ALLEN ENGINEERING & ASSOCIATES, INC.

DRAINAGE ANALYSIS
For
"Blackstone Street Improvements"
Blackstone Street
In
Bellingham, MA 02019

February 14, 2025

Prepared For:
Wall Street Development Corp.
P.O. Box 272
Westwood, MA 02090

140 Hartford Avenue East ~ Hopedale, Massachusetts 01747 ~ (508) 381-3212 - Phone
www.allen-ea.com

TABLE OF CONTENTS

Drainage Analysis

Blackstone Street Improvements
Bellingham, MA

SUMMARY OF EXISTING DRAINAGE CONDITIONS

Site Description:

The project for which this analysis has been prepared comprises 1,900 linear feet of a town-owned gravel road that runs along a varying width ROW in the town of Bellingham, Massachusetts. The existing gravel road slopes down and splits an existing wetland, then slopes back up the hill to a high point, and then slopes back down the hill before entering the Town of Blackstone. Locus contains several wetland systems, which have been identified and delineated by Goddard Consulting LLC and mapped by Allen Engineering & Associates, Inc.

Allen Engineering & Associates, Inc. has reviewed the Soil Survey for Worcester County prepared by the USDA/NRCS and has found the site to contain several soil types having hydrologic soil group (HSG) designations ranging from "A" through "D". The "D" or very slow infiltrating soils appear to be associated with the mapped wetlands, while the remaining areas are located within areas designated as "Canton" and "Ridgebury". On-site test data is appended to this report in section 4.

Hydrology Background:

Allen Engineering & Associates, Inc. has utilized AutoCAD and HydroCAD software to perform this drainage analysis. Autocad was used to generate the existing and proposed drainage plans that can be found in sections 1 and 2 of this report. These plans were used to define such items as subcatchment areas, time of concentration paths and ground cover. Two design evaluation points numbered EV1 and EV2 in the calculations have been established corresponding to the existing surface runoff collection area. HydroCAD was used to calculate the rates and volume of storm water runoff during various storm events at these evaluation points. These rates are summarized for the existing and proposed site conditions on page iii.

SUMMARY OF PROPOSED DEVELOPMENT DRAINAGE CONDITIONS

Site Description:
The proposed project ("the Project") consists of improving the 1900 lf of gravel road. The proposed road is a 22-foot paved travel way with a modified Cape Cod berm. It ends with a 45-foot radius cul-de-sac. A proposed open box culvert and retaining wall will allow for limited wetland impact and hydraulically connect the two existing wetlands.

Stormwater Management:

The proposed drainage system has been designed to meet the Stormwater Management Standards set by the Massachusetts Department of Environmental Protection (DEP). As detailed in the following standards compliance section the total peak flow rate for the constructed site is less than the existing rates for all storm events examined, and the stormwater runoff is treated to the required level and volume by approved Best Management Practices for Total Suspended Solids removal.

Stormwater runoff from the paved roadway will collect in deep sump hooded catch basins. The stormwater will then be sent to 2 different infiltration basins. The infiltration basins have been designed in accordance with the Massachusetts Stormwater Management Standards to recharge the required volume of runoff as well as provide temporary storage volume necessary to attenuate post-development peak rates to pre-development conditions.

SUMMARY OF HYDROLOGY

Blackstone Street Improvement

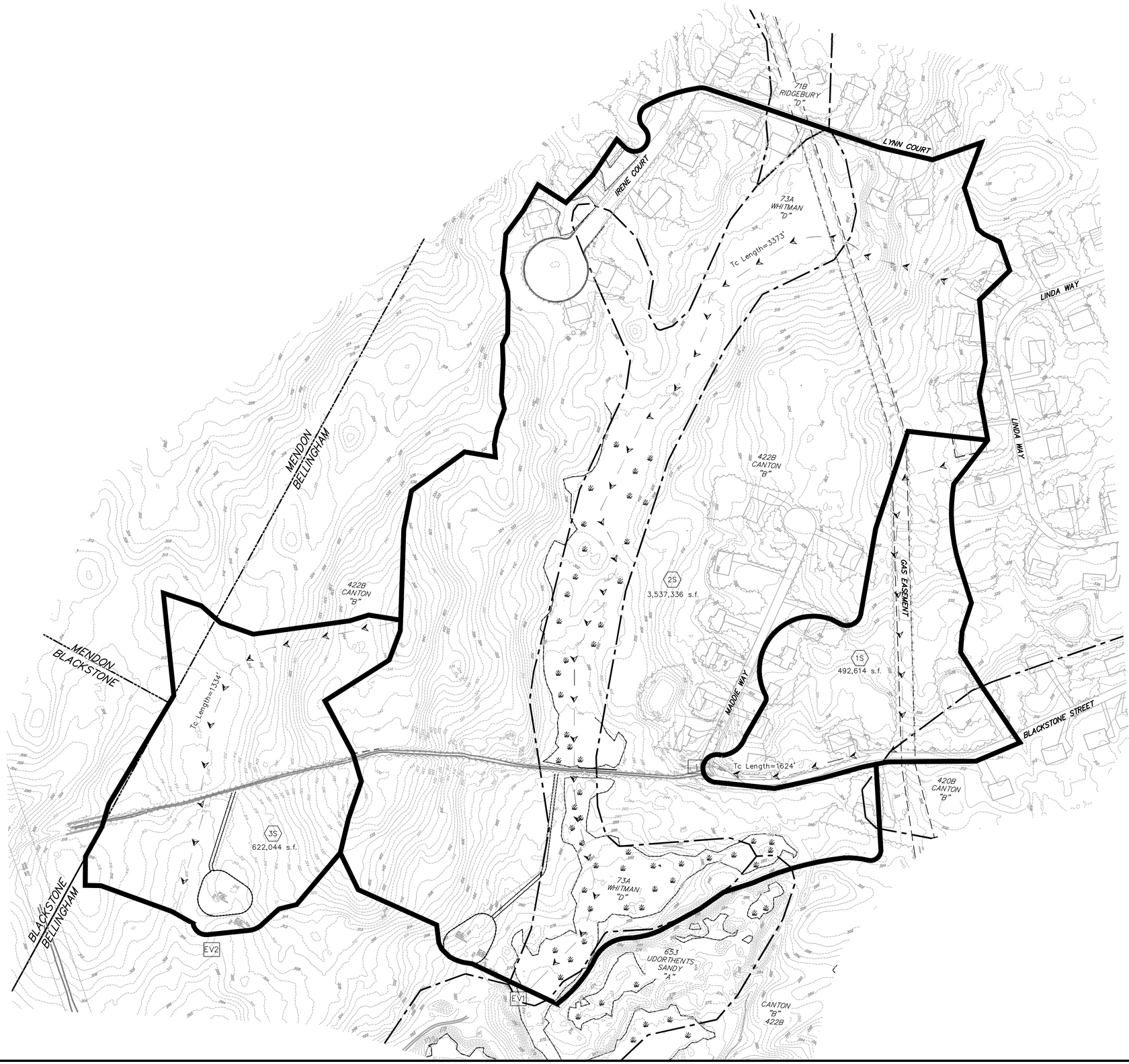
Using HydroCAD Software

Job No.:	454	Calced By:	J.Scanlom
Client:	Wall Street Development Corp	Date:	2/14/2025
Location:	Blackstone Street, Bellingham MA	Revised:	

TABLE 1: Summary of Peak Rates of Stormwater Runoff

Evaluation Point	HydroCAD symbols	Existing Conditions Runoff (CFS) 2-Yr	10-Yr	25-Yr	100-Yr	HydroCAD symbols	Proposed Conditions Runoff (CFS) 2-Yr	10-Yr	25-Yr	100-Yr
Wetland	1EV	17.72	61.98	95.94	154.08	1EV	14.76	53.65	83.92	135.77
Offsite	2EV	1.44	8.44	14.58	25.64	2EV	1.34	7.82	13.54	23.89
TOTAL		**19.16**	**70.42**	**110.52**	**179.72**		**16.10**	**61.47**	**97.46**	**159.66**

Existing Drainage Calculations



DRAINAGE LEGEND

- SUBCATCHMENT AREA
- REACH
- POND
- SOIL DELINEATION
- TIME OF CONCENTRATION PATH
- DRAINAGE AREA LIMIT

LEGEND

- EDGE OF WETLAND
- 256 EXISTING CONTOUR
- EXISTING TREE LINE

NOTES

1. ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.
2. HORIZONTAL DATUM: NAD 83
3. PARTIAL WETLAND RESOURCES FLAGGED BY GODDARD CONSULTING IN 2024.FLAGS WERE FIELD LOCATED BY ALLEN ENGINEERING & ASSOCIATES IN NOVEMBER 2024.
4. PROPERTY LINE AND TOPOGRAPHIC INFORMATION OBTAINED BY ALLEN ENGINEERING & ASSOCIATES, INC IN AUGUST, 2024.
5. UNDERGROUND UTILITIES SHOWN HAVE BEEN COMPILED FROM AVAILABLE PLANS FROM PUBLIC AND PRIVATE AGENCIES, OR AS INDICATED BY FIELD OBSERVATIONS AND ARE APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OR STRUCTURES NOT SHOWN HEREON MIGHT EXIST. BEFORE ANY EXCAVATION OR CONSTRUCTION CALL DIG-SAFE AT 811.
6. TOPOGRAPHIC INFORMATION OBTAINED FROM LIDAR DATA ISSUED BY NOAA (2021).

OWNER:

Wall Street Development Corp.
P.O. Box 272
Westwood, MA 02090

TITLE:

EXISTING DRAINAGE PLAN
for
Blackstone Street Improvements
Bellingham, MA

SEAL:

COMMONWEALTH OF MASSACHUSETTS
MARK E. ALLEN NO. 41799
REGISTERED PROFESSIONAL ENGINEER
2/14/25

PROFESSIONAL ENGINEER

PREPARED BY:

ALLEN ENGINEERING & ASSOCIATES, INC.
Civil Engineers · Surveyors
Land Development Consultants
140 Hartford Avenue East
Hopedale, Ma 01747
(508) 381-3212 · www.allen-ea.com

SCALE: 1"= 150 FEET

0 150 300 450

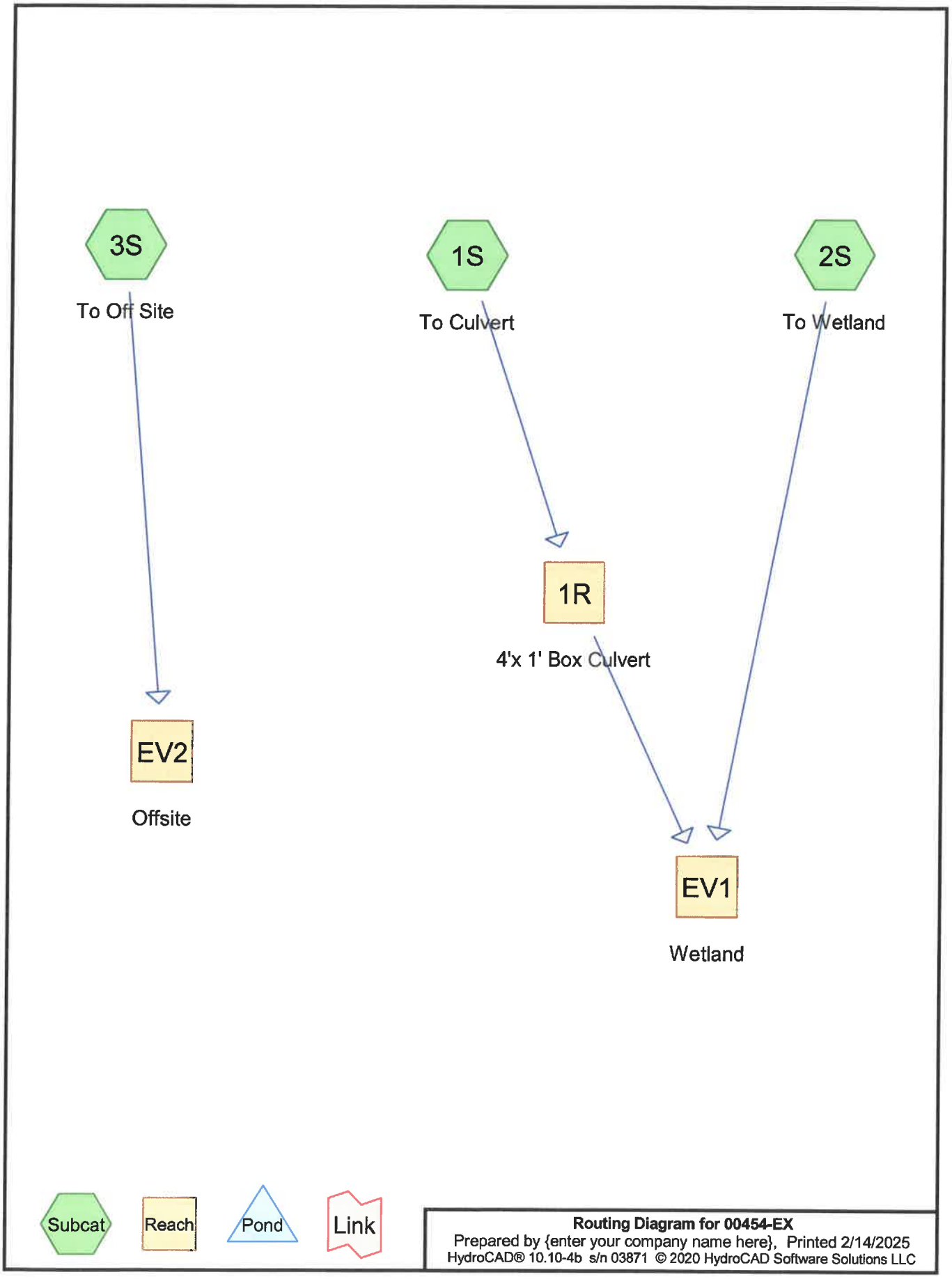
DATE: January 28, 2025

REVISIONS

#	DATE	DESCRIPTION	INIT

JOB NO: 00454

SHEET: 1 of 1


3S
To Off Site
1S
To Culvert
2S
To Wetland
1R
4'x 1' Box Culvert
EV2
Offsite
EV1
Wetland
Subcat
Reach
Pond
Link
Routing Diagram for 00454-EX
Prepared by {enter your company name here}, Printed 2/14/2025
HydroCAD® 10.10-4b s/n 03871 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YR	Type III 24-hr		Default	24.00	1	3.38	2
2	10 YR	Type III 24-hr		Default	24.00	1	5.23	2
3	25 YR	Type III 24-hr		Default	24.00	1	6.38	2
4	100 YR	Type III 24-hr		Default	24.00	1	8.16	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
394,101	61	>75% Grass cover, Good, HSG B (1S, 2S)
20,077	80	>75% Grass cover, Good, HSG D (2S)
5,248	96	Gravel surface, HSG B (2S, 3S)
7,421	96	Gravel surface, HSG D (2S)
92,735	98	Paved roads w/curbs & sewers, HSG B (1S, 2S)
39,866	98	Roofs, HSG B (1S, 2S)
3,202	98	Roofs, HSG D (2S)
3,295,421	55	Woods, Good, HSG B (1S, 2S, 3S)
793,923	77	Woods, Good, HSG D (2S)
4,651,994	**61**	**TOTAL AREA**

Summary for Reach 1R: 4'x 1' Box Culvert

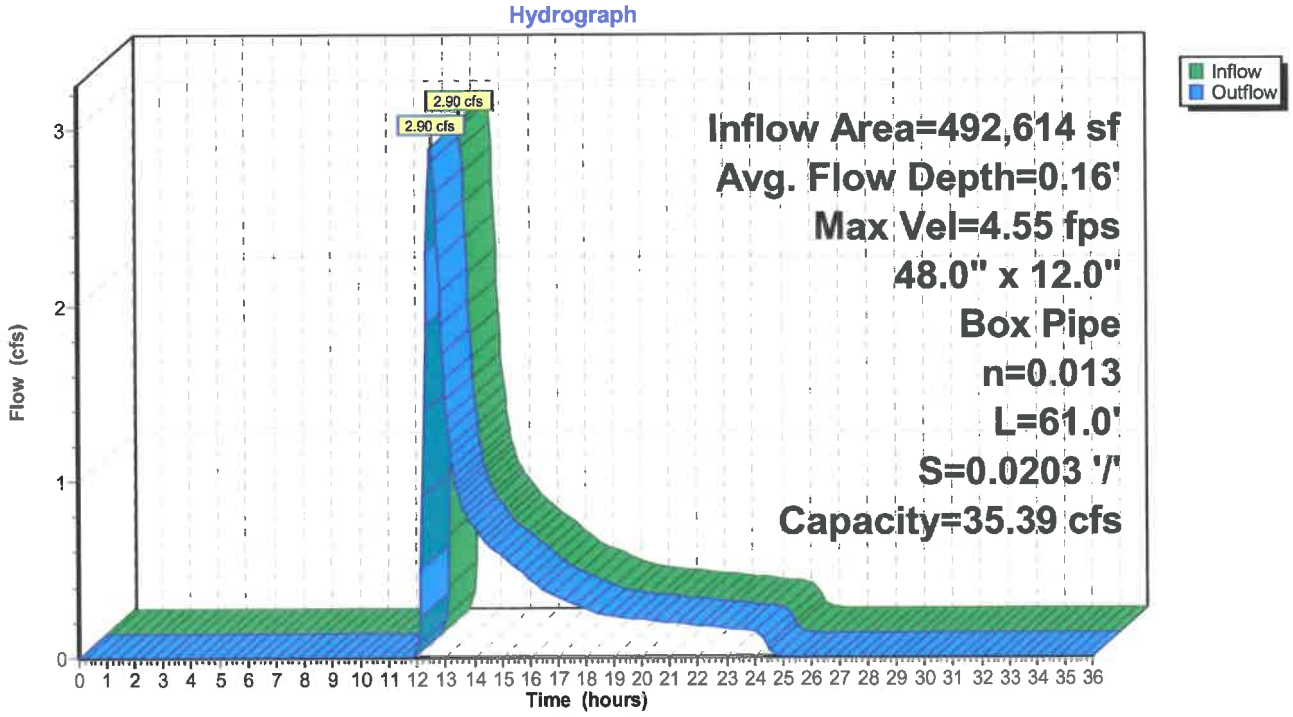
Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 0.52" for 2 YR event
Inflow = 2.90 cfs @ 12.51 hrs, Volume= 21,338 cf
Outflow = 2.90 cfs @ 12.51 hrs, Volume= 21,338 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.55 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.95 fps, Avg. Travel Time= 0.5 min

Peak Storage= 39 cf @ 12.51 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'

Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

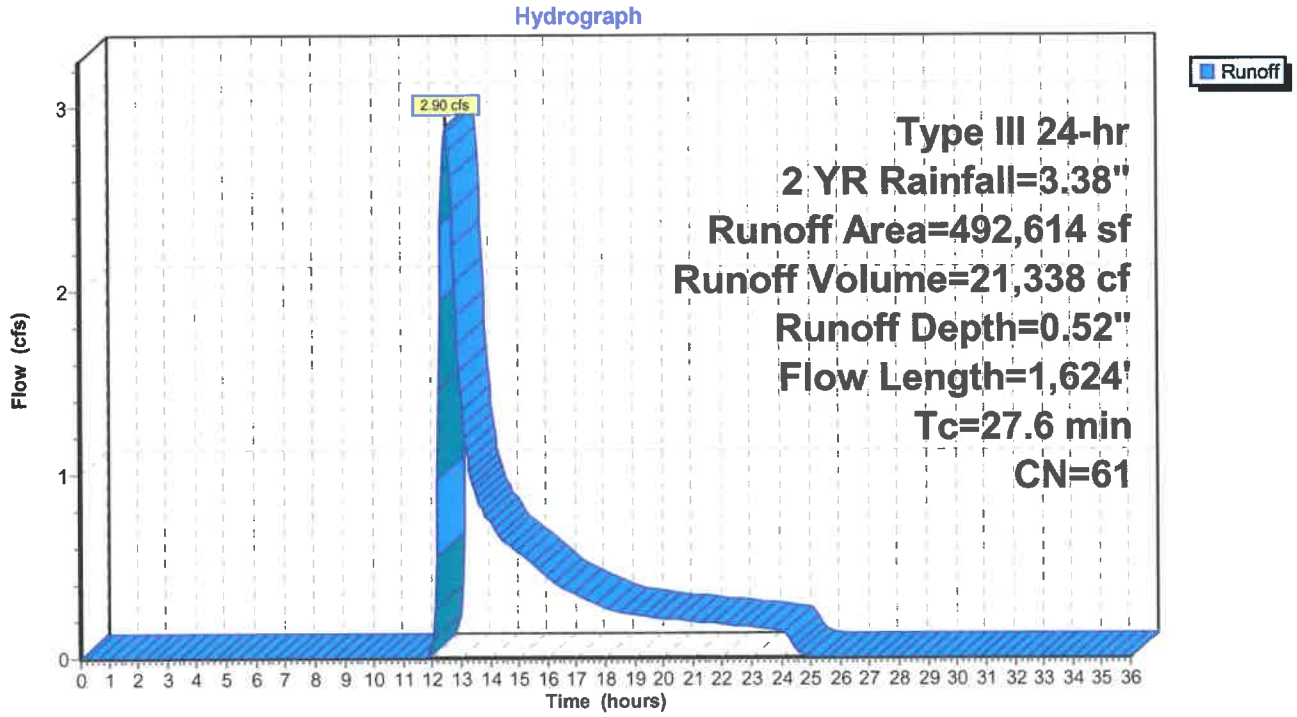
Runoff = 2.90 cfs @ 12.51 hrs, Volume= 21,338 cf, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Subcatchment 2S: To Wetland

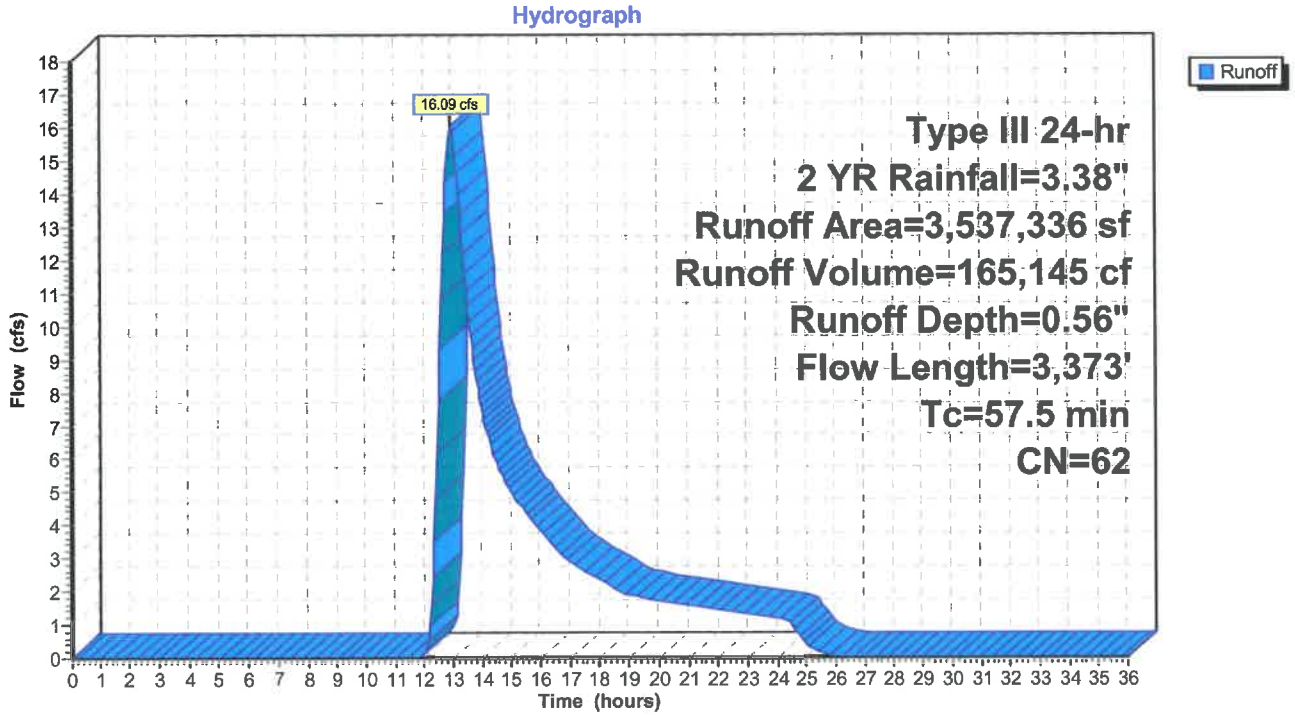
Runoff = 16.09 cfs @ 12.94 hrs, Volume= 165,145 cf, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,388,844	55	Woods, Good, HSG B
793,923	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
3,537,336	62	Weighted Average
3,450,644		97.55% Pervious Area
86,692		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
44.2	2,957	0.0115	1.12	1.34	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
57.5	3,373	Total			

Subcatchment 2S: To Wetland



Summary for Subcatchment 3S: To Off Site

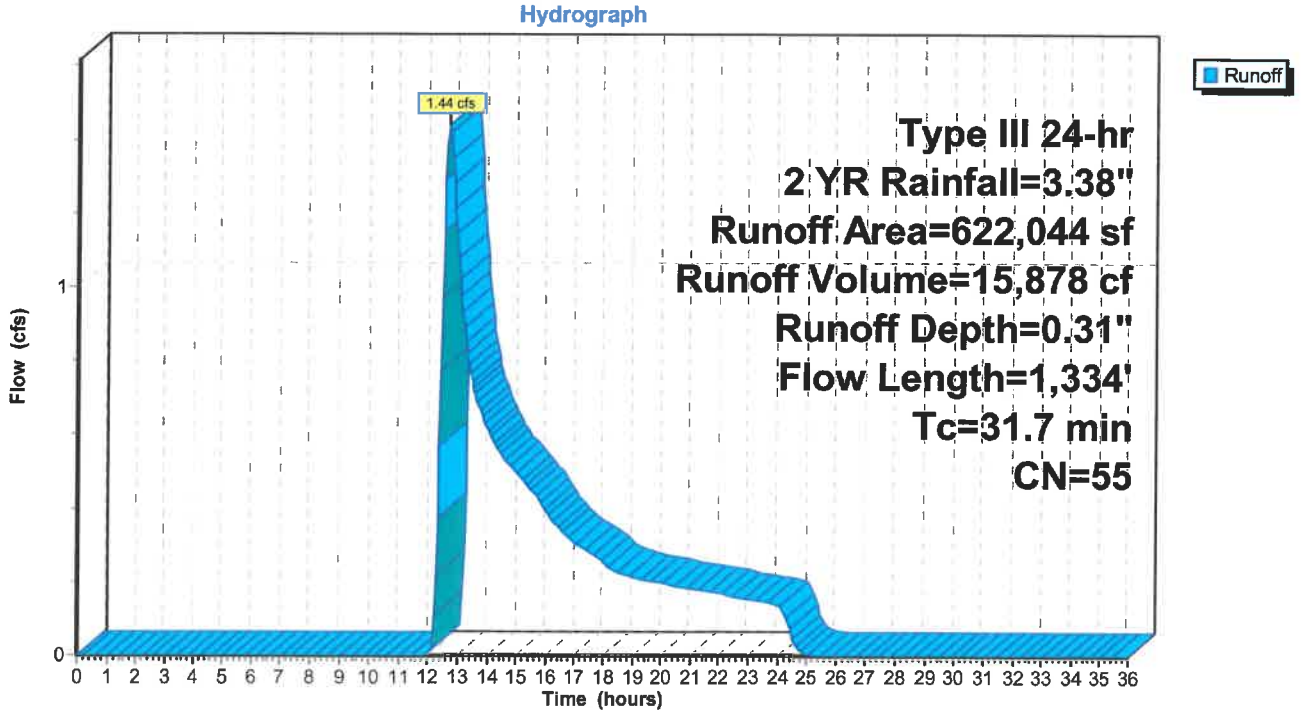
Runoff = 1.44 cfs @ 12.68 hrs, Volume= 15,878 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
617,678	55	Woods, Good, HSG B
622,044	55	Weighted Average
622,044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
15.2	912	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	8	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.3	364	0.0172	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
31.7	1,334	Total			

Subcatchment 3S: To Off Site

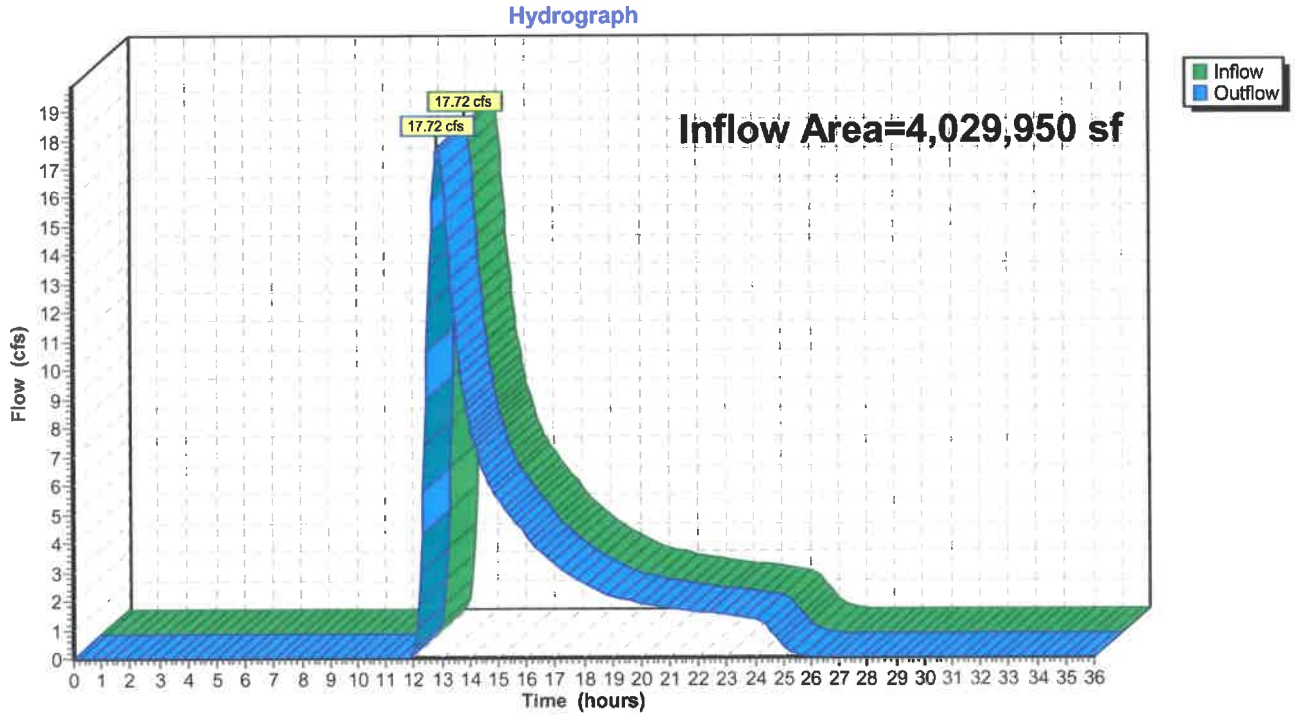


Summary for Reach EV1: Wetland

Inflow Area = 4,029,950 sf, 3.37% Impervious, Inflow Depth = 0.56" for 2 YR event
Inflow = 17.72 cfs @ 12.91 hrs, Volume= 186,483 cf
Outflow = 17.72 cfs @ 12.91 hrs, Volume= 186,483 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV1: Wetland



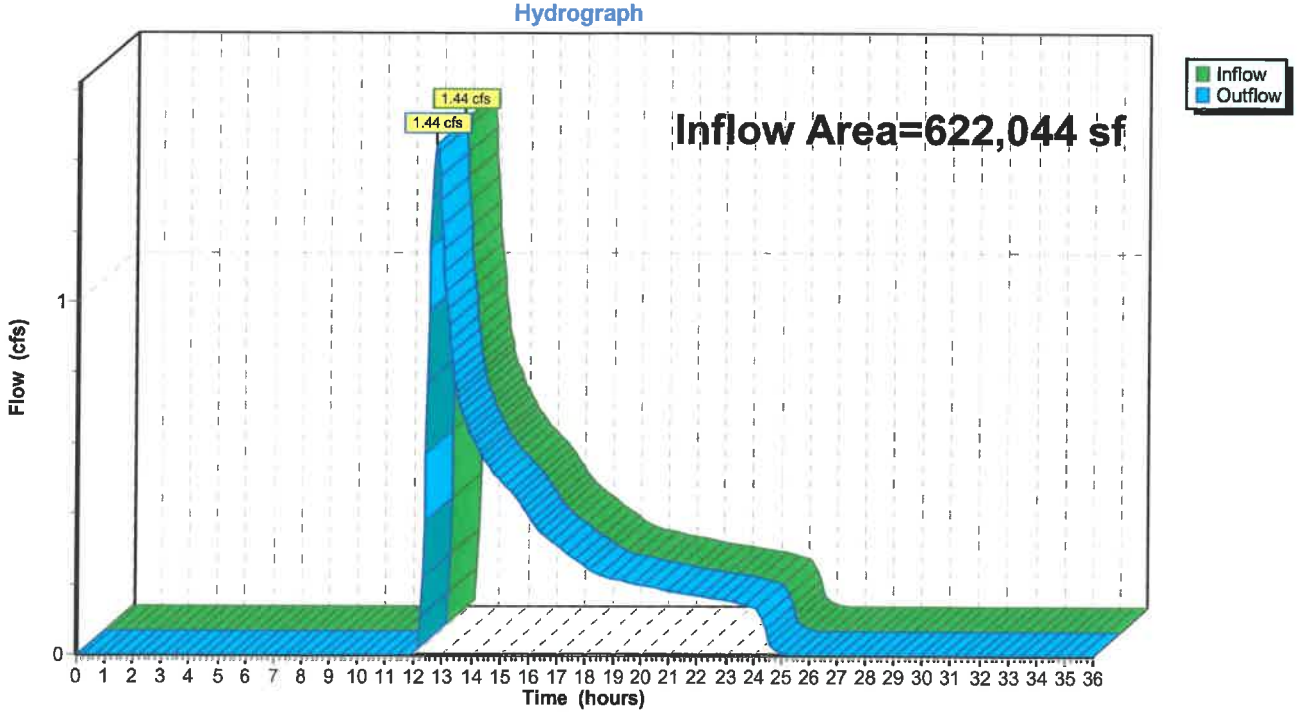
Summary for Reach EV2: Offsite

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 0.31" for 2 YR event
Inflow = 1.44 cfs @ 12.68 hrs, Volume= 15,878 cf
Outflow = 1.44 cfs @ 12.68 hrs, Volume= 15,878 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV2: Offsite

Hydrograph



Summary for Reach 1R: 4'x 1' Box Culvert

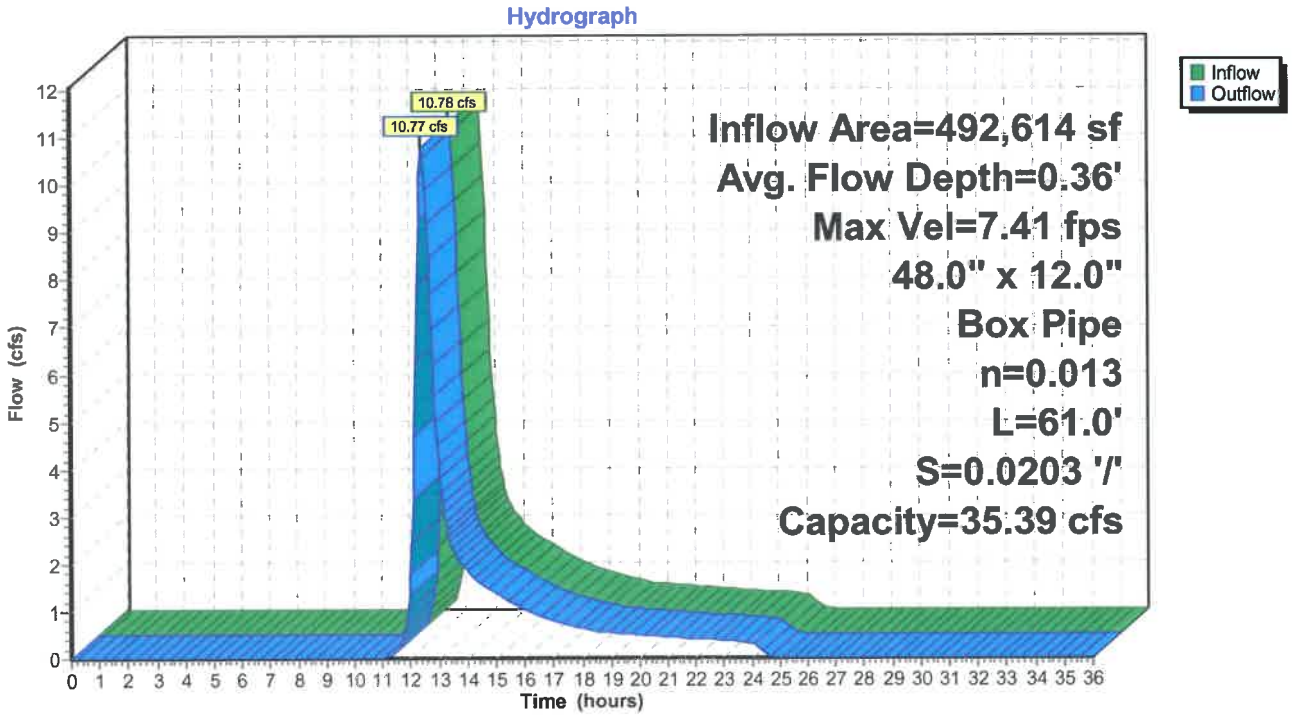
Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 1.51" for 10 YR event
Inflow = 10.78 cfs @ 12.43 hrs, Volume= 61,957 cf
Outflow = 10.77 cfs @ 12.43 hrs, Volume= 61,957 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.41 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.72 fps, Avg. Travel Time= 0.4 min

Peak Storage= 89 cf @ 12.43 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'

Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

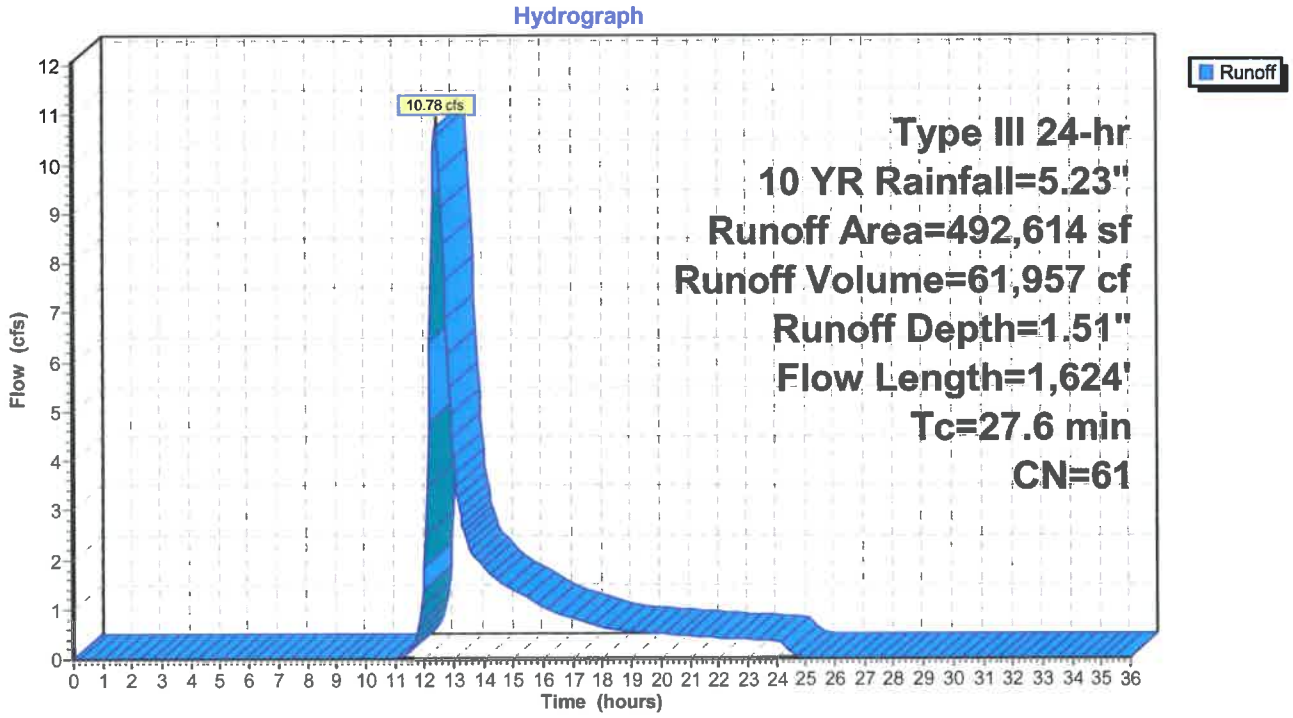
Runoff = 10.78 cfs @ 12.43 hrs, Volume= 61,957 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Subcatchment 2S: To Wetland

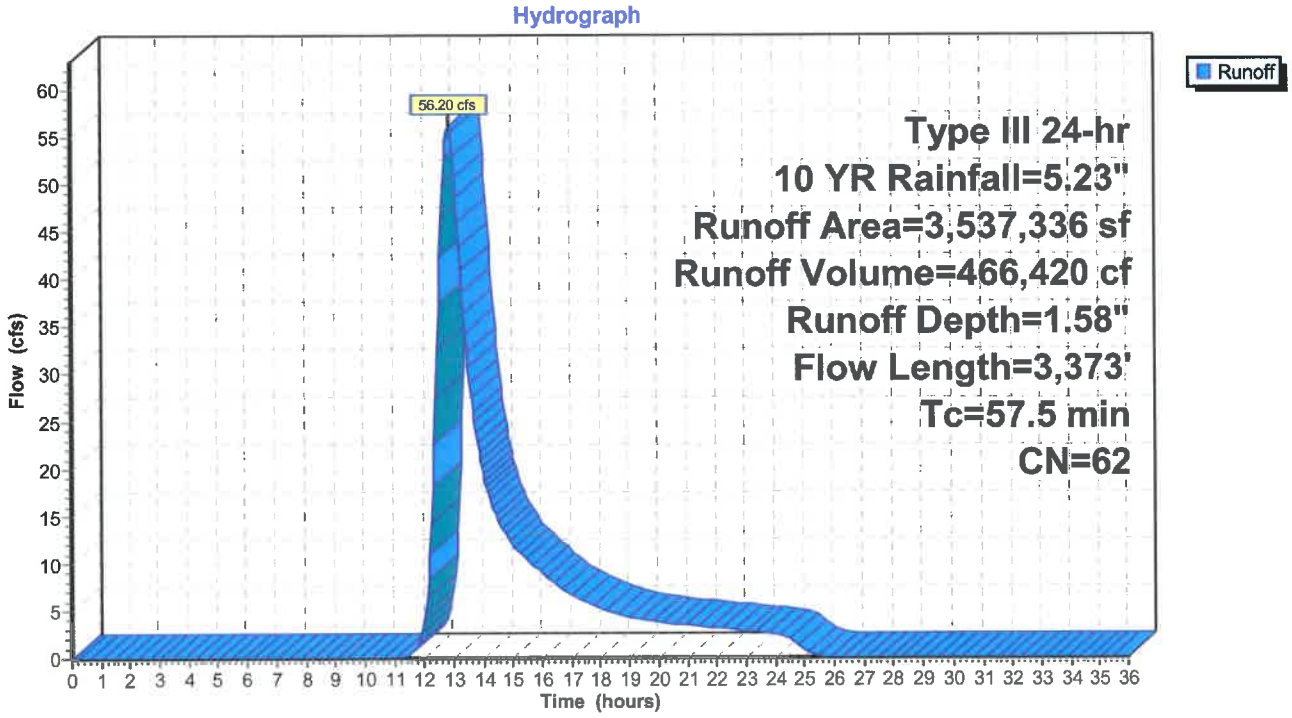
Runoff = 56.20 cfs @ 12.85 hrs, Volume= 466,420 cf, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,388,844	55	Woods, Good, HSG B
793,923	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
3,537,336	62	Weighted Average
3,450,644		97.55% Pervious Area
86,692		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
44.2	2,957	0.0115	1.12	1.34	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
57.5	3,373	Total			

Subcatchment 2S: To Wetland



Summary for Subcatchment 3S: To Off Site

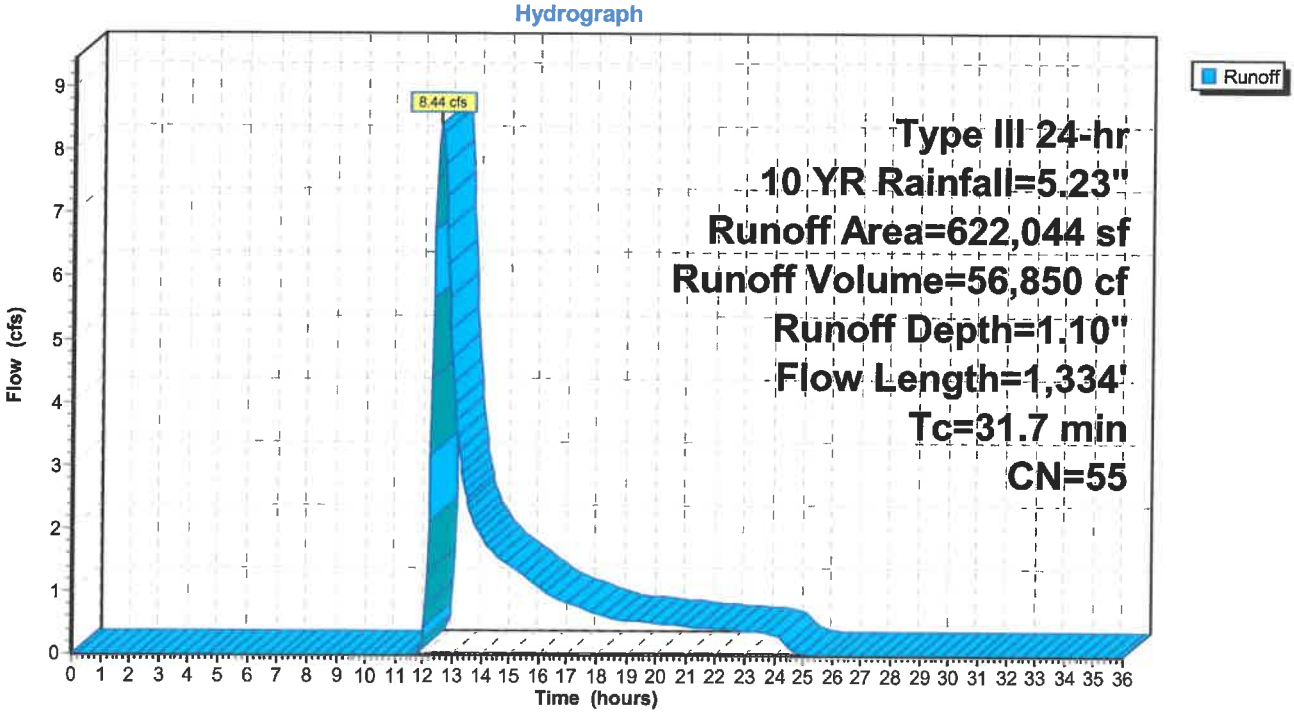
Runoff = 8.44 cfs @ 12.53 hrs, Volume= 56,850 cf, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
617,678	55	Woods, Good, HSG B
622,044	55	Weighted Average
622,044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
15.2	912	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	8	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.3	364	0.0172	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
31.7	1,334	Total			

