

**WETLANDS
DRAINAGE ANALYSIS
for
THE WINDSOR AT MILLBROOK VILLAGE
Railroad Avenue
Duxbury, MA**

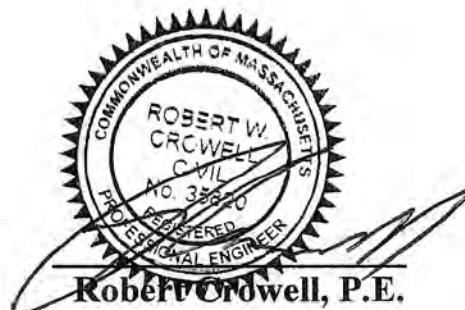
Report prepared for

**50 RR AVE DUX LLC
272 St. George Street
Duxbury, MA 02332
781-934-8502**

by

**Crowell Engineering
981 Long Pond Road
Plymouth, MA 02360
774-283-0443**

**July 5, 2023
Revised August 31, 2023**



NARRATIVE

The rate of runoff decreased leaving the site as shown on Table 1. These numbers account for runoff from the site, the street and across the street. The infiltration system takes stormwater from the site. The two “wet” basins store stormwater from the site, the street and across the street. Approximately a third of this runoff is from the street (offsite).

As mentioned above, we reduced the runoff rate leaving the site. However, the volume of runoff has increased.

Storm Event	Increase Leaving the Site
2yr	3267 ft ³
10yr	3920 ft ³
25 yr	4443 ft ³
100yr	5706 ft ³

Crowell Engineering shot the culvert inverts on both sides of Alden Street. We looked at the surrounding area, approximately 21.4 acres contributing runoff to the wetland. We looked at the peak heights at the culvert. There was no increase in height for the 2-year storm. The 10-, 25- & 100-year storm showed a slight decrease even though we have increased the volume entering the wetlands. The basins help store the runoff and slowly release it into the wetlands. It is all about the timing and distance the water flows to the culvert.

Summary of Peak Runoffs, Volumes & Water Heights in Wetlands

The following are summary tables of the pre- and post-development peak runoff rates and volumes for the wetlands at Alden Street and of the maximum heights of the water surface in the wetlands.

TABLE 1: Total Peak Flows From Wetlands at Alden Street To Bluefish River

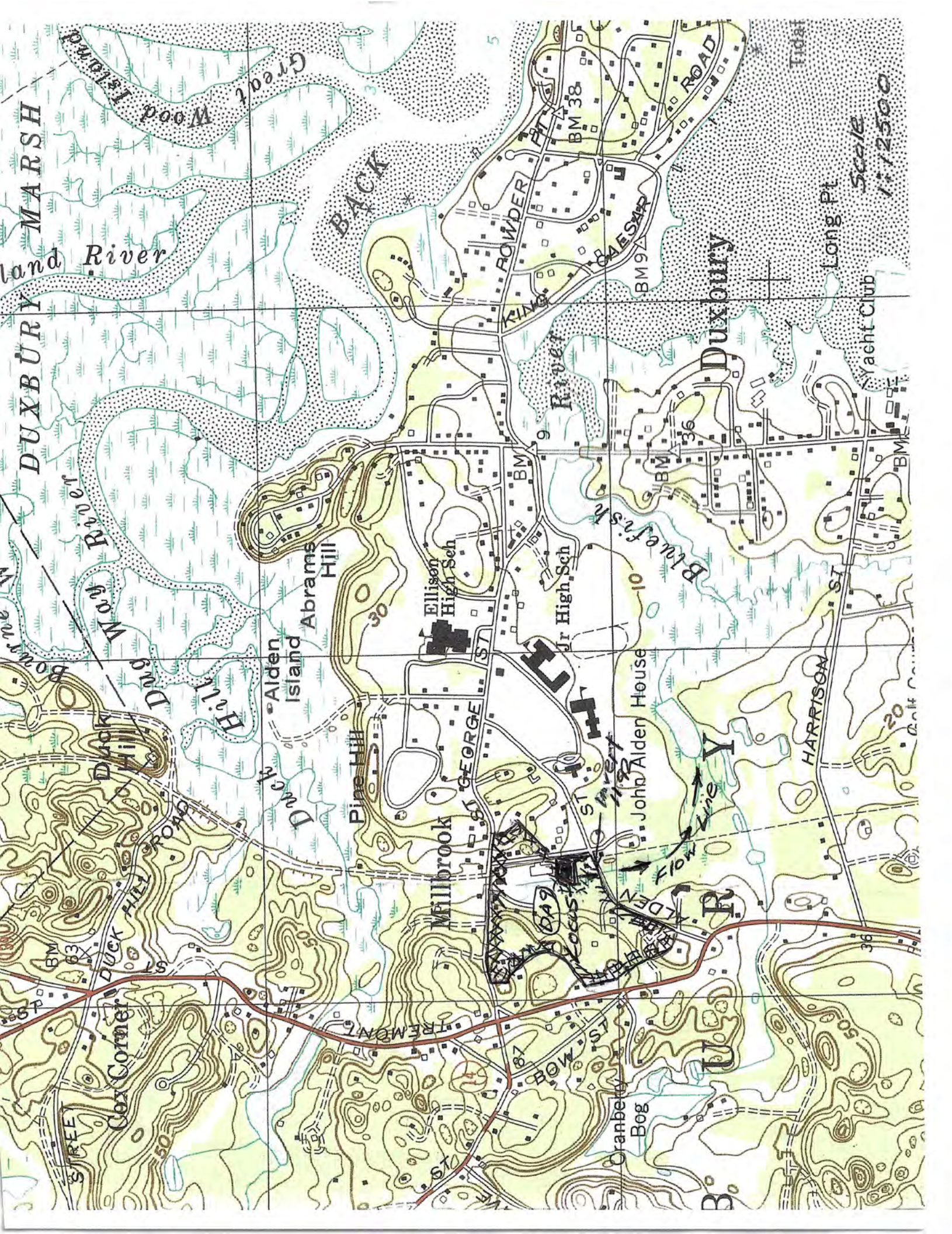
DESIGN STORM (YEAR)	TOTAL PEAK RUNOFF		
	PRE DEVELOP. (CFS)	POST DEVELOP. (CFS)	NET CHANGE (CFS)
2	4.11	4.09	-0.02
10	8.77	8.57	-0.20
25	11.11	10.76	-0.35
100	14.85	14.46	-0.39

TABLE 2: Total Runoff Volumes To Wetlands

DESIGN STORM (YEAR)	TOTAL RUNOFF VOLUME		
	PRE DEVELOP. (Ac Ft)	POST DEVELOP. (Ac Ft)	NET CHANGE (Ac Ft)
2	1.190	1.247	+0.057
			(+4.790%)
10	2.623	2.680	+0.057
			(+2.173%)
25	3.699	3.760	+0.061
			(+1.649%)
100	5.399	5.479	+0.080
			(+1.482%)

TABLE 3: Total Peak Heights in Wetlands

DESIGN STORM (YEAR)	PEAK HEIGHTS		
	PRE DEVELOP. (FT)	POST DEVELOP. (FT)	NET CHANGE (FT)
2	12.87	12.86	-0.01
10	13.51	13.48	-0.03
25	14.03	13.96	-0.07
100	14.89	14.74	-0.15





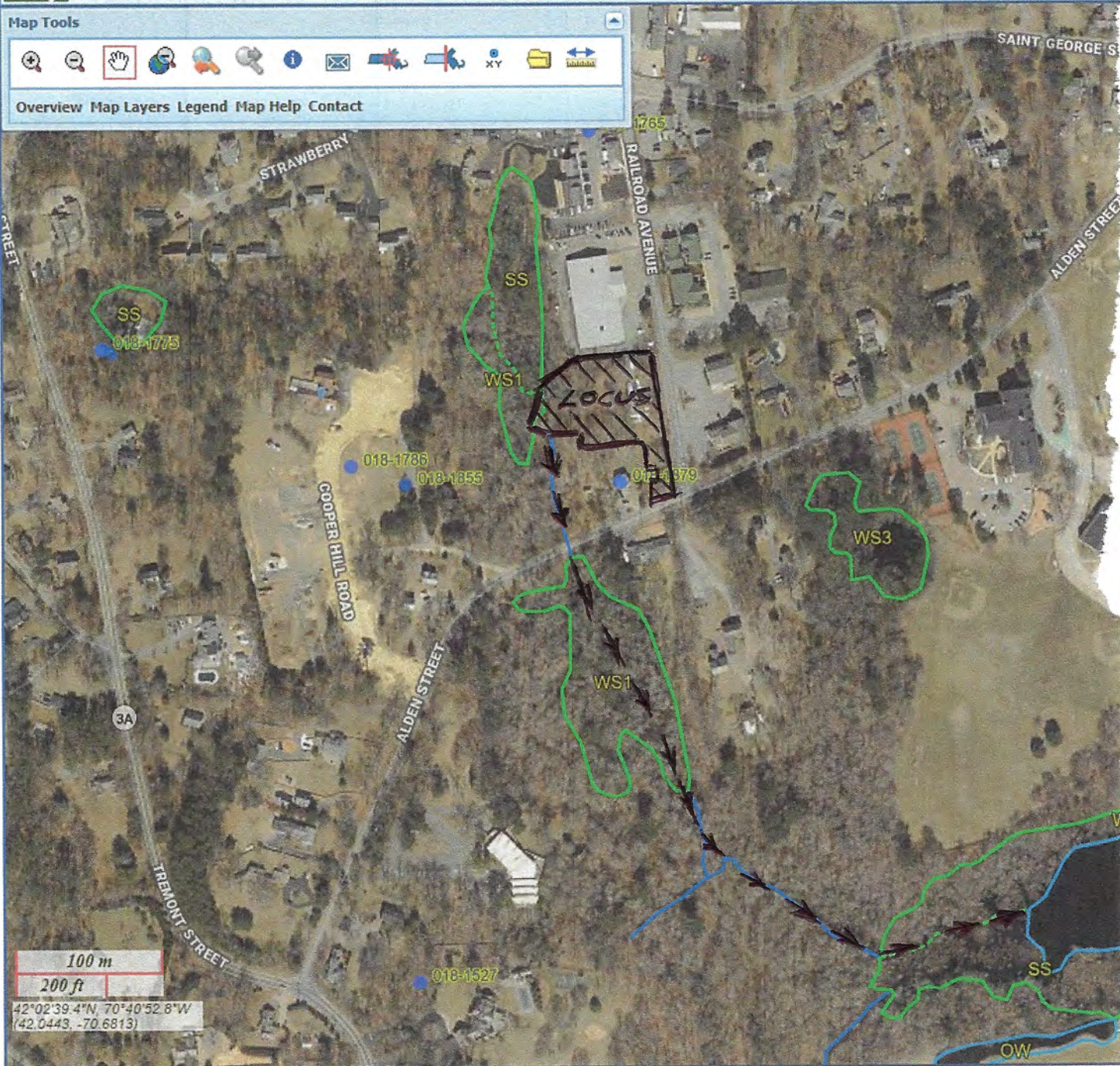
MassDEP Online Map Viewer

Wetland and Wetland Change Areas Map

Map Tools

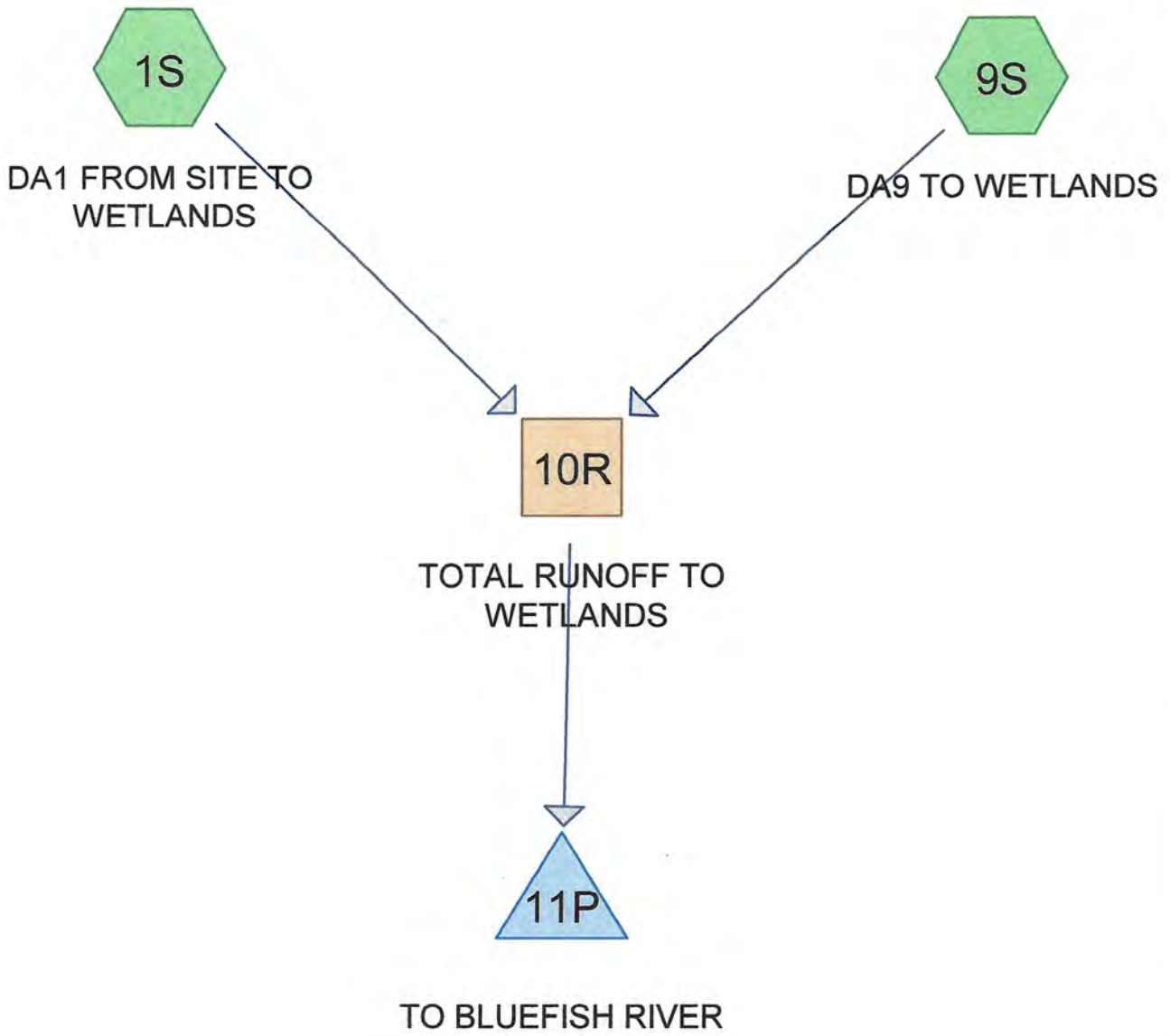


Overview Map Layers Legend Map Help Contact





**Pre-Development Drainage Analysis
(Existing Conditions)**



Subcat



Reach



Pond



Link

Routing Diagram for THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (PRE) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (PRE) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year Storm	Type III 24-hr		Default	24.00	1	3.40	2
2	10 Year Storm	Type III 24-hr		Default	24.00	1	4.80	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	5.70	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	7.00	2

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (PRE) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.813	39	>75% Grass cover, Good, HSG A (1S, 9S)
0.569	74	>75% Grass cover, Good, HSG C (1S, 9S)
0.004	98	Conc Culvert, HSG D (1S)
0.029	98	Paved parking, HSG C (1S)
0.002	98	Roofs, HSG C (1S)
8.494	98	Roofs,Pavement HSG A (9S)
4.548	30	Woods, Good, HSG A (1S, 9S)
1.055	70	Woods, Good, HSG C (1S, 9S)
0.888	77	Woods-wetland, Good, HSG D (1S, 9S)
21.403	65	TOTAL AREA

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (PRE) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
18.855	HSG A	1S, 9S
0.000	HSG B	
1.656	HSG C	1S, 9S
0.892	HSG D	1S, 9S
0.000	Other	
21.403		TOTAL AREA

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (PRE) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
5.813	0.000	0.569	0.000	0.000	6.383	>75% Grass cover, Good	1S, 9S
0.000	0.000	0.000	0.004	0.000	0.004	Conc Culvert	1S
0.000	0.000	0.029	0.000	0.000	0.029	Paved parking	1S
0.000	0.000	0.002	0.000	0.000	0.002	Roofs	1S
8.494	0.000	0.000	0.000	0.000	8.494	Roofs,Pavement	9S
4.548	0.000	1.055	0.000	0.000	5.603	Woods, Good	1S, 9S
0.000	0.000	0.000	0.888	0.000	0.888	Woods-wetland, Good	1S, 9S
18.855	0.000	1.656	0.892	0.000	21.403	TOTAL AREA	

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (PRE) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	11P	11.92	11.50	44.0	0.0095	0.011	18.0	0.0	0.0

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY Type III 24-hr 2 Year Storm Rainfall=3.40"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 6

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 FROM SITE TO Runoff Area=39,154 sf 3.91% Impervious Runoff Depth=0.95"
Flow Length=268' Tc=17.5 min CN=70 Runoff=0.64 cfs 0.071 af

Subcatchment 9S: DA9 TO WETLANDS Runoff Area=893,172 sf 41.43% Impervious Runoff Depth=0.66"
Flow Length=1,175' Tc=26.9 min CN=64 Runoff=7.49 cfs 1.119 af

Reach 10R: TOTAL RUNOFF TO WETLANDS Inflow=7.98 cfs 1.190 af
Outflow=7.98 cfs 1.190 af

Pond 11P: TO BLUEFISH RIVER Peak Elev=12.87' Storage=9,695 cf Inflow=7.98 cfs 1.190 af
Outflow=4.11 cfs 1.190 af

Total Runoff Area = 21.403 ac Runoff Volume = 1.190 af Average Runoff Depth = 0.67"
60.15% Pervious = 12.874 ac 39.85% Impervious = 8.529 ac

Summary for Subcatchment 1S: DA1 FROM SITE TO WETLANDS

Runoff = 0.64 cfs @ 12.27 hrs, Volume= 0.071 af, Depth= 0.95"

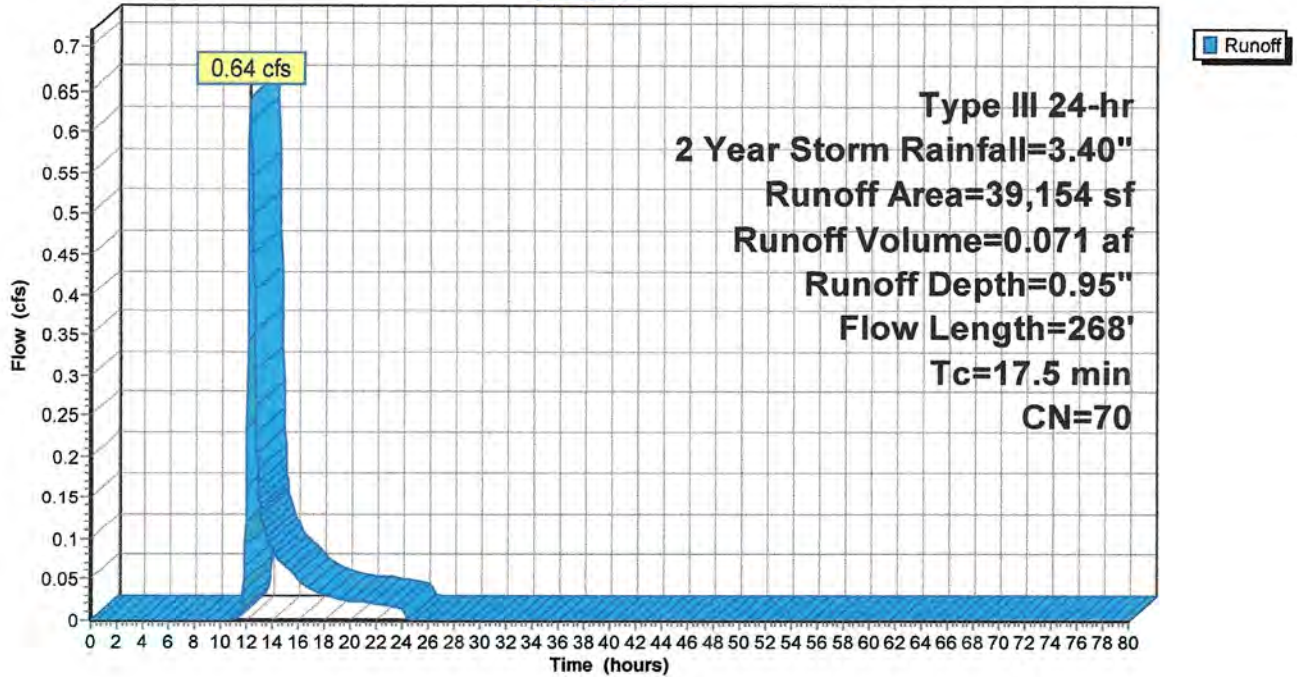
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
1,091	30	Woods, Good, HSG A
25,974	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
1,059	39	>75% Grass cover, Good, HSG A
4,807	74	>75% Grass cover, Good, HSG C
1,268	98	Paved parking, HSG C
* 164	98	Conc Culvert, HSG D
97	98	Roofs, HSG C
39,154	70	Weighted Average
37,625		96.09% Pervious Area
1,529		3.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, WOODS
					Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	168	0.0330	0.91		Shallow Concentrated Flow, PAVED
					Woodland Kv= 5.0 fps
2.4	50	0.0050	0.35		Shallow Concentrated Flow, WOODS/WETLANDS
					Woodland Kv= 5.0 fps
17.5	268	Total			

Subcatchment 1S: DA1 FROM SITE TO WETLANDS

Hydrograph



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 7.49 cfs @ 12.46 hrs, Volume= 1.119 af, Depth= 0.66"

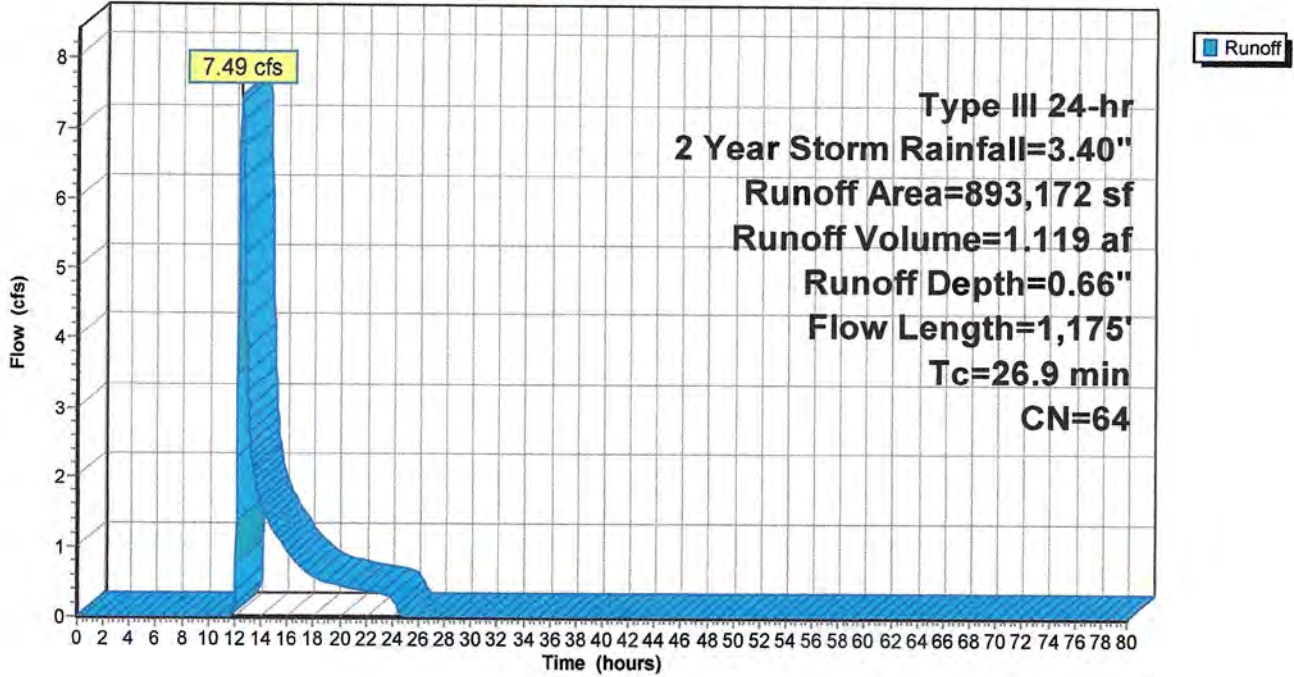
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
197,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
252,172	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 370,000	98	Roofs,Pavement HSG A
893,172	64	Weighted Average
523,172		58.57% Pervious Area
370,000		41.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

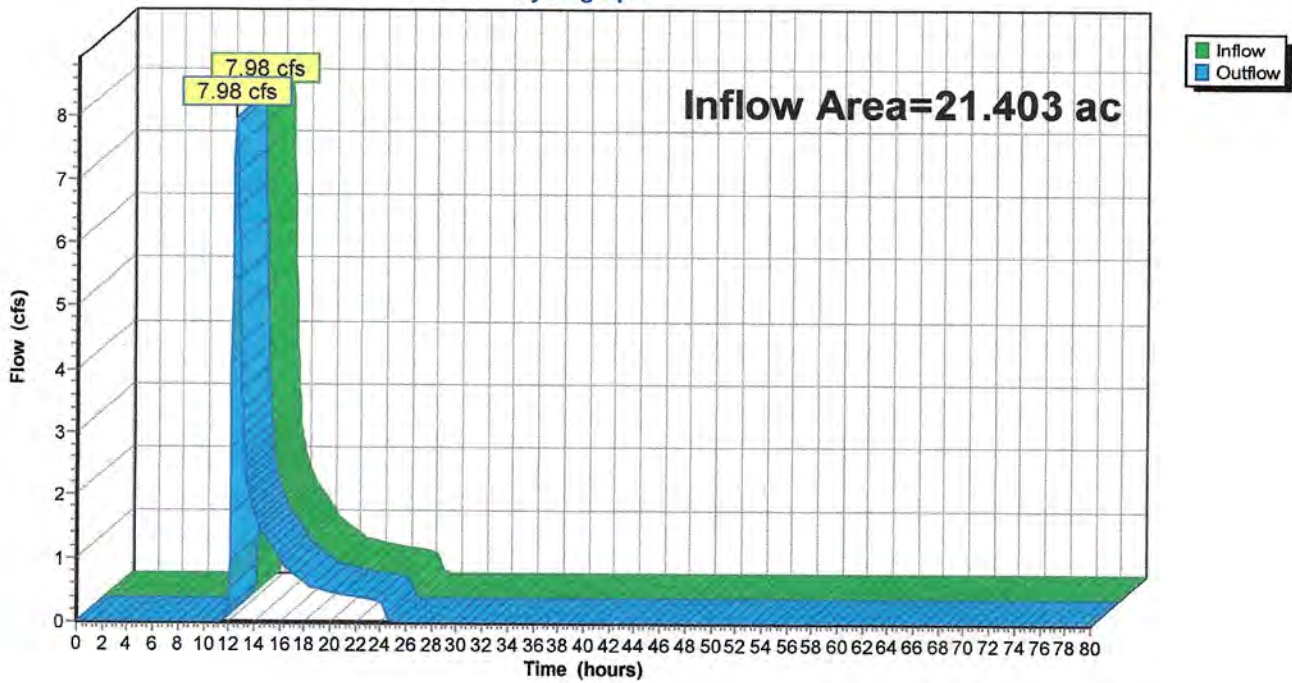
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 0.67" for 2 Year Storm event
Inflow = 7.98 cfs @ 12.45 hrs, Volume= 1.190 af
Outflow = 7.98 cfs @ 12.45 hrs, Volume= 1.190 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS

Hydrograph



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 0.67" for 2 Year Storm event
 Inflow = 7.98 cfs @ 12.45 hrs, Volume= 1.190 af
 Outflow = 4.11 cfs @ 12.89 hrs, Volume= 1.190 af, Atten= 49%, Lag= 26.4 min
 Primary = 4.11 cfs @ 12.89 hrs, Volume= 1.190 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.87' @ 12.89 hrs Surf.Area= 24,376 sf Storage= 9,695 cf

Plug-Flow detention time= 31.7 min calculated for 1.190 af (100% of inflow)
 Center-of-Mass det. time= 31.7 min (943.0 - 911.2)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	138,692 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	32,500	31,242	44,544	32,580
15.00	37,000	34,726	79,269	37,128
16.00	40,500	38,737	118,006	40,697
16.50	42,250	20,686	138,692	42,484

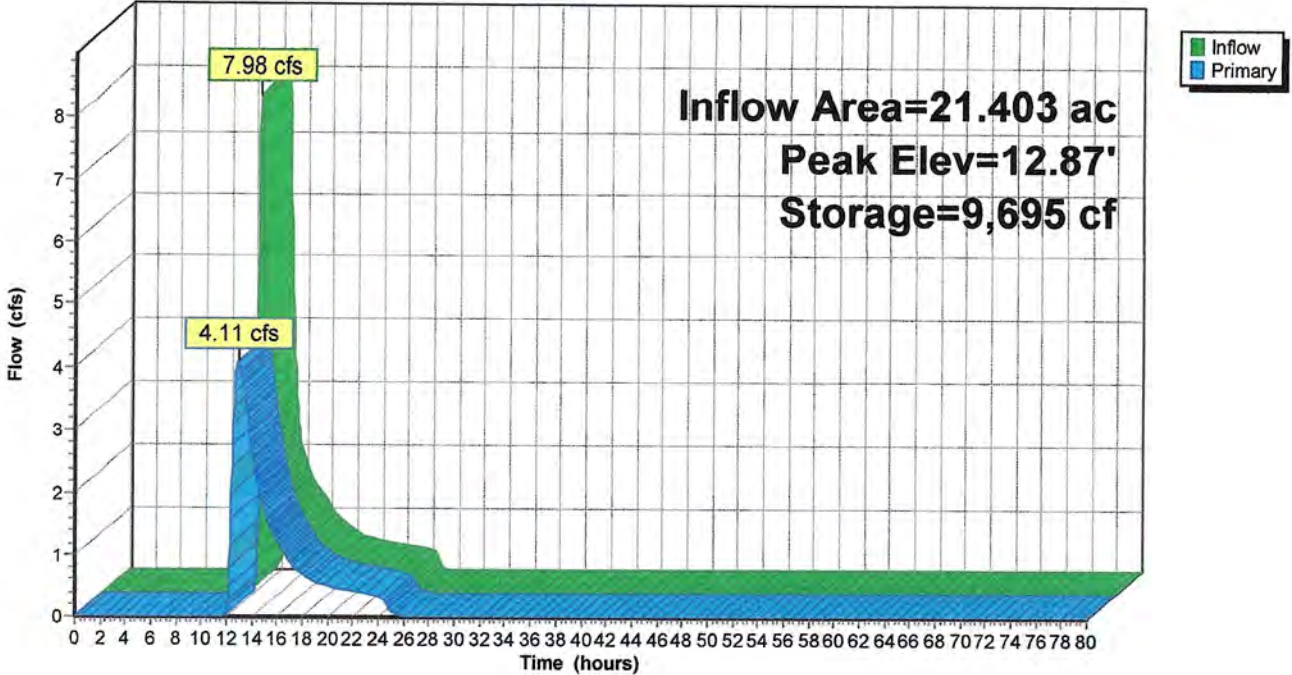
Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 ' / S= 0.0095 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.10 cfs @ 12.89 hrs HW=12.87' (Free Discharge)

- 1=RCP_Round 18" (Barrel Controls 4.10 cfs @ 4.98 fps)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 FROM SITE TO

Runoff Area=39,154 sf 3.91% Impervious Runoff Depth=1.89"
Flow Length=268' Tc=17.5 min CN=70 Runoff=1.38 cfs 0.142 af

Subcatchment 9S: DA9 TO WETLANDS

Runoff Area=893,172 sf 41.43% Impervious Runoff Depth=1.45"
Flow Length=1,175' Tc=26.9 min CN=64 Runoff=19.24 cfs 2.481 af

Reach 10R: TOTAL RUNOFF TO WETLANDS

Inflow=20.33 cfs 2.623 af
Outflow=20.33 cfs 2.623 af

Pond 11P: TO BLUEFISH RIVER

Peak Elev=13.51' Storage=28,820 cf Inflow=20.33 cfs 2.623 af
Outflow=8.77 cfs 2.623 af

Total Runoff Area = 21.403 ac Runoff Volume = 2.623 af Average Runoff Depth = 1.47"
60.15% Pervious = 12.874 ac 39.85% Impervious = 8.529 ac

Summary for Subcatchment 1S: DA1 FROM SITE TO WETLANDS

Runoff = 1.38 cfs @ 12.26 hrs, Volume= 0.142 af, Depth= 1.89"

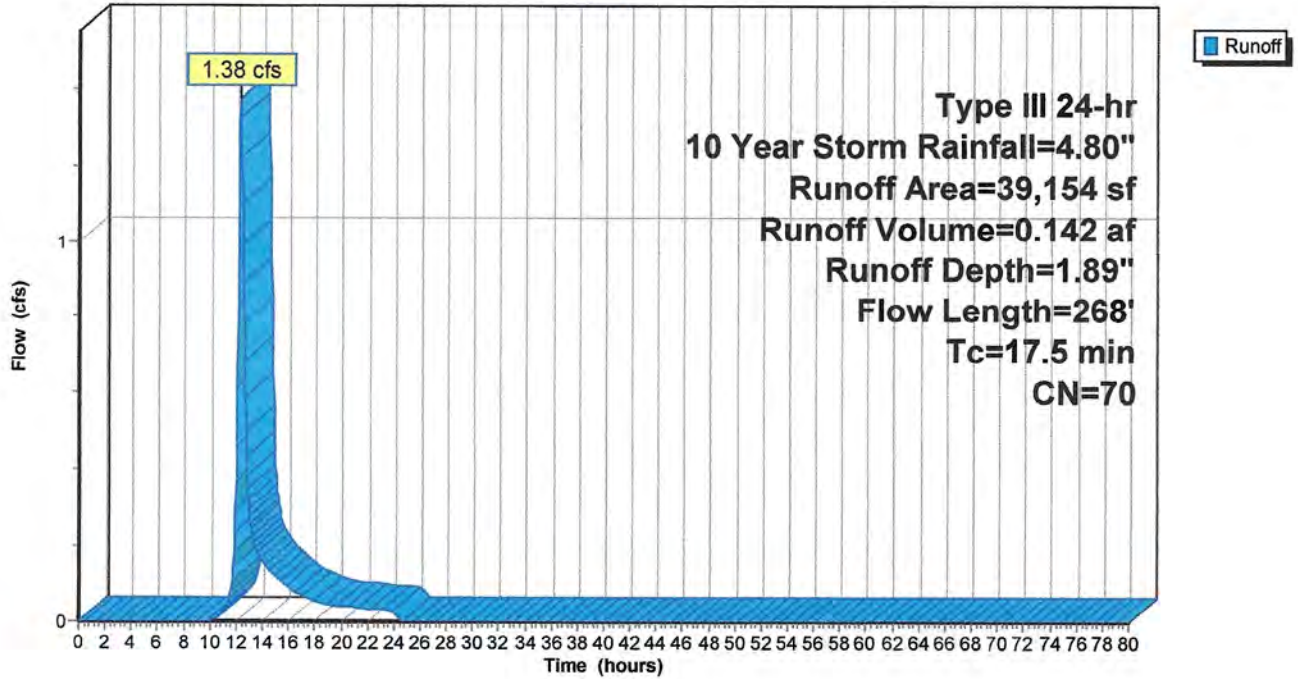
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
1,091	30	Woods, Good, HSG A
25,974	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
1,059	39	>75% Grass cover, Good, HSG A
4,807	74	>75% Grass cover, Good, HSG C
1,268	98	Paved parking, HSG C
* 164	98	Conc Culvert, HSG D
97	98	Roofs, HSG C
39,154	70	Weighted Average
37,625		96.09% Pervious Area
1,529		3.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, WOODS
					Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	168	0.0330	0.91		Shallow Concentrated Flow, PAVED
					Woodland Kv= 5.0 fps
2.4	50	0.0050	0.35		Shallow Concentrated Flow, WOODS/WETLANDS
					Woodland Kv= 5.0 fps
17.5	268	Total			

Subcatchment 1S: DA1 FROM SITE TO WETLANDS

Hydrograph



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 19.24 cfs @ 12.41 hrs, Volume= 2.481 af, Depth= 1.45"

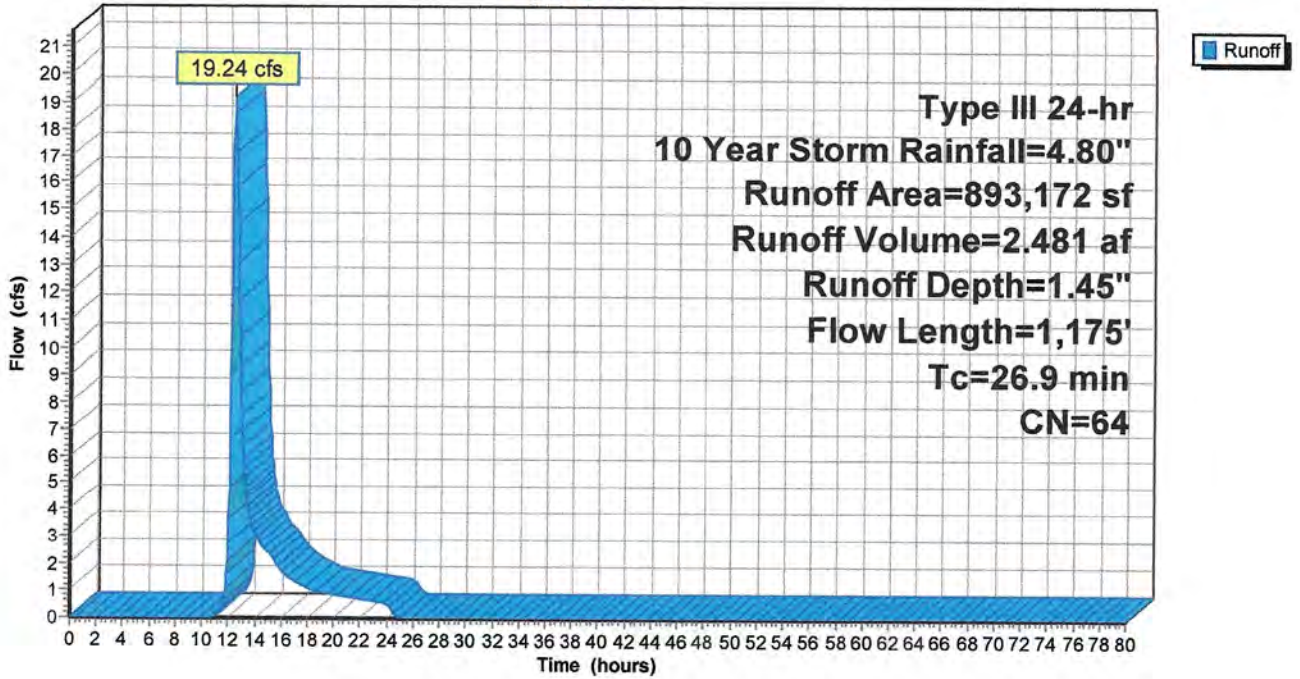
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
197,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
252,172	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 370,000	98	Roofs,Pavement HSG A
893,172	64	Weighted Average
523,172		58.57% Pervious Area
370,000		41.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 1.47" for 10 Year Storm event

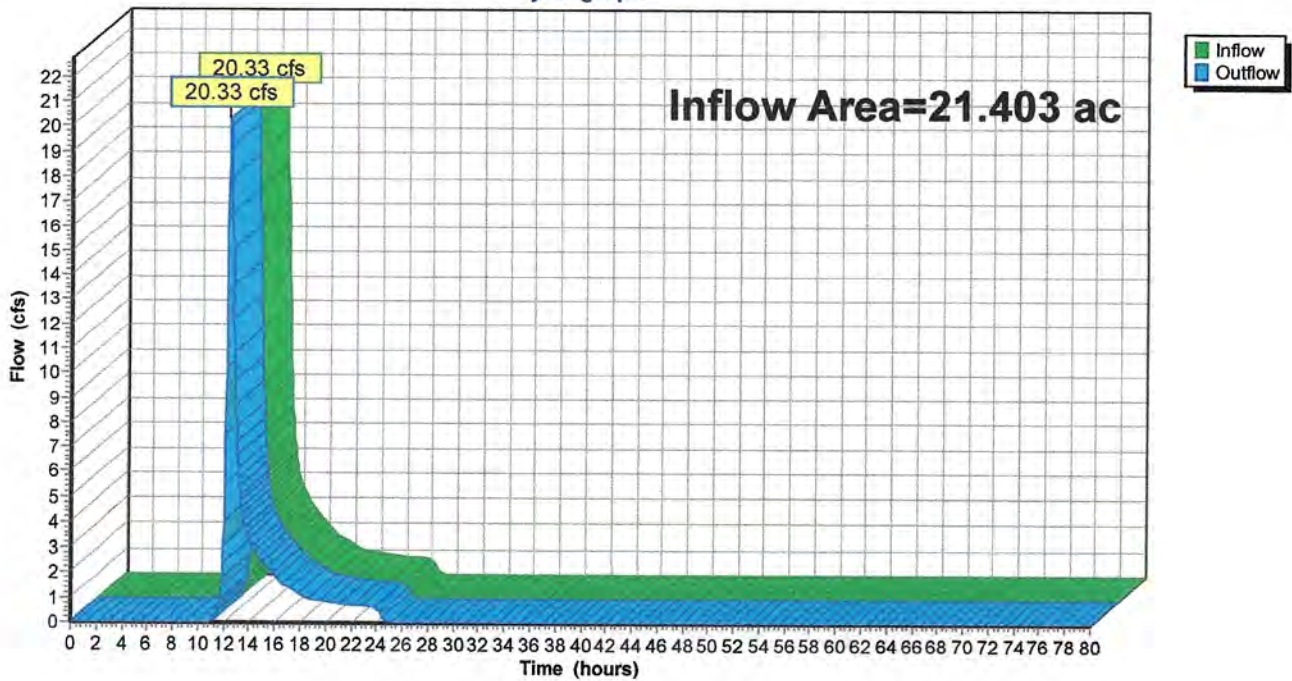
Inflow = 20.33 cfs @ 12.41 hrs, Volume= 2.623 af

Outflow = 20.33 cfs @ 12.41 hrs, Volume= 2.623 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS

Hydrograph



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 1.47" for 10 Year Storm event
 Inflow = 20.33 cfs @ 12.41 hrs, Volume= 2.623 af
 Outflow = 8.77 cfs @ 12.90 hrs, Volume= 2.623 af, Atten= 57%, Lag= 29.5 min
 Primary = 8.77 cfs @ 12.90 hrs, Volume= 2.623 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 13.51' @ 12.90 hrs Surf.Area= 31,254 sf Storage= 28,820 cf

Plug-Flow detention time= 41.5 min calculated for 2.623 af (100% of inflow)
 Center-of-Mass det. time= 41.4 min (925.7 - 884.3)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	138,692 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	32,500	31,242	44,544	32,580
15.00	37,000	34,726	79,269	37,128
16.00	40,500	38,737	118,006	40,697
16.50	42,250	20,686	138,692	42,484

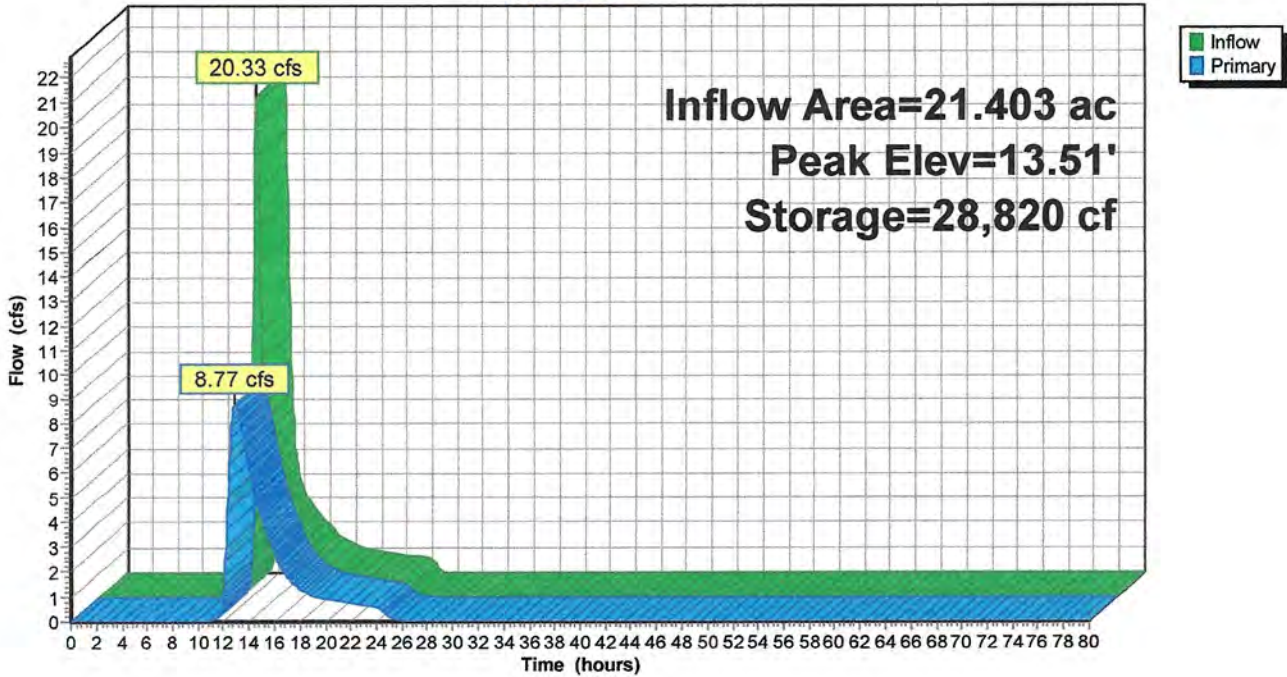
Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=8.77 cfs @ 12.90 hrs HW=13.51' (Free Discharge)

- 1=RCP_Round 18" (Barrel Controls 8.77 cfs @ 5.84 fps)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



THE WINSOR AT MILLBROOK VILLAGE, DUXBUR *Type III 24-hr 25 Year Storm Rainfall=5.70"*

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 FROM SITE TO Runoff Area=39,154 sf 3.91% Impervious Runoff Depth=2.57"
Flow Length=268' Tc=17.5 min CN=70 Runoff=1.90 cfs 0.192 af

Subcatchment 9S: DA9 TO WETLANDS Runoff Area=893,172 sf 41.43% Impervious Runoff Depth=2.05"
Flow Length=1,175' Tc=26.9 min CN=64 Runoff=28.11 cfs 3.506 af

Reach 10R: TOTAL RUNOFF TO WETLANDS Inflow=29.62 cfs 3.699 af
Outflow=29.62 cfs 3.699 af

Pond 11P: TO BLUEFISH RIVER Peak Elev=14.03' Storage=45,488 cf Inflow=29.62 cfs 3.699 af
Outflow=11.11 cfs 3.699 af

Total Runoff Area = 21.403 ac Runoff Volume = 3.699 af Average Runoff Depth = 2.07"
60.15% Pervious = 12.874 ac 39.85% Impervious = 8.529 ac

Summary for Subcatchment 1S: DA1 FROM SITE TO WETLANDS

Runoff = 1.90 cfs @ 12.25 hrs, Volume= 0.192 af, Depth= 2.57"

