PROPOSED
MULTI-UNIT
DEVELOPMENT
HUTTLESTON AVE.
FAIRHAVEN, MA

Drainage Summary
Dec. 10, 2019

COMMONWEALTH OF MASSACHUSETTS
RICHARD J. BREAUME
No. 28373
CIVIL
REGISTERED PROFESSIONAL ENGINEER

2 YR STORM - NRCC (3.40 in.)

Receptor	Pre Development Q Max (cfs)	Post Development Q Max (cfs)
DP-1	0.87	0.81
DP-2	0.28	0.00

10 YR STORM - NRCC (4.80 in.)

Receptor	Pre Development Q Max (cfs)	Post Development Q Max (cfs)
DP-1	1.82	1.29
DP-2	0.50	0.00

25 YR STORM - NRCC (5.60 in.)

Receptor	Pre Development Q Max (cfs)	Post Development Q Max (cfs)
DP-1	2.42	1.57
DP-2	0.63	0.00

100 YR STORM - NRCC (7.00 in.)

Receptor	Pre Development Q Max (cfs)	Post Development Q Max (cfs)
DP-1	3.52	2.06
DP-2	0.86	0.00

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Input Values

K Values for grate R-3405-A with a transverse gutter slope of 2%	
LONGITUDINAL SLOPE (%)	K FOR R-3405-A
1	19
1.5	20.75
2	22.5
2.5	24.25
3	26
3.5	27.25
4	28.5
4.5	29.5
5	30.5
5.5	31.5
6	32.5

$$D = \left(\frac{QN}{0.56Z\sqrt{S}}\right)^{\frac{3}{8}}$$

K Values for grate R-3455-A with a transverse gutter slope of 2%	
LONGITUDINAL SLOPE (%)	K FOR R-3405-A
1	19
1.5	22
2	25
2.5	26.5
3	28
3.5	29.5
4	31
4.5	31.75
5	32.5
5.5	33.25
6	34

$$Q = KD^{\frac{3}{2}}$$

ROADWAY PROPERTIES	
Roughness Coefficient of Bituminous Asphalt	0.013
Transverse Slope of Roadway	0.02
Slope of Curbing (if CC Berm)	0.25
Composite Transverse Slope (Eq. 4-7 of HEC-22)	0.0185

Geometric Values for grate R-3405-A	
Square Dimention (in.)	23.6
Free Area (sq. ft.)	1.3

GUTTER DEPTH OF FLOW

$$Q = .6A\sqrt{2gh}$$

Q = Channel flow (cfs)
Z = Reciprocal of transverse slope (ft/ft)
S = Longitudinal Slope
N = Roughness Coefficient
D = Depth (ft)

GUTTER CAPACITY OF GRATE

$$Q = 3.3P(h)^{\frac{3}{2}}$$

Q = Grate capacity (cfs)
K = Grate coef. from "Inlet Grate Capacities Manual"
D = Depth of flow in feet (from previous equation)

ORIFICE FLOW EQUATION

Q = Capacity (cfs)
A = Free open area (sq. ft.)
g = Acceleration of Gravity (32.2 ft/s^2)
h = Head (ft.)

WEIR EQUATION

Q = Capacity (cfs)
P = Perimeter (ft.)
h = Head (ft.)

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CATCH BASINS IN DEPRESSIONS

STRUCTURE	CONTRIBUTING FLOW (cfs)	CARRYOVER FLOW (cfs)	TOTAL FLOW (cfs)	SIDES ON CURB	(S)INGLE OR (D)OUBLE	P (ft)	HEAD OVER GRATE (ft)	ORIFICE		WEIR		MAX CAPACITY (cfs)	ACTUAL DEPTH (ft)	OVERFLOW (cfs)	OVERFLOW TO
								Q_{MAX} (cfs)	H (ft)	Q_{MAX} (cfs)	H (ft)				
CB-1	1.65		1.65	1	D	7.9	0.25	6.26	0.02	3.25	0.16	3.25 cfs	0.16 ft.	0.00	-
CB-2	1.30		1.30	1	S	5.9	0.25	3.13	0.04	2.44	0.16	2.44 cfs	0.16 ft.	0.00	-
															-
															-
															-
															-
															-
															-
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RATIONAL METHOD OF FLOWS TOWARD INLET GRATES									
FROM	UNPAVED AREA	UNPAVED COEFFICIENT	PAVE/ROOF AREA	PAVE/ROOF COEFFICIENT	AREA ACRES	WEIGHTED C	TOC MIN.	i 25-YR	Q cfs
CB-1	5707	0.2	12229	0.9	0.41	0.68	6	5.9	1.65
CB-2	385	0.2	10585	0.9	0.25	0.88	6	5.9	1.30

OPEN CHANNEL FLOW CAPACITIES

FROM	TO	PIPE DIA.	FROM INVERT	TO INVERT	PIPE LENGTH	SLOPE FT./FT.	N VALUE	Q FULL cfs
CB-1	DMH-1	12	60.85	60.20	65	0.010	0.011	4.22
CB-2	DMH-1	12	61.69	60.20	156	0.010	0.009	5.04
DMH-1	HEADWALL	12	60.10	60.00	10	0.010	0.011	4.22

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Pipe Design Calculations

PROJECT HUTTLESTON AVE.
25-YEAR DESIGN STORM
INLET GRATE AND PIPE ANALYSIS
CALCULATED BY: SWL DATE 12/10/2019
CHECKED BY: EKW/RJR DATE 12/10/2019

LOCATION		GRATE ANALYSIS					PIPE ANALYSIS								
FROM	TO	(S)ag or (G)utter	FLOW TO GRATE	GRATE CAPACITY	OVER-FLOW	FLOW TO PIPE	PIPE SIZE DIA.	LNGTH FT.	SLOPE FT./FT.	Q CAPACITY cfs	Q ACTUAL cfs	CHECK $Q_C>Q_A$?	V FULL fps	V ACTUAL fps	CHECK V >2 <12
CB-1	DMH-1	S	1.65	3.25	0.00	1.65	12	65	0.010	4.22	1.65	OK	5.38	5.08	OK
CB-2	DMH-1	S	1.30	2.44	0.00	1.30	12	156	0.010	5.04	1.30	OK	6.42	5.46	OK
DMH-1	FLARED END					2.95	12	10	0.010	4.22	2.95	OK	5.38	5.70	OK

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: POST-1B (HUTTLESTON AVE.)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Grass Channel	0.50	1.00	0.50	0.50
Rain Garden	0.90	0.50	0.45	0.05
	0.00	0.05	0.00	0.05
	0.00	0.05	0.00	0.05
	0.00	0.05	0.00	0.05

Total TSS Removal = 95%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: HUTTLESTON AVE.
Prepared By: SPENCER LYNDS
Date: 12/10/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: POST-1A (HUTTLESTON AVE.)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Constructed Stormwater Wetland	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

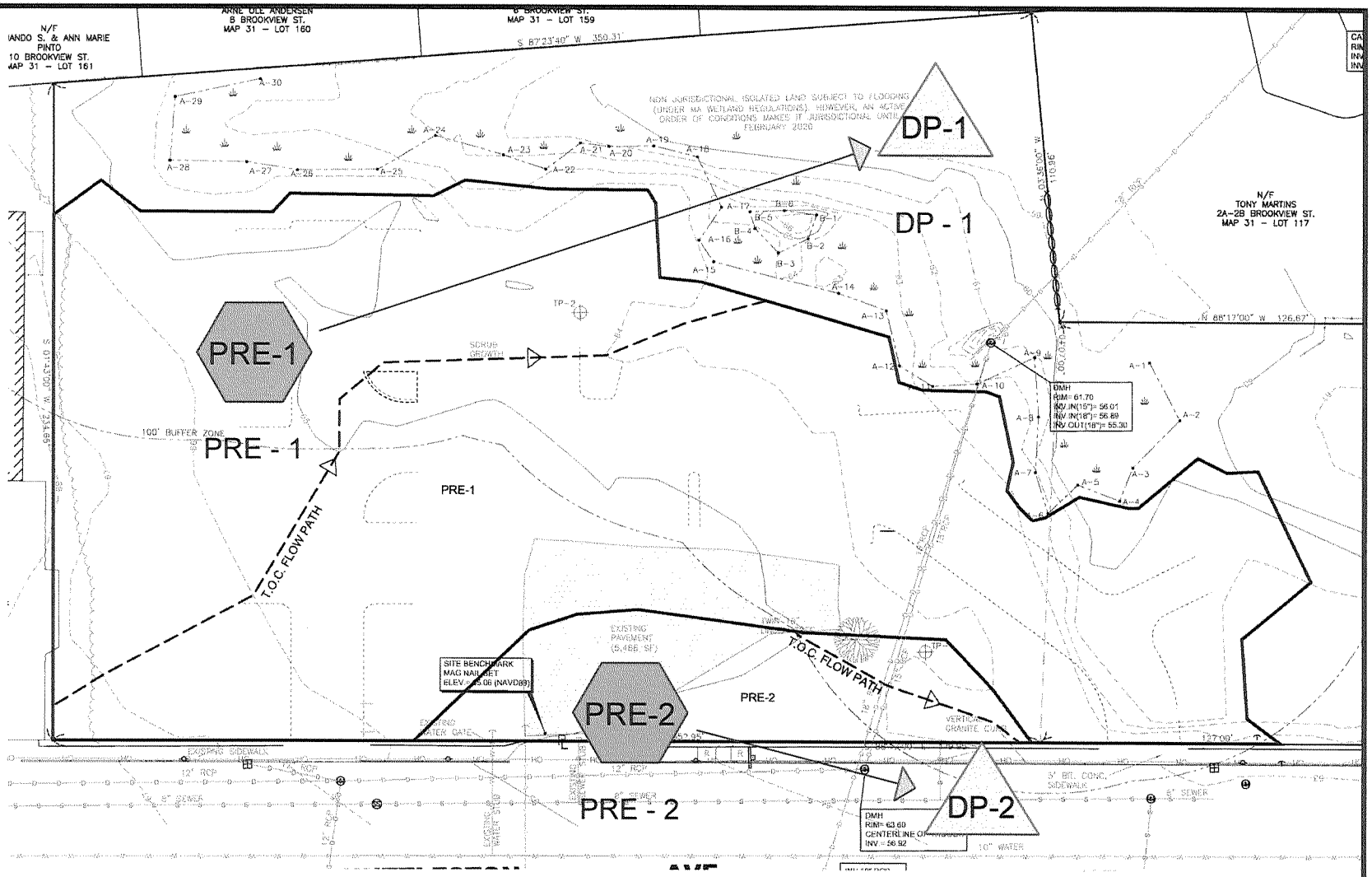
Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: HUTTLESTON AVE.
Prepared By: SPENCER LYNDS
Date: 12/10/2019

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1



Subcat Reach Pond Link

Routing Diagram for LEWIS LANDING PRE-DEV

Prepared by Prime Engineering, Inc, Printed 12/10/2019

HydroCAD® 10.00-13 s/n 01299 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.126	98	Paved parking, HSG C (PRE-1, PRE-2)
1.455	70	Woods, Good, HSG C (PRE-1, PRE-2)
1.581	**72**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.581	HSG C	PRE-1, PRE-2
0.000	HSG D	
0.000	Other	
1.581		**TOTAL AREA**

Ground Covers (all 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	0.126	0.000	0.000	0.126	Paved parking	PRE-1, PRE-2
0.000	0.000	1.455	0.000	0.000	1.455	Woods, Good	PRE-1, PRE-2
0.000	**0.000**	**1.581**	**0.000**	**0.000**	**1.581**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PRE-1: PRE - 1 Runoff Area=61,216 sf 4.67% Impervious Runoff Depth>0.99"
Flow Length=320' Tc=29.0 min CN=71 Runoff=0.87 cfs 0.116 af

Subcatchment PRE-2: PRE - 2 Runoff Area=7,656 sf 34.21% Impervious Runoff Depth>1.55"
Flow Length=90' Tc=8.7 min CN=80 Runoff=0.28 cfs 0.023 af

Pond DP-1: DP - 1 Inflow=0.87 cfs 0.116 af
Primary=0.87 cfs 0.116 af

Pond DP-2: DP - 2 Inflow=0.28 cfs 0.023 af
Primary=0.28 cfs 0.023 af

Total Runoff Area = 1.581 ac Runoff Volume = 0.139 af Average Runoff Depth = 1.06"
92.05% Pervious = 1.455 ac 7.95% Impervious = 0.126 ac

Summary for Subcatchment PRE-1: PRE - 1

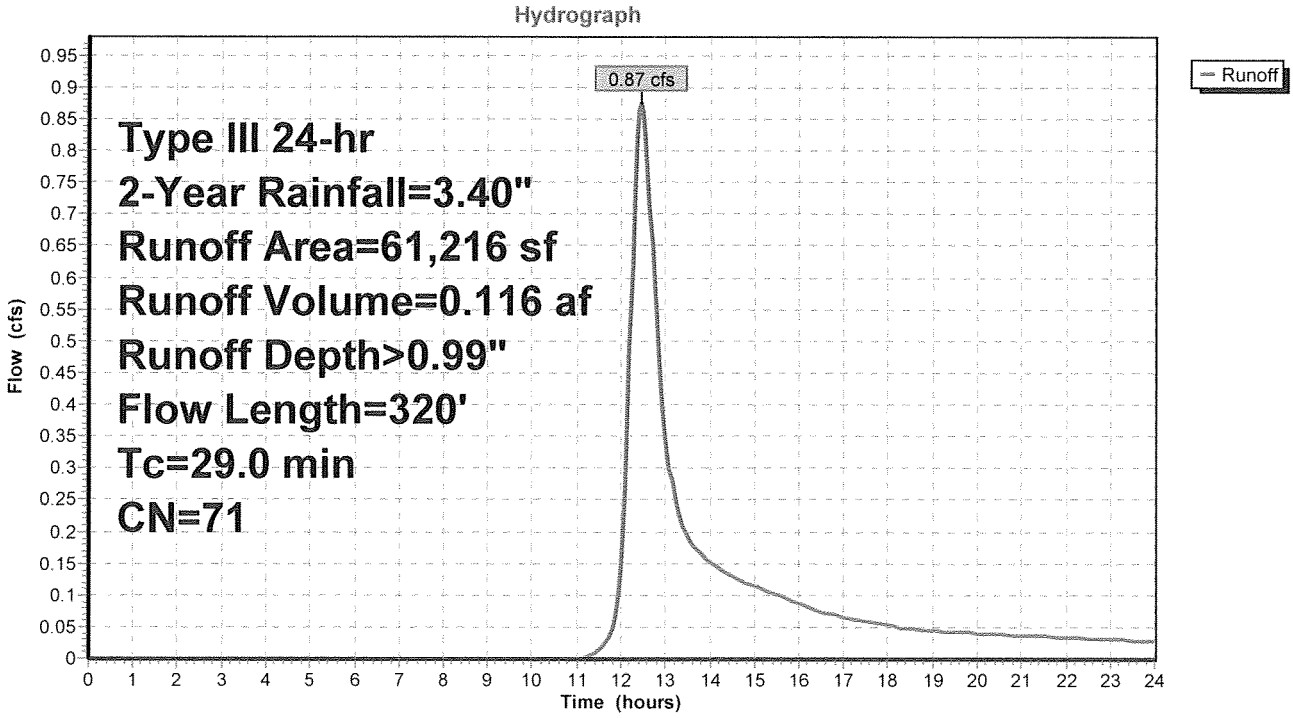
Runoff = 0.87 cfs @ 12.45 hrs, Volume= 0.116 af, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
58,360	70	Woods, Good, HSG C
2,856	98	Paved parking, HSG C
61,216	71	Weighted Average
58,360		95.33% Pervious Area
2,856		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	50	0.0200	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.40"
8.2	270	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.0	320	Total			

Subcatchment PRE-1: PRE - 1



Summary for Subcatchment PRE-2: PRE - 2

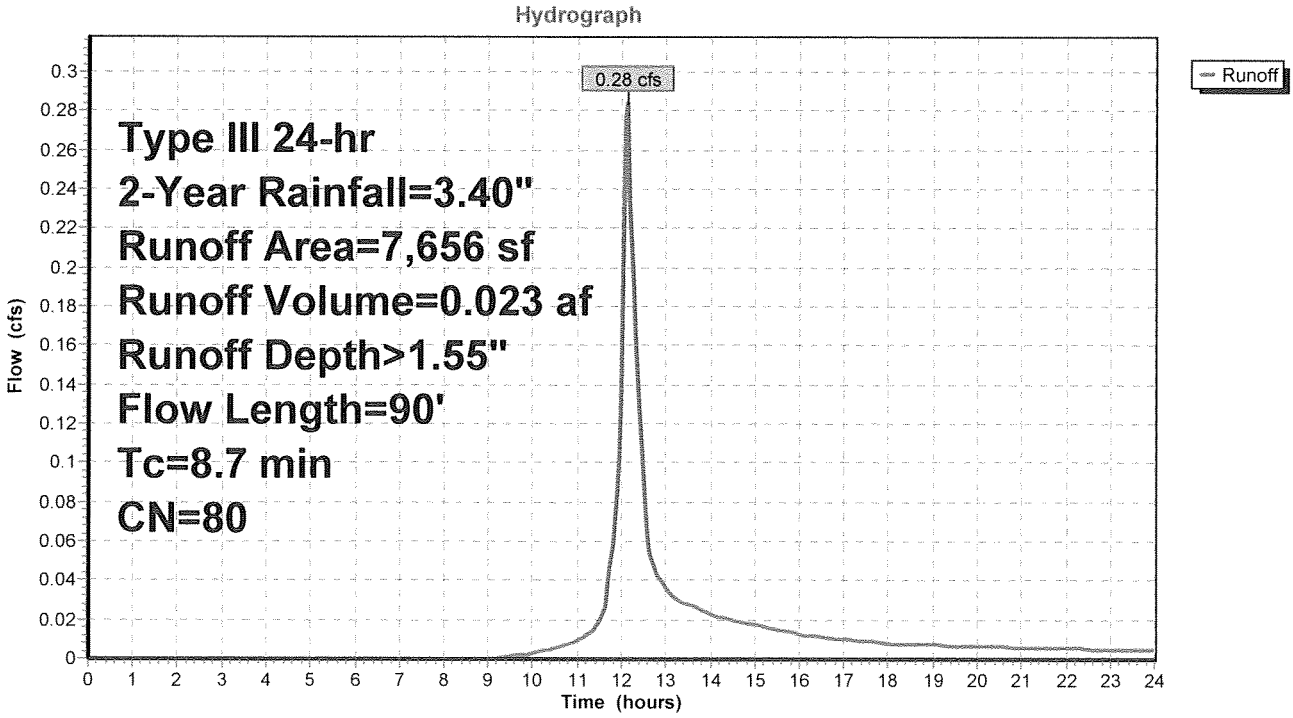
Runoff = 0.28 cfs @ 12.13 hrs, Volume= 0.023 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
2,619	98	Paved parking, HSG C
5,037	70	Woods, Good, HSG C
7,656	80	Weighted Average
5,037		65.79% Pervious Area
2,619		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0260	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.5	40	0.0075	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.7	90	Total			

