



ENGINEER'S REPORT

for

Townhomes at Muir Woods

770 John James Audubon Parkway
Amherst, Erie County, NY

Prepared for

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Section 1 - Location & Description

This project is a development of a 17.14-acre site located 770 John James Audubon Pkwy in the Town of Amherst. Construction will consist of 160 three-bedroom townhouse units, 4 private roads, the relocation of the existing Town of Amherst bike trail, and will also include associated utility, lighting and landscaping improvements. Currently the site is undeveloped. The proposed site development area to be disturbed for this project is approximately 14.5 acres when construction is completed.

Section 2 - Water Service

Water service for the proposed townhome development will be provided by a proposed private 8-inch water main serving the site, tapped from the existing 12-inch ECWA water main located on the east side of John James Audubon Parkway. The proposed site water main will consist of 8-inch AWWA C-900 pipe and will function as a combined domestic and fire service. Each townhome unit will be provided with a 1-inch polyethylene combined water service connected to the proposed 8-inch water main. The combined service will be split within each unit to provide separate domestic and fire water services. The proposed 8-inch water main will extend into a dedicated insulated enclosure. Within this enclosure, the combined service will be equipped with a water meter and a reduced pressure zone (RPZ) backflow preventer.

The enclosure will be heated to prevent freezing. Discharge resulting from RPZ testing or failure will be conveyed by gravity to the nearest drainage inlet. The property owner will be responsible for maintaining the drainage ports and keeping them clear of snow and debris to ensure proper operation. Water service within the buildings will be utilized for typical domestic purposes.

Six private hydrants will be installed on site as part of the development to ensure fire hose coverage not exceeding 400'.

Domestic Summary:

Peak Operating Demand:	145.20 gpm
Water Main:	12" on John James Audubon Pkwy
Static Pressure:	100 psi (Per ECWA)
Friction Loss:	0.0 psi
Loss through meter/RPZ:	13 psi
Elevation Loss:	3.03 psi
Pressure after RPZ:	84.0 psi

Repairs to all devices will be made during off hours, dual backflow preventers are not required. The site is not located in a 100-year flood plain. Disinfection of the water service following installation will be continuous feed, according to AWWA C-651, latest revision.

Section 3 - Sanitary Sewer Service

Sanitary service for the proposed townhouse development will be provided by a proposed private sanitary sewer system consisting of an 8-inch sanitary sewer main with manholes provided at all changes in direction and at appropriate intervals. Each townhome building will connect to the private sanitary sewer system by an individual 4-inch SDR-35 PVC sanitary lateral installed at a minimum slope of 1.0 percent.

The proposed private sanitary sewer will convey flows to a proposed on-site pump station, which will be designed to Town of Amherst and Erie County standards by others and submitted under separate cover. From the pump station, sanitary flow will be discharged to the existing public force main located along John James Audubon Parkway. The force main will ultimately discharge to the existing Town of Amherst sanitary sewer system via a manhole located near the intersection of John James Audubon Parkway and Dodge Road.

Design Parameters

3-bedroom townhouse:	330 gal/day/house x 160 units = 52,800 gpd
52,800 gpd * 3.96 = 209,190 gpd	*use peaking factor of 3.96

The hydraulic loading rate is per "Design Standards for Intermediate Sized Wastewater Treatment Systems" 2014, NYSDEC.

Section 4 - Storm Sewer Service

The existing site generally drains to the south, east, and west toward the existing stormwater management pond and perimeter drainage ditches located along the south, east, and west portions of the site. The on-site ditch ultimately discharges to Ellicott creek

Stormwater runoff generated by the proposed development will be collected and conveyed through a proposed storm sewer system consisting of bioretention areas, catch basins, yard drains, manholes, and smooth interior HDPE storm pipe. Side-yard swales between buildings are proposed to intercept and direct runoff away from the townhouse structures and into the storm sewer system.

The proposed bioretention areas are designed to provide 100 percent of the minimum Runoff Reduction Volume (RRv) and Water Quality Volume (WQv) for the development. Soils in the vicinity of the bioretention practices are predominantly USDA Hydrologic Soil Group D; therefore, underdrains will be provided in accordance with NYSDEC requirements. Each bioretention area will include 8-inch perforated HDPE underdrains embedded in 12 inches of drainage gravel, overlain by filter fabric and a minimum of 30 inches of approved filter media. Outlet Control Structures will be installed within the bioretention areas to limit maximum ponding depths to 18 inches while still providing the required RRv treatment. Discharge from the bioretention areas will outlet to the existing on-site stormwater management system. Stormwater management for the site, including RRv, WQv, and volume attenuation, has been designed in accordance with Chapter 4 of the NYSDEC Stormwater Management Design Manual. The bioretention areas are incorporated as green infrastructure practices to satisfy runoff reduction and water quality treatment requirements for the site.

Post development impervious cover is estimated at 7.33 acres, representing an increase of 7.10 acres. This portion of Muir Woods is part of a larger planned development for which stormwater quantity management is provided by the existing on-site stormwater management system, including the existing stormwater pond. As concluded in the *Muir Woods Preliminary Drainage Report* (Greenman-Pedersen, Inc., August 2007), a watershed-scale hydrologic and hydraulic analysis determined that no additional stormwater quantity detention was required because further delaying runoff would increase peak flows in Ellicott Creek. The analysis also concluded that the existing Town Ditch No. 4 system has adequate capacity to convey the increase in post development runoff without adverse downstream impacts and that the proposed development would have no significant impact on downstream flooding. Therefore, no additional stormwater quantity detention is required for this phase of the development. The proposed bioretention areas have been designed to safely convey runoff from extreme storm events without flooding the proposed development. Each bioretention area includes an outlet control structure to regulate discharge rates and a check valve at the outfall to prevent stormwater from backing up into the proposed storm drainage system during elevated downstream water levels.

Water Quality Summary:

WQv req'd = 23,417 cf (0.538 ac-ft)

RRv min. req'd = 4,530 cf (0.104 ac-ft)

RRv provided - bioretention areas = 9,475 cf (0.218 ac-ft)

WQv provided - bioretention area = 13,942 cf (0.320 ac-ft)

Total RRv + WQv provided = 9,475 cf + 13,942 cf = 23,417 cf (0.538 ac-ft)

Bioretention 1

Area: 1,150 sf

Bottom Elevation: 571.50

Outlet Control Structure #1 (2' SQ.) - Rim Elevation: 572.50, Weir Elevation: 572.00

Summary:

Event	Outflow (cfs)	Elevation (cfs)	Storage (cfs)
1-year	2.52	572.21	959
10-year	6.05	572.38	1,245
25-year	7.59	572.48	1,424
100-year	10.08	572.62	1,666

Townhouses at Muir Woods

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Bioretention 2

Area: 1,200 sf

Bottom Elevation: 571.50

Outlet Control Structure #2 (2' SQ.) - Rim Elevation:572.50, Weir Elevation: 572.00

Summary:

Event	Outflow (cfs)	Elevation (cfs)	Storage (cfs)
1-year	2.47	572.24	1,075
10-year	5.10	572.39	1,337
25-year	6.31	572.45	1,443
100-year	8.18	572.53	1,597

Bioretention 3

Area: 2,420 sf

Bottom Elevation: 571.50

Outlet Control Structure #3 (3' SQ.) - Rim Elevation:572.50, Weir Elevation: 572.00

Summary:

Event	Outflow (cfs)	Elevation (cfs)	Storage (cfs)
1-year	4.93	572.27	2,102
10-year	10.93	572.46	2,677
25-year	13.71	572.53	2,909
100-year	17.91	572.63	3,253

Bioretention 4

Area: 1,100 sf

Bottom Elevation: 571.50

Outlet Control Structure #4 (2' SQ.) - Rim Elevation:572.50, Weir Elevation: 572.00

Summary:

Event	Outflow (cfs)	Elevation (cfs)	Storage (cfs)
1-year	1.99	572.21	879
10-year	3.97	572.33	1,056
25-year	4.88	572.38	1,128
100-year	6.28	572.45	1,232

Bioretention 5

Area: 4,000 sf

Bottom Elevation: 571.75

Outlet Control Structure #5 (3' SQ.) - Rim Elevation:573.00, Weir Elevation: 572.25

Summary:

Event	Outflow (cfs)	Elevation (cfs)	Storage (cfs)
1-year	6.76	572.64	4,181
10-year	16.13	572.99	6,197
25-year	20.18	573.13	7,041
100-year	21.04	573.57	9,904

Runoff Summary:

Event	Ex. Runoff (cfs)	Pro. Runoff (cfs)	Result (cfs)
1-year	8.08	22.15	+14.07
10-year	27.58	54.27	+26.69
25-year	37.80	69.31	+31.51
100-year	54.29	88.79	+34.50

Note: This portion of Muir Woods is part of a larger planned development for which stormwater quantity management is provided by the existing on-site stormwater management system, including the existing stormwater pond. As concluded in the *Muir Woods Preliminary Drainage Report* (Greenman-Pedersen, Inc., August 2007), a watershed-scale hydrologic and hydraulic analysis determined that no additional stormwater quantity detention was required because further delaying runoff would increase peak flows in Ellicott Creek. The analysis also concluded that the existing Town Ditch No. 4 system has adequate capacity to convey the increase in post development runoff without adverse downstream impacts and that the proposed development would have no significant impact on downstream flooding. Therefore, no additional stormwater quantity detention is required for this phase of the development.

Appendix A

Sanitary Sewer and Water Demand Calculations

Sanitary Sewage Demand Calculations:

Proposed Townhome Development

$$330 \text{ gal/d/unit} \times 160 \text{ Units} = 52,800 \text{ gpd} \quad \text{*use 330 gallons per unit per day (2-bdrm)}$$

$$\text{Total Site Sanitary Demand:} = 52,800 \text{ gpd}$$

*The hydraulic loading rate is per "Design Standards for Intermediate Sized Wastewater Treatment Systems" 2014, NYSDEC.

Find Peak Sanitary Demand:

Peaking Factor based on Population:

$$\text{Total demand: } 52,800 \text{ gpd} / 100 \text{ gpcd} = 528 \text{ per capita}$$

$$\text{Population (P)} = 528 \text{ people}$$

$$\text{Peaking Factor : } (18 + \sqrt{P}) / (4 + \sqrt{P}) \quad \text{where P is in thousands}$$

$$\text{Peaking Factor} = 3.96$$

$$\begin{aligned} \text{Peak Sanitary Demand} &= 52,800 \times 3.96 = 209,190 \text{ gpd} \\ &= 0.209 \text{ MGD} \\ &= 0.324 \text{ cfs} \end{aligned}$$

Required Infiltration and Inflow Mitigation:

$$\text{Peak Sanitary Flow} = 209,190 \text{ gpd} = 145.3 \text{ gpm}$$

$$4:1 \text{ offset flow per NYSDEC requirements} = 145.3 \times 4 = 581.1 \text{ gpm req'd}$$

$$\text{Mitigation Credit} = 250 \text{ /gpm}$$

$$\text{Mitigation Agreement Amount} = \$ 145,271.04$$

Water Demand Calculations (Domestic):

Proposed Townhome Development

$$52,800 \text{ gpd} \times 1.1 = 58,080 \text{ gpd} \quad \text{*use 110\% of sewage demand}$$

*use 1.8 peaking factor and assume a 12 hour day

$$58,080 \text{ gpm} \times 1\text{day}/12\text{hr} \times 1\text{hr}/60\text{min} = 80.67 \text{ gpm}$$

$$80.67 \text{ gpm} \times 1.8 = 145.20 \text{ gpm} \quad Q_{\text{peak}}$$

Headlosses:

$$Q_{\text{peak}} = 145.20 \text{ gpm}$$

$$\text{Pipe} = 8 \text{ inch C-900 PVC} \quad C = 140$$

$$\text{Length} = 50 \text{ LF (approx. distance from Tap to RPZ)}$$

$$H_L = \frac{10.44 L Q^{1.85}}{C^{1.85} D^{4.866}} = \frac{10.44(50)(96.80)^{1.85}}{(140)^{1.85} (8)^{4.866}} = 0.02 \text{ ft} = 0.01 \text{ psi}$$

$$\Delta \text{ elev} = 0 \text{ ft} = 0.00 \text{ psi}$$

$$\text{Loss through meter} = 1 \text{ psi}$$

$$\text{Loss through RPZ} = 12 \text{ psi}$$

$$\text{Total Losses} = 13.0 \text{ psi}$$

$$\text{Static Pressure} = 100 \text{ psi (Assumed)}$$

$$\text{Residual Pressure Following RPZ} = 100 - 13.0 = \underline{87.0 \text{ psi}} \quad (\text{available after rpz \& meter})$$

Residual Pressure 30" above 2nd Floor

$$\Delta \text{ elev} = 7 \text{ ft} = 3.03 \text{ psi}$$

$$\text{Residual Pressure 30" above 2nd Floor} = \underline{84.0 \text{ psi}}$$

Water Demand Calculations (fire):

Proposed Townhome Development

$$Q = 1,000 \text{ gpd}$$

Headlosses:

$$Q_{\text{peak}} = 1000 \text{ gpm}$$

$$\text{Pipe} = 8 \text{ inch C-900 PVC} \quad C = 140$$

$$\text{Length} = 1,050 \text{ LF (approx. distance from RPZ to farthest hydrant)}$$

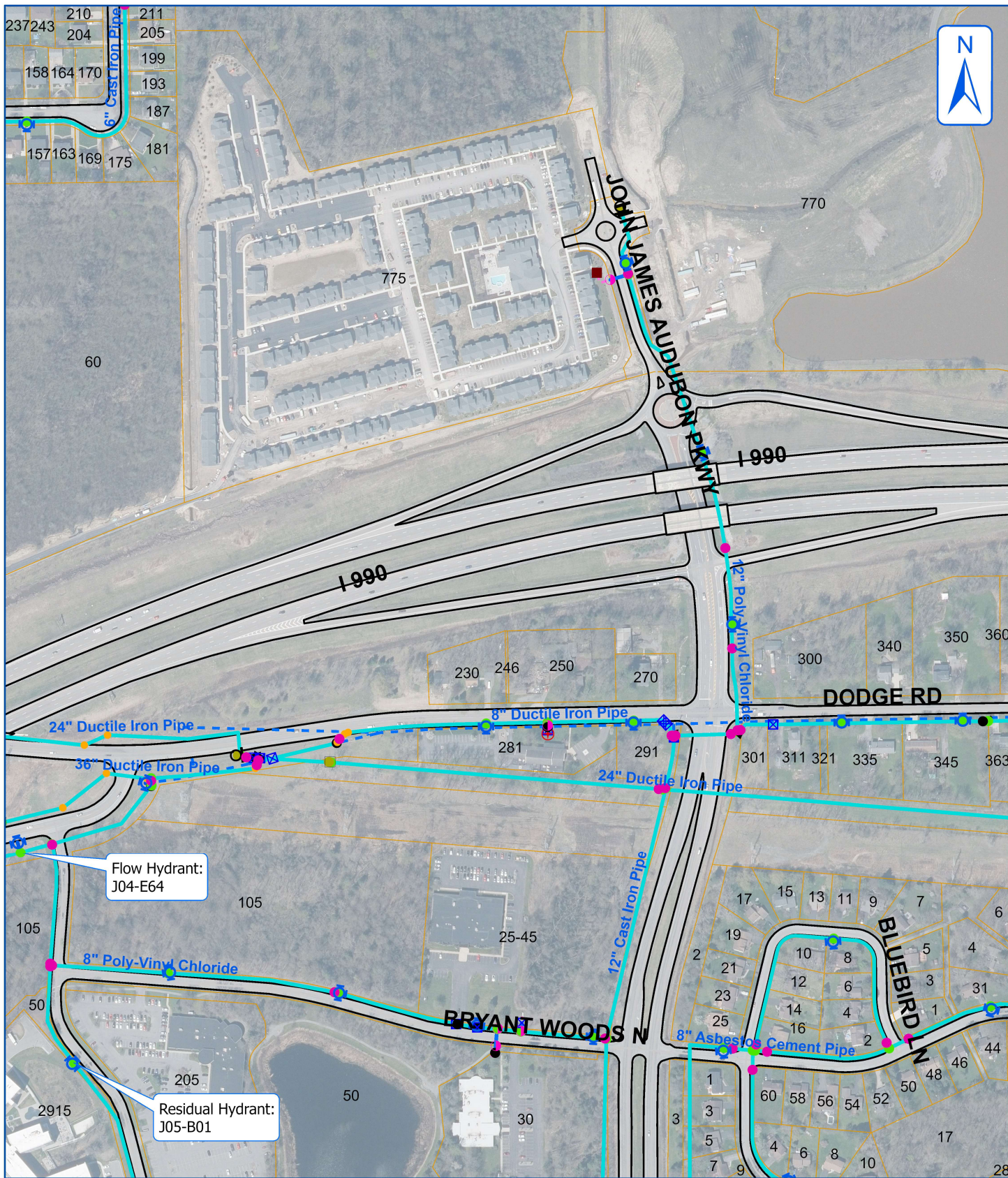
$$H_L = \frac{10.44 L Q^{1.85}}{C^{1.85} D^{4.866}} = \frac{10.44(1050)(1000)^{1.85}}{(140)^{1.85} (8)^{4.866}} = 16.79 \text{ ft} = 7.27 \text{ psi}$$

$$\Delta \text{ elev} = 4 \text{ ft} = 1.73 \text{ psi}$$

$$\text{Static Pressure after RPZ} = 87.0 \text{ psi (per ECWA)}$$

$$\text{Residual Pressure at hydrant} = 87 - 9.00 = \underline{78.0 \text{ psi}}$$

Hydrant Testing Data



**770 John James Audubon Parkway
Town of Amherst
Flow Test Data From 2018**



Erie County Water Authority
Buffalo, New York

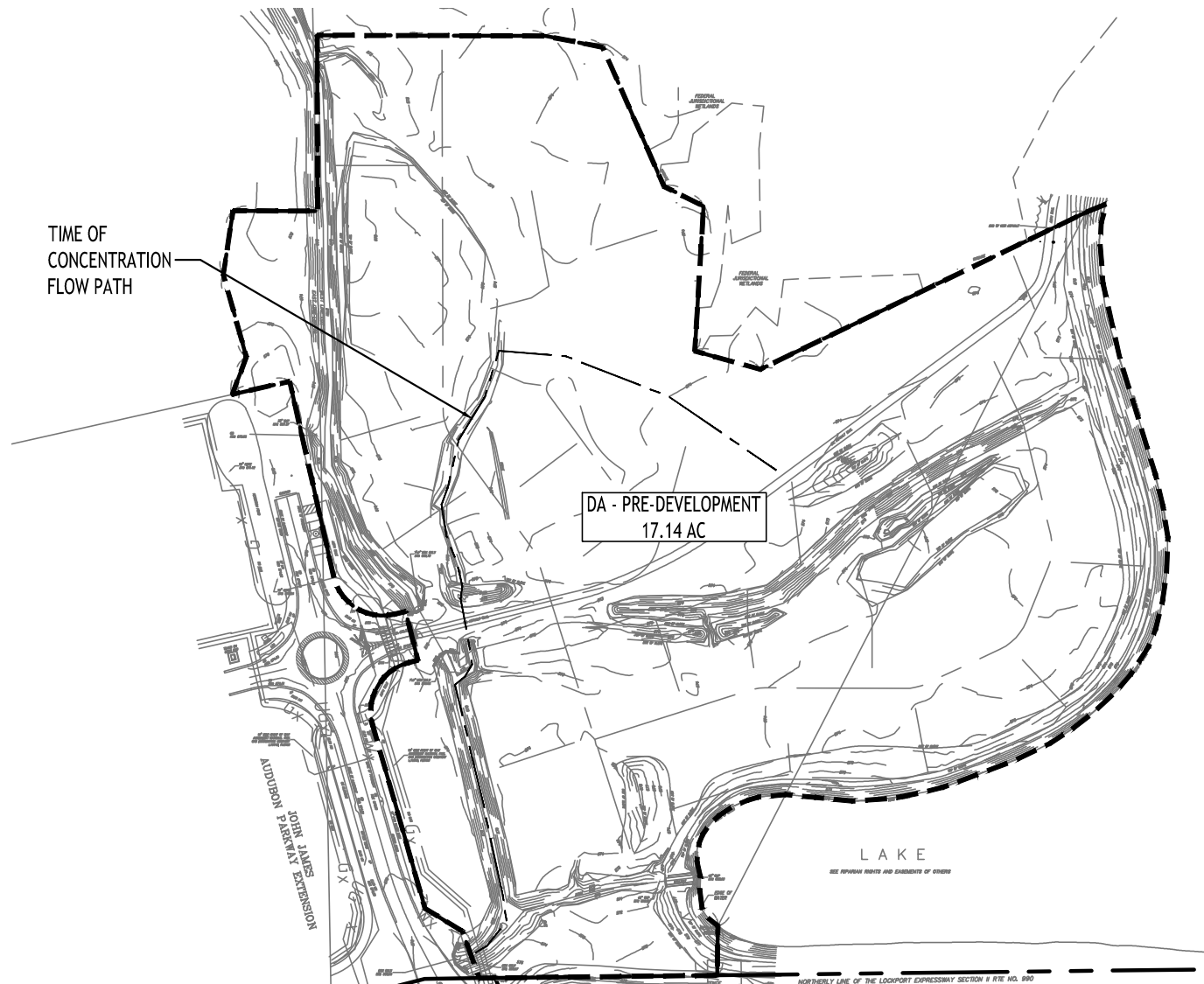
Print Date: 2/18/2026

Flow	Hyd	Location	Main/Brnch	Nzle	Size	Pitot	Flow	Comments
J05	B01	OP 205 BRYANT WOODS S	8"/6"	1:	2.50	77.0	1,472	
		1ST HYD SE/O BRYANT WOODS N		2:				
				3:				Total Flow: 1,472

Appendix B

Storm Sewer System Drainage Calculations

Existing Runoff



PRE-DEV DRAINAGE MAP

SCALE: 1"=200'

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS,
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Project Notes

Rainfall events imported from "NRCS2-Rain.txt" for 1421 NY Erie

Rainfall events imported from "NRCS2-Rain.txt" for 1421 NY Erie

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	NOAA10 24-hr	A	Default	24.00	1	1.91	2
2	10-Year	NOAA10 24-hr	A	Default	24.00	1	3.44	2
3	25-Year	NOAA10 24-hr	A	Default	24.00	1	4.15	2
4	100-Year	NOAA10 24-hr	A	Default	24.00	1	5.25	2

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NOAA10 24-hr A 1-Year Rainfall=1.91"

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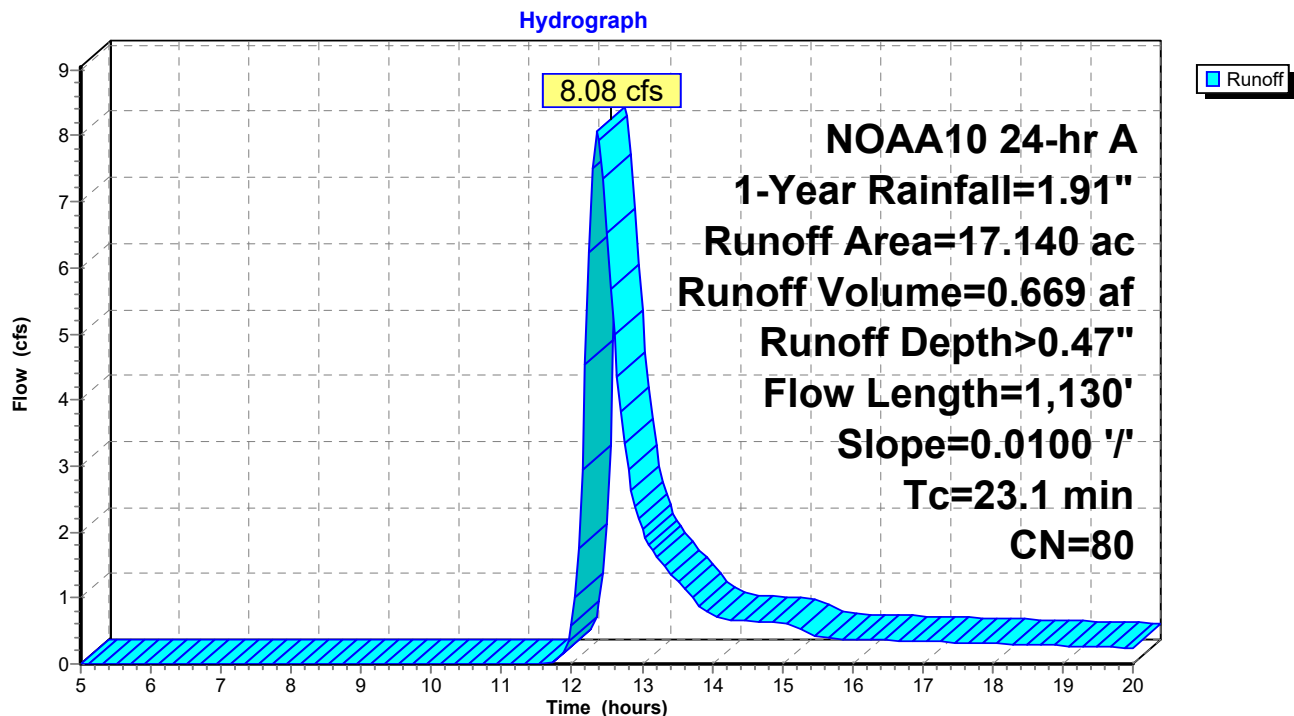
Summary for Subcatchment 18S: PRE-DEV DA

Runoff = 8.08 cfs @ 12.37 hrs, Volume= 0.669 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
0.230	98	Paved parking, HSG C
16.910	80	>75% Grass cover, Good, HSG D
17.140	80	Weighted Average
16.910		98.66% Pervious Area
0.230		1.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0100	0.11		Sheet Flow, SF - GRASS Grass: Short n= 0.150 P2= 2.20"
7.0	630	0.0100	1.50		Shallow Concentrated Flow, SCF - GRASS Grassed Waterway Kv= 15.0 fps
0.5	400	0.0100	12.71	1,270.51	Channel Flow, CF - DITCH Area= 100.0 sf Perim= 32.0' r= 3.13' n= 0.025 Earth, clean & winding
23.1	1,130	Total			

Subcatchment 18S: PRE-DEV DA

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NOAA10 24-hr A 10-Year Rainfall=3.44"

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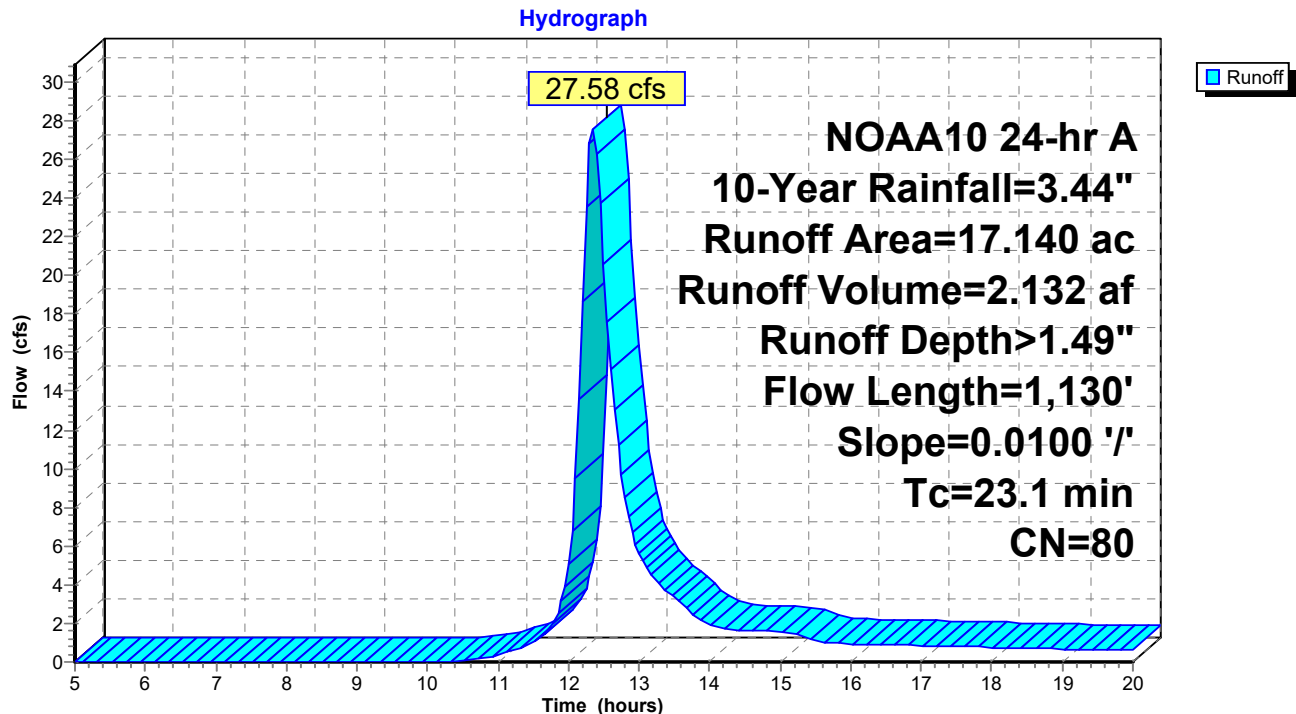
Summary for Subcatchment 18S: PRE-DEV DA

Runoff = 27.58 cfs @ 12.34 hrs, Volume= 2.132 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
0.230	98	Paved parking, HSG C
16.910	80	>75% Grass cover, Good, HSG D
17.140	80	Weighted Average
16.910		98.66% Pervious Area
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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23.1	1,130	Total			

Subcatchment 18S: PRE-DEV DA

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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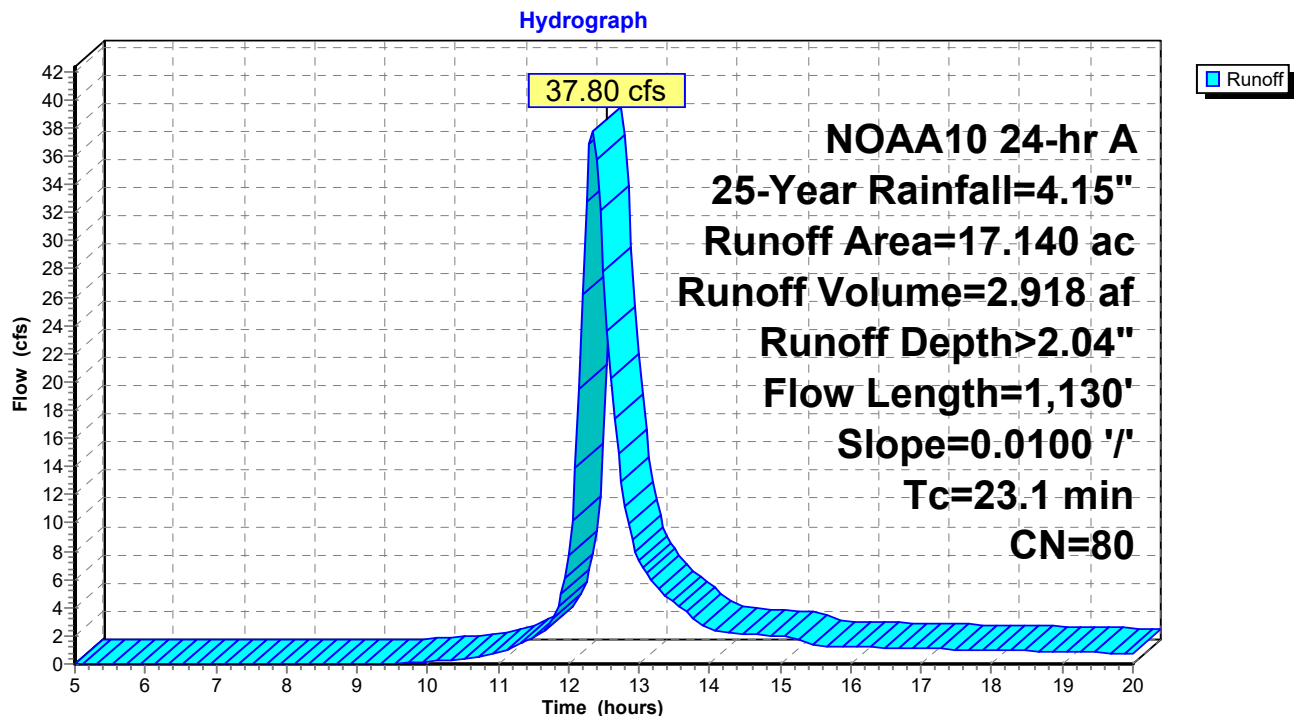
Summary for Subcatchment 18S: PRE-DEV DA

Runoff = 37.80 cfs @ 12.34 hrs, Volume= 2.918 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
0.230	98	Paved parking, HSG C
16.910	80	>75% Grass cover, Good, HSG D
17.140	80	Weighted Average
16.910		98.66% Pervious Area
0.230		1.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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0.5	400	0.0100	12.71	1,270.51	Channel Flow, CF - DITCH Area= 100.0 sf Perim= 32.0' r= 3.13' n= 0.025 Earth, clean & winding
23.1	1,130	Total			

Subcatchment 18S: PRE-DEV DA

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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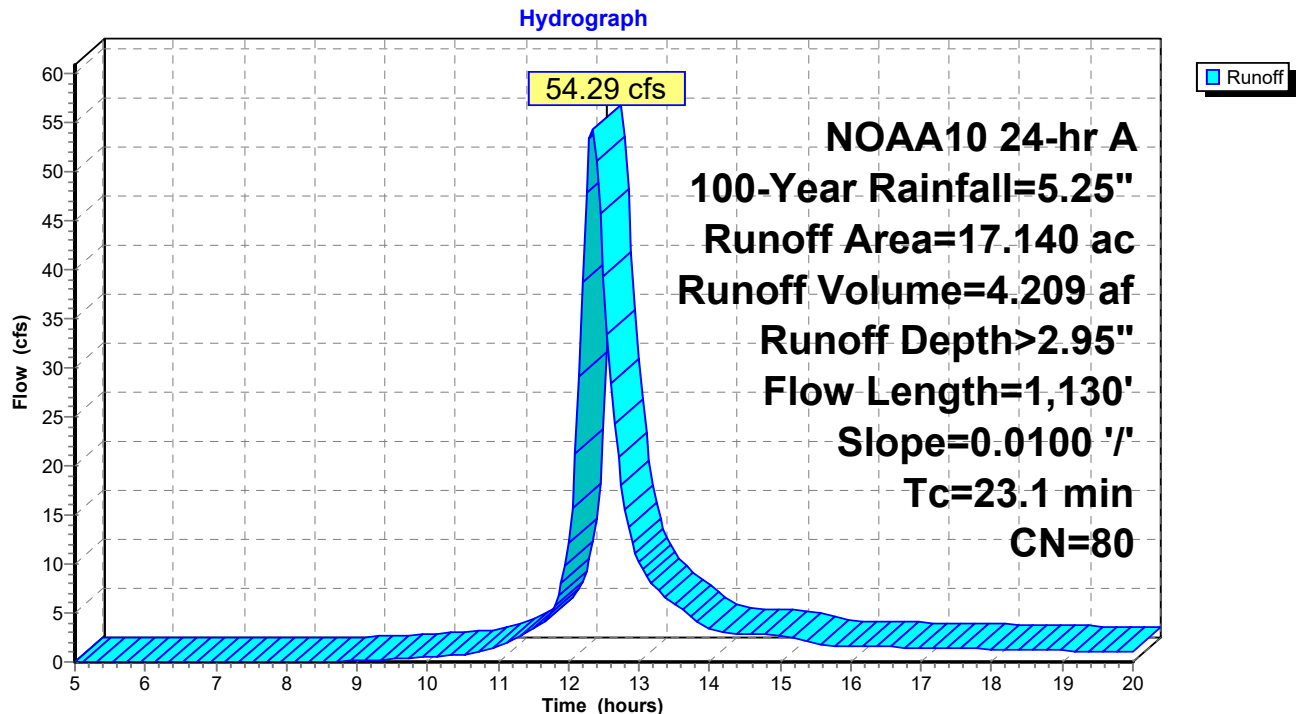
Summary for Subcatchment 18S: PRE-DEV DA

