Stormwater Management System Report
Addendum 2

PLUMBERS SUPPLY COMPANY

PROPOSED OFFICE/WAREHOUSE FACILITY

FLAHERTY DRIVE
NEW BEDFORD, MASSACHUSETTS

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May 7, 2018
Project No. 2190

FIELD ENGINEERING CO., INC.
CONSULTING ENGINEERS

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Section 1

Hydrologic Overview

1.1 Purpose for Addendum

The purpose of this Stormwater Management System Report-Addendum 1 is to present theupdated Post-Development Hydrologic Analysis following modifications to the design that have been performed based on the Commission's consulting review engineer second comment letter dated May 1, 2018 and minor modifications to the detention/infiltration basin as a result of the Conservation Agent's review of the wetland line. Modifications to the design are further described in the response letter prepared by Field Engineering dated May 7, 2018.

1.2 Pre Development Hydrologic Summary

A summary of the previously submitted Pre-Development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.3 below for comparison to the revised Post Development Hydrologic Calculations. The Pre-Development hydrologic conditions remain unchanged from the original Stormwater Management System Report dated March 16, 2018.

Table 1.2 – Pre-Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	16.65
10-year storm	33.09
25-year storm	44.29
100-year storm	64.99

1.3 Revised Post Development Hydrologic Summary

The Post Development Hydrologic Calculations have been revised to address the comments from the Conservation Commission's consulting engineer during their review of the Notice of Intent. Revisions included changes Time of Concentration for the area flowing to the proposed extended detention/infiltration basin and a modification to the size of the detention/infiltration basin as a result of modifications to the wetland line by the Conservation Agent.

A summary of the revised post-development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 13 below.

Table 1.3 – Post Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	16.40
10-year storm	31.96
25-year storm	39.47
100-year storm	52.97

A summary of the pre and post-development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.5 below. Results shown as a “negative” represent a decrease in post development condition rates of runoff.

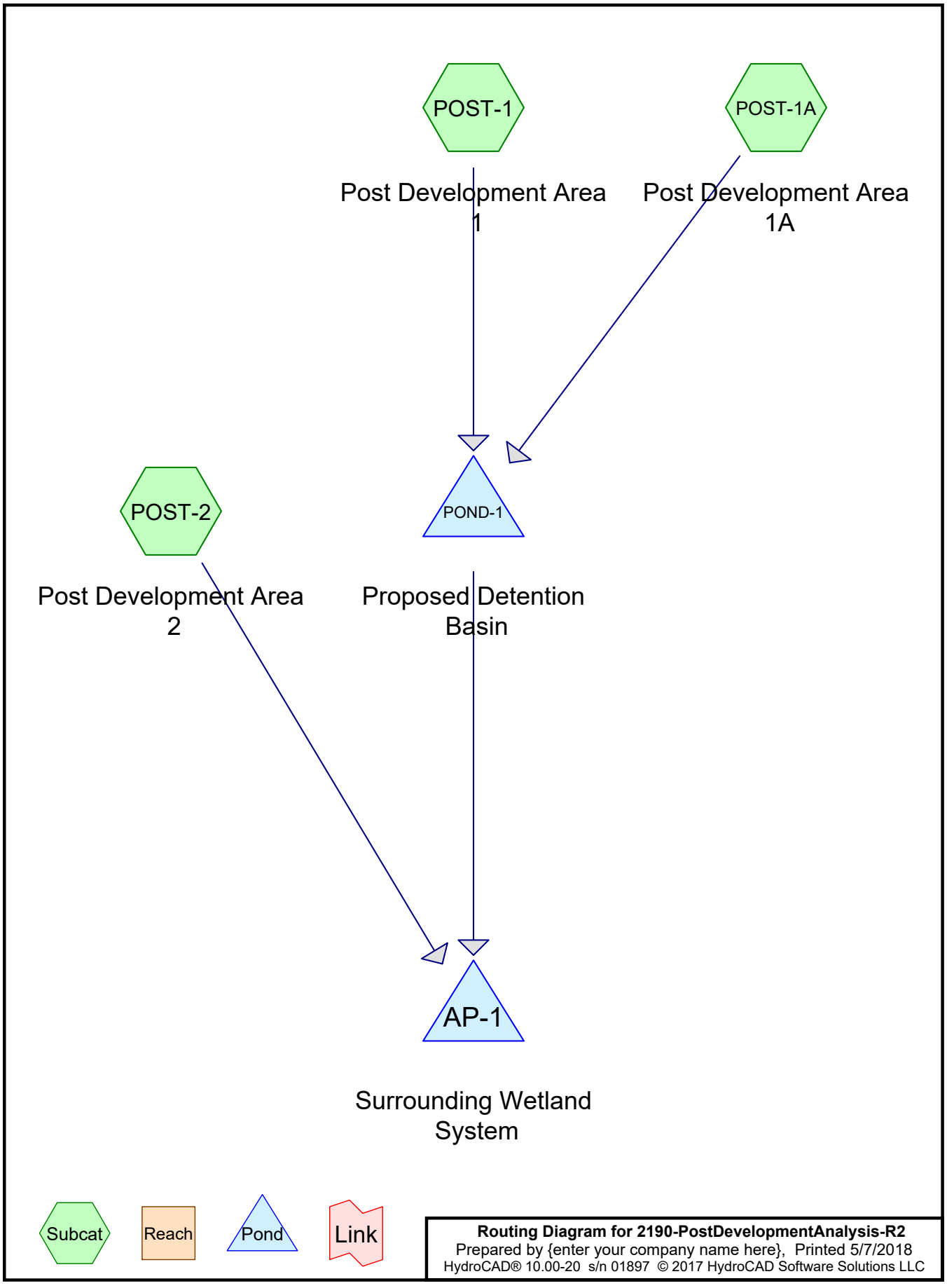
Table 1.5 – Pre-Post Development Hydrologic Results

Storm Event	Analysis Point AP-1 Rate of Flow
2-year storm	-1.5%
10-year storm	-3.4%
25-year storm	-10.9%
100-year storm	-18.5%

The hydrologic analysis indicates that the stormwater management system design for the site meets or reduces peak runoff rates for the 2, 10, 25, and 100-year, 24-hour, Type III storm events from the pre-developed levels at the subject analysis point. The analysis shows the proposed development of this project area will not result in an increase in the rates of runoff from the project site.

Section 2

Revised Post Development Hydrologic Analysis



Routing Diagram for 2190-PostDevelopmentAnalysis-R2
Prepared by {enter your company name here}, Printed 5/7/2018

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
407,555	74	>75% Grass cover, Good, HSG C (POST-1, POST-2)
244,724	98	Paved roads w/curbs & sewers, HSG C (POST-1)
156,685	98	Roofs, HSG C (POST-1A)
297,385	70	Woods, Good, HSG C (POST-2)
1,106,349	**82**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=357,727 sf 68.41% Impervious Runoff Depth=2.45"
Flow Length=393' Tc=9.4 min CN=90 Runoff=20.69 cfs 72,975 cf

Subcatchment POST-1A: Post Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=12.23 cfs 42,651 cf

Subcatchment POST-2: Post Development Runoff Area=591,937 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=780' Tc=22.3 min CN=72 Runoff=10.80 cfs 55,293 cf

Pond AP-1: Surrounding Wetland System Inflow=16.40 cfs 116,484 cf
Primary=16.40 cfs 116,484 cf

Pond POND-1: Proposed Detention Basin Peak Elev=81.11' Storage=53,109 cf Inflow=31.91 cfs 115,626 cf
Discarded=0.99 cfs 54,435 cf Primary=6.40 cfs 61,191 cf Outflow=7.39 cfs 115,626 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 170,918 cf Average Runoff Depth = 1.85"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

Summary for Subcatchment POST-1: Post Development Area 1

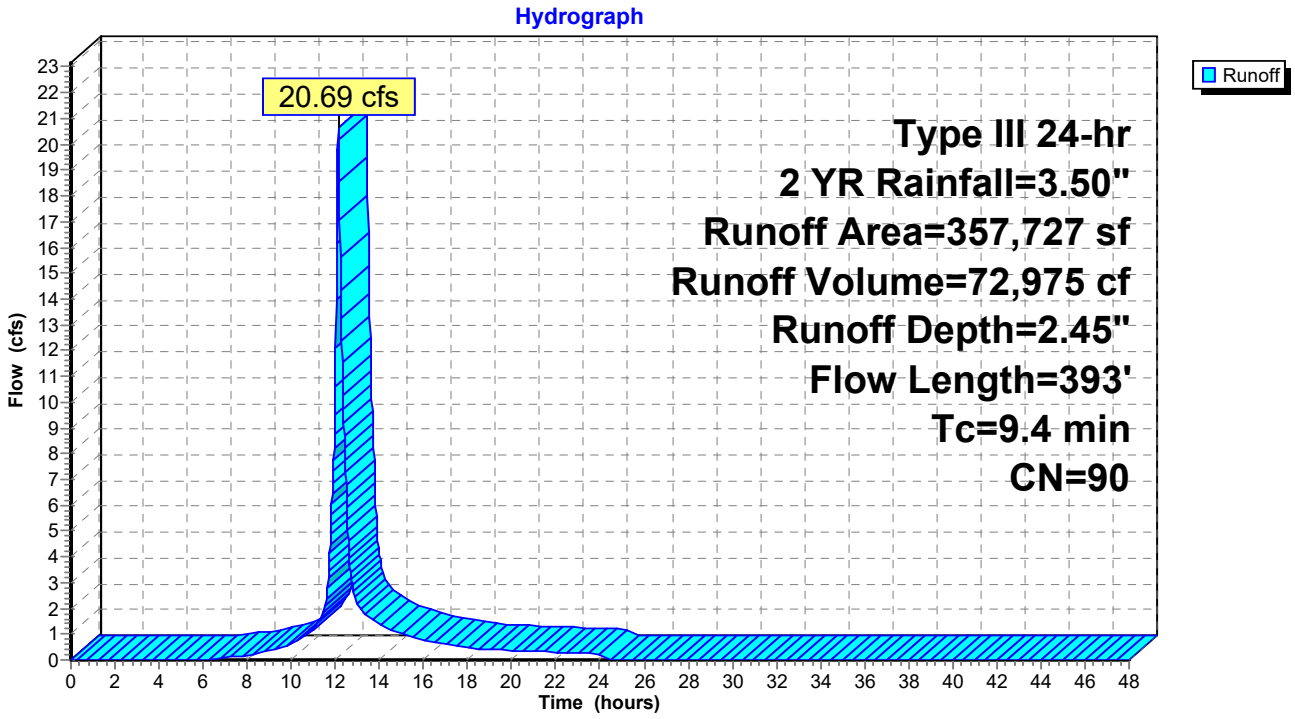
Runoff = 20.69 cfs @ 12.13 hrs, Volume= 72,975 cf, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,003	74	>75% Grass cover, Good, HSG C
357,727	90	Weighted Average
113,003		31.59% Pervious Area
244,724		68.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0175	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.8	230	0.0175	2.13		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	123	0.0200	2.87		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.4	393	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-1A: Post Development Area 1A

