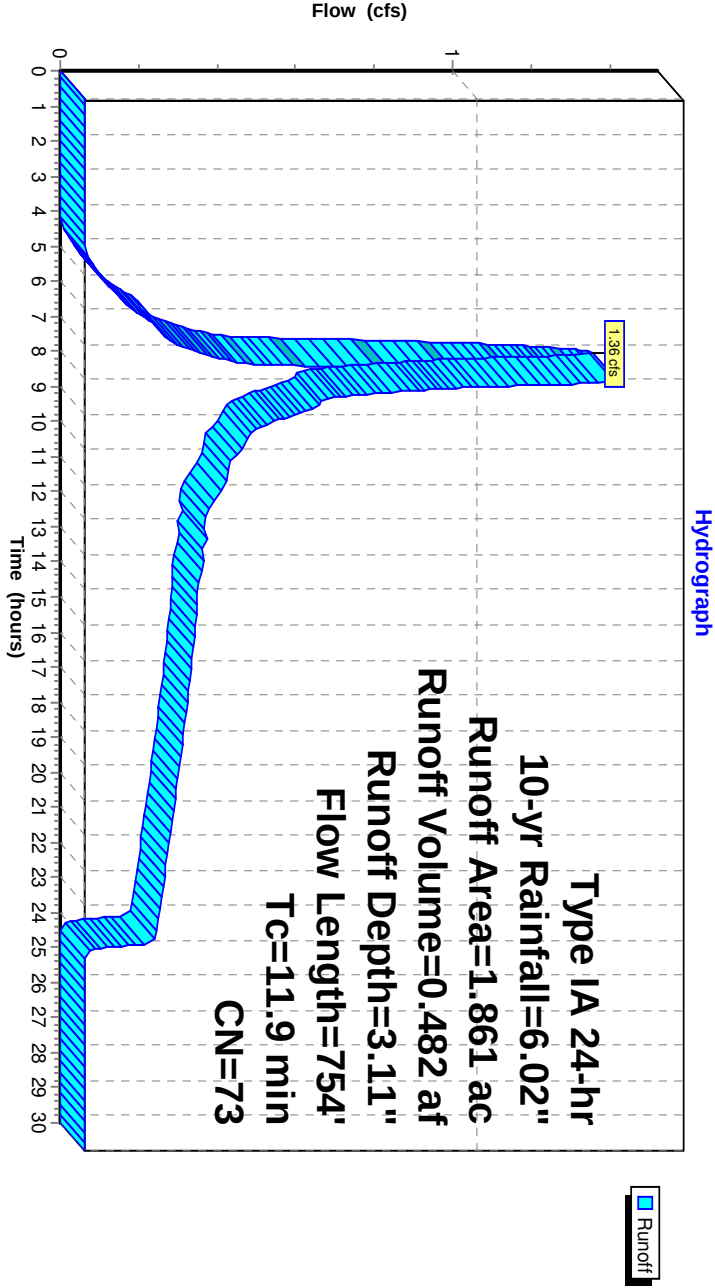
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Page 81

Subcatchment WS-2: Subcat WS-2



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Page 82

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 6.09 cfs @ 8.09 hrs, Volume= 2.260 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.639	75	Annual Grass, Good, HSG C
0.190	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
0.289	75	Vineyard, Good, HSG C
7.377	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.5	499	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
1.0	152	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.0	125	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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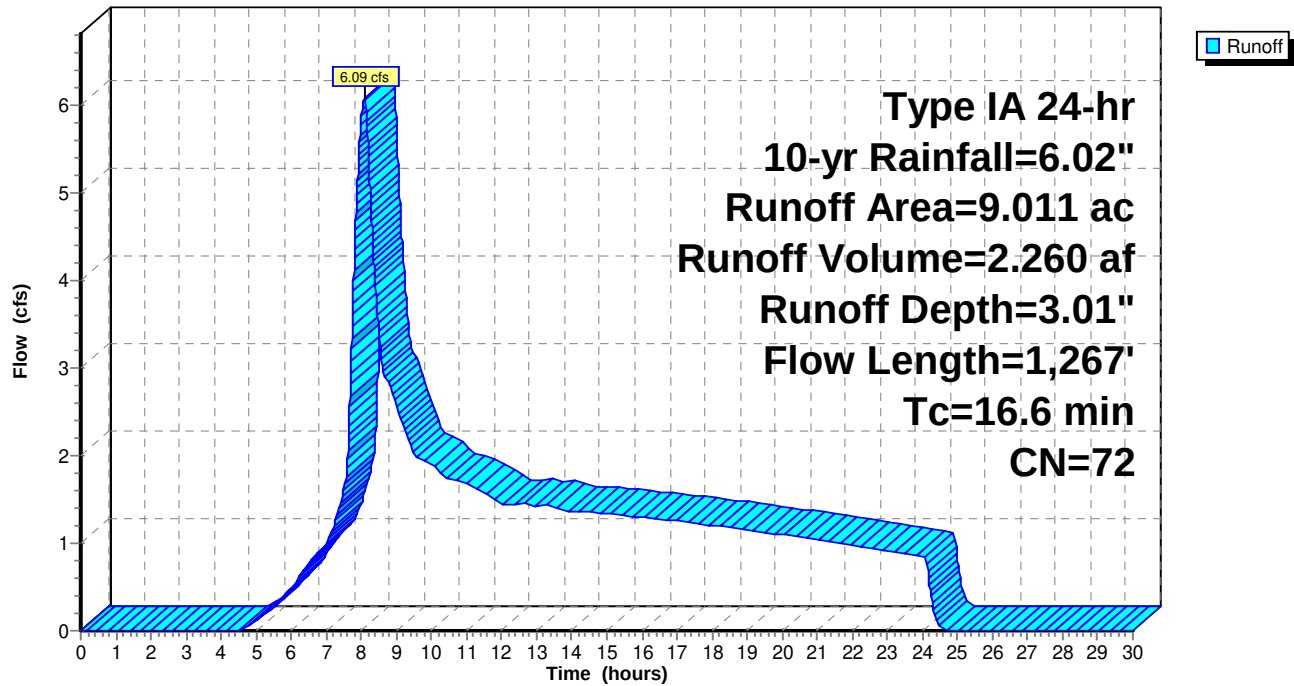
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Page 83

Subcatchment WS-3: Subcat WS-3

Hydrograph



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Page 84

Summary for Subcatchment WS-4: Subcat WS-4

Runoff = 6.20 cfs @ 8.04 hrs, Volume= 2.199 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-yr Rainfall=6.02"

Area (ac)	CN	Description
0.033	75	Annual Grass, Good, HSG C
0.084	81	Annual Grass, Good, HSG D
0.116	87	Dirt roads, HSG C
0.075	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
1.469	75	Vineyard, Good, HSG C
0.128	81	Vineyard, Good, HSG D
5.124	70	Woods, Good, HSG C
1.390	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
2.0	285	0.1200	2.42		Shallow Concentrated Flow, Shallow - Short Grass Short Grass Pasture Kv= 7.0 fps
0.3	36	0.1700	2.06		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017
11.8	1,373	Total			

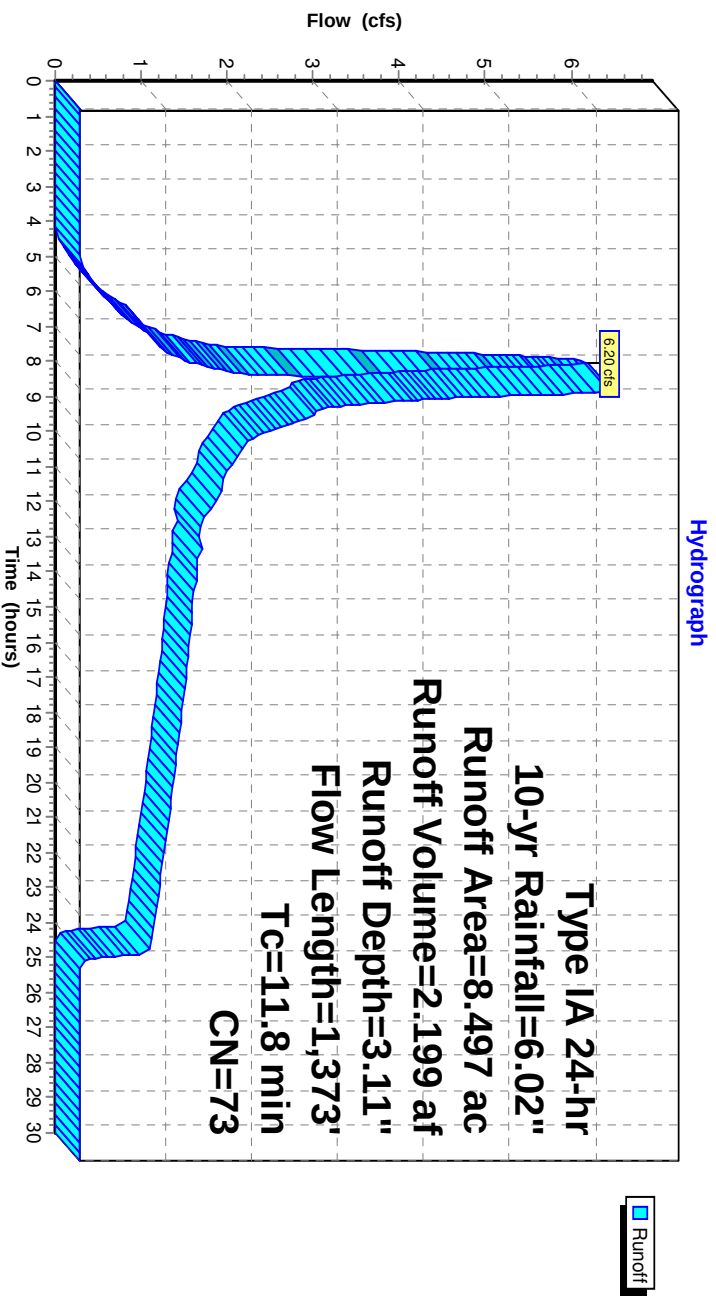
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Subcatchment WS-4: Subcat WS-4



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Page 86

Summary for Reach 2R: Reach 1A - Ditch

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

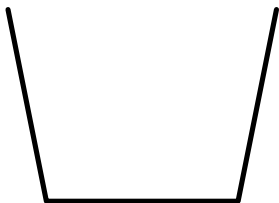
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

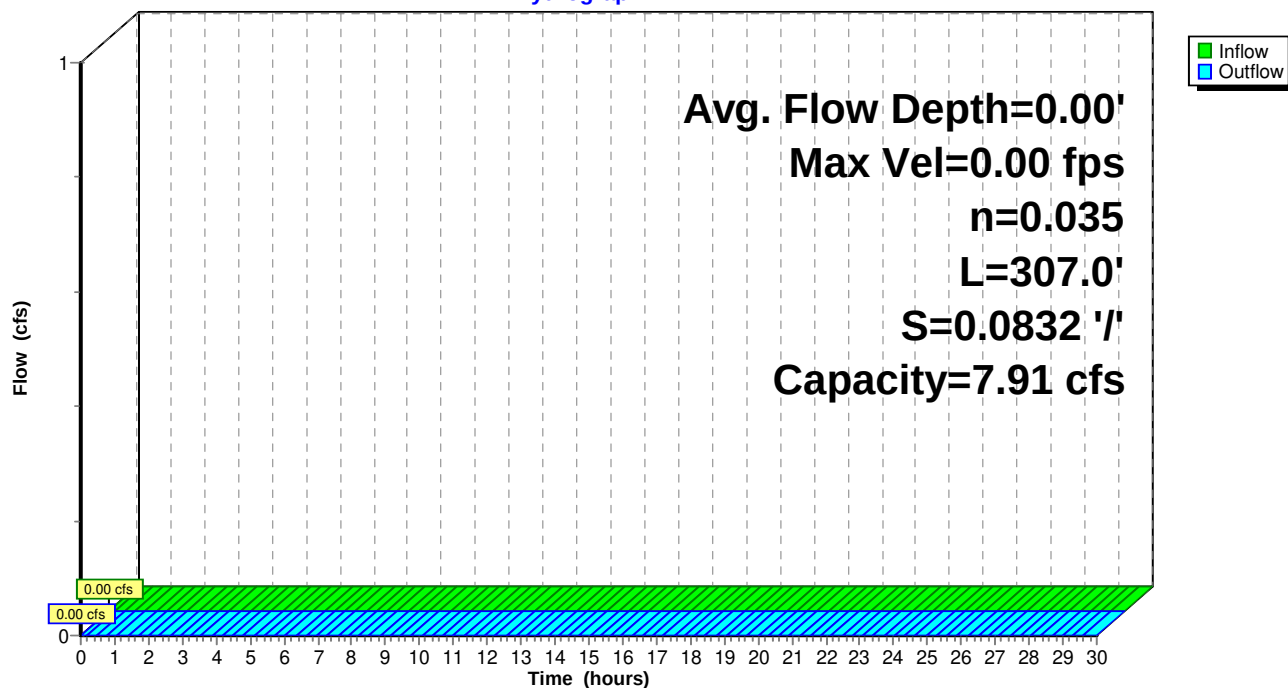
Length= 307.0' Slope= 0.0832 '/'