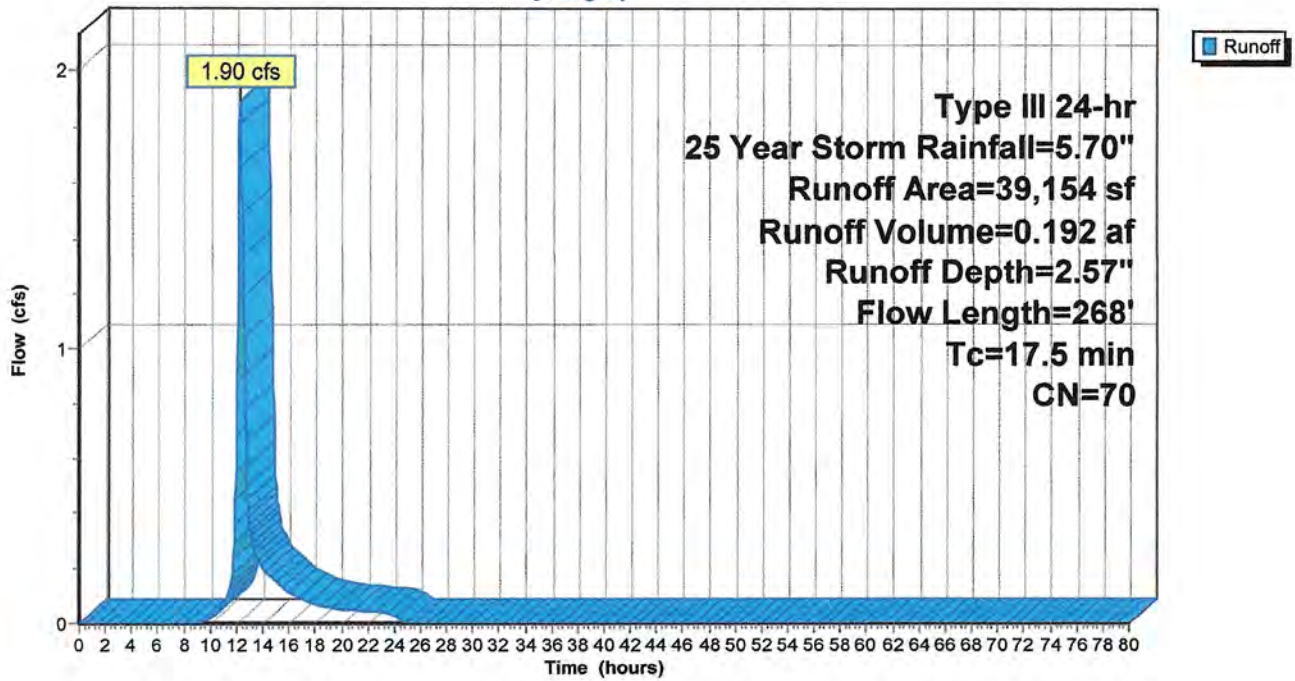
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
1,091	30	Woods, Good, HSG A
25,974	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
1,059	39	>75% Grass cover, Good, HSG A
4,807	74	>75% Grass cover, Good, HSG C
1,268	98	Paved parking, HSG C
* 164	98	Conc Culvert, HSG D
97	98	Roofs, HSG C
39,154	70	Weighted Average
37,625		96.09% Pervious Area
1,529		3.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, WOODS
					Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	168	0.0330	0.91		Shallow Concentrated Flow, PAVED
					Woodland Kv= 5.0 fps
2.4	50	0.0050	0.35		Shallow Concentrated Flow, WOODS/WETLANDS
					Woodland Kv= 5.0 fps
17.5	268	Total			

Subcatchment 1S: DA1 FROM SITE TO WETLANDS

Hydrograph



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 28.11 cfs @ 12.40 hrs, Volume= 3.506 af, Depth= 2.05"

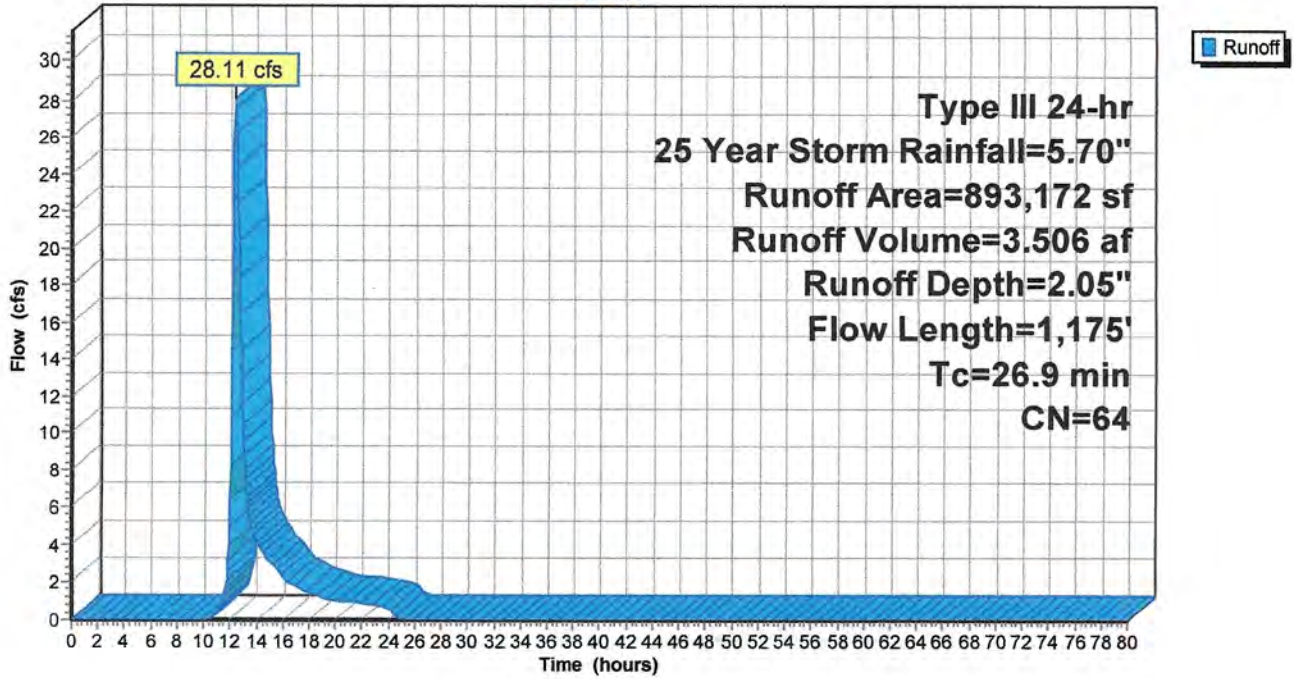
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
197,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
252,172	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 370,000	98	Roofs,Pavement HSG A
893,172	64	Weighted Average
523,172		58.57% Pervious Area
370,000		41.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



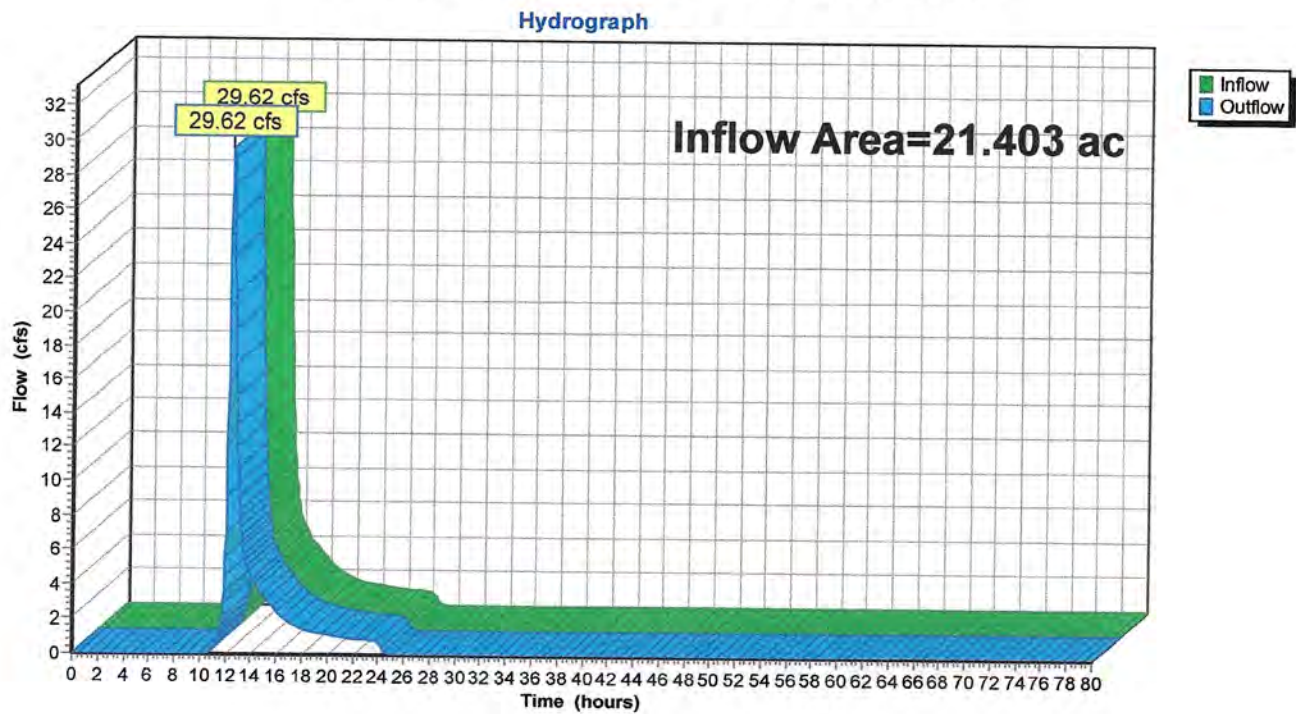
Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 2.07" for 25 Year Storm event
Inflow = 29.62 cfs @ 12.39 hrs, Volume= 3.699 af
Outflow = 29.62 cfs @ 12.39 hrs, Volume= 3.699 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 2.07" for 25 Year Storm event
 Inflow = 29.62 cfs @ 12.39 hrs, Volume= 3.699 af
 Outflow = 11.11 cfs @ 12.94 hrs, Volume= 3.699 af, Atten= 62%, Lag= 32.8 min
 Primary = 11.11 cfs @ 12.94 hrs, Volume= 3.699 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.03' @ 12.94 hrs Surf.Area= 32,626 sf Storage= 45,488 cf

Plug-Flow detention time= 48.0 min calculated for 3.696 af (100% of inflow)
 Center-of-Mass det. time= 48.0 min (921.8 - 873.7)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	138,692 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	32,500	31,242	44,544	32,580
15.00	37,000	34,726	79,269	37,128
16.00	40,500	38,737	118,006	40,697
16.50	42,250	20,686	138,692	42,484

Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

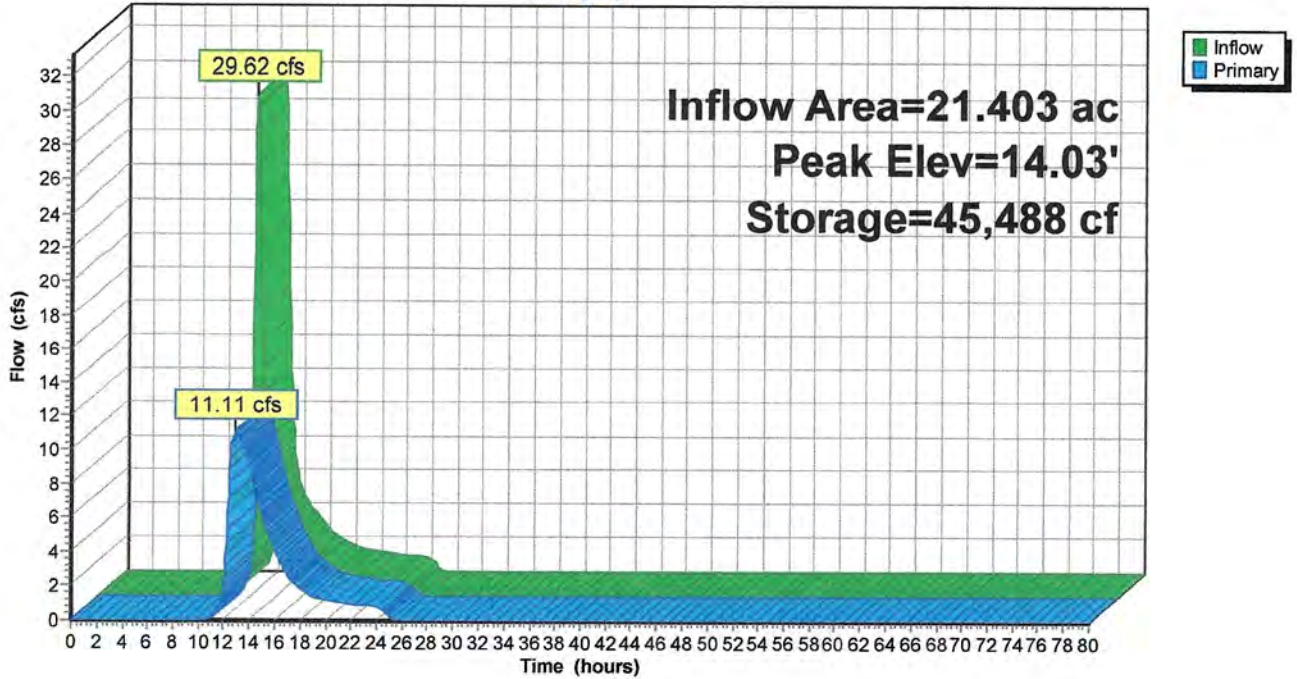
Primary OutFlow Max=11.11 cfs @ 12.94 hrs HW=14.03' (Free Discharge)

1=RCP_Round 18" (Barrel Controls 11.11 cfs @ 6.29 fps)

2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



THE WINSOR AT MILLBROOK VILLAGE, DUXBU Type III 24-hr 100 Year Storm Rainfall=7.00"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 30

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 FROM SITE TO Runoff Area=39,154 sf 3.91% Impervious Runoff Depth=3.62"
Flow Length=268' Tc=17.5 min CN=70 Runoff=2.70 cfs 0.271 af

Subcatchment 9S: DA9 TO WETLANDS Runoff Area=893,172 sf 41.43% Impervious Runoff Depth=3.00"
Flow Length=1,175' Tc=26.9 min CN=64 Runoff=42.08 cfs 5.128 af

Reach 10R: TOTAL RUNOFF TO WETLANDS Inflow=44.23 cfs 5.399 af
Outflow=44.23 cfs 5.399 af

Pond 11P: TO BLUEFISH RIVER Peak Elev=14.85' Storage=73,681 cf Inflow=44.23 cfs 5.399 af
Outflow=14.89 cfs 5.399 af

Total Runoff Area = 21.403 ac Runoff Volume = 5.399 af Average Runoff Depth = 3.03"
60.15% Pervious = 12.874 ac 39.85% Impervious = 8.529 ac

Summary for Subcatchment 1S: DA1 FROM SITE TO WETLANDS

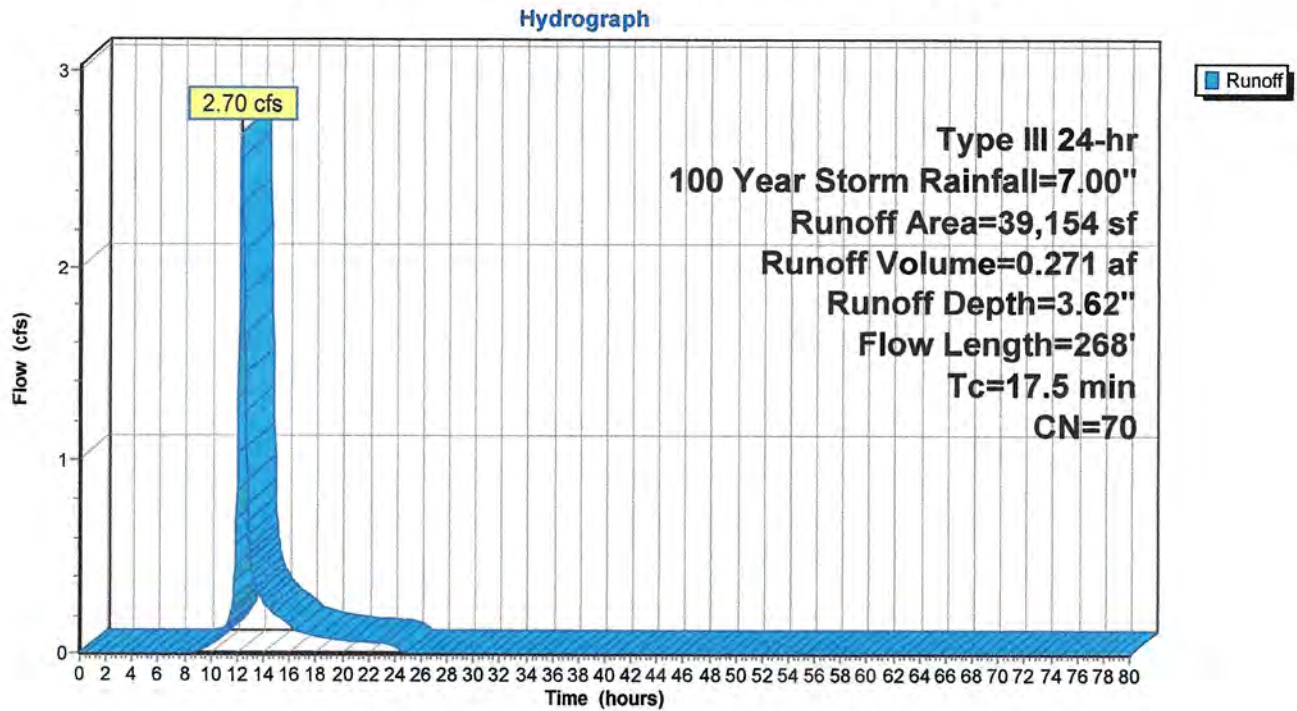
Runoff = 2.70 cfs @ 12.25 hrs, Volume= 0.271 af, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
1,091	30	Woods, Good, HSG A
25,974	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
1,059	39	>75% Grass cover, Good, HSG A
4,807	74	>75% Grass cover, Good, HSG C
1,268	98	Paved parking, HSG C
* 164	98	Conc Culvert, HSG D
97	98	Roofs, HSG C
39,154	70	Weighted Average
37,625		96.09% Pervious Area
1,529		3.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, WOODS
					Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	168	0.0330	0.91		Shallow Concentrated Flow, PAVED
					Woodland Kv= 5.0 fps
2.4	50	0.0050	0.35		Shallow Concentrated Flow, WOODS/WETLANDS
					Woodland Kv= 5.0 fps
17.5	268	Total			

Subcatchment 1S: DA1 FROM SITE TO WETLANDS



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 42.08 cfs @ 12.39 hrs, Volume= 5.128 af, Depth= 3.00"

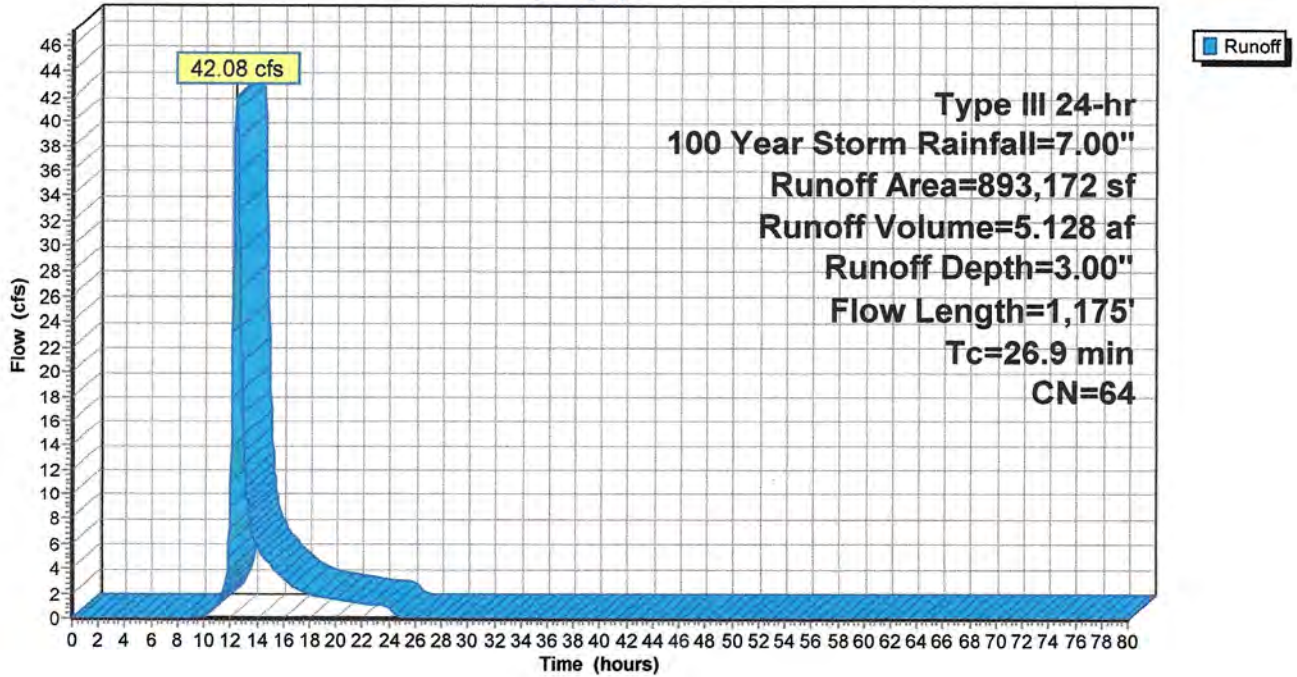
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
197,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
252,172	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 370,000	98	Roofs,Pavement HSG A
893,172	64	Weighted Average
523,172		58.57% Pervious Area
370,000		41.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 3.03" for 100 Year Storm event

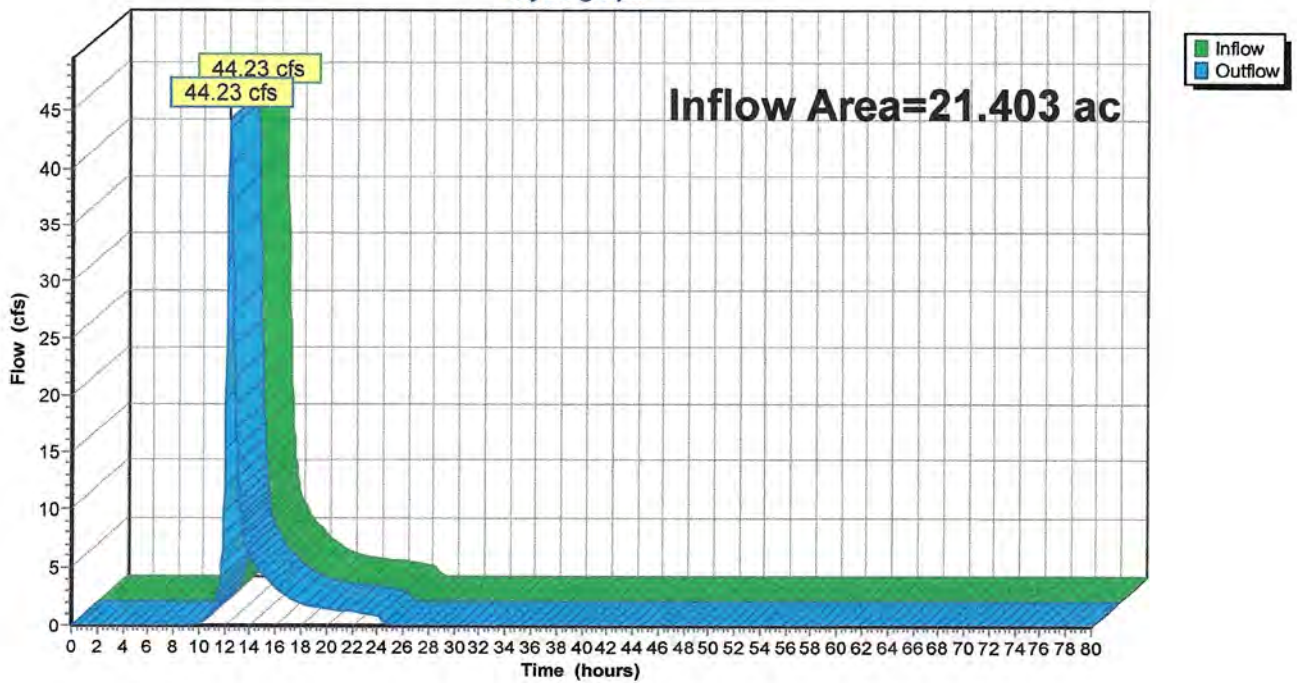
Inflow = 44.23 cfs @ 12.38 hrs, Volume= 5.399 af

Outflow = 44.23 cfs @ 12.38 hrs, Volume= 5.399 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS

Hydrograph



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 39.85% Impervious, Inflow Depth = 3.03" for 100 Year Storm event
 Inflow = 44.23 cfs @ 12.38 hrs, Volume= 5.399 af
 Outflow = 14.89 cfs @ 12.97 hrs, Volume= 5.399 af, Atten= 66%, Lag= 35.2 min
 Primary = 14.89 cfs @ 12.97 hrs, Volume= 5.399 af

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.85' @ 12.97 hrs Surf.Area= 36,295 sf Storage= 73,681 cf

Plug-Flow detention time= 57.6 min calculated for 5.396 af (100% of inflow)
 Center-of-Mass det. time= 57.7 min (920.2 - 862.5)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	138,692 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	32,500	31,242	44,544	32,580
15.00	37,000	34,726	79,269	37,128
16.00	40,500	38,737	118,006	40,697
16.50	42,250	20,686	138,692	42,484

Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 ' S= 0.0095 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

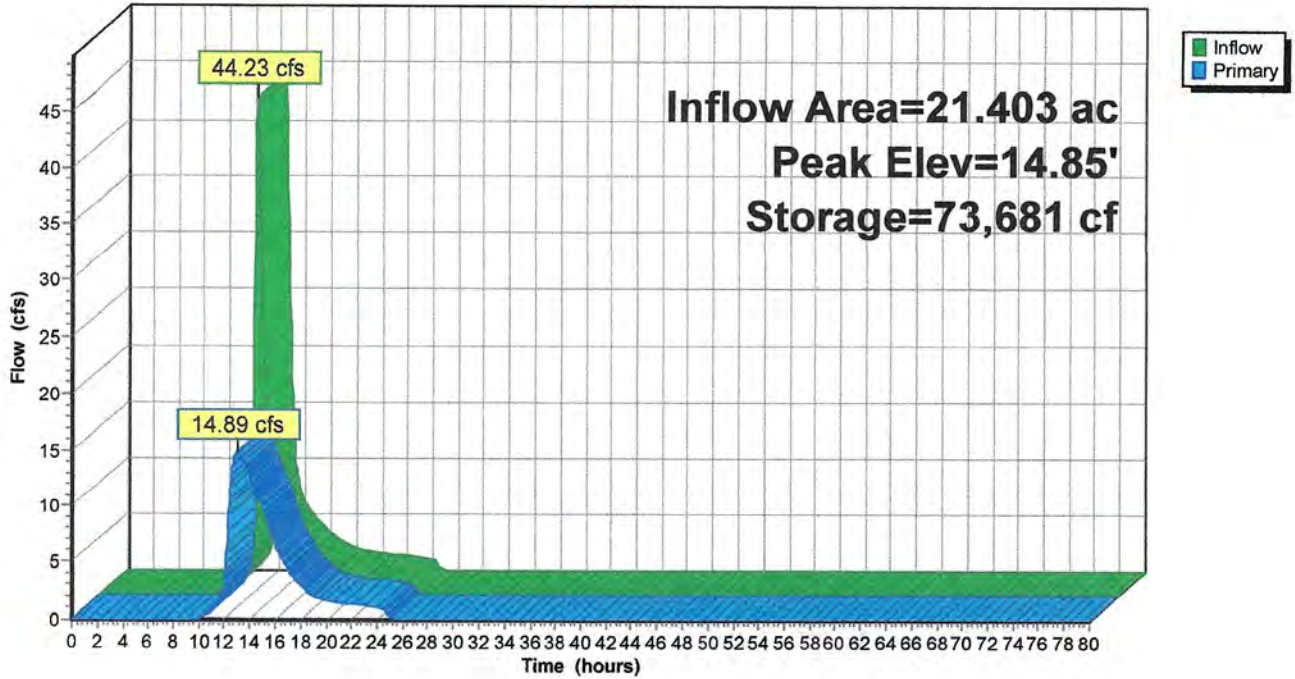
Primary OutFlow Max=14.89 cfs @ 12.97 hrs HW=14.85' (Free Discharge)

1=RCP_Round 18" (Barrel Controls 14.89 cfs @ 8.42 fps)

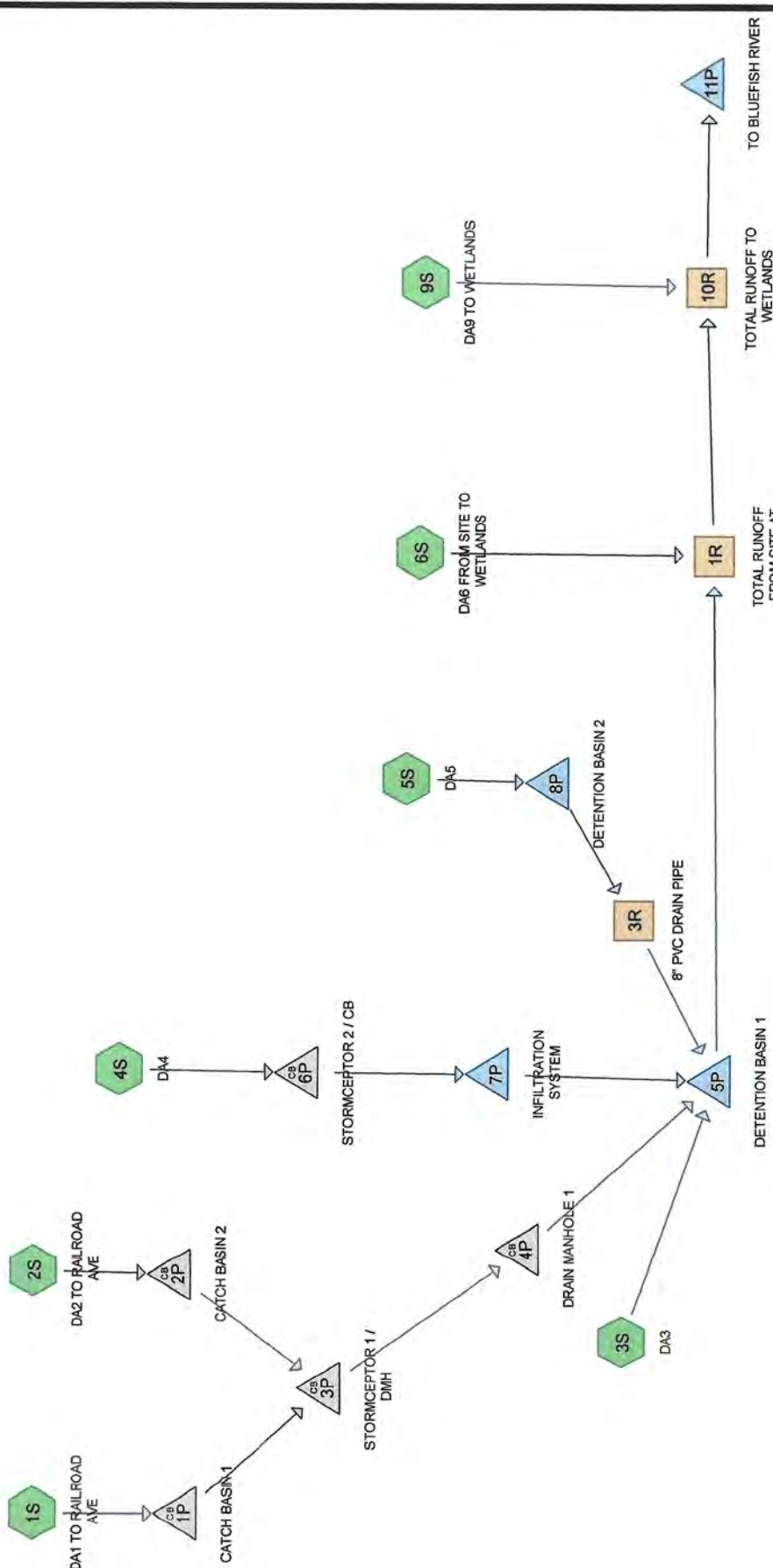
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



**Post-Development Drainage Analysis
(Proposed Conditions)**



Routing Diagram for THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (POST) wetlands
 Prepared by CROWELL ENGINEERING
 HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Legend:

- Subcat
- Reach
- Pond
- Link

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (POST) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 1

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year Storm	Type III 24-hr		Default	24.00	1	3.40	2
2	10 Year Storm	Type III 24-hr		Default	24.00	1	4.80	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	5.70	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	7.00	2

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (POST) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.151	39	>75% Grass cover, Good, HSG A (1S, 2S, 4S, 5S, 6S, 9S)
0.789	74	>75% Grass cover, Good, HSG C (1S, 3S, 4S, 5S, 6S, 9S)
0.004	98	Conc Culvert, HSG D (6S)
0.060	98	Detention Basin 1, Water Surface, HSG C (3S)
0.046	98	Detention Basin 2, Water Surface, HSG C (5S)
0.010	98	Paved parking, HSG C (1S)
0.003	98	Paved parking, dwy, curbs, HSG A (4S)
0.158	98	Paved parking, dwy, curbs, HSG C (4S)
0.071	98	Paved sreet, driveway, HSG A (2S)
0.179	98	Paved street, dwys, parking, curbs HSG A (1S)
0.076	98	Roofs, HSG A (1S, 4S, 5S)
0.176	98	Roofs, HSG C (1S, 4S, 5S, 6S)
8.035	98	Roofs,Pavement HSG A&C262200 (9S)
0.009	98	Sidewalks, HSG A (1S, 4S)
0.026	98	Sidewalks, HSG C (1S, 4S)
0.007	98	Walls, HSG A (5S)
0.001	98	Walls, HSG C (5S)
4.247	30	Woods, Good, HSG A (9S)
0.467	70	Woods, Good, HSG C (6S, 9S)
0.888	77	Woods-wetland, Good, HSG D (6S, 9S)
21.403	65	TOTAL AREA

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (POST) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
18.778	HSG A	1S, 2S, 4S, 5S, 6S, 9S
0.000	HSG B	
1.733	HSG C	1S, 3S, 4S, 5S, 6S, 9S
0.892	HSG D	6S, 9S
0.000	Other	
21.403		TOTAL AREA

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (POST) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
6.151	0.000	0.789	0.000	0.000	6.940	>75% Grass cover, Good	1S, 2S, 3S, 4S, 5S, 6S, 9S
0.000	0.000	0.000	0.004	0.000	0.004	Conc Culvert	6S
0.000	0.000	0.060	0.000	0.000	0.060	Detention Basin 1, Water Surface	3S
0.000	0.000	0.046	0.000	0.000	0.046	Detention Basin 2, Water Surface	5S
0.000	0.000	0.010	0.000	0.000	0.010	Paved parking	1S
0.003	0.000	0.158	0.000	0.000	0.161	Paved parking, dwy, curbs	4S
0.071	0.000	0.000	0.000	0.000	0.071	Paved sreet, driveway	2S
0.179	0.000	0.000	0.000	0.000	0.179	Paved street, dwys, parking, curbs	1S
0.076	0.000	0.176	0.000	0.000	0.252	Roofs	1S, 4S, 5S, 6S
8.035	0.000	0.000	0.000	0.000	8.035	Roofs,Pavement	9S
0.009	0.000	0.026	0.000	0.000	0.035	Sidewalks	1S, 4S
0.007	0.000	0.001	0.000	0.000	0.007	Walls	5S
4.247	0.000	0.467	0.000	0.000	4.714	Woods, Good	6S, 9S
0.000	0.000	0.000	0.888	0.000	0.888	Woods-wetland, Good	6S, 9S
18.778	0.000	1.733	0.892	0.000	21.403	TOTAL AREA	

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY (POST) wetlands

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 5

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3R	14.38	13.75	68.0	0.0093	0.010	8.0	0.0	0.0
2	1P	16.12	15.53	118.0	0.0050	0.012	12.0	0.0	0.0
3	2P	16.65	15.53	56.0	0.0200	0.012	12.0	0.0	0.0
4	3P	15.28	14.81	133.0	0.0035	0.012	15.0	0.0	0.0
5	4P	14.81	14.75	17.0	0.0035	0.012	15.0	0.0	0.0
6	5P	13.75	13.55	20.0	0.0100	0.010	4.0	0.0	0.0
7	6P	17.02	16.75	18.0	0.0150	0.010	12.0	0.0	0.0
8	7P	17.68	15.95	30.0	0.0577	0.012	6.0	0.0	0.0
9	8P	14.50	14.38	12.0	0.0100	0.010	4.0	0.0	0.0
10	11P	11.92	11.50	44.0	0.0095	0.011	18.0	0.0	0.0

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY Type III 24-hr 2 Year Storm Rainfall=3.40"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 6

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 TO RAILROAD AVE	Runoff Area=12,039 sf 84.98% Impervious Runoff Depth=2.45" Flow Length=157' Tc=7.0 min CN=91 Runoff=0.74 cfs 0.056 af
Subcatchment 2S: DA2 TO RAILROAD AVE	Runoff Area=5,729 sf 53.83% Impervious Runoff Depth=1.00" Flow Length=100' Tc=5.7 min CN=71 Runoff=0.14 cfs 0.011 af
Subcatchment 3S: DA3	Runoff Area=5,613 sf 46.59% Impervious Runoff Depth=1.93" Tc=5.0 min CN=85 Runoff=0.29 cfs 0.021 af
Subcatchment 4S: DA4	Runoff Area=15,291 sf 83.57% Impervious Runoff Depth=2.64" Flow Length=225' Slope=0.0050 '/ Tc=5.0 min CN=93 Runoff=1.05 cfs 0.077 af
Subcatchment 5S: DA5	Runoff Area=8,903 sf 57.97% Impervious Runoff Depth=1.85" Flow Length=151' Tc=10.6 min CN=84 Runoff=0.38 cfs 0.032 af
Subcatchment 6S: DA6 FROM SITE TO	Runoff Area=13,540 sf 15.41% Impervious Runoff Depth=1.36" Flow Length=440' Tc=14.6 min CN=77 Runoff=0.37 cfs 0.035 af
Subcatchment 9S: DA9 TO WETLANDS	Runoff Area=871,200 sf 40.17% Impervious Runoff Depth=0.66" Flow Length=1,175' Tc=26.9 min CN=64 Runoff=7.31 cfs 1.092 af
Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS	Inflow=0.62 cfs 0.152 af Outflow=0.62 cfs 0.152 af
Reach 3R: 8" PVC DRAIN PIPE	Avg. Flow Depth=0.13' Max Vel=2.66 fps Inflow=0.13 cfs 0.031 af 8.0" Round Pipe n=0.010 L=68.0' S=0.0093 '/ Capacity=1.51 cfs Outflow=0.13 cfs 0.031 af
Reach 10R: TOTAL RUNOFF TO WETLANDS	Inflow=7.82 cfs 1.244 af Outflow=7.82 cfs 1.244 af
Pond 1P: CATCH BASIN 1	Peak Elev=16.61' Inflow=0.74 cfs 0.056 af 12.0" Round Culvert n=0.012 L=118.0' S=0.0050 '/ Outflow=0.74 cfs 0.056 af
Pond 2P: CATCH BASIN 2	Peak Elev=16.83' Inflow=0.14 cfs 0.011 af 12.0" Round Culvert n=0.012 L=56.0' S=0.0200 '/ Outflow=0.14 cfs 0.011 af
Pond 3P: STORMCEPTOR 1 / DMH	Peak Elev=15.81' Inflow=0.88 cfs 0.067 af 15.0" Round Culvert n=0.012 L=133.0' S=0.0035 '/ Outflow=0.88 cfs 0.067 af
Pond 4P: DRAIN MANHOLE 1	Peak Elev=15.37' Inflow=0.88 cfs 0.067 af 15.0" Round Culvert n=0.012 L=17.0' S=0.0035 '/ Outflow=0.88 cfs 0.067 af
Pond 5P: DETENTION BASIN 1	Peak Elev=14.43' Storage=1,654 cf Inflow=1.22 cfs 0.119 af Outflow=0.29 cfs 0.117 af
Pond 6P: STORMCEPTOR 2 / CB	Peak Elev=17.55' Inflow=1.05 cfs 0.077 af 12.0" Round Culvert n=0.010 L=18.0' S=0.0150 '/ Outflow=1.05 cfs 0.077 af

THE WINSOR AT MILLBROOK VILLAGE, DUXBURY Type III 24-hr 2 Year Storm Rainfall=3.40"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 7

Pond 7P: INFILTRATION SYSTEM

Peak Elev=16.73' Storage=1,939 cf Inflow=1.05 cfs 0.077 af
Discarded=0.03 cfs 0.061 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.061 af

Pond 8P: DETENTION BASIN 2

Peak Elev=14.78' Storage=492 cf Inflow=0.38 cfs 0.032 af
Outflow=0.13 cfs 0.031 af

Pond 11P: TO BLUEFISH RIVER

Peak Elev=12.86' Storage=9,641 cf Inflow=7.82 cfs 1.244 af
Outflow=4.09 cfs 1.244 af

Total Runoff Area = 21.403 ac Runoff Volume = 1.324 af Average Runoff Depth = 0.74"
58.60% Pervious = 12.543 ac 41.40% Impervious = 8.860 ac

Summary for Subcatchment 1S: DA1 TO RAILROAD AVE

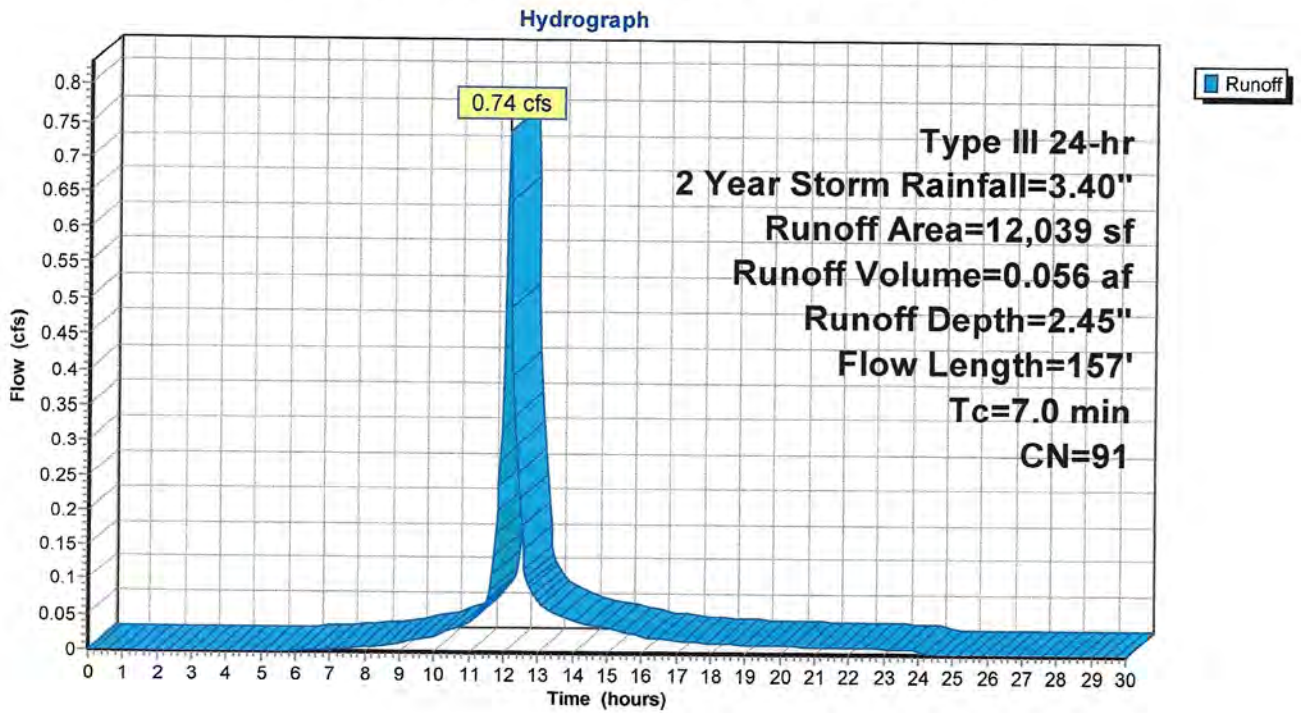
Runoff = 0.74 cfs @ 12.10 hrs, Volume= 0.056 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
1,270	39	>75% Grass cover, Good, HSG A
538	74	>75% Grass cover, Good, HSG C
* 7,805	98	Paved street, dwys, parking, curbs HSG A
449	98	Paved parking, HSG C
* 292	98	Sidewalks, HSG A
* 146	98	Sidewalks, HSG C
1,028	98	Roofs, HSG A
511	98	Roofs, HSG C
12,039	91	Weighted Average
1,808		15.02% Pervious Area
10,231		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	28	0.0150	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	24	0.0100	0.81		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.9	105	0.0090	1.93		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
7.0	157	Total			

Subcatchment 1S: DA1 TO RAILROAD AVE



Summary for Subcatchment 2S: DA2 TO RAILROAD AVE

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 1.00"

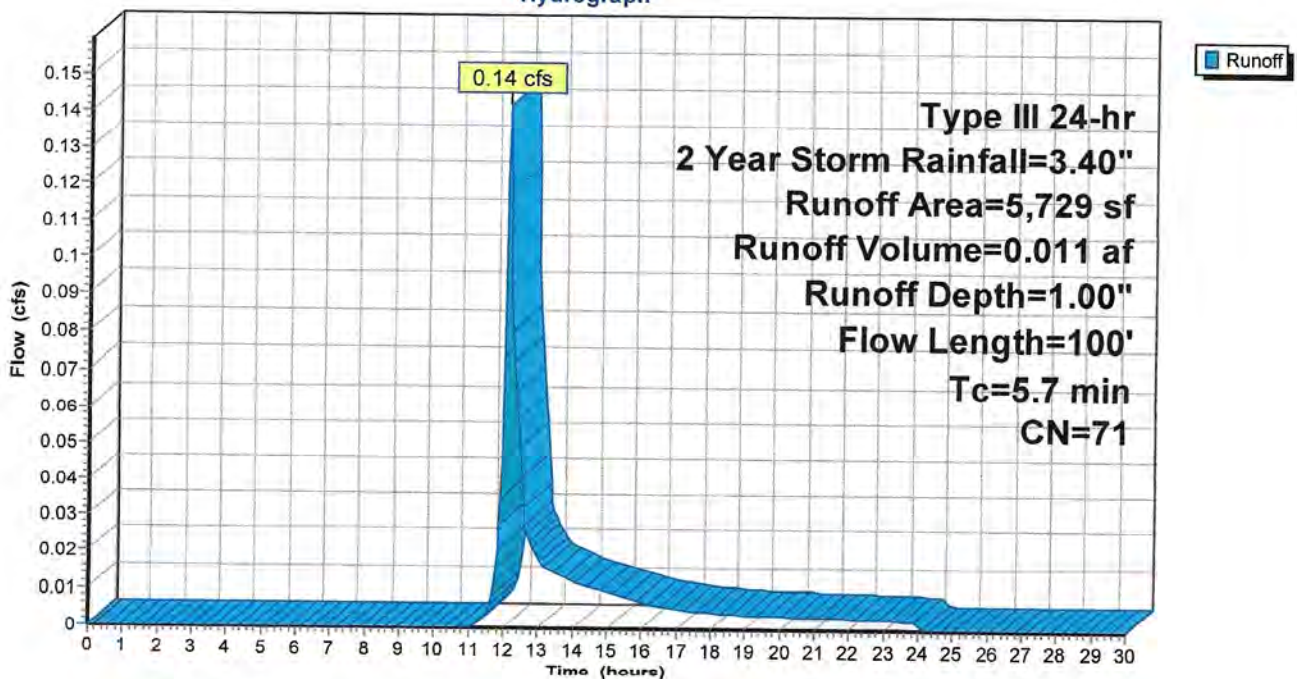
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
2,645	39	>75% Grass cover, Good, HSG A
* 3,084	98	Paved sreet, driveway, HSG A
5,729	71	Weighted Average
2,645		46.17% Pervious Area
3,084		53.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	28	0.0250	0.10		Sheet Flow, GRASS Grass: Dense $n= 0.240$ P2= 3.40"
0.5	22	0.0100	0.79		Sheet Flow, PAVED Smooth surfaces $n= 0.011$ P2= 3.40"
0.6	50	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved $K_v= 20.3$ fps
5.7	100	Total			

Subcatchment 2S: DA2 TO RAILROAD AVE

Hydrograph



Summary for Subcatchment 3S: DA3

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 1.93"

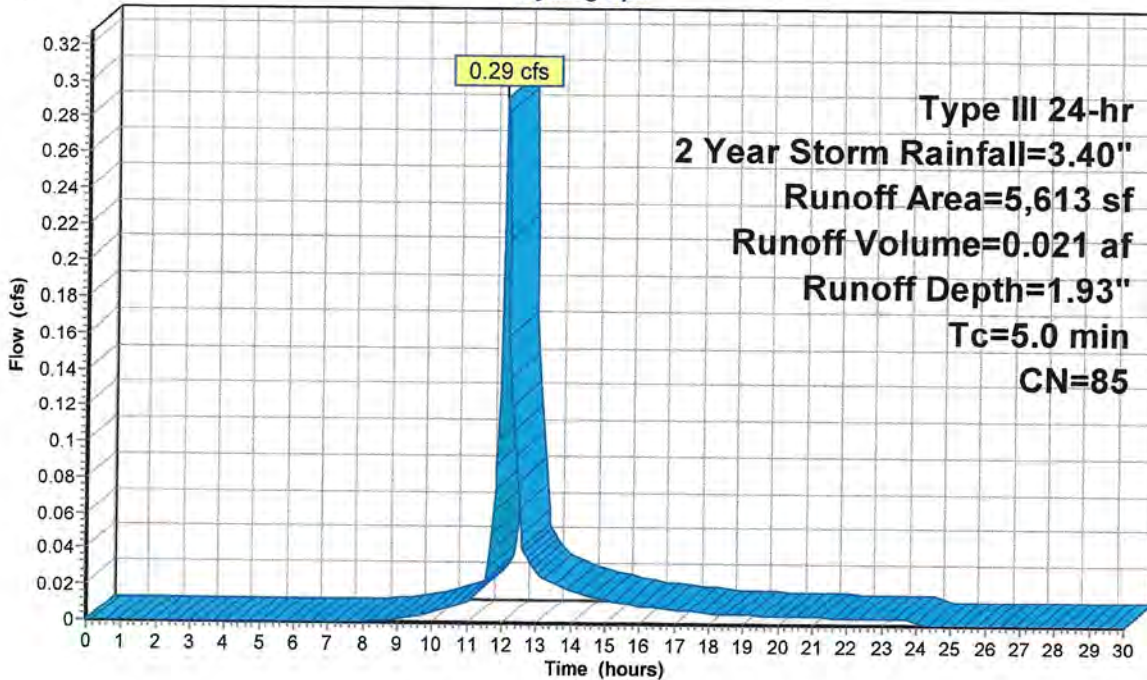
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, $dt= 0.05$ hrs
 Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
2,998	74	>75% Grass cover, Good, HSG C
* 2,615	98	Detention Basin 1, Water Surface, HSG C
5,613	85	Weighted Average
2,998		53.41% Pervious Area
2,615		46.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, DETENTION BASIN 1

Subcatchment 3S: DA3

Hydrograph



Runoff

Summary for Subcatchment 4S: DA4

[49] Hint: Tc<2dt may require smaller dt

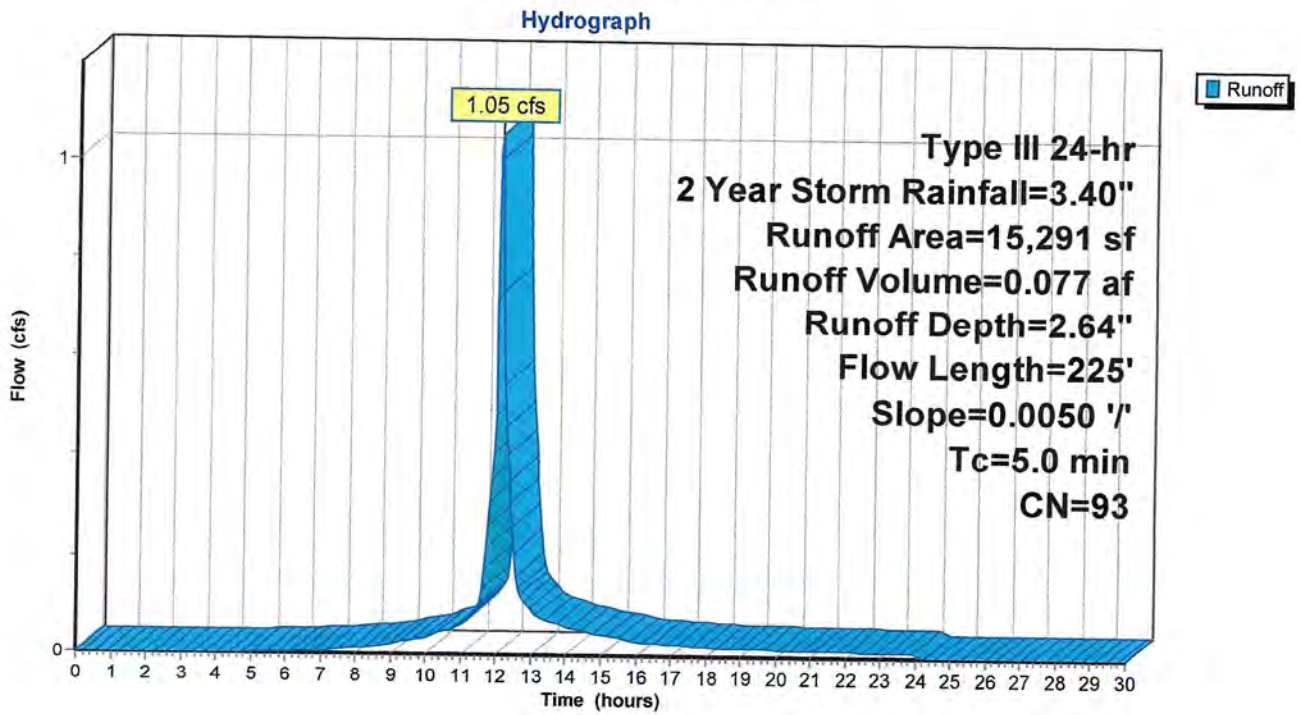
Runoff = 1.05 cfs @ 12.07 hrs, Volume= 0.077 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
250	39	>75% Grass cover, Good, HSG A
2,262	74	>75% Grass cover, Good, HSG C
490	98	Roofs, HSG A
4,174	98	Roofs, HSG C
* 149	98	Paved parking, dwy, curbs, HSG A
* 6,878	98	Paved parking, dwy, curbs, HSG C
* 97	98	Sidewalks, HSG A
* 991	98	Sidewalks, HSG C
15,291	93	Weighted Average
2,512		16.43% Pervious Area
12,779		83.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description	
1.2	50	0.0050	0.71		Sheet Flow, PAVED	
2.0	175	0.0050	1.44		Smooth surfaces n= 0.011 P2= 3.40" Shallow Concentrated Flow, PAVED	
3.2	225	Total, Increased to minimum Tc = 5.0 min				Paved Kv= 20.3 fps

Subcatchment 4S: DA4



Summary for Subcatchment 5S: DA5

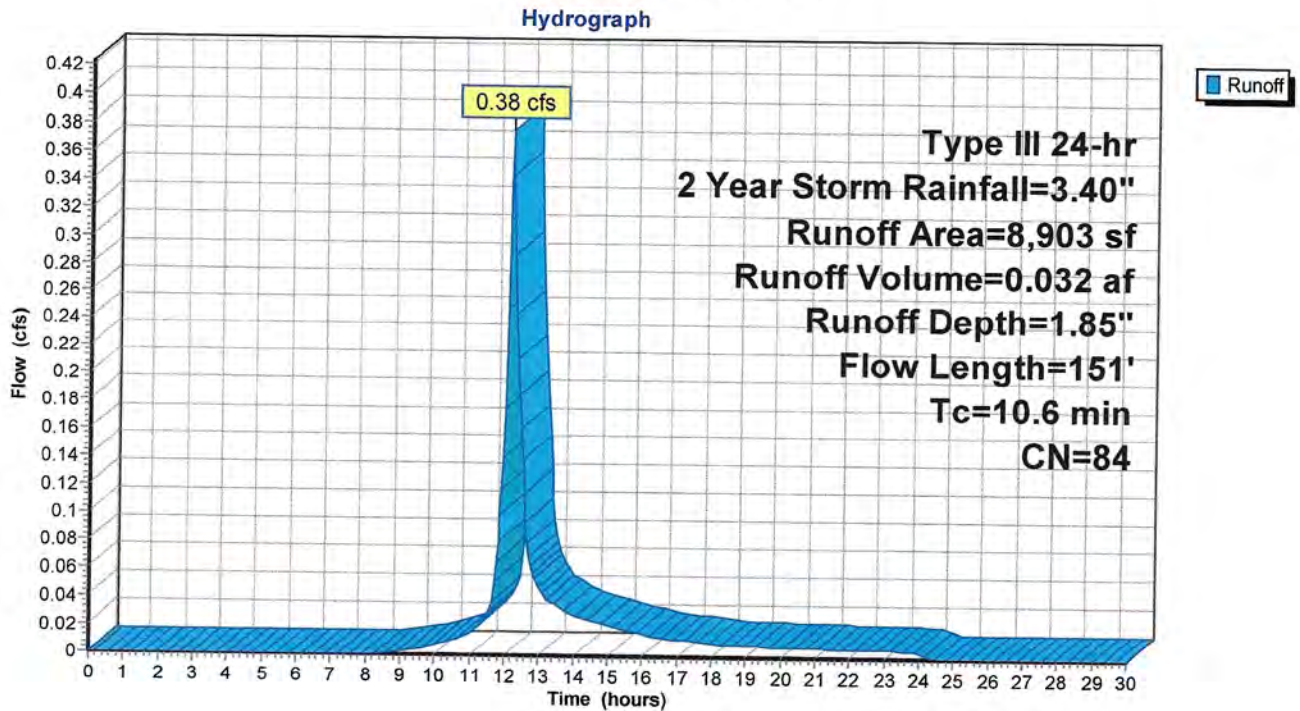
Runoff = 0.38 cfs @ 12.15 hrs, Volume= 0.032 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
1,113	39	>75% Grass cover, Good, HSG A
2,629	74	>75% Grass cover, Good, HSG C
* 1,982	98	Detention Basin 2, Water Surface, HSG C
1,807	98	Roofs, HSG A
1,050	98	Roofs, HSG C
* 292	98	Walls, HSG A
* 30	98	Walls, HSG C
8,903	84	Weighted Average
3,742		42.03% Pervious Area
5,161		57.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		Sheet Flow, grass
					Grass: Short n= 0.150 P2= 3.40"
1.0	65	0.0050	1.14		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
0.1	36	0.1400	6.02		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
10.6	151	Total			

Subcatchment 5S: DA5



Summary for Subcatchment 6S: DA6 FROM SITE TO WETLANDS

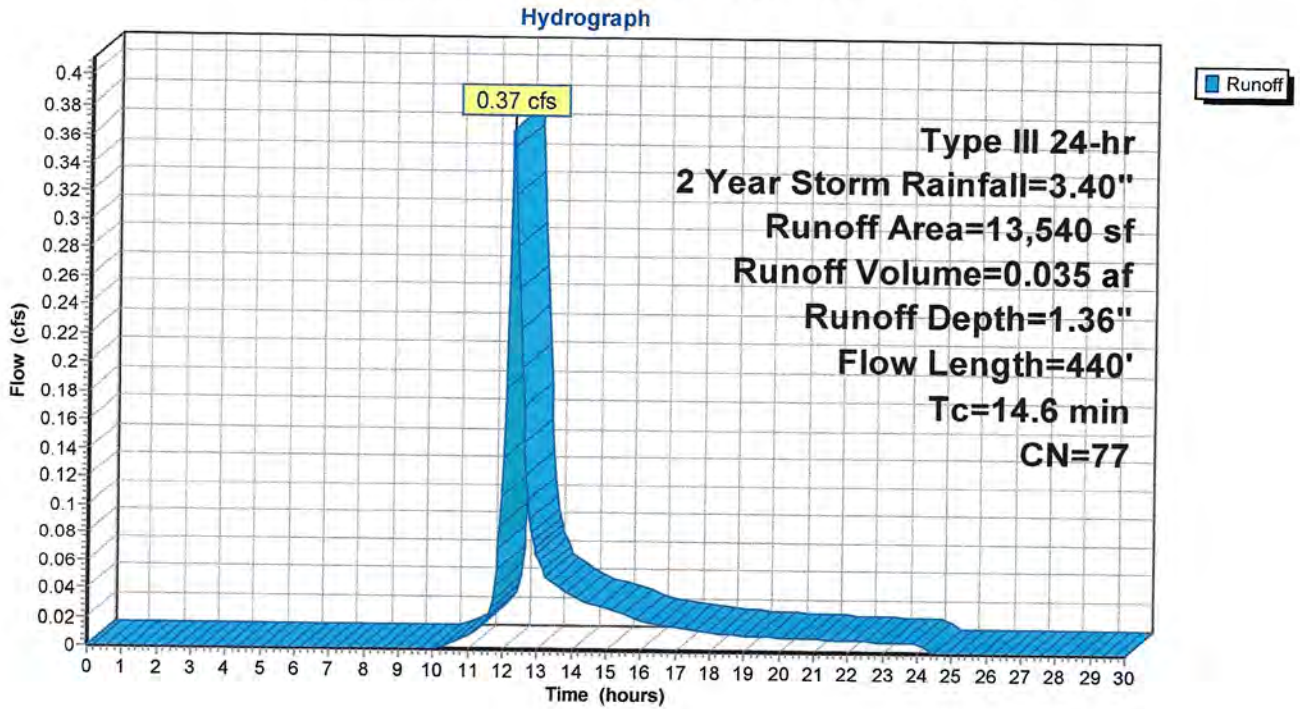
Runoff = 0.37 cfs @ 12.21 hrs, Volume= 0.035 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
353	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
463	39	>75% Grass cover, Good, HSG A
5,944	74	>75% Grass cover, Good, HSG C
1,922	98	Roofs, HSG C
* 164	98	Conc Culvert, HSG D
13,540	77	Weighted Average
11,454		84.59% Pervious Area
2,086		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.40"
0.6	100	0.0180	2.72		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
0.5	90	0.0220	3.01		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
8.2	220	0.0080	0.45		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
14.6	440	Total			

Subcatchment 6S: DA6 FROM SITE TO WETLANDS



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 7.31 cfs @ 12.46 hrs, Volume= 1.092 af, Depth= 0.66"

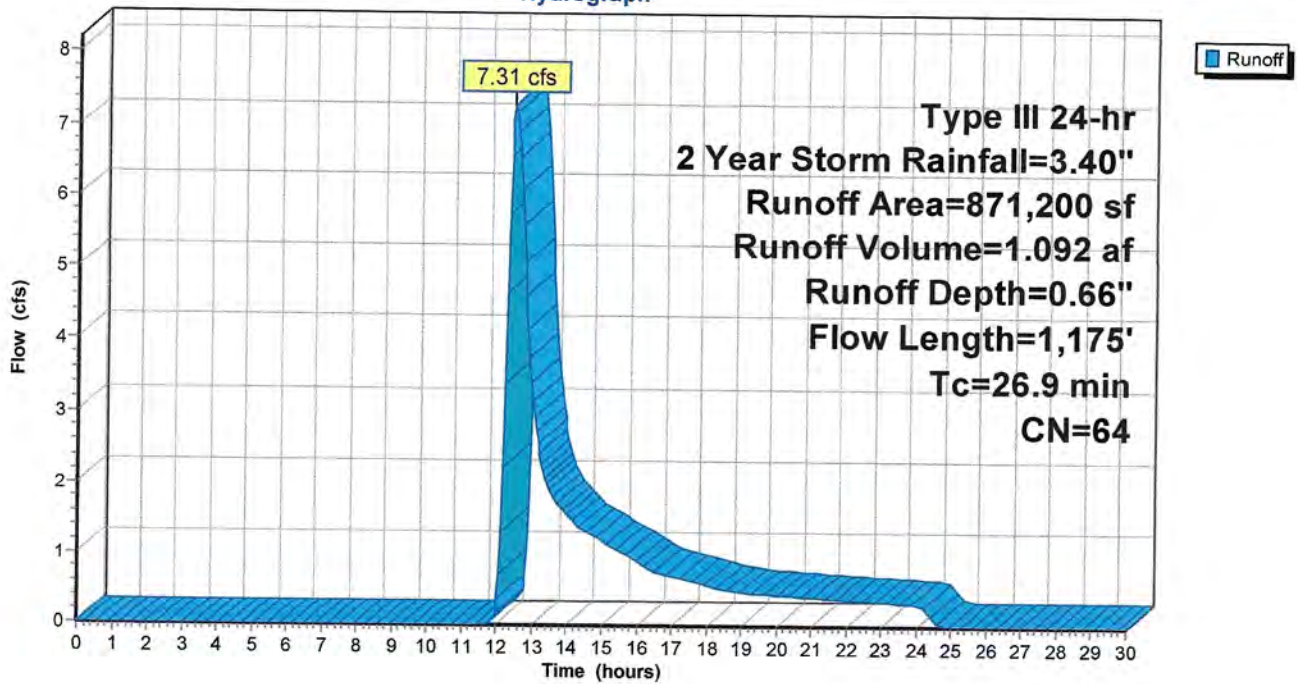
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.40"

Area (sf)	CN	Description
185,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
262,200	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 350,000	98	Roofs,Pavement HSG A&C262200
871,200	64	Weighted Average
521,200		59.83% Pervious Area
350,000		40.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS
					Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS
					Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS
					Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



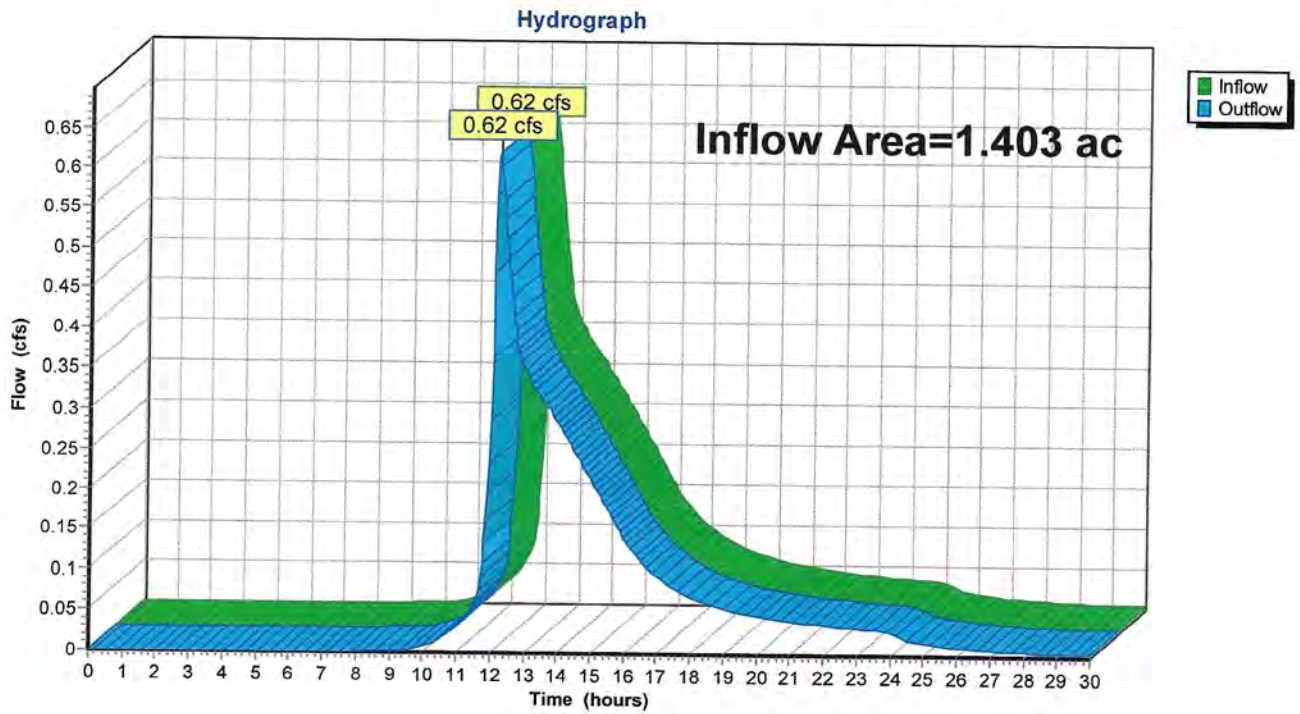
Summary for Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS

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

Inflow Area = 1.403 ac, 58.83% Impervious, Inflow Depth > 1.30" for 2 Year Storm event
Inflow = 0.62 cfs @ 12.22 hrs, Volume= 0.152 af
Outflow = 0.62 cfs @ 12.22 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS



Summary for Reach 3R: 8" PVC DRAIN PIPE

[52] Hint: Inlet/Outlet conditions not evaluated

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.01'

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth > 1.81" for 2 Year Storm event
Inflow = 0.13 cfs @ 12.52 hrs, Volume= 0.031 af
Outflow = 0.13 cfs @ 12.53 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.66 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.20 fps, Avg. Travel Time= 0.9 min

Peak Storage= 3 cf @ 12.52 hrs

Average Depth at Peak Storage= 0.13', Surface Width= 0.53'

Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.51 cfs

8.0" Round Pipe

n= 0.010 PVC, smooth interior

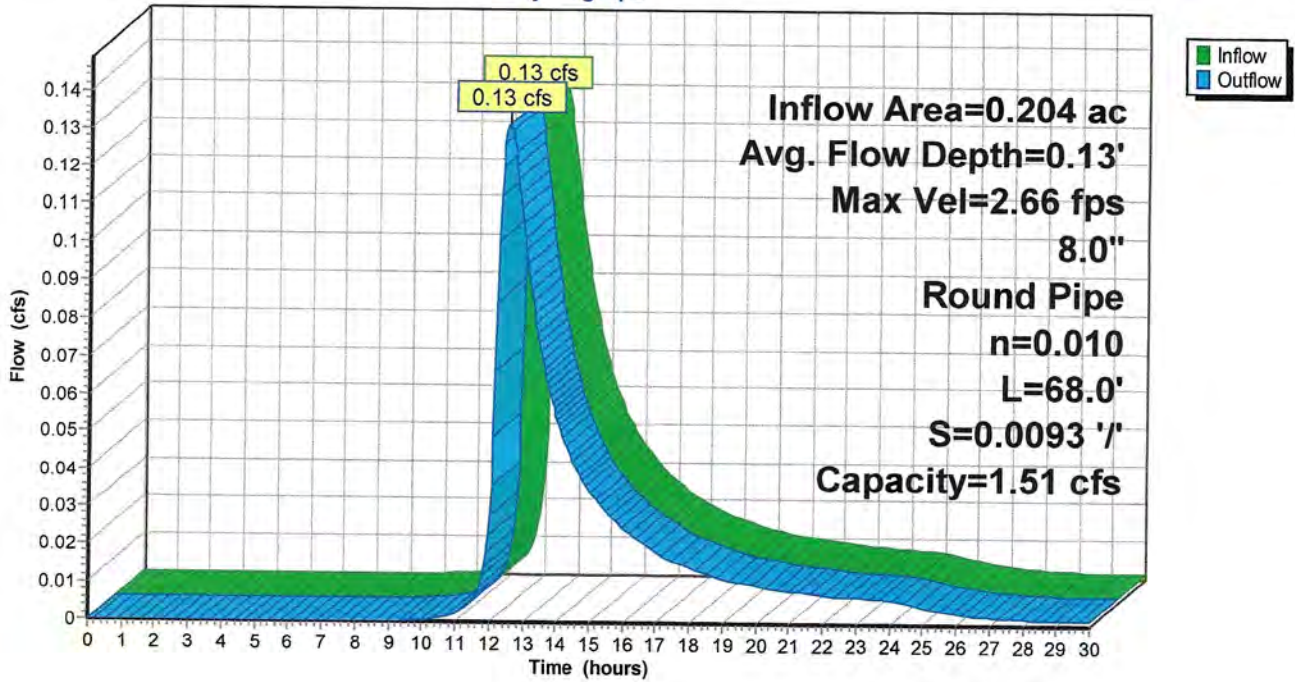
Length= 68.0' Slope= 0.0093 1'

Inlet Invert= 14.38', Outlet Invert= 13.75'



Reach 3R: 8" PVC DRAIN PIPE

Hydrograph



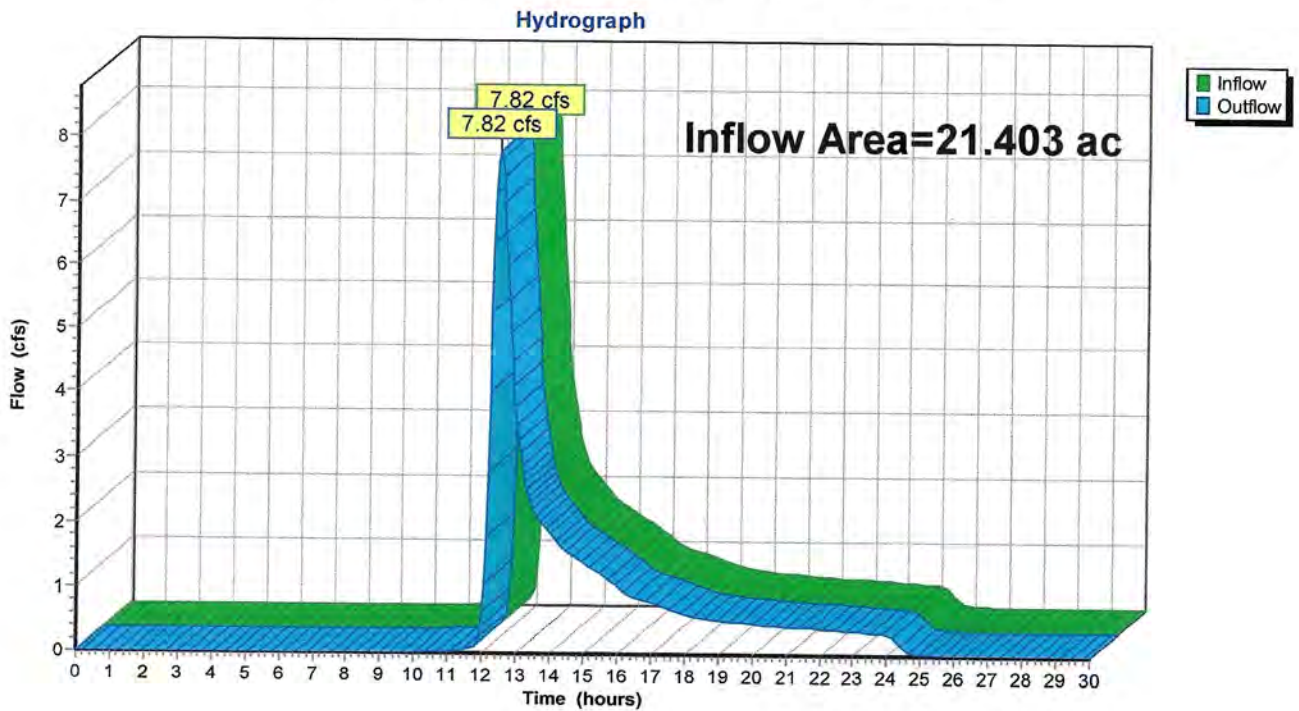
Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 0.70" for 2 Year Storm event
Inflow = 7.82 cfs @ 12.46 hrs, Volume= 1.244 af
Outflow = 7.82 cfs @ 12.46 hrs, Volume= 1.244 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS



Summary for Pond 1P: CATCH BASIN 1

[57] Hint: Peaked at 16.61' (Flood elevation advised)

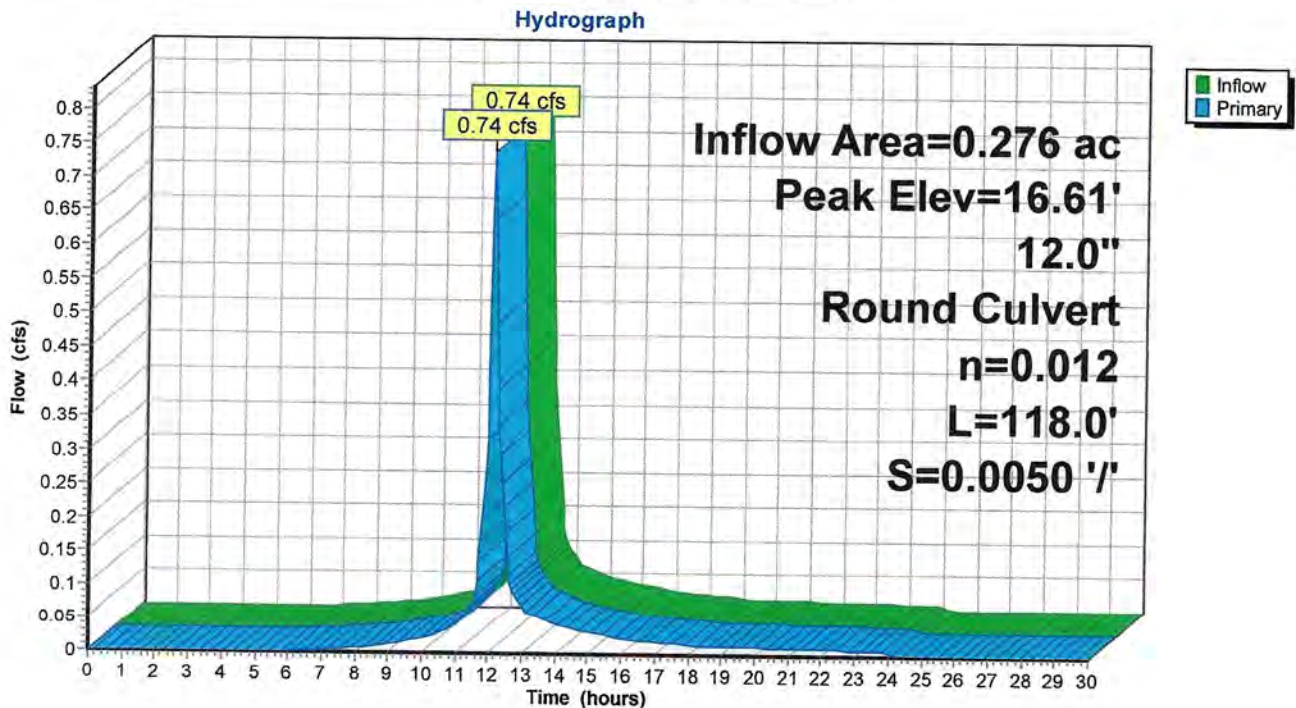
Inflow Area = 0.276 ac, 84.98% Impervious, Inflow Depth = 2.45" for 2 Year Storm event
 Inflow = 0.74 cfs @ 12.10 hrs, Volume= 0.056 af
 Outflow = 0.74 cfs @ 12.10 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.74 cfs @ 12.10 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.61' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.12'	12.0" Round CPP_Round 12" L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.12' / 15.53' S= 0.0050 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.74 cfs @ 12.10 hrs HW=16.61' (Free Discharge)
 ↳ 1=CPP_Round 12" (Barrel Controls 0.74 cfs @ 2.83 fps)

Pond 1P: CATCH BASIN 1



Summary for Pond 2P: CATCH BASIN 2

[57] Hint: Peaked at 16.83' (Flood elevation advised)

Inflow Area = 0.132 ac, 53.83% Impervious, Inflow Depth = 1.00" for 2 Year Storm event
 Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.011 af
 Outflow = 0.14 cfs @ 12.10 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.14 cfs @ 12.10 hrs, Volume= 0.011 af

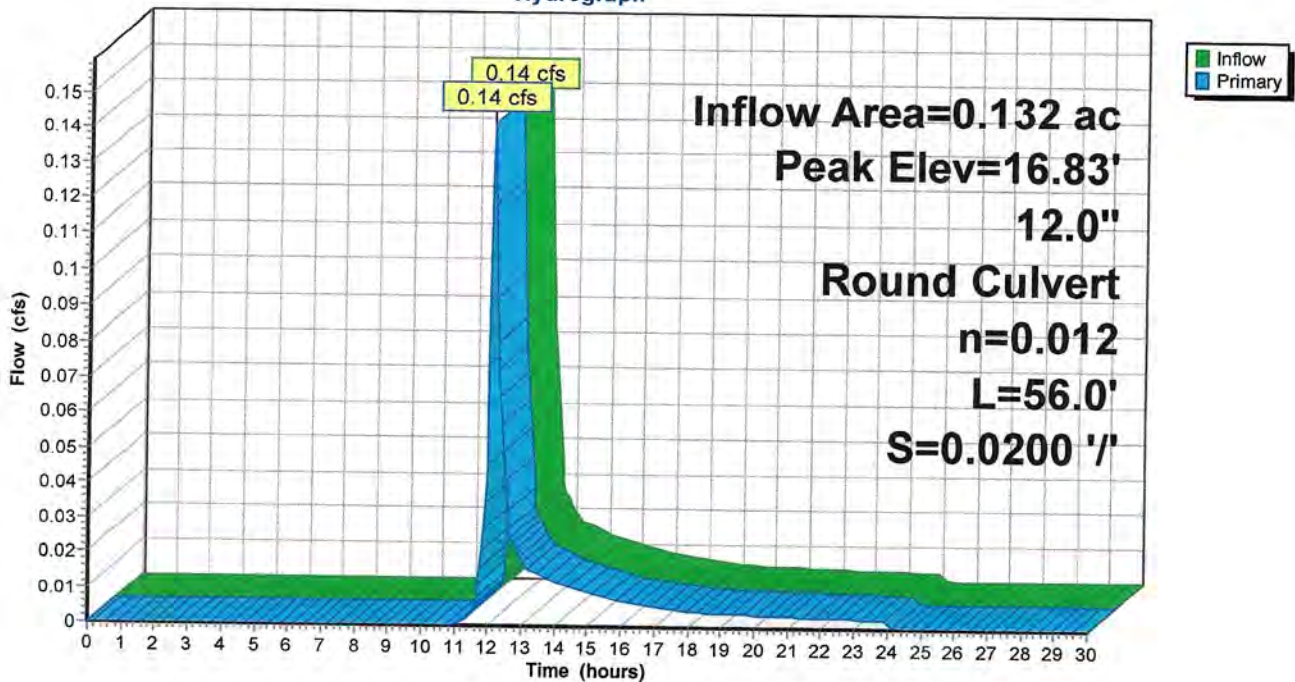
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.83' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.65'	12.0" Round CPP_Round 12" L= 56.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.65' / 15.53' S= 0.0200 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.10 hrs HW=16.83' (Free Discharge)
 ↳ 1=CPP_Round 12" (Inlet Controls 0.14 cfs @ 1.45 fps)

Pond 2P: CATCH BASIN 2

Hydrograph



Summary for Pond 3P: STORMCEPTOR 1 / DMH

[57] Hint: Peaked at 15.81' (Flood elevation advised)

[79] Warning: Submerged Pond 1P Primary device # 1 OUTLET by 0.28'

[79] Warning: Submerged Pond 2P Primary device # 1 OUTLET by 0.28'

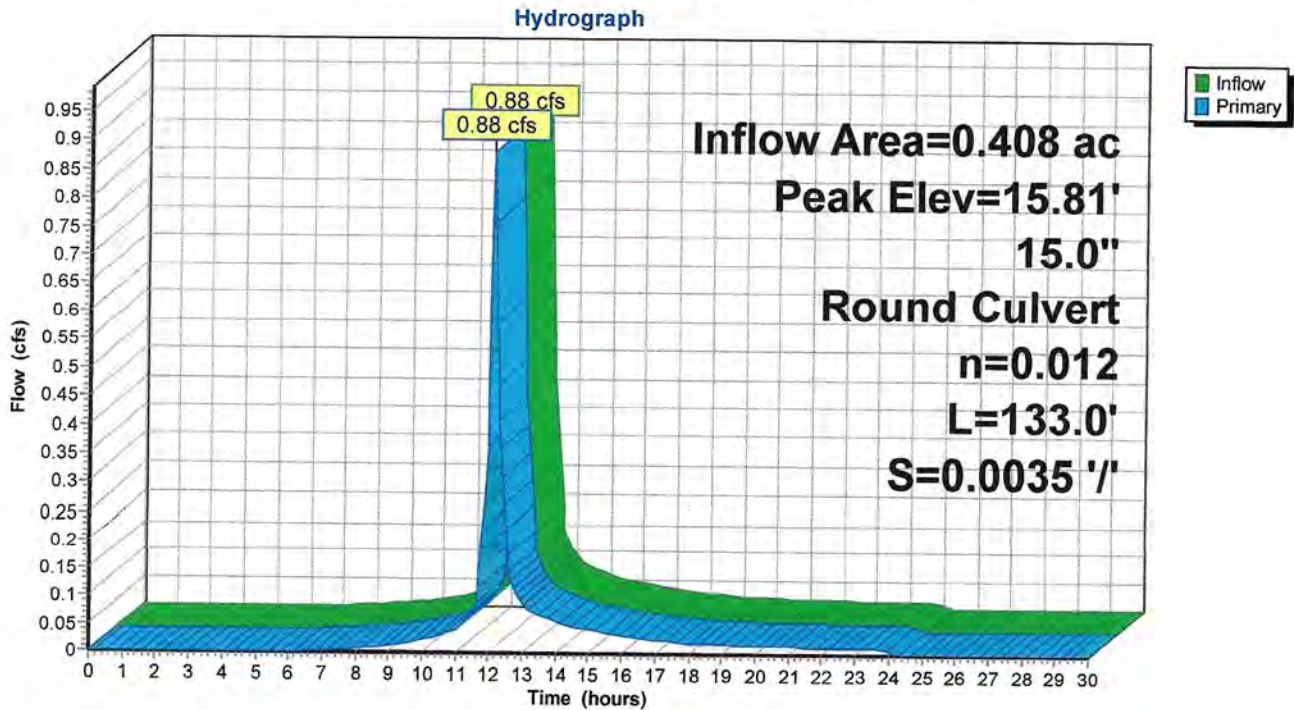
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 1.98" for 2 Year Storm event
 Inflow = 0.88 cfs @ 12.10 hrs, Volume= 0.067 af
 Outflow = 0.88 cfs @ 12.10 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.88 cfs @ 12.10 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.81' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	15.28'	15.0" Round CPP_Round 15" L= 133.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.28' / 14.81' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.88 cfs @ 12.10 hrs HW=15.81' (Free Discharge)
 ↳1=CPP_Round 15" (Barrel Controls 0.88 cfs @ 2.63 fps)

Pond 3P: STORMCEPTOR 1 / DMH



Summary for Pond 4P: DRAIN MANHOLE 1

[57] Hint: Peaked at 15.37' (Flood elevation advised)

[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 0.09'

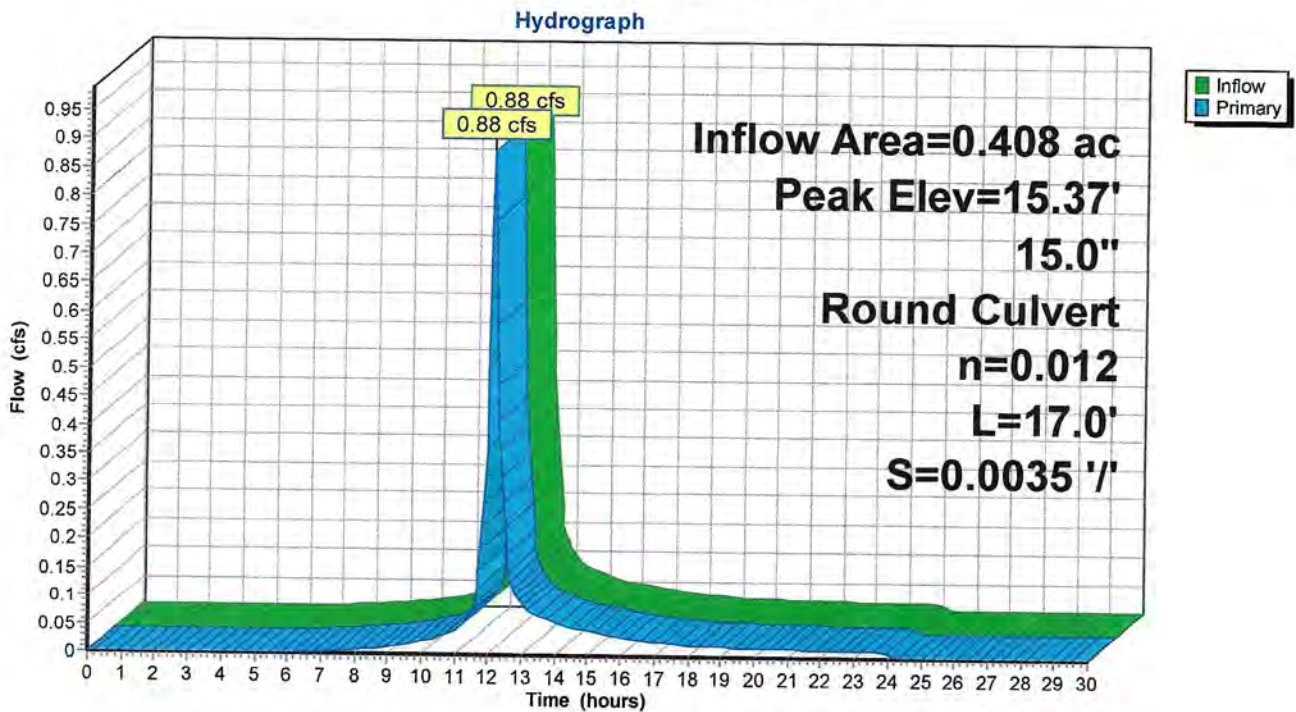
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 1.98" for 2 Year Storm event
 Inflow = 0.88 cfs @ 12.10 hrs, Volume= 0.067 af
 Outflow = 0.88 cfs @ 12.10 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.88 cfs @ 12.10 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.37' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	14.81'	15.0" Round CPP_Round 15" L= 17.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 14.81' / 14.75' S= 0.0035 ' /' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.88 cfs @ 12.10 hrs HW=15.37' (Free Discharge)
 ↳ 1=CPP_Round 15" (Barrel Controls 0.88 cfs @ 2.42 fps)

Pond 4P: DRAIN MANHOLE 1



Summary for Pond 5P: DETENTION BASIN 1

[62] Hint: Exceeded Reach 3R OUTLET depth by 0.56' @ 12.80 hrs

Inflow Area = 1.092 ac, 71.19% Impervious, Inflow Depth > 1.31" for 2 Year Storm event
 Inflow = 1.22 cfs @ 12.10 hrs, Volume= 0.119 af
 Outflow = 0.29 cfs @ 12.66 hrs, Volume= 0.117 af, Atten= 76%, Lag= 33.9 min
 Primary = 0.29 cfs @ 12.66 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.43' @ 12.66 hrs Surf.Area= 2,591 sf Storage= 1,654 cf

Plug-Flow detention time= 97.5 min calculated for 0.117 af (98% of inflow)
 Center-of-Mass det. time= 86.5 min (929.5 - 843.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	13.75'	11,218 cf	Custom Stage Data (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
13.75	2,256	0	0	2,256	
14.00	2,367	578	578	2,375	
15.00	2,897	2,628	3,205	2,935	
16.00	3,450	3,169	6,375	3,523	
17.00	4,137	3,788	10,163	4,244	
17.25	4,302	1,055	11,218	4,419	

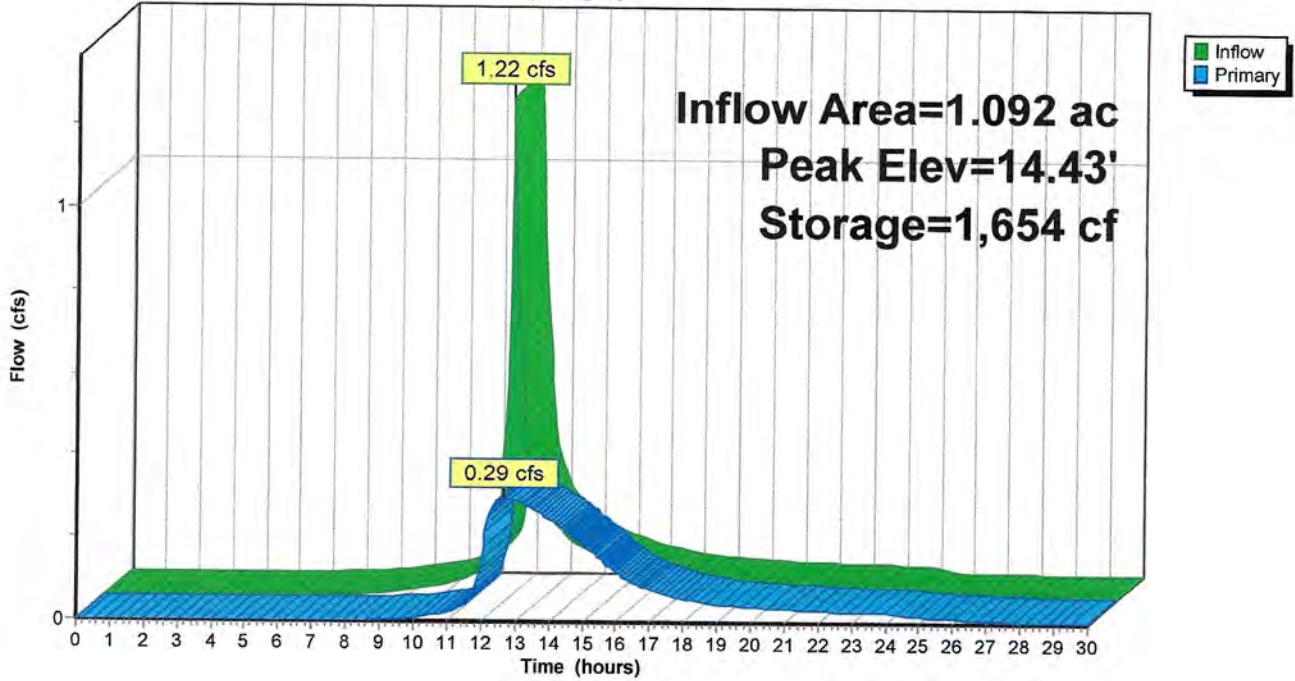
Device	Routing	Invert	Outlet Devices
#1	Primary	13.75'	4.0" Round 4" PVC Culvert L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 13.75' / 13.55' S= 0.0100 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	15.95'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.29 cfs @ 12.66 hrs HW=14.43' (Free Discharge)

- 1=4" PVC Culvert (Barrel Controls 0.29 cfs @ 3.38 fps)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: DETENTION BASIN 1

Hydrograph



Summary for Pond 6P: STORMCEPTOR 2 / CB

[57] Hint: Peaked at 17.55' (Flood elevation advised)