Runoff = 54.29 cfs @ 12.34 hrs, Volume= 4.209 af, Depth> 2.95"

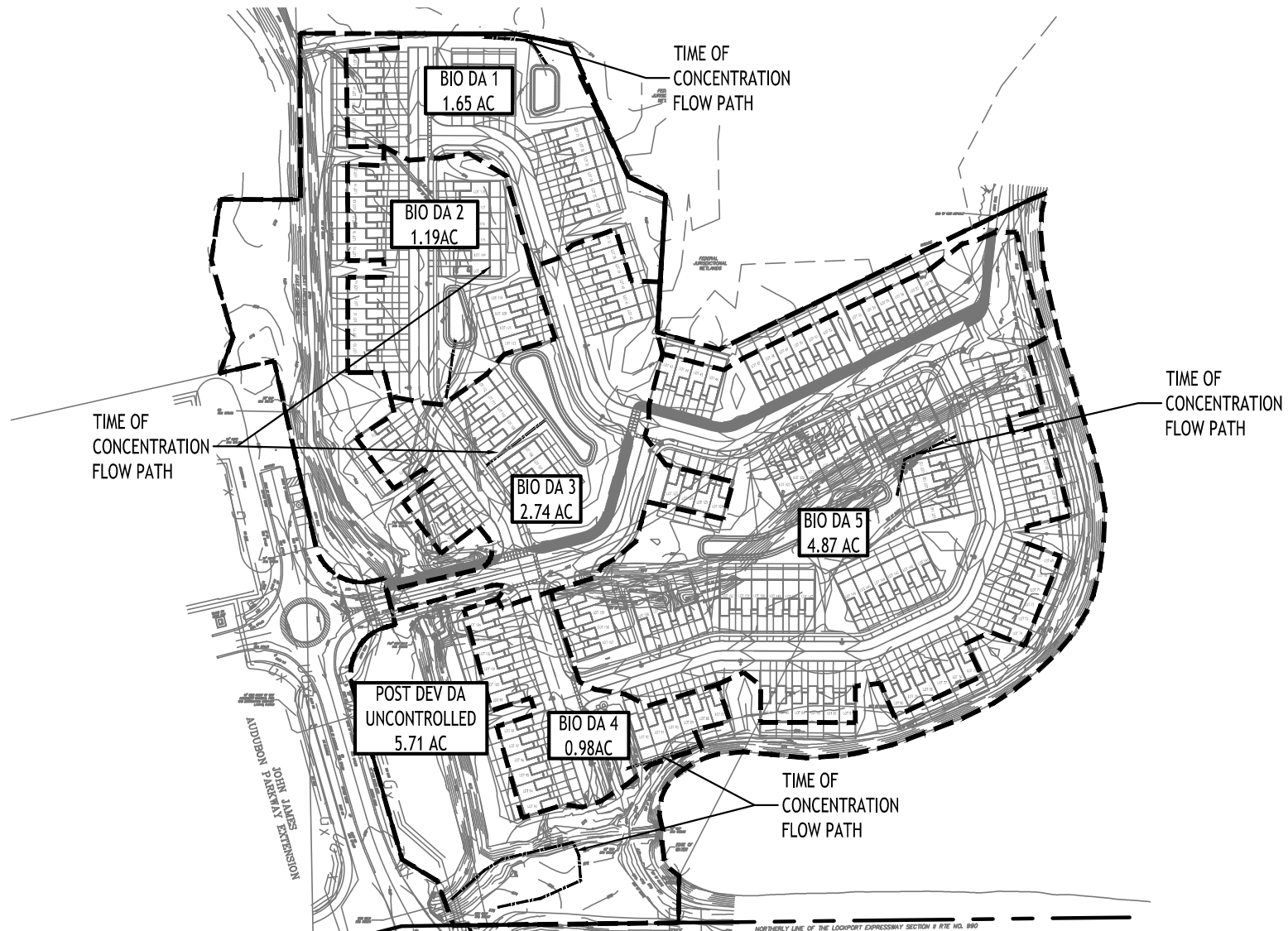
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
0.230	98	Paved parking, HSG C
16.910	80	>75% Grass cover, Good, HSG D
17.140	80	Weighted Average
16.910		98.66% Pervious Area
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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23.1	1,130	Total			

Subcatchment 18S: PRE-DEV DA

Proposed Runoff

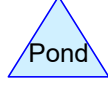
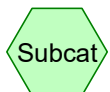
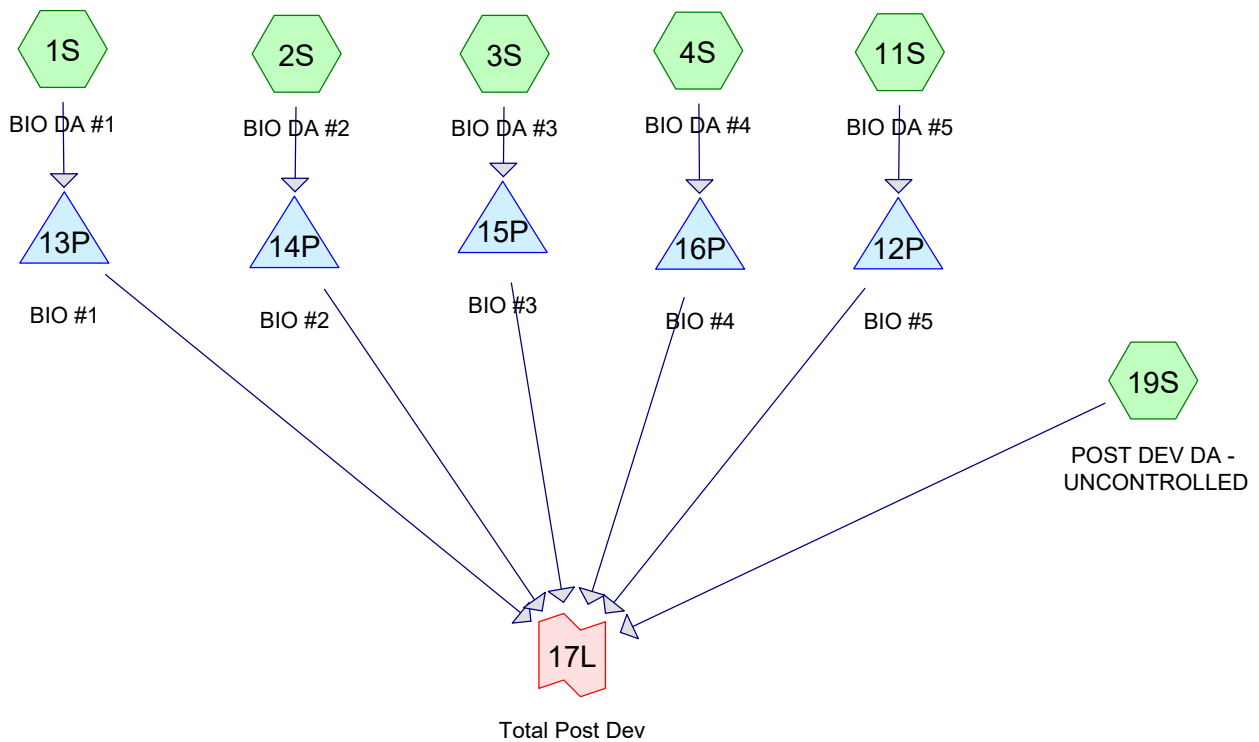


POST-DEV DRAINAGE MAP

SCALE: 1"=200'

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2	10-Year	NOAA10 24-hr	A	Default	24.00	1	3.44	2
3	25-Year	NOAA10 24-hr	A	Default	24.00	1	4.15	2
4	100-Year	NOAA10 24-hr	A	Default	24.00	1	5.25	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
9.820	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S, 11S, 19S)
2.150	98	Paved parking, HSG D (1S, 2S, 3S, 4S, 11S)
5.170	98	Roofs, HSG D (1S, 2S, 3S, 4S, 11S)
17.140	88	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
17.140	HSG D	1S, 2S, 3S, 4S, 11S, 19S
0.000	Other	
17.140		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	9.820	0.000	9.820	>75% Grass cover, Good	1S, 2S, 3S, 4S, 11S, 19S
0.000	0.000	0.000	2.150	0.000	2.150	Paved parking	1S, 2S, 3S, 4S, 11S
0.000	0.000	0.000	5.170	0.000	5.170	Roofs	1S, 2S, 3S, 4S, 11S
0.000	0.000	0.000	17.140	0.000	17.140	TOTAL AREA	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	12P	568.25	567.04	401.0	0.0030	0.013	0.0	24.0	0.0	
2	12P	568.25	568.25	203.0	0.0000	0.012	0.0	8.0	0.0	
3	13P	568.00	567.37	315.0	0.0020	0.013	0.0	18.0	0.0	
4	13P	568.00	568.00	67.0	0.0000	0.012	0.0	8.0	0.0	
5	14P	568.00	567.47	176.0	0.0030	0.013	0.0	18.0	0.0	
6	14P	568.00	568.00	70.0	0.0000	0.012	0.0	8.0	0.0	
7	15P	568.00	567.34	272.0	0.0024	0.013	0.0	24.0	0.0	
8	15P	568.00	568.00	75.0	0.0000	0.012	0.0	8.0	0.0	
9	16P	568.00	567.39	203.0	0.0030	0.013	0.0	18.0	0.0	
10	16P	568.00	568.00	50.0	0.0000	0.012	0.0	8.0	0.0	

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NOAA10 24-hr A 1-Year Rainfall=1.91"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: BIO DA #1 Runoff Area=1.650 ac 50.91% Impervious Runoff Depth>0.90"
Flow Length=72' Slope=0.0150 '/' Tc=7.8 min CN=89 Runoff=2.67 cfs 0.124 af

Subcatchment2S: BIO DA #2 Runoff Area=1.190 ac 75.63% Impervious Runoff Depth>1.25"
Flow Length=85' Slope=0.0200 '/' Tc=7.1 min CN=94 Runoff=2.64 cfs 0.124 af

Subcatchment3S: BIO DA #3 Runoff Area=2.740 ac 66.42% Impervious Runoff Depth>1.10"
Flow Length=110' Slope=0.0200 '/' Tc=7.3 min CN=92 Runoff=5.43 cfs 0.251 af

Subcatchment4S: BIO DA #4 Runoff Area=0.980 ac 82.65% Impervious Runoff Depth>1.34"
Flow Length=95' Slope=0.0100 '/' Tc=9.5 min CN=95 Runoff=2.06 cfs 0.109 af

Subcatchment11S: BIO DA #5 Runoff Area=4.870 ac 60.57% Impervious Runoff Depth>1.03"
Flow Length=110' Tc=9.5 min CN=91 Runoff=8.21 cfs 0.418 af

Subcatchment19S: POST DEV DA - Runoff Area=5.710 ac 0.00% Impervious Runoff Depth>0.47"
Flow Length=340' Tc=10.6 min CN=80 Runoff=4.07 cfs 0.224 af

Pond 12P: BIO #5 Peak Elev=572.64' Storage=4,181 cf Inflow=8.21 cfs 0.418 af
Outflow=6.76 cfs 0.366 af

Pond 13P: BIO #1 Peak Elev=572.21' Storage=959 cf Inflow=2.67 cfs 0.124 af
Outflow=2.49 cfs 0.109 af

Pond 14P: BIO #2 Peak Elev=572.24' Storage=1,075 cf Inflow=2.64 cfs 0.124 af
Outflow=2.41 cfs 0.109 af

Pond 15P: BIO #3 Peak Elev=572.27' Storage=2,102 cf Inflow=5.43 cfs 0.251 af
Outflow=4.93 cfs 0.221 af

Pond 16P: BIO #4 Peak Elev=572.21' Storage=879 cf Inflow=2.06 cfs 0.109 af
Outflow=1.97 cfs 0.096 af

Link 17L: Total Post Dev Inflow=22.15 cfs 1.125 af
Primary=22.15 cfs 1.125 af

Total Runoff Area = 17.140 ac Runoff Volume = 1.252 af Average Runoff Depth = 0.88"
57.29% Pervious = 9.820 ac 42.71% Impervious = 7.320 ac

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NOAA10 24-hr A 1-Year Rainfall=1.91"

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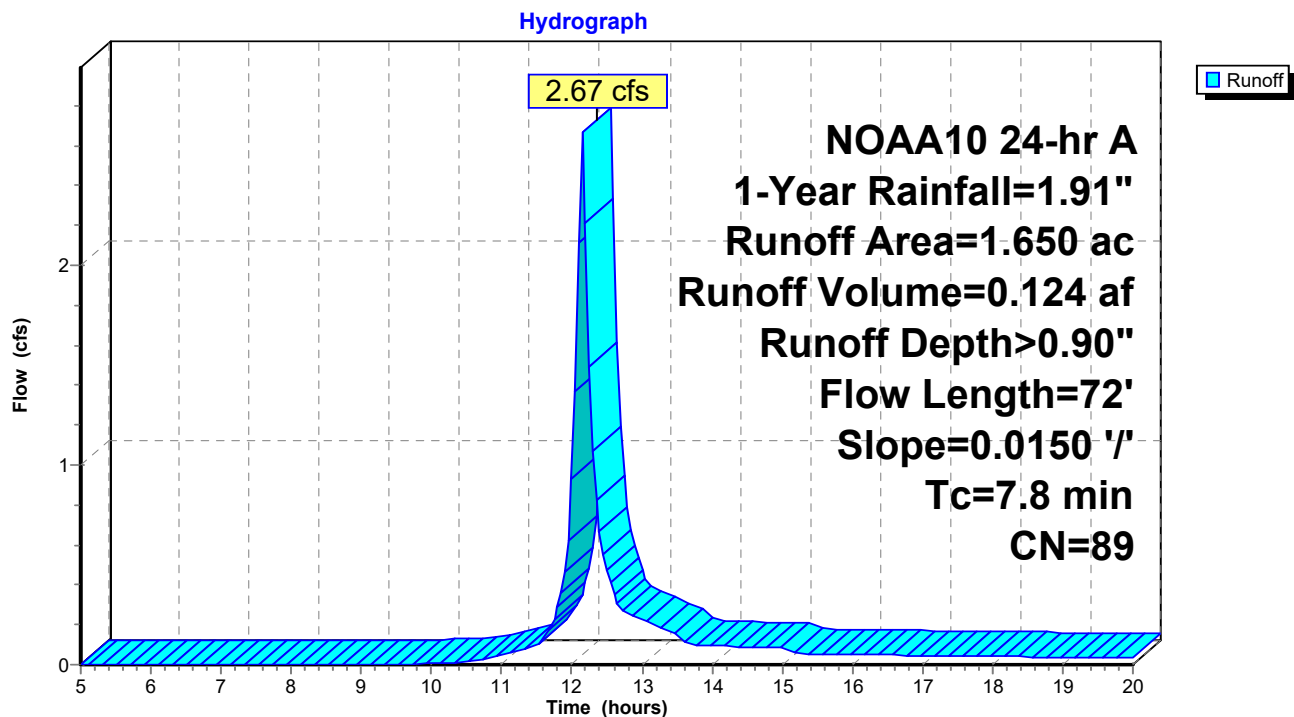
Summary for Subcatchment 1S: BIO DA #1

Runoff = 2.67 cfs @ 12.15 hrs, Volume= 0.124 af, Depth> 0.90"
Routed to Pond 13P : BIO #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.260	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
1.650	89	Weighted Average
0.810		49.09% Pervious Area
0.840		50.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0150	0.11		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.2	22	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
7.8	72	Total			

Subcatchment 1S: BIO DA #1

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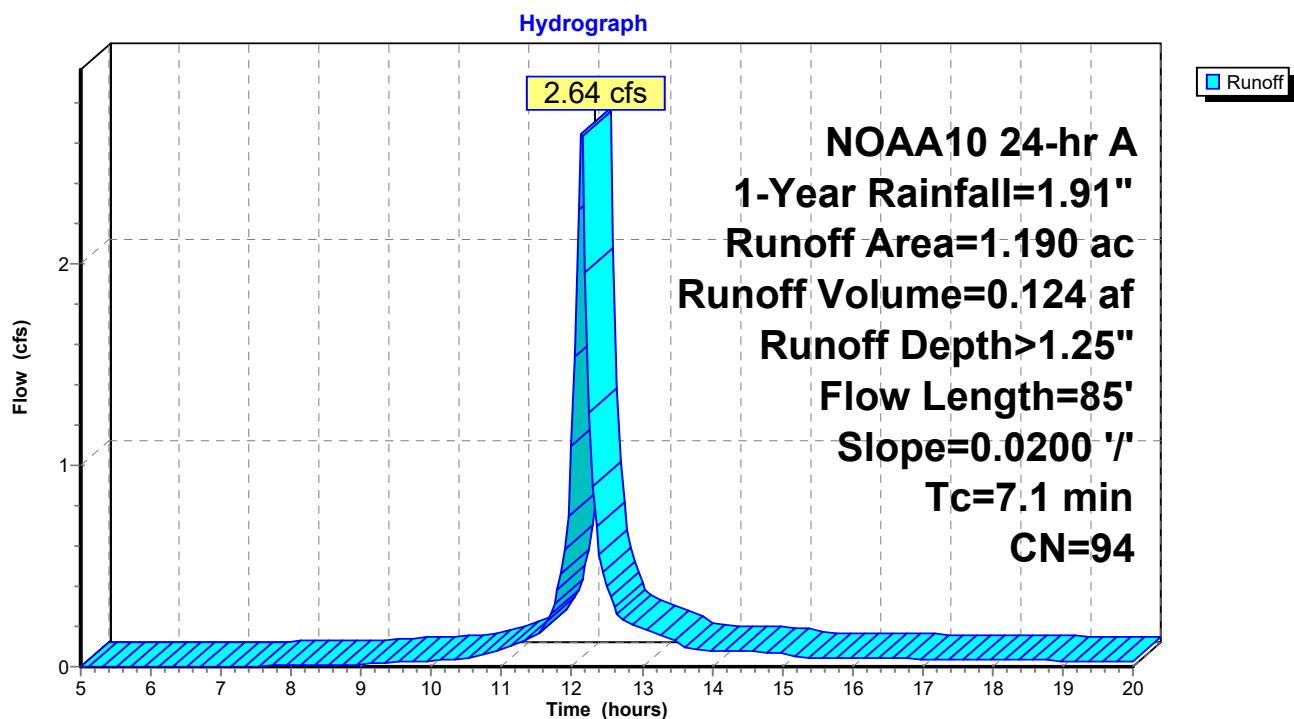
Summary for Subcatchment 2S: BIO DA #2

Runoff = 2.64 cfs @ 12.14 hrs, Volume= 0.124 af, Depth> 1.25"
Routed to Pond 14P : BIO #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
0.710	98	Roofs, HSG D
0.190	98	Paved parking, HSG D
0.290	80	>75% Grass cover, Good, HSG D
1.190	94	Weighted Average
0.290		24.37% Pervious Area
0.900		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.3	35	0.0200	2.12		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
7.1	85	Total			

Subcatchment 2S: BIO DA #2

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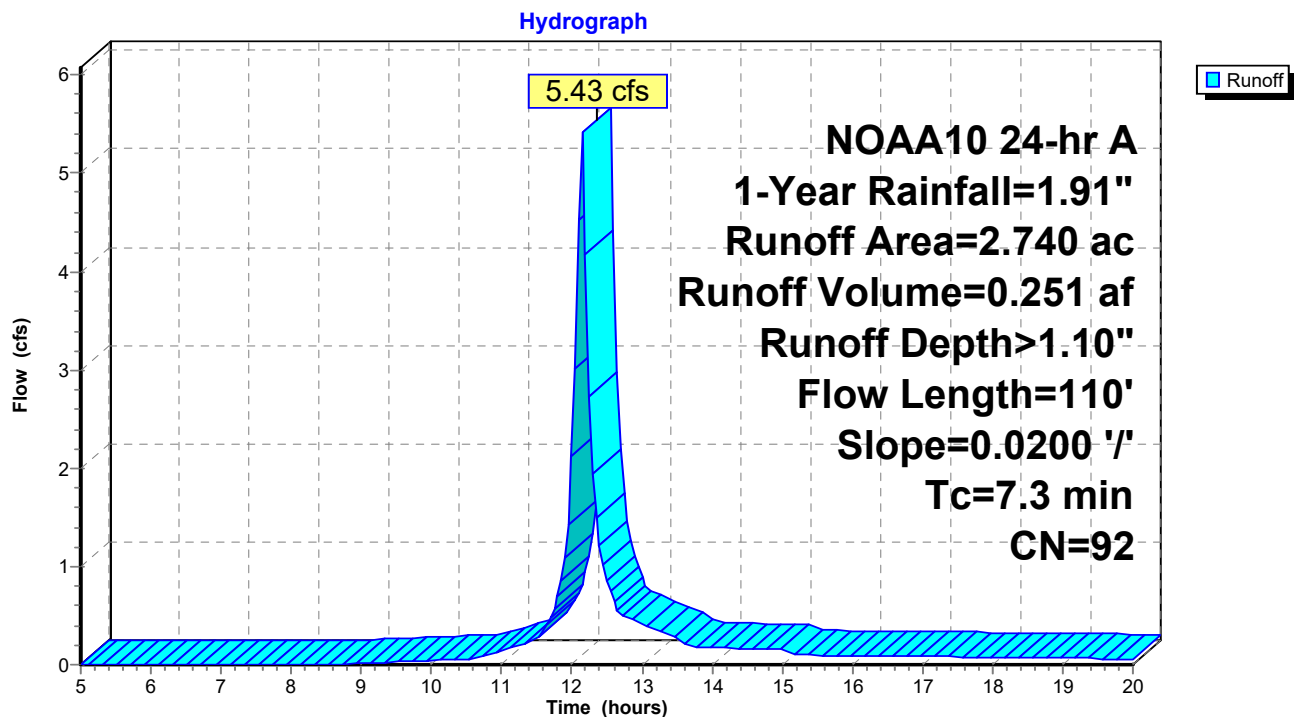
Summary for Subcatchment 3S: BIO DA #3

Runoff = 5.43 cfs @ 12.15 hrs, Volume= 0.251 af, Depth> 1.10"
Routed to Pond 15P : BIO #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
1.230	98	Roofs, HSG D
0.590	98	Paved parking, HSG D
0.920	80	>75% Grass cover, Good, HSG D
2.740	92	Weighted Average
0.920		33.58% Pervious Area
1.820		66.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
7.3	110	Total			

Subcatchment 3S: BIO DA #3

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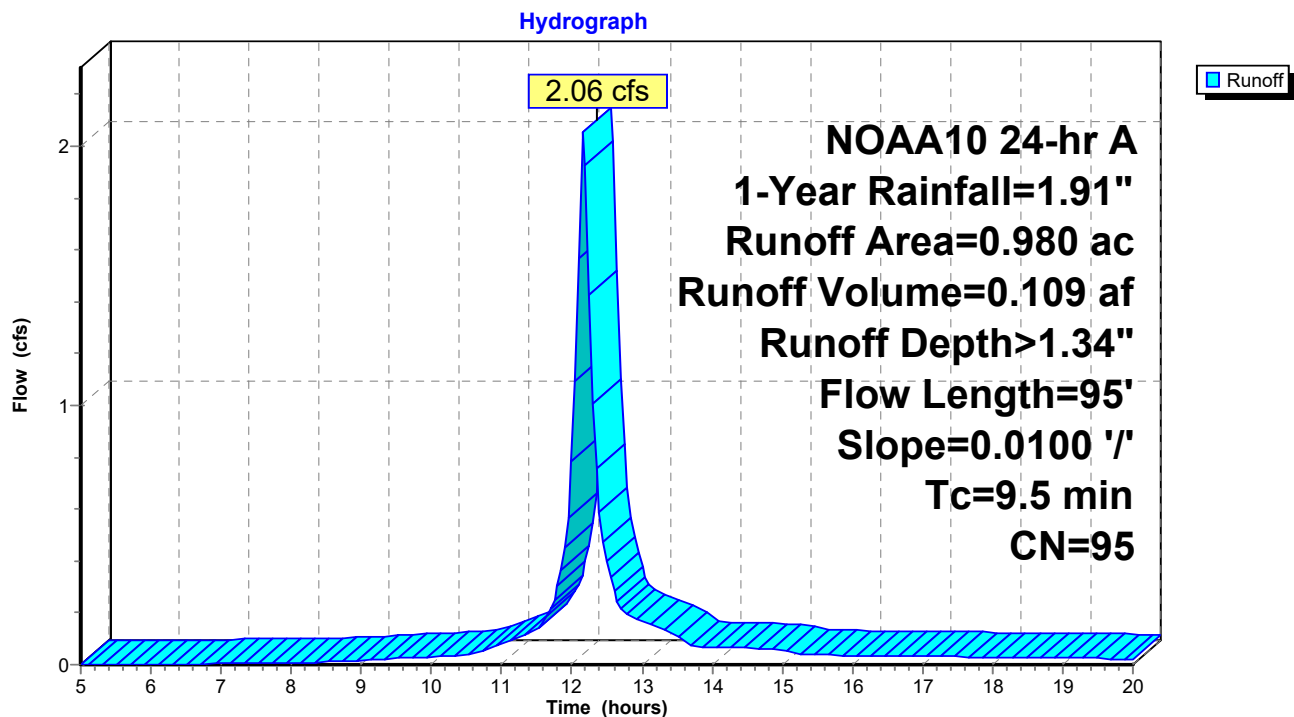
Summary for Subcatchment 4S: BIO DA #4

Runoff = 2.06 cfs @ 12.17 hrs, Volume= 0.109 af, Depth> 1.34"
Routed to Pond 16P : BIO #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.230	98	Paved parking, HSG D
0.170	80	>75% Grass cover, Good, HSG D
0.980	95	Weighted Average
0.170		17.35% Pervious Area
0.810		82.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.5	45	0.0100	1.50		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
9.5	95	Total			

Subcatchment 4S: BIO DA #4

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Summary for Subcatchment 11S: BIO DA #5

Runoff = 8.21 cfs @ 12.17 hrs, Volume= 0.418 af, Depth> 1.03"
 Routed to Pond 12P : BIO #5

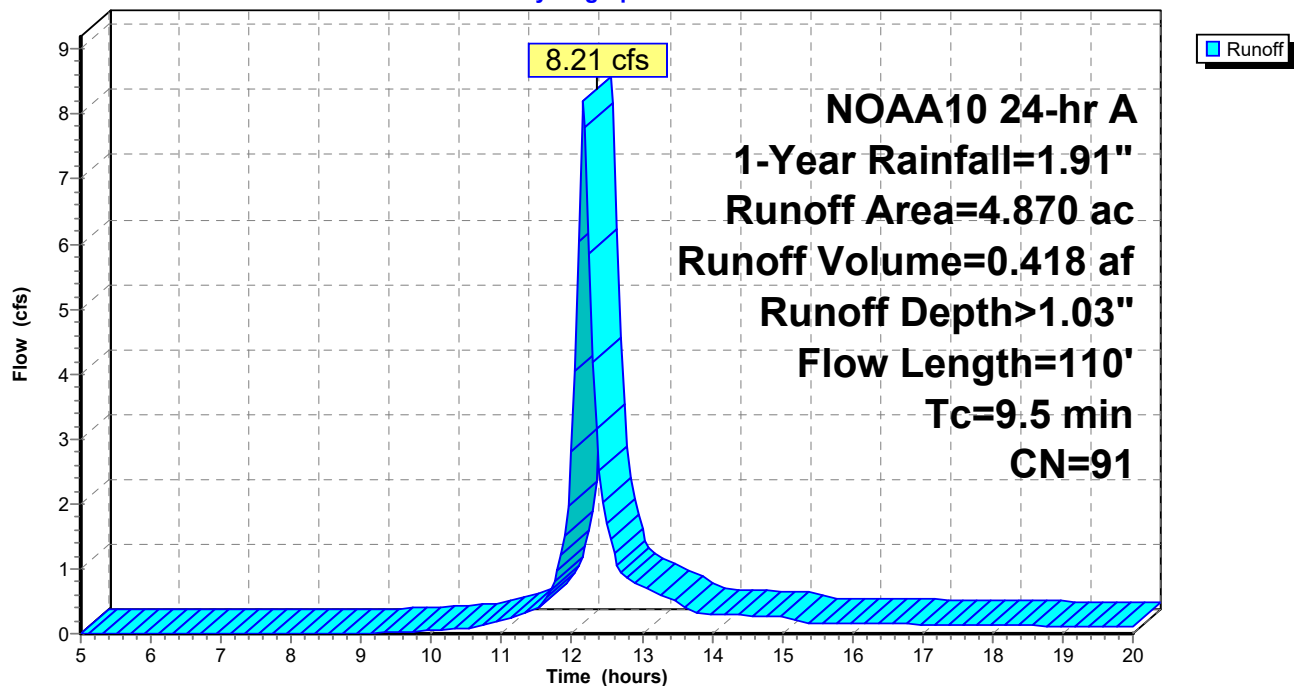
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
2.070	98	Roofs, HSG D
0.880	98	Paved parking, HSG D
1.920	80	>75% Grass cover, Good, HSG D
4.870	91	Weighted Average
1.920		39.43% Pervious Area
2.950		60.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
9.5	110	Total			

Subcatchment 11S: BIO DA #5

Hydrograph



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NOAA10 24-hr A 1-Year Rainfall=1.91"

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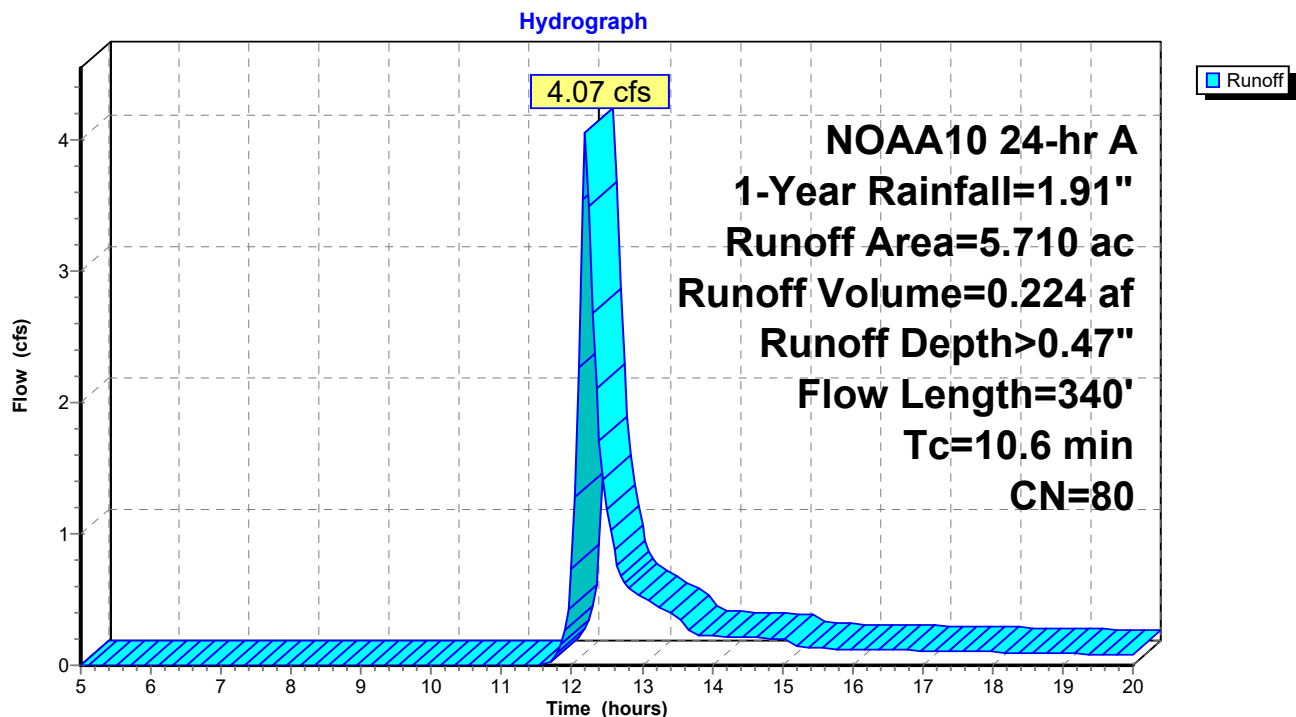
Summary for Subcatchment 19S: POST DEV DA - UNCONTROLLED

Runoff = 4.07 cfs @ 12.20 hrs, Volume= 0.224 af, Depth> 0.47"
 Routed to Link 17L : Total Post Dev

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 1-Year Rainfall=1.91"

Area (ac)	CN	Description
5.710	80	>75% Grass cover, Good, HSG D
5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0300	0.17		Sheet Flow, SF - GRASS Grass: Short n= 0.150 P2= 2.20"
0.4	60	0.0300	2.60		Shallow Concentrated Flow, SCF -GRASS Grassed Waterway Kv= 15.0 fps
0.2	180	0.0100	12.71	1,270.51	Channel Flow, CF - DITCH Area= 100.0 sf Perim= 32.0' r= 3.13' n= 0.025 Earth, clean & winding
10.6	340	Total			

Subcatchment 19S: POST DEV DA - UNCONTROLLED

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NOAA10 24-hr A 1-Year Rainfall=1.91"

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Summary for Pond 12P: BIO #5

Inflow Area = 4.870 ac, 60.57% Impervious, Inflow Depth > 1.03" for 1-Year event
 Inflow = 8.21 cfs @ 12.17 hrs, Volume= 0.418 af
 Outflow = 6.76 cfs @ 12.23 hrs, Volume= 0.366 af, Atten= 18%, Lag= 3.7 min
 Primary = 6.76 cfs @ 12.23 hrs, Volume= 0.366 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.64' @ 12.23 hrs Surf.Area= 5,420 sf Storage= 4,181 cf