Subcatchment 3S: To Off Site

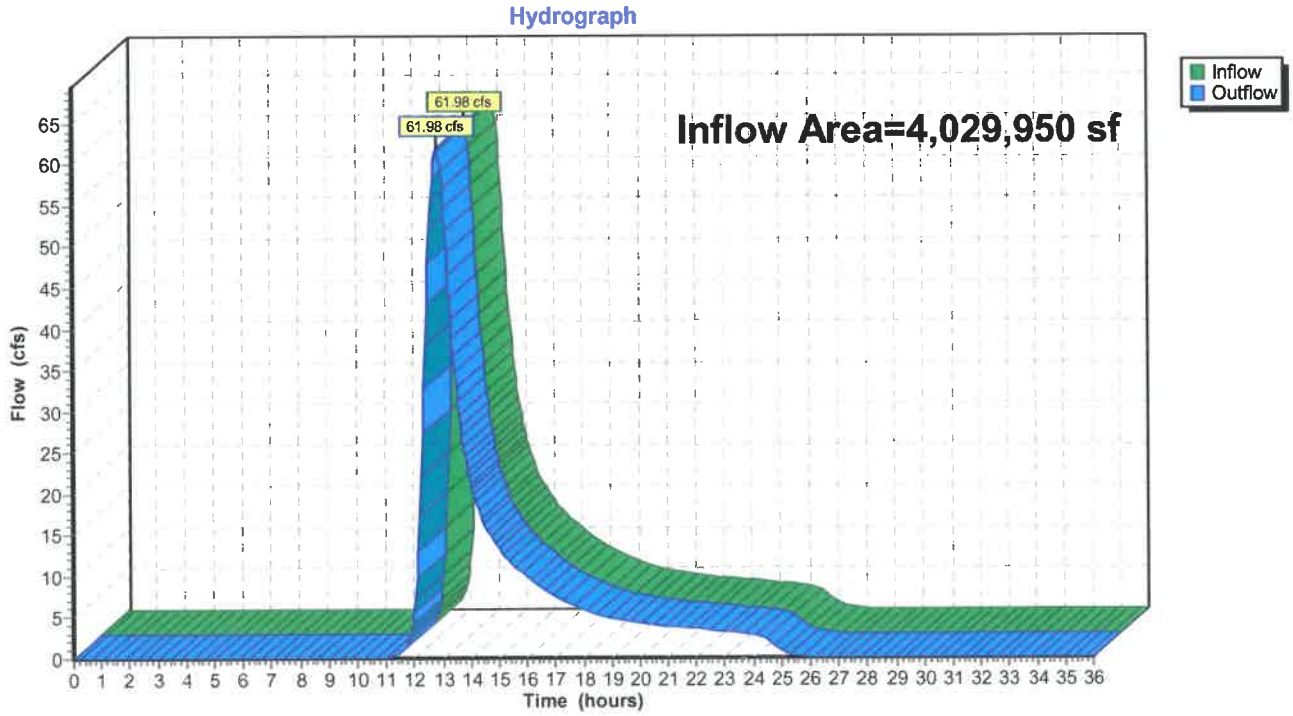


Summary for Reach EV1: Wetland

Inflow Area = 4,029,950 sf, 3.37% Impervious, Inflow Depth = 1.57" for 10 YR event
Inflow = 61.98 cfs @ 12.81 hrs, Volume= 528,377 cf
Outflow = 61.98 cfs @ 12.81 hrs, Volume= 528,377 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV1: Wetland



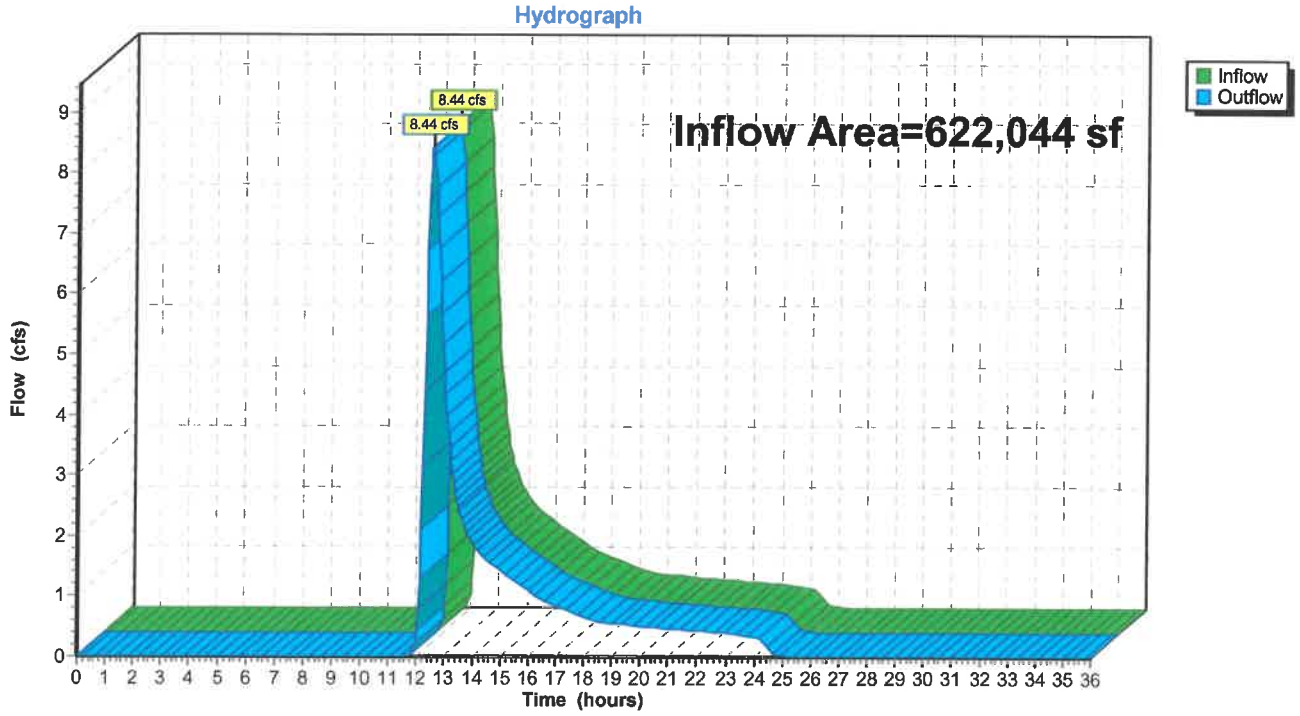
Summary for Reach EV2: Offsite

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 1.10" for 10 YR event
Inflow = 8.44 cfs @ 12.53 hrs, Volume= 56,850 cf
Outflow = 8.44 cfs @ 12.53 hrs, Volume= 56,850 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV2: Offsite

Hydrograph



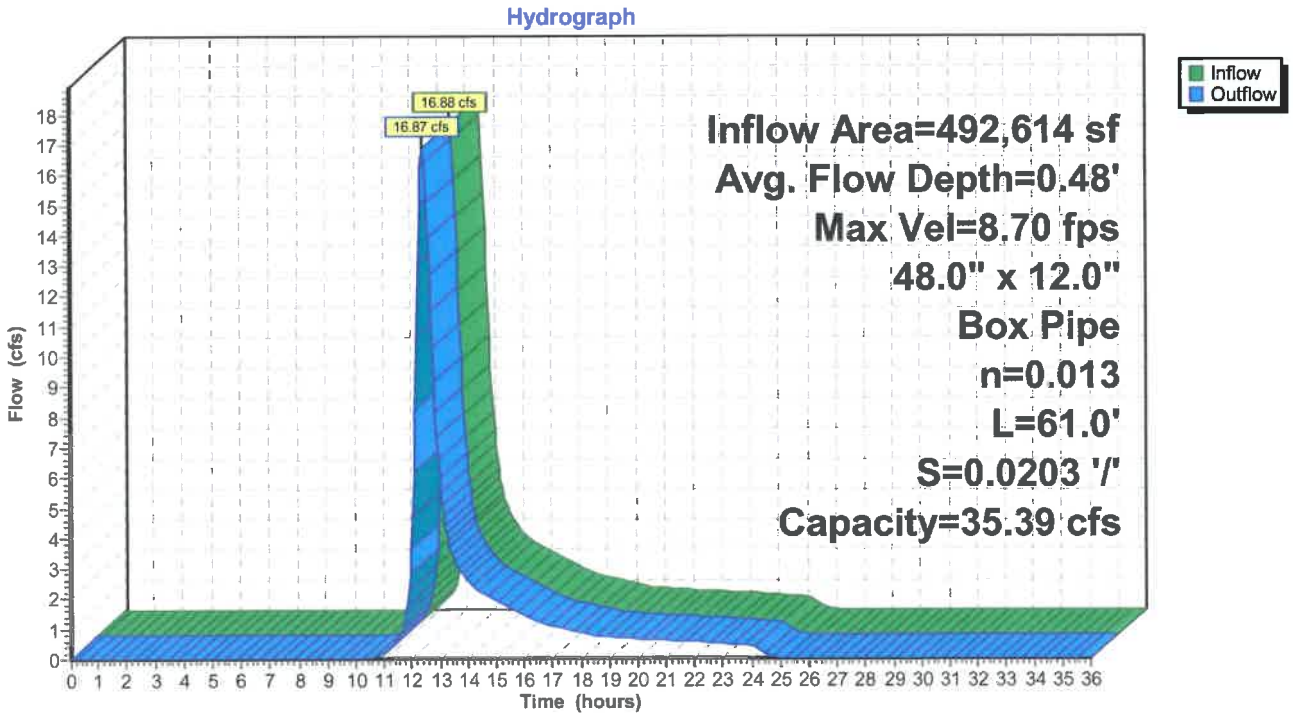
Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 2.26" for 25 YR event
Inflow = 16.88 cfs @ 12.41 hrs, Volume= 92,937 cf
Outflow = 16.87 cfs @ 12.42 hrs, Volume= 92,937 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.70 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.06 fps, Avg. Travel Time= 0.3 min

Peak Storage= 118 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'



Summary for Subcatchment 1S: To Culvert

Runoff = 16.88 cfs @ 12.41 hrs, Volume= 92,937 cf, Depth= 2.26"

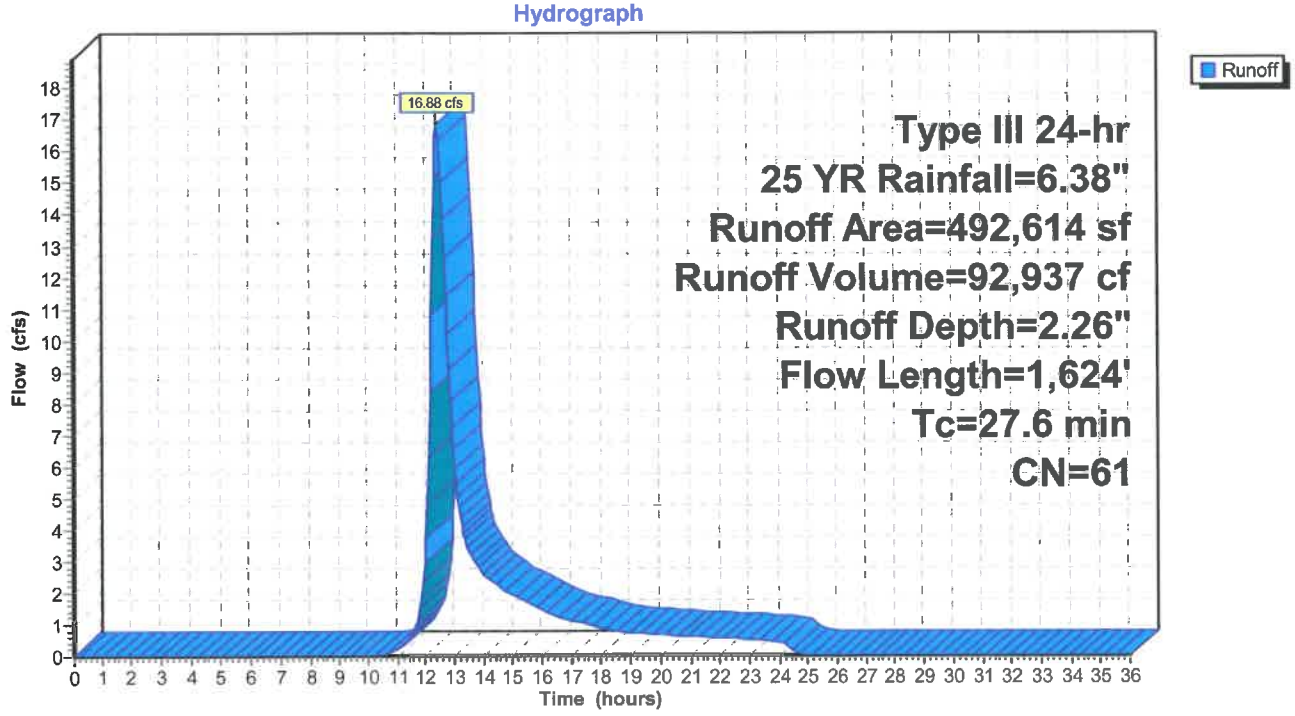
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

Subcatchment 1S: To Culvert

Hydrograph



Summary for Subcatchment 2S: To Wetland

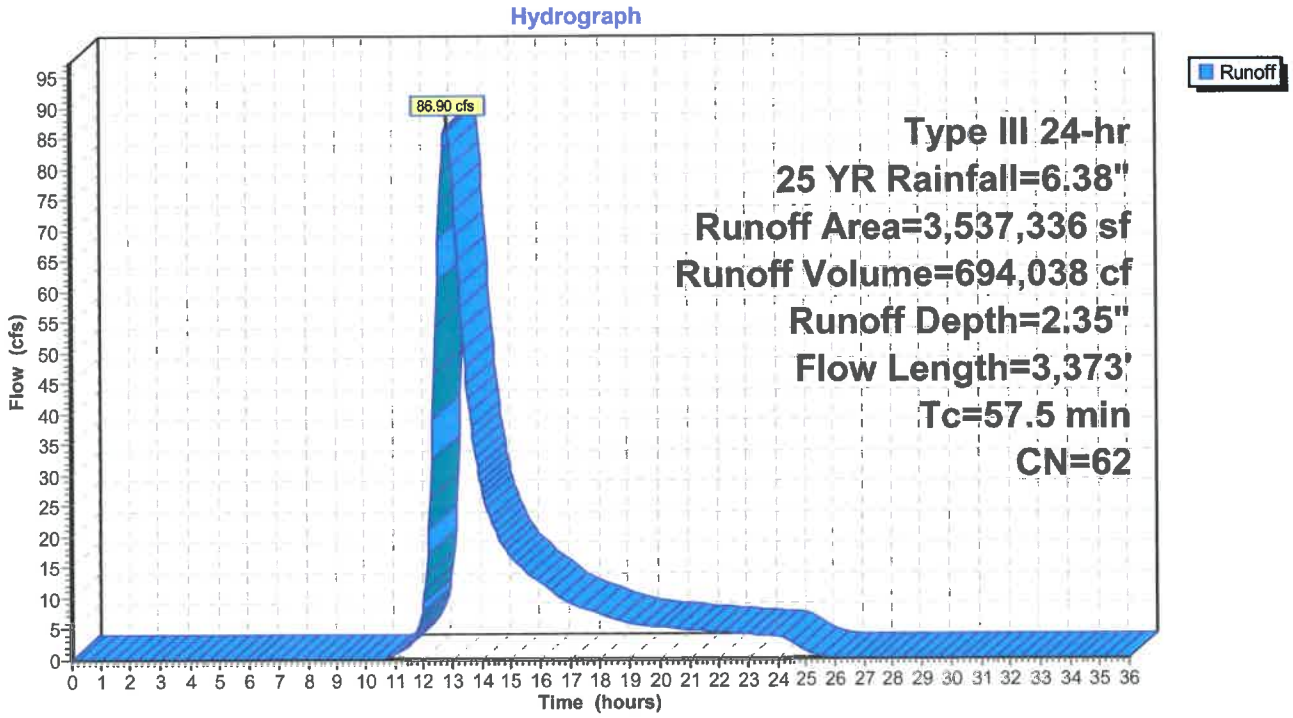
Runoff = 86.90 cfs @ 12.83 hrs, Volume= 694,038 cf, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,388,844	55	Woods, Good, HSG B
793,923	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
3,537,336	62	Weighted Average
3,450,644		97.55% Pervious Area
86,692		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
44.2	2,957	0.0115	1.12	1.34	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
57.5	3,373	Total			

Subcatchment 2S: To Wetland



Summary for Subcatchment 3S: To Off Site

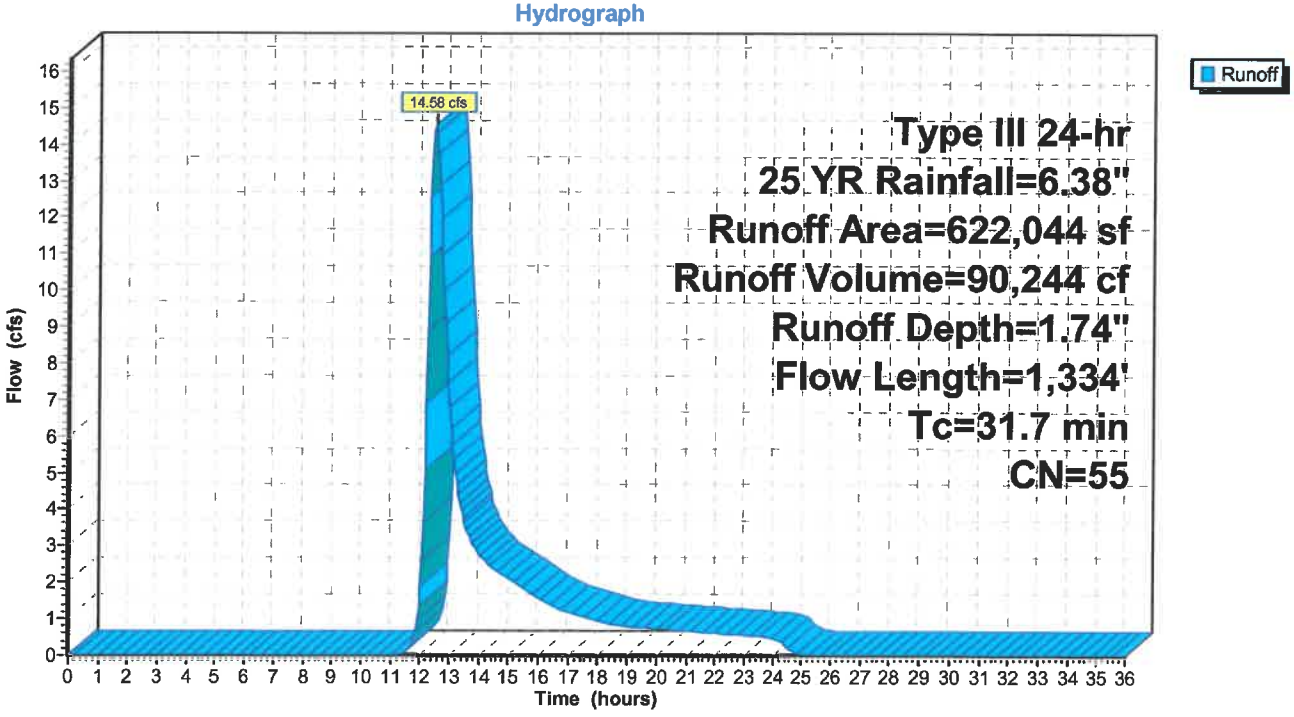
Runoff = 14.58 cfs @ 12.50 hrs, Volume= 90,244 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
617,678	55	Woods, Good, HSG B
622,044	55	Weighted Average
622,044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
15.2	912	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	8	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.3	364	0.0172	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
31.7	1,334	Total			

Subcatchment 3S: To Off Site

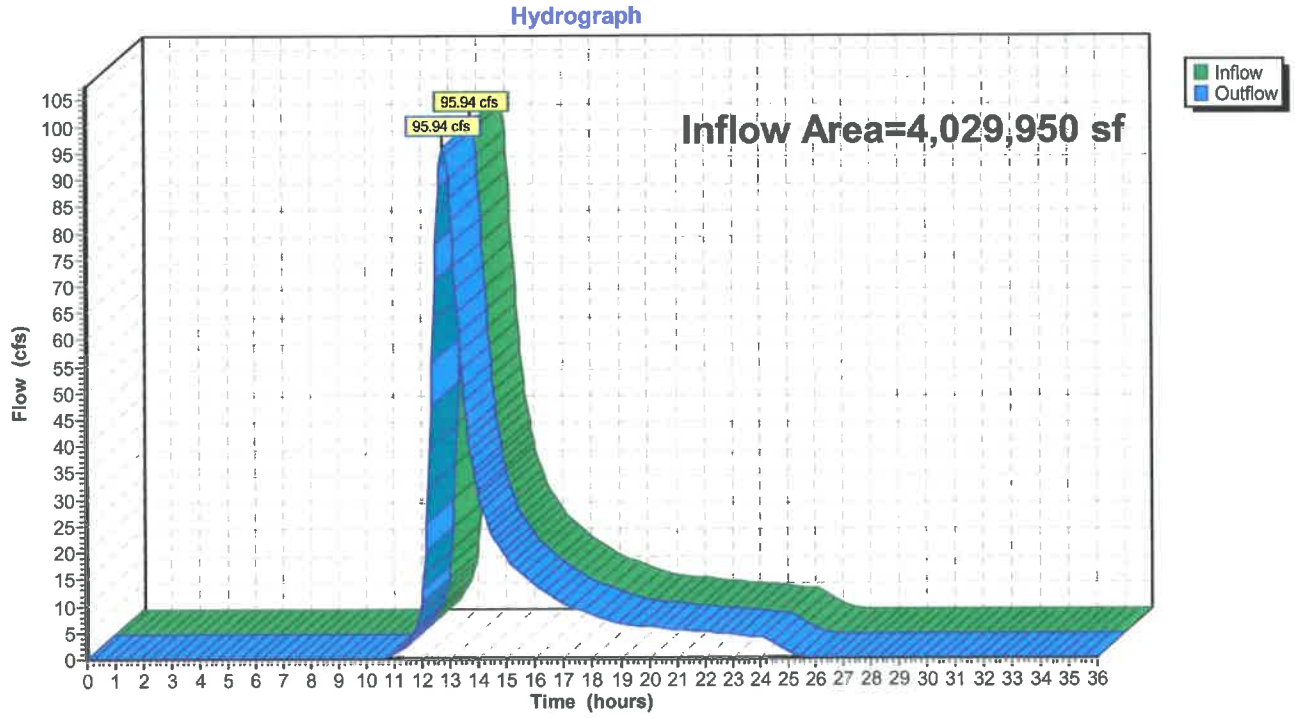


Summary for Reach EV1: Wetland

Inflow Area = 4,029,950 sf, 3.37% Impervious, Inflow Depth = 2.34" for 25 YR event
Inflow = 95.94 cfs @ 12.78 hrs, Volume= 786,975 cf
Outflow = 95.94 cfs @ 12.78 hrs, Volume= 786,975 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV1: Wetland



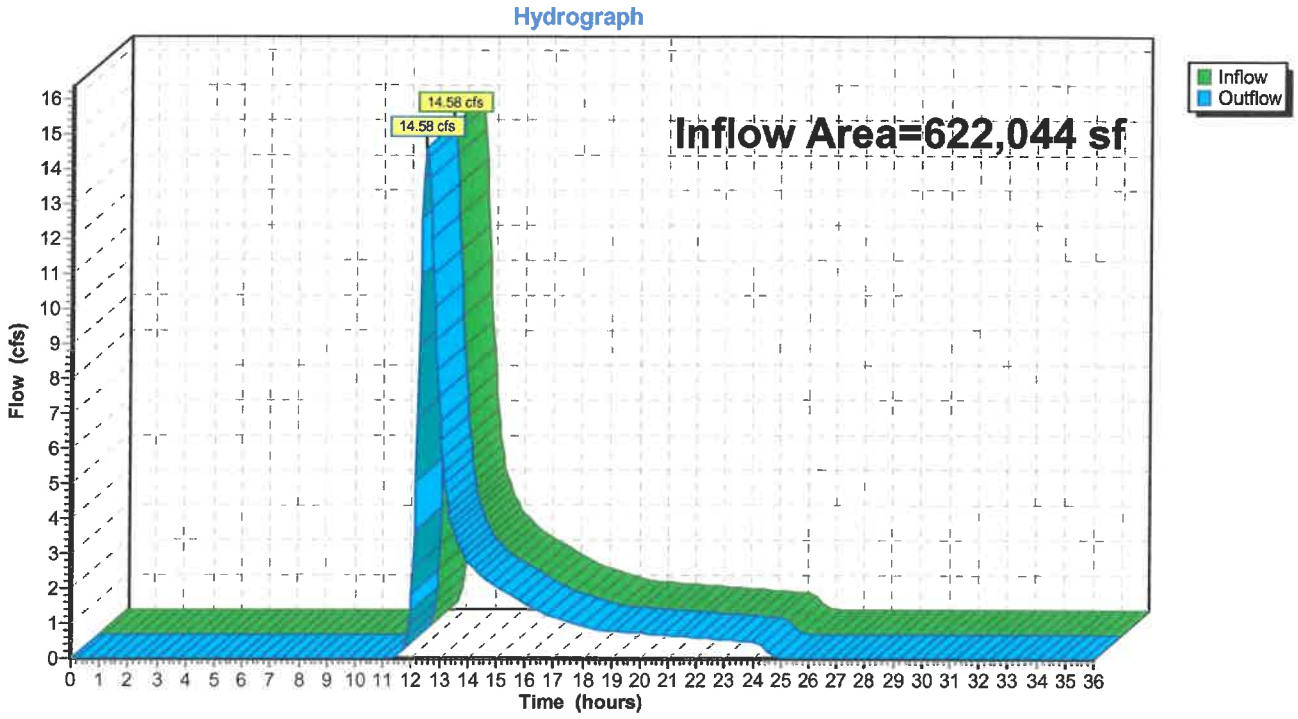
Summary for Reach EV2: Offsite

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 1.74" for 25 YR event
Inflow = 14.58 cfs @ 12.50 hrs, Volume= 90,244 cf
Outflow = 14.58 cfs @ 12.50 hrs, Volume= 90,244 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV2: Offsite

Hydrograph



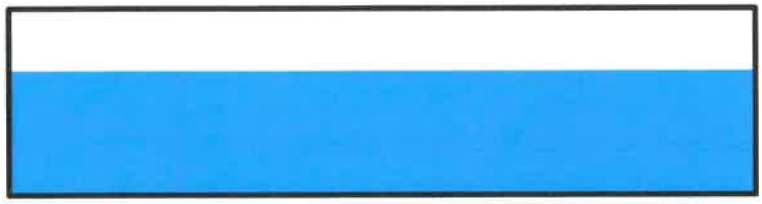
Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth = 3.57" for 100 YR event
Inflow = 27.33 cfs @ 12.40 hrs, Volume= 146,434 cf
Outflow = 27.32 cfs @ 12.40 hrs, Volume= 146,434 cf, Atten= 0%, Lag= 0.2 min

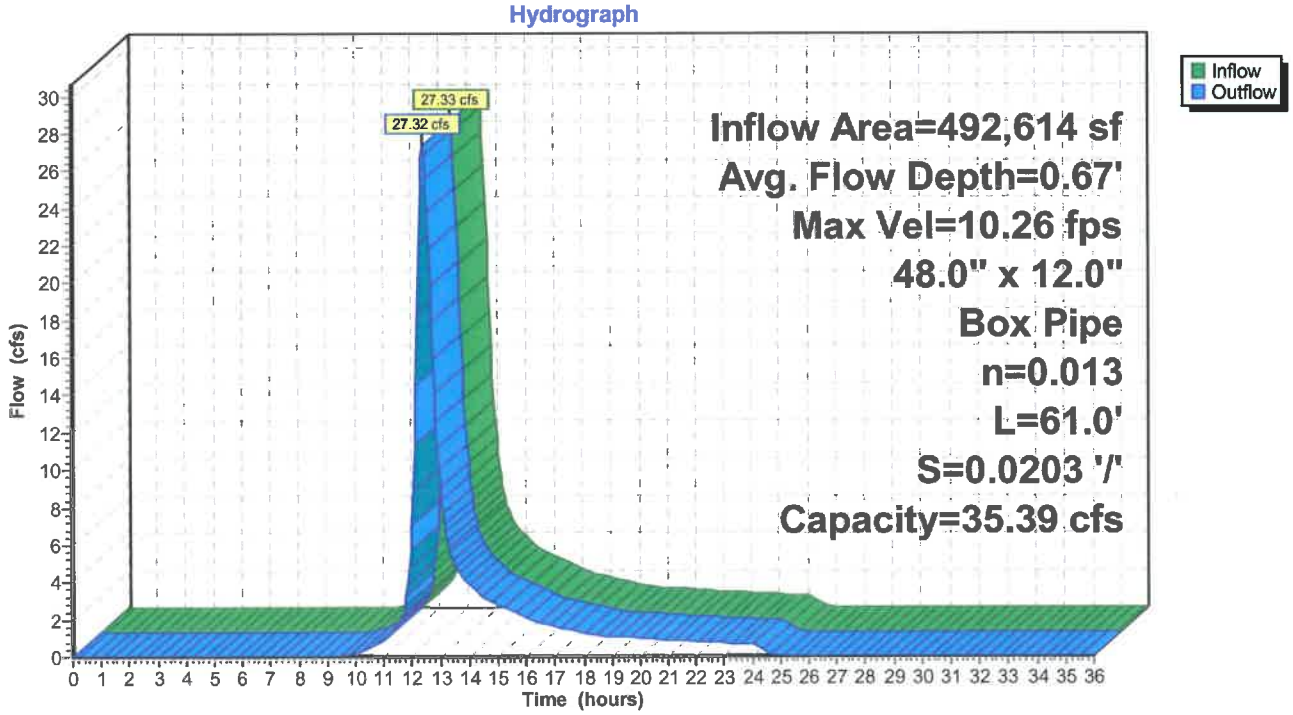
Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.26 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.50 fps, Avg. Travel Time= 0.3 min

Peak Storage= 162 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'



Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

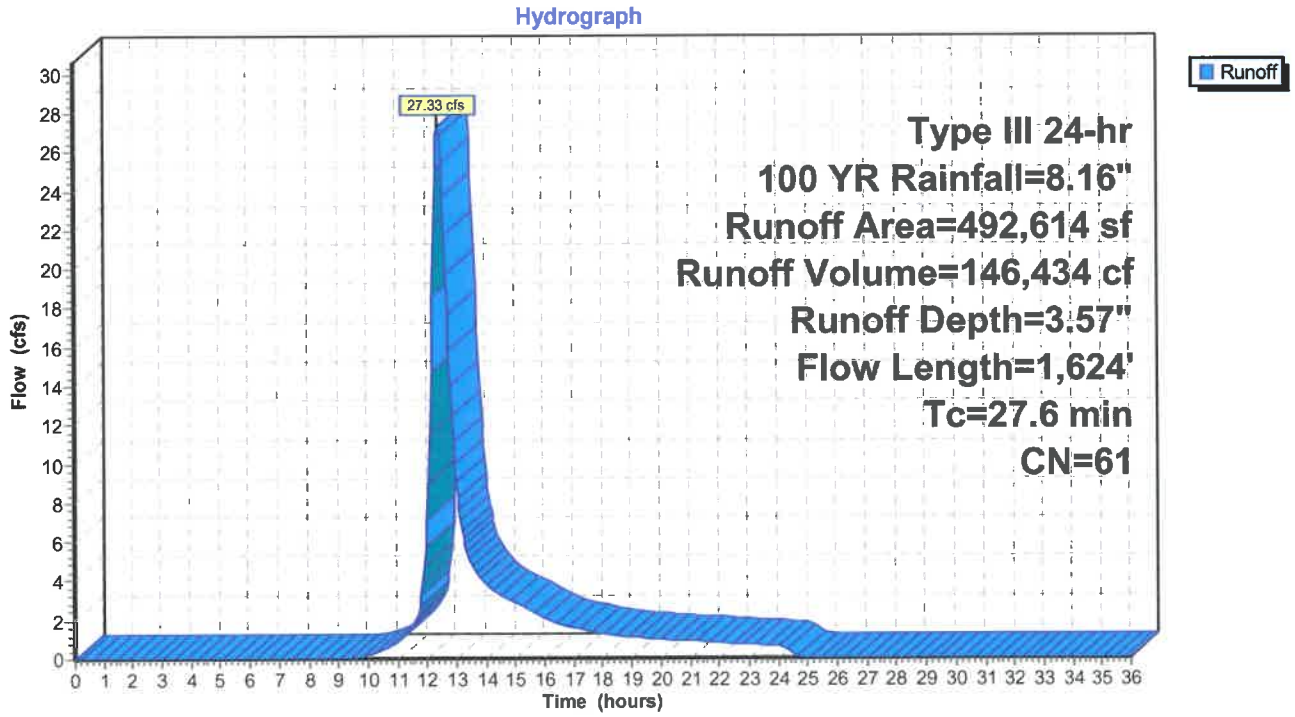
Runoff = 27.33 cfs @ 12.40 hrs, Volume= 146,434 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.16"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	880	0.0432	1.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
27.6	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Subcatchment 2S: To Wetland

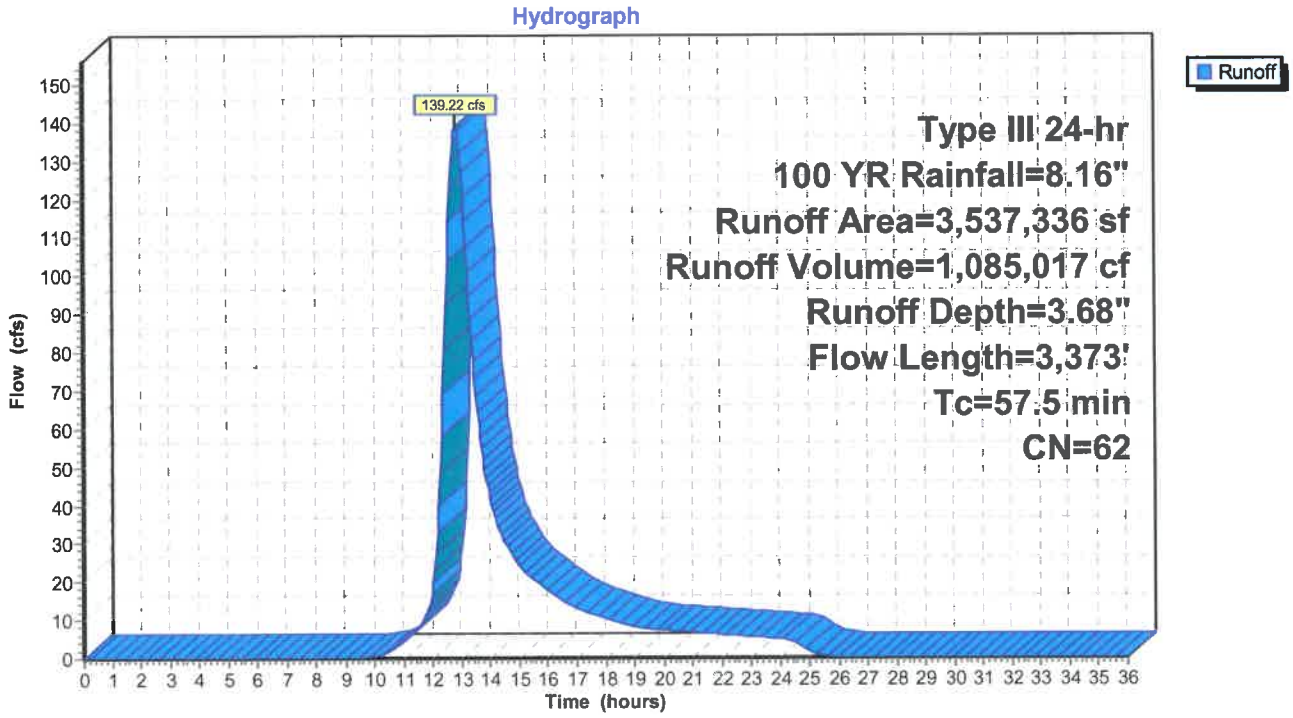
Runoff = 139.22 cfs @ 12.81 hrs, Volume= 1,085,017 cf, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.16"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
2,388,844	55	Woods, Good, HSG B
793,923	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
882	96	Gravel surface, HSG B
7,421	96	Gravel surface, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
3,537,336	62	Weighted Average
3,450,644		97.55% Pervious Area
86,692		2.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.5	366	0.1202	1.73		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
44.2	2,957	0.0115	1.12	1.34	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush
57.5	3,373	Total			

Subcatchment 2S: To Wetland



Summary for Subcatchment 3S: To Off Site

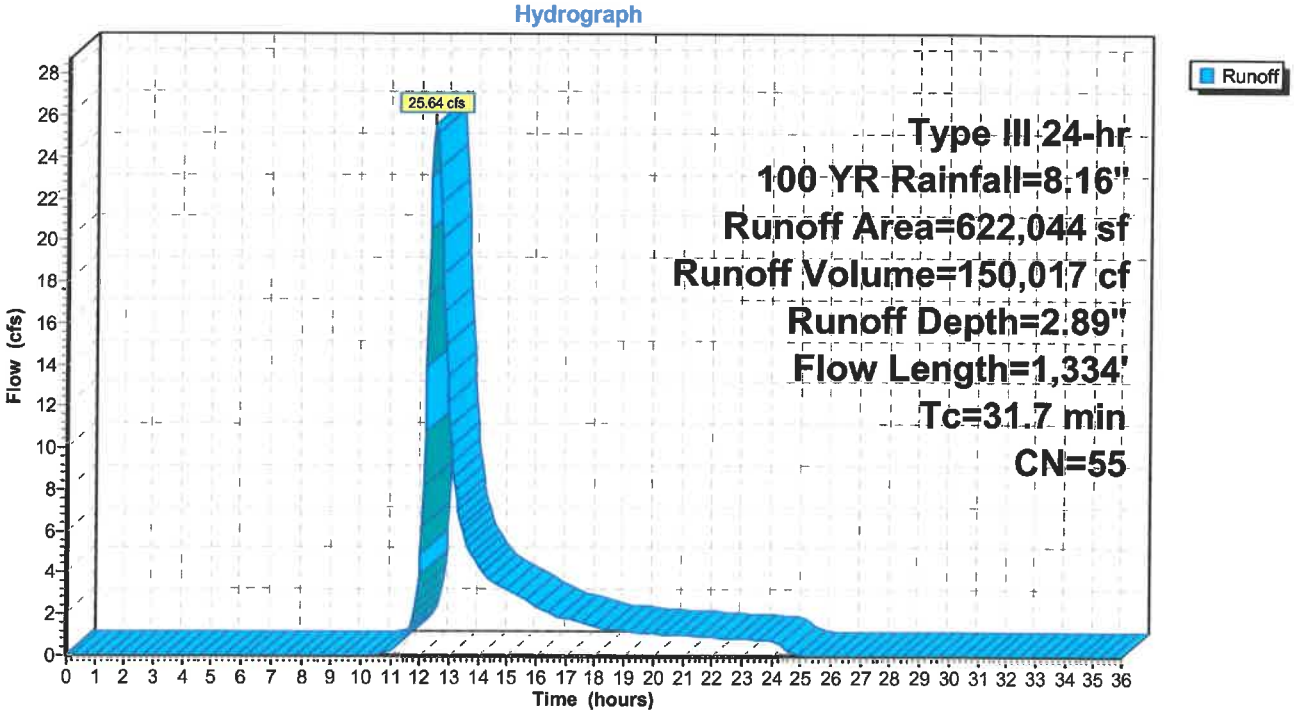
Runoff = 25.64 cfs @ 12.47 hrs, Volume= 150,017 cf, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.16"

Area (sf)	CN	Description
4,366	96	Gravel surface, HSG B
617,678	55	Woods, Good, HSG B
622,044	55	Weighted Average
622,044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
15.2	912	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	8	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.3	364	0.0172	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
31.7	1,334	Total			

Subcatchment 3S: To Off Site

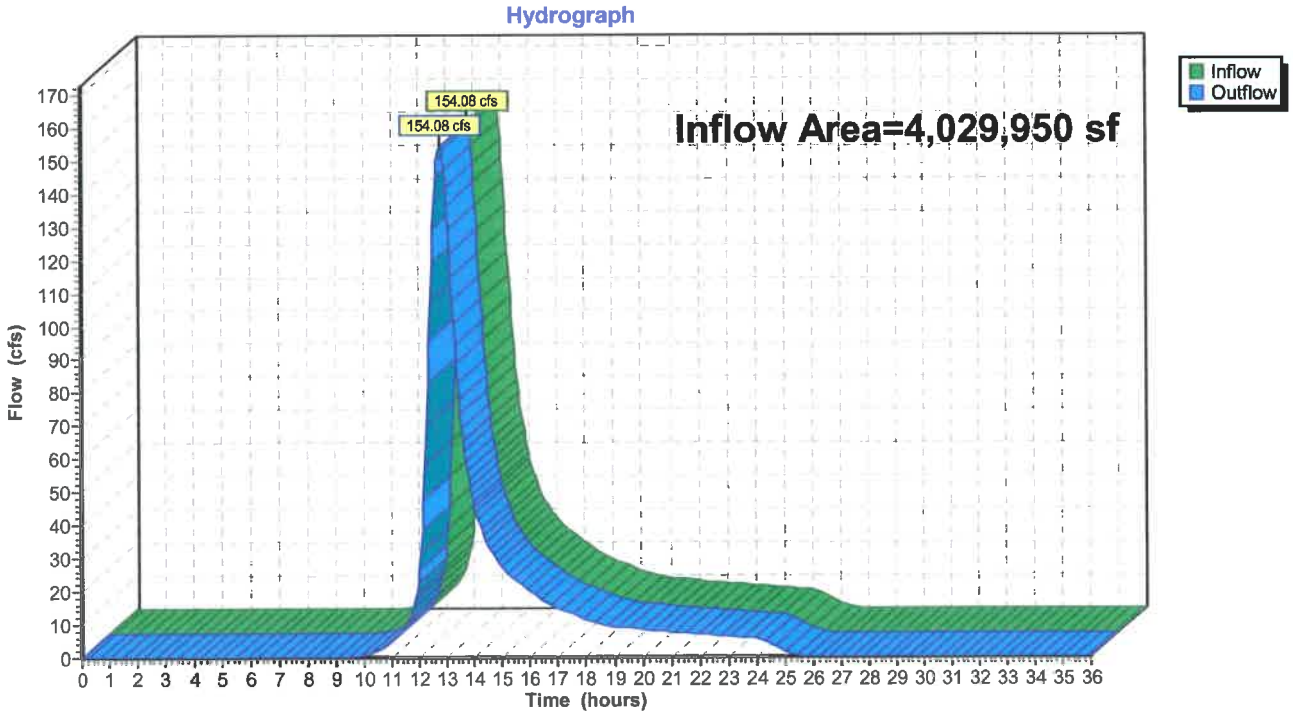


Summary for Reach EV1: Wetland

Inflow Area = 4,029,950 sf, 3.37% Impervious, Inflow Depth = 3.67" for 100 YR event
Inflow = 154.08 cfs @ 12.75 hrs, Volume= 1,231,451 cf
Outflow = 154.08 cfs @ 12.75 hrs, Volume= 1,231,451 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV1: Wetland