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Page 87

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 3.03" for 10-yr event
Inflow = 7.42 cfs @ 8.07 hrs, Volume= 2.742 af
Outflow = 7.42 cfs @ 8.08 hrs, Volume= 2.742 af, Atten= 0%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 8.25 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 4.99 fps, Avg. Travel Time= 1.5 min

Peak Storage= 416 cf @ 8.08 hrs

Average Depth at Peak Storage= 0.78' , Surface Width= 1.31'

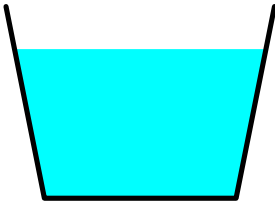
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 ' / ' Top Width= 1.40'

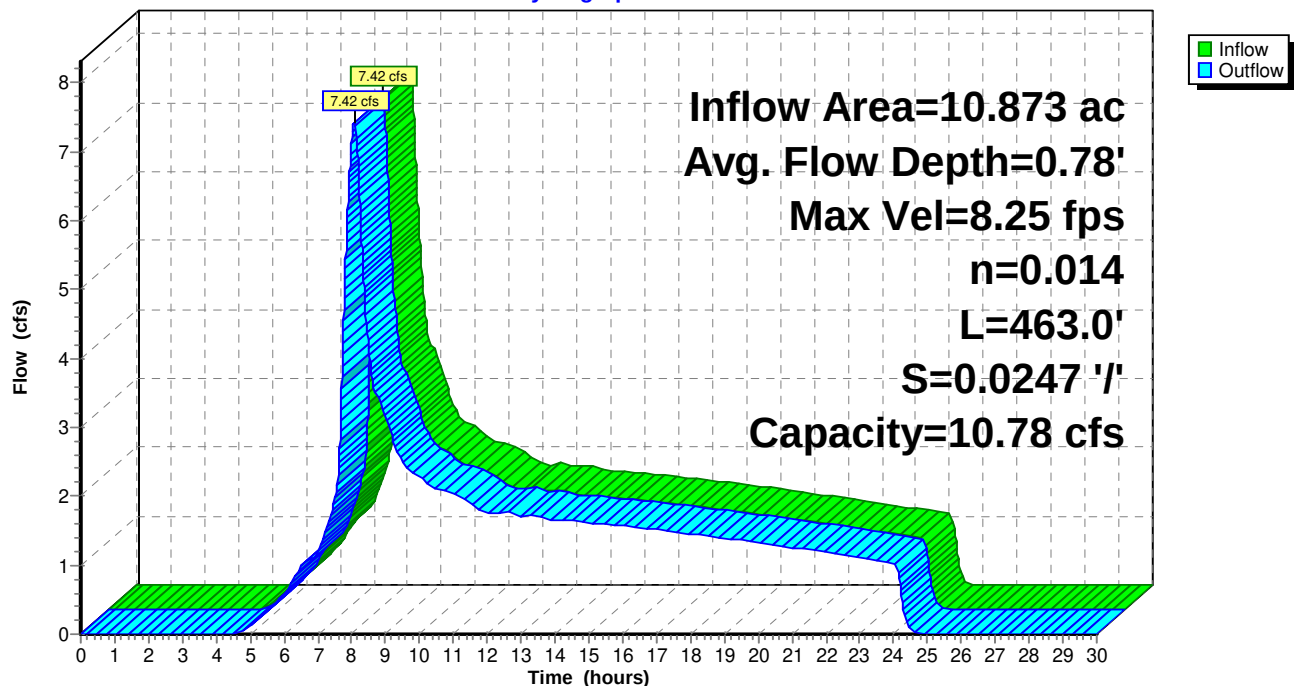
Length= 463.0' Slope= 0.0247 ' / '

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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Page 88

Summary for Reach 5R: Reach 1B - 12" SW

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

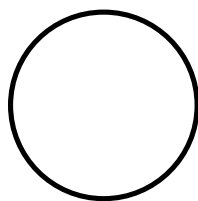
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

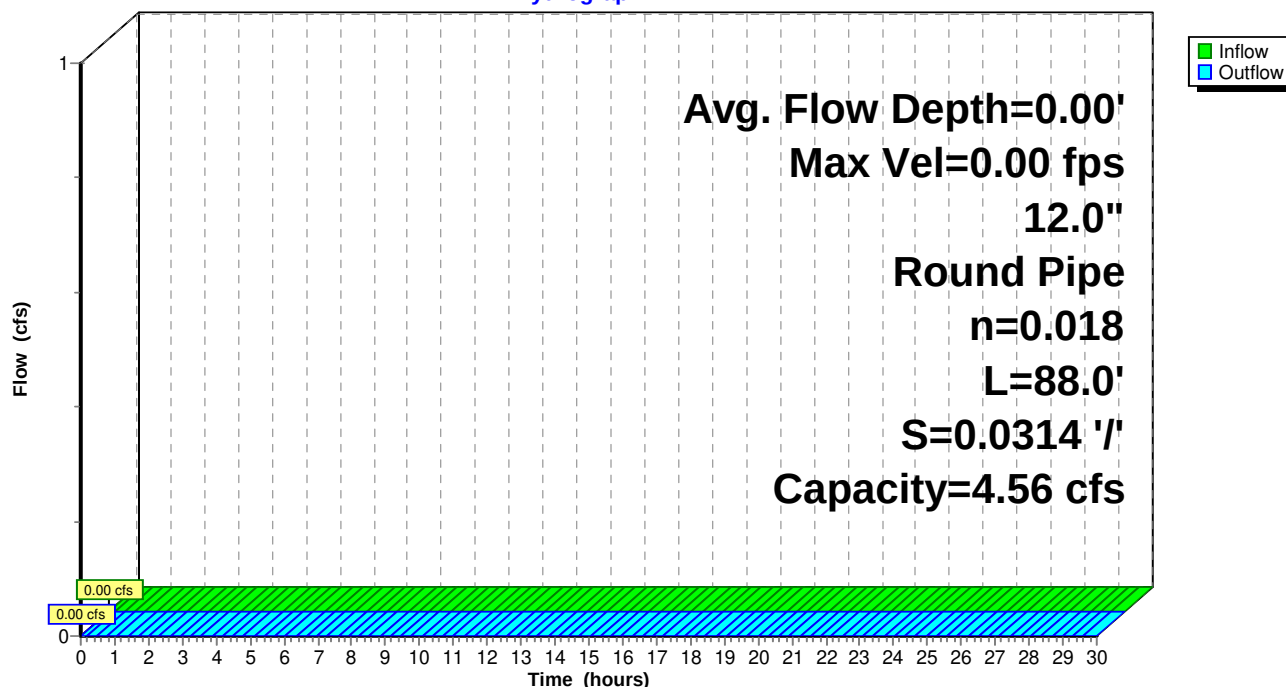
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



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Page 89

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 3.11" for 10-yr event
 Inflow = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af
 Outflow = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.36 cfs @ 8.03 hrs, Volume= 0.482 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 273.75' @ 8.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=1.36 cfs @ 8.03 hrs HW=273.75' TW=267.98' (Dynamic Tailwater)

↑**1=Culvert** (Passes 1.36 cfs of 1.64 cfs potential flow)
 ↑**2=Orifice/Grate** (Weir Controls 1.36 cfs @ 1.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=272.11' TW=273.81' (Dynamic Tailwater)

↑**3=Custom Weir/Orifice** (Controls 0.00 cfs)

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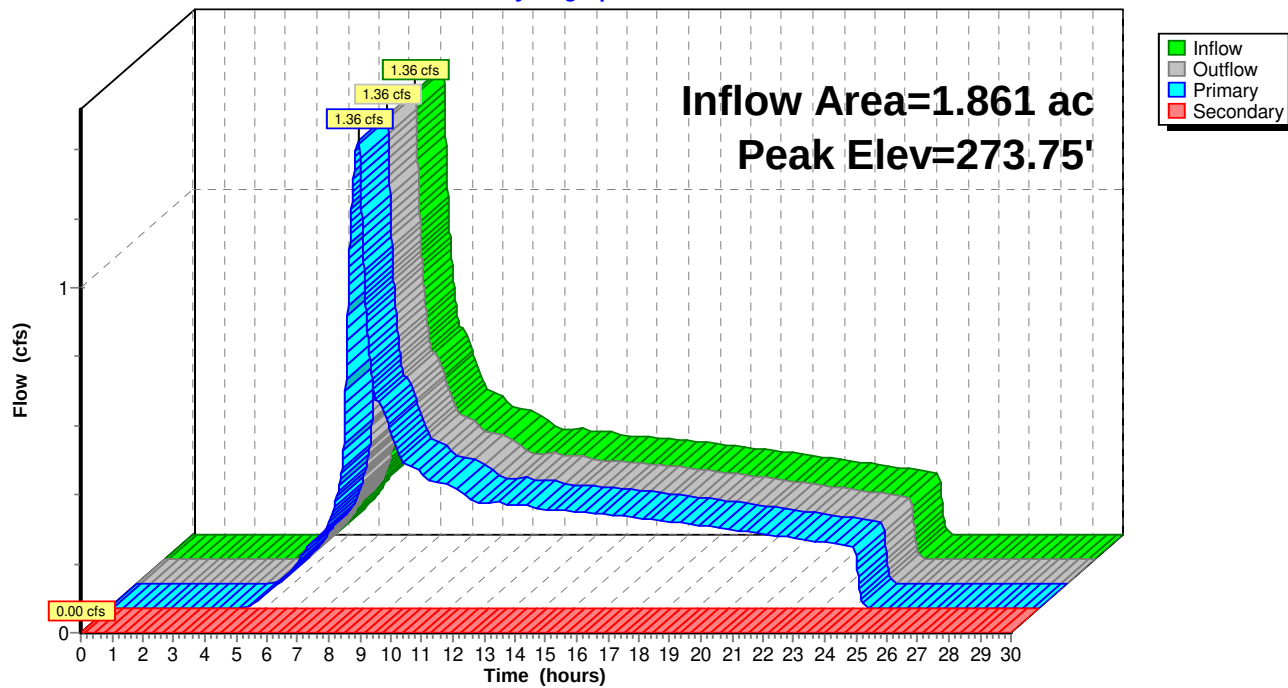
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Page 90

Pond 1P: Catch Basin

Hydrograph



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Page 91

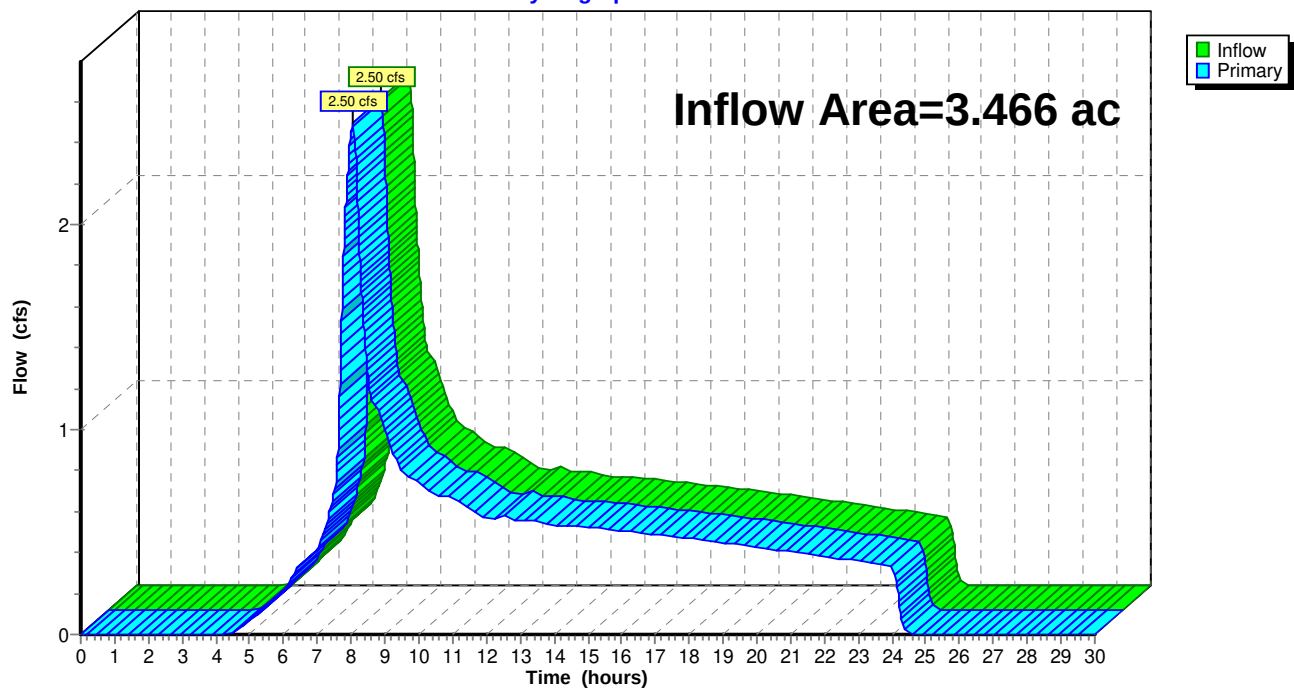
Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 3.11" for 10-yr event
Inflow = 2.50 cfs @ 8.05 hrs, Volume= 0.897 af
Primary = 2.50 cfs @ 8.05 hrs, Volume= 0.897 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet

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Type IA 24-hr 10-yr Rainfall=6.02"

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Page 92

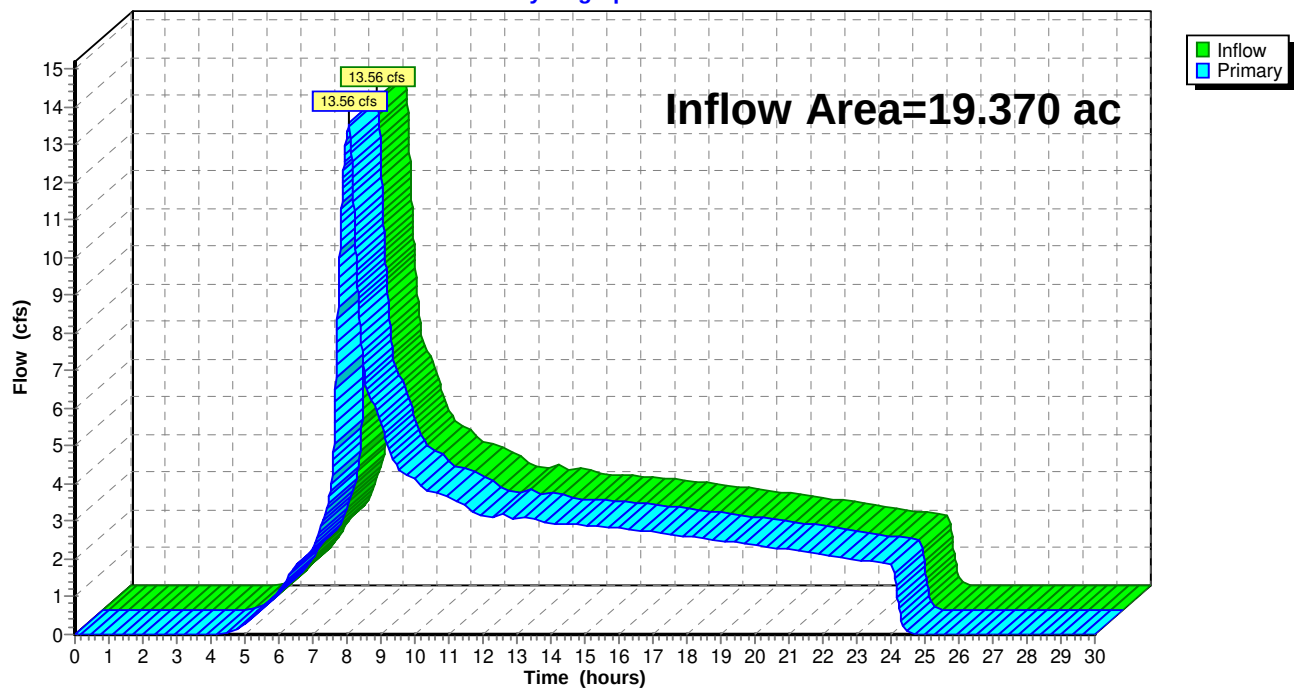
Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 3.06" for 10-yr event
Inflow = 13.56 cfs @ 8.06 hrs, Volume= 4.941 af
Primary = 13.56 cfs @ 8.06 hrs, Volume= 4.941 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 93

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 4.11 cfs @ 8.05 hrs, Volume= 1.399 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.117	75	Annual Grass, Good, HSG C
0.134	81	Annual Grass, Good, HSG D
0.086	87	Dirt roads, HSG C
1.180	75	Vineyard, Good, HSG C
0.025	81	Vineyard, Good, HSG D
1.674	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

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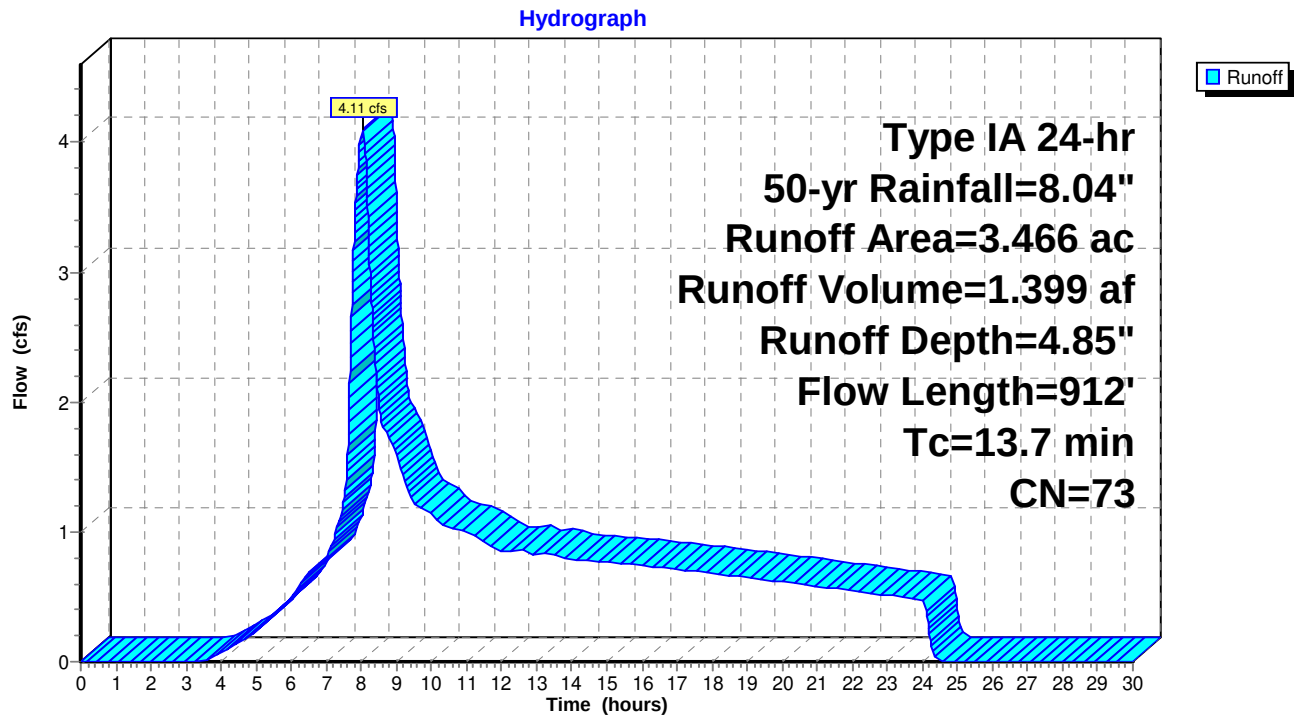
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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 94

Subcatchment WS-1: Subcat WS-1



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 95

Summary for Subcatchment WS-2: Subcat WS-2

Runoff = 2.23 cfs @ 8.03 hrs, Volume= 0.752 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.102	75	Annual Grass, Good, HSG C
0.004	87	Dirt roads, HSG C
1.187	75	Vineyard, Good, HSG C
0.569	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow Woods: Dense underbrush n= 0.800 P2= 4.05"
1.6	178	0.1400	1.87		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
0.8	119	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
11.9	754	Total			

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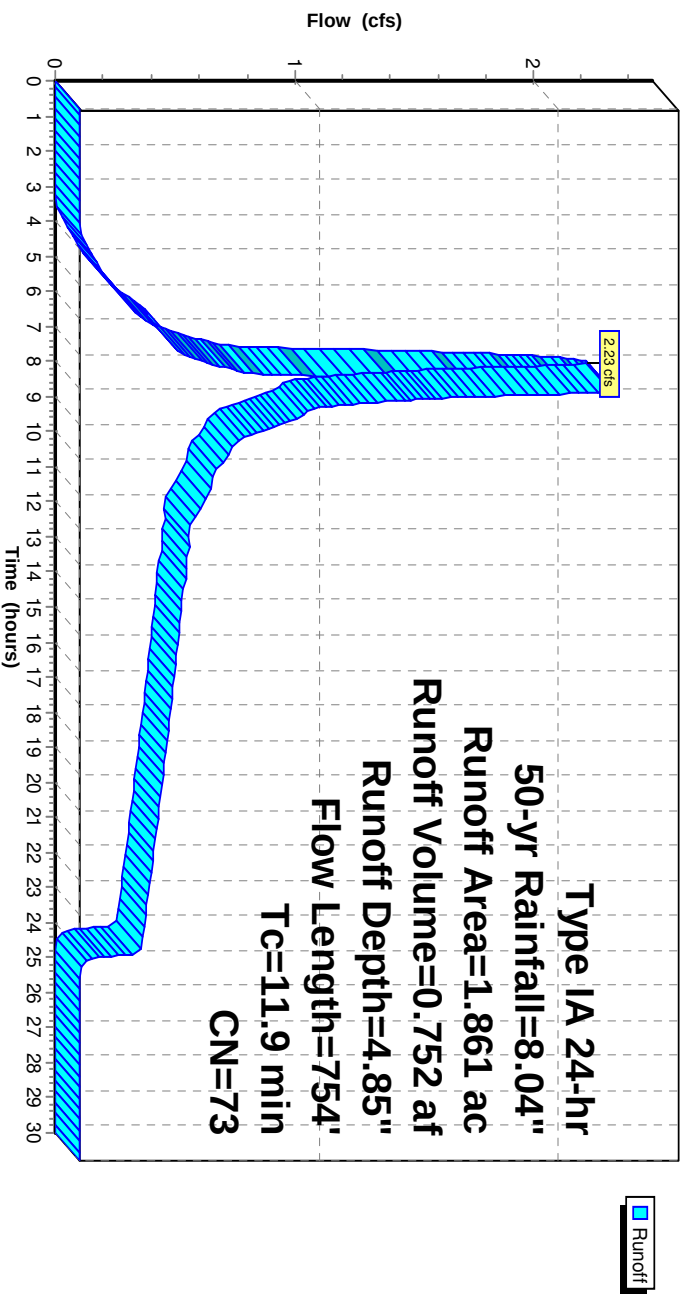
Type IA 24-hr 50-yr Rainfall=8.04"

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Page 96

Subcatchment WS-2: Subcat WS-2

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 97

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 10.15 cfs @ 8.07 hrs, Volume= 3.552 af, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.639	75	Annual Grass, Good, HSG C
0.190	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
0.289	75	Vineyard, Good, HSG C
7.377	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.5	499	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
1.0	152	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.0	125	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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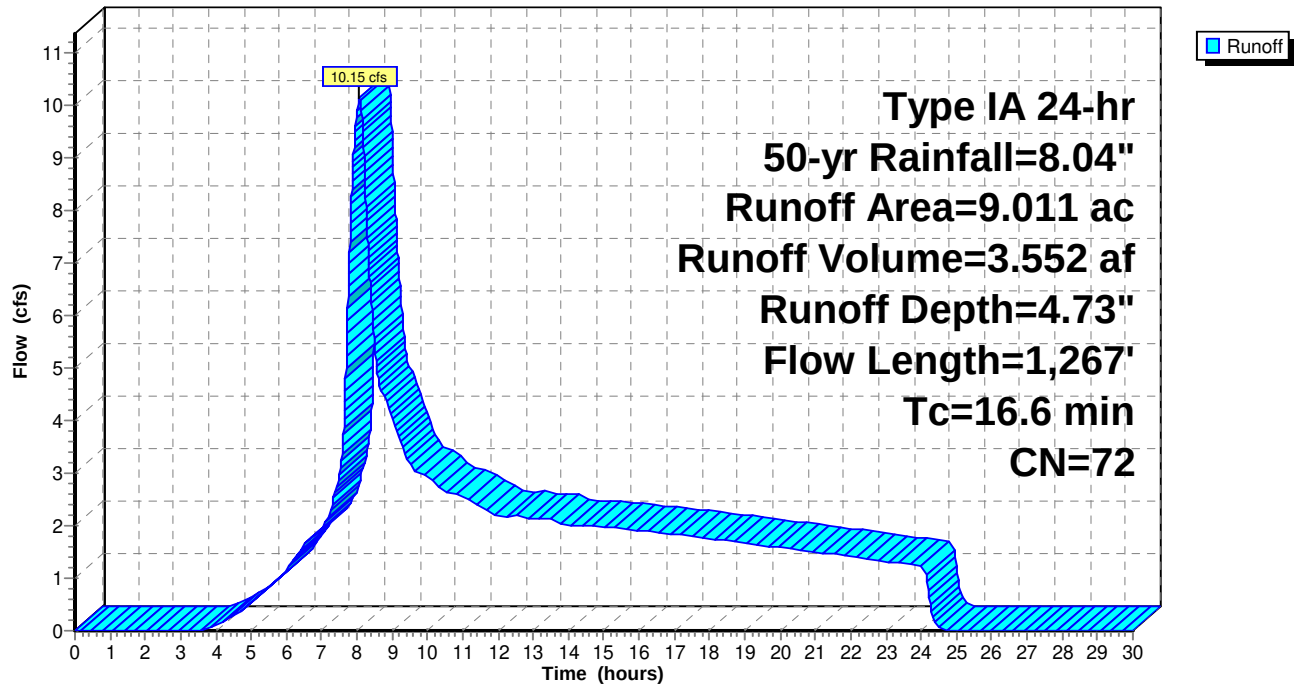
Type IA 24-hr 50-yr Rainfall=8.04"

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Page 98

Subcatchment WS-3: Subcat WS-3

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 99

Summary for Subcatchment WS-4: Subcat WS-4

Runoff = 10.17 cfs @ 8.03 hrs, Volume= 3.431 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50-yr Rainfall=8.04"

Area (ac)	CN	Description
0.033	75	Annual Grass, Good, HSG C
0.084	81	Annual Grass, Good, HSG D
0.116	87	Dirt roads, HSG C
0.075	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
1.469	75	Vineyard, Good, HSG C
0.128	81	Vineyard, Good, HSG D
5.124	70	Woods, Good, HSG C
1.390	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
2.0	285	0.1200	2.42		Shallow Concentrated Flow, Shallow - Short Grass Short Grass Pasture Kv= 7.0 fps
0.3	36	0.1700	2.06		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017
11.8	1,373	Total			

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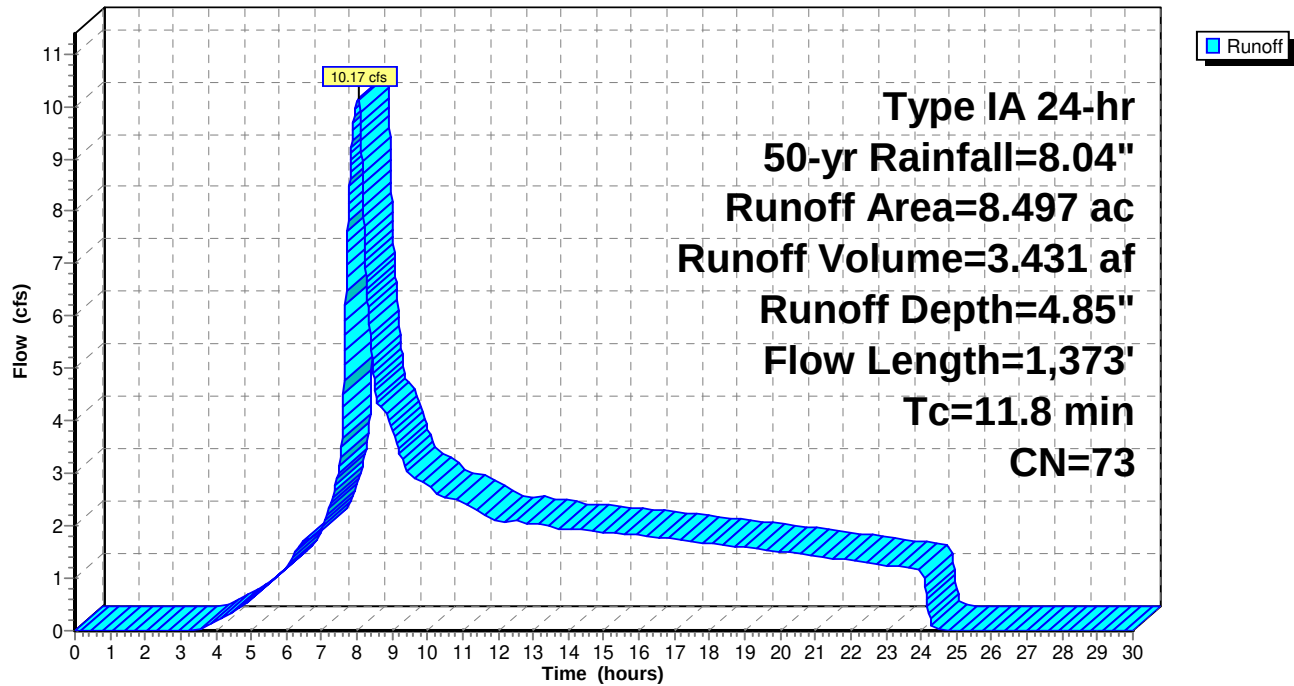
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Page 100

Subcatchment WS-4: Subcat WS-4

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 101

Summary for Reach 2R: Reach 1A - Ditch

Inflow = 0.57 cfs @ 8.03 hrs, Volume= 0.015 af
Outflow = 0.57 cfs @ 8.04 hrs, Volume= 0.015 af, Atten= 1%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.18 fps, Min. Travel Time= 1.6 min

Avg. Velocity= 1.33 fps, Avg. Travel Time= 3.9 min

Peak Storage= 55 cf @ 8.04 hrs

Average Depth at Peak Storage= 0.17' , Surface Width= 1.07'

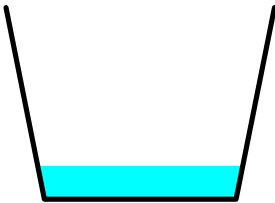
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 ' ' Top Width= 1.40'

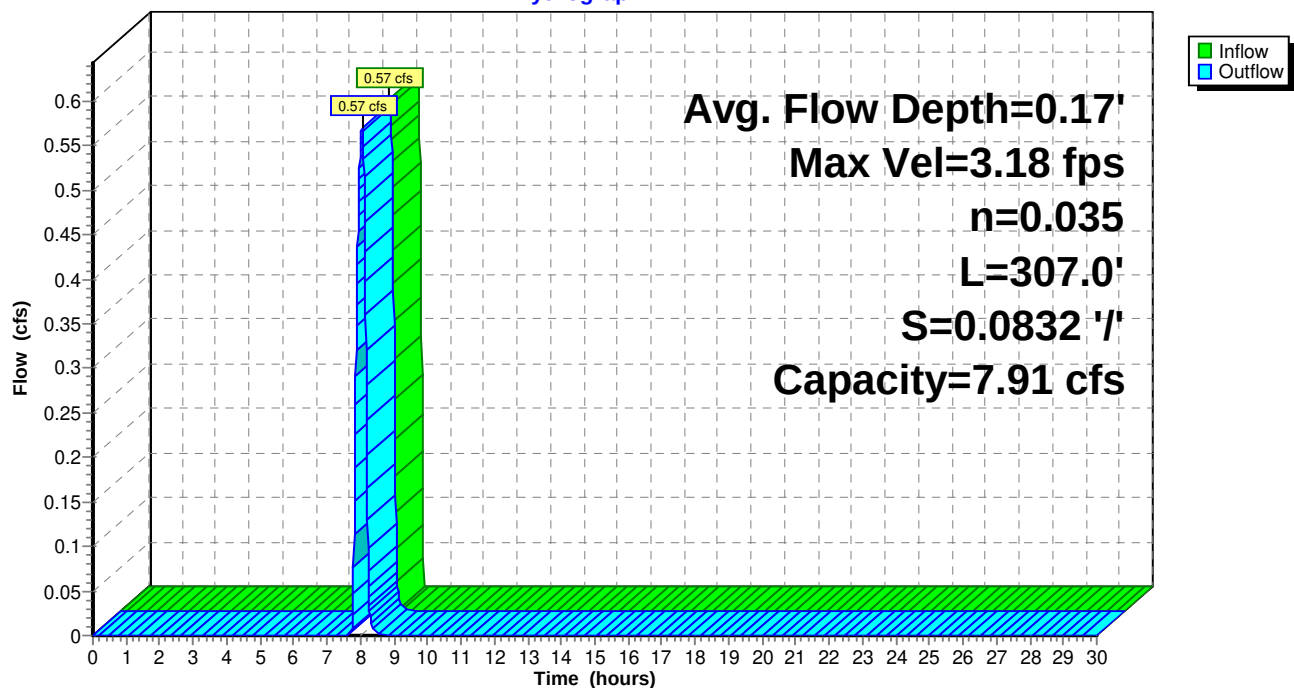
Length= 307.0' Slope= 0.0832 ' '

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 102

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 4.73" for 50-yr event
Inflow = 11.80 cfs @ 8.07 hrs, Volume= 4.289 af
Outflow = 11.79 cfs @ 8.08 hrs, Volume= 4.289 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 9.15 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 5.60 fps, Avg. Travel Time= 1.4 min

Peak Storage= 596 cf @ 8.08 hrs

Average Depth at Peak Storage= 1.06' , Surface Width= 1.43'

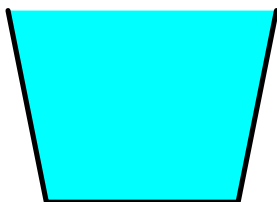
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

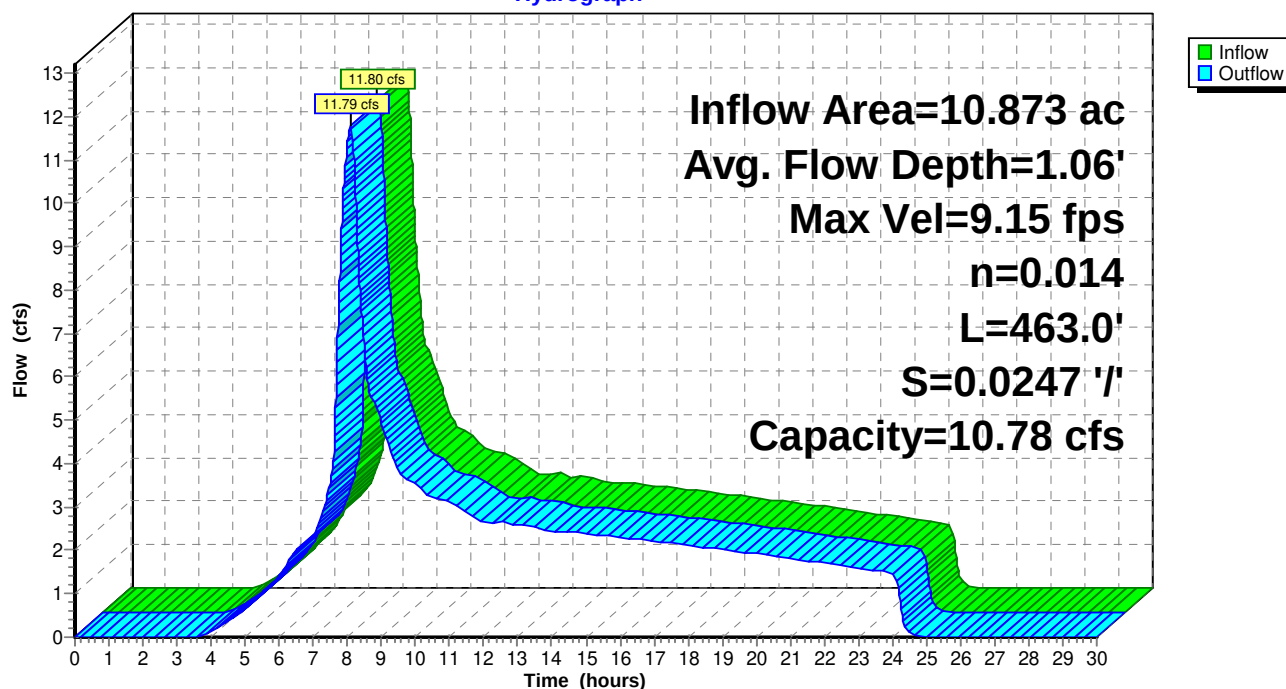
Length= 463.0' Slope= 0.0247 '/'

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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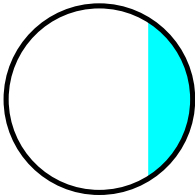
Summary for Reach 5R: Reach 1B - 12" SW

Inflow	=	0.57 cfs @	8.04 hrs,	Volume=	0.015 af
Outflow	=	0.57 cfs @	8.05 hrs,	Volume=	0.015 af, Atten= 0%, Lag= 0.2 min

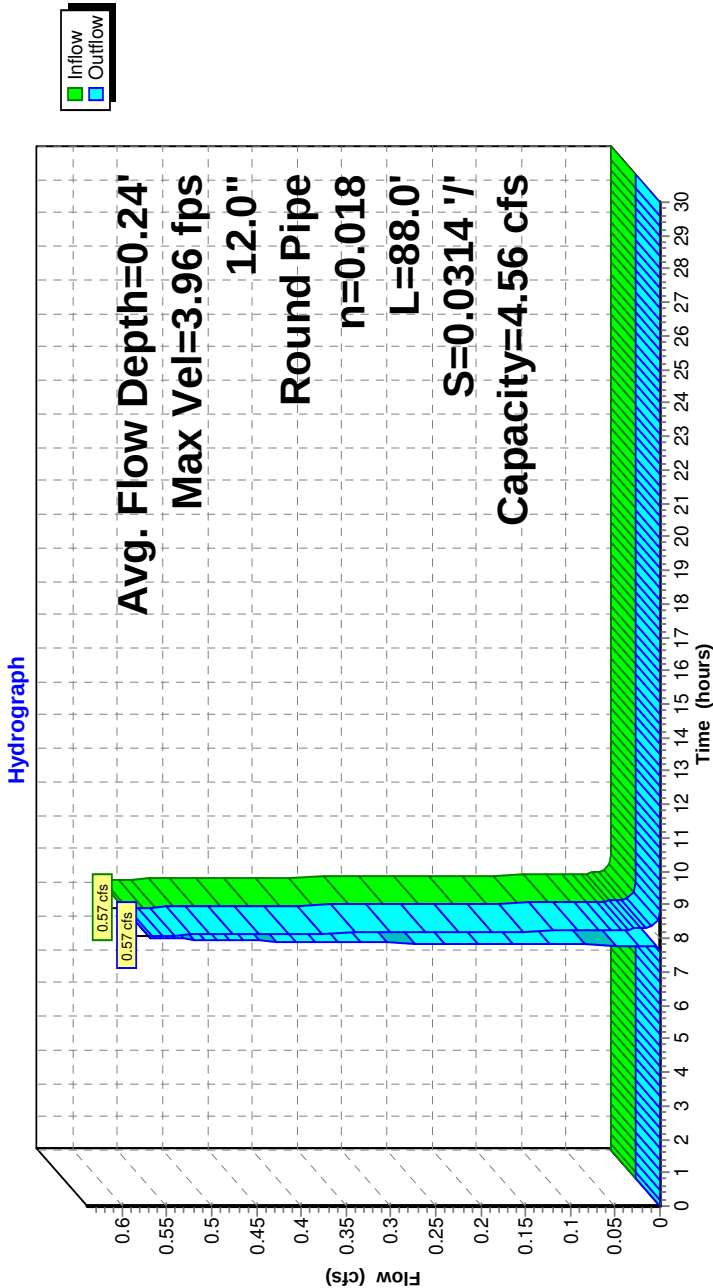
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.96 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.63 fps, Avg. Travel Time= 0.9 min

Peak Storage= 13 cf @ 8.05 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.85'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe
n= 0.018 PPI 12in-15in CPP
Length= 88.0' Slope= 0.0314 '/'
Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW



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Page 104

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 4.85" for 50-yr event
Inflow = 2.23 cfs @ 8.03 hrs, Volume= 0.752 af
Outflow = 2.23 cfs @ 8.03 hrs, Volume= 0.752 af, Atten= 0%, Lag= 0.0 min
Primary = 1.66 cfs @ 7.87 hrs, Volume= 0.737 af
Secondary = 0.57 cfs @ 8.03 hrs, Volume= 0.015 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 274.15' @ 8.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=1.65 cfs @ 7.87 hrs HW=274.07' TW=268.16' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 1.65 cfs @ 4.74 fps)

↑**2=Orifice/Grate** (Passes 1.65 cfs of 4.73 cfs potential flow)

Secondary OutFlow Max=0.57 cfs @ 8.03 hrs HW=274.15' TW=273.98' (Dynamic Tailwater)

↑**3=Custom Weir/Orifice** (Weir Controls 0.57 cfs @ 1.68 fps)

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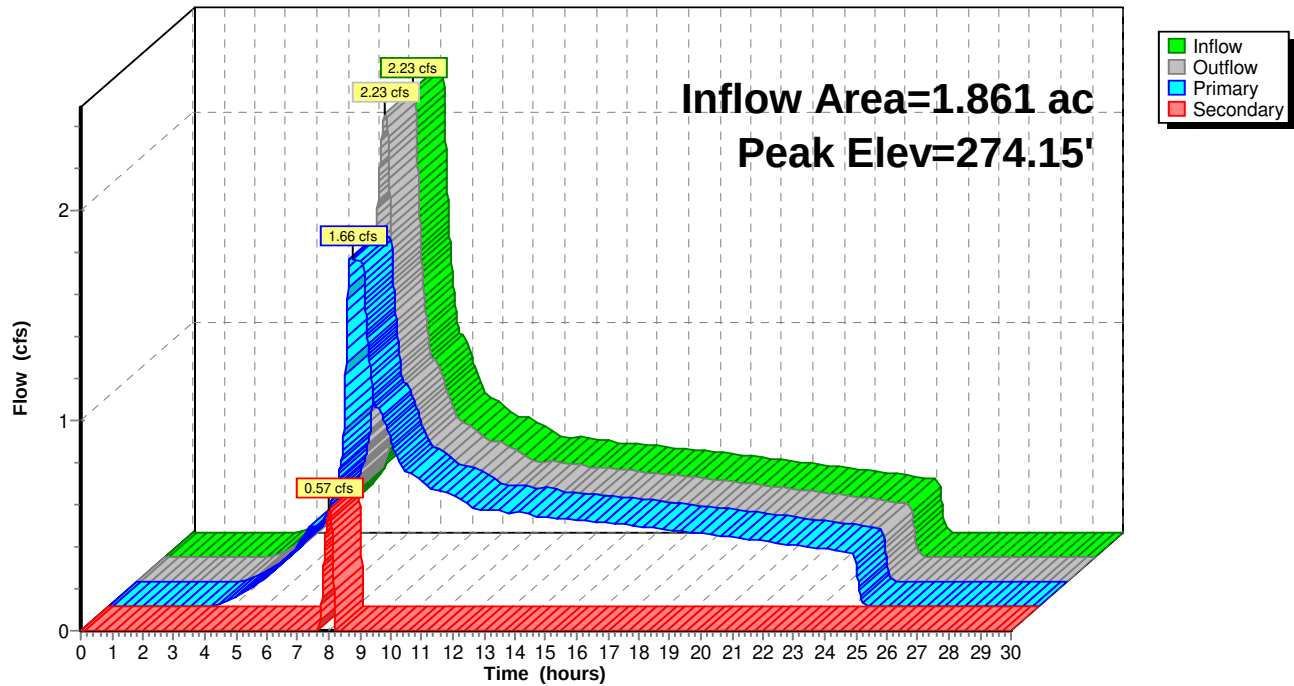
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Type IA 24-hr 50-yr Rainfall=8.04"

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Page 105

Pond 1P: Catch Basin

Hydrograph



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Page 106

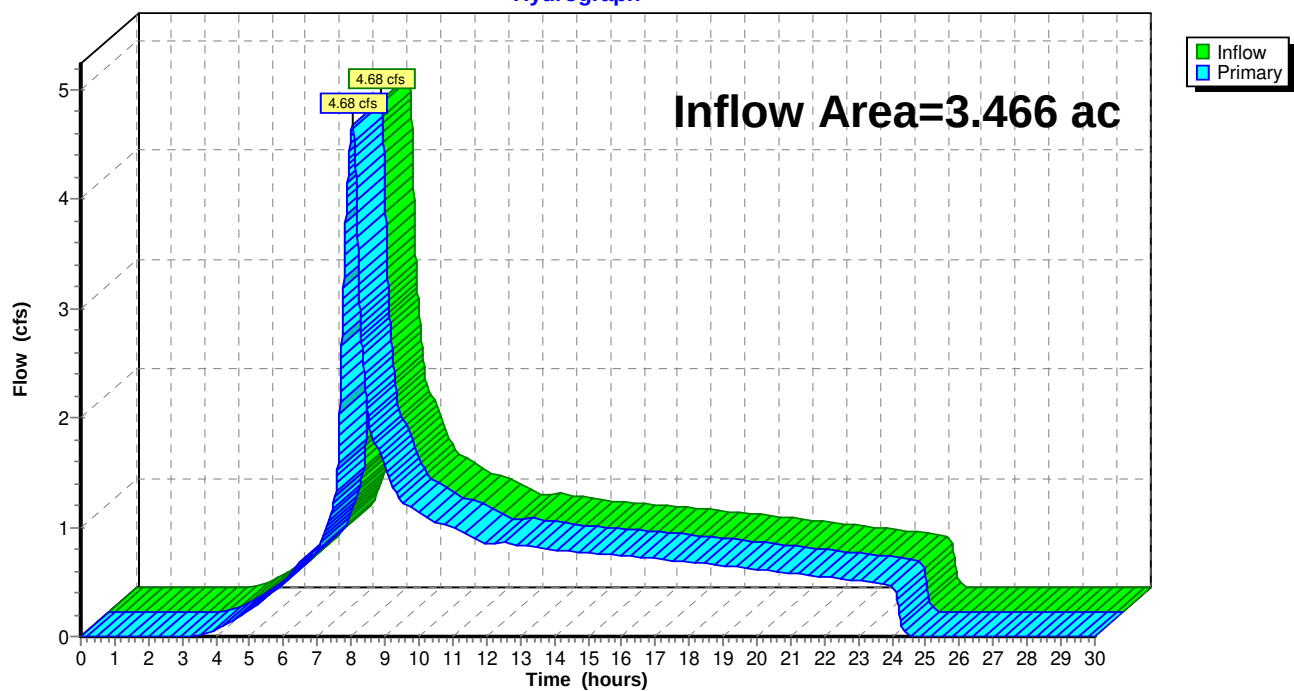
Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 4.90" for 50-yr event
Inflow = 4.68 cfs @ 8.05 hrs, Volume= 1.414 af
Primary = 4.68 cfs @ 8.05 hrs, Volume= 1.414 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet

Hydrograph



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Page 107

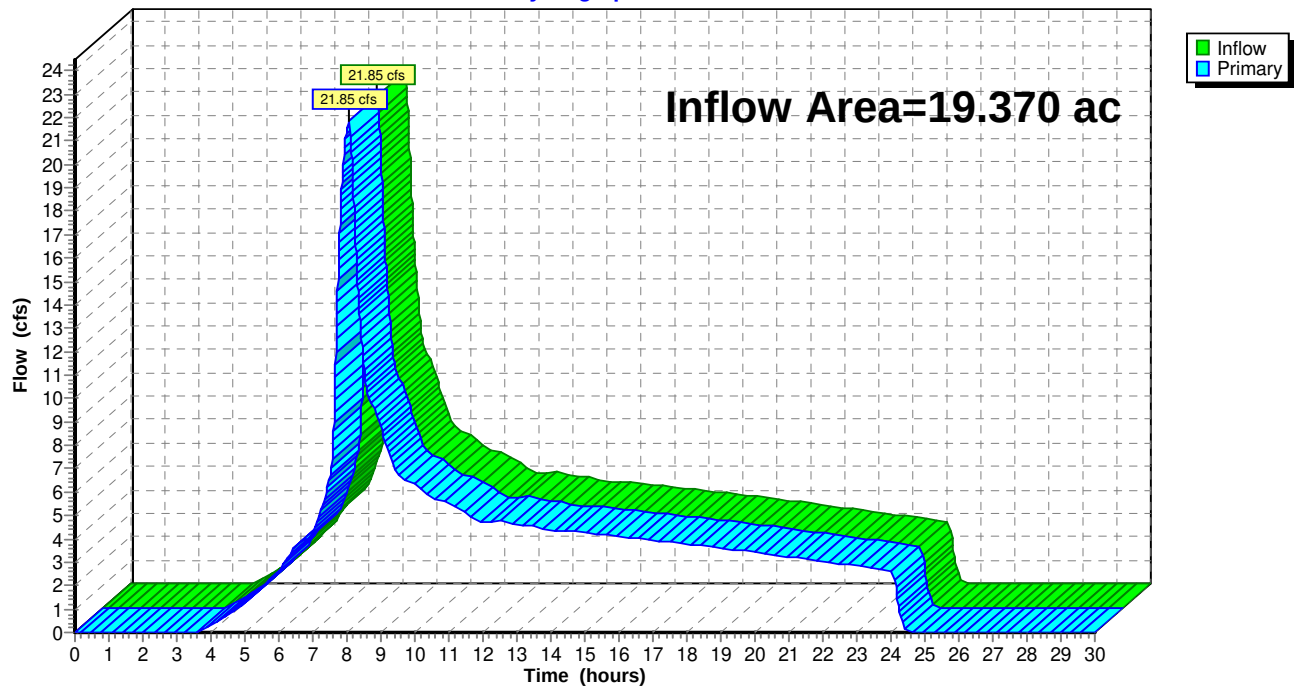
Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 4.78" for 50-yr event
Inflow = 21.85 cfs @ 8.06 hrs, Volume= 7.720 af
Primary = 21.85 cfs @ 8.06 hrs, Volume= 7.720 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