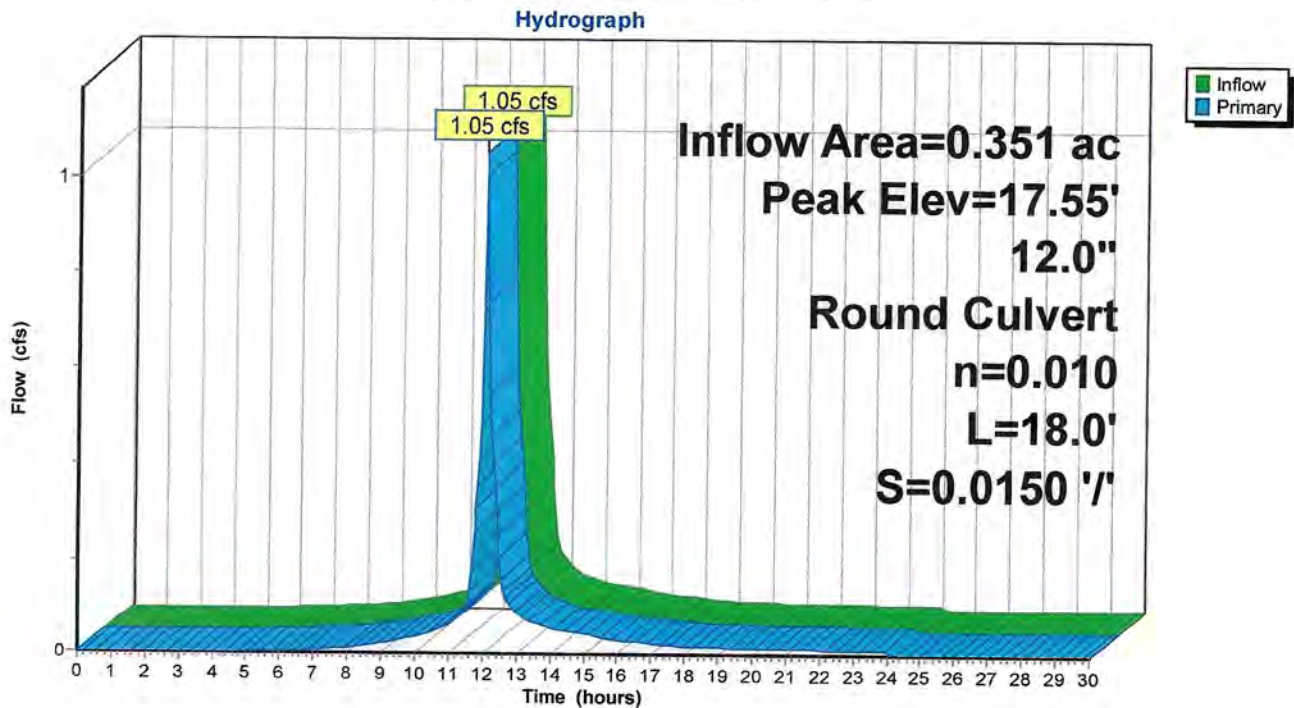
Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 2.64" for 2 Year Storm event
 Inflow = 1.05 cfs @ 12.07 hrs, Volume= 0.077 af
 Outflow = 1.05 cfs @ 12.07 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.05 cfs @ 12.07 hrs, Volume= 0.077 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.55' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	17.02'	12.0" Round CMP_Round 12" L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 17.02' / 16.75' S= 0.0150 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.01 cfs @ 12.07 hrs HW=17.54' (Free Discharge)
 ↳ 1=CMP_Round 12" (Inlet Controls 1.01 cfs @ 2.46 fps)

Pond 6P: STORMCEPTOR 2 / CB



Summary for Pond 7P: INFILTRATION SYSTEM

Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 2.64" for 2 Year Storm event
 Inflow = 1.05 cfs @ 12.07 hrs, Volume= 0.077 af
 Outflow = 0.03 cfs @ 15.70 hrs, Volume= 0.061 af, Atten= 97%, Lag= 217.6 min
 Discarded = 0.03 cfs @ 15.70 hrs, Volume= 0.061 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.73' @ 15.70 hrs Surf.Area= 2,673 sf Storage= 1,939 cf

Plug-Flow detention time= 433.9 min calculated for 0.061 af (80% of inflow)
 Center-of-Mass det. time= 357.6 min (1,147.3 - 789.7)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	1,595 cf	Custom Stage Data (Conic) Listed below (Recalc) 7,137 cf Overall - 3,149 cf Embedded = 3,988 cf x 40.0% Voids
#2	15.83'	2,683 cf	24.0" Round CMP_Round 24" Inside #1 L= 854.0' 3,149 cf Overall - 1.0" Wall Thickness = 2,683 cf
		4,278 cf	Total Available Storage

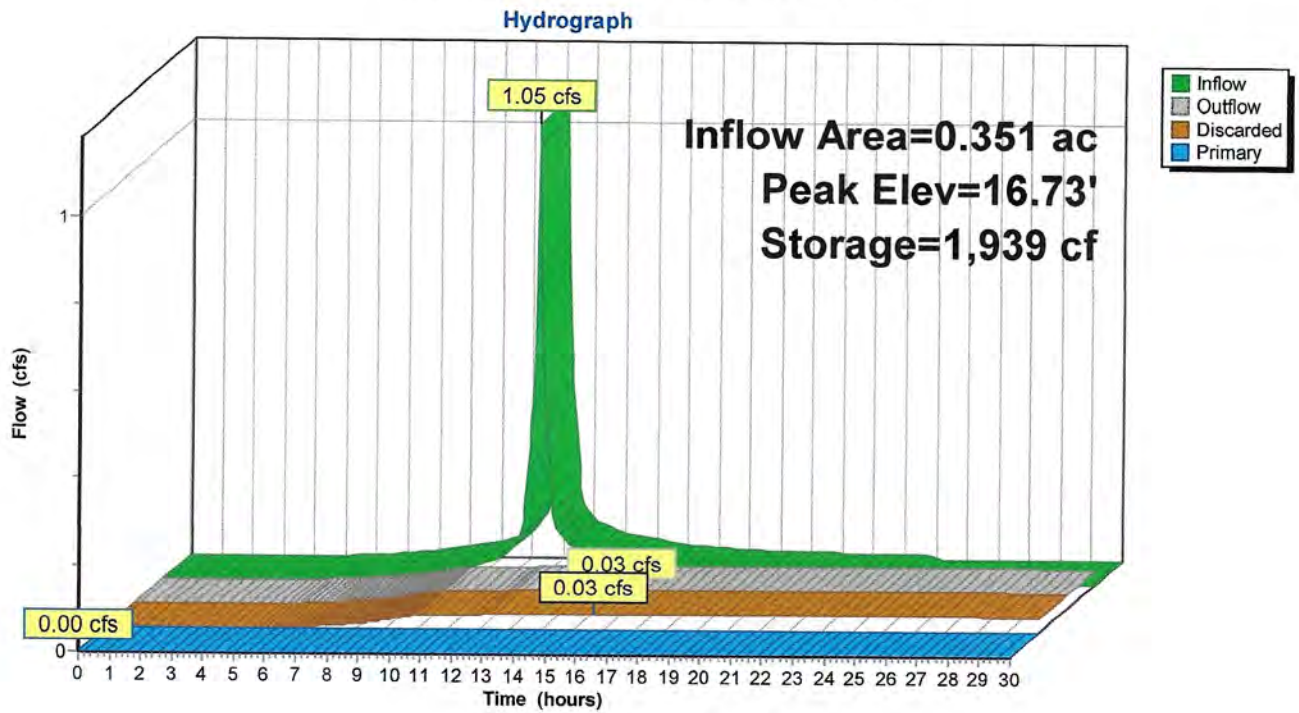
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.50	2,673	0	0	2,673
15.83	2,673	882	882	2,733
16.00	2,673	454	1,337	2,765
17.00	2,673	2,673	4,010	2,948
17.83	2,673	2,219	6,228	3,100
18.00	2,673	454	6,683	3,131
18.17	2,673	454	7,137	3,162

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	0.520 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	17.68'	6.0" Round PVC_Round 6" L= 30.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 17.68' / 15.95' S= 0.0577 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 15.70 hrs HW=16.73' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
 ↑2=PVC_Round 6" (Controls 0.00 cfs)

Pond 7P: INFILTRATION SYSTEM



Summary for Pond 8P: DETENTION BASIN 2

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth = 1.85" for 2 Year Storm event
 Inflow = 0.38 cfs @ 12.15 hrs, Volume= 0.032 af
 Outflow = 0.13 cfs @ 12.52 hrs, Volume= 0.031 af, Atten= 65%, Lag= 21.8 min
 Primary = 0.13 cfs @ 12.52 hrs, Volume= 0.031 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.78' @ 12.52 hrs Surf.Area= 1,818 sf Storage= 492 cf

Plug-Flow detention time= 106.0 min calculated for 0.031 af (98% of inflow)
 Center-of-Mass det. time= 92.5 min (923.6 - 831.1)

Volume	Invert	Avail.Storage	Storage Description
#1	14.50'	6,448 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.50	1,712	0	0	1,712
15.00	1,904	904	904	1,918
16.00	2,370	2,133	3,036	2,412
17.00	2,952	2,656	5,692	3,022
17.25	3,098	756	6,448	3,176

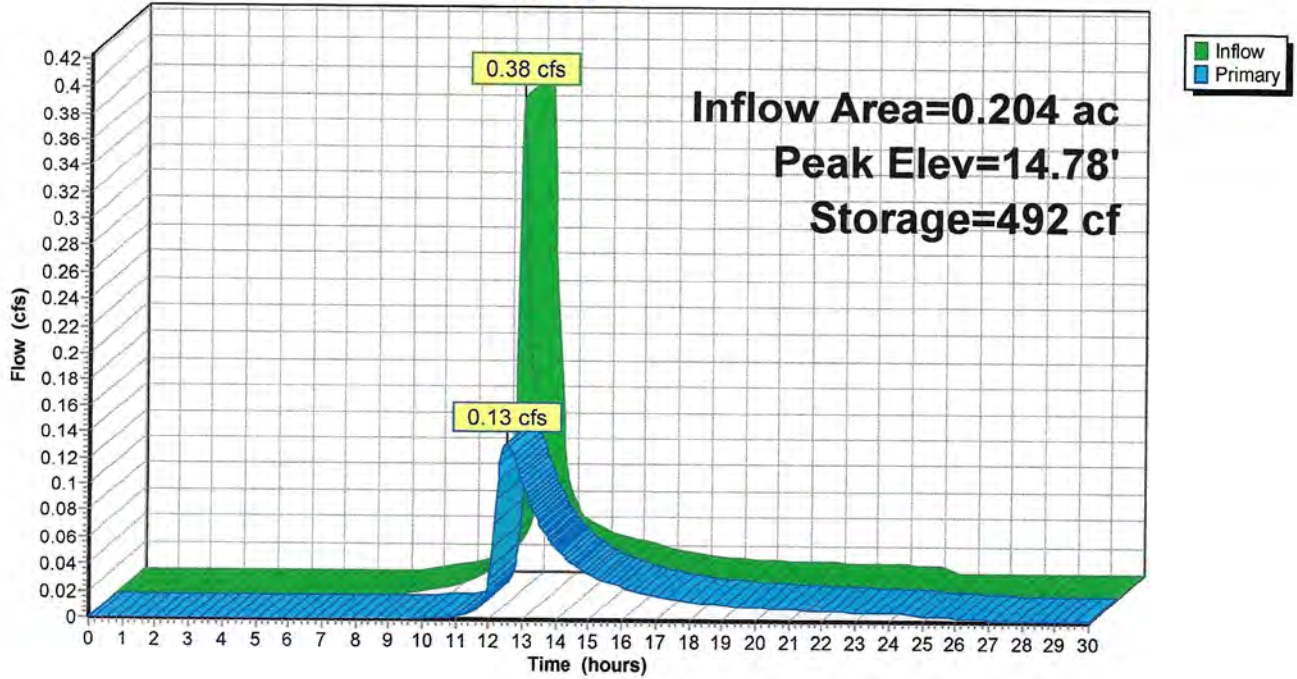
Device	Routing	Invert	Outlet Devices
#1	Primary	14.50'	4.0" Round 4" PVC Culvert L= 12.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.50' / 14.38' S= 0.0100 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	16.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.13 cfs @ 12.52 hrs HW=14.78' (Free Discharge)

- 1=4" PVC Culvert (Barrel Controls 0.13 cfs @ 2.30 fps)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: DETENTION BASIN 2

Hydrograph



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 0.70" for 2 Year Storm event
 Inflow = 7.82 cfs @ 12.46 hrs, Volume= 1.244 af
 Outflow = 4.09 cfs @ 12.91 hrs, Volume= 1.244 af, Atten= 48%, Lag= 27.0 min
 Primary = 4.09 cfs @ 12.91 hrs, Volume= 1.244 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.86' @ 12.91 hrs Surf.Area= 24,287 sf Storage= 9,641 cf

Plug-Flow detention time= 31.8 min calculated for 1.244 af (100% of inflow)
 Center-of-Mass det. time= 31.7 min (944.8 - 913.0)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	139,694 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	33,500	31,734	45,036	33,559
15.00	37,000	35,236	80,271	37,122
16.00	40,500	38,737	119,008	40,691
16.50	42,250	20,686	139,694	42,477

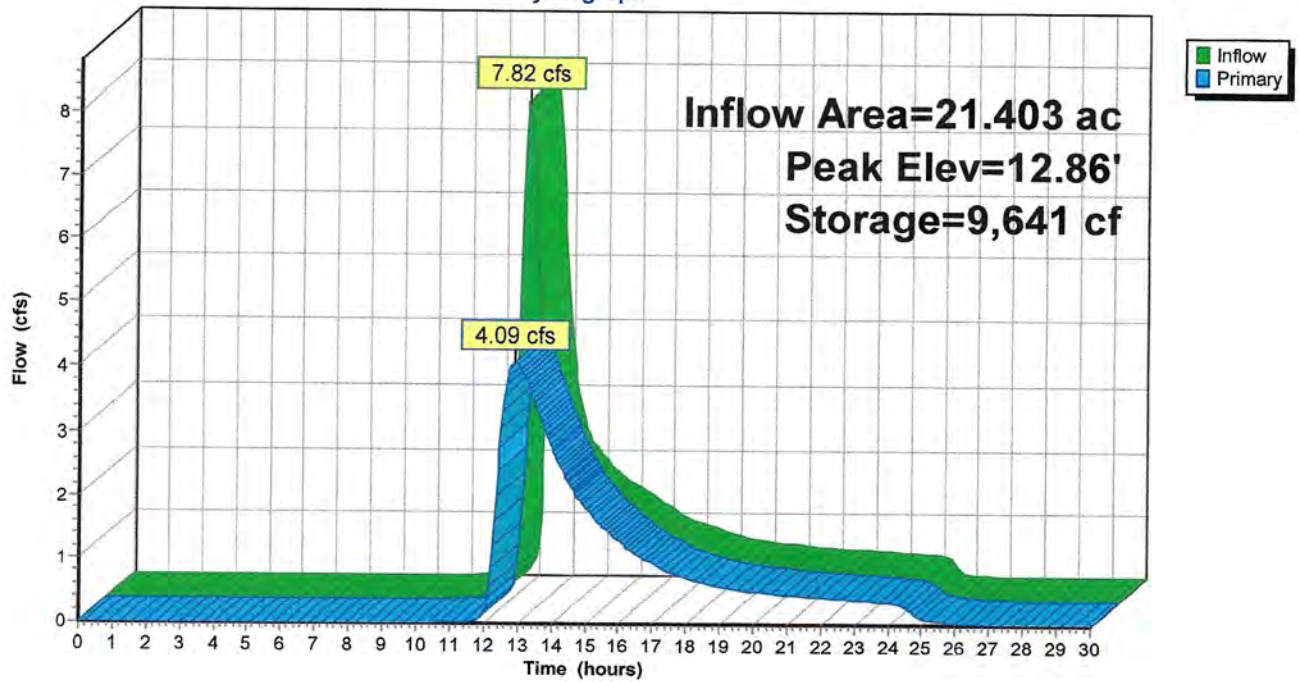
Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.09 cfs @ 12.91 hrs HW=12.86' (Free Discharge)

- 1=RCP_Round 18" (Barrel Controls 4.09 cfs @ 4.98 fps)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



THE WINSOR AT MILLBROOK VILLAGE, DUXBUR Type III 24-hr 10 Year Storm Rainfall=4.80"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 37

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 TO RAILROAD AVE	Runoff Area=12,039 sf 84.98% Impervious Runoff Depth=3.79" Flow Length=157' Tc=7.0 min CN=91 Runoff=1.12 cfs 0.087 af
Subcatchment 2S: DA2 TO RAILROAD AVE	Runoff Area=5,729 sf 53.83% Impervious Runoff Depth=1.97" Flow Length=100' Tc=5.7 min CN=71 Runoff=0.29 cfs 0.022 af
Subcatchment 3S: DA3	Runoff Area=5,613 sf 46.59% Impervious Runoff Depth=3.18" Tc=5.0 min CN=85 Runoff=0.48 cfs 0.034 af
Subcatchment 4S: DA4	Runoff Area=15,291 sf 83.57% Impervious Runoff Depth=4.00" Flow Length=225' Slope=0.0050 '/ Tc=5.0 min CN=93 Runoff=1.56 cfs 0.117 af
Subcatchment 5S: DA5	Runoff Area=8,903 sf 57.97% Impervious Runoff Depth=3.09" Flow Length=151' Tc=10.6 min CN=84 Runoff=0.63 cfs 0.053 af
Subcatchment 6S: DA6 FROM SITE TO	Runoff Area=13,540 sf 15.41% Impervious Runoff Depth=2.46" Flow Length=440' Tc=14.6 min CN=77 Runoff=0.68 cfs 0.064 af
Subcatchment 9S: DA9 TO WETLANDS	Runoff Area=871,200 sf 40.17% Impervious Runoff Depth=1.45" Flow Length=1,175' Tc=26.9 min CN=64 Runoff=18.77 cfs 2.420 af
Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS	Inflow=1.03 cfs 0.256 af Outflow=1.03 cfs 0.256 af
Reach 3R: 8" PVC DRAIN PIPE	Avg. Flow Depth=0.17' Max Vel=3.08 fps Inflow=0.22 cfs 0.052 af 8.0" Round Pipe n=0.010 L=68.0' S=0.0093 '/ Capacity=1.51 cfs Outflow=0.22 cfs 0.052 af
Reach 10R: TOTAL RUNOFF TO WETLANDS	Inflow=19.59 cfs 2.677 af Outflow=19.59 cfs 2.677 af
Pond 1P: CATCH BASIN 1	Peak Elev=16.74' Inflow=1.12 cfs 0.087 af 12.0" Round Culvert n=0.012 L=118.0' S=0.0050 '/ Outflow=1.12 cfs 0.087 af
Pond 2P: CATCH BASIN 2	Peak Elev=16.92' Inflow=0.29 cfs 0.022 af 12.0" Round Culvert n=0.012 L=56.0' S=0.0200 '/ Outflow=0.29 cfs 0.022 af
Pond 3P: STORMCEPTOR 1 / DMH	Peak Elev=15.97' Inflow=1.42 cfs 0.109 af 15.0" Round Culvert n=0.012 L=133.0' S=0.0035 '/ Outflow=1.42 cfs 0.109 af
Pond 4P: DRAIN MANHOLE 1	Peak Elev=15.54' Inflow=1.42 cfs 0.109 af 15.0" Round Culvert n=0.012 L=17.0' S=0.0035 '/ Outflow=1.42 cfs 0.109 af
Pond 5P: DETENTION BASIN 1	Peak Elev=14.90' Storage=2,917 cf Inflow=2.00 cfs 0.195 af Outflow=0.40 cfs 0.193 af
Pond 6P: STORMCEPTOR 2 / CB	Peak Elev=17.69' Inflow=1.56 cfs 0.117 af 12.0" Round Culvert n=0.010 L=18.0' S=0.0150 '/ Outflow=1.56 cfs 0.117 af

THE WINSOR AT MILLBROOK VILLAGE, DUXBUR Type III 24-hr 10 Year Storm Rainfall=4.80"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 38

Pond 7P: INFILTRATION SYSTEM

Peak Elev=17.42' Storage=3,296 cf Inflow=1.56 cfs 0.117 af
Discarded=0.04 cfs 0.067 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.067 af

Pond 8P: DETENTION BASIN 2

Peak Elev=14.94' Storage=794 cf Inflow=0.63 cfs 0.053 af
Outflow=0.22 cfs 0.052 af

Pond 11P: TO BLUEFISH RIVER

Peak Elev=13.48' Storage=27,995 cf Inflow=19.59 cfs 2.677 af
Outflow=8.57 cfs 2.677 af

Total Runoff Area = 21.403 ac Runoff Volume = 2.797 af Average Runoff Depth = 1.57"
58.60% Pervious = 12.543 ac 41.40% Impervious = 8.860 ac

Summary for Subcatchment 1S: DA1 TO RAILROAD AVE

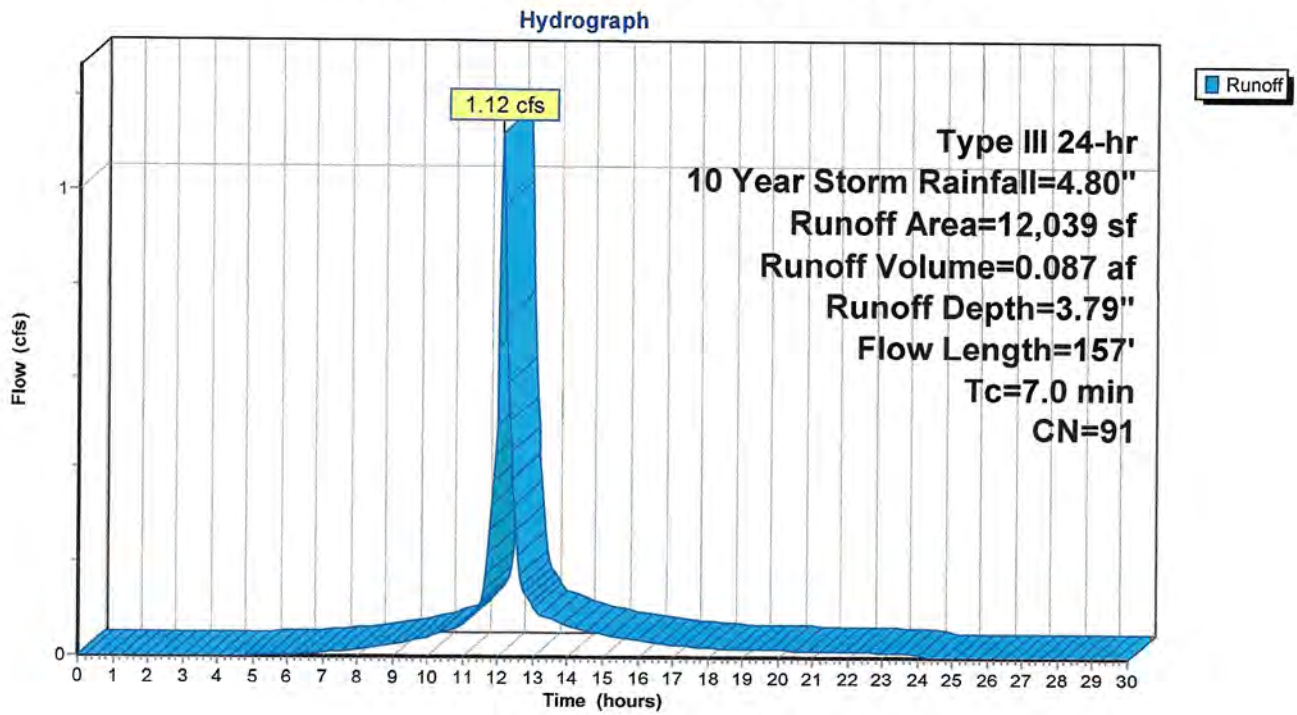
Runoff = 1.12 cfs @ 12.10 hrs, Volume= 0.087 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
1,270	39	>75% Grass cover, Good, HSG A
538	74	>75% Grass cover, Good, HSG C
* 7,805	98	Paved street, dwys, parking, curbs HSG A
449	98	Paved parking, HSG C
* 292	98	Sidewalks, HSG A
* 146	98	Sidewalks, HSG C
1,028	98	Roofs, HSG A
511	98	Roofs, HSG C
12,039	91	Weighted Average
1,808		15.02% Pervious Area
10,231		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	28	0.0150	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	24	0.0100	0.81		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.9	105	0.0090	1.93		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
7.0	157	Total			

Subcatchment 1S: DA1 TO RAILROAD AVE



Summary for Subcatchment 2S: DA2 TO RAILROAD AVE

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 1.97"

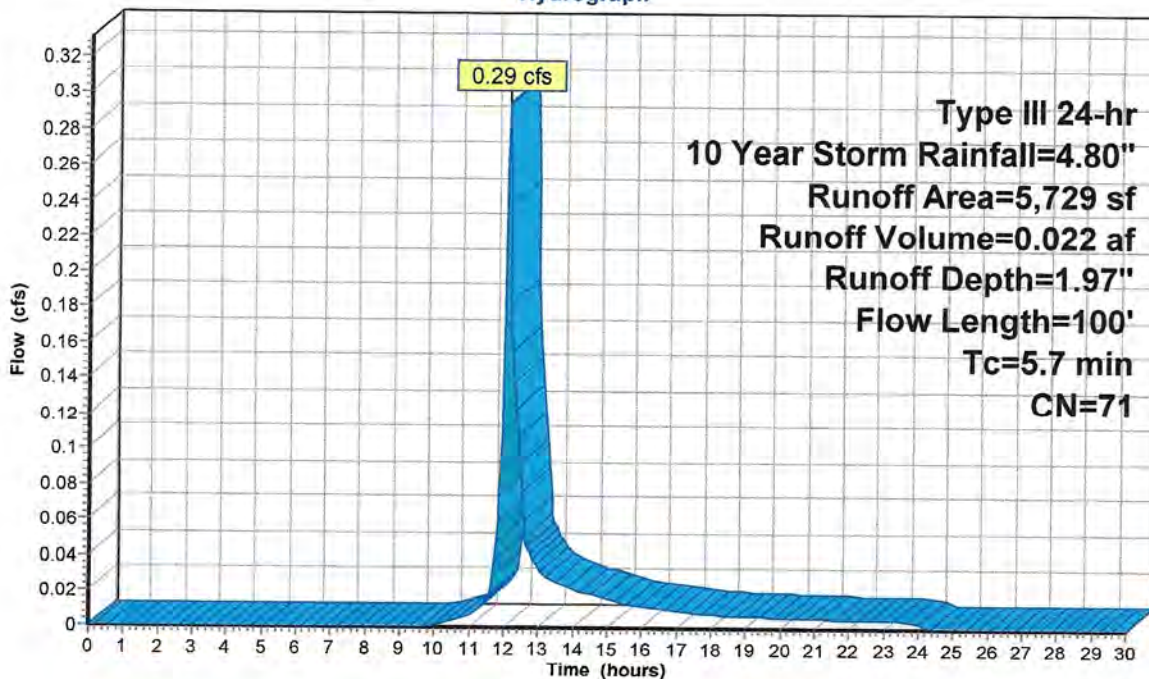
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
2,645	39	>75% Grass cover, Good, HSG A
* 3,084	98	Paved sreet, driveway, HSG A
5,729	71	Weighted Average
2,645		46.17% Pervious Area
3,084		53.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	28	0.0250	0.10		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	22	0.0100	0.79		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.6	50	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
5.7	100	Total			

Subcatchment 2S: DA2 TO RAILROAD AVE

Hydrograph



Summary for Subcatchment 3S: DA3

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.034 af, Depth= 3.18"

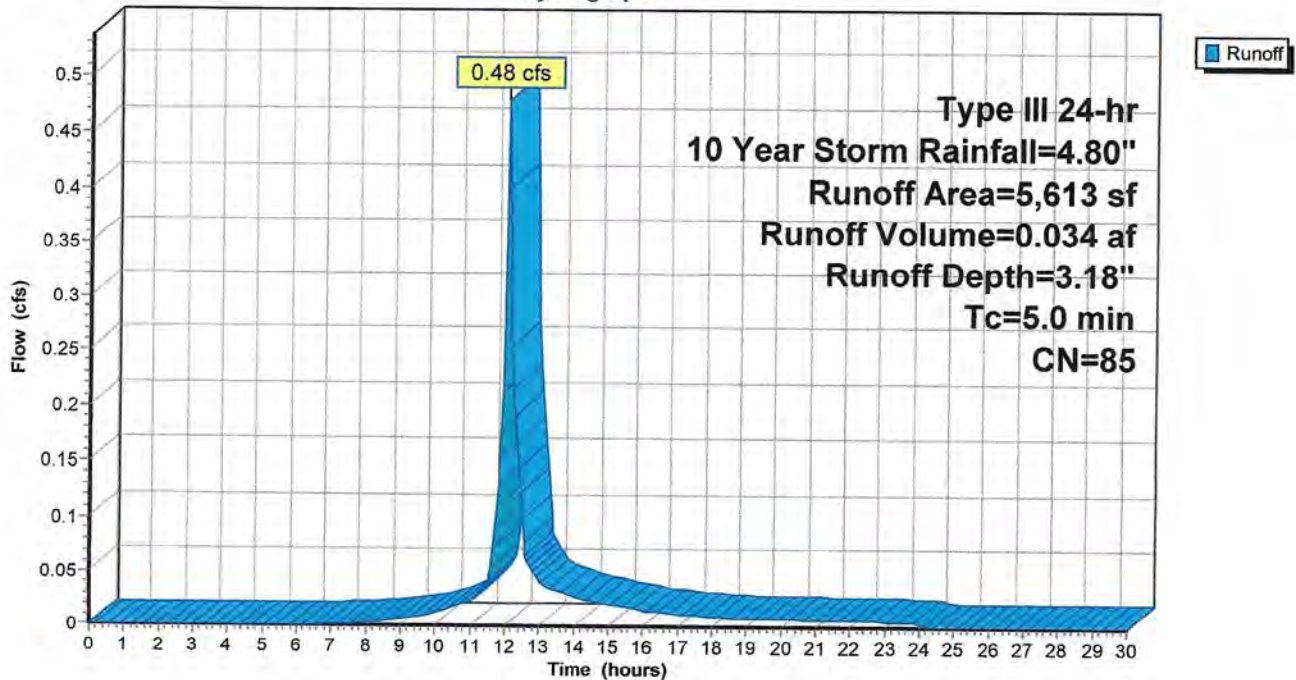
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, $dt= 0.05$ hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
2,998	74	>75% Grass cover, Good, HSG C
* 2,615	98	Detention Basin 1, Water Surface, HSG C
5,613	85	Weighted Average
2,998		53.41% Pervious Area
2,615		46.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, DETENTION BASIN 1

Subcatchment 3S: DA3

Hydrograph



Summary for Subcatchment 4S: DA4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.56 cfs @ 12.07 hrs, Volume= 0.117 af, Depth= 4.00"

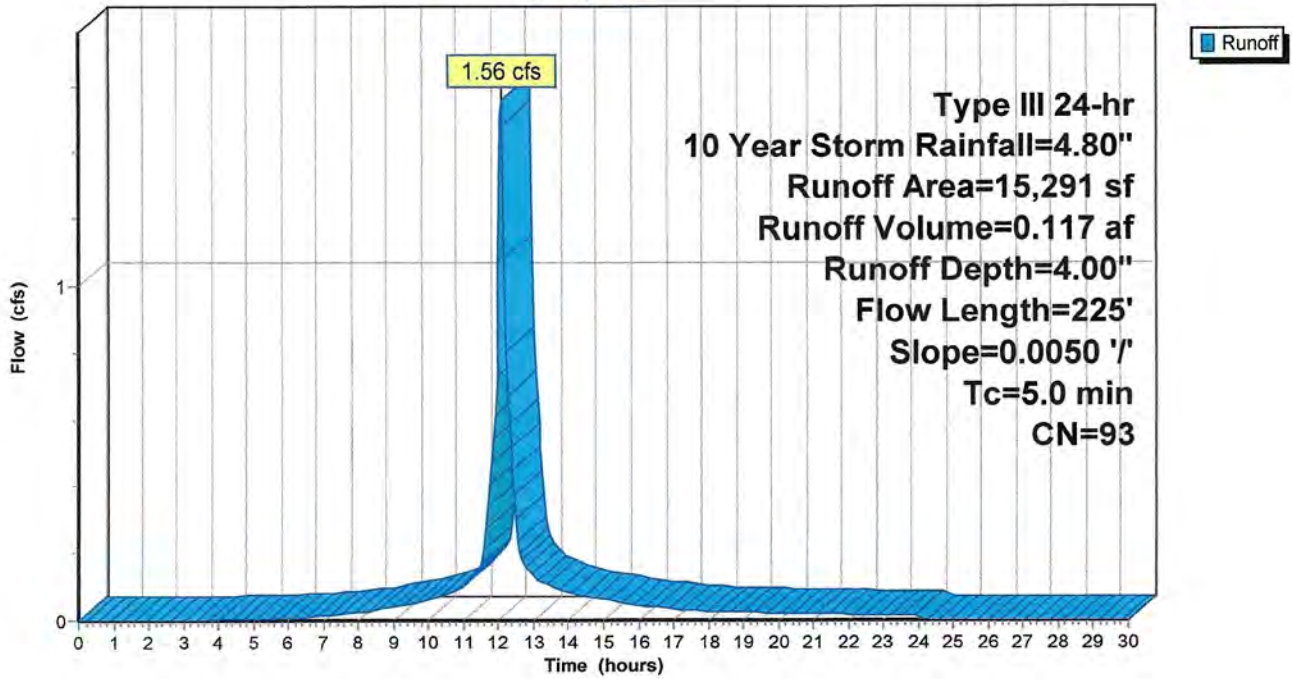
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
250	39	>75% Grass cover, Good, HSG A
2,262	74	>75% Grass cover, Good, HSG C
490	98	Roofs, HSG A
4,174	98	Roofs, HSG C
* 149	98	Paved parking, dwy, curbs, HSG A
* 6,878	98	Paved parking, dwy, curbs, HSG C
* 97	98	Sidewalks, HSG A
* 991	98	Sidewalks, HSG C
15,291	93	Weighted Average
2,512		16.43% Pervious Area
12,779		83.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
2.0	175	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
3.2	225	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 4S: DA4

Hydrograph



Summary for Subcatchment 5S: DA5

Runoff = 0.63 cfs @ 12.15 hrs, Volume= 0.053 af, Depth= 3.09"

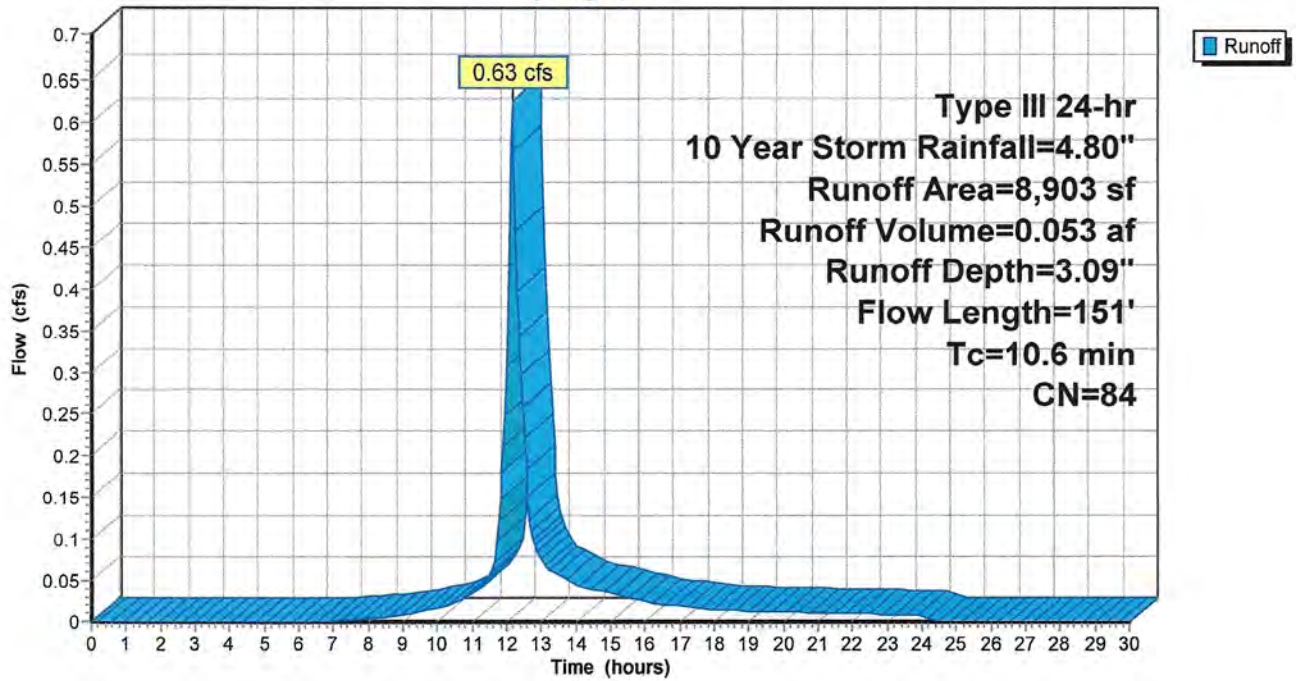
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
1,113	39	>75% Grass cover, Good, HSG A
2,629	74	>75% Grass cover, Good, HSG C
* 1,982	98	Detention Basin 2, Water Surface, HSG C
1,807	98	Roofs, HSG A
1,050	98	Roofs, HSG C
* 292	98	Walls, HSG A
* 30	98	Walls, HSG C
8,903	84	Weighted Average
3,742		42.03% Pervious Area
5,161		57.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		Sheet Flow, grass Grass: Short n= 0.150 P2= 3.40"
1.0	65	0.0050	1.14		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
0.1	36	0.1400	6.02		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
10.6	151	Total			

Subcatchment 5S: DA5

Hydrograph



Summary for Subcatchment 6S: DA6 FROM SITE TO WETLANDS

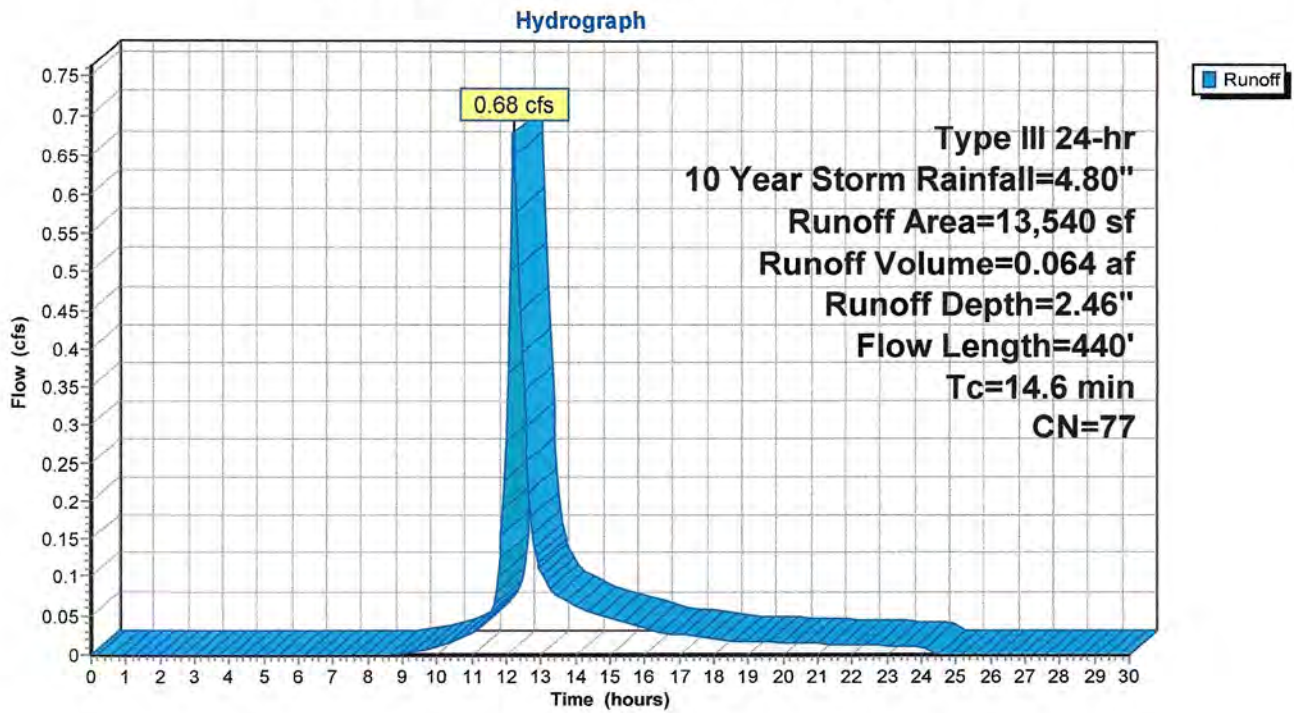
Runoff = 0.68 cfs @ 12.21 hrs, Volume= 0.064 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
353	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
463	39	>75% Grass cover, Good, HSG A
5,944	74	>75% Grass cover, Good, HSG C
1,922	98	Roofs, HSG C
* 164	98	Conc Culvert, HSG D
13,540	77	Weighted Average
11,454		84.59% Pervious Area
2,086		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.40"
0.6	100	0.0180	2.72		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
0.5	90	0.0220	3.01		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
8.2	220	0.0080	0.45		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
14.6	440	Total			

Subcatchment 6S: DA6 FROM SITE TO WETLANDS



Summary for Subcatchment 9S: DA9 TO WETLANDS

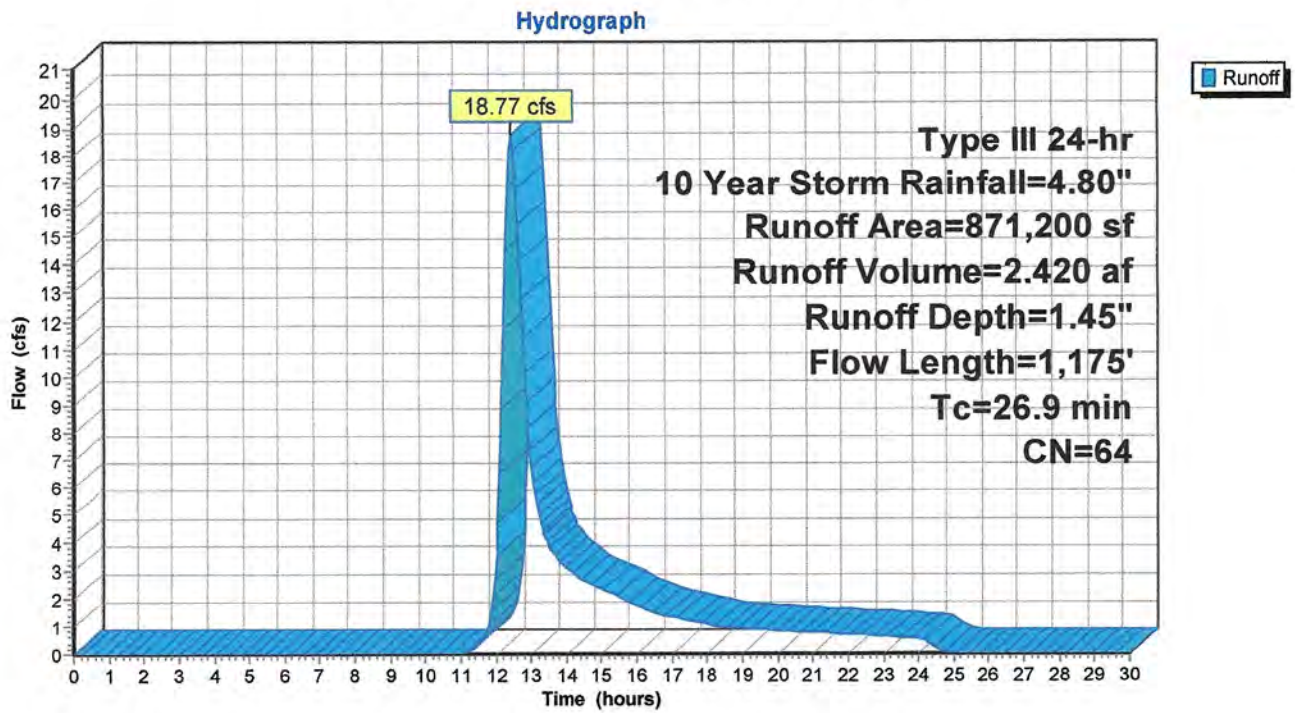
Runoff = 18.77 cfs @ 12.41 hrs, Volume= 2.420 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
185,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
262,200	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 350,000	98	Roofs,Pavement HSG A&C262200
871,200	64	Weighted Average
521,200		59.83% Pervious Area
350,000		40.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS



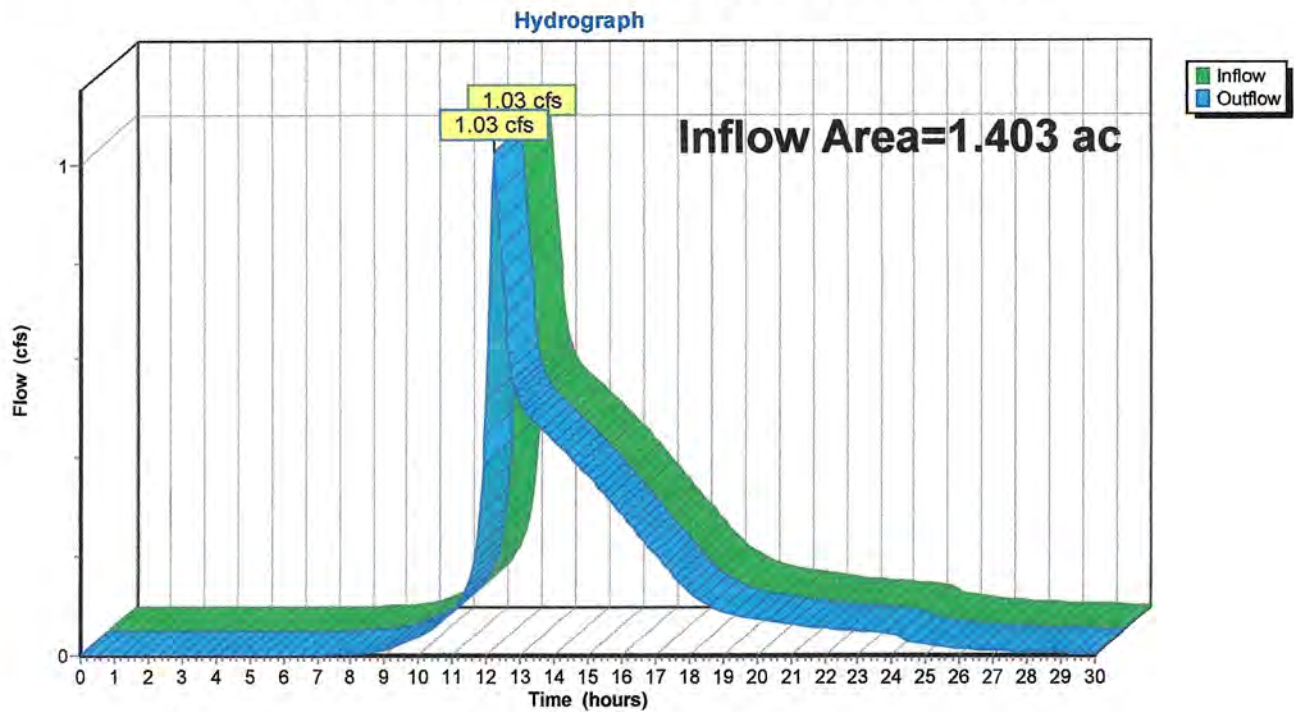
Summary for Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS

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

Inflow Area = 1.403 ac, 58.83% Impervious, Inflow Depth > 2.19" for 10 Year Storm event
Inflow = 1.03 cfs @ 12.22 hrs, Volume= 0.256 af
Outflow = 1.03 cfs @ 12.22 hrs, Volume= 0.256 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS



Summary for Reach 3R: 8" PVC DRAIN PIPE

[52] Hint: Inlet/Outlet conditions not evaluated

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.05'

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth > 3.04" for 10 Year Storm event
Inflow = 0.22 cfs @ 12.50 hrs, Volume= 0.052 af
Outflow = 0.22 cfs @ 12.52 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.08 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 1.34 fps, Avg. Travel Time= 0.8 min

Peak Storage= 5 cf @ 12.51 hrs

Average Depth at Peak Storage= 0.17' , Surface Width= 0.58'

Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.51 cfs

8.0" Round Pipe

n= 0.010 PVC, smooth interior

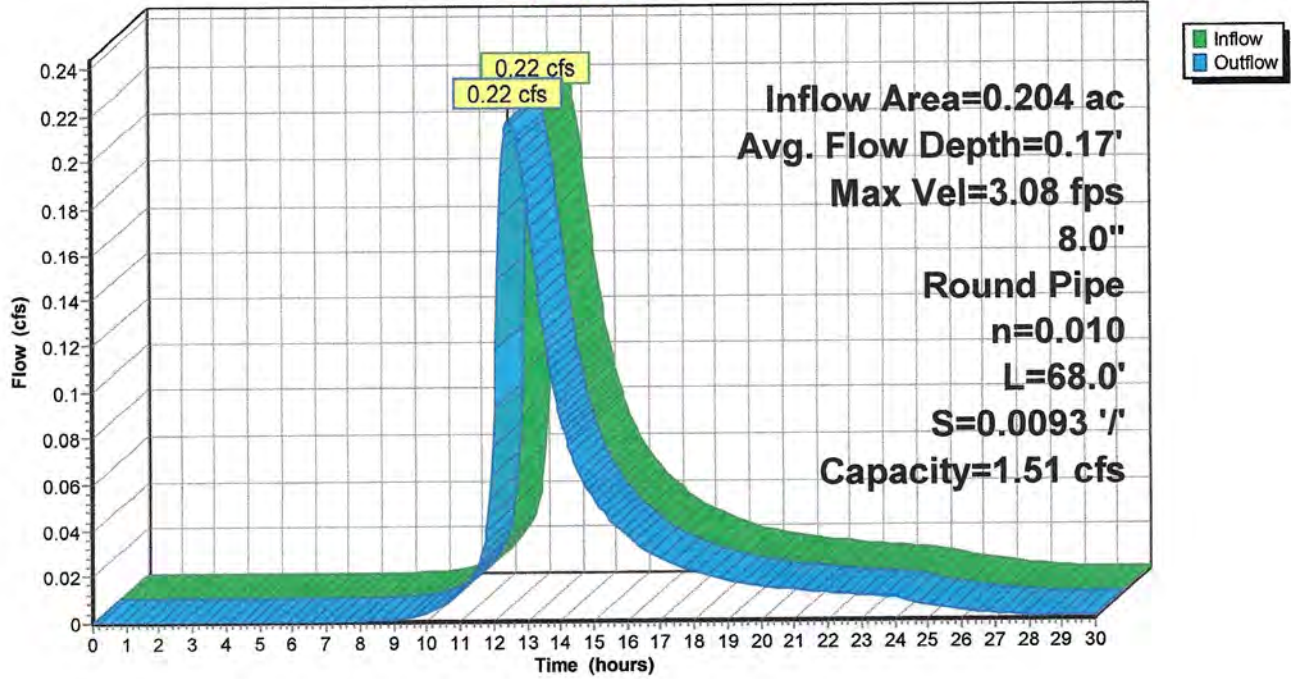
Length= 68.0' Slope= 0.0093 '/'

Inlet Invert= 14.38', Outlet Invert= 13.75'



Reach 3R: 8" PVC DRAIN PIPE

Hydrograph



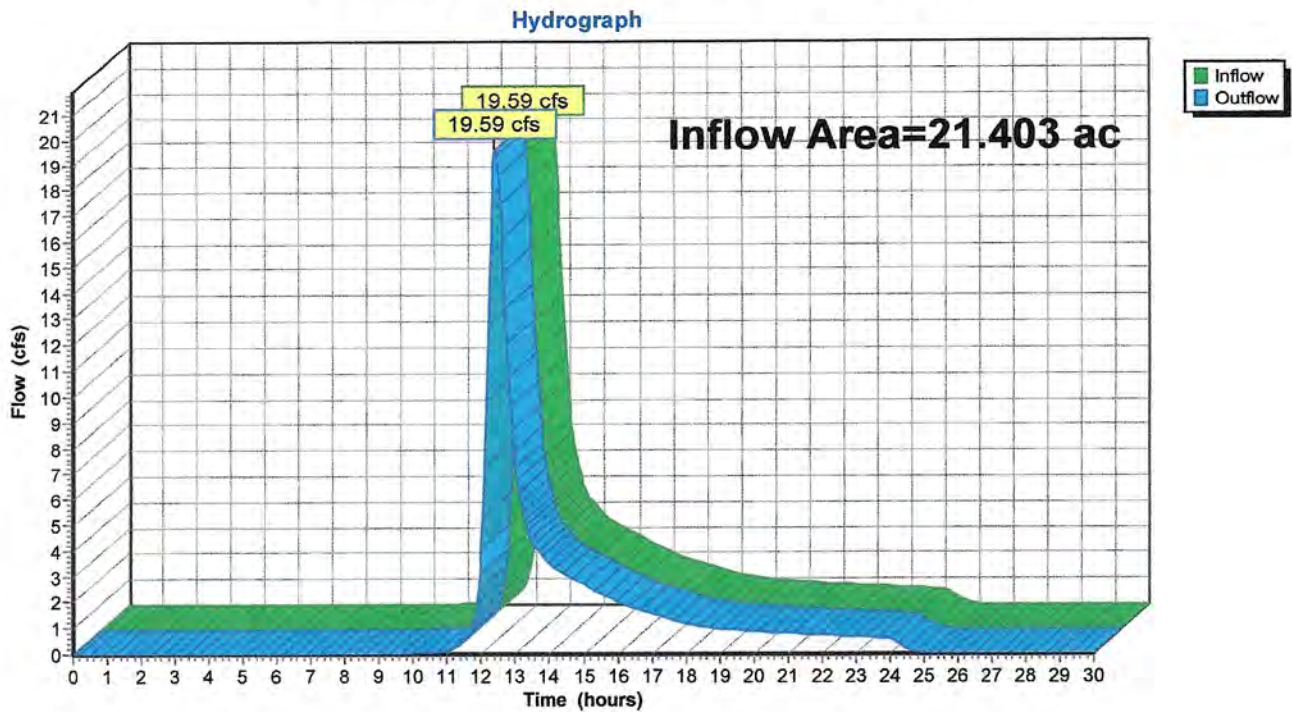
Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 1.50" for 10 Year Storm event
Inflow = 19.59 cfs @ 12.41 hrs, Volume= 2.677 af
Outflow = 19.59 cfs @ 12.41 hrs, Volume= 2.677 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS



Summary for Pond 1P: CATCH BASIN 1

[57] Hint: Peaked at 16.74' (Flood elevation advised)

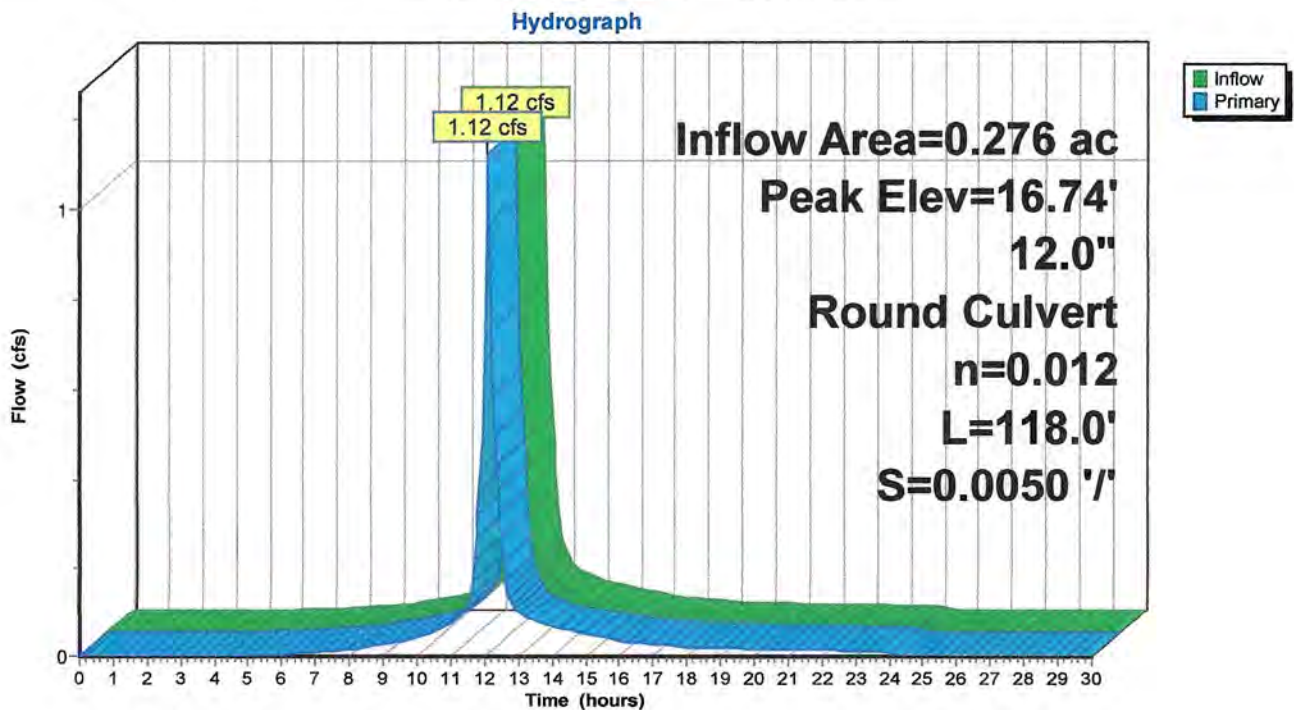
Inflow Area = 0.276 ac, 84.98% Impervious, Inflow Depth = 3.79" for 10 Year Storm event
 Inflow = 1.12 cfs @ 12.10 hrs, Volume= 0.087 af
 Outflow = 1.12 cfs @ 12.10 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.12 cfs @ 12.10 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.74' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.12'	12.0" Round CPP_Round 12" L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.12' / 15.53' S= 0.0050 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.12 cfs @ 12.10 hrs HW=16.74' (Free Discharge)
 ↑1=CPP_Round 12" (Barrel Controls 1.12 cfs @ 3.14 fps)

Pond 1P: CATCH BASIN 1



Summary for Pond 2P: CATCH BASIN 2

[57] Hint: Peaked at 16.92' (Flood elevation advised)

Inflow Area = 0.132 ac, 53.83% Impervious, Inflow Depth = 1.97" for 10 Year Storm event
 Inflow = 0.29 cfs @ 12.09 hrs, Volume= 0.022 af
 Outflow = 0.29 cfs @ 12.09 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.29 cfs @ 12.09 hrs, Volume= 0.022 af

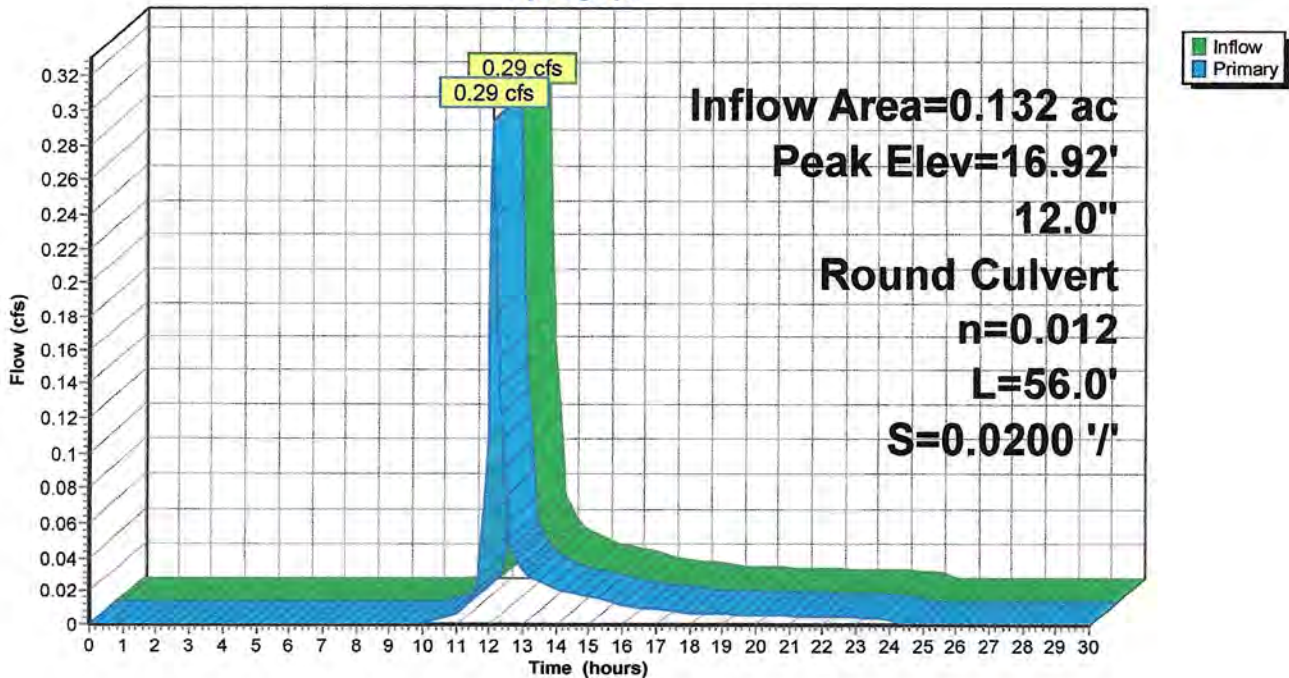
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.92' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.65'	12.0" Round CPP_Round 12" L= 56.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.65' / 15.53' S= 0.0200 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 12.09 hrs HW=16.91' (Free Discharge)
 ↑1=CPP_Round 12" (Inlet Controls 0.29 cfs @ 1.75 fps)

Pond 2P: CATCH BASIN 2

Hydrograph



Summary for Pond 3P: STORMCEPTOR 1 / DMH

[57] Hint: Peaked at 15.97' (Flood elevation advised)

[79] Warning: Submerged Pond 1P Primary device # 1 OUTLET by 0.44'

[79] Warning: Submerged Pond 2P Primary device # 1 OUTLET by 0.44'

Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 3.20" for 10 Year Storm event
 Inflow = 1.42 cfs @ 12.10 hrs, Volume= 0.109 af
 Outflow = 1.42 cfs @ 12.10 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.42 cfs @ 12.10 hrs, Volume= 0.109 af

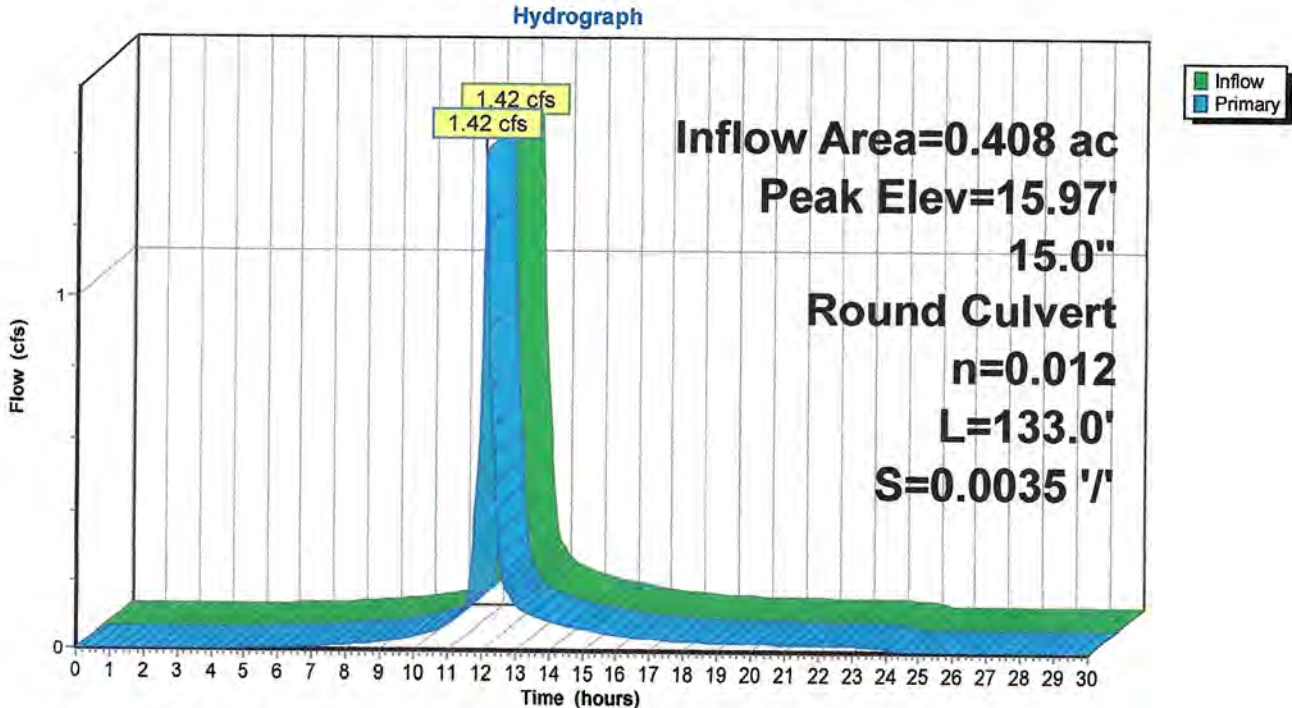
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.97' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	15.28'	15.0" Round CPP_Round 15" L= 133.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.28' / 14.81' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.41 cfs @ 12.10 hrs HW=15.96' (Free Discharge)

↑1=CPP_Round 15" (Barrel Controls 1.41 cfs @ 2.97 fps)

Pond 3P: STORMCEPTOR 1 / DMH



Summary for Pond 4P: DRAIN MANHOLE 1

[57] Hint: Peaked at 15.54' (Flood elevation advised)

[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 0.26'

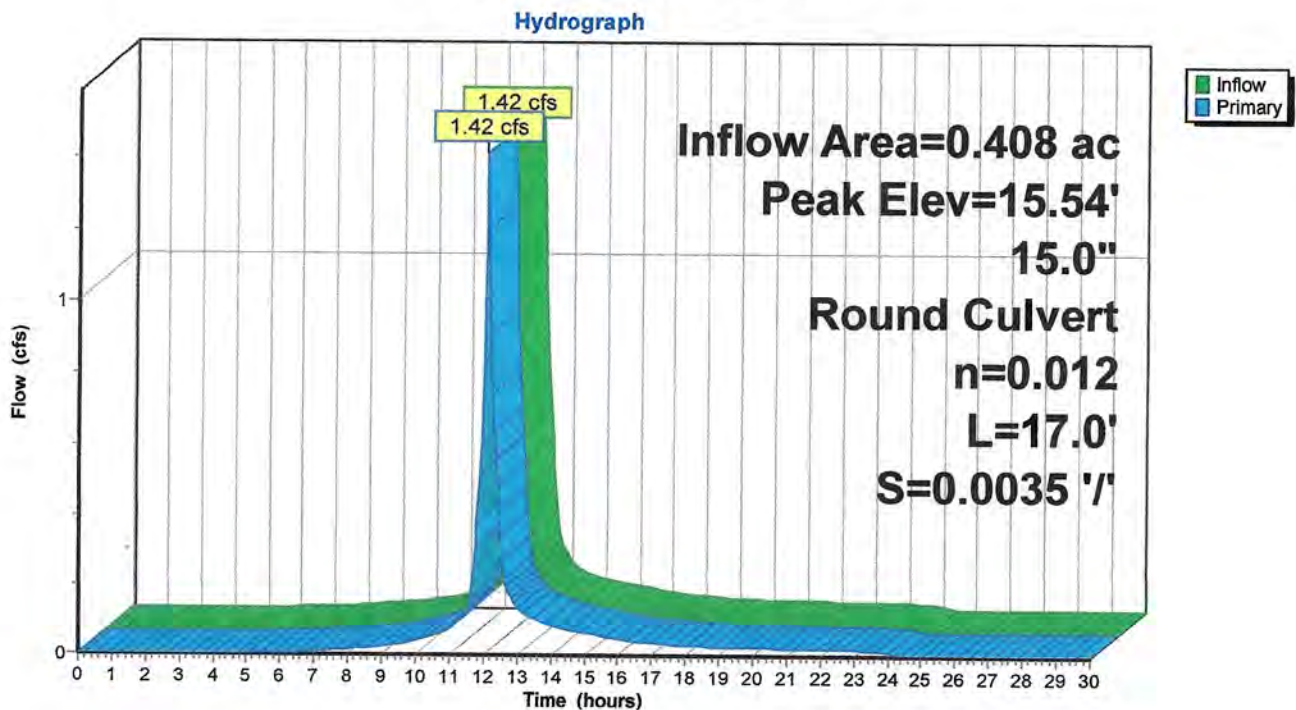
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 3.20" for 10 Year Storm event
 Inflow = 1.42 cfs @ 12.10 hrs, Volume= 0.109 af
 Outflow = 1.42 cfs @ 12.10 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.42 cfs @ 12.10 hrs, Volume= 0.109 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.54' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	14.81'	15.0" Round CPP_Round 15" L= 17.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 14.81' / 14.75' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.41 cfs @ 12.10 hrs HW=15.54' (Free Discharge)
 ↳ 1=CPP_Round 15" (Barrel Controls 1.41 cfs @ 2.74 fps)

Pond 4P: DRAIN MANHOLE 1



Summary for Pond 5P: DETENTION BASIN 1

[63] Warning: Exceeded Reach 3R INLET depth by 0.36' @ 13.00 hrs

[79] Warning: Submerged Pond 4P Primary device # 1 INLET by 0.09'

Inflow Area = 1.092 ac, 71.19% Impervious, Inflow Depth > 2.14" for 10 Year Storm event
 Inflow = 2.00 cfs @ 12.10 hrs, Volume= 0.195 af
 Outflow = 0.40 cfs @ 12.88 hrs, Volume= 0.193 af, Atten= 80%, Lag= 47.3 min
 Primary = 0.40 cfs @ 12.88 hrs, Volume= 0.193 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.90' @ 12.88 hrs Surf.Area= 2,841 sf Storage= 2,917 cf

Plug-Flow detention time= 104.8 min calculated for 0.193 af (99% of inflow)
 Center-of-Mass det. time= 97.3 min (924.9 - 827.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	13.75'	11,218 cf	Custom Stage Data (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
13.75	2,256	0	0	2,256	
14.00	2,367	578	578	2,375	
15.00	2,897	2,628	3,205	2,935	
16.00	3,450	3,169	6,375	3,523	
17.00	4,137	3,788	10,163	4,244	
17.25	4,302	1,055	11,218	4,419	

Device	Routing	Invert	Outlet Devices
#1	Primary	13.75'	4.0" Round 4" PVC Culvert L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 13.75' / 13.55' S= 0.0100 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	15.95'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

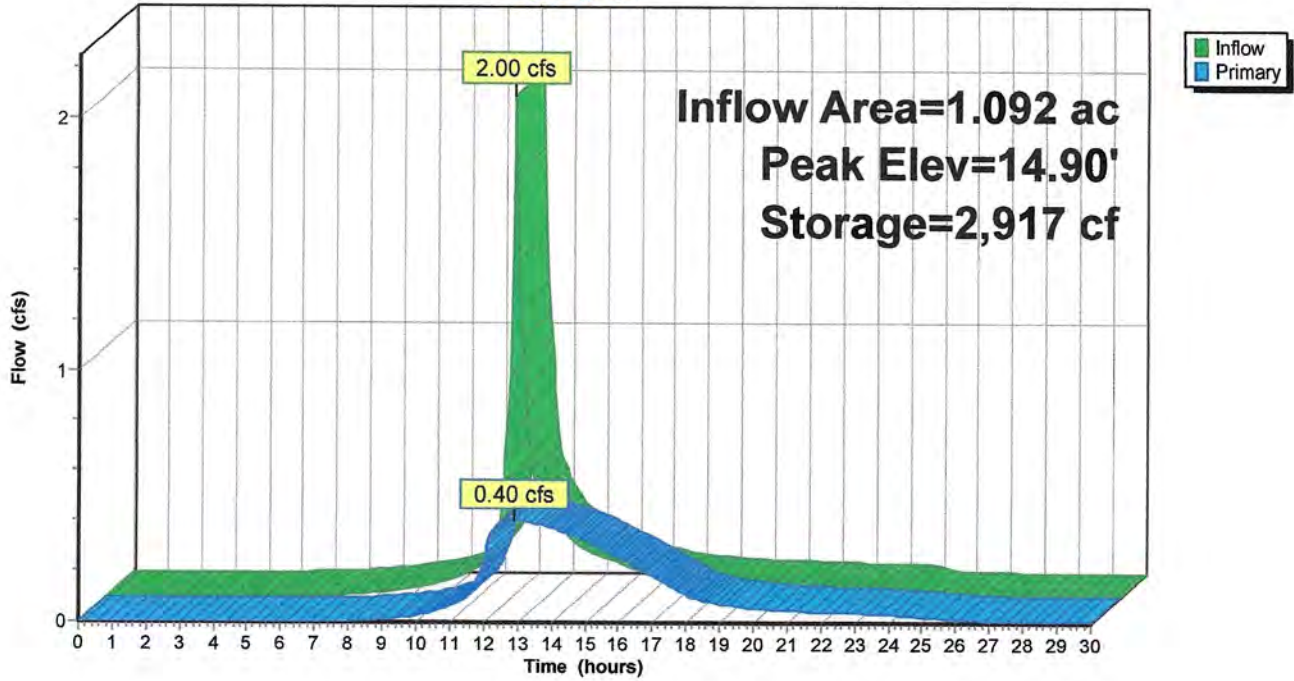
Primary OutFlow Max=0.40 cfs @ 12.88 hrs HW=14.90' (Free Discharge)

1=4" PVC Culvert (Barrel Controls 0.40 cfs @ 4.59 fps)

2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: DETENTION BASIN 1

Hydrograph



Summary for Pond 6P: STORMCEPTOR 2 / CB

[57] Hint: Peaked at 17.69' (Flood elevation advised)

Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 4.00" for 10 Year Storm event
 Inflow = 1.56 cfs @ 12.07 hrs, Volume= 0.117 af
 Outflow = 1.56 cfs @ 12.07 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.56 cfs @ 12.07 hrs, Volume= 0.117 af

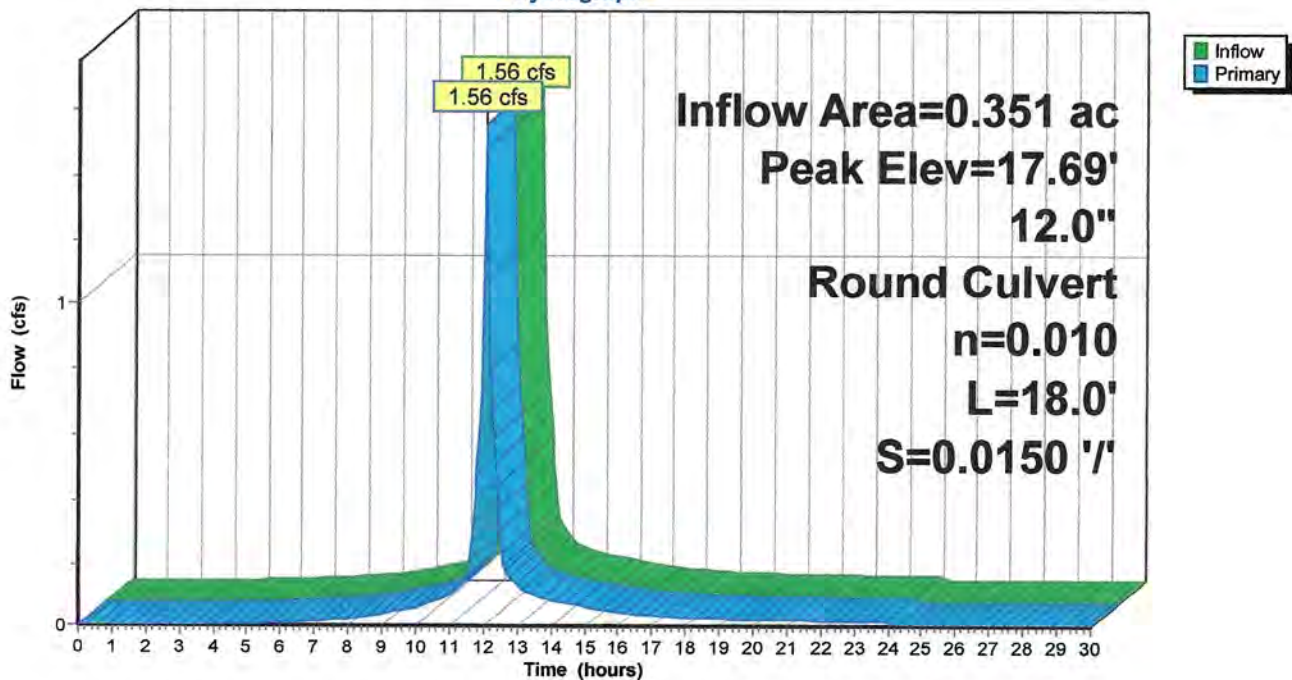
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.69' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	17.02'	12.0" Round CMP_Round 12" L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 17.02' / 16.75' S= 0.0150 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.50 cfs @ 12.07 hrs HW=17.68' (Free Discharge)
 ↑1=CMP_Round 12" (Barrel Controls 1.50 cfs @ 3.90 fps)

Pond 6P: STORMCEPTOR 2 / CB

Hydrograph



Summary for Pond 7P: INFILTRATION SYSTEM

[81] Warning: Exceeded Pond 6P by 0.31' @ 17.60 hrs

Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 4.00" for 10 Year Storm event
 Inflow = 1.56 cfs @ 12.07 hrs, Volume= 0.117 af
 Outflow = 0.04 cfs @ 16.89 hrs, Volume= 0.067 af, Atten= 98%, Lag= 289.1 min
 Discarded = 0.04 cfs @ 16.89 hrs, Volume= 0.067 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.42' @ 16.89 hrs Surf.Area= 2,673 sf Storage= 3,296 cf

Plug-Flow detention time= 441.9 min calculated for 0.067 af (58% of inflow)
 Center-of-Mass det. time= 335.5 min (1,114.1 - 778.6)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	1,595 cf	Custom Stage Data (Conic) Listed below (Recalc) 7,137 cf Overall - 3,149 cf Embedded = 3,988 cf x 40.0% Voids
#2	15.83'	2,683 cf	24.0" Round CMP_Round 24" Inside #1 L= 854.0' 3,149 cf Overall - 1.0" Wall Thickness = 2,683 cf
		4,278 cf	Total Available Storage

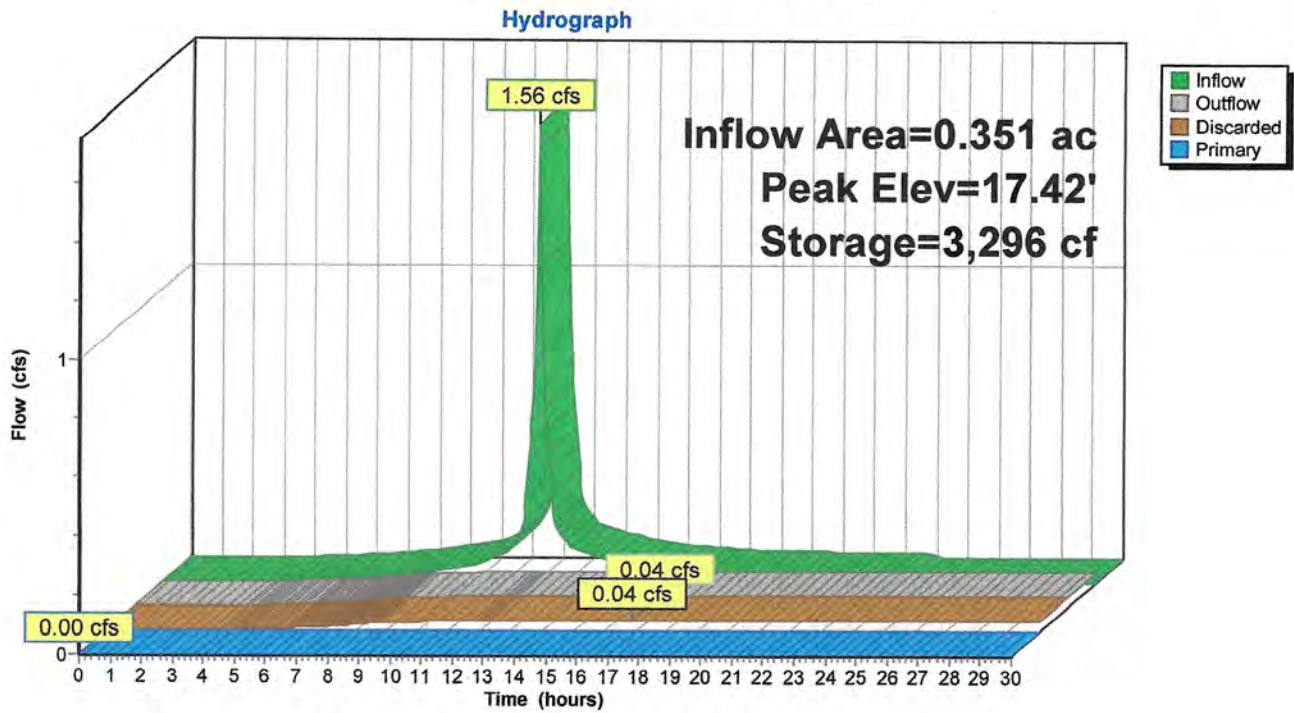
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.50	2,673	0	0	2,673
15.83	2,673	882	882	2,733
16.00	2,673	454	1,337	2,765
17.00	2,673	2,673	4,010	2,948
17.83	2,673	2,219	6,228	3,100
18.00	2,673	454	6,683	3,131
18.17	2,673	454	7,137	3,162

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	0.520 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	17.68'	6.0" Round PVC_Round 6" L= 30.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 17.68' / 15.95' S= 0.0577 ' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.04 cfs @ 16.89 hrs HW=17.42' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
 ↑2=PVC_Round 6" (Controls 0.00 cfs)

Pond 7P: INFILTRATION SYSTEM



Summary for Pond 8P: DETENTION BASIN 2

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth = 3.09" for 10 Year Storm event
 Inflow = 0.63 cfs @ 12.15 hrs, Volume= 0.053 af
 Outflow = 0.22 cfs @ 12.50 hrs, Volume= 0.052 af, Atten= 65%, Lag= 21.3 min
 Primary = 0.22 cfs @ 12.50 hrs, Volume= 0.052 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.94' @ 12.50 hrs Surf.Area= 1,881 sf Storage= 794 cf

Plug-Flow detention time= 89.0 min calculated for 0.052 af (98% of inflow)
 Center-of-Mass det. time= 79.8 min (896.2 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1	14.50'	6,448 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.50	1,712	0	0	1,712
15.00	1,904	904	904	1,918
16.00	2,370	2,133	3,036	2,412
17.00	2,952	2,656	5,692	3,022
17.25	3,098	756	6,448	3,176

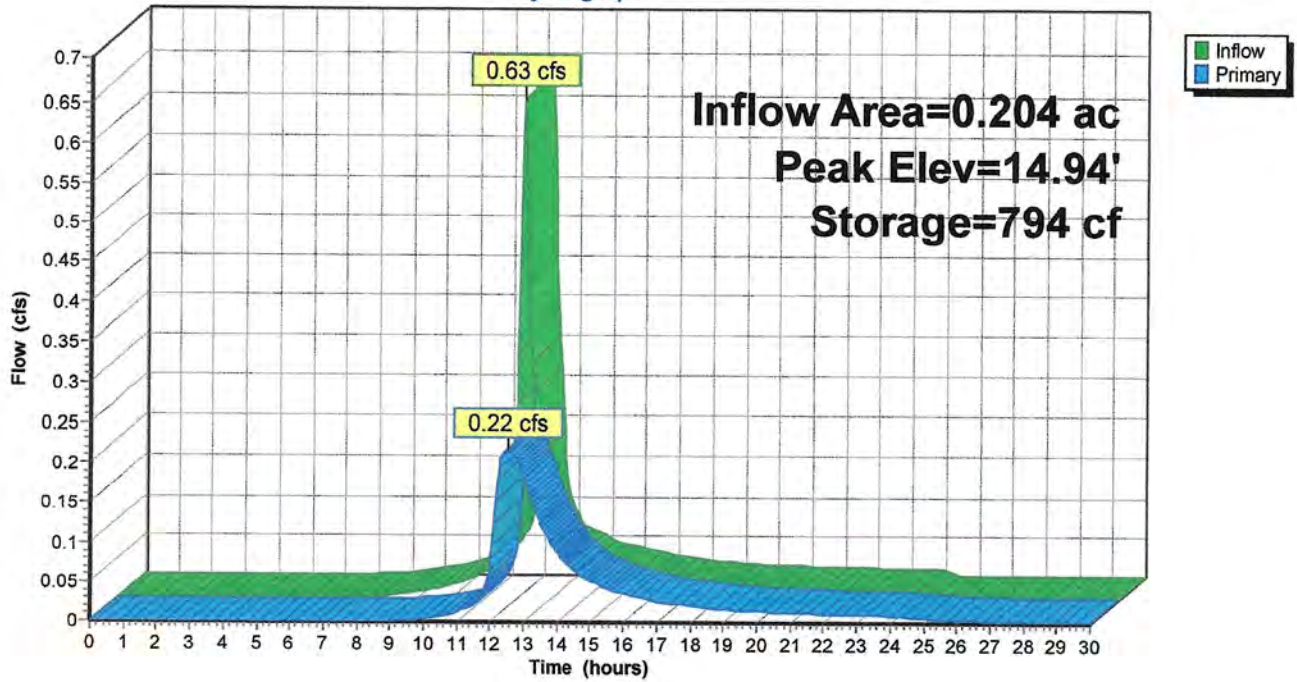
Device	Routing	Invert	Outlet Devices
#1	Primary	14.50'	4.0" Round 4" PVC Culvert L= 12.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.50' / 14.38' S= 0.0100 ' S= 0.0100 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	16.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.22 cfs @ 12.50 hrs HW=14.94' (Free Discharge)

- 1=4" PVC Culvert (Barrel Controls 0.22 cfs @ 2.48 fps)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: DETENTION BASIN 2

Hydrograph



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 1.50" for 10 Year Storm event
 Inflow = 19.59 cfs @ 12.41 hrs, Volume= 2.677 af
 Outflow = 8.57 cfs @ 12.91 hrs, Volume= 2.677 af, Atten= 56%, Lag= 29.9 min
 Primary = 8.57 cfs @ 12.91 hrs, Volume= 2.677 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 13.48' @ 12.91 hrs Surf.Area= 31,645 sf Storage= 27,995 cf

Plug-Flow detention time= 41.2 min calculated for 2.672 af (100% of inflow)
 Center-of-Mass det. time= 41.1 min (928.5 - 887.4)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	139,694 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	33,500	31,734	45,036	33,559
15.00	37,000	35,236	80,271	37,122
16.00	40,500	38,737	119,008	40,691
16.50	42,250	20,686	139,694	42,477

Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

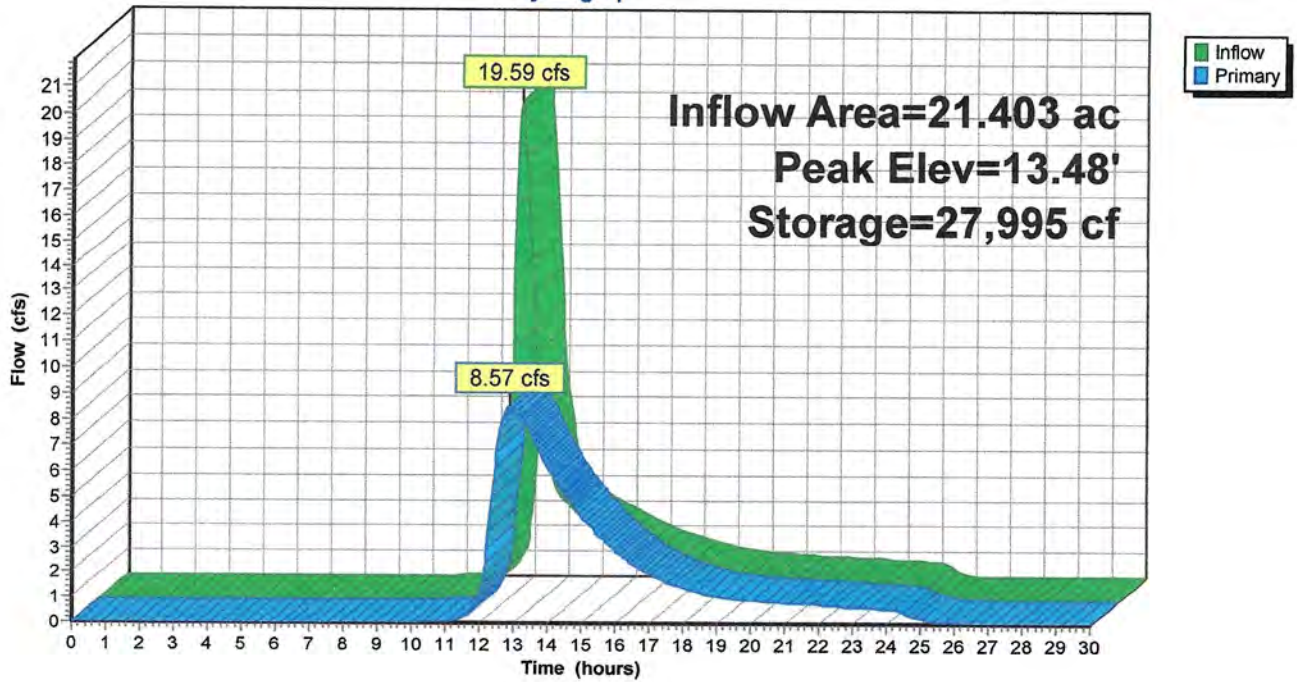
Primary OutFlow Max=8.57 cfs @ 12.91 hrs HW=13.48' (Free Discharge)

1=RCP_Round 18" (Barrel Controls 8.57 cfs @ 5.81 fps)

2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



THE WINSOR AT MILLBROOK VILLAGE, DUXBUR Type III 24-hr 25 Year Storm Rainfall=5.70"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 68

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 TO RAILROAD AVE Runoff Area=12,039 sf 84.98% Impervious Runoff Depth=4.66"
Flow Length=157' Tc=7.0 min CN=91 Runoff=1.37 cfs 0.107 af

Subcatchment 2S: DA2 TO RAILROAD AVE Runoff Area=5,729 sf 53.83% Impervious Runoff Depth=2.66"
Flow Length=100' Tc=5.7 min CN=71 Runoff=0.40 cfs 0.029 af

Subcatchment 3S: DA3 Runoff Area=5,613 sf 46.59% Impervious Runoff Depth=4.02"
Tc=5.0 min CN=85 Runoff=0.60 cfs 0.043 af

Subcatchment 4S: DA4 Runoff Area=15,291 sf 83.57% Impervious Runoff Depth=4.89"
Flow Length=225' Slope=0.0050 '/ Tc=5.0 min CN=93 Runoff=1.89 cfs 0.143 af

Subcatchment 5S: DA5 Runoff Area=8,903 sf 57.97% Impervious Runoff Depth=3.92"
Flow Length=151' Tc=10.6 min CN=84 Runoff=0.79 cfs 0.067 af

Subcatchment 6S: DA6 FROM SITE TO Runoff Area=13,540 sf 15.41% Impervious Runoff Depth=3.22"
Flow Length=440' Tc=14.6 min CN=77 Runoff=0.89 cfs 0.083 af

Subcatchment 9S: DA9 TO WETLANDS Runoff Area=871,200 sf 40.17% Impervious Runoff Depth=2.05"
Flow Length=1,175' Tc=26.9 min CN=64 Runoff=27.42 cfs 3.420 af

Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS Inflow=1.29 cfs 0.337 af
Outflow=1.29 cfs 0.337 af

Reach 3R: 8" PVC DRAIN PIPE Avg. Flow Depth=0.19' Max Vel=3.24 fps Inflow=0.26 cfs 0.066 af
8.0" Round Pipe n=0.010 L=68.0' S=0.0093 '/ Capacity=1.51 cfs Outflow=0.26 cfs 0.066 af

Reach 10R: TOTAL RUNOFF TO WETLANDS Inflow=28.43 cfs 3.757 af
Outflow=28.43 cfs 3.757 af

Pond 1P: CATCH BASIN 1 Peak Elev=16.82' Inflow=1.37 cfs 0.107 af
12.0" Round Culvert n=0.012 L=118.0' S=0.0050 '/ Outflow=1.37 cfs 0.107 af

Pond 2P: CATCH BASIN 2 Peak Elev=16.96' Inflow=0.40 cfs 0.029 af
12.0" Round Culvert n=0.012 L=56.0' S=0.0200 '/ Outflow=0.40 cfs 0.029 af

Pond 3P: STORMCEPTOR 1 / DMH Peak Elev=16.06' Inflow=1.77 cfs 0.137 af
15.0" Round Culvert n=0.012 L=133.0' S=0.0035 '/ Outflow=1.77 cfs 0.137 af

Pond 4P: DRAIN MANHOLE 1 Peak Elev=15.64' Inflow=1.77 cfs 0.137 af
15.0" Round Culvert n=0.012 L=17.0' S=0.0035 '/ Outflow=1.77 cfs 0.137 af

Pond 5P: DETENTION BASIN 1 Peak Elev=15.20' Storage=3,783 cf Inflow=2.51 cfs 0.255 af
Outflow=0.46 cfs 0.253 af

Pond 6P: STORMCEPTOR 2 / CB Peak Elev=17.78' Inflow=1.89 cfs 0.143 af
12.0" Round Culvert n=0.010 L=18.0' S=0.0150 '/ Outflow=1.89 cfs 0.143 af

THE WINSOR AT MILLBROOK VILLAGE, DUXBUR *Type III 24-hr 25 Year Storm Rainfall=5.70"*

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 69

Pond 7P: INFILTRATION SYSTEM

Peak Elev=17.81' Storage=3,912 cf Inflow=1.89 cfs 0.143 af
Discarded=0.04 cfs 0.070 af Primary=0.05 cfs 0.010 af Outflow=0.08 cfs 0.080 af

Pond 8P: DETENTION BASIN 2

Peak Elev=15.05' Storage=1,008 cf Inflow=0.79 cfs 0.067 af
Outflow=0.26 cfs 0.066 af

Pond 11P: TO BLUEFISH RIVER

Peak Elev=13.96' Storage=43,861 cf Inflow=28.43 cfs 3.757 af
Outflow=10.76 cfs 3.757 af

Total Runoff Area = 21.403 ac Runoff Volume = 3.893 af Average Runoff Depth = 2.18"
58.60% Pervious = 12.543 ac 41.40% Impervious = 8.860 ac