Subcatchment PRE-2: PRE - 2

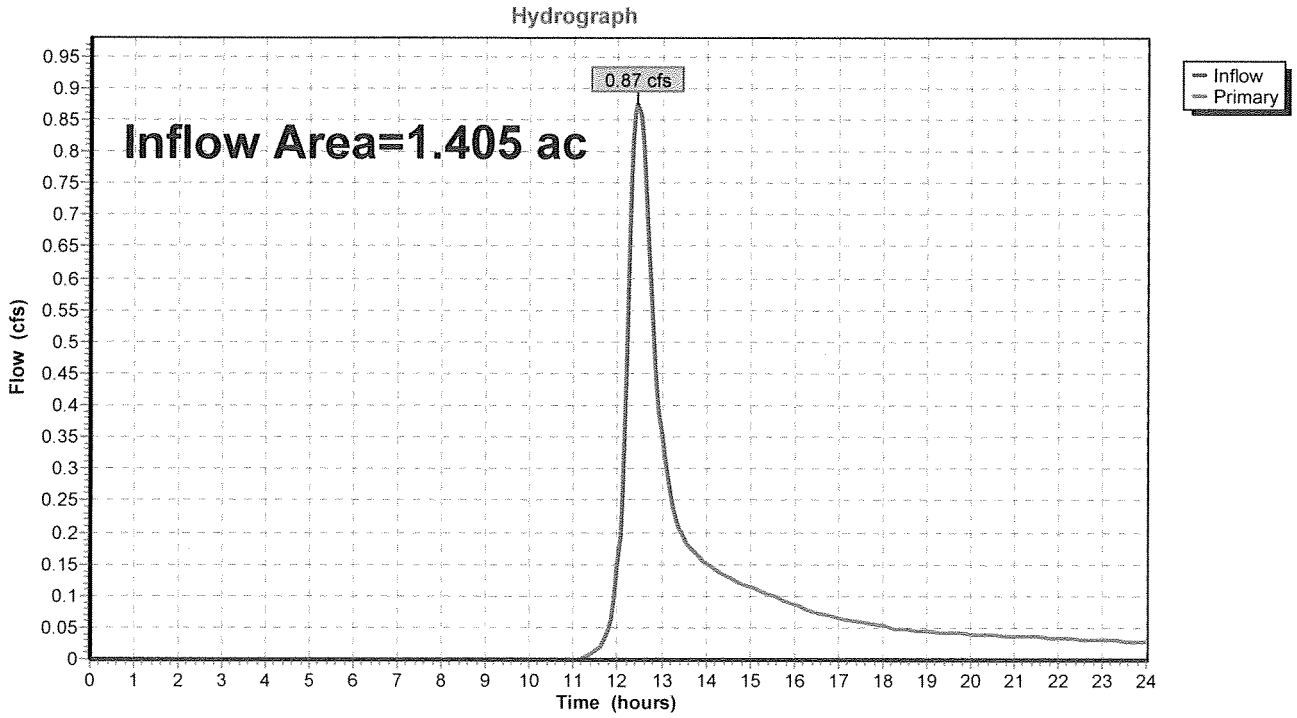


Summary for Pond DP-1: DP - 1

Inflow Area = 1.405 ac, 4.67% Impervious, Inflow Depth > 0.99" for 2-Year event
Inflow = 0.87 cfs @ 12.45 hrs, Volume= 0.116 af
Primary = 0.87 cfs @ 12.45 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-1: DP - 1

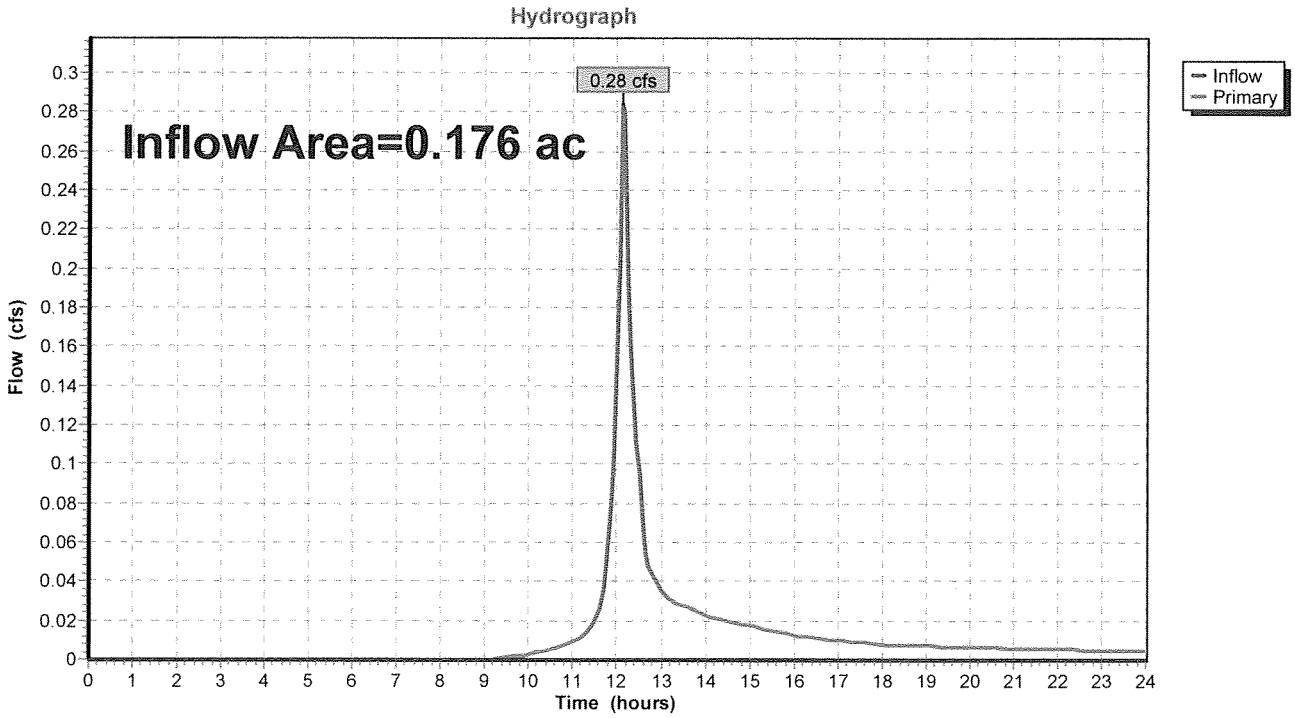


Summary for Pond DP-2: DP - 2

Inflow Area = 0.176 ac, 34.21% Impervious, Inflow Depth > 1.55" for 2-Year event
Inflow = 0.28 cfs @ 12.13 hrs, Volume= 0.023 af
Primary = 0.28 cfs @ 12.13 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-2: DP - 2



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PRE-1: PRE - 1 Runoff Area=61,216 sf 4.67% Impervious Runoff Depth>1.95"
Flow Length=320' Tc=29.0 min CN=71 Runoff=1.82 cfs 0.229 af

Subcatchment PRE-2: PRE - 2 Runoff Area=7,656 sf 34.21% Impervious Runoff Depth>2.72"
Flow Length=90' Tc=8.7 min CN=80 Runoff=0.50 cfs 0.040 af

Pond DP-1: DP - 1 Inflow=1.82 cfs 0.229 af
Primary=1.82 cfs 0.229 af

Pond DP-2: DP - 2 Inflow=0.50 cfs 0.040 af
Primary=0.50 cfs 0.040 af

Total Runoff Area = 1.581 ac Runoff Volume = 0.269 af Average Runoff Depth = 2.04"
92.05% Pervious = 1.455 ac 7.95% Impervious = 0.126 ac

Summary for Subcatchment PRE-1: PRE - 1

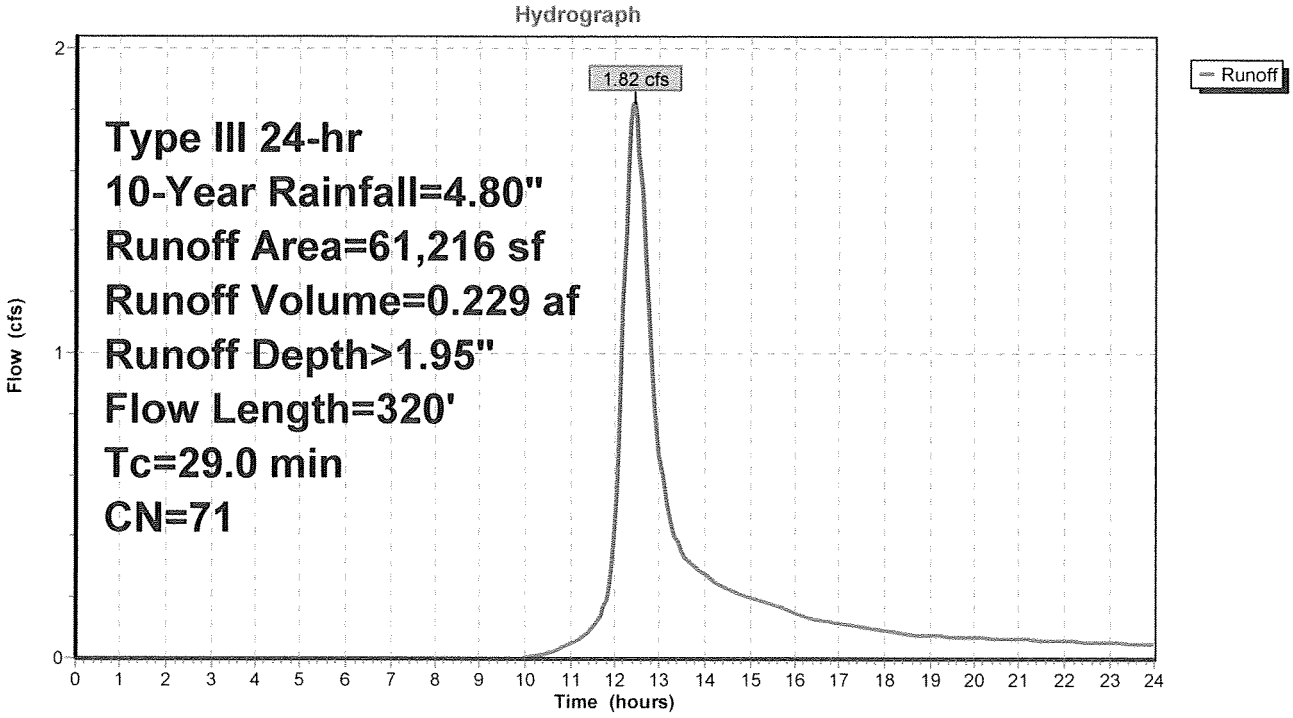
Runoff = 1.82 cfs @ 12.42 hrs, Volume= 0.229 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
58,360	70	Woods, Good, HSG C
2,856	98	Paved parking, HSG C
61,216	71	Weighted Average
58,360		95.33% Pervious Area
2,856		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	50	0.0200	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.40"
8.2	270	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.0	320	Total			

Subcatchment PRE-1: PRE - 1



Summary for Subcatchment PRE-2: PRE - 2

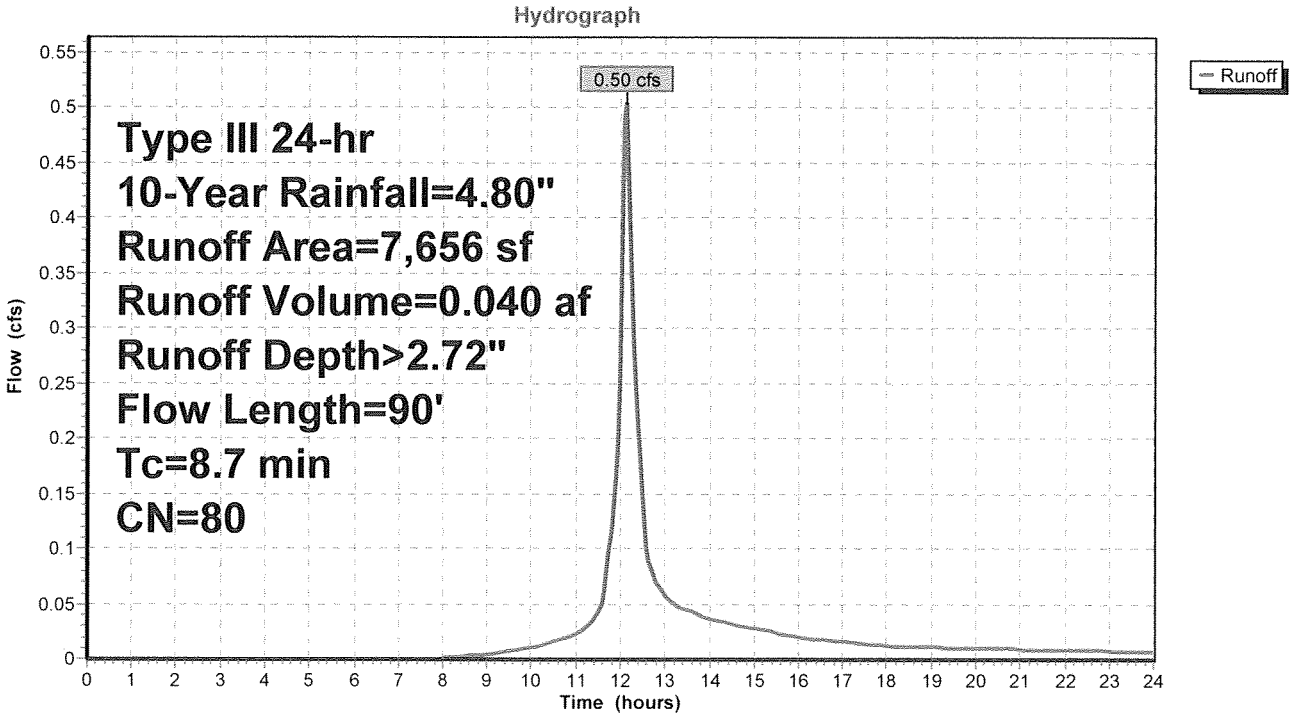
Runoff = 0.50 cfs @ 12.12 hrs, Volume= 0.040 af, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
2,619	98	Paved parking, HSG C
5,037	70	Woods, Good, HSG C
7,656	80	Weighted Average
5,037		65.79% Pervious Area
2,619		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0260	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.5	40	0.0075	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.7	90	Total			

Subcatchment PRE-2: PRE - 2

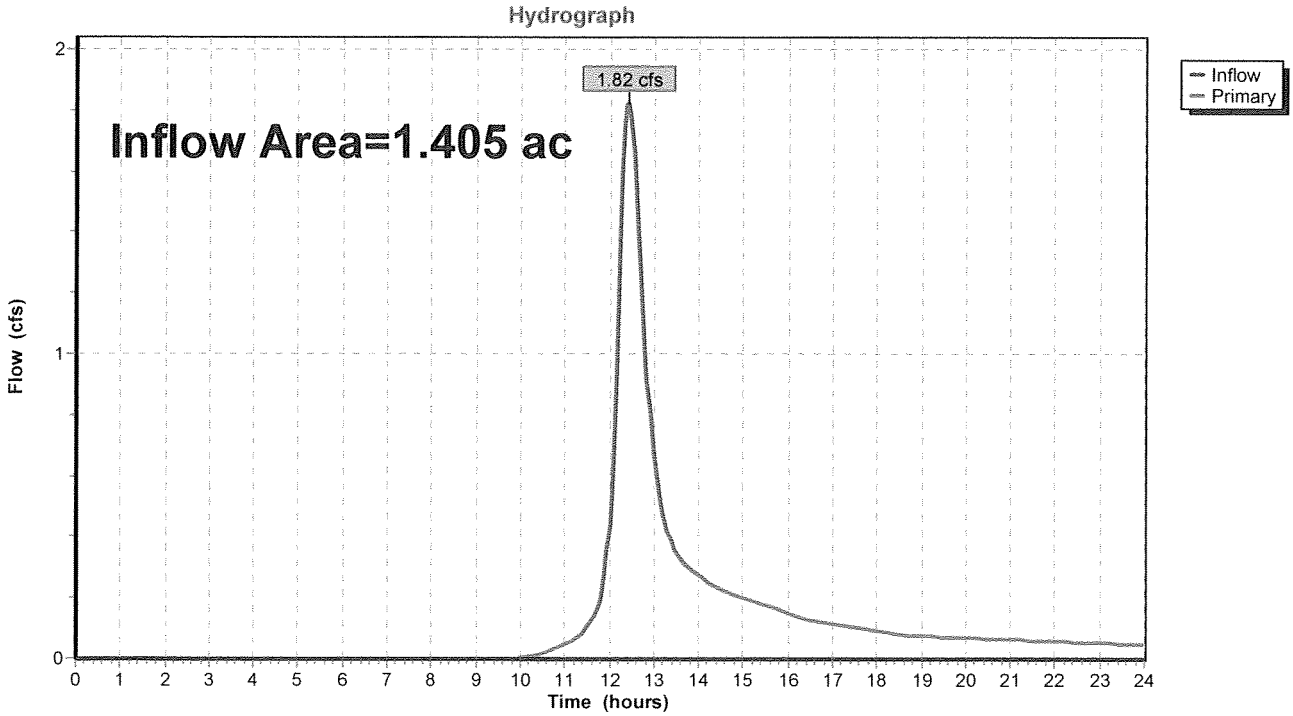


Summary for Pond DP-1: DP - 1

Inflow Area = 1.405 ac, 4.67% Impervious, Inflow Depth > 1.95" for 10-Year event
Inflow = 1.82 cfs @ 12.42 hrs, Volume= 0.229 af
Primary = 1.82 cfs @ 12.42 hrs, Volume= 0.229 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-1: DP - 1