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Page 108

Summary for Subcatchment WS-1: Subcat WS-1

Runoff = 4.81 cfs @ 8.05 hrs, Volume= 1.619 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.117	75	Annual Grass, Good, HSG C
0.134	81	Annual Grass, Good, HSG D
0.086	87	Dirt roads, HSG C
1.180	75	Vineyard, Good, HSG C
0.025	81	Vineyard, Good, HSG D
1.674	70	Woods, Good, HSG C
0.251	77	Woods, Good, HSG D
3.466	73	Weighted Average
3.466		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	41	0.1100	0.08		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
4.9	570	0.1500	1.94		Shallow Concentrated Flow, Shallow - Woodland
					Woodland Kv= 5.0 fps
0.5	281	0.1700	10.24	20.47	Trap/Vee/Rect Channel Flow, Channel - Stream
					Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00'
					n= 0.035
0.1	20	0.0100	3.28	2.57	Pipe Channel, 12" SWCPP
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.018 PPI 12in-15in CPP
13.7	912	Total			

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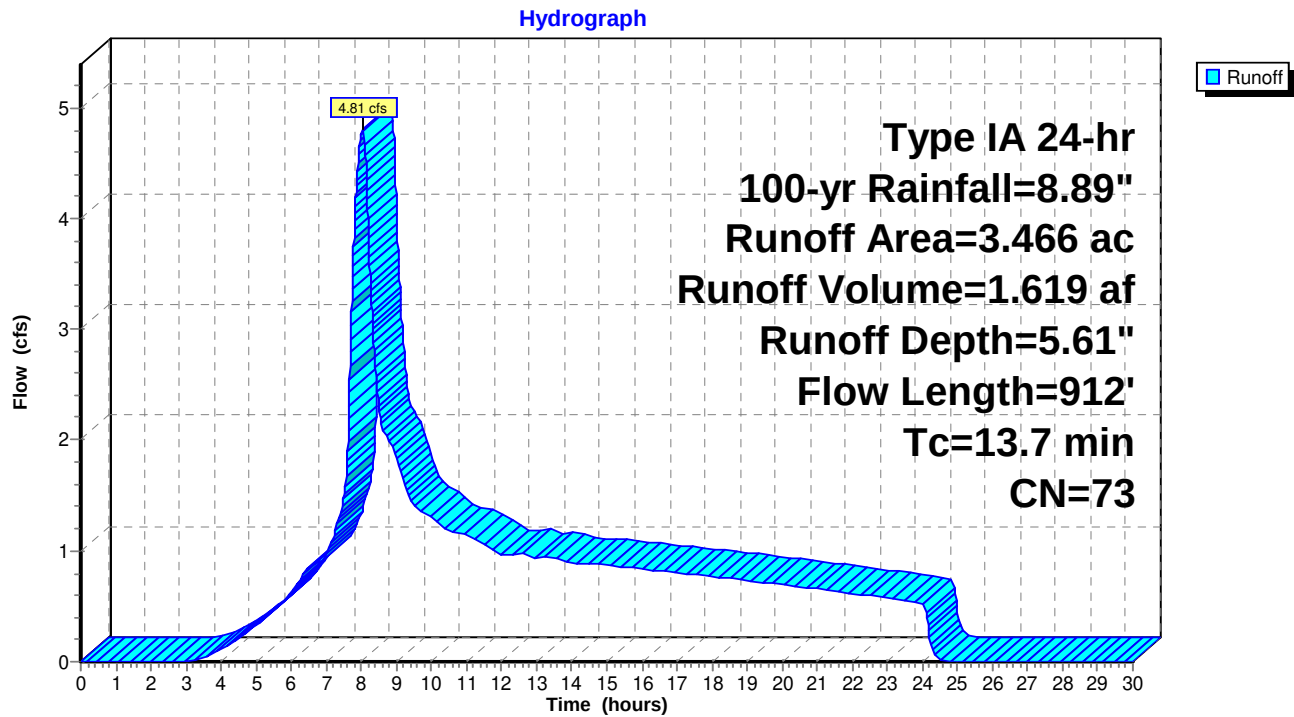
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Page 109

Subcatchment WS-1: Subcat WS-1



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Page 110

Summary for Subcatchment WS-2: Subcat WS-2

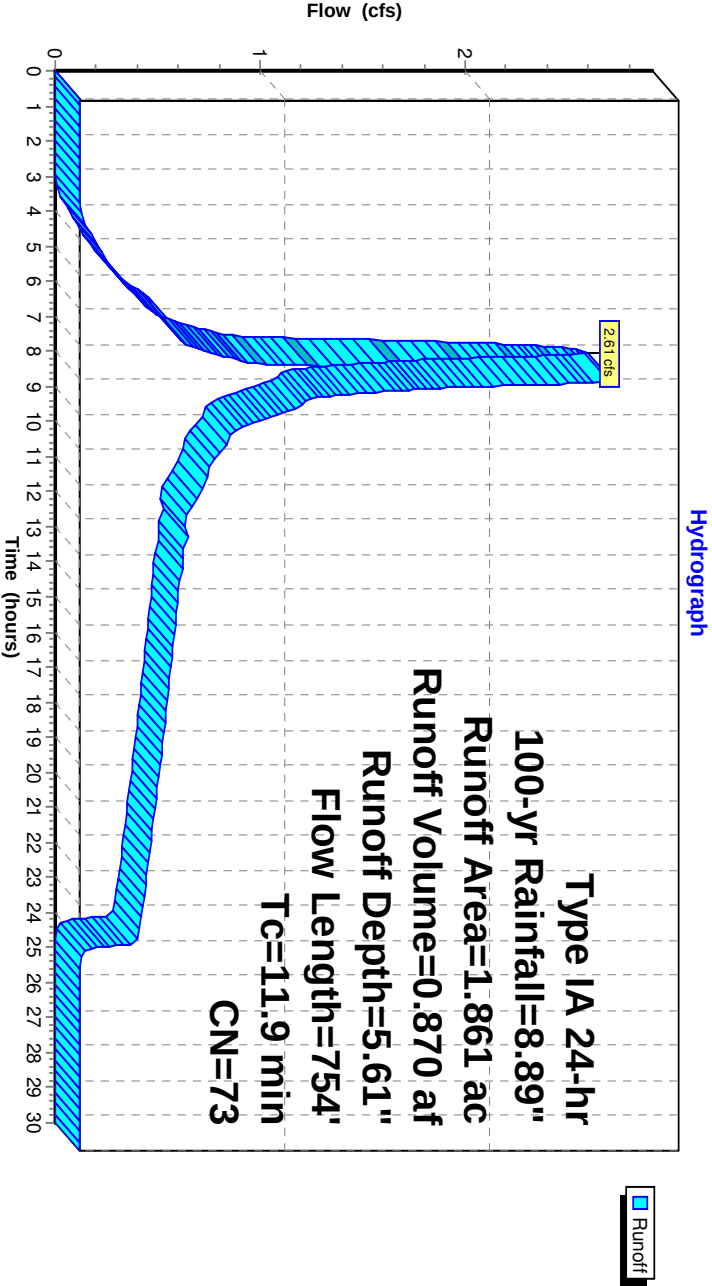
Runoff = 2.61 cfs @ 8.02 hrs, Volume= 0.870 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.102	75	Annual Grass, Good, HSG C
0.004	87	Dirt roads, HSG C
1.187	75	Vineyard, Good, HSG C
0.569	70	Woods, Good, HSG C
1.861	73	Weighted Average
1.861		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	43	0.1200	0.09		Sheet Flow, Shallow Woods: Dense underbrush n= 0.800 P2= 4.05"
1.6	178	0.1400	1.87		Shallow Concentrated Flow, Shallow 1 - Woodland Woodland Kv= 5.0 fps
0.8	119	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass Short Grass Pasture Kv= 7.0 fps
0.6	87	0.2100	2.29		Shallow Concentrated Flow, Shallow 3 - Woodland Woodland Kv= 5.0 fps
0.6	327	0.1500	9.62	19.23	Trap/Vee/Rect Channel Flow, Ditch Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
11.9	754	Total			

Subcatchment WS-2: Subcat WS-2



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Page 112

Summary for Subcatchment WS-3: Subcat WS-3

Runoff = 11.94 cfs @ 8.06 hrs, Volume= 4.118 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.639	75	Annual Grass, Good, HSG C
0.190	87	Dirt roads, HSG C
0.512	82	Farmsteads, HSG C
0.289	75	Vineyard, Good, HSG C
7.377	70	Woods, Good, HSG C
0.005	77	Woods, Good, HSG D
9.011	72	Weighted Average
9.011		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	59	0.2200	0.12		Sheet Flow, Sheet
					Woods: Dense underbrush n= 0.800 P2= 4.05"
3.5	499	0.2300	2.40		Shallow Concentrated Flow, Shallow 1 - Woodland
					Woodland Kv= 5.0 fps
1.0	152	0.1300	2.52		Shallow Concentrated Flow, Shallow 2 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
1.0	125	0.1600	2.00		Shallow Concentrated Flow, Shallow 3 - Woodland
					Woodland Kv= 5.0 fps
2.5	372	0.1300	2.52		Shallow Concentrated Flow, Shallow 4 - Short Grass
					Short Grass Pasture Kv= 7.0 fps
0.2	60	0.0300	4.87	1.70	Pipe Channel, 8" CPP
					8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'
					n= 0.016 PPI 8in CPP
16.6	1,267	Total			

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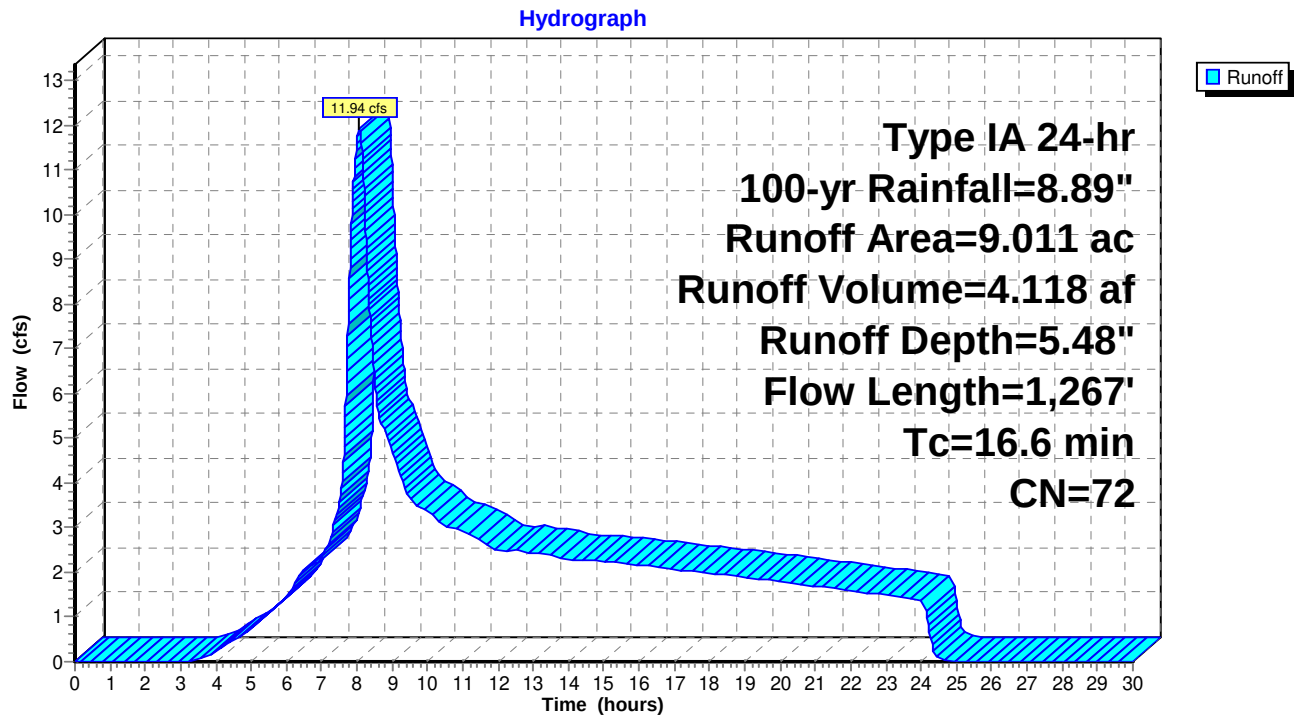
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Type IA 24-hr 100-yr Rainfall=8.89"