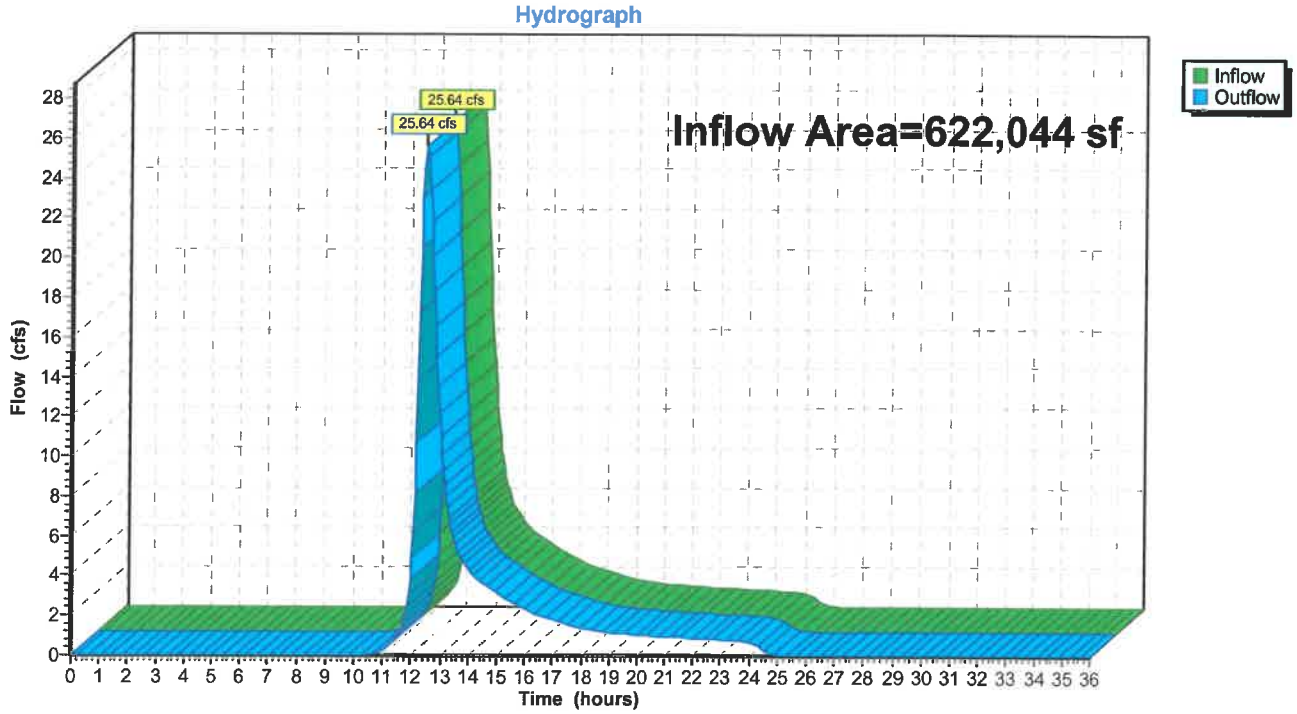


Summary for Reach EV2: Offsite

Inflow Area = 622,044 sf, 0.00% Impervious, Inflow Depth = 2.89" for 100 YR event
Inflow = 25.64 cfs @ 12.47 hrs, Volume= 150,017 cf
Outflow = 25.64 cfs @ 12.47 hrs, Volume= 150,017 cf, Atten= 0%, Lag= 0.0 min

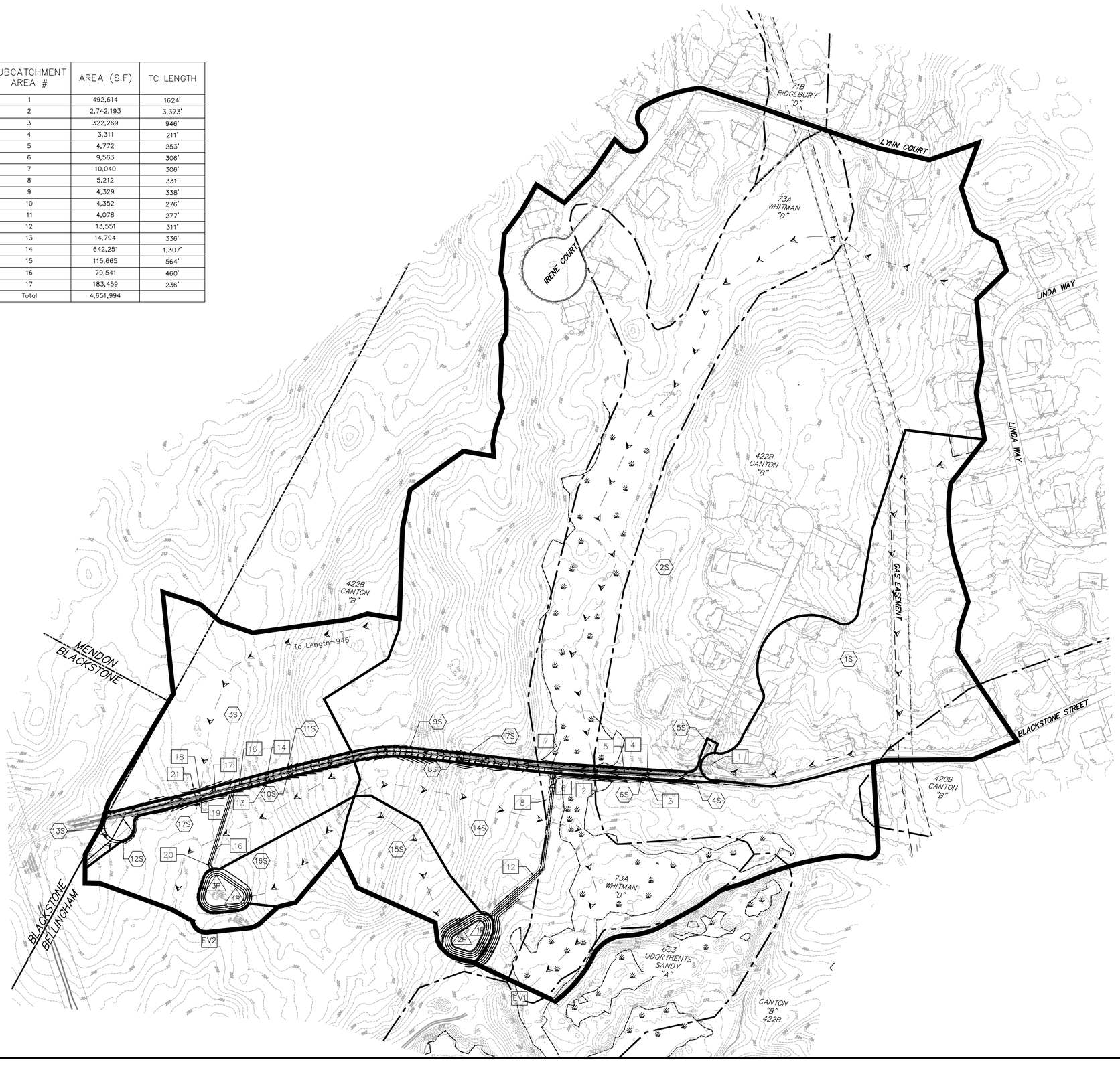
Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach EV2: Offsite



Post-Development Drainage Calculations

SUBCATCHMENT AREA #	AREA (S.F)	TC LENGTH
1	492,614	1624'
2	2,742,193	3,373'
3	322,269	946'
4	3,311	211'
5	4,772	253'
6	9,563	306'
7	10,040	306'
8	5,212	331'
9	4,329	338'
10	4,352	276'
11	4,078	277'
12	13,551	311'
13	14,794	336'
14	642,251	1,307'
15	115,665	564'
16	79,541	460'
17	183,459	236'
Total	4,651,994	



DRAINAGE LEGEND

- SUBCATCHMENT AREA
- REACH
- POND
- SOIL DELINEATION
- TIME OF CONCENTRATION PATH
- DRAINAGE AREA LIMIT

LEGEND

- EDGE OF WETLAND
- 256 EXISTING CONTOUR
- 256 PROPOSED CONTOUR
- EXISTING TREE LINE

NOTES

1. ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.
2. HORIZONTAL DATUM: NAD 83
3. PARTIAL WETLAND RESOURCES FLAGGED BY GODDARD CONSULTING IN 2024.FLAGS WERE FIELD LOCATED BY ALLEN ENGINEERING & ASSOCIATES IN NOVEMBER 2024.
4. PROPERTY LINE AND TOPOGRAPHIC INFORMATION OBTAINED BY ALLEN ENGINEERING & ASSOCIATES, INC IN AUGUST, 2024.
5. UNDERGROUND UTILITIES SHOWN HAVE BEEN COMPILED FROM AVAILABLE PLANS FROM PUBLIC AND PRIVATE AGENCIES, OR AS INDICATED BY FIELD OBSERVATIONS AND ARE APPROXIMATE ONLY. ADDITIONAL UNDERGROUND UTILITIES OR STRUCTURES NOT SHOWN HEREON MIGHT EXIST. BEFORE ANY EXCAVATION OR CONSTRUCTION CALL DIG-SAFE AT 811.
6. TOPOGRAPHIC INFORMATION OBTAINED FROM LIDAR DATA ISSUED BY NOAA (2021).

OWNER:

Wall Street Development Corp.
P.O. Box 272
Westwood, MA 02090

TITLE:

PROPOSED DRAINAGE PLAN

for

Blackstone Street Improvements
Bellingham, MA

SEAL:

COMMONWEALTH OF MASSACHUSETTS
MARK E. ALLEN
NO. 41799
REGISTERED PROFESSIONAL ENGINEER

2/14/25

PROFESSIONAL ENGINEER

PREPARED BY:

ALLEN ENGINEERING & ASSOCIATES, INC.
Civil Engineers - Surveyors
Land Development Consultants
140 Hartford Avenue East
Hopedale, Ma 01747
(508) 381-3212 · www.allen-ea.com

SCALE: 1"= 150 FEET

0 150 300 450

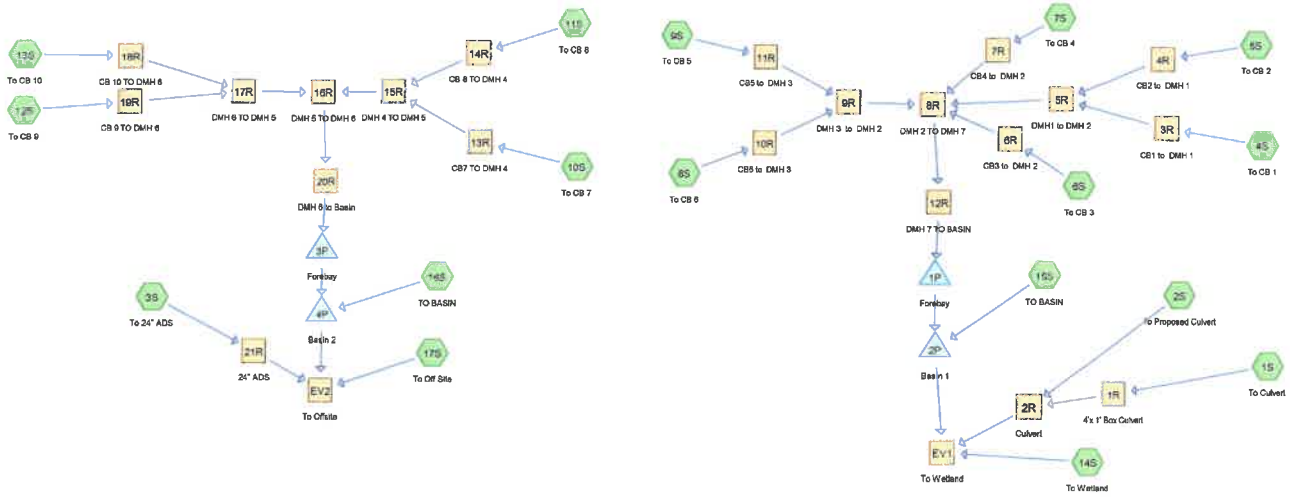
DATE: January 28, 2025

REVISIONS

#	DATE	DESCRIPTION	INIT

JOB NO: 00454

SHEET: 1 of 1



Subcat Reach Pond Link

Routing Diagram for 00454-PR

Prepared by {enter your company name here}, Printed 2/14/2025

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YR	Type III 24-hr		Default	24.00	1	3.38	2
2	10 YR	Type III 24-hr		Default	24.00	1	5.23	2
3	25 YR	Type III 24-hr		Default	24.00	1	6.38	2
4	100 YR	Type III 24-hr		Default	24.00	1	8.16	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
499,000	61	>75% Grass cover, Good, HSG B (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S)
20,077	80	>75% Grass cover, Good, HSG D (2S)
142,134	98	Paved roads w/curbs & sewers, HSG B (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S)
39,866	98	Roofs, HSG B (1S, 2S)
3,202	98	Roofs, HSG D (2S)
3,153,792	55	Woods, Good, HSG B (1S, 2S, 3S, 14S, 15S, 16S, 17S)
793,923	77	Woods, Good, HSG D (2S, 14S)
4,651,994	**61**	**TOTAL AREA**

Summary for Pond 1P: Forebay

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 2.13" for 2 YR event
Inflow = 1.85 cfs @ 12.17 hrs, Volume= 6,617 cf
Outflow = 2.14 cfs @ 12.22 hrs, Volume= 4,513 cf, Atten= 0%, Lag= 2.8 min
Primary = 2.14 cfs @ 12.22 hrs, Volume= 4,513 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 282.54' @ 12.20 hrs Surf.Area= 1,661 sf Storage= 2,217 cf

Plug-Flow detention time= 157.4 min calculated for 4,513 cf (68% of inflow)
Center-of-Mass det. time= 61.5 min (879.5 - 818.0)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

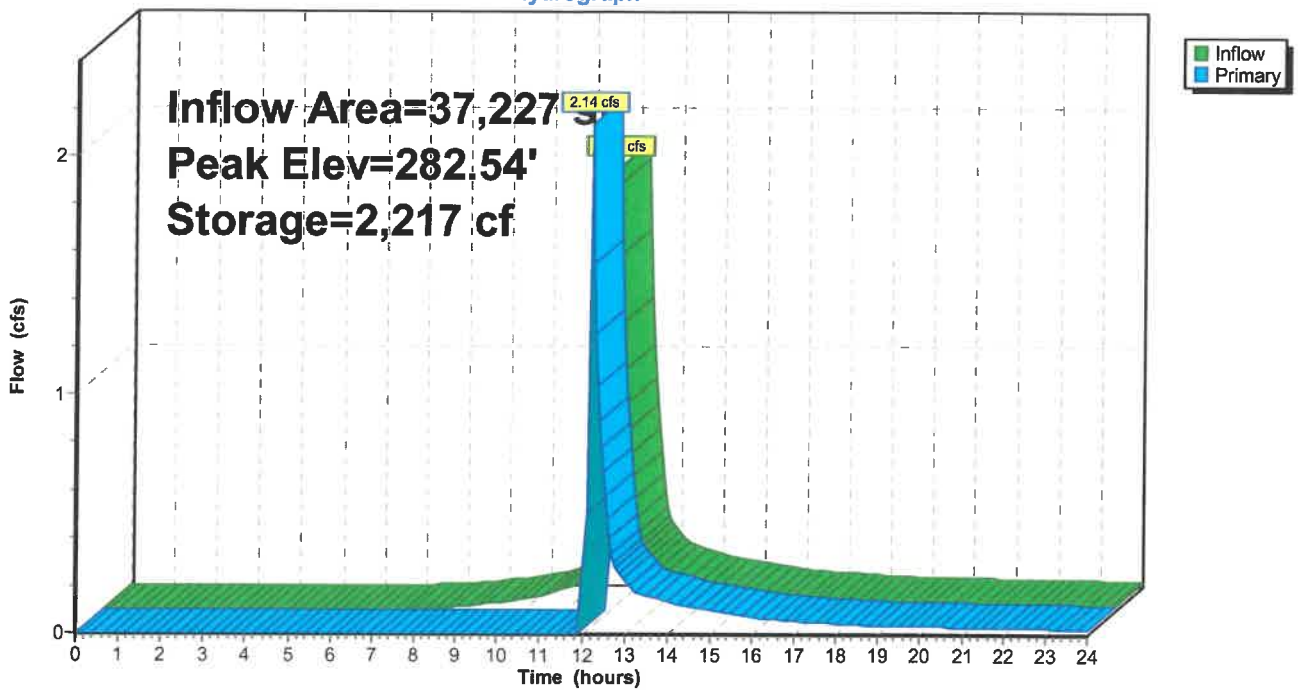
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	282.50'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.28 cfs @ 12.22 hrs HW=282.53' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 1.28 cfs @ 0.61 fps)

Pond 1P: Forebay

Hydrograph



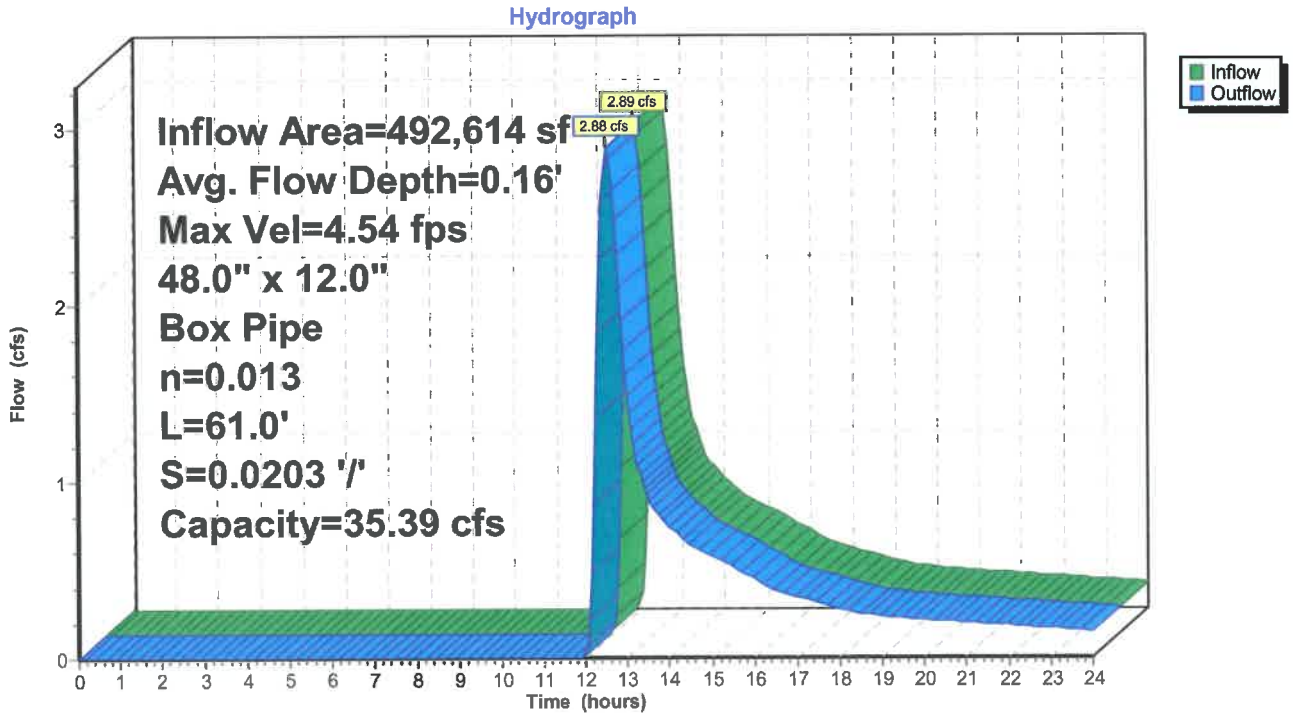
Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 0.51" for 2 YR event
Inflow = 2.89 cfs @ 12.51 hrs, Volume= 21,123 cf
Outflow = 2.88 cfs @ 12.52 hrs, Volume= 21,115 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.54 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.07 fps, Avg. Travel Time= 0.5 min

Peak Storage= 39 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'



Summary for Subcatchment 1S: To Culvert

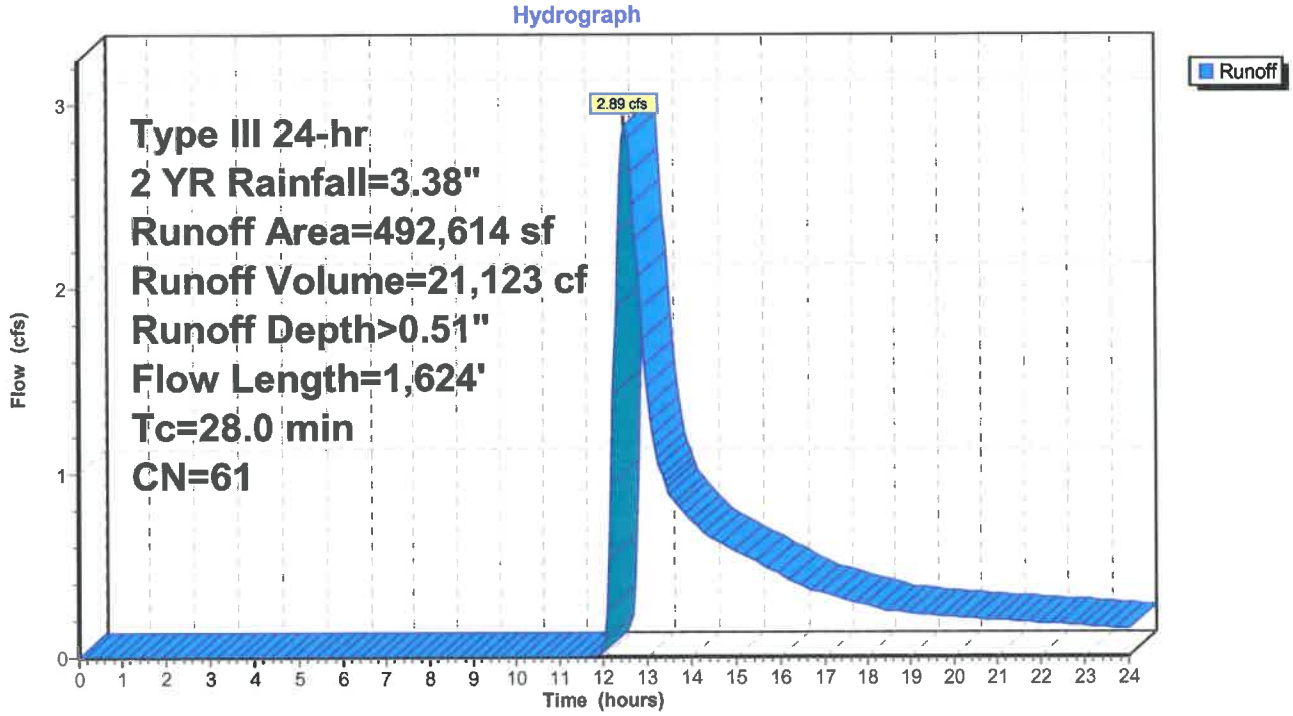
Runoff = 2.89 cfs @ 12.51 hrs, Volume= 21,123 cf, Depth> 0.51"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.5	880	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
28.0	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Pond 2P: Basin 1

Inflow Area = 152,892 sf, 17.50% Impervious, Inflow Depth > 0.61" for 2 YR event
Inflow = 2.45 cfs @ 12.22 hrs, Volume= 7,758 cf
Outflow = 0.13 cfs @ 16.35 hrs, Volume= 5,471 cf, Atten= 95%, Lag= 247.7 min
Discarded = 0.13 cfs @ 16.35 hrs, Volume= 5,471 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 281.78' @ 16.35 hrs Surf.Area= 5,033 sf Storage= 3,707 cf

Plug-Flow detention time= 287.6 min calculated for 5,460 cf (70% of inflow)
Center-of-Mass det. time= 180.5 min (1,085.8 - 905.4)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

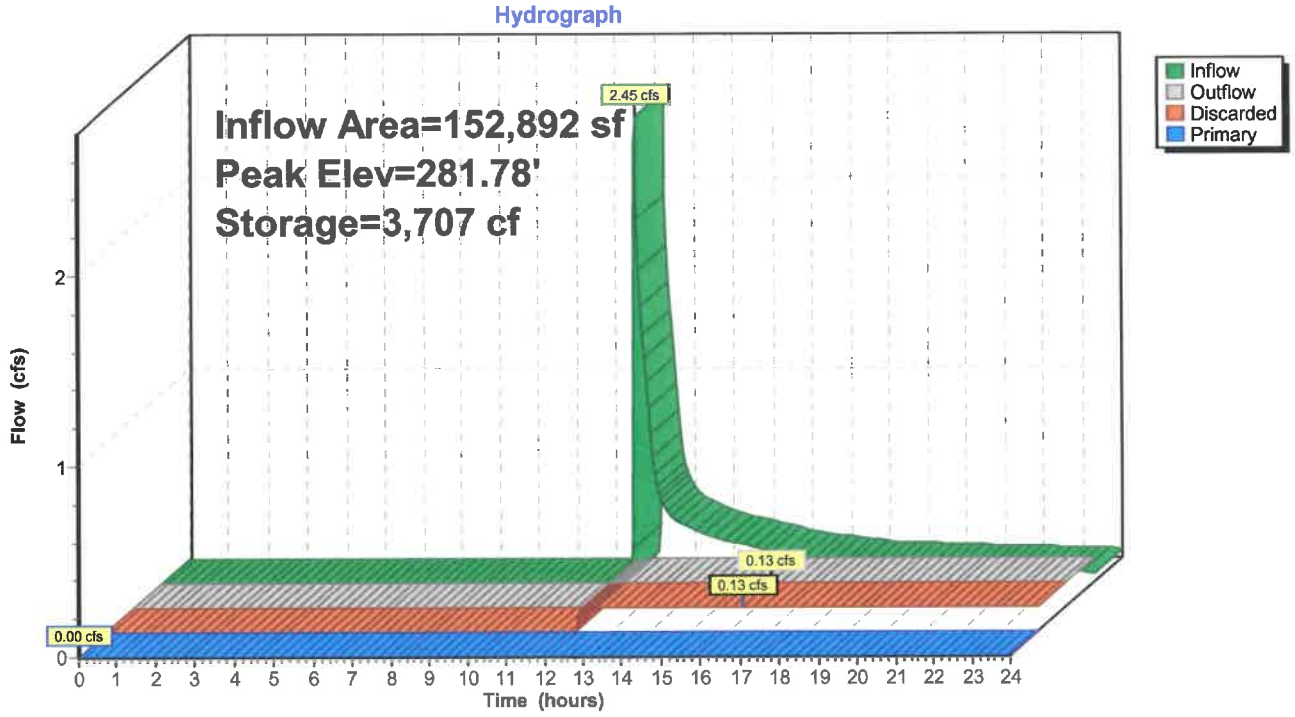
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	288.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	**1.100 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.13 cfs @ 16.35 hrs HW=281.78' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Basin 1



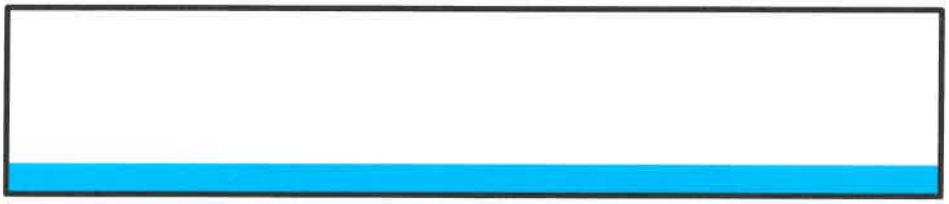
Summary for Reach 2R: Culvert

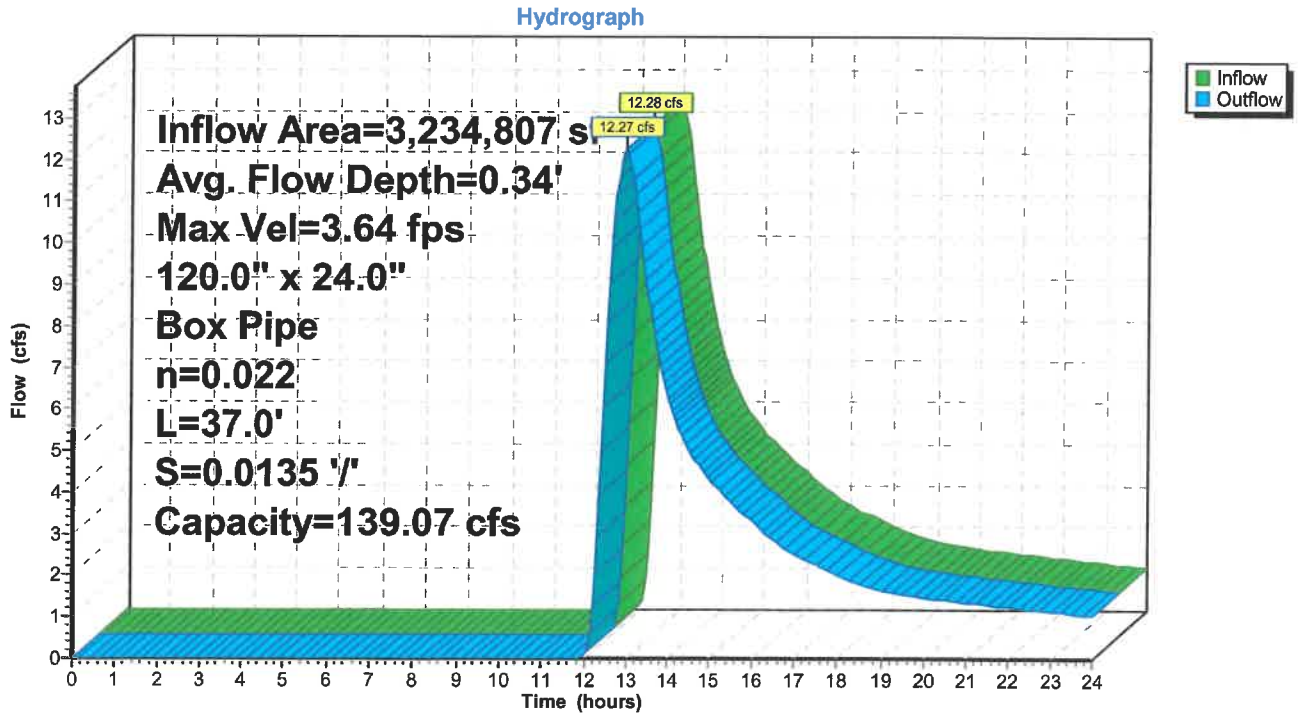
Inflow Area = 3,234,807 sf, 4.20% Impervious, Inflow Depth > 0.51" for 2 YR event
Inflow = 12.28 cfs @ 12.96 hrs, Volume= 137,097 cf
Outflow = 12.27 cfs @ 12.97 hrs, Volume= 137,059 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.64 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.98 fps, Avg. Travel Time= 0.3 min

Peak Storage= 125 cf @ 12.96 hrs
Average Depth at Peak Storage= 0.34' , Surface Width= 10.00'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 139.07 cfs

120.0" W x 24.0" H Box Pipe
n= 0.022 Earth, clean & straight
Length= 37.0' Slope= 0.0135 '/'
Inlet Invert= 292.00', Outlet Invert= 291.50'





Summary for Subcatchment 2S: To Proposed Culvert

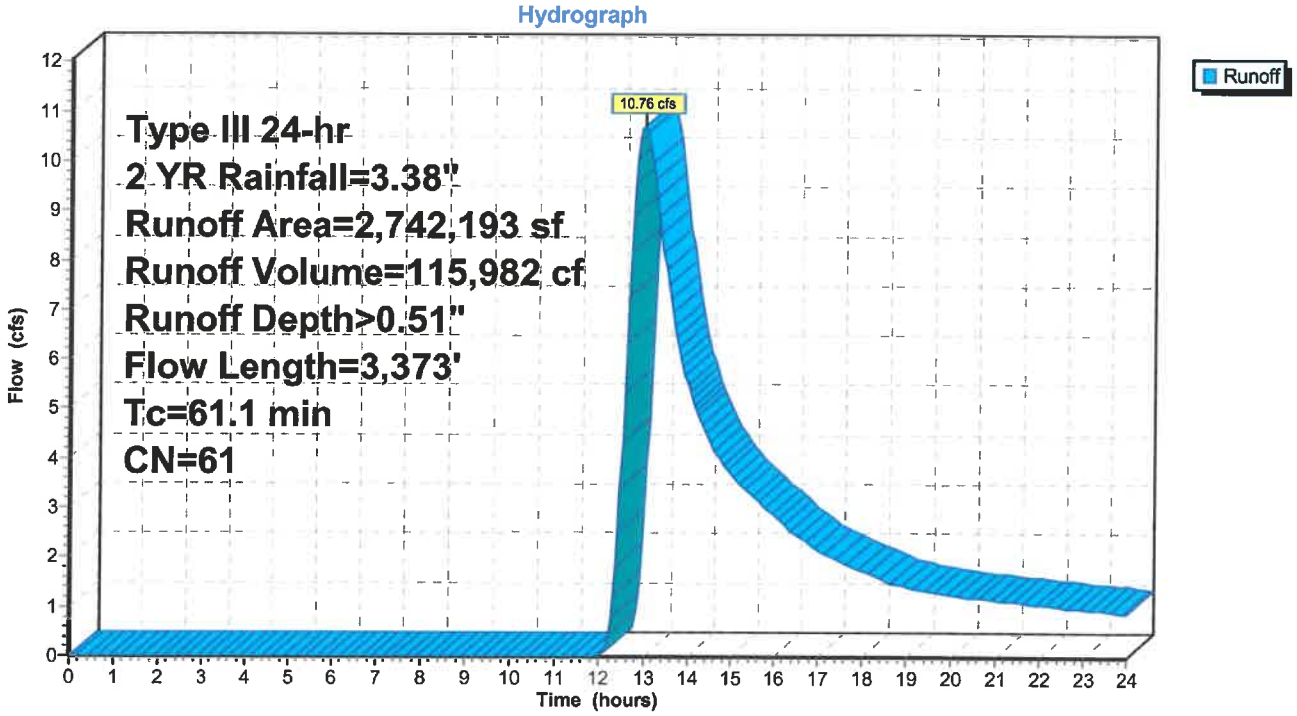
Runoff = 10.76 cfs @ 13.01 hrs, Volume= 115,982 cf, Depth> 0.51"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
1,862,663	55	Woods, Good, HSG B
533,264	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,742,193	61	Weighted Average
2,655,501		96.84% Pervious Area
86,692		3.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.9	366	0.1000	1.58		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
47.4	2,957	0.0100	1.04	1.25	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
61.1	3,373	Total			

Subcatchment 2S: To Proposed Culvert



Summary for Pond 3P: Forebay

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 1.82" for 2 YR event
Inflow = 1.66 cfs @ 12.13 hrs, Volume= 5,591 cf
Outflow = 1.08 cfs @ 12.31 hrs, Volume= 3,327 cf, Atten= 35%, Lag= 11.1 min
Primary = 1.08 cfs @ 12.31 hrs, Volume= 3,327 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 305.53' @ 12.30 hrs Surf.Area= 1,769 sf Storage= 2,310 cf

Plug-Flow detention time= 191.3 min calculated for 3,320 cf (59% of inflow)
Center-of-Mass det. time= 83.9 min (913.0 - 829.0)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

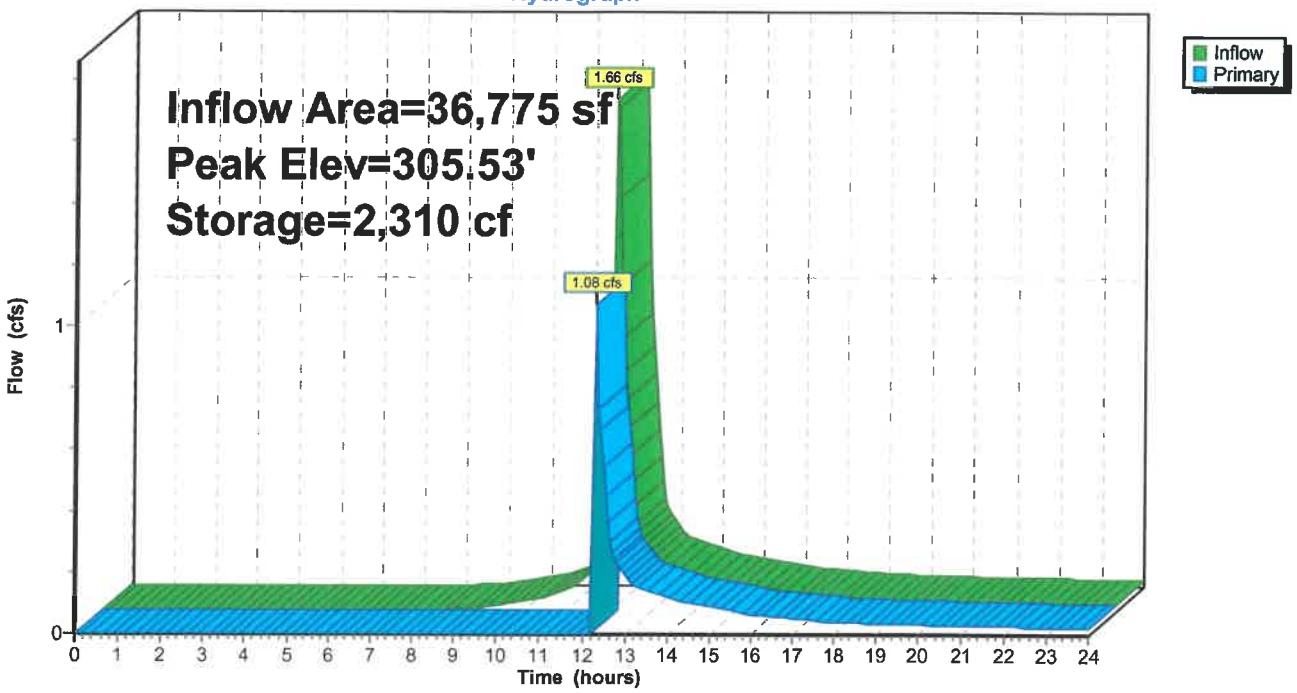
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	**65.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.86 cfs @ 12.31 hrs HW=305.53' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.86 cfs @ 0.52 fps)

Pond 3P: Forebay

Hydrograph



Summary for Reach 3R: CB1 to DMH 1

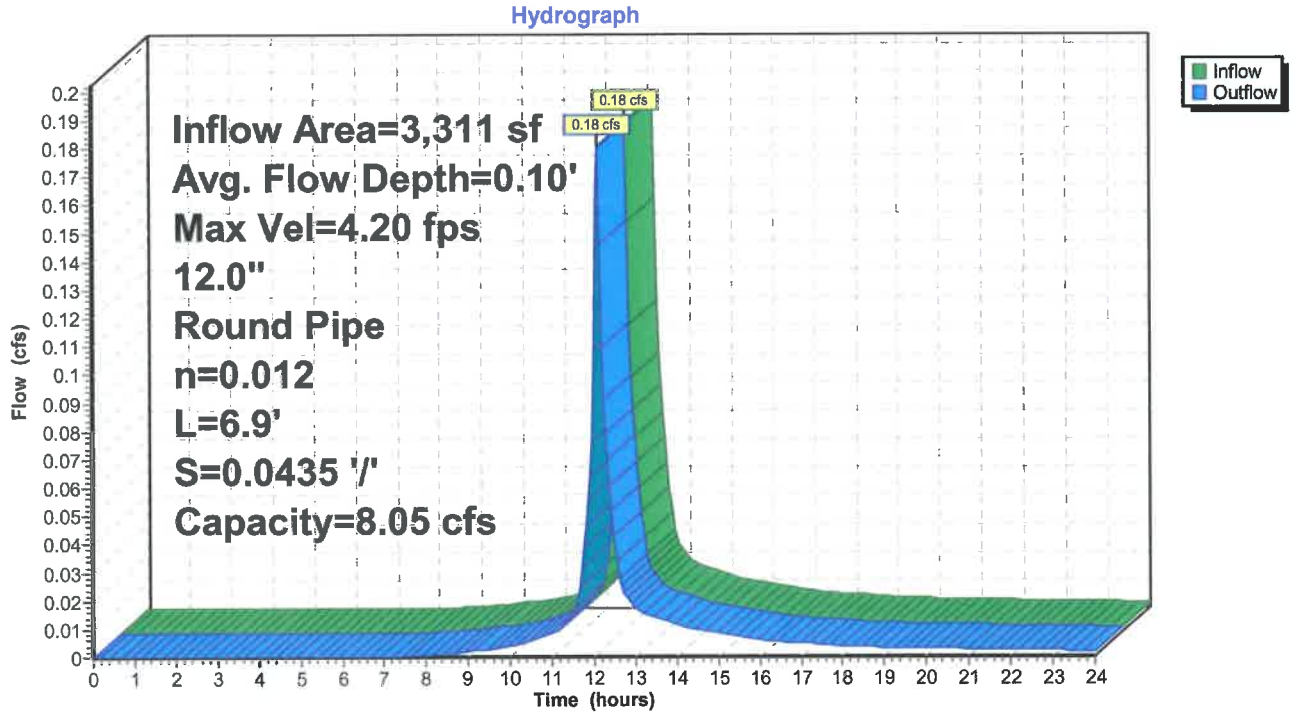
Inflow Area = 3,311 sf, 69.56% Impervious, Inflow Depth > 2.07" for 2 YR event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 572 cf
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 572 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.20 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 0.61'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'

Reach 3R: CB1 to DMH 1



Summary for Subcatchment 3S: To 24" ADS

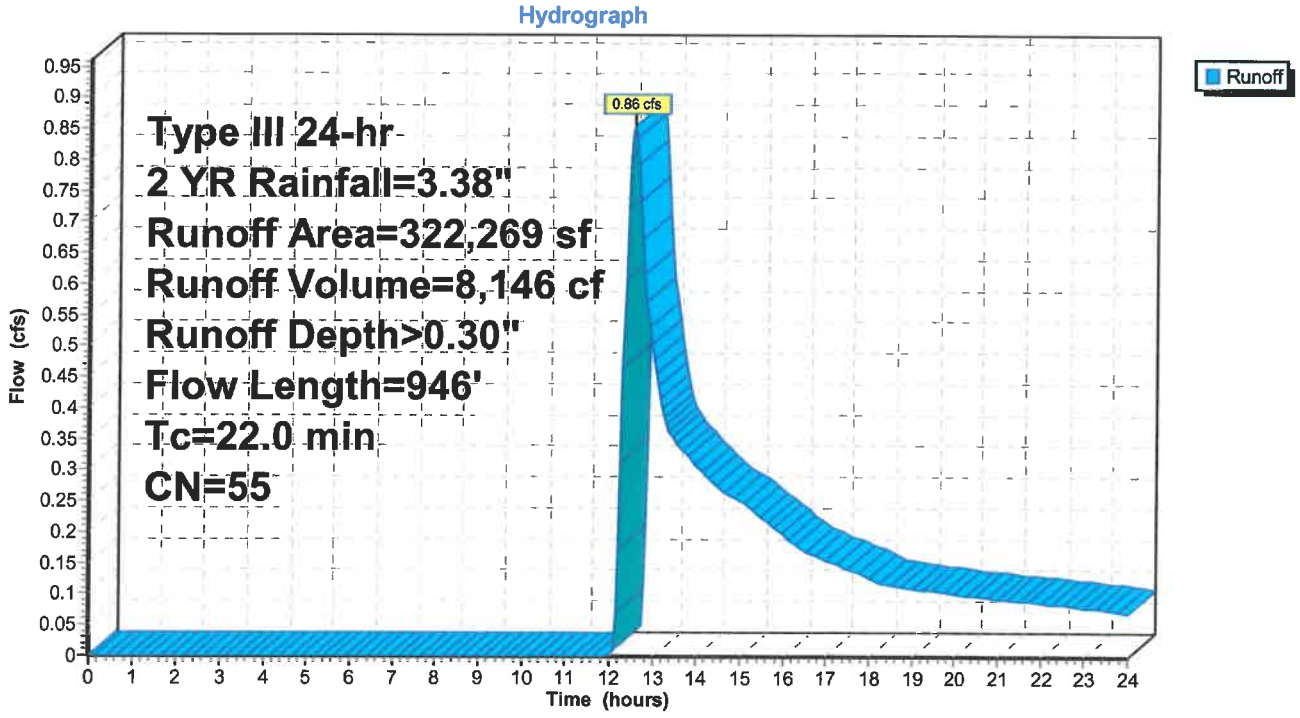
Runoff = 0.86 cfs @ 12.54 hrs, Volume= 8,146 cf, Depth> 0.30"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
322,269	55	Woods, Good, HSG B
322,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.0	946	Total			

Subcatchment 3S: To 24" ADS



Summary for Pond 4P: Basin 2

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 0.62" for 2 YR event
Inflow = 1.46 cfs @ 12.31 hrs, Volume= 6,012 cf
Outflow = 0.18 cfs @ 14.56 hrs, Volume= 5,925 cf, Atten= 87%, Lag= 134.6 min
Discarded = 0.18 cfs @ 14.56 hrs, Volume= 5,925 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 304.25' @ 14.56 hrs Surf.Area= 7,203 sf Storage= 1,757 cf

Plug-Flow detention time= 103.0 min calculated for 5,913 cf (98% of inflow)
Center-of-Mass det. time= 95.4 min (1,015.0 - 919.5)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	45,905 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

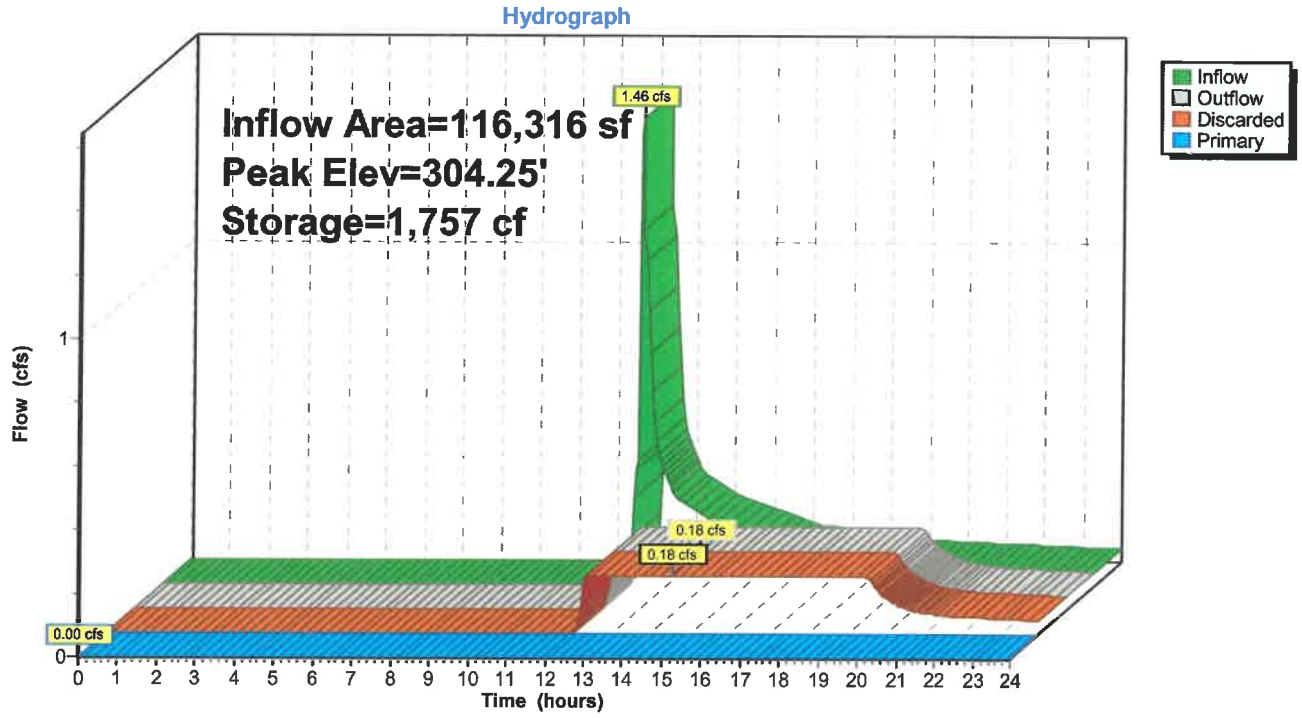
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	**1.100 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 14.56 hrs HW=304.25' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Basin 2