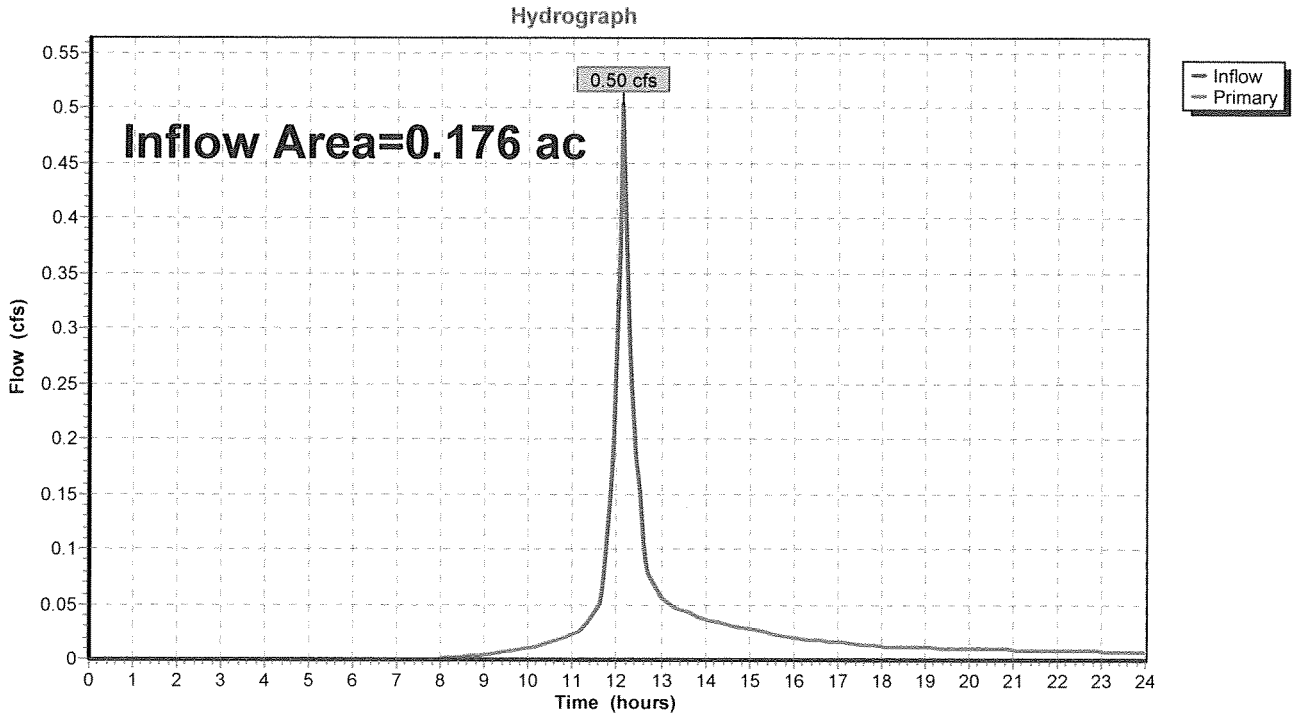


Summary for Pond DP-2: DP - 2

Inflow Area = 0.176 ac, 34.21% Impervious, Inflow Depth > 2.72" for 10-Year event
Inflow = 0.50 cfs @ 12.12 hrs, Volume= 0.040 af
Primary = 0.50 cfs @ 12.12 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-2: DP - 2



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PRE-1: PRE - 1 Runoff Area=61,216 sf 4.67% Impervious Runoff Depth>2.56"
Flow Length=320' Tc=29.0 min CN=71 Runoff=2.42 cfs 0.300 af

Subcatchment PRE-2: PRE - 2 Runoff Area=7,656 sf 34.21% Impervious Runoff Depth>3.42"
Flow Length=90' Tc=8.7 min CN=80 Runoff=0.63 cfs 0.050 af

Pond DP-1: DP - 1 Inflow=2.42 cfs 0.300 af
Primary=2.42 cfs 0.300 af

Pond DP-2: DP - 2 Inflow=0.63 cfs 0.050 af
Primary=0.63 cfs 0.050 af

Total Runoff Area = 1.581 ac Runoff Volume = 0.350 af Average Runoff Depth = 2.66"
92.05% Pervious = 1.455 ac 7.95% Impervious = 0.126 ac

Summary for Subcatchment PRE-1: PRE - 1

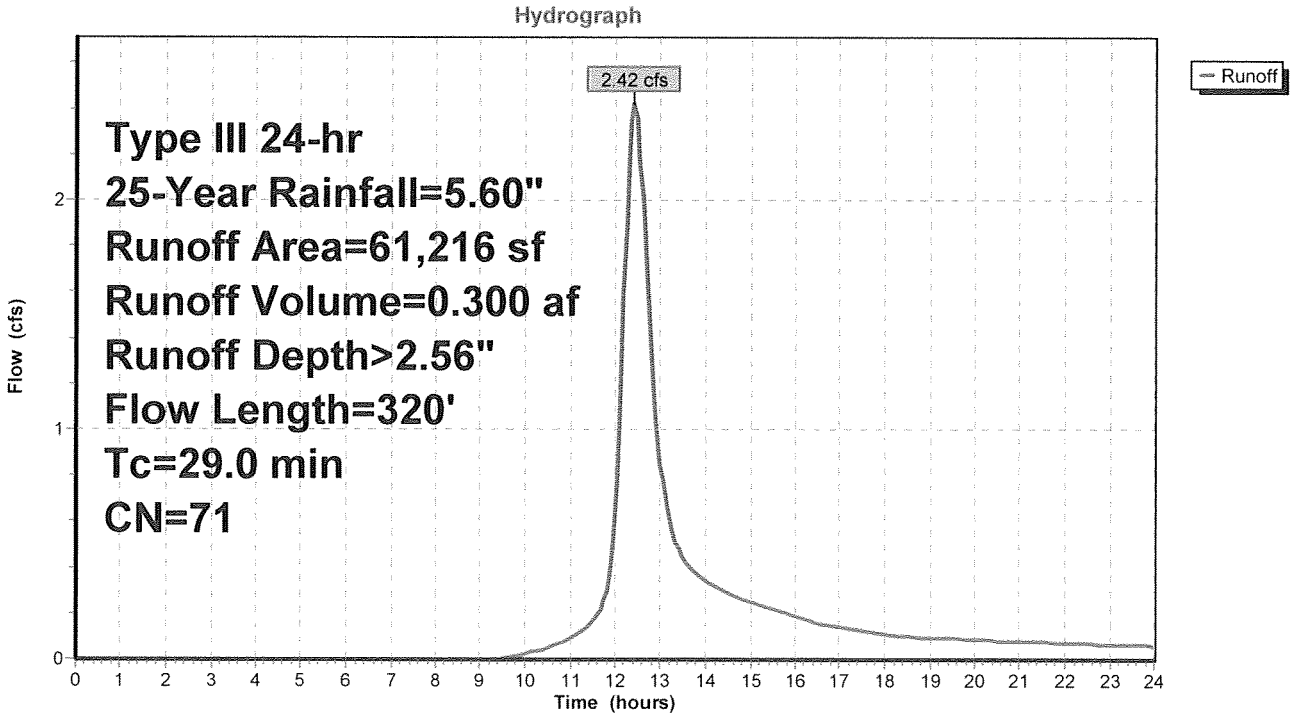
Runoff = 2.42 cfs @ 12.42 hrs, Volume= 0.300 af, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
58,360	70	Woods, Good, HSG C
2,856	98	Paved parking, HSG C
61,216	71	Weighted Average
58,360		95.33% Pervious Area
2,856		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	50	0.0200	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.40"
8.2	270	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.0	320	Total			

Subcatchment PRE-1: PRE - 1



Summary for Subcatchment PRE-2: PRE - 2

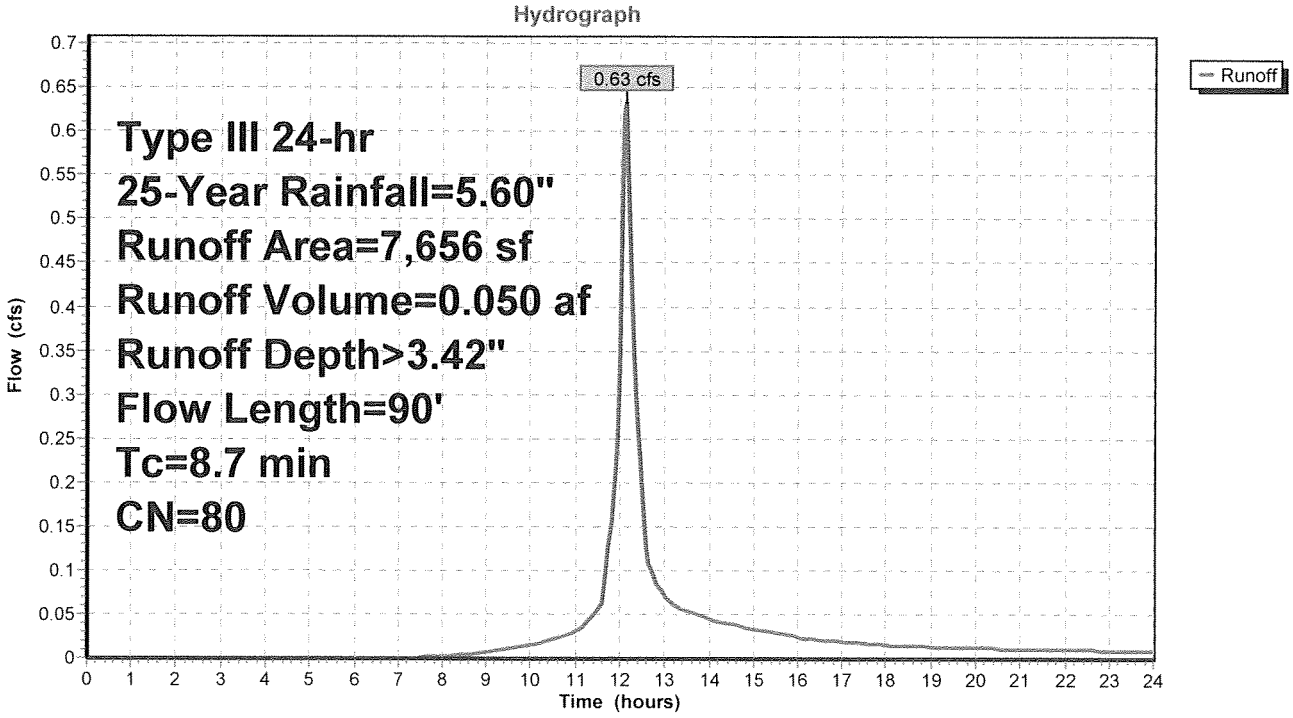
Runoff = 0.63 cfs @ 12.12 hrs, Volume= 0.050 af, Depth> 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
2,619	98	Paved parking, HSG C
5,037	70	Woods, Good, HSG C
7,656	80	Weighted Average
5,037		65.79% Pervious Area
2,619		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0260	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.5	40	0.0075	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.7	90	Total			

Subcatchment PRE-2: PRE - 2

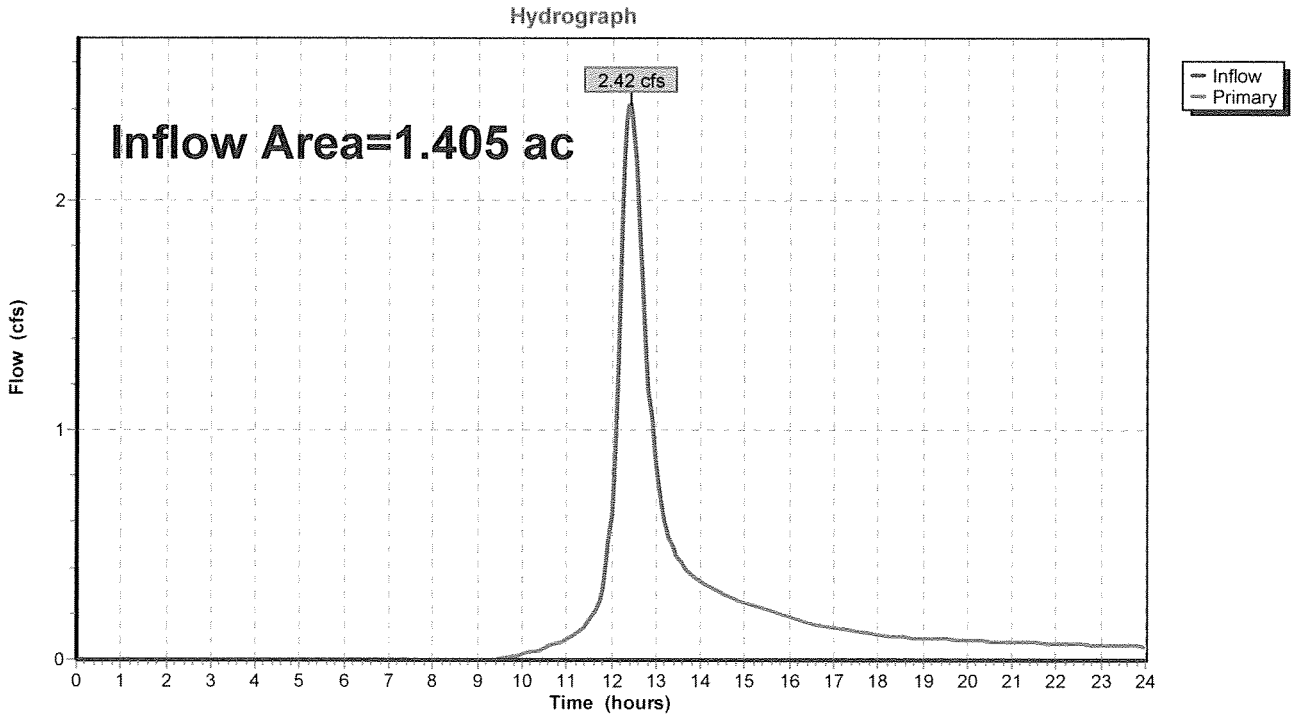


Summary for Pond DP-1: DP - 1

Inflow Area = 1.405 ac, 4.67% Impervious, Inflow Depth > 2.56" for 25-Year event
Inflow = 2.42 cfs @ 12.42 hrs, Volume= 0.300 af
Primary = 2.42 cfs @ 12.42 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-1: DP - 1

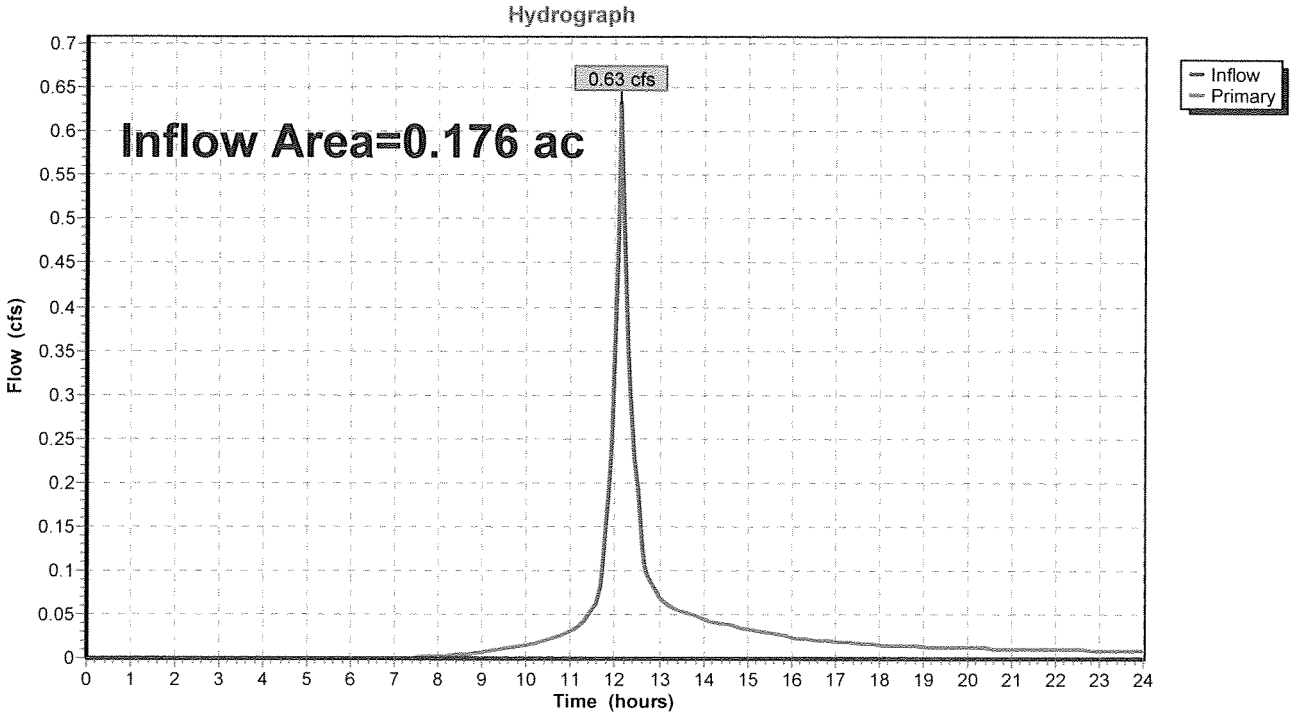


Summary for Pond DP-2: DP - 2

Inflow Area = 0.176 ac, 34.21% Impervious, Inflow Depth > 3.42" for 25-Year event
Inflow = 0.63 cfs @ 12.12 hrs, Volume= 0.050 af
Primary = 0.63 cfs @ 12.12 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-2: DP - 2



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PRE-1: PRE - 1 Runoff Area=61,216 sf 4.67% Impervious Runoff Depth>3.70"
Flow Length=320' Tc=29.0 min CN=71 Runoff=3.52 cfs 0.433 af

Subcatchment PRE-2: PRE - 2 Runoff Area=7,656 sf 34.21% Impervious Runoff Depth>4.69"
Flow Length=90' Tc=8.7 min CN=80 Runoff=0.86 cfs 0.069 af

Pond DP-1: DP - 1 Inflow=3.52 cfs 0.433 af
Primary=3.52 cfs 0.433 af

Pond DP-2: DP - 2 Inflow=0.86 cfs 0.069 af
Primary=0.86 cfs 0.069 af

Total Runoff Area = 1.581 ac Runoff Volume = 0.502 af Average Runoff Depth = 3.81"
92.05% Pervious = 1.455 ac 7.95% Impervious = 0.126 ac

Summary for Subcatchment PRE-1: PRE - 1

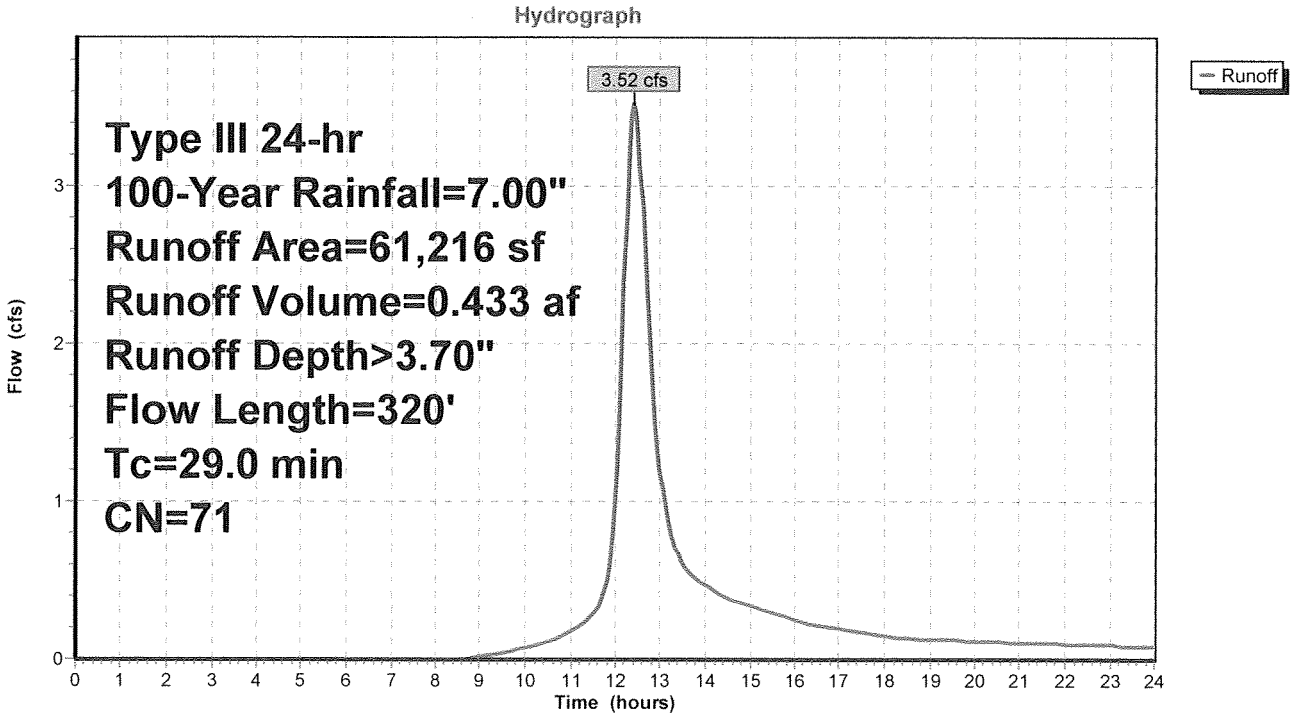
Runoff = 3.52 cfs @ 12.41 hrs, Volume= 0.433 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
58,360	70	Woods, Good, HSG C
2,856	98	Paved parking, HSG C
61,216	71	Weighted Average
58,360		95.33% Pervious Area
2,856		4.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	50	0.0200	0.04		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.40"
8.2	270	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
29.0	320	Total			

Subcatchment PRE-1: PRE - 1



Summary for Subcatchment PRE-2: PRE - 2

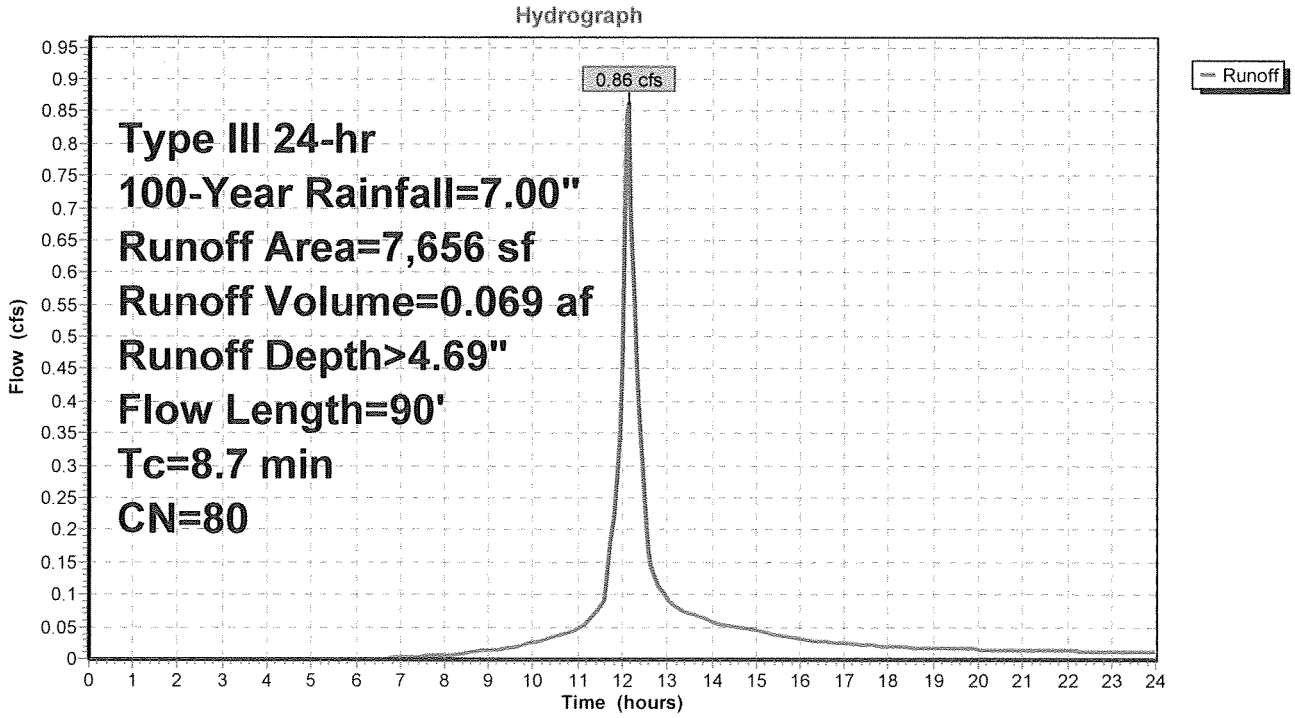
Runoff = 0.86 cfs @ 12.12 hrs, Volume= 0.069 af, Depth> 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
2,619	98	Paved parking, HSG C
5,037	70	Woods, Good, HSG C
7,656	80	Weighted Average
5,037		65.79% Pervious Area
2,619		34.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0260	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.5	40	0.0075	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.7	90	Total			

Subcatchment PRE-2: PRE - 2

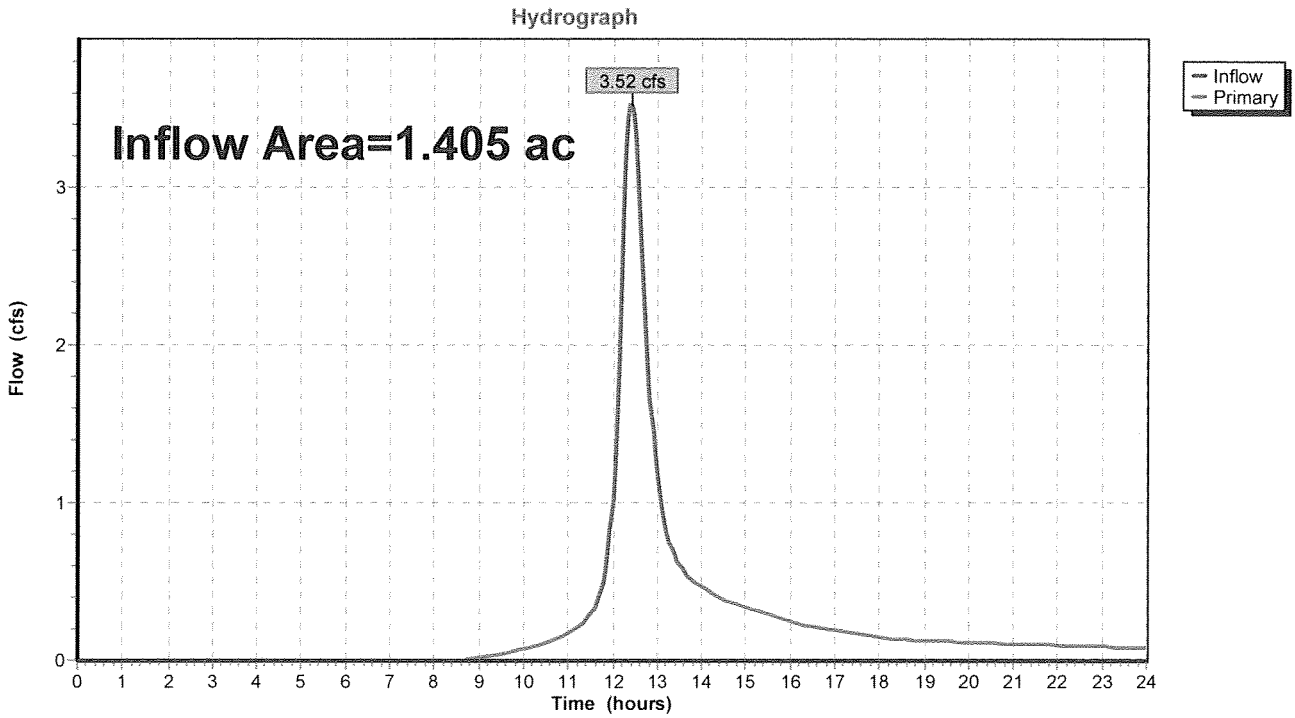


Summary for Pond DP-1: DP - 1

Inflow Area = 1.405 ac, 4.67% Impervious, Inflow Depth > 3.70" for 100-Year event
Inflow = 3.52 cfs @ 12.41 hrs, Volume= 0.433 af
Primary = 3.52 cfs @ 12.41 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-1: DP - 1

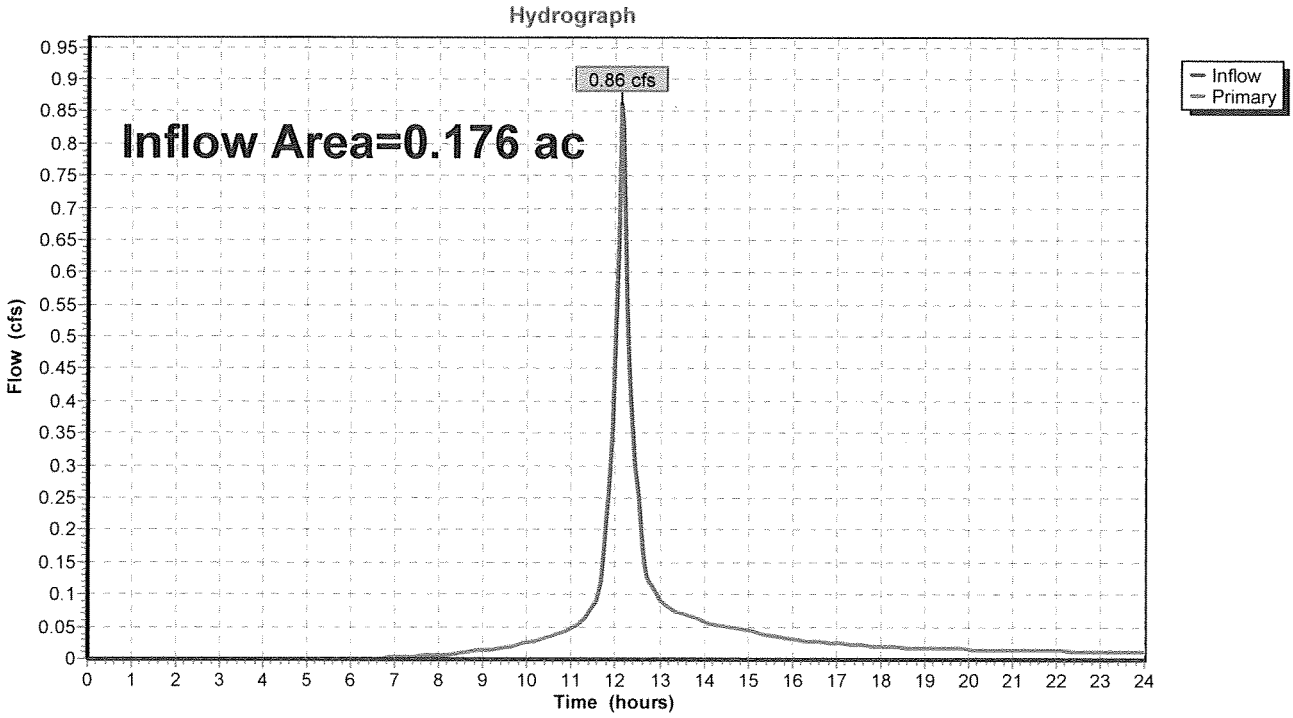


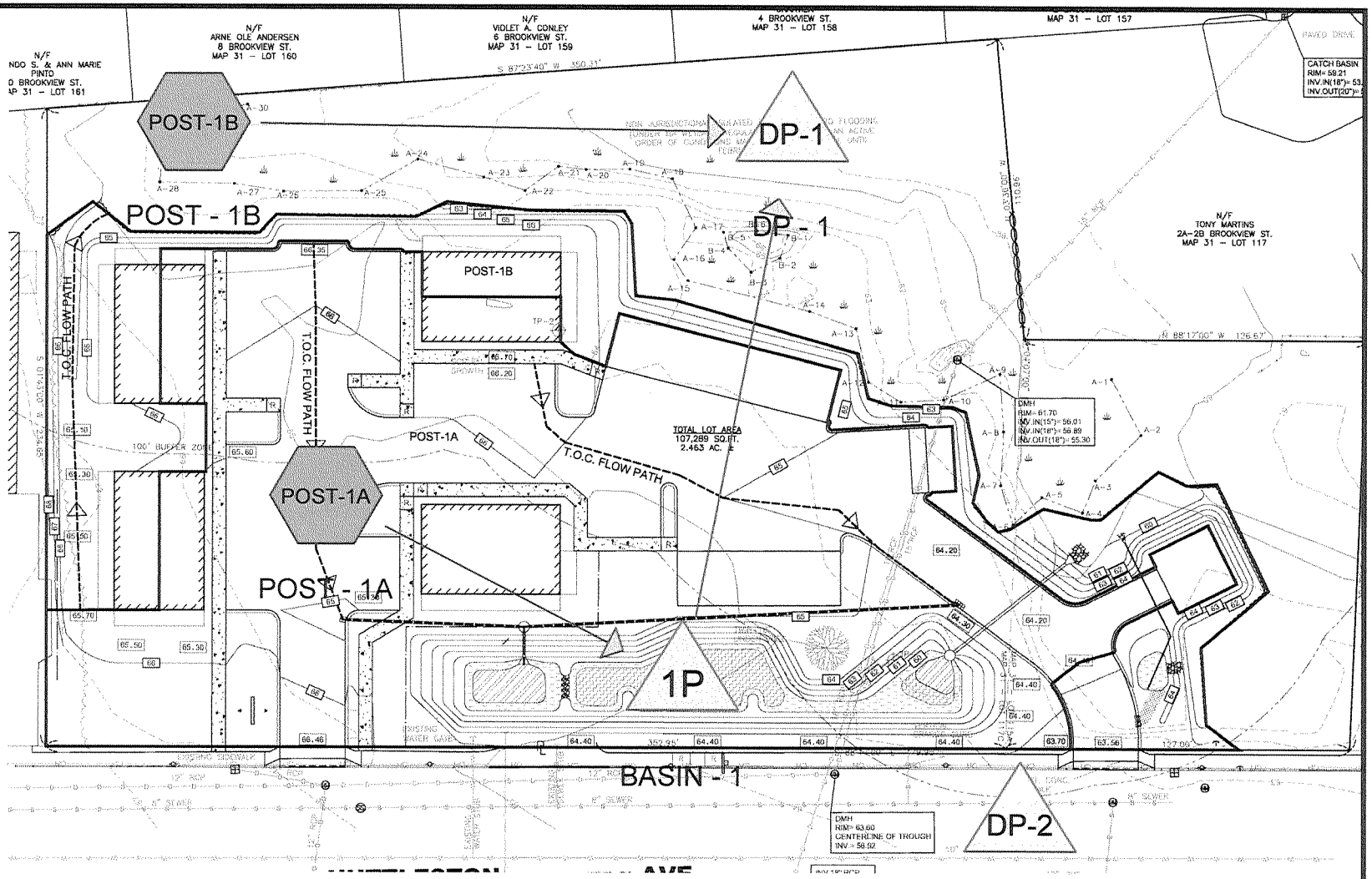
Summary for Pond DP-2: DP - 2

Inflow Area = 0.176 ac, 34.21% Impervious, Inflow Depth > 4.69" for 100-Year event
Inflow = 0.86 cfs @ 12.12 hrs, Volume= 0.069 af
Primary = 0.86 cfs @ 12.12 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-2: DP - 2