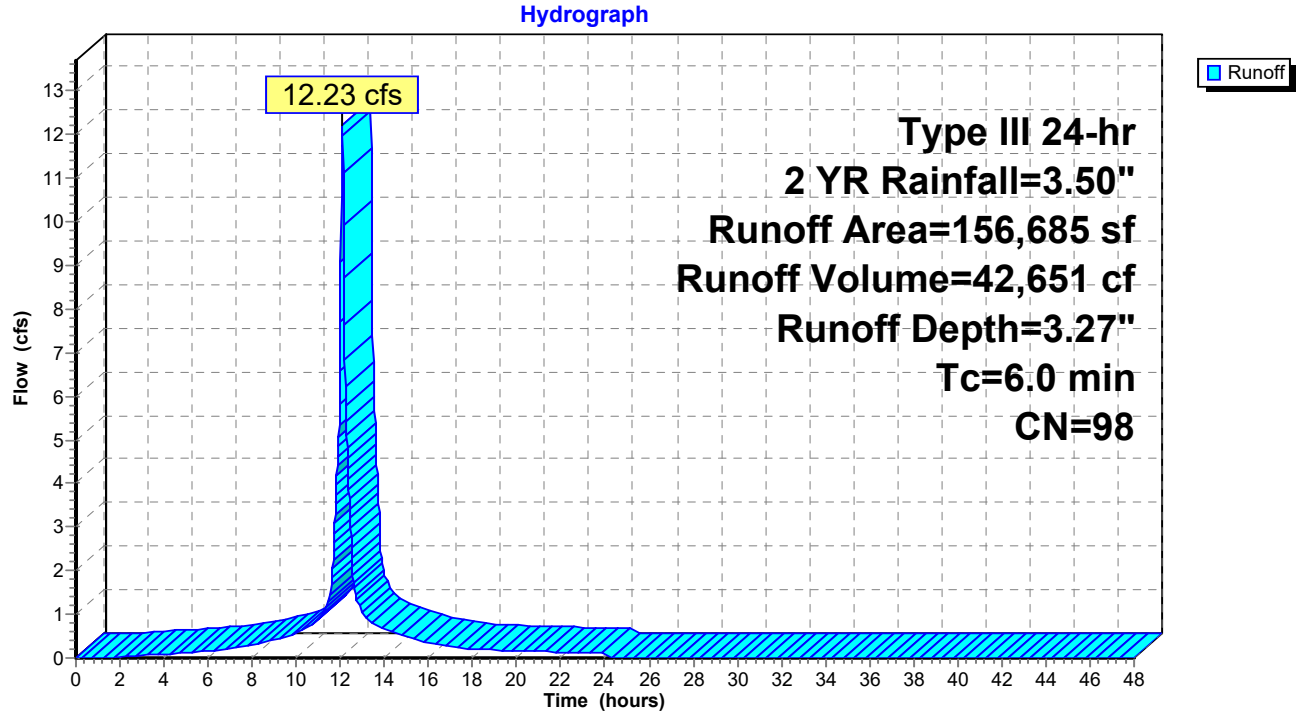
Runoff = 12.23 cfs @ 12.08 hrs, Volume= 42,651 cf, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A



Summary for Subcatchment POST-2: Post Development Area 2

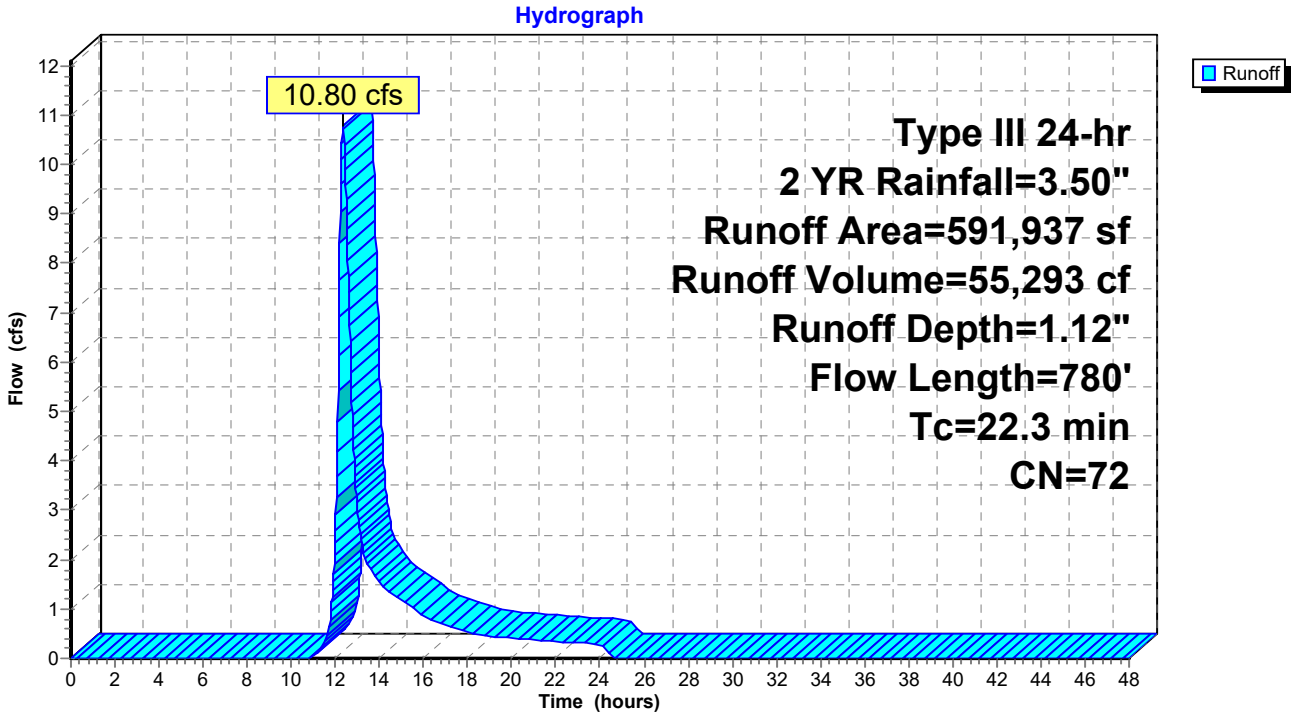
Runoff = 10.80 cfs @ 12.33 hrs, Volume= 55,293 cf, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
294,552	74	>75% Grass cover, Good, HSG C
297,385	70	Woods, Good, HSG C
591,937	72	Weighted Average
591,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



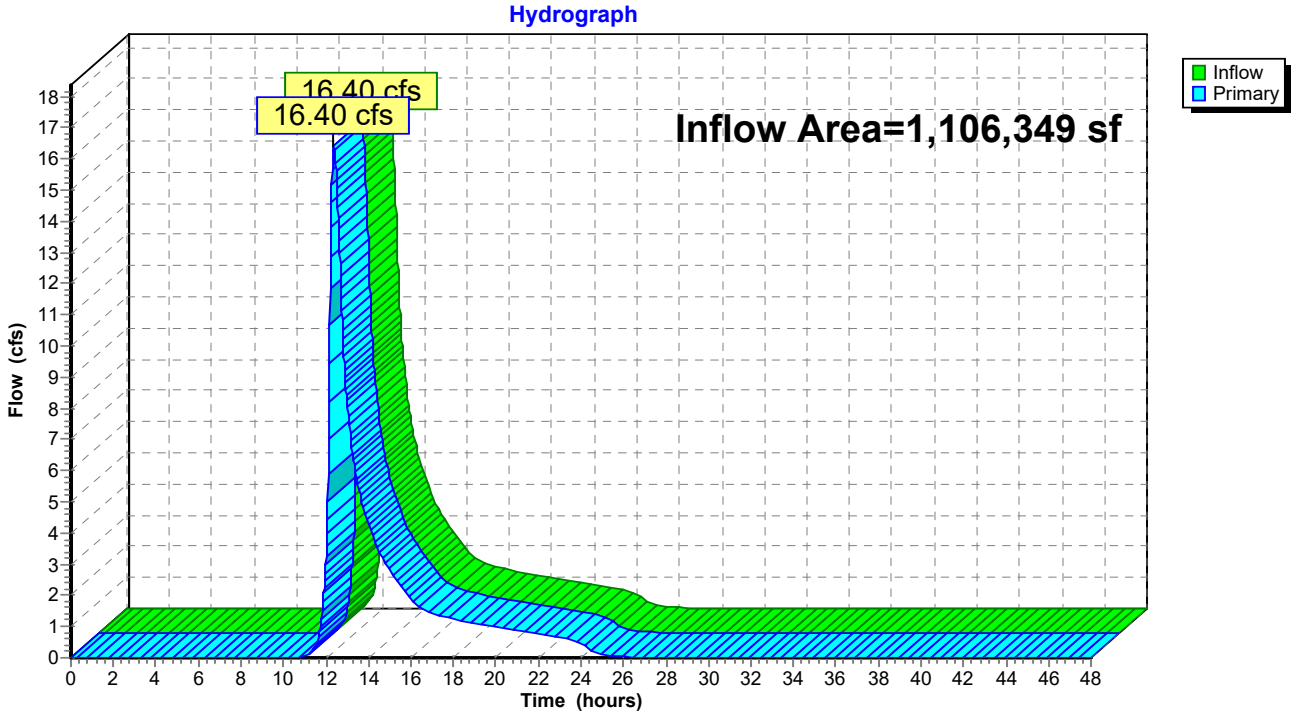
Summary for Pond AP-1: Surrounding Wetland System

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

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 1.26" for 2 YR event
Inflow = 16.40 cfs @ 12.37 hrs, Volume= 116,484 cf
Primary = 16.40 cfs @ 12.37 hrs, Volume= 116,484 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 514,412 sf, 78.03% Impervious, Inflow Depth = 2.70" for 2 YR event
Inflow = 31.91 cfs @ 12.11 hrs, Volume= 115,626 cf
Outflow = 7.39 cfs @ 12.54 hrs, Volume= 115,626 cf, Atten= 77%, Lag= 26.1 min
Discarded = 0.99 cfs @ 12.54 hrs, Volume= 54,435 cf
Primary = 6.40 cfs @ 12.54 hrs, Volume= 61,191 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 81.11' @ 12.54 hrs Surf.Area= 41,839 sf Storage= 53,109 cf

Plug-Flow detention time= 230.2 min calculated for 115,578 cf (100% of inflow)
Center-of-Mass det. time= 230.4 min (1,017.8 - 787.4)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	163,077 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