Summary for Reach 4R: CB2 to DMH 1

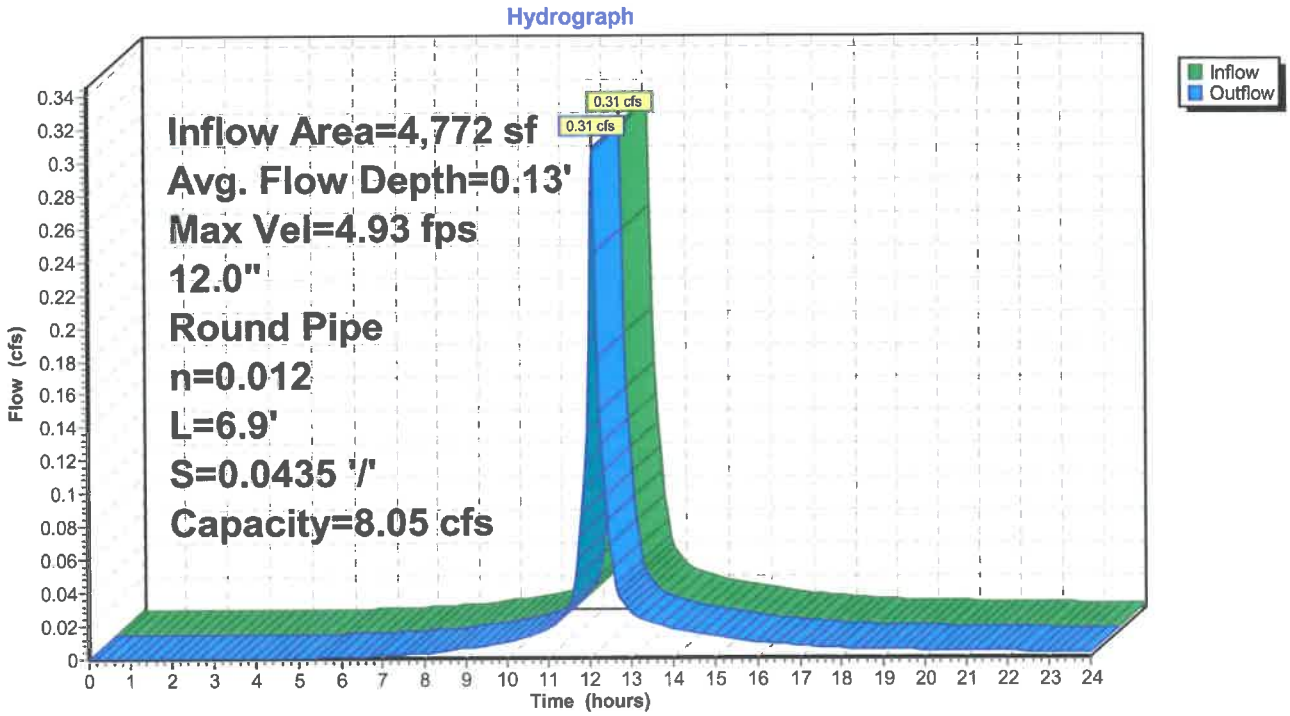
Inflow Area = 4,772 sf, 83.28% Impervious, Inflow Depth > 2.52" for 2 YR event
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 1,002 cf
Outflow = 0.31 cfs @ 12.09 hrs, Volume= 1,002 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.93 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.66 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 0.68'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'

Reach 4R: CB2 to DMH 1



Summary for Subcatchment 4S: To CB 1

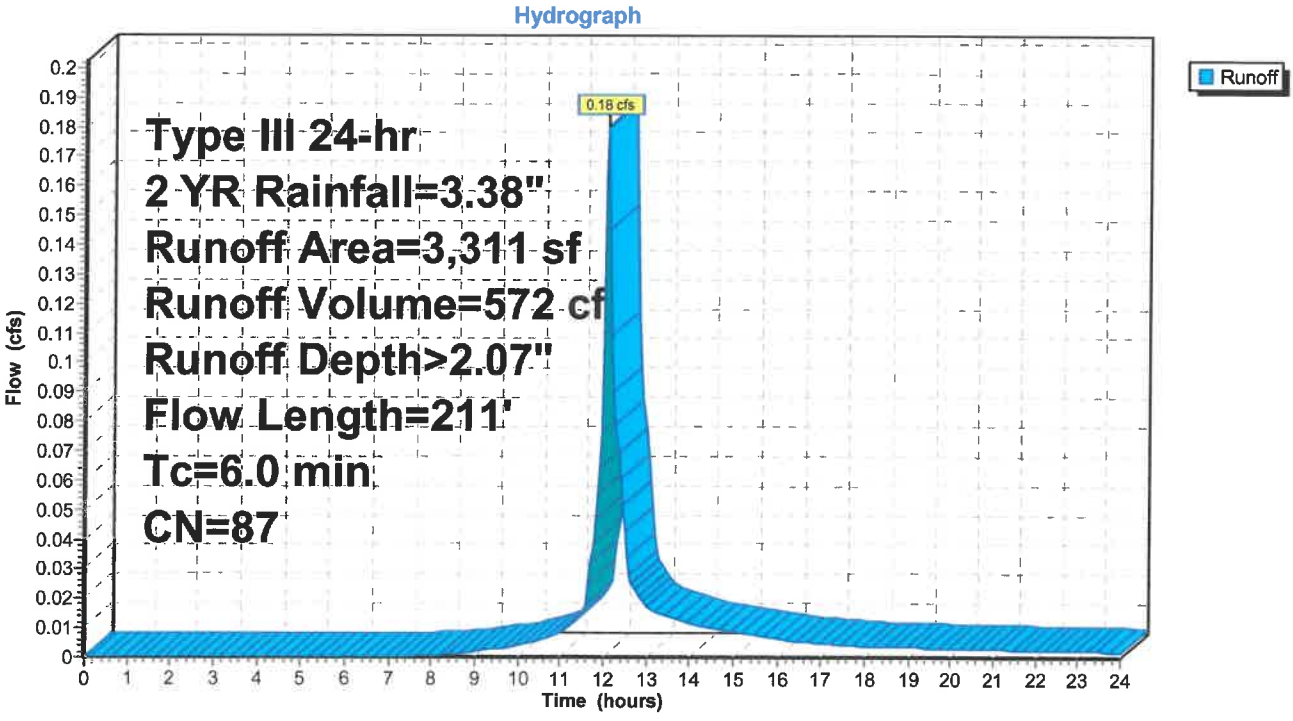
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 572 cf, Depth> 2.07"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
2,303	98	Paved roads w/curbs & sewers, HSG B
1,008	61	>75% Grass cover, Good, HSG B
3,311	87	Weighted Average
1,008		30.44% Pervious Area
2,303		69.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.0	161	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	211	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: To CB 1



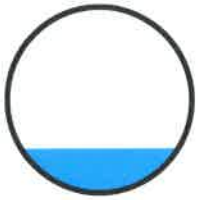
Summary for Reach 5R: DMH1 to DMH 2

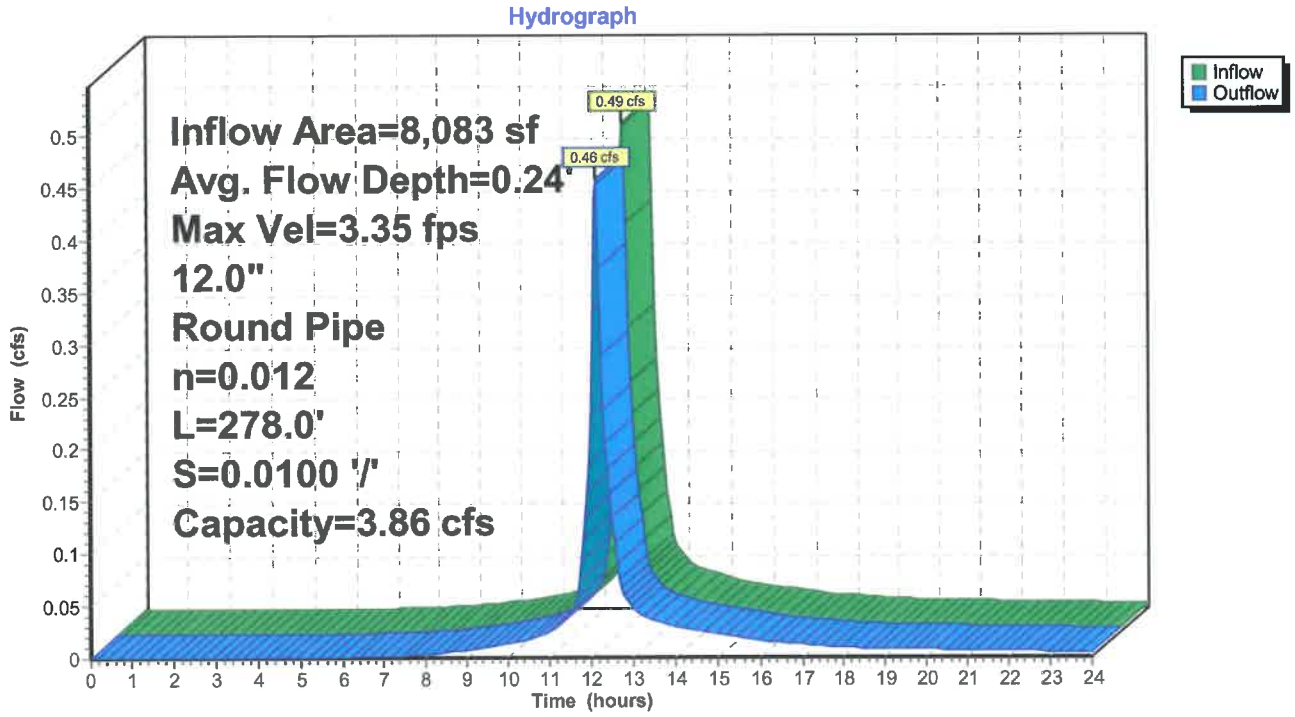
Inflow Area = 8,083 sf, 77.66% Impervious, Inflow Depth > 2.34" for 2 YR event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,574 cf
Outflow = 0.46 cfs @ 12.13 hrs, Volume= 1,572 cf, Atten= 6%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.35 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 4.2 min

Peak Storage= 40 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.85'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 278.0' Slope= 0.0100 '/'
Inlet Invert= 290.68', Outlet Invert= 287.90'





Summary for Subcatchment 5S: To CB 2

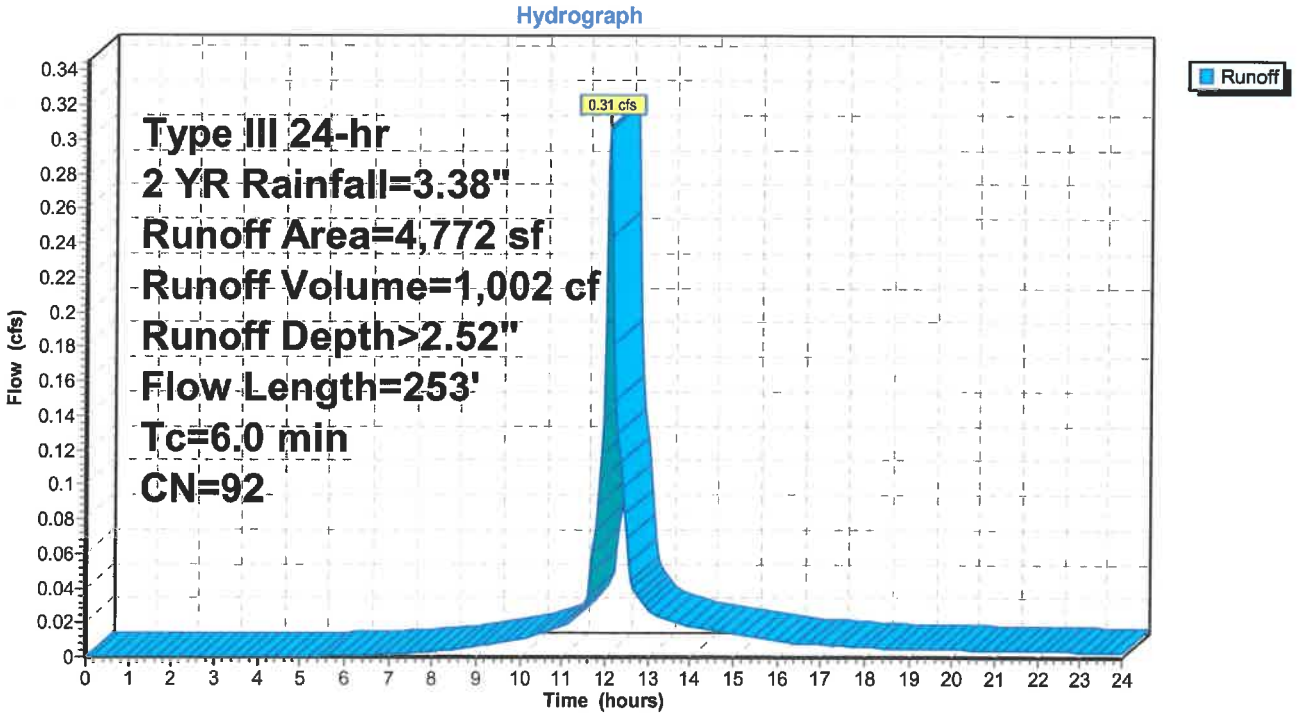
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 1,002 cf, Depth> 2.52"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
3,974	98	Paved roads w/curbs & sewers, HSG B
798	61	>75% Grass cover, Good, HSG B
4,772	92	Weighted Average
798		16.72% Pervious Area
3,974		83.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.2	203	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	253	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: To CB 2



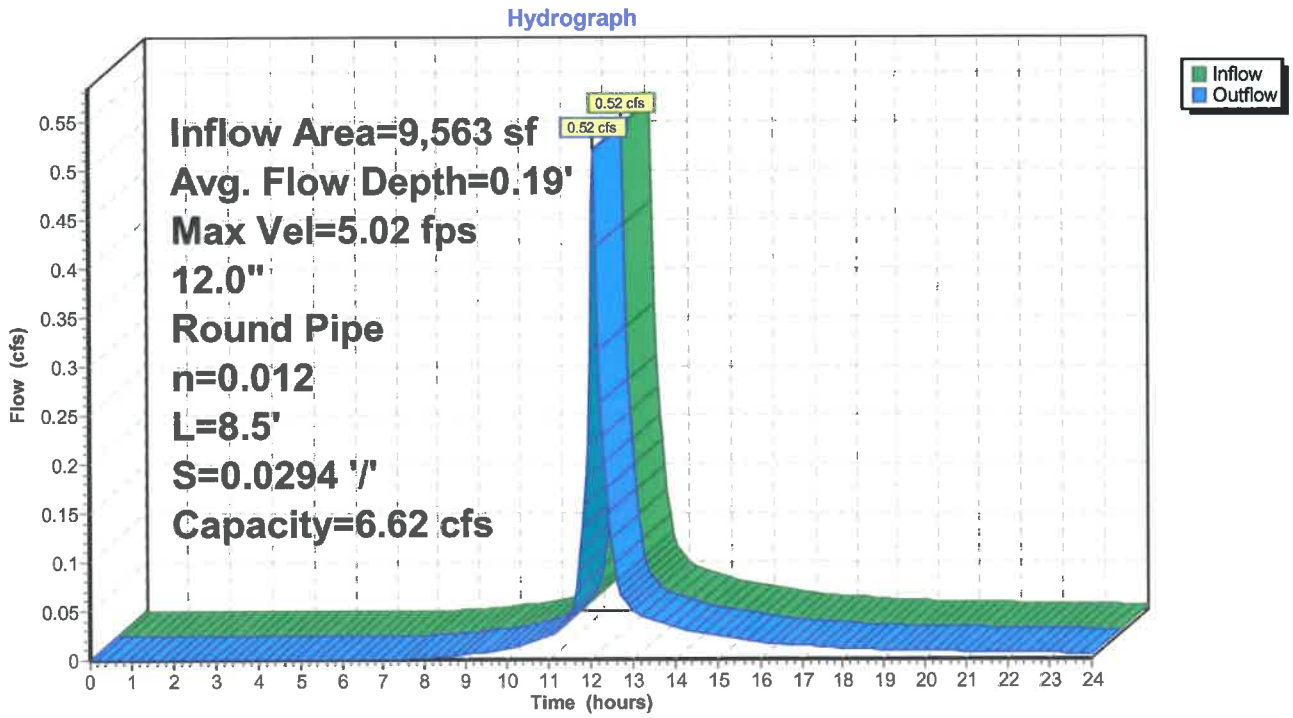
Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 9,563 sf, 69.08% Impervious, Inflow Depth > 2.07" for 2 YR event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,652 cf
Outflow = 0.52 cfs @ 12.09 hrs, Volume= 1,652 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.02 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.78'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.62 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 8.5' Slope= 0.0294 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 6S: To CB 3

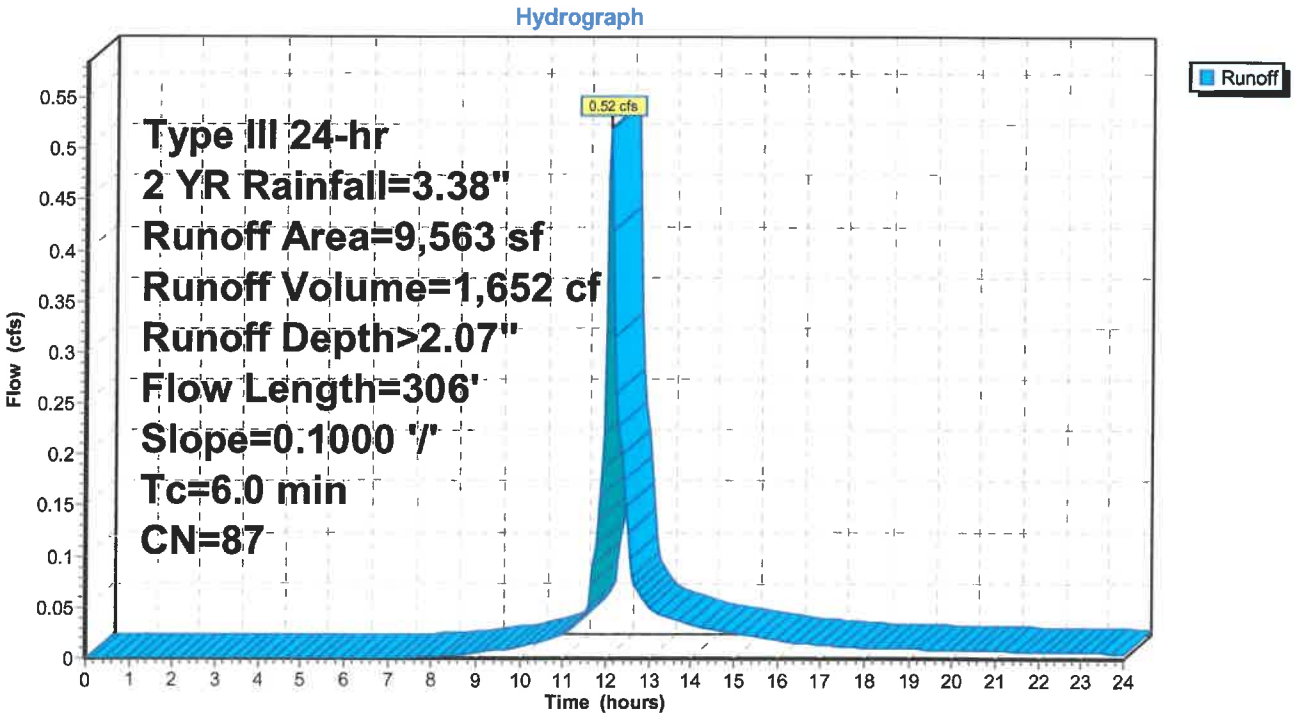
Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,652 cf, Depth> 2.07"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
2,957	61	>75% Grass cover, Good, HSG B
9,563	87	Weighted Average
2,957		30.92% Pervious Area
6,606		69.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6S: To CB 3



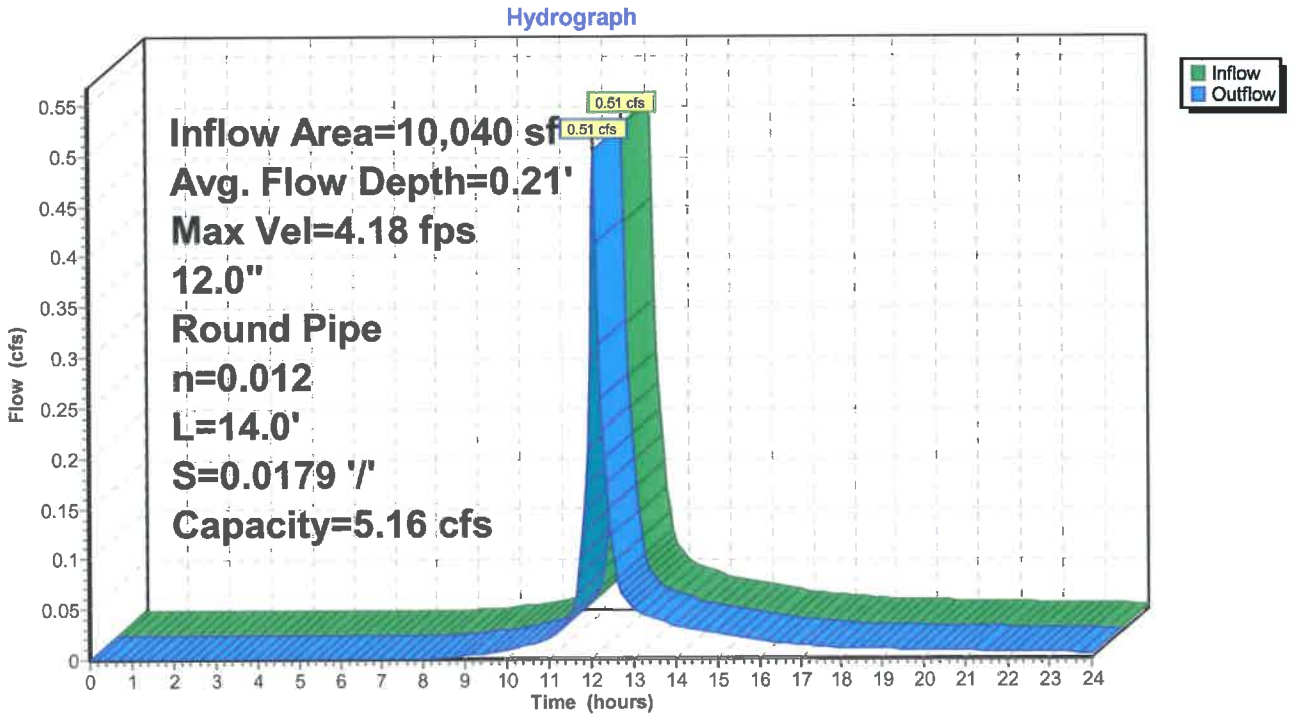
Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 10,040 sf, 65.80% Impervious, Inflow Depth > 1.91" for 2 YR event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 1,599 cf
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 1,598 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.18 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.82'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.16 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 14.0' Slope= 0.0179 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 7S: To CB 4

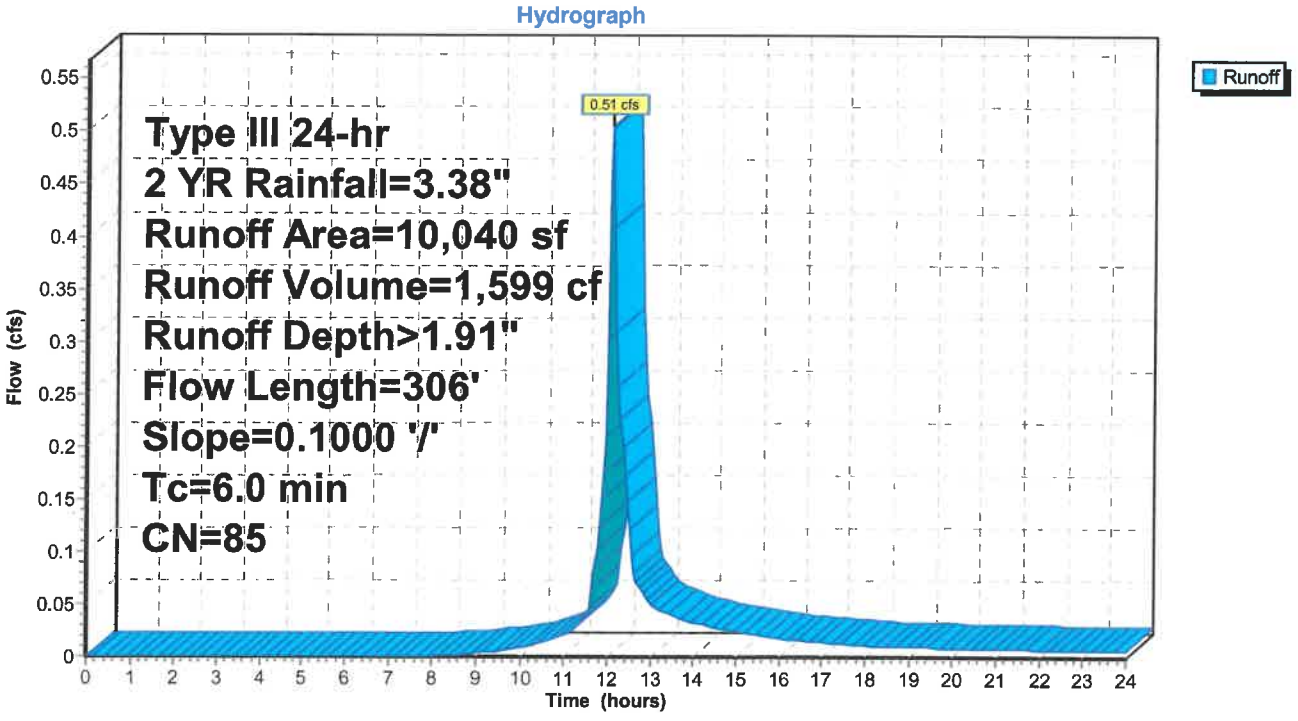
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,599 cf, Depth> 1.91"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
3,434	61	>75% Grass cover, Good, HSG B
10,040	85	Weighted Average
3,434		34.20% Pervious Area
6,606		65.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: To CB 4



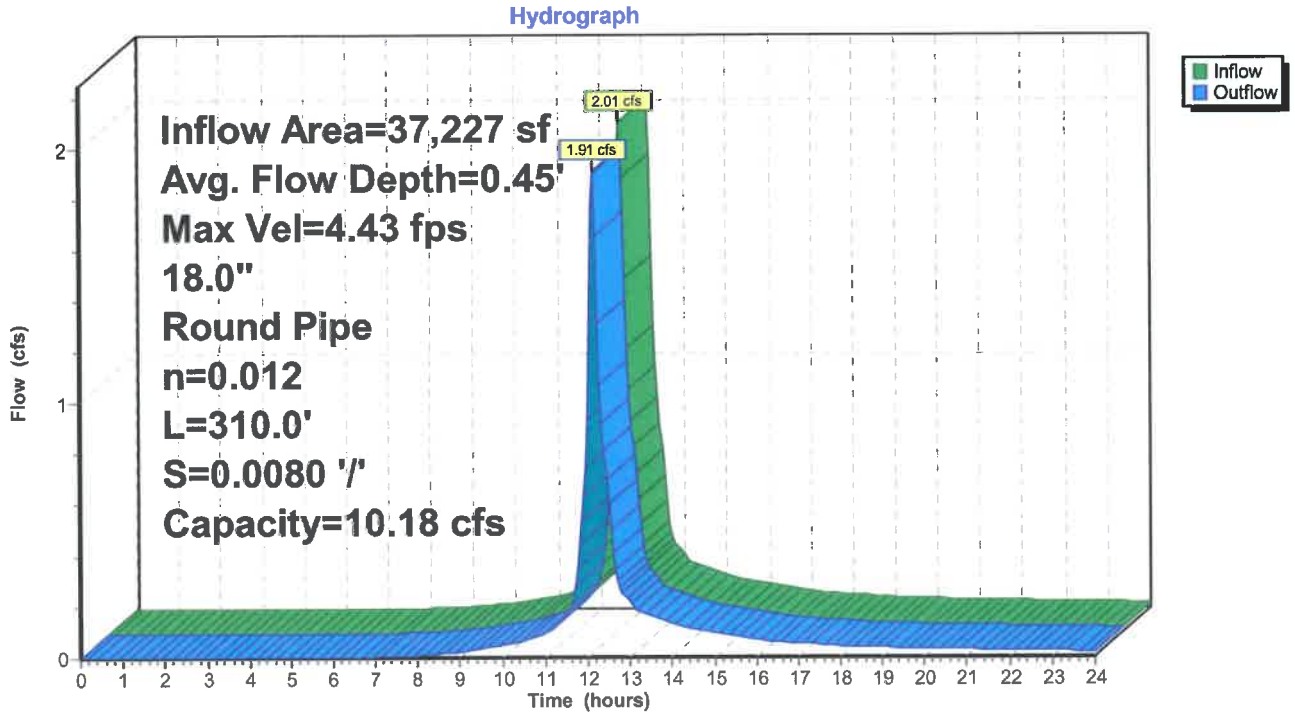
Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 2.14" for 2 YR event
Inflow = 2.01 cfs @ 12.10 hrs, Volume= 6,631 cf
Outflow = 1.91 cfs @ 12.14 hrs, Volume= 6,623 cf, Atten= 5%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.43 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 3.5 min

Peak Storage= 137 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 1.37'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 310.0' Slope= 0.0080 '/'
Inlet Invert= 287.40', Outlet Invert= 284.92'



Summary for Subcatchment 8S: To CB 6

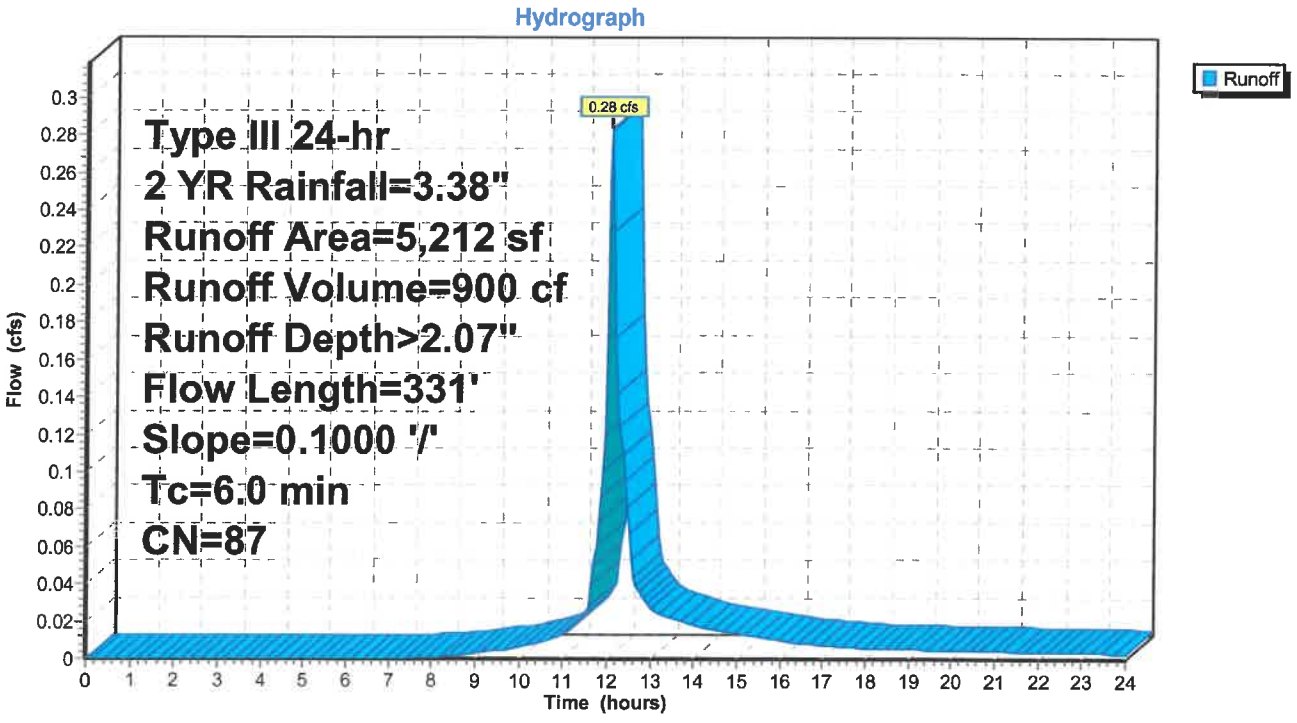
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 900 cf, Depth> 2.07"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
1,579	61	>75% Grass cover, Good, HSG B
5,212	87	Weighted Average
1,579		30.30% Pervious Area
3,633		69.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8S: To CB 6



Summary for Reach 9R: DMH 3 to DMH 2

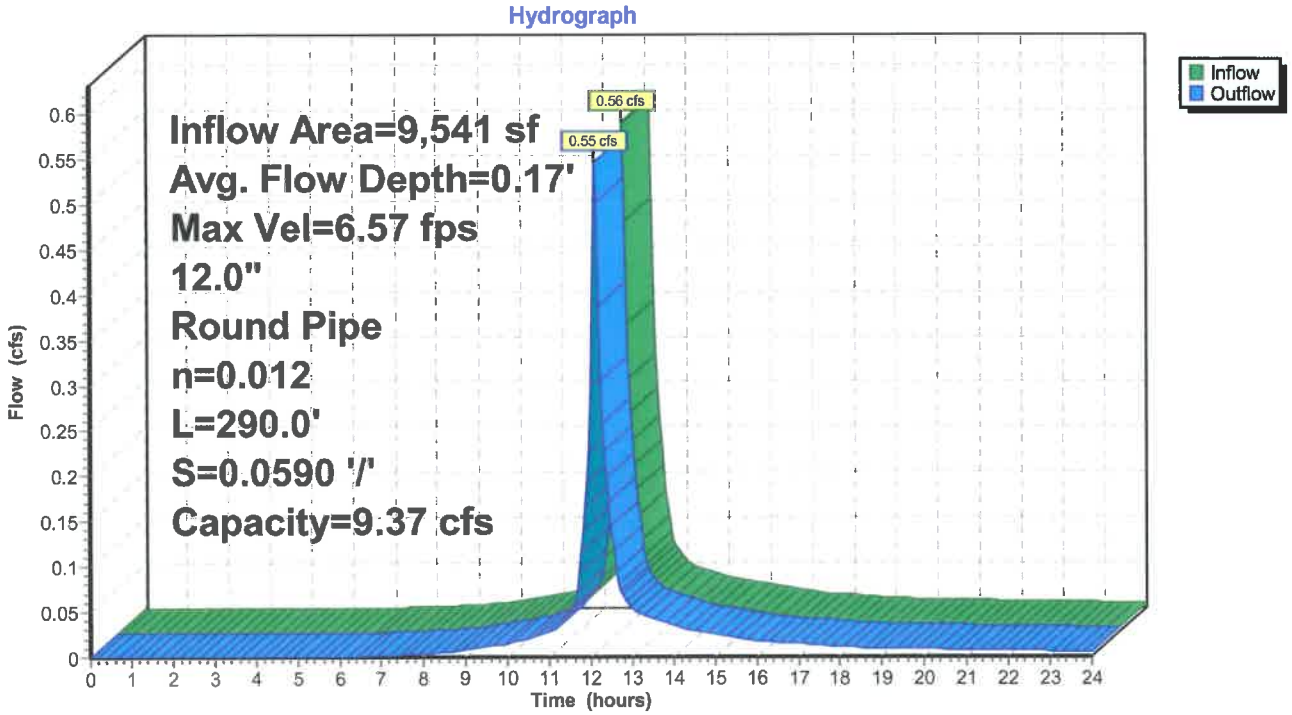
Inflow Area = 9,541 sf, 76.16% Impervious, Inflow Depth > 2.28" for 2 YR event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 1,810 cf
Outflow = 0.55 cfs @ 12.11 hrs, Volume= 1,808 cf, Atten= 3%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.57 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 2.2 min

Peak Storage= 25 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 0.74'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 290.0' Slope= 0.0590 '/'
Inlet Invert= 305.00', Outlet Invert= 287.90'

Reach 9R: DMH 3 to DMH 2



Summary for Subcatchment 9S: To CB 5

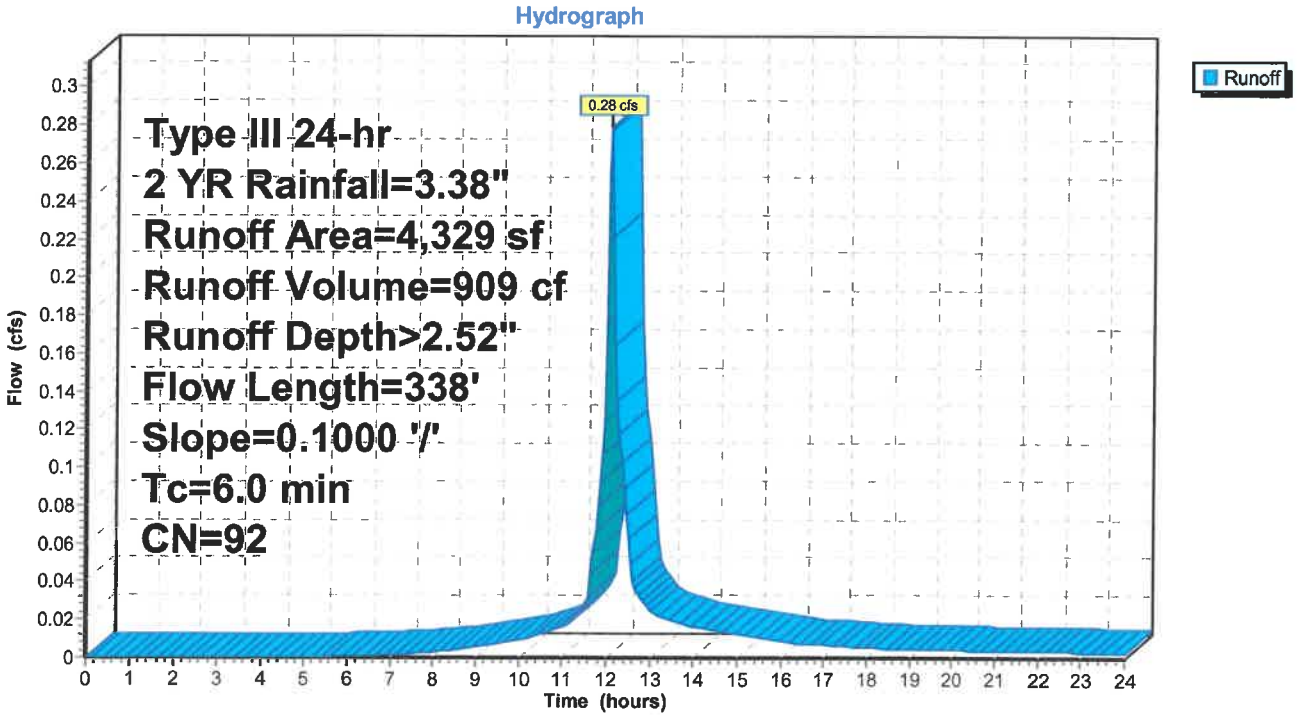
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 909 cf, Depth> 2.52"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
696	61	>75% Grass cover, Good, HSG B
4,329	92	Weighted Average
696		16.08% Pervious Area
3,633		83.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: To CB 5



Summary for Reach 10R: CB6 to DMH 3

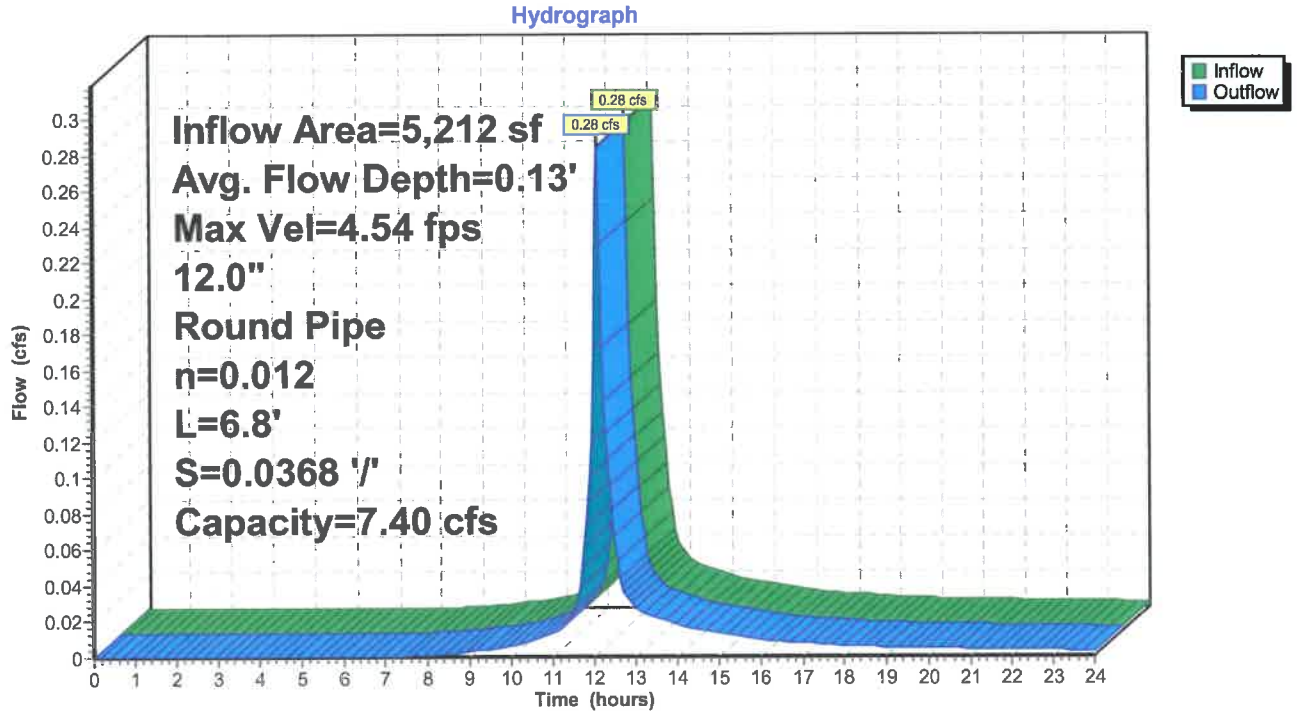
Inflow Area = 5,212 sf, 69.70% Impervious, Inflow Depth > 2.07" for 2 YR event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 900 cf
Outflow = 0.28 cfs @ 12.09 hrs, Volume= 900 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.54 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 0.68'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.40 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.8' Slope= 0.0368 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'

Reach 10R: CB6 to DMH 3



Summary for Subcatchment 10S: To CB 7

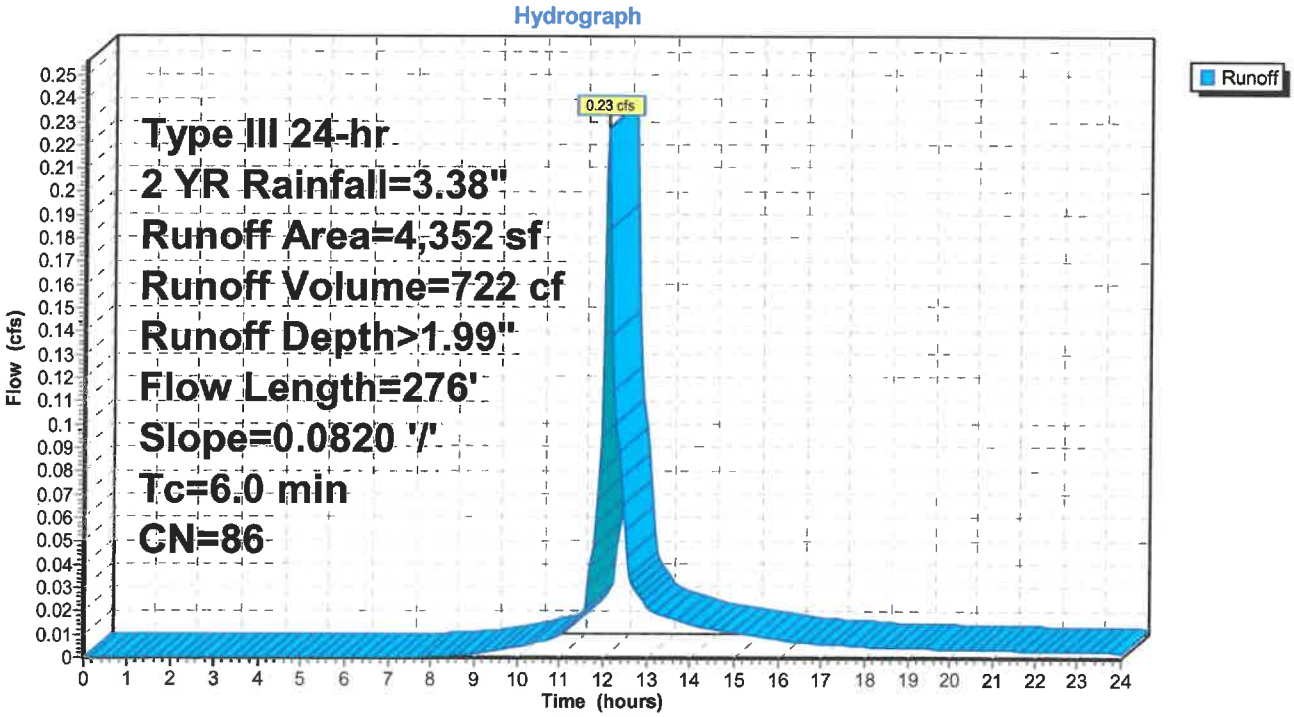
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 722 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: To CB 7



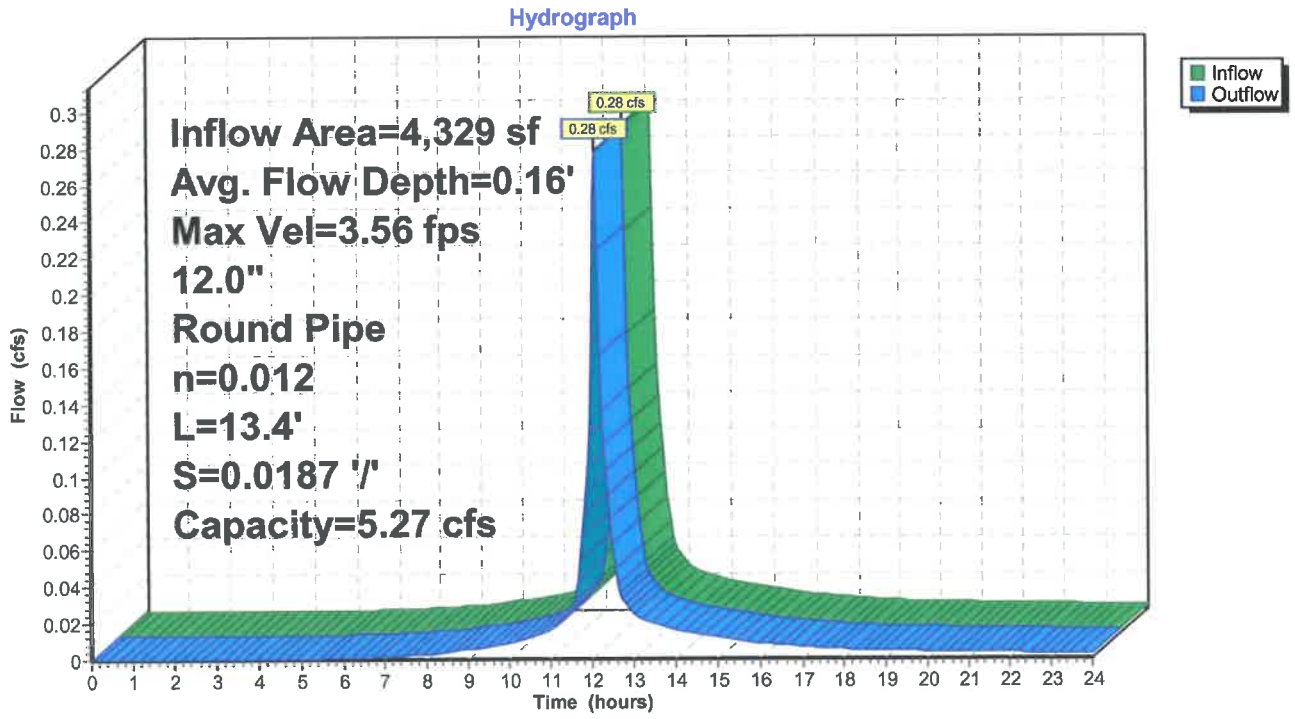
Summary for Reach 11R: CB5 to DMH 3

Inflow Area = 4,329 sf, 83.92% Impervious, Inflow Depth > 2.52" for 2 YR event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 909 cf
Outflow = 0.28 cfs @ 12.09 hrs, Volume= 909 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.73'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Summary for Subcatchment 11S: To CB 8

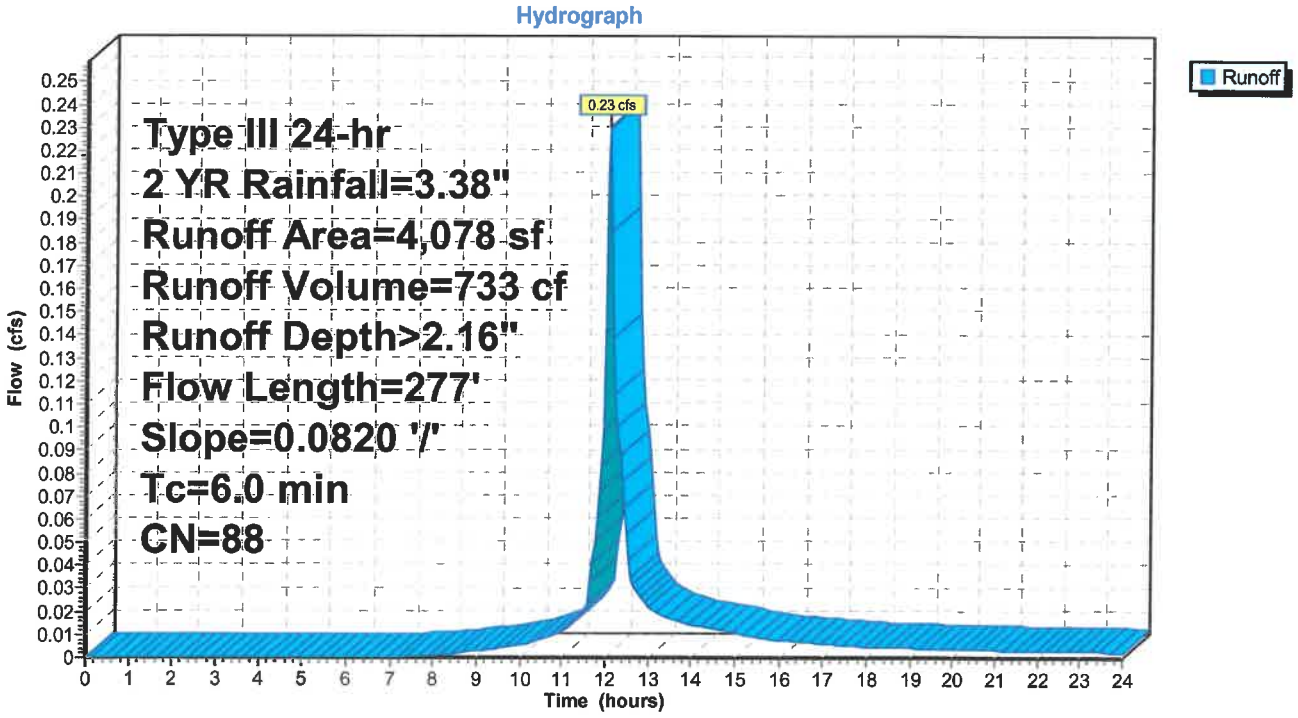
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 733 cf, Depth> 2.16"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 11S: To CB 8



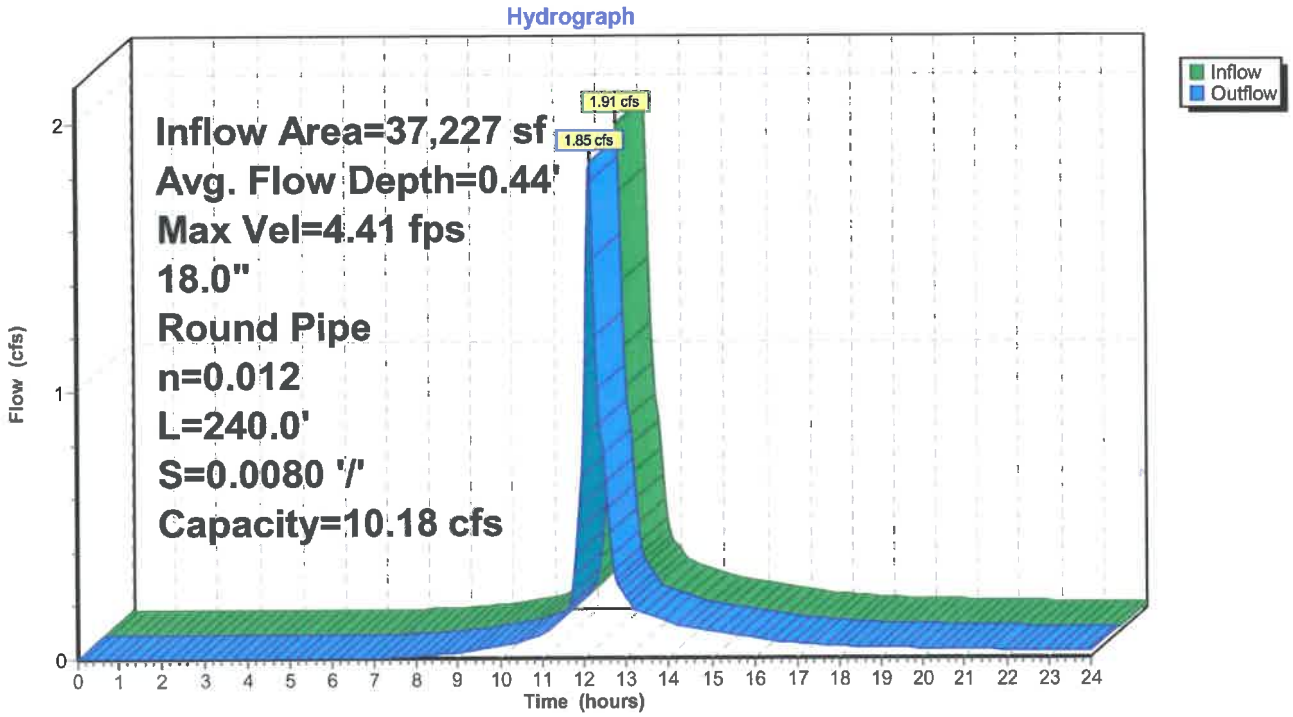
Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 2.13" for 2 YR event
Inflow = 1.91 cfs @ 12.14 hrs, Volume= 6,623 cf
Outflow = 1.85 cfs @ 12.17 hrs, Volume= 6,617 cf, Atten= 3%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.41 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 2.7 min

Peak Storage= 104 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.44' , Surface Width= 1.37'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 240.0' Slope= 0.0080 '/'
Inlet Invert= 284.92', Outlet Invert= 283.00'



Summary for Subcatchment 12S: To CB 9

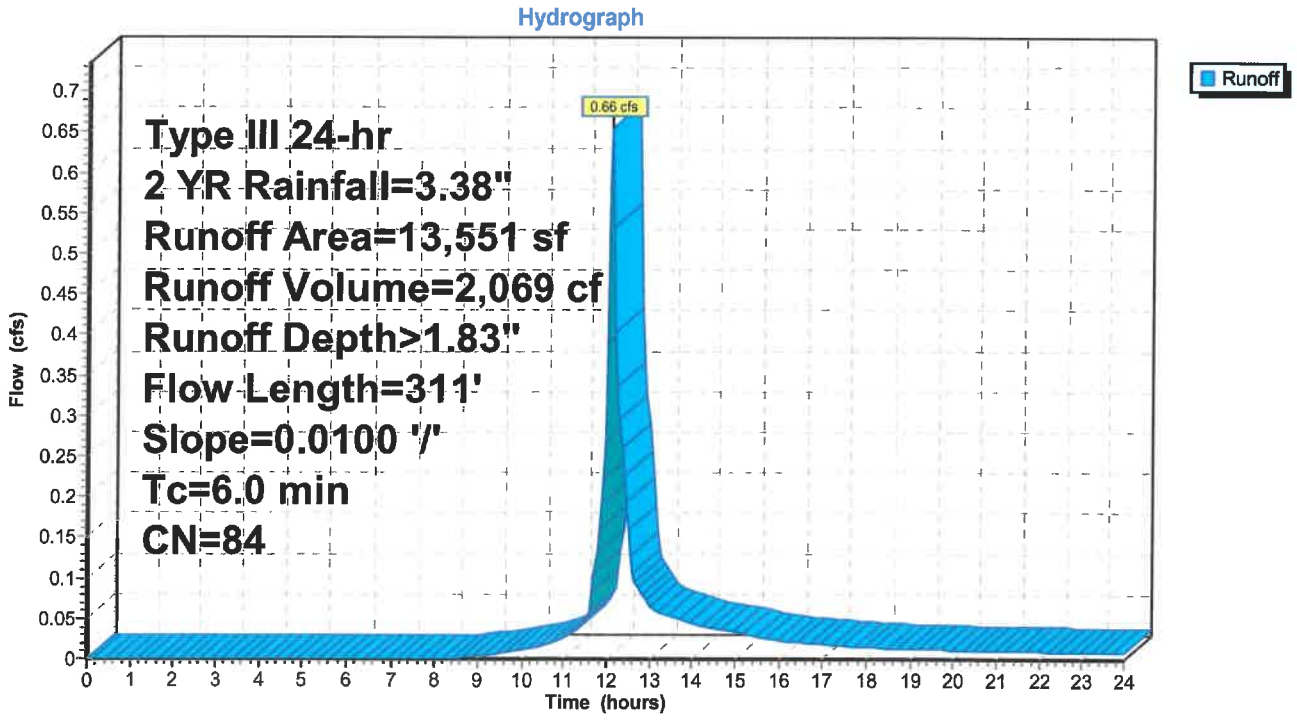
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,069 cf, Depth> 1.83"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 12S: To CB 9



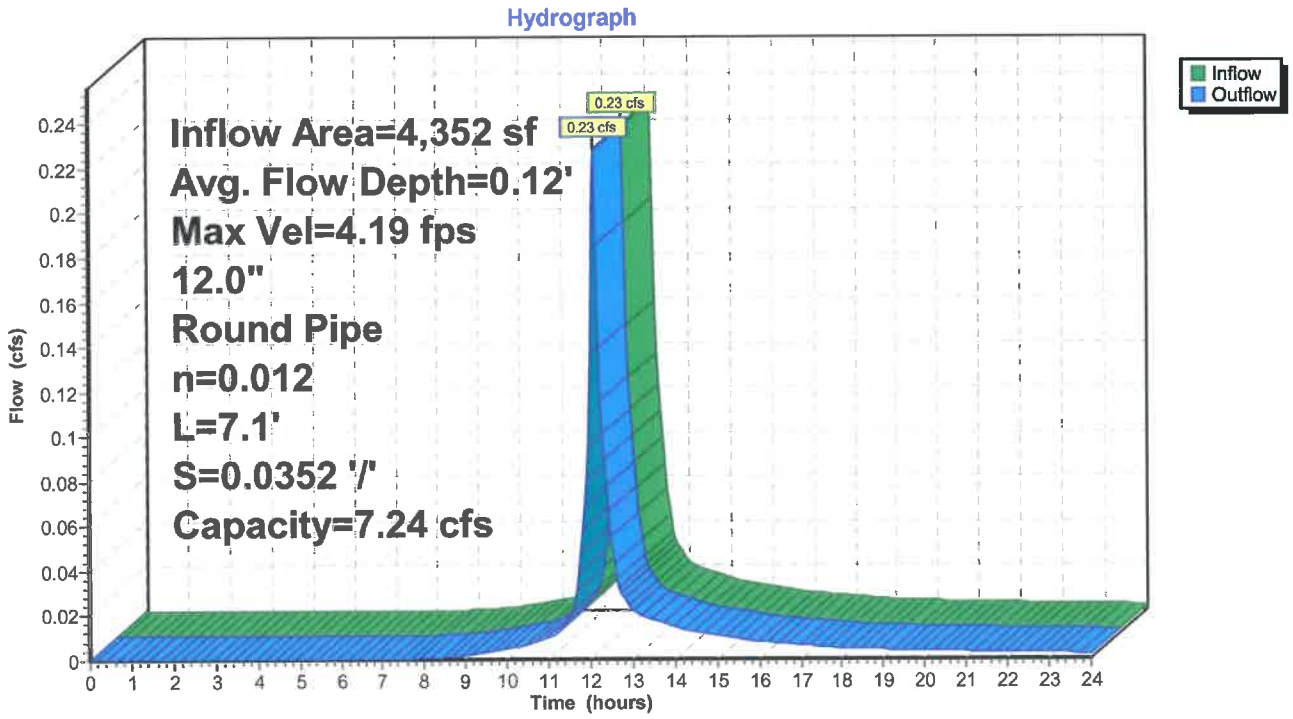
Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 1.99" for 2 YR event
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 722 cf
Outflow = 0.23 cfs @ 12.09 hrs, Volume= 722 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.19 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 0.65'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.1' Slope= 0.0352 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 13S: To CB 10

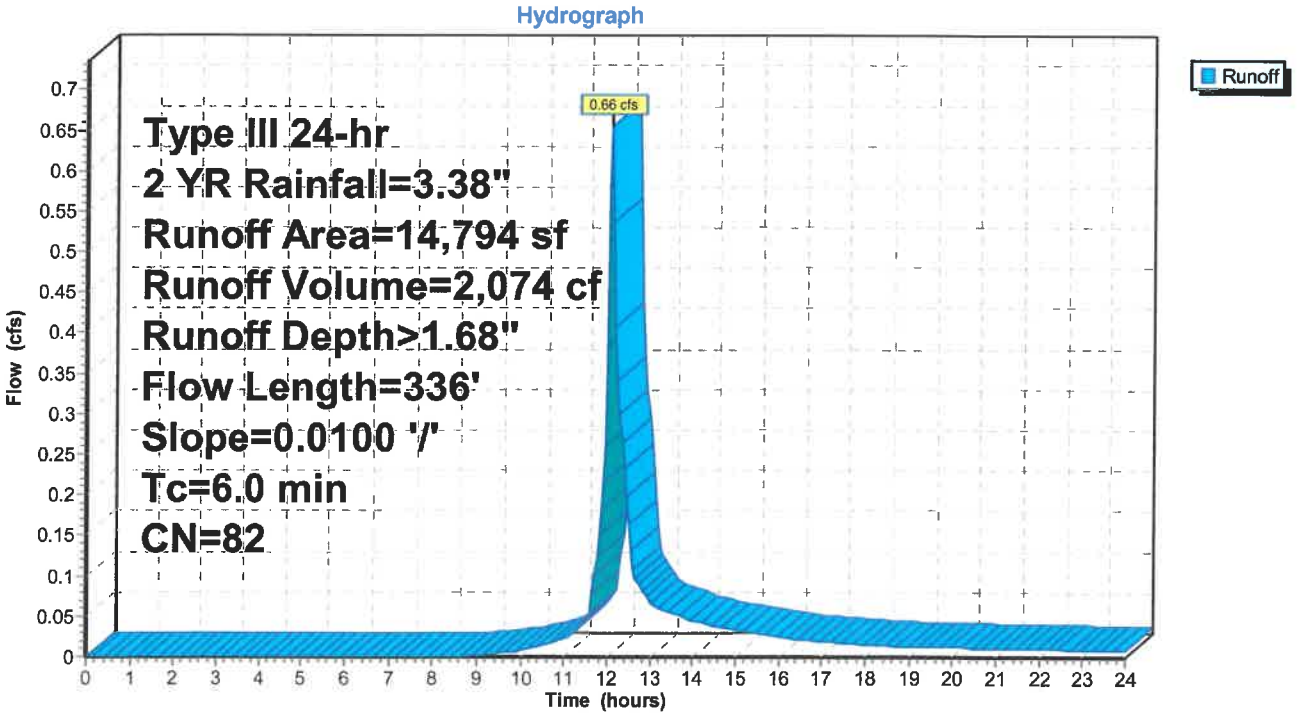
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,074 cf, Depth> 1.68"

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 YR Rainfall=3.38"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: To CB 10



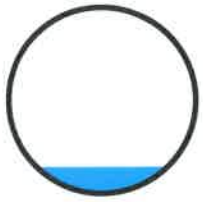
Summary for Reach 14R: CB 8 TO DMH 4

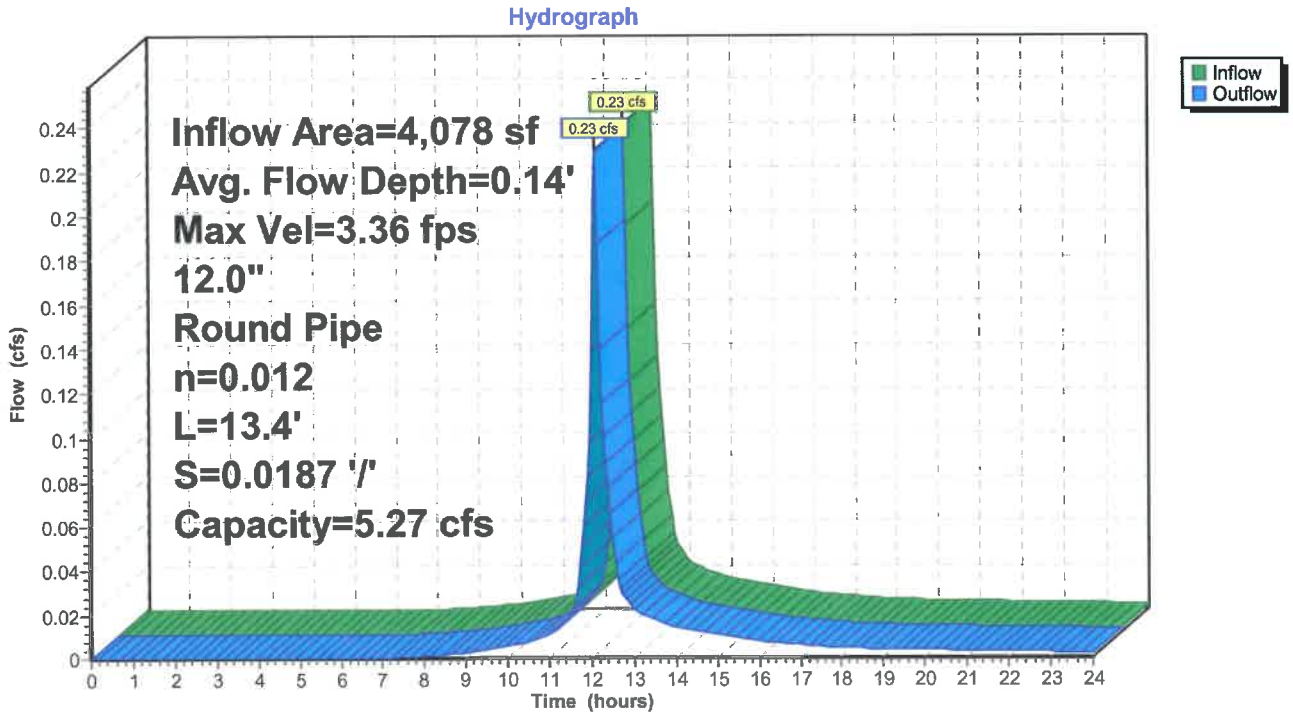
Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 2.16" for 2 YR event
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 733 cf
Outflow = 0.23 cfs @ 12.09 hrs, Volume= 733 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.36 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 0.70'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'





Summary for Subcatchment 14S: To Wetland

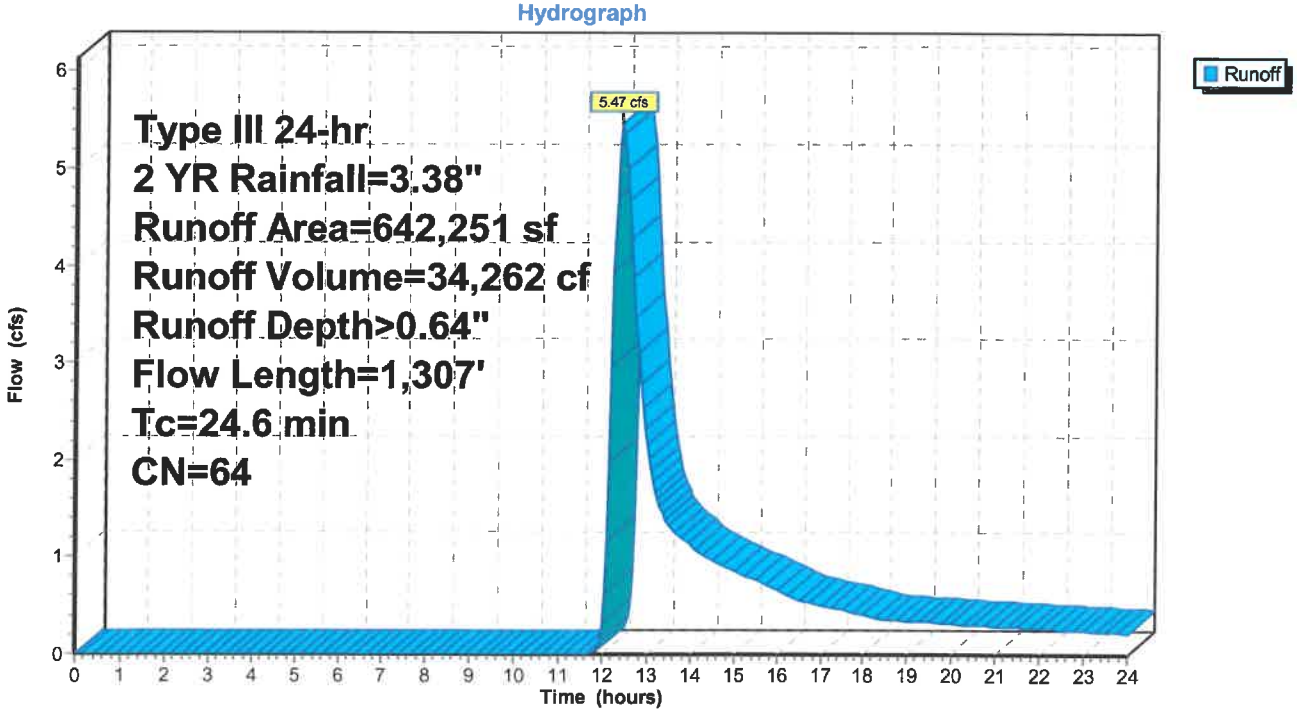
Runoff = 5.47 cfs @ 12.42 hrs, Volume= 34,262 cf, Depth> 0.64"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
358,166	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
642,251	64	Weighted Average
642,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

Subcatchment 14S: To Wetland



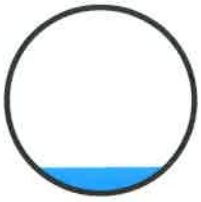
Summary for Reach 15R: DMH 4 TO DMH 5

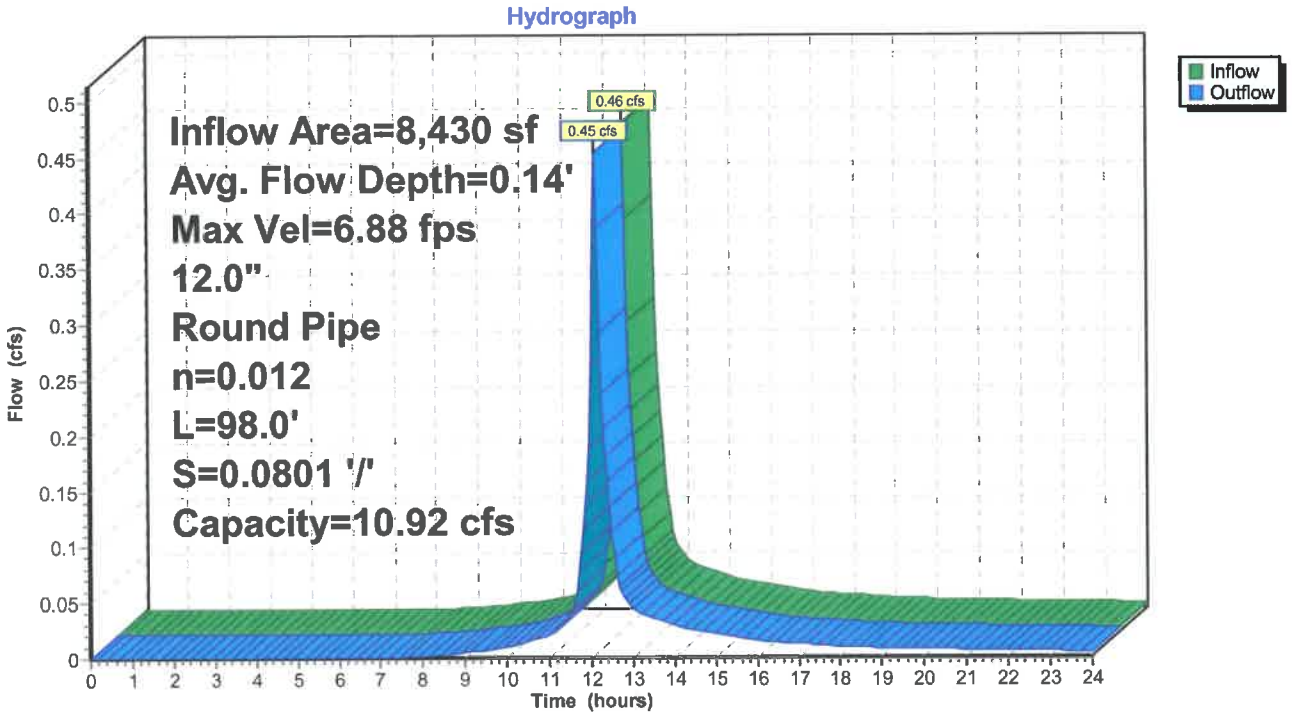
Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 2.07" for 2 YR event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,455 cf
Outflow = 0.45 cfs @ 12.10 hrs, Volume= 1,455 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.88 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.38 fps, Avg. Travel Time= 0.7 min

Peak Storage= 7 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 0.69'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 98.0' Slope= 0.0801 '/'
Inlet Invert= 316.20', Outlet Invert= 308.35'





Summary for Subcatchment 15S: TO BASIN

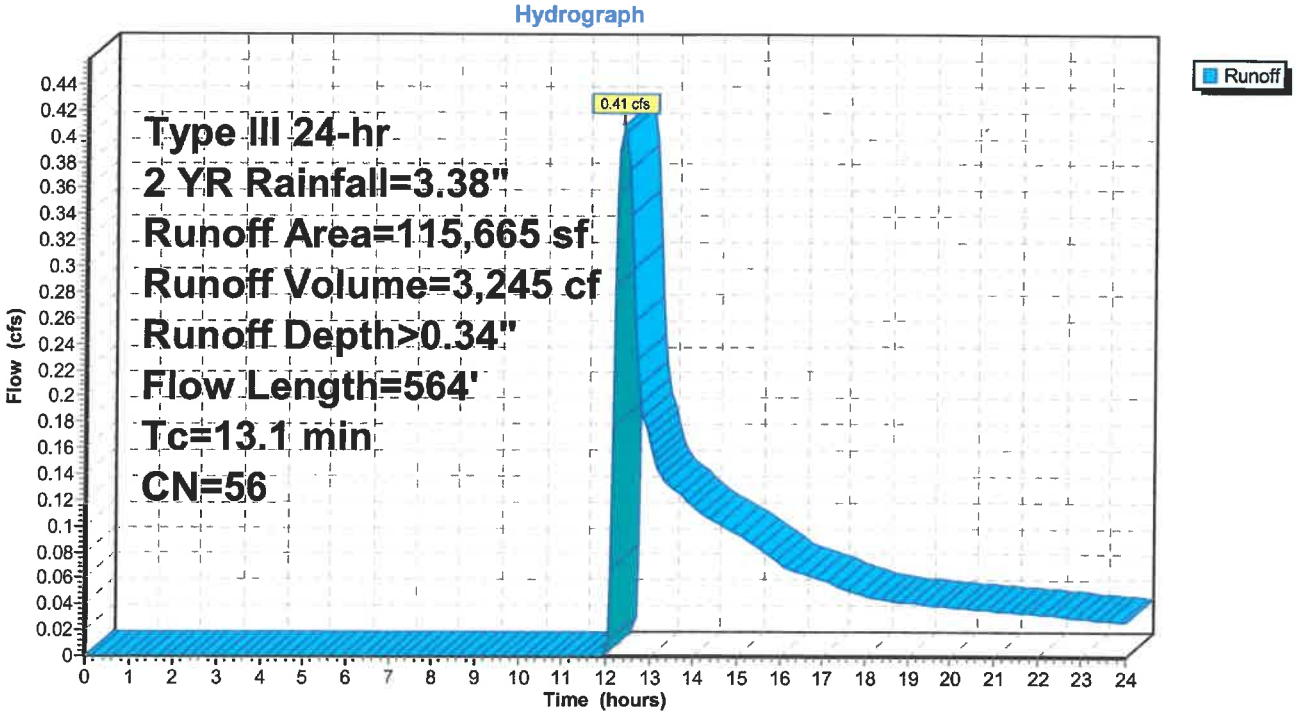
Runoff = 0.41 cfs @ 12.39 hrs, Volume= 3,245 cf, Depth> 0.34"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
94,222	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
115,665	56	Weighted Average
115,665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

Subcatchment 15S: TO BASIN



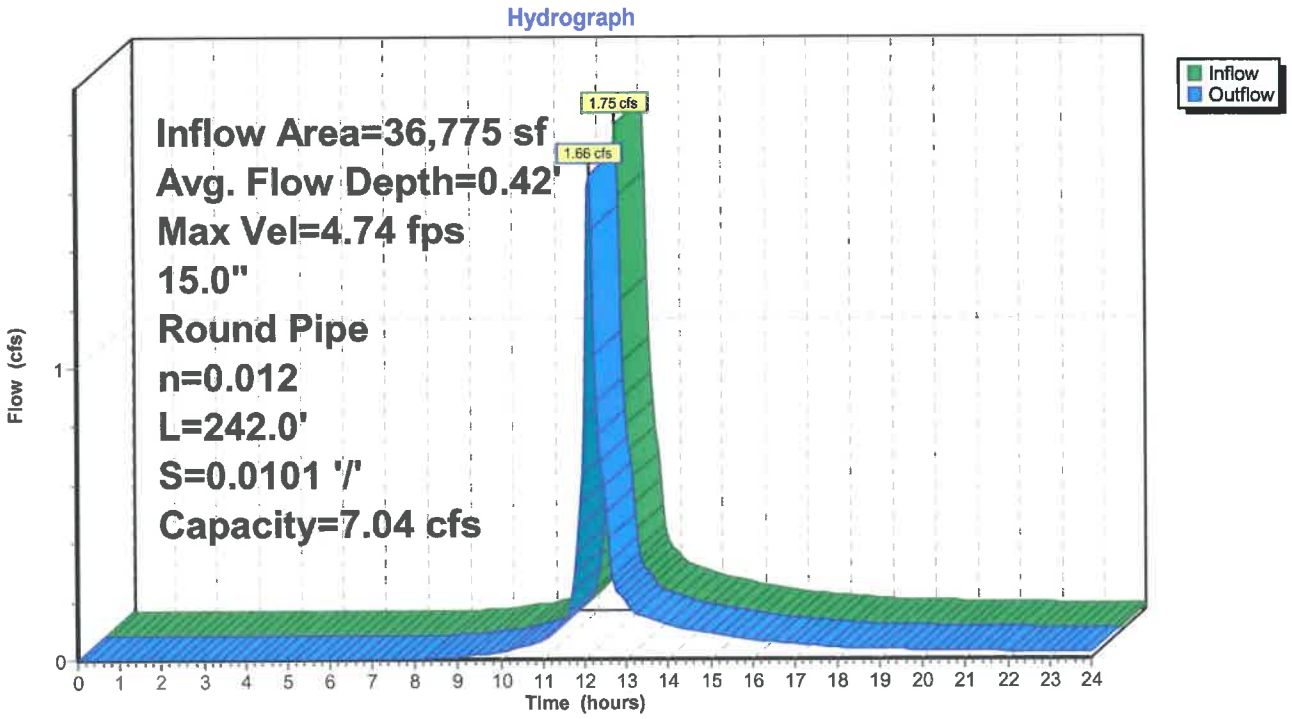
Summary for Reach 16R: DMH 5 TO DMH 6

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 1.83" for 2 YR event
Inflow = 1.75 cfs @ 12.10 hrs, Volume= 5,597 cf
Outflow = 1.66 cfs @ 12.13 hrs, Volume= 5,592 cf, Atten= 5%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.74 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.64 fps, Avg. Travel Time= 2.5 min

Peak Storage= 89 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 1.18'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 242.0' Slope= 0.0101 '/'
Inlet Invert= 308.10', Outlet Invert= 305.65'



Summary for Subcatchment 16S: TO BASIN

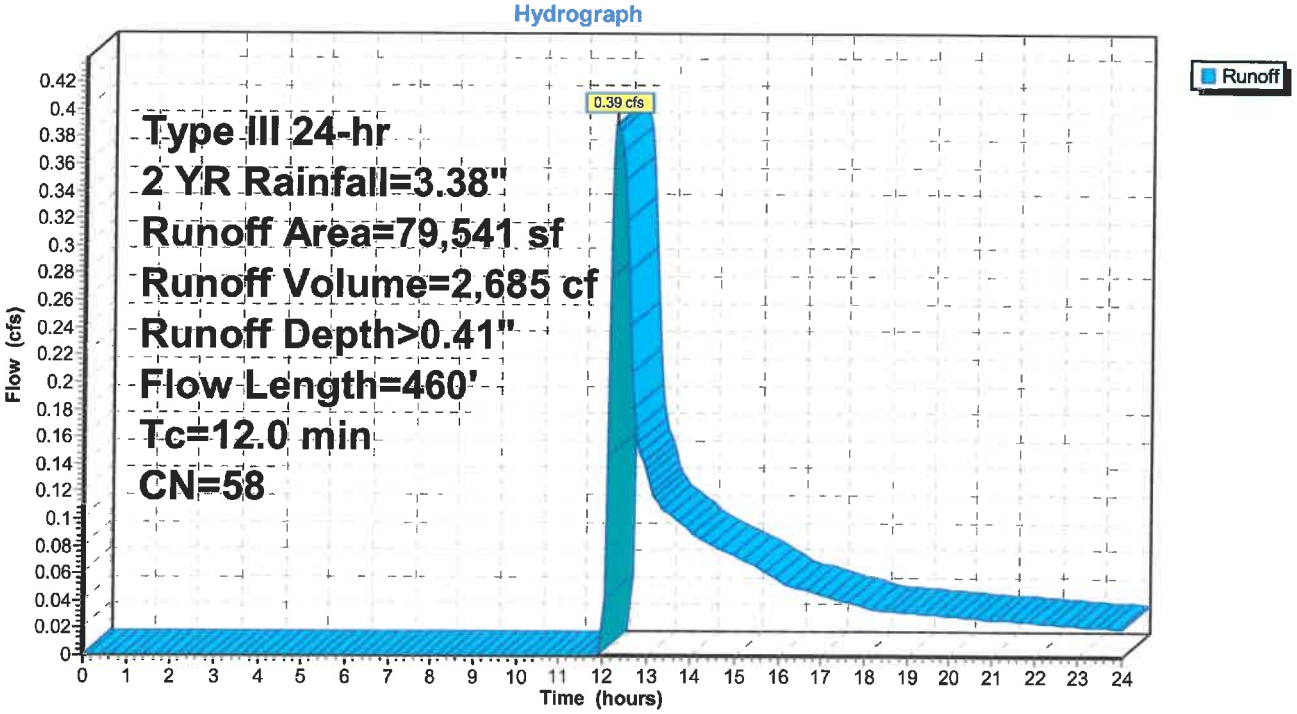
Runoff = 0.39 cfs @ 12.28 hrs, Volume= 2,685 cf, Depth> 0.41"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

Subcatchment 16S: TO BASIN



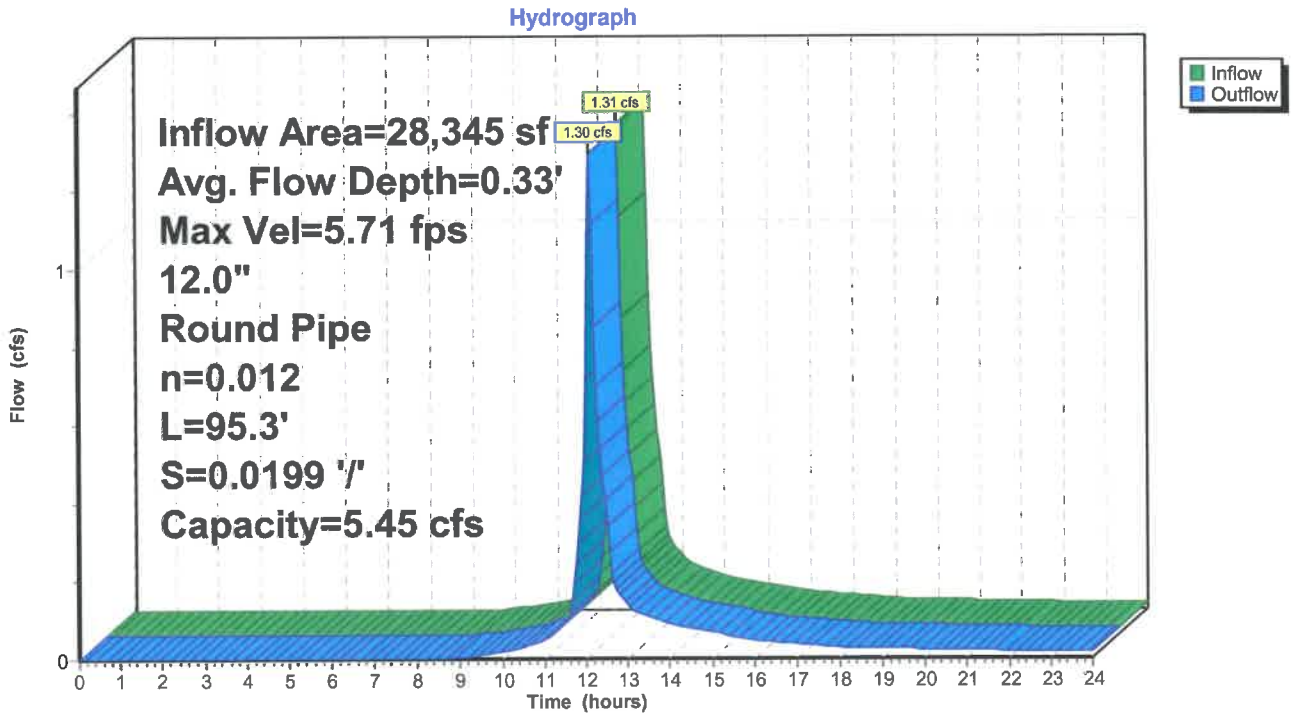
Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 1.75" for 2 YR event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 4,143 cf
Outflow = 1.30 cfs @ 12.10 hrs, Volume= 4,142 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.71 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.05 fps, Avg. Travel Time= 0.8 min

Peak Storage= 22 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 95.3' Slope= 0.0199 '/'
Inlet Invert= 310.25', Outlet Invert= 308.35'



Summary for Subcatchment 17S: To Off Site

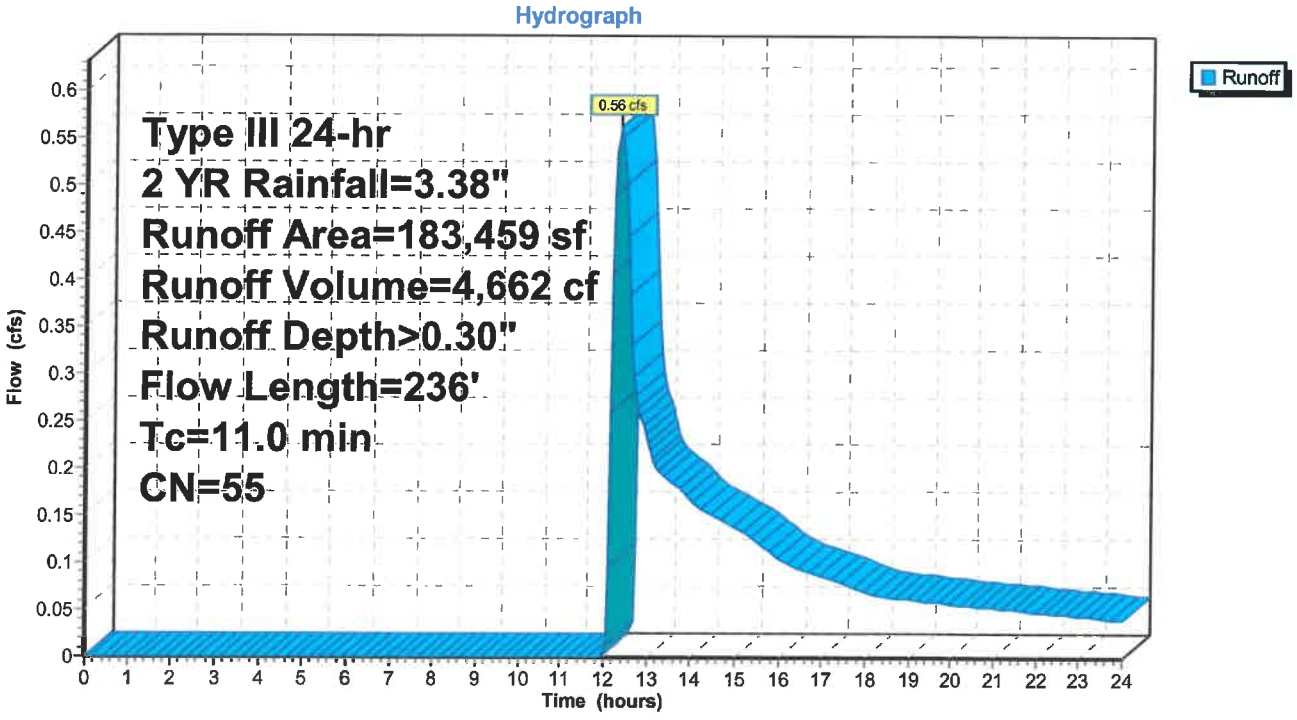
Runoff = 0.56 cfs @ 12.38 hrs, Volume= 4,662 cf, Depth> 0.30"

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 YR Rainfall=3.38"

Area (sf)	CN	Description
183,459	55	Woods, Good, HSG B
183,459		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	236	Total			

Subcatchment 17S: To Off Site



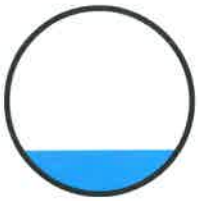
Summary for Reach 18R: CB 10 TO DMH 6

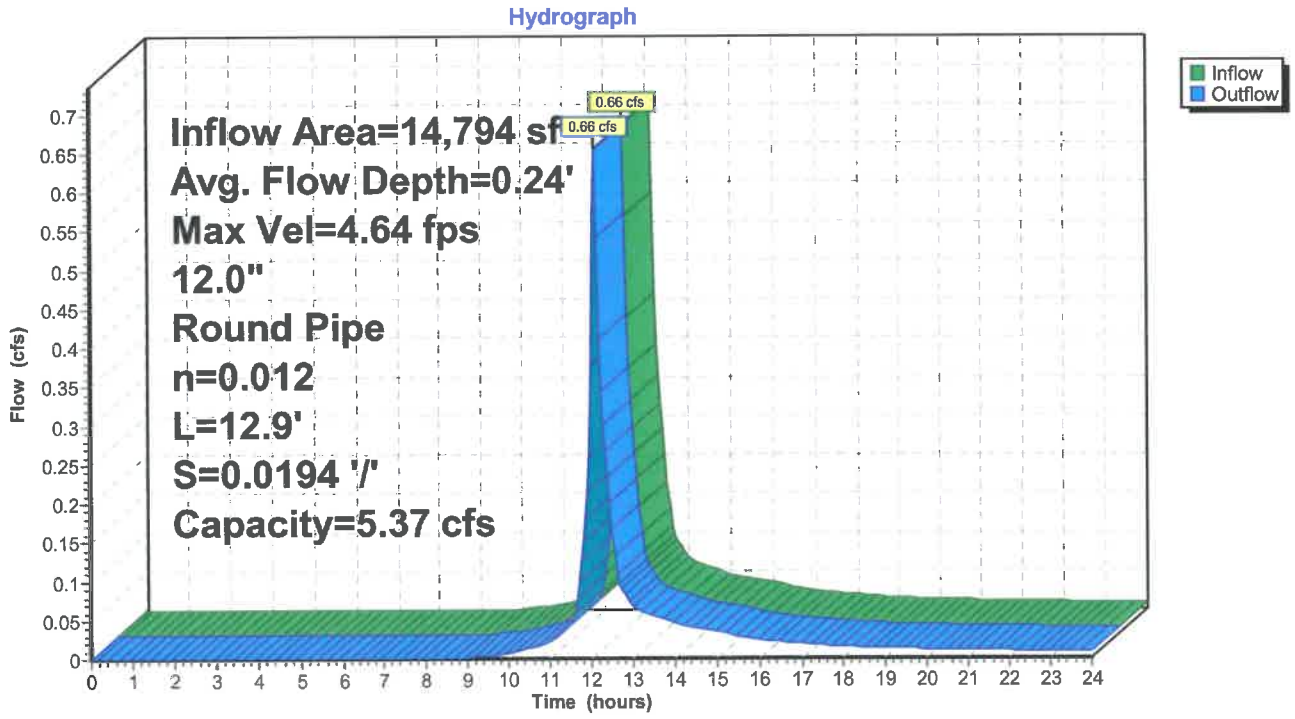
Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 1.68" for 2 YR event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 2,074 cf
Outflow = 0.66 cfs @ 12.10 hrs, Volume= 2,074 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.64 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.85'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 12.9' Slope= 0.0194 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'





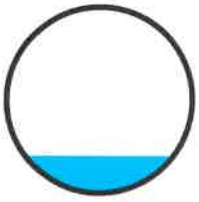
Summary for Reach 19R: CB 9 TO DMH 6

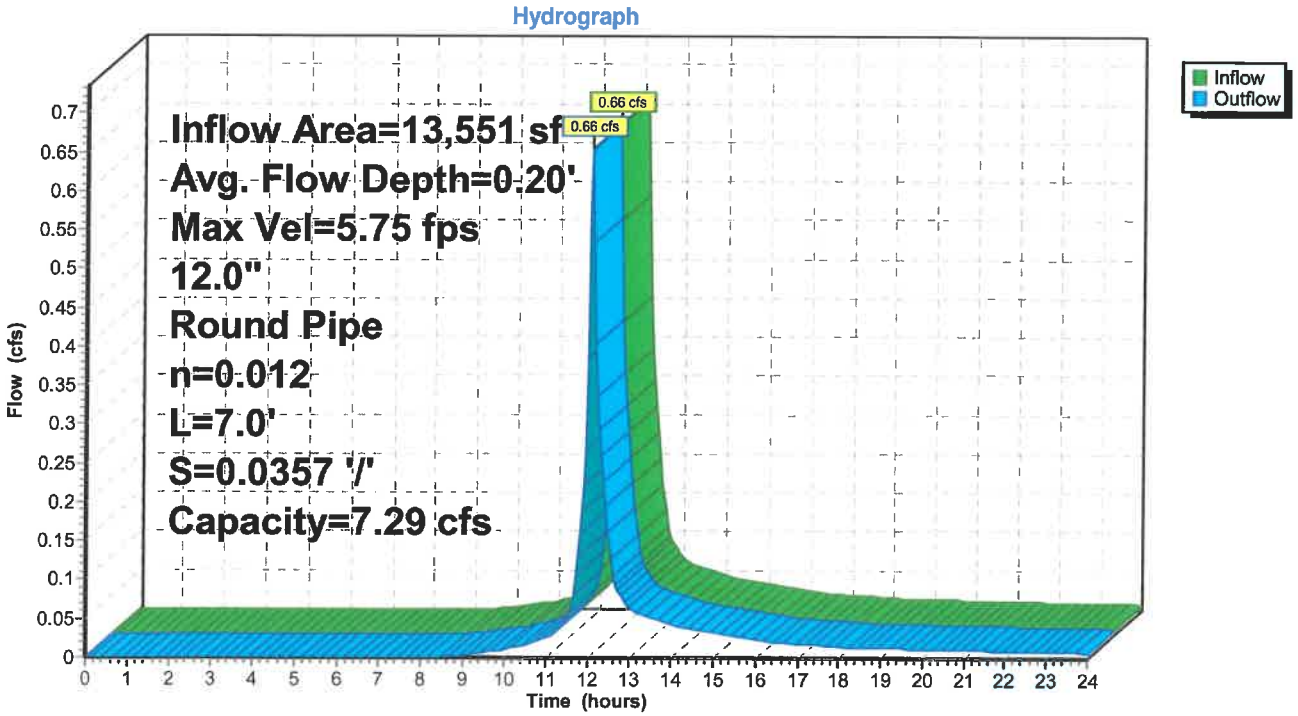
Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 1.83" for 2 YR event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 2,069 cf
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 2,069 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.75 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.05 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.0' Slope= 0.0357 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'





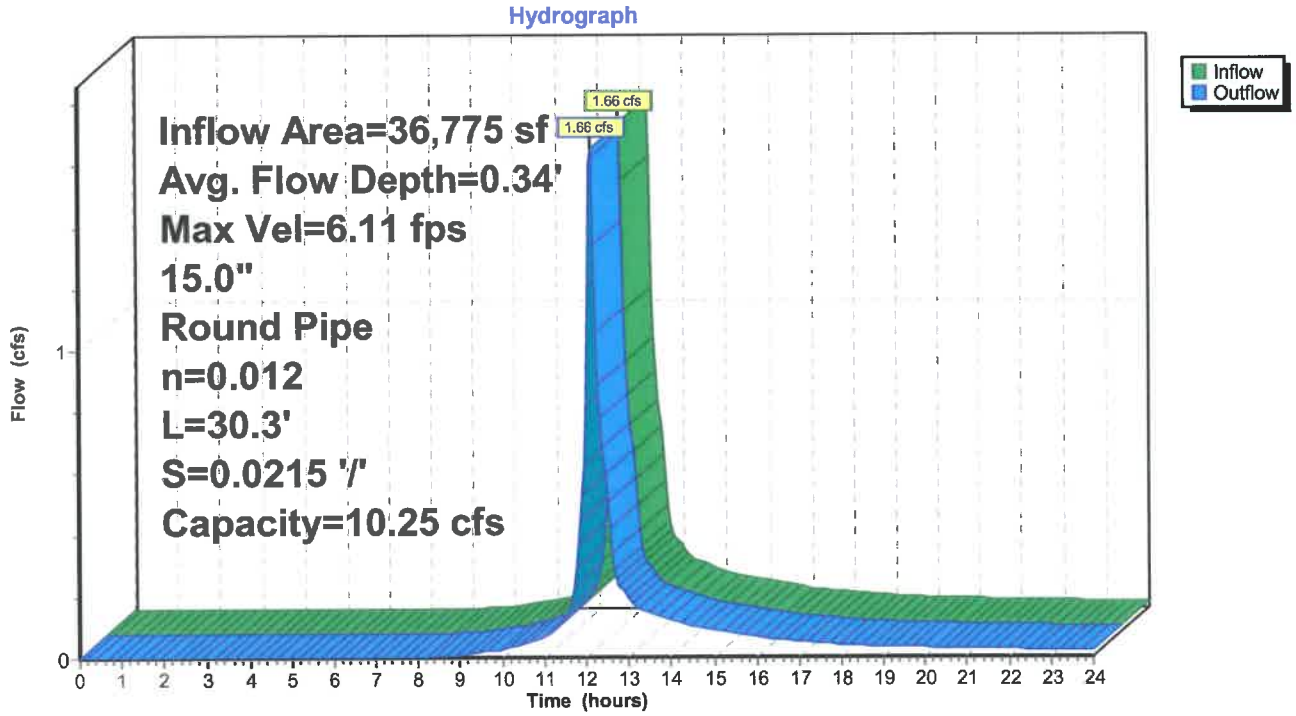
Summary for Reach 20R: DMH 6 to Basin

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 1.82" for 2 YR event
Inflow = 1.66 cfs @ 12.13 hrs, Volume= 5,592 cf
Outflow = 1.66 cfs @ 12.13 hrs, Volume= 5,591 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.11 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.2 min

Peak Storage= 8 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.34' , Surface Width= 1.11'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.3' Slope= 0.0215 '/'
Inlet Invert= 305.65', Outlet Invert= 305.00'



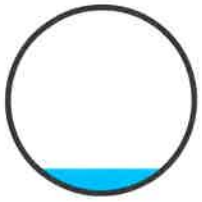
Summary for Reach 21R: 24" ADS

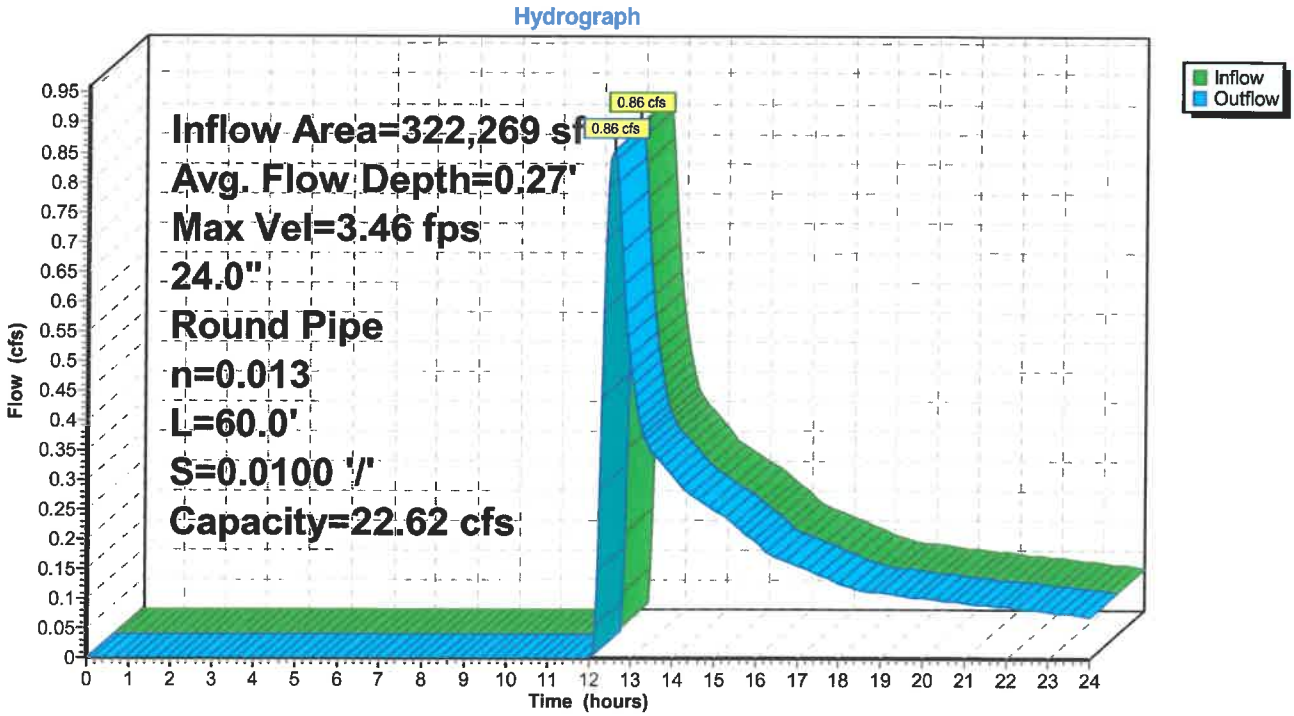
Inflow Area = 322,269 sf, 0.00% Impervious, Inflow Depth > 0.30" for 2 YR event
Inflow = 0.86 cfs @ 12.54 hrs, Volume= 8,146 cf
Outflow = 0.86 cfs @ 12.55 hrs, Volume= 8,143 cf, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.46 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.08 fps, Avg. Travel Time= 0.5 min

Peak Storage= 15 cf @ 12.55 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 1.36'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 22.62 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 310.00', Outlet Invert= 309.40'



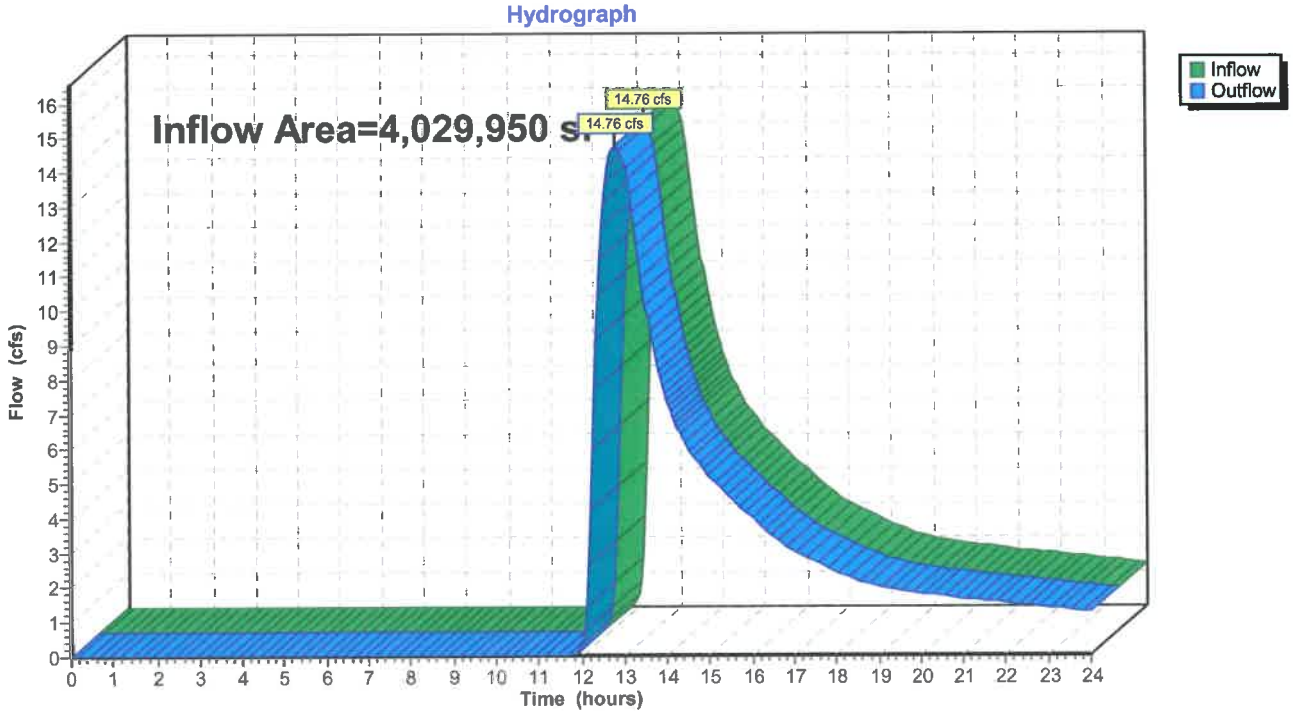


Summary for Reach EV1: To Wetland

Inflow Area = 4,029,950 sf, 4.03% Impervious, Inflow Depth > 0.51" for 2 YR event
Inflow = 14.76 cfs @ 12.84 hrs, Volume= 171,321 cf
Outflow = 14.76 cfs @ 12.84 hrs, Volume= 171,321 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV1: To Wetland

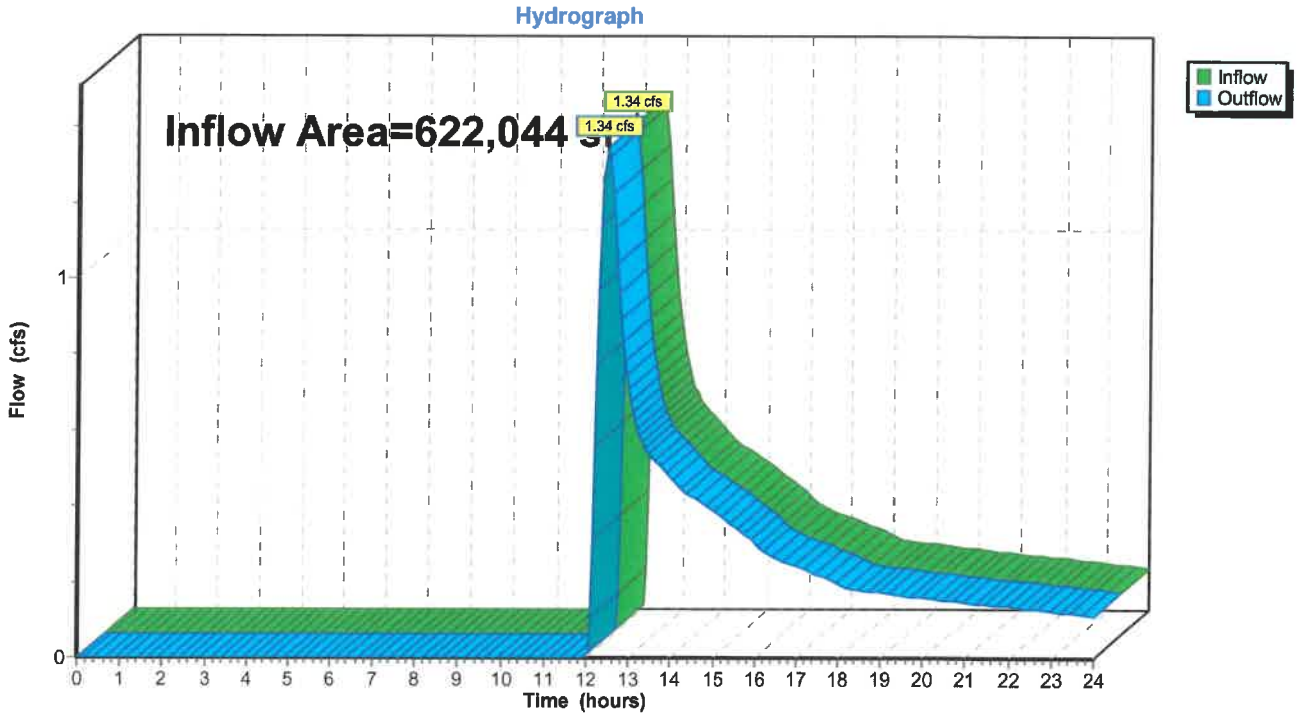


Summary for Reach EV2: To Offsite

Inflow Area = 622,044 sf, 3.64% Impervious, Inflow Depth > 0.25" for 2 YR event
Inflow = 1.34 cfs @ 12.48 hrs, Volume= 12,805 cf
Outflow = 1.34 cfs @ 12.48 hrs, Volume= 12,805 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV2: To Offsite



Summary for Pond 1P: Forebay

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 3.85" for 10 YR event
Inflow = 3.33 cfs @ 12.15 hrs, Volume= 11,939 cf
Outflow = 3.27 cfs @ 12.16 hrs, Volume= 9,760 cf, Atten= 2%, Lag= 0.4 min
Primary = 3.27 cfs @ 12.16 hrs, Volume= 9,760 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 282.56' @ 12.16 hrs Surf.Area= 1,668 sf Storage= 2,256 cf

Plug-Flow detention time= 111.1 min calculated for 9,760 cf (82% of inflow)
Center-of-Mass det. time= 40.3 min (841.3 - 801.1)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

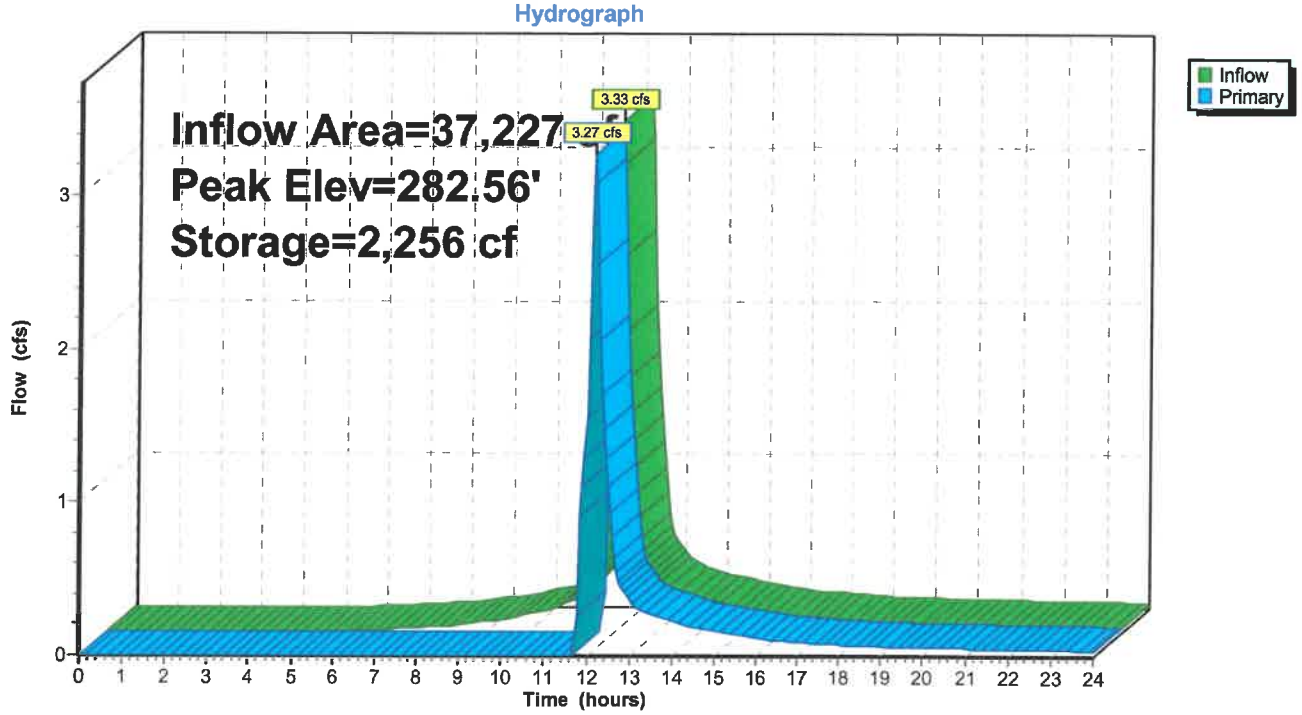
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	282.50'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.88 cfs @ 12.16 hrs HW=282.56' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.88 cfs @ 0.80 fps)

Pond 1P: Forebay

Hydrograph



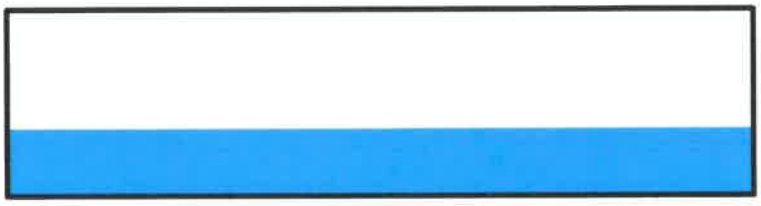
Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 1.50" for 10 YR event
Inflow = 10.71 cfs @ 12.43 hrs, Volume= 61,482 cf
Outflow = 10.71 cfs @ 12.44 hrs, Volume= 61,469 cf, Atten= 0%, Lag= 0.2 min

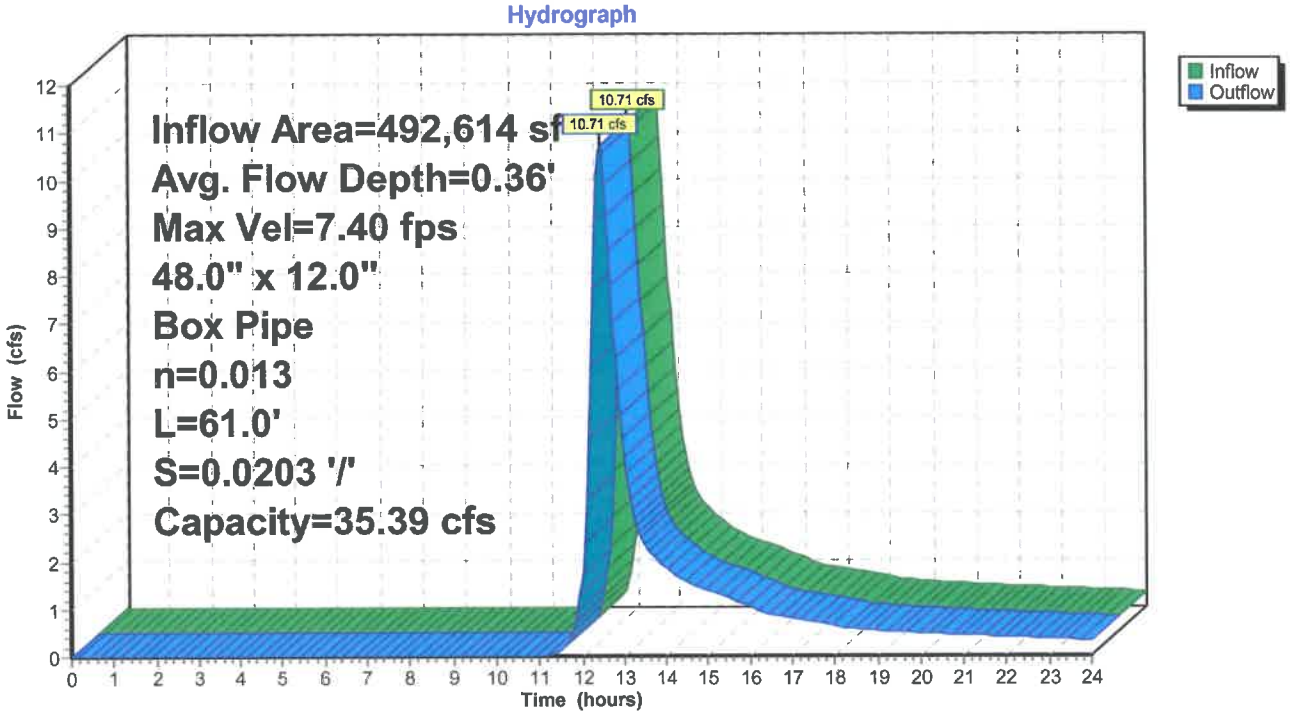
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.40 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.91 fps, Avg. Travel Time= 0.3 min

Peak Storage= 88 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'



Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

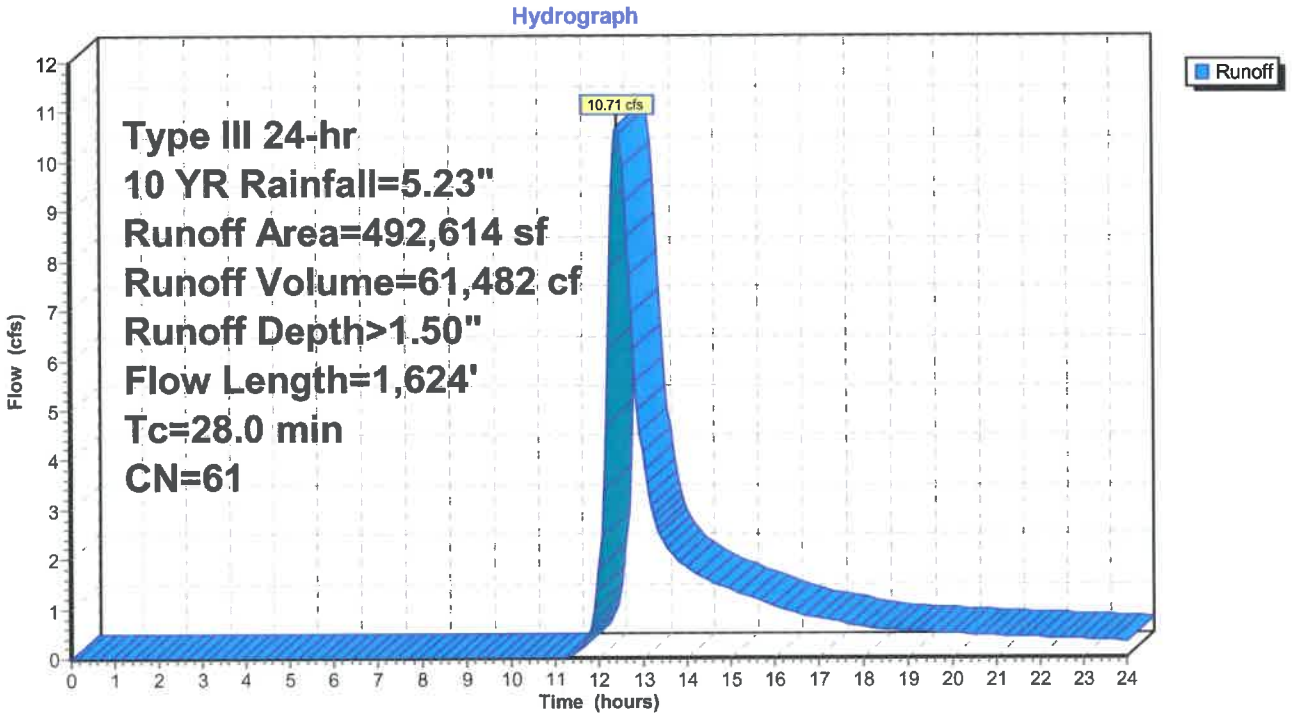
Runoff = 10.71 cfs @ 12.43 hrs, Volume= 61,482 cf, Depth> 1.50"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.5	880	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
28.0	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Pond 2P: Basin 1

Inflow Area = 152,892 sf, 17.50% Impervious, Inflow Depth > 1.64" for 10 YR event
Inflow = 5.53 cfs @ 12.18 hrs, Volume= 20,922 cf
Outflow = 0.17 cfs @ 18.84 hrs, Volume= 7,268 cf, Atten= 97%, Lag= 399.3 min
Discarded = 0.17 cfs @ 18.84 hrs, Volume= 7,268 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 283.65' @ 18.84 hrs Surf.Area= 6,327 sf Storage= 14,307 cf

Plug-Flow detention time= 353.3 min calculated for 7,253 cf (35% of inflow)
Center-of-Mass det. time= 217.1 min (1,084.1 - 867.0)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

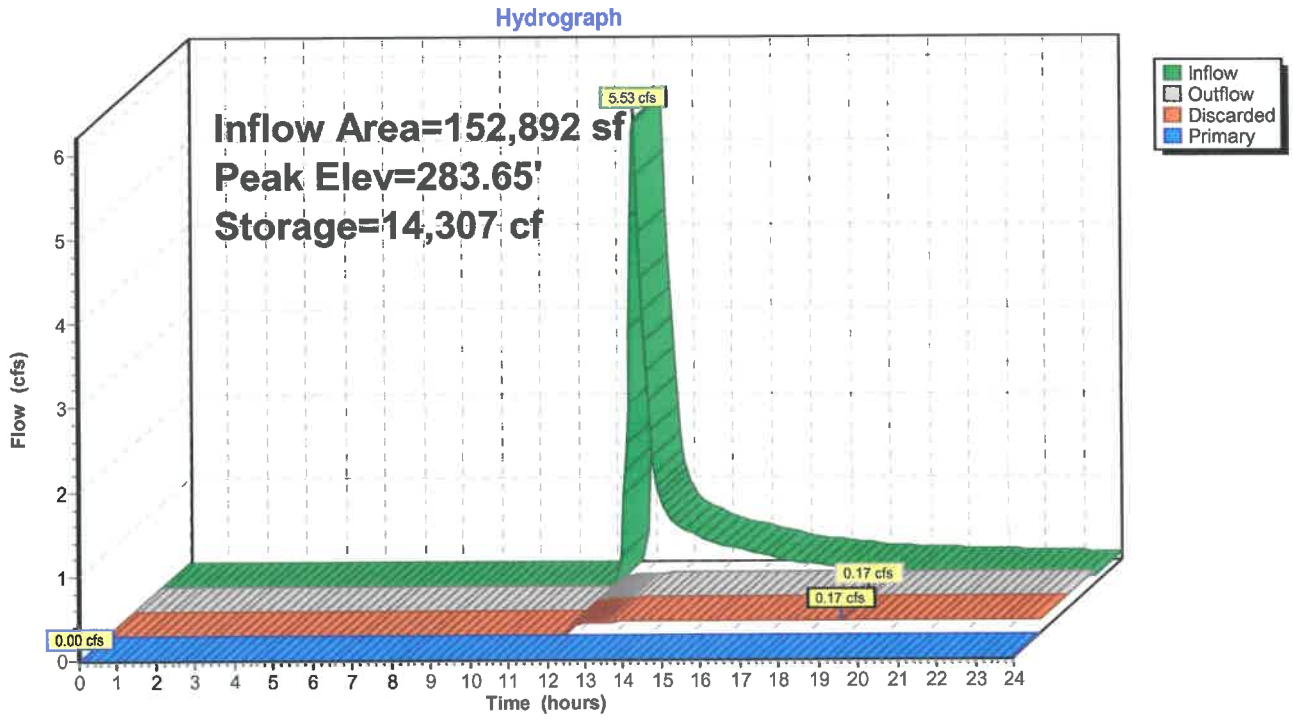
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	288.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	**1.100 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.17 cfs @ 18.84 hrs HW=283.65' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Basin 1



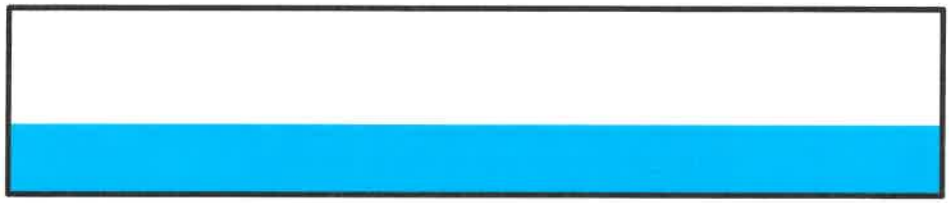
Summary for Reach 2R: Culvert

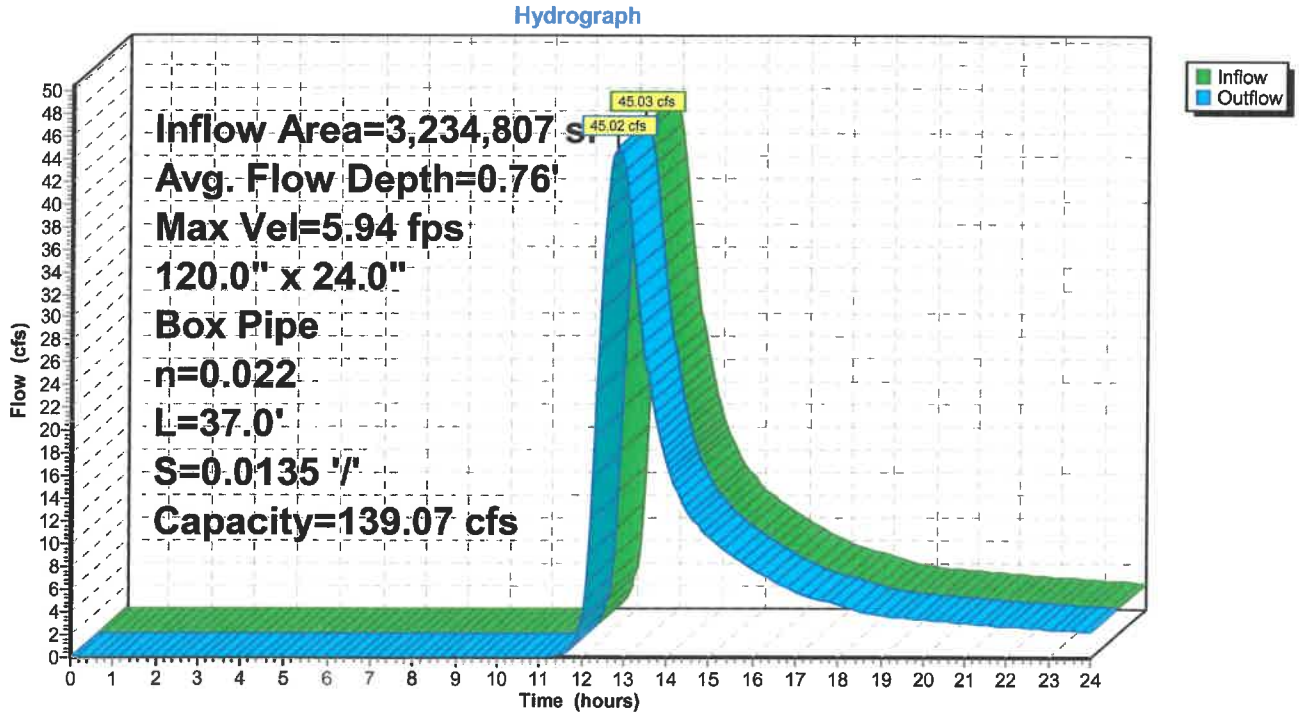
Inflow Area = 3,234,807 sf, 4.20% Impervious, Inflow Depth > 1.48" for 10 YR event
Inflow = 45.03 cfs @ 12.84 hrs, Volume= 400,170 cf
Outflow = 45.02 cfs @ 12.84 hrs, Volume= 400,112 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.94 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.78 fps, Avg. Travel Time= 0.2 min

Peak Storage= 280 cf @ 12.84 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 10.00'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 139.07 cfs

120.0" W x 24.0" H Box Pipe
n= 0.022 Earth, clean & straight
Length= 37.0' Slope= 0.0135 '/'
Inlet Invert= 292.00', Outlet Invert= 291.50'





Summary for Subcatchment 2S: To Proposed Culvert

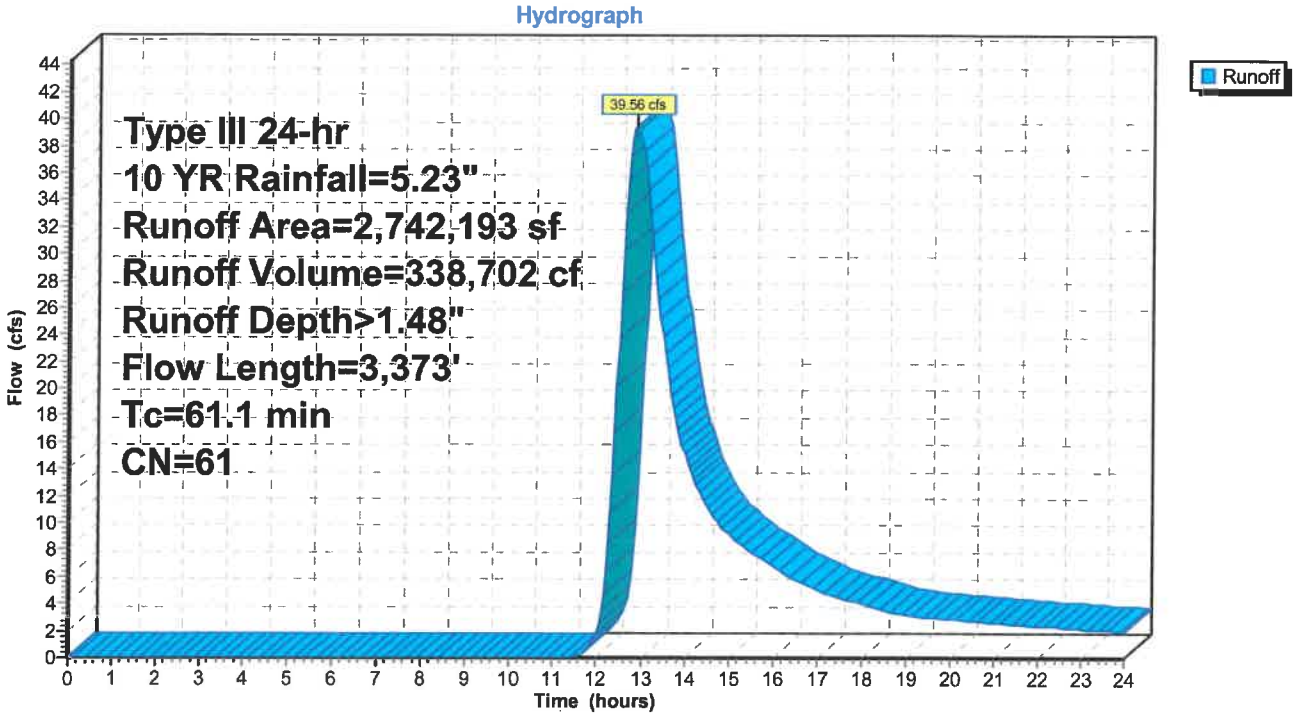
Runoff = 39.56 cfs @ 12.90 hrs, Volume= 338,702 cf, Depth> 1.48"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
1,862,663	55	Woods, Good, HSG B
533,264	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,742,193	61	Weighted Average
2,655,501		96.84% Pervious Area
86,692		3.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.9	366	0.1000	1.58		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
47.4	2,957	0.0100	1.04	1.25	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
61.1	3,373	Total			

Subcatchment 2S: To Proposed Culvert



Summary for Pond 3P: Forebay

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 3.47" for 10 YR event
Inflow = 3.17 cfs @ 12.12 hrs, Volume= 10,620 cf
Outflow = 3.26 cfs @ 12.12 hrs, Volume= 8,355 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.26 cfs @ 12.12 hrs, Volume= 8,355 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 305.56' @ 12.12 hrs Surf.Area= 1,778 sf Storage= 2,373 cf

Plug-Flow detention time= 119.5 min calculated for 8,337 cf (79% of inflow)
Center-of-Mass det. time= 42.2 min (852.7 - 810.6)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

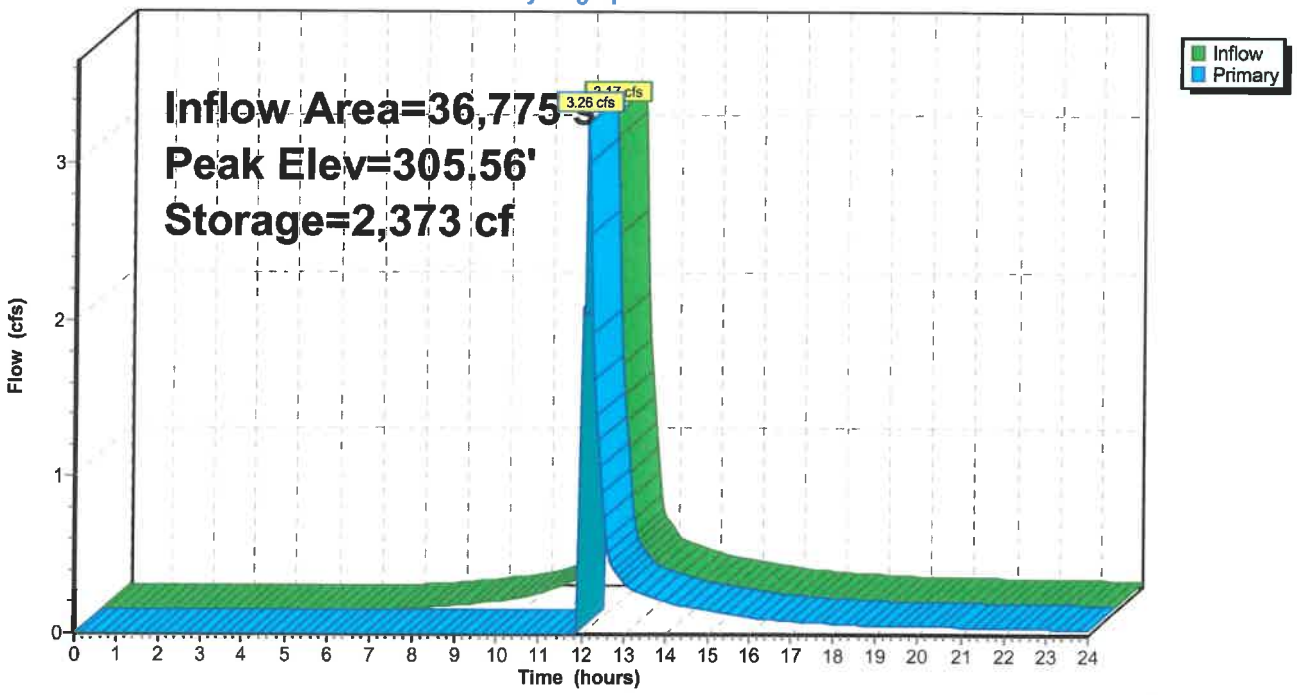
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	**65.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.09 cfs @ 12.12 hrs HW=305.56' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 3.09 cfs @ 0.80 fps)

Pond 3P: Forebay

Hydrograph



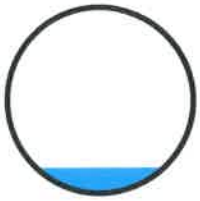
Summary for Reach 3R: CB1 to DMH 1

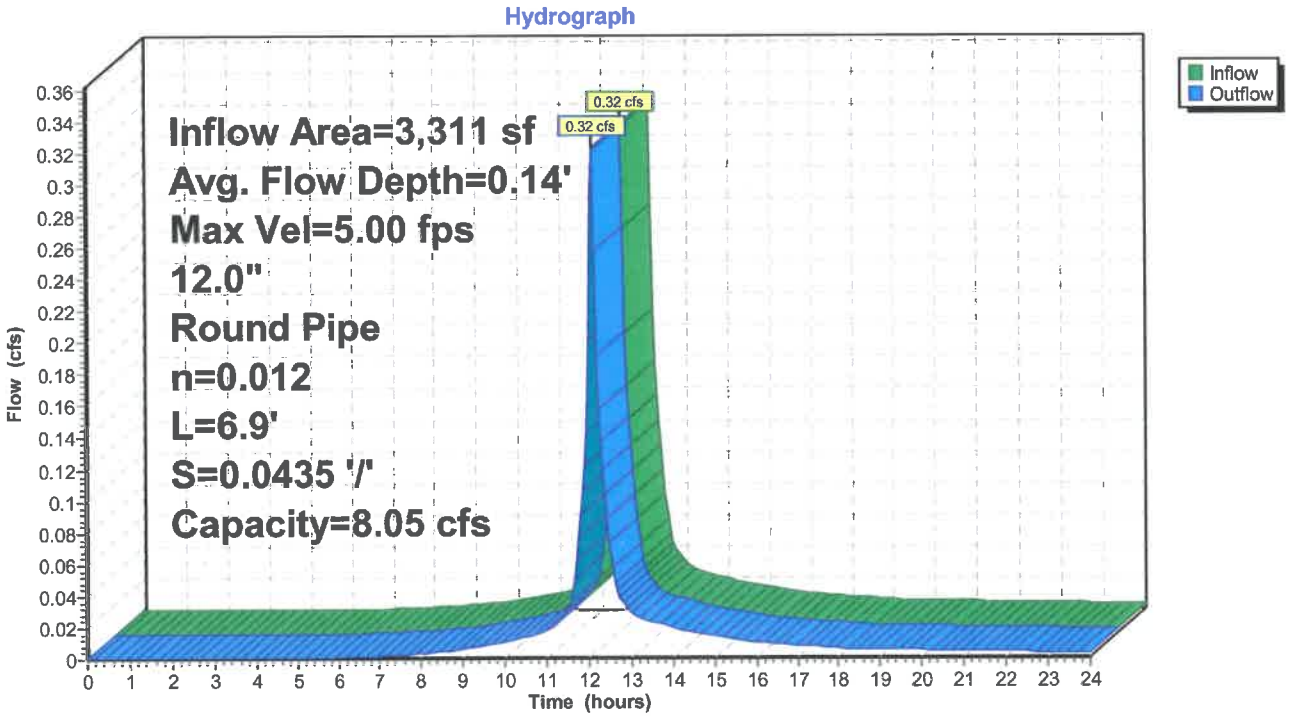
Inflow Area = 3,311 sf, 69.56% Impervious, Inflow Depth > 3.78" for 10 YR event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,043 cf
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,043 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 0.69'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'





Summary for Subcatchment 3S: To 24" ADS

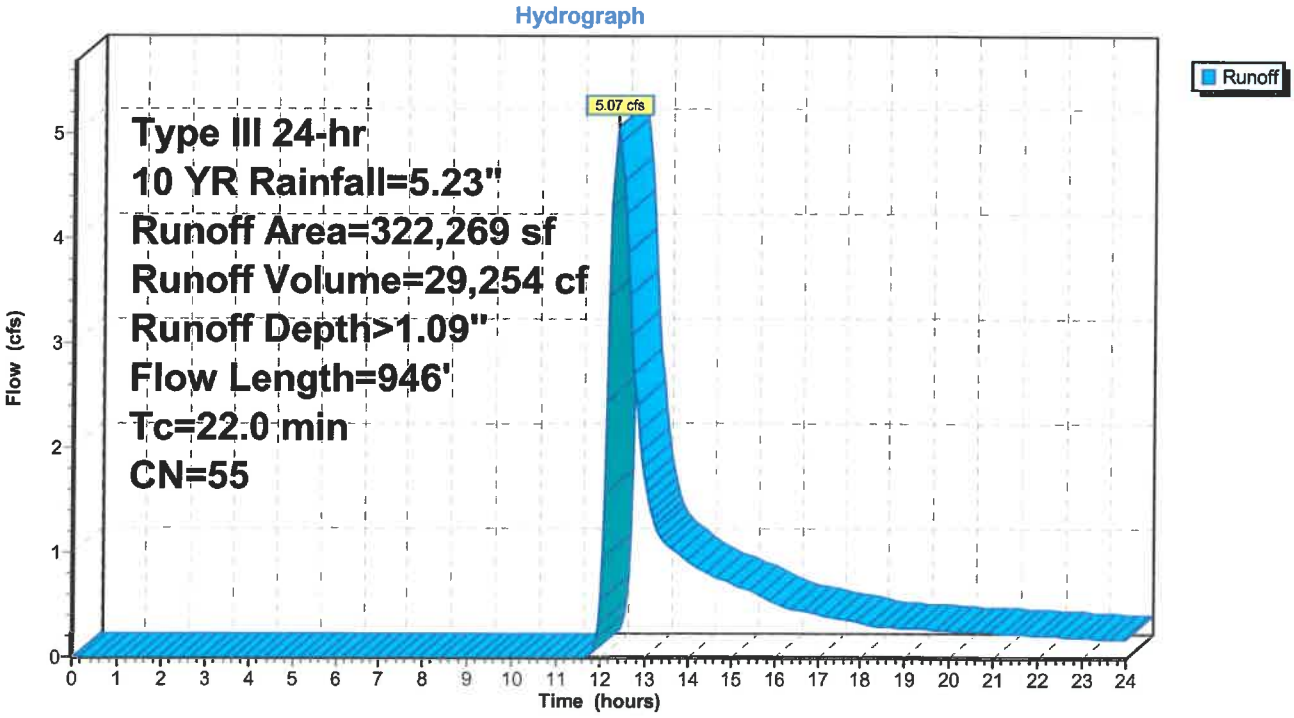
Runoff = 5.07 cfs @ 12.37 hrs, Volume= 29,254 cf, Depth> 1.09"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
322,269	55	Woods, Good, HSG B
322,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.0	946	Total			

Subcatchment 3S: To 24" ADS



Summary for Pond 4P: Basin 2

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 1.75" for 10 YR event
Inflow = 4.90 cfs @ 12.15 hrs, Volume= 16,927 cf
Outflow = 0.21 cfs @ 16.83 hrs, Volume= 8,874 cf, Atten= 96%, Lag= 280.8 min
Discarded = 0.21 cfs @ 16.83 hrs, Volume= 8,874 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 305.34' @ 16.83 hrs Surf.Area= 8,114 sf Storage= 10,097 cf

Plug-Flow detention time= 338.5 min calculated for 8,874 cf (52% of inflow)
Center-of-Mass det. time= 211.7 min (1,079.3 - 867.6)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	45,905 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

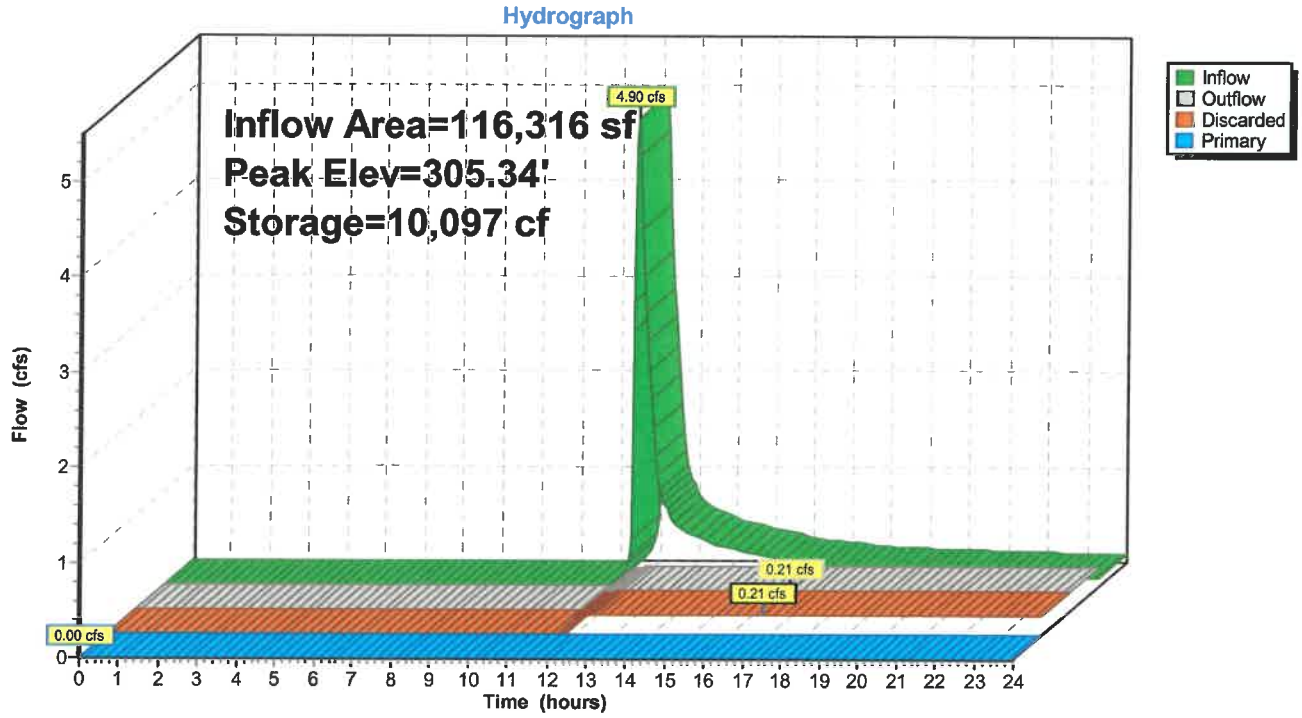
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	**1.100 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.21 cfs @ 16.83 hrs HW=305.34' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Basin 2



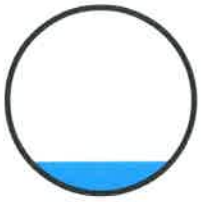
Summary for Reach 4R: CB2 to DMH 1

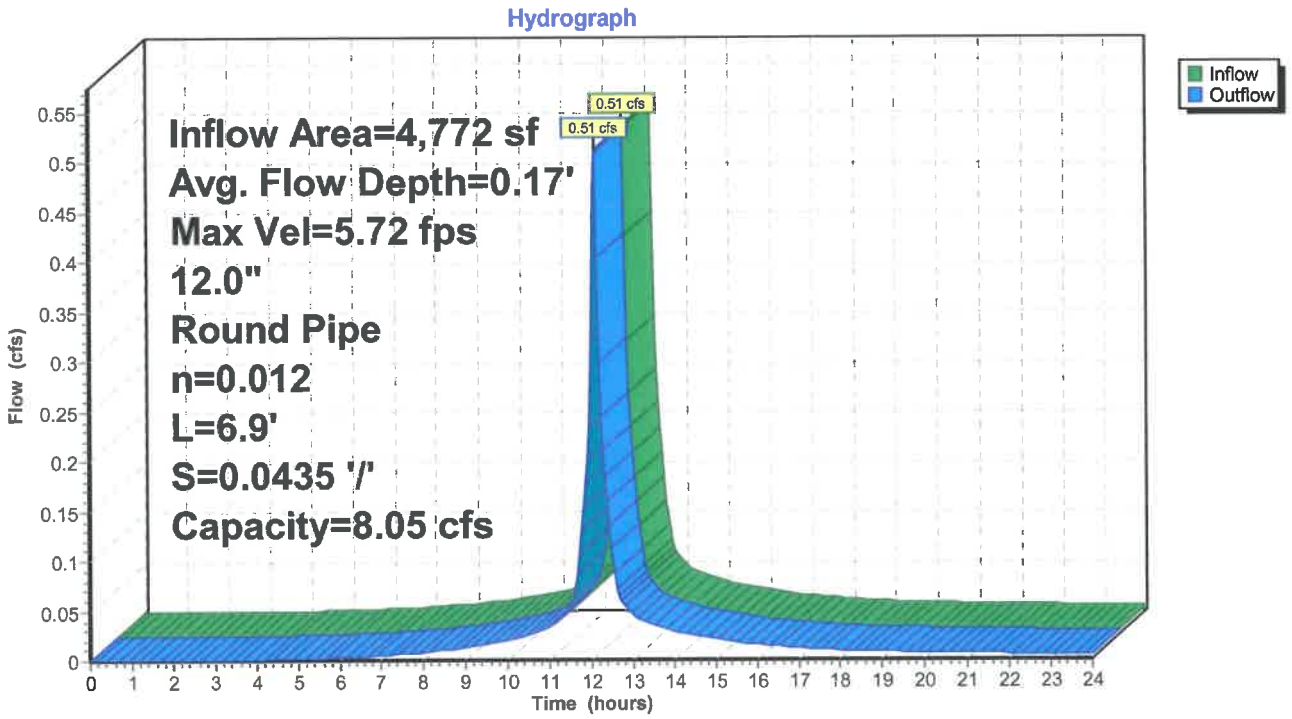
Inflow Area = 4,772 sf, 83.28% Impervious, Inflow Depth > 4.31" for 10 YR event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 1,714 cf
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 1,714 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.72 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 0.75'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'





Summary for Subcatchment 4S: To CB 1

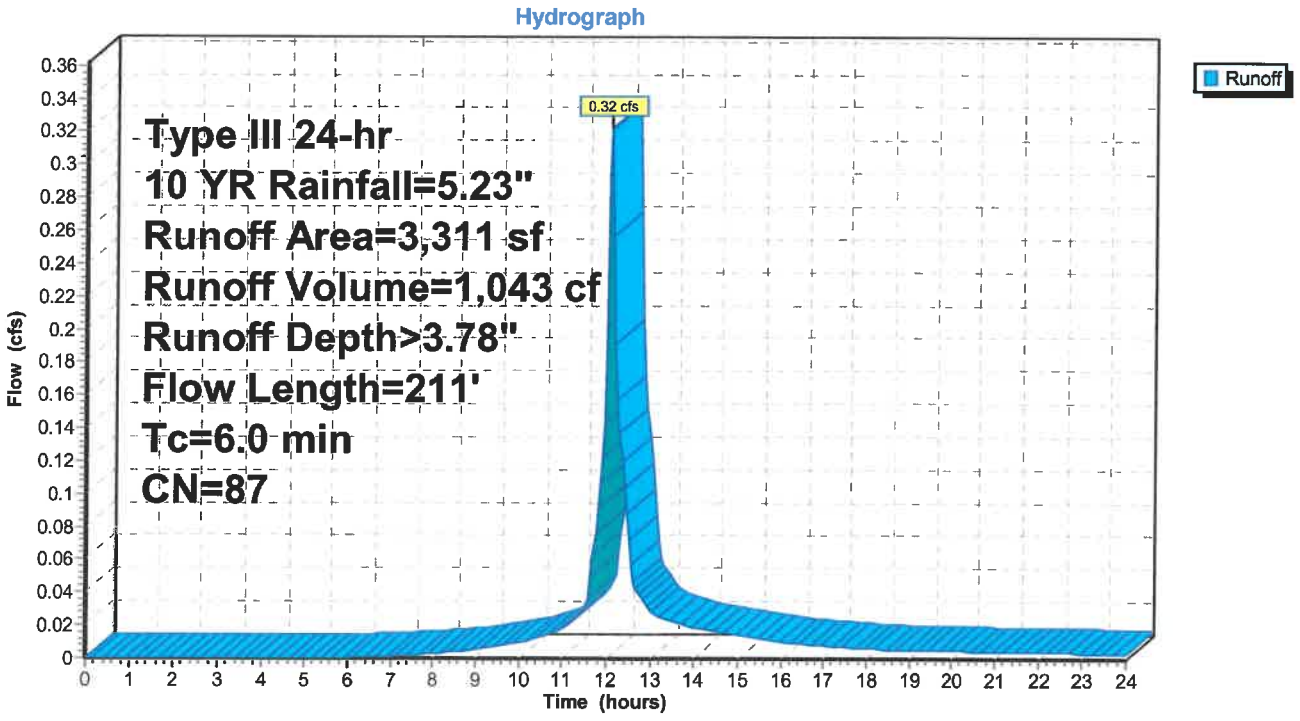
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,043 cf, Depth> 3.78"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
2,303	98	Paved roads w/curbs & sewers, HSG B
1,008	61	>75% Grass cover, Good, HSG B
3,311	87	Weighted Average
1,008		30.44% Pervious Area
2,303		69.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.0	161	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	211	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: To CB 1



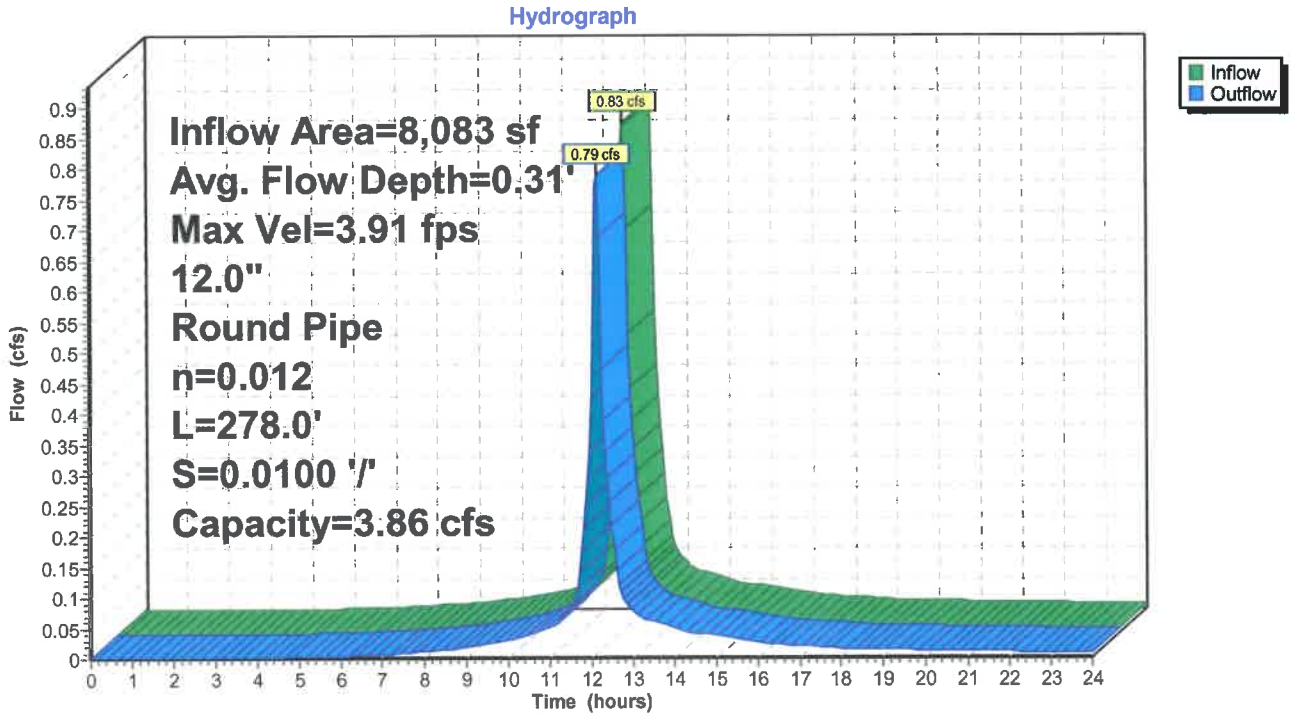
Summary for Reach 5R: DMH1 to DMH 2

Inflow Area = 8,083 sf, 77.66% Impervious, Inflow Depth > 4.09" for 10 YR event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 2,758 cf
Outflow = 0.79 cfs @ 12.12 hrs, Volume= 2,755 cf, Atten= 5%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.91 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 3.6 min

Peak Storage= 59 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 0.93'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 278.0' Slope= 0.0100 '/'
Inlet Invert= 290.68', Outlet Invert= 287.90'



Summary for Subcatchment 5S: To CB 2

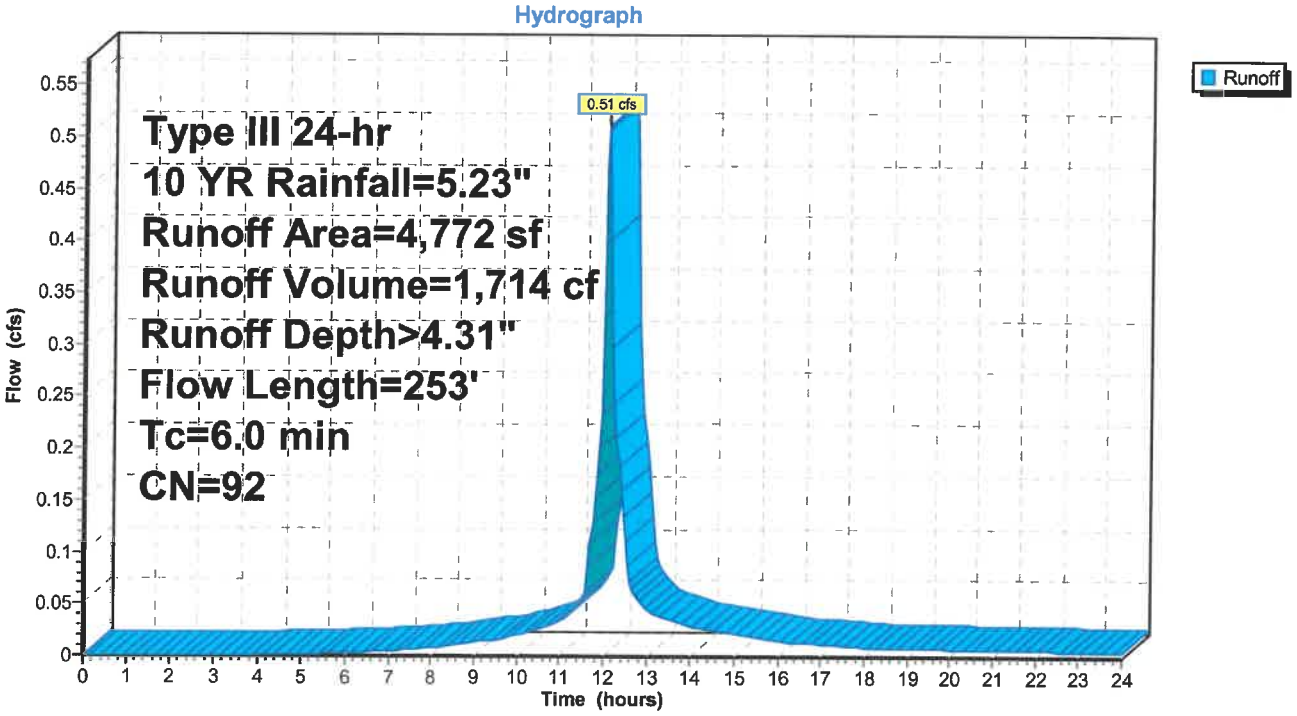
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,714 cf, Depth> 4.31"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
3,974	98	Paved roads w/curbs & sewers, HSG B
798	61	>75% Grass cover, Good, HSG B
4,772	92	Weighted Average
798		16.72% Pervious Area
3,974		83.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.2	203	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	253	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: To CB 2



Summary for Reach 6R: CB3 to DMH 2

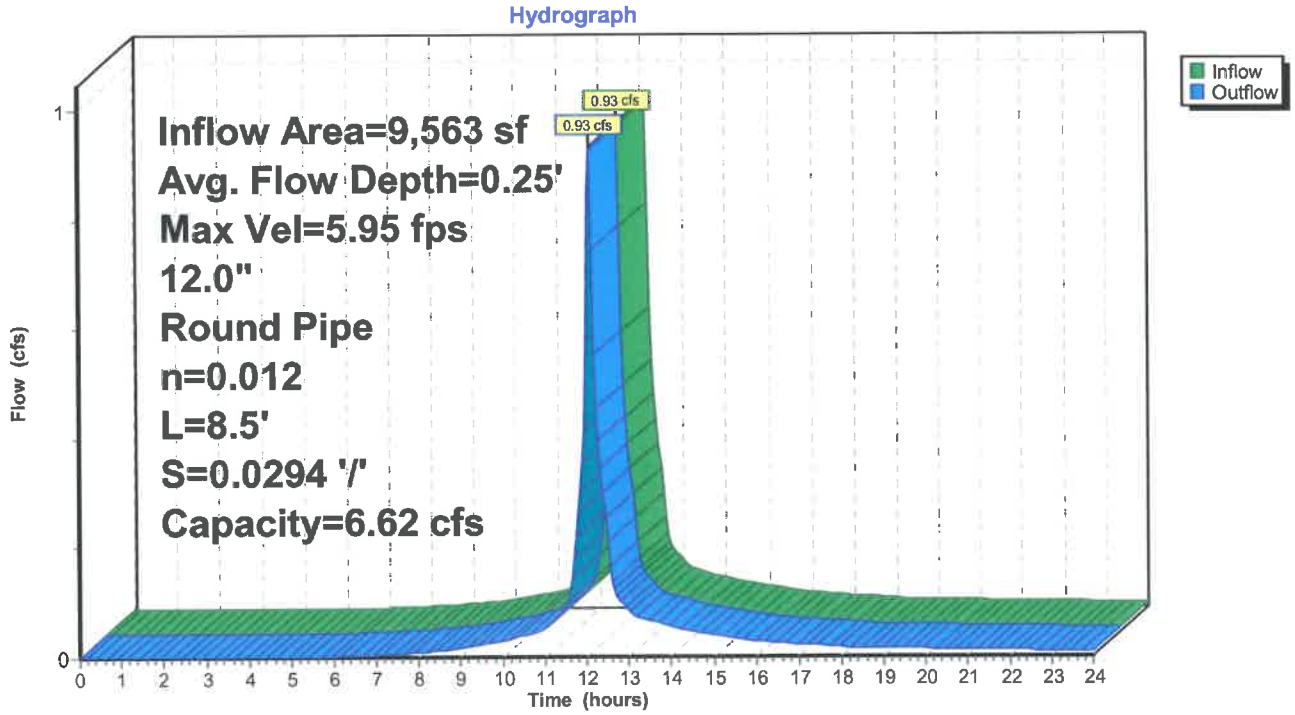
Inflow Area = 9,563 sf, 69.08% Impervious, Inflow Depth > 3.78" for 10 YR event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 3,014 cf
Outflow = 0.93 cfs @ 12.09 hrs, Volume= 3,013 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.95 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.00 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 0.87'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.62 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 8.5' Slope= 0.0294 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'

Reach 6R: CB3 to DMH 2



Summary for Subcatchment 6S: To CB 3

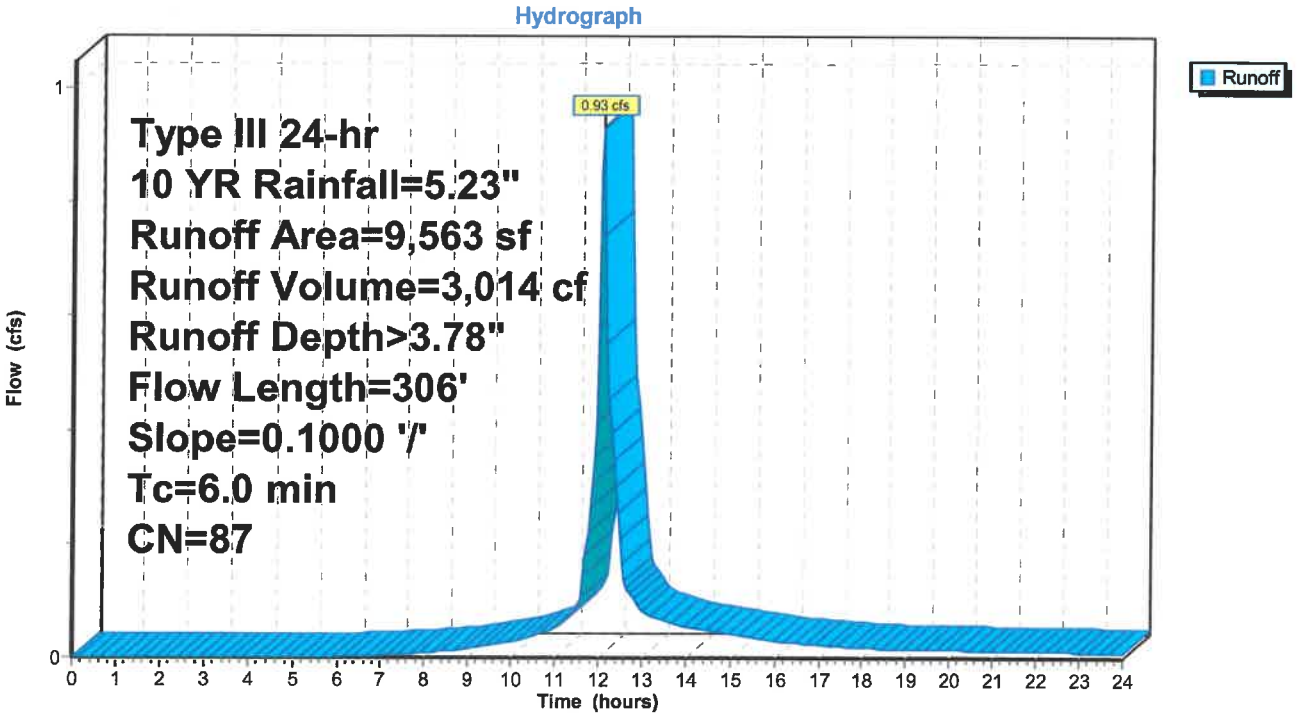
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 3,014 cf, Depth> 3.78"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
2,957	61	>75% Grass cover, Good, HSG B
9,563	87	Weighted Average
2,957		30.92% Pervious Area
6,606		69.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6S: To CB 3



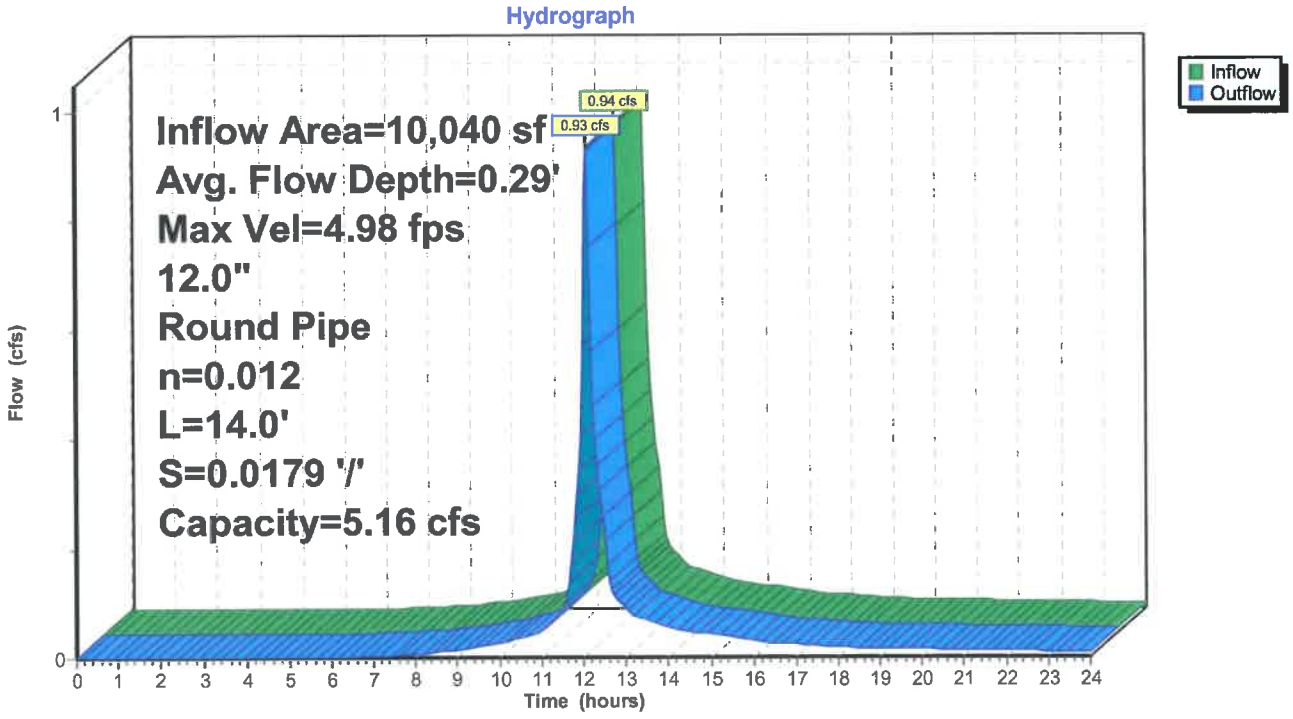
Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 10,040 sf, 65.80% Impervious, Inflow Depth > 3.58" for 10 YR event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 2,994 cf
Outflow = 0.93 cfs @ 12.09 hrs, Volume= 2,994 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.98 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 0.91'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.16 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 14.0' Slope= 0.0179 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 7S: To CB 4

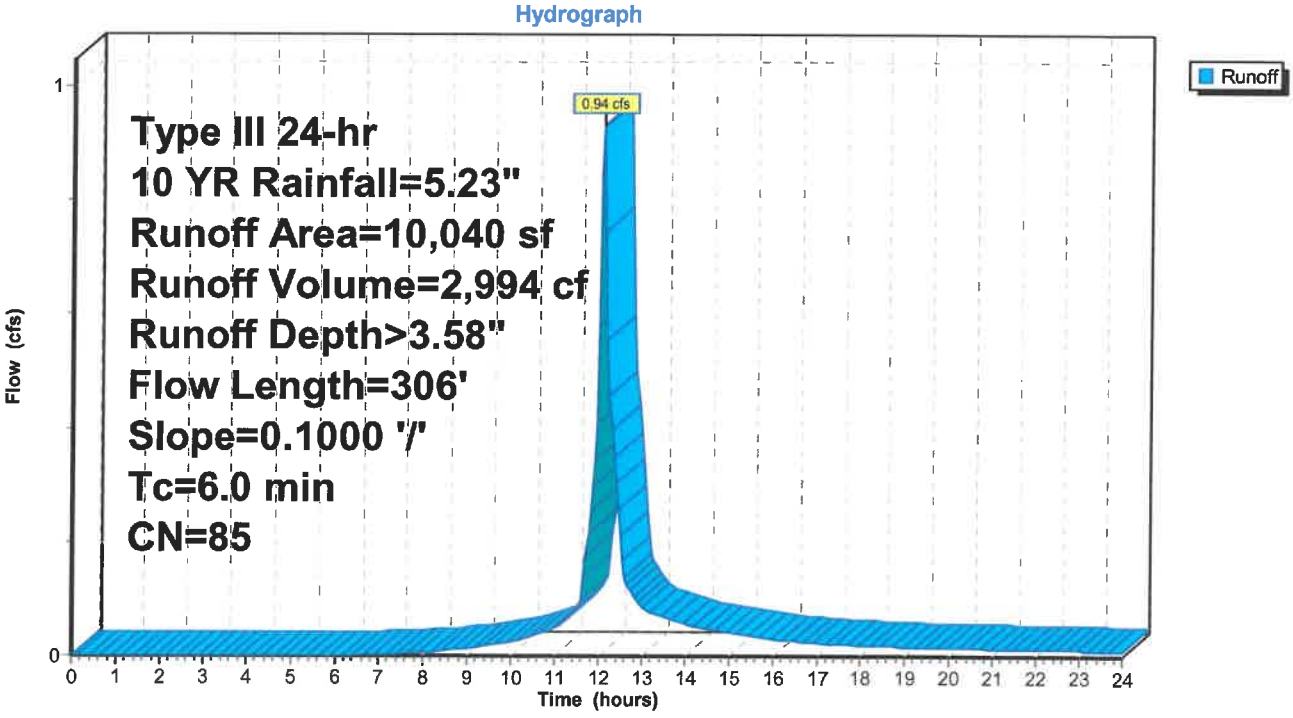
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 2,994 cf, Depth> 3.58"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
3,434	61	>75% Grass cover, Good, HSG B
10,040	85	Weighted Average
3,434		34.20% Pervious Area
6,606		65.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: To CB 4



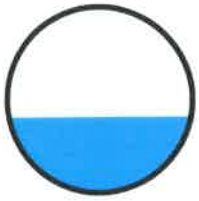
Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 3.85" for 10 YR event
Inflow = 3.57 cfs @ 12.10 hrs, Volume= 11,958 cf
Outflow = 3.40 cfs @ 12.13 hrs, Volume= 11,947 cf, Atten= 5%, Lag= 1.8 min

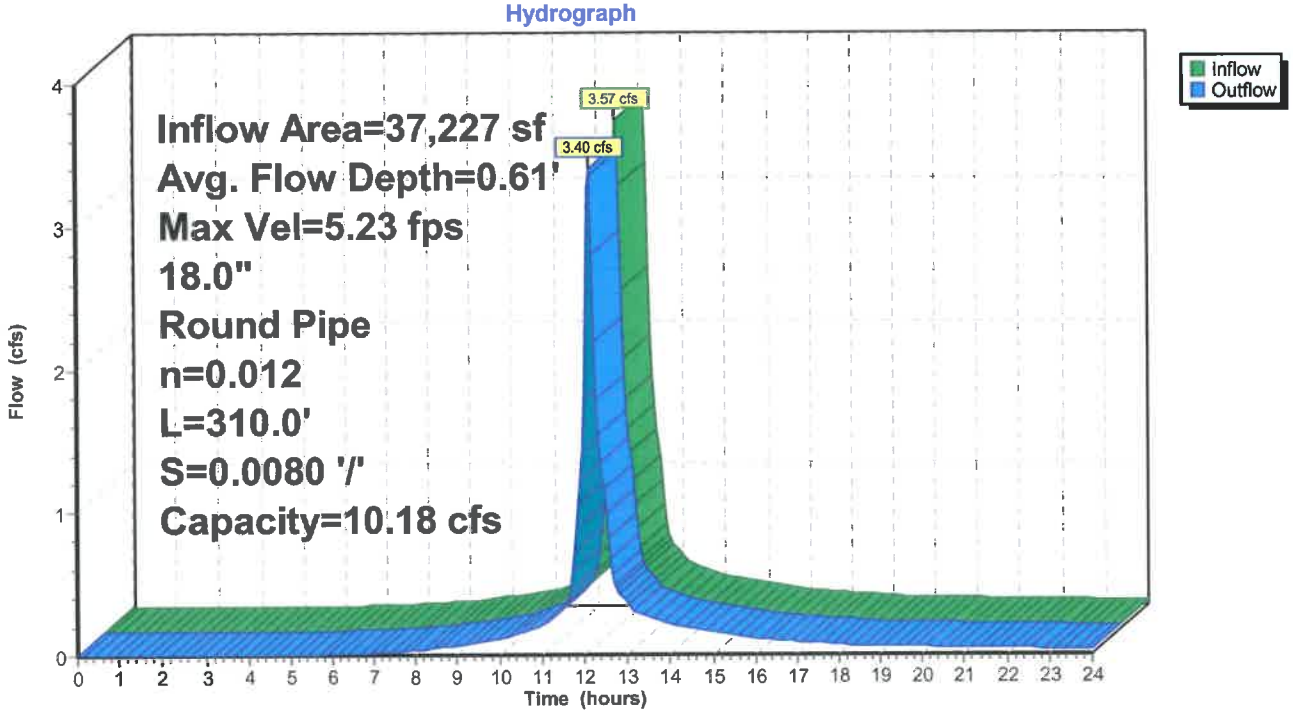
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.23 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 3.0 min

Peak Storage= 209 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 1.47'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 310.0' Slope= 0.0080 '/'
Inlet Invert= 287.40', Outlet Invert= 284.92'



Reach 8R: DMH 2 TO DMH 7



Summary for Subcatchment 8S: To CB 6

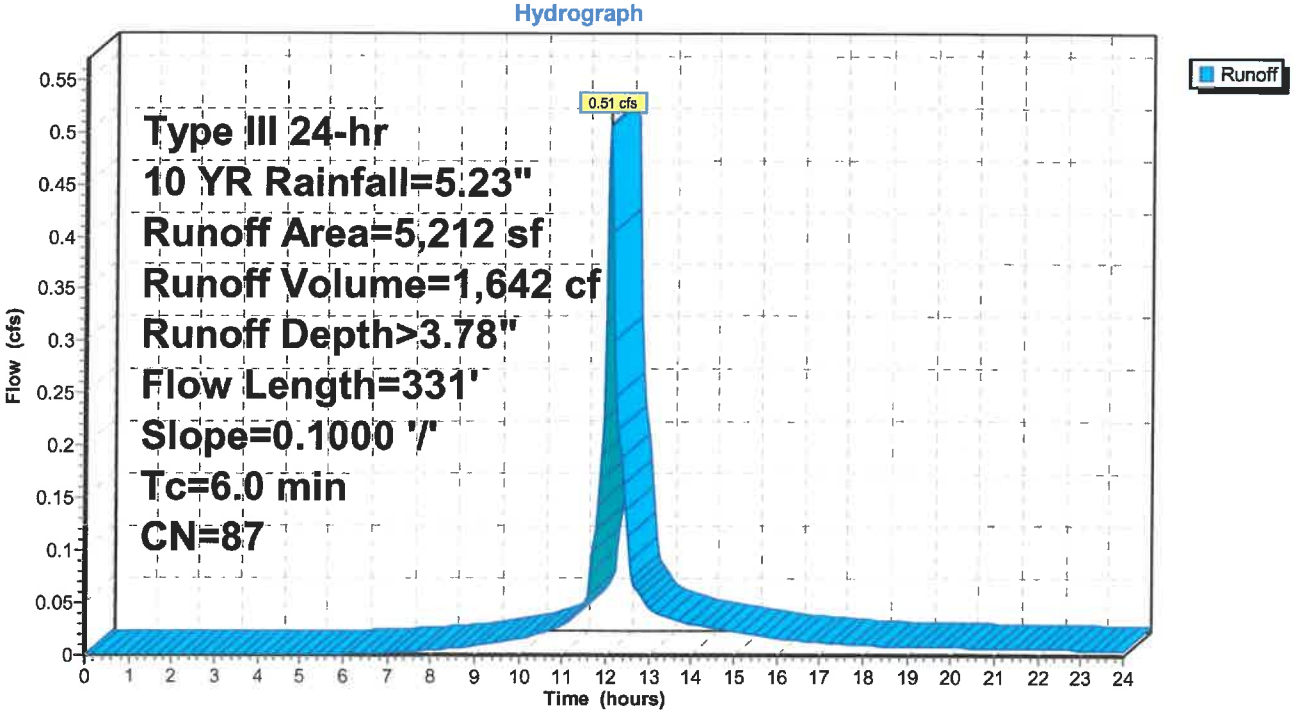
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,642 cf, Depth> 3.78"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
1,579	61	>75% Grass cover, Good, HSG B
5,212	87	Weighted Average
1,579		30.30% Pervious Area
3,633		69.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8S: To CB 6



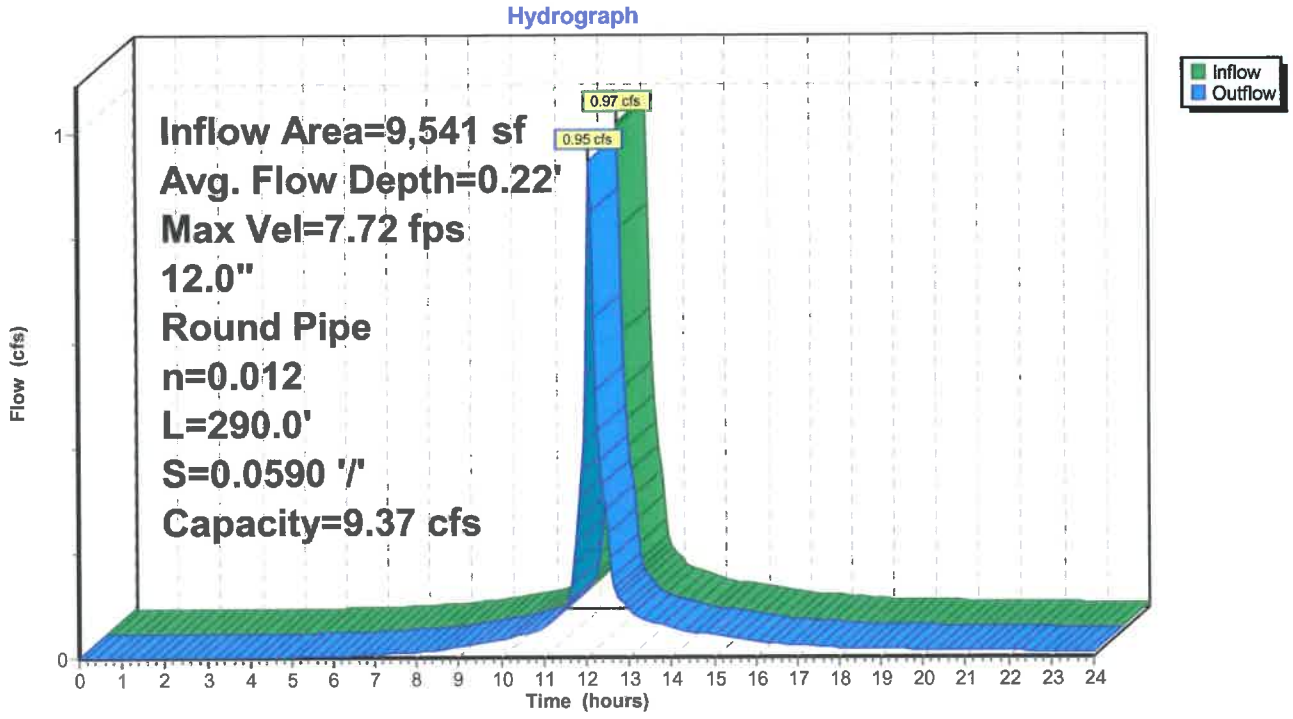
Summary for Reach 9R: DMH 3 to DMH 2

Inflow Area = 9,541 sf, 76.16% Impervious, Inflow Depth > 4.02" for 10 YR event
Inflow = 0.97 cfs @ 12.09 hrs, Volume= 3,198 cf
Outflow = 0.95 cfs @ 12.11 hrs, Volume= 3,196 cf, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.72 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.51 fps, Avg. Travel Time= 1.9 min

Peak Storage= 37 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 0.83'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 290.0' Slope= 0.0590 '/'
Inlet Invert= 305.00', Outlet Invert= 287.90'



Summary for Subcatchment 9S: To CB 5

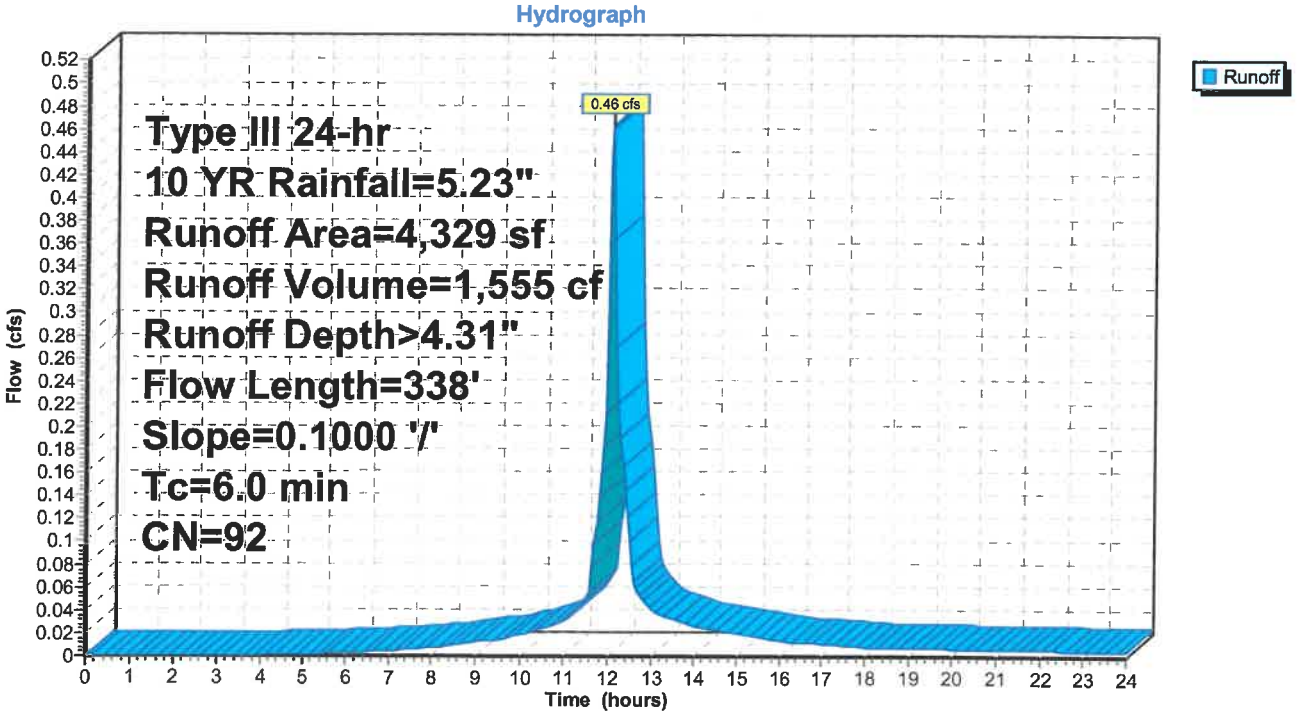
Runoff = 0.46 cfs @ 12.09 hrs, Volume= 1,555 cf, Depth> 4.31"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
696	61	>75% Grass cover, Good, HSG B
4,329	92	Weighted Average
696		16.08% Pervious Area
3,633		83.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: To CB 5



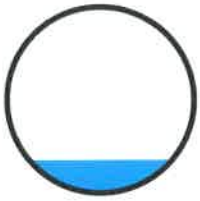
Summary for Reach 10R: CB6 to DMH 3

Inflow Area = 5,212 sf, 69.70% Impervious, Inflow Depth > 3.78" for 10 YR event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 1,642 cf
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 1,642 cf, Atten= 0%, Lag= 0.0 min

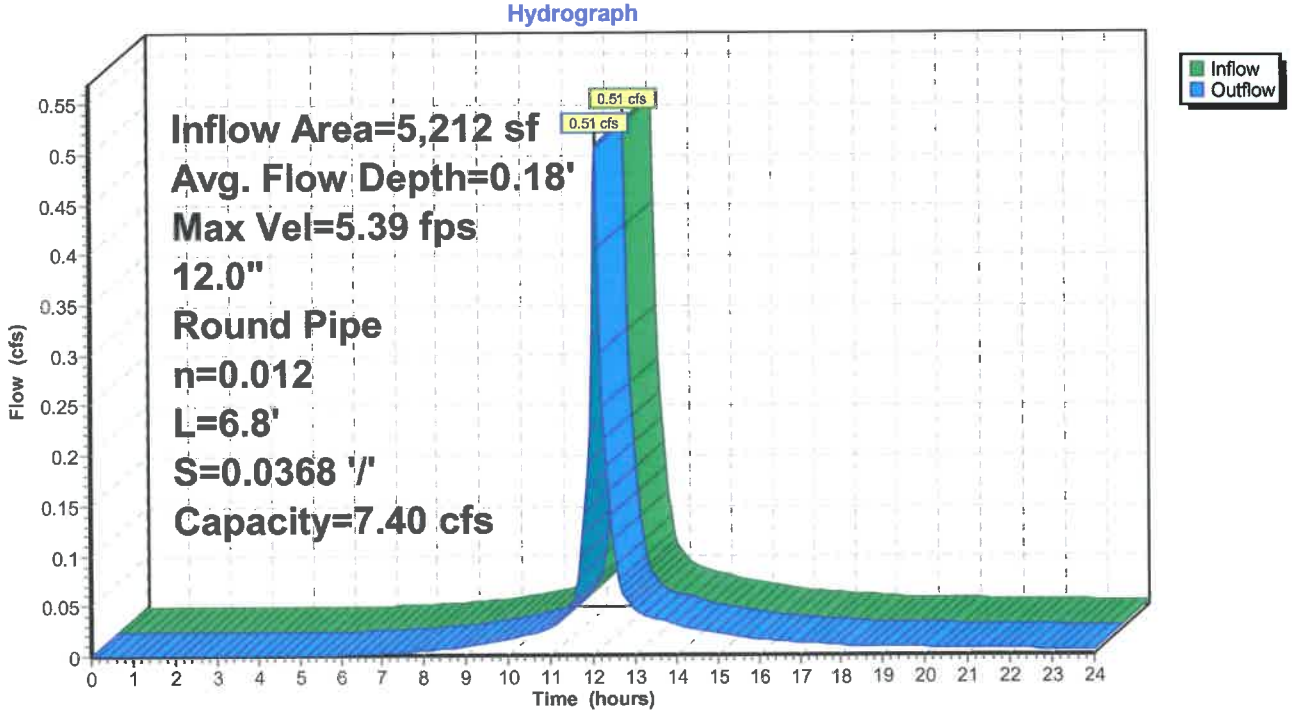
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.39 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 0.76'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.40 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.8' Slope= 0.0368 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Reach 10R: CB6 to DMH 3



Summary for Subcatchment 10S: To CB 7

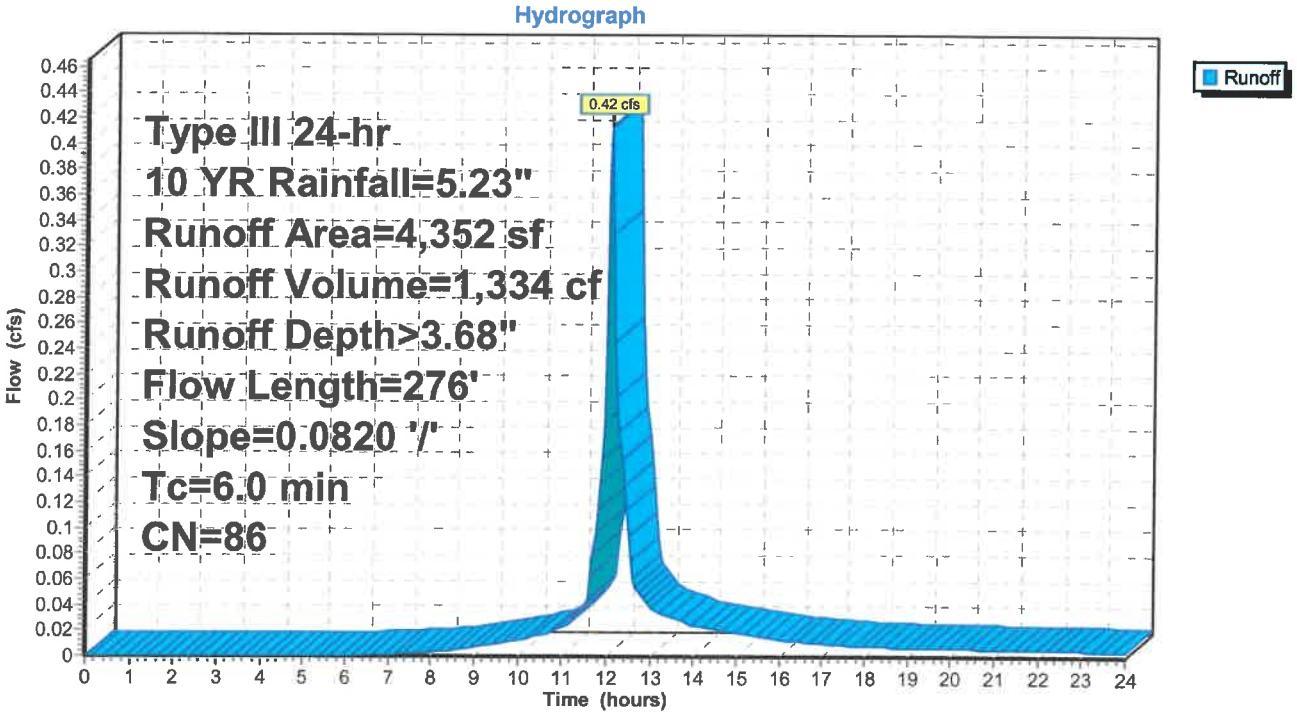
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,334 cf, Depth> 3.68"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: To CB 7



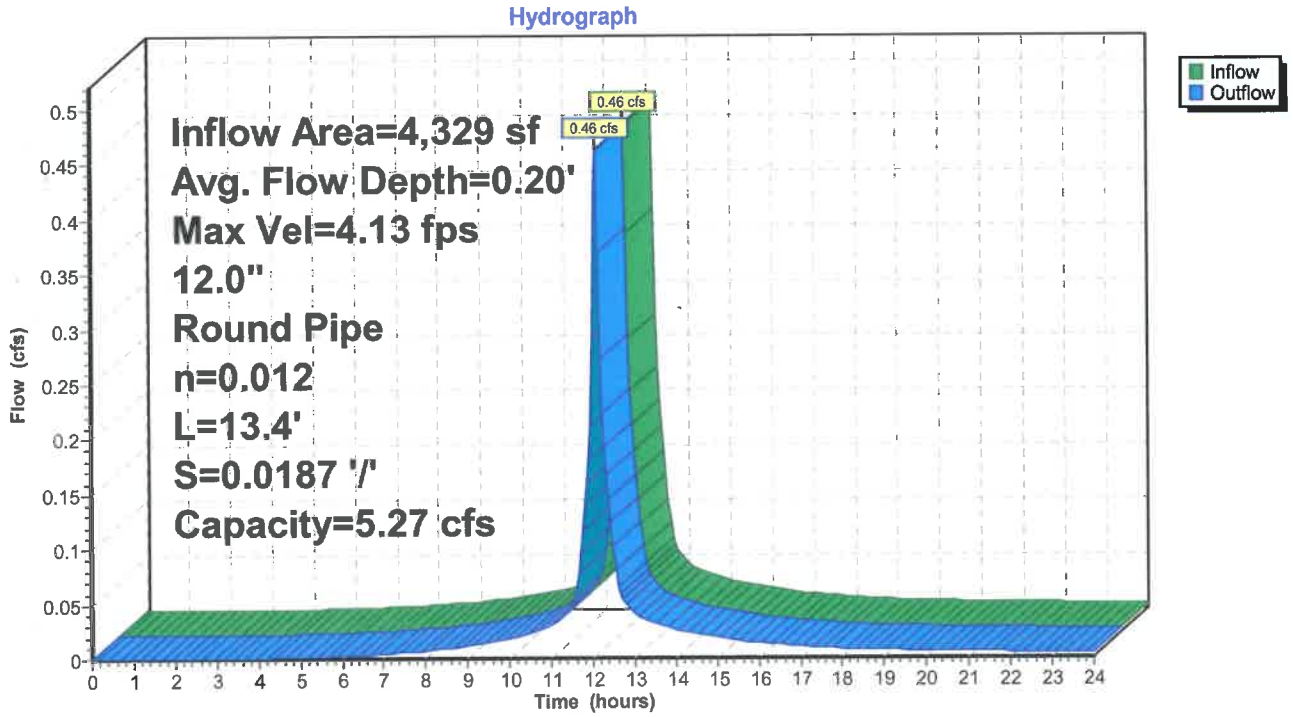
Summary for Reach 11R: CB5 to DMH 3

Inflow Area = 4,329 sf, 83.92% Impervious, Inflow Depth > 4.31" for 10 YR event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,555 cf
Outflow = 0.46 cfs @ 12.09 hrs, Volume= 1,555 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.13 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Summary for Subcatchment 11S: To CB 8

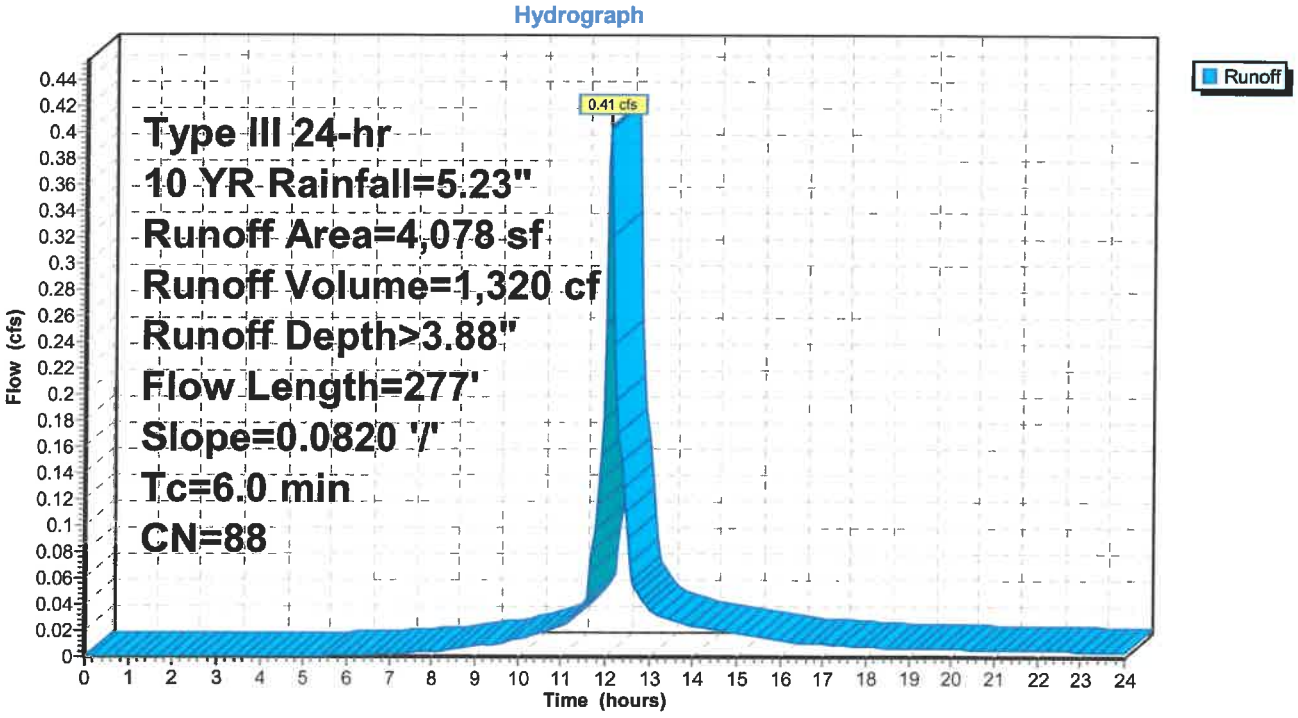
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,320 cf, Depth> 3.88"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 11S: To CB 8



Summary for Reach 12R: DMH 7 TO BASIN

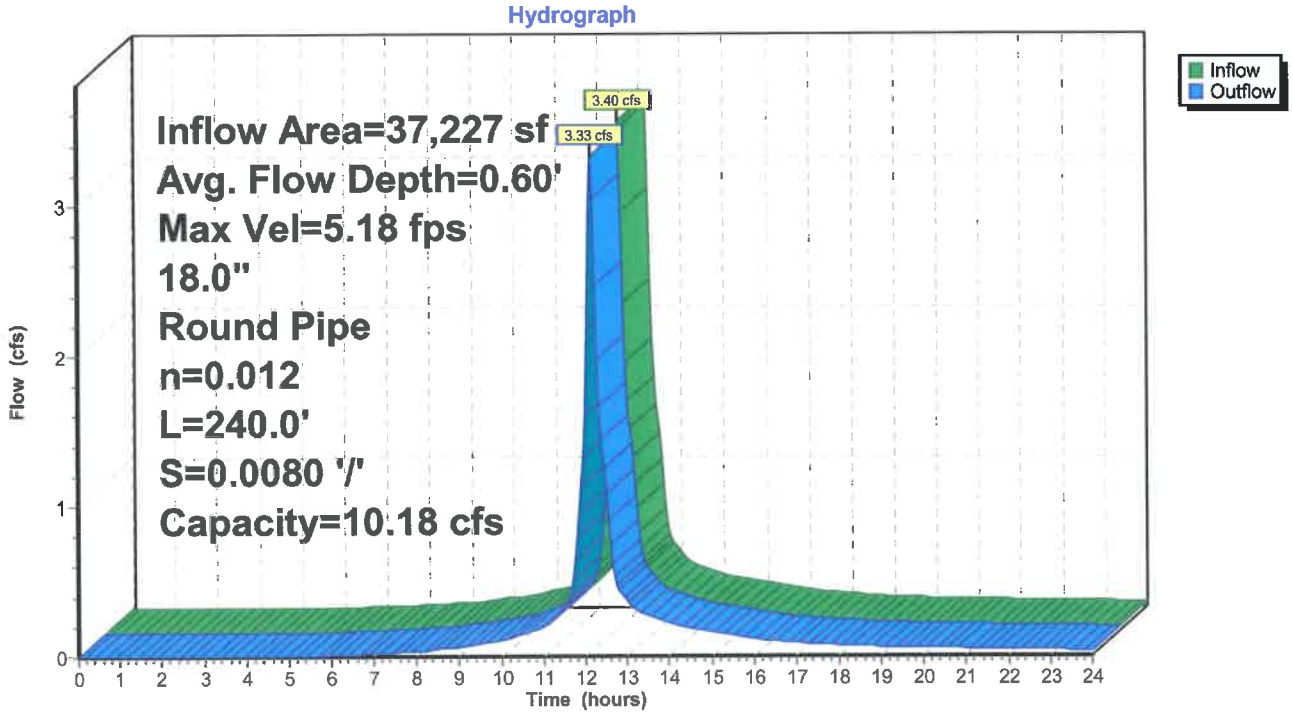
Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 3.85" for 10 YR event
Inflow = 3.40 cfs @ 12.13 hrs, Volume= 11,947 cf
Outflow = 3.33 cfs @ 12.15 hrs, Volume= 11,939 cf, Atten= 2%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.18 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 2.3 min

Peak Storage= 157 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 1.47'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 240.0' Slope= 0.0080 '/'
Inlet Invert= 284.92', Outlet Invert= 283.00'

Reach 12R: DMH 7 TO BASIN



Summary for Subcatchment 12S: To CB 9

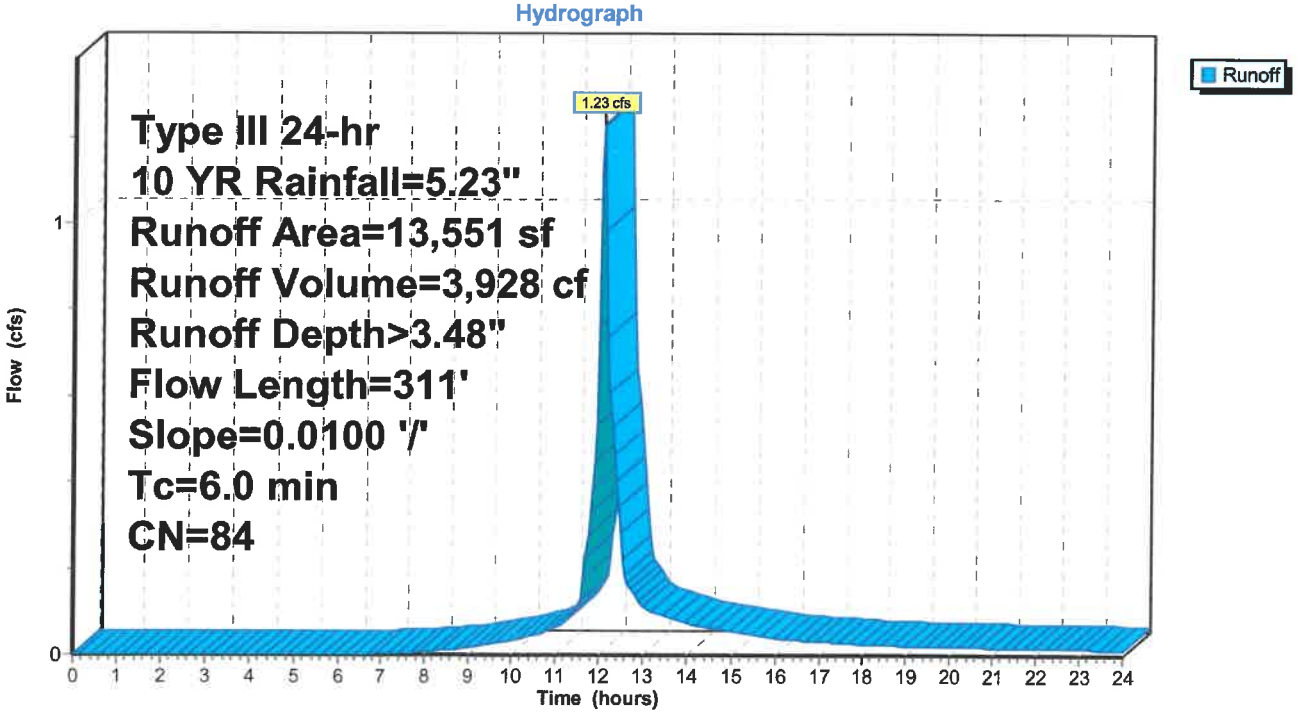
Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,928 cf, Depth> 3.48"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 12S: To CB 9



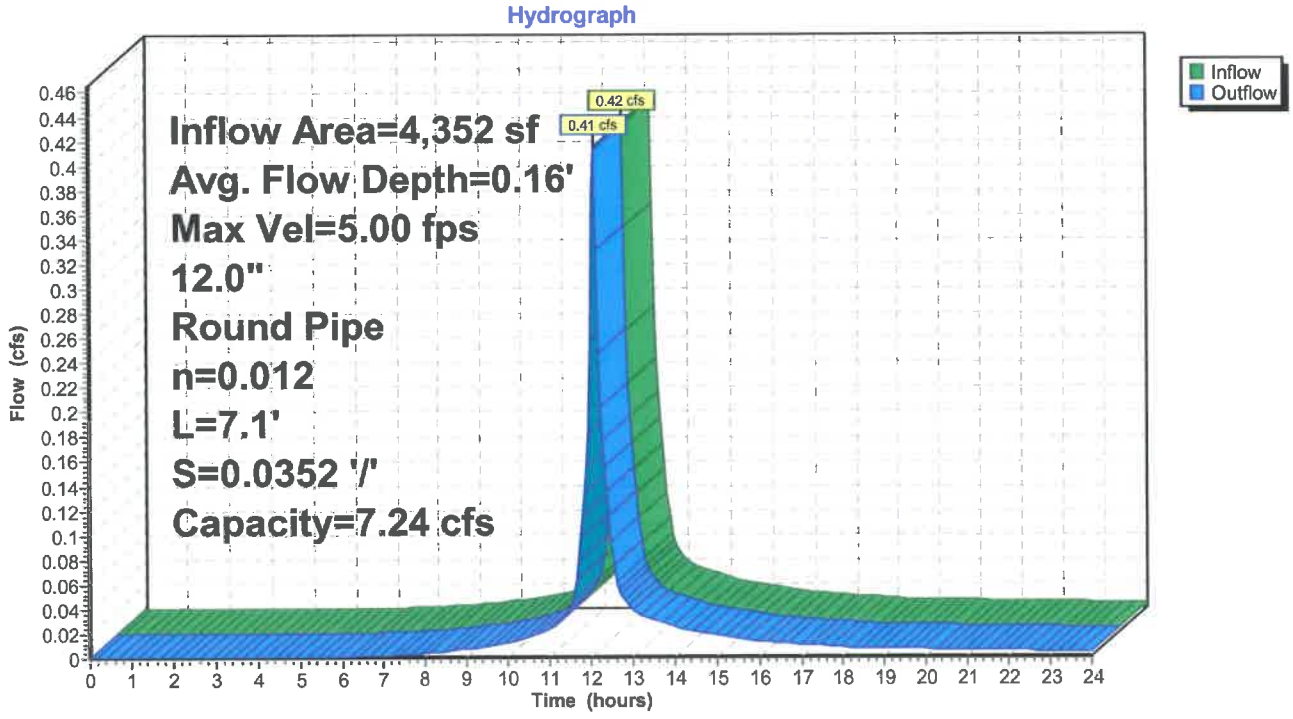
Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 3.68" for 10 YR event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,334 cf
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,334 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.74'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.1' Slope= 0.0352 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 13S: To CB 10

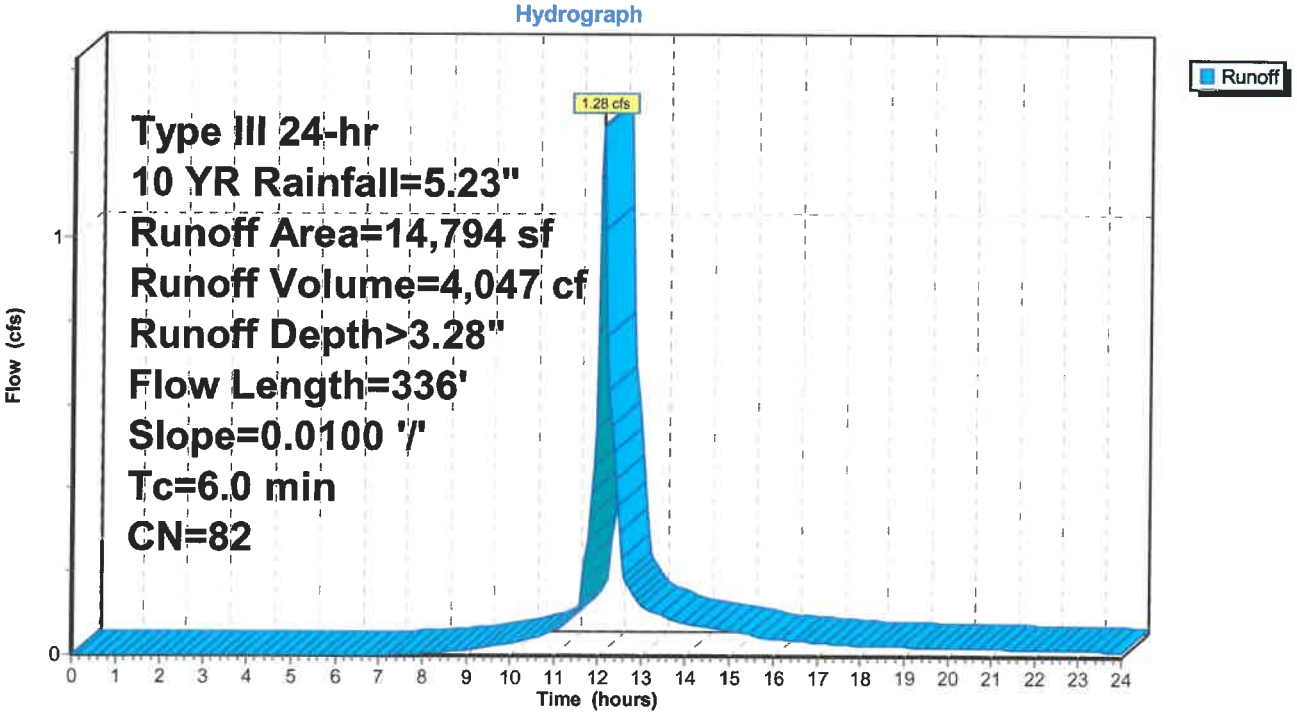
Runoff = 1.28 cfs @ 12.09 hrs, Volume= 4,047 cf, Depth> 3.28"

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 YR Rainfall=5.23"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: To CB 10



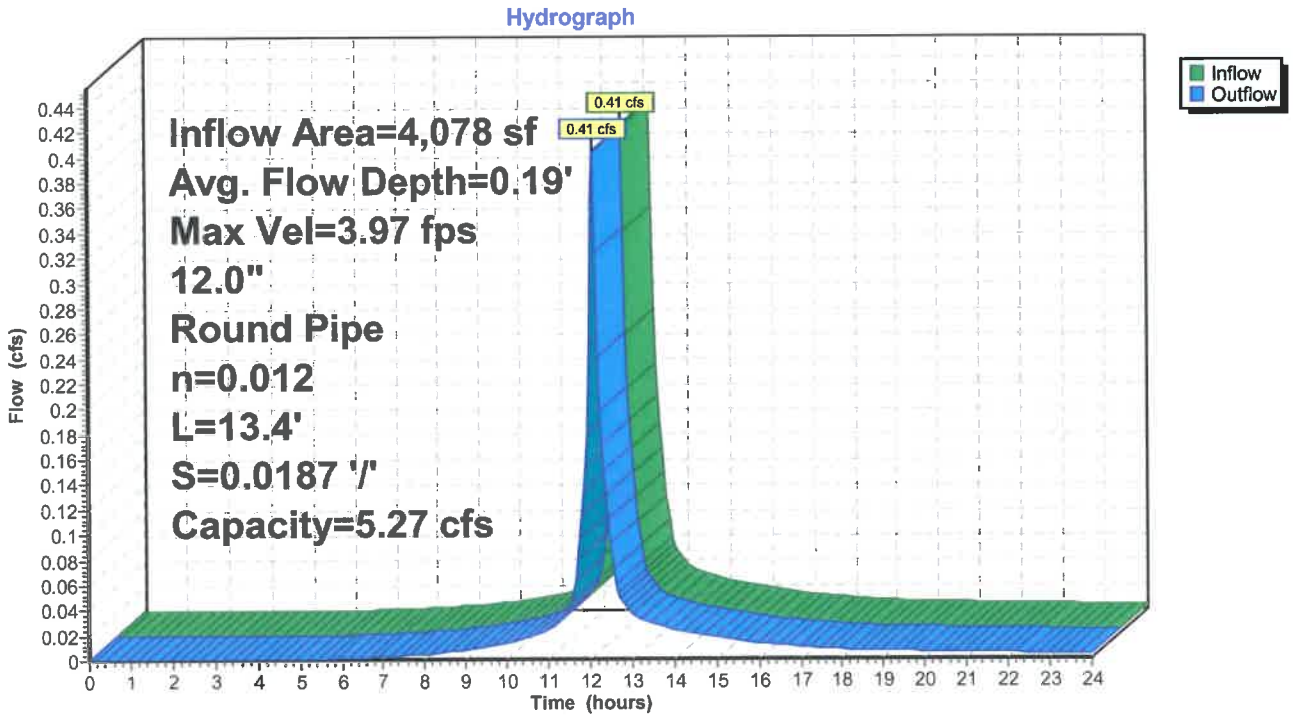
Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 3.88" for 10 YR event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,320 cf
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,320 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.97 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.78'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 14S: To Wetland

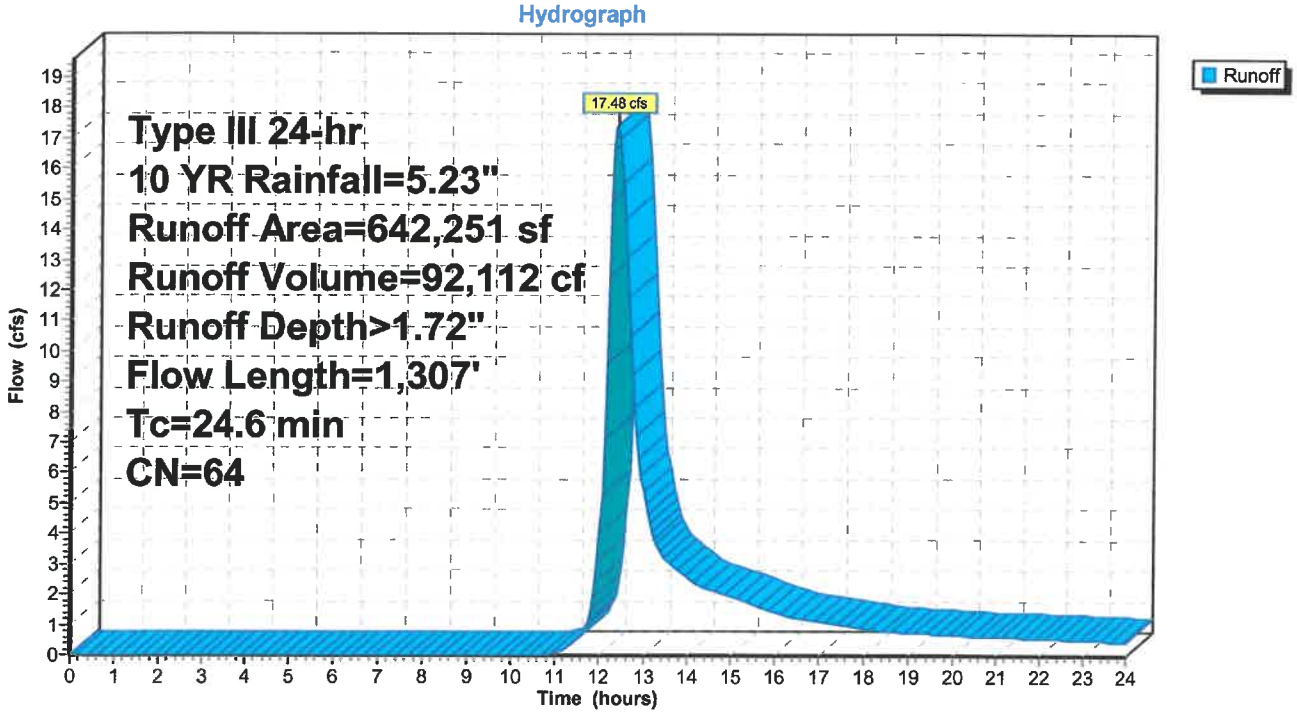
Runoff = 17.48 cfs @ 12.37 hrs, Volume= 92,112 cf, Depth> 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.23"

Area (sf)	CN	Description
358,166	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
642,251	64	Weighted Average
642,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

Subcatchment 14S: To Wetland



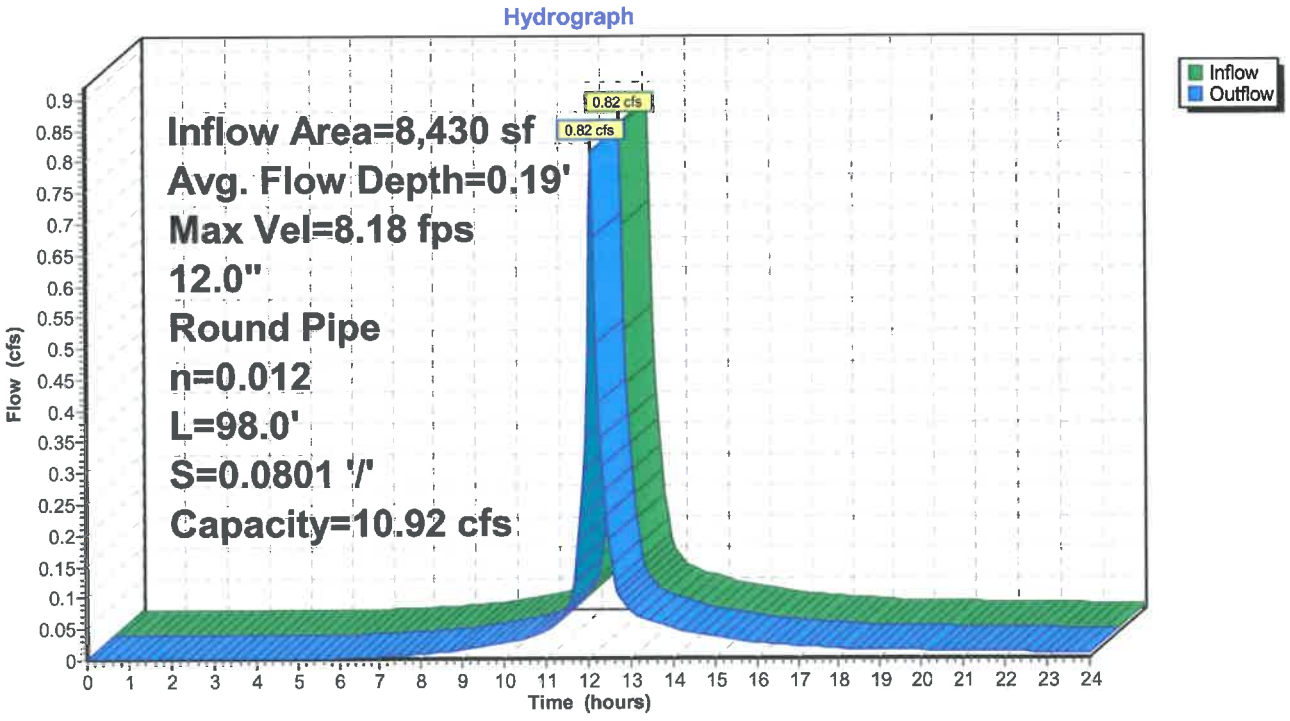
Summary for Reach 15R: DMH 4 TO DMH 5

Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 3.78" for 10 YR event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 2,655 cf
Outflow = 0.82 cfs @ 12.10 hrs, Volume= 2,654 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.18 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.73 fps, Avg. Travel Time= 0.6 min

Peak Storage= 10 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.78'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 98.0' Slope= 0.0801 '/'
Inlet Invert= 316.20', Outlet Invert= 308.35'



Summary for Subcatchment 15S: TO BASIN

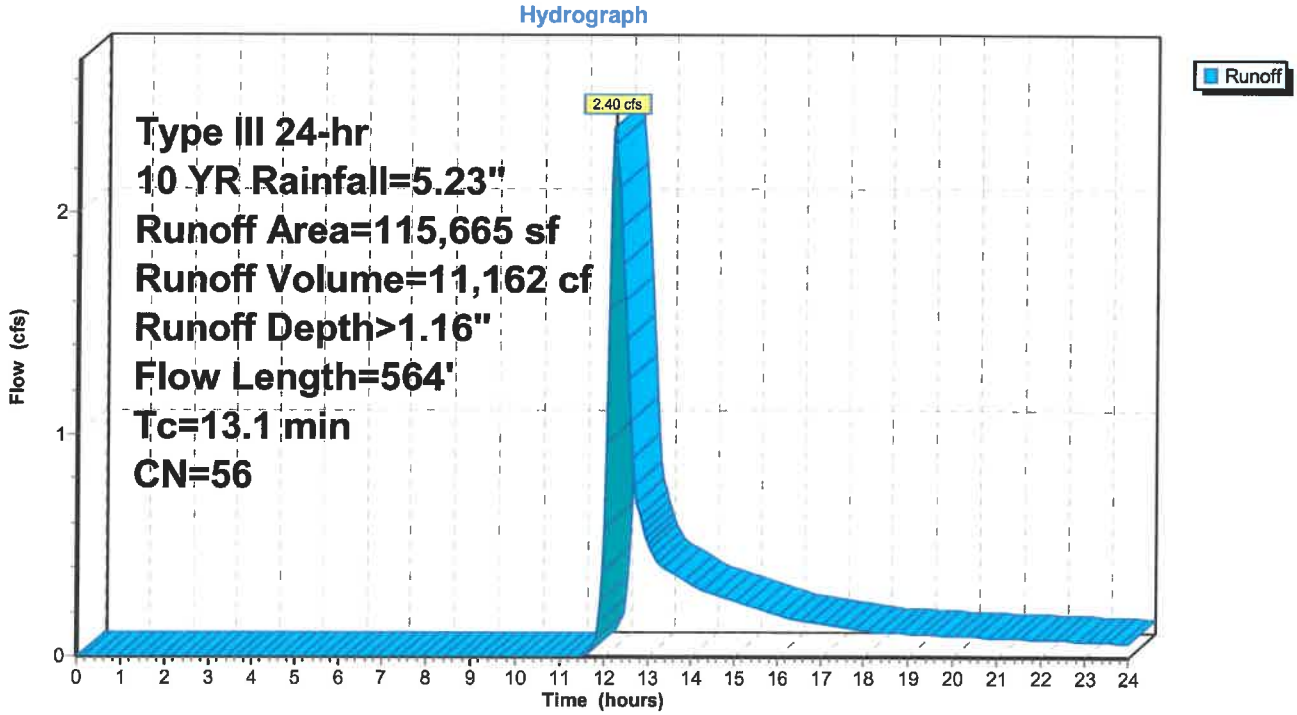
Runoff = 2.40 cfs @ 12.21 hrs, Volume= 11,162 cf, Depth> 1.16"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
94,222	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
115,665	56	Weighted Average
115,665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

Subcatchment 15S: TO BASIN



Summary for Reach 16R: DMH 5 TO DMH 6

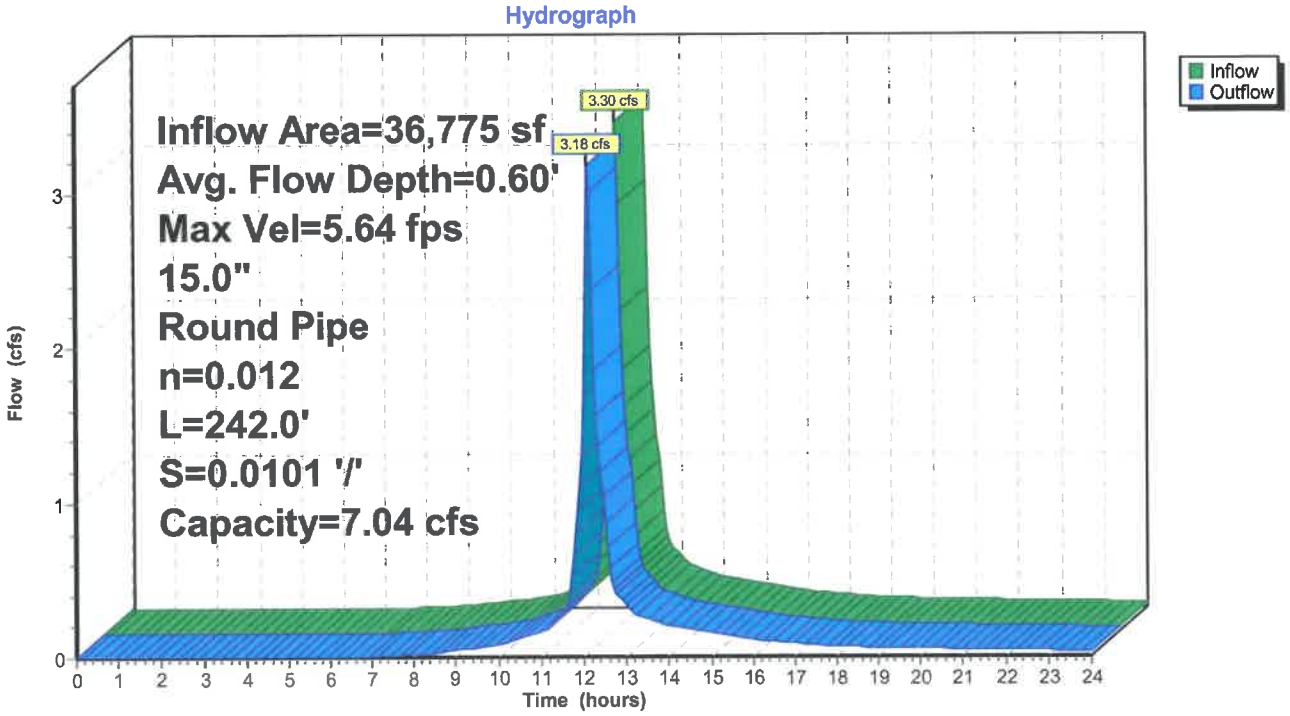
Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 3.47" for 10 YR event
Inflow = 3.30 cfs @ 12.10 hrs, Volume= 10,628 cf
Outflow = 3.18 cfs @ 12.12 hrs, Volume= 10,620 cf, Atten= 4%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.64 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.90 fps, Avg. Travel Time= 2.1 min

Peak Storage= 141 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 1.25'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 242.0' Slope= 0.0101 '/'
Inlet Invert= 308.10', Outlet Invert= 305.65'

Reach 16R: DMH 5 TO DMH 6



Summary for Subcatchment 16S: TO BASIN