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Page 113

Subcatchment WS-3: Subcat WS-3



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Page 114

Summary for Subcatchment WS-4: Subcat WS-4

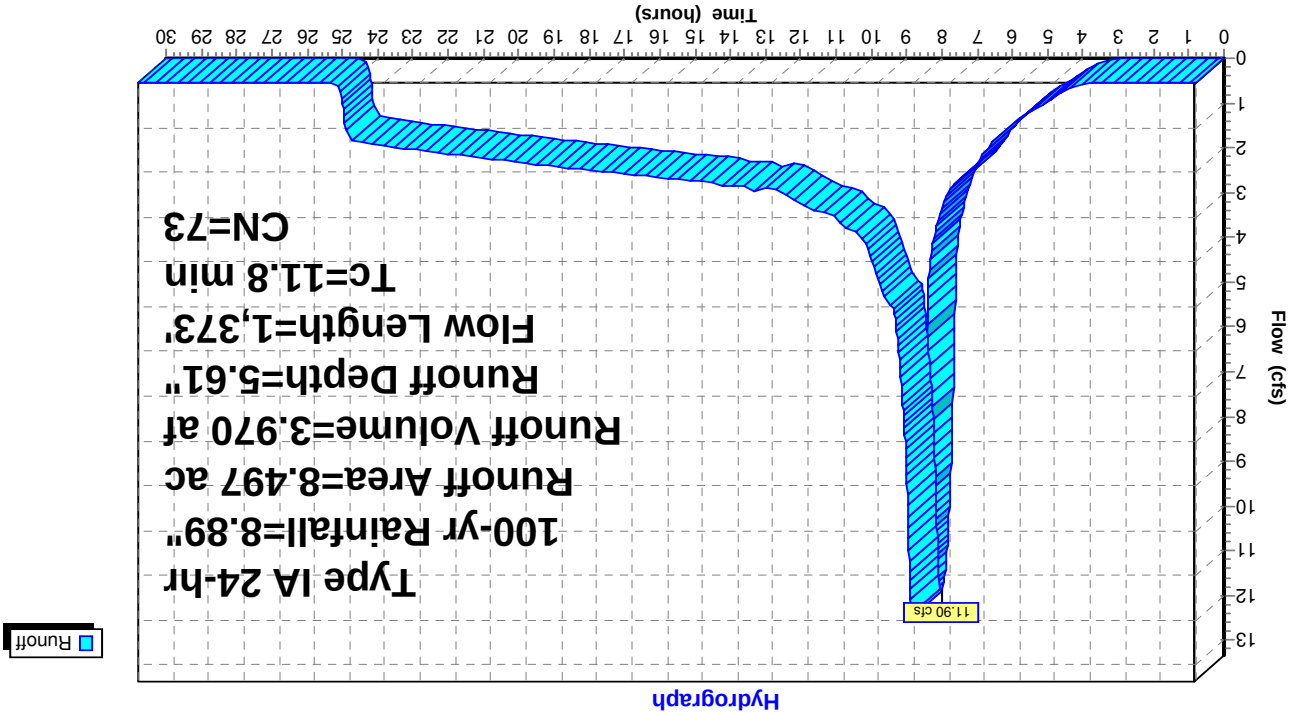
Runoff = 11.90 cfs @ 8.01 hrs, Volume= 3.970 af, Depth= 5.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-yr Rainfall=8.89"

Area (ac)	CN	Description
0.033	75	Annual Grass, Good, HSG C
0.084	81	Annual Grass, Good, HSG D
0.116	87	Dirt roads, HSG C
0.075	89	Dirt roads, HSG D
0.079	93	Paved roads w/open ditches, 50% imp, HSG D
1.469	75	Vineyard, Good, HSG C
0.128	81	Vineyard, Good, HSG D
5.124	70	Woods, Good, HSG C
1.390	77	Woods, Good, HSG D
8.497	73	Weighted Average
8.458		99.54% Pervious Area
0.039		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	100	0.0800	0.33		Sheet Flow, Sheet Grass: Short n= 0.150 P2= 4.05"
3.7	579	0.2700	2.60		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
2.0	285	0.1200	2.42		Shallow Concentrated Flow, Shallow - Short Grass Short Grass Pasture Kv= 7.0 fps
0.3	36	0.1700	2.06		Shallow Concentrated Flow, Shallow - Woodland Woodland Kv= 5.0 fps
0.8	373	0.0300	8.15	9.78	Trap/Vee/Rect Channel Flow, Concrete Ditch Bot.W=1.00' D=1.00' Z= 0.2 '/' Top.W=1.40' n= 0.017
11.8	1,373	Total			

Subcatchment WS-4: Subcat WS-4



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Page 116

Summary for Reach 2R: Reach 1A - Ditch

Inflow = 0.95 cfs @ 8.03 hrs, Volume= 0.030 af
Outflow = 0.95 cfs @ 8.04 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.75 fps, Min. Travel Time= 1.4 min

Avg. Velocity= 1.62 fps, Avg. Travel Time= 3.1 min

Peak Storage= 78 cf @ 8.04 hrs

Average Depth at Peak Storage= 0.24' , Surface Width= 1.10'

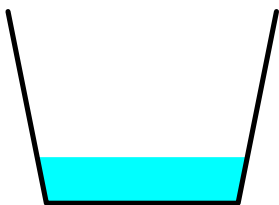
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 7.91 cfs

1.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 0.2 ' / ' Top Width= 1.40'

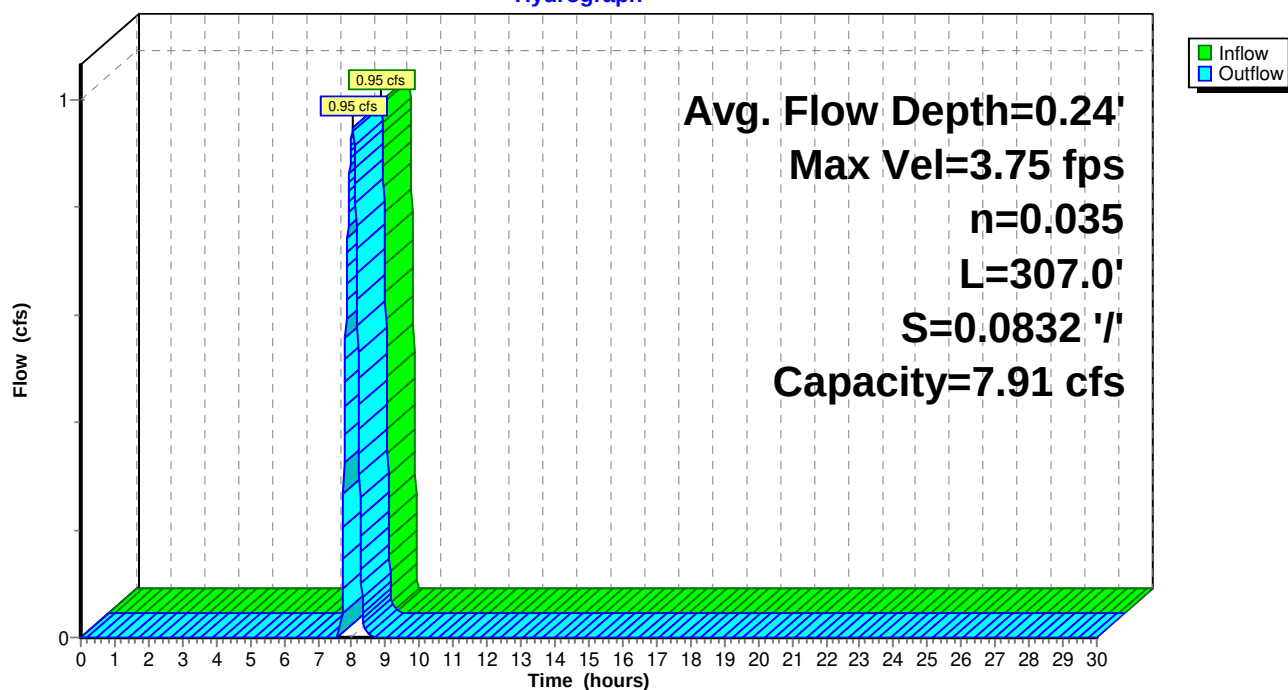
Length= 307.0' Slope= 0.0832 ' / '

Inlet Invert= 273.81', Outlet Invert= 248.28'



Reach 2R: Reach 1A - Ditch

Hydrograph



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Page 117

Summary for Reach 3R: Reach 2B - Conc. Ditch

Inflow Area = 10.873 ac, 0.00% Impervious, Inflow Depth = 5.47" for 100-yr event
Inflow = 13.59 cfs @ 8.06 hrs, Volume= 4.958 af
Outflow = 13.58 cfs @ 8.08 hrs, Volume= 4.958 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 9.41 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 5.81 fps, Avg. Travel Time= 1.3 min

Peak Storage= 668 cf @ 8.08 hrs

Average Depth at Peak Storage= 1.17', Surface Width= 1.47'

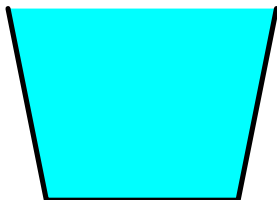
Bank-Full Depth= 1.00' Flow Area= 1.2 sf, Capacity= 10.78 cfs

1.00' x 1.00' deep channel, n= 0.014 Concrete, unfinished

Side Slope Z-value= 0.2 '/' Top Width= 1.40'

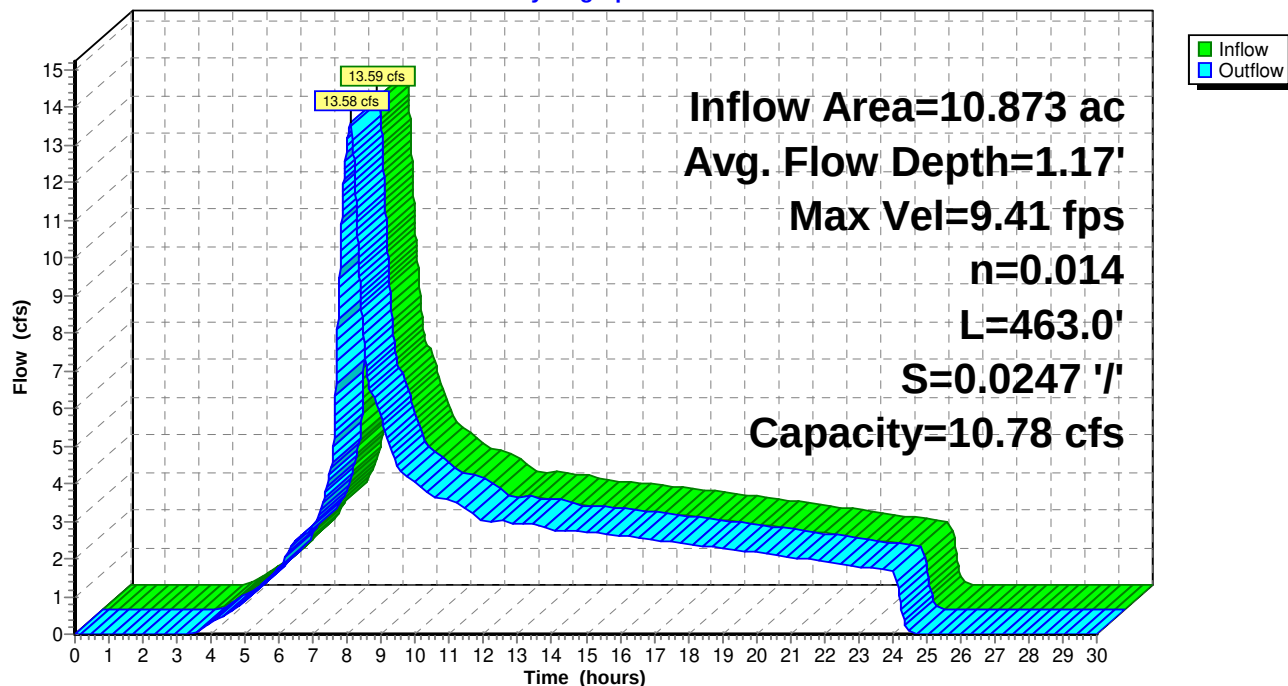
Length= 463.0' Slope= 0.0247 '/'