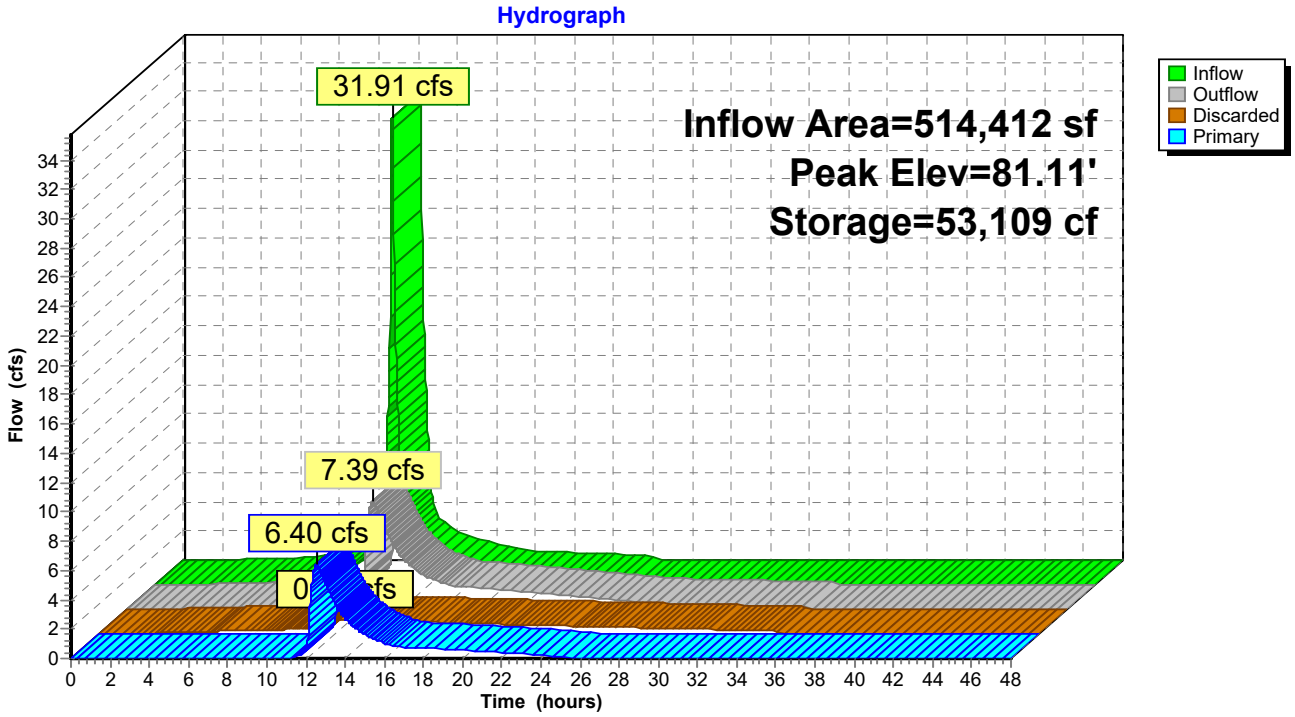
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	8,010	0	0
80.00	23,704	15,857	15,857
81.00	41,448	32,576	48,433
82.00	44,933	43,191	91,624
83.00	48,532	46,733	138,356
83.50	50,352	24,721	163,077

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**18.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.50' S= 0.0405 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	79.65'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	80.55'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	79.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.99 cfs @ 12.54 hrs HW=81.11' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.99 cfs)

Primary OutFlow Max=6.40 cfs @ 12.54 hrs HW=81.11' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 6.40 cfs of 9.93 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.04 cfs @ 5.30 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 5.36 cfs @ 2.45 fps)

Pond POND-1: Proposed Detention Basin



Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=357,727 sf 68.41% Impervious Runoff Depth=3.68"
Flow Length=393' Tc=9.4 min CN=90 Runoff=30.59 cfs 109,813 cf

Subcatchment POST-1A: Post Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=16.86 cfs 59,586 cf

Subcatchment POST-2: Post Development Runoff Area=591,937 sf 0.00% Impervious Runoff Depth=2.05"
Flow Length=780' Tc=22.3 min CN=72 Runoff=20.64 cfs 100,876 cf

Pond AP-1: Surrounding Wetland System Inflow=31.96 cfs 208,629 cf
Primary=31.96 cfs 208,629 cf

Pond POND-1: Proposed Detention Basin Peak Elev=81.59' Storage=73,417 cf Inflow=46.09 cfs 169,399 cf
Discarded=1.03 cfs 61,651 cf Primary=11.54 cfs 107,753 cf Outflow=12.56 cfs 169,404 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 270,275 cf Average Runoff Depth = 2.93"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

Summary for Subcatchment POST-1: Post Development Area 1

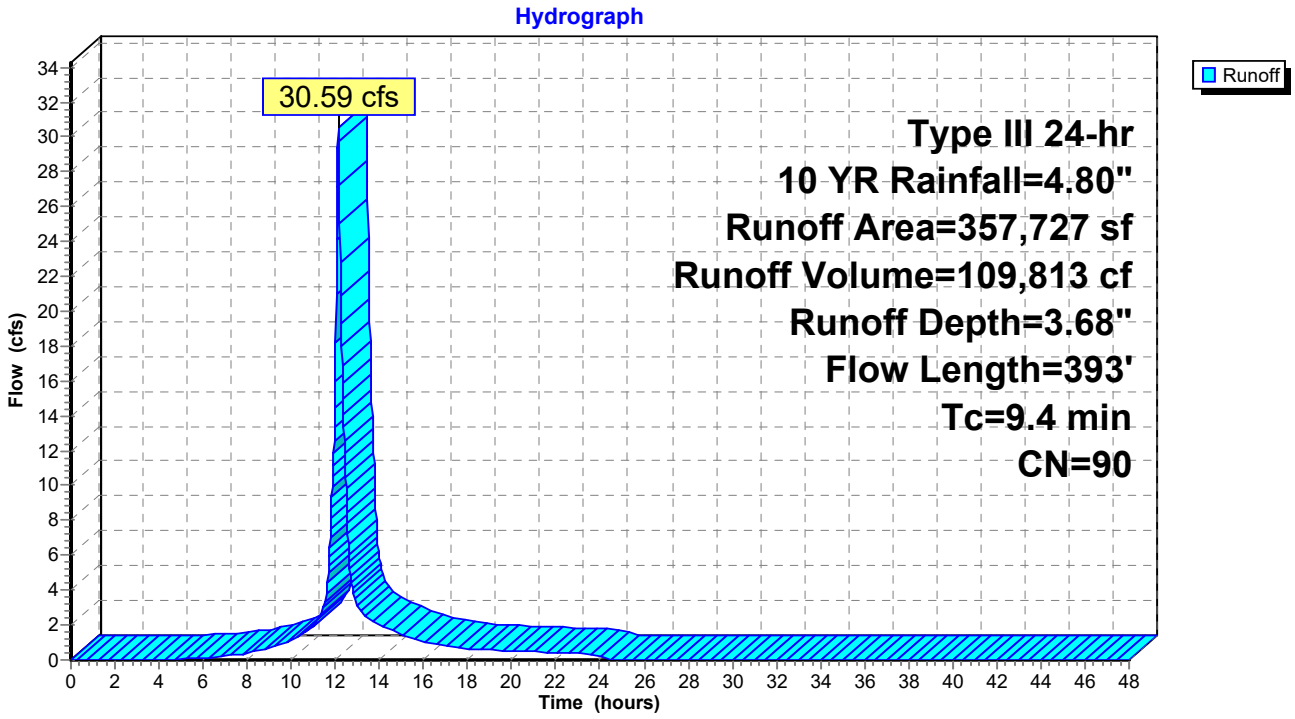
Runoff = 30.59 cfs @ 12.13 hrs, Volume= 109,813 cf, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,003	74	>75% Grass cover, Good, HSG C
357,727	90	Weighted Average
113,003		31.59% Pervious Area
244,724		68.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0175	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.8	230	0.0175	2.13		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	123	0.0200	2.87		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.4	393	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-1A: Post Development Area 1A

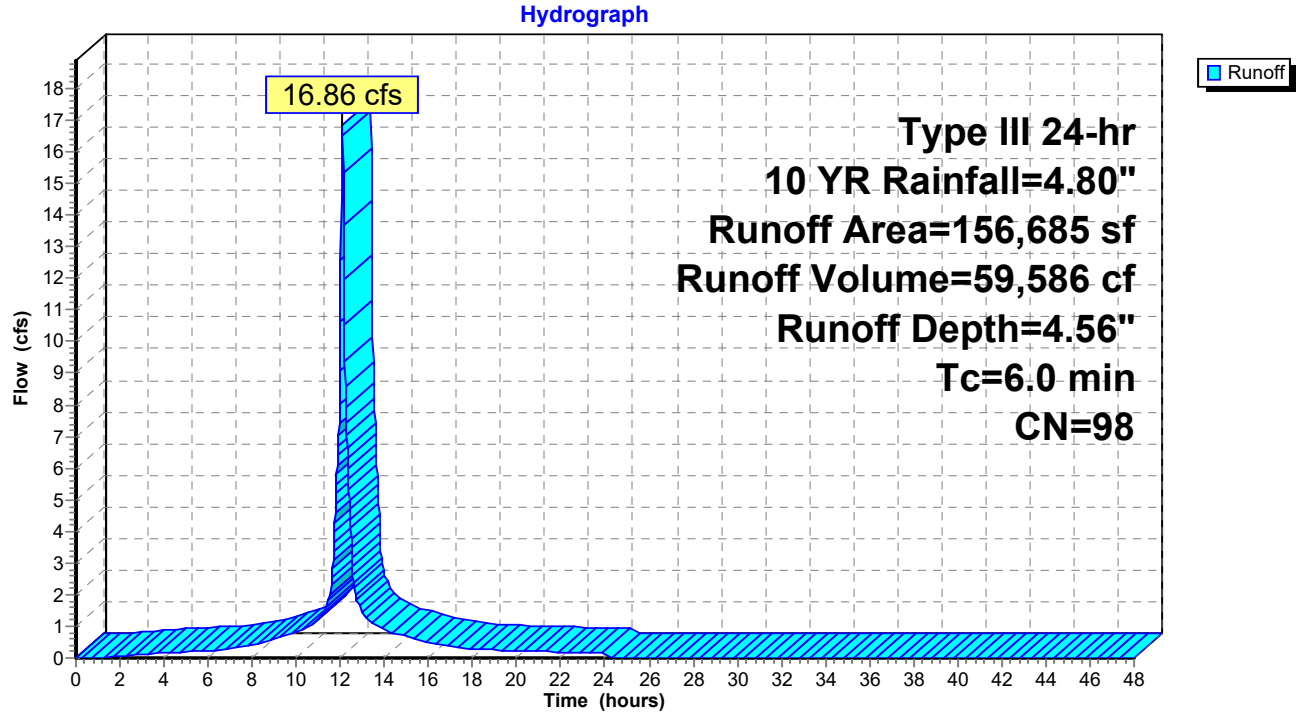
Runoff = 16.86 cfs @ 12.08 hrs, Volume= 59,586 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A