Plug-Flow detention time= 56.0 min calculated for 0.365 af (87% of inflow)
 Center-of-Mass det. time= 19.4 min (805.1 - 785.7)

Volume	Invert	Avail.Storage	Storage Description
#1	571.75'	13,050 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.75	4,000	0	0
572.00	4,400	1,050	1,050
573.00	6,000	5,200	6,250
574.00	7,600	6,800	13,050

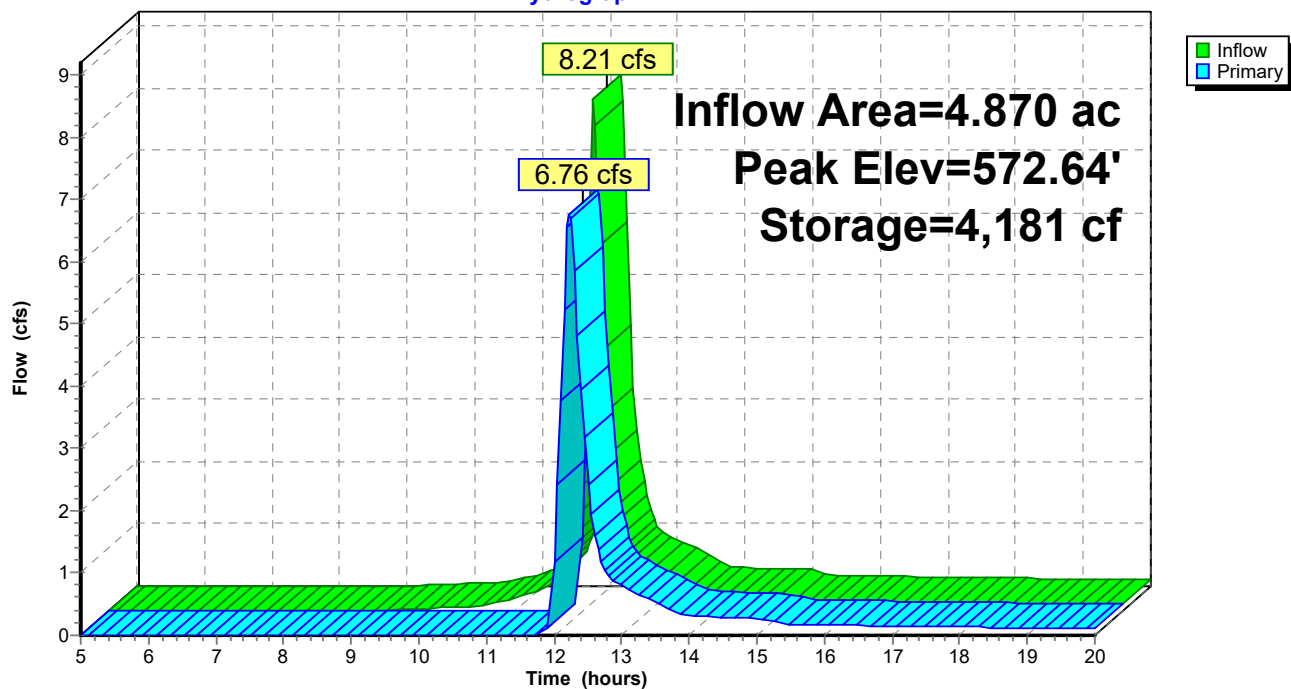
Device	Routing	Invert	Outlet Devices
#1	Primary	568.25'	24.0" Round Culvert L= 401.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 567.04' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 3	572.25'	24.0" W x 24.0" H Vert. YARD DRAINS X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	568.25'	8.0" Round 8" PHDPE UNDERDRAIN L= 203.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 568.25' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#4	Device 1	573.00'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#5	Device 1	572.25'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=6.64 cfs @ 12.23 hrs HW=572.63' (Free Discharge)

1=Culvert (Passes 6.64 cfs of 18.74 cfs potential flow)
 3=8" PHDPE UNDERDRAIN (Barrel Controls 1.64 cfs @ 4.70 fps)
 2=YARD DRAINS (Passes 1.64 cfs of 4.55 cfs potential flow)
 4=OUTLET STRUCTURE (Controls 0.00 cfs)
 5=Sharp-Crested Rectangular Weir (Weir Controls 5.00 cfs @ 2.21 fps)

Pond 12P: BIO #5

Hydrograph



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NOAA10 24-hr A 1-Year Rainfall=1.91"

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Summary for Pond 13P: BIO #1

Inflow Area = 1.650 ac, 50.91% Impervious, Inflow Depth > 0.90" for 1-Year event
 Inflow = 2.67 cfs @ 12.15 hrs, Volume= 0.124 af
 Outflow = 2.49 cfs @ 12.18 hrs, Volume= 0.109 af, Atten= 7%, Lag= 1.6 min
 Primary = 2.49 cfs @ 12.18 hrs, Volume= 0.109 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.21' @ 12.18 hrs Surf.Area= 1,578 sf Storage= 959 cf

Plug-Flow detention time= 51.8 min calculated for 0.109 af (88% of inflow)
 Center-of-Mass det. time= 15.2 min (806.0 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,408 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,140	0	0
573.00	2,070	2,408	2,408

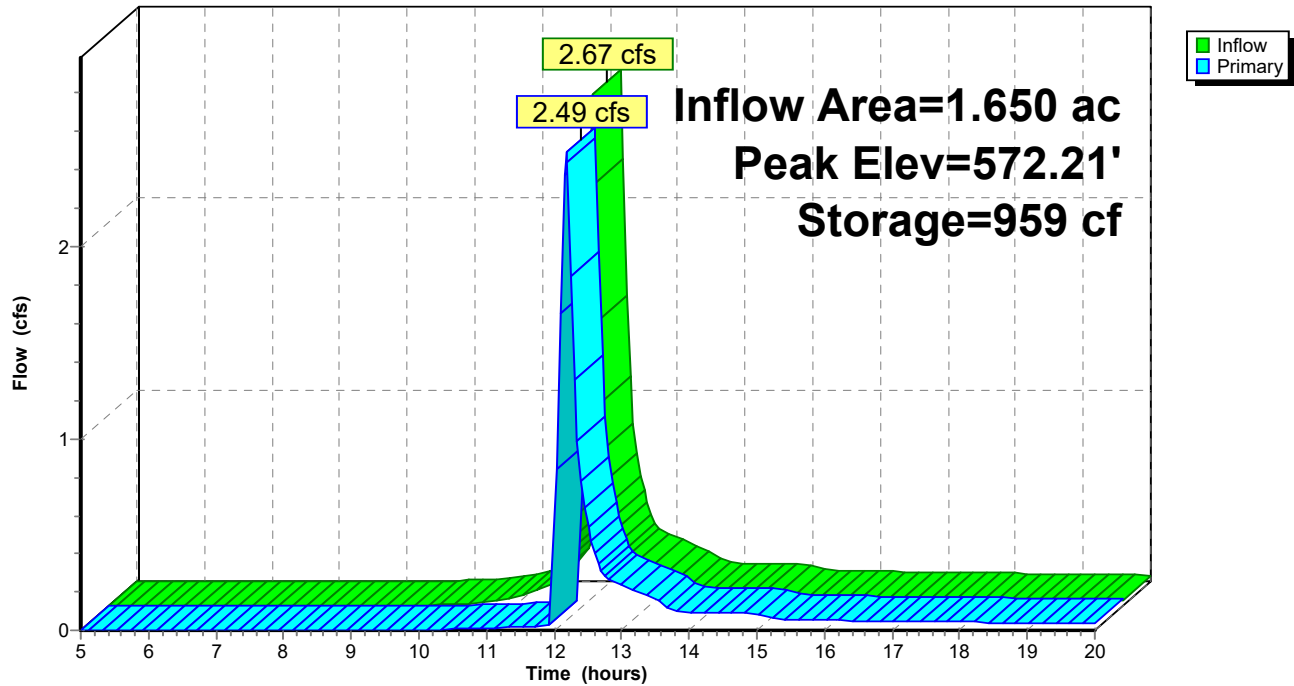
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 315.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.37' S= 0.0020 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=2.41 cfs @ 12.18 hrs HW=572.20' (Free Discharge)

1=Culvert (Passes 2.41 cfs of 9.61 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.18 cfs of 2.46 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.16 cfs @ 1.44 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 1.23 cfs @ 1.54 fps)

Pond 13P: BIO #1

Hydrograph



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Summary for Pond 14P: BIO #2

Inflow Area = 1.190 ac, 75.63% Impervious, Inflow Depth > 1.25" for 1-Year event
 Inflow = 2.64 cfs @ 12.14 hrs, Volume= 0.124 af
 Outflow = 2.41 cfs @ 12.17 hrs, Volume= 0.109 af, Atten= 9%, Lag= 1.7 min
 Primary = 2.41 cfs @ 12.17 hrs, Volume= 0.109 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.24' @ 12.17 hrs Surf.Area= 1,709 sf Storage= 1,075 cf

Plug-Flow detention time= 56.0 min calculated for 0.109 af (87% of inflow)
 Center-of-Mass det. time= 18.3 min (790.2 - 771.9)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,573 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,190	0	0
573.00	2,240	2,573	2,573

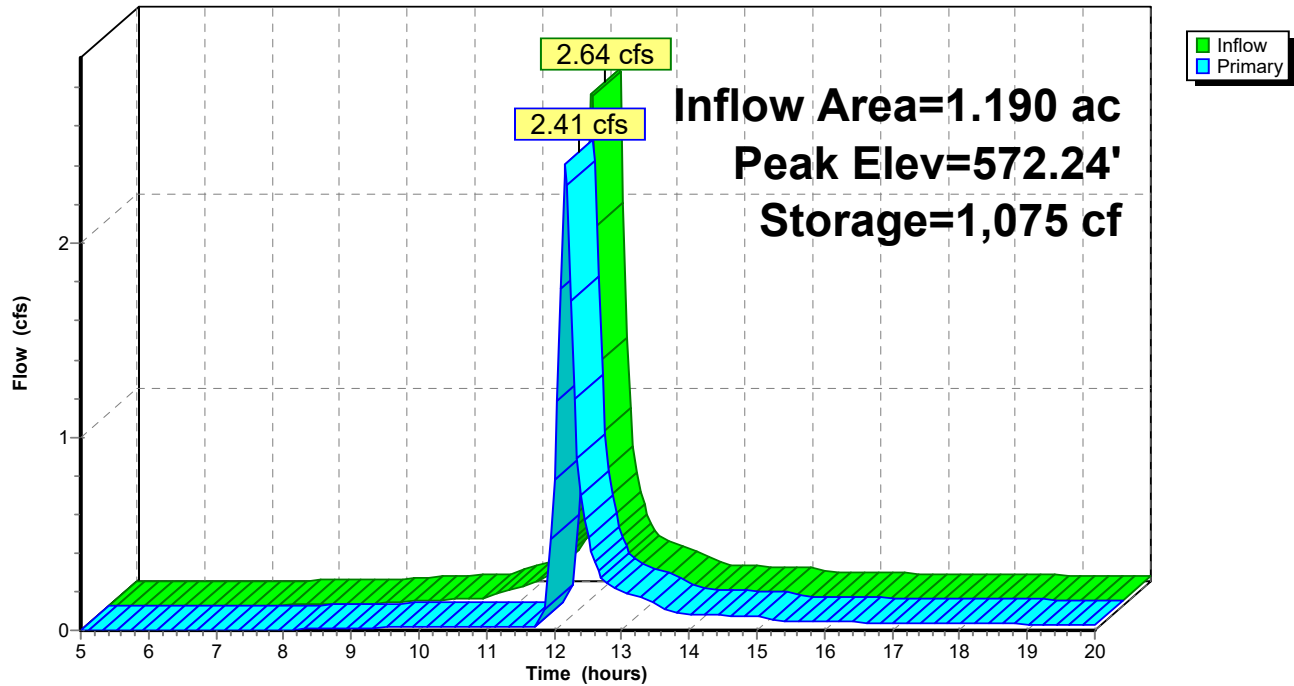
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 176.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.47' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 70.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=2.33 cfs @ 12.17 hrs HW=572.24' (Free Discharge)

1=Culvert (Passes 2.33 cfs of 11.80 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 0.76 cfs of 2.44 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 0.74 cfs @ 1.56 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 1.57 cfs @ 1.68 fps)

Pond 14P: BIO #2

Hydrograph



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NOAA10 24-hr A 1-Year Rainfall=1.91"

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Summary for Pond 15P: BIO #3

Inflow Area = 2.740 ac, 66.42% Impervious, Inflow Depth > 1.10" for 1-Year event
 Inflow = 5.43 cfs @ 12.15 hrs, Volume= 0.251 af
 Outflow = 4.93 cfs @ 12.18 hrs, Volume= 0.221 af, Atten= 9%, Lag= 1.8 min
 Primary = 4.93 cfs @ 12.18 hrs, Volume= 0.221 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.27' @ 12.18 hrs Surf.Area= 3,049 sf Storage= 2,102 cf

Plug-Flow detention time= 52.8 min calculated for 0.221 af (88% of inflow)
 Center-of-Mass det. time= 17.0 min (797.3 - 780.4)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	4,930 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	2,400	0	0
572.00	2,800	1,300	1,300
573.10	3,800	3,630	4,930

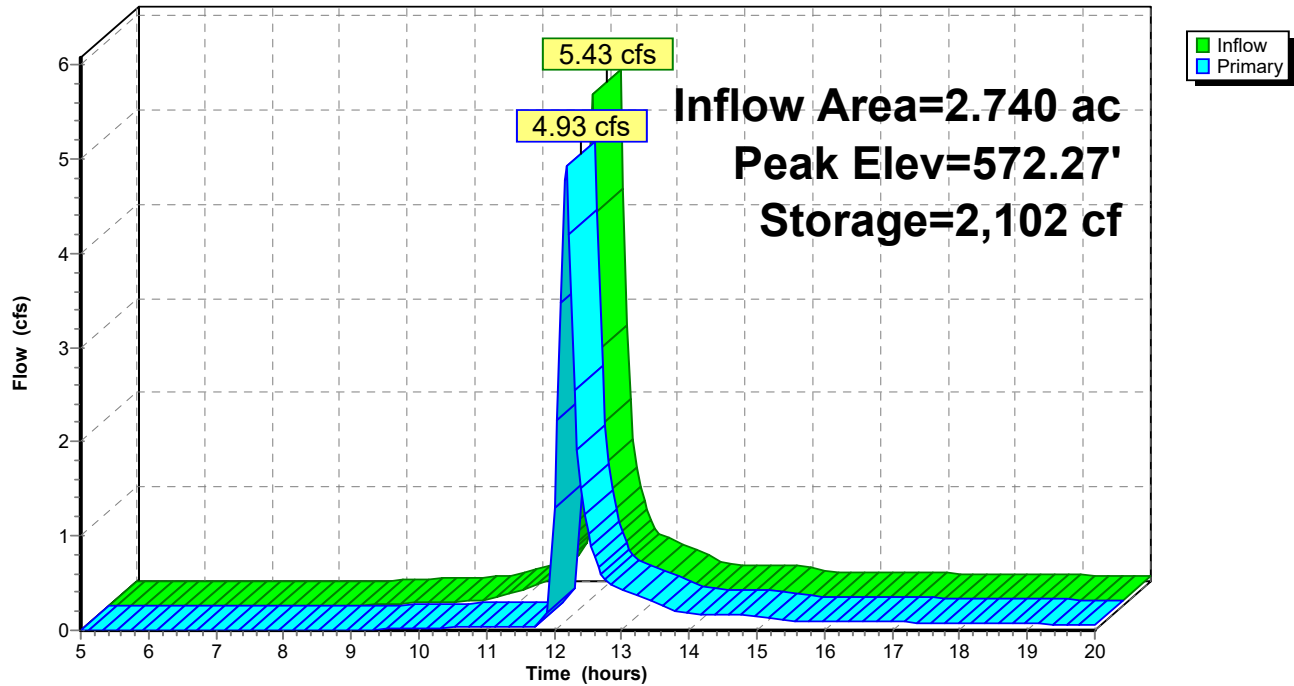
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	24.0" Round Culvert L= 272.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.34' S= 0.0024 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 75.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=4.78 cfs @ 12.18 hrs HW=572.27' (Free Discharge)

1=Culvert (Passes 4.78 cfs of 19.51 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 0.93 cfs of 2.39 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 0.89 cfs @ 1.66 fps)
 3=Exfiltration (Exfiltration Controls 0.04 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 3.85 cfs @ 1.81 fps)

Pond 15P: BIO #3

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 1-Year Rainfall=1.91"

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Summary for Pond 16P: BIO #4

Inflow Area = 0.980 ac, 82.65% Impervious, Inflow Depth > 1.34" for 1-Year event
 Inflow = 2.06 cfs @ 12.17 hrs, Volume= 0.109 af
 Outflow = 1.97 cfs @ 12.20 hrs, Volume= 0.096 af, Atten= 5%, Lag= 1.9 min
 Primary = 1.97 cfs @ 12.20 hrs, Volume= 0.096 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.21' @ 12.20 hrs Surf.Area= 1,420 sf Storage= 879 cf

Plug-Flow detention time= 55.4 min calculated for 0.096 af (87% of inflow)
 Center-of-Mass det. time= 18.4 min (787.2 - 768.8)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,160 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,050	0	0
573.00	1,830	2,160	2,160

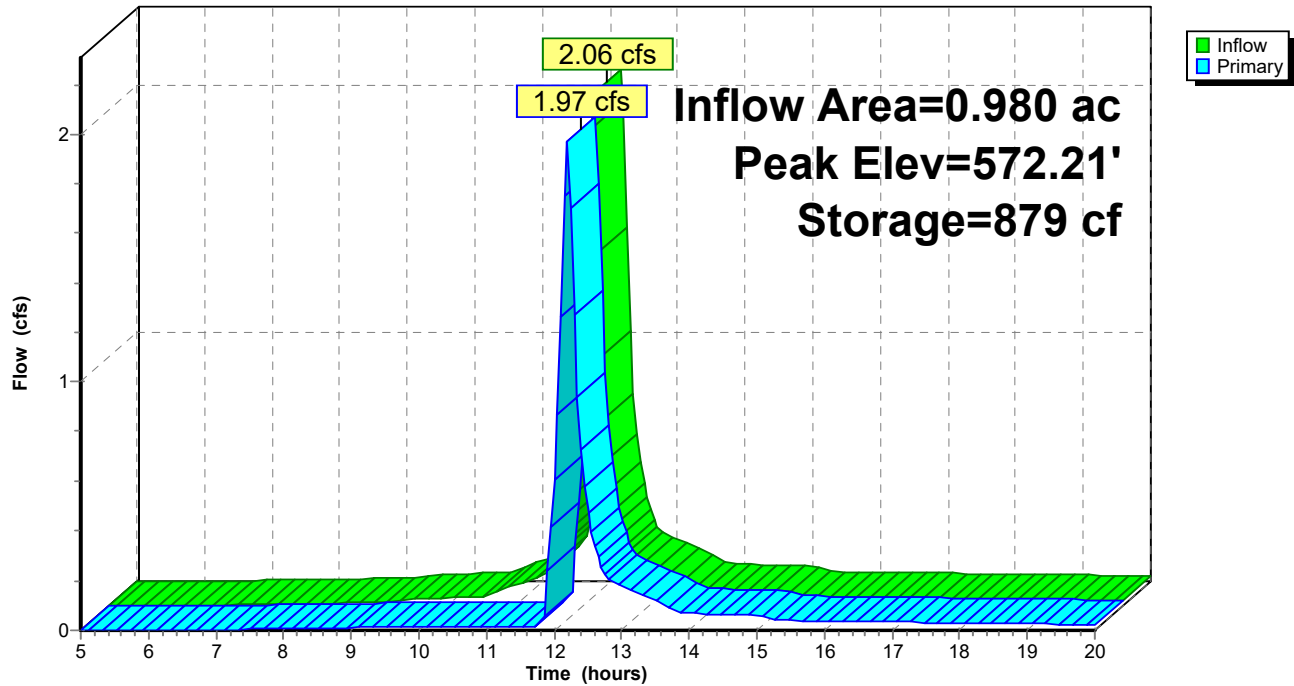
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 203.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.39' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 50.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=1.95 cfs @ 12.20 hrs HW=572.21' (Free Discharge)

1=Culvert (Passes 1.95 cfs of 11.32 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 0.64 cfs of 2.71 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 0.62 cfs @ 1.47 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 1.31 cfs @ 1.58 fps)

Pond 16P: BIO #4

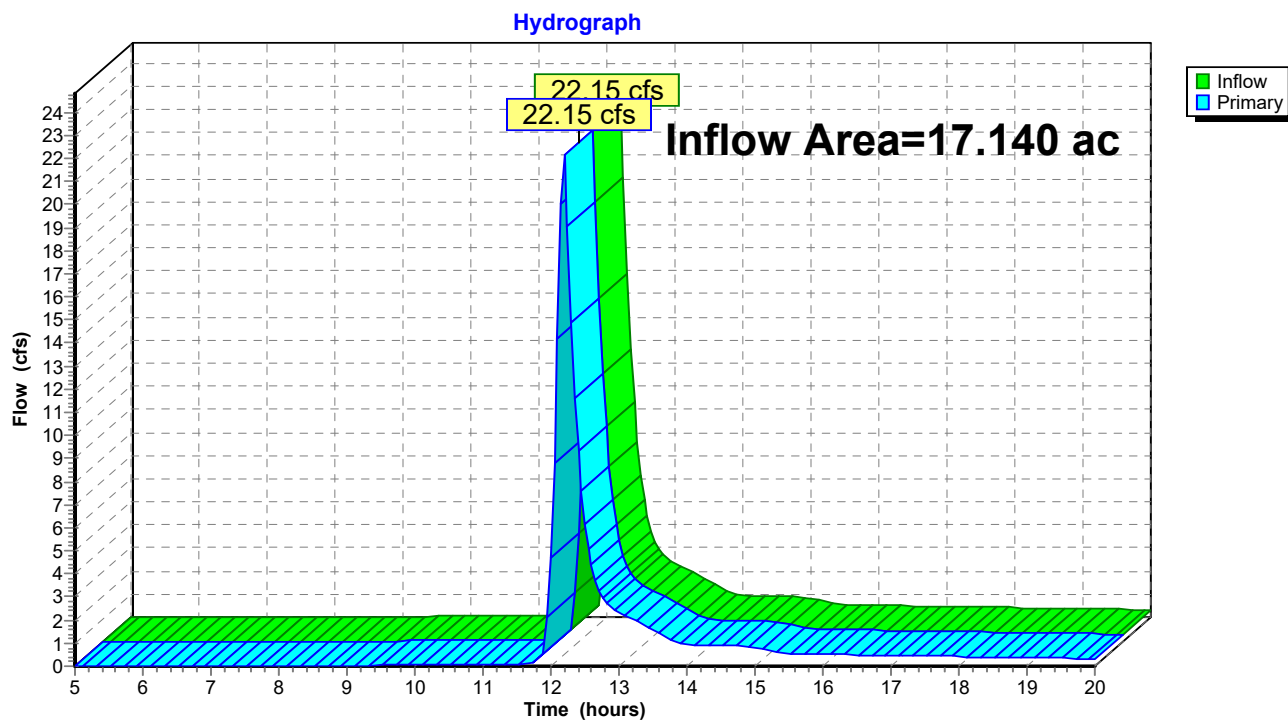
Hydrograph



Summary for Link 17L: Total Post Dev

Inflow Area = 17.140 ac, 42.71% Impervious, Inflow Depth > 0.79" for 1-Year event
Inflow = 22.15 cfs @ 12.20 hrs, Volume= 1.125 af
Primary = 22.15 cfs @ 12.20 hrs, Volume= 1.125 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 17L: Total Post Dev

25-4080 HYDROCAD

NOAA10 24-hr A 10-Year Rainfall=3.44"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: BIO DA #1 Runoff Area=1.650 ac 50.91% Impervious Runoff Depth>2.20"
Flow Length=72' Slope=0.0150 '/' Tc=7.8 min CN=89 Runoff=6.29 cfs 0.302 af

Subcatchment2S: BIO DA #2 Runoff Area=1.190 ac 75.63% Impervious Runoff Depth>2.67"
Flow Length=85' Slope=0.0200 '/' Tc=7.1 min CN=94 Runoff=5.35 cfs 0.264 af

Subcatchment3S: BIO DA #3 Runoff Area=2.740 ac 66.42% Impervious Runoff Depth>2.47"
Flow Length=110' Slope=0.0200 '/' Tc=7.3 min CN=92 Runoff=11.64 cfs 0.564 af

Subcatchment4S: BIO DA #4 Runoff Area=0.980 ac 82.65% Impervious Runoff Depth>2.77"
Flow Length=95' Slope=0.0100 '/' Tc=9.5 min CN=95 Runoff=4.07 cfs 0.226 af

Subcatchment11S: BIO DA #5 Runoff Area=4.870 ac 60.57% Impervious Runoff Depth>2.38"
Flow Length=110' Tc=9.5 min CN=91 Runoff=18.26 cfs 0.965 af

Subcatchment19S: POST DEV DA - Runoff Area=5.710 ac 0.00% Impervious Runoff Depth>1.50"
Flow Length=340' Tc=10.6 min CN=80 Runoff=13.53 cfs 0.713 af

Pond 12P: BIO #5 Peak Elev=572.99' Storage=6,197 cf Inflow=18.26 cfs 0.965 af
Outflow=16.13 cfs 0.911 af

Pond 13P: BIO #1 Peak Elev=572.38' Storage=1,245 cf Inflow=6.29 cfs 0.302 af
Outflow=5.86 cfs 0.287 af

Pond 14P: BIO #2 Peak Elev=572.39' Storage=1,337 cf Inflow=5.35 cfs 0.264 af
Outflow=5.01 cfs 0.248 af

Pond 15P: BIO #3 Peak Elev=572.46' Storage=2,677 cf Inflow=11.64 cfs 0.564 af
Outflow=10.93 cfs 0.533 af

Pond 16P: BIO #4 Peak Elev=572.33' Storage=1,056 cf Inflow=4.07 cfs 0.226 af
Outflow=3.94 cfs 0.212 af

Link 17L: Total Post Dev Inflow=54.27 cfs 2.905 af
Primary=54.27 cfs 2.905 af

Total Runoff Area = 17.140 ac Runoff Volume = 3.035 af Average Runoff Depth = 2.12"
57.29% Pervious = 9.820 ac 42.71% Impervious = 7.320 ac

25-4080 HYDROCAD

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NOAA10 24-hr A 10-Year Rainfall=3.44"

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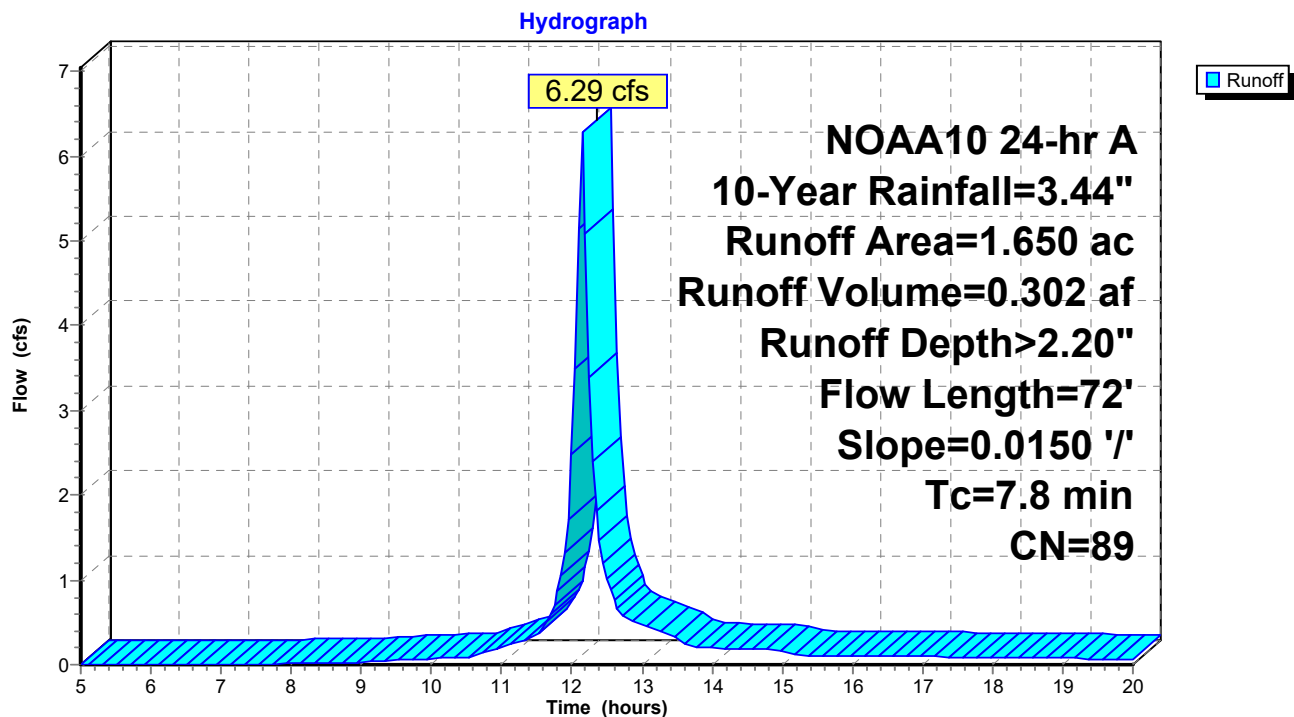
Summary for Subcatchment 1S: BIO DA #1

Runoff = 6.29 cfs @ 12.15 hrs, Volume= 0.302 af, Depth> 2.20"
Routed to Pond 13P : BIO #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.260	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
1.650	89	Weighted Average
0.810		49.09% Pervious Area
0.840		50.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0150	0.11		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.2	22	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
7.8	72	Total			

Subcatchment 1S: BIO DA #1

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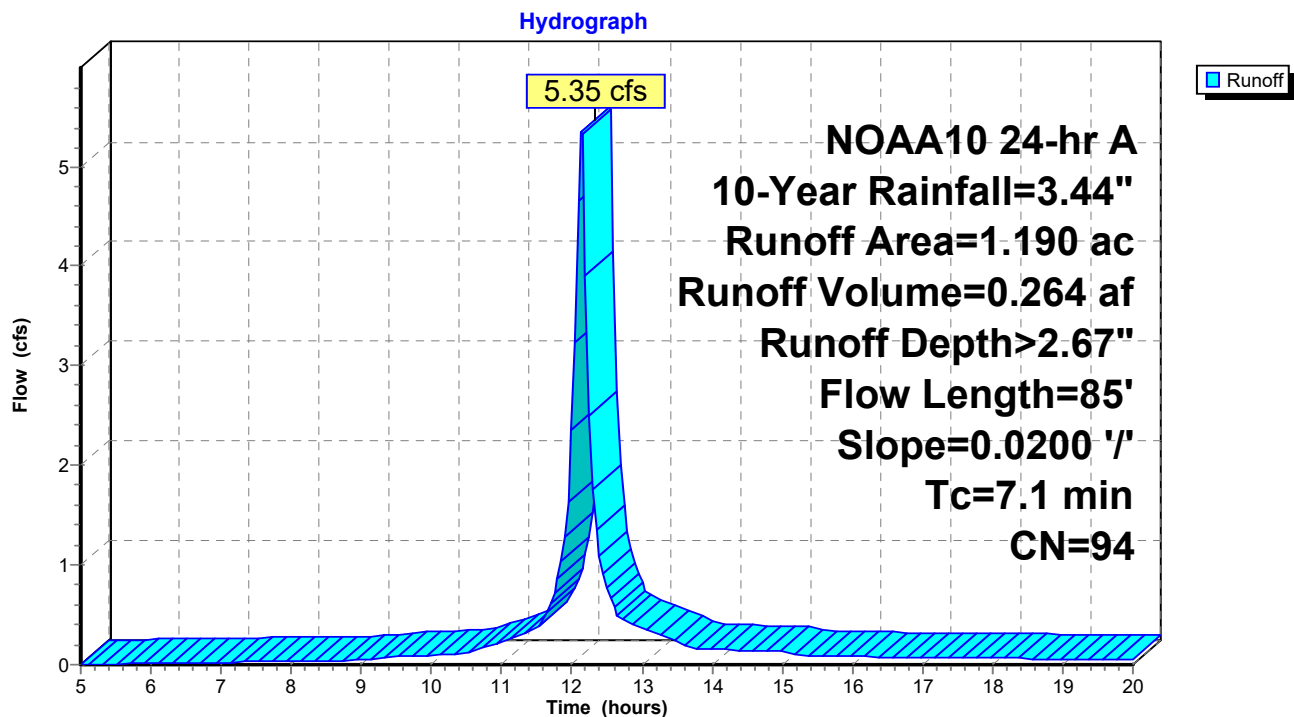
Summary for Subcatchment 2S: BIO DA #2

Runoff = 5.35 cfs @ 12.14 hrs, Volume= 0.264 af, Depth> 2.67"
Routed to Pond 14P : BIO #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
0.710	98	Roofs, HSG D
0.190	98	Paved parking, HSG D
0.290	80	>75% Grass cover, Good, HSG D
1.190	94	Weighted Average
0.290		24.37% Pervious Area
0.900		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.3	35	0.0200	2.12		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
7.1	85	Total			