Summary for Subcatchment 1S: DA1 TO RAILROAD AVE

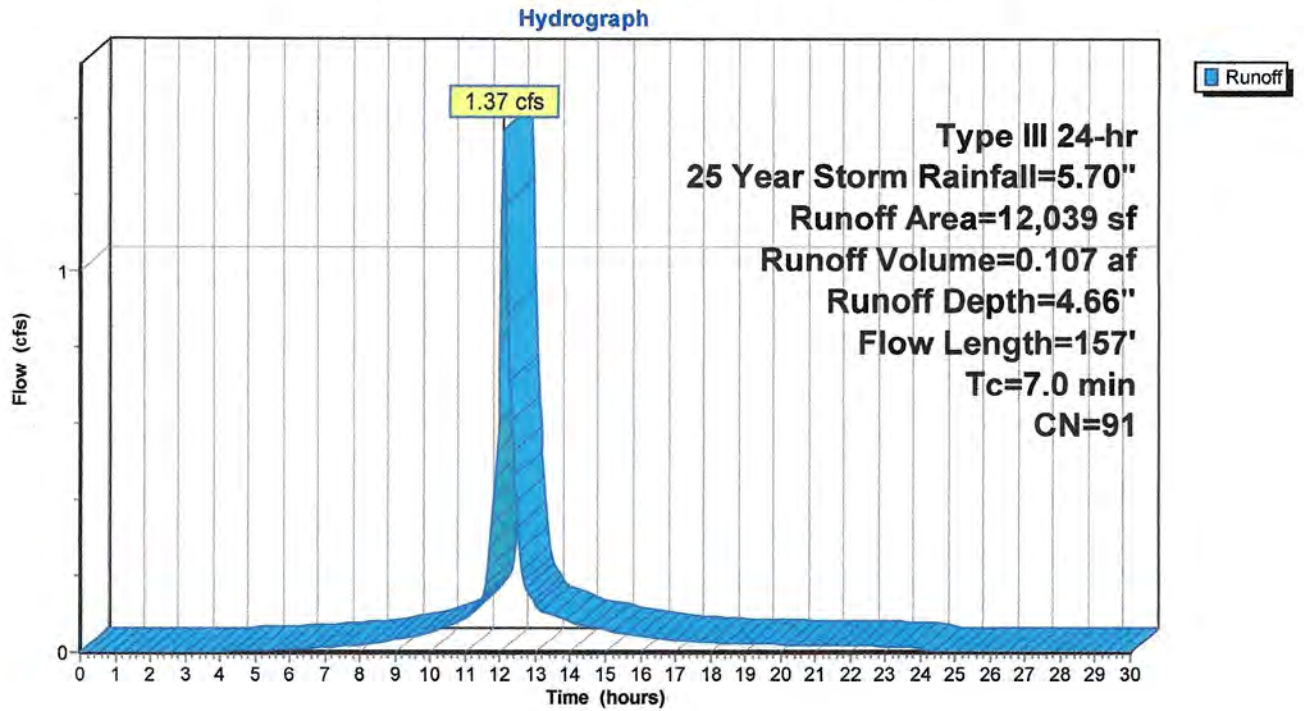
Runoff = 1.37 cfs @ 12.10 hrs, Volume= 0.107 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
1,270	39	>75% Grass cover, Good, HSG A
538	74	>75% Grass cover, Good, HSG C
* 7,805	98	Paved street, dwys, parking, curbs HSG A
449	98	Paved parking, HSG C
* 292	98	Sidewalks, HSG A
* 146	98	Sidewalks, HSG C
1,028	98	Roofs, HSG A
511	98	Roofs, HSG C
12,039	91	Weighted Average
1,808		15.02% Pervious Area
10,231		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	28	0.0150	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	24	0.0100	0.81		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.9	105	0.0090	1.93		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
7.0	157	Total			

Subcatchment 1S: DA1 TO RAILROAD AVE



Summary for Subcatchment 2S: DA2 TO RAILROAD AVE

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 2.66"

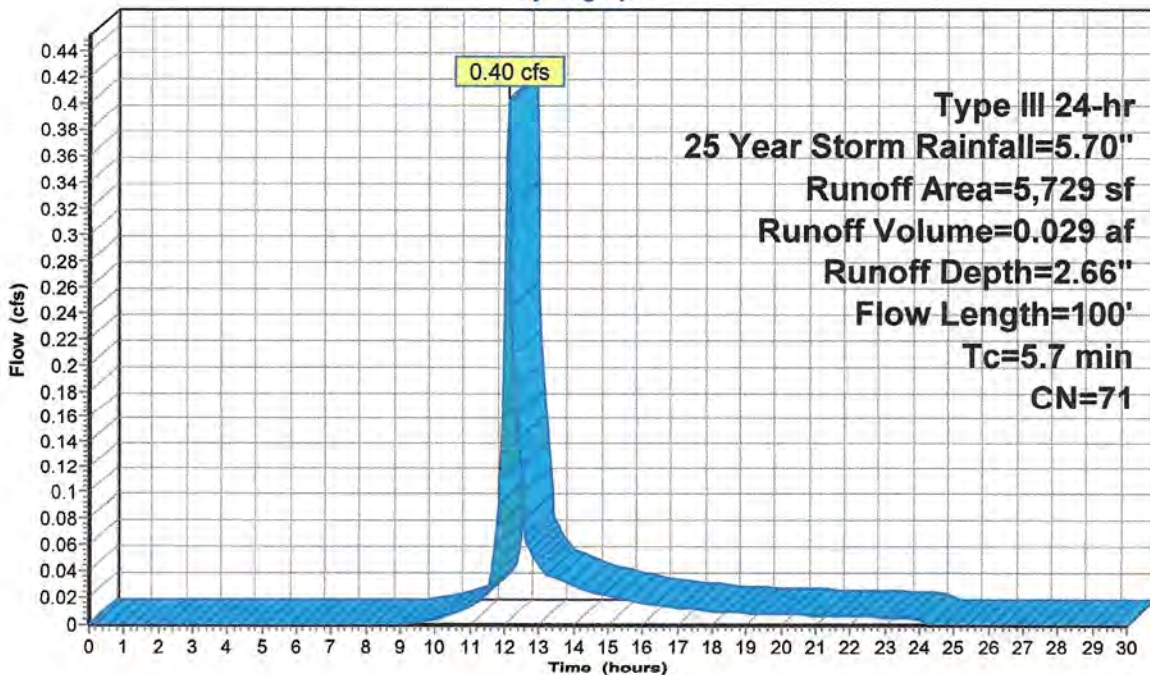
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
2,645	39	>75% Grass cover, Good, HSG A
* 3,084	98	Paved sreet, driveway, HSG A
5,729	71	Weighted Average
2,645		46.17% Pervious Area
3,084		53.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	28	0.0250	0.10		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	22	0.0100	0.79		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.6	50	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
5.7	100	Total			

Subcatchment 2S: DA2 TO RAILROAD AVE

Hydrograph



Runoff

Type III 24-hr
 25 Year Storm Rainfall=5.70"
 Runoff Area=5,729 sf
 Runoff Volume=0.029 af
 Runoff Depth=2.66"
 Flow Length=100'
 Tc=5.7 min
 CN=71

Summary for Subcatchment 3S: DA3

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.60 cfs @ 12.07 hrs, Volume= 0.043 af, Depth= 4.02"

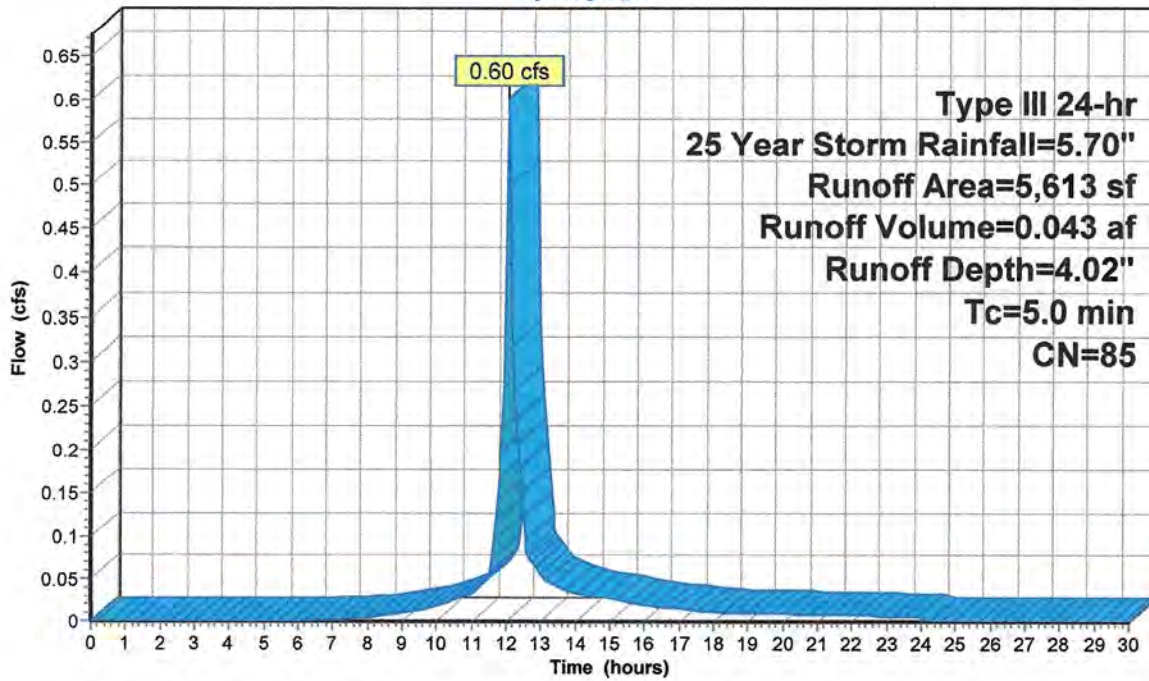
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
2,998	74	>75% Grass cover, Good, HSG C
* 2,615	98	Detention Basin 1, Water Surface, HSG C
5,613	85	Weighted Average
2,998		53.41% Pervious Area
2,615		46.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, DETENTION BASIN 1

Subcatchment 3S: DA3

Hydrograph



Runoff

Summary for Subcatchment 4S: DA4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.89 cfs @ 12.07 hrs, Volume= 0.143 af, Depth= 4.89"

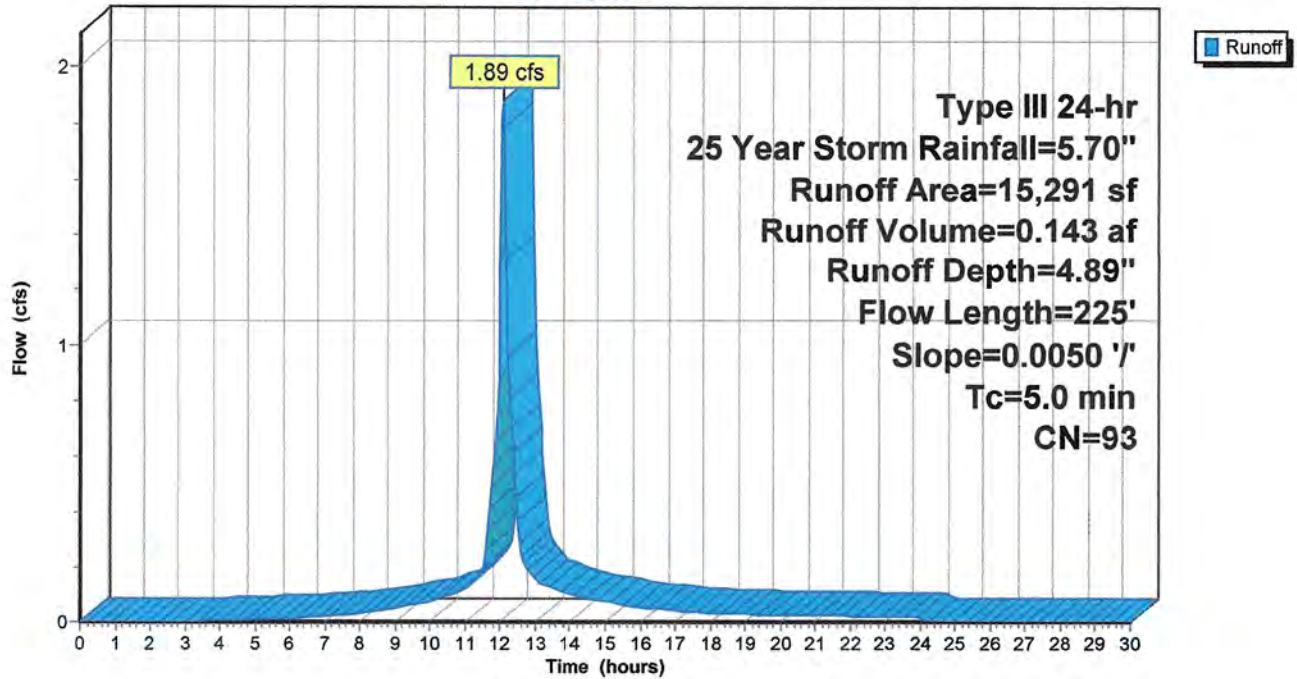
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
250	39	>75% Grass cover, Good, HSG A
2,262	74	>75% Grass cover, Good, HSG C
490	98	Roofs, HSG A
4,174	98	Roofs, HSG C
* 149	98	Paved parking, dwy, curbs, HSG A
* 6,878	98	Paved parking, dwy, curbs, HSG C
* 97	98	Sidewalks, HSG A
* 991	98	Sidewalks, HSG C
15,291	93	Weighted Average
2,512		16.43% Pervious Area
12,779		83.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
2.0	175	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
3.2	225	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 4S: DA4

Hydrograph



Summary for Subcatchment 5S: DA5

Runoff = 0.79 cfs @ 12.15 hrs, Volume= 0.067 af, Depth= 3.92"

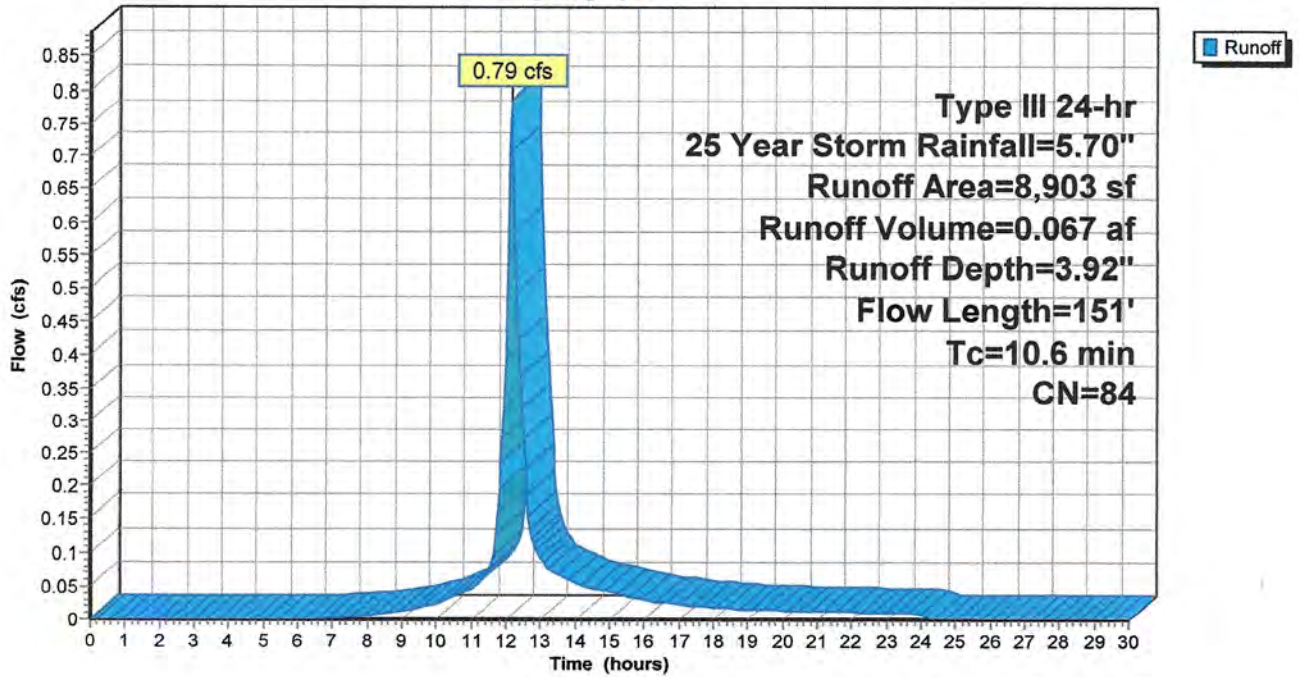
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
1,113	39	>75% Grass cover, Good, HSG A
2,629	74	>75% Grass cover, Good, HSG C
* 1,982	98	Detention Basin 2, Water Surface, HSG C
1,807	98	Roofs, HSG A
1,050	98	Roofs, HSG C
* 292	98	Walls, HSG A
* 30	98	Walls, HSG C
8,903	84	Weighted Average
3,742		42.03% Pervious Area
5,161		57.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		Sheet Flow, grass Grass: Short n= 0.150 P2= 3.40"
1.0	65	0.0050	1.14		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
0.1	36	0.1400	6.02		Shallow Concentrated Flow, Grass Unpaved Kv= 16.1 fps
10.6	151	Total			

Subcatchment 5S: DA5

Hydrograph



Summary for Subcatchment 6S: DA6 FROM SITE TO WETLANDS

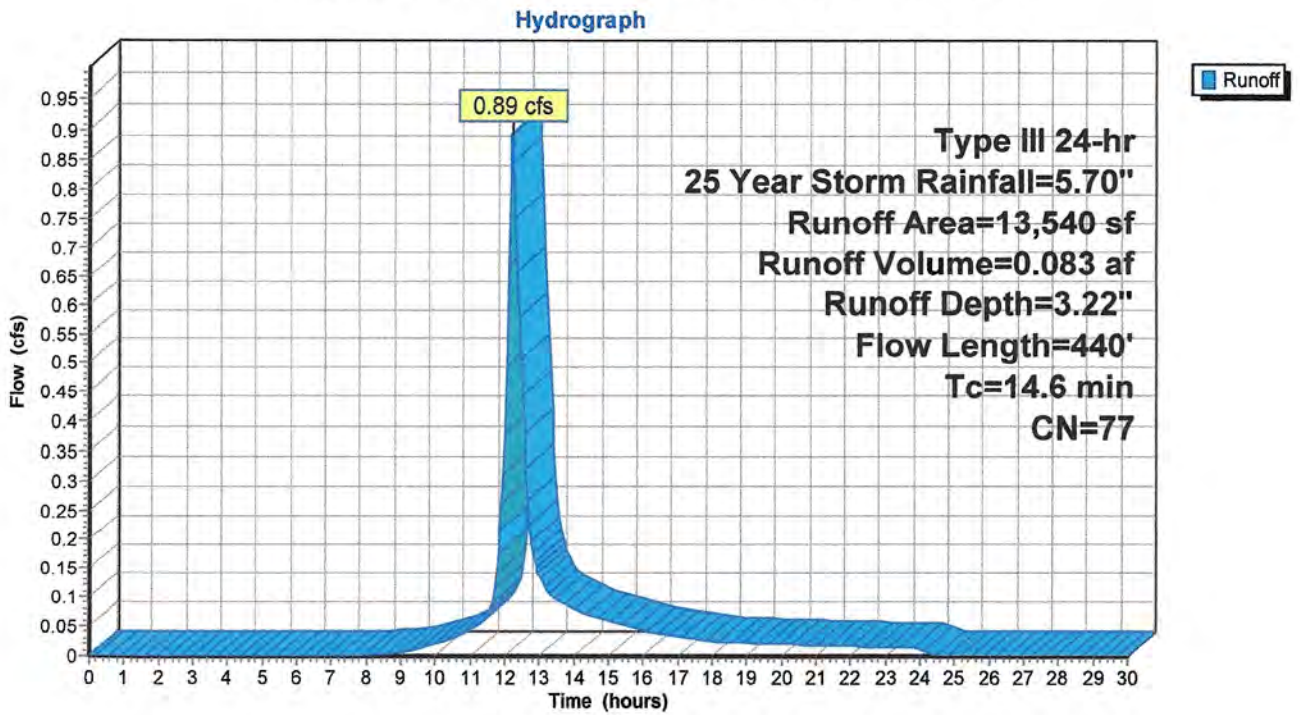
Runoff = 0.89 cfs @ 12.20 hrs, Volume= 0.083 af, Depth= 3.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
353	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
463	39	>75% Grass cover, Good, HSG A
5,944	74	>75% Grass cover, Good, HSG C
1,922	98	Roofs, HSG C
* 164	98	Conc Culvert, HSG D
13,540	77	Weighted Average
11,454		84.59% Pervious Area
2,086		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.40"
0.6	100	0.0180	2.72		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
0.5	90	0.0220	3.01		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
8.2	220	0.0080	0.45		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
14.6	440	Total			

Subcatchment 6S: DA6 FROM SITE TO WETLANDS



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 27.42 cfs @ 12.40 hrs, Volume= 3.420 af, Depth= 2.05"

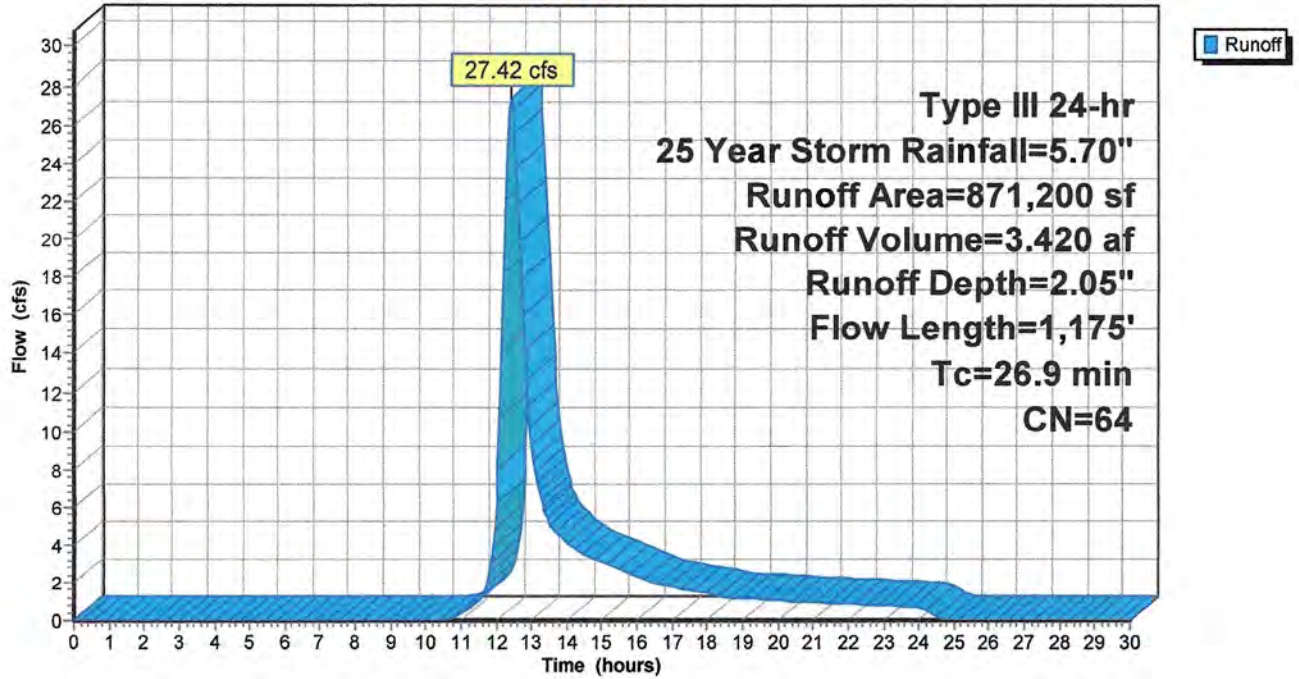
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 Year Storm Rainfall=5.70"

Area (sf)	CN	Description
185,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
262,200	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 350,000	98	Roofs,Pavement HSG A&C262200
871,200	64	Weighted Average
521,200		59.83% Pervious Area
350,000		40.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



Summary for Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS

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

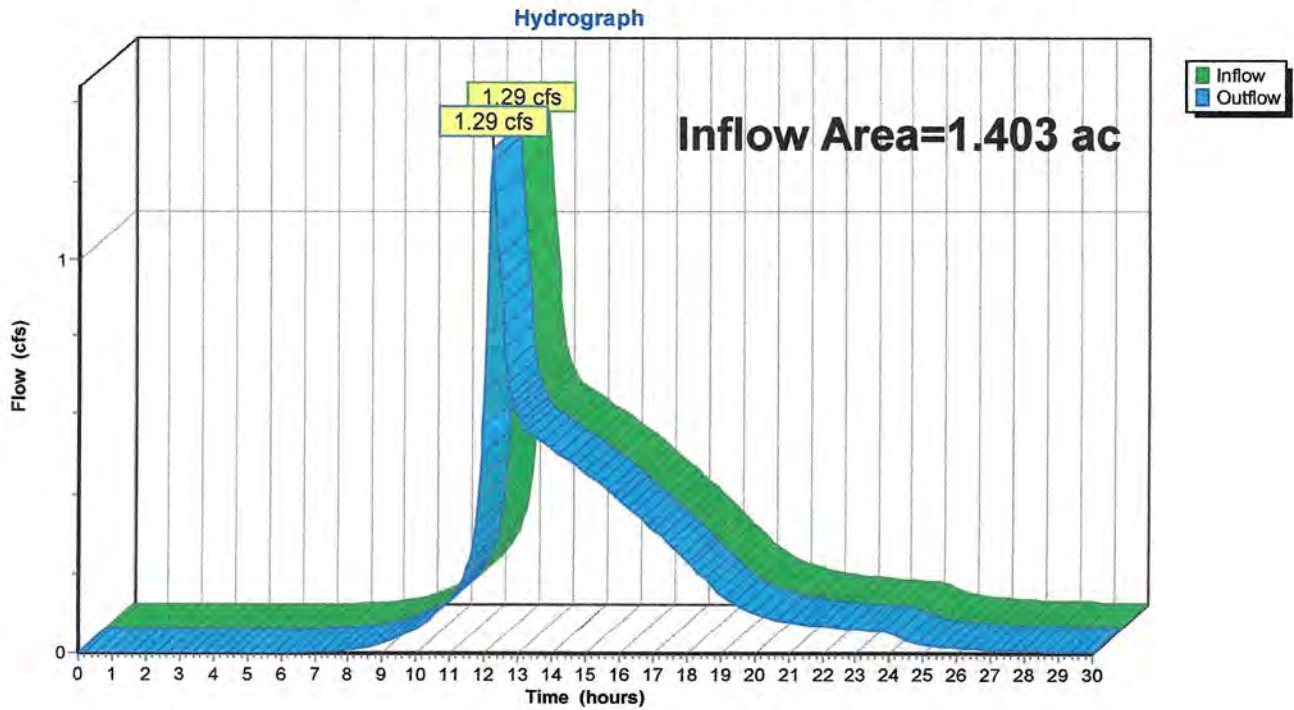
Inflow Area = 1.403 ac, 58.83% Impervious, Inflow Depth > 2.88" for 25 Year Storm event

Inflow = 1.29 cfs @ 12.21 hrs, Volume= 0.337 af

Outflow = 1.29 cfs @ 12.21 hrs, Volume= 0.337 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS



Summary for Reach 3R: 8" PVC DRAIN PIPE

[52] Hint: Inlet/Outlet conditions not evaluated

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.07'

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth > 3.87" for 25 Year Storm event
Inflow = 0.26 cfs @ 12.51 hrs, Volume= 0.066 af
Outflow = 0.26 cfs @ 12.53 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.24 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 1.41 fps, Avg. Travel Time= 0.8 min

Peak Storage= 5 cf @ 12.52 hrs

Average Depth at Peak Storage= 0.19', Surface Width= 0.60'

Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.51 cfs

8.0" Round Pipe

n= 0.010 PVC, smooth interior

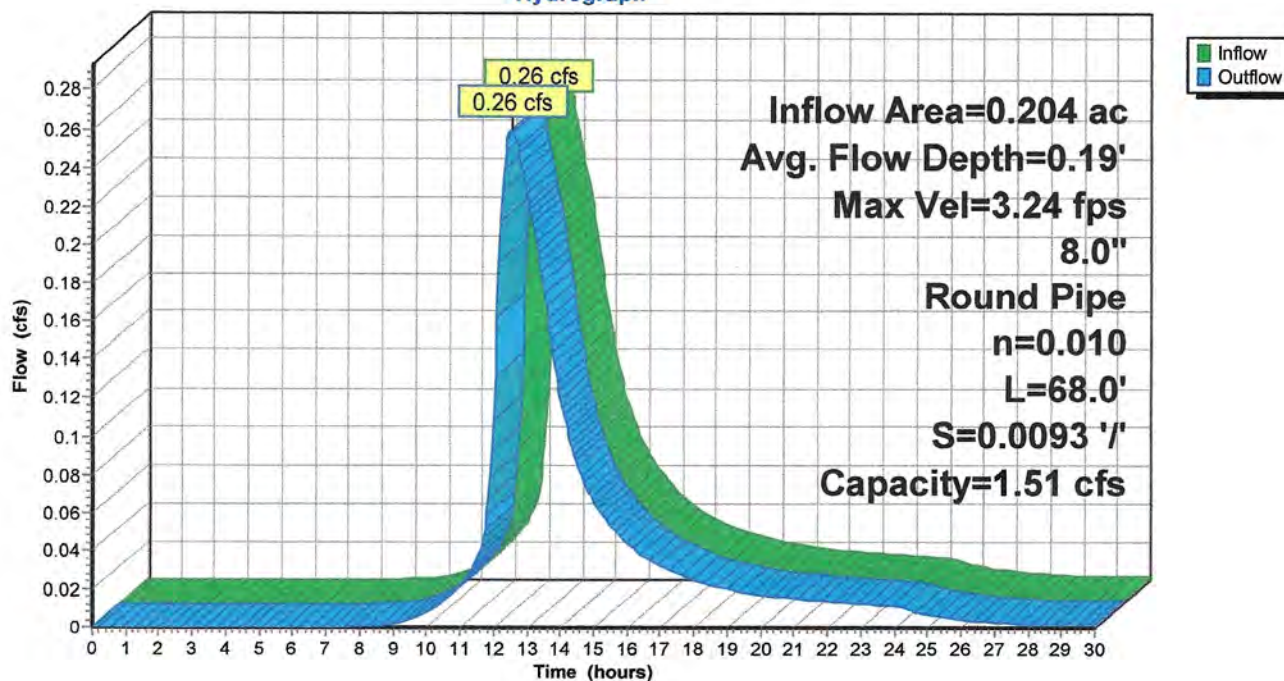
Length= 68.0' Slope= 0.0093 1/100'

Inlet Invert= 14.38', Outlet Invert= 13.75'



Reach 3R: 8" PVC DRAIN PIPE

Hydrograph



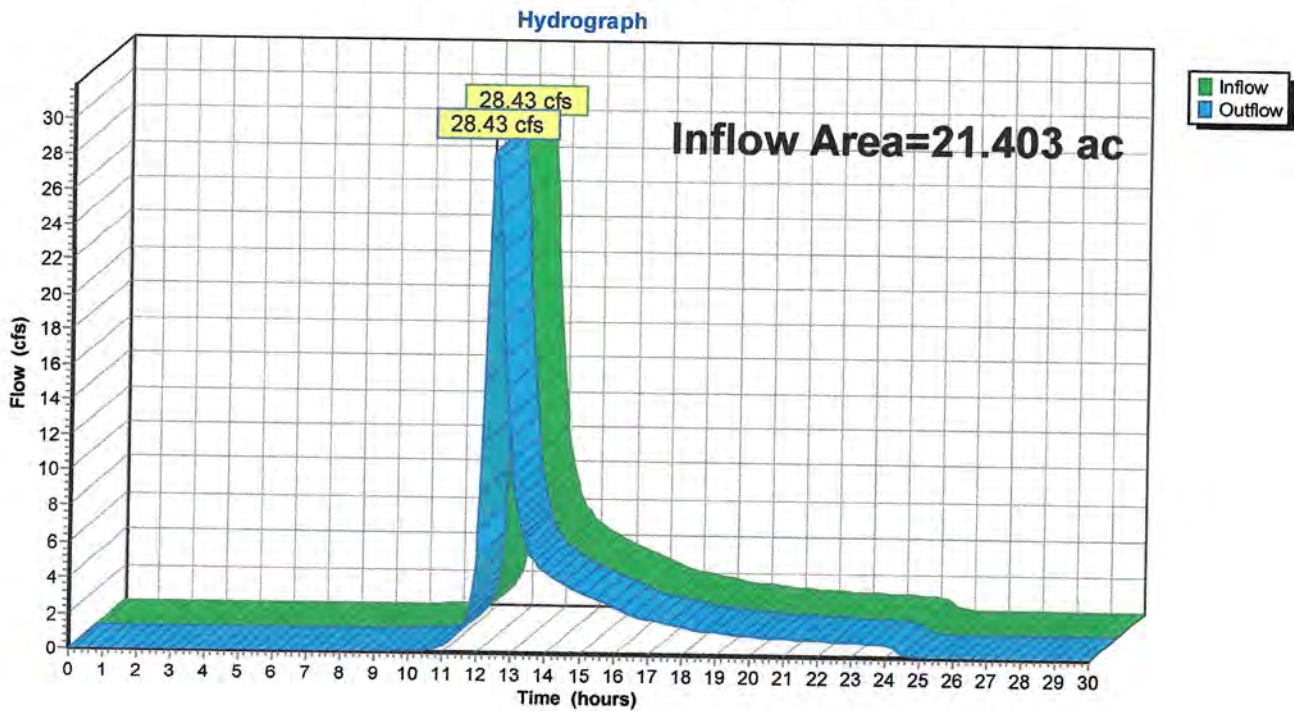
Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 2.11" for 25 Year Storm event
Inflow = 28.43 cfs @ 12.40 hrs, Volume= 3.757 af
Outflow = 28.43 cfs @ 12.40 hrs, Volume= 3.757 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS



Summary for Pond 1P: CATCH BASIN 1

[57] Hint: Peaked at 16.82' (Flood elevation advised)

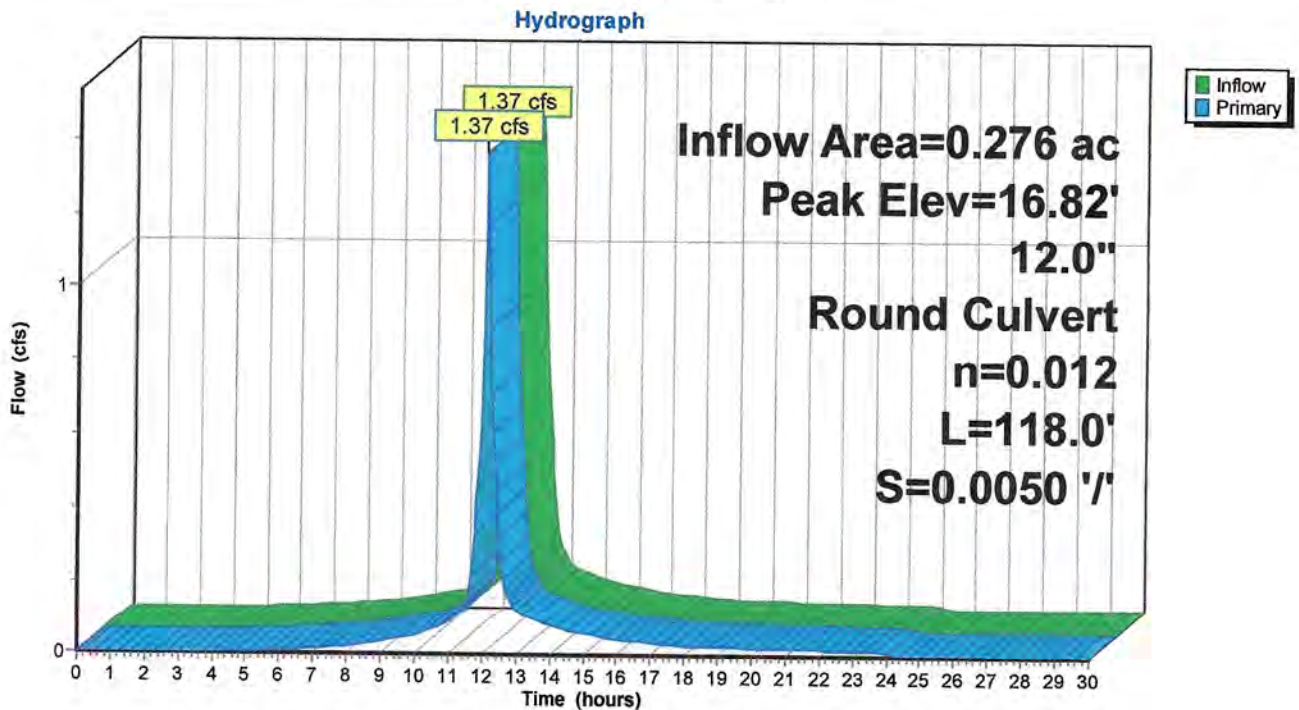
Inflow Area = 0.276 ac, 84.98% Impervious, Inflow Depth = 4.66" for 25 Year Storm event
 Inflow = 1.37 cfs @ 12.10 hrs, Volume= 0.107 af
 Outflow = 1.37 cfs @ 12.10 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.37 cfs @ 12.10 hrs, Volume= 0.107 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.82' @ 12.10 hrs

Device #	Routing	Invert	Outlet Devices
#1	Primary	16.12'	12.0" Round CPP_Round 12" L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.12' / 15.53' S= 0.0050 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.37 cfs @ 12.10 hrs HW=16.82' (Free Discharge)
 ↑1=CPP_Round 12" (Barrel Controls 1.37 cfs @ 3.29 fps)

Pond 1P: CATCH BASIN 1



Summary for Pond 2P: CATCH BASIN 2

[57] Hint: Peaked at 16.96' (Flood elevation advised)

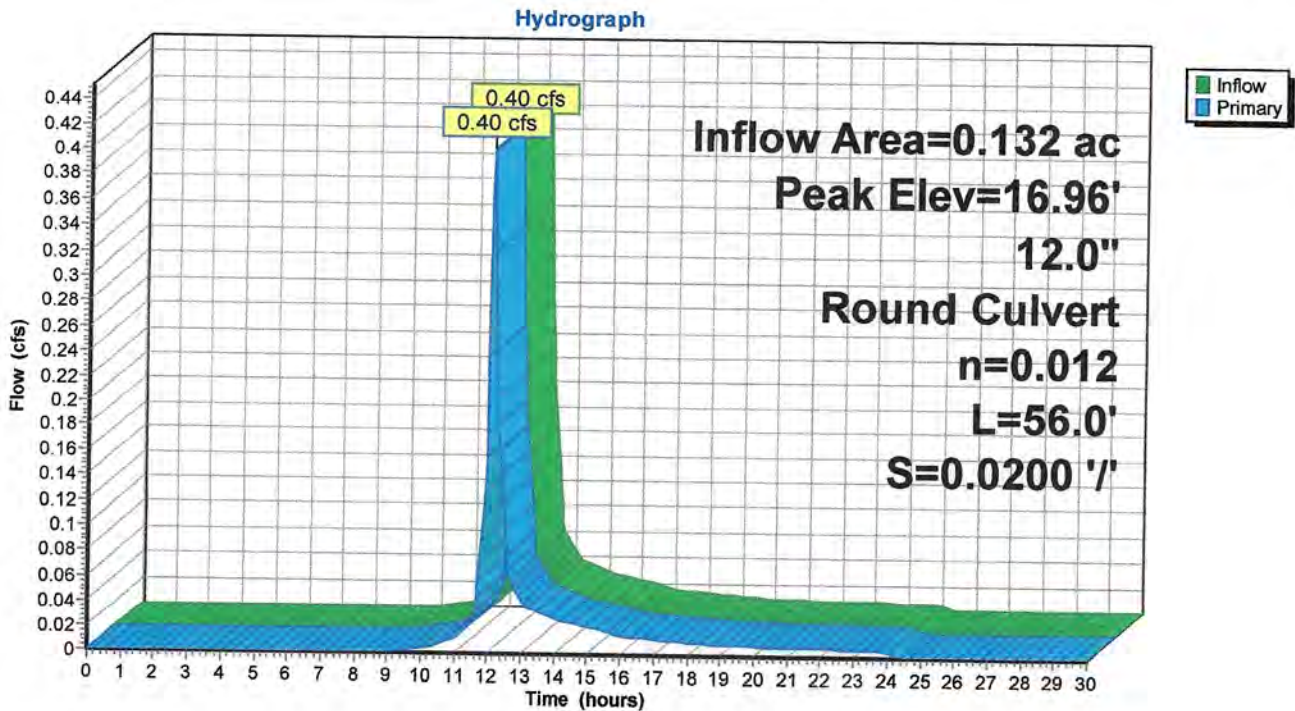
Inflow Area = 0.132 ac, 53.83% Impervious, Inflow Depth = 2.66" for 25 Year Storm event
 Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af
 Outflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.96' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.65'	12.0" Round CPP_Round 12" L= 56.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.65' / 15.53' S= 0.0200 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.09 hrs HW=16.96' (Free Discharge)
 ↳1=CPP_Round 12" (Inlet Controls 0.39 cfs @ 1.90 fps)

Pond 2P: CATCH BASIN 2



Summary for Pond 3P: STORMCEPTOR 1 / DMH

[57] Hint: Peaked at 16.06' (Flood elevation advised)

[79] Warning: Submerged Pond 1P Primary device # 1 OUTLET by 0.53'

[79] Warning: Submerged Pond 2P Primary device # 1 OUTLET by 0.53'

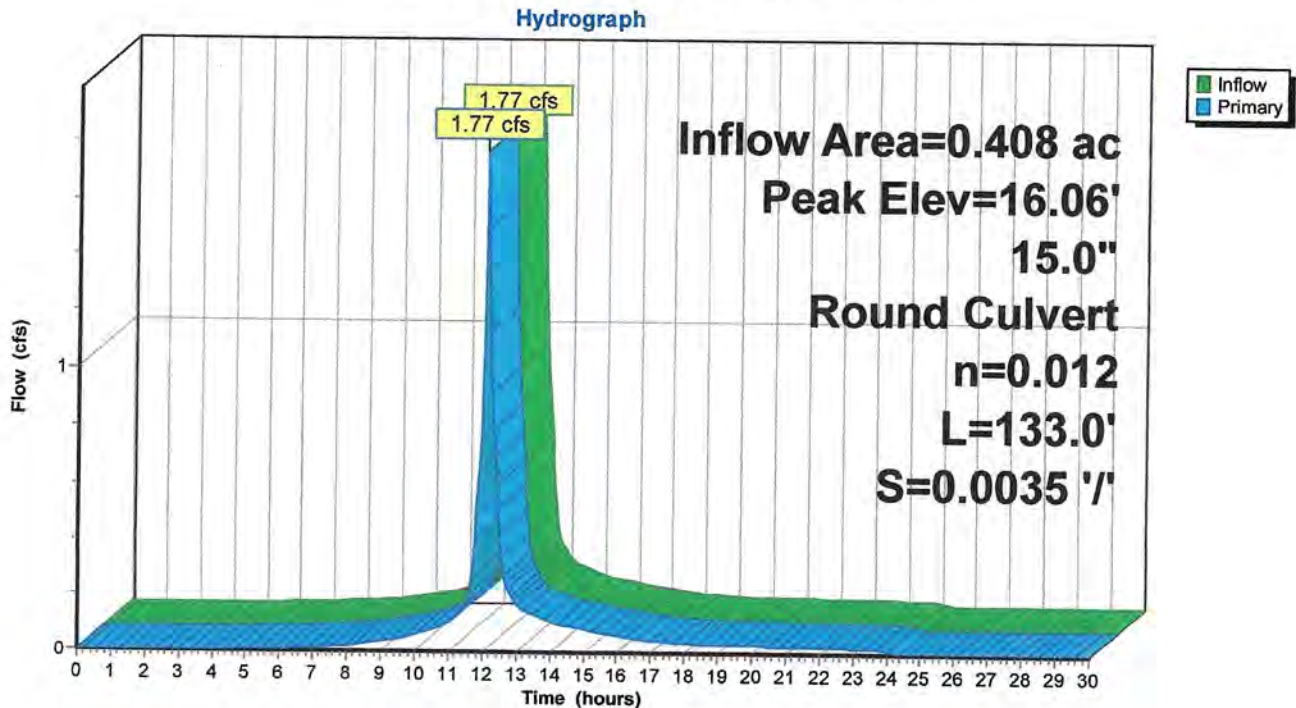
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 4.02" for 25 Year Storm event
 Inflow = 1.77 cfs @ 12.10 hrs, Volume= 0.137 af
 Outflow = 1.77 cfs @ 12.10 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.77 cfs @ 12.10 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.06' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	15.28'	15.0" Round CPP_Round 15" L= 133.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.28' / 14.81' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.76 cfs @ 12.10 hrs HW=16.05' (Free Discharge)
 ↳ 1=CPP_Round 15" (Barrel Controls 1.76 cfs @ 3.15 fps)

Pond 3P: STORMCEPTOR 1 / DMH



Summary for Pond 4P: DRAIN MANHOLE 1

[57] Hint: Peaked at 15.64' (Flood elevation advised)

[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 0.36'

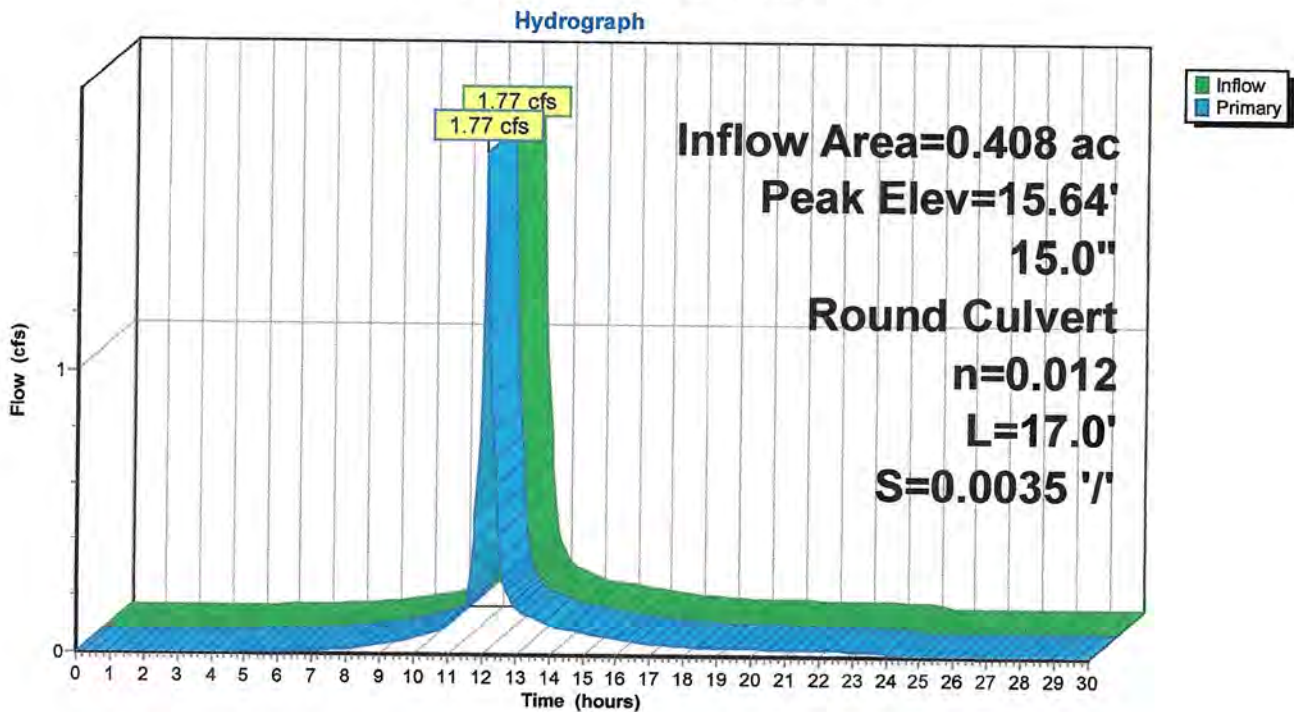
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 4.02" for 25 Year Storm event
 Inflow = 1.77 cfs @ 12.10 hrs, Volume= 0.137 af
 Outflow = 1.77 cfs @ 12.10 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.77 cfs @ 12.10 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.64' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	14.81'	15.0" Round CPP_Round 15" L= 17.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 14.81' / 14.75' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.76 cfs @ 12.10 hrs HW=15.64' (Free Discharge)
 ↳CPP_Round 15" (Barrel Controls 1.76 cfs @ 2.90 fps)

Pond 4P: DRAIN MANHOLE 1



Summary for Pond 5P: DETENTION BASIN 1

[63] Warning: Exceeded Reach 3R INLET depth by 0.64' @ 13.05 hrs
 [81] Warning: Exceeded Pond 4P by 0.16' @ 13.15 hrs

Inflow Area = 1.092 ac, 71.19% Impervious, Inflow Depth > 2.81" for 25 Year Storm event
 Inflow = 2.51 cfs @ 12.09 hrs, Volume= 0.255 af
 Outflow = 0.46 cfs @ 12.97 hrs, Volume= 0.253 af, Atten= 82%, Lag= 52.7 min
 Primary = 0.46 cfs @ 12.97 hrs, Volume= 0.253 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.20' @ 12.97 hrs Surf.Area= 3,001 sf Storage= 3,783 cf

Plug-Flow detention time= 112.7 min calculated for 0.253 af (99% of inflow)
 Center-of-Mass det. time= 106.8 min (932.0 - 825.2)

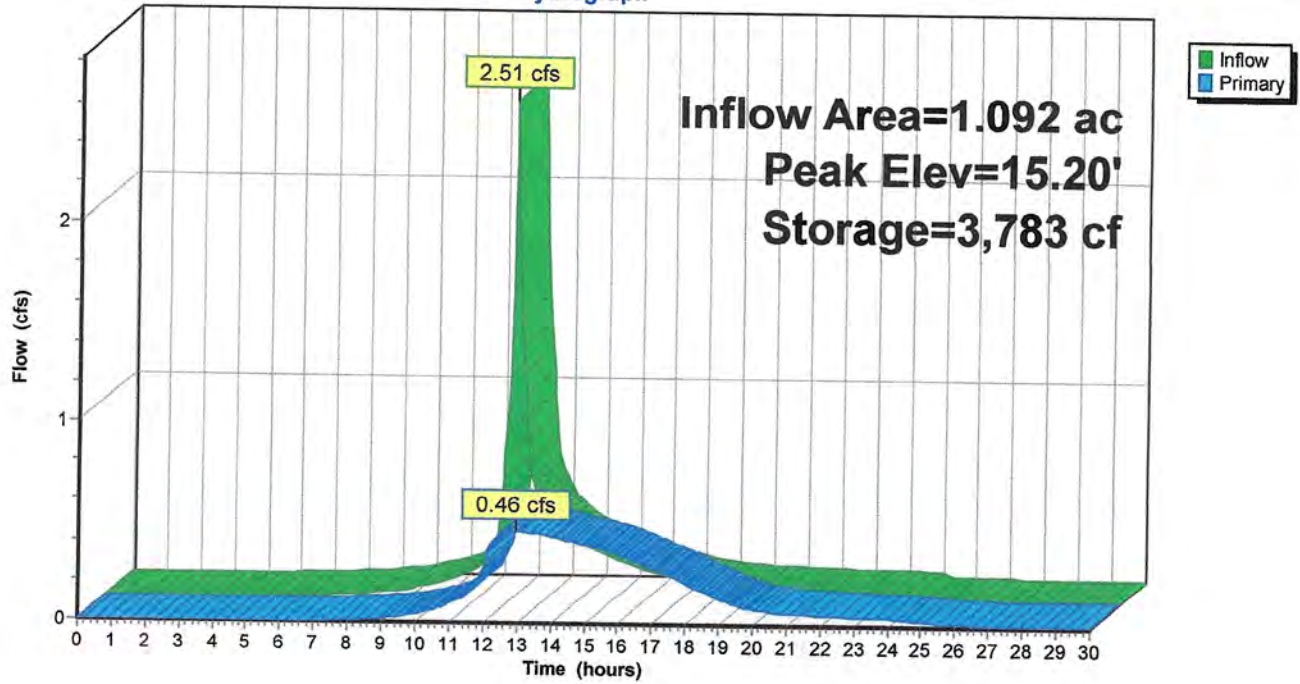
Volume	Invert	Avail.Storage	Storage Description		
#1	13.75'	11,218 cf	Custom Stage Data (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
13.75	2,256	0	0	2,256	
14.00	2,367	578	578	2,375	
15.00	2,897	2,628	3,205	2,935	
16.00	3,450	3,169	6,375	3,523	
17.00	4,137	3,788	10,163	4,244	
17.25	4,302	1,055	11,218	4,419	

Device	Routing	Invert	Outlet Devices
#1	Primary	13.75'	4.0" Round 4" PVC Culvert L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 13.75' / 13.55' S= 0.0100 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	15.95'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.46 cfs @ 12.97 hrs HW=15.20' (Free Discharge)
 1=4" PVC Culvert (Barrel Controls 0.46 cfs @ 5.22 fps)
 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: DETENTION BASIN 1

Hydrograph



Summary for Pond 6P: STORMCEPTOR 2 / CB

[57] Hint: Peaked at 17.78' (Flood elevation advised)

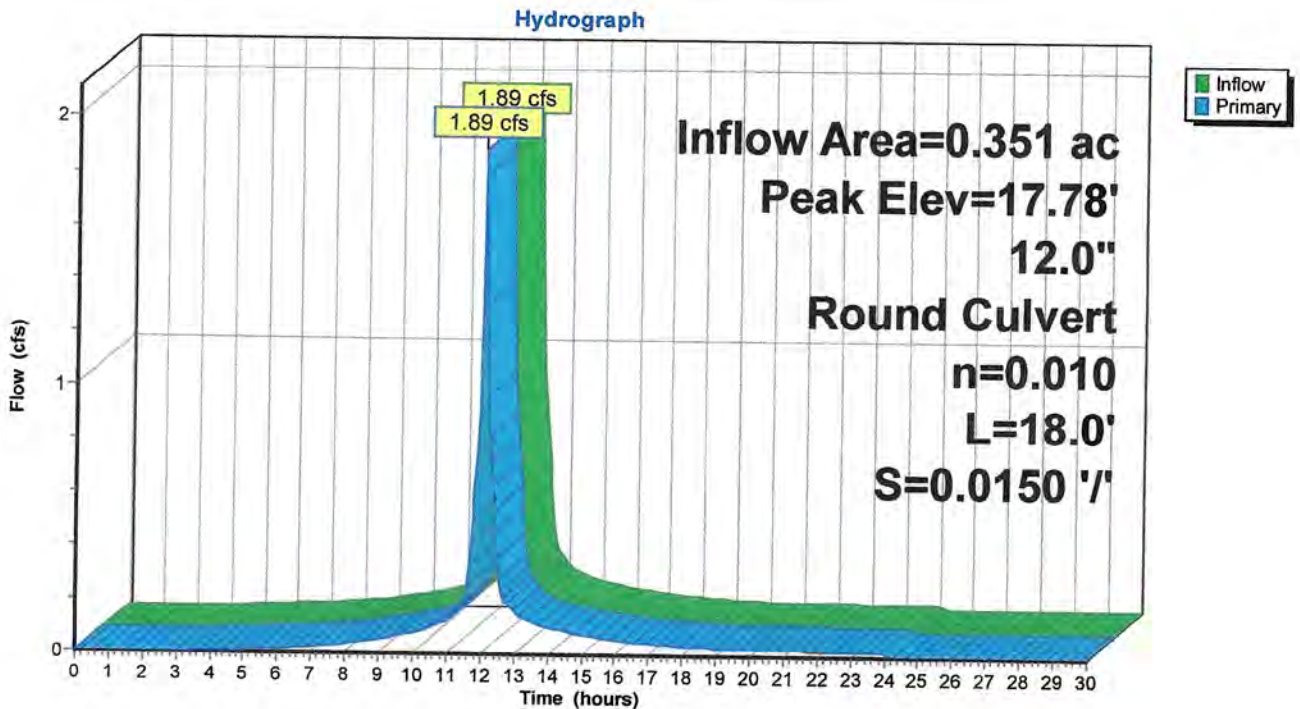
Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 4.89" for 25 Year Storm event
 Inflow = 1.89 cfs @ 12.07 hrs, Volume= 0.143 af
 Outflow = 1.89 cfs @ 12.07 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.89 cfs @ 12.07 hrs, Volume= 0.143 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.78' @ 12.07 hrs

Device #	Routing	Invert	Outlet Devices
#1	Primary	17.02'	12.0" Round CMP_Round 12" L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 17.02' / 16.75' S= 0.0150 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.82 cfs @ 12.07 hrs HW=17.76' (Free Discharge)
 ↳ 1=CMP_Round 12" (Barrel Controls 1.82 cfs @ 4.03 fps)

Pond 6P: STORMCEPTOR 2 / CB



Summary for Pond 7P: INFILTRATION SYSTEM

[81] Warning: Exceeded Pond 6P by 0.66' @ 15.15 hrs

Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 4.89" for 25 Year Storm event
 Inflow = 1.89 cfs @ 12.07 hrs, Volume= 0.143 af
 Outflow = 0.08 cfs @ 14.72 hrs, Volume= 0.080 af, Atten= 96%, Lag= 158.7 min
 Discarded = 0.04 cfs @ 14.72 hrs, Volume= 0.070 af
 Primary = 0.05 cfs @ 14.72 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.81' @ 14.72 hrs Surf.Area= 2,673 sf Storage= 3,912 cf

Plug-Flow detention time= 410.9 min calculated for 0.080 af (56% of inflow)
 Center-of-Mass det. time= 301.9 min (1,075.5 - 773.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	1,595 cf	Custom Stage Data (Conic) Listed below (Recalc) 7,137 cf Overall - 3,149 cf Embedded = 3,988 cf x 40.0% Voids
#2	15.83'	2,683 cf	24.0" Round CMP_Round 24" Inside #1 L= 854.0' 3,149 cf Overall - 1.0" Wall Thickness = 2,683 cf
		4,278 cf	Total Available Storage

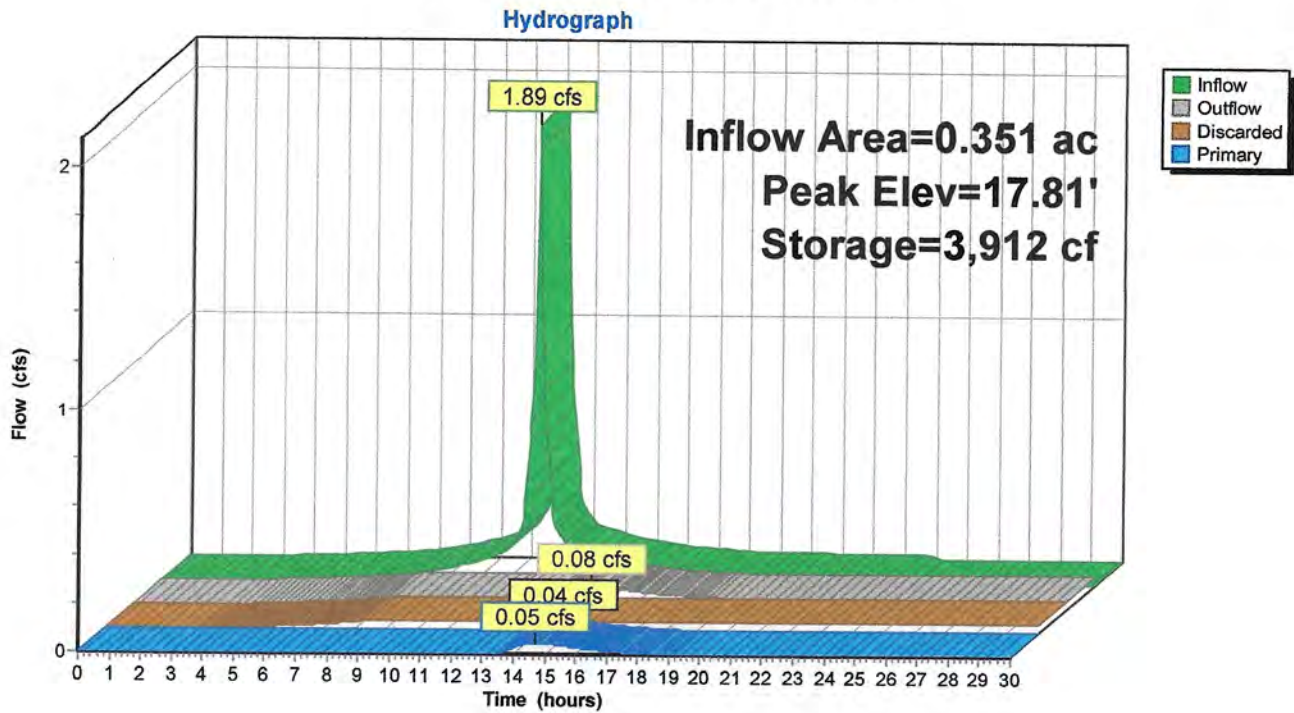
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.50	2,673	0	0	2,673
15.83	2,673	882	882	2,733
16.00	2,673	454	1,337	2,765
17.00	2,673	2,673	4,010	2,948
17.83	2,673	2,219	6,228	3,100
18.00	2,673	454	6,683	3,131
18.17	2,673	454	7,137	3,162

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	0.520 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	17.68'	6.0" Round PVC_Round 6" L= 30.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 17.68' / 15.95' S= 0.0577 ' / Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.04 cfs @ 14.72 hrs HW=17.81' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.04 cfs @ 14.72 hrs HW=17.81' (Free Discharge)
 ↑**2=PVC_Round 6"** (Inlet Controls 0.04 cfs @ 1.09 fps)

Pond 7P: INFILTRATION SYSTEM



Summary for Pond 8P: DETENTION BASIN 2

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth = 3.92" for 25 Year Storm event
 Inflow = 0.79 cfs @ 12.15 hrs, Volume= 0.067 af
 Outflow = 0.26 cfs @ 12.51 hrs, Volume= 0.066 af, Atten= 67%, Lag= 21.9 min
 Primary = 0.26 cfs @ 12.51 hrs, Volume= 0.066 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.05' @ 12.51 hrs Surf.Area= 1,928 sf Storage= 1,008 cf

Plug-Flow detention time= 84.0 min calculated for 0.066 af (99% of inflow)
 Center-of-Mass det. time= 76.8 min (886.5 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1	14.50'	6,448 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.50	1,712	0	0	1,712
15.00	1,904	904	904	1,918
16.00	2,370	2,133	3,036	2,412
17.00	2,952	2,656	5,692	3,022
17.25	3,098	756	6,448	3,176

Device	Routing	Invert	Outlet Devices
#1	Primary	14.50'	4.0" Round 4" PVC Culvert L= 12.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.50' / 14.38' S= 0.0100 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	16.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

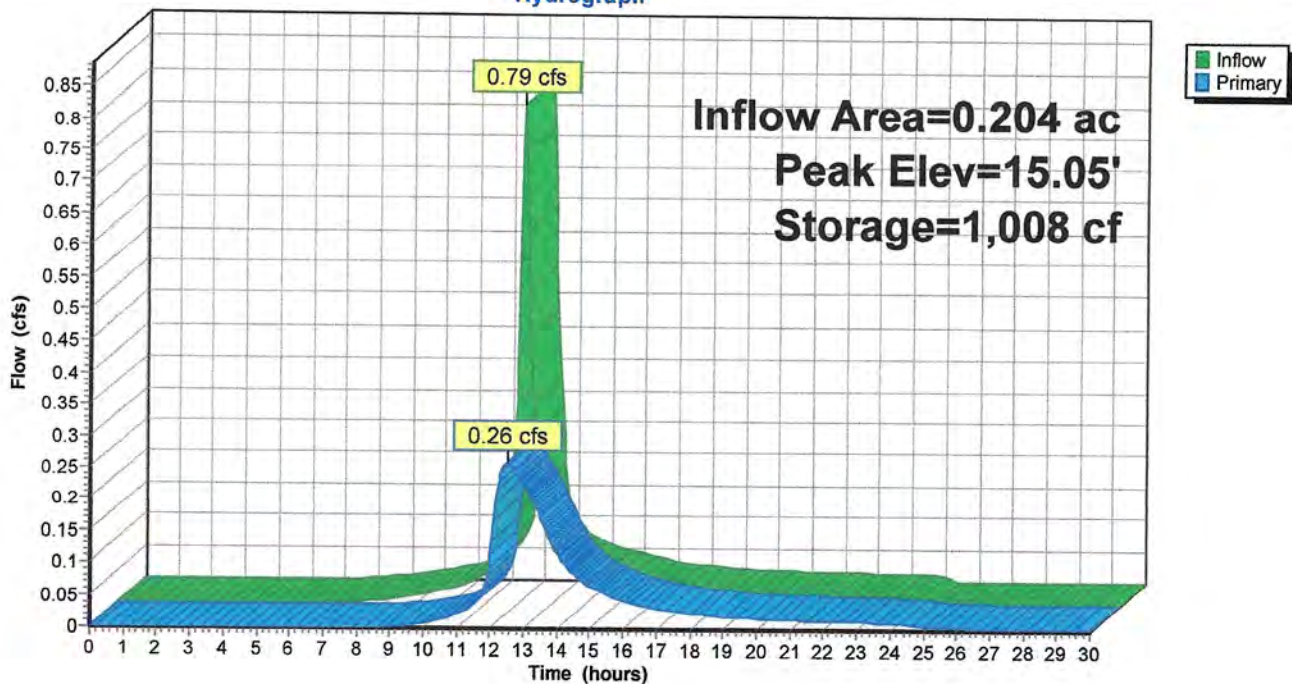
Primary OutFlow Max=0.26 cfs @ 12.51 hrs HW=15.05' (Free Discharge)

1=4" PVC Culvert (Barrel Controls 0.26 cfs @ 2.98 fps)

2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: DETENTION BASIN 2

Hydrograph



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 2.11" for 25 Year Storm event
 Inflow = 28.43 cfs @ 12.40 hrs, Volume= 3.757 af
 Outflow = 10.76 cfs @ 12.95 hrs, Volume= 3.757 af, Atten= 62%, Lag= 33.4 min
 Primary = 10.76 cfs @ 12.95 hrs, Volume= 3.757 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 13.96' @ 12.95 hrs Surf.Area= 33,374 sf Storage= 43,861 cf

Plug-Flow detention time= 47.5 min calculated for 3.757 af (100% of inflow)
 Center-of-Mass det. time= 47.5 min (925.3 - 877.9)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	139,694 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	33,500	31,734	45,036	33,559
15.00	37,000	35,236	80,271	37,122
16.00	40,500	38,737	119,008	40,691
16.50	42,250	20,686	139,694	42,477

Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 ' / Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

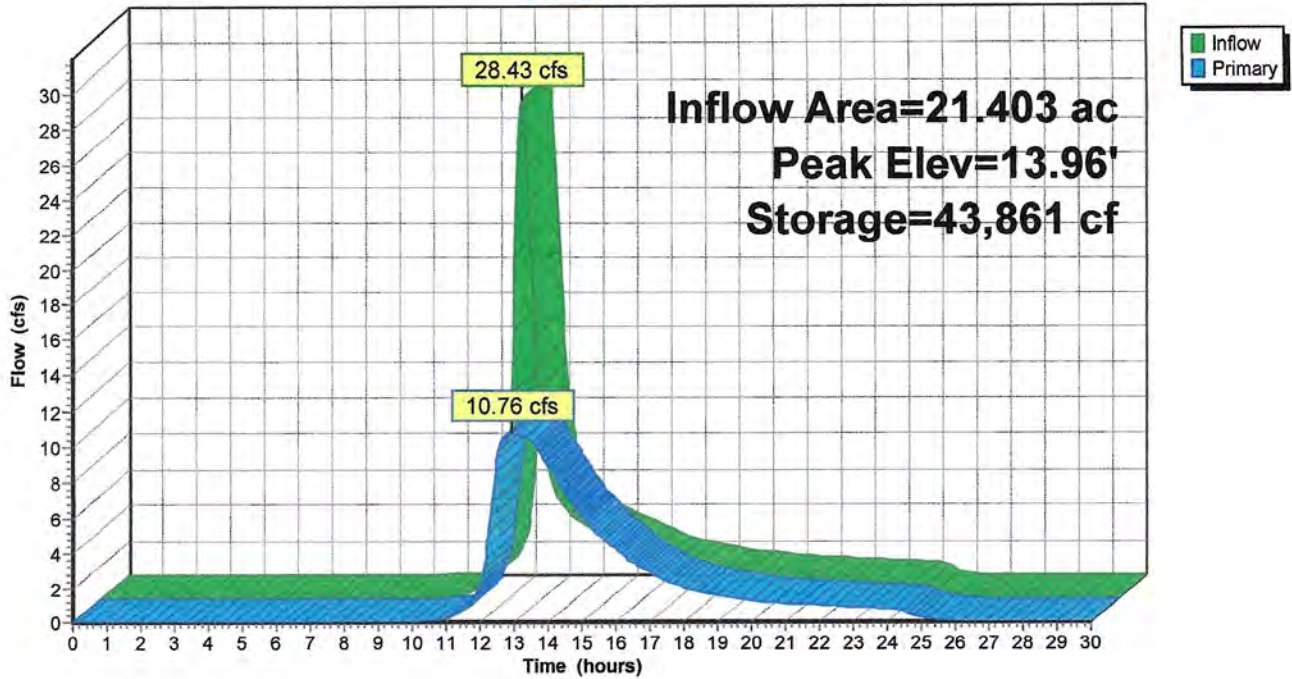
Primary OutFlow Max=10.76 cfs @ 12.95 hrs HW=13.96' (Free Discharge)

1=RCP_Round 18" (Barrel Controls 10.76 cfs @ 6.09 fps)

2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA1 TO RAILROAD AVE	Runoff Area=12,039 sf 84.98% Impervious Runoff Depth=5.94" Flow Length=157' Tc=7.0 min CN=91 Runoff=1.72 cfs 0.137 af
Subcatchment 2S: DA2 TO RAILROAD AVE	Runoff Area=5,729 sf 53.83% Impervious Runoff Depth=3.72" Flow Length=100' Tc=5.7 min CN=71 Runoff=0.57 cfs 0.041 af
Subcatchment 3S: DA3	Runoff Area=5,613 sf 46.59% Impervious Runoff Depth=5.25" Tc=5.0 min CN=85 Runoff=0.78 cfs 0.056 af
Subcatchment 4S: DA4	Runoff Area=15,291 sf 83.57% Impervious Runoff Depth=6.17" Flow Length=225' Slope=0.0050 '/ Tc=5.0 min CN=93 Runoff=2.35 cfs 0.181 af
Subcatchment 5S: DA5	Runoff Area=8,903 sf 57.97% Impervious Runoff Depth=5.14" Flow Length=151' Tc=10.6 min CN=84 Runoff=1.02 cfs 0.088 af
Subcatchment 6S: DA6 FROM SITE TO	Runoff Area=13,540 sf 15.41% Impervious Runoff Depth=4.37" Flow Length=440' Tc=14.6 min CN=77 Runoff=1.21 cfs 0.113 af
Subcatchment 9S: DA9 TO WETLANDS	Runoff Area=871,200 sf 40.17% Impervious Runoff Depth=3.00" Flow Length=1,175' Tc=26.9 min CN=64 Runoff=41.04 cfs 5.002 af
Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS	Inflow=1.66 cfs 0.474 af Outflow=1.66 cfs 0.474 af
Reach 3R: 8" PVC DRAIN PIPE	Avg. Flow Depth=0.21' Max Vel=3.41 fps Inflow=0.31 cfs 0.087 af 8.0" Round Pipe n=0.010 L=68.0' S=0.0093 '/ Capacity=1.51 cfs Outflow=0.31 cfs 0.087 af
Reach 10R: TOTAL RUNOFF TO WETLANDS	Inflow=42.33 cfs 5.476 af Outflow=42.33 cfs 5.476 af
Pond 1P: CATCH BASIN 1	Peak Elev=16.92' Inflow=1.72 cfs 0.137 af 12.0" Round Culvert n=0.012 L=118.0' S=0.0050 '/ Outflow=1.72 cfs 0.137 af
Pond 2P: CATCH BASIN 2	Peak Elev=17.03' Inflow=0.57 cfs 0.041 af 12.0" Round Culvert n=0.012 L=56.0' S=0.0200 '/ Outflow=0.57 cfs 0.041 af
Pond 3P: STORMCEPTOR 1 / DMH	Peak Elev=16.18' Inflow=2.28 cfs 0.178 af 15.0" Round Culvert n=0.012 L=133.0' S=0.0035 '/ Outflow=2.28 cfs 0.178 af
Pond 4P: DRAIN MANHOLE 1	Peak Elev=15.77' Inflow=2.28 cfs 0.178 af 15.0" Round Culvert n=0.012 L=17.0' S=0.0035 '/ Outflow=2.28 cfs 0.178 af
Pond 5P: DETENTION BASIN 1	Peak Elev=15.85' Storage=5,875 cf Inflow=3.24 cfs 0.363 af Outflow=0.56 cfs 0.361 af
Pond 6P: STORMCEPTOR 2 / CB	Peak Elev=17.91' Inflow=2.35 cfs 0.181 af 12.0" Round Culvert n=0.010 L=18.0' S=0.0150 '/ Outflow=2.35 cfs 0.181 af

THE WINSOR AT MILLBROOK VILLAGE, DUXBU Type III 24-hr 100 Year Storm Rainfall=7.00"

Prepared by CROWELL ENGINEERING

HydroCAD® 10.10-4a s/n 07857 © 2020 HydroCAD Software Solutions LLC

Page 100

Pond 7P: INFILTRATION SYSTEM

Peak Elev=18.07' Storage=4,166 cf Inflow=2.35 cfs 0.181 af
Discarded=0.04 cfs 0.073 af Primary=0.30 cfs 0.042 af Outflow=0.34 cfs 0.115 af

Pond 8P: DETENTION BASIN 2

Peak Elev=15.22' Storage=1,329 cf Inflow=1.02 cfs 0.088 af
Outflow=0.31 cfs 0.087 af

Pond 11P: TO BLUEFISH RIVER

Peak Elev=14.74' Storage=70,850 cf Inflow=42.33 cfs 5.476 af
Outflow=14.46 cfs 5.476 af

Total Runoff Area = 21.403 ac Runoff Volume = 5.617 af Average Runoff Depth = 3.15"
58.60% Pervious = 12.543 ac 41.40% Impervious = 8.860 ac

Summary for Subcatchment 1S: DA1 TO RAILROAD AVE

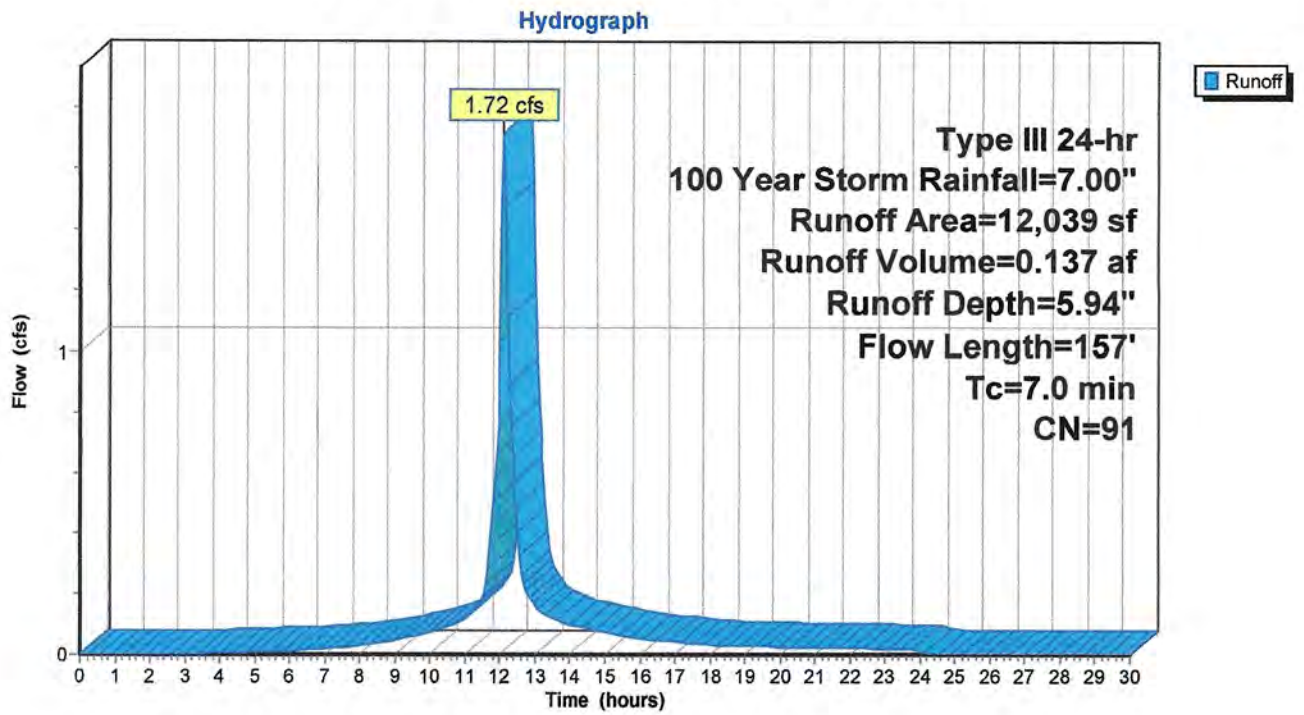
Runoff = 1.72 cfs @ 12.10 hrs, Volume= 0.137 af, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
1,270	39	>75% Grass cover, Good, HSG A
538	74	>75% Grass cover, Good, HSG C
* 7,805	98	Paved street, dwys, parking, curbs HSG A
449	98	Paved parking, HSG C
* 292	98	Sidewalks, HSG A
* 146	98	Sidewalks, HSG C
1,028	98	Roofs, HSG A
511	98	Roofs, HSG C
12,039	91	Weighted Average
1,808		15.02% Pervious Area
10,231		84.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	28	0.0150	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	24	0.0100	0.81		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.9	105	0.0090	1.93		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
7.0	157	Total			

Subcatchment 1S: DA1 TO RAILROAD AVE



Summary for Subcatchment 2S: DA2 TO RAILROAD AVE

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 3.72"

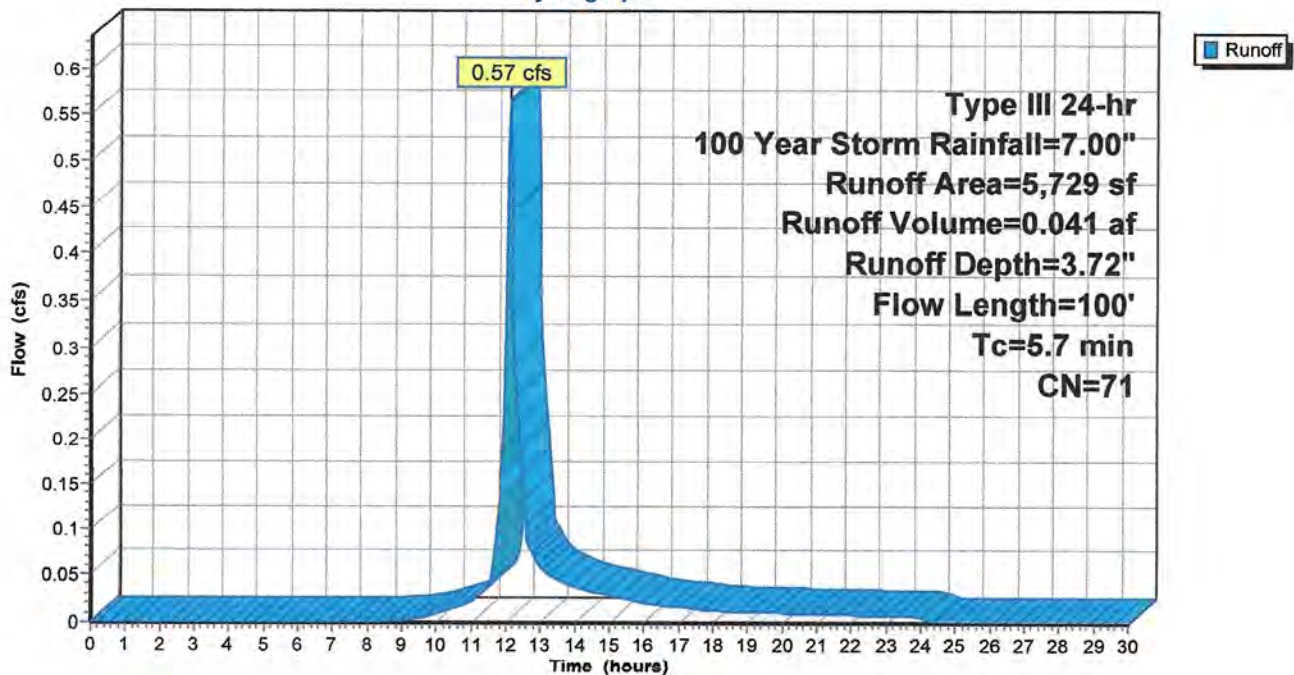
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
2,645	39	>75% Grass cover, Good, HSG A
* 3,084	98	Paved sreet, driveway, HSG A
5,729	71	Weighted Average
2,645		46.17% Pervious Area
3,084		53.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	28	0.0250	0.10		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
0.5	22	0.0100	0.79		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
0.6	50	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
5.7	100	Total			

Subcatchment 2S: DA2 TO RAILROAD AVE

Hydrograph



Summary for Subcatchment 3S: DA3

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.78 cfs @ 12.07 hrs, Volume= 0.056 af, Depth= 5.25"

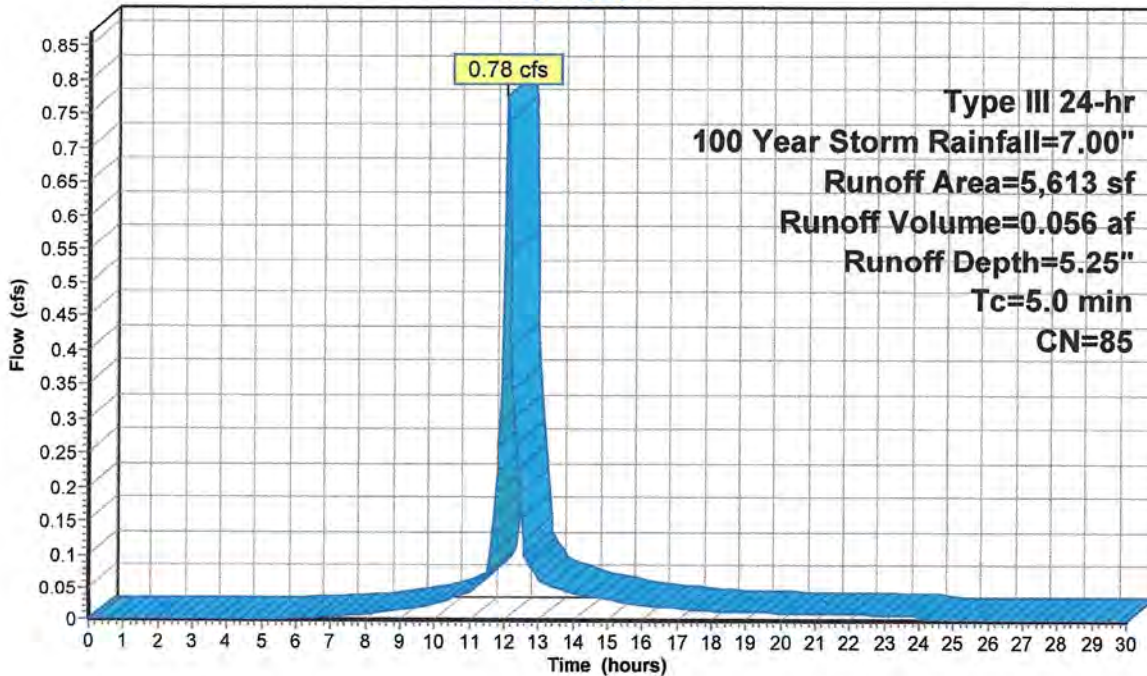
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
2,998	74	>75% Grass cover, Good, HSG C
* 2,615	98	Detention Basin 1, Water Surface, HSG C
5,613	85	Weighted Average
2,998		53.41% Pervious Area
2,615		46.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, DETENTION BASIN 1

Subcatchment 3S: DA3

Hydrograph



Runoff

Summary for Subcatchment 4S: DA4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.35 cfs @ 12.07 hrs, Volume= 0.181 af, Depth= 6.17"

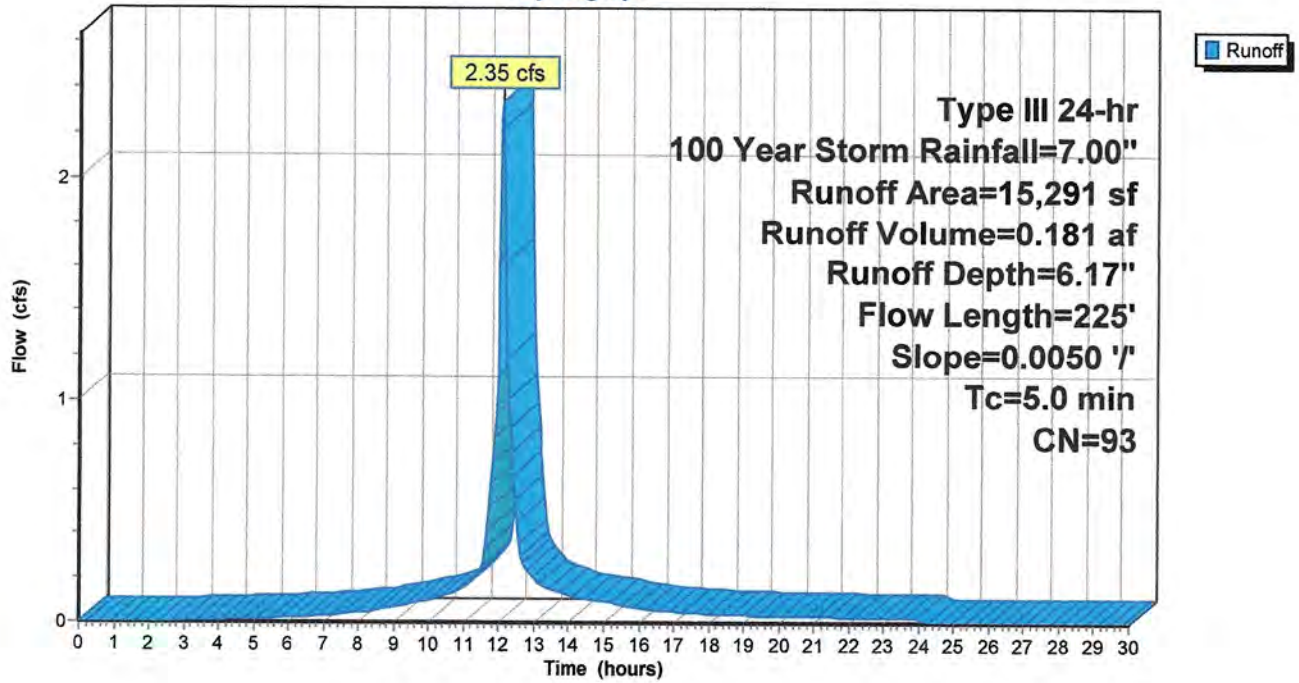
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
250	39	>75% Grass cover, Good, HSG A
2,262	74	>75% Grass cover, Good, HSG C
490	98	Roofs, HSG A
4,174	98	Roofs, HSG C
* 149	98	Paved parking, dwy, curbs, HSG A
* 6,878	98	Paved parking, dwy, curbs, HSG C
* 97	98	Sidewalks, HSG A
* 991	98	Sidewalks, HSG C
15,291	93	Weighted Average
2,512		16.43% Pervious Area
12,779		83.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		Sheet Flow, PAVED Smooth surfaces n= 0.011 P2= 3.40"
2.0	175	0.0050	1.44		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
3.2	225	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 4S: DA4

Hydrograph



Summary for Subcatchment 5S: DA5

Runoff = 1.02 cfs @ 12.15 hrs, Volume= 0.088 af, Depth= 5.14"

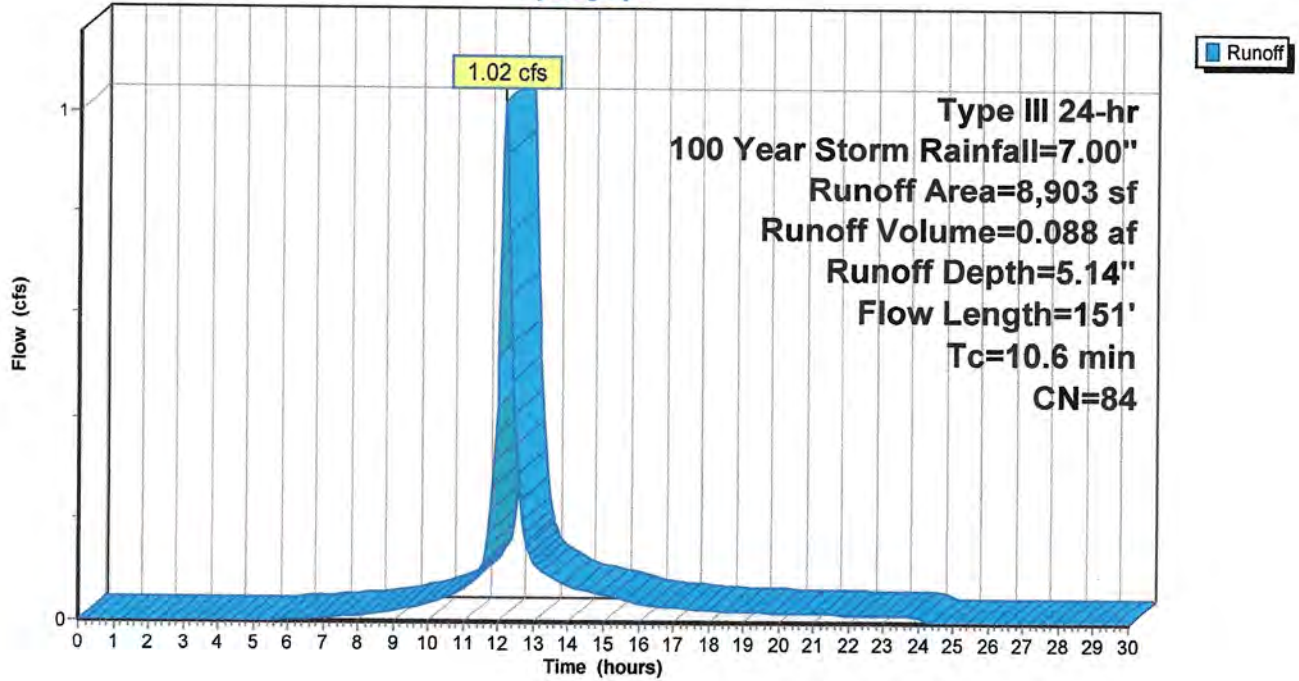
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
1,113	39	>75% Grass cover, Good, HSG A
2,629	74	>75% Grass cover, Good, HSG C
* 1,982	98	Detention Basin 2, Water Surface, HSG C
1,807	98	Roofs, HSG A
1,050	98	Roofs, HSG C
* 292	98	Walls, HSG A
* 30	98	Walls, HSG C
8,903	84	Weighted Average
3,742		42.03% Pervious Area
5,161		57.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0050	0.09		Sheet Flow, grass
					Grass: Short n= 0.150 P2= 3.40"
1.0	65	0.0050	1.14		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
0.1	36	0.1400	6.02		Shallow Concentrated Flow, Grass
					Unpaved Kv= 16.1 fps
10.6	151	Total			

Subcatchment 5S: DA5

Hydrograph



Summary for Subcatchment 6S: DA6 FROM SITE TO WETLANDS

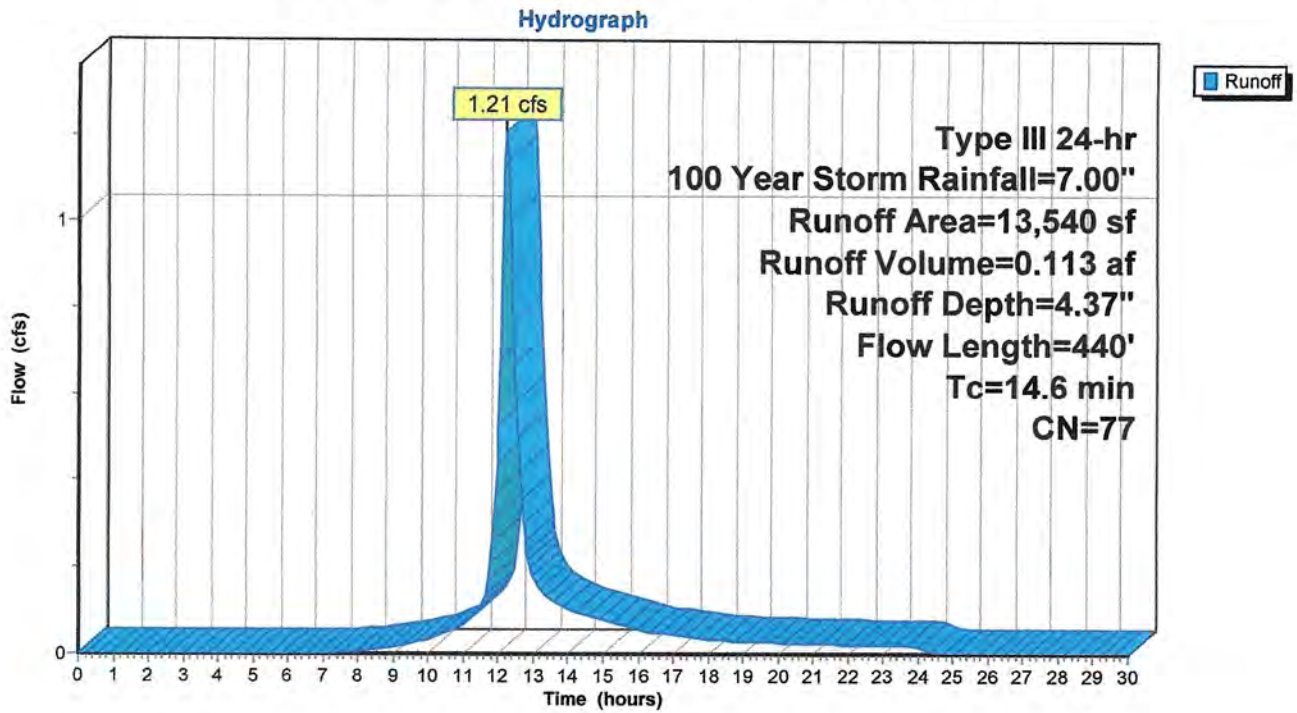
Runoff = 1.21 cfs @ 12.20 hrs, Volume= 0.113 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
353	70	Woods, Good, HSG C
* 4,694	77	Woods-wetland, Good, HSG D
463	39	>75% Grass cover, Good, HSG A
5,944	74	>75% Grass cover, Good, HSG C
1,922	98	Roofs, HSG C
* 164	98	Conc Culvert, HSG D
13,540	77	Weighted Average
11,454		84.59% Pervious Area
2,086		15.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.40"
0.6	100	0.0180	2.72		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
0.5	90	0.0220	3.01		Shallow Concentrated Flow, PAVED Paved Kv= 20.3 fps
8.2	220	0.0080	0.45		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
14.6	440	Total			

Subcatchment 6S: DA6 FROM SITE TO WETLANDS



Summary for Subcatchment 9S: DA9 TO WETLANDS

Runoff = 41.04 cfs @ 12.39 hrs, Volume= 5.002 af, Depth= 3.00"

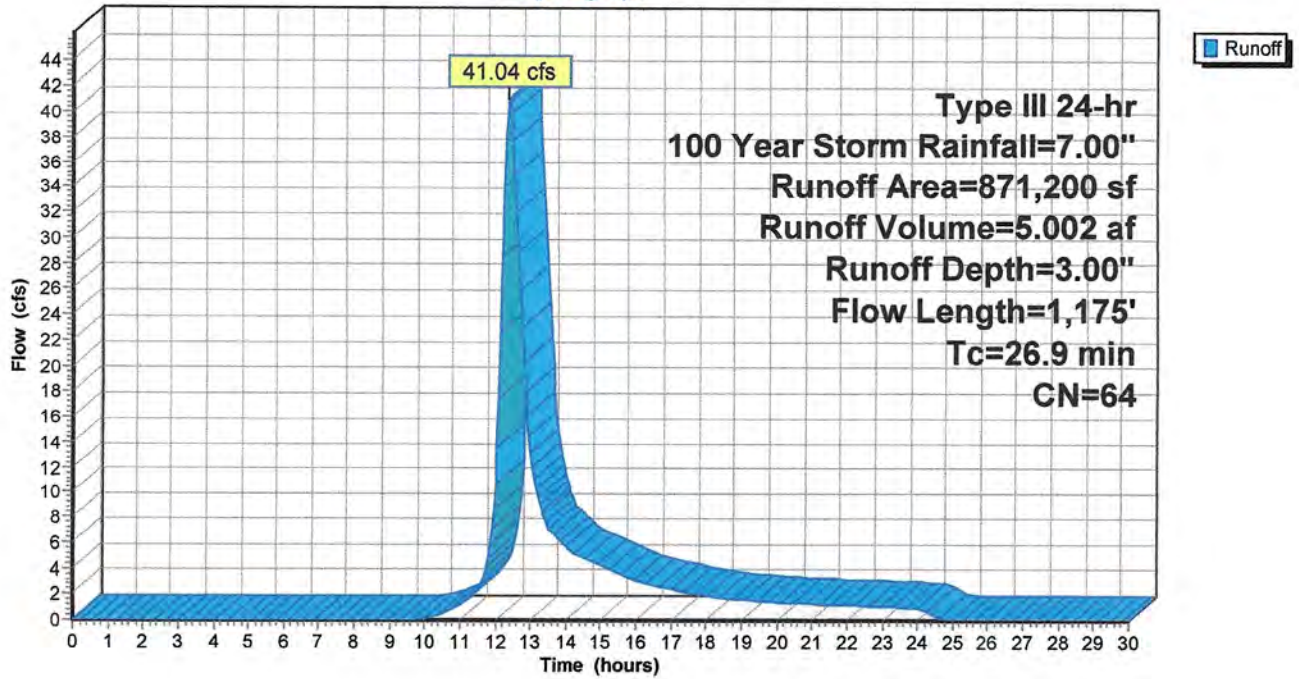
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 Year Storm Rainfall=7.00"

Area (sf)	CN	Description
185,000	30	Woods, Good, HSG A
20,000	70	Woods, Good, HSG C
* 34,000	77	Woods-wetland, Good, HSG D
262,200	39	>75% Grass cover, Good, HSG A
20,000	74	>75% Grass cover, Good, HSG C
* 350,000	98	Roofs,Pavement HSG A&C262200
871,200	64	Weighted Average
521,200		59.83% Pervious Area
350,000		40.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0100	0.08		Sheet Flow, GRASS Grass: Dense n= 0.240 P2= 3.40"
8.5	625	0.0600	1.22		Shallow Concentrated Flow, WOODS Woodland Kv= 5.0 fps
7.9	500	0.0050	1.06		Shallow Concentrated Flow, WETLANDS Grassed Waterway Kv= 15.0 fps
26.9	1,175	Total			

Subcatchment 9S: DA9 TO WETLANDS

Hydrograph



Summary for Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS

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

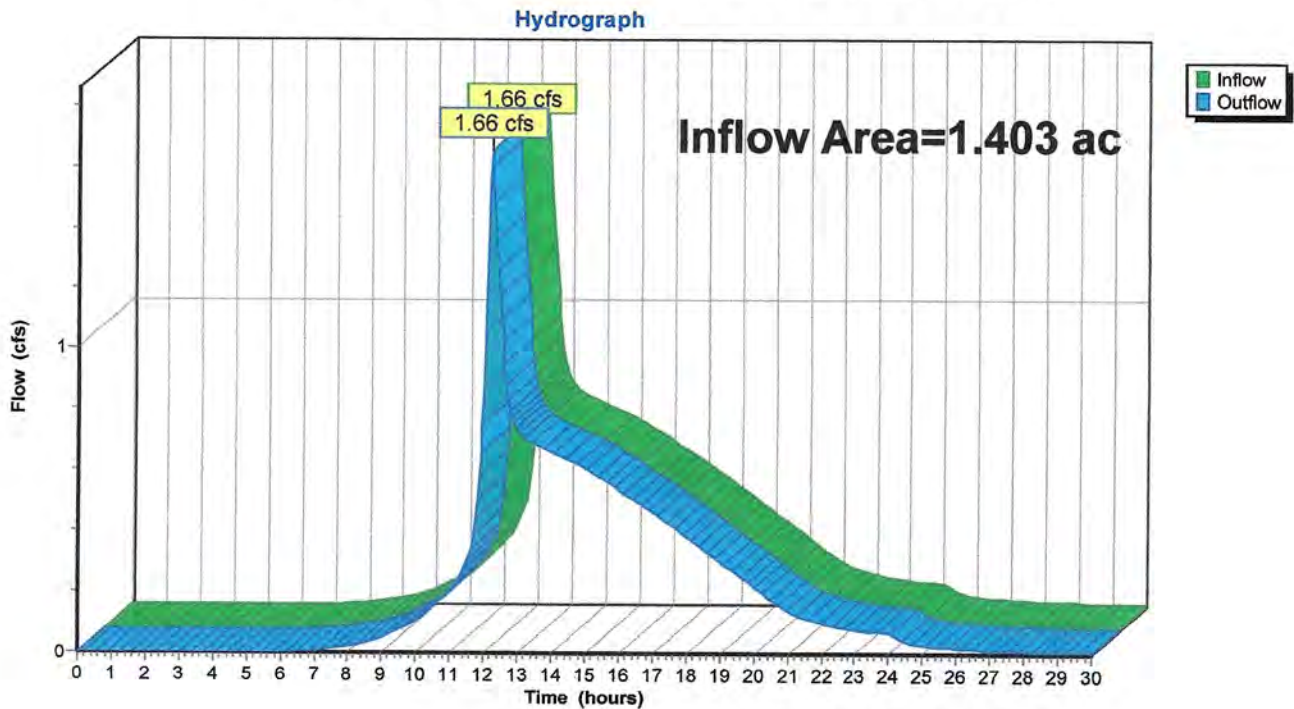
Inflow Area = 1.403 ac, 58.83% Impervious, Inflow Depth > 4.05" for 100 Year Storm event

Inflow = 1.66 cfs @ 12.21 hrs, Volume= 0.474 af

Outflow = 1.66 cfs @ 12.21 hrs, Volume= 0.474 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: TOTAL RUNOFF FROM SITE AT WETLANDS



Summary for Reach 3R: 8" PVC DRAIN PIPE

[52] Hint: Inlet/Outlet conditions not evaluated

[79] Warning: Submerged Pond 8P Primary device # 1 INLET by 0.09'

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth > 5.09" for 100 Year Storm event
Inflow = 0.31 cfs @ 12.53 hrs, Volume= 0.087 af
Outflow = 0.31 cfs @ 12.54 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.41 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 1.51 fps, Avg. Travel Time= 0.8 min

Peak Storage= 6 cf @ 12.54 hrs

Average Depth at Peak Storage= 0.21', Surface Width= 0.62'

Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.51 cfs

8.0" Round Pipe

n= 0.010 PVC, smooth interior

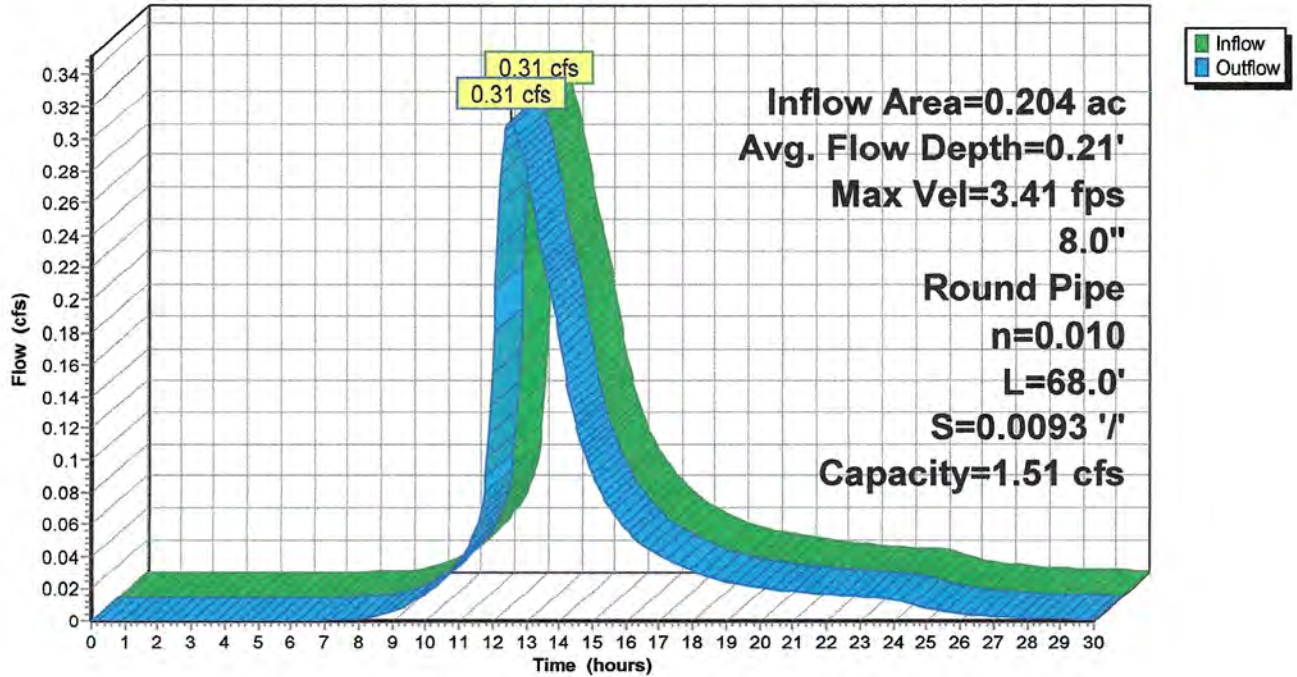
Length= 68.0' Slope= 0.0093 '/'

Inlet Invert= 14.38', Outlet Invert= 13.75'



Reach 3R: 8" PVC DRAIN PIPE

Hydrograph



Summary for Reach 10R: TOTAL RUNOFF TO WETLANDS

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

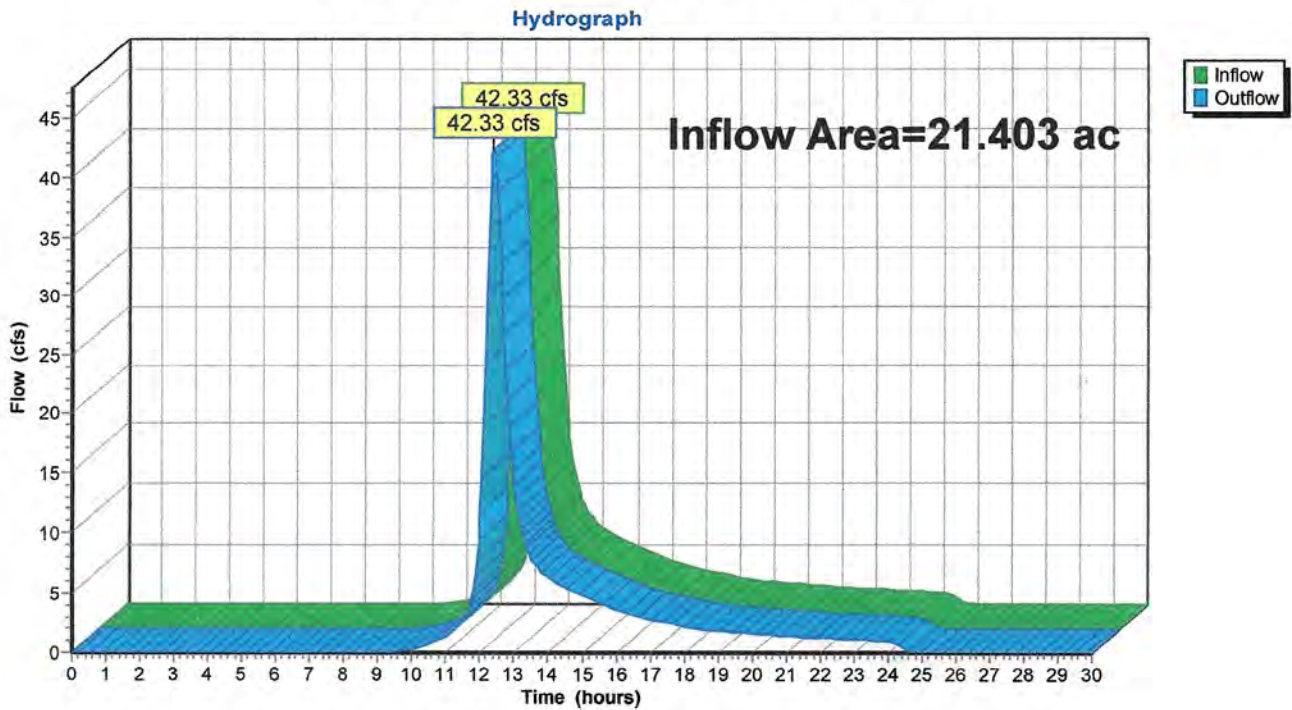
Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 3.07" for 100 Year Storm event

Inflow = 42.33 cfs @ 12.39 hrs, Volume= 5.476 af

Outflow = 42.33 cfs @ 12.39 hrs, Volume= 5.476 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 10R: TOTAL RUNOFF TO WETLANDS



Summary for Pond 1P: CATCH BASIN 1

[57] Hint: Peaked at 16.92' (Flood elevation advised)

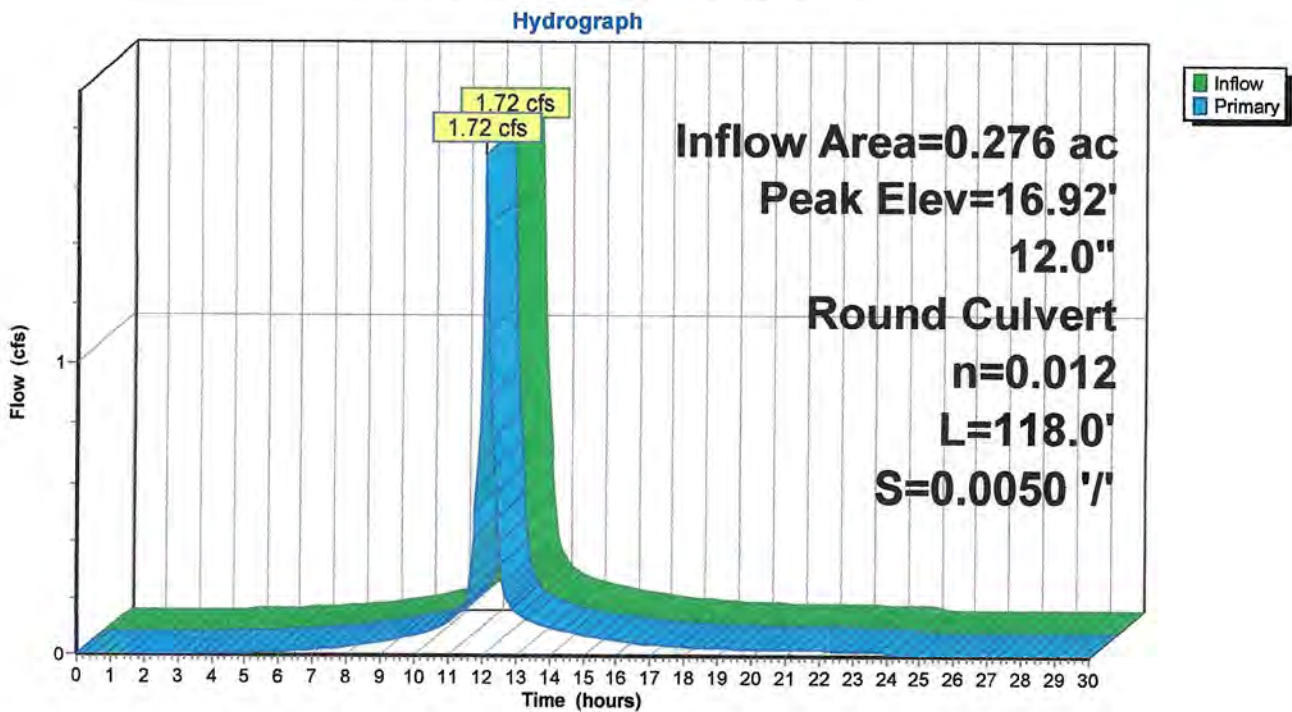
Inflow Area = 0.276 ac, 84.98% Impervious, Inflow Depth = 5.94" for 100 Year Storm event
 Inflow = 1.72 cfs @ 12.10 hrs, Volume= 0.137 af
 Outflow = 1.72 cfs @ 12.10 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.72 cfs @ 12.10 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.92' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.12'	12.0" Round CPP_Round 12" L= 118.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.12' / 15.53' S= 0.0050 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.71 cfs @ 12.10 hrs HW=16.92' (Free Discharge)
 ↳1=CPP_Round 12" (Barrel Controls 1.71 cfs @ 3.47 fps)

Pond 1P: CATCH BASIN 1



Summary for Pond 2P: CATCH BASIN 2

[57] Hint: Peaked at 17.03' (Flood elevation advised)

Inflow Area = 0.132 ac, 53.83% Impervious, Inflow Depth = 3.72" for 100 Year Storm event
 Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af
 Outflow = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af

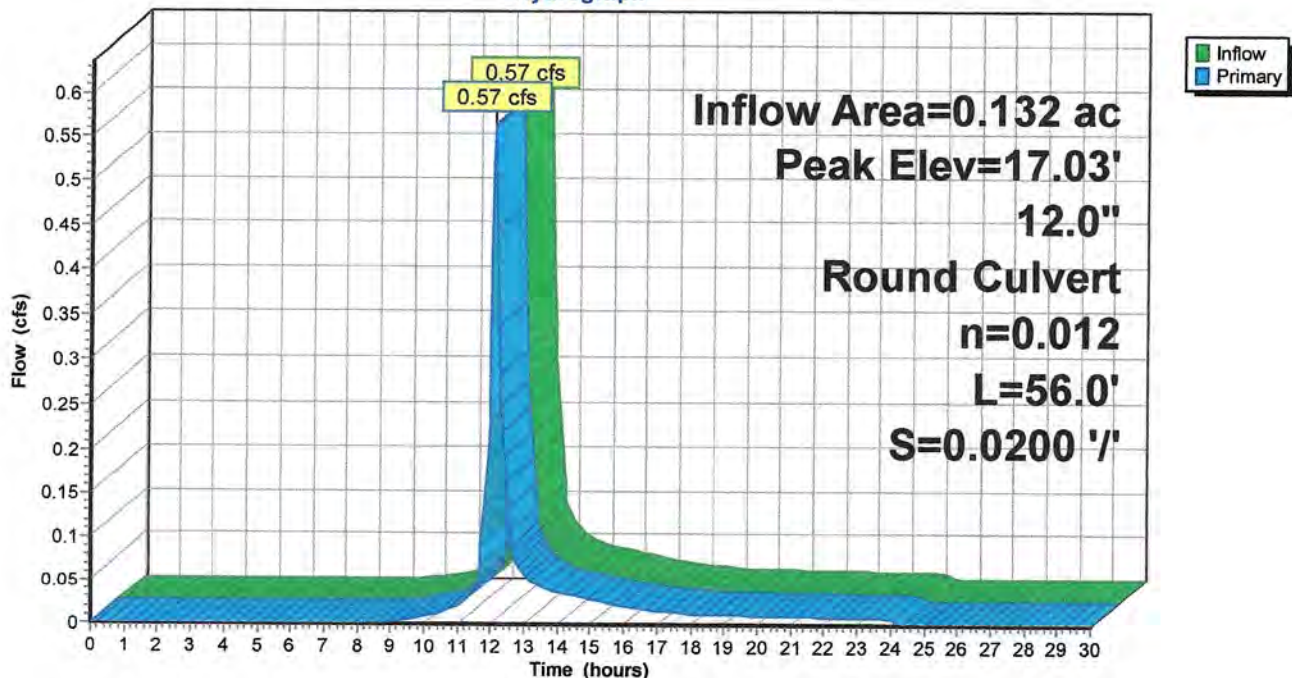
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.03' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	16.65'	12.0" Round CPP_Round 12" L= 56.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.65' / 15.53' S= 0.0200 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.55 cfs @ 12.09 hrs HW=17.02' (Free Discharge)
 ↑1=CPP_Round 12" (Inlet Controls 0.55 cfs @ 2.08 fps)

Pond 2P: CATCH BASIN 2

Hydrograph



Summary for Pond 3P: STORMCEPTOR 1 / DMH

[57] Hint: Peaked at 16.18' (Flood elevation advised)

[79] Warning: Submerged Pond 1P Primary device # 1 INLET by 0.06'

[79] Warning: Submerged Pond 2P Primary device # 1 OUTLET by 0.65'

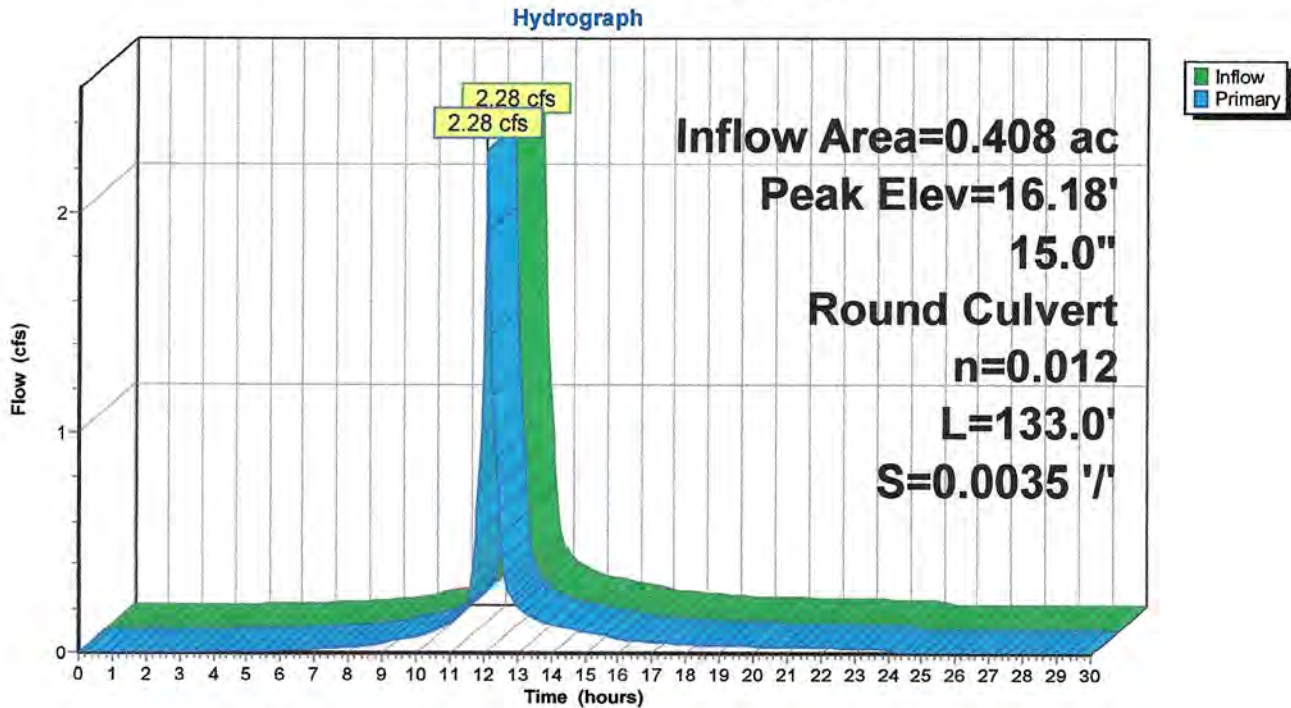
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 5.22" for 100 Year Storm event
 Inflow = 2.28 cfs @ 12.10 hrs, Volume= 0.178 af
 Outflow = 2.28 cfs @ 12.10 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.28 cfs @ 12.10 hrs, Volume= 0.178 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.18' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	15.28'	15.0" Round CPP_Round 15" L= 133.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.28' / 14.81' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.26 cfs @ 12.10 hrs HW=16.18' (Free Discharge)
 ↑1=CPP_Round 15" (Barrel Controls 2.26 cfs @ 3.35 fps)

Pond 3P: STORMCEPTOR 1 / DMH



Summary for Pond 4P: DRAIN MANHOLE 1

[57] Hint: Peaked at 15.77' (Flood elevation advised)

[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 0.49'

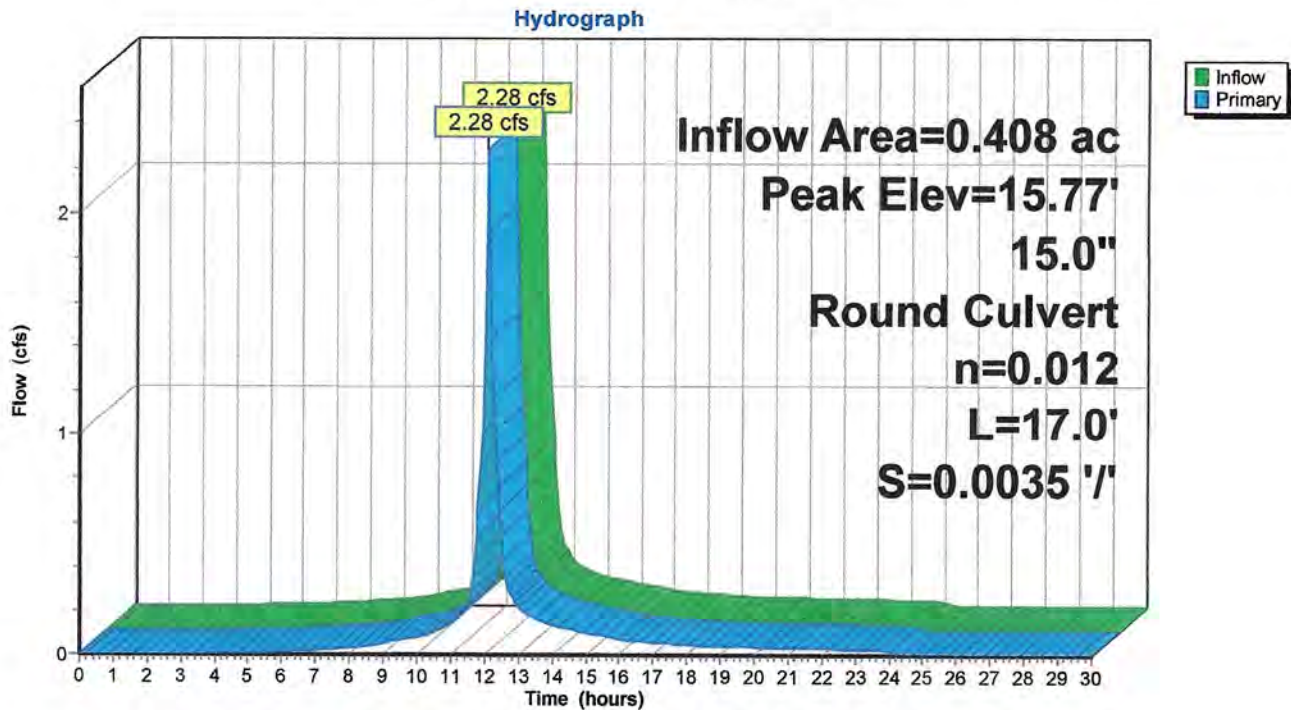
Inflow Area = 0.408 ac, 74.94% Impervious, Inflow Depth = 5.22" for 100 Year Storm event
 Inflow = 2.28 cfs @ 12.10 hrs, Volume= 0.178 af
 Outflow = 2.28 cfs @ 12.10 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.28 cfs @ 12.10 hrs, Volume= 0.178 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.77' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	14.81'	15.0" Round CPP_Round 15" L= 17.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 14.81' / 14.75' S= 0.0035 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.26 cfs @ 12.10 hrs HW=15.77' (Free Discharge)
 ←1=CPP_Round 15" (Barrel Controls 2.26 cfs @ 3.10 fps)

Pond 4P: DRAIN MANHOLE 1



Summary for Pond 5P: DETENTION BASIN 1

[63] Warning: Exceeded Reach 3R INLET depth by 1.31' @ 13.80 hrs

[81] Warning: Exceeded Pond 4P by 0.82' @ 13.80 hrs

Inflow Area = 1.092 ac, 71.19% Impervious, Inflow Depth > 3.99" for 100 Year Storm event
 Inflow = 3.24 cfs @ 12.09 hrs, Volume= 0.363 af
 Outflow = 0.56 cfs @ 13.62 hrs, Volume= 0.361 af, Atten= 83%, Lag= 91.5 min
 Primary = 0.56 cfs @ 13.62 hrs, Volume= 0.361 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.85' @ 13.62 hrs Surf.Area= 3,366 sf Storage= 5,875 cf

Plug-Flow detention time= 133.7 min calculated for 0.360 af (99% of inflow)
 Center-of-Mass det. time= 129.6 min (947.0 - 817.3)

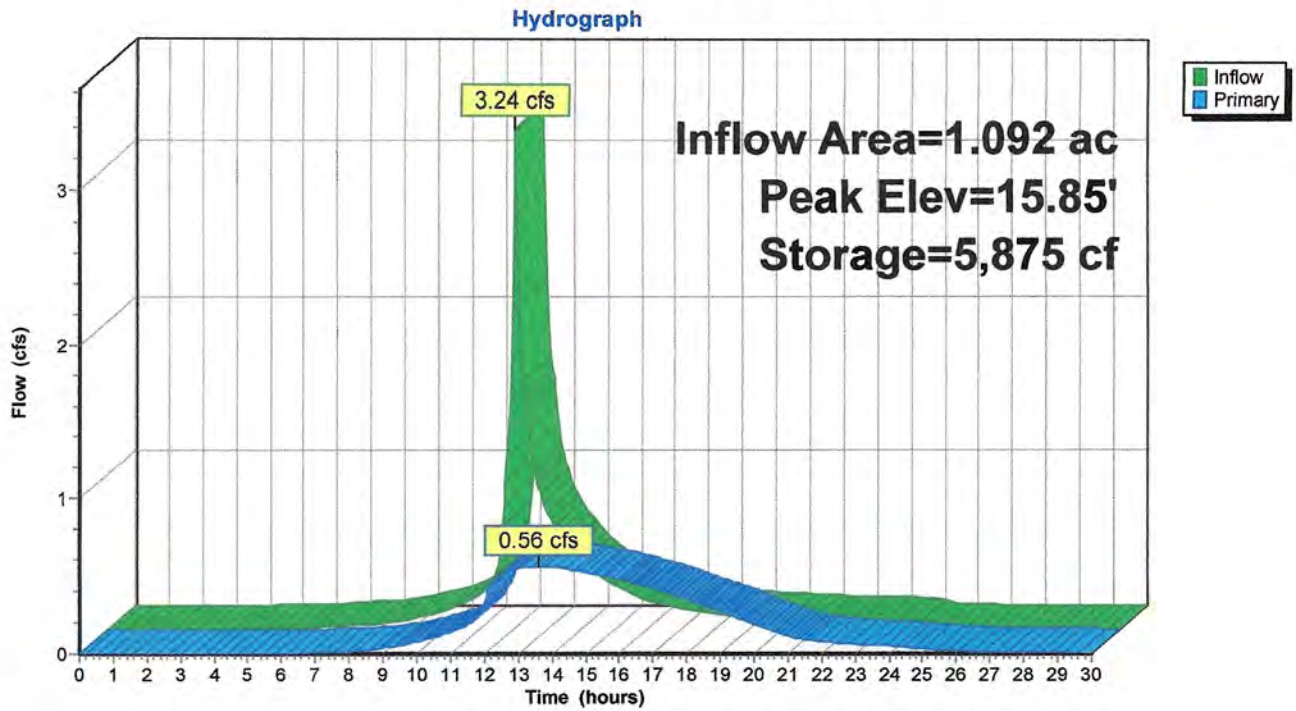
Volume	Invert	Avail.Storage	Storage Description		
#1	13.75'	11,218 cf	Custom Stage Data (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
13.75	2,256	0	0	2,256	
14.00	2,367	578	578	2,375	
15.00	2,897	2,628	3,205	2,935	
16.00	3,450	3,169	6,375	3,523	
17.00	4,137	3,788	10,163	4,244	
17.25	4,302	1,055	11,218	4,419	

Device	Routing	Invert	Outlet Devices	
#1	Primary	13.75'	4.0" Round 4" PVC Culvert L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 13.75' / 13.55' S= 0.0100 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf	
#2	Primary	15.95'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height	

Primary OutFlow Max=0.56 cfs @ 13.62 hrs HW=15.85' (Free Discharge)

- 1=4" PVC Culvert (Barrel Controls 0.56 cfs @ 6.39 fps)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: DETENTION BASIN 1



Summary for Pond 6P: STORMCEPTOR 2 / CB

[57] Hint: Peaked at 17.91' (Flood elevation advised)

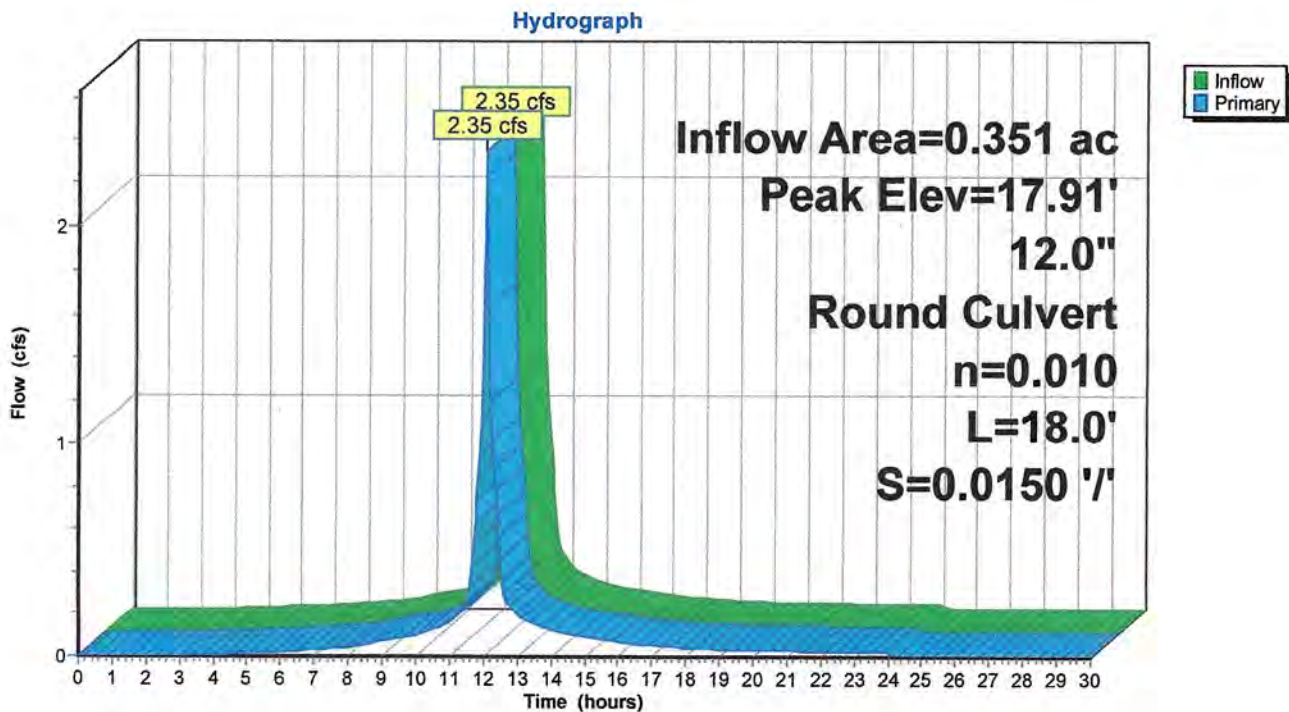
Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 6.17" for 100 Year Storm event
 Inflow = 2.35 cfs @ 12.07 hrs, Volume= 0.181 af
 Outflow = 2.35 cfs @ 12.07 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.35 cfs @ 12.07 hrs, Volume= 0.181 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.91' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	17.02'	12.0" Round CMP_Round 12" L= 18.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 17.02' / 16.75' S= 0.0150 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.26 cfs @ 12.07 hrs HW=17.88' (Free Discharge)
 ↑1=CMP_Round 12" (Barrel Controls 2.26 cfs @ 4.20 fps)

Pond 6P: STORMCEPTOR 2 / CB



Summary for Pond 7P: INFILTRATION SYSTEM

[81] Warning: Exceeded Pond 6P by 0.78' @ 12.65 hrs

Inflow Area = 0.351 ac, 83.57% Impervious, Inflow Depth = 6.17" for 100 Year Storm event
 Inflow = 2.35 cfs @ 12.07 hrs, Volume= 0.181 af
 Outflow = 0.34 cfs @ 12.57 hrs, Volume= 0.115 af, Atten= 86%, Lag= 29.9 min
 Discarded = 0.04 cfs @ 12.57 hrs, Volume= 0.073 af
 Primary = 0.30 cfs @ 12.57 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.07' @ 12.57 hrs Surf.Area= 2,673 sf Storage= 4,166 cf

Plug-Flow detention time= 318.9 min calculated for 0.115 af (64% of inflow)
 Center-of-Mass det. time= 219.7 min (987.6 - 767.9)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	1,595 cf	Custom Stage Data (Conic) Listed below (Recalc) 7,137 cf Overall - 3,149 cf Embedded = 3,988 cf x 40.0% Voids
#2	15.83'	2,683 cf	24.0" Round CMP_Round 24" Inside #1 L= 854.0' 3,149 cf Overall - 1.0" Wall Thickness = 2,683 cf
		4,278 cf	Total Available Storage

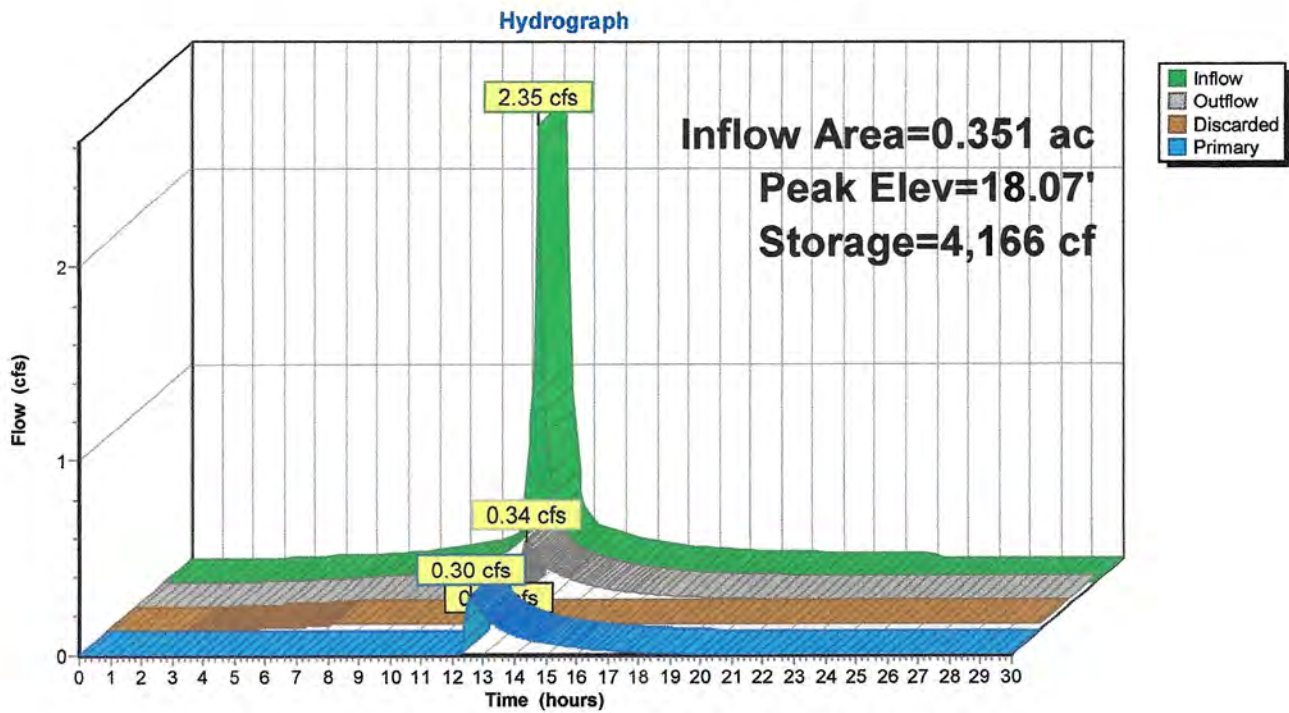
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
15.50	2,673	0	0	2,673
15.83	2,673	882	882	2,733
16.00	2,673	454	1,337	2,765
17.00	2,673	2,673	4,010	2,948
17.83	2,673	2,219	6,228	3,100
18.00	2,673	454	6,683	3,131
18.17	2,673	454	7,137	3,162

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	0.520 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	17.68'	6.0" Round PVC_Round 6" L= 30.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 17.68' / 15.95' S= 0.0577 ' / Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.04 cfs @ 12.57 hrs HW=18.06' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.30 cfs @ 12.57 hrs HW=18.06' (Free Discharge)
 ↑2=PVC_Round 6" (Inlet Controls 0.30 cfs @ 1.86 fps)

Pond 7P: INFILTRATION SYSTEM



Summary for Pond 8P: DETENTION BASIN 2

Inflow Area = 0.204 ac, 57.97% Impervious, Inflow Depth = 5.14" for 100 Year Storm event
 Inflow = 1.02 cfs @ 12.15 hrs, Volume= 0.088 af
 Outflow = 0.31 cfs @ 12.53 hrs, Volume= 0.087 af, Atten= 70%, Lag= 23.0 min
 Primary = 0.31 cfs @ 12.53 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.22' @ 12.53 hrs Surf.Area= 2,001 sf Storage= 1,329 cf

Plug-Flow detention time= 81.2 min calculated for 0.087 af (99% of inflow)
 Center-of-Mass det. time= 75.0 min (877.1 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	14.50'	6,448 cf	Custom Stage Data (Conic) Listed below (Recalc)

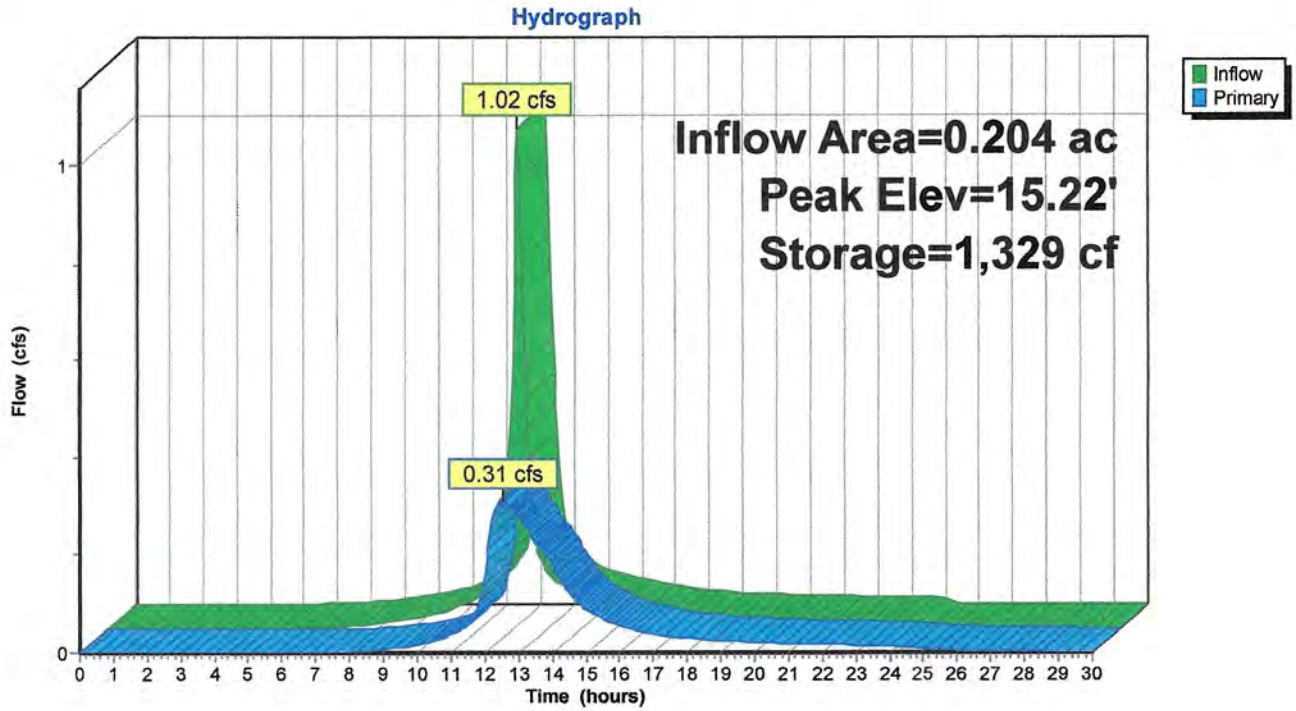
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.50	1,712	0	0	1,712
15.00	1,904	904	904	1,918
16.00	2,370	2,133	3,036	2,412
17.00	2,952	2,656	5,692	3,022
17.25	3,098	756	6,448	3,176

Device	Routing	Invert	Outlet Devices
#1	Primary	14.50'	4.0" Round 4" PVC Culvert L= 12.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.50' / 14.38' S= 0.0100 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Primary	16.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.31 cfs @ 12.53 hrs HW=15.22' (Free Discharge)

- 1=4" PVC Culvert (Inlet Controls 0.31 cfs @ 3.57 fps)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 8P: DETENTION BASIN 2



Summary for Pond 11P: TO BLUEFISH RIVER

Inflow Area = 21.403 ac, 41.40% Impervious, Inflow Depth > 3.07" for 100 Year Storm event
 Inflow = 42.33 cfs @ 12.39 hrs, Volume= 5.476 af
 Outflow = 14.46 cfs @ 12.98 hrs, Volume= 5.476 af, Atten= 66%, Lag= 35.5 min
 Primary = 14.46 cfs @ 12.98 hrs, Volume= 5.476 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 14.74' @ 12.98 hrs Surf.Area= 36,081 sf Storage= 70,850 cf

Plug-Flow detention time= 57.0 min calculated for 5.476 af (100% of inflow)
 Center-of-Mass det. time= 57.0 min (925.3 - 868.3)

Volume	Invert	Avail.Storage	Storage Description
#1	11.92'	139,694 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.92	0	0	0	0
12.00	2,000	53	53	2,000
13.00	30,000	13,249	13,302	30,003
14.00	33,500	31,734	45,036	33,559
15.00	37,000	35,236	80,271	37,122
16.00	40,500	38,737	119,008	40,691
16.50	42,250	20,686	139,694	42,477

Device	Routing	Invert	Outlet Devices
#1	Primary	11.92'	18.0" Round RCP_Round 18" L= 44.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 11.92' / 11.50' S= 0.0095 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	16.20'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=14.45 cfs @ 12.98 hrs HW=14.74' (Free Discharge)

- 1=RCP_Round 18" (Barrel Controls 14.45 cfs @ 8.18 fps)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 11P: TO BLUEFISH RIVER

Hydrograph