Inlet Invert= 267.21', Outlet Invert= 255.76'



Reach 3R: Reach 2B - Conc. Ditch

Hydrograph



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Page 118

Summary for Reach 5R: Reach 1B - 12" SW

Inflow = 0.95 cfs @ 8.04 hrs, Volume= 0.030 af
Outflow = 0.95 cfs @ 8.04 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 4.58 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.96 fps, Avg. Travel Time= 0.7 min

Peak Storage= 18 cf @ 8.04 hrs

Average Depth at Peak Storage= 0.31', Surface Width= 0.92'

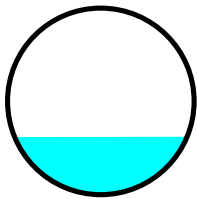
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.56 cfs

12.0" Round Pipe

n= 0.018 PPI 12in-15in CPP

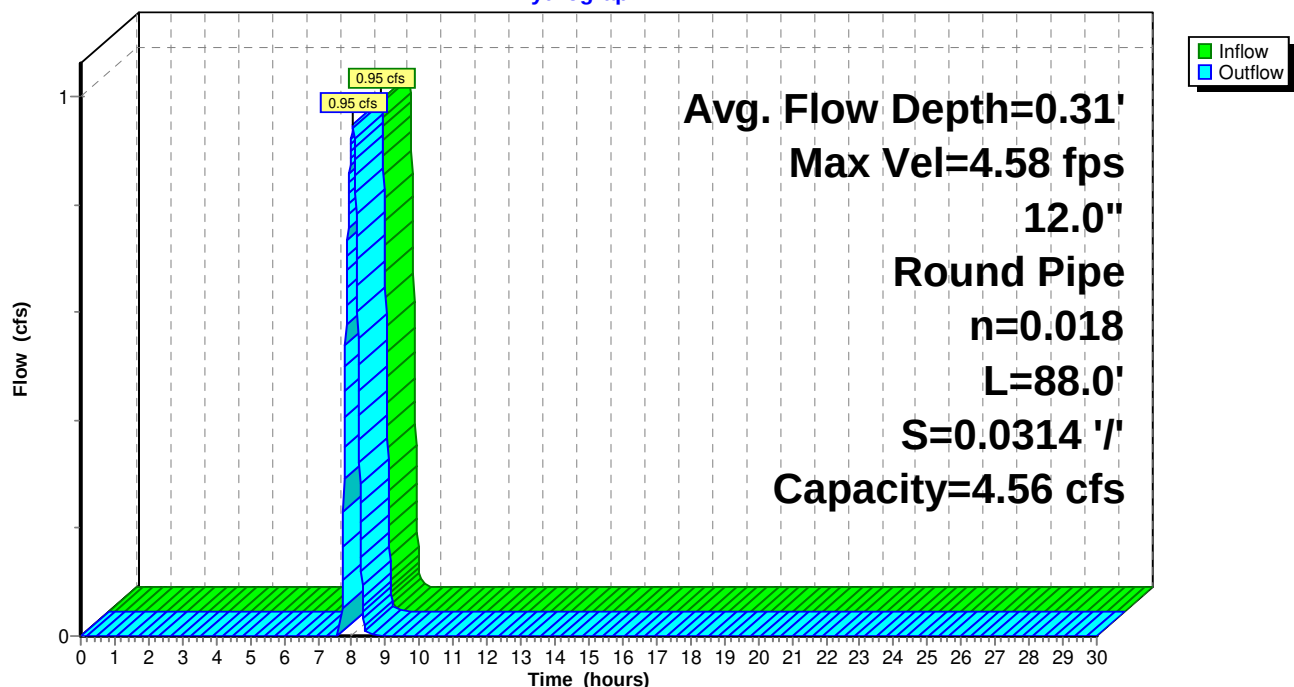
Length= 88.0' Slope= 0.0314 '/'

Inlet Invert= 248.28', Outlet Invert= 245.52'



Reach 5R: Reach 1B - 12" SW

Hydrograph



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Page 119

Summary for Pond 1P: Catch Basin

Inflow Area = 1.861 ac, 0.00% Impervious, Inflow Depth = 5.61" for 100-yr event
 Inflow = 2.61 cfs @ 8.02 hrs, Volume= 0.870 af
 Outflow = 2.61 cfs @ 8.02 hrs, Volume= 0.870 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.66 cfs @ 7.79 hrs, Volume= 0.840 af
 Secondary = 0.95 cfs @ 8.03 hrs, Volume= 0.030 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 274.29' @ 8.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	272.11'	8.0" Round Culvert L= 189.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 272.11' / 267.21' S= 0.0259 '/' Cc= 0.900 n= 0.016 PPI 8in CPP, Flow Area= 0.35 sf
#2	Device 1	273.61'	1.0" x 4.0" Horiz. Orifice/Grate X 13.00 columns X 4 rows C= 0.600 in 24.0" x 24.0" Grate (36% open area) Limited to weir flow at low heads
#3	Secondary	273.81'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Elev. (feet) 273.81 274.71 Width (feet) 1.00 1.00

Primary OutFlow Max=1.66 cfs @ 7.79 hrs HW=274.12' TW=268.16' (Dynamic Tailwater)

1=Culvert (Outlet Controls 1.66 cfs @ 4.76 fps)

2=Orifice/Grate (Passes 1.66 cfs of 4.97 cfs potential flow)
Secondary OutFlow Max=0.95 cfs @ 8.03 hrs HW=274.29' TW=274.05' (Dynamic Tailwater)

3=Custom Weir/Orifice (Weir Controls 0.95 cfs @ 1.99 fps)

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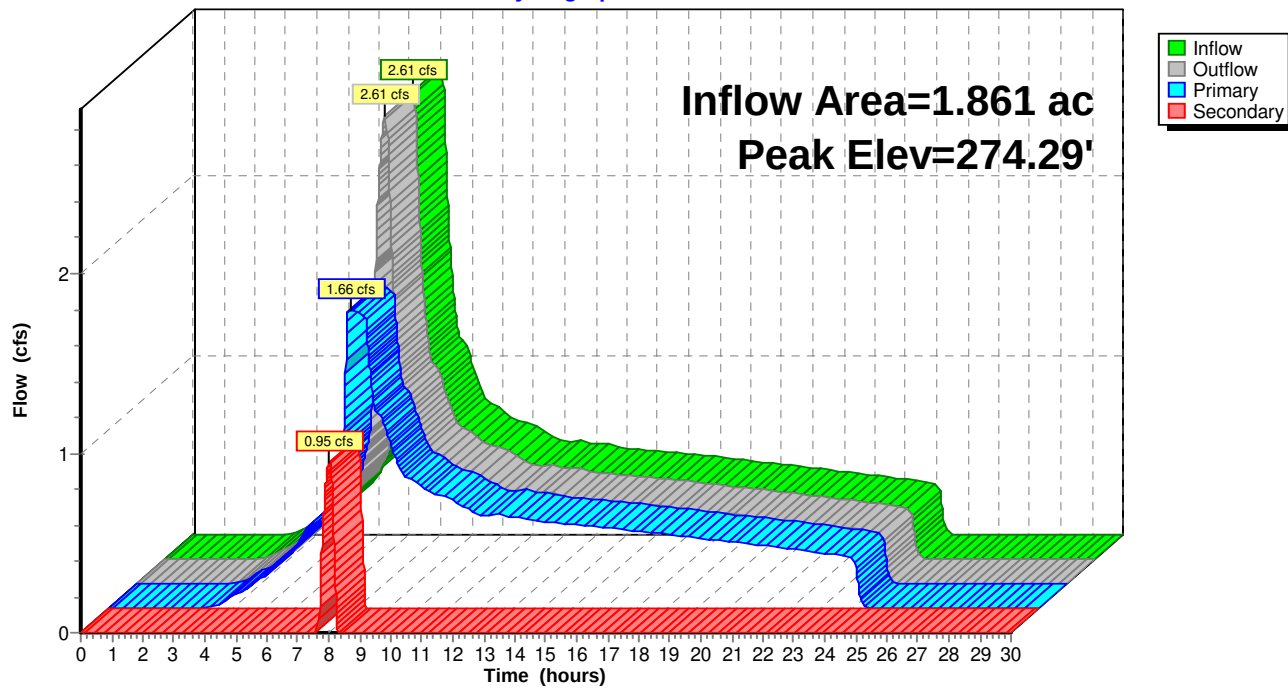
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Page 120

Pond 1P: Catch Basin

Hydrograph



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Page 121

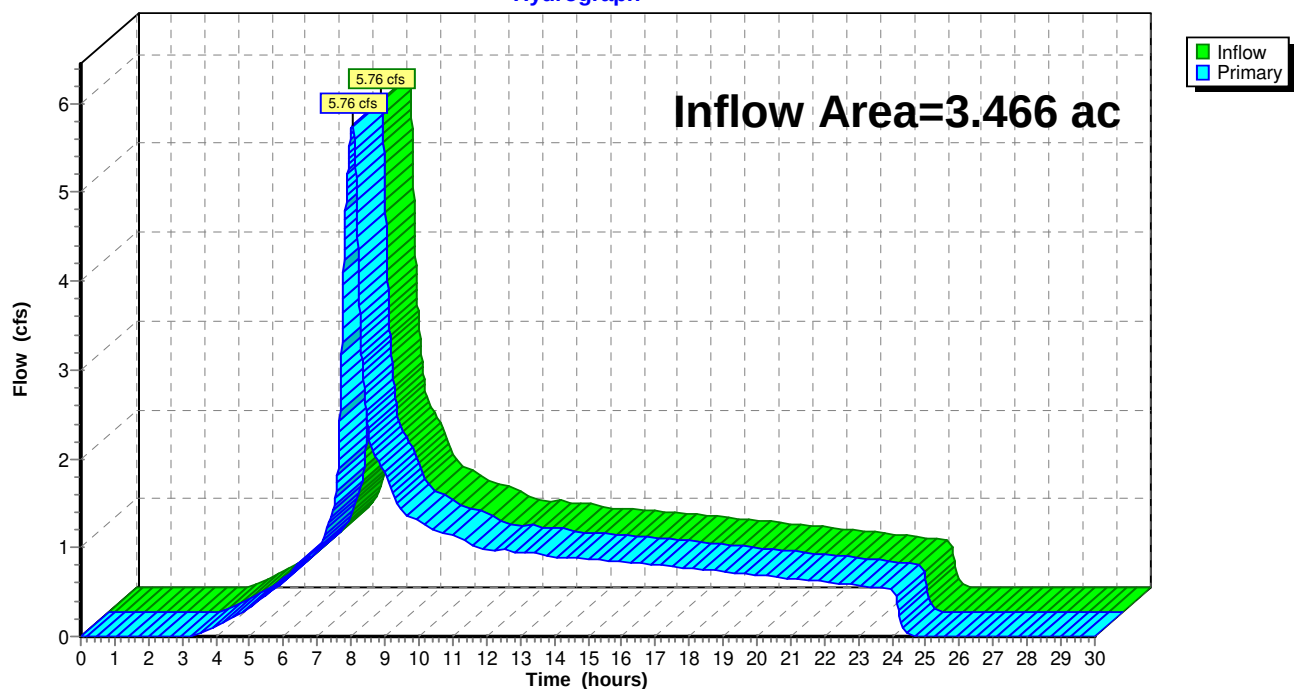
Summary for Link 4L: Outlet

Inflow Area = 3.466 ac, 0.00% Impervious, Inflow Depth = 5.71" for 100-yr event
Inflow = 5.76 cfs @ 8.05 hrs, Volume= 1.649 af
Primary = 5.76 cfs @ 8.05 hrs, Volume= 1.649 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 4L: Outlet

Hydrograph



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Page 122

Summary for Link 5L: Outlet 2

Inflow Area = 19.370 ac, 0.20% Impervious, Inflow Depth = 5.53" for 100-yr event
Inflow = 25.37 cfs @ 8.04 hrs, Volume= 8.927 af
Primary = 25.37 cfs @ 8.04 hrs, Volume= 8.927 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 5L: Outlet 2

Hydrograph