Subcatchment 2S: BIO DA #2

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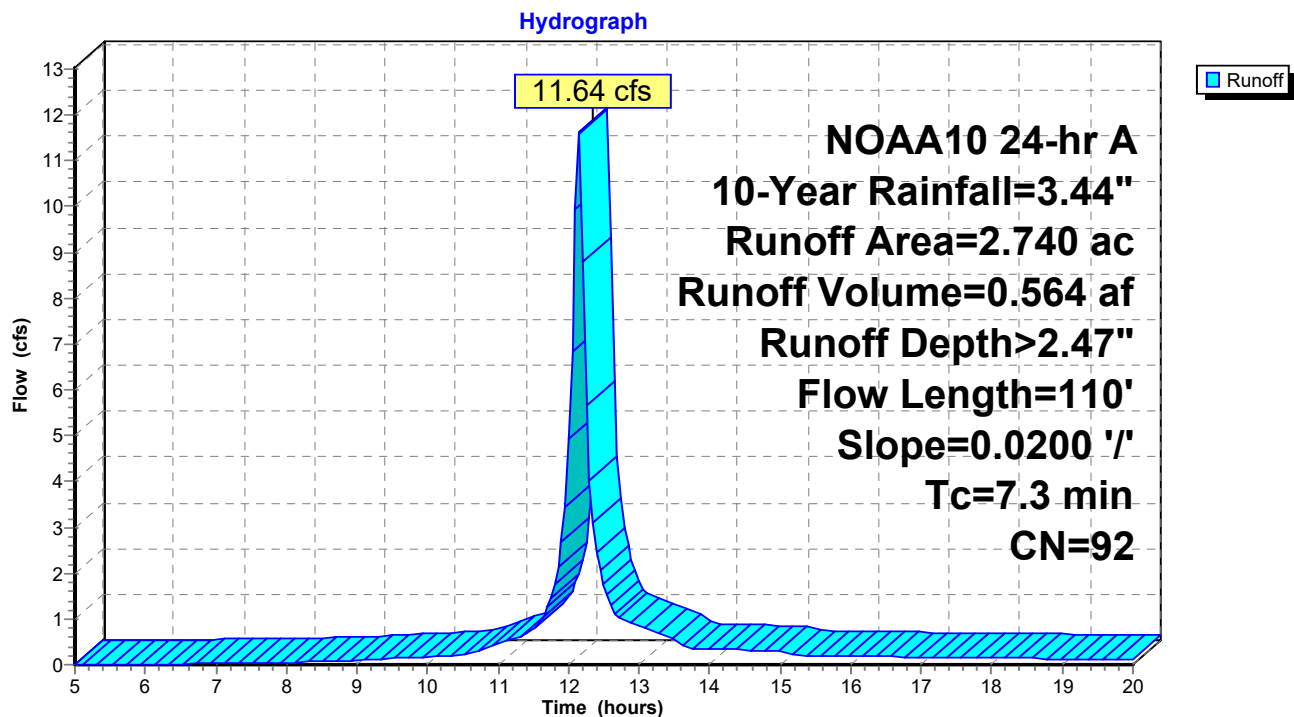
Summary for Subcatchment 3S: BIO DA #3

Runoff = 11.64 cfs @ 12.14 hrs, Volume= 0.564 af, Depth> 2.47"
Routed to Pond 15P : BIO #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
1.230	98	Roofs, HSG D
0.590	98	Paved parking, HSG D
0.920	80	>75% Grass cover, Good, HSG D
2.740	92	Weighted Average
0.920		33.58% Pervious Area
1.820		66.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
7.3	110	Total			

Subcatchment 3S: BIO DA #3

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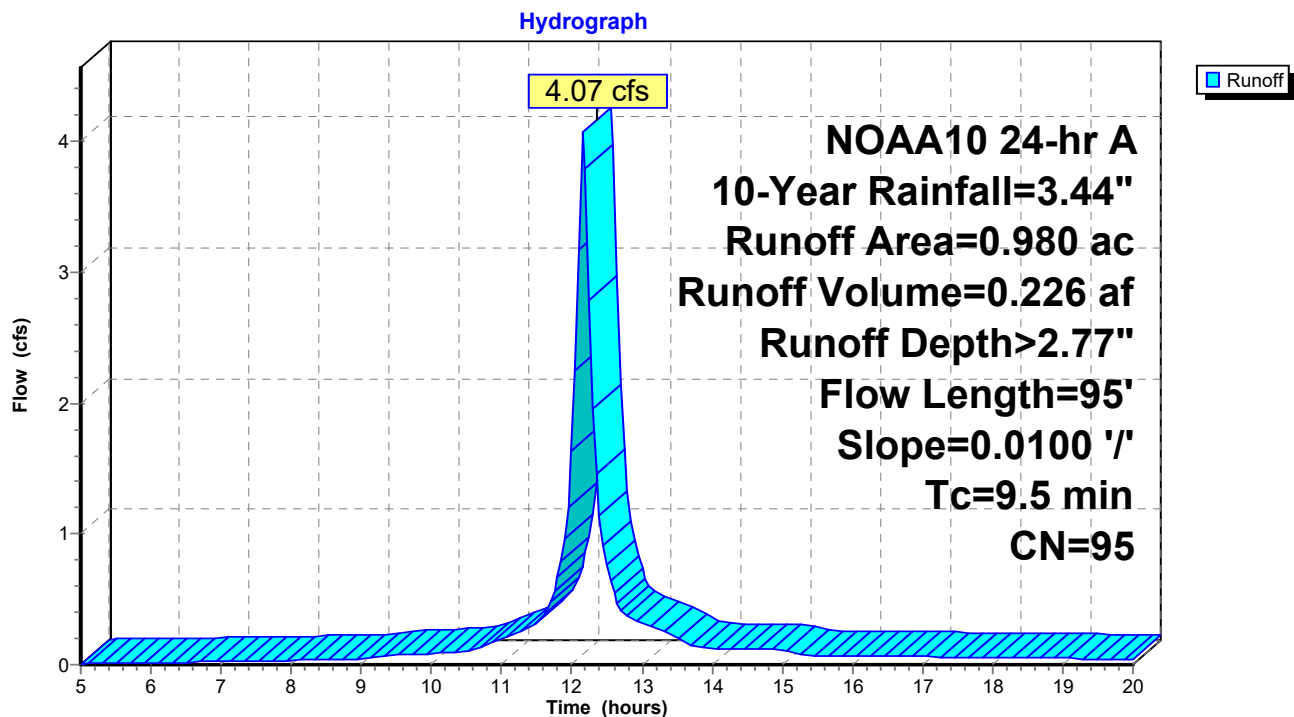
Summary for Subcatchment 4S: BIO DA #4

Runoff = 4.07 cfs @ 12.16 hrs, Volume= 0.226 af, Depth> 2.77"
Routed to Pond 16P : BIO #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.230	98	Paved parking, HSG D
0.170	80	>75% Grass cover, Good, HSG D
0.980	95	Weighted Average
0.170		17.35% Pervious Area
0.810		82.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	45	0.0100	1.50		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
9.5	95	Total			

Subcatchment 4S: BIO DA #4

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NOAA10 24-hr A 10-Year Rainfall=3.44"

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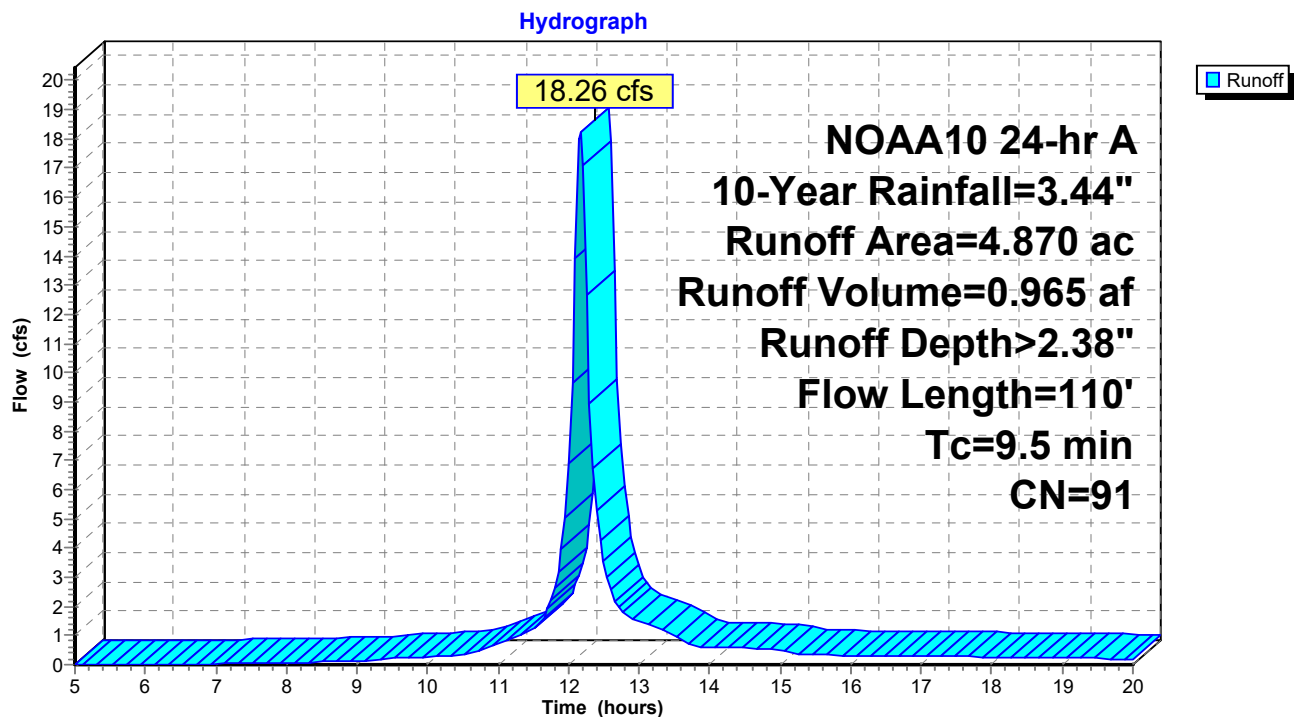
Summary for Subcatchment 11S: BIO DA #5

Runoff = 18.26 cfs @ 12.17 hrs, Volume= 0.965 af, Depth> 2.38"
Routed to Pond 12P : BIO #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
2.070	98	Roofs, HSG D
0.880	98	Paved parking, HSG D
1.920	80	>75% Grass cover, Good, HSG D
4.870	91	Weighted Average
1.920		39.43% Pervious Area
2.950		60.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
9.5	110	Total			

Subcatchment 11S: BIO DA #5

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NOAA10 24-hr A 10-Year Rainfall=3.44"

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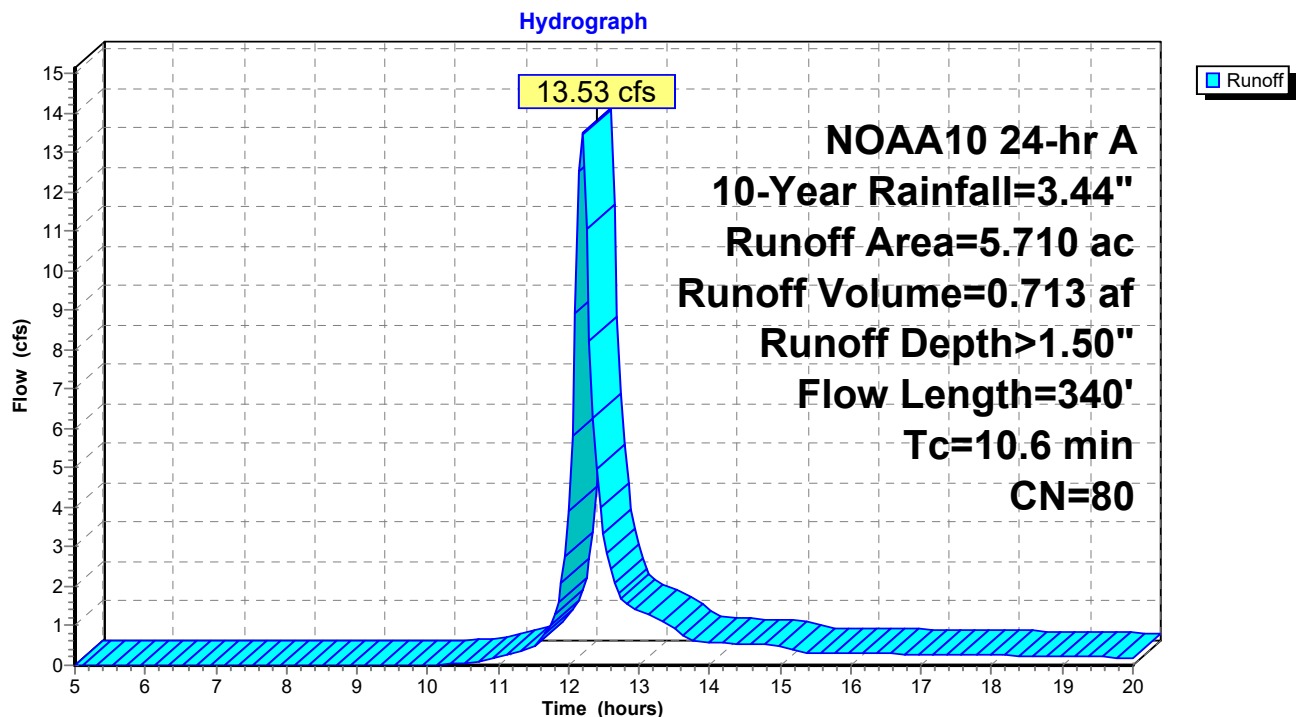
Summary for Subcatchment 19S: POST DEV DA - UNCONTROLLED

Runoff = 13.53 cfs @ 12.19 hrs, Volume= 0.713 af, Depth> 1.50"
 Routed to Link 17L : Total Post Dev

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 10-Year Rainfall=3.44"

Area (ac)	CN	Description
5.710	80	>75% Grass cover, Good, HSG D
5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0300	0.17		Sheet Flow, SF - GRASS Grass: Short n= 0.150 P2= 2.20"
0.4	60	0.0300	2.60		Shallow Concentrated Flow, SCF -GRASS Grassed Waterway Kv= 15.0 fps
0.2	180	0.0100	12.71	1,270.51	Channel Flow, CF - DITCH Area= 100.0 sf Perim= 32.0' r= 3.13' n= 0.025 Earth, clean & winding
10.6	340	Total			

Subcatchment 19S: POST DEV DA - UNCONTROLLED

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NOAA10 24-hr A 10-Year Rainfall=3.44"

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Summary for Pond 12P: BIO #5

Inflow Area = 4.870 ac, 60.57% Impervious, Inflow Depth > 2.38" for 10-Year event
 Inflow = 18.26 cfs @ 12.17 hrs, Volume= 0.965 af
 Outflow = 16.13 cfs @ 12.21 hrs, Volume= 0.911 af, Atten= 12%, Lag= 2.9 min
 Primary = 16.13 cfs @ 12.21 hrs, Volume= 0.911 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.99' @ 12.21 hrs Surf.Area= 5,986 sf Storage= 6,197 cf

Plug-Flow detention time= 35.0 min calculated for 0.908 af (94% of inflow)
 Center-of-Mass det. time= 15.6 min (785.4 - 769.9)

Volume	Invert	Avail.Storage	Storage Description
#1	571.75'	13,050 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.75	4,000	0	0
572.00	4,400	1,050	1,050
573.00	6,000	5,200	6,250
574.00	7,600	6,800	13,050

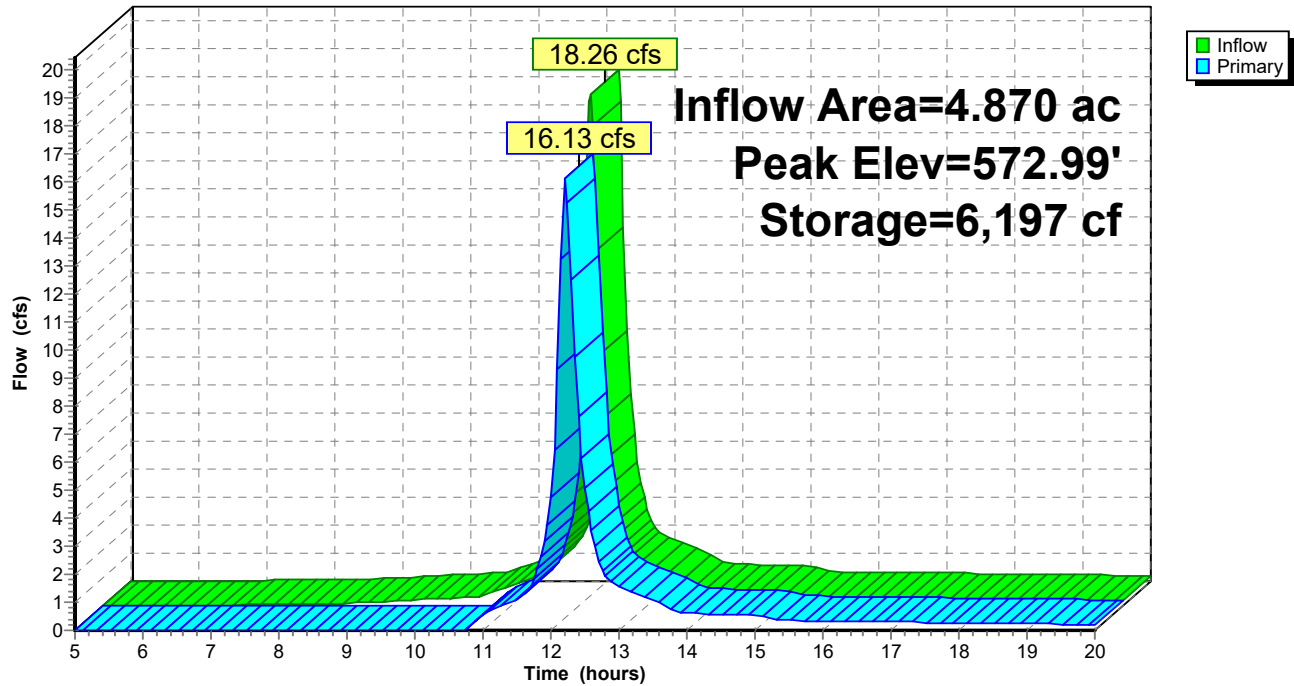
Device	Routing	Invert	Outlet Devices
#1	Primary	568.25'	24.0" Round Culvert L= 401.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 567.04' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 3	572.25'	24.0" W x 24.0" H Vert. YARD DRAINS X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	568.25'	8.0" Round 8" PHDPE UNDERDRAIN L= 203.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 568.25' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#4	Device 1	573.00'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#5	Device 1	572.25'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=15.78 cfs @ 12.21 hrs HW=572.98' (Free Discharge)

1=Culvert (Passes 15.78 cfs of 19.63 cfs potential flow)
 3=8" PHDPE UNDERDRAIN (Barrel Controls 1.72 cfs @ 4.92 fps)
 2=YARD DRAINS (Passes 1.72 cfs of 12.00 cfs potential flow)
 4=OUTLET STRUCTURE (Controls 0.00 cfs)
 5=Sharp-Crested Rectangular Weir (Weir Controls 14.06 cfs @ 3.29 fps)

Pond 12P: BIO #5

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 10-Year Rainfall=3.44"

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Summary for Pond 13P: BIO #1

Inflow Area = 1.650 ac, 50.91% Impervious, Inflow Depth > 2.20" for 10-Year event
 Inflow = 6.29 cfs @ 12.15 hrs, Volume= 0.302 af
 Outflow = 5.86 cfs @ 12.17 hrs, Volume= 0.287 af, Atten= 7%, Lag= 1.5 min
 Primary = 5.86 cfs @ 12.17 hrs, Volume= 0.287 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.38' @ 12.17 hrs Surf.Area= 1,686 sf Storage= 1,245 cf

Plug-Flow detention time= 28.9 min calculated for 0.287 af (95% of inflow)
 Center-of-Mass det. time= 10.2 min (784.5 - 774.3)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,408 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,140	0	0
573.00	2,070	2,408	2,408

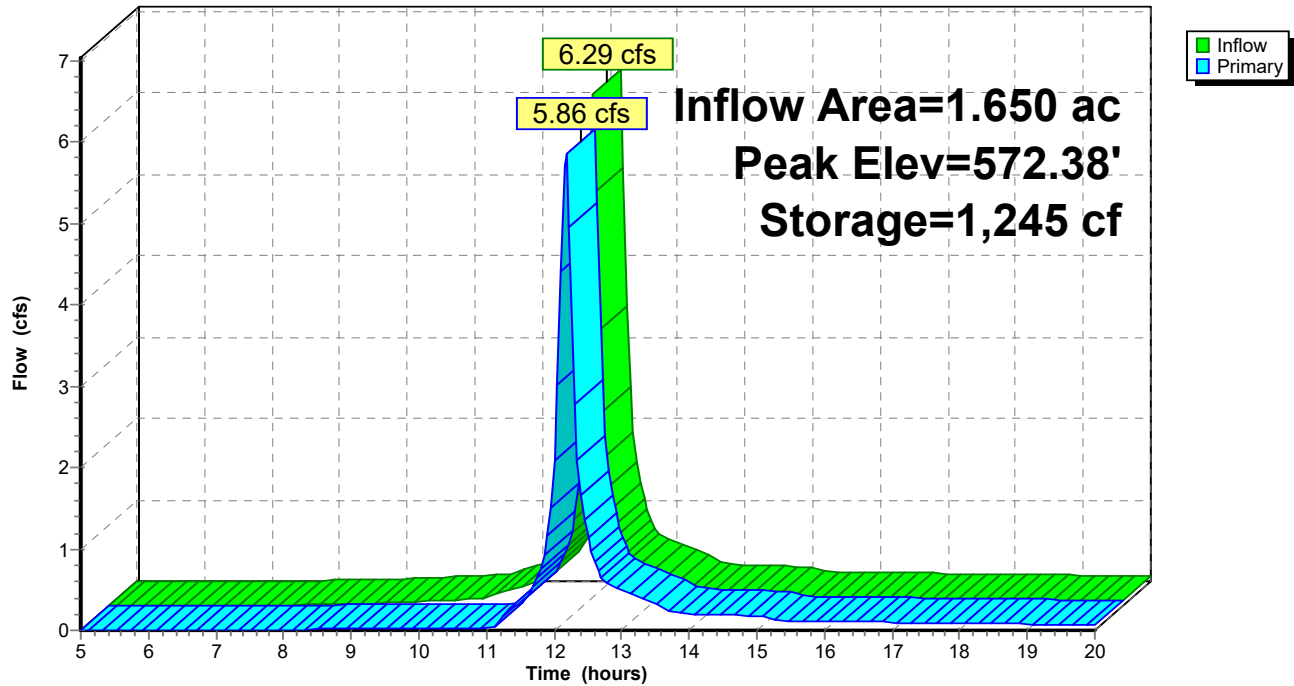
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 315.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.37' S= 0.0020 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=5.70 cfs @ 12.17 hrs HW=572.37' (Free Discharge)

1=Culvert (Passes 5.70 cfs of 9.85 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Barrel Controls 2.52 cfs @ 7.22 fps)
 2=YARD DRAINS (Passes < 2.91 cfs potential flow)
 3=Exfiltration (Passes < 0.02 cfs potential flow)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 3.18 cfs @ 2.18 fps)

Pond 13P: BIO #1

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 10-Year Rainfall=3.44"

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Summary for Pond 14P: BIO #2

Inflow Area = 1.190 ac, 75.63% Impervious, Inflow Depth > 2.67" for 10-Year event
 Inflow = 5.35 cfs @ 12.14 hrs, Volume= 0.264 af
 Outflow = 5.01 cfs @ 12.16 hrs, Volume= 0.248 af, Atten= 6%, Lag= 1.3 min
 Primary = 5.01 cfs @ 12.16 hrs, Volume= 0.248 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.39' @ 12.16 hrs Surf.Area= 1,813 sf Storage= 1,337 cf

Plug-Flow detention time= 36.9 min calculated for 0.248 af (94% of inflow)
 Center-of-Mass det. time= 15.1 min (772.2 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,573 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,190	0	0
573.00	2,240	2,573	2,573

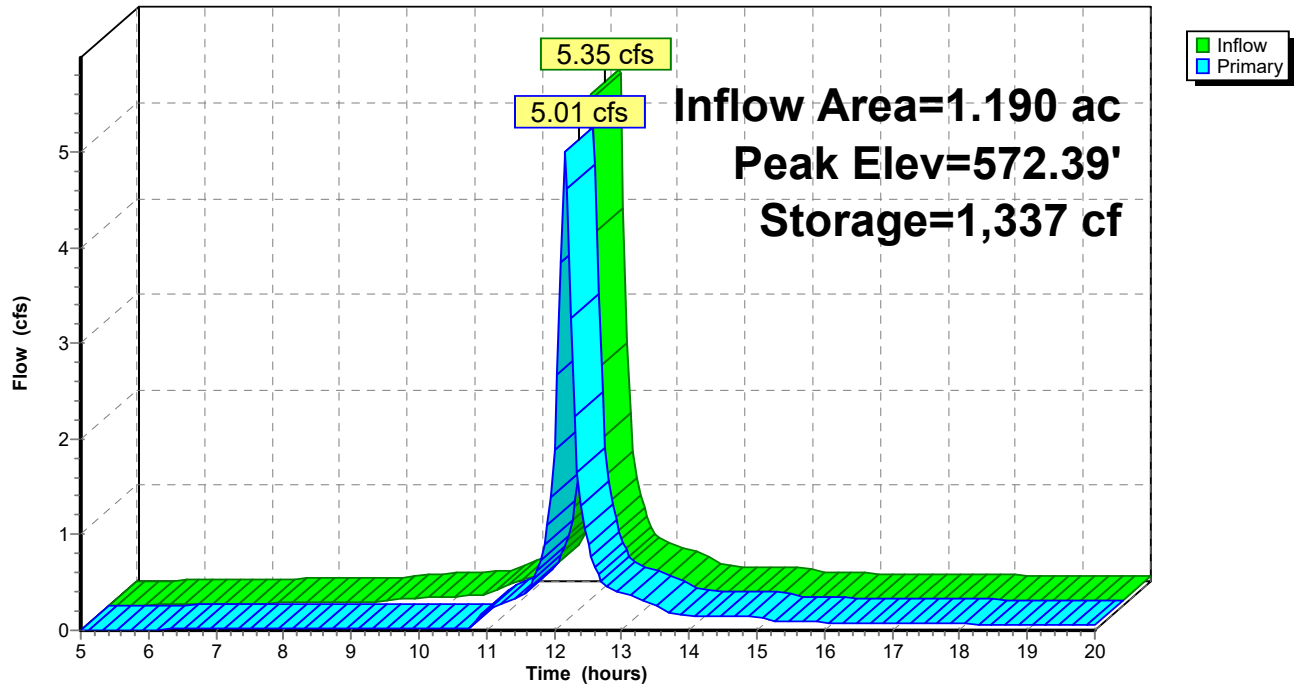
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 176.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.47' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 70.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=4.87 cfs @ 12.16 hrs HW=572.38' (Free Discharge)

1=Culvert (Passes 4.87 cfs of 12.06 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.54 cfs of 2.49 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.52 cfs @ 1.99 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 3.32 cfs @ 2.21 fps)

Pond 14P: BIO #2

Hydrograph



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NOAA10 24-hr A 10-Year Rainfall=3.44"

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Summary for Pond 15P: BIO #3

Inflow Area = 2.740 ac, 66.42% Impervious, Inflow Depth > 2.47" for 10-Year event
 Inflow = 11.64 cfs @ 12.14 hrs, Volume= 0.564 af
 Outflow = 10.93 cfs @ 12.17 hrs, Volume= 0.533 af, Atten= 6%, Lag= 1.3 min
 Primary = 10.93 cfs @ 12.17 hrs, Volume= 0.533 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.46' @ 12.17 hrs Surf.Area= 3,216 sf Storage= 2,677 cf

Plug-Flow detention time= 32.7 min calculated for 0.532 af (94% of inflow)
 Center-of-Mass det. time= 12.9 min (777.7 - 764.8)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	4,930 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	2,400	0	0
572.00	2,800	1,300	1,300
573.10	3,800	3,630	4,930

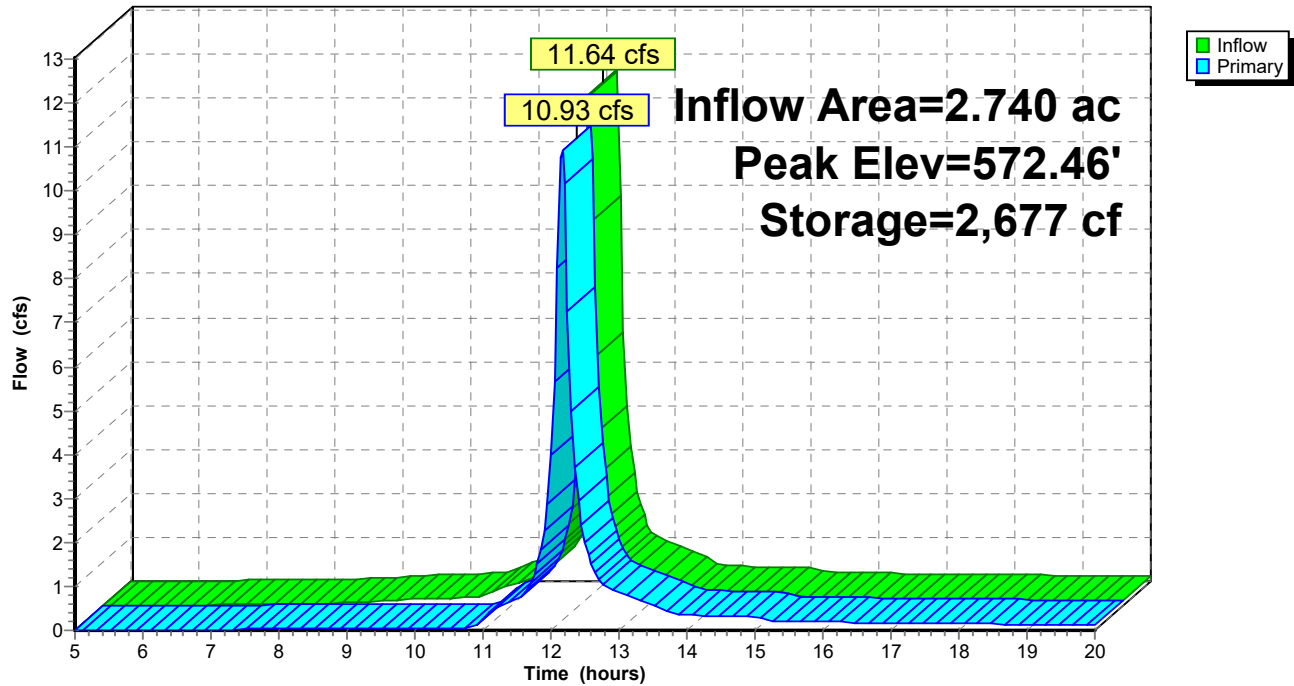
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	24.0" Round Culvert L= 272.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.34' S= 0.0024 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 75.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=10.59 cfs @ 12.17 hrs HW=572.45' (Free Discharge)

1=Culvert (Passes 10.59 cfs of 20.10 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.97 cfs of 2.45 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.93 cfs @ 2.15 fps)
 3=Exfiltration (Exfiltration Controls 0.04 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 8.62 cfs @ 2.43 fps)

Pond 15P: BIO #3

Hydrograph



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NOAA10 24-hr A 10-Year Rainfall=3.44"

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Summary for Pond 16P: BIO #4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.980 ac, 82.65% Impervious, Inflow Depth > 2.77" for 10-Year event
 Inflow = 4.07 cfs @ 12.16 hrs, Volume= 0.226 af
 Outflow = 3.94 cfs @ 12.19 hrs, Volume= 0.212 af, Atten= 3%, Lag= 1.6 min
 Primary = 3.94 cfs @ 12.19 hrs, Volume= 0.212 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.33' @ 12.19 hrs Surf.Area= 1,484 sf Storage= 1,056 cf

Plug-Flow detention time= 38.3 min calculated for 0.212 af (94% of inflow)
 Center-of-Mass det. time= 15.9 min (770.8 - 755.0)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,160 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,050	0	0
573.00	1,830	2,160	2,160

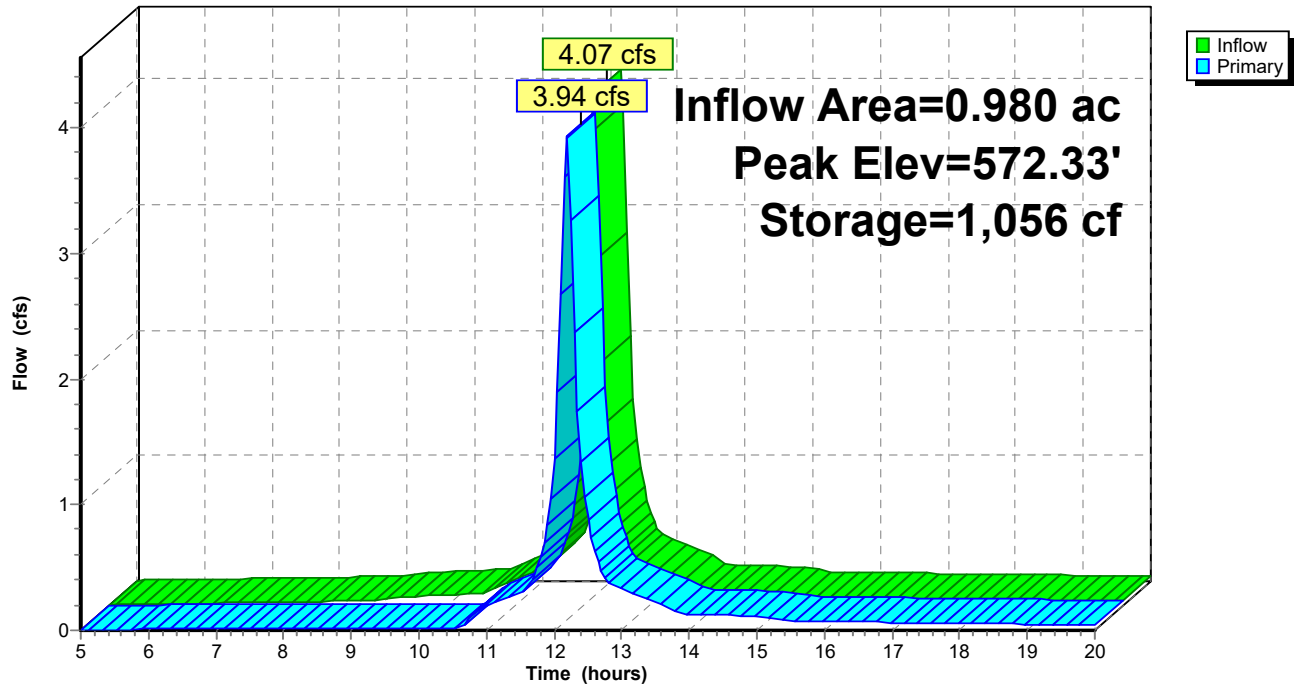
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 203.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.39' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 50.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=3.86 cfs @ 12.19 hrs HW=572.33' (Free Discharge)

1=Culvert (Passes 3.86 cfs of 11.52 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.23 cfs of 2.75 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.22 cfs @ 1.84 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 2.63 cfs @ 2.03 fps)