Subcat Reach Pond Link

Routing Diagram for LEWIS LANDING POST-DEV

Prepared by Prime Engineering, Inc, Printed 12/10/2019

HydroCAD® 10.00-13 s/n 01299 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.554	74	>75% Grass cover, Good, HSG C (POST-1A, POST-1B)
0.192	98	BUILDINGS (POST-1A)
0.168	98	DETENTION POND (POST-1A)
0.497	98	PAVEMENT (POST-1A)
0.018	98	Paved parking, HSG C (POST-1B)
0.086	98	Roofs, HSG C (POST-1B)
0.066	98	SIDEWALKS (POST-1A)
1.581	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.659	HSG C	POST-1A, POST-1B
0.000	HSG D	
0.922	Other	POST-1A
1.581		**TOTAL AREA**

Ground Covers (all 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	0.554	0.000	0.000	0.554	>75% Grass cover, Good	POST-1A, POST-1B
0.000	0.000	0.000	0.000	0.192	0.192	BUILDINGS	POST-1A
0.000	0.000	0.000	0.000	0.168	0.168	DETENTION POND	POST-1A
0.000	0.000	0.000	0.000	0.497	0.497	PAVEMENT	POST-1A
0.000	0.000	0.018	0.000	0.000	0.018	Paved parking	POST-1B
0.000	0.000	0.086	0.000	0.000	0.086	Roofs	POST-1B
0.000	0.000	0.000	0.000	0.066	0.066	SIDEWALKS	POST-1A
0.000	**0.000**	**0.659**	**0.000**	**0.922**	**1.581**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	POST-1A	0.00	0.00	174.0	0.0100	0.011	12.0	0.0	0.0
2	1P	59.72	59.45	52.0	0.0052	0.011	18.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment POST-1A: POST - 1A Runoff Area=52,018 sf 77.24% Impervious Runoff Depth>2.64"
Flow Length=368' Tc=6.0 min CN=93 Runoff=3.56 cfs 0.262 af

Subcatchment POST-1B: POST - 1B Runoff Area=16,854 sf 26.96% Impervious Runoff Depth>1.55"
Flow Length=151' Tc=12.8 min CN=80 Runoff=0.56 cfs 0.050 af

Pond 1P: BASIN - 1 Peak Elev=61.56' Storage=5,909 cf Inflow=3.56 cfs 0.262 af
Outflow=0.28 cfs 0.238 af

Pond DP-1: DP - 1 Inflow=0.81 cfs 0.288 af
Primary=0.81 cfs 0.288 af

Pond DP-2: DP-2

Total Runoff Area = 1.581 ac Runoff Volume = 0.312 af Average Runoff Depth = 2.37"
35.06% Pervious = 0.554 ac 64.94% Impervious = 1.027 ac

Summary for Subcatchment POST-1A: POST - 1A

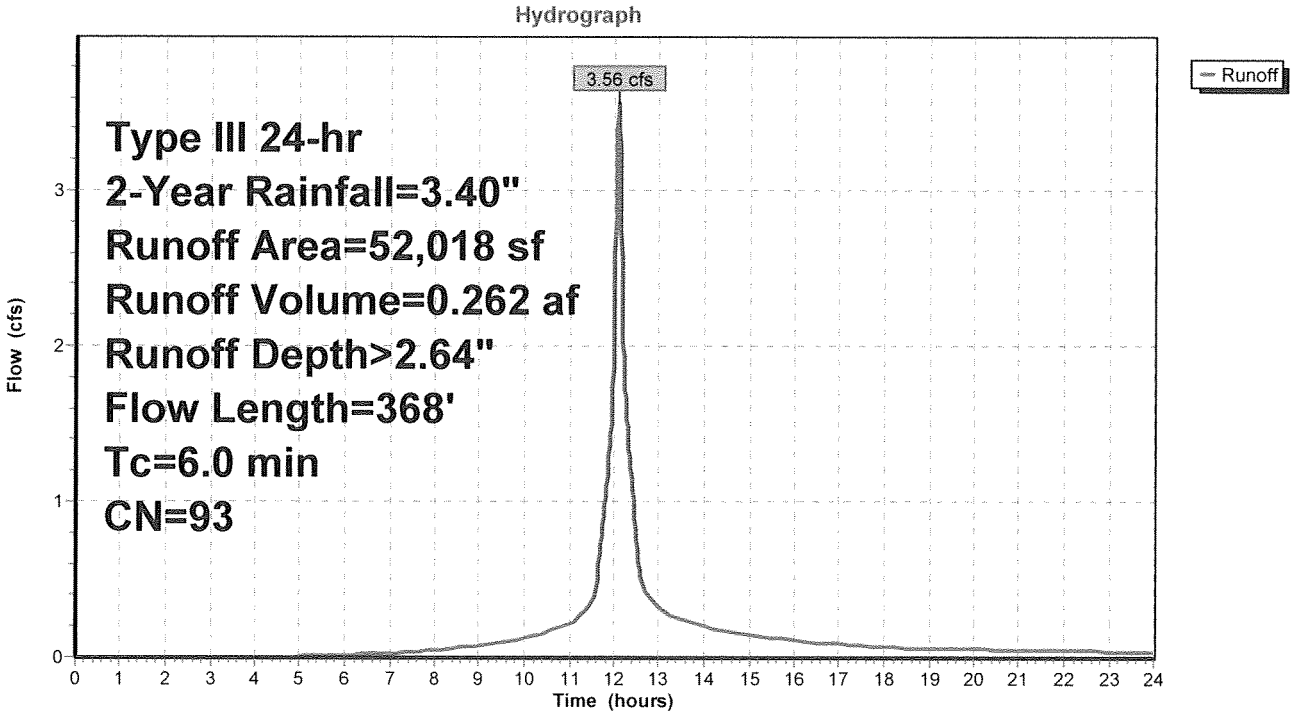
Runoff = 3.56 cfs @ 12.09 hrs, Volume= 0.262 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
*	21,663	98	PAVEMENT
*	8,344	98	BUILDINGS
*	2,876	98	SIDEWALKS
	11,838	74	>75% Grass cover, Good, HSG C
*	7,297	98	DETENTION POND
	52,018	93	Weighted Average
	11,838		22.76% Pervious Area
	40,180		77.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.0	144	0.0132	2.33		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	174	0.0100	5.36	4.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.4	368	Total, Increased to minimum Tc = 6.0 min			

Subcatchment POST-1A: POST - 1A



Summary for Subcatchment POST-1B: POST - 1B

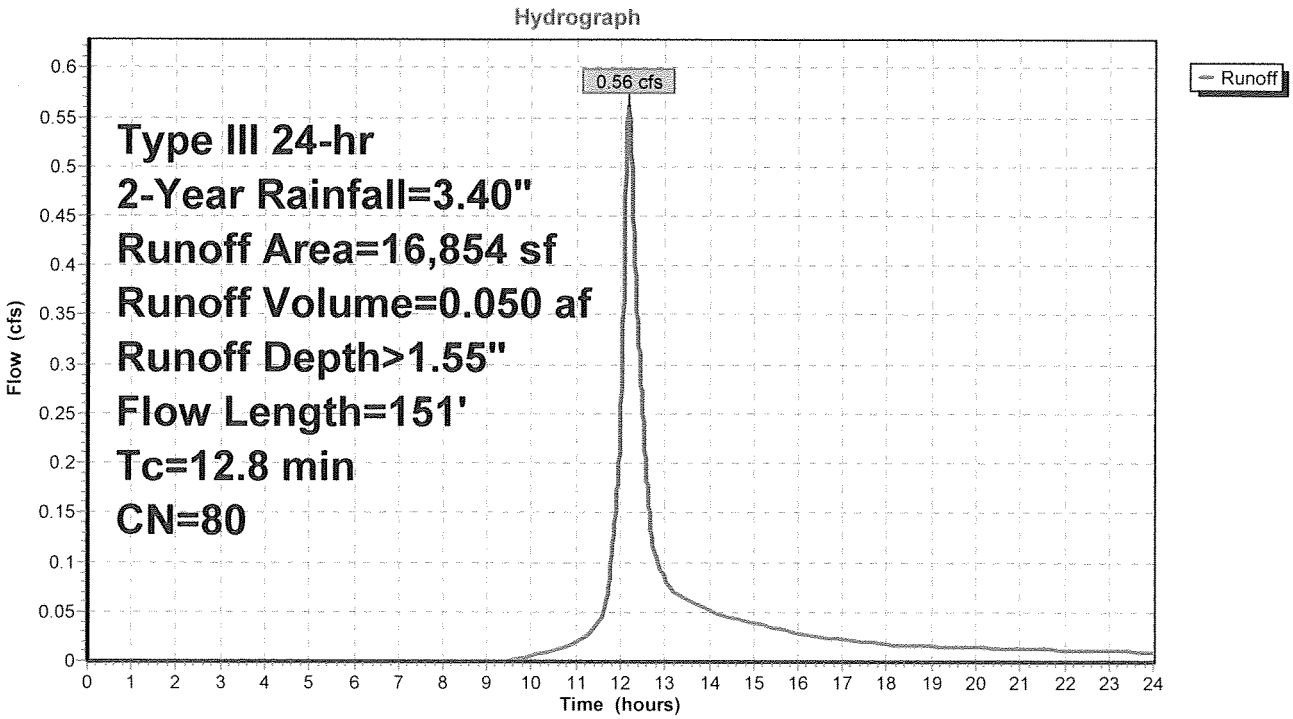
Runoff = 0.56 cfs @ 12.18 hrs, Volume= 0.050 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
12,310	74	>75% Grass cover, Good, HSG C
3,758	98	Roofs, HSG C
786	98	Paved parking, HSG C
16,854	80	Weighted Average
12,310		73.04% Pervious Area
4,544		26.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.3	101	0.0070	1.25		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.8	151	Total			

Subcatchment POST-1B: POST - 1B



Summary for Pond 1P: BASIN - 1

Inflow Area = 1.194 ac, 77.24% Impervious, Inflow Depth > 2.64" for 2-Year event
Inflow = 3.56 cfs @ 12.09 hrs, Volume= 0.262 af
Outflow = 0.28 cfs @ 13.11 hrs, Volume= 0.238 af, Atten= 92%, Lag= 61.5 min
Primary = 0.28 cfs @ 13.11 hrs, Volume= 0.238 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 61.56' @ 13.11 hrs Surf.Area= 4,602 sf Storage= 5,909 cf

Plug-Flow detention time= 251.0 min calculated for 0.238 af (91% of inflow)
Center-of-Mass det. time= 204.7 min (994.7 - 790.0)

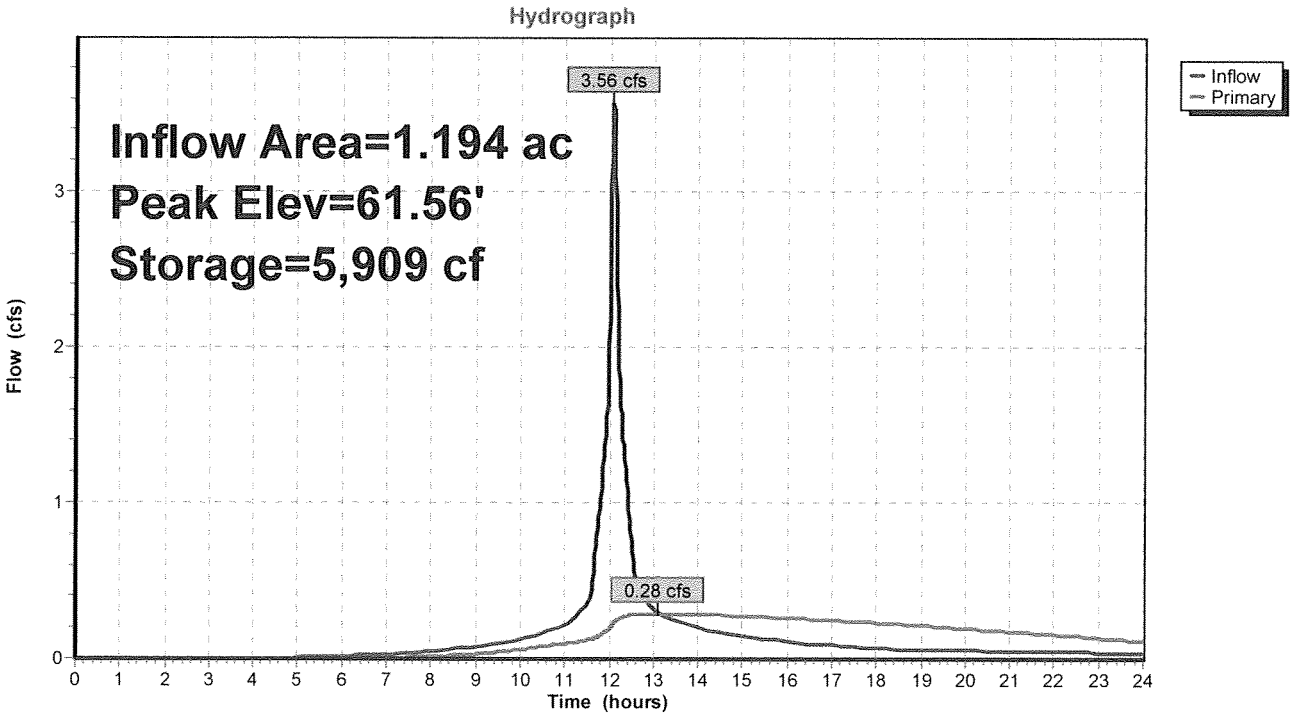
Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	20,371 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,952	0	0
61.00	4,037	3,495	3,495
62.00	5,048	4,543	8,037
63.00	6,161	5,605	13,642
64.00	7,297	6,729	20,371

Device	Routing	Invert	Outlet Devices
#1	Primary	59.72'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.72' / 59.45' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.28 cfs @ 13.11 hrs HW=61.56' (Free Discharge)
└─**1=Culvert** (Passes 0.28 cfs of 8.15 cfs potential flow)
└─**2=Orifice/Grate** (Orifice Controls 0.28 cfs @ 5.77 fps)

Pond 1P: BASIN - 1

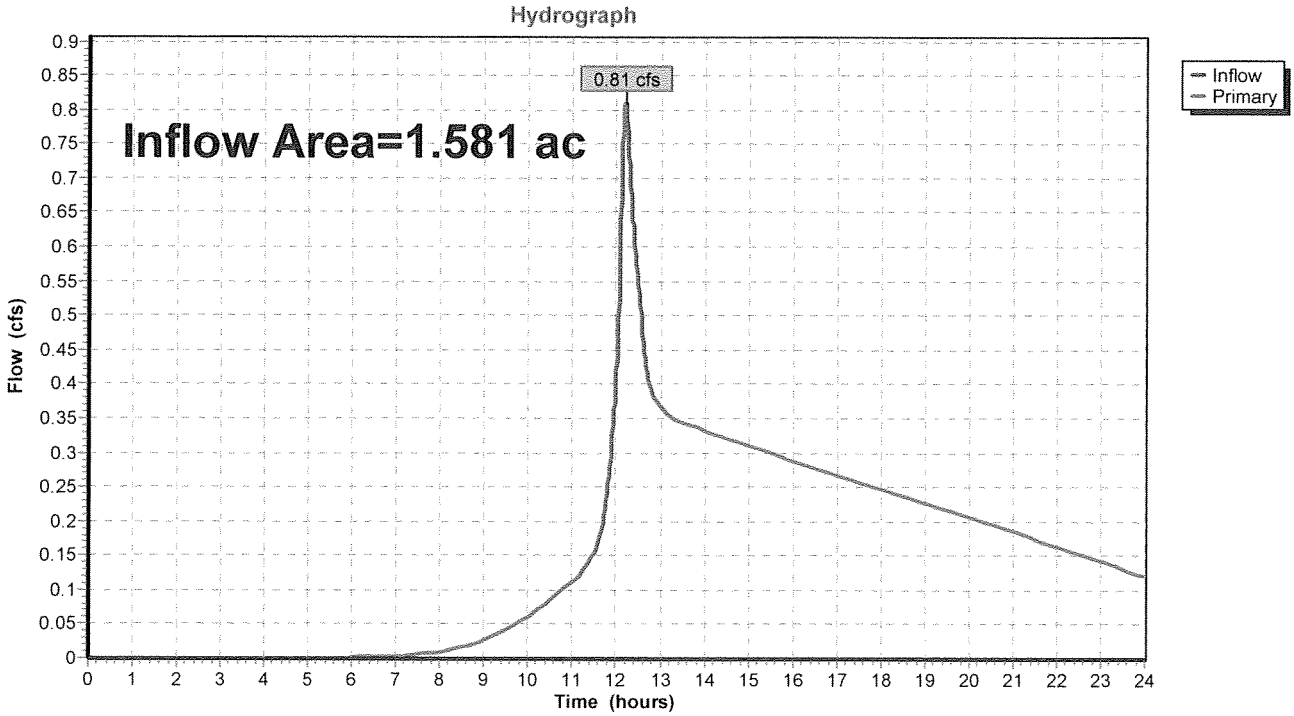


Summary for Pond DP-1: DP - 1

Inflow Area = 1.581 ac, 64.94% Impervious, Inflow Depth > 2.18" for 2-Year event
Inflow = 0.81 cfs @ 12.19 hrs, Volume= 0.288 af
Primary = 0.81 cfs @ 12.19 hrs, Volume= 0.288 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond DP-1: DP - 1



Summary for Pond DP-2: DP-2

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Free Discharge)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment POST-1A: POST - 1A Runoff Area=52,018 sf 77.24% Impervious Runoff Depth>4.00"
Flow Length=368' Tc=6.0 min CN=93 Runoff=5.28 cfs 0.398 af

Subcatchment POST-1B: POST - 1B Runoff Area=16,854 sf 26.96% Impervious Runoff Depth>2.71"
Flow Length=151' Tc=12.8 min CN=80 Runoff=0.99 cfs 0.087 af

Pond 1P: BASIN - 1 Peak Elev=62.26' Storage=9,382 cf Inflow=5.28 cfs 0.398 af
Outflow=0.35 cfs 0.330 af

Pond DP-1: DP - 1 Inflow=1.29 cfs 0.417 af
Primary=1.29 cfs 0.417 af

Pond DP-2: DP-2

Total Runoff Area = 1.581 ac Runoff Volume = 0.485 af Average Runoff Depth = 3.68"
35.06% Pervious = 0.554 ac 64.94% Impervious = 1.027 ac

Summary for Subcatchment POST-1A: POST - 1A

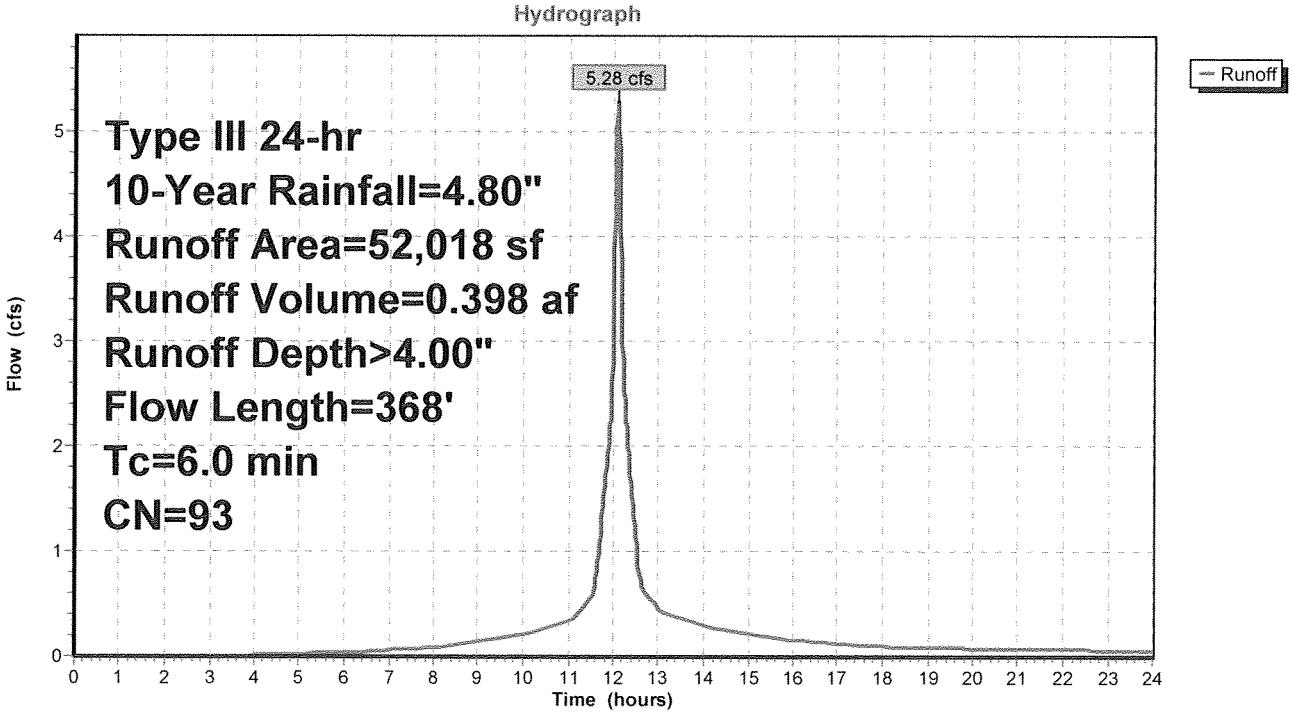
Runoff = 5.28 cfs @ 12.08 hrs, Volume= 0.398 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
*	21,663	98	PAVEMENT
*	8,344	98	BUILDINGS
*	2,876	98	SIDEWALKS
	11,838	74	>75% Grass cover, Good, HSG C
*	7,297	98	DETENTION POND
	52,018	93	Weighted Average
	11,838		22.76% Pervious Area
	40,180		77.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.0	144	0.0132	2.33		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	174	0.0100	5.36	4.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.4	368	Total, Increased to minimum Tc = 6.0 min			

Subcatchment POST-1A: POST - 1A



Summary for Subcatchment POST-1B: POST - 1B

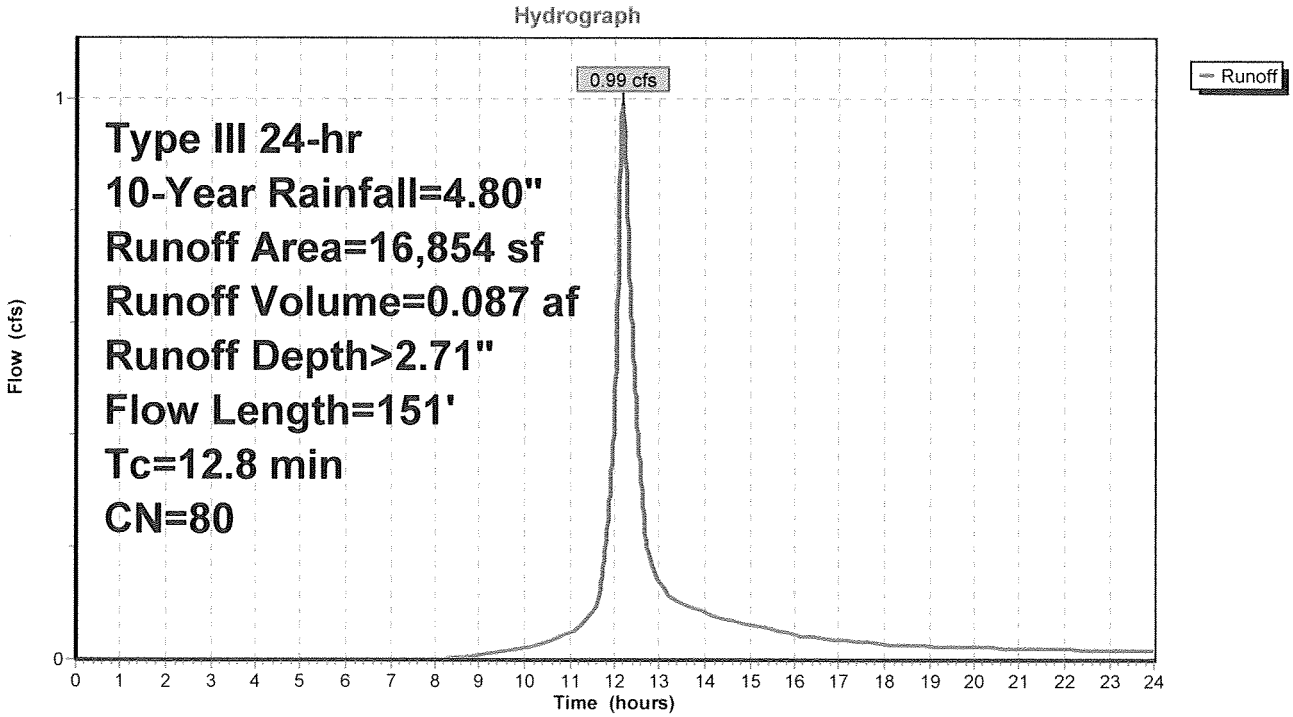
Runoff = 0.99 cfs @ 12.18 hrs, Volume= 0.087 af, Depth> 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
12,310	74	>75% Grass cover, Good, HSG C
3,758	98	Roofs, HSG C
786	98	Paved parking, HSG C
16,854	80	Weighted Average
12,310		73.04% Pervious Area
4,544		26.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.3	101	0.0070	1.25		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.8	151	Total			

Subcatchment POST-1B: POST - 1B



Summary for Pond 1P: BASIN - 1

Inflow Area = 1.194 ac, 77.24% Impervious, Inflow Depth > 4.00" for 10-Year event
Inflow = 5.28 cfs @ 12.08 hrs, Volume= 0.398 af
Outflow = 0.35 cfs @ 13.57 hrs, Volume= 0.330 af, Atten= 93%, Lag= 89.1 min
Primary = 0.35 cfs @ 13.57 hrs, Volume= 0.330 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 62.26' @ 13.57 hrs Surf.Area= 5,336 sf Storage= 9,382 cf

Plug-Flow detention time= 290.1 min calculated for 0.330 af (83% of inflow)
Center-of-Mass det. time= 221.6 min (1,000.5 - 778.9)

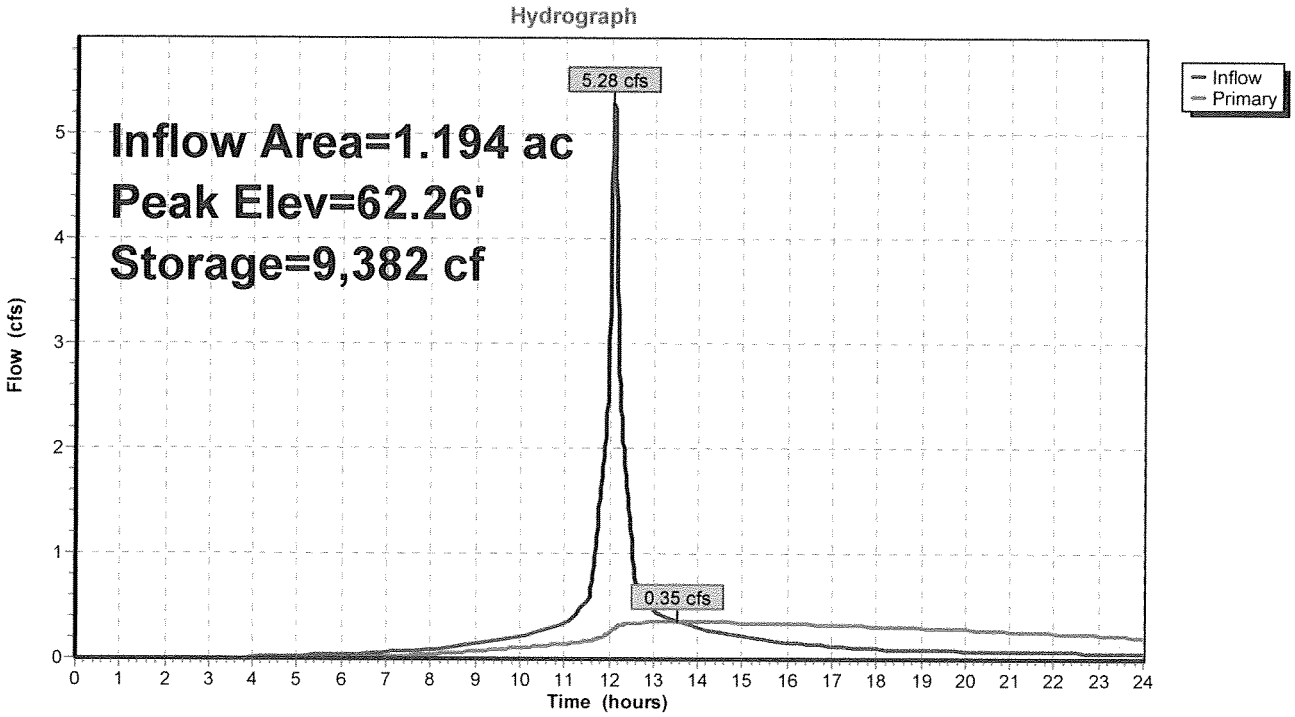
Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	20,371 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,952	0	0
61.00	4,037	3,495	3,495
62.00	5,048	4,543	8,037
63.00	6,161	5,605	13,642
64.00	7,297	6,729	20,371

Device	Routing	Invert	Outlet Devices
#1	Primary	59.72'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.72' / 59.45' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.35 cfs @ 13.57 hrs HW=62.26' (Free Discharge)
└─**1=Culvert** (Passes 0.35 cfs of 10.99 cfs potential flow)
└─**2=Orifice/Grate** (Orifice Controls 0.35 cfs @ 7.03 fps)

Pond 1P: BASIN - 1

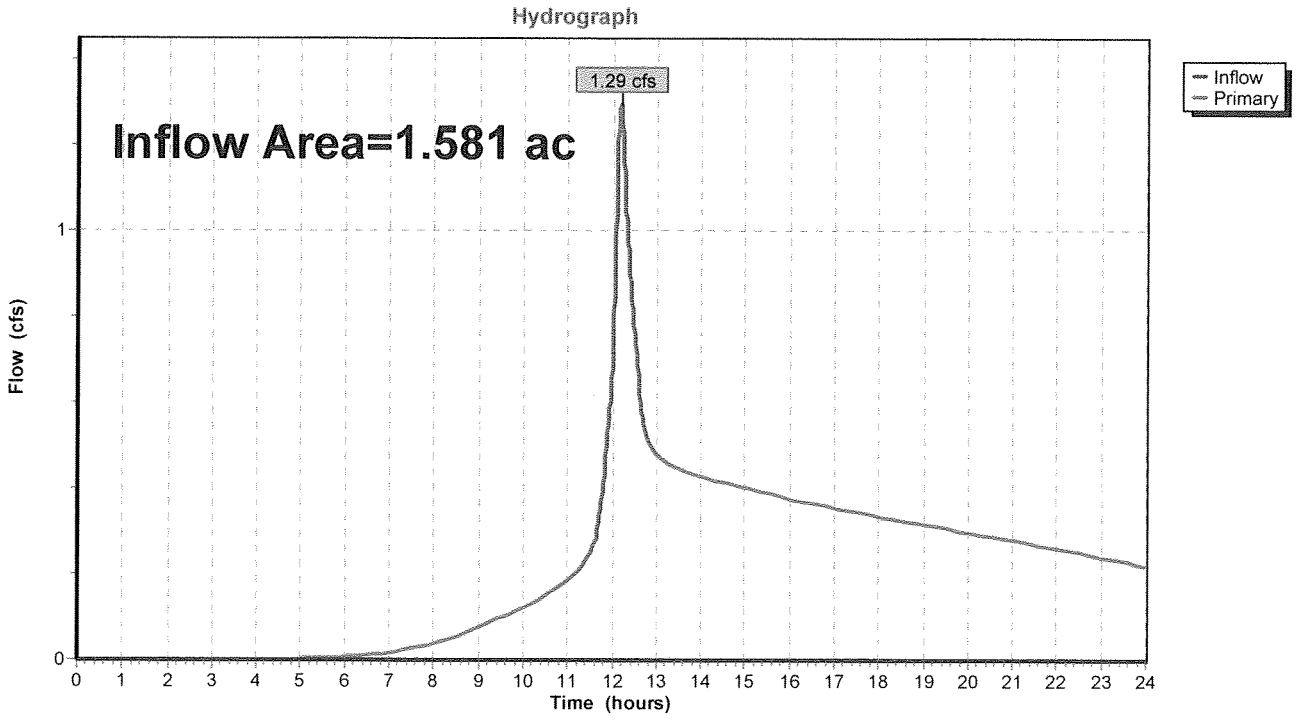


Summary for Pond DP-1: DP - 1

Inflow Area = 1.581 ac, 64.94% Impervious, Inflow Depth > 3.17" for 10-Year event
Inflow = 1.29 cfs @ 12.18 hrs, Volume= 0.417 af
Primary = 1.29 cfs @ 12.18 hrs, Volume= 0.417 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond DP-1: DP - 1



Summary for Pond DP-2: DP-2

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Free Discharge)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment POST-1A: POST - 1A Runoff Area=52,018 sf 77.24% Impervious Runoff Depth>4.78"
Flow Length=368' Tc=6.0 min CN=93 Runoff=6.25 cfs 0.476 af

Subcatchment POST-1B: POST - 1B Runoff Area=16,854 sf 26.96% Impervious Runoff Depth>3.41"
Flow Length=151' Tc=12.8 min CN=80 Runoff=1.24 cfs 0.110 af

Pond 1P: BASIN - 1 Peak Elev=62.64' Storage=11,482 cf Inflow=6.25 cfs 0.476 af
Outflow=0.37 cfs 0.374 af

Pond DP-1: DP - 1 Inflow=1.57 cfs 0.484 af
Primary=1.57 cfs 0.484 af

Pond DP-2: DP-2

Total Runoff Area = 1.581 ac Runoff Volume = 0.586 af Average Runoff Depth = 4.45"
35.06% Pervious = 0.554 ac 64.94% Impervious = 1.027 ac

Summary for Subcatchment POST-1A: POST - 1A

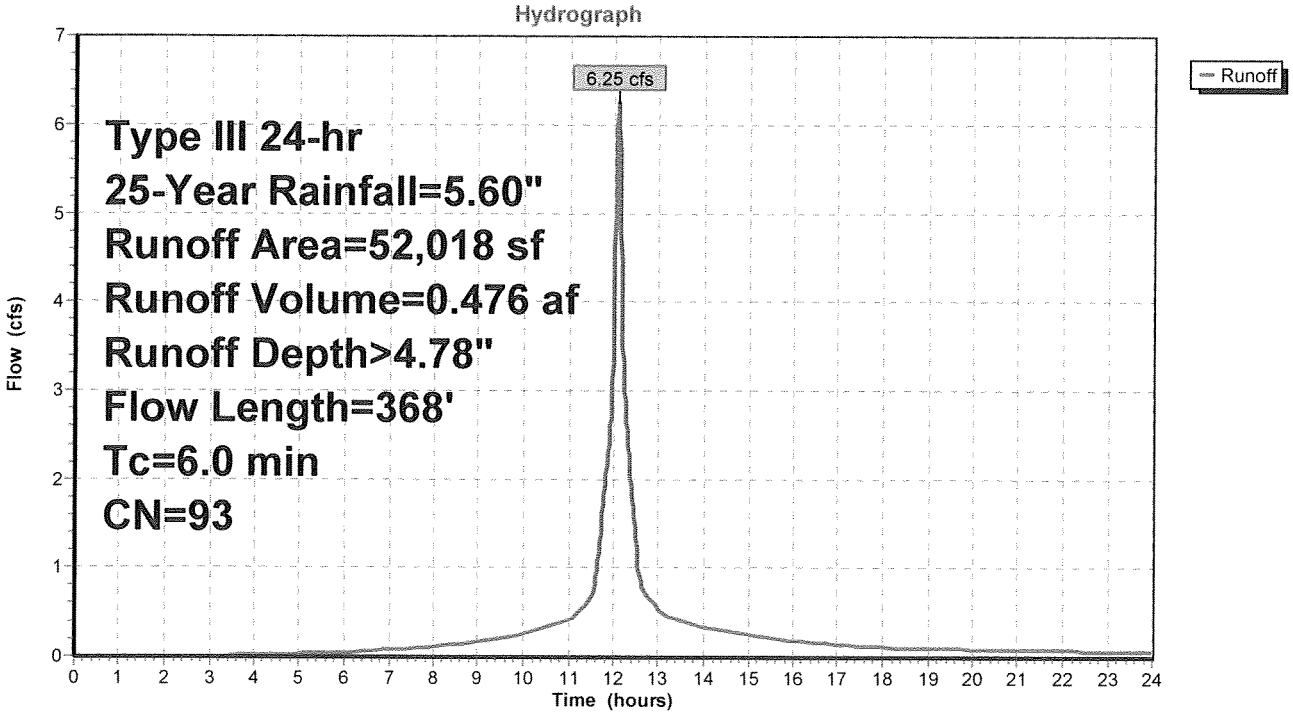
Runoff = 6.25 cfs @ 12.08 hrs, Volume= 0.476 af, Depth> 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
*	21,663	98	PAVEMENT
*	8,344	98	BUILDINGS
*	2,876	98	SIDEWALKS
	11,838	74	>75% Grass cover, Good, HSG C
*	7,297	98	DETENTION POND
	52,018	93	Weighted Average
	11,838		22.76% Pervious Area
	40,180		77.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.0	144	0.0132	2.33		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	174	0.0100	5.36	4.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.4	368	Total, Increased to minimum Tc = 6.0 min			

Subcatchment POST-1A: POST - 1A



Summary for Subcatchment POST-1B: POST - 1B

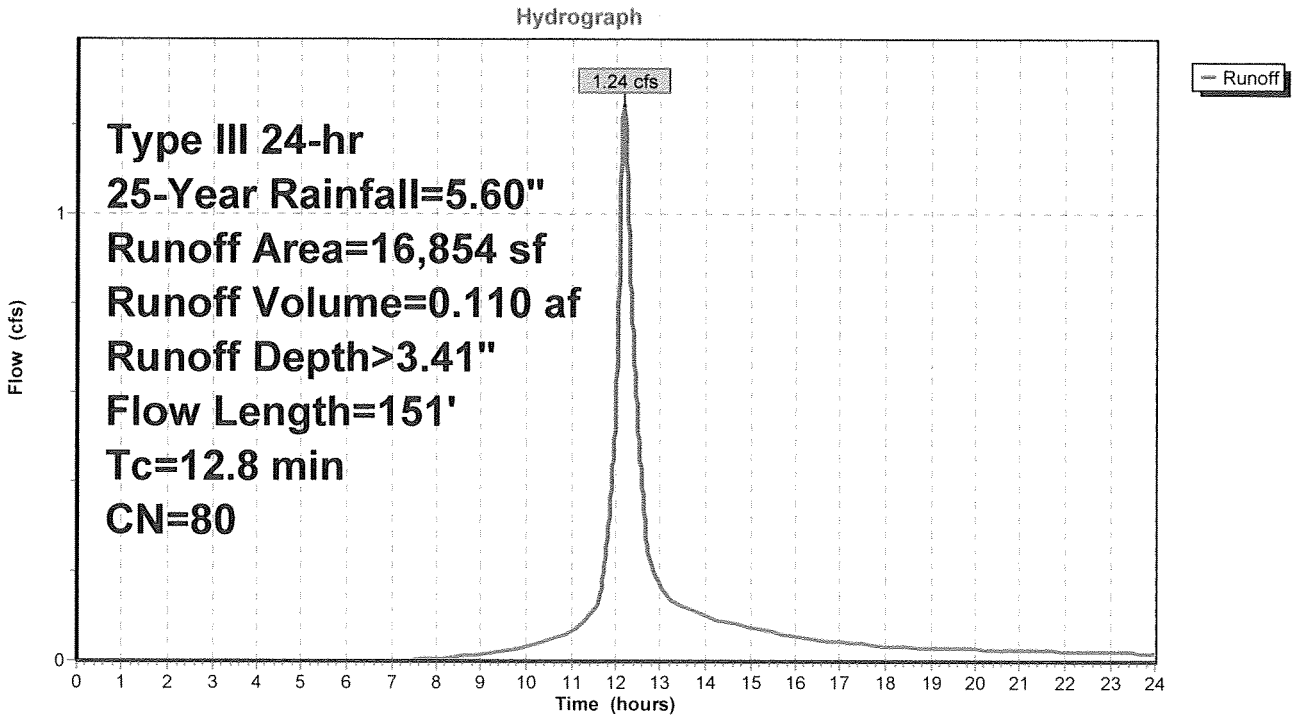
Runoff = 1.24 cfs @ 12.18 hrs, Volume= 0.110 af, Depth> 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
12,310	74	>75% Grass cover, Good, HSG C
3,758	98	Roofs, HSG C
786	98	Paved parking, HSG C
16,854	80	Weighted Average
12,310		73.04% Pervious Area
4,544		26.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.3	101	0.0070	1.25		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.8	151	Total			

Subcatchment POST-1B: POST - 1B



Summary for Pond 1P: BASIN - 1

Inflow Area = 1.194 ac, 77.24% Impervious, Inflow Depth > 4.78" for 25-Year event
Inflow = 6.25 cfs @ 12.08 hrs, Volume= 0.476 af
Outflow = 0.37 cfs @ 13.77 hrs, Volume= 0.374 af, Atten= 94%, Lag= 100.9 min
Primary = 0.37 cfs @ 13.77 hrs, Volume= 0.374 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 62.64' @ 13.77 hrs Surf.Area= 5,758 sf Storage= 11,482 cf

Plug-Flow detention time= 303.4 min calculated for 0.374 af (79% of inflow)
Center-of-Mass det. time= 225.6 min (1,000.0 - 774.4)

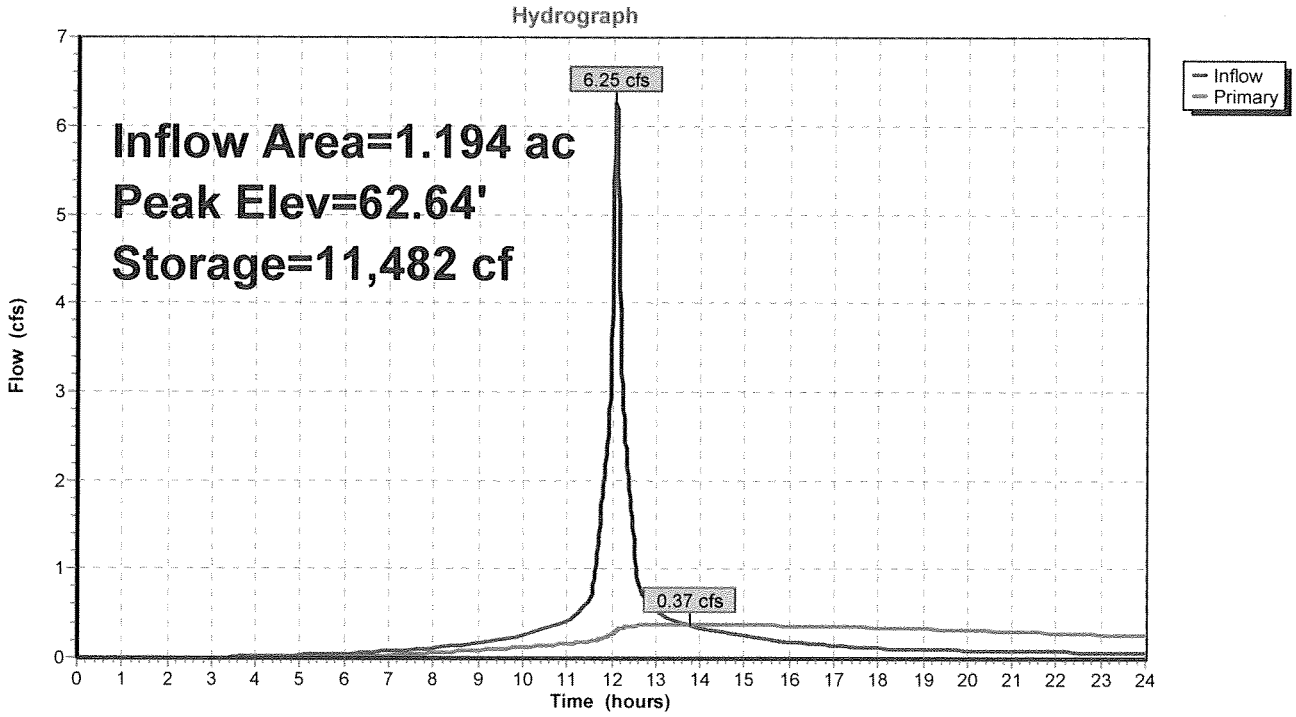
Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	20,371 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,952	0	0
61.00	4,037	3,495	3,495
62.00	5,048	4,543	8,037
63.00	6,161	5,605	13,642
64.00	7,297	6,729	20,371

Device	Routing	Invert	Outlet Devices
#1	Primary	59.72'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.72' / 59.45' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.37 cfs @ 13.77 hrs HW=62.64' (Free Discharge)
└─**1=Culvert** (Passes 0.37 cfs of 12.47 cfs potential flow)
└─**2=Orifice/Grate** (Orifice Controls 0.37 cfs @ 7.63 fps)

Pond 1P: BASIN - 1

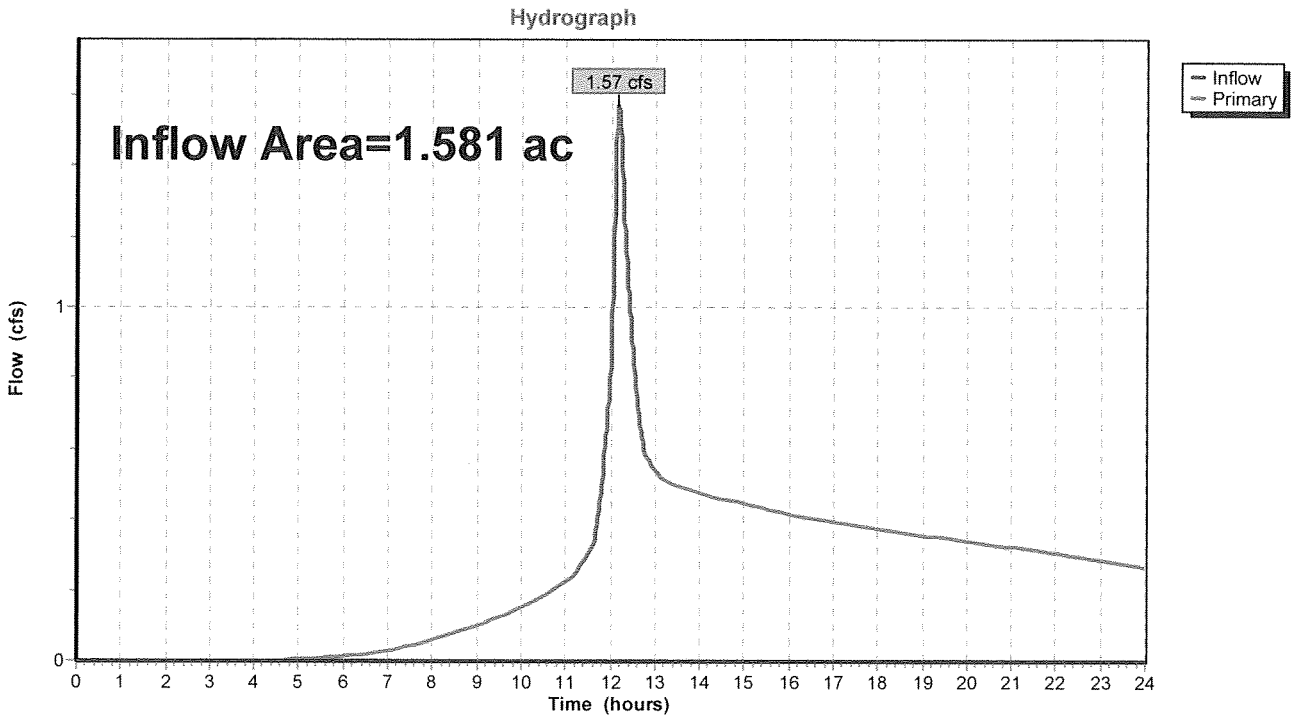


Summary for Pond DP-1: DP - 1

Inflow Area = 1.581 ac, 64.94% Impervious, Inflow Depth > 3.68" for 25-Year event
Inflow = 1.57 cfs @ 12.18 hrs, Volume= 0.484 af
Primary = 1.57 cfs @ 12.18 hrs, Volume= 0.484 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond DP-1: DP - 1



Summary for Pond DP-2: DP-2

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Free Discharge)

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment POST-1A: POST - 1A Runoff Area=52,018 sf 77.24% Impervious Runoff Depth>6.17"
Flow Length=368' Tc=6.0 min CN=93 Runoff=7.94 cfs 0.614 af

Subcatchment POST-1B: POST - 1B Runoff Area=16,854 sf 26.96% Impervious Runoff Depth>4.68"
Flow Length=151' Tc=12.8 min CN=80 Runoff=1.70 cfs 0.151 af

Pond 1P: BASIN - 1 Peak Elev=63.26' Storage=15,302 cf Inflow=7.94 cfs 0.614 af
Outflow=0.42 cfs 0.442 af

Pond DP-1: DP - 1 Inflow=2.06 cfs 0.593 af
Primary=2.06 cfs 0.593 af

Pond DP-2: DP-2

Total Runoff Area = 1.581 ac Runoff Volume = 0.765 af Average Runoff Depth = 5.80"
35.06% Pervious = 0.554 ac 64.94% Impervious = 1.027 ac

Summary for Subcatchment POST-1A: POST - 1A

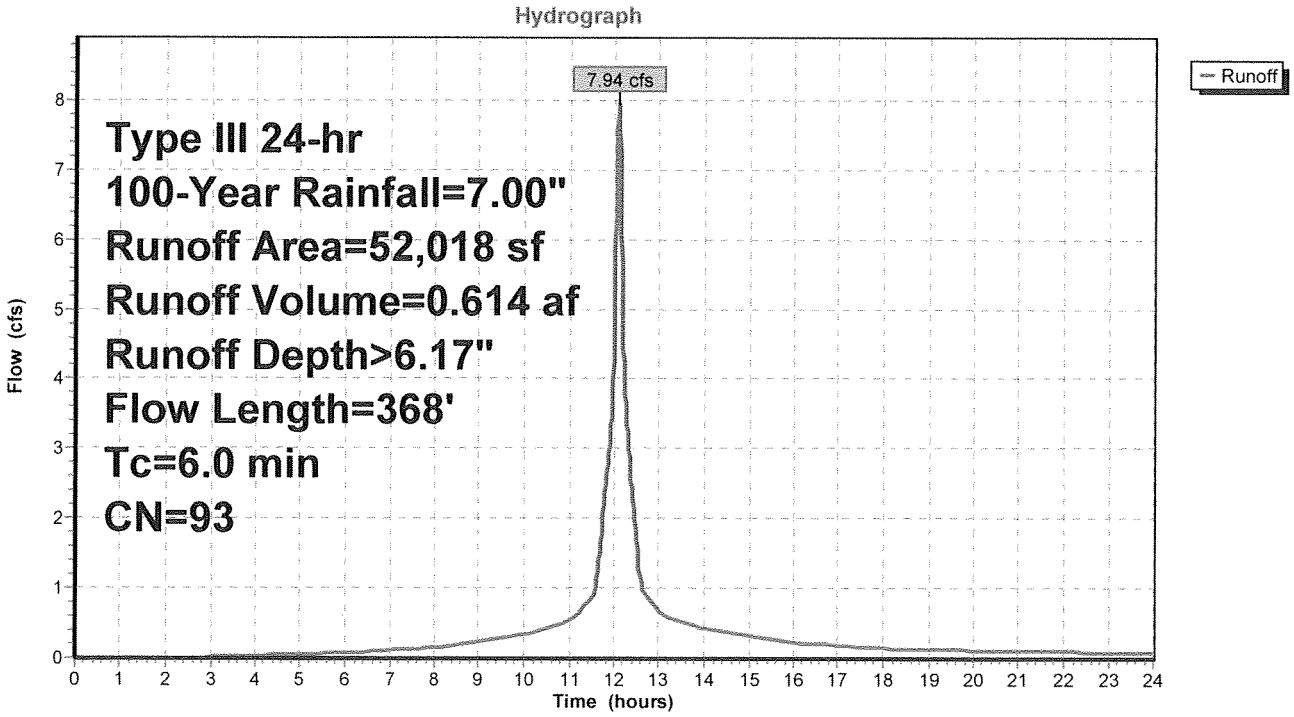
Runoff = 7.94 cfs @ 12.08 hrs, Volume= 0.614 af, Depth> 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (sf)	CN	Description
*	21,663	98	PAVEMENT
*	8,344	98	BUILDINGS
*	2,876	98	SIDEWALKS
	11,838	74	>75% Grass cover, Good, HSG C
*	7,297	98	DETENTION POND
	52,018	93	Weighted Average
	11,838		22.76% Pervious Area
	40,180		77.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.40"
1.0	144	0.0132	2.33		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	174	0.0100	5.36	4.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.4	368	Total, Increased to minimum Tc = 6.0 min			

Subcatchment POST-1A: POST - 1A



Summary for Subcatchment POST-1B: POST - 1B

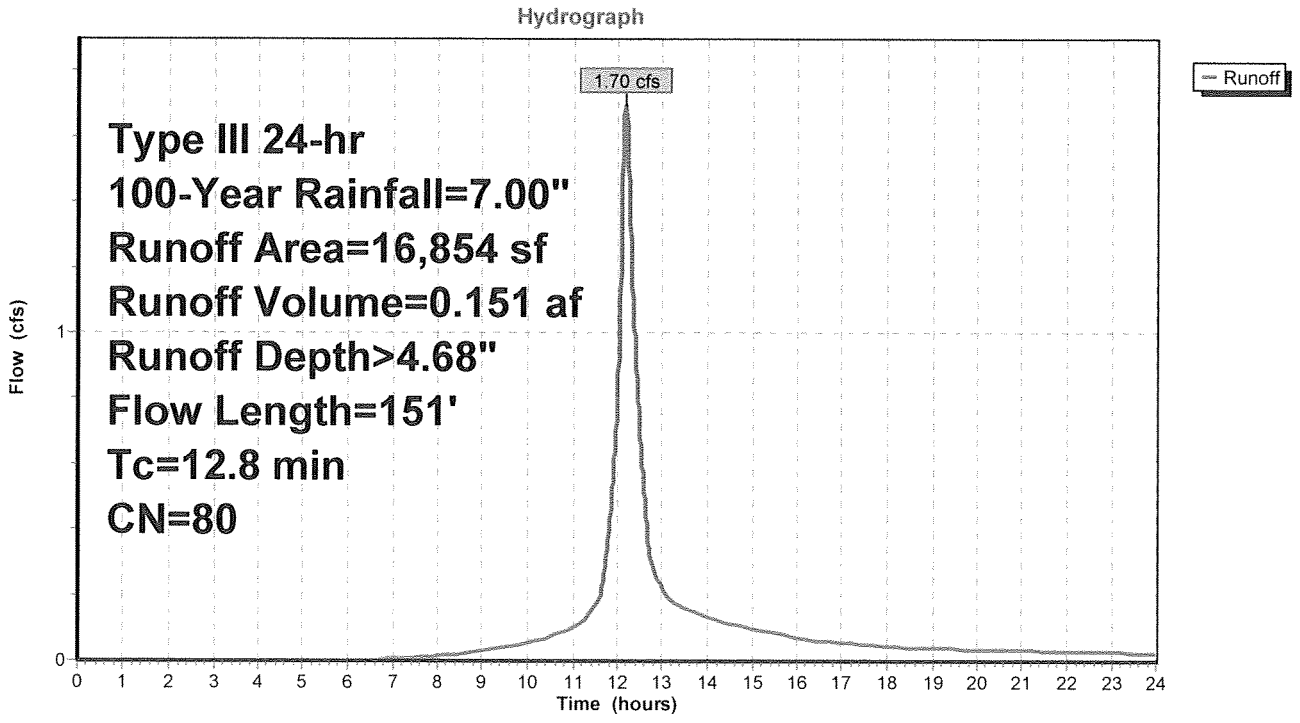
Runoff = 1.70 cfs @ 12.17 hrs, Volume= 0.151 af, Depth> 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
12,310	74	>75% Grass cover, Good, HSG C
3,758	98	Roofs, HSG C
786	98	Paved parking, HSG C
16,854	80	Weighted Average
12,310		73.04% Pervious Area
4,544		26.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.3	101	0.0070	1.25		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
12.8	151	Total			

Subcatchment POST-1B: POST - 1B



Summary for Pond 1P: BASIN - 1

Inflow Area = 1.194 ac, 77.24% Impervious, Inflow Depth > 6.17" for 100-Year event
Inflow = 7.94 cfs @ 12.08 hrs, Volume= 0.614 af
Outflow = 0.42 cfs @ 14.03 hrs, Volume= 0.442 af, Atten= 95%, Lag= 117.0 min
Primary = 0.42 cfs @ 14.03 hrs, Volume= 0.442 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 63.26' @ 14.03 hrs Surf.Area= 6,460 sf Storage= 15,302 cf

Plug-Flow detention time= 317.5 min calculated for 0.441 af (72% of inflow)
Center-of-Mass det. time= 228.4 min (996.6 - 768.2)

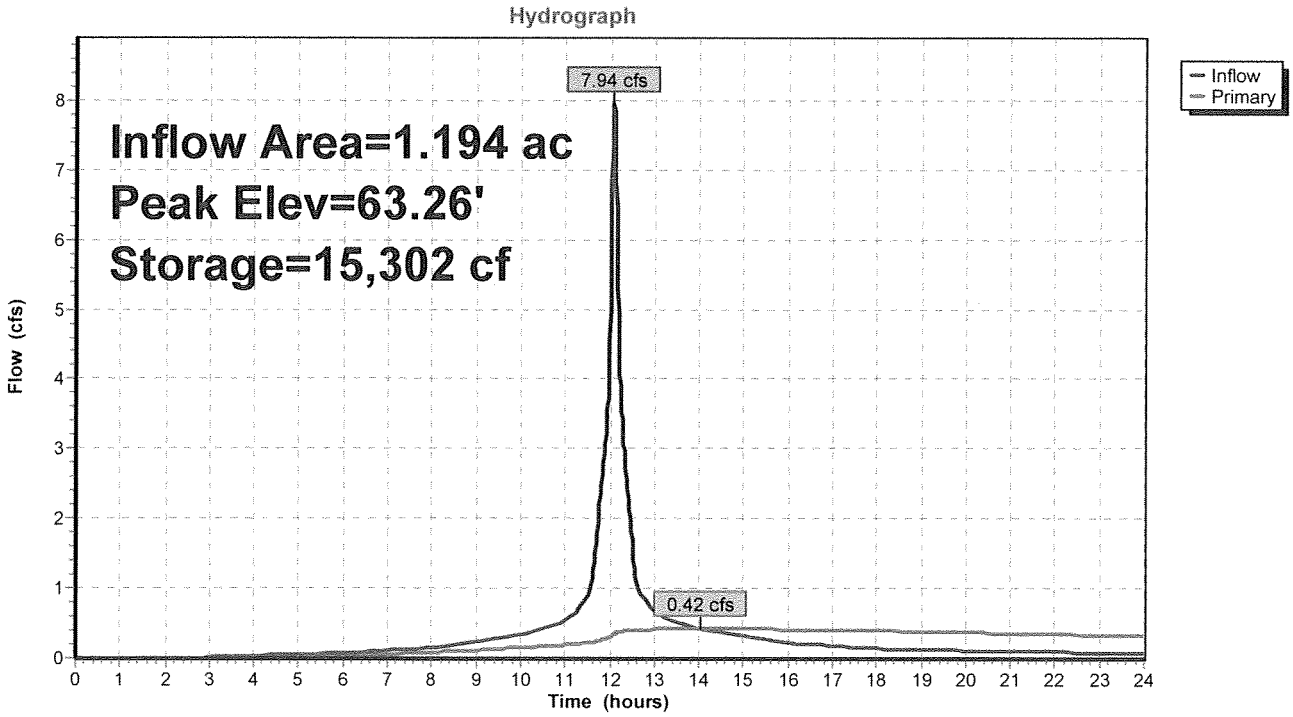
Volume	Invert	Avail.Storage	Storage Description
#1	60.00'	20,371 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	2,952	0	0
61.00	4,037	3,495	3,495
62.00	5,048	4,543	8,037
63.00	6,161	5,605	13,642
64.00	7,297	6,729	20,371

Device	Routing	Invert	Outlet Devices
#1	Primary	59.72'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 59.72' / 59.45' S= 0.0052 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	60.00'	**3.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.42 cfs @ 14.03 hrs HW=63.26' (Free Discharge)
└─**1=Culvert** (Passes 0.42 cfs of 14.22 cfs potential flow)
└─**2=Orifice/Grate** (Orifice Controls 0.42 cfs @ 8.53 fps)

Pond 1P: BASIN - 1

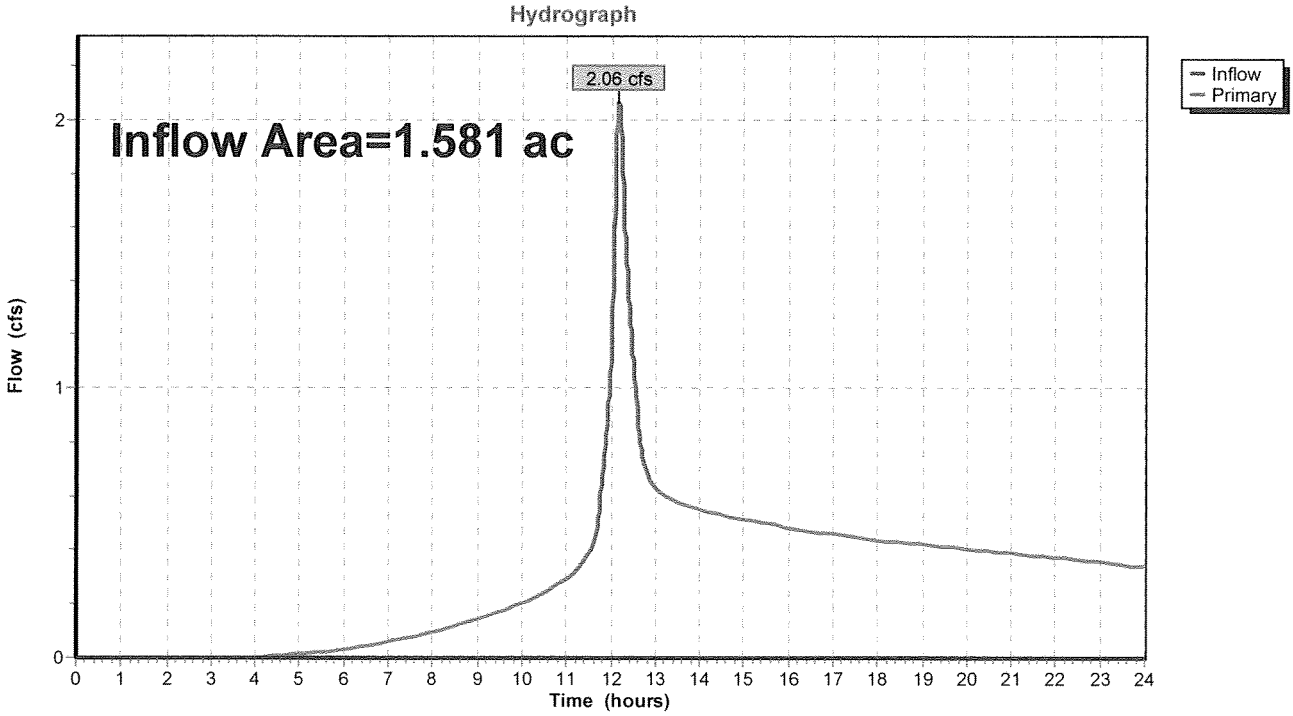


Summary for Pond DP-1: DP - 1

Inflow Area = 1.581 ac, 64.94% Impervious, Inflow Depth > 4.50" for 100-Year event
Inflow = 2.06 cfs @ 12.18 hrs, Volume= 0.593 af
Primary = 2.06 cfs @ 12.18 hrs, Volume= 0.593 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond DP-1: DP - 1



Summary for Pond DP-2: DP-2

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Free Discharge)

N/F
FERNANDO S. & ANN MARIE PINTO
10 BROOKVIEW ST.
MAP 31 – LOT 161

N/F
ARNE OLE ANDERSEN
8 BROOKVIEW ST.
MAP 31 – LOT 160

N/F
VIOLET A. CONLEY
6 BROOKVIEW ST.
MAP 31 – LOT 159

N/F
PHILIP E. & DONNA M. CHARTIER
4 BROOKVIEW ST.
MAP 31 – LOT 158

N/F
DAVID & DESIREE VINCENT
2 BROOKVIEW ST.
MAP 31 – LOT 157

N/F
TONY MARTINS
2A–2B BROOKVIEW ST.
MAP 31 – LOT 117

N/F
BRANDON L. BRASSEUR
347 HUTTLESTON AVE
MAP 31 – LOT 114

N/F
SMR HUTTLESTON LLC
355 HUTTLESTON AVE.
MAP 31 – LOT 117A & 117B

SOUTHCOAST WINE & SPIRITS

S 87°23'40" W 350.31'

S 01°43'00" W 234.65'

N 03°36'00" W 110.96'

N 88°17'00" W 126.67'

N 04°07'00" E 156.76'

S 88°44'00" E 79.95'

352.95'

127.09'

NON JURISDICTIONAL ISOLATED LAND SUBJECT TO FLOODING (UNDER MA WETLAND REGULATIONS). HOWEVER, AN ACTIVE ORDER OF CONDITIONS MAKES IT JURISDICTIONAL UNTIL FEBRUARY 2020.

PAVED DRIVE

LAWN

CATCH BASIN
RIM= 59.21
INV.IN(18")= 53.26
INV.OUT(20")= 52.96

DMH
RIM= 61.70
INV.IN(15")= 56.01
INV.IN(18")= 56.89
INV.OUT(18")= 55.30

DMH
RIM= 63.60
CENTERLINE OF TROUGH
INV.= 56.92

INV.18" RCP
ELEV.= 59.06

POST-1A

POST-1B

TP-2

SCRUB GROWTH

100' BUFFER ZONE

T.O.C. FLOW PATH

TOTAL LOT AREA
107,289 SQ.FT.
2.463 AC. ±

TWIN 18" LINDEN TREES

EXISTING WATER GATE

EXISTING SIDEWALK

VERTICAL GRANITE CURB

5' BIT. CONC. SIDEWALK

15" RCP

12" RCP

8" SEWER

EXISTING 8" SEWER STUB

EXISTING 8" WATER STUB

10" WATER

4" GAS

HUTTLESTON (U.S. ROUTE 6) AVE.

0 20 40 60

REV.	DATE	DESCRIPTION	BY	APP.

DRAWING TITLE
POST-DEVELOPMENT STORMFLOW

PROJECT
MAP 31- LOT 117C
FAIRHAVEN, MASSACHUSETTS

CLIENT
DANA LEWIS
FAIRHAVEN, MASSACHUSETTS

• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING INC

P.O. BOX 1088
350 BEDFORD ST.
LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004

SCALE: 1" = 20'	
DATE: SEPT. 9, 2019	
DRAWN BY: SWL	
DESIGNED BY: RJR	
CHECKED BY: RJR	SHEET NO. 1 OF 1
APPROVED BY: RJR	PROJECT NO. 2729-01-01

C:\Users\Admin\appdata\local\temp\AcPublish_17216\Huttleston Ave.- Map 31 Lot 117C - BASE.DWG

N/F
FERNANDO S. & ANN MARIE PINTO
10 BROOKVIEW ST.
MAP 31 – LOT 161

N/F
ARNE OLE ANDERSEN
8 BROOKVIEW ST.
MAP 31 – LOT 160

N/F
VIOLET A. CONLEY
6 BROOKVIEW ST.
MAP 31 – LOT 159

N/F
PHILIP E. & DONNA M. CHARTIER
4 BROOKVIEW ST.
MAP 31 – LOT 158

N/F
DAVID & DESIREE VINCENT
2 BROOKVIEW ST.
MAP 31 – LOT 157

N/F
TONY MARTINS
2A–2B BROOKVIEW ST.
MAP 31 – LOT 117

N/F
SMR HUTTLESTON LLC
355 HUTTLESTON AVE.
MAP 31 – LOT 117A & 117B

N/F
BRANDON L. BRASSEUR
347 HUTTLESTON AVE
MAP 31 – LOT 114

SOUTHCOAST WINE & SPIRITS

S 87°23'40" W 350.31'

S 01°43'00" W 234.65'

N 03°36'00" W 110.96'

N 00°07'00" E 156.70'

N 88°17'00" W 126.67'

352.95'

127.09'

NON JURISDICTIONAL ISOLATED LAND SUBJECT TO FLOODING (UNDER MA WETLAND REGULATIONS). HOWEVER, AN ACTIVE ORDER OF CONDITIONS MAKES IT JURISDICTIONAL UNTIL FEBRUARY 2020.

SCRUB GROWTH

100' BUFFER ZONE

PRE-1

PRE-2

T.O.C. FLOW PATH

T.O.C. FLOW PATH

EXISTING PAVEMENT (5,488 SF)

TWIN - 18" CMP

SITE BENCHMARK
MAG NAIL SET
ELEV.= 59.06 (NAVD88)

EXISTING WATER GATE

VERTICAL GRANITE CURB

PAVED DRIVE

LAWN

CATCH BASIN
RIM= 59.21
INV.IN(18")= 53.26
INV.OUT(20")= 52.96

DMH
RIM= 61.70
INV.IN(15")= 56.01
INV.IN(18")= 56.89
INV.OUT(18")= 55.30

DMH
RIM= 63.60
CENTERLINE OF TROUGH
INV.= 56.92

INV.18" RCP
ELEV.= 59.06

EXISTING SIDEWALK

12" RCP

8" SEWER

EXISTING WATER STUB

EXISTING SEWER STUB

5' BIT. CONC. SIDEWALK

10" WATER

4" GAS

HUTTLESTON (U.S. ROUTE 6) AVE.

0 20 40 60

REV.	DATE	DESCRIPTION	BY	APP.

DRAWING TITLE: PRE-DEVELOPMENT STORMFLOW

PROJECT: MAP 31- LOT 117C
FAIRHAVEN, MASSACHUSETTS

CLIENT: DANA LEWIS
FAIRHAVEN, MASSACHUSETTS

SCALE: 1" = 20'
DATE: SEPT. 9, 2019
DRAWN BY: SWL
DESIGNED BY: RJR
CHECKED BY: RJR
APPROVED BY: RJR
SHEET NO. 1 OF 1
PROJECT NO. 2729-01-01

• CIVIL ENGINEERING
• LAND SURVEYING
• ENVIRONMENTAL ASSESSMENT

PRIME ENGINEERING

P.O. BOX 1088
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LAKEVILLE, MA 02347
TEL: 508.947.0050
FAX: 508.947.2004

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