Summary for Subcatchment POST-2: Post Development Area 2

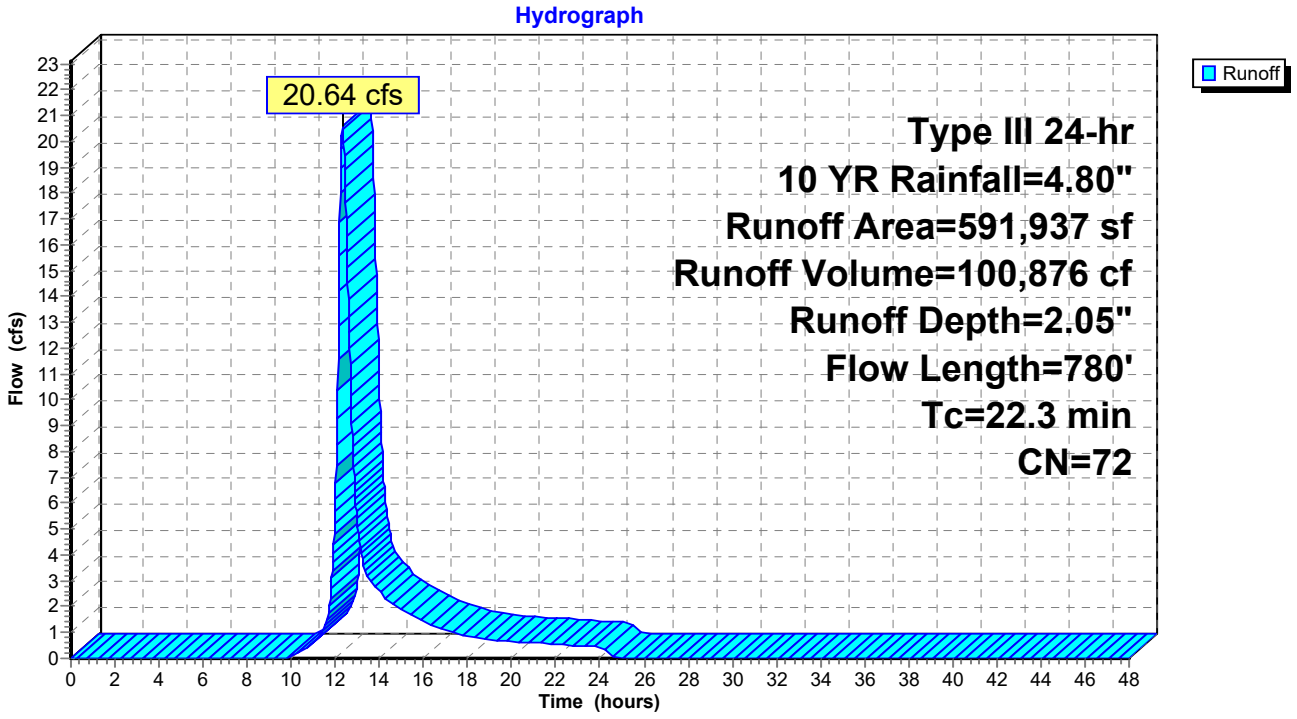
Runoff = 20.64 cfs @ 12.32 hrs, Volume= 100,876 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
294,552	74	>75% Grass cover, Good, HSG C
297,385	70	Woods, Good, HSG C
591,937	72	Weighted Average
591,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



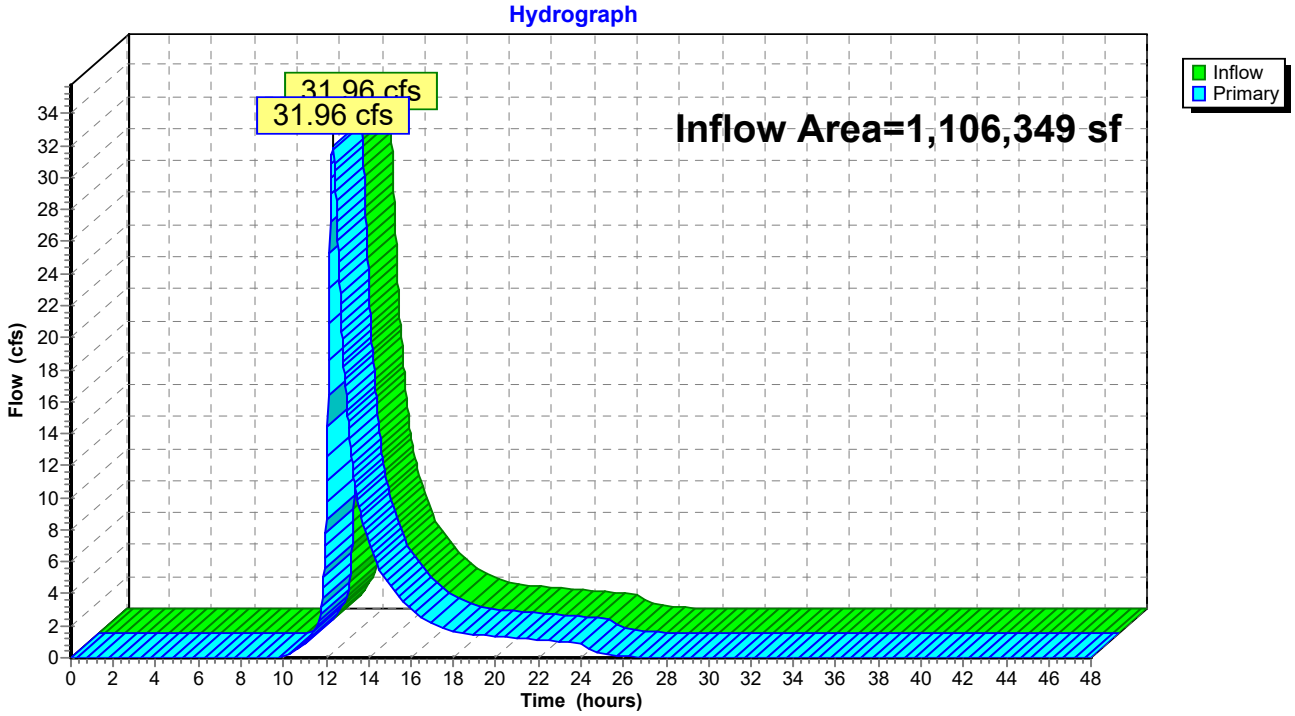
Summary for Pond AP-1: Surrounding Wetland System

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

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 2.26" for 10 YR event
Inflow = 31.96 cfs @ 12.32 hrs, Volume= 208,629 cf
Primary = 31.96 cfs @ 12.32 hrs, Volume= 208,629 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 514,412 sf, 78.03% Impervious, Inflow Depth = 3.95" for 10 YR event
Inflow = 46.09 cfs @ 12.11 hrs, Volume= 169,399 cf
Outflow = 12.56 cfs @ 12.50 hrs, Volume= 169,404 cf, Atten= 73%, Lag= 23.5 min
Discarded = 1.03 cfs @ 12.50 hrs, Volume= 61,651 cf
Primary = 11.54 cfs @ 12.50 hrs, Volume= 107,753 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 81.59' @ 12.50 hrs Surf.Area= 43,498 sf Storage= 73,417 cf

Plug-Flow detention time= 194.9 min calculated for 169,333 cf (100% of inflow)
Center-of-Mass det. time= 195.2 min (974.0 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	163,077 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

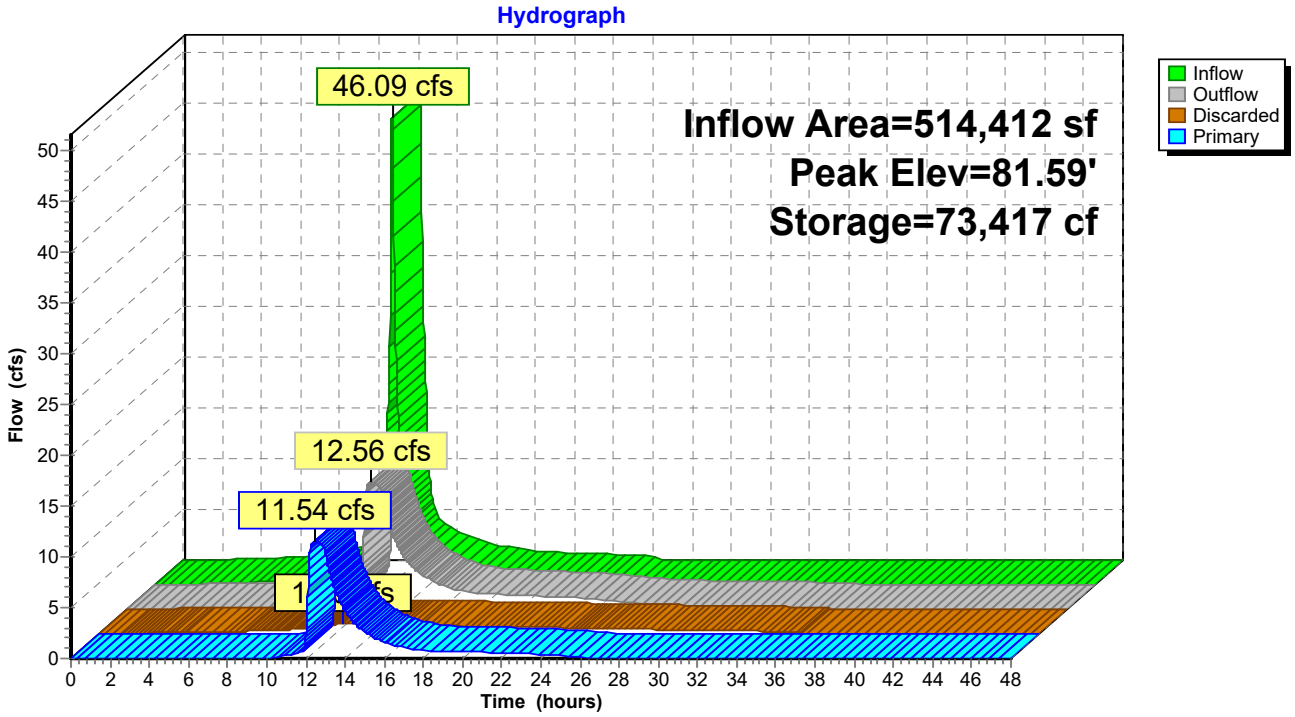
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	8,010	0	0
80.00	23,704	15,857	15,857
81.00	41,448	32,576	48,433
82.00	44,933	43,191	91,624
83.00	48,532	46,733	138,356
83.50	50,352	24,721	163,077

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**18.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.50' S= 0.0405 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	79.65'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	80.55'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	79.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.03 cfs @ 12.50 hrs HW=81.59' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 1.03 cfs)

Primary OutFlow Max=11.54 cfs @ 12.50 hrs HW=81.59' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 11.54 cfs @ 6.53 fps)
  ├**2=Orifice/Grate** (Passes < 1.23 cfs potential flow)
  └**3=Sharp-Crested Rectangular Weir** (Passes < 13.12 cfs potential flow)

Pond POND-1: Proposed Detention Basin



Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=357,727 sf 68.41% Impervious Runoff Depth=4.46"
Flow Length=393' Tc=9.4 min CN=90 Runoff=36.66 cfs 132,864 cf

Subcatchment POST-1A: Post Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=19.70 cfs 70,016 cf

Subcatchment POST-2: Post Development Runoff Area=591,937 sf 0.00% Impervious Runoff Depth=2.67"
Flow Length=780' Tc=22.3 min CN=72 Runoff=27.22 cfs 131,679 cf

Pond AP-1: Surrounding Wetland System Inflow=39.47 cfs 268,980 cf
Primary=39.47 cfs 268,980 cf

Pond POND-1: Proposed Detention Basin Peak Elev=81.93' Storage=88,325 cf Inflow=54.78 cfs 202,880 cf
Discarded=1.05 cfs 65,579 cf Primary=12.55 cfs 137,301 cf Outflow=13.61 cfs 202,880 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 334,558 cf Average Runoff Depth = 3.63"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

Summary for Subcatchment POST-1: Post Development Area 1

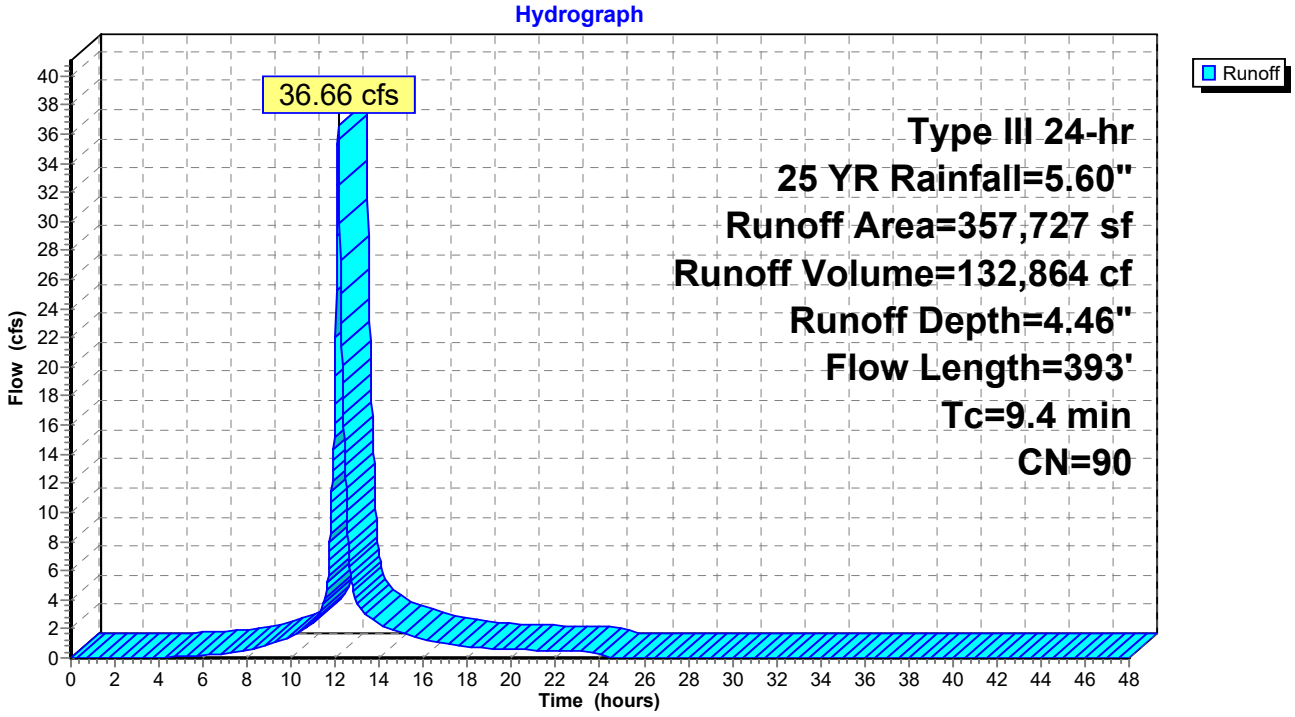
Runoff = 36.66 cfs @ 12.13 hrs, Volume= 132,864 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,003	74	>75% Grass cover, Good, HSG C
357,727	90	Weighted Average
113,003		31.59% Pervious Area
244,724		68.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0175	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.8	230	0.0175	2.13		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	123	0.0200	2.87		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.4	393	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-1A: Post Development Area 1A

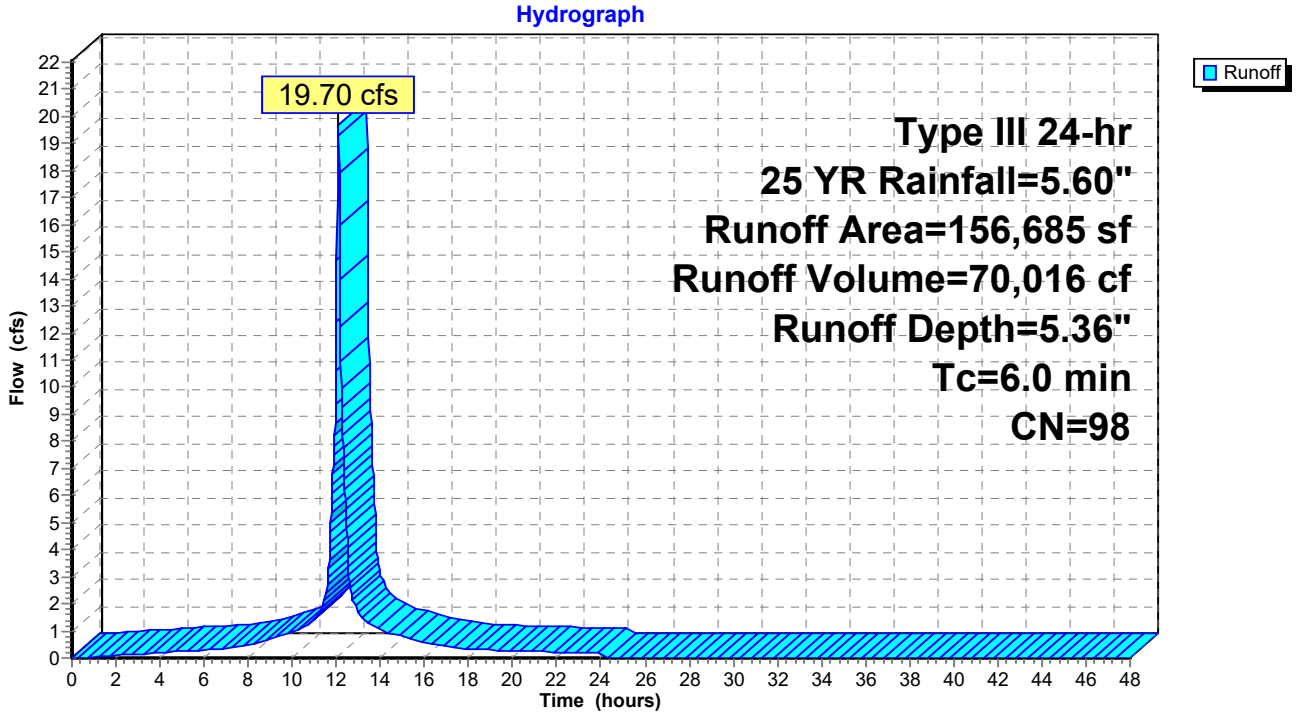
Runoff = 19.70 cfs @ 12.08 hrs, Volume= 70,016 cf, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A



Summary for Subcatchment POST-2: Post Development Area 2

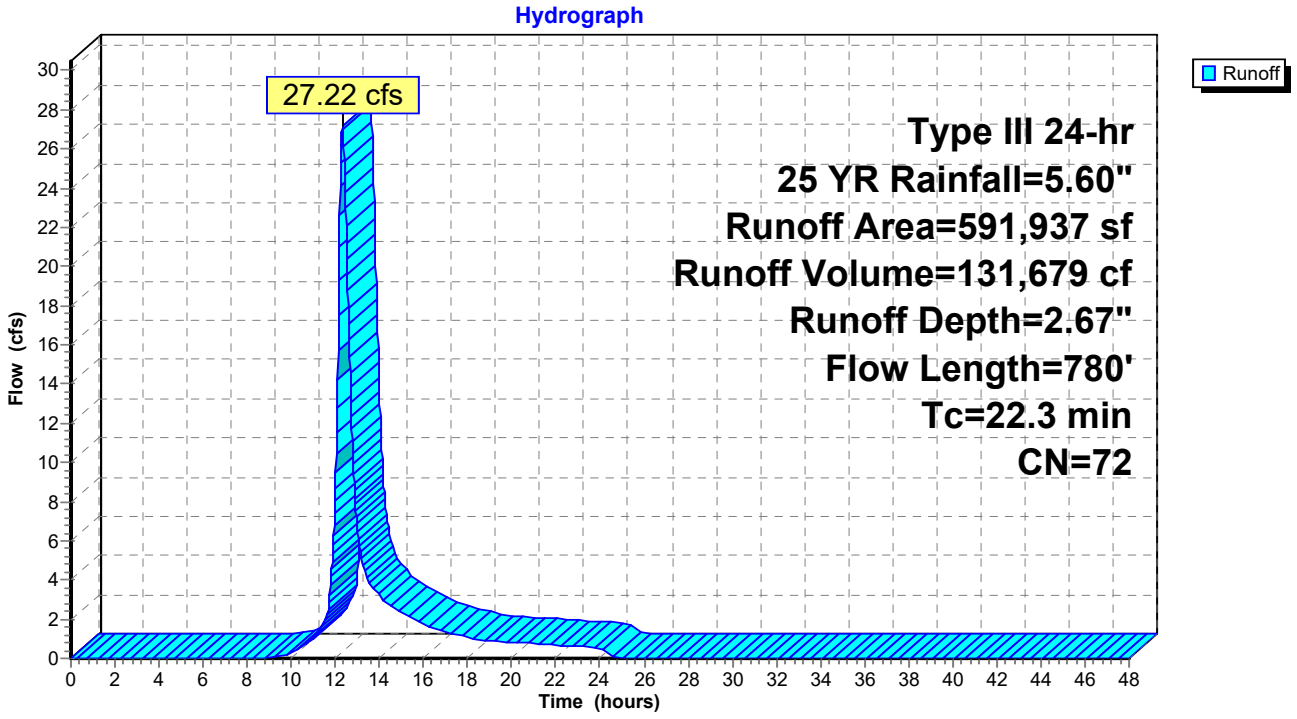
Runoff = 27.22 cfs @ 12.32 hrs, Volume= 131,679 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
294,552	74	>75% Grass cover, Good, HSG C
297,385	70	Woods, Good, HSG C
591,937	72	Weighted Average
591,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



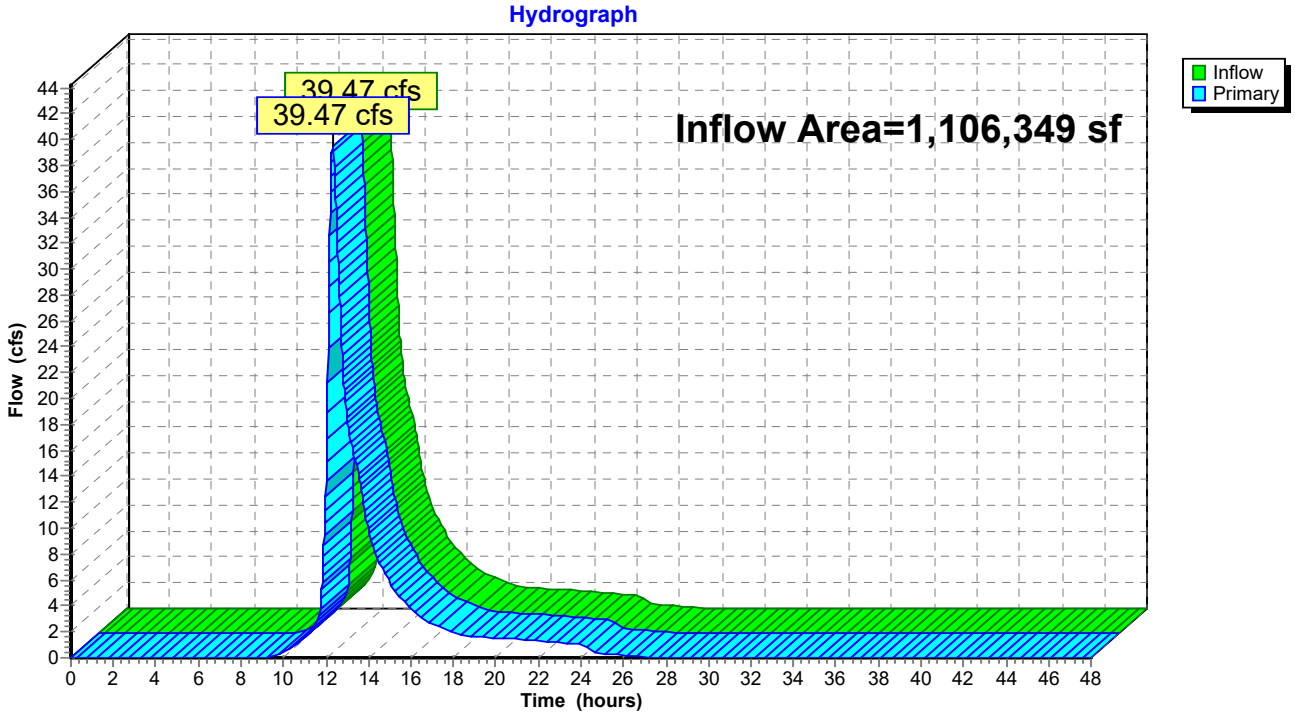
Summary for Pond AP-1: Surrounding Wetland System

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

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 2.92" for 25 YR event
Inflow = 39.47 cfs @ 12.32 hrs, Volume= 268,980 cf
Primary = 39.47 cfs @ 12.32 hrs, Volume= 268,980 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 514,412 sf, 78.03% Impervious, Inflow Depth = 4.73" for 25 YR event
Inflow = 54.78 cfs @ 12.11 hrs, Volume= 202,880 cf
Outflow = 13.61 cfs @ 12.52 hrs, Volume= 202,880 cf, Atten= 75%, Lag= 24.8 min
Discarded = 1.05 cfs @ 12.52 hrs, Volume= 65,579 cf
Primary = 12.55 cfs @ 12.52 hrs, Volume= 137,301 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 81.93' @ 12.52 hrs Surf.Area= 44,676 sf Storage= 88,325 cf

Plug-Flow detention time= 184.4 min calculated for 202,796 cf (100% of inflow)
Center-of-Mass det. time= 184.6 min (959.6 - 774.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	163,077 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

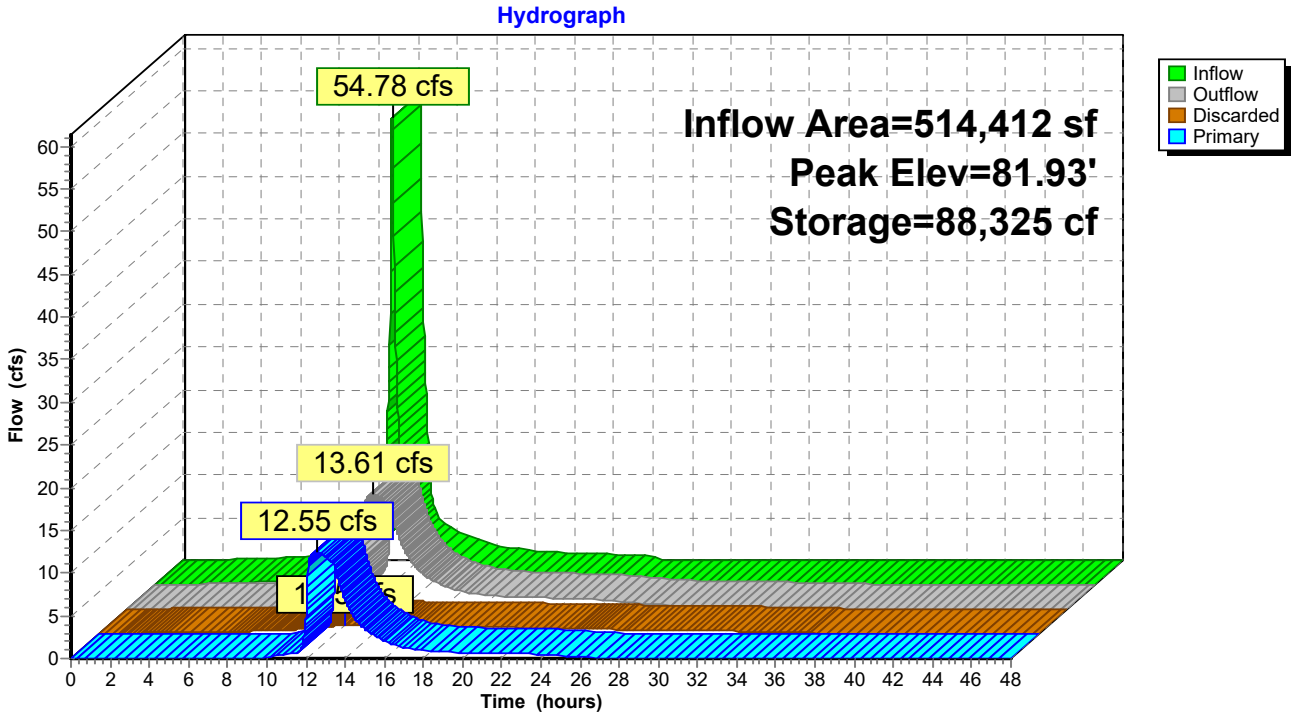
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	8,010	0	0
80.00	23,704	15,857	15,857
81.00	41,448	32,576	48,433
82.00	44,933	43,191	91,624
83.00	48,532	46,733	138,356
83.50	50,352	24,721	163,077

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**18.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.50' S= 0.0405 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	79.65'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	80.55'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	79.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.05 cfs @ 12.52 hrs HW=81.93' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 1.05 cfs)

Primary OutFlow Max=12.55 cfs @ 12.52 hrs HW=81.93' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 12.55 cfs @ 7.10 fps)
  ├**2=Orifice/Grate** (Passes < 1.35 cfs potential flow)
  └**3=Sharp-Crested Rectangular Weir** (Passes < 19.66 cfs potential flow)

Pond POND-1: Proposed Detention Basin



Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=357,727 sf 68.41% Impervious Runoff Depth=5.82"
Flow Length=393' Tc=9.4 min CN=90 Runoff=47.20 cfs 173,592 cf

Subcatchment POST-1A: Post Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=24.67 cfs 88,278 cf

Subcatchment POST-2: Post Development Runoff Area=591,937 sf 0.00% Impervious Runoff Depth=3.83"
Flow Length=780' Tc=22.3 min CN=72 Runoff=39.29 cfs 188,880 cf

Pond AP-1: Surrounding Wetland System Inflow=52.97 cfs 379,015 cf
Primary=52.97 cfs 379,015 cf

Pond POND-1: Proposed Detention Peak Elev=82.50' Storage=114,603 cf Inflow=69.92 cfs 261,870 cf
Discarded=1.10 cfs 71,737 cf Primary=14.11 cfs 190,135 cf Outflow=15.22 cfs 261,872 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 450,750 cf Average Runoff Depth = 4.89"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

Summary for Subcatchment POST-1: Post Development Area 1

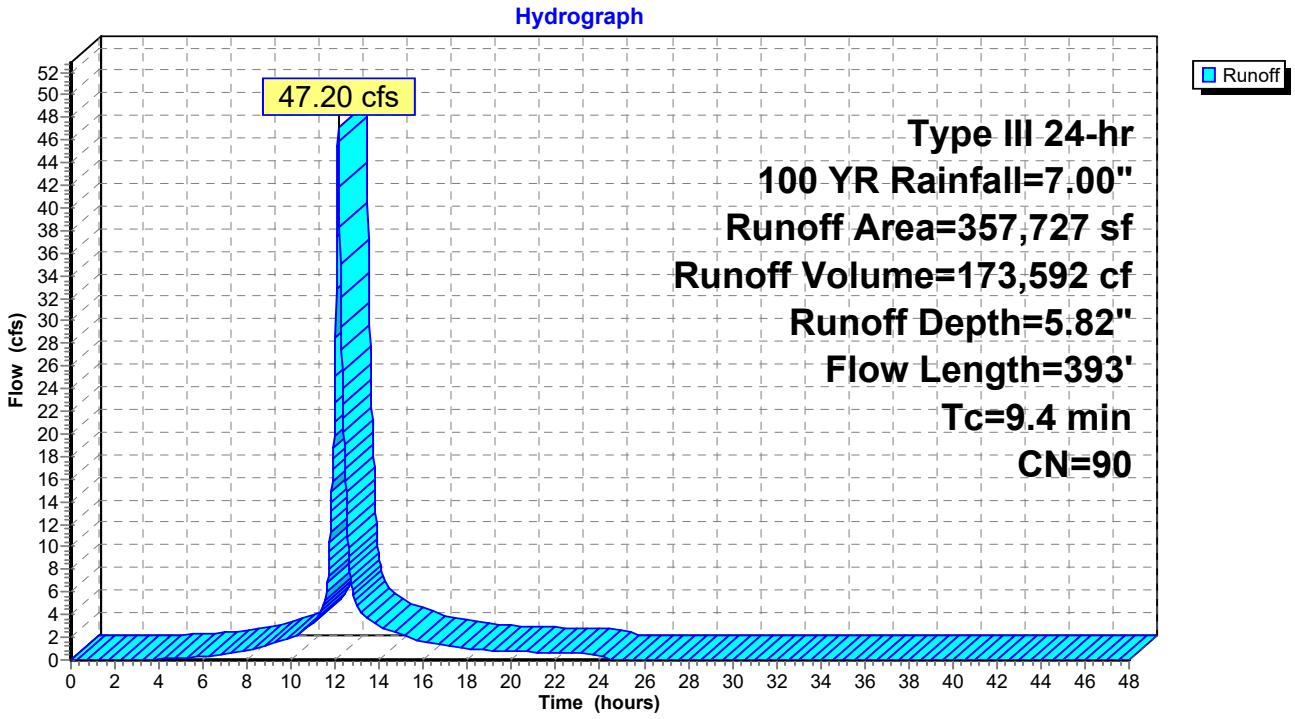
Runoff = 47.20 cfs @ 12.13 hrs, Volume= 173,592 cf, Depth= 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,003	74	>75% Grass cover, Good, HSG C
357,727	90	Weighted Average
113,003		31.59% Pervious Area
244,724		68.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	40	0.0175	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.8	230	0.0175	2.13		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	123	0.0200	2.87		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
9.4	393	Total			

Subcatchment POST-1: Post Development Area 1



Summary for Subcatchment POST-1A: Post Development Area 1A

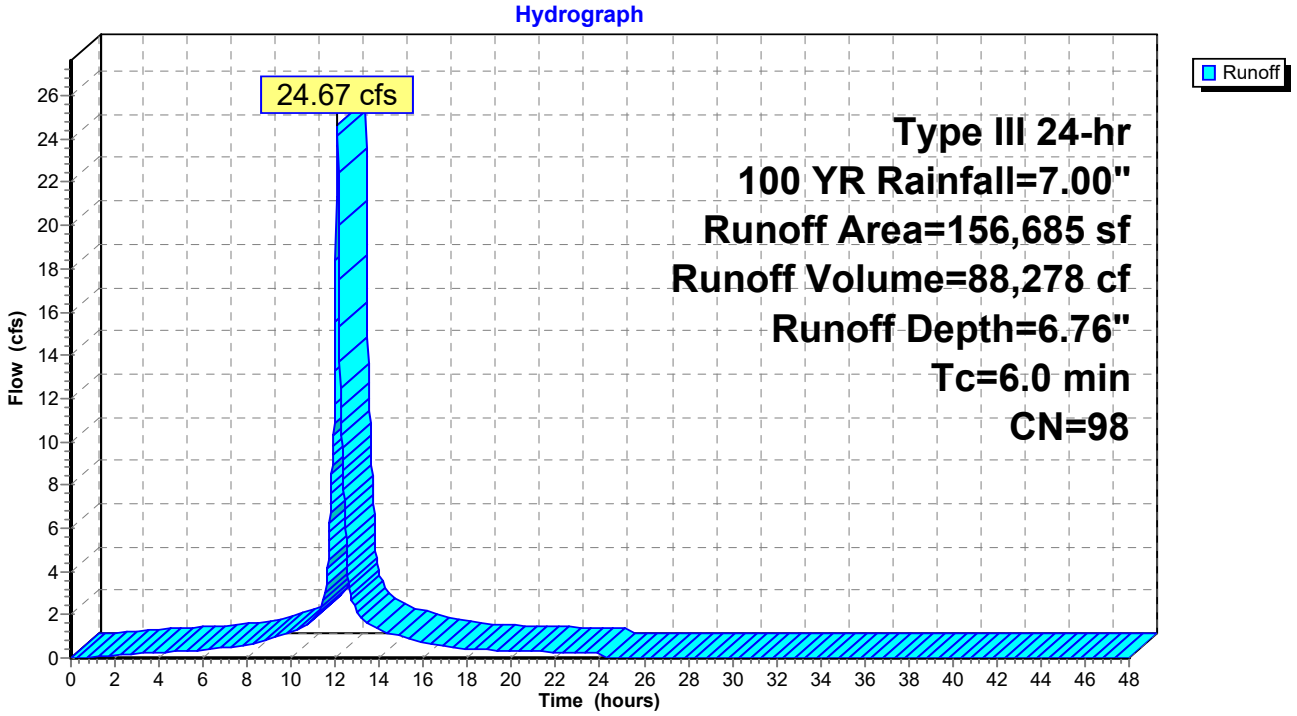
Runoff = 24.67 cfs @ 12.08 hrs, Volume= 88,278 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A



Summary for Subcatchment POST-2: Post Development Area 2

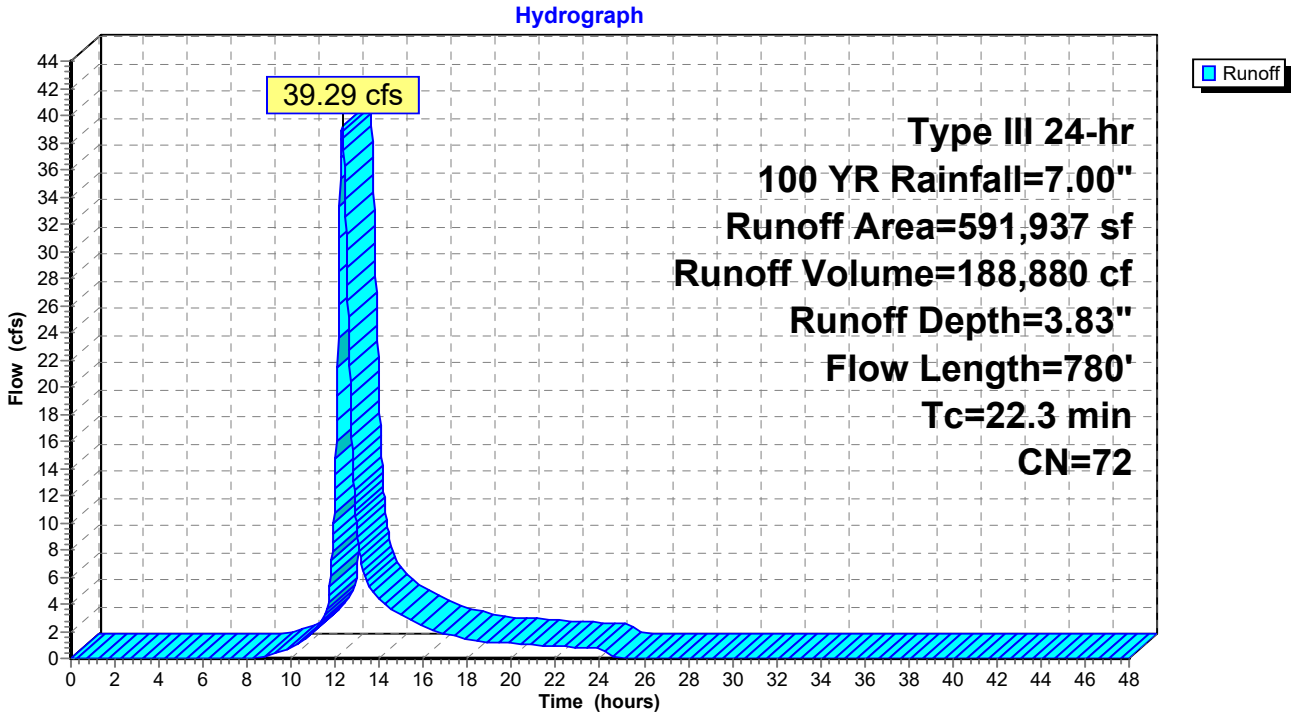
Runoff = 39.29 cfs @ 12.31 hrs, Volume= 188,880 cf, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
294,552	74	>75% Grass cover, Good, HSG C
297,385	70	Woods, Good, HSG C
591,937	72	Weighted Average
591,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



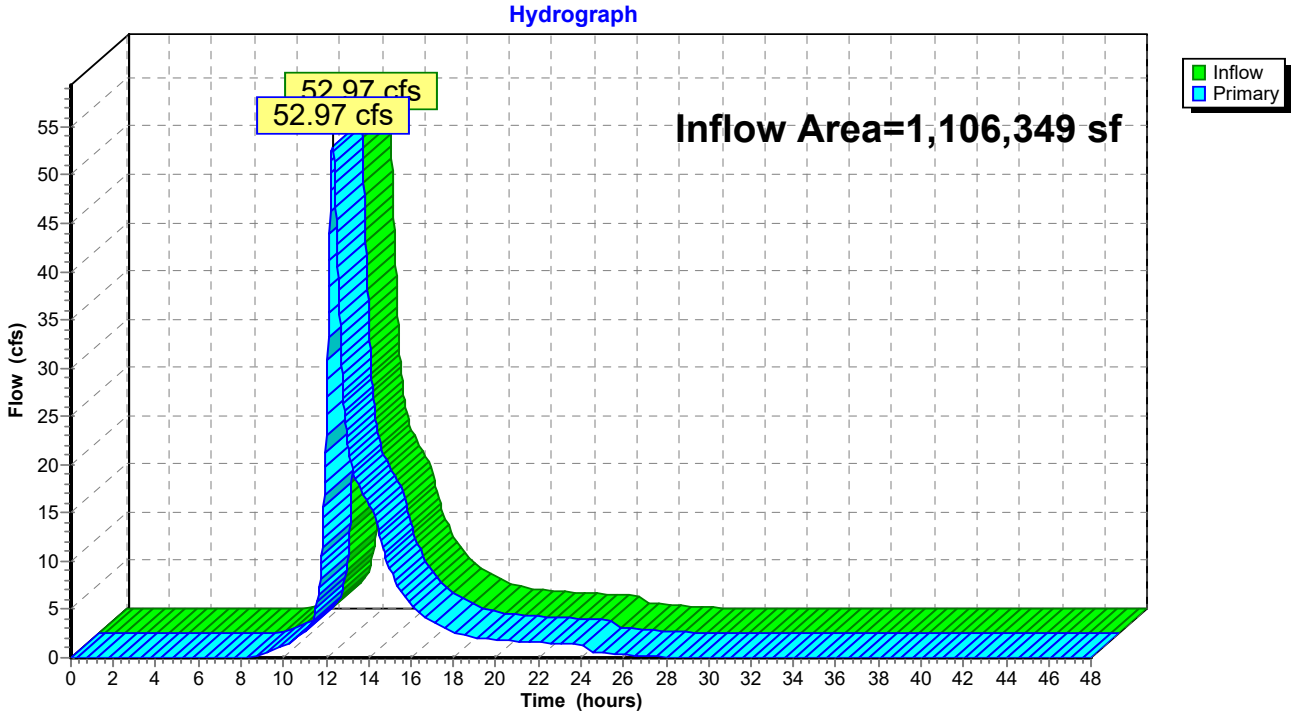
Summary for Pond AP-1: Surrounding Wetland System

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

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 4.11" for 100 YR event
Inflow = 52.97 cfs @ 12.32 hrs, Volume= 379,015 cf
Primary = 52.97 cfs @ 12.32 hrs, Volume= 379,015 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 514,412 sf, 78.03% Impervious, Inflow Depth = 6.11" for 100 YR event
Inflow = 69.92 cfs @ 12.11 hrs, Volume= 261,870 cf
Outflow = 15.22 cfs @ 12.55 hrs, Volume= 261,872 cf, Atten= 78%, Lag= 26.6 min
Discarded = 1.10 cfs @ 12.55 hrs, Volume= 71,737 cf
Primary = 14.11 cfs @ 12.55 hrs, Volume= 190,135 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 82.50' @ 12.55 hrs Surf.Area= 46,737 sf Storage= 114,603 cf

Plug-Flow detention time= 174.9 min calculated for 261,763 cf (100% of inflow)
Center-of-Mass det. time= 175.1 min (944.6 - 769.5)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	163,077 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

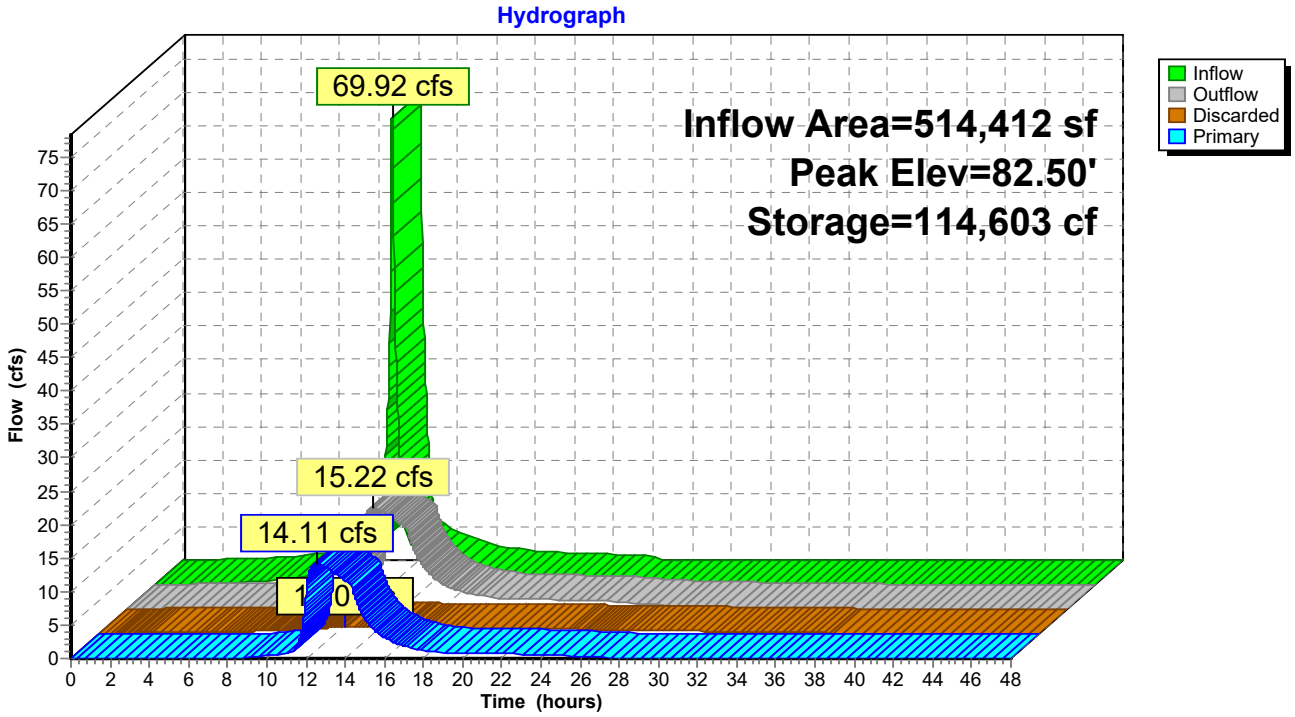
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	8,010	0	0
80.00	23,704	15,857	15,857
81.00	41,448	32,576	48,433
82.00	44,933	43,191	91,624
83.00	48,532	46,733	138,356
83.50	50,352	24,721	163,077

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**18.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.50' S= 0.0405 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	79.65'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	80.55'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	79.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.10 cfs @ 12.55 hrs HW=82.50' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=14.11 cfs @ 12.55 hrs HW=82.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 14.11 cfs @ 7.99 fps)
  ├**2=Orifice/Grate** (Passes < 1.52 cfs potential flow)
  └**3=Sharp-Crested Rectangular Weir** (Passes < 32.17 cfs potential flow)

Pond POND-1: Proposed Detention Basin



Section 3

Supplemental Data

FIELD ENGINEERING, INC. MATTAPOISETT, MA

WATER QUALITY VOLUME CALCULATIONS

Client:	PLUMBERS SUPPLY COMPANY, INC.	Job No.	2190
Project:	PROPOSED OFFICE/WAREHOUSE	Date:	3/20/2018 Rev 5/7/18
Location:	FLAHERTY DRIVE EXTENSION	Design by:	R. RICCIO

REQUIRED WATER QUALITY VOLUME-POST-1

UNIT VOLUME (in.) =	1.00
IMPERVIOUS AREA (s.f.) =	226,004
WATER QUALITY VOLUME (cu.ft.) =	18,834

AVAILABLE VOLUME CALCULATION (POND-1)

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
79.0	8,010.0	0.0	0.0	0.000
80.00	23,704.0	15,857.0	15,857.0	0.364
81.00	41,448.0	32,576.0	48,433.0	1.112

WATER QUALITY VOLUME PROVIDED =	48,433.0	1.112	
WATER QUALITY VOLUME REQUIRED =	18,833.7	0.432	OK

FIELD ENGINEERING, INC. MATTAPOISETT, MA

RECHARGE VOLUME CALCULATIONS

Client:	PLUMBERS SUPPLY COMPANY, INC.	Job No.	2190
Project:	PROPOSED OFFICE/WAREHOUSE	Date:	3/20/2018 Rev 5/7/18
Location:	FLAHERTY DRIVE EXTENSION	Design by:	R. RICCIO

RECHARGE VOLUME CALCULATIONS

HYDROLOGIC SOIL GROUP	C
UNIT VOLUME (in.) =	0.25
IMPERVIOUS AREA (s.f.) =	401,409
RECHARGE VOLUME (cu.ft.) =	8,363

AVAILABLE VOLUME CALCULATION (POND-1)

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
79.0	8,010.0	0.0	0.0	0.000
79.65	18,211.0	8,521.8	8,521.8	0.196

RECHARGE VOLUME PROVIDED	8,521.8	0.196
RECHARGE VOLUME REQUIRED	8,362.7	0.192

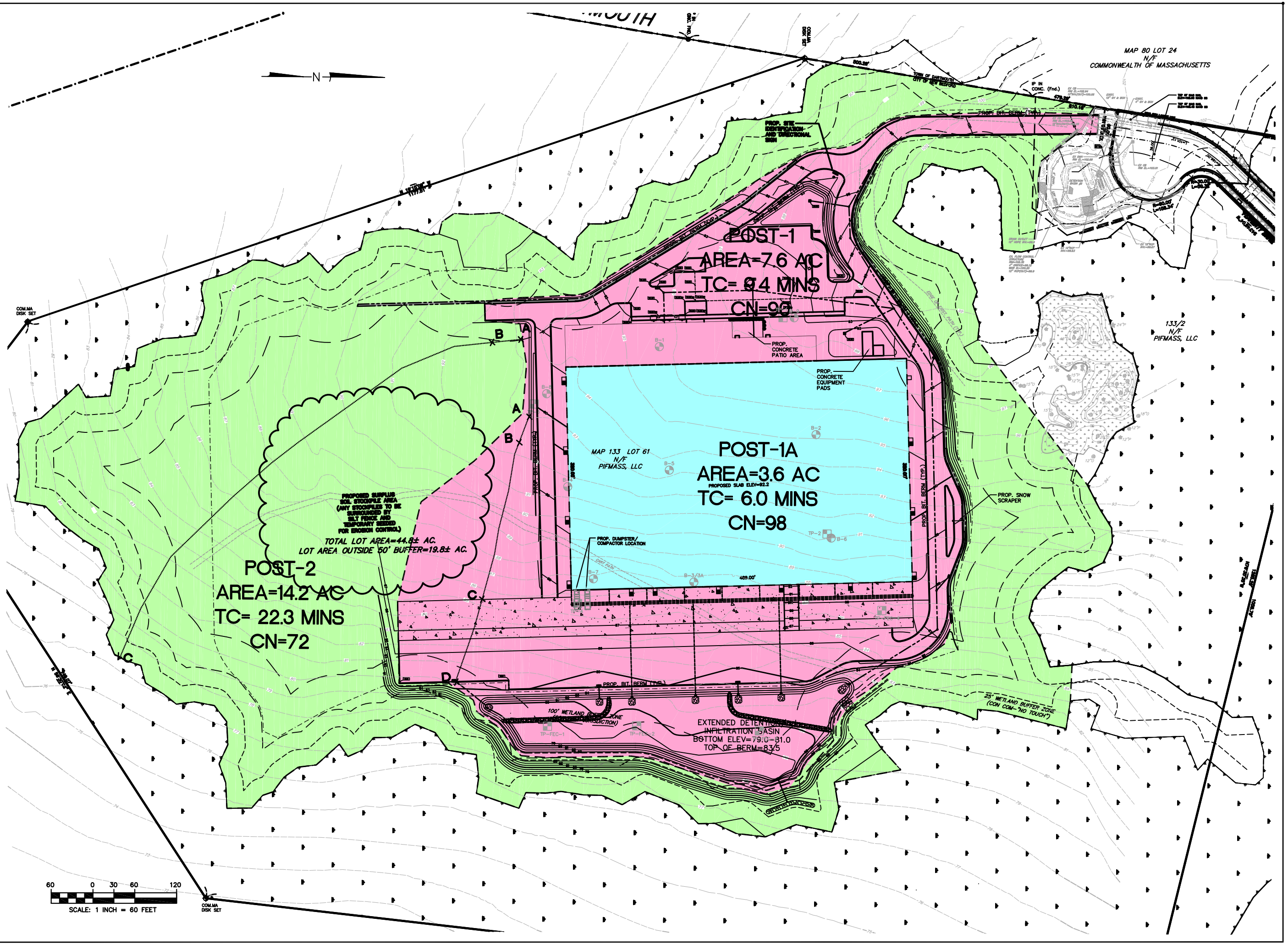
DRAWDOWN TIME CALCULATION

DRAWDOWN TIME=(REQ.RECH. VOL.)/(DES. INFILTRATION RATE "K"*BOTTOM AREA)

RECHARGE VOLUME PROVIDED (CF)=	8,521.8	
DESIGN INFILTRATION RATE (IN/HR)=	1.0	
BOTTOM AREA(SF)=	8,010.0	
DRAWDOWN TIME (HRS)=	12.5	OK

Appendix A

Updated Post Development Watershed Plan



Lot 10 Parcel Plan 12-14-17

FIELD ENGINEERING CO., INC.
CONSULTING ENGINEERS

11D INDUSTRIAL DRIVE
P.O. BOX 1178
MATTAPOISETT, MA 02739
TEL: (508) 758-2749
FAX: (508) 758-2849

Revisions			
3	REVISED PER CON COM REVIEW	5/1/18	RRR
2	REVISED PER CON COM REVIEW	4/24/18	RRR
No.	Description	Date	Appvd.

Date: 3/20/18

Scale: 1"=60'

Drawn By	Designed By	Checked By
RMS	RRR	RRR

Issued For: PERMITTING

POST DEVELOPMENT WATERSHED PLAN
PLUMBERS' SUPPLY COMPANY
LOT 10 FLAHERTY DRIVE (ASSESSORS MAP 133, LOT 61)
NEW BEDFORD, MASSACHUSETTS

Drawing Title: POST DEVELOPMENT WATERSHED PLAN

Project No.	Sheet
2190	1 OF 1

POST