Pond 16P: BIO #4

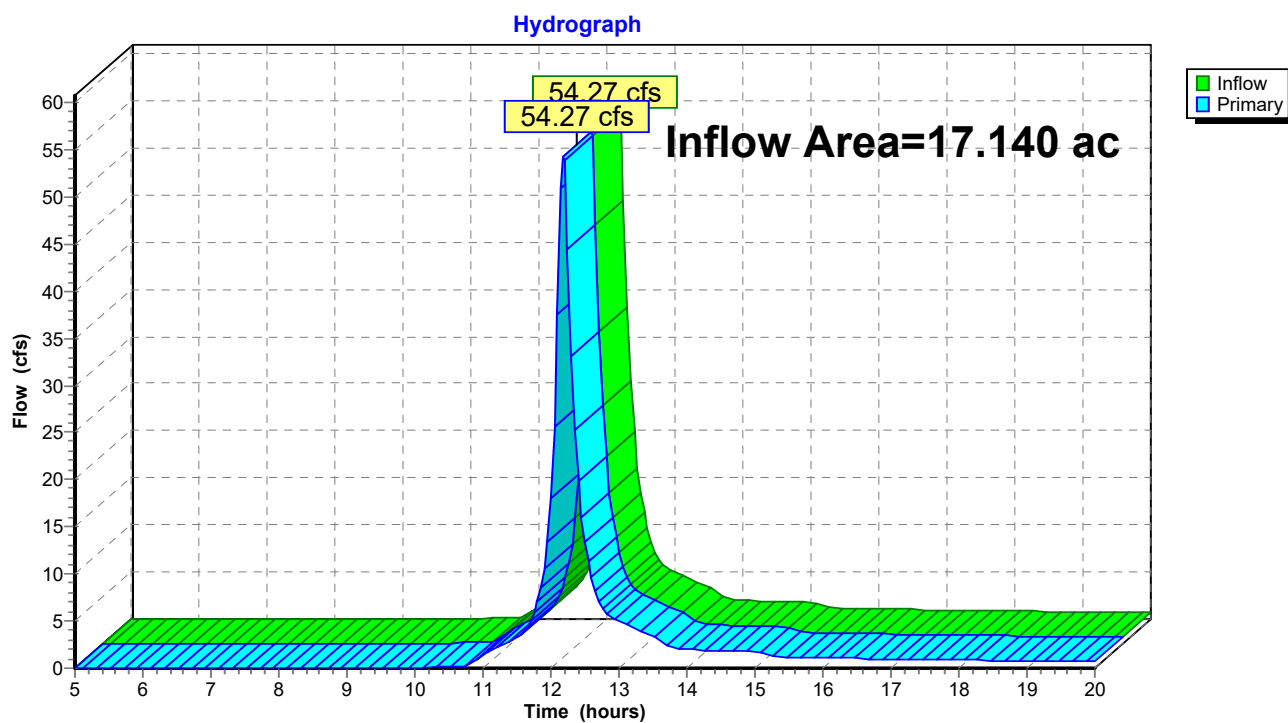
Hydrograph



Summary for Link 17L: Total Post Dev

Inflow Area = 17.140 ac, 42.71% Impervious, Inflow Depth > 2.03" for 10-Year event
Inflow = 54.27 cfs @ 12.19 hrs, Volume= 2.905 af
Primary = 54.27 cfs @ 12.19 hrs, Volume= 2.905 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 17L: Total Post Dev

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: BIO DA #1 Runoff Area=1.650 ac 50.91% Impervious Runoff Depth>2.84"
Flow Length=72' Slope=0.0150 '/' Tc=7.8 min CN=89 Runoff=8.00 cfs 0.390 af

Subcatchment2S: BIO DA #2 Runoff Area=1.190 ac 75.63% Impervious Runoff Depth>3.33"
Flow Length=85' Slope=0.0200 '/' Tc=7.1 min CN=94 Runoff=6.59 cfs 0.331 af

Subcatchment3S: BIO DA #3 Runoff Area=2.740 ac 66.42% Impervious Runoff Depth>3.13"
Flow Length=110' Slope=0.0200 '/' Tc=7.3 min CN=92 Runoff=14.52 cfs 0.715 af

Subcatchment4S: BIO DA #4 Runoff Area=0.980 ac 82.65% Impervious Runoff Depth>3.43"
Flow Length=95' Slope=0.0100 '/' Tc=9.5 min CN=95 Runoff=5.00 cfs 0.281 af

Subcatchment11S: BIO DA #5 Runoff Area=4.870 ac 60.57% Impervious Runoff Depth>3.03"
Flow Length=110' Tc=9.5 min CN=91 Runoff=22.94 cfs 1.229 af

Subcatchment19S: POST DEV DA - Runoff Area=5.710 ac 0.00% Impervious Runoff Depth>2.05"
Flow Length=340' Tc=10.6 min CN=80 Runoff=18.44 cfs 0.976 af

Pond 12P: BIO #5 Peak Elev=573.13' Storage=7,041 cf Inflow=22.94 cfs 1.229 af
Outflow=20.18 cfs 1.175 af

Pond 13P: BIO #1 Peak Elev=572.48' Storage=1,424 cf Inflow=8.00 cfs 0.390 af
Outflow=7.37 cfs 0.375 af

Pond 14P: BIO #2 Peak Elev=572.45' Storage=1,443 cf Inflow=6.59 cfs 0.331 af
Outflow=6.21 cfs 0.314 af

Pond 15P: BIO #3 Peak Elev=572.53' Storage=2,909 cf Inflow=14.52 cfs 0.715 af
Outflow=13.71 cfs 0.684 af

Pond 16P: BIO #4 Peak Elev=572.38' Storage=1,128 cf Inflow=5.00 cfs 0.281 af
Outflow=4.84 cfs 0.267 af

Link 17L: Total Post Dev Inflow=69.31 cfs 3.791 af
Primary=69.31 cfs 3.791 af

Total Runoff Area = 17.140 ac Runoff Volume = 3.921 af Average Runoff Depth = 2.75"
57.29% Pervious = 9.820 ac 42.71% Impervious = 7.320 ac

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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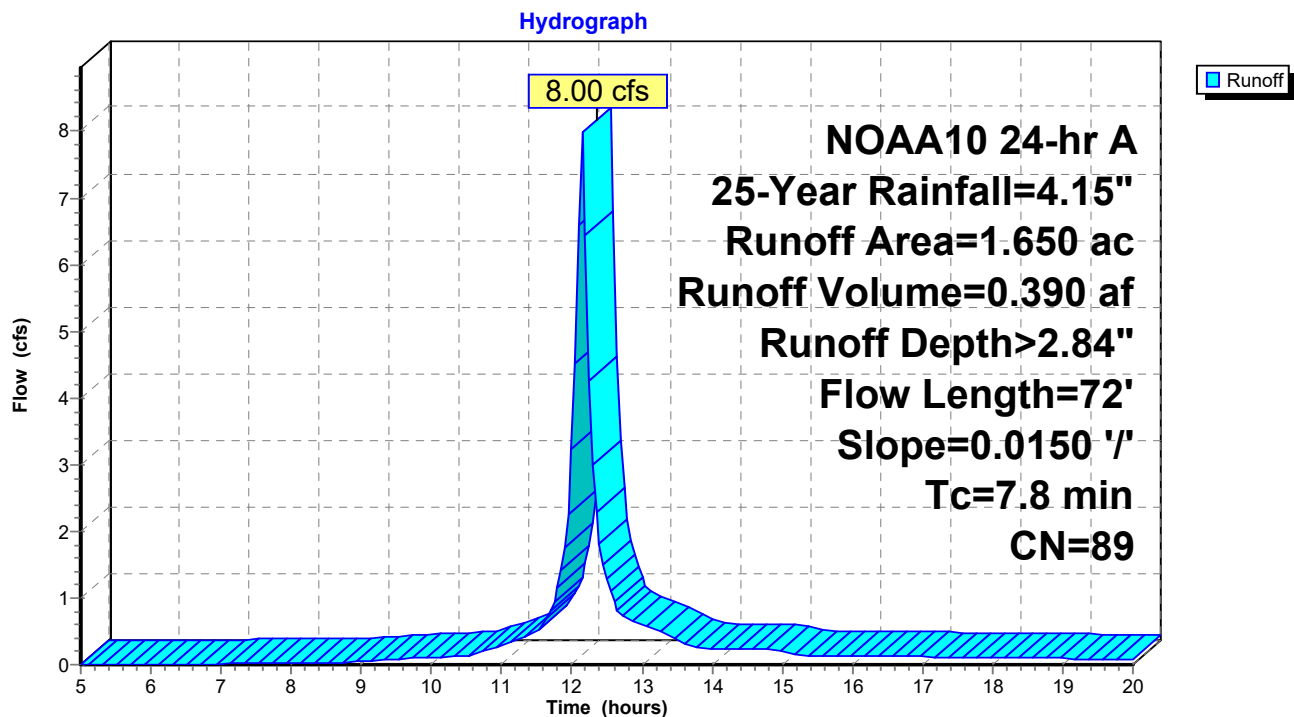
Summary for Subcatchment 1S: BIO DA #1

Runoff = 8.00 cfs @ 12.15 hrs, Volume= 0.390 af, Depth> 2.84"
Routed to Pond 13P : BIO #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.260	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
1.650	89	Weighted Average
0.810		49.09% Pervious Area
0.840		50.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0150	0.11		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.2	22	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
7.8	72	Total			

Subcatchment 1S: BIO DA #1

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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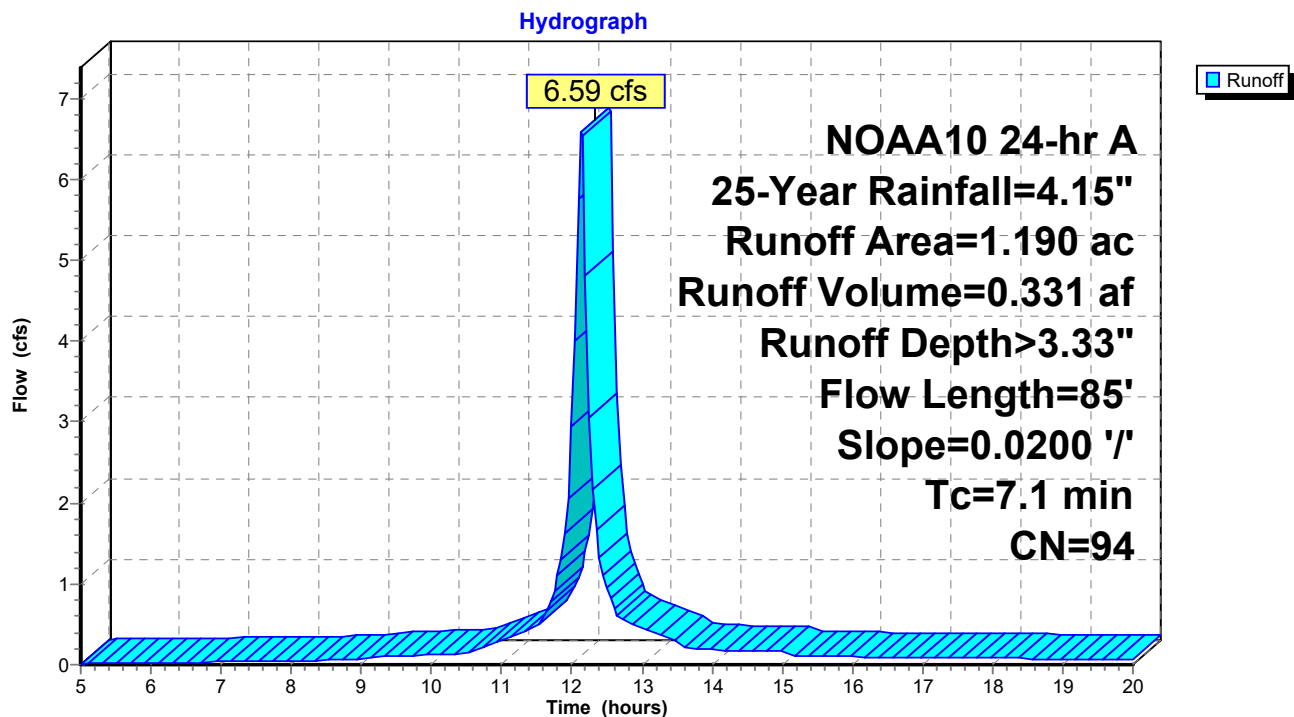
Summary for Subcatchment 2S: BIO DA #2

Runoff = 6.59 cfs @ 12.14 hrs, Volume= 0.331 af, Depth> 3.33"
 Routed to Pond 14P : BIO #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
0.710	98	Roofs, HSG D
0.190	98	Paved parking, HSG D
0.290	80	>75% Grass cover, Good, HSG D
1.190	94	Weighted Average
0.290		24.37% Pervious Area
0.900		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.3	35	0.0200	2.12		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
7.1	85	Total			

Subcatchment 2S: BIO DA #2

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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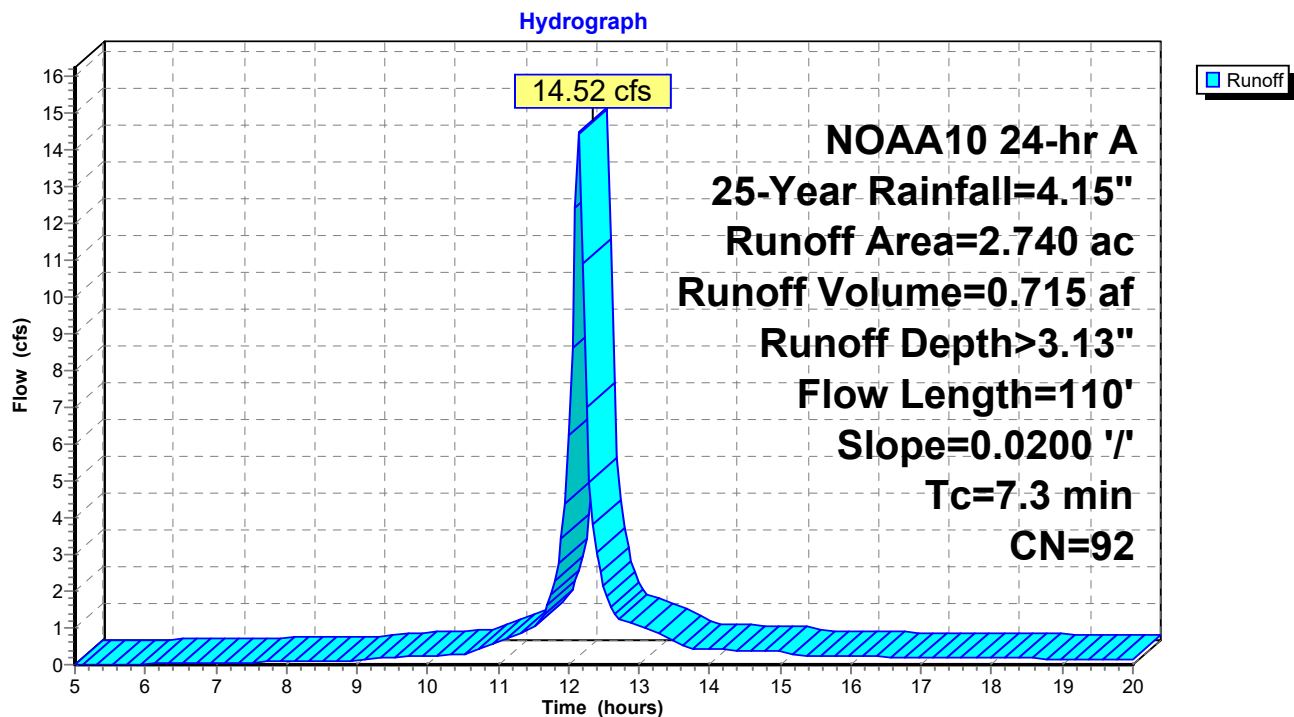
Summary for Subcatchment 3S: BIO DA #3

Runoff = 14.52 cfs @ 12.14 hrs, Volume= 0.715 af, Depth> 3.13"
Routed to Pond 15P : BIO #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
1.230	98	Roofs, HSG D
0.590	98	Paved parking, HSG D
0.920	80	>75% Grass cover, Good, HSG D
2.740	92	Weighted Average
0.920		33.58% Pervious Area
1.820		66.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
7.3	110	Total			

Subcatchment 3S: BIO DA #3

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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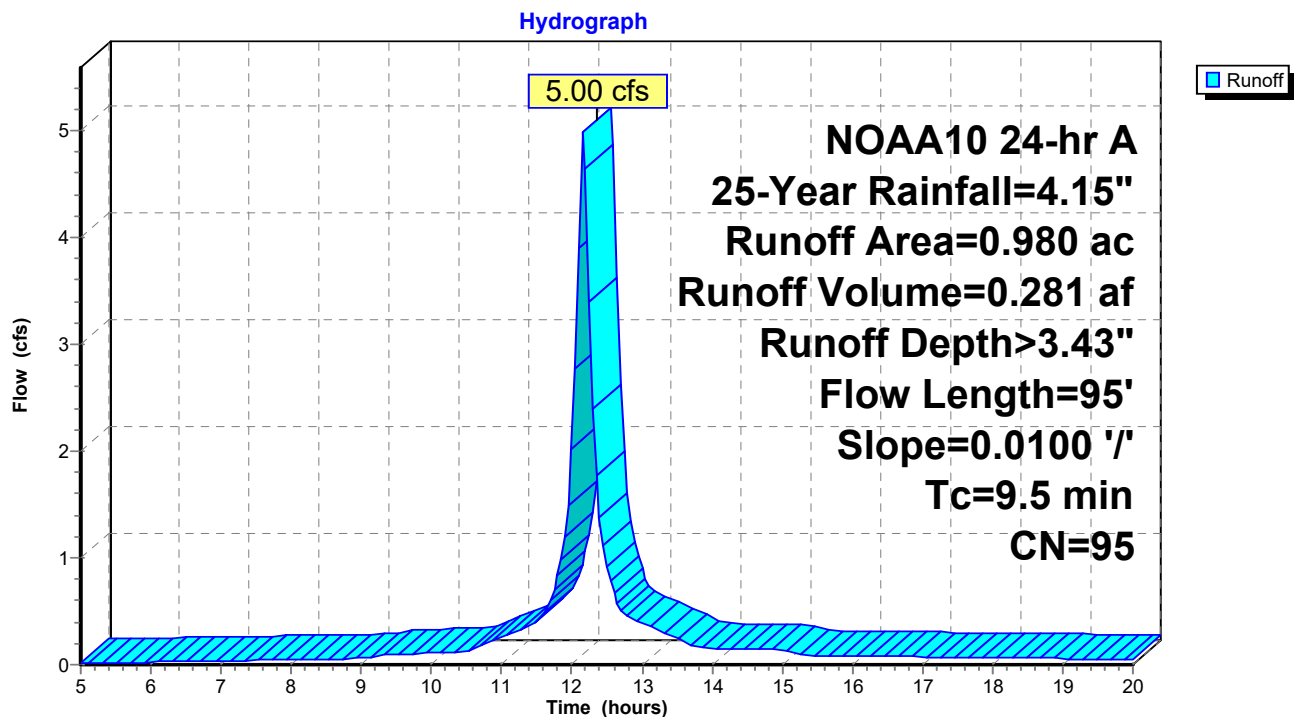
Summary for Subcatchment 4S: BIO DA #4

Runoff = 5.00 cfs @ 12.16 hrs, Volume= 0.281 af, Depth> 3.43"
Routed to Pond 16P : BIO #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.230	98	Paved parking, HSG D
0.170	80	>75% Grass cover, Good, HSG D
0.980	95	Weighted Average
0.170		17.35% Pervious Area
0.810		82.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	45	0.0100	1.50		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
9.5	95	Total			

Subcatchment 4S: BIO DA #4

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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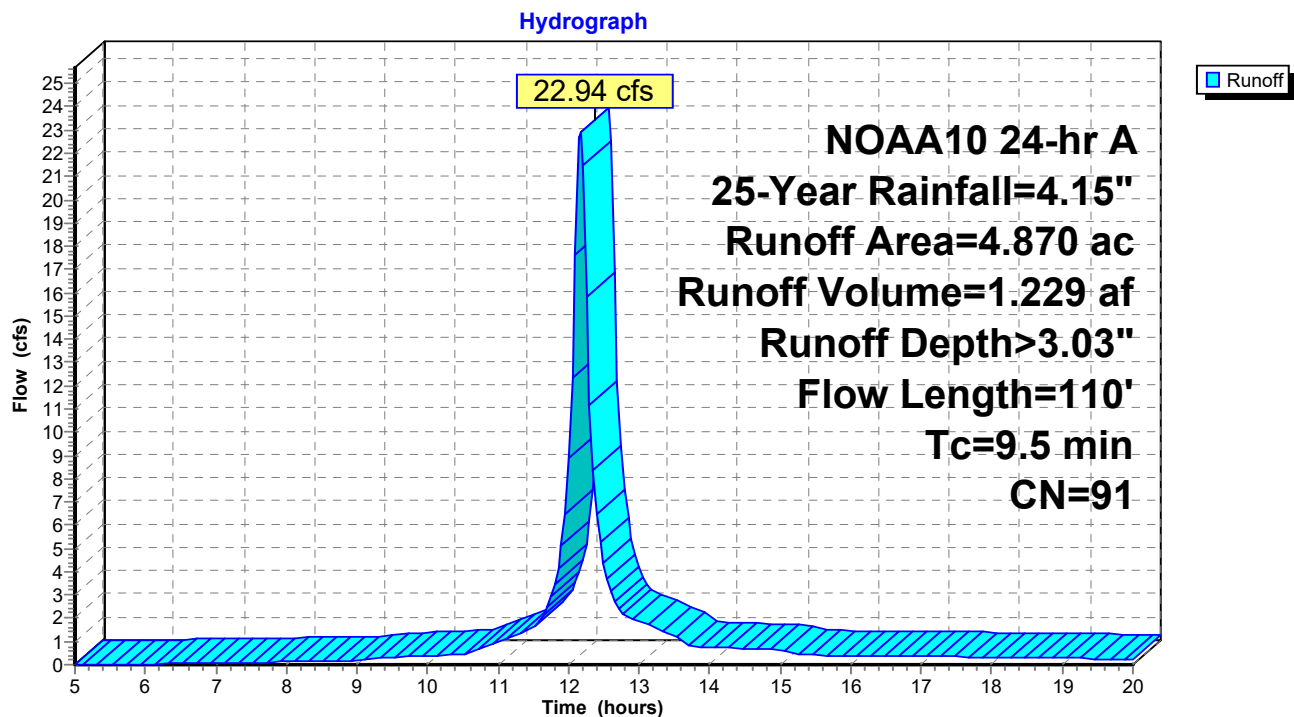
Summary for Subcatchment 11S: BIO DA #5

Runoff = 22.94 cfs @ 12.17 hrs, Volume= 1.229 af, Depth> 3.03"
Routed to Pond 12P : BIO #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
2.070	98	Roofs, HSG D
0.880	98	Paved parking, HSG D
1.920	80	>75% Grass cover, Good, HSG D
4.870	91	Weighted Average
1.920		39.43% Pervious Area
2.950		60.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS Grassed Waterway Kv= 15.0 fps
9.5	110	Total			

Subcatchment 11S: BIO DA #5

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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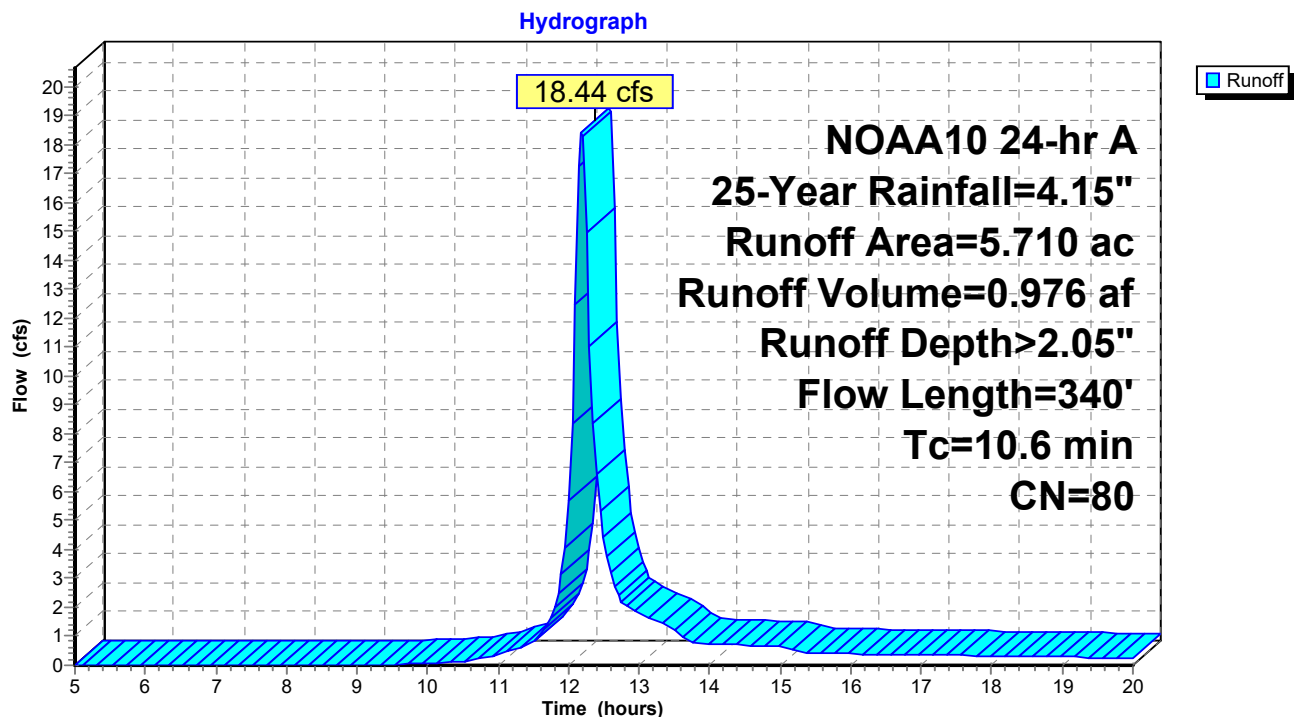
Summary for Subcatchment 19S: POST DEV DA - UNCONTROLLED

Runoff = 18.44 cfs @ 12.19 hrs, Volume= 0.976 af, Depth> 2.05"
 Routed to Link 17L : Total Post Dev

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 25-Year Rainfall=4.15"

Area (ac)	CN	Description
5.710	80	>75% Grass cover, Good, HSG D
5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0300	0.17		Sheet Flow, SF - GRASS Grass: Short n= 0.150 P2= 2.20"
0.4	60	0.0300	2.60		Shallow Concentrated Flow, SCF -GRASS Grassed Waterway Kv= 15.0 fps
0.2	180	0.0100	12.71	1,270.51	Channel Flow, CF - DITCH Area= 100.0 sf Perim= 32.0' r= 3.13' n= 0.025 Earth, clean & winding
10.6	340	Total			

Subcatchment 19S: POST DEV DA - UNCONTROLLED

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NOAA10 24-hr A 25-Year Rainfall=4.15"

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Summary for Pond 12P: BIO #5

Inflow Area = 4.870 ac, 60.57% Impervious, Inflow Depth > 3.03" for 25-Year event
 Inflow = 22.94 cfs @ 12.17 hrs, Volume= 1.229 af
 Outflow = 20.18 cfs @ 12.22 hrs, Volume= 1.175 af, Atten= 12%, Lag= 3.1 min
 Primary = 20.18 cfs @ 12.22 hrs, Volume= 1.175 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 573.13' @ 12.21 hrs Surf.Area= 6,207 sf Storage= 7,041 cf

Plug-Flow detention time= 30.7 min calculated for 1.172 af (95% of inflow)
 Center-of-Mass det. time= 14.8 min (779.9 - 765.1)

Volume	Invert	Avail.Storage	Storage Description
#1	571.75'	13,050 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.75	4,000	0	0
572.00	4,400	1,050	1,050
573.00	6,000	5,200	6,250
574.00	7,600	6,800	13,050

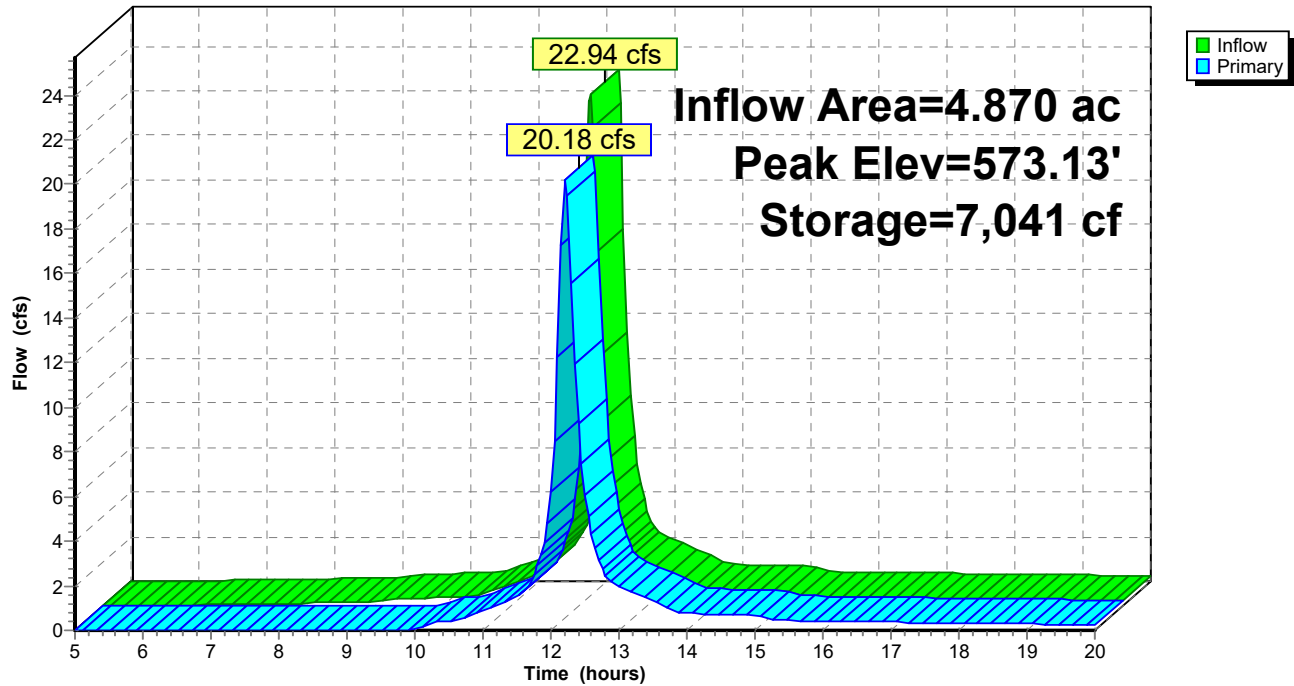
Device	Routing	Invert	Outlet Devices
#1	Primary	568.25'	24.0" Round Culvert L= 401.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 567.04' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 3	572.25'	24.0" W x 24.0" H Vert. YARD DRAINS X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	568.25'	8.0" Round 8" PHDPE UNDERDRAIN L= 203.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 568.25' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#4	Device 1	573.00'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#5	Device 1	572.25'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=19.96 cfs @ 12.22 hrs HW=573.11' (Free Discharge)

1=Culvert (Barrel Controls 19.96 cfs @ 6.35 fps)
 3=8" PHDPE UNDERDRAIN (Passes < 1.74 cfs potential flow)
 2=YARD DRAINS (Passes < 15.47 cfs potential flow)
 4=OUTLET STRUCTURE (Passes < 0.37 cfs potential flow)
 5=Sharp-Crested Rectangular Weir (Passes < 18.54 cfs potential flow)

Pond 12P: BIO #5

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 25-Year Rainfall=4.15"

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Summary for Pond 13P: BIO #1

Inflow Area = 1.650 ac, 50.91% Impervious, Inflow Depth > 2.84" for 25-Year event
 Inflow = 8.00 cfs @ 12.15 hrs, Volume= 0.390 af
 Outflow = 7.37 cfs @ 12.18 hrs, Volume= 0.375 af, Atten= 8%, Lag= 1.8 min
 Primary = 7.37 cfs @ 12.18 hrs, Volume= 0.375 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.48' @ 12.18 hrs Surf.Area= 1,751 sf Storage= 1,424 cf

Plug-Flow detention time= 24.5 min calculated for 0.373 af (96% of inflow)
 Center-of-Mass det. time= 9.7 min (779.1 - 769.4)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,408 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,140	0	0
573.00	2,070	2,408	2,408

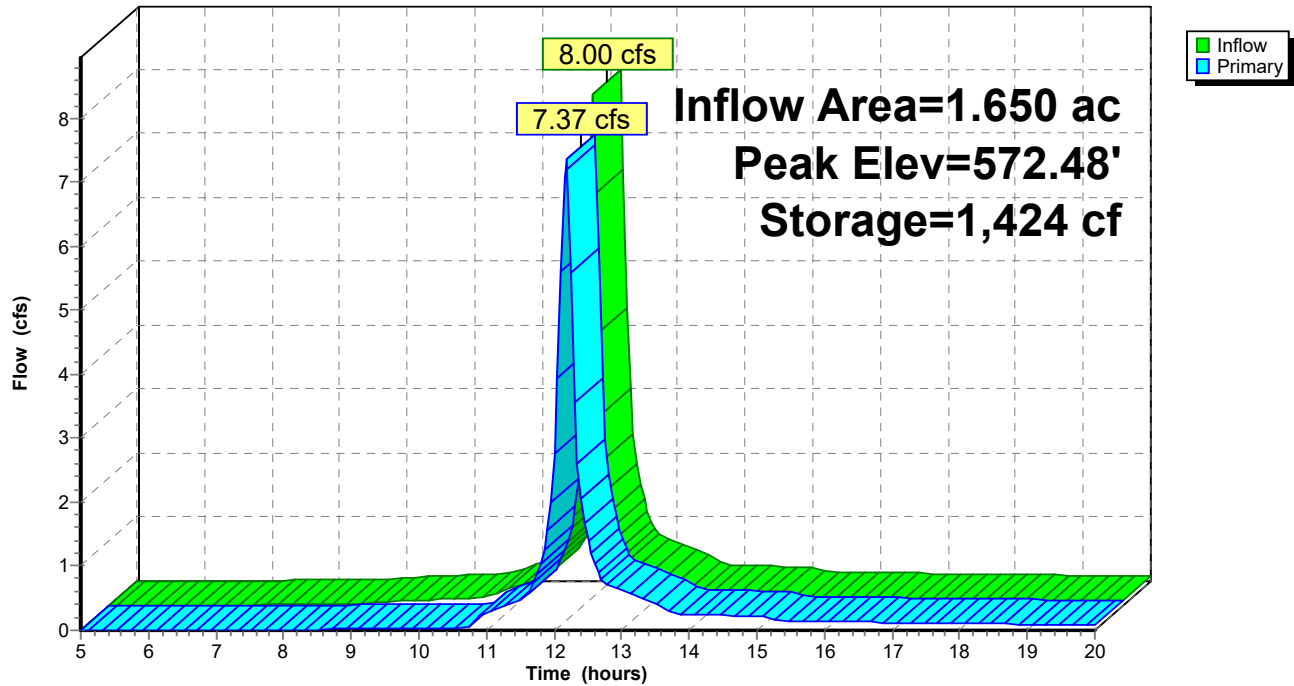
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 315.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.37' S= 0.0020 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 ' / Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=7.15 cfs @ 12.18 hrs HW=572.47' (Free Discharge)

1=Culvert (Passes 7.15 cfs of 9.99 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Barrel Controls 2.55 cfs @ 7.32 fps)
 2=YARD DRAINS (Passes < 4.14 cfs potential flow)
 3=Exfiltration (Passes < 0.02 cfs potential flow)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 4.60 cfs @ 2.50 fps)

Pond 13P: BIO #1

Hydrograph



Summary for Pond 14P: BIO #2

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.190 ac, 75.63% Impervious, Inflow Depth > 3.33" for 25-Year event
 Inflow = 6.59 cfs @ 12.14 hrs, Volume= 0.331 af
 Outflow = 6.21 cfs @ 12.16 hrs, Volume= 0.314 af, Atten= 6%, Lag= 1.3 min
 Primary = 6.21 cfs @ 12.16 hrs, Volume= 0.314 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.45' @ 12.16 hrs Surf.Area= 1,854 sf Storage= 1,443 cf

Plug-Flow detention time= 32.9 min calculated for 0.313 af (95% of inflow)
 Center-of-Mass det. time= 14.7 min (767.8 - 753.1)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,573 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,190	0	0
573.00	2,240	2,573	2,573

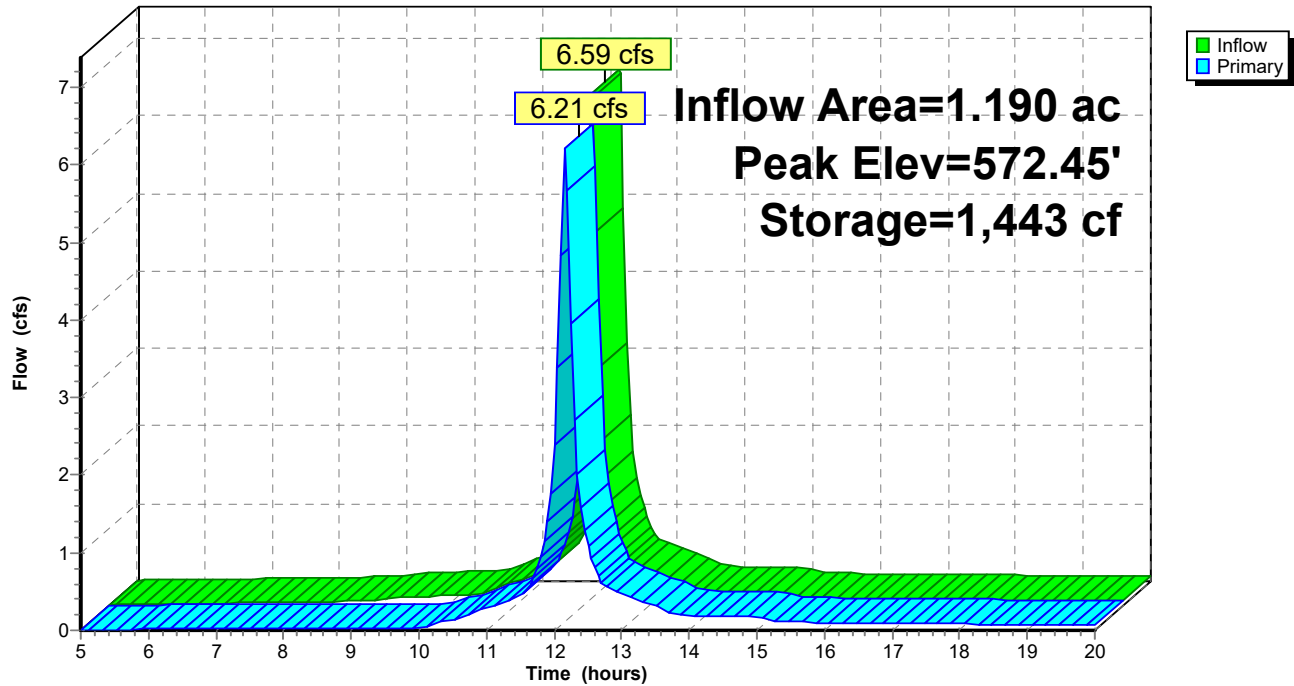
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 176.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.47' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 70.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=6.04 cfs @ 12.16 hrs HW=572.44' (Free Discharge)

1=Culvert (Passes 6.04 cfs of 12.16 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.90 cfs of 2.51 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.88 cfs @ 2.13 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 4.14 cfs @ 2.40 fps)

Pond 14P: BIO #2

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 25-Year Rainfall=4.15"

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Summary for Pond 15P: BIO #3

Inflow Area = 2.740 ac, 66.42% Impervious, Inflow Depth > 3.13" for 25-Year event
 Inflow = 14.52 cfs @ 12.14 hrs, Volume= 0.715 af
 Outflow = 13.71 cfs @ 12.16 hrs, Volume= 0.684 af, Atten= 6%, Lag= 1.2 min
 Primary = 13.71 cfs @ 12.16 hrs, Volume= 0.684 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.53' @ 12.16 hrs Surf.Area= 3,281 sf Storage= 2,909 cf

Plug-Flow detention time= 29.2 min calculated for 0.684 af (96% of inflow)
 Center-of-Mass det. time= 12.4 min (772.6 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	4,930 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	2,400	0	0
572.00	2,800	1,300	1,300
573.10	3,800	3,630	4,930

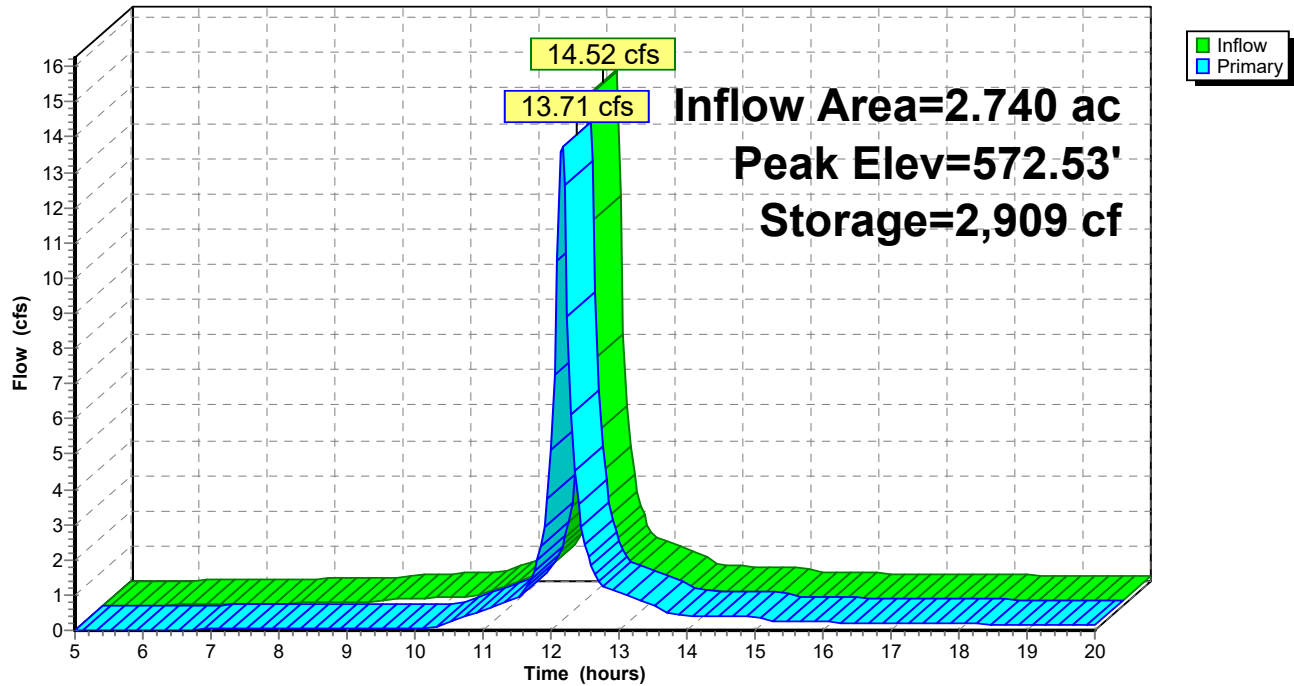
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	24.0" Round Culvert L= 272.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.34' S= 0.0024 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 75.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 ' / Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=13.34 cfs @ 12.16 hrs HW=572.52' (Free Discharge)

1=Culvert (Passes 13.34 cfs of 20.33 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 2.44 cfs of 2.47 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 2.40 cfs @ 2.31 fps)
 3=Exfiltration (Exfiltration Controls 0.04 cfs)
 5=OUTLET STRUCTURE (Orifice Controls 0.03 cfs @ 0.44 fps)
 6=Sharp-Crested Rectangular Weir (Weir Controls 10.88 cfs @ 2.65 fps)

Pond 15P: BIO #3

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 25-Year Rainfall=4.15"

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Summary for Pond 16P: BIO #4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.980 ac, 82.65% Impervious, Inflow Depth > 3.43" for 25-Year event
 Inflow = 5.00 cfs @ 12.16 hrs, Volume= 0.281 af
 Outflow = 4.84 cfs @ 12.19 hrs, Volume= 0.267 af, Atten= 3%, Lag= 1.5 min
 Primary = 4.84 cfs @ 12.19 hrs, Volume= 0.267 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.38' @ 12.19 hrs Surf.Area= 1,509 sf Storage= 1,128 cf

Plug-Flow detention time= 34.3 min calculated for 0.267 af (95% of inflow)
 Center-of-Mass det. time= 15.3 min (766.7 - 751.4)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,160 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,050	0	0
573.00	1,830	2,160	2,160

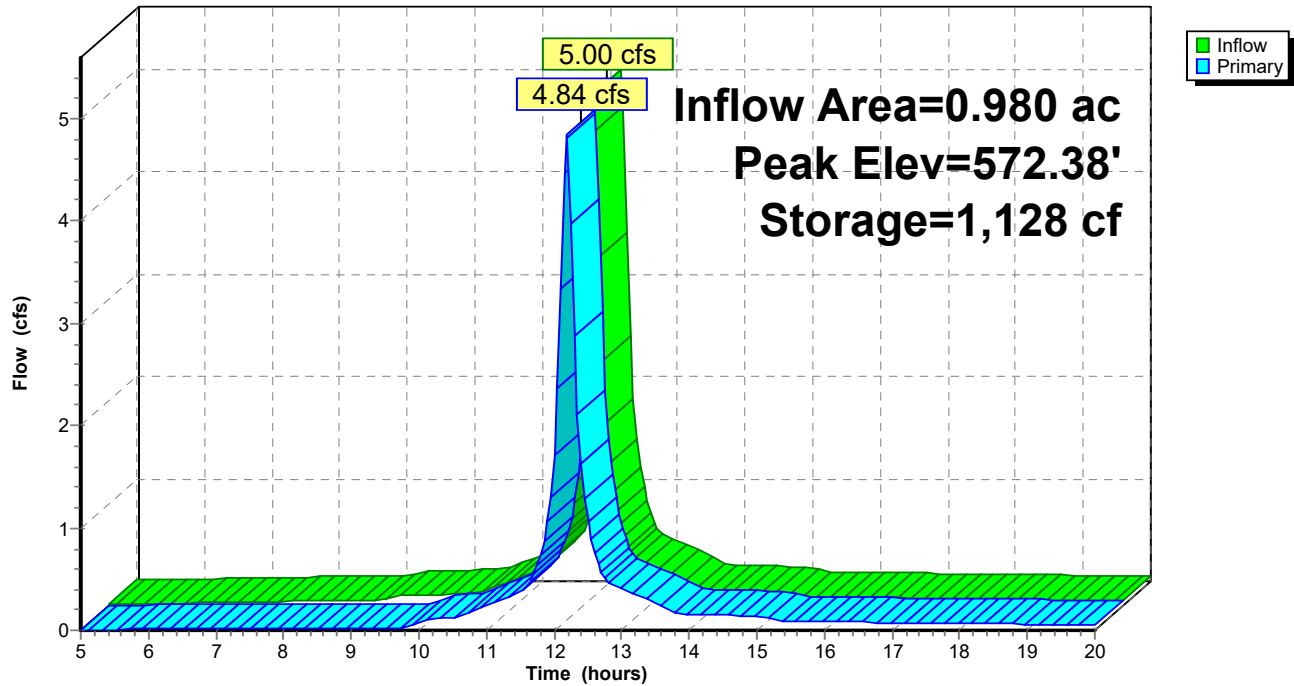
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 203.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.39' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 50.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=4.74 cfs @ 12.19 hrs HW=572.38' (Free Discharge)

1=Culvert (Passes 4.74 cfs of 11.60 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.50 cfs of 2.77 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.48 cfs @ 1.97 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 3.24 cfs @ 2.19 fps)

Pond 16P: BIO #4

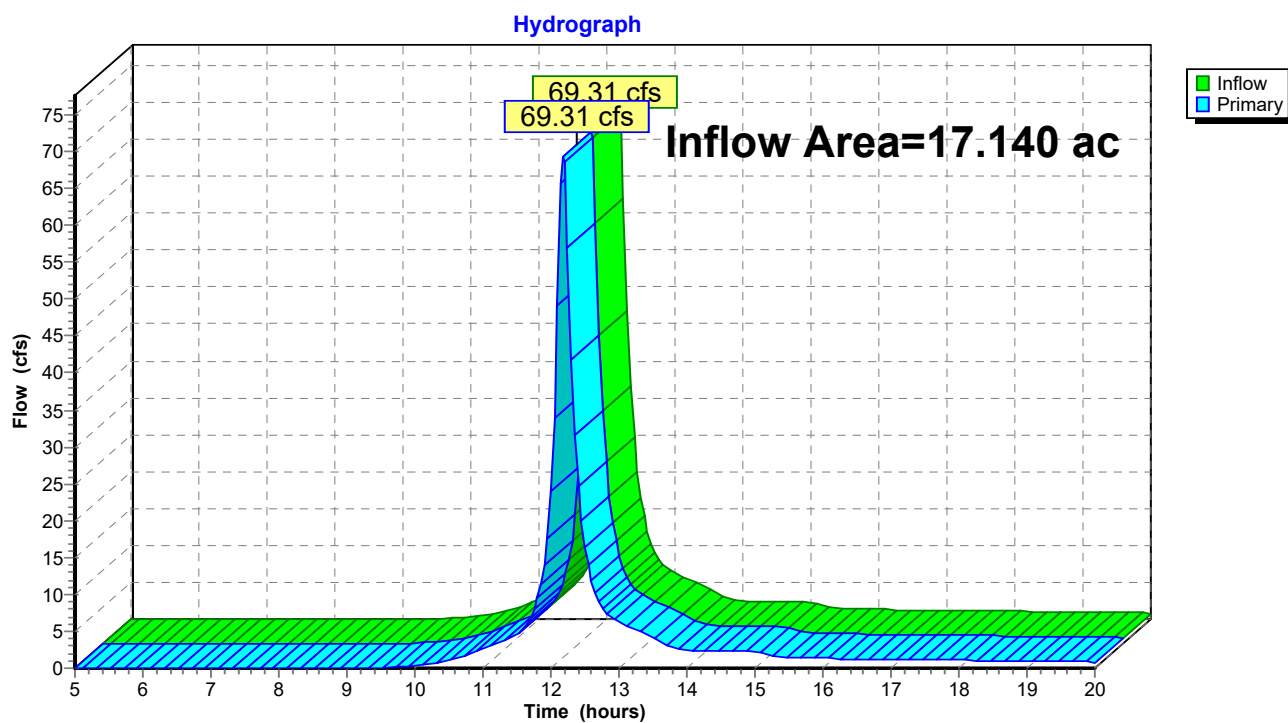
Hydrograph



Summary for Link 17L: Total Post Dev

Inflow Area = 17.140 ac, 42.71% Impervious, Inflow Depth > 2.65" for 25-Year event
Inflow = 69.31 cfs @ 12.18 hrs, Volume= 3.791 af
Primary = 69.31 cfs @ 12.18 hrs, Volume= 3.791 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 17L: Total Post Dev

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: BIO DA #1 Runoff Area=1.650 ac 50.91% Impervious Runoff Depth>3.85"
Flow Length=72' Slope=0.0150 '/' Tc=7.8 min CN=89 Runoff=10.64 cfs 0.529 af

Subcatchment2S: BIO DA #2 Runoff Area=1.190 ac 75.63% Impervious Runoff Depth>4.37"
Flow Length=85' Slope=0.0200 '/' Tc=7.1 min CN=94 Runoff=8.50 cfs 0.434 af

Subcatchment3S: BIO DA #3 Runoff Area=2.740 ac 66.42% Impervious Runoff Depth>4.16"
Flow Length=110' Slope=0.0200 '/' Tc=7.3 min CN=92 Runoff=18.94 cfs 0.950 af

Subcatchment4S: BIO DA #4 Runoff Area=0.980 ac 82.65% Impervious Runoff Depth>4.47"
Flow Length=95' Slope=0.0100 '/' Tc=9.5 min CN=95 Runoff=6.42 cfs 0.365 af

Subcatchment11S: BIO DA #5 Runoff Area=4.870 ac 60.57% Impervious Runoff Depth>4.06"
Flow Length=110' Tc=9.5 min CN=91 Runoff=30.15 cfs 1.646 af

Subcatchment19S: POST DEV DA - Runoff Area=5.710 ac 0.00% Impervious Runoff Depth>2.96"
Flow Length=340' Tc=10.6 min CN=80 Runoff=26.34 cfs 1.408 af

Pond 12P: BIO #5 Peak Elev=573.57' Storage=9,904 cf Inflow=30.15 cfs 1.646 af
Outflow=21.04 cfs 1.591 af

Pond 13P: BIO #1 Peak Elev=572.62' Storage=1,666 cf Inflow=10.64 cfs 0.529 af
Outflow=9.95 cfs 0.513 af

Pond 14P: BIO #2 Peak Elev=572.53' Storage=1,597 cf Inflow=8.50 cfs 0.434 af
Outflow=8.06 cfs 0.417 af

Pond 15P: BIO #3 Peak Elev=572.63' Storage=3,253 cf Inflow=18.94 cfs 0.950 af
Outflow=17.91 cfs 0.919 af

Pond 16P: BIO #4 Peak Elev=572.45' Storage=1,232 cf Inflow=6.42 cfs 0.365 af
Outflow=6.24 cfs 0.351 af

Link 17L: Total Post Dev Inflow=88.79 cfs 5.200 af
Primary=88.79 cfs 5.200 af

Total Runoff Area = 17.140 ac Runoff Volume = 5.332 af Average Runoff Depth = 3.73"
57.29% Pervious = 9.820 ac 42.71% Impervious = 7.320 ac

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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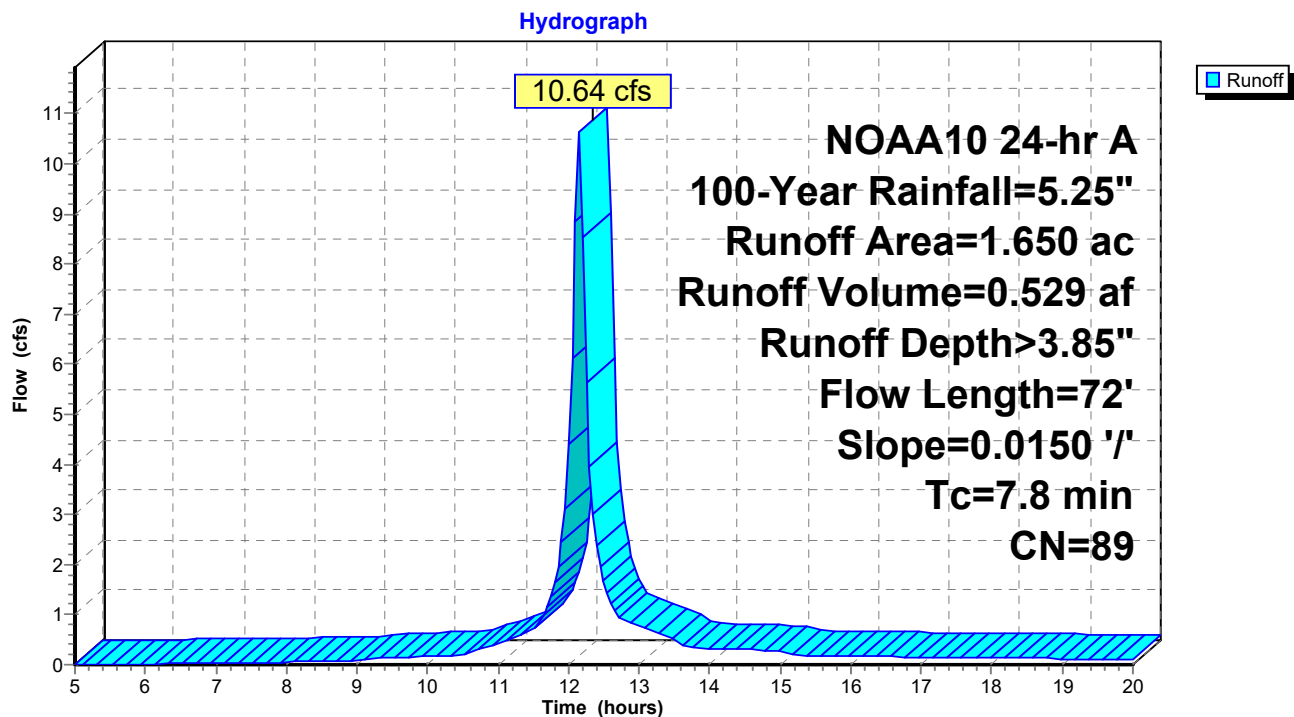
Summary for Subcatchment 1S: BIO DA #1

Runoff = 10.64 cfs @ 12.15 hrs, Volume= 0.529 af, Depth> 3.85"
 Routed to Pond 13P : BIO #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.260	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
1.650	89	Weighted Average
0.810		49.09% Pervious Area
0.840		50.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0150	0.11		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.2	22	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
7.8	72	Total			

Subcatchment 1S: BIO DA #1

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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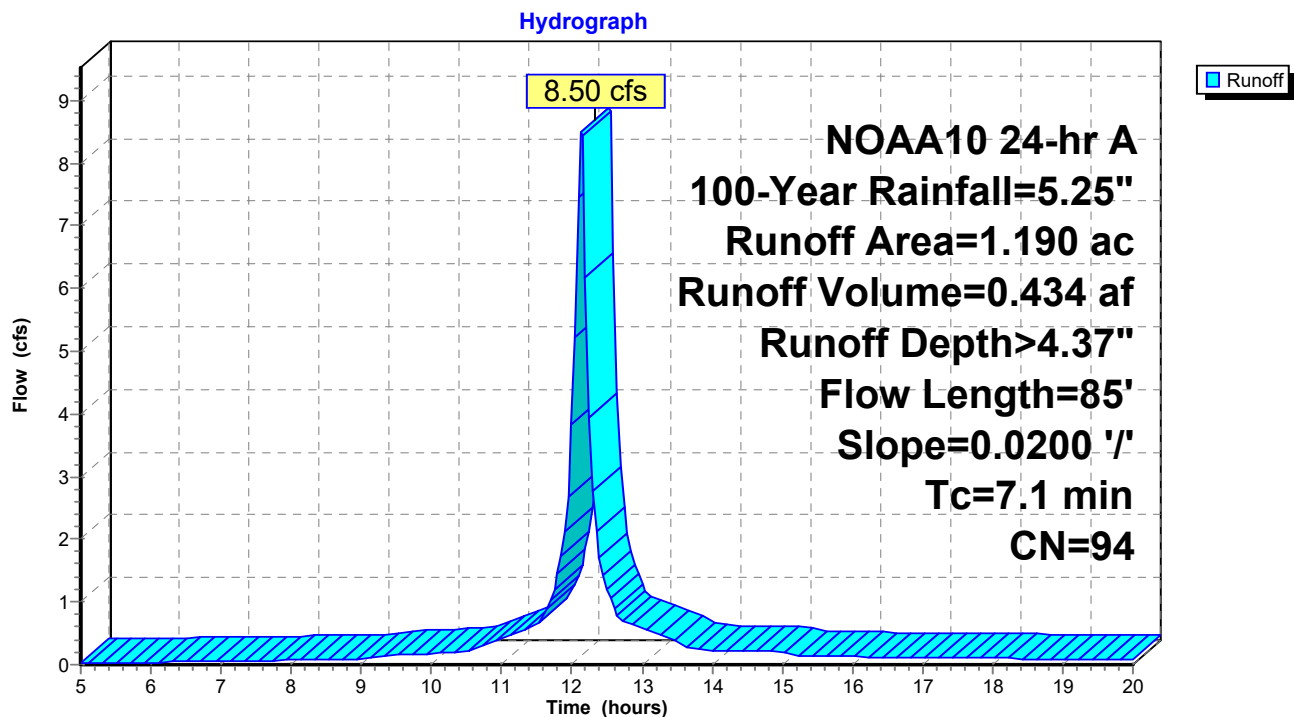
Summary for Subcatchment 2S: BIO DA #2

Runoff = 8.50 cfs @ 12.14 hrs, Volume= 0.434 af, Depth> 4.37"
Routed to Pond 14P : BIO #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
0.710	98	Roofs, HSG D
0.190	98	Paved parking, HSG D
0.290	80	>75% Grass cover, Good, HSG D
1.190	94	Weighted Average
0.290		24.37% Pervious Area
0.900		75.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.3	35	0.0200	2.12		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
7.1	85	Total			

Subcatchment 2S: BIO DA #2

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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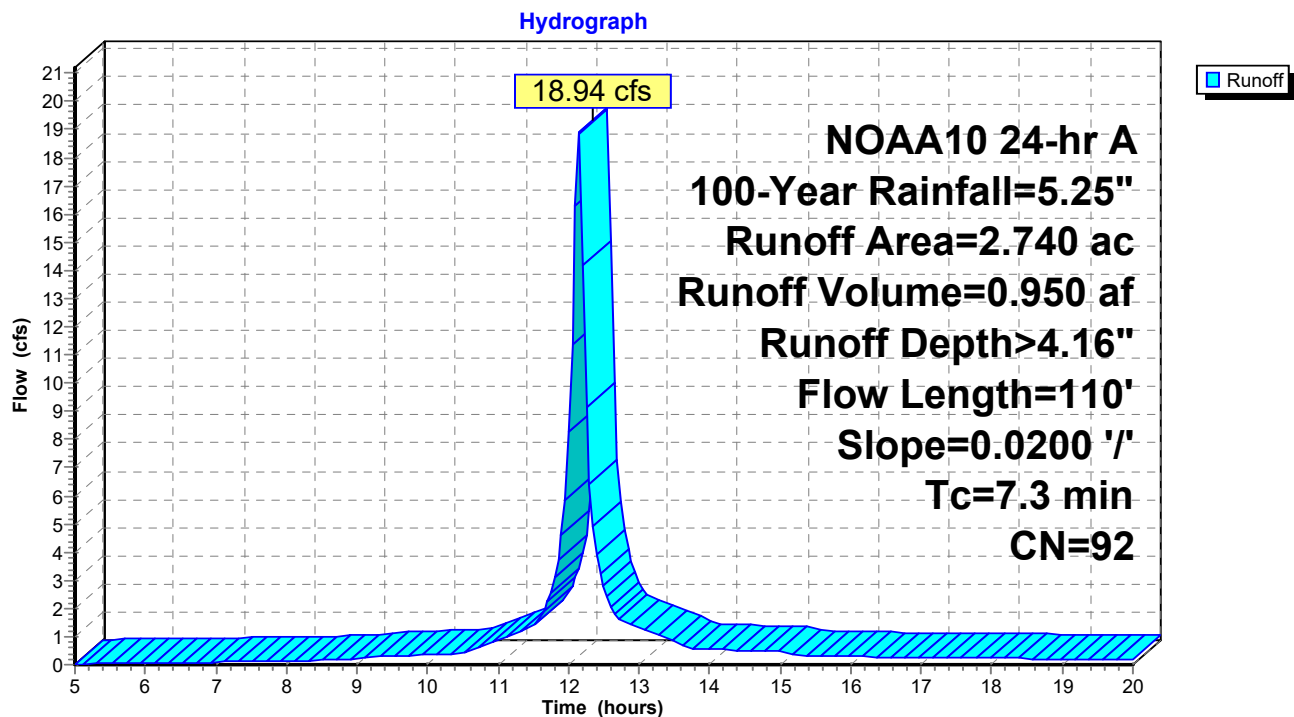
Summary for Subcatchment 3S: BIO DA #3

Runoff = 18.94 cfs @ 12.14 hrs, Volume= 0.950 af, Depth> 4.16"
Routed to Pond 15P : BIO #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
1.230	98	Roofs, HSG D
0.590	98	Paved parking, HSG D
0.920	80	>75% Grass cover, Good, HSG D
2.740	92	Weighted Average
0.920		33.58% Pervious Area
1.820		66.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0200	0.12		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0200	2.12		Shallow Concentrated Flow,
					Grassed Waterway Kv= 15.0 fps
7.3	110	Total			

Subcatchment 3S: BIO DA #3

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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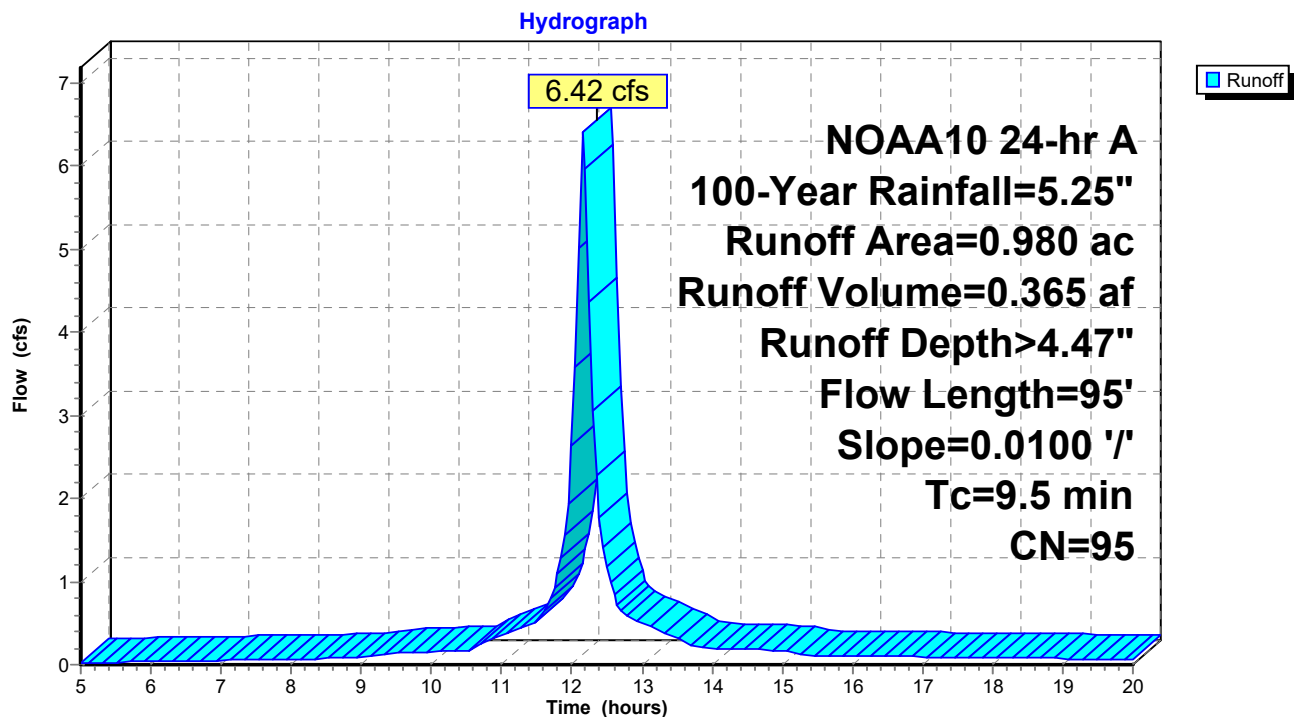
Summary for Subcatchment 4S: BIO DA #4

Runoff = 6.42 cfs @ 12.16 hrs, Volume= 0.365 af, Depth> 4.47"
 Routed to Pond 16P : BIO #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
0.580	98	Roofs, HSG D
0.230	98	Paved parking, HSG D
0.170	80	>75% Grass cover, Good, HSG D
0.980	95	Weighted Average
0.170		17.35% Pervious Area
0.810		82.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.5	45	0.0100	1.50		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
9.5	95	Total			

Subcatchment 4S: BIO DA #4

25-4080 HYDROCAD

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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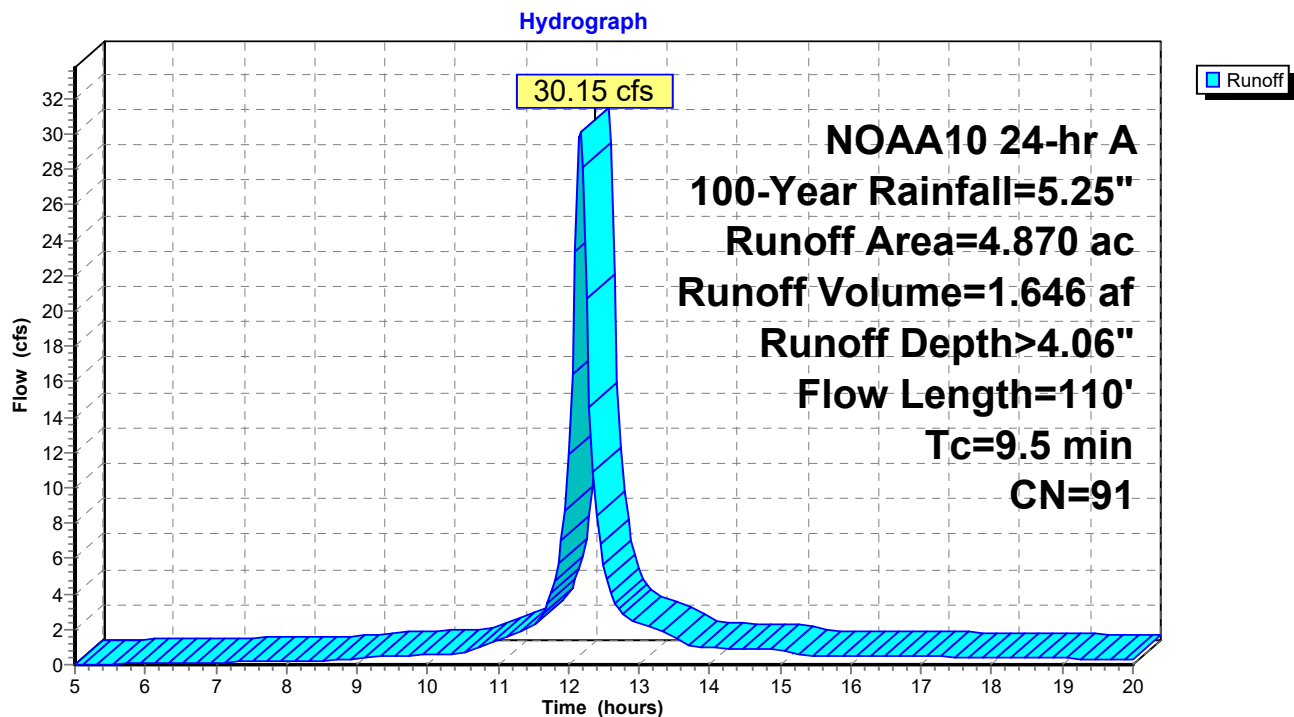
Summary for Subcatchment 11S: BIO DA #5

Runoff = 30.15 cfs @ 12.16 hrs, Volume= 1.646 af, Depth> 4.06"
Routed to Pond 12P : BIO #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
2.070	98	Roofs, HSG D
0.880	98	Paved parking, HSG D
1.920	80	>75% Grass cover, Good, HSG D
4.870	91	Weighted Average
1.920		39.43% Pervious Area
2.950		60.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	50	0.0100	0.09		Sheet Flow, SF-GRASS
					Grass: Short n= 0.150 P2= 2.20"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, SCF-GRASS
					Grassed Waterway Kv= 15.0 fps
9.5	110	Total			

Subcatchment 11S: BIO DA #5

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NOAA10 24-hr A 100-Year Rainfall=5.25"

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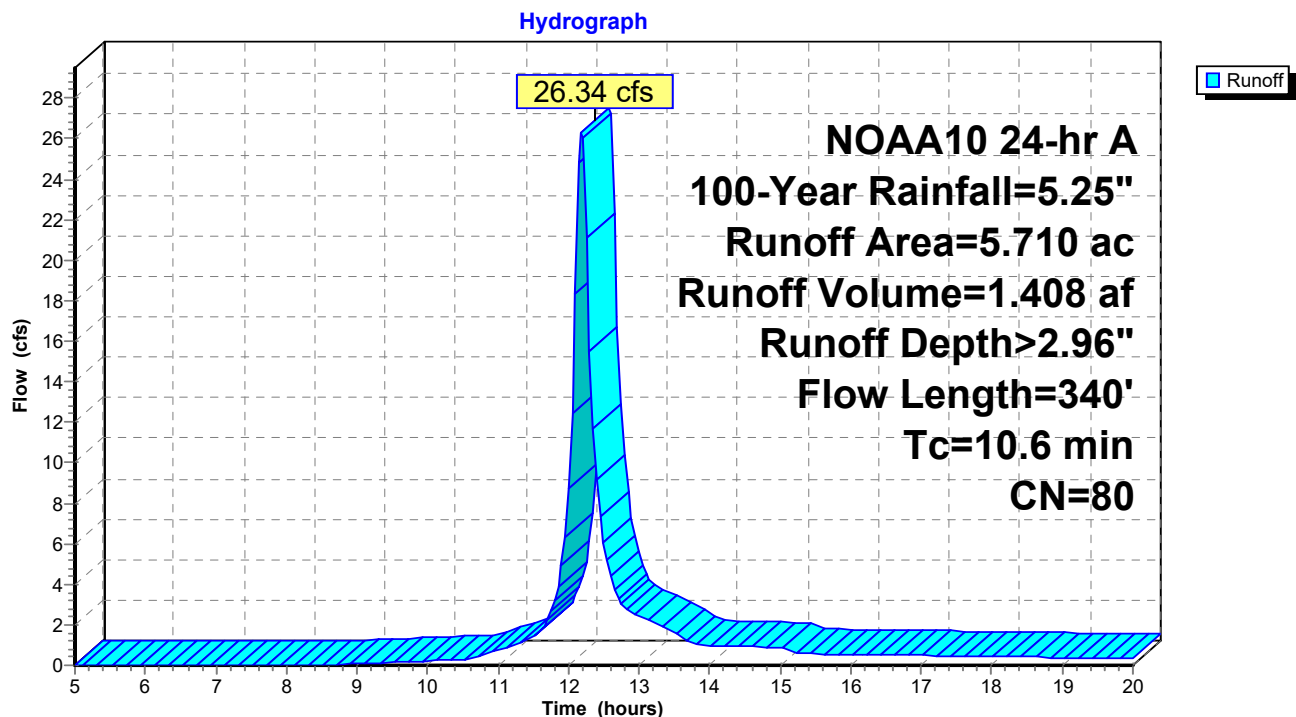
Summary for Subcatchment 19S: POST DEV DA - UNCONTROLLED

Runoff = 26.34 cfs @ 12.18 hrs, Volume= 1.408 af, Depth> 2.96"
 Routed to Link 17L : Total Post Dev

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA10 24-hr A 100-Year Rainfall=5.25"

Area (ac)	CN	Description
5.710	80	>75% Grass cover, Good, HSG D
5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0300	0.17		Sheet Flow, SF - GRASS Grass: Short n= 0.150 P2= 2.20"
0.4	60	0.0300	2.60		Shallow Concentrated Flow, SCF -GRASS Grassed Waterway Kv= 15.0 fps
0.2	180	0.0100	12.71	1,270.51	Channel Flow, CF - DITCH Area= 100.0 sf Perim= 32.0' r= 3.13' n= 0.025 Earth, clean & winding
10.6	340	Total			

Subcatchment 19S: POST DEV DA - UNCONTROLLED

25-4080 HYDROCAD

NOAA10 24-hr A 100-Year Rainfall=5.25"

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Summary for Pond 12P: BIO #5

Inflow Area = 4.870 ac, 60.57% Impervious, Inflow Depth > 4.06" for 100-Year event
 Inflow = 30.15 cfs @ 12.16 hrs, Volume= 1.646 af
 Outflow = 21.04 cfs @ 12.25 hrs, Volume= 1.591 af, Atten= 30%, Lag= 5.2 min
 Primary = 21.04 cfs @ 12.25 hrs, Volume= 1.591 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 573.57' @ 12.25 hrs Surf.Area= 6,906 sf Storage= 9,904 cf

Plug-Flow detention time= 27.0 min calculated for 1.586 af (96% of inflow)
 Center-of-Mass det. time= 14.0 min (773.5 - 759.4)

Volume	Invert	Avail.Storage	Storage Description
#1	571.75'	13,050 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.75	4,000	0	0
572.00	4,400	1,050	1,050
573.00	6,000	5,200	6,250
574.00	7,600	6,800	13,050

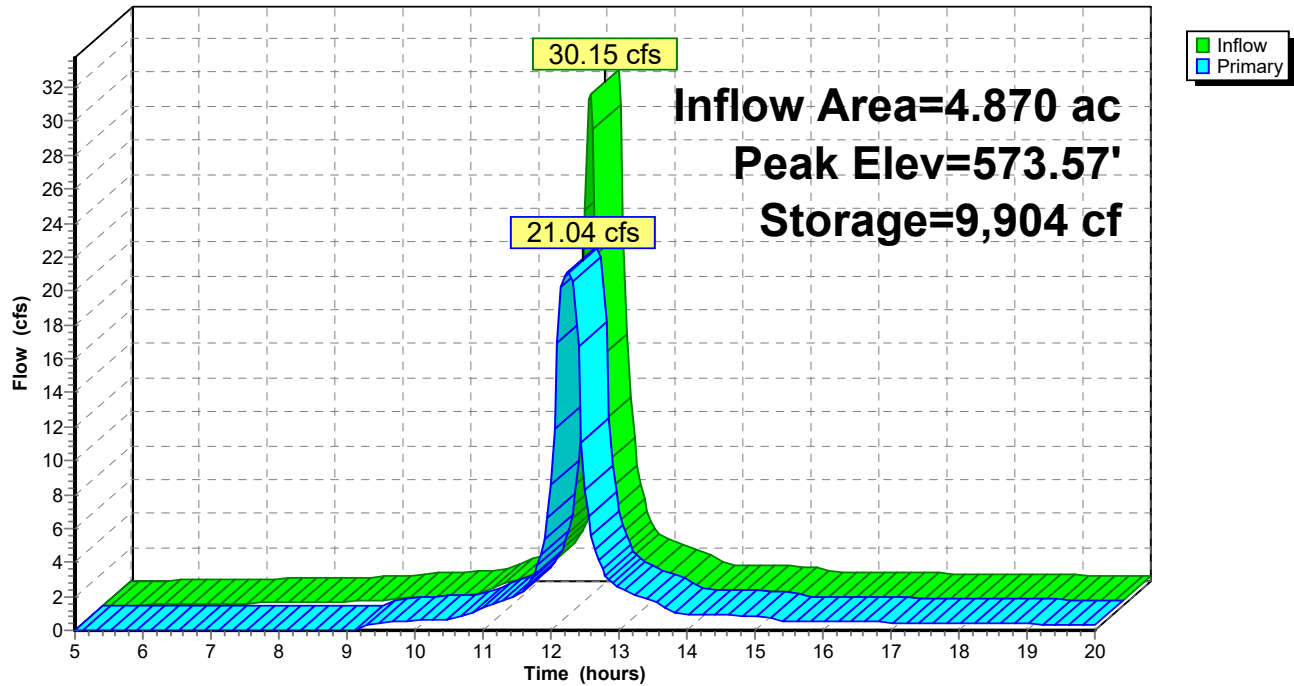
Device	Routing	Invert	Outlet Devices
#1	Primary	568.25'	24.0" Round Culvert L= 401.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 567.04' S= 0.0030 ' S= 0.0030 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 3	572.25'	24.0" W x 24.0" H Vert. YARD DRAINS X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	568.25'	8.0" Round 8" PHDPE UNDERDRAIN L= 203.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.25' / 568.25' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#4	Device 1	573.00'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#5	Device 1	572.25'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=21.04 cfs @ 12.25 hrs HW=573.57' (Free Discharge)

1=Culvert (Barrel Controls 21.04 cfs @ 6.70 fps)
 3=8" PHDPE UNDERDRAIN (Passes < 1.84 cfs potential flow)
 2=YARD DRAINS (Passes < 29.06 cfs potential flow)
 4=OUTLET STRUCTURE (Passes < 4.09 cfs potential flow)
 5=Sharp-Crested Rectangular Weir (Passes < 37.41 cfs potential flow)

Pond 12P: BIO #5

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 100-Year Rainfall=5.25"

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Summary for Pond 13P: BIO #1

Inflow Area = 1.650 ac, 50.91% Impervious, Inflow Depth > 3.85" for 100-Year event
 Inflow = 10.64 cfs @ 12.15 hrs, Volume= 0.529 af
 Outflow = 9.95 cfs @ 12.17 hrs, Volume= 0.513 af, Atten= 6%, Lag= 1.5 min
 Primary = 9.95 cfs @ 12.17 hrs, Volume= 0.513 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.62' @ 12.17 hrs Surf.Area= 1,834 sf Storage= 1,666 cf

Plug-Flow detention time= 20.6 min calculated for 0.512 af (97% of inflow)
 Center-of-Mass det. time= 9.1 min (772.6 - 763.4)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,408 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,140	0	0
573.00	2,070	2,408	2,408

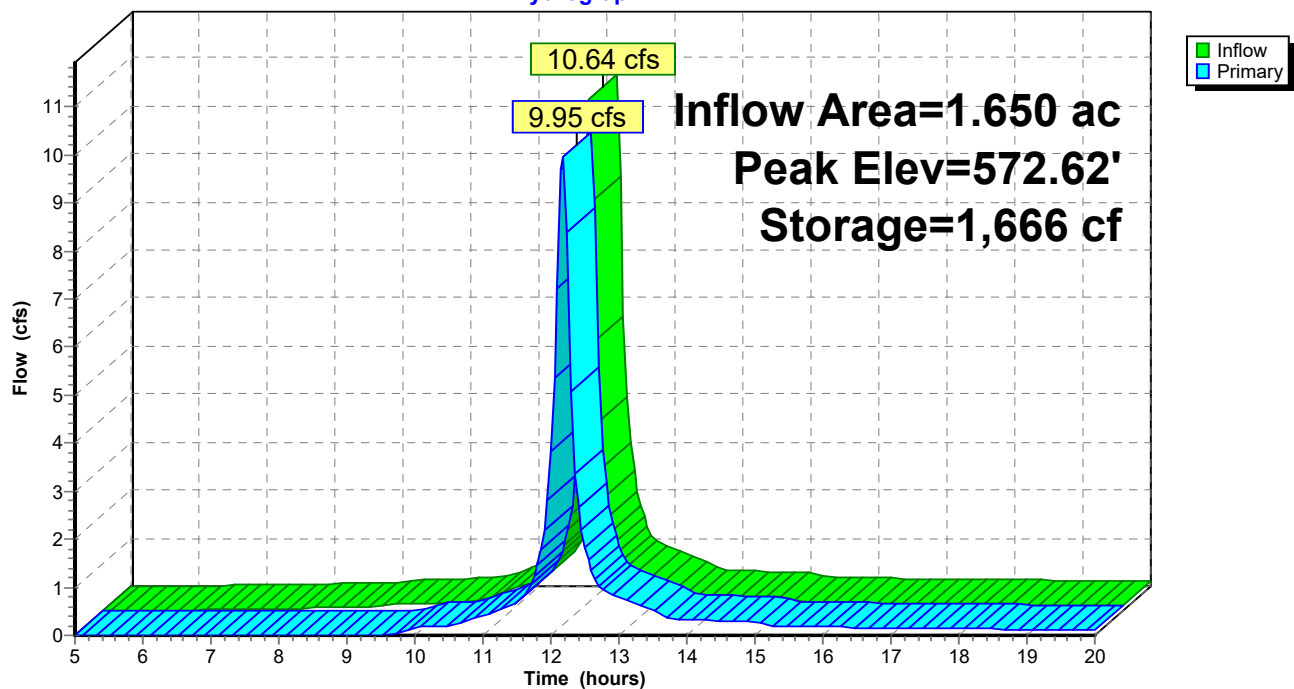
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 315.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.37' S= 0.0020 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=9.63 cfs @ 12.17 hrs HW=572.60' (Free Discharge)

1=Culvert (Passes 9.63 cfs of 10.17 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Barrel Controls 2.60 cfs @ 7.44 fps)
 2=YARD DRAINS (Passes < 6.02 cfs potential flow)
 3=Exfiltration (Passes < 0.02 cfs potential flow)
 5=OUTLET STRUCTURE (Orifice Controls 0.21 cfs @ 1.03 fps)
 6=Sharp-Crested Rectangular Weir (Weir Controls 6.82 cfs @ 2.91 fps)

Pond 13P: BIO #1

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 100-Year Rainfall=5.25"

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Summary for Pond 14P: BIO #2

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.190 ac, 75.63% Impervious, Inflow Depth > 4.37" for 100-Year event
 Inflow = 8.50 cfs @ 12.14 hrs, Volume= 0.434 af
 Outflow = 8.06 cfs @ 12.16 hrs, Volume= 0.417 af, Atten= 5%, Lag= 1.2 min
 Primary = 8.06 cfs @ 12.16 hrs, Volume= 0.417 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.53' @ 12.16 hrs Surf.Area= 1,911 sf Storage= 1,597 cf

Plug-Flow detention time= 28.4 min calculated for 0.416 af (96% of inflow)
 Center-of-Mass det. time= 13.7 min (762.4 - 748.8)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,573 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,190	0	0
573.00	2,240	2,573	2,573

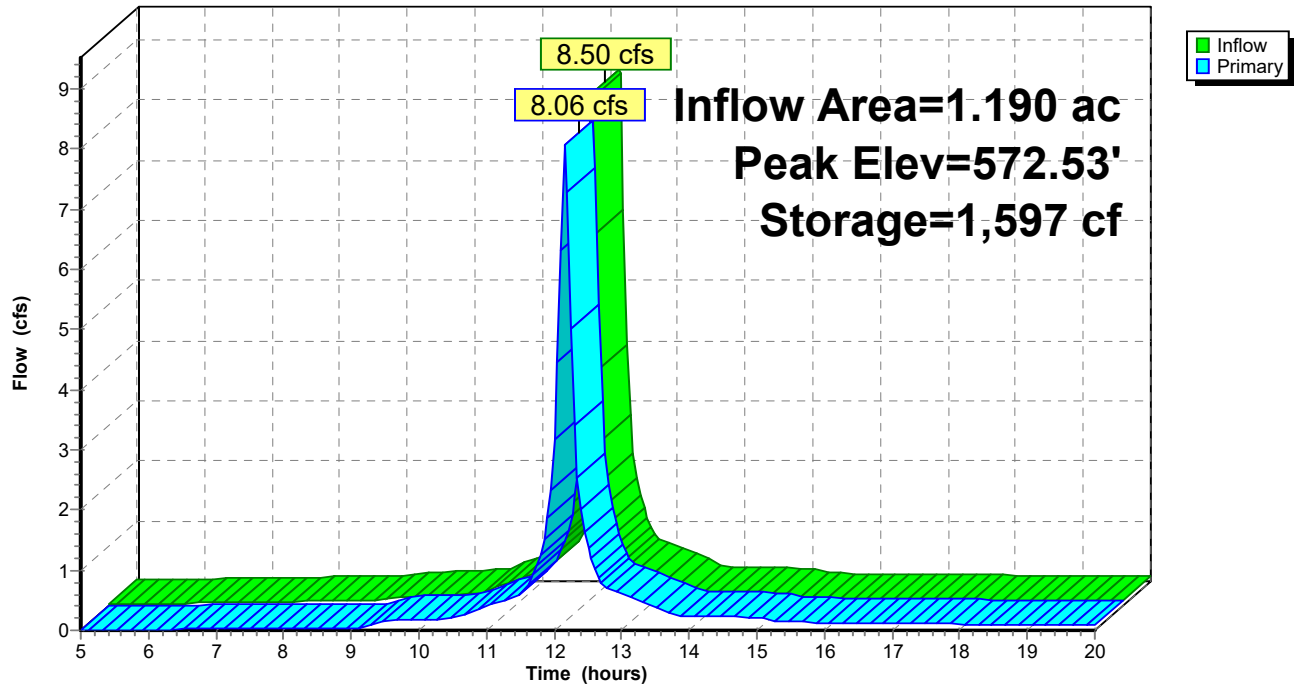
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 176.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.47' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 70.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=7.88 cfs @ 12.16 hrs HW=572.52' (Free Discharge)

1=Culvert (Passes 7.88 cfs of 12.30 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 2.44 cfs of 2.53 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 2.42 cfs @ 2.32 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Orifice Controls 0.02 cfs @ 0.47 fps)
 6=Sharp-Crested Rectangular Weir (Weir Controls 5.42 cfs @ 2.66 fps)

Pond 14P: BIO #2

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 100-Year Rainfall=5.25"

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Summary for Pond 15P: BIO #3

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.740 ac, 66.42% Impervious, Inflow Depth > 4.16" for 100-Year event
 Inflow = 18.94 cfs @ 12.14 hrs, Volume= 0.950 af
 Outflow = 17.91 cfs @ 12.16 hrs, Volume= 0.919 af, Atten= 5%, Lag= 1.2 min
 Primary = 17.91 cfs @ 12.16 hrs, Volume= 0.919 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.63' @ 12.16 hrs Surf.Area= 3,375 sf Storage= 3,253 cf

Plug-Flow detention time= 24.6 min calculated for 0.916 af (96% of inflow)
 Center-of-Mass det. time= 11.7 min (766.5 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	4,930 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	2,400	0	0
572.00	2,800	1,300	1,300
573.10	3,800	3,630	4,930

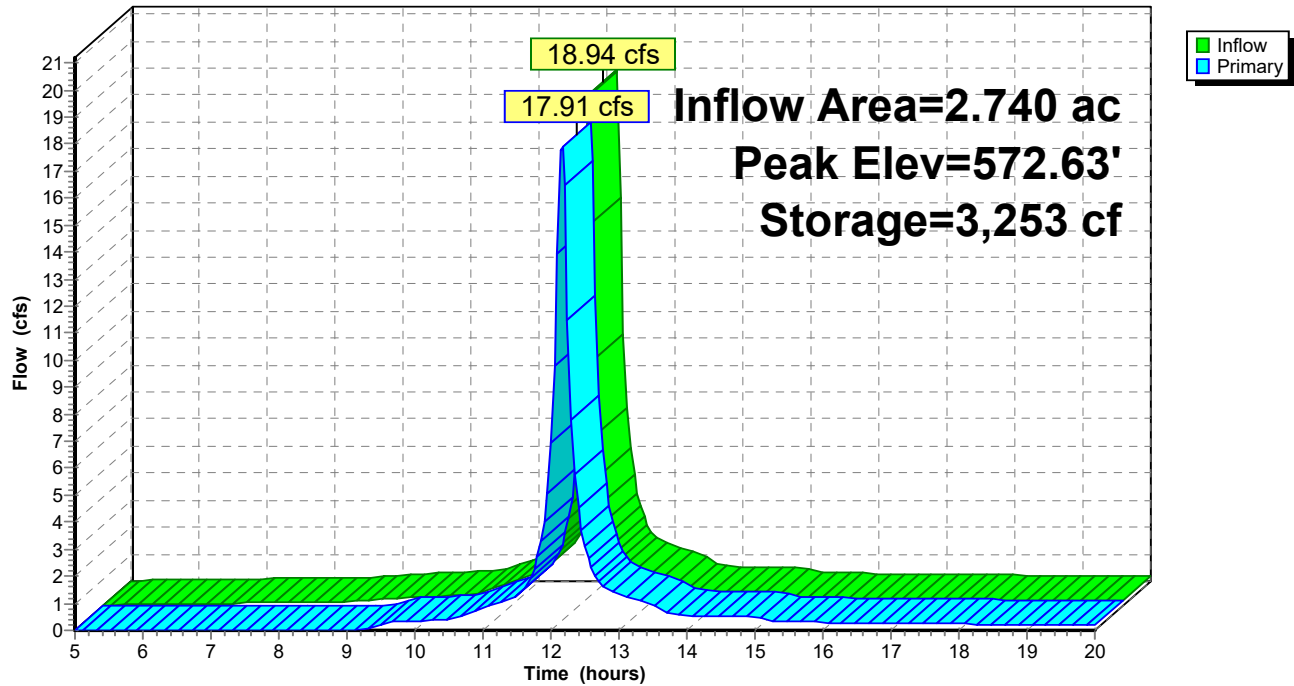
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	24.0" Round Culvert L= 272.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.34' S= 0.0024 ' S= 0.0024 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 75.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	36.0" W x 36.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=17.43 cfs @ 12.16 hrs HW=572.62' (Free Discharge)

1=Culvert (Passes 17.43 cfs of 20.65 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Barrel Controls 2.51 cfs @ 7.18 fps)
 2=YARD DRAINS (Passes < 3.14 cfs potential flow)
 3=Exfiltration (Passes < 0.04 cfs potential flow)
 5=OUTLET STRUCTURE (Orifice Controls 0.41 cfs @ 1.12 fps)
 6=Sharp-Crested Rectangular Weir (Weir Controls 14.52 cfs @ 2.97 fps)

Pond 15P: BIO #3

Hydrograph



25-4080 HYDROCAD

NOAA10 24-hr A 100-Year Rainfall=5.25"

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Summary for Pond 16P: BIO #4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.980 ac, 82.65% Impervious, Inflow Depth > 4.47" for 100-Year event
 Inflow = 6.42 cfs @ 12.16 hrs, Volume= 0.365 af
 Outflow = 6.24 cfs @ 12.19 hrs, Volume= 0.351 af, Atten= 3%, Lag= 1.5 min
 Primary = 6.24 cfs @ 12.19 hrs, Volume= 0.351 af
 Routed to Link 17L : Total Post Dev

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 572.45' @ 12.19 hrs Surf.Area= 1,544 sf Storage= 1,232 cf

Plug-Flow detention time= 29.5 min calculated for 0.351 af (96% of inflow)
 Center-of-Mass det. time= 14.2 min (761.7 - 747.6)

Volume	Invert	Avail.Storage	Storage Description
#1	571.50'	2,160 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
571.50	1,050	0	0
573.00	1,830	2,160	2,160

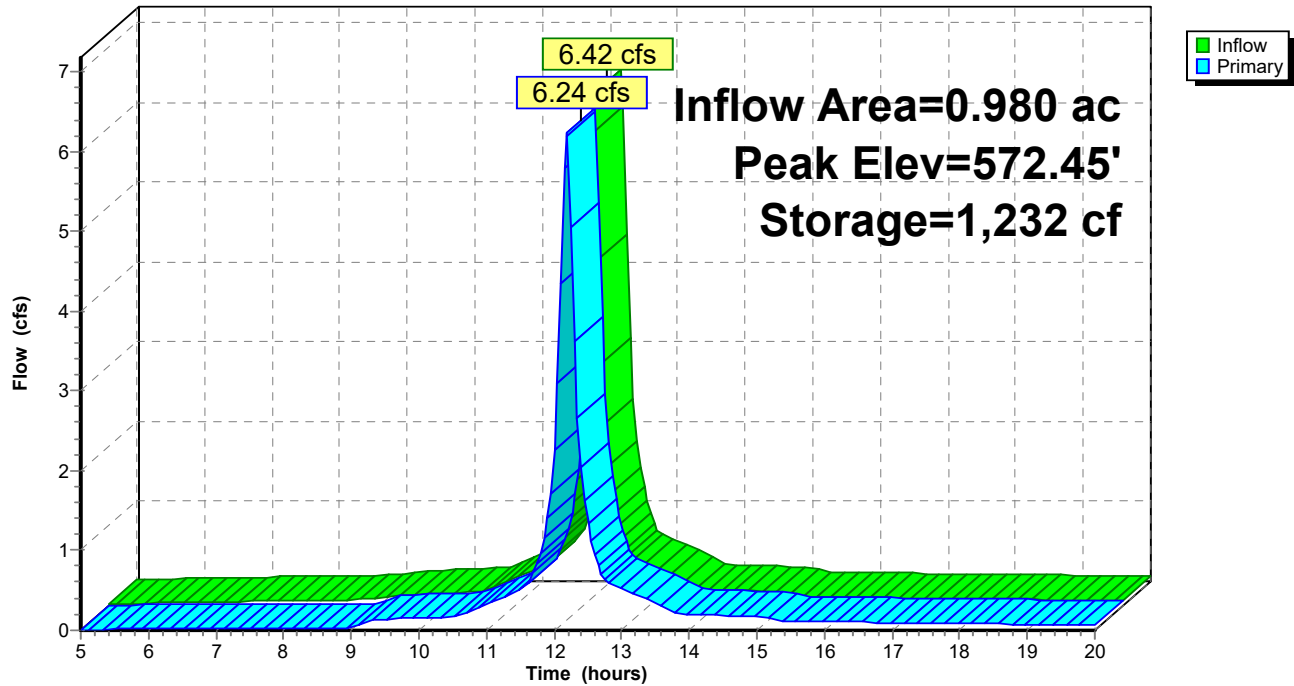
Device	Routing	Invert	Outlet Devices
#1	Primary	568.00'	18.0" Round Culvert L= 203.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 567.39' S= 0.0030 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 4	572.00'	24.0" W x 24.0" H Vert. YARD DRAINS C= 0.600 Limited to weir flow at low heads
#3	Device 4	571.50'	0.500 in/hr Exfiltration over Surface area from 568.00' - 573.00' Excluded Surface area = 0 sf
#4	Device 1	568.00'	8.0" Round 8" PHDPE UNDERDRAIN L= 50.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 568.00' / 568.00' S= 0.0000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#5	Device 1	572.50'	24.0" W x 24.0" H Vert. OUTLET STRUCTURE C= 0.600 Limited to weir flow at low heads
#6	Device 1	572.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Primary OutFlow Max=6.09 cfs @ 12.19 hrs HW=572.44' (Free Discharge)

1=Culvert (Passes 6.09 cfs of 11.71 cfs potential flow)
 4=8" PHDPE UNDERDRAIN (Passes 1.91 cfs of 2.79 cfs potential flow)
 2=YARD DRAINS (Orifice Controls 1.89 cfs @ 2.14 fps)
 3=Exfiltration (Exfiltration Controls 0.02 cfs)
 5=OUTLET STRUCTURE (Controls 0.00 cfs)
 6=Sharp-Crested Rectangular Weir (Weir Controls 4.18 cfs @ 2.41 fps)

Pond 16P: BIO #4

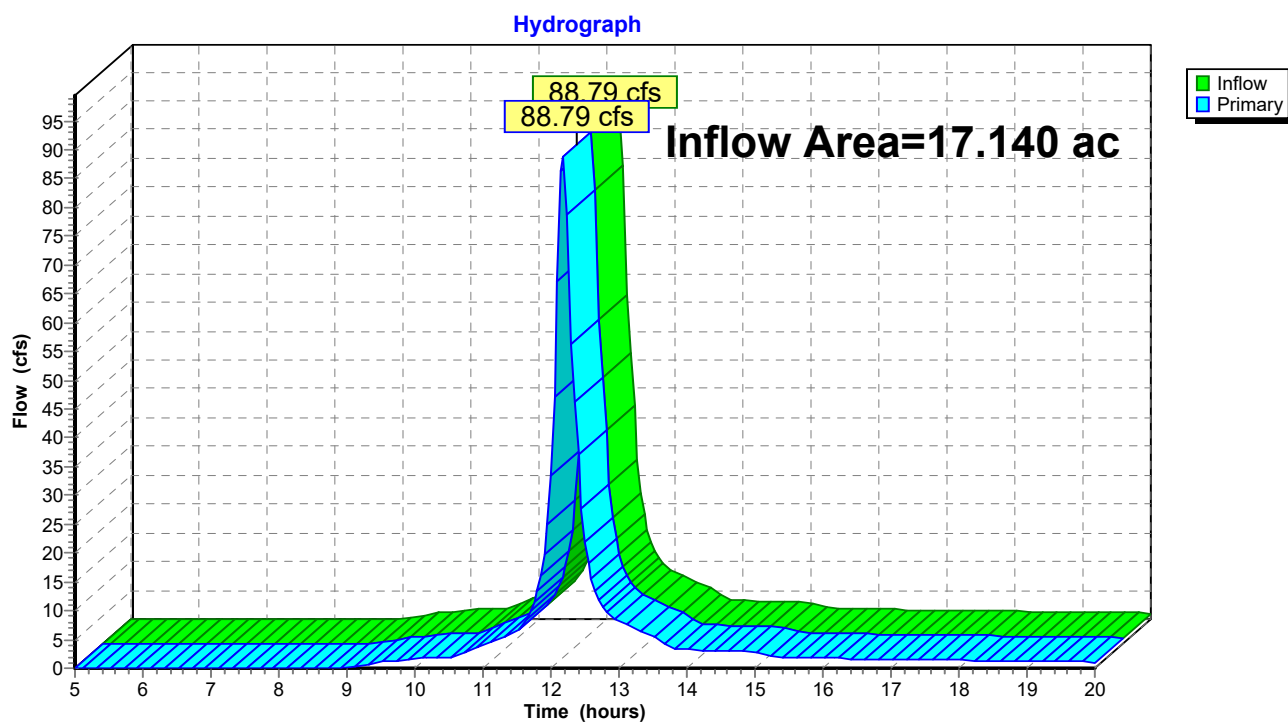
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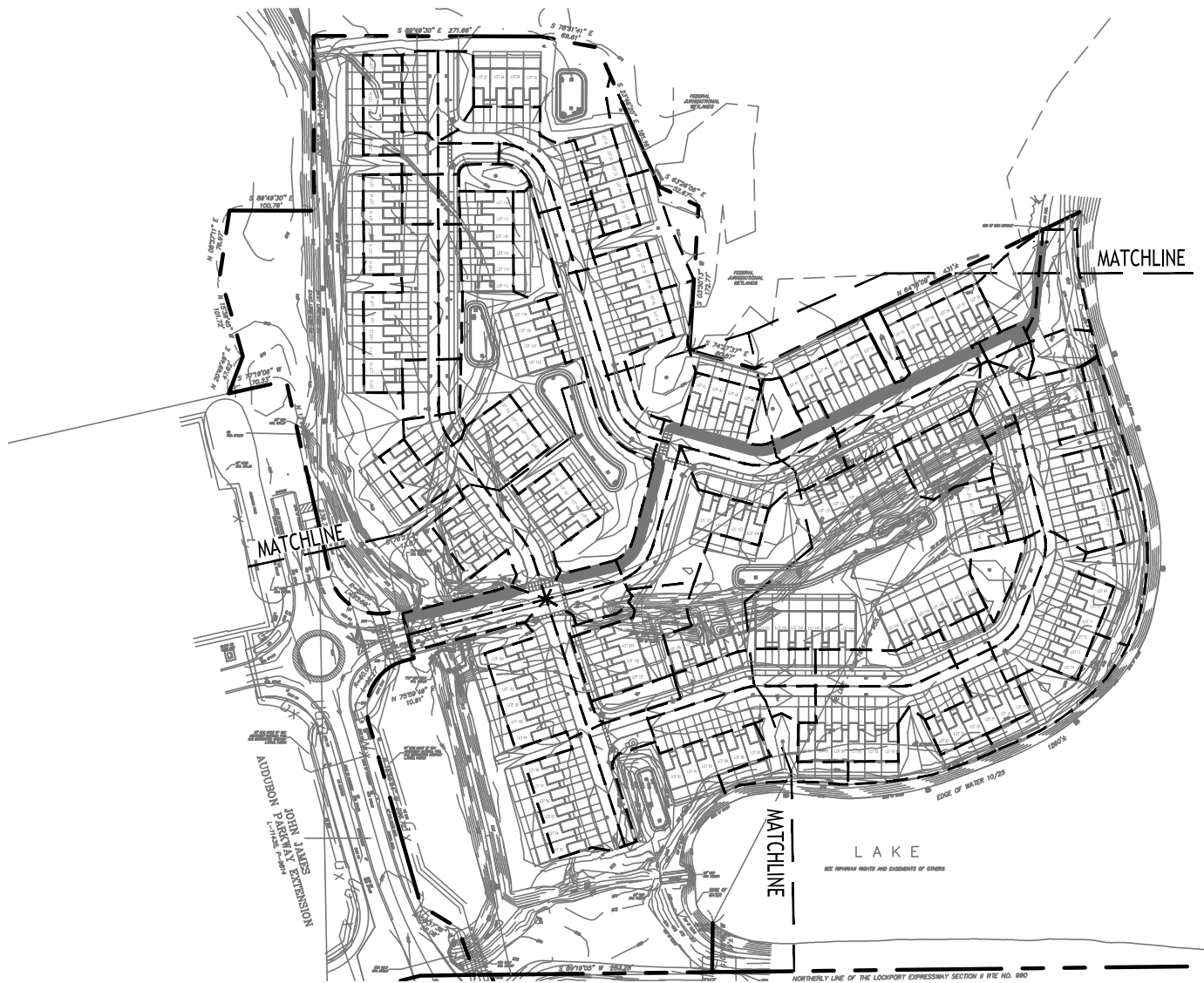
Summary for Link 17L: Total Post Dev

Inflow Area = 17.140 ac, 42.71% Impervious, Inflow Depth > 3.64" for 100-Year event
Inflow = 88.79 cfs @ 12.17 hrs, Volume= 5.200 af
Primary = 88.79 cfs @ 12.17 hrs, Volume= 5.200 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 17L: Total Post Dev

Pipe Capacity Calculations



OVERALL STORM DRAINAGE MAP

SCALE: 1"=200'

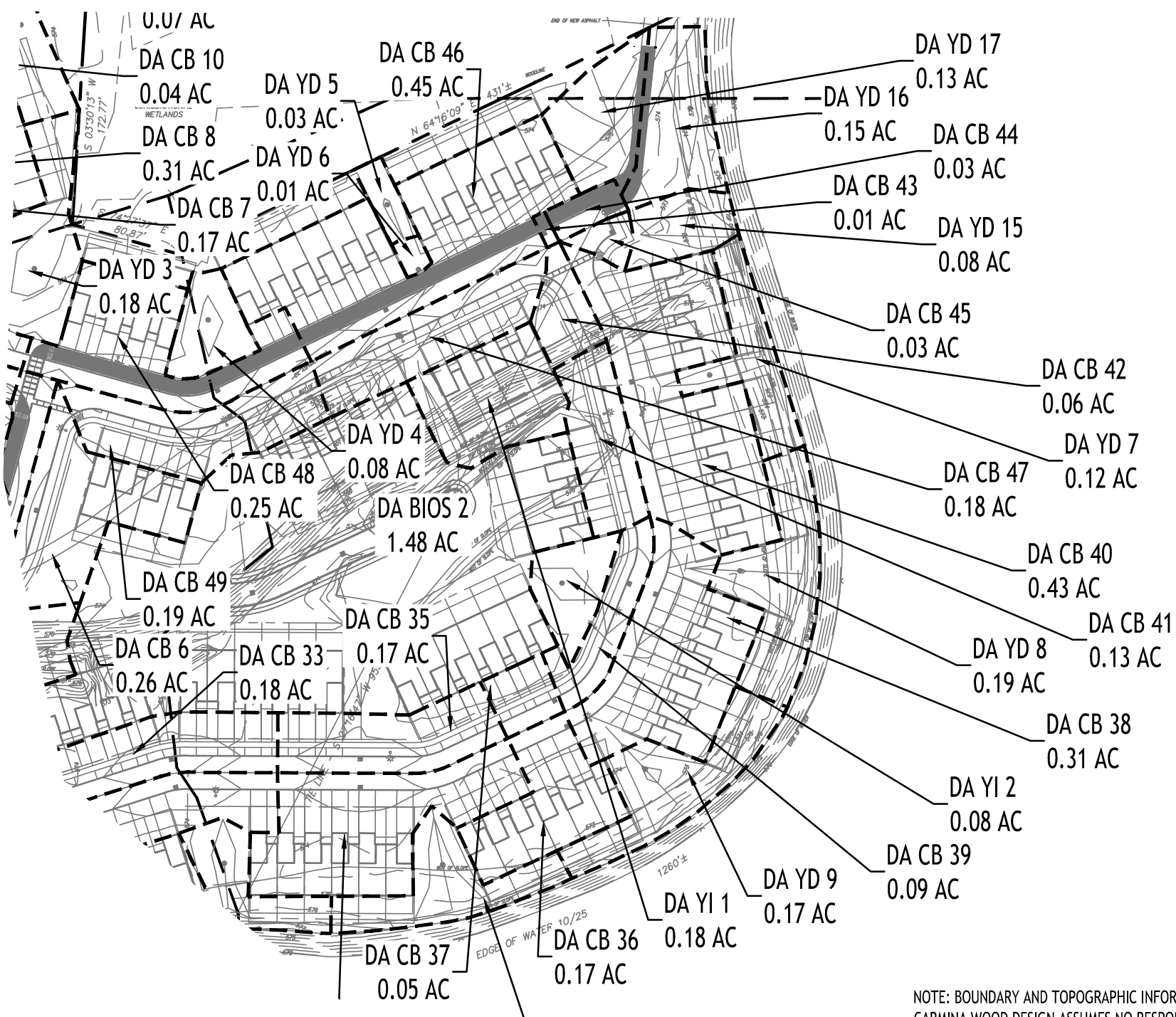
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Number of Children

Number of Families



NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS,
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ENLARGED STORM DRAINAGE MAP

SCALE: 1"=100'



Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	105.291	0.08	0.70	0.25	0.02	0.52	5.0	8.0	4.9	2.54	2.57	3.67	12	0.52	571.75	572.30	572.59	573.11	572.92	574.51	YI 2 - ES
2	1	49.180	0.09	0.62	0.80	0.07	0.50	5.0	7.8	5.0	2.48	2.69	3.32	12	0.57	572.30	572.58	573.25	573.44	574.51	574.66	CB 39 - YI 2
3	2	20.813	0.31	0.53	0.80	0.25	0.42	5.0	7.7	5.0	2.13	2.21	2.74	12	0.38	572.58	572.66	573.56	573.62	574.66	574.66	CB 38 - CB 39
4	3	83.577	0.01	0.22	0.80	0.01	0.18	5.0	6.6	5.4	0.95	2.84	1.46	12	0.63	572.66	573.19	573.80	573.85	574.66	575.46	CB 36A - CB 38
5	4	36.268	0.16	0.21	0.80	0.13	0.17	5.0	6.1	5.6	0.94	3.13	2.36	12	0.77	573.19	573.47	573.89	573.88	575.46	575.68	CB 36 - CB 36A
6	5	20.973	0.05	0.05	0.80	0.04	0.04	5.0	5.0	6.1	0.24	3.56	1.47	12	1.00	573.47	573.68	573.88	573.88	575.68	575.68	CB 37 - CB 36
7	End	30.384	0.10	0.74	0.80	0.08	0.55	5.0	14.9	3.6	1.95	3.54	3.46	12	0.99	571.50	571.80	572.30	572.40	572.67	574.62	CB 30 - ES
8	7	129.102	0.01	0.40	0.80	0.01	0.28	5.0	13.9	3.7	1.03	3.56	2.66	12	1.00	571.80	573.09	572.40	573.52	574.62	575.52	CB 29 - CB 30
9	8	25.872	0.05	0.32	0.80	0.04	0.26	5.0	5.2	6.0	1.53	2.52	3.37	12	0.50	573.09	573.22	573.65	573.78	575.52	575.33	CB 28 - CB 29
10	9	20.957	0.27	0.27	0.80	0.22	0.22	5.0	5.0	6.1	1.31	2.58	2.01	12	0.53	573.22	573.33	574.05	574.06	575.33	575.33	CB 27 - CB 28
11	End	111.602	0.36	0.73	0.80	0.29	0.58	5.0	9.4	4.5	2.65	3.29	4.13	12	0.85	571.50	572.45	572.35	573.15	0.00	574.65	CB 25 - ES
12	11	84.714	0.02	0.07	0.80	0.02	0.06	5.0	6.1	5.6	0.31	3.19	1.41	12	0.80	572.45	573.13	573.15	573.36	574.65	575.29	CB 24 - CB 25
13	12	21.005	0.05	0.05	0.80	0.04	0.04	5.0	5.0	6.1	0.24	3.11	1.96	12	0.76	573.13	573.29	573.36	573.49	575.29	575.29	CB 23 - CB 24
14	8	57.878	0.07	0.07	0.20	0.01	0.01	5.0	5.0	6.1	0.08	2.85	0.80	12	0.64	573.09	573.46	573.52	573.60	575.52	574.96	YI 5 - CB 29
15	End	28.201	0.10	0.72	0.80	0.08	0.58	5.0	9.4	4.5	2.62	4.74	4.10	12	1.77	571.50	572.00	572.35	572.69	572.67	574.30	CB 19 - ES
16	15	114.626	0.03	0.09	0.80	0.02	0.07	5.0	5.9	5.6	0.41	3.19	1.58	12	0.80	572.00	572.92	572.69	573.18	574.30	575.17	CB 18 - CB 19
17	16	21.000	0.06	0.06	0.80	0.05	0.05	5.0	5.0	6.1	0.29	3.56	2.00	12	1.00	572.92	573.13	573.18	573.35	575.17	575.17	CB 17 - CB 18
18	End	24.431	0.18	1.82	0.25	0.05	1.18	5.0	34.3	2.2	2.55	6.72	2.02	18	0.41	571.75	571.85	572.80	572.81	573.46	574.18	YI 1 - ES
19	18	117.224	0.13	0.97	0.80	0.10	0.62	5.0	14.2	3.7	2.28	5.31	1.89	18	0.26	571.85	572.15	572.95	573.02	574.18	574.65	CB 41 - YI 1
20	19	32.266	0.06	0.41	0.80	0.05	0.17	5.0	13.7	3.7	0.65	2.26	1.02	12	0.40	572.32	572.45	573.15	573.15	574.65	574.83	CB 42 - CB 41
21	20	89.836	0.01	0.35	0.80	0.01	0.13	5.0	12.1	4.0	0.50	1.95	1.10	12	0.30	572.45	572.72	573.16	573.20	574.83	575.77	CB 43 - CB 42
22	21	45.033	0.03	0.34	0.80	0.02	0.12	5.0	11.2	4.2	0.49	1.99	1.39	12	0.31	572.72	572.86	573.24	573.27	575.77	575.24	CB 44 - CB 43
Project File: Muir Woods Pipe Calcs after town comments - 20260928.stm											Number of lines: 73		Run Date: 9/28/2026									
NOTES:Intensity = 26.66 / (Inlet time + 3.50) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID	
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)				
23	22	20.887	0.03	0.03	0.80	0.02	0.02	5.0	5.0	6.1	0.15	3.57	1.12	12	1.01	572.86	573.07	573.35	573.23	575.24	575.24	CB 45 - CB 44	
24	22	78.634	0.13	0.28	0.25	0.03	0.07	5.0	8.7	4.7	0.33	1.97	0.67	12	0.31	572.61	572.85	573.35	573.37	575.24	574.42	YD 17 - CB 44	
25	24	64.084	0.15	0.15	0.25	0.04	0.04	5.0	5.0	6.1	0.23	1.94	0.72	12	0.30	572.85	573.04	573.38	573.40	574.42	574.49	YD 16 - YD 17	
26	18	98.677	0.18	0.67	0.80	0.14	0.51	5.0	33.9	2.2	1.12	3.48	2.37	12	0.95	571.85	572.79	572.95	573.23	574.18	574.70	CB 47 - YI 1	
27	26	20.978	0.45	0.49	0.80	0.36	0.37	5.0	33.8	2.2	0.80	2.46	2.60	12	0.48	572.79	572.89	573.23	573.28	574.70	574.70	CB 46 - CB 47	
28	27	37.789	0.01	0.04	0.25	0.00	0.01	5.0	24.0	2.7	0.02	2.53	0.04	12	0.50	572.64	572.83	573.45	573.45	574.70	575.24	YD 6 - CB 46	
29	28	52.753	0.03	0.03	0.20	0.01	0.01	5.0	5.0	6.1	0.04	1.95	0.09	12	0.30	572.83	572.99	573.45	573.45	575.24	574.74	YD 5 - YD 6	
30	End	34.729	0.17	0.89	0.80	0.14	0.53	5.0	12.0	4.0	2.13	3.58	3.63	12	1.01	571.50	571.85	572.31	572.47	0.00	574.95	CB 7 - ES	
31	30	20.997	0.31	0.72	0.80	0.25	0.40	5.0	11.8	4.0	1.60	3.39	3.41	12	0.90	571.85	572.04	572.47	572.58	574.95	574.95	CB 8 - CB 7	
32	31	191.000	0.07	0.23	0.80	0.06	0.11	5.0	8.1	4.9	0.55	2.25	1.96	12	0.40	572.04	572.80	572.58	573.11	574.95	575.54	CB 9 - CB 8	
33	32	21.361	0.04	0.16	0.80	0.03	0.06	5.0	7.3	5.2	0.29	2.31	0.91	12	0.42	572.80	572.89	573.27	573.28	575.54	575.54	CB 10 - CB 9	
34	End	58.674	0.10	0.66	0.80	0.08	0.50	5.0	11.2	4.2	2.09	5.82	1.80	18	0.31	571.50	571.68	572.52	572.55	573.21	574.91	CB 5 - ES	
35	34	20.995	0.25	0.56	0.70	0.18	0.42	5.0	11.0	4.2	1.77	1.95	2.36	12	0.30	571.68	571.74	572.60	572.64	574.91	574.91	CB 6 - CB 5	
36	35	46.535	0.01	0.31	0.80	0.01	0.25	5.0	10.6	4.3	1.06	1.95	1.37	12	0.30	571.74	571.88	572.78	572.81	574.91	575.14	CB 4A - CB 6	
37	36	42.355	0.07	0.30	0.80	0.06	0.24	5.0	10.1	4.4	1.05	1.97	1.41	12	0.31	571.88	572.01	572.84	572.87	575.14	575.60	CB 4 - CB 4A	
38	37	260.537	0.07	0.16	0.80	0.06	0.13	5.0	5.7	5.7	0.73	1.91	1.54	12	0.29	572.01	572.76	572.92	573.22	575.60	574.82	CB 1 - CB 4	
39	38	23.557	0.09	0.09	0.80	0.07	0.07	5.0	5.0	6.1	0.44	1.64	1.01	12	0.21	572.76	572.81	573.32	573.33	574.82	574.81	CB 2 - CB 1	
40	End	121.840	0.19	0.52	0.80	0.15	0.37	5.0	12.2	4.0	1.46	3.04	2.95	12	0.73	571.75	572.64	572.51	573.15	574.74	574.74	CB 49 - ES	
41	40	21.194	0.25	0.33	0.80	0.20	0.22	5.0	12.0	4.0	0.87	2.57	2.43	12	0.52	572.64	572.75	573.15	573.18	574.74	574.73	CB 48 - CB 49	
42	33	25.092	0.12	0.12	0.20	0.02	0.02	5.0	5.0	6.1	0.15	2.01	0.29	12	0.32	572.64	572.72	573.29	573.29	575.54	574.47	YD 12 - CB 10	
43	15	70.147	0.04	0.11	0.80	0.03	0.09	5.0	5.8	5.7	0.50	3.18	1.74	12	0.80	572.00	572.56	572.69	572.85	574.30	574.75	CB 21 - CB 19	
44	43	20.998	0.07	0.07	0.80	0.06	0.06	5.0	5.0	6.1	0.34	3.30	2.05	12	0.86	572.56	572.74	572.85	572.98	574.75	574.74	CB 22 - CB 21	
Project File: Muir Woods Pipe Calcs after town comments - 20260928.stm														Number of lines: 73						Run Date: 9/28/2026			
NOTES:Intensity = 26.66 / (Inlet time + 3.50) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box																							

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	41	51.901	0.08	0.08	0.20	0.02	0.02	5.0	5.0	6.1	0.10	2.27	0.19	12	0.40	572.50	572.71	573.24	573.24	574.73	574.46	YD 4 - CB 48
46	11	20.865	0.30	0.30	0.80	0.24	0.24	5.0	5.0	6.1	1.46	3.49	3.05	12	0.96	572.45	572.65	573.15	573.16	574.65	574.65	CB 26 - CB 25
47	End	13.533	0.01	0.64	0.20	0.00	0.48	5.0	6.2	5.5	2.65	3.62	4.14	12	1.03	571.75	571.89	572.60	572.59	572.92	574.26	YI 3 - ES
48	47	104.013	0.18	0.37	0.80	0.14	0.30	5.0	5.3	5.9	1.75	2.52	3.33	12	0.50	571.89	572.41	572.59	573.00	574.26	574.64	CB 33 - YI 3
49	48	20.974	0.19	0.19	0.80	0.15	0.15	5.0	5.0	6.1	0.92	2.46	1.73	12	0.48	572.41	572.51	573.10	573.11	574.64	574.64	CB 32 - CB 33
50	End	147.834	0.17	0.47	0.80	0.14	0.38	5.0	5.2	6.0	2.25	2.25	3.26	12	0.40	571.75	572.34	572.57	573.16	572.92	574.60	CB 35 - ES
51	50	20.943	0.30	0.30	0.80	0.24	0.24	5.0	5.0	6.1	1.46	3.97	2.78	12	1.24	572.34	572.60	573.24	573.11	574.60	574.60	CB 34 - CB 35
52	19	21.000	0.43	0.43	0.80	0.34	0.34	5.0	5.0	6.1	2.09	2.58	3.11	12	0.52	572.32	572.43	573.15	573.20	574.65	574.65	CB 40 - CB 41
53	End	48.512	0.19	0.71	0.80	0.15	0.53	5.0	10.5	4.3	2.28	5.84	1.89	18	0.31	571.50	571.65	572.54	572.56	573.21	574.69	CB 11 - ES 10
54	53	21.037	0.05	0.52	0.80	0.04	0.38	5.0	10.4	4.3	1.64	1.95	2.16	12	0.30	571.65	571.71	572.59	572.63	574.69	574.69	CB 12 - CB 11
55	54	35.316	0.05	0.47	0.80	0.04	0.34	5.0	10.2	4.4	1.48	1.99	1.90	12	0.31	571.71	571.82	572.73	572.79	574.69	574.96	CB 13 - CB 12
56	55	84.904	0.17	0.36	0.80	0.14	0.29	5.0	7.0	5.3	1.51	1.93	1.95	12	0.29	571.82	572.07	572.87	573.02	574.96	575.40	CB 14 - CB 13
57	56	92.137	0.10	0.19	0.80	0.08	0.15	5.0	5.6	5.8	0.88	1.82	1.18	12	0.26	572.07	572.31	573.11	573.16	575.40	574.37	CB 15 - CB 14
58	57	21.062	0.09	0.09	0.80	0.07	0.07	5.0	5.0	6.1	0.44	1.90	0.61	12	0.28	572.31	572.37	573.19	573.19	574.37	574.37	CB 16 - CB 15
59	37	21.256	0.05	0.05	0.80	0.04	0.04	5.0	5.0	6.1	0.24	1.89	0.33	12	0.28	572.01	572.07	572.92	572.93	575.60	575.58	CB 3 - CB 4
60	15	20.970	0.42	0.42	0.80	0.34	0.34	5.0	5.0	6.1	2.04	3.56	3.79	12	1.00	572.00	572.21	572.69	572.82	574.30	574.30	CB 20 - CB 19
61	47	103.093	0.26	0.26	0.70	0.18	0.18	5.0	5.0	6.1	1.10	3.14	2.61	12	0.78	571.90	572.70	572.59	573.14	574.26	574.67	YI 4 - YI 3
62	7	21.073	0.24	0.24	0.80	0.19	0.19	5.0	5.0	6.1	1.17	3.56	2.87	12	1.00	571.80	572.01	572.40	572.46	574.62	574.62	CB 31 - CB 30
63	31	56.705	0.18	0.18	0.20	0.04	0.04	5.0	5.0	6.1	0.22	1.95	0.38	12	0.30	571.79	571.96	572.58	572.58	574.95	574.12	YD 3 - CB 8
64	37	34.422	0.02	0.02	0.80	0.02	0.02	5.0	5.0	6.1	0.10	3.32	0.13	12	0.87	571.76	572.06	572.92	572.92	575.60	575.67	YD 14 - CB 4
65	55	28.777	0.06	0.06	0.20	0.01	0.01	5.0	5.0	6.1	0.07	5.79	0.13	12	2.64	571.57	572.33	572.87	572.87	574.96	574.58	YD 13 - CB 13
66	End	46.639	0.06	0.21	0.20	0.01	0.04	5.0	15.6	3.5	0.15	2.95	1.09	12	0.69	570.75	571.07	571.33	571.23	571.92	573.88	YD 1 - ES 2
Project File: Muir Woods Pipe Calcs after town comments - 20260928.stm															Number of lines: 73					Run Date: 9/28/2026		
NOTES:Intensity = 26.66 / (Inlet time + 3.50) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
67	66	148.009	0.15	0.15	0.20	0.03	0.03	5.0	5.0	6.1	0.18	3.18	2.08	12	0.80	571.07	572.25	571.23	572.42	573.88	574.57	YD 2 - YD 1
68	End	22.662	0.08	0.08	0.20	0.02	0.02	5.0	5.0	6.1	0.10	6.17	0.94	12	3.00	569.25	569.93	569.81	570.06	570.42	574.32	YD 15 - ES
69	End	74.310	0.19	0.19	0.25	0.05	0.05	5.0	5.0	6.1	0.29	6.60	1.41	12	3.43	569.25	571.80	569.86	572.02	570.42	573.96	YD 8 - ES
70	End	59.470	0.17	0.17	0.25	0.04	0.04	5.0	5.0	6.1	0.26	7.39	1.35	12	4.30	569.25	571.81	569.85	572.02	570.42	573.83	YD 9 - ES
71	End	55.497	0.14	0.14	0.30	0.04	0.04	5.0	5.0	6.1	0.25	7.19	1.34	12	4.07	569.25	571.51	569.85	571.72	570.42	574.24	YD 10 - ES
72	End	61.096	0.14	0.14	0.20	0.03	0.03	5.0	5.0	6.1	0.17	6.97	1.15	12	3.83	569.25	571.59	569.83	571.76	570.42	574.40	YD 11 - ES
73	End	68.469	0.12	0.12	0.25	0.03	0.03	5.0	5.0	6.1	0.18	6.48	1.18	12	3.32	569.25	571.52	569.84	571.69	570.42	574.30	YD 7 - ES
Project File: Muir Woods Pipe Calcs after town comments - 20260928.stm											Number of lines: 73		Run Date: 9/28/2026									
NOTES:Intensity = 26.66 / (Inlet time + 3.50) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Green Infrastructure & Water Quality Calculations

Step 2 - Calculate Water Quality Volume

Is this project subject to Section 4.3 of the NYS Design Manual for Enhanced Phosphorus Removal?							No
What is the nature of this construction project?							New Construction
Design Point:	1						
P=	0.90	inches	Enter 90% Rainfall Event as P				
Calculate Required WQv							
Drainage Area Number	Contributing Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (cf)	SMP Description	
1	1.65	0.84	51	0.51	2,747	Filtration Bioretention	
2	1.19	0.90	76	0.73	2,847	Filtration Bioretention	
3	2.74	1.82	66	0.65	5,799	Filtration Bioretention	
4	0.98	0.81	83	0.80	2,550	Filtration Bioretention	
5	4.87	2.95	61	0.60	9,474	Filtration Bioretention	
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
Total	11.43	7.33	64	0.63	23417	Required WQv	

Step 4 - Calculate Minimum RRv Required

Enter the Soils Data for the site

Hydrologic Soil Group	Acres	S
A		55%
B		40%
C		30%
D	7.33	20%
Total Area	7.33	

Calculate the Minimum RRv

S =	0.20	
Impervious =	7.33	<i>acres</i>
Precipitation	0.90	<i>inches</i>
Rv	0.95	
Minimum RRv	0.104	<i>af</i>
	4530	<i>cf</i>

Filtration Bioretention (F-5)

Design Point:	1						
Enter Site Data For Drainage Area to be Treated by Practice							
Drainage Area Number	Contributing Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (cf)	Precipitation (in)	Description
1	1.65	0.84	51	0.51	2,747	0.90	Filtration Bioretention
Design Criteria							
Enter underlying soil infiltration rate (based on geotechnical testing, refer to Appendix D)			0	Underdrains required			
Is the contributing area to the practice a stormwater hotspot?			No				
Is the practice the first in series for treatment of a Level 1 (Infiltration Restricted) hotspot?			No				
Is contributing area greater than max. contributing area?			No				
Enter depth to seasonal high water table (ft)			10				
Enter depth to bedrock (ft)			10				
Is pretreatment provided, in conformance with Section 6.4.3.1			Yes				
Enter average height of ponding (ft)			0.5				
Enter depth of surface layer (inches)			3				
Enter depth of filter media (ft)			2.5				
Enter depth of drainage layer (inches)			12				
Enter slope of maintenance access (%)			5				
Enter width of maintenance access (ft)			12				
Sizing Criteria							
				Value	Units	Notes	
Permeability Flow Rate			k	1	ft/day		
Filter Time			tf	2	days		
Required Filter Area			Af	1145	sf		
Enter Provided Filter Area			Af	1150	sf		
Recalculated Water Quality Volume (based on provided filter area)			WQv calc	2760	cf		
Calculate Runoff Reduction							
RRv Provided		1,104	cf				
WQv Treated		1643	cf	This is the portion of the WQv that is not reduced in the practice.			

Filtration Bioretention (F-5)

Design Point:	1						
Enter Site Data For Drainage Area to be Treated by Practice							
Drainage Area Number	Contributing Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (cf)	Precipitation (in)	Description
2	1.19	0.90	76	0.73	2,847	0.90	Filtration Bioretention
Design Criteria							
Enter underlying soil infiltration rate (based on geotechnical testing, refer to Appendix D)			0	Underdrains required			
Is the contributing area to the practice a stormwater hotspot?			No				
Is the practice the first in series for treatment of a Level 1 (Infiltration Restricted) hotspot?			No				
Is contributing area greater than max. contributing area?			No				
Enter depth to seasonal high water table (ft)			10				
Enter depth to bedrock (ft)			10				
Is pretreatment provided, in conformance with Section 6.4.3.1			Yes				
Enter average height of ponding (ft)			0.5				
Enter depth of surface layer (inches)			3				
Enter depth of filter media (ft)			2.5				
Enter depth of drainage layer (inches)			12				
Enter slope of maintenance access (%)			5				
Enter width of maintenance access (ft)			12				
Sizing Criteria							
				Value	Units	Notes	
Permeability Flow Rate			k	1	ft/day		
Filter Time			tf	2	days		
Required Filter Area			Af	1186	sf		
Enter Provided Filter Area			Af	1200	sf		
Recalculated Water Quality Volume (based on provided filter area)			WQv calc	2880	cf		
Calculate Runoff Reduction							
RRv Provided		1,152	cf				
WQv Treated		1695	cf	This is the portion of the WQv that is not reduced in the practice.			

Filtration Bioretention (F-5)

Design Point:	1						
Enter Site Data For Drainage Area to be Treated by Practice							
Drainage Area Number	Contributing Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (cf)	Precipitation (in)	Description
3	2.74	1.82	66	0.65	5,799	0.90	Filtration Bioretention
Design Criteria							
Enter underlying soil infiltration rate (based on geotechnical testing, refer to Appendix D)			0	Underdrains required			
Is the contributing area to the practice a stormwater hotspot?			No				
Is the practice the first in series for treatment of a Level 1 (Infiltration Restricted) hotspot?			No				
Is contributing area greater than max. contributing area?			No				
Enter depth to seasonal high water table (ft)			10				
Enter depth to bedrock (ft)			10				
Is pretreatment provided, in conformance with Section 6.4.3.1			Yes				
Enter average height of ponding (ft)			0.5				
Enter depth of surface layer (inches)			3				
Enter depth of filter media (ft)			2.5				
Enter depth of drainage layer (inches)			12				
Enter slope of maintenance access (%)			5				
Enter width of maintenance access (ft)			12				
Sizing Criteria							
				Value	Units	Notes	
Permeability Flow Rate			k	1	ft/day		
Filter Time			tf	2	days		
Required Filter Area			Af	2416	sf		
Enter Provided Filter Area			Af	2420	sf		
Recalculated Water Quality Volume (based on provided filter area)			WQv calc	5808	cf		
Calculate Runoff Reduction							
RRv Provided		2,323	cf				
WQv Treated		3476	cf	This is the portion of the WQv that is not reduced in the practice.			

Filtration Bioretention (F-5)

Design Point:	1						
Enter Site Data For Drainage Area to be Treated by Practice							
Drainage Area Number	Contributing Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (cf)	Precipitation (in)	Description
4	0.98	0.81	83	0.80	2,550	0.90	Filtration Bioretention
Design Criteria							
Enter underlying soil infiltration rate (based on geotechnical testing, refer to Appendix D)			0	Underdrains required			
Is the contributing area to the practice a stormwater hotspot?			No				
Is the practice the first in series for treatment of a Level 1 (Infiltration Restricted) hotspot?			No				
Is contributing area greater than max. contributing area?			No				
Enter depth to seasonal high water table (ft)			10				
Enter depth to bedrock (ft)			10				
Is pretreatment provided, in conformance with Section 6.4.3.1			Yes				
Enter average height of ponding (ft)			0.5				
Enter depth of surface layer (inches)			3				
Enter depth of filter media (ft)			2.5				
Enter depth of drainage layer (inches)			12				
Enter slope of maintenance access (%)			5				
Enter width of maintenance access (ft)			12				
Sizing Criteria							
				Value	Units	Notes	
Permeability Flow Rate			k	1	ft/day		
Filter Time			tf	2	days		
Required Filter Area			Af	1063	sf		
Enter Provided Filter Area			Af	1100	sf		
Recalculated Water Quality Volume (based on provided filter area)			WQv calc	2640	cf		
Calculate Runoff Reduction							
RRv Provided		1,056	cf				
WQv Treated		1494	cf	This is the portion of the WQv that is not reduced in the practice.			

Filtration Bioretention (F-5)

Design Point:	1						
Enter Site Data For Drainage Area to be Treated by Practice							
Drainage Area Number	Contributing Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (cf)	Precipitation (in)	Description
5	4.87	2.95	61	0.60	9,474	0.90	Filtration Bioretention
Design Criteria							
Enter underlying soil infiltration rate (based on geotechnical testing, refer to Appendix D)			0	Underdrains required			
Is the contributing area to the practice a stormwater hotspot?			No				
Is the practice the first in series for treatment of a Level 1 (Infiltration Restricted) hotspot?			No				
Is contributing area greater than max. contributing area?			No				
Enter depth to seasonal high water table (ft)			10				
Enter depth to bedrock (ft)			10				
Is pretreatment provided, in conformance with Section 6.4.3.1			Yes				
Enter average height of ponding (ft)			0.5				
Enter depth of surface layer (inches)			3				
Enter depth of filter media (ft)			2.5				
Enter depth of drainage layer (inches)			12				
Enter slope of maintenance access (%)			5				
Enter width of maintenance access (ft)			12				
Sizing Criteria							
				Value	Units	Notes	
Permeability Flow Rate			k	1	ft/day		
Filter Time			tf	2	days		
Required Filter Area			Af	3948	sf		
Enter Provided Filter Area			Af	4000	sf		
Recalculated Water Quality Volume (based on provided filter area)			WQv calc	9600	cf		
Calculate Runoff Reduction							
RRv Provided		3,840	cf				
WQv Treated		5634	cf	This is the portion of the WQv that is not reduced in the practice.			

Filtration Bioretention (F-5)

Total Area	11.43	acres
Total Impervious	7	acres
Total RRv Provided	9,475	cf
Total WQv Provided	13,942	cf

Steps 3 and 5 - Apply RR Techniques and Standard SMPs

Runoff Reduction Volume and Treated Volumes						
	Runoff Reduction Techniques/Standard SMPs		Total Contributing Area	Total Contributing Impervious Area	WQv Reduced (RRv)	WQv Treated
			(acres)	(acres)	(cf)	(cf)
RR Techniques	Conservation of Natural Areas	RR-1	0.00		0	
	Sheet Flow to Riparian Buffer/Filter Strip	RR-2	0.00	0.00	0	
	Tree Planting/Tree Pit/Tree Trench	RR-3	0.00	0.00	0	
	Disconnection of Rooftop Runoff	RR-4		0.00	0	
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rainwater Harvesting Systems	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Extensive & Intensive)	RR-10	0.00	0.00	0	
	Stream Daylighting	RR-11				
Standard SMPs w/ RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4	0.00	0.00	0	0
	Infiltration Bioretention	F-4	0.00	0.00	0	0
	Filtration Bioretention	F-5	11.43	7.33	9,475	13,942
	Bioslope	F-6	0.00	0.00	0	0
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention	P-1	0.00	0.00		0
	Wet Pond	P-2	0.00	0.00		0
	Wet Extended Detention	P-3	0.00	0.00		0
	Multiple Pond System	P-4	0.00	0.00		0
	Shallow Wetland	W-1	0.00	0.00		0
	Extended Detention Shallow Wetland	W-2	0.00	0.00		0
	Pond/Wetland System	W-3	0.00	0.00		0
	Pocket Wetland	W-4	0.00	0.00		0
	Gravel Wetland	W-5	0.00	0.00		0
	Surface Sand Filter	F-1	0.00	0.00		0
	Underground Sand Filter	F-2	0.00	0.00		0
	Perimeter Sand Filter	F-3	0.00	0.00		0
	Wet Swale	O-2	0.00	0.00		0
Alt. SMPs	Flow Based Alternative Practice	-	0.00	0.00		0
	Volume Based Alternative Practice	-				
Totals by RR Technique →			0.00	0.00	0	
Totals by Standard SMP w/RRV →			11.43	7.33	9,475	13,942
Totals by Standard SMP →			0.00	0.00		0
Totals by Alternative SMP →			0.00	0.00		0
Totals (RR Techniques + all SMPs) →			11.43	7.33	9,475	13,942

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	23417	0.538
30	Total RRV Provided	9475	0.218
31	Is RRV Provided $\geq$ WQv Required?	No	
32	Minimum RRV	4530	0.104
32a	Is RRV Provided $\geq$ Minimum RRV Required?	Yes	
33a	Total WQv Treated	13942	0.320
34	Sum of Volume Reduced & Treated	23417	0.538
35	Is Sum RRV Provided and WQv Provided $\geq$ WQv Required?	Yes	

Appendix C

Earthwork Calculations

CARMINA WOOD DESIGN
80 SILO CITY ROW, STE 100
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 25-4080 Date: 7/8/2026
Project Name: Townhome Development
Project Address: John James Audubon Parkway
Subject: Earthwork Calculations
Sheet: 1 of 1

SITE EARTHWORK CALCULATIONS

INITIAL CUT/FILL NUMBERS COMPARING EX SURFACE AND PROPOSED SURFACE

CUT	21,000	CY
FILL	23,300	CY
NET	(2,300)	CY

TOPSOIL STRIP	7,742	CY	(ASSUME 4" OF TOPSOIL)
TOPSOIL RESPREAD	3,849	CY	(ASSUME 4" OF TOPSOIL)
TOPSOIL EXPORT	3,892	CY	

PROPOSED IMPERVIOUS VOLUME CALCULATIONS

	DEPTH (INCHES)	AREA (SF)	VOLUME (CF)	
BUILDING PADS	8	184,000	122,667	
CONCRETE	8	13,326	8,884	
DRIVEWAYS	11	38,400	35,200	
ROAD	11	82,726	75,832	
TOTAL			242,583	CF
			8,985	CY

TOTAL EARTHWORK

ADJUSTED NET	2,792	CY	<u>DIRT TO BE SPREAD ACROSS SITE</u>
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