



GRADY CONSULTING, L.L.C.

Registered Professional Civil Engineers & Land Surveyors

Planning Received 5/5/25

STORMWATER MANAGEMENT DESIGN CALCULATIONS

157 Market Street

Assessors Map

51-094

Rockland, Massachusetts



Prepared for

Rockland FCU
241 Union Street
Rockland, MA 02370

April 23, 2025

Table of Contents

Table of Contents		2
Summary		3-4
Peak Flow Summary		5
Overall Site Analysis	Section I	
Peak Rate Analysis		
HydroCAD Report		6-123
	Section II	
Stormwater Management Standards		124-126
Stormwater Compliance Checklist		127-134
Pre-Construction O&M		135-137
Post- Construction O&M		138-140
Deep Sump Catch Basin BMP		141-144
NRCS Soils Map		145-159
Site Plan, Erosion Control Plan & Catchment Plans		Attached

SUMMARY

This analysis was prepared to demonstrate Compliance with the Town of Rockland Zoning Regulations. The proposed project is for the redevelopment of a site for the construction of a bank, driveway, associated grading, stormwater mitigation measures, and erosion control.

The area of the proposed work is developed and the previous location of a fast food restaurant. Stormwater currently flows from the site to the south of the lot towards wooded areas with 2 catch basins which capture the developed portion of the lot.

There is a proposed reduction of 2,059 SF of total impervious area on the site.



The post development runoff is broken up into 2 discharge points with 3 catchments

Post 1 – Grassed, paved areas, and roof that flow into the catch basin at the southwestern portion of the lot.

Post 2 – Grassed, paved areas, and roof that flow into the catch basin at the southeastern portion of the lot.

Post 3 – Wooded, grassed and paved areas that flow out to the south of the lot through the woods.

The design as proposed reduces peak runoff and volume rates, and improves stormwater by reducing the amount of impervious surface on the lot.

This analysis is divided into the following sections:

Section I	Overall Site Analysis
Section II	Compliance with Massachusetts Storm water Management Regulations
Section III	Operation And Maintenance Plan

The calculations have been performed for the 2, 10, 25, 100-year 24 hour storm event, using the HydroCAD computer program. This computer program is based upon the Soils Conservation Service (SCS) TR-20 and TR-55 computer models and uses the SCS Curvilinear Unit rainfall distribution.

SUMMARY OF STORMWATER ANALYSIS

PRE-DEVELOPMENT (FLOW)

	100 YR	25 YR	10 YR	2 YR
DP 1	7.19	4.85	3.68	2.17
DP 2	0.54	0.27	0.16	0.04

POST-DEVELOPMENT (FLOW)

	100 YR	25 YR	10 YR	2 YR
DP 1	7.02	4.66	3.49	2.02
DP 2	0.51	0.26	0.15	0.04

REDUCTION (FLOW)

	100 YR	25 YR	10 YR	2 YR
DP 1	0.17	0.19	0.19	0.15
DP 2	0.03	0.01	0.01	0.00

PRE-DEVELOPMENT (VOLUME)

	100 YR	25 YR	10 YR	2 YR
DP 1	24,149	15,939	11,932	6,934
DP 2	2,086	1,108	689	253

POST-DEVELOPMENT (VOLUME)

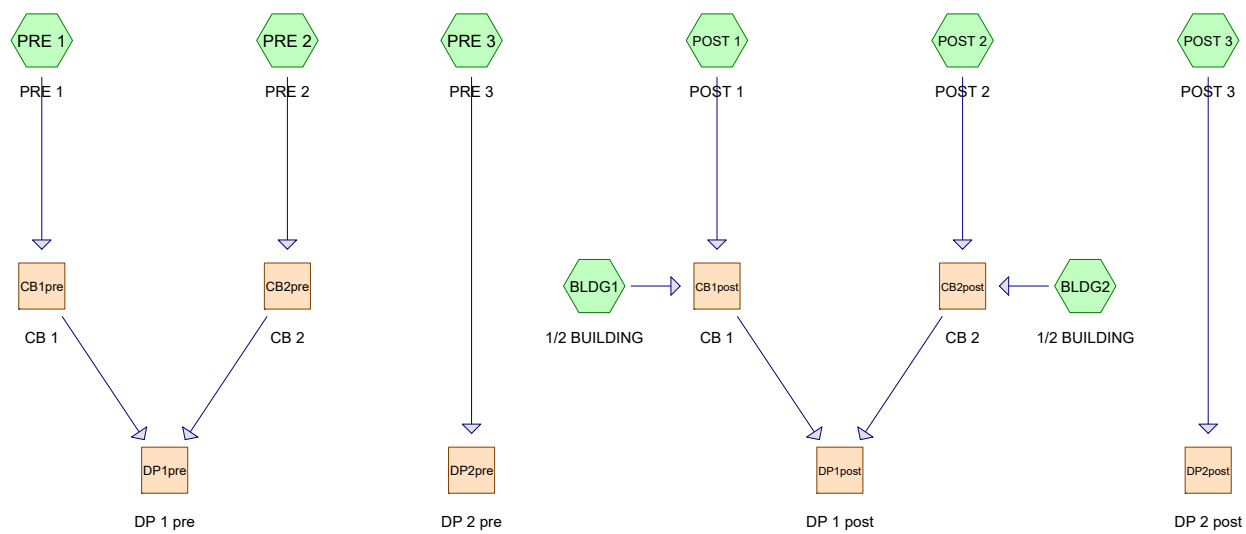
	100 YR	25 YR	10 YR	2 YR
DP 1	23,557	15,408	11,461	6,593
DP 2	1,973	1,048	651	240

REDUCTION (VOLUME)

	100 YR	25 YR	10 YR	2 YR
DP 1	592	531	471	341
DP 2	113	60	38	13

Section I

Overall Site Analysis



157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.35	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.95	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.19	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.68	2

157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
30,473	61	>75% Grass cover, Good, HSG B (POST 1, POST 2, POST 3, PRE 1, PRE 2, PRE 3)
47,731	98	Paved parking, HSG B (POST 1, POST 2, POST 3, PRE 1, PRE 2, PRE 3)
8,898	98	Unconnected roofs, HSG B (BLDG1, BLDG2, PRE 1, PRE 2)
7,734	55	Woods, Good, HSG B (POST 1, POST 2, POST 3, PRE 1, PRE 2, PRE 3)
94,836	83	TOTAL AREA

157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
94,836	HSG B	BLDG1, BLDG2, POST 1, POST 2, POST 3, PRE 1, PRE 2, PRE 3
0	HSG C	
0	HSG D	
0	Other	
94,836		TOTAL AREA

157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	30,473	0	0	0	30,473	>75% Grass cover, Good
0	47,731	0	0	0	47,731	Paved parking
0	8,898	0	0	0	8,898	Unconnected roofs
0	7,734	0	0	0	7,734	Woods, Good
0	94,836	0	0	0	94,836	TOTAL AREA

Sub
Num

157 Market Street*Type III 24-hr 2-Year Rainfall=3.35"*

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 6

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentBLDG1: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>3.12" Tc=5.0 min CN=98 Runoff=0.21 cfs 733 cf
SubcatchmentBLDG2: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>3.12" Tc=5.0 min CN=98 Runoff=0.21 cfs 733 cf
SubcatchmentPOST 1: POST 1	Runoff Area=24,472 sf 65.72% Impervious Runoff Depth>1.88" Flow Length=280' Tc=6.3 min CN=85 Runoff=1.21 cfs 3,843 cf
SubcatchmentPOST 2: POST 2	Runoff Area=11,134 sf 46.96% Impervious Runoff Depth>1.38" Flow Length=274' Tc=6.3 min CN=78 Runoff=0.40 cfs 1,283 cf
SubcatchmentPOST 3: POST 3	Runoff Area=6,162 sf 5.24% Impervious Runoff Depth>0.47" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.04 cfs 240 cf
SubcatchmentPRE 1: PRE 1	Runoff Area=28,744 sf 73.92% Impervious Runoff Depth>2.13" Flow Length=280' Tc=6.3 min CN=88 Runoff=1.60 cfs 5,103 cf
SubcatchmentPRE 2: PRE 2	Runoff Area=12,158 sf 63.94% Impervious Runoff Depth>1.81" Flow Length=274' Tc=6.3 min CN=84 Runoff=0.58 cfs 1,831 cf
SubcatchmentPRE 3: PRE 3	Runoff Area=6,516 sf 4.96% Impervious Runoff Depth>0.47" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.04 cfs 253 cf
Reach CB1post: CB 1	Inflow=1.41 cfs 4,577 cf Outflow=1.41 cfs 4,577 cf
Reach CB1pre: CB 1	Inflow=1.60 cfs 5,103 cf Outflow=1.60 cfs 5,103 cf
Reach CB2post: CB 2	Inflow=0.60 cfs 2,016 cf Outflow=0.60 cfs 2,016 cf
Reach CB2pre: CB 2	Inflow=0.58 cfs 1,831 cf Outflow=0.58 cfs 1,831 cf
Reach DP1post: DP 1 post	Inflow=2.02 cfs 6,593 cf Outflow=2.02 cfs 6,593 cf
Reach DP1pre: DP 1 pre	Inflow=2.17 cfs 6,934 cf Outflow=2.17 cfs 6,934 cf
Reach DP2post: DP 2 post	Inflow=0.04 cfs 240 cf Outflow=0.04 cfs 240 cf
Reach DP2pre: DP 2 pre	Inflow=0.04 cfs 253 cf Outflow=0.04 cfs 253 cf

157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 7

Total Runoff Area = 94,836 sf Runoff Volume = 14,020 cf Average Runoff Depth = 1.77"
40.29% Pervious = 38,207 sf 59.71% Impervious = 56,629 sf

157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 8

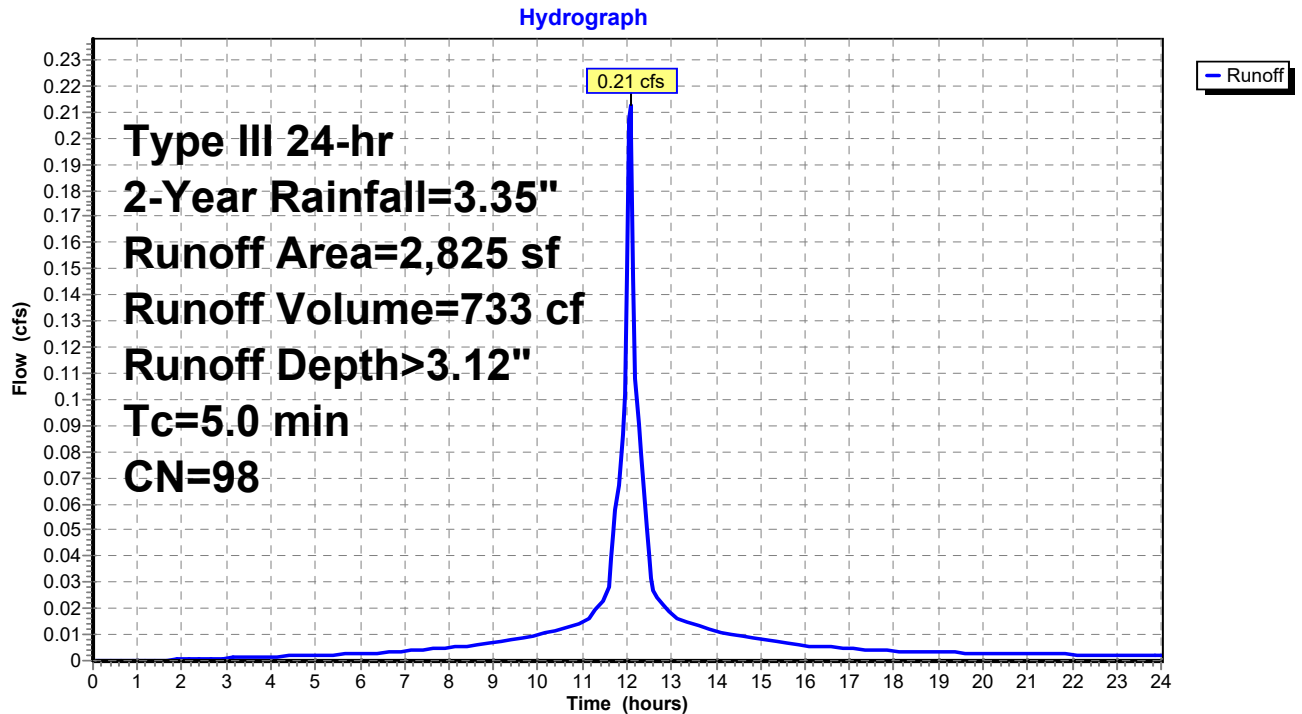
Summary for Subcatchment BLDG1: 1/2 BUILDING

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 733 cf, Depth> 3.12"
Routed to Reach CB1post : CB 1

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=3.35"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG1: 1/2 BUILDING

157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.35"

Page 9

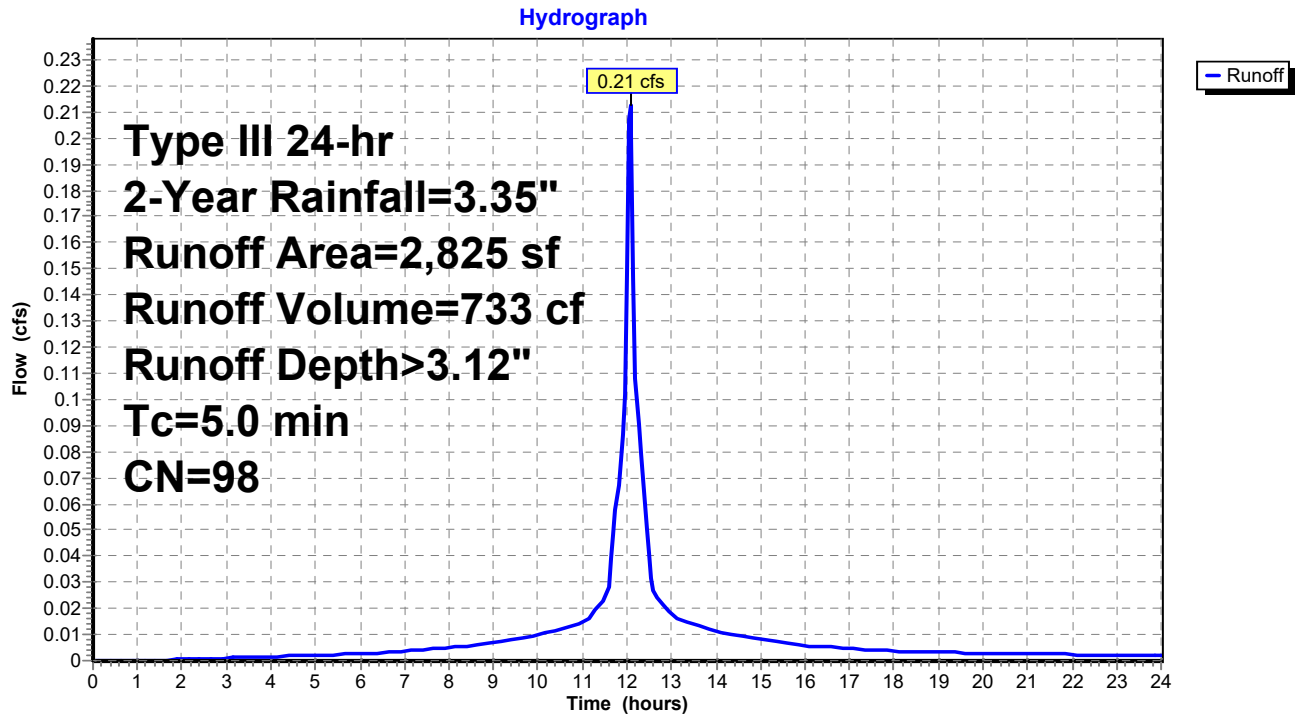
Summary for Subcatchment BLDG2: 1/2 BUILDING

Runoff = 0.21 cfs @ 12.07 hrs, Volume= 733 cf, Depth> 3.12"
Routed to Reach CB2post : CB 2

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=3.35"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG2: 1/2 BUILDING

157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 10

Summary for Subcatchment POST 1: POST 1

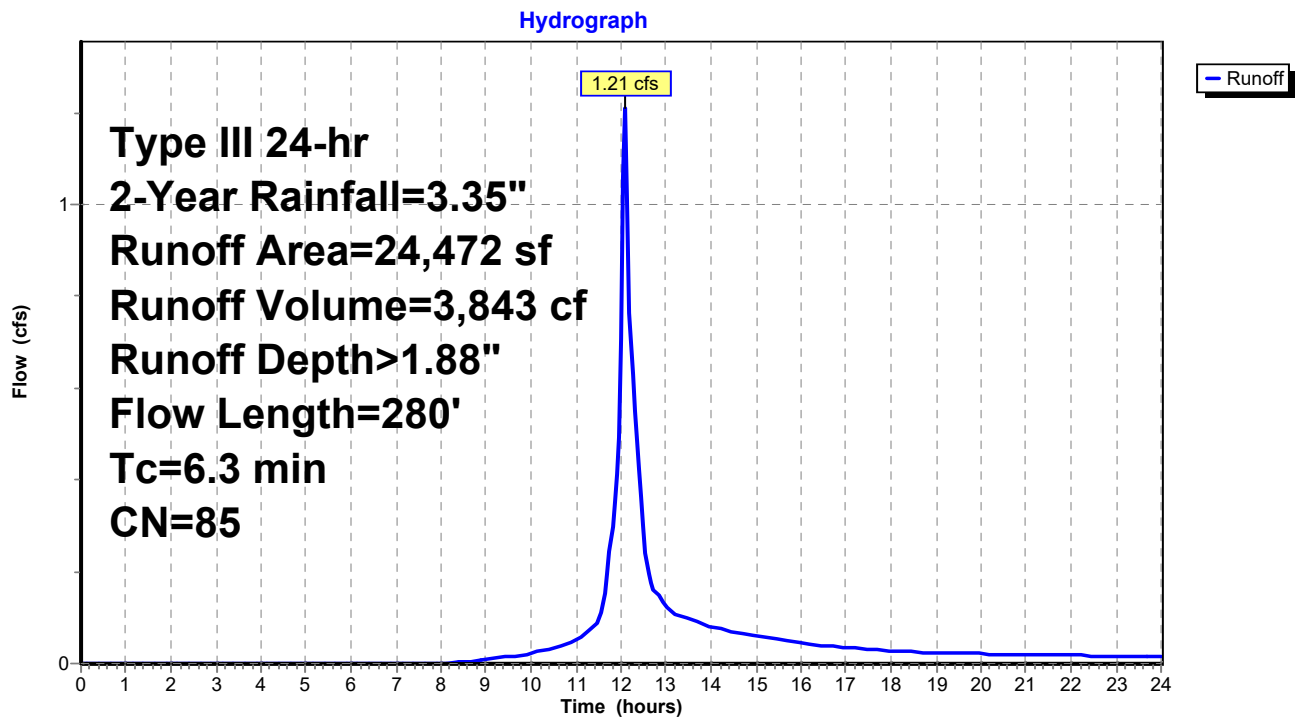
Runoff = 1.21 cfs @ 12.10 hrs, Volume= 3,843 cf, Depth> 1.88"
 Routed to Reach CB1post : CB 1

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=3.35"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
8,206	61	>75% Grass cover, Good, HSG B
14,824	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
1,259	98	Paved parking, HSG B
24,472	85	Weighted Average
8,389		34.28% Pervious Area
16,083		65.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment POST 1: POST 1



157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 12

Summary for Subcatchment POST 2: POST 2

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 1,283 cf, Depth> 1.38"
 Routed to Reach CB2post : CB 2

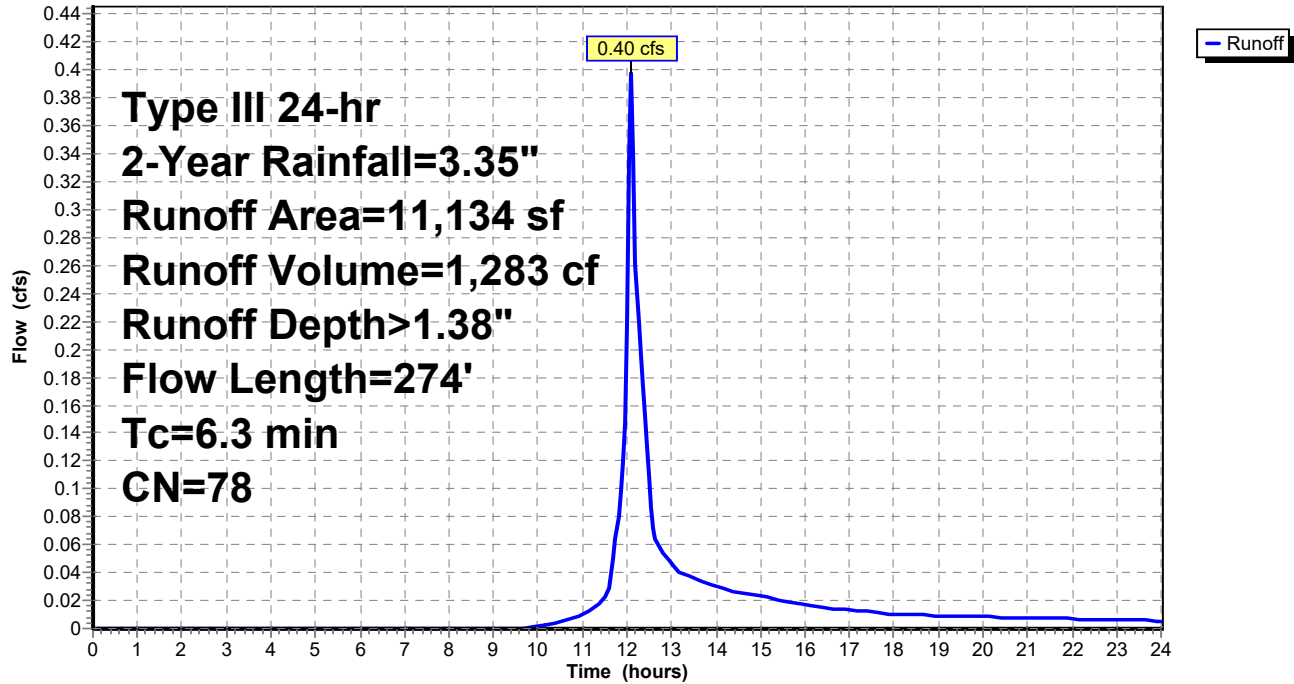
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
5,510	61	>75% Grass cover, Good, HSG B
4,654	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
575	98	Paved parking, HSG B
11,134	78	Weighted Average
5,905		53.04% Pervious Area
5,229		46.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment POST 2: POST 2

Hydrograph



157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 14

Summary for Subcatchment POST 3: POST 3

Runoff = 0.04 cfs @ 12.24 hrs, Volume= 240 cf, Depth> 0.47"
 Routed to Reach DP2post : DP 2 post

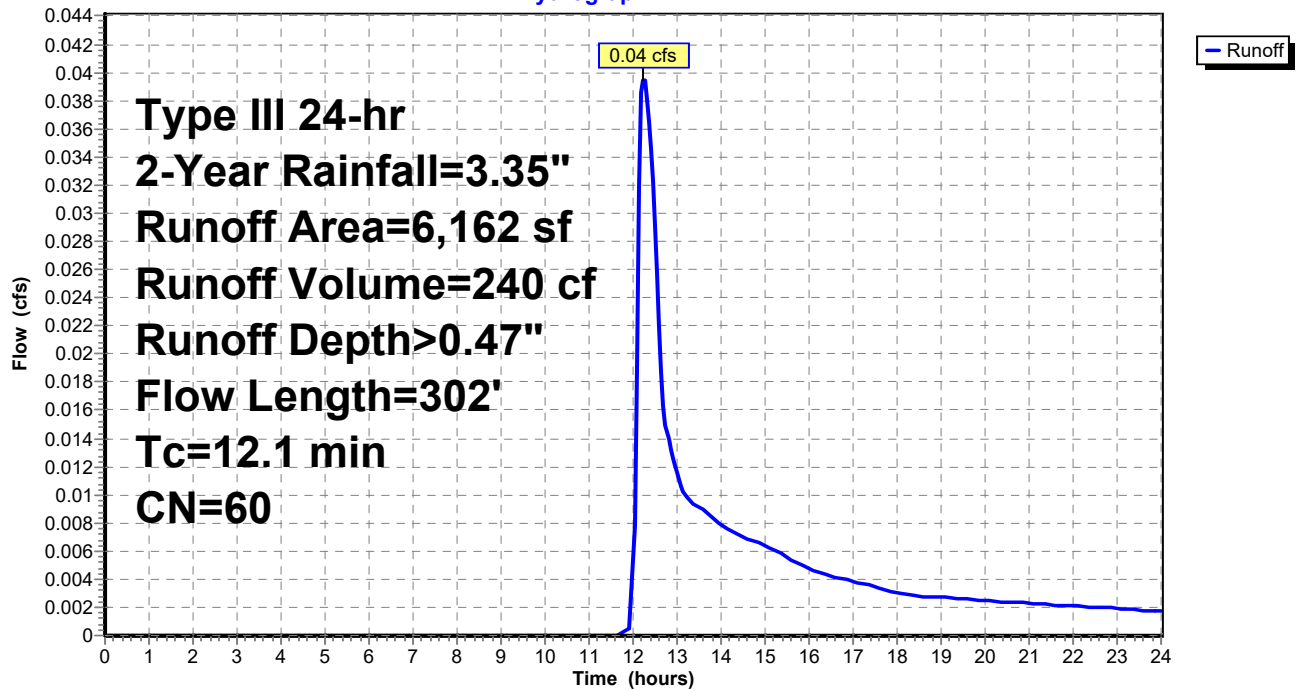
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,550	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,162	60	Weighted Average
5,839		94.76% Pervious Area
323		5.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment POST 3: POST 3

Hydrograph



157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 16

Summary for Subcatchment PRE 1: PRE 1

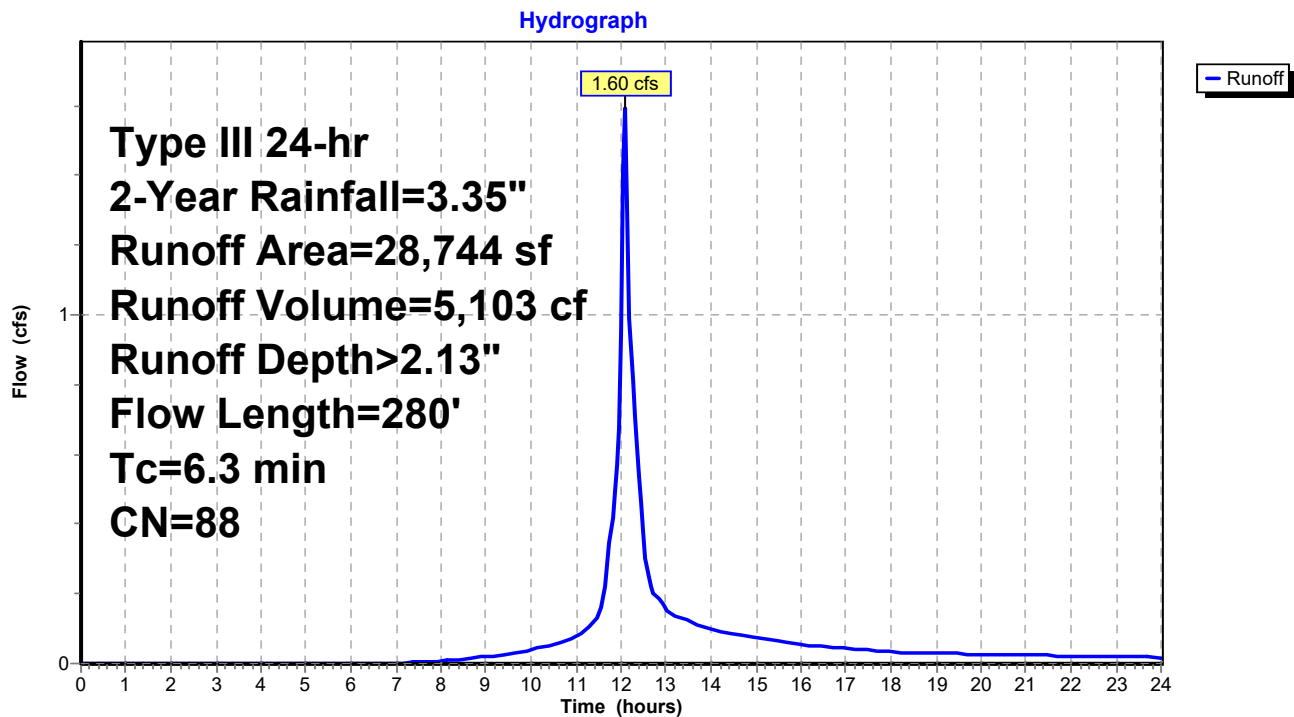
Runoff = 1.60 cfs @ 12.09 hrs, Volume= 5,103 cf, Depth> 2.13"
 Routed to Reach CB1pre : CB 1

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=3.35"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
7,314	61	>75% Grass cover, Good, HSG B
17,874	98	Paved parking, HSG B
1,722	98	Unconnected roofs, HSG B
1,651	98	Paved parking, HSG B
28,744	88	Weighted Average
7,497		26.08% Pervious Area
21,247		73.92% Impervious Area
1,722		8.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment PRE 1: PRE 1



157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 18

Summary for Subcatchment PRE 2: PRE 2

Runoff = 0.58 cfs @ 12.10 hrs, Volume= 1,831 cf, Depth> 1.81"
 Routed to Reach CB2pre : CB 2

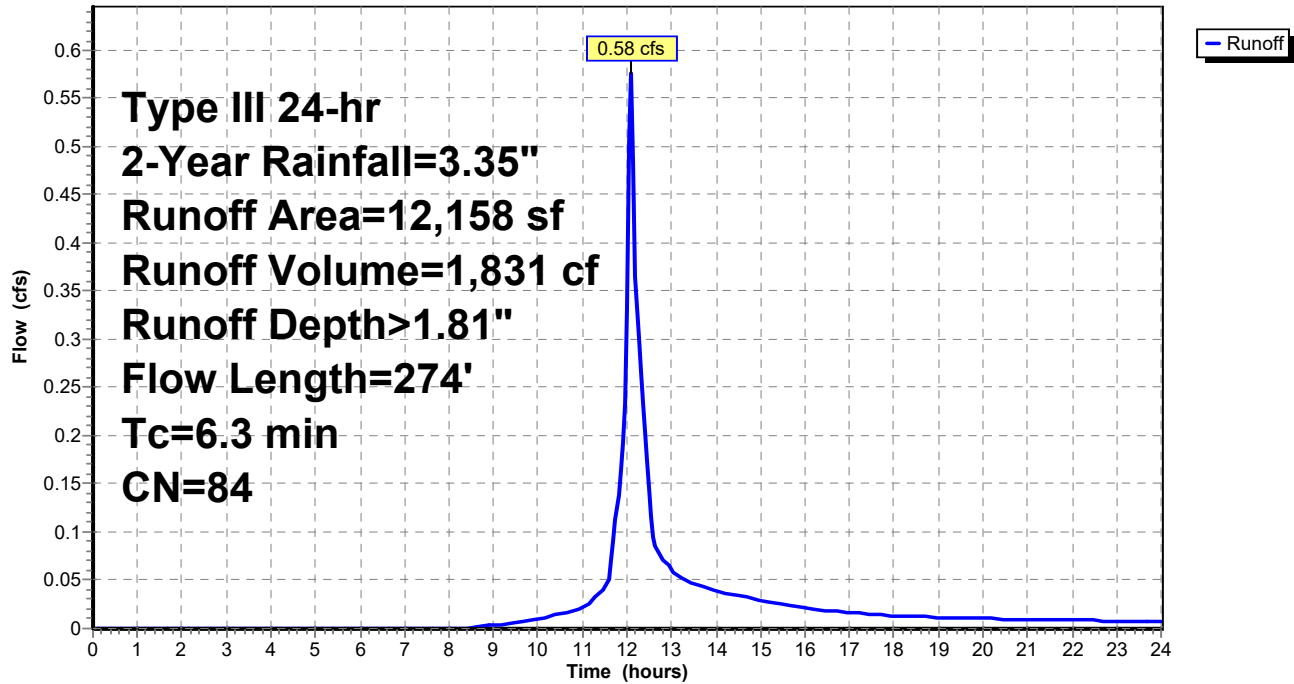
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
3,989	61	>75% Grass cover, Good, HSG B
5,930	98	Paved parking, HSG B
1,526	98	Unconnected roofs, HSG B
318	98	Paved parking, HSG B
12,158	84	Weighted Average
4,384		36.06% Pervious Area
7,774		63.94% Impervious Area
1,526		19.63% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment PRE 2: PRE 2

Hydrograph



157 Market Street

Type III 24-hr 2-Year Rainfall=3.35"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 20

Summary for Subcatchment PRE 3: PRE 3

Runoff = 0.04 cfs @ 12.24 hrs, Volume= 253 cf, Depth> 0.47"
 Routed to Reach DP2pre : DP 2 pre

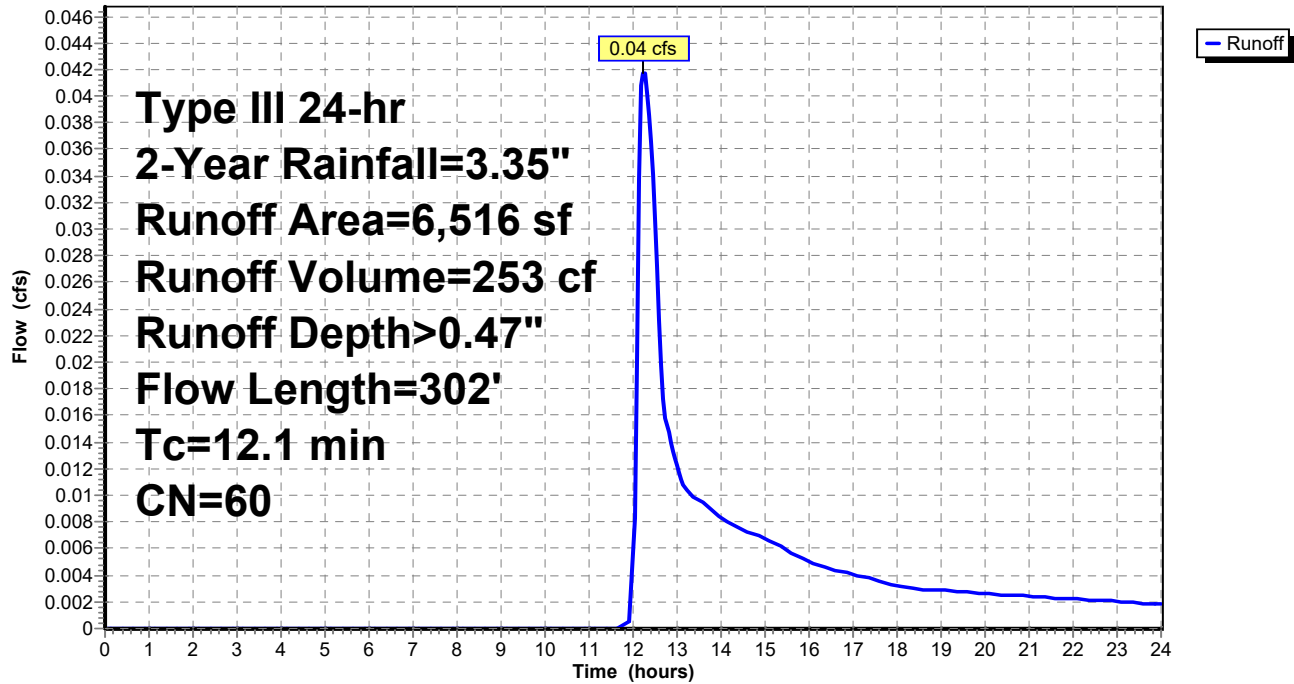
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.35"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,904	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,516	60	Weighted Average
6,193		95.04% Pervious Area
323		4.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment PRE 3: PRE 3

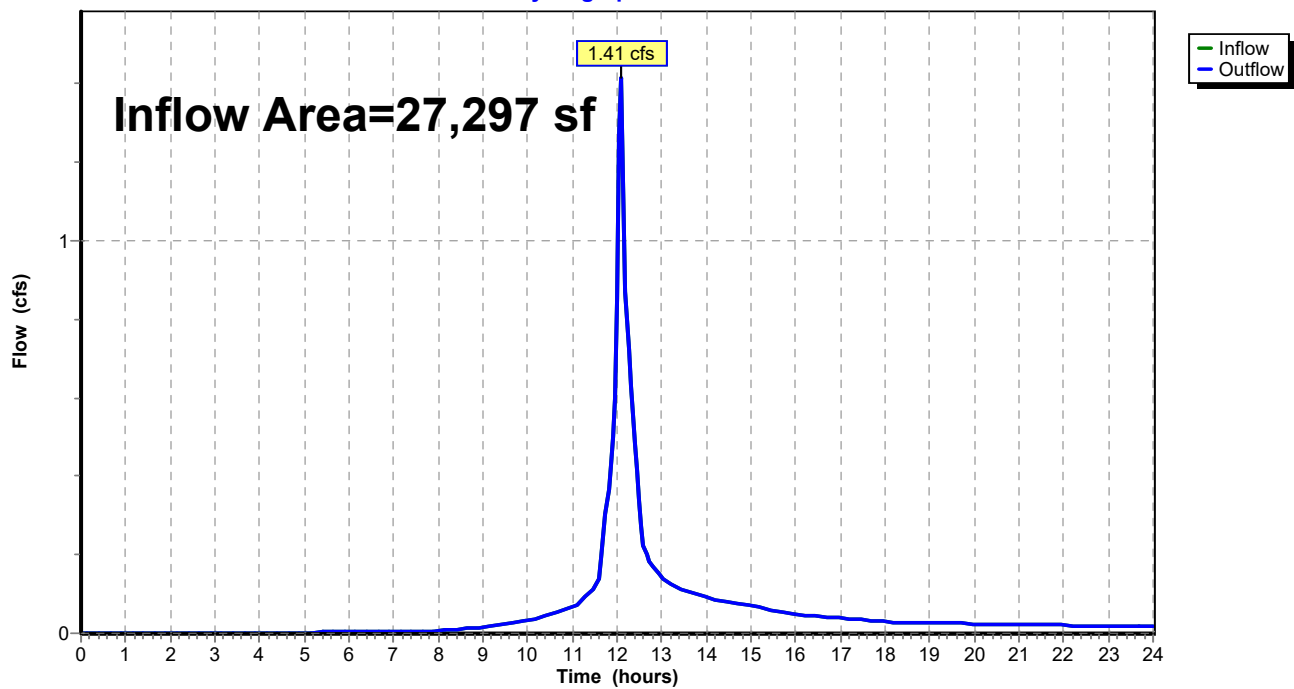
Hydrograph



Summary for Reach CB1post: CB 1

Inflow Area = 27,297 sf, 69.27% Impervious, Inflow Depth > 2.01" for 2-Year event
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 4,577 cf
Outflow = 1.41 cfs @ 12.09 hrs, Volume= 4,577 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1post : DP 1 post

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

Reach CB1post: CB 1**Hydrograph**

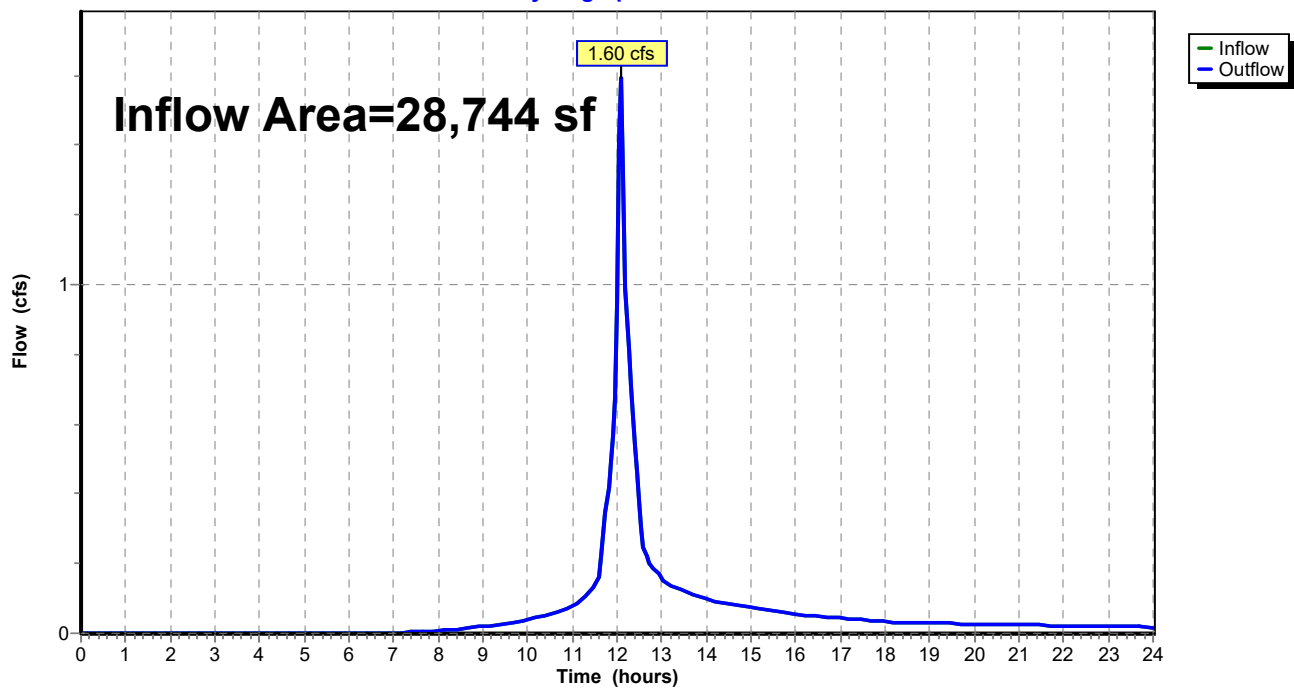
Summary for Reach CB1pre: CB 1

Inflow Area = 28,744 sf, 73.92% Impervious, Inflow Depth > 2.13" for 2-Year event
 Inflow = 1.60 cfs @ 12.09 hrs, Volume= 5,103 cf
 Outflow = 1.60 cfs @ 12.09 hrs, Volume= 5,103 cf, Atten= 0%, Lag= 0.0 min
 Routed to Reach DP1pre : DP 1 pre

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

Reach CB1pre: CB 1

Hydrograph



157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.35"

Page 24

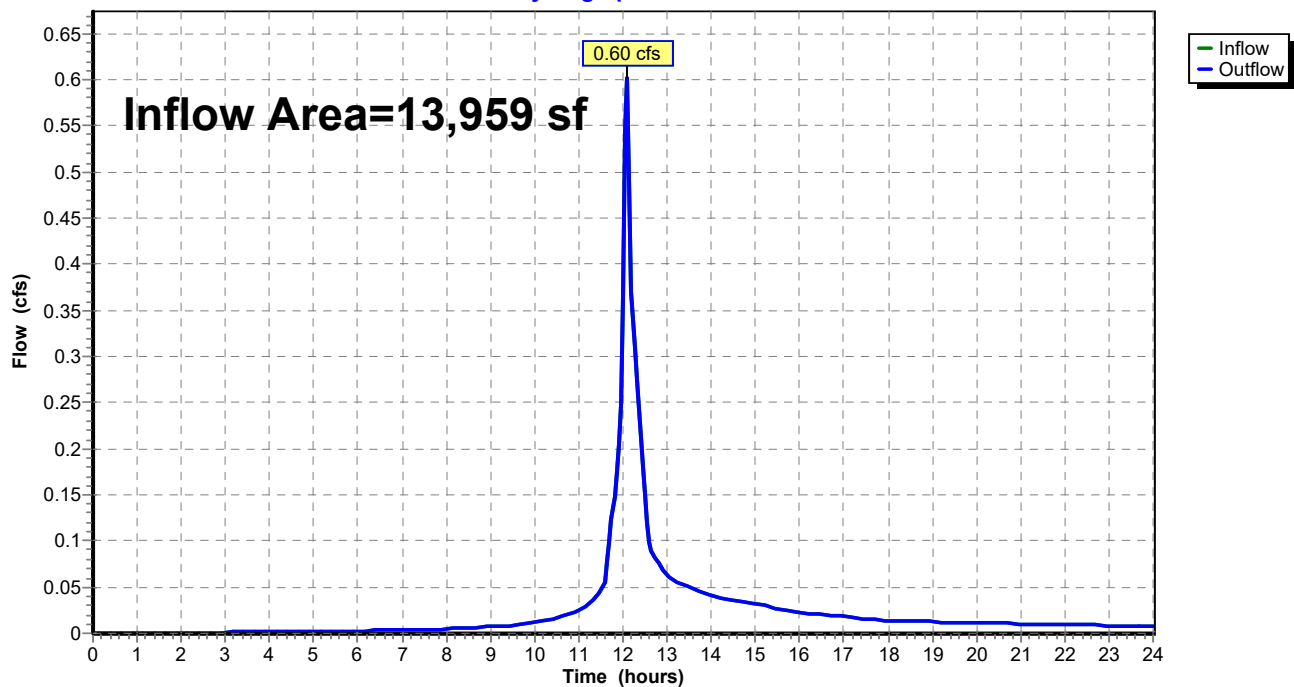
Summary for Reach CB2post: CB 2

Inflow Area = 13,959 sf, 57.70% Impervious, Inflow Depth > 1.73" for 2-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 2,016 cf
Outflow = 0.60 cfs @ 12.09 hrs, Volume= 2,016 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1post : DP 1 post

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

Reach CB2post: CB 2

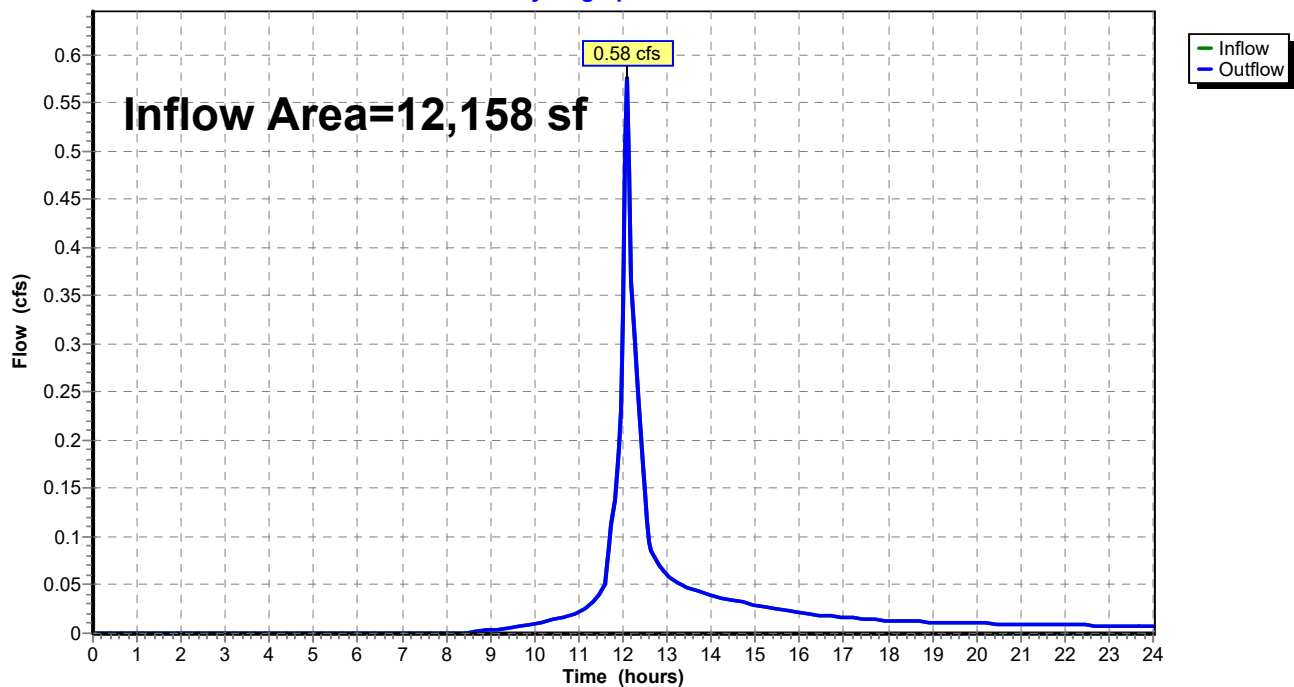
Hydrograph



Summary for Reach CB2pre: CB 2

Inflow Area = 12,158 sf, 63.94% Impervious, Inflow Depth > 1.81" for 2-Year event
Inflow = 0.58 cfs @ 12.10 hrs, Volume= 1,831 cf
Outflow = 0.58 cfs @ 12.10 hrs, Volume= 1,831 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1pre : DP 1 pre

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

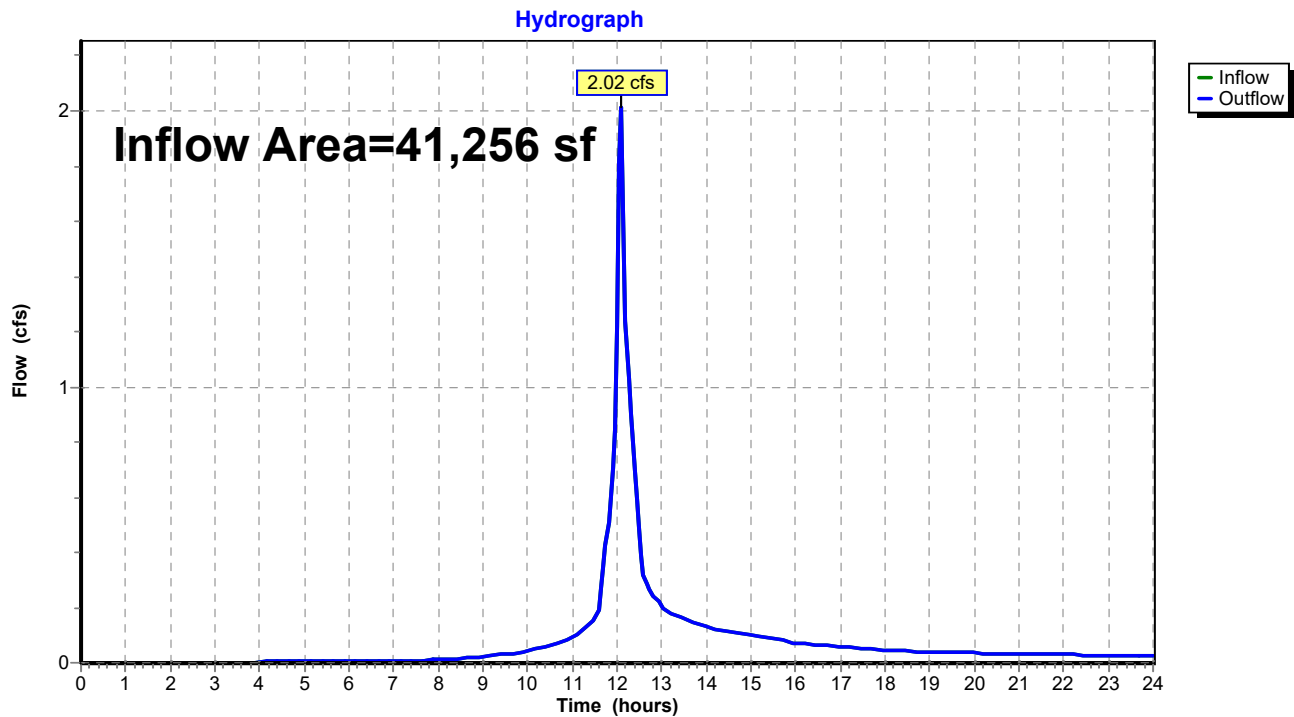
Reach CB2pre: CB 2**Hydrograph**

Summary for Reach DP1post: DP 1 post

Inflow Area = 41,256 sf, 65.35% Impervious, Inflow Depth > 1.92" for 2-Year event
 Inflow = 2.02 cfs @ 12.09 hrs, Volume= 6,593 cf
 Outflow = 2.02 cfs @ 12.09 hrs, Volume= 6,593 cf, Atten= 0%, Lag= 0.0 min

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

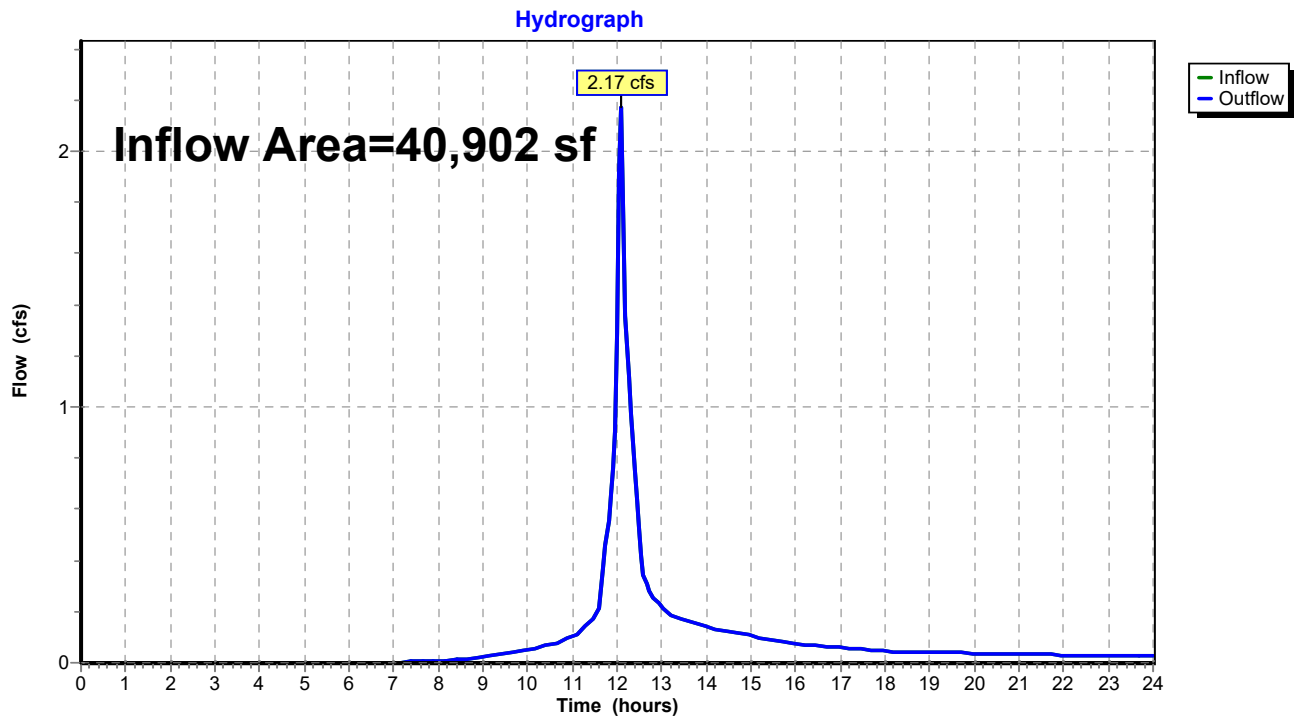
Reach DP1post: DP 1 post



Summary for Reach DP1pre: DP 1 pre

Inflow Area = 40,902 sf, 70.95% Impervious, Inflow Depth > 2.03" for 2-Year event
Inflow = 2.17 cfs @ 12.10 hrs, Volume= 6,934 cf
Outflow = 2.17 cfs @ 12.10 hrs, Volume= 6,934 cf, Atten= 0%, Lag= 0.0 min

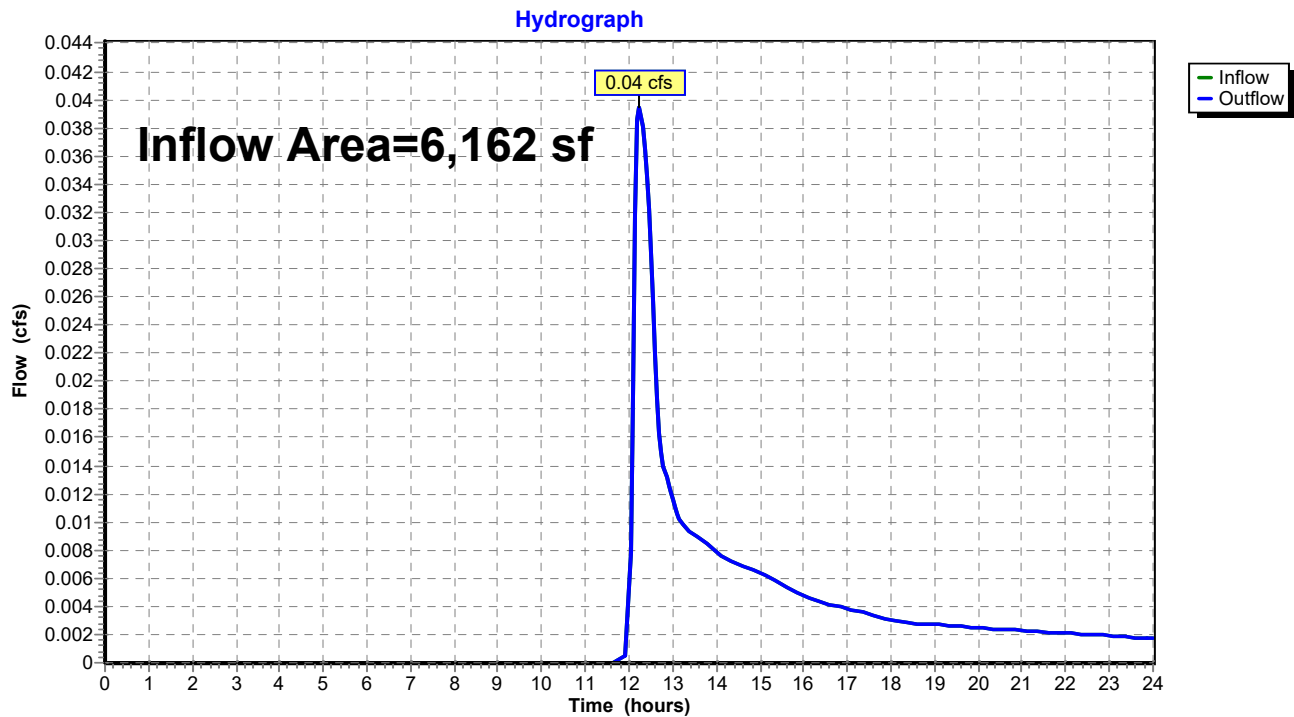
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1pre: DP 1 pre

Summary for Reach DP2post: DP 2 post

Inflow Area = 6,162 sf, 5.24% Impervious, Inflow Depth > 0.47" for 2-Year event
Inflow = 0.04 cfs @ 12.24 hrs, Volume= 240 cf
Outflow = 0.04 cfs @ 12.24 hrs, Volume= 240 cf, Atten= 0%, Lag= 0.0 min

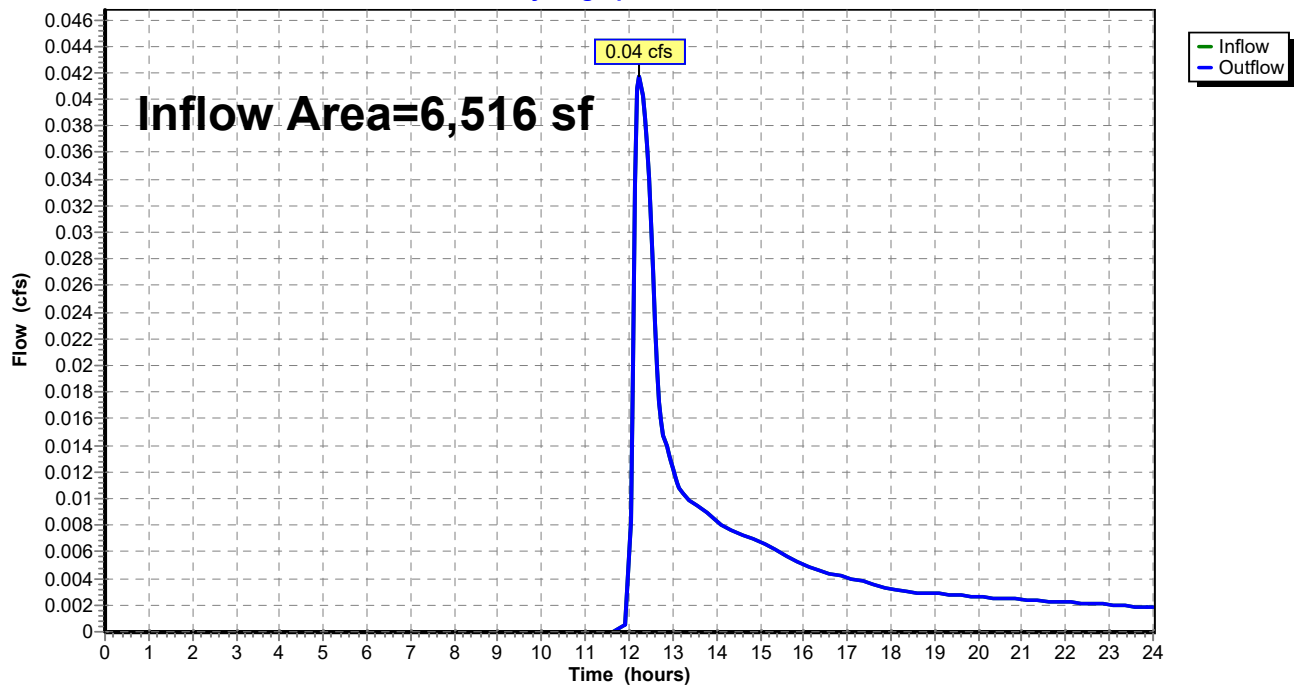
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP2post: DP 2 post

Summary for Reach DP2pre: DP 2 pre

Inflow Area = 6,516 sf, 4.96% Impervious, Inflow Depth > 0.47" for 2-Year event
Inflow = 0.04 cfs @ 12.24 hrs, Volume= 253 cf
Outflow = 0.04 cfs @ 12.24 hrs, Volume= 253 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP2pre: DP 2 pre**Hydrograph**

157 Market Street*Type III 24-hr 10-Year Rainfall=4.95"*

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 30

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentBLDG1: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>4.71" Tc=5.0 min CN=98 Runoff=0.32 cfs 1,109 cf
SubcatchmentBLDG2: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>4.71" Tc=5.0 min CN=98 Runoff=0.32 cfs 1,109 cf
SubcatchmentPOST 1: POST 1	Runoff Area=24,472 sf 65.72% Impervious Runoff Depth>3.32" Flow Length=280' Tc=6.3 min CN=85 Runoff=2.11 cfs 6,769 cf
SubcatchmentPOST 2: POST 2	Runoff Area=11,134 sf 46.96% Impervious Runoff Depth>2.67" Flow Length=274' Tc=6.3 min CN=78 Runoff=0.78 cfs 2,474 cf
SubcatchmentPOST 3: POST 3	Runoff Area=6,162 sf 5.24% Impervious Runoff Depth>1.27" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.15 cfs 651 cf
SubcatchmentPRE 1: PRE 1	Runoff Area=28,744 sf 73.92% Impervious Runoff Depth>3.62" Flow Length=280' Tc=6.3 min CN=88 Runoff=2.66 cfs 8,668 cf
SubcatchmentPRE 2: PRE 2	Runoff Area=12,158 sf 63.94% Impervious Runoff Depth>3.22" Flow Length=274' Tc=6.3 min CN=84 Runoff=1.02 cfs 3,264 cf
SubcatchmentPRE 3: PRE 3	Runoff Area=6,516 sf 4.96% Impervious Runoff Depth>1.27" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.16 cfs 689 cf
Reach CB1post: CB 1	Inflow=2.41 cfs 7,878 cf Outflow=2.41 cfs 7,878 cf
Reach CB1pre: CB 1	Inflow=2.66 cfs 8,668 cf Outflow=2.66 cfs 8,668 cf
Reach CB2post: CB 2	Inflow=1.08 cfs 3,583 cf Outflow=1.08 cfs 3,583 cf
Reach CB2pre: CB 2	Inflow=1.02 cfs 3,264 cf Outflow=1.02 cfs 3,264 cf
Reach DP1post: DP 1 post	Inflow=3.49 cfs 11,461 cf Outflow=3.49 cfs 11,461 cf
Reach DP1pre: DP 1 pre	Inflow=3.68 cfs 11,932 cf Outflow=3.68 cfs 11,932 cf
Reach DP2post: DP 2 post	Inflow=0.15 cfs 651 cf Outflow=0.15 cfs 651 cf
Reach DP2pre: DP 2 pre	Inflow=0.16 cfs 689 cf Outflow=0.16 cfs 689 cf

157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 31

Total Runoff Area = 94,836 sf Runoff Volume = 24,733 cf Average Runoff Depth = 3.13"
40.29% Pervious = 38,207 sf 59.71% Impervious = 56,629 sf

157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 32

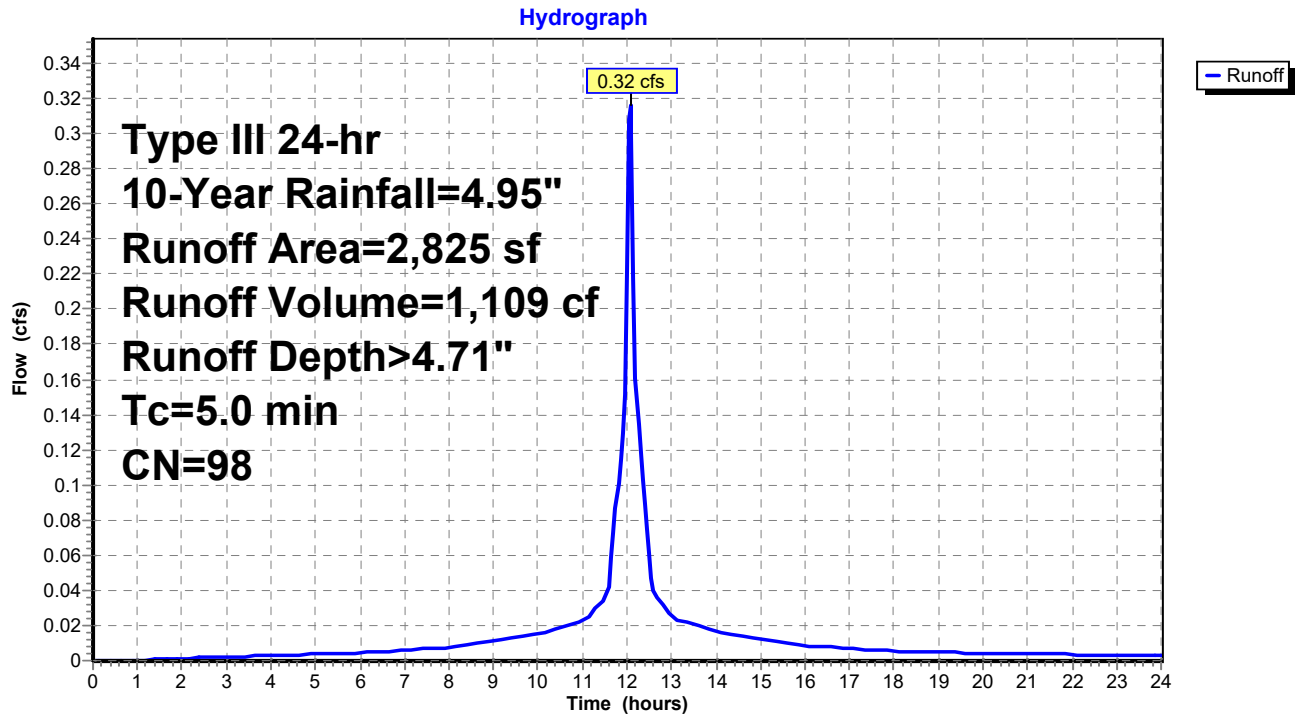
Summary for Subcatchment BLDG1: 1/2 BUILDING

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,109 cf, Depth> 4.71"
Routed to Reach CB1post : CB 1

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=4.95"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG1: 1/2 BUILDING

157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 33

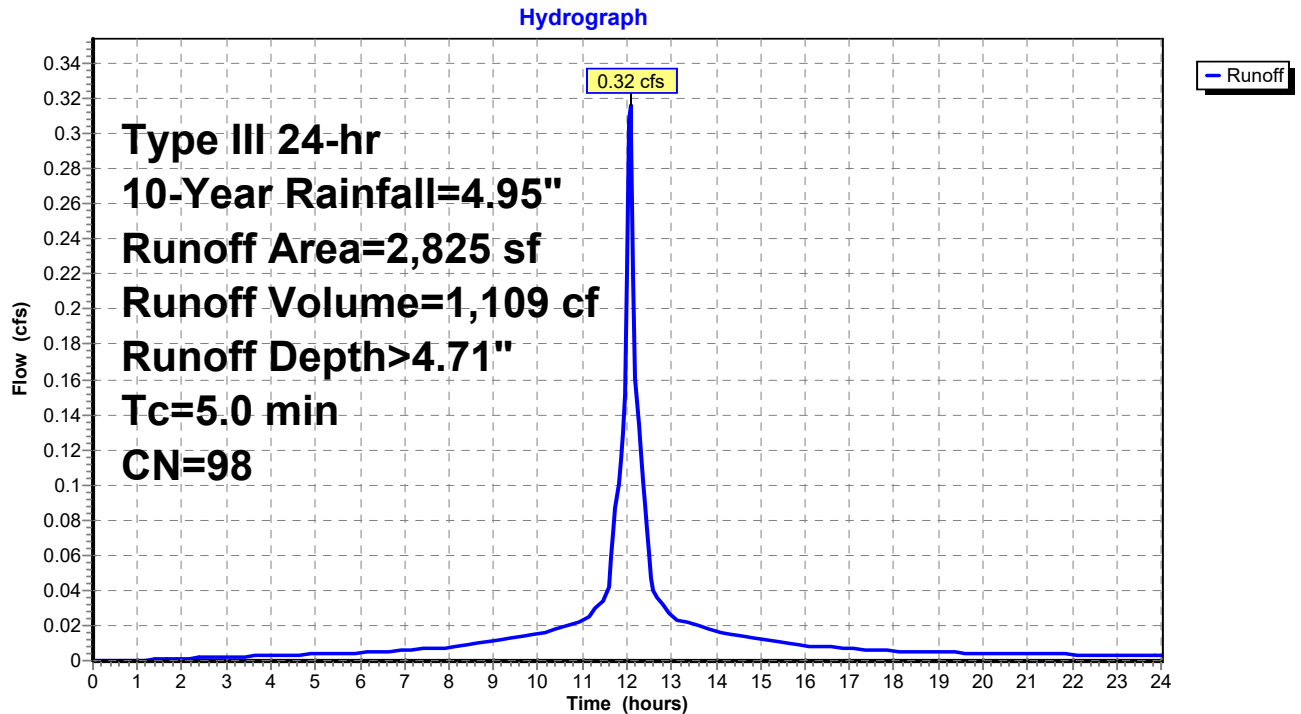
Summary for Subcatchment BLDG2: 1/2 BUILDING

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,109 cf, Depth> 4.71"
Routed to Reach CB2post : CB 2

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=4.95"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG2: 1/2 BUILDING

157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 34

Summary for Subcatchment POST 1: POST 1

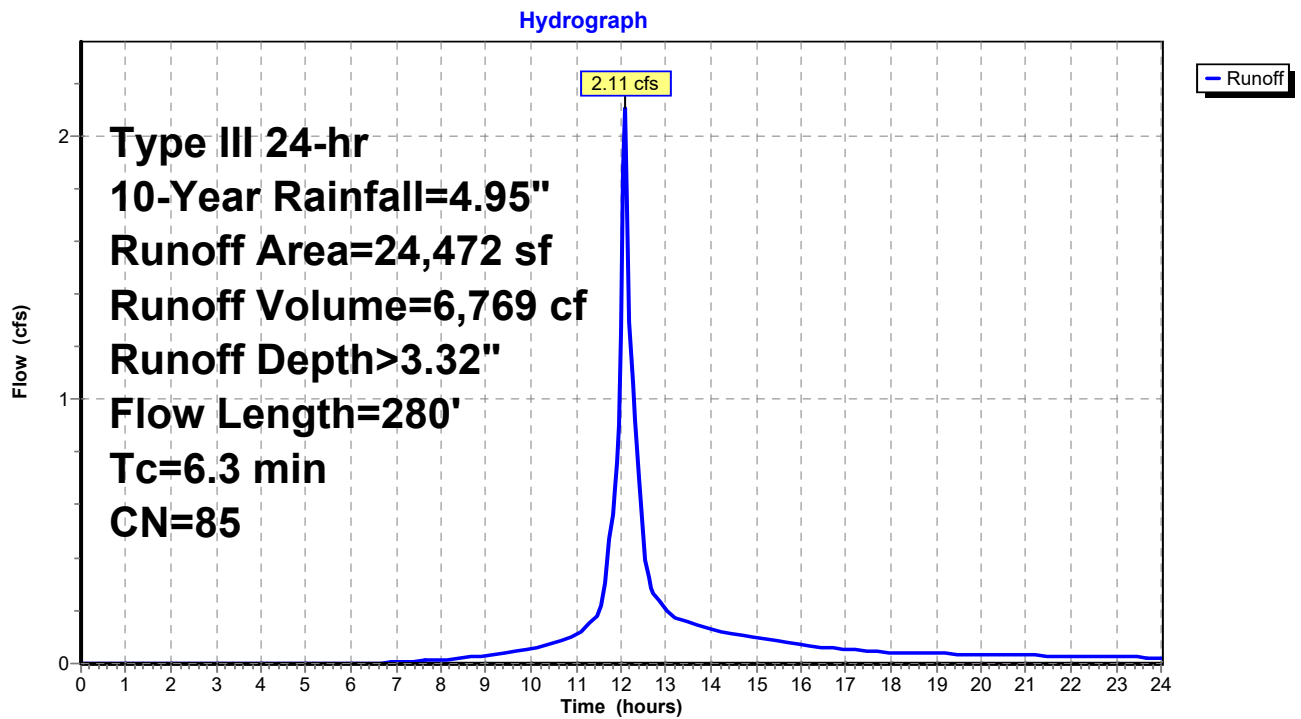
Runoff = 2.11 cfs @ 12.09 hrs, Volume= 6,769 cf, Depth> 3.32"
 Routed to Reach CB1post : CB 1

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=4.95"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
8,206	61	>75% Grass cover, Good, HSG B
14,824	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
1,259	98	Paved parking, HSG B
24,472	85	Weighted Average
8,389		34.28% Pervious Area
16,083		65.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment POST 1: POST 1



157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 36

Summary for Subcatchment POST 2: POST 2

Runoff = 0.78 cfs @ 12.10 hrs, Volume= 2,474 cf, Depth> 2.67"
 Routed to Reach CB2post : CB 2

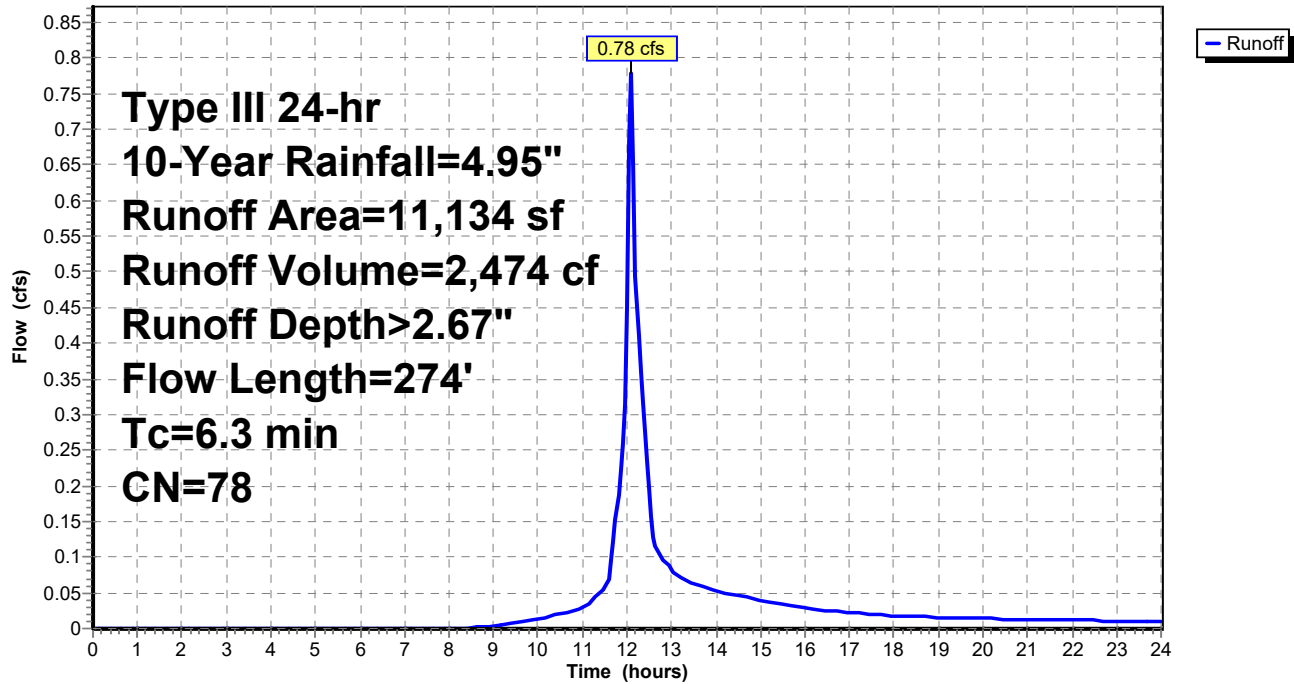
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.95"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
5,510	61	>75% Grass cover, Good, HSG B
4,654	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
575	98	Paved parking, HSG B
11,134	78	Weighted Average
5,905		53.04% Pervious Area
5,229		46.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment POST 2: POST 2

Hydrograph



157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 38

Summary for Subcatchment POST 3: POST 3

Runoff = 0.15 cfs @ 12.19 hrs, Volume= 651 cf, Depth> 1.27"

Routed to Reach DP2post : DP 2 post

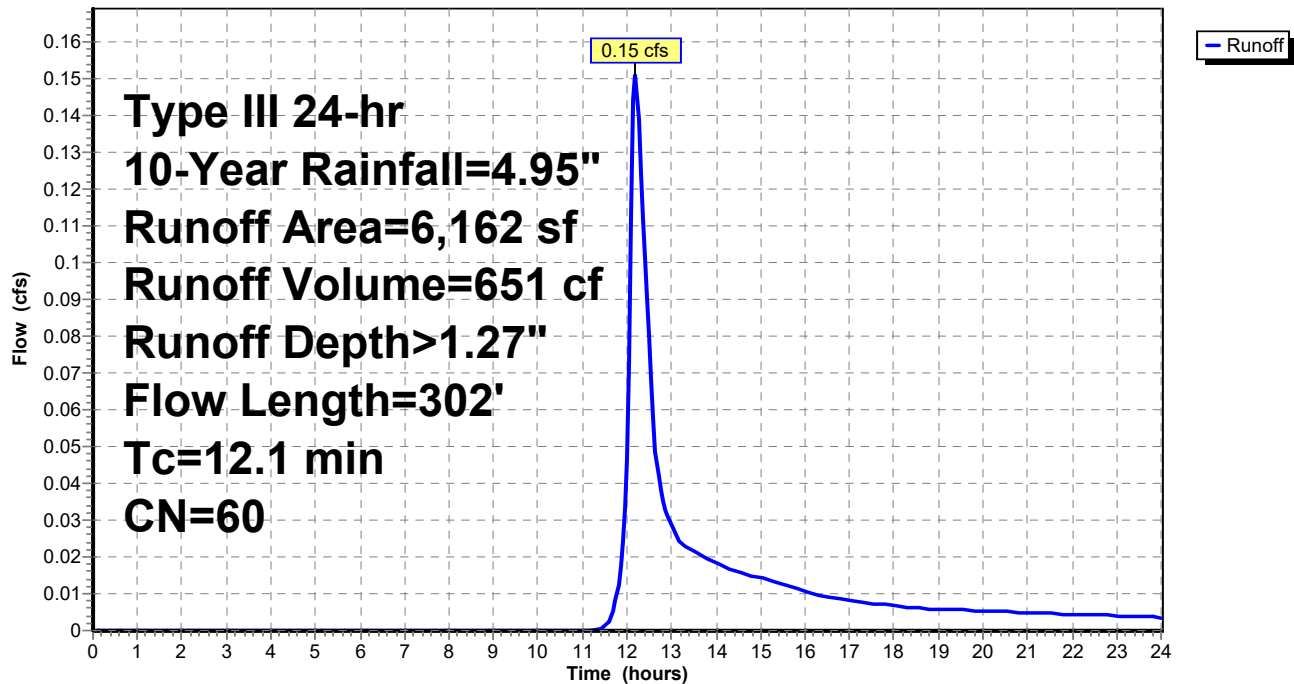
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.95"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,550	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,162	60	Weighted Average
5,839		94.76% Pervious Area
323		5.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment POST 3: POST 3

Hydrograph



157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 40

Summary for Subcatchment PRE 1: PRE 1

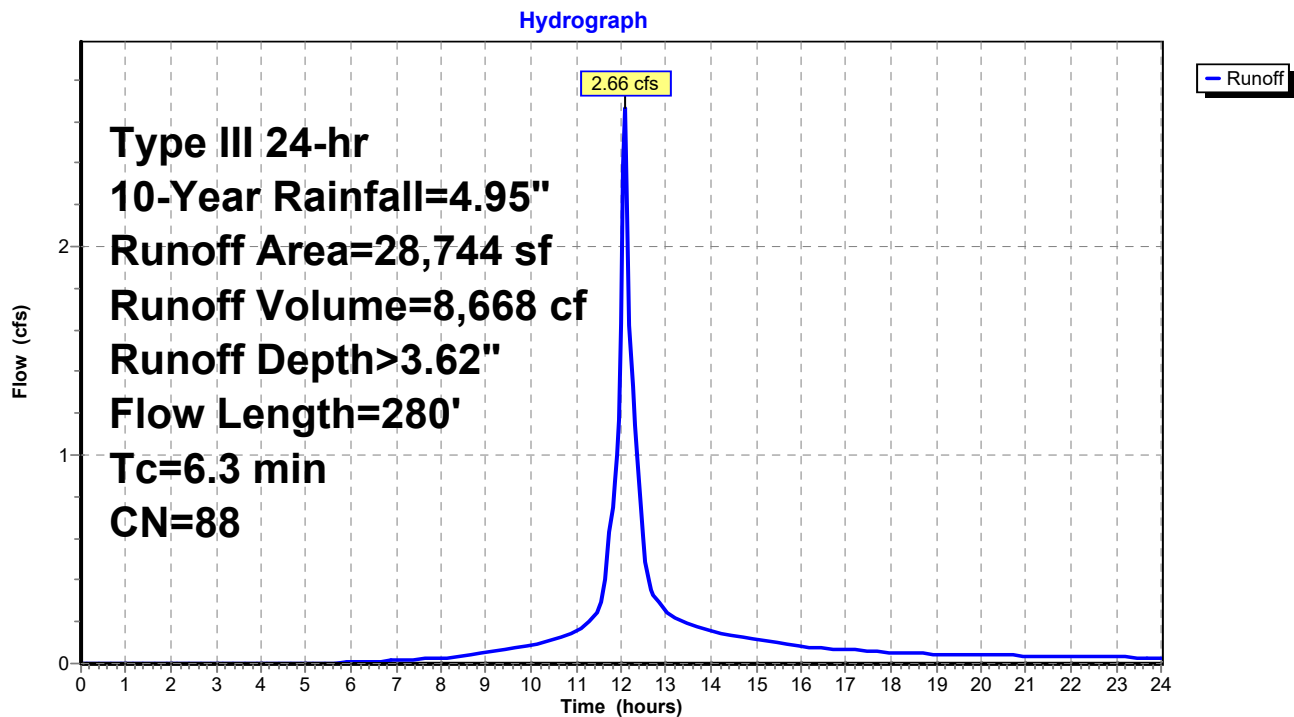
Runoff = 2.66 cfs @ 12.09 hrs, Volume= 8,668 cf, Depth> 3.62"
 Routed to Reach CB1pre : CB 1

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=4.95"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
7,314	61	>75% Grass cover, Good, HSG B
17,874	98	Paved parking, HSG B
1,722	98	Unconnected roofs, HSG B
1,651	98	Paved parking, HSG B
28,744	88	Weighted Average
7,497		26.08% Pervious Area
21,247		73.92% Impervious Area
1,722		8.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment PRE 1: PRE 1



157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 42

Summary for Subcatchment PRE 2: PRE 2

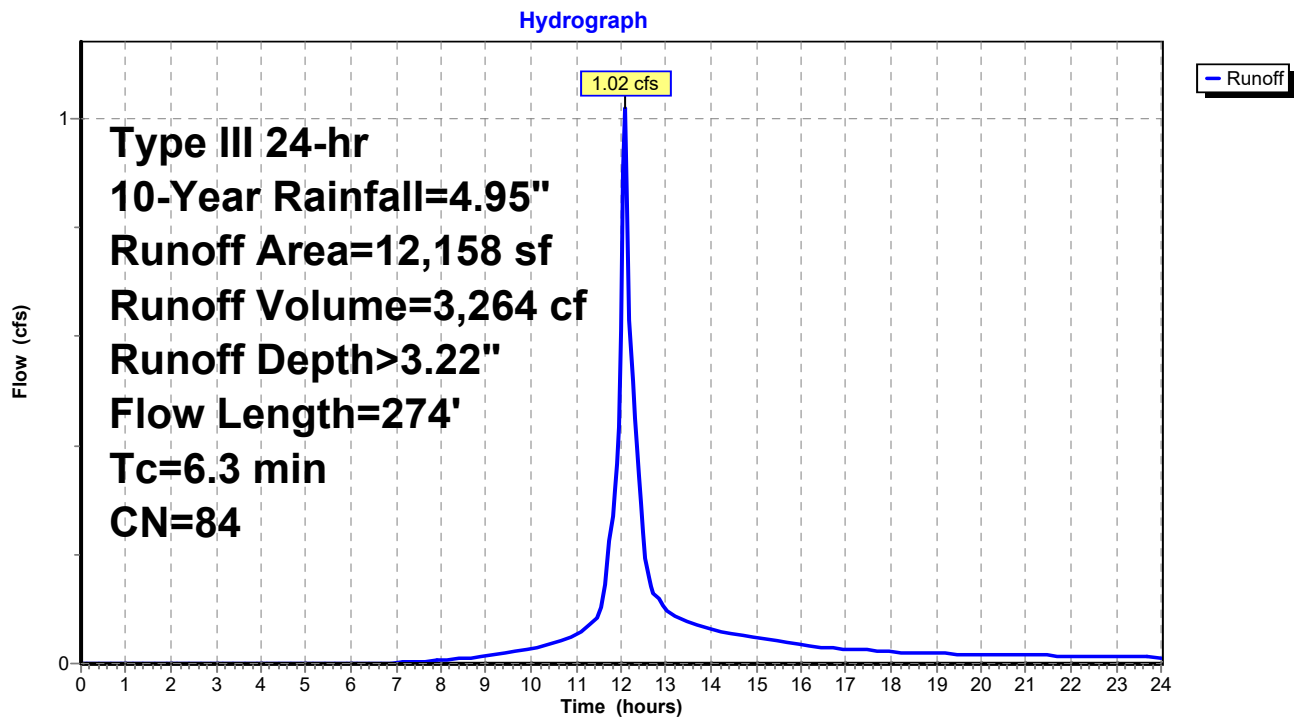
Runoff = 1.02 cfs @ 12.09 hrs, Volume= 3,264 cf, Depth> 3.22"
 Routed to Reach CB2pre : CB 2

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=4.95"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
3,989	61	>75% Grass cover, Good, HSG B
5,930	98	Paved parking, HSG B
1,526	98	Unconnected roofs, HSG B
318	98	Paved parking, HSG B
12,158	84	Weighted Average
4,384		36.06% Pervious Area
7,774		63.94% Impervious Area
1,526		19.63% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment PRE 2: PRE 2



157 Market Street

Type III 24-hr 10-Year Rainfall=4.95"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 44

Summary for Subcatchment PRE 3: PRE 3

Runoff = 0.16 cfs @ 12.19 hrs, Volume= 689 cf, Depth> 1.27"
 Routed to Reach DP2pre : DP 2 pre

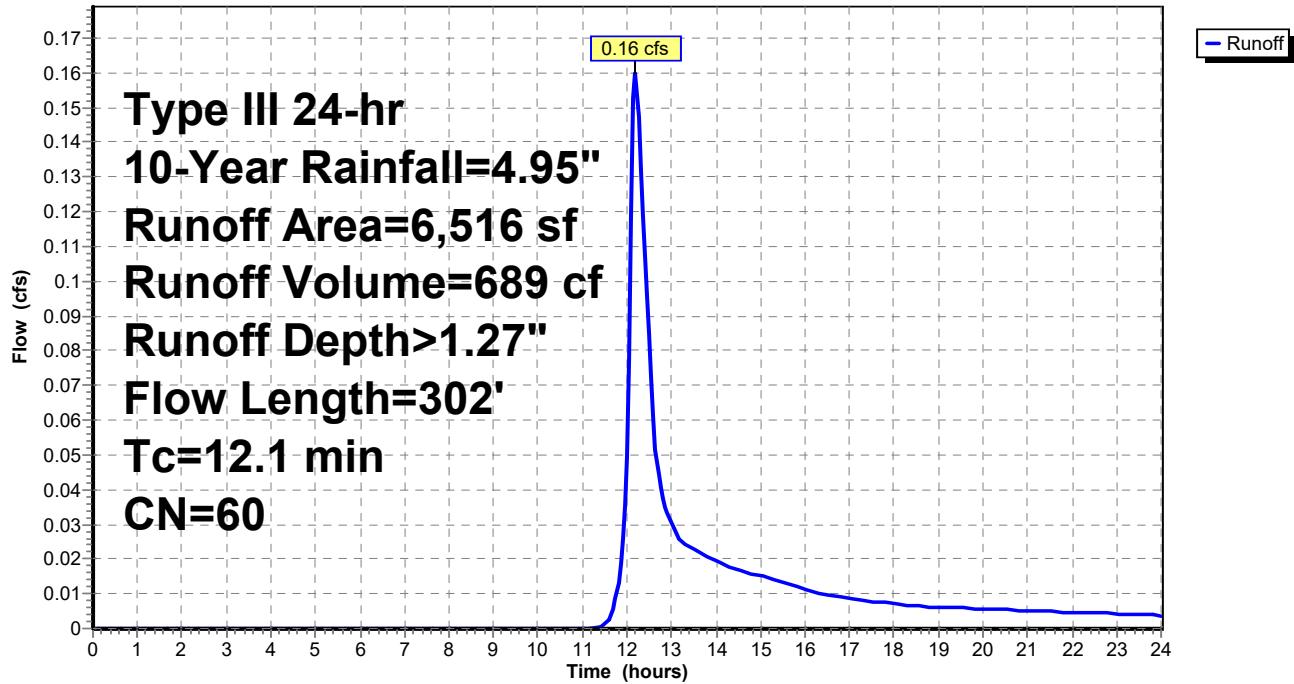
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.95"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,904	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,516	60	Weighted Average
6,193		95.04% Pervious Area
323		4.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment PRE 3: PRE 3

Hydrograph



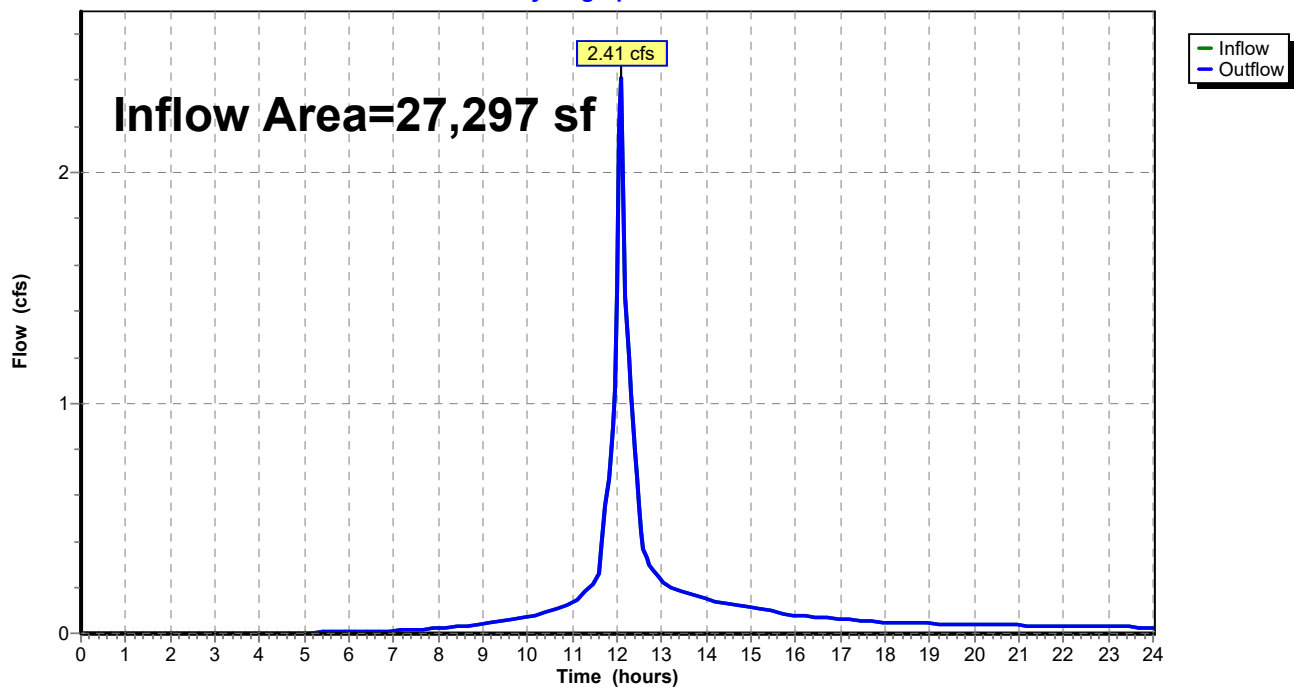
Summary for Reach CB1post: CB 1

Inflow Area = 27,297 sf, 69.27% Impervious, Inflow Depth > 3.46" for 10-Year event
Inflow = 2.41 cfs @ 12.09 hrs, Volume= 7,878 cf
Outflow = 2.41 cfs @ 12.09 hrs, Volume= 7,878 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1post : DP 1 post

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

Reach CB1post: CB 1

Hydrograph



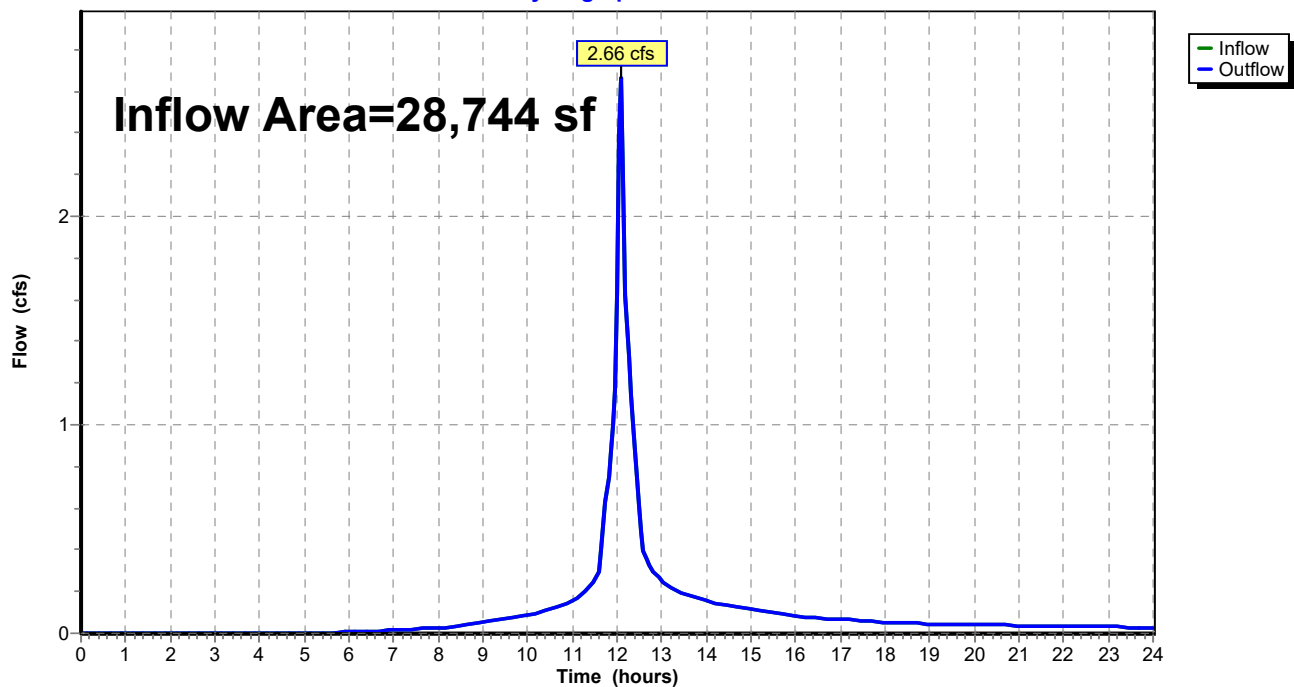
Summary for Reach CB1pre: CB 1

Inflow Area = 28,744 sf, 73.92% Impervious, Inflow Depth > 3.62" for 10-Year event
Inflow = 2.66 cfs @ 12.09 hrs, Volume= 8,668 cf
Outflow = 2.66 cfs @ 12.09 hrs, Volume= 8,668 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1pre : DP 1 pre

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

Reach CB1pre: CB 1

Hydrograph



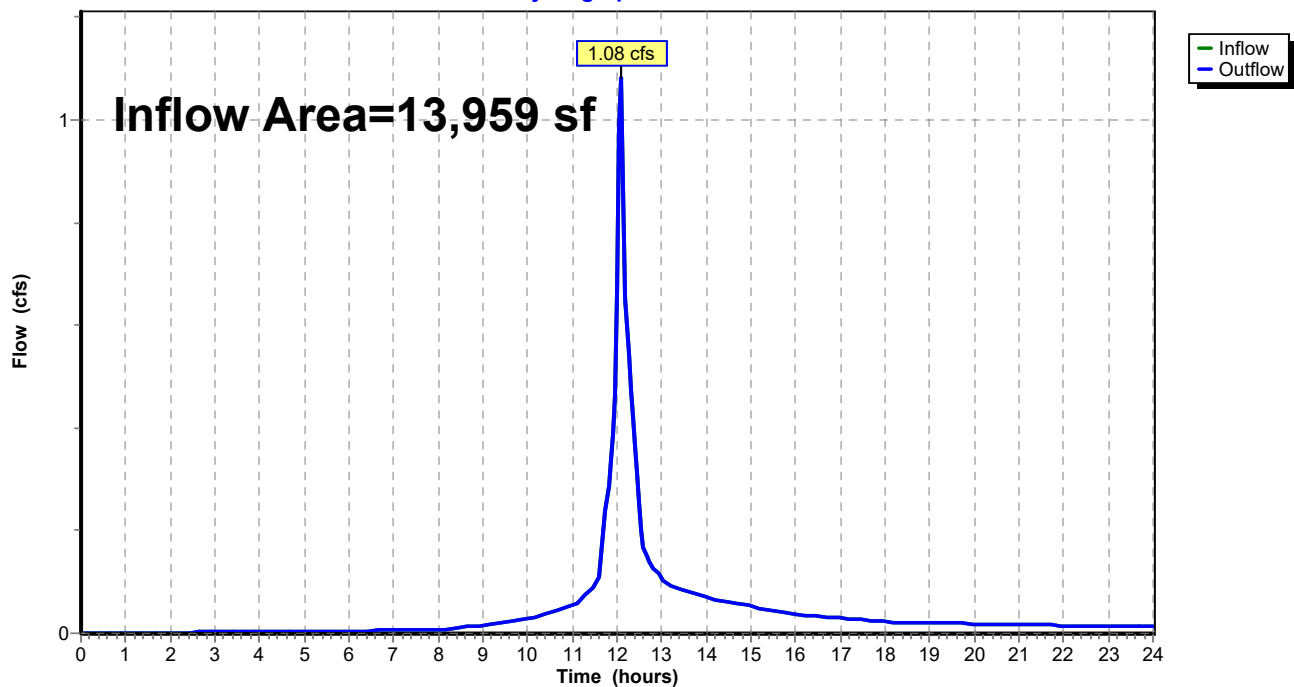
Summary for Reach CB2post: CB 2

Inflow Area = 13,959 sf, 57.70% Impervious, Inflow Depth > 3.08" for 10-Year event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 3,583 cf
Outflow = 1.08 cfs @ 12.09 hrs, Volume= 3,583 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1post : DP 1 post

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

Reach CB2post: CB 2

Hydrograph



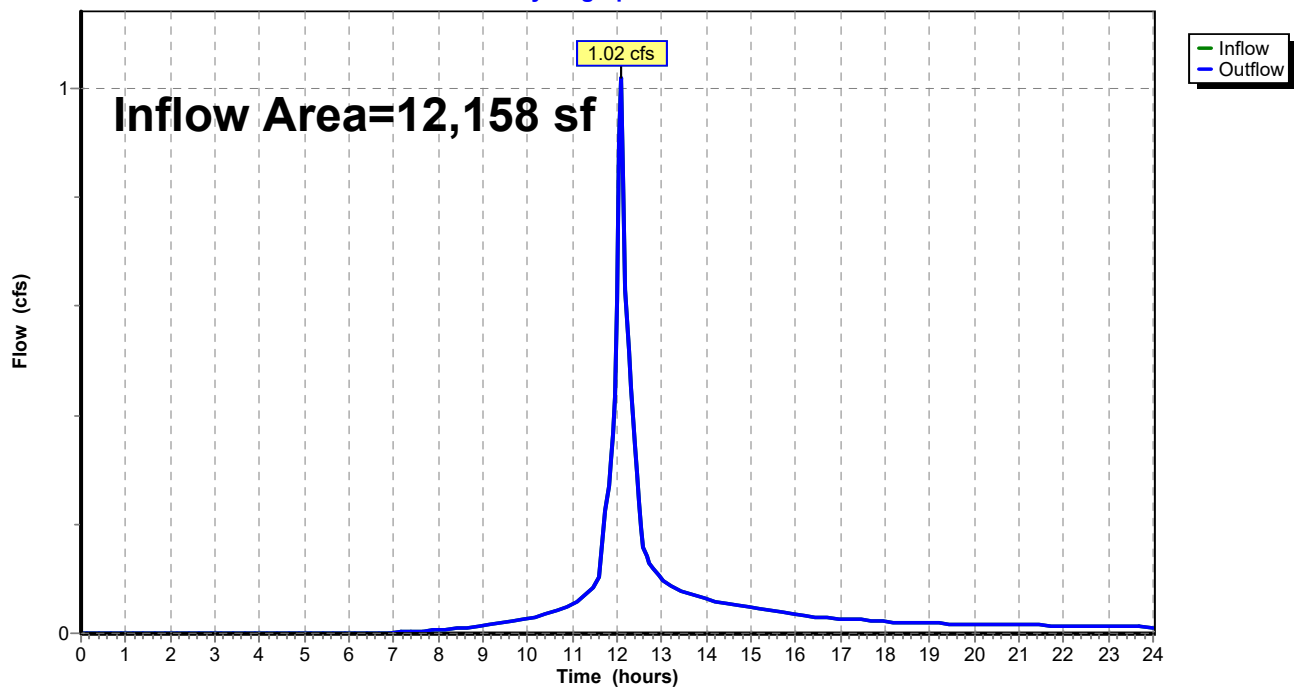
Summary for Reach CB2pre: CB 2

Inflow Area = 12,158 sf, 63.94% Impervious, Inflow Depth > 3.22" for 10-Year event
Inflow = 1.02 cfs @ 12.09 hrs, Volume= 3,264 cf
Outflow = 1.02 cfs @ 12.09 hrs, Volume= 3,264 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1pre : DP 1 pre

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

Reach CB2pre: CB 2

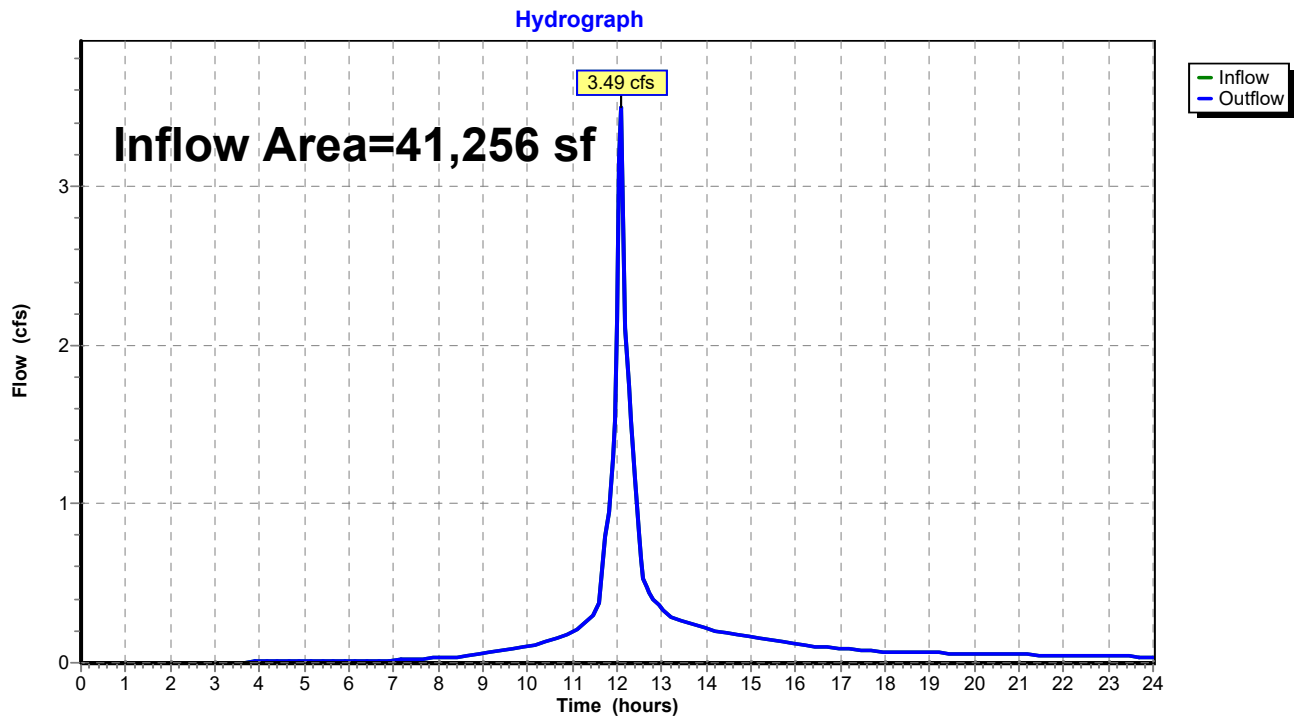
Hydrograph



Summary for Reach DP1post: DP 1 post

Inflow Area = 41,256 sf, 65.35% Impervious, Inflow Depth > 3.33" for 10-Year event
Inflow = 3.49 cfs @ 12.09 hrs, Volume= 11,461 cf
Outflow = 3.49 cfs @ 12.09 hrs, Volume= 11,461 cf, Atten= 0%, Lag= 0.0 min

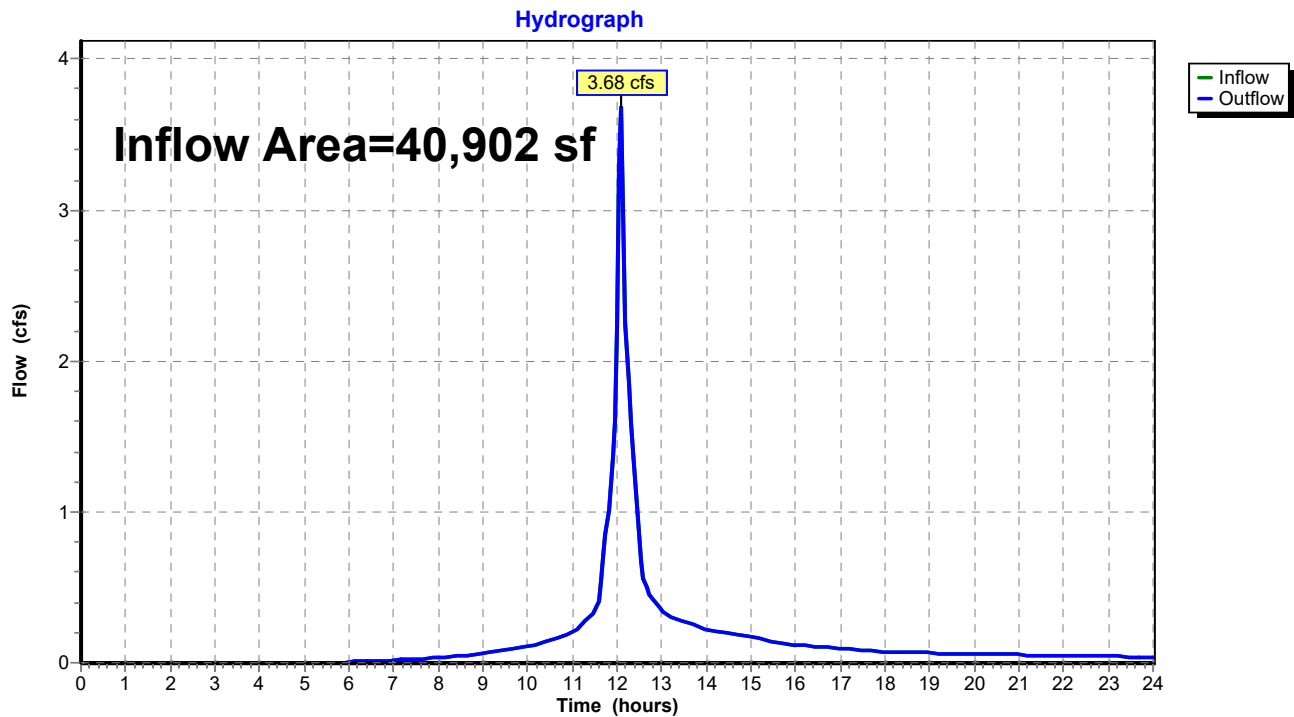
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1post: DP 1 post

Summary for Reach DP1pre: DP 1 pre

Inflow Area = 40,902 sf, 70.95% Impervious, Inflow Depth > 3.50" for 10-Year event
Inflow = 3.68 cfs @ 12.09 hrs, Volume= 11,932 cf
Outflow = 3.68 cfs @ 12.09 hrs, Volume= 11,932 cf, Atten= 0%, Lag= 0.0 min

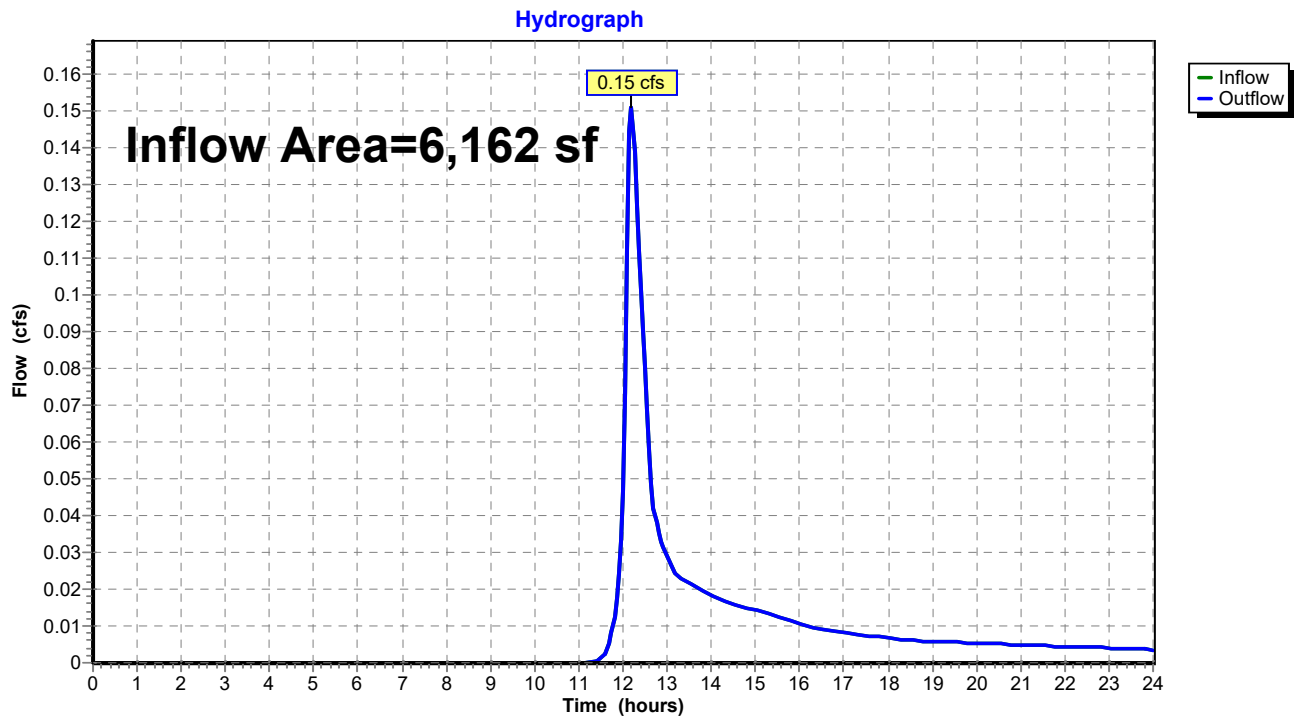
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1pre: DP 1 pre

Summary for Reach DP2post: DP 2 post

Inflow Area = 6,162 sf, 5.24% Impervious, Inflow Depth > 1.27" for 10-Year event
Inflow = 0.15 cfs @ 12.19 hrs, Volume= 651 cf
Outflow = 0.15 cfs @ 12.19 hrs, Volume= 651 cf, Atten= 0%, Lag= 0.0 min

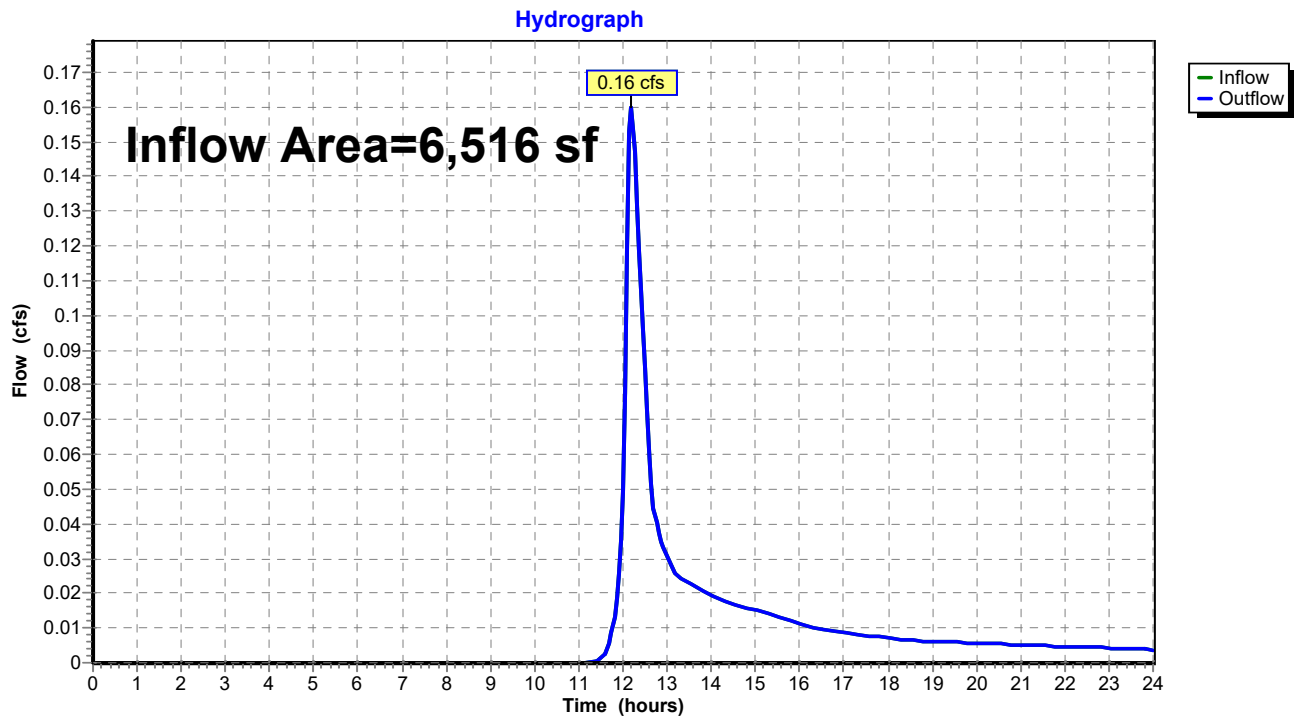
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP2post: DP 2 post

Summary for Reach DP2pre: DP 2 pre

Inflow Area = 6,516 sf, 4.96% Impervious, Inflow Depth > 1.27" for 10-Year event
Inflow = 0.16 cfs @ 12.19 hrs, Volume= 689 cf
Outflow = 0.16 cfs @ 12.19 hrs, Volume= 689 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP2pre: DP 2 pre

157 Market Street*Type III 24-hr 25-Year Rainfall=6.19"*

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 54

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentBLDG1: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>5.95" Tc=5.0 min CN=98 Runoff=0.40 cfs 1,400 cf
SubcatchmentBLDG2: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>5.95" Tc=5.0 min CN=98 Runoff=0.40 cfs 1,400 cf
SubcatchmentPOST 1: POST 1	Runoff Area=24,472 sf 65.72% Impervious Runoff Depth>4.48" Flow Length=280' Tc=6.3 min CN=85 Runoff=2.81 cfs 9,133 cf
SubcatchmentPOST 2: POST 2	Runoff Area=11,134 sf 46.96% Impervious Runoff Depth>3.74" Flow Length=274' Tc=6.3 min CN=78 Runoff=1.09 cfs 3,474 cf
SubcatchmentPOST 3: POST 3	Runoff Area=6,162 sf 5.24% Impervious Runoff Depth>2.04" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.26 cfs 1,048 cf
SubcatchmentPRE 1: PRE 1	Runoff Area=28,744 sf 73.92% Impervious Runoff Depth>4.81" Flow Length=280' Tc=6.3 min CN=88 Runoff=3.48 cfs 11,510 cf
SubcatchmentPRE 2: PRE 2	Runoff Area=12,158 sf 63.94% Impervious Runoff Depth>4.37" Flow Length=274' Tc=6.3 min CN=84 Runoff=1.37 cfs 4,429 cf
SubcatchmentPRE 3: PRE 3	Runoff Area=6,516 sf 4.96% Impervious Runoff Depth>2.04" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.27 cfs 1,108 cf
Reach CB1post: CB 1	Inflow=3.19 cfs 10,533 cf Outflow=3.19 cfs 10,533 cf
Reach CB1pre: CB 1	Inflow=3.48 cfs 11,510 cf Outflow=3.48 cfs 11,510 cf
Reach CB2post: CB 2	Inflow=1.47 cfs 4,874 cf Outflow=1.47 cfs 4,874 cf
Reach CB2pre: CB 2	Inflow=1.37 cfs 4,429 cf Outflow=1.37 cfs 4,429 cf
Reach DP1post: DP 1 post	Inflow=4.66 cfs 15,408 cf Outflow=4.66 cfs 15,408 cf
Reach DP1pre: DP 1 pre	Inflow=4.85 cfs 15,939 cf Outflow=4.85 cfs 15,939 cf
Reach DP2post: DP 2 post	Inflow=0.26 cfs 1,048 cf Outflow=0.26 cfs 1,048 cf
Reach DP2pre: DP 2 pre	Inflow=0.27 cfs 1,108 cf Outflow=0.27 cfs 1,108 cf

157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 55

Total Runoff Area = 94,836 sf Runoff Volume = 33,503 cf Average Runoff Depth = 4.24"
40.29% Pervious = 38,207 sf 59.71% Impervious = 56,629 sf

157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 56

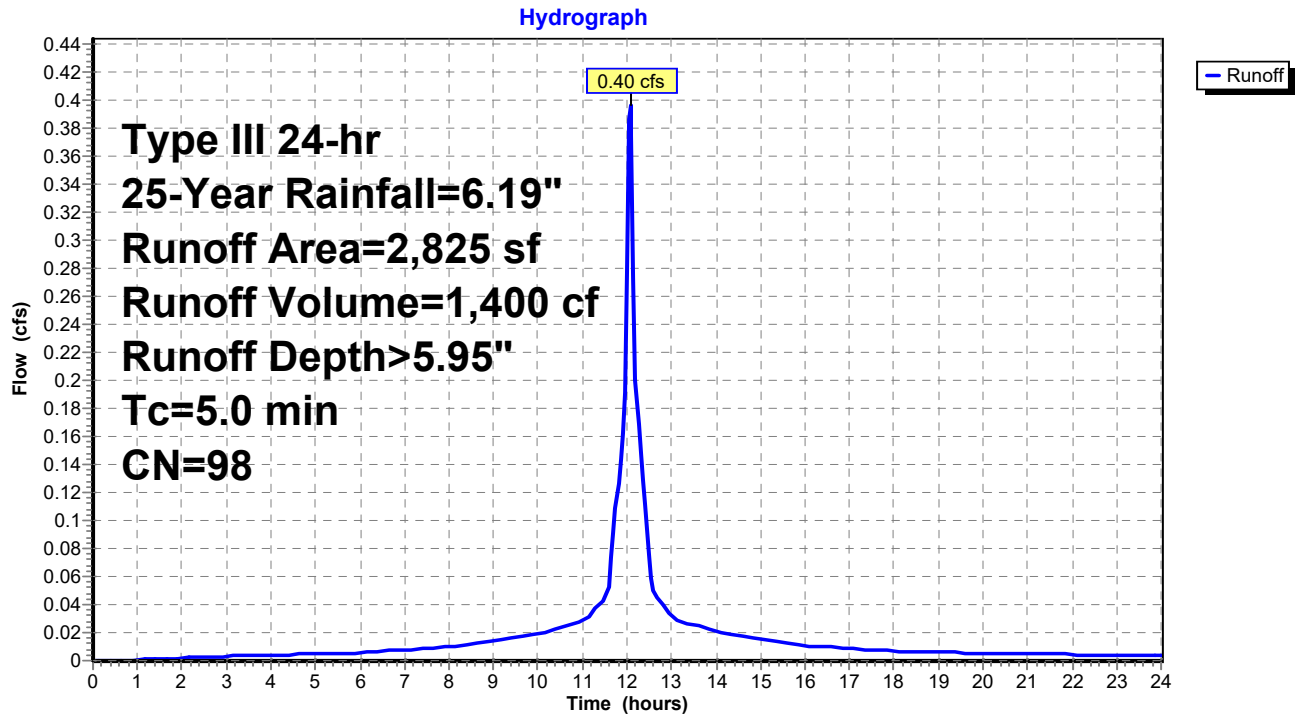
Summary for Subcatchment BLDG1: 1/2 BUILDING

Runoff = 0.40 cfs @ 12.07 hrs, Volume= 1,400 cf, Depth> 5.95"
Routed to Reach CB1post : CB 1

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=6.19"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG1: 1/2 BUILDING

157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 57

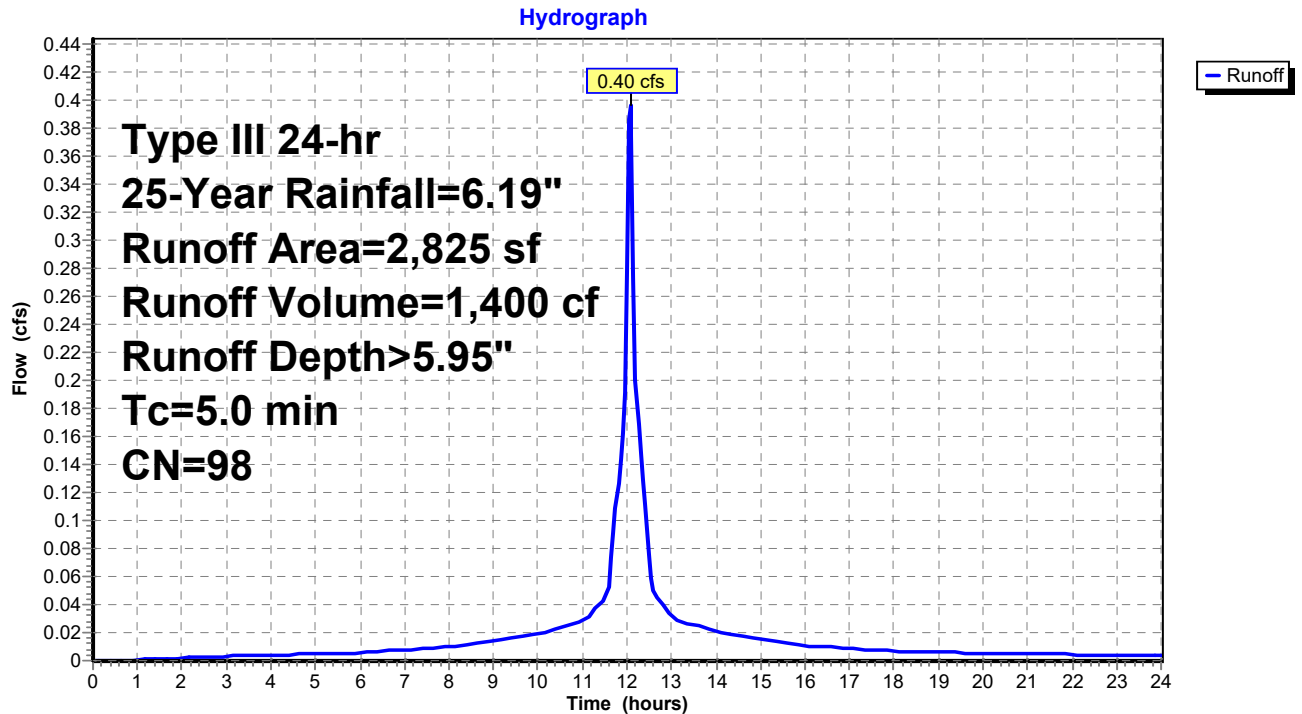
Summary for Subcatchment BLDG2: 1/2 BUILDING

Runoff = 0.40 cfs @ 12.07 hrs, Volume= 1,400 cf, Depth> 5.95"
Routed to Reach CB2post : CB 2

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=6.19"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG2: 1/2 BUILDING

157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 58

Summary for Subcatchment POST 1: POST 1

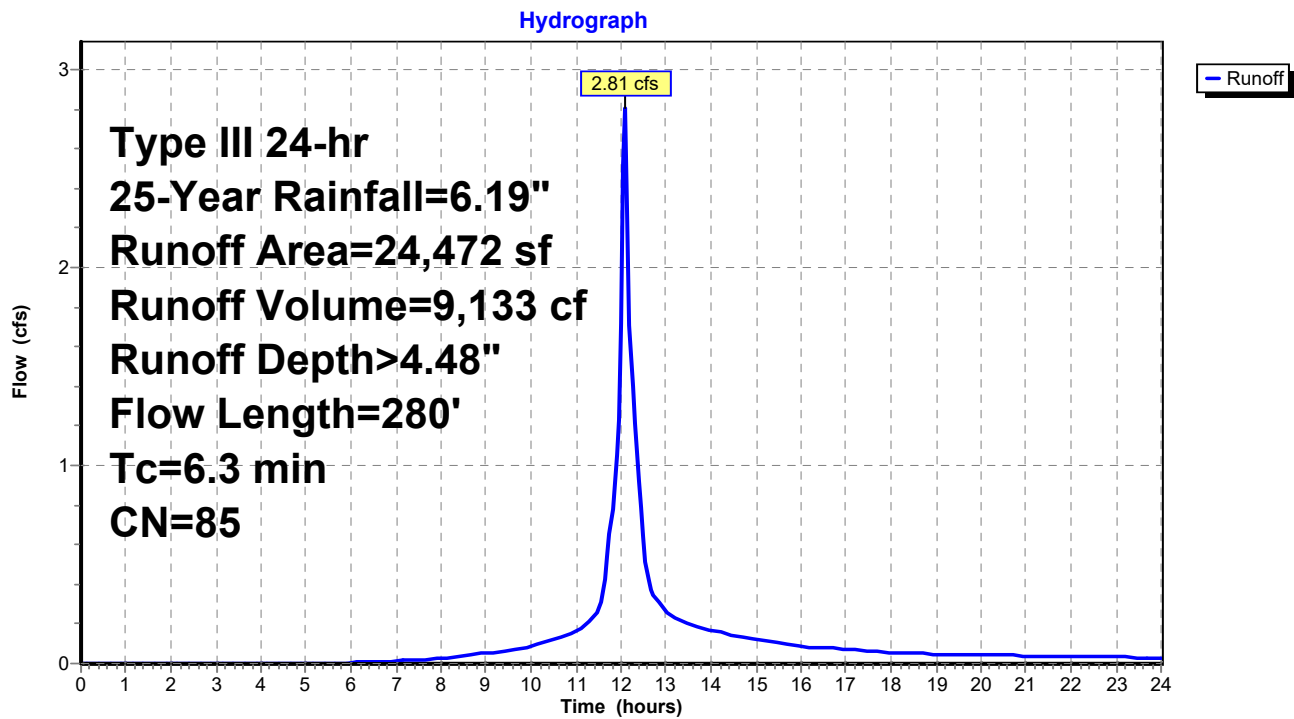
Runoff = 2.81 cfs @ 12.09 hrs, Volume= 9,133 cf, Depth> 4.48"
 Routed to Reach CB1post : CB 1

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=6.19"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
8,206	61	>75% Grass cover, Good, HSG B
14,824	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
1,259	98	Paved parking, HSG B
24,472	85	Weighted Average
8,389		34.28% Pervious Area
16,083		65.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment POST 1: POST 1



157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 60

Summary for Subcatchment POST 2: POST 2

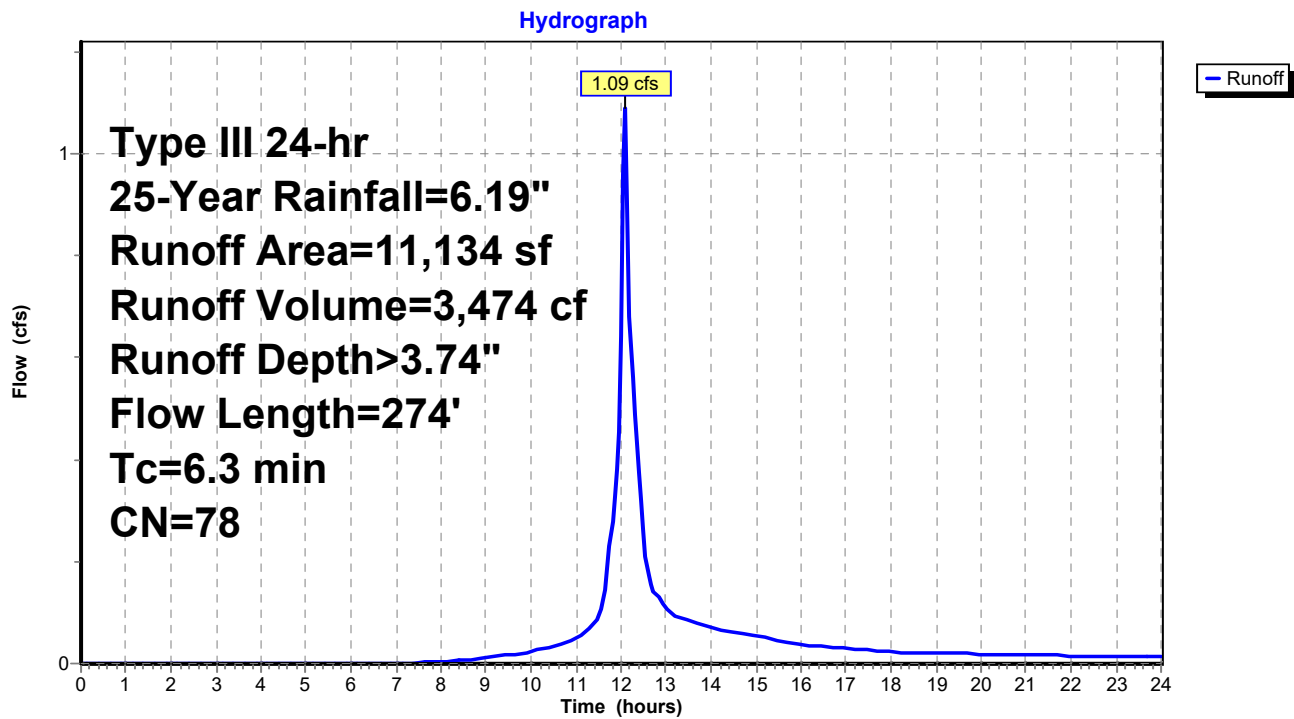
Runoff = 1.09 cfs @ 12.10 hrs, Volume= 3,474 cf, Depth> 3.74"
 Routed to Reach CB2post : CB 2

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=6.19"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
5,510	61	>75% Grass cover, Good, HSG B
4,654	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
575	98	Paved parking, HSG B
11,134	78	Weighted Average
5,905		53.04% Pervious Area
5,229		46.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment POST 2: POST 2



157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 62

Summary for Subcatchment POST 3: POST 3

Runoff = 0.26 cfs @ 12.18 hrs, Volume= 1,048 cf, Depth> 2.04"
 Routed to Reach DP2post : DP 2 post

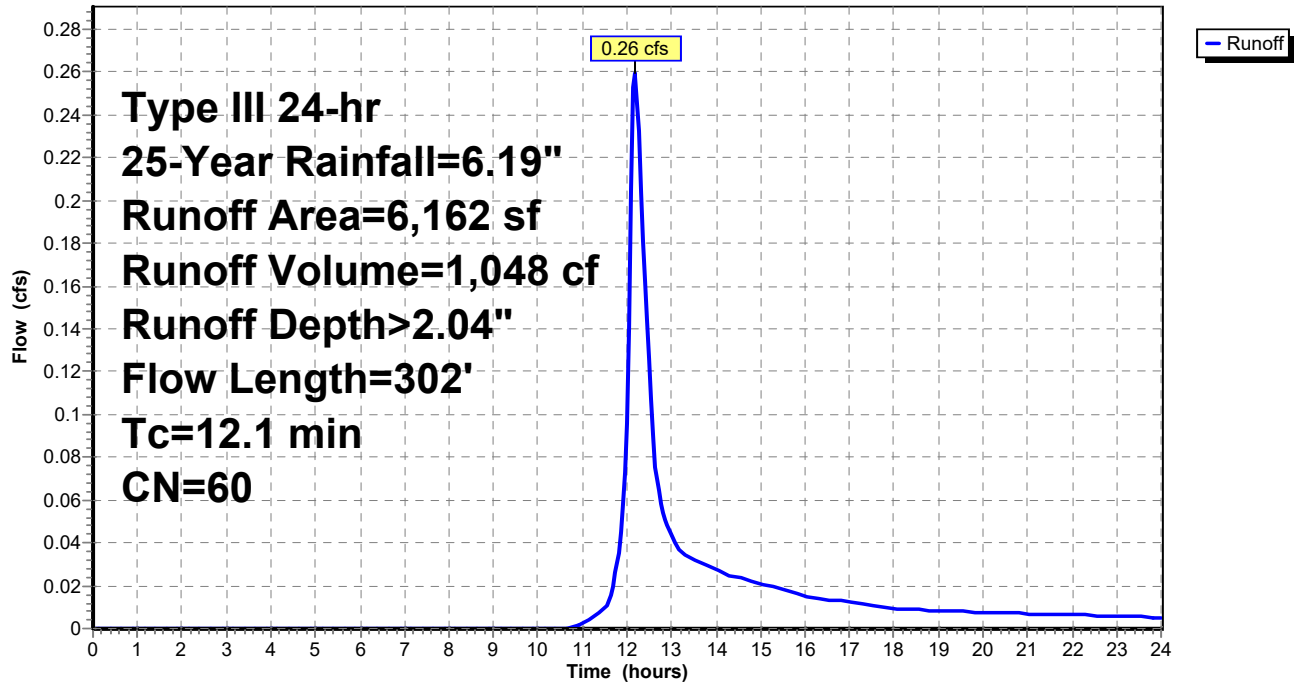
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.19"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,550	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,162	60	Weighted Average
5,839		94.76% Pervious Area
323		5.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment POST 3: POST 3

Hydrograph



157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 64

Summary for Subcatchment PRE 1: PRE 1

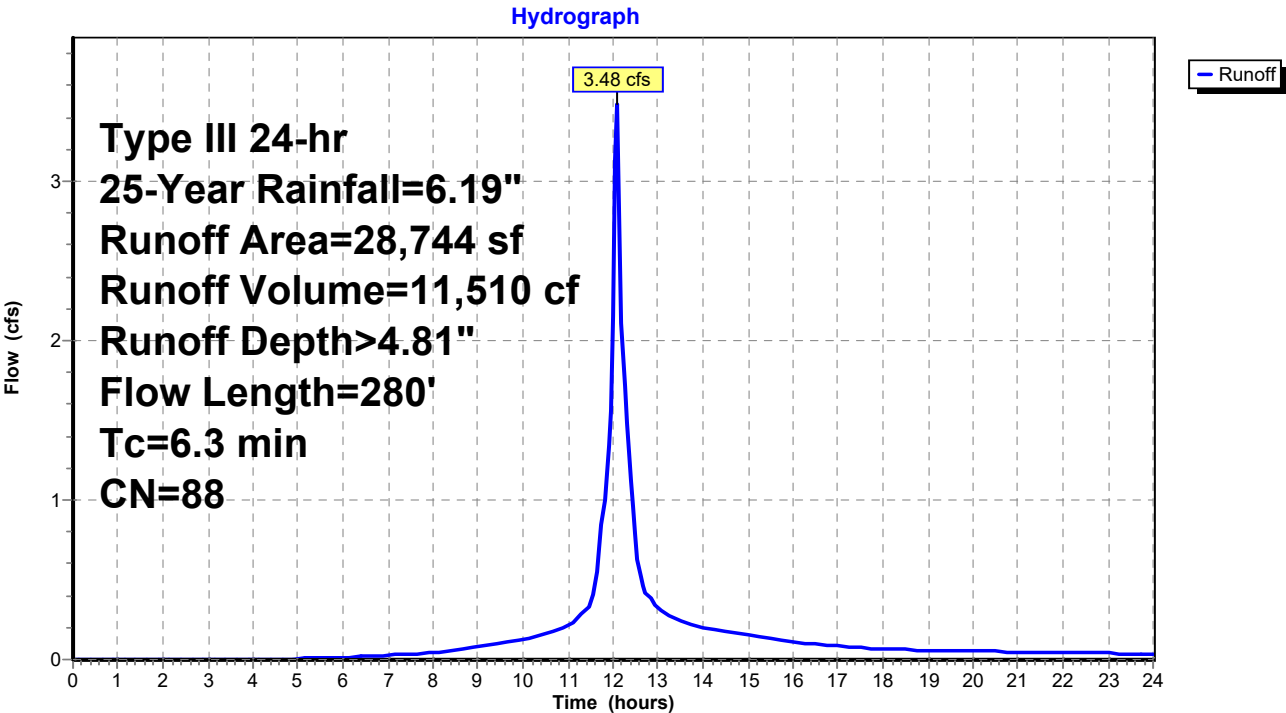
Runoff = 3.48 cfs @ 12.09 hrs, Volume= 11,510 cf, Depth> 4.81"
 Routed to Reach CB1pre : CB 1

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=6.19"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
7,314	61	>75% Grass cover, Good, HSG B
17,874	98	Paved parking, HSG B
1,722	98	Unconnected roofs, HSG B
1,651	98	Paved parking, HSG B
28,744	88	Weighted Average
7,497		26.08% Pervious Area
21,247		73.92% Impervious Area
1,722		8.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment PRE 1: PRE 1



157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 66

Summary for Subcatchment PRE 2: PRE 2

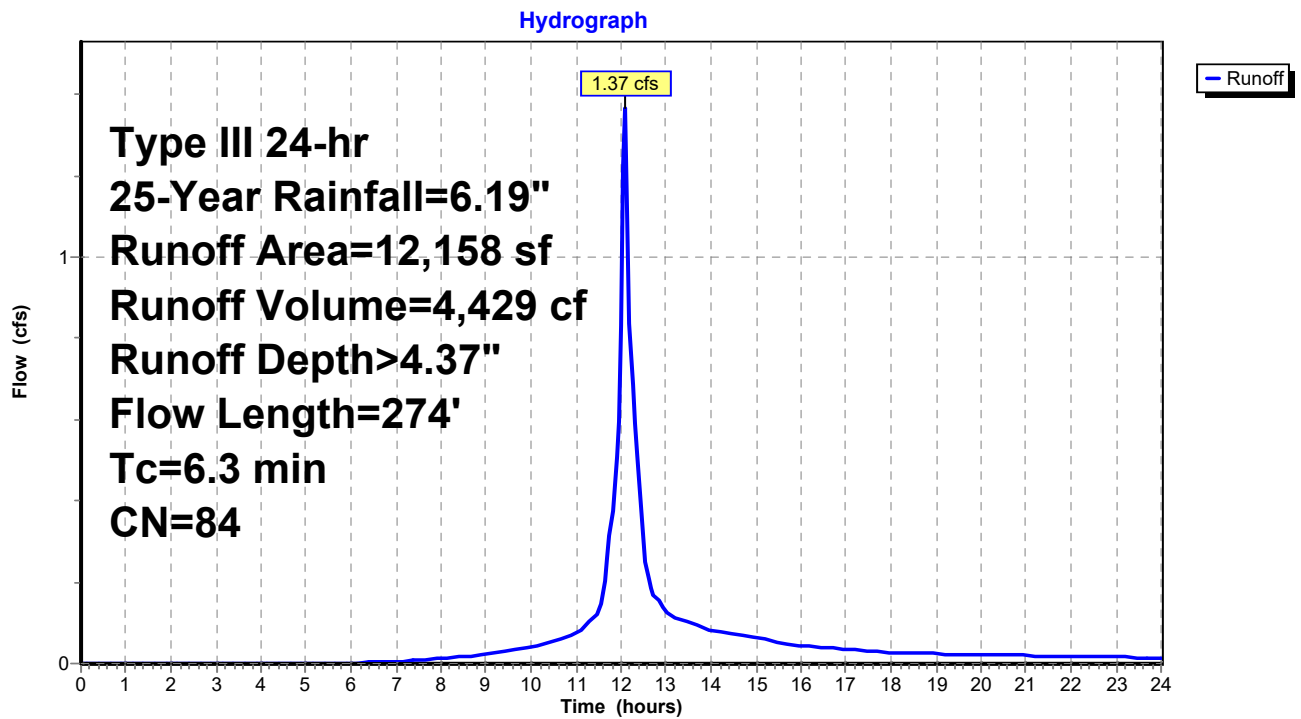
Runoff = 1.37 cfs @ 12.09 hrs, Volume= 4,429 cf, Depth> 4.37"
 Routed to Reach CB2pre : CB 2

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=6.19"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
3,989	61	>75% Grass cover, Good, HSG B
5,930	98	Paved parking, HSG B
1,526	98	Unconnected roofs, HSG B
318	98	Paved parking, HSG B
12,158	84	Weighted Average
4,384		36.06% Pervious Area
7,774		63.94% Impervious Area
1,526		19.63% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment PRE 2: PRE 2



157 Market Street

Type III 24-hr 25-Year Rainfall=6.19"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 68

Summary for Subcatchment PRE 3: PRE 3

Runoff = 0.27 cfs @ 12.18 hrs, Volume= 1,108 cf, Depth> 2.04"
 Routed to Reach DP2pre : DP 2 pre

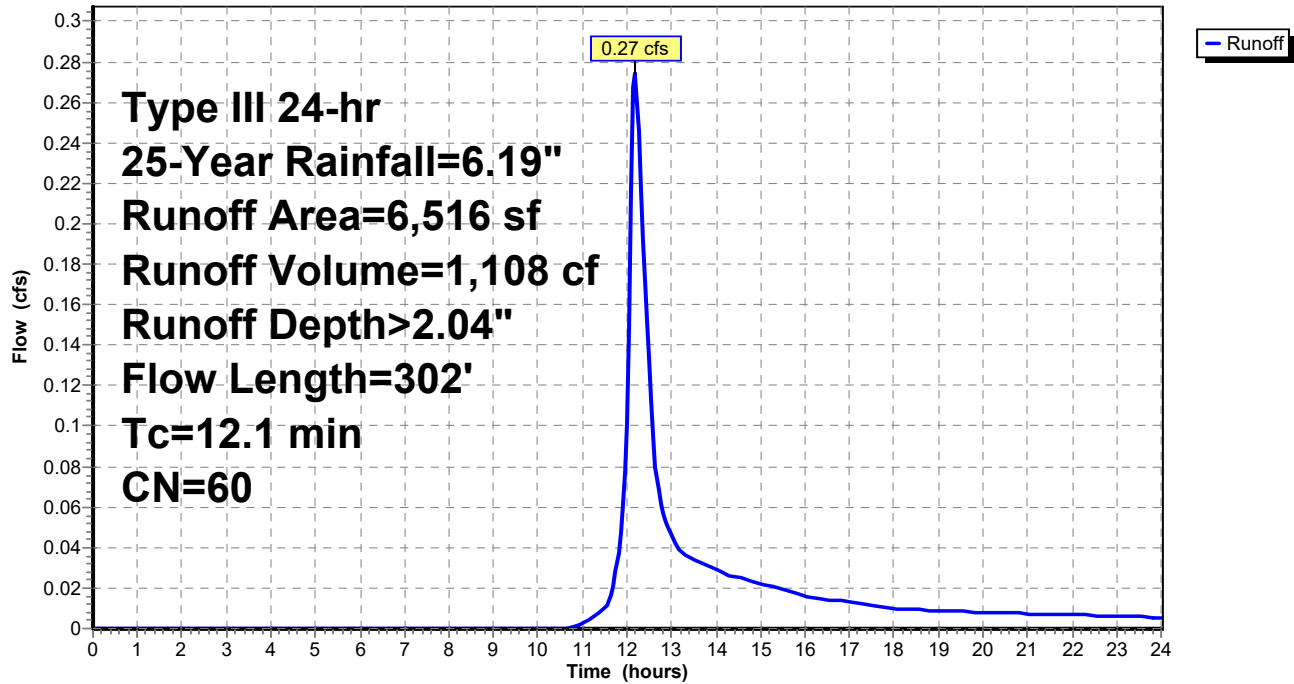
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.19"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,904	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,516	60	Weighted Average
6,193		95.04% Pervious Area
323		4.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment PRE 3: PRE 3

Hydrograph

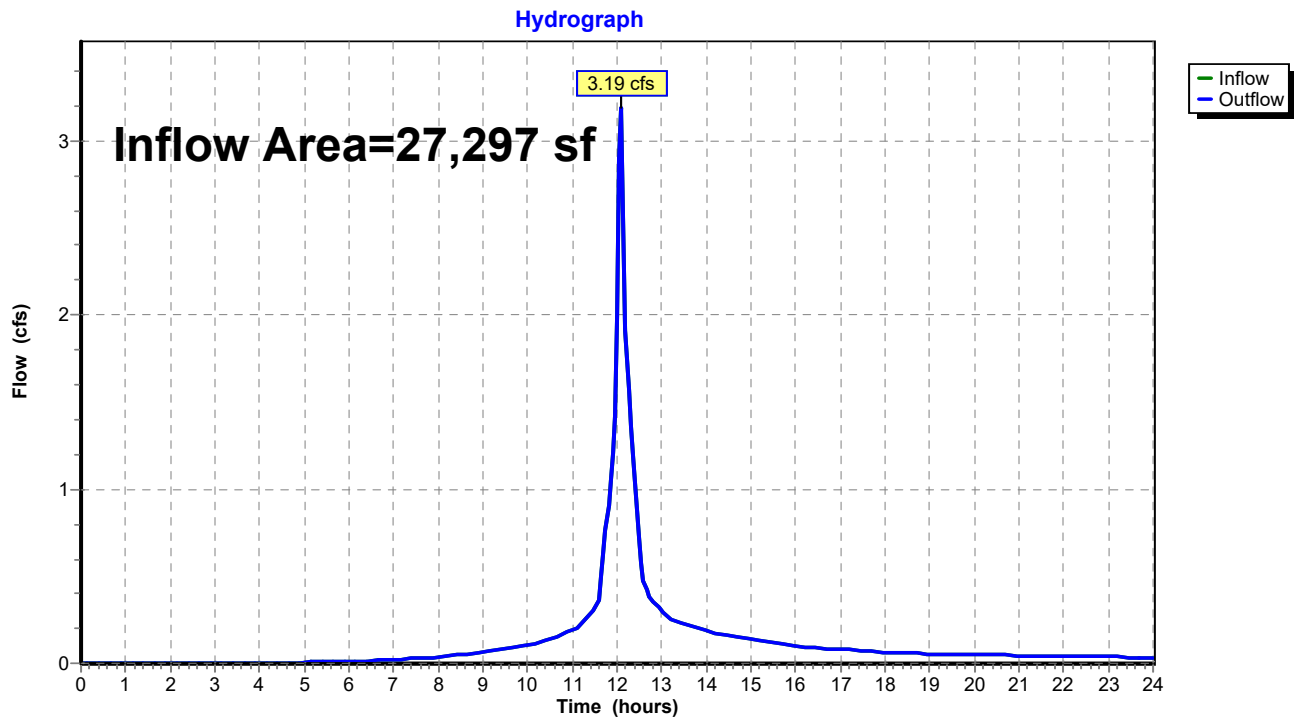


Summary for Reach CB1post: CB 1

Inflow Area = 27,297 sf, 69.27% Impervious, Inflow Depth > 4.63" for 25-Year event
 Inflow = 3.19 cfs @ 12.09 hrs, Volume= 10,533 cf
 Outflow = 3.19 cfs @ 12.09 hrs, Volume= 10,533 cf, Atten= 0%, Lag= 0.0 min
 Routed to Reach DP1post : DP 1 post

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

Reach CB1post: CB 1



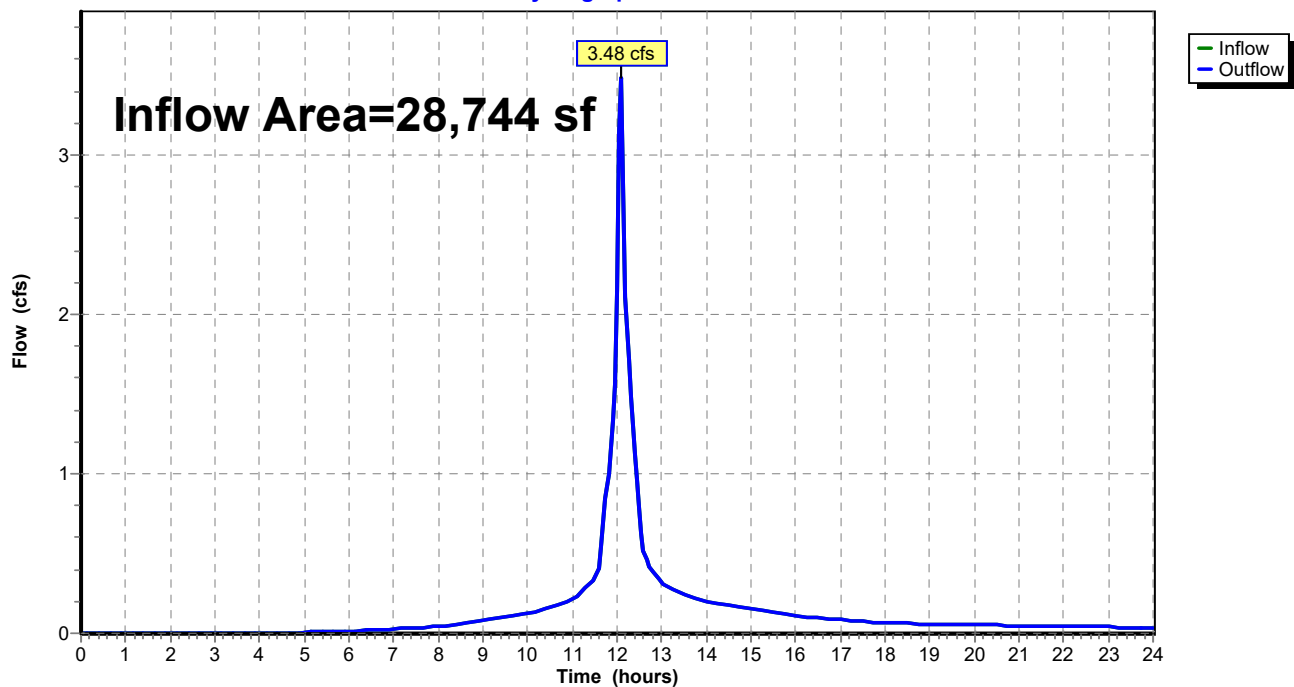
Summary for Reach CB1pre: CB 1

Inflow Area = 28,744 sf, 73.92% Impervious, Inflow Depth > 4.81" for 25-Year event
Inflow = 3.48 cfs @ 12.09 hrs, Volume= 11,510 cf
Outflow = 3.48 cfs @ 12.09 hrs, Volume= 11,510 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1pre : DP 1 pre

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

Reach CB1pre: CB 1

Hydrograph



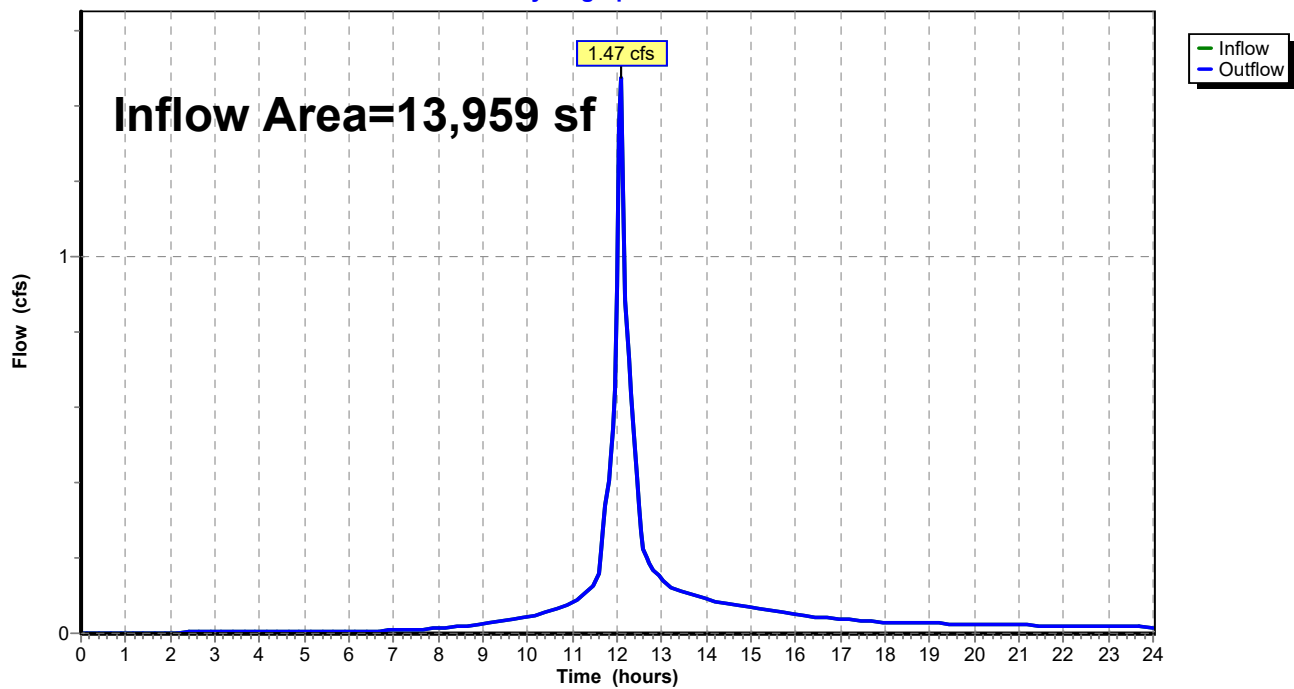
Summary for Reach CB2post: CB 2

Inflow Area = 13,959 sf, 57.70% Impervious, Inflow Depth > 4.19" for 25-Year event
Inflow = 1.47 cfs @ 12.09 hrs, Volume= 4,874 cf
Outflow = 1.47 cfs @ 12.09 hrs, Volume= 4,874 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1post : DP 1 post

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

Reach CB2post: CB 2

Hydrograph



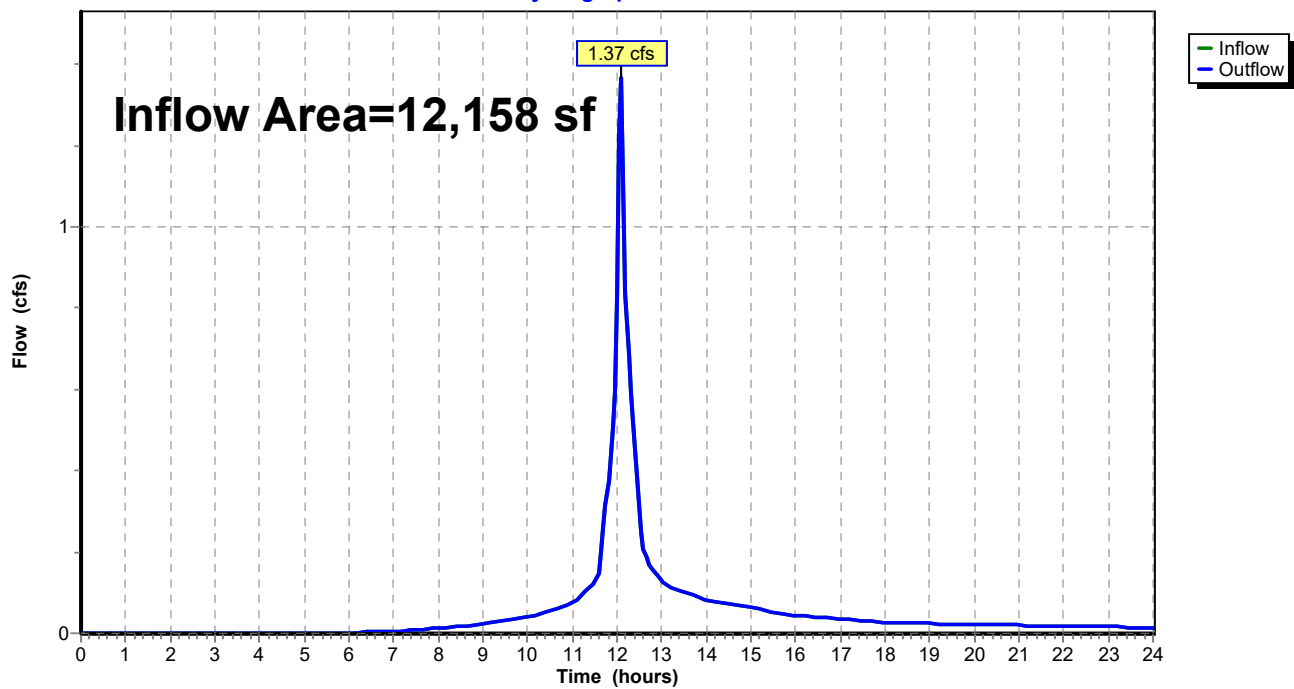
Summary for Reach CB2pre: CB 2

Inflow Area = 12,158 sf, 63.94% Impervious, Inflow Depth > 4.37" for 25-Year event
Inflow = 1.37 cfs @ 12.09 hrs, Volume= 4,429 cf
Outflow = 1.37 cfs @ 12.09 hrs, Volume= 4,429 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1pre : DP 1 pre

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

Reach CB2pre: CB 2

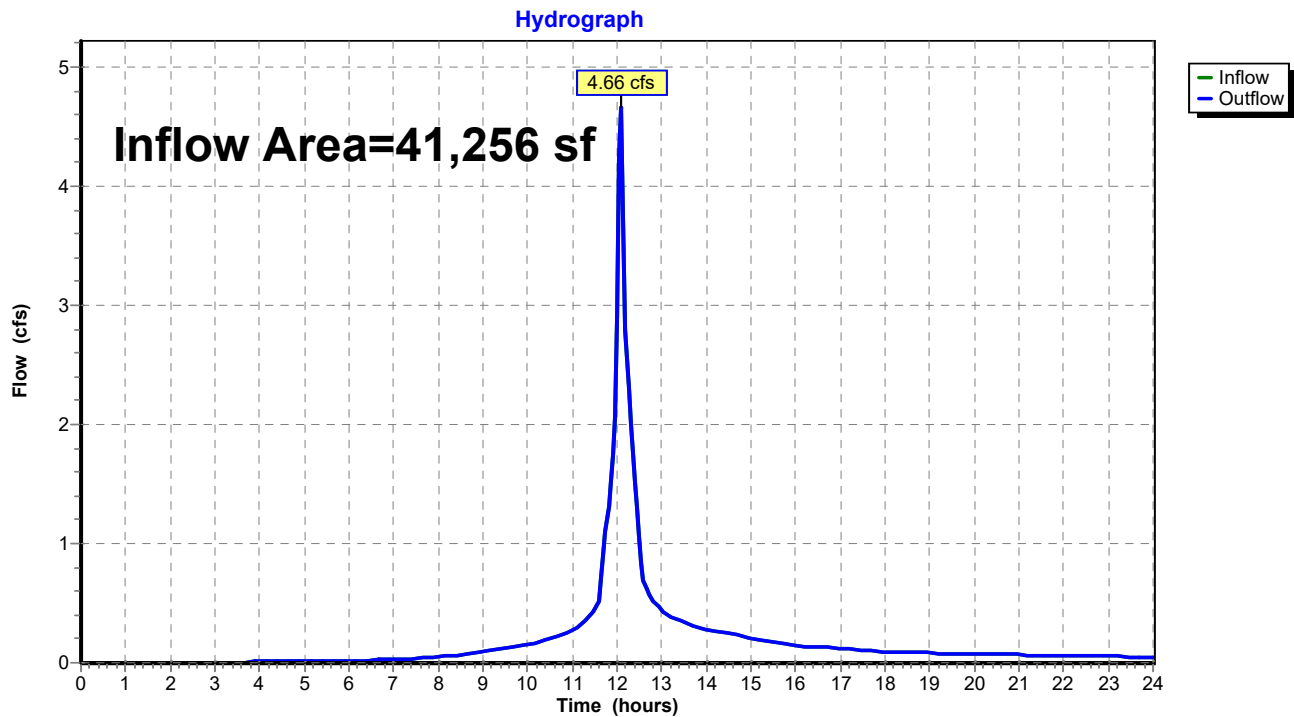
Hydrograph



Summary for Reach DP1post: DP 1 post

Inflow Area = 41,256 sf, 65.35% Impervious, Inflow Depth > 4.48" for 25-Year event
Inflow = 4.66 cfs @ 12.09 hrs, Volume= 15,408 cf
Outflow = 4.66 cfs @ 12.09 hrs, Volume= 15,408 cf, Atten= 0%, Lag= 0.0 min

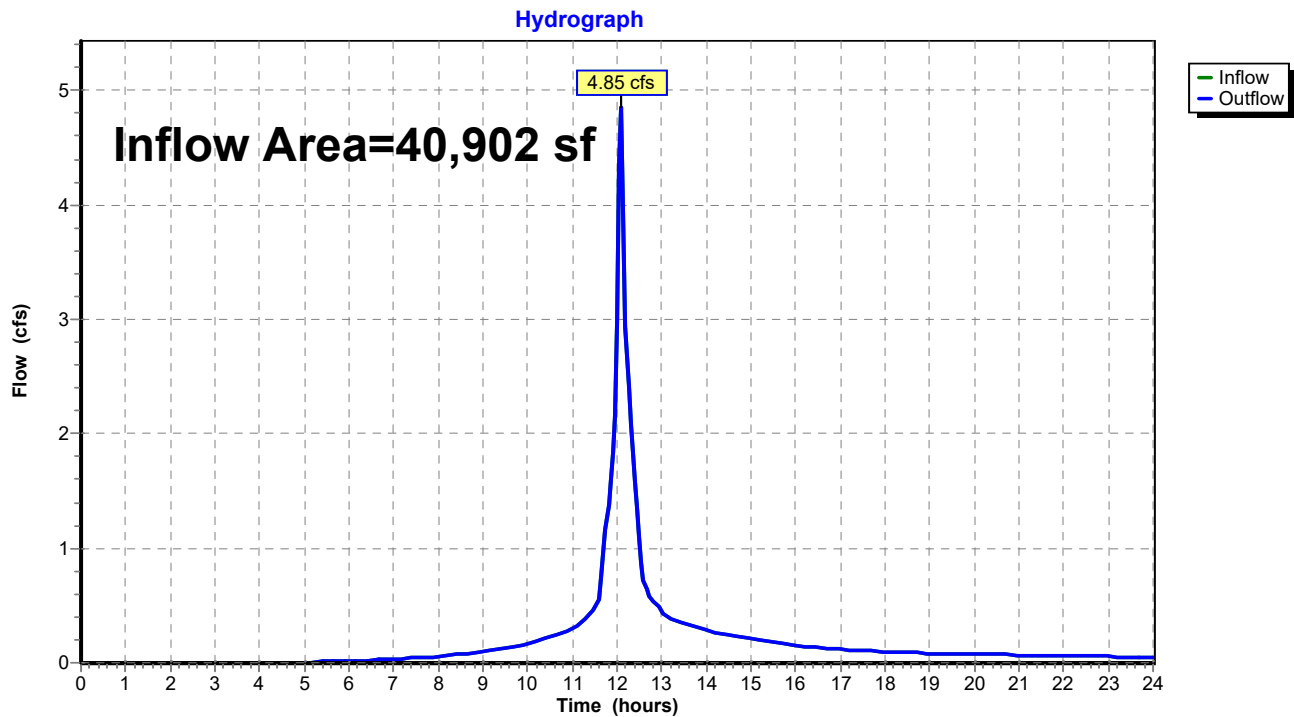
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1post: DP 1 post

Summary for Reach DP1pre: DP 1 pre

Inflow Area = 40,902 sf, 70.95% Impervious, Inflow Depth > 4.68" for 25-Year event
Inflow = 4.85 cfs @ 12.09 hrs, Volume= 15,939 cf
Outflow = 4.85 cfs @ 12.09 hrs, Volume= 15,939 cf, Atten= 0%, Lag= 0.0 min

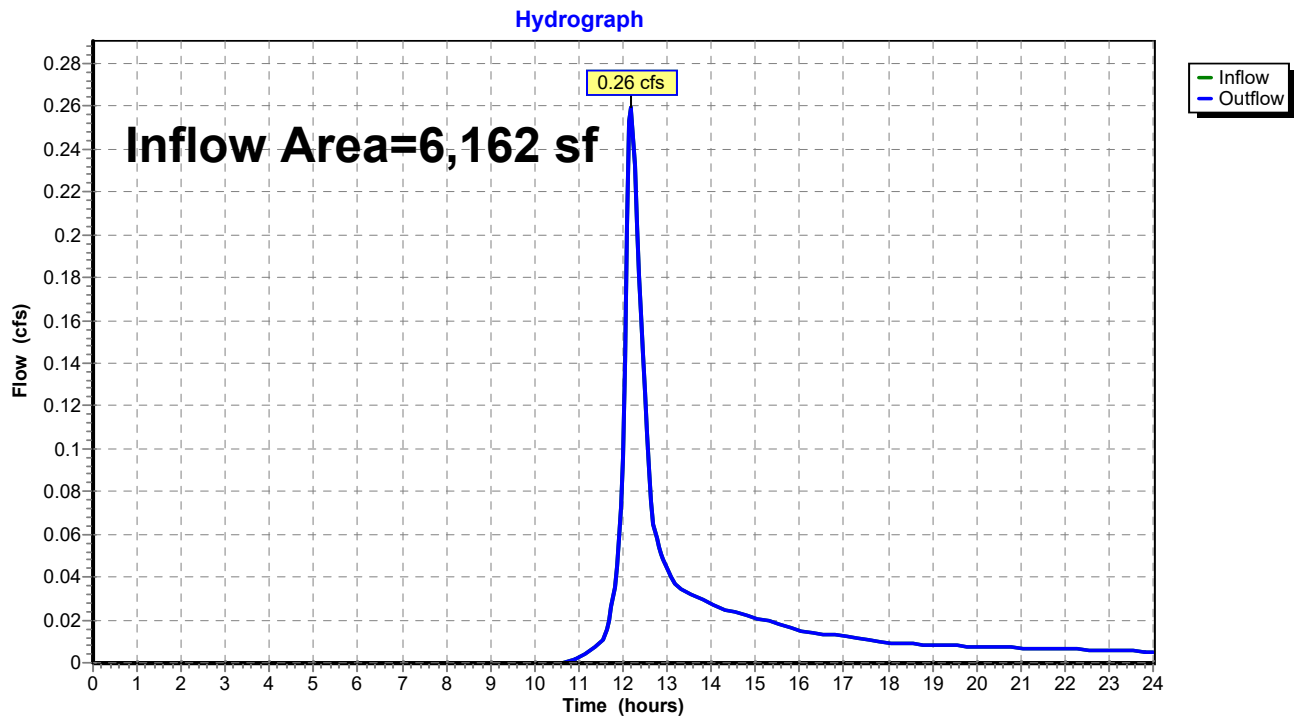
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1pre: DP 1 pre

Summary for Reach DP2post: DP 2 post

Inflow Area = 6,162 sf, 5.24% Impervious, Inflow Depth > 2.04" for 25-Year event
Inflow = 0.26 cfs @ 12.18 hrs, Volume= 1,048 cf
Outflow = 0.26 cfs @ 12.18 hrs, Volume= 1,048 cf, Atten= 0%, Lag= 0.0 min

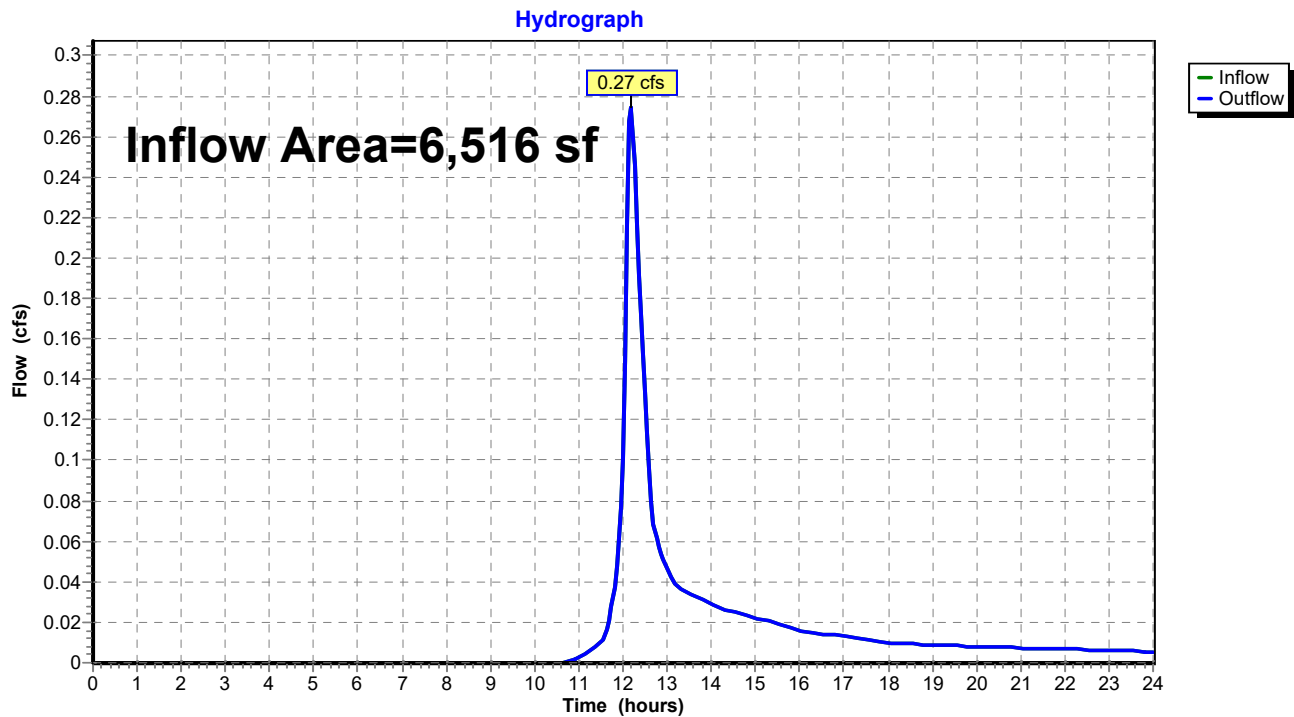
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP2post: DP 2 post

Summary for Reach DP2pre: DP 2 pre

Inflow Area = 6,516 sf, 4.96% Impervious, Inflow Depth > 2.04" for 25-Year event
Inflow = 0.27 cfs @ 12.18 hrs, Volume= 1,108 cf
Outflow = 0.27 cfs @ 12.18 hrs, Volume= 1,108 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP2pre: DP 2 pre

157 Market Street*Type III 24-hr 100-Year Rainfall=8.68"*

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 78

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentBLDG1: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>8.44" Tc=5.0 min CN=98 Runoff=0.56 cfs 1,986 cf
SubcatchmentBLDG2: 1/2 BUILDING	Runoff Area=2,825 sf 100.00% Impervious Runoff Depth>8.44" Tc=5.0 min CN=98 Runoff=0.56 cfs 1,986 cf
SubcatchmentPOST 1: POST 1	Runoff Area=24,472 sf 65.72% Impervious Runoff Depth>6.87" Flow Length=280' Tc=6.3 min CN=85 Runoff=4.21 cfs 14,001 cf
SubcatchmentPOST 2: POST 2	Runoff Area=11,134 sf 46.96% Impervious Runoff Depth>6.02" Flow Length=274' Tc=6.3 min CN=78 Runoff=1.73 cfs 5,583 cf
SubcatchmentPOST 3: POST 3	Runoff Area=6,162 sf 5.24% Impervious Runoff Depth>3.84" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.51 cfs 1,973 cf
SubcatchmentPRE 1: PRE 1	Runoff Area=28,744 sf 73.92% Impervious Runoff Depth>7.23" Flow Length=280' Tc=6.3 min CN=88 Runoff=5.12 cfs 17,315 cf
SubcatchmentPRE 2: PRE 2	Runoff Area=12,158 sf 63.94% Impervious Runoff Depth>6.74" Flow Length=274' Tc=6.3 min CN=84 Runoff=2.07 cfs 6,833 cf
SubcatchmentPRE 3: PRE 3	Runoff Area=6,516 sf 4.96% Impervious Runoff Depth>3.84" Flow Length=302' Tc=12.1 min CN=60 Runoff=0.54 cfs 2,086 cf
Reach CB1post: CB 1	Inflow=4.75 cfs 15,987 cf Outflow=4.75 cfs 15,987 cf
Reach CB1pre: CB 1	Inflow=5.12 cfs 17,315 cf Outflow=5.12 cfs 17,315 cf
Reach CB2post: CB 2	Inflow=2.27 cfs 7,569 cf Outflow=2.27 cfs 7,569 cf
Reach CB2pre: CB 2	Inflow=2.07 cfs 6,833 cf Outflow=2.07 cfs 6,833 cf
Reach DP1post: DP 1 post	Inflow=7.02 cfs 23,557 cf Outflow=7.02 cfs 23,557 cf
Reach DP1pre: DP 1 pre	Inflow=7.19 cfs 24,149 cf Outflow=7.19 cfs 24,149 cf
Reach DP2post: DP 2 post	Inflow=0.51 cfs 1,973 cf Outflow=0.51 cfs 1,973 cf
Reach DP2pre: DP 2 pre	Inflow=0.54 cfs 2,086 cf Outflow=0.54 cfs 2,086 cf

157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 79

Total Runoff Area = 94,836 sf Runoff Volume = 51,765 cf Average Runoff Depth = 6.55"
40.29% Pervious = 38,207 sf 59.71% Impervious = 56,629 sf

157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.68"

Page 80

Summary for Subcatchment BLDG1: 1/2 BUILDING

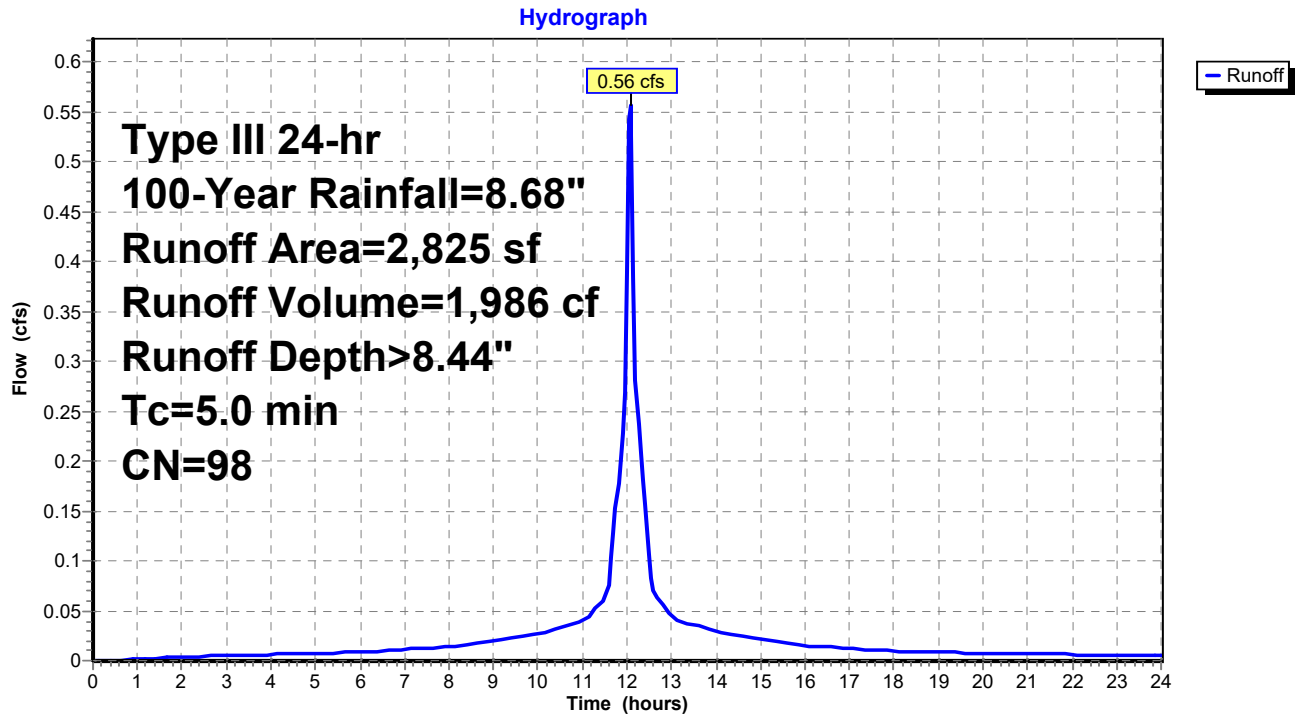
Runoff = 0.56 cfs @ 12.07 hrs, Volume= 1,986 cf, Depth> 8.44"
Routed to Reach CB1post : CB 1

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=8.68"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG1: 1/2 BUILDING



157 Market Street

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.68"

Page 81

Summary for Subcatchment BLDG2: 1/2 BUILDING

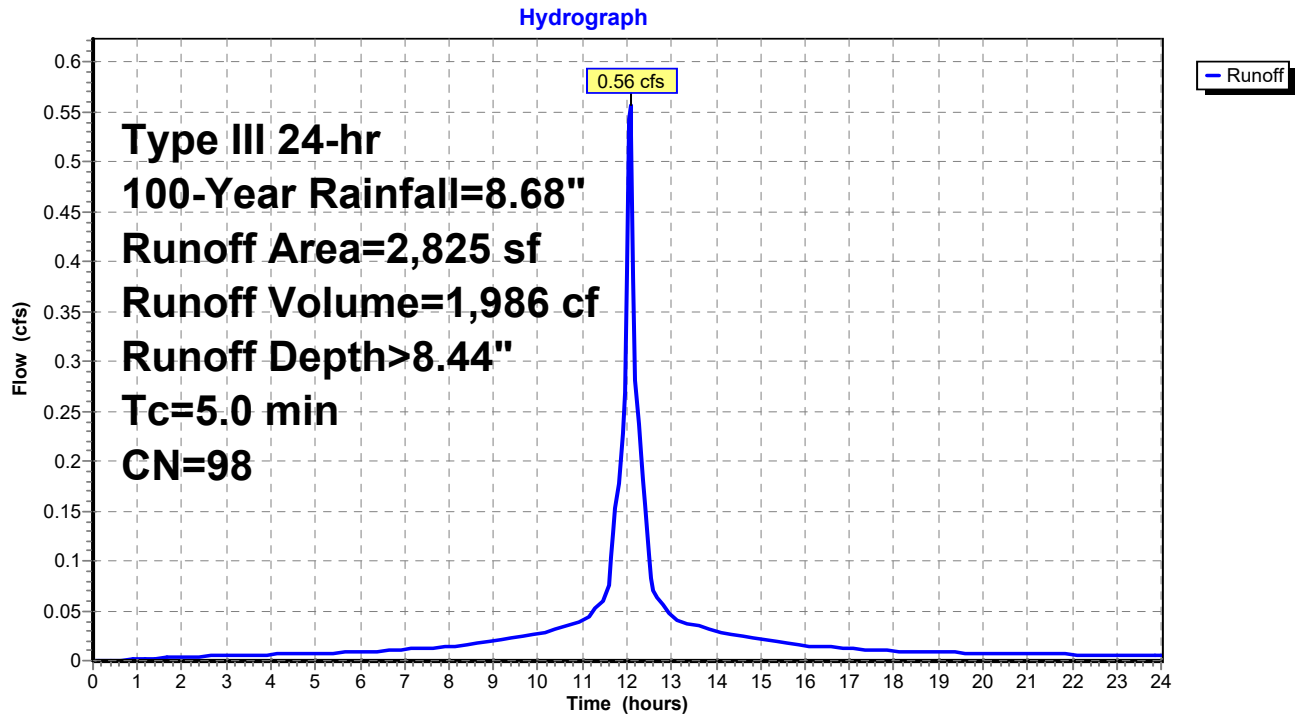
Runoff = 0.56 cfs @ 12.07 hrs, Volume= 1,986 cf, Depth> 8.44"
Routed to Reach CB2post : CB 2

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=8.68"

Area (sf)	CN	Description
0	55	Woods, Good, HSG B
0	61	>75% Grass cover, Good, HSG B
0	98	Paved parking, HSG B
2,825	98	Unconnected roofs, HSG B
0	98	Paved parking, HSG B
2,825	98	Weighted Average
2,825		100.00% Impervious Area
2,825		100.00% Unconnected

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

Subcatchment BLDG2: 1/2 BUILDING



157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 82

Summary for Subcatchment POST 1: POST 1

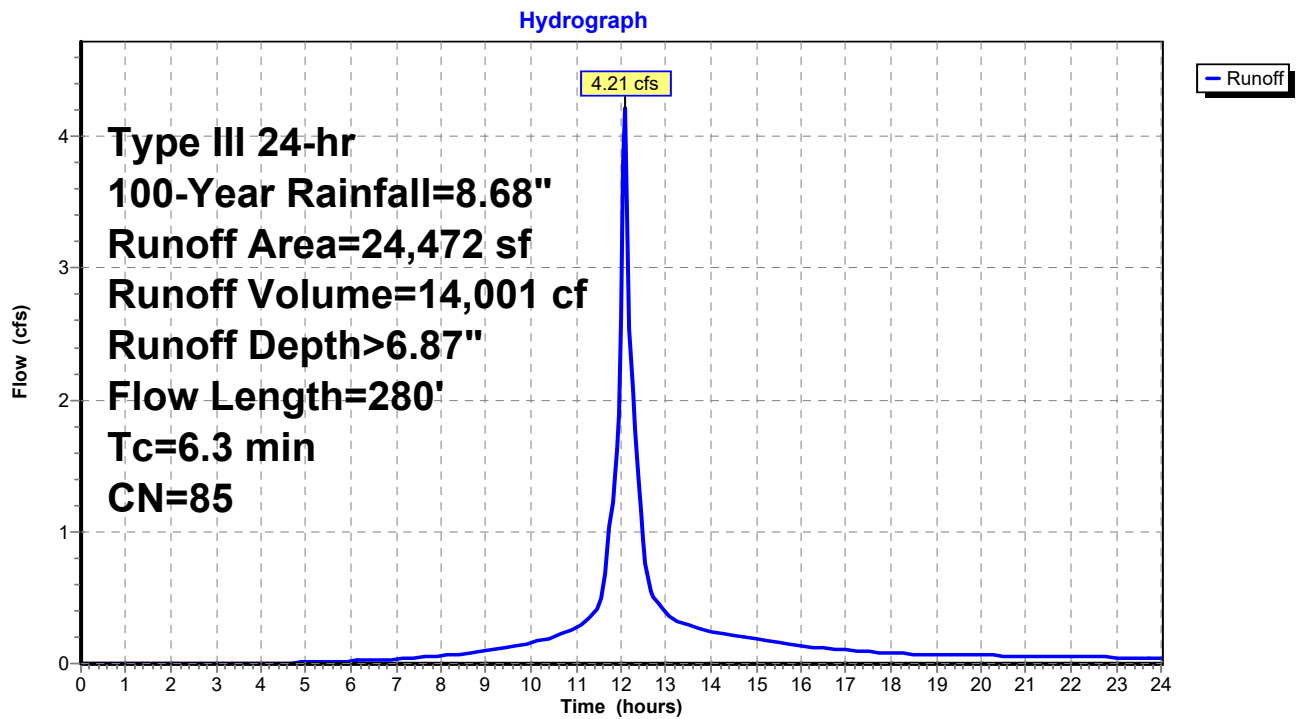
Runoff = 4.21 cfs @ 12.09 hrs, Volume= 14,001 cf, Depth> 6.87"
 Routed to Reach CB1post : CB 1

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=8.68"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
8,206	61	>75% Grass cover, Good, HSG B
14,824	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
1,259	98	Paved parking, HSG B
24,472	85	Weighted Average
8,389		34.28% Pervious Area
16,083		65.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment POST 1: POST 1



157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 84

Summary for Subcatchment POST 2: POST 2

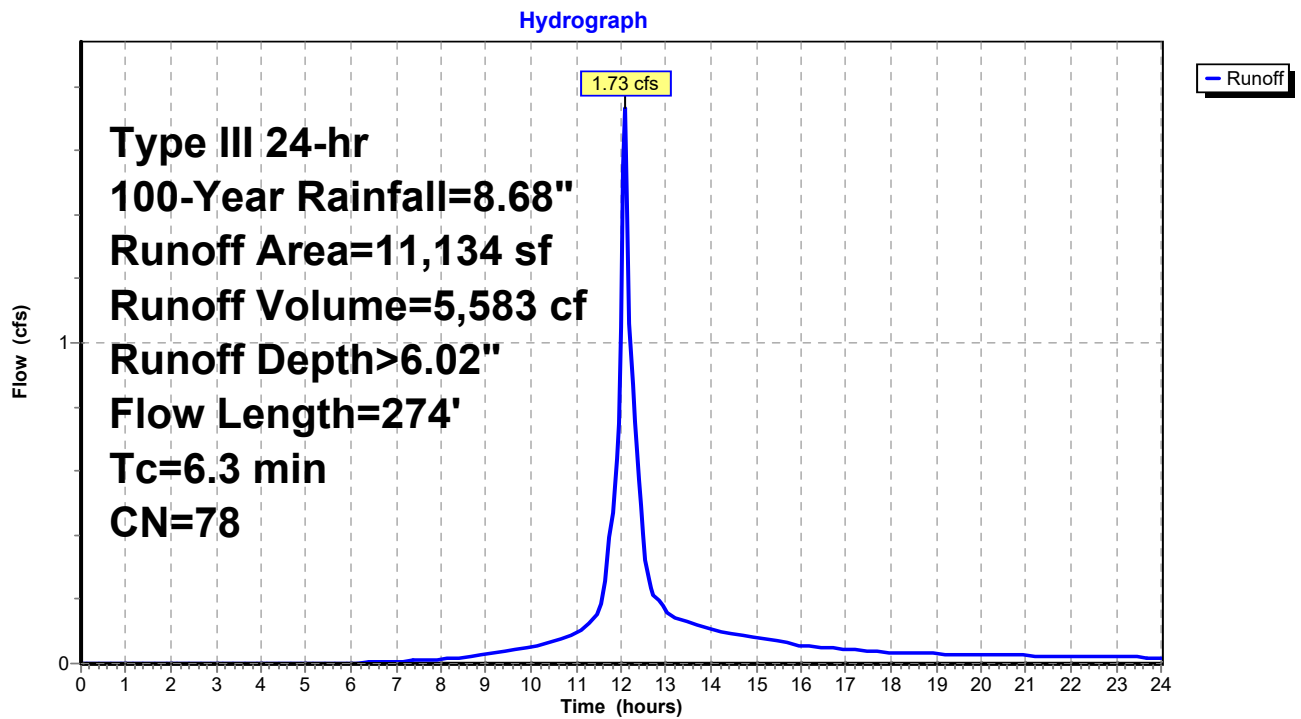
Runoff = 1.73 cfs @ 12.09 hrs, Volume= 5,583 cf, Depth> 6.02"
 Routed to Reach CB2post : CB 2

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=8.68"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
5,510	61	>75% Grass cover, Good, HSG B
4,654	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
575	98	Paved parking, HSG B
11,134	78	Weighted Average
5,905		53.04% Pervious Area
5,229		46.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment POST 2: POST 2



157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 86

Summary for Subcatchment POST 3: POST 3

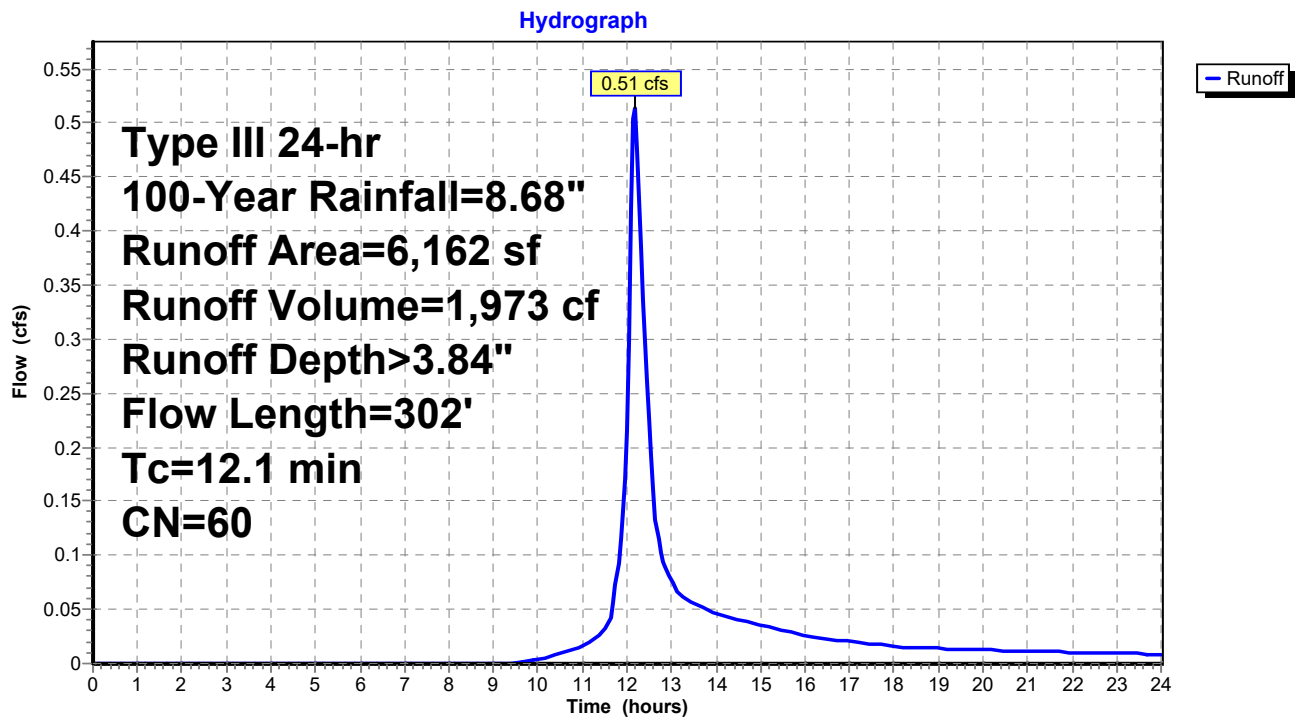
Runoff = 0.51 cfs @ 12.17 hrs, Volume= 1,973 cf, Depth> 3.84"
 Routed to Reach DP2post : DP 2 post

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=8.68"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,550	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,162	60	Weighted Average
5,839		94.76% Pervious Area
323		5.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment POST 3: POST 3



157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 88

Summary for Subcatchment PRE 1: PRE 1

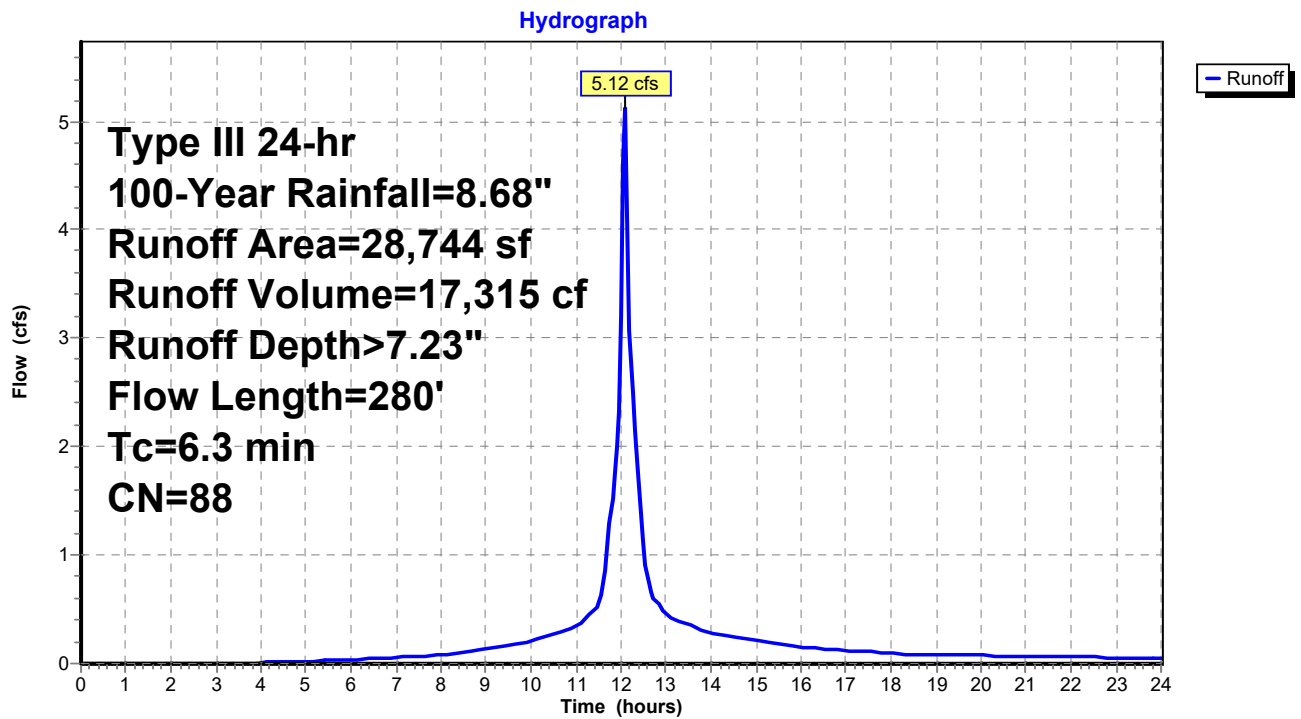
Runoff = 5.12 cfs @ 12.09 hrs, Volume= 17,315 cf, Depth> 7.23"
 Routed to Reach CB1pre : CB 1

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=8.68"

Area (sf)	CN	Description
183	55	Woods, Good, HSG B
7,314	61	>75% Grass cover, Good, HSG B
17,874	98	Paved parking, HSG B
1,722	98	Unconnected roofs, HSG B
1,651	98	Paved parking, HSG B
28,744	88	Weighted Average
7,497		26.08% Pervious Area
21,247		73.92% Impervious Area
1,722		8.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	25	0.0459	0.08		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	25	0.0424	1.44		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
0.8	210	0.0424	4.18		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
0.1	20	0.0295	3.49		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	280	Total			

Subcatchment PRE 1: PRE 1



157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 90

Summary for Subcatchment PRE 2: PRE 2

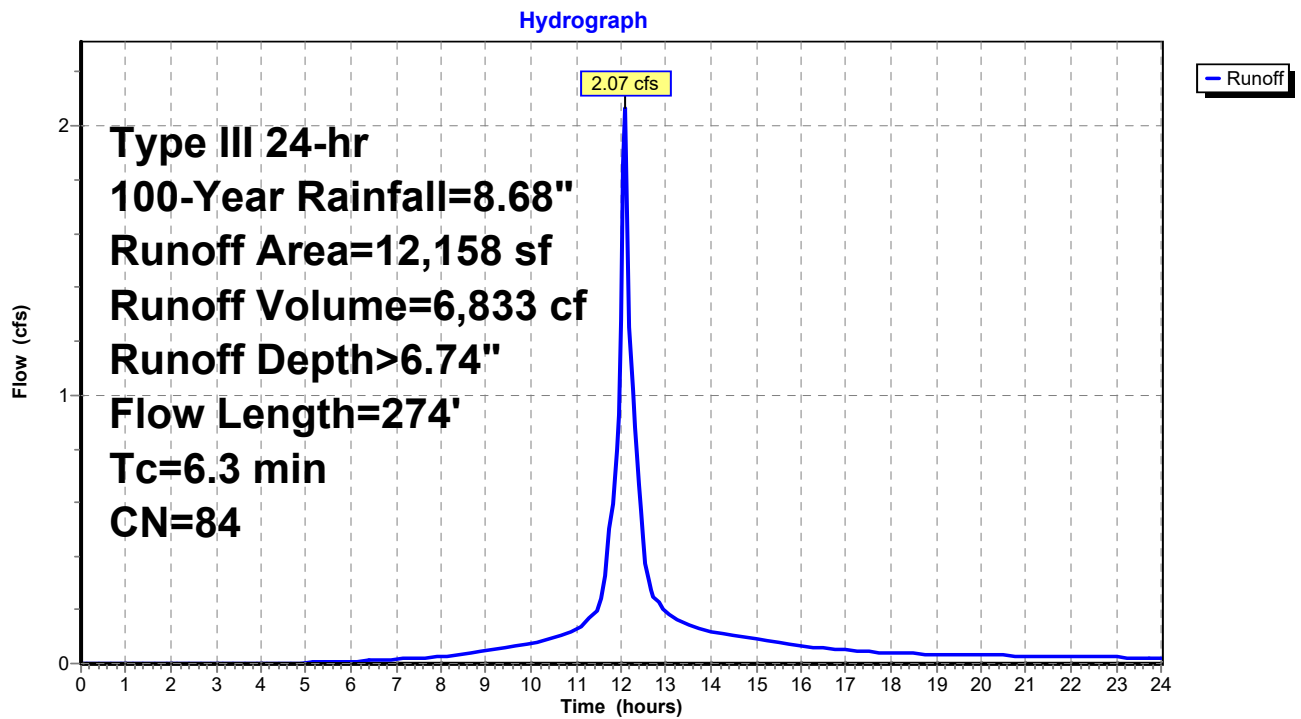
Runoff = 2.07 cfs @ 12.09 hrs, Volume= 6,833 cf, Depth> 6.74"
 Routed to Reach CB2pre : CB 2

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=8.68"

Area (sf)	CN	Description
395	55	Woods, Good, HSG B
3,989	61	>75% Grass cover, Good, HSG B
5,930	98	Paved parking, HSG B
1,526	98	Unconnected roofs, HSG B
318	98	Paved parking, HSG B
12,158	84	Weighted Average
4,384		36.06% Pervious Area
7,774		63.94% Impervious Area
1,526		19.63% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	30	0.0683	0.10		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
0.3	20	0.0321	1.23		Sheet Flow, PAVEMENT Smooth surfaces n= 0.011 P2= 3.35"
1.0	224	0.0357	3.84		Shallow Concentrated Flow, PAVEMENT Paved Kv= 20.3 fps
6.3	274	Total			

Subcatchment PRE 2: PRE 2



157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 92

Summary for Subcatchment PRE 3: PRE 3

Runoff = 0.54 cfs @ 12.17 hrs, Volume= 2,086 cf, Depth> 3.84"
 Routed to Reach DP2pre : DP 2 pre

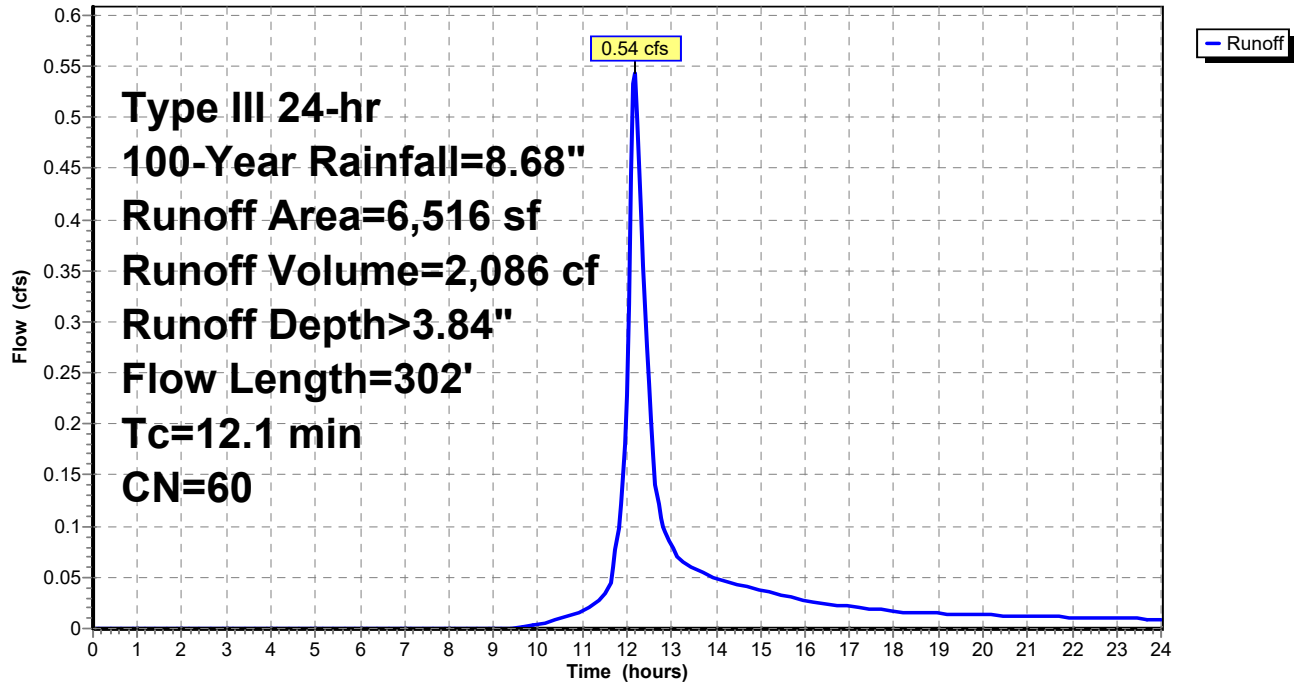
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.68"

Area (sf)	CN	Description
3,289	55	Woods, Good, HSG B
2,904	61	>75% Grass cover, Good, HSG B
267	98	Paved parking, HSG B
0	98	Unconnected roofs, HSG B
56	98	Paved parking, HSG B
6,516	60	Weighted Average
6,193		95.04% Pervious Area
323		4.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0443	0.09		Sheet Flow, GRASS Grass: Bermuda n= 0.410 P2= 3.35"
2.2	162	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0305	1.22		Shallow Concentrated Flow, PAVEMENT Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0305	1.22		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
0.3	35	0.0797	1.98		Shallow Concentrated Flow, GRASS Short Grass Pasture Kv= 7.0 fps
12.1	302	Total			

Subcatchment PRE 3: PRE 3

Hydrograph



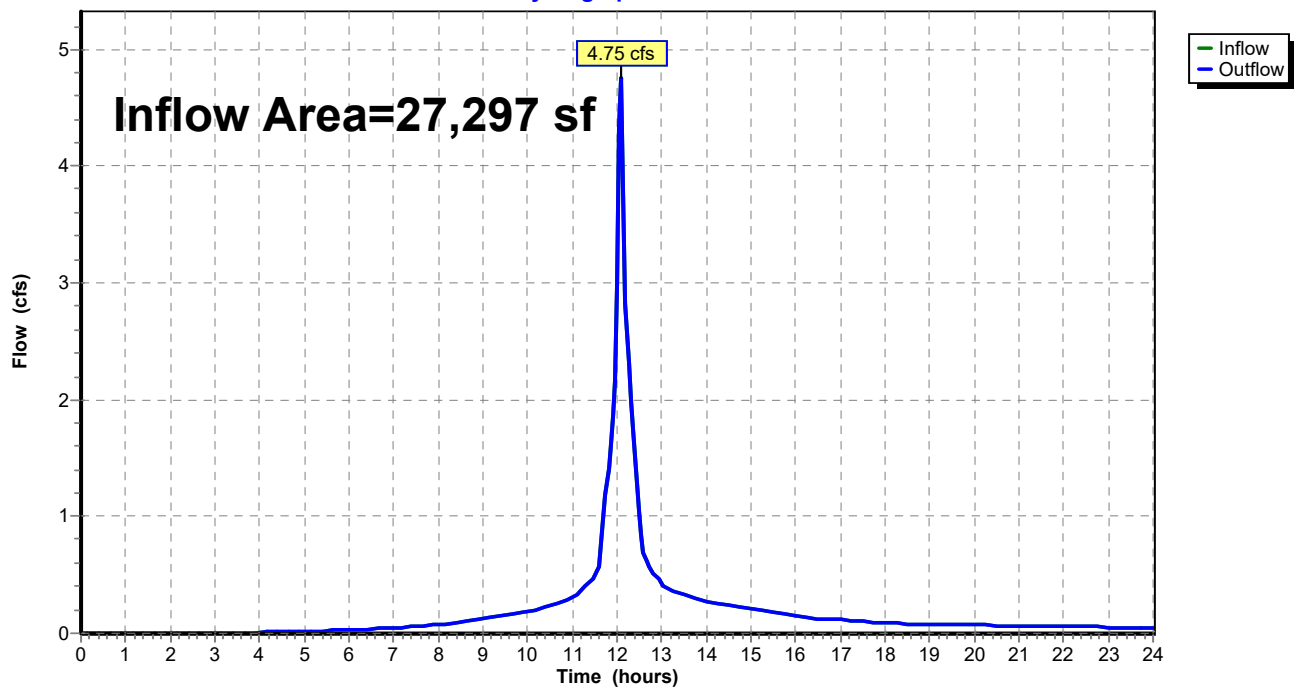
Summary for Reach CB1post: CB 1

Inflow Area = 27,297 sf, 69.27% Impervious, Inflow Depth > 7.03" for 100-Year event
 Inflow = 4.75 cfs @ 12.09 hrs, Volume= 15,987 cf
 Outflow = 4.75 cfs @ 12.09 hrs, Volume= 15,987 cf, Atten= 0%, Lag= 0.0 min
 Routed to Reach DP1post : DP 1 post

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

Reach CB1post: CB 1

Hydrograph



Summary for Reach CB1pre: CB 1

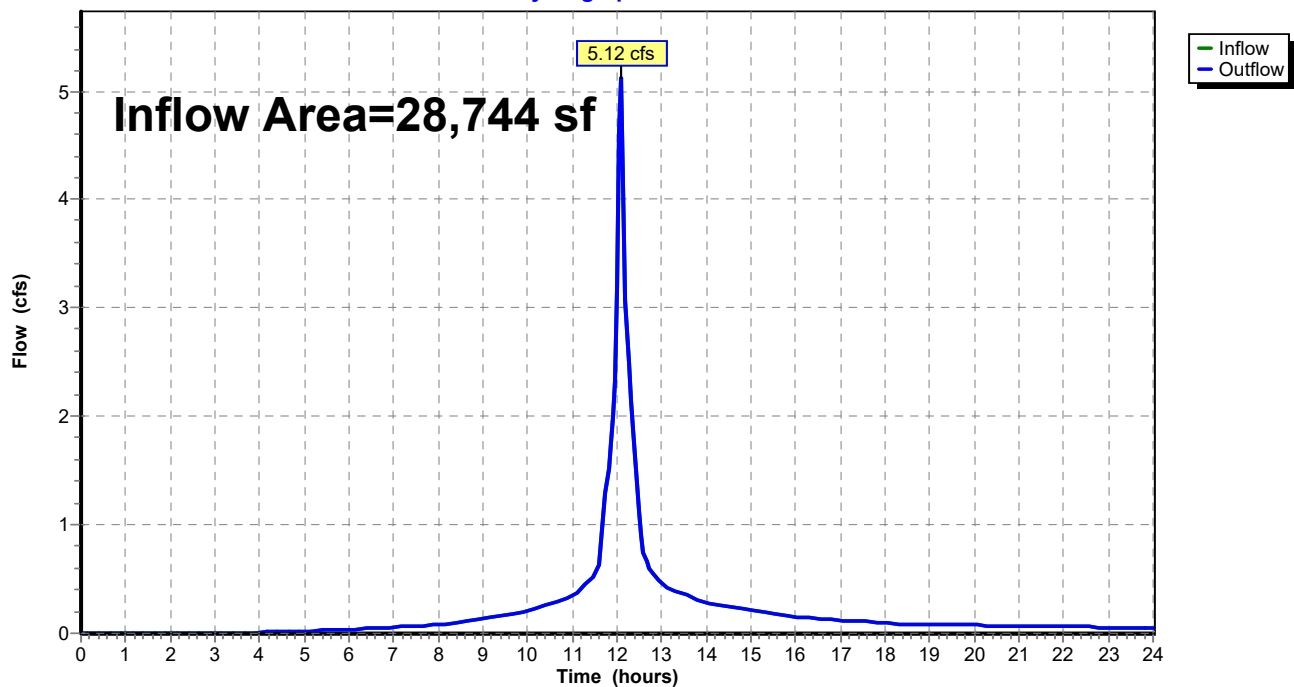
Inflow Area = 28,744 sf, 73.92% Impervious, Inflow Depth > 7.23" for 100-Year event

Inflow = 5.12 cfs @ 12.09 hrs, Volume= 17,315 cf

Outflow = 5.12 cfs @ 12.09 hrs, Volume= 17,315 cf, Atten= 0%, Lag= 0.0 min

Routed to Reach DP1pre : DP 1 pre

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

Reach CB1pre: CB 1**Hydrograph**

157 Market Street

Type III 24-hr 100-Year Rainfall=8.68"

Prepared by Grady Consulting LLC

HydroCAD® 10.20-5c s/n 09955 © 2023 HydroCAD Software Solutions LLC

Page 96

Summary for Reach CB2post: CB 2

Inflow Area = 13,959 sf, 57.70% Impervious, Inflow Depth > 6.51" for 100-Year event

Inflow = 2.27 cfs @ 12.09 hrs, Volume= 7,569 cf

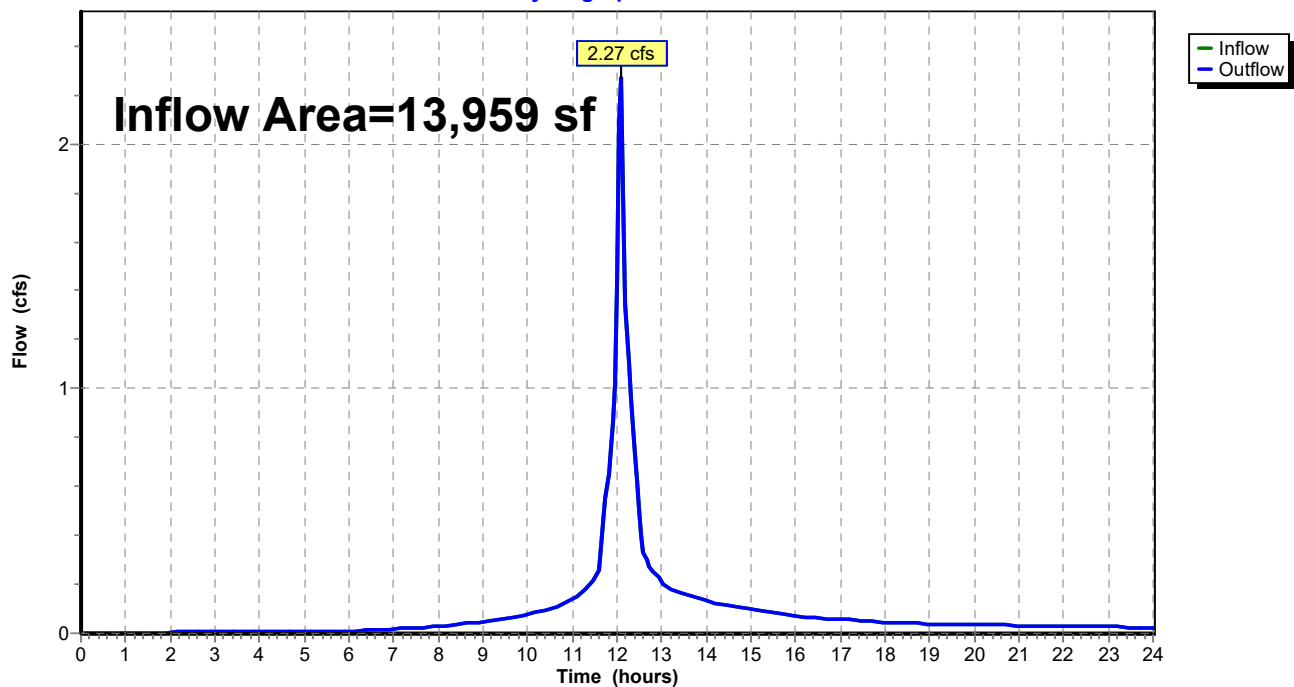
Outflow = 2.27 cfs @ 12.09 hrs, Volume= 7,569 cf, Atten= 0%, Lag= 0.0 min

Routed to Reach DP1post : DP 1 post

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

Reach CB2post: CB 2

Hydrograph



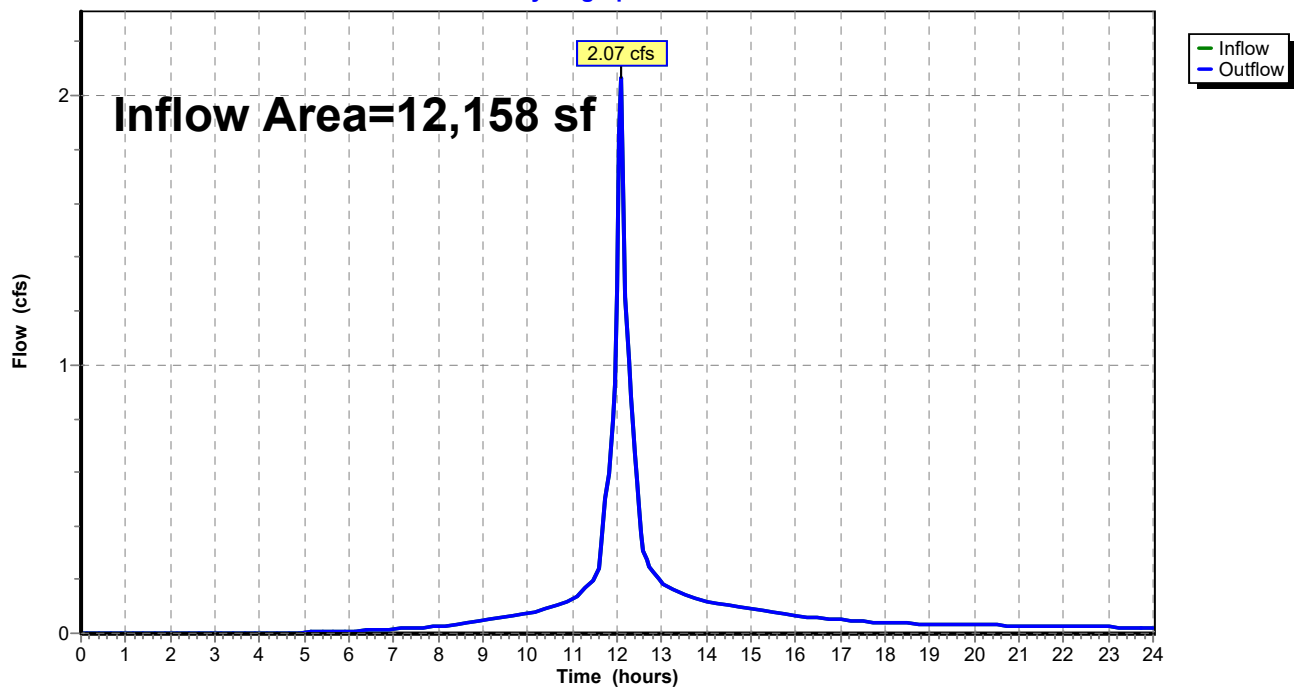
Summary for Reach CB2pre: CB 2

Inflow Area = 12,158 sf, 63.94% Impervious, Inflow Depth > 6.74" for 100-Year event
Inflow = 2.07 cfs @ 12.09 hrs, Volume= 6,833 cf
Outflow = 2.07 cfs @ 12.09 hrs, Volume= 6,833 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach DP1pre : DP 1 pre

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

Reach CB2pre: CB 2

Hydrograph



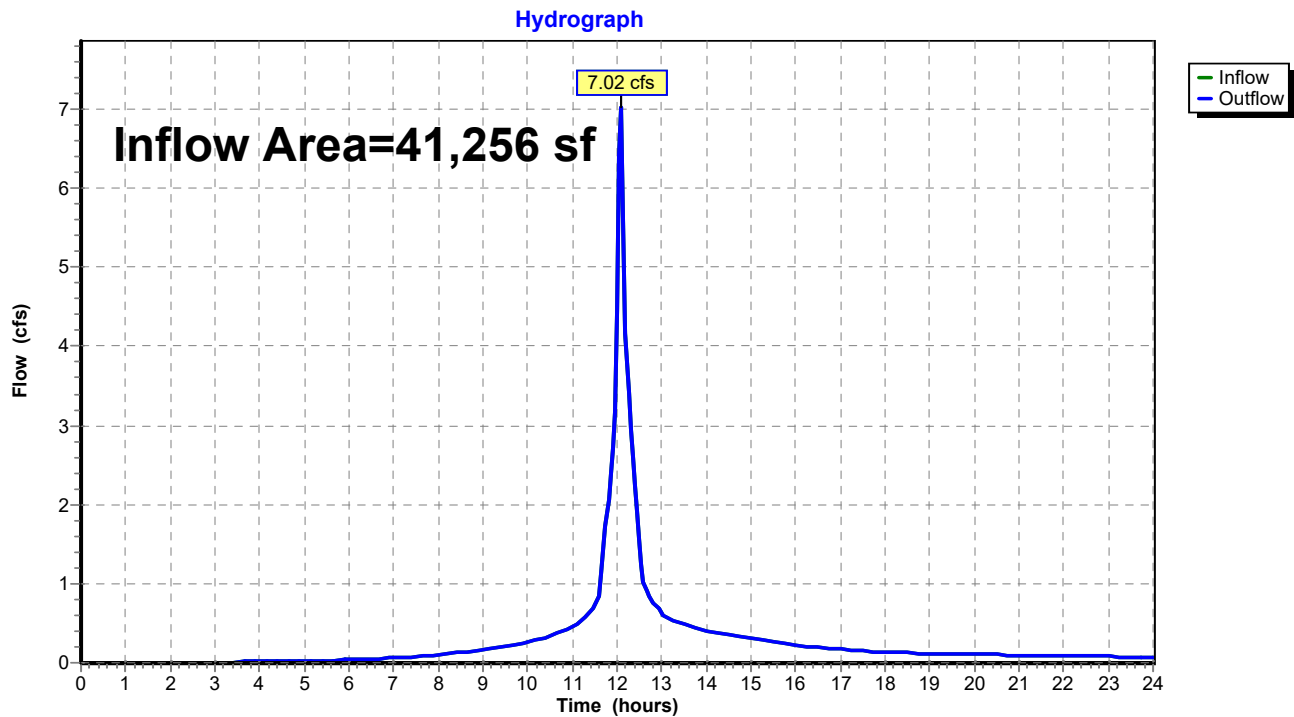
Summary for Reach DP1post: DP 1 post

Inflow Area = 41,256 sf, 65.35% Impervious, Inflow Depth > 6.85" for 100-Year event

Inflow = 7.02 cfs @ 12.09 hrs, Volume= 23,557 cf

Outflow = 7.02 cfs @ 12.09 hrs, Volume= 23,557 cf, Atten= 0%, Lag= 0.0 min

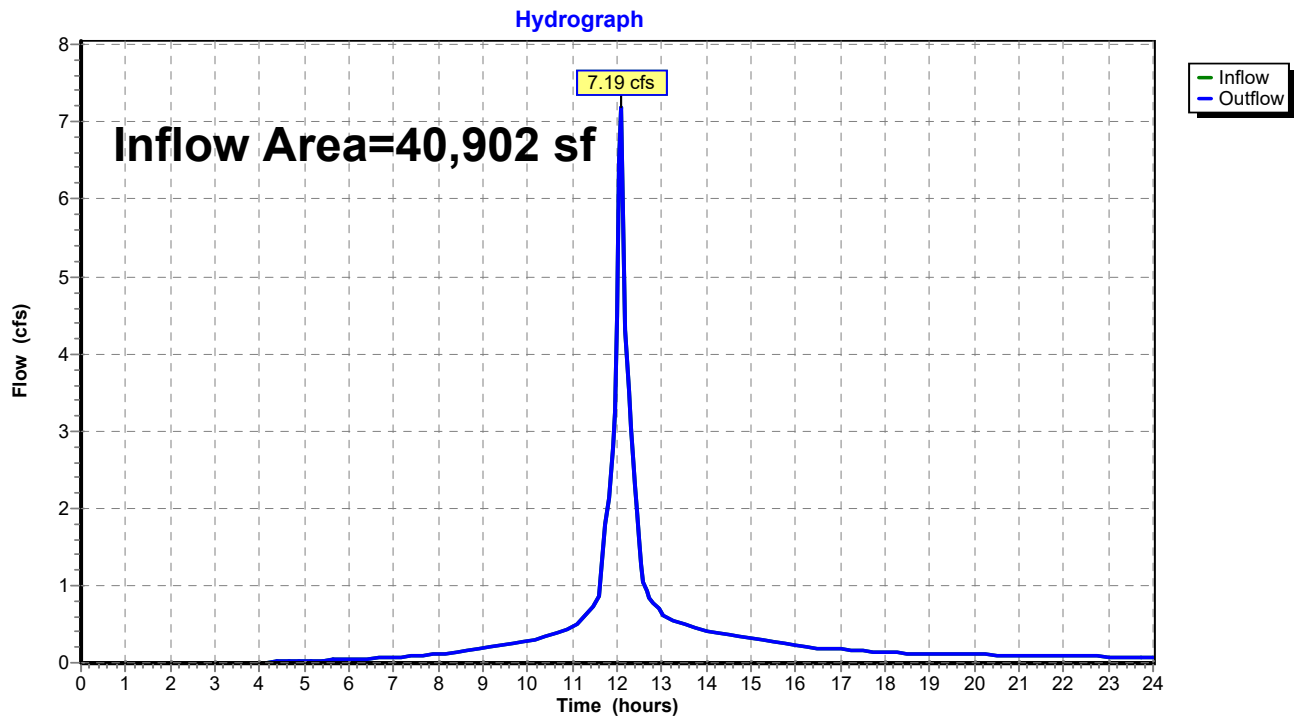
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1post: DP 1 post

Summary for Reach DP1pre: DP 1 pre

Inflow Area = 40,902 sf, 70.95% Impervious, Inflow Depth > 7.08" for 100-Year event
Inflow = 7.19 cfs @ 12.09 hrs, Volume= 24,149 cf
Outflow = 7.19 cfs @ 12.09 hrs, Volume= 24,149 cf, Atten= 0%, Lag= 0.0 min

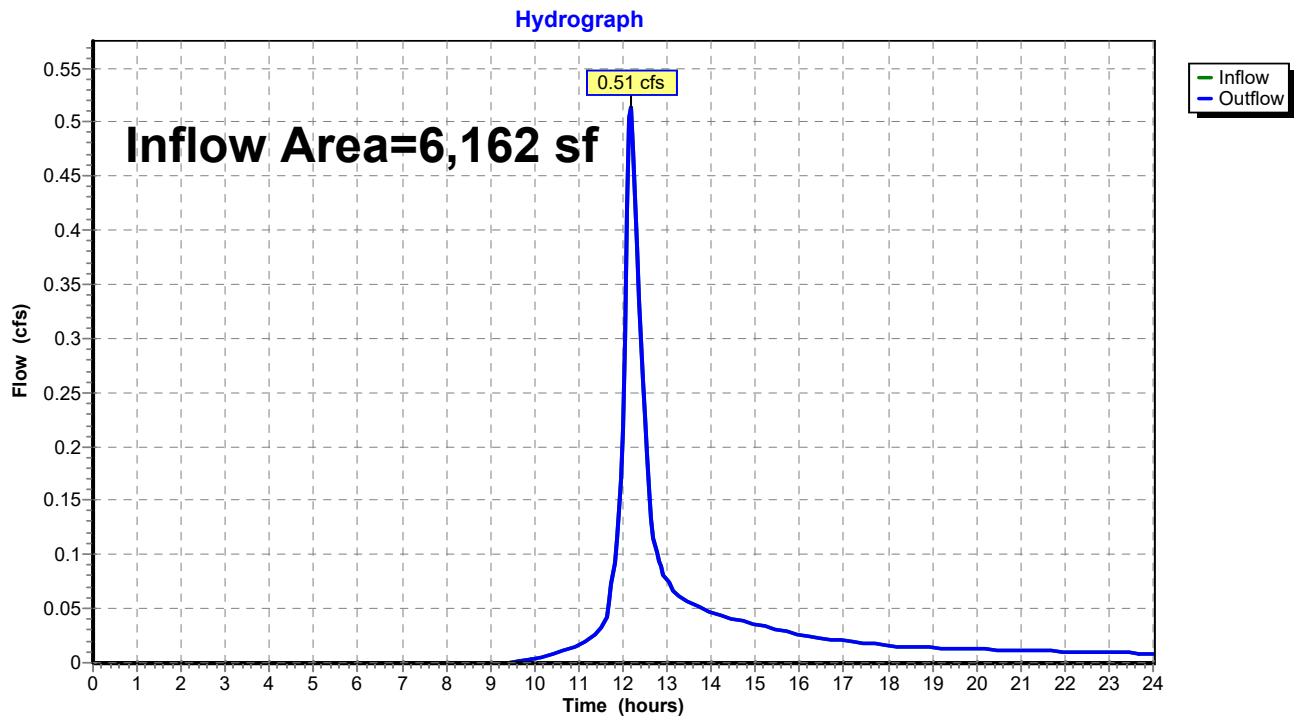
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP1pre: DP 1 pre

Summary for Reach DP2post: DP 2 post

Inflow Area = 6,162 sf, 5.24% Impervious, Inflow Depth > 3.84" for 100-Year event
Inflow = 0.51 cfs @ 12.17 hrs, Volume= 1,973 cf
Outflow = 0.51 cfs @ 12.17 hrs, Volume= 1,973 cf, Atten= 0%, Lag= 0.0 min

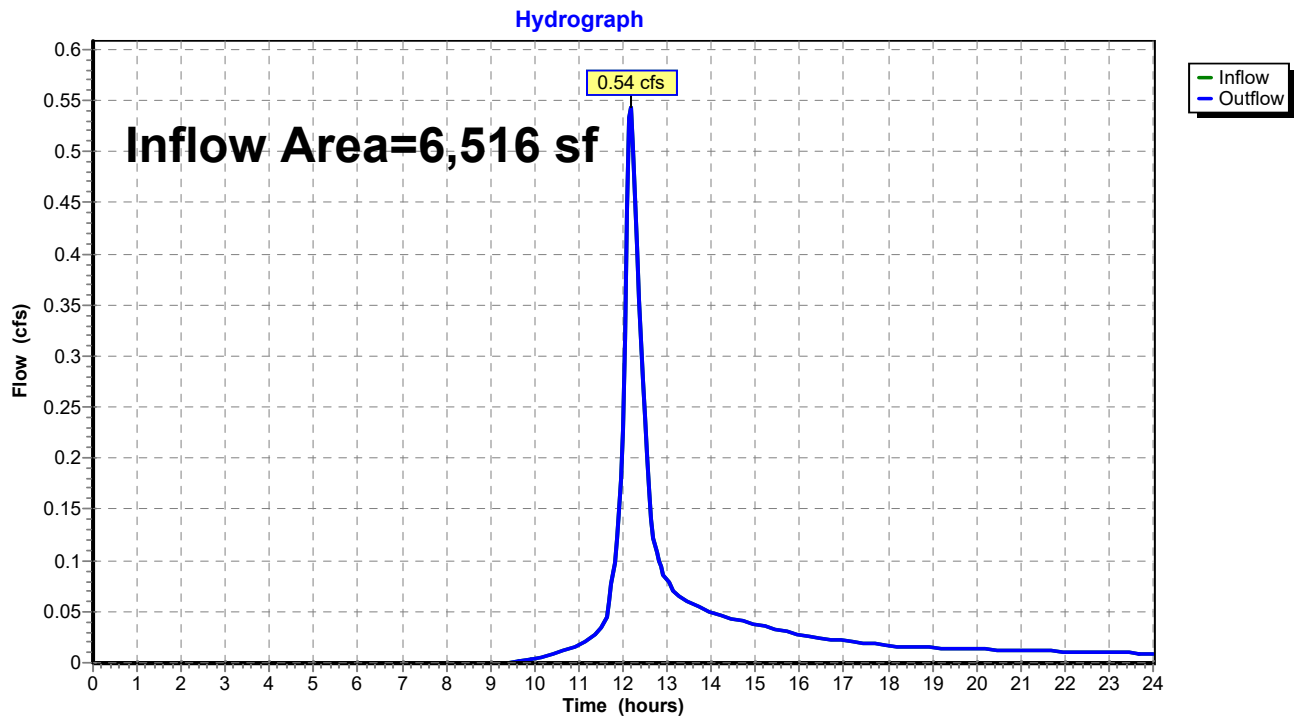
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP2post: DP 2 post

Summary for Reach DP2pre: DP 2 pre

Inflow Area = 6,516 sf, 4.96% Impervious, Inflow Depth > 3.84" for 100-Year event
Inflow = 0.54 cfs @ 12.17 hrs, Volume= 2,086 cf
Outflow = 0.54 cfs @ 12.17 hrs, Volume= 2,086 cf, Atten= 0%, Lag= 0.0 min

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

Reach DP2pre: DP 2 pre

Events for Subcatchment BLDG1: 1/2 BUILDING

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	0.21	733	3.12
10-Year	4.95	0.32	1,109	4.71
25-Year	6.19	0.40	1,400	5.95
100-Year	8.68	0.56	1,986	8.44

Events for Subcatchment BLDG2: 1/2 BUILDING

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	0.21	733	3.12
10-Year	4.95	0.32	1,109	4.71
25-Year	6.19	0.40	1,400	5.95
100-Year	8.68	0.56	1,986	8.44

Events for Subcatchment POST 1: POST 1

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	1.21	3,843	1.88
10-Year	4.95	2.11	6,769	3.32
25-Year	6.19	2.81	9,133	4.48
100-Year	8.68	4.21	14,001	6.87

Events for Subcatchment POST 2: POST 2

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	0.40	1,283	1.38
10-Year	4.95	0.78	2,474	2.67
25-Year	6.19	1.09	3,474	3.74
100-Year	8.68	1.73	5,583	6.02

Events for Subcatchment POST 3: POST 3

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	0.04	240	0.47
10-Year	4.95	0.15	651	1.27
25-Year	6.19	0.26	1,048	2.04
100-Year	8.68	0.51	1,973	3.84

Events for Subcatchment PRE 1: PRE 1

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	1.60	5,103	2.13
10-Year	4.95	2.66	8,668	3.62
25-Year	6.19	3.48	11,510	4.81
100-Year	8.68	5.12	17,315	7.23

Events for Subcatchment PRE 2: PRE 2

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	0.58	1,831	1.81
10-Year	4.95	1.02	3,264	3.22
25-Year	6.19	1.37	4,429	4.37
100-Year	8.68	2.07	6,833	6.74

Events for Subcatchment PRE 3: PRE 3

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.35	0.04	253	0.47
10-Year	4.95	0.16	689	1.27
25-Year	6.19	0.27	1,108	2.04
100-Year	8.68	0.54	2,086	3.84

Events for Reach CB1post: CB 1

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	1.41	1.41	0.00	0
10-Year	2.41	2.41	0.00	0
25-Year	3.19	3.19	0.00	0
100-Year	4.75	4.75	0.00	0

Events for Reach CB1pre: CB 1

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	1.60	1.60	0.00	0
10-Year	2.66	2.66	0.00	0
25-Year	3.48	3.48	0.00	0
100-Year	5.12	5.12	0.00	0

Events for Reach CB2post: CB 2

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.60	0.60	0.00	0
10-Year	1.08	1.08	0.00	0
25-Year	1.47	1.47	0.00	0
100-Year	2.27	2.27	0.00	0

Events for Reach CB2pre: CB 2

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.58	0.58	0.00	0
10-Year	1.02	1.02	0.00	0
25-Year	1.37	1.37	0.00	0
100-Year	2.07	2.07	0.00	0

Events for Reach DP1post: DP 1 post

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	2.02	2.02	0.00	0
10-Year	3.49	3.49	0.00	0
25-Year	4.66	4.66	0.00	0
100-Year	7.02	7.02	0.00	0

Events for Reach DP1pre: DP 1 pre

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	2.17	2.17	0.00	0
10-Year	3.68	3.68	0.00	0
25-Year	4.85	4.85	0.00	0
100-Year	7.19	7.19	0.00	0

Events for Reach DP2post: DP 2 post

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.04	0.04	0.00	0
10-Year	0.15	0.15	0.00	0
25-Year	0.26	0.26	0.00	0
100-Year	0.51	0.51	0.00	0

Events for Reach DP2pre: DP 2 pre

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.04	0.04	0.00	0
10-Year	0.16	0.16	0.00	0
25-Year	0.27	0.27	0.00	0
100-Year	0.54	0.54	0.00	0

Section II

Stormwater Management

◆ **STANDARD #1 No New Stormwater Conveyances**

The proposed development proposes no new stormwater conveyances that discharge untreated stormwater off-site or cause down gradient erosion.

◆ **STANDARD #2 Post Development Peak Discharge**

The overall site analysis demonstrates that the stormwater management system has been designed so that the post-development peak discharge rates do not exceed the pre-development discharge rate for the 2yr, 10 yr, 25yr & 100 yr 24 hr storm events.

◆ **STANDARD #3 RECHARGE TO GROUNDWATER**

Total existing impervious areas:

Roof = 3,248 SF

Pavement = 26,096 SF

Total = 29,344 SF

Total proposed impervious areas:

Roof = 5,650 SF

Pavement = 21,635 SF

Total = 27,285 SF

Reduction in impervious = 2,059 SF

◆ **STANDARD #4 WATER QUALITY**

Total existing non-roof impervious areas:

Pavement = 26,096 SF

Total non-roof impervious areas:

Pavement = 21,635 SF

Reduction in pavement requiring treatment = 4,461 SF

◆ **STANDARD #5 Land Uses With Higher Potential Pollutant Loads**

This site will not produce a higher potential pollutant load.

◆ **STANDARD #6 Critical Areas**

The site is not located in or near any critical areas

◆ **STANDARD #7 Redevelopment**

There is a reduction of 2,059 sf of impervious area on the site, therefore, the project is considered a redevelopment. The site drainage will be cleaned and retained, the proposed area that requires treatment (i.e. paved areas) has been reduced by 4,461 sf.

◆ **STANDARD #8 Erosion & Sediment Control Plan**

Erosion and sediment controls are detailed within the erosion control plan.

◆ **STANDARD #9 Operation & Maintenance Plan**

See O&M plan attached hereto.

◆ **STANDARD #10 Illicit Discharge Statement**

“All illicit discharges to the stormwater management system are prohibited.”

This statement is intended to meet Standard #10 of the Stormwater Management requirements

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater.

Except for the potential for deliberate criminal act of discharge by an unauthorized entity for which the property owner has no control, there are to be no illicit discharges into the stormwater system.

Applicant\Owner



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



2025-05-05

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☐ New development
- ☒ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☒ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☐ Soil Analysis provided.
- ☐ Required Recharge Volume calculation provided.
- ☒ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☐ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☒ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☐ The BMP is sized (and calculations provided) based on:
 - ☐ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☒ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☒ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☒ Estimated operation and maintenance budget; and
 - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

OPERATION AND MAINTENANCE PLAN
PROPOSED SITE WORK – DURING CONSTRUCTION
Assessors Lot 51-94
157 Market St.
Rockland, MA

Owner:

Rockland FCU
241 Union Street
Rockland, MA 02370

Party Responsible for Operation and Maintenance:

Rockland FCU
241 Union Street
Rockland, MA 02370

Source of Funding:

Operation and Maintenance of this stormwater management system will be the responsibility of the property owner to include its successor and/or assigns, as the same may appear on record with the appropriate register of deeds.

During Construction:

Construction activities shall follow the Construction Sequence shown on the approved plans. During periods of active construction the stormwater management system shall be inspected on a weekly basis and within 24 hours of a storm event of greater than ½". Maintenance tasks shall be performed monthly or after significant rainfall events of 1" of rain or greater. During construction, silt-laden runoff shall be prevented from entering the drainage system and off-site properties. Temporary swales shall be constructed as needed during construction to direct runoff to sediment traps. Infiltration systems and subsurface storage systems shall not be placed in service until after the installation of base course pavement and vegetative stabilization of the areas contributing to the systems.

During dewatering operations, all water pumped from the dewatering shall be directed to a "dirt bag" pumped sediment removal system (or approved equal) as manufactured by ACF Environmental. Water from construction dewatering activities should not be directed into any of the existing or proposed stormwater management facilities system unless it is fully treated prior to discharge. The unit shall be placed on a crushed stone blanket. Disposal of such "dirt bag" shall occur when the device is full and can no longer effectively filter sediment or allow water to pass at a reasonable flow rate. Disposal of this unit shall be the responsibility of the contractor and shall be as directed by the owner in accordance with applicable local, state, and federal guidelines and regulations.

Stabilized construction entrances shall be placed at the entrances and shall consist of ¾” to 1½” stone and be constructed as shown on the approved plans.

All erosion and sedimentation control measures shall be in place prior to the commencement of any site work or earthwork operations, and shall be maintained during construction, and shall remain in place until all site work is complete and ground cover is established.

Heavy equipment shall not be used on basin bottoms.

All exposed soils not to be paved shall be stabilized as soon as practical. Seed mixes shall only be applied during appropriate periods as recommended by the seed supplier, typically May 1 to October 15. Any exposed soils that cannot be stabilized by vegetation during these dates shall be stabilized with hay bales, hay mulch, check dams, jute netting or other acceptable means.

Once each structure is in place, it should be maintained in accordance with the procedures described in the post-construction Operations and Maintenance Plan.

During dry periods where dust is created by construction activities the following control measures should be implemented.

- Sprinkling – The contractor may sprinkle the ground along haul roads and traffic areas until moist.
- Vegetative cover – Areas that are not expected to be disturbed regularly may be stabilized with vegetative cover.
- Mulch – Mulching can be used as a quick and effective means of dust control in recently disturbed areas.
- Spray on chemical soil treatments may be utilized. Application rates shall conform to manufacturers recommendations.

Illicit Discharges

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Illicit discharges are prohibited from the stormwater management system and the stormwater management system shall be inspected for illicit discharges annually.

The following is a list of discharges that are allowed under the EPA Construction General Permit (CGP) provided that appropriate stormwater controls are designed, installed, and maintained:

- a. Stormwater discharges, including stormwater runoff, snowmelt runoff, and surface runoff and drainage, associated with construction activity under 40 CFR §122.26(b)(14) or § 122.26(b)(15)(i);
- b. Stormwater discharges designated by EPA as needing a permit under 40 CFR § 122.26(a)(1)(v) or §122.26(b)(15)(ii);
- c. Stormwater discharges from construction support activities (*e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas*) provided:
 - i. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
 - ii. The support activity is not a commercial operation, nor does it serve multiple unrelated construction projects;
 - iii. The support activity does not continue to operate beyond the completion of the construction activity at the project it supports; and
 - iv. Stormwater controls are implemented in accordance with Part 2 of the CGP and, if applicable, Part 3 of the CGP, for discharges from the support activity areas.

The following non-stormwater discharges from your construction activity, provided that, with the exception of water used to control dust and to irrigate areas to be

vegetatively stabilized, these discharges are not routed to areas of exposed soil on your site and you comply with any applicable requirements for these discharges in Part 2 of the CGP:

- i. Discharges from emergency fire-fighting activities;
- ii. Fire hydrant flushings;
- iii. Landscape irrigation;
- iv. Water used to wash vehicles and equipment, provided that there is no discharge of soaps, solvents, or detergents used for such purposes;
- v. Water used to control dust;
- vi. Potable water including uncontaminated water line flushings;
- vii. Routine external building washdown that does not use detergents;
- viii. Pavement wash waters provided spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used. You are prohibited from directing pavement wash waters directly into any surface water, storm drain inlet, or stormwater conveyance, unless the conveyance is connected to a sediment basin, sediment trap, or similarly effective control;
- ix. Uncontaminated air conditioning or compressor condensate;
- x. Uncontaminated, non-turbid discharges of ground water or spring water;
- xi. Foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated ground water; and
- xii. Construction dewatering water that has been treated by an appropriate control under Part 2.1.3.4 of the CGP; and
- e. Discharges of stormwater listed above in Parts a, b, and c, or authorized nonstormwater discharges in Part d above, commingled with a discharge authorized by a different NPDES permit and/or a discharge that does not require NPDES permit authorization.

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

STORMWATER MANAGEMENT
BEST MANAGEMENT PRACTICES
INSPECTION SCHEDULE AND EVALUATION CHECKLIST – CONSTRUCTION PHASE

PROJECT LOCATION: 157 Market Street

Latest Revision: April 23, 2025

Stormwater Control Manager: _____

Stamp

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Detention System
Silt socks & swales and silt traps	After every major storm event							
Dewatering Operations	Daily-during actual dewatering							
Temporary Safety Fencing	Daily or as needed							
Temporary Construction Entrance	Daily or as needed.							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
 Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

OPERATION AND MAINTENANCE PLAN
PROPOSED DRAINAGE SYSTEM – POST CONSTRUCTION
Assessors Lot 51-94
157 Market St.
Rockland, MA

Owner:

Rockland FCU
241 Union Street
Rockland, MA 02370

Party Responsible for Operation and Maintenance:

After construction is complete the owner will be the party responsible for operation and maintenance of the drainage system. When the property is conveyed, the new owner will be the party responsible for operation and maintenance.

Source of Funding:

Operation and Maintenance of this stormwater management system will be the responsibility of the owner. The estimated annual budget for the operation and maintenance of the stormwater system is \$1,000.

Schedule for Inspection and Maintenance:

Deep Sump Catch Basins & Drain Manholes

Deep sump catch basins shall become part of the roadway system and shall be inspected after every major storm event during construction and cleaned when sediment exceeds 24” depth. After construction when all slopes have been stabilized, basins shall be cleaned a minimum of 4 times per year or whenever the depth of deposits is greater than or equal to on half the depth from the bottom of the invert (2 ft). Disposal of the accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.

Lawn Fertilization

Lawn fertilizer shall be slow release and limited to 3 lbs per 1000 s.f. per year.

Snow Removal and De-icing

Snow will be plowed from driveways and shoveled or removed with a snow blower. If additional stockpiling area is needed, excess snow will be removed from the site with proper off-site disposal. Stockpiling within infiltration areas is prohibited.

Inspections

Yearly inspections of the stormwater management system shall be performed and an Inspection Schedule and Evaluation Checklist shall be maintained by the Owner and made available to regulatory officials if requested. Copies of the receipts for cleaning of the systems shall also be maintained.

The Owner shall be responsible to secure the services of a Licensed Engineer on an on-going basis. The inspector shall review the project with respect to the following:

- Proper installation and performance of the Stormwater Management System.
- Review of the controls to determine any damaged or ineffective controls.
- Corrective actions.

The Engineer shall prepare, stamp and submit, to the Owner, a report documenting the findings and should request the required maintenance or repair for the pollution prevention controls when the inspector finds that it is necessary for the control to be effective (see attached Inspection Schedule and Evaluation Checklist). The inspector shall notify the Owner to make the changes.

The owner and/or their employees responsible for the O&M of the stormwater management system shall be trained annually. Records of trained individuals shall be kept and submitted to the town with the check list. The records shall indicate the latest training date.

The attached inspection form shall be retained and kept available for a minimum of three years.

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection

Definition of Major Storm Event

For the purposes of this operation and maintenance plan a major storm event should be defined as a rainfall of such intensity or duration that causes observable movement of sediment on the roadway or site. It is the intent of this plan to prevent this sediment from entering the drainage system. Prior to stabilization of the site this may occur more frequently with less intense storms. As the site is stabilized with ground cover the movement of sediment will only occur during more severe storms.

Illicit Discharges

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Illicit discharges are prohibited from the stormwater management system and the stormwater management system shall be inspected for illicit discharges annually.

This Standard prohibits illicit discharges to stormwater management systems. The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

For additional information, refer to Performance Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

STORMWATER MANAGEMENT
BEST MANAGEMENT PRACTICES

INSPECTION SCHEDULE AND EVALUATION CHECKLIST – POST CONSTRUCTION PHASE

PROJECT LOCATION: 157 Market St.
Latest Revision April 23, 2025

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Drainage System
Deep Sump Hooded Catch Basins	4 times per year							

- (1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.
(2) records shall be kept for a minimum of three years.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____

Stamp

Deep Sump Catch Basin



Description: Deep sump catch basins, also known as oil and grease or hooded catch basins, are underground retention systems designed to remove trash, debris, and coarse sediment from stormwater runoff, and serve as temporary spill containment devices for floatables such as oils and greases.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	Provides no peak flow attenuation
3 - Recharge	Provides no groundwater recharge
4 - TSS Removal	25% TSS removal credit when used for pretreatment. Because of their limited effectiveness and storage capacity, deep sump catch basins receive credit for removing TSS only if they are used for pretreatment and designed as off-line systems.
5 - Higher Pollutant Loading	Recommended as pretreatment BMP. Although provides some spill control capability, a deep sump catch basin may not be used in place of an oil grit separator or sand filter for land uses that have the potential to generate runoff with high concentrations of oil and grease such as: high-intensity-use parking lots, gas stations, fleet storage areas, vehicle and/or equipment maintenance and service areas.
6 - Discharges near or to Critical Areas	May be used as pretreatment BMP. not an adequate spill control device for discharges near or to critical areas.
7 - Redevelopment	Highly suitable.

Advantages/Benefits:

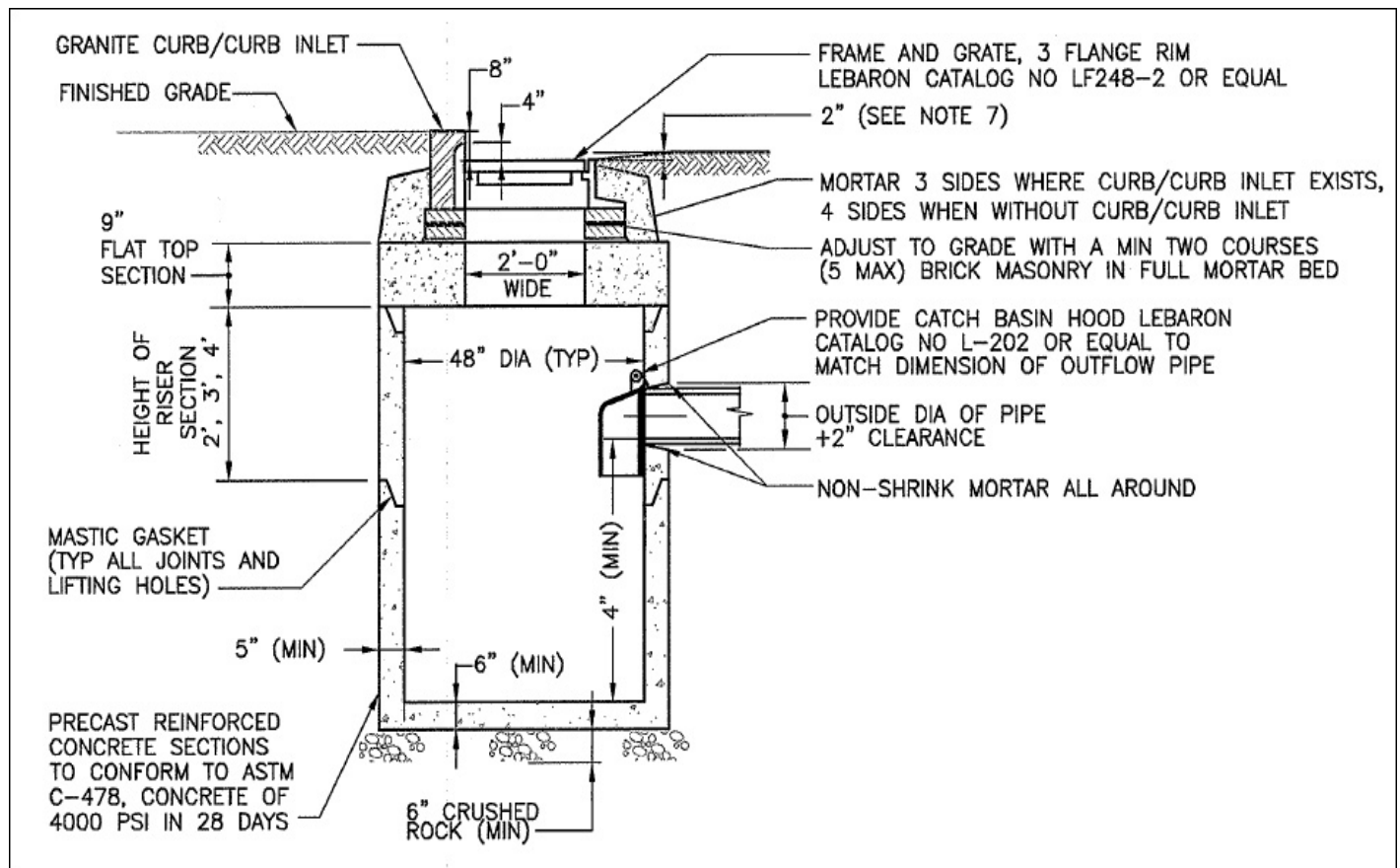
- Located underground, so limited lot size is not a deterrent.
- Compatible with subsurface storm drain systems.
- Can be used for retrofitting small urban lots where larger BMPs are not feasible.
- Provide pretreatment of runoff before it is delivered to other BMPs.
- Easily accessed for maintenance.
- Longevity is high with proper maintenance.

Disadvantages/Limitations:

- Limited pollutant removal.
- Expensive to install and maintain, resulting in high cost per unit area treated.
- No ability to control volume of stormwater
- Frequent maintenance is essential
- Requires proper disposal of trapped sediment and oil and grease
- Entrapment hazard for amphibians and other small animals

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) - 25% (for regulatory purposes)
- Nutrients (Nitrogen, phosphorus) - Insufficient data
- Metals (copper, lead, zinc, cadmium) - Insufficient data
- Pathogens (coliform, e coli) - Insufficient data



adapted from the University of New Hampshire

Maintenance

Activity	Frequency
Inspect units	Four times per year
Clean units	Four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Special Features

All deep sump catch basins must include hoods. For MassHighway projects, consult the Stormwater Handbook for Highways and Bridges for hood requirements.

LID Alternative

Reduce Impervious Surface

Disconnect rooftop and non-rooftop runoff

Vegetated Filter Strip

Deep Sump Catch Basin

Suitable Applications

- Pretreatment
- Residential subdivisions
- Office
- Retail

Design Considerations

- The contributing drainage area to any deep sump catch basin should not exceed $\frac{1}{4}$ acre of impervious cover.
 - Design and construct deep sump catch basins as off-line systems.
 - Size the drainage area so that the flow rate does not exceed the capacity of the inlet grate.
 - Divert excess flows to another BMP intended to meet the water quantity requirements (peak rate attenuation) or to a storm drain system.
- An off-line design enhances pollutant removal efficiency, because it prevents the resuspension of sediments in large storms.

Make the sump depth (distance from the bottom of the outlet pipe to the bottom of the basin) at least four feet times the diameter of the outlet pipe and more if the contributing drainage area has a high sediment load. The minimum sump depth is 4 feet. Double catch basins, those with 2 inlet grates, may require deeper sumps. Install the invert of the outlet pipe at least 4 feet from the bottom of the catch basin grate.

The inlet grate serves to prevent larger debris from entering the sump. To be effective, the grate must have a separation between the grates of one square inch or less. The inlet openings must not allow flows greater than 3 cfs to enter the deep sump catch basin. If the inlet grate is designed with a curb cut, the grate must reach the back of the curb cut to prevent bypassing. The inlet grate must be constructed of a durable material and fit tightly into the frame so it won't be dislodged by automobile traffic. The inlet grate must not be welded to the frame so that sediments may be easily removed. To facilitate maintenance, the inlet grate must be placed along the road shoulder or curb line rather than a traffic lane.

Note that within parking garages, the State Plumbing Code regulates inlet grates and other stormwater

management controls. Inlet grates inside parking garages are currently required to have much smaller openings than those described herein.

To receive the 25% removal credit, hoods must be used in deep sump catch basins. Hoods also help contain oil spills. MassHighway may install catch basins without hoods provided they are designed, constructed, operated, and maintained in accordance with the Mass Highway Stormwater Handbook.

Install the weep hole above the outlet pipe. Never install the weep hole in the bottom of the catch basin barrel.

Site Constraints

A proponent may not be able to install a deep sump catch basin because of:

- Depth to bedrock;
- High groundwater;
- Presence of utilities; or
- Other site conditions that limit depth of excavation because of stability.

Maintenance

Regular maintenance is essential. Deep sump catch basins remain effective at removing pollutants only if they are cleaned out frequently. One study found that once 50% of the sump volume is filled, the catch basin is not able to retain additional sediments.

Inspect or clean deep sump basins at least four times per year and at the end of the foliage and snow-removal seasons. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If handling runoff from land uses with higher potential pollutant loads or discharging runoff near or to a critical area, more frequent cleaning may be necessary.

Clamshell buckets are typically used to remove sediment in Massachusetts. However, vacuum trucks are preferable, because they remove more trapped sediment and supernatant than clamshells. Vacuuming is also a speedier process and is less likely to snap the cast iron hood within the deep sump catch basin.

Always consider the safety of the staff cleaning deep sump catch basins. Cleaning a deep sump catch basin within a road with active traffic or even within a parking lot is dangerous, and a police detail may be necessary to safeguard workers.

Although catch basin debris often contains concentrations of oil and hazardous materials such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Unless there is evidence that they have been contaminated by a spill or other means, MassDEP does not routinely require catch basin cleanings to be tested before disposal. Contaminated catch basin cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept solid waste, without any prior approval by MassDEP. However, some landfills require catch basin cleanings to be tested before they are accepted.

With prior MassDEP approval, catch basin cleanings may be used as grading and shaping materials at landfills undergoing closure (see Revised Guidelines for Determining Closure Activities at Inactive Unlined Landfill Sites) or as daily cover at active landfills. MassDEP also encourages the beneficial reuse of catch basin cleanings whenever possible. A Beneficial Reuse Determination is required for such use.

MassDEP regulations prohibit landfills from accepting materials that contain free-draining liquids. One way to remove liquids is to use a hydraulic lift truck during cleaning operations so that the material can be decanted at the site. After loading material from several catch basins into a truck, elevate the truck so that any free-draining liquid can flow back into the structure. If there is no free water in the truck, the material may be deemed to be sufficiently dry. Otherwise the catch basin cleanings must undergo a Paint Filter Liquids Test. Go to www.Mass.gov/dep/recycle/laws/cafacts.doc for information on all of the MassDEP requirements pertaining to the disposal of catch basin cleanings.



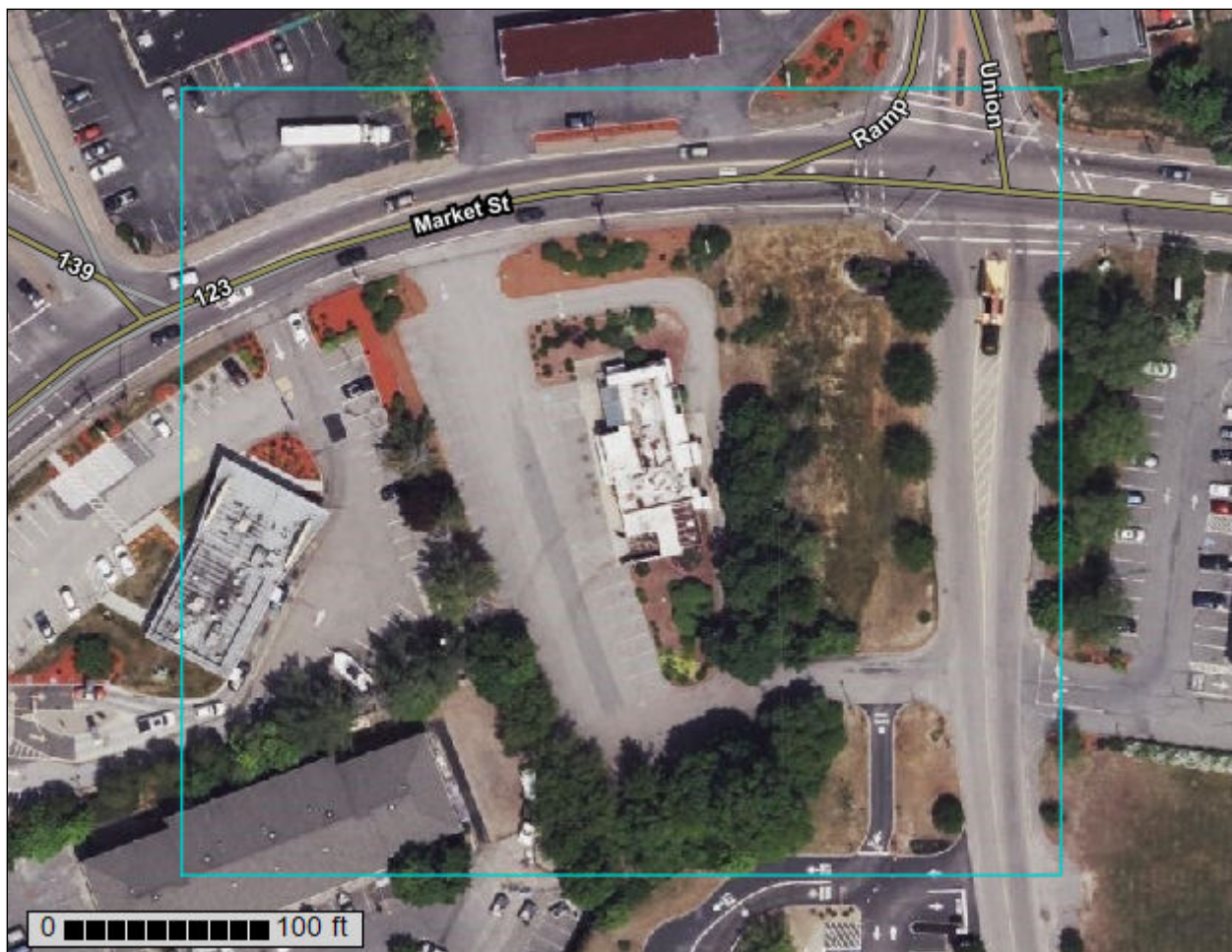
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Plymouth County, Massachusetts**



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
Plymouth County, Massachusetts.....	13
603A—Urban land, wet substratum. 0 to 3 percent slopes.....	13
640B—Urban land, till substratum, 0 to 8 percent slopes.....	13
References	14

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 17, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
603A	Urban land, wet substratum, 0 to 3 percent slopes	2.8	73.5%
640B	Urban land, till substratum, 0 to 8 percent slopes	1.0	26.5%
Totals for Area of Interest		3.8	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Plymouth County, Massachusetts

603A—Urban land, wet substratum. 0 to 3 percent slopes

Map Unit Composition

Urban land, wet substratum: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Urban land

Percent of map unit: 5 percent

640B—Urban land, till substratum, 0 to 8 percent slopes

Map Unit Composition

Urban land, till substratum: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelpdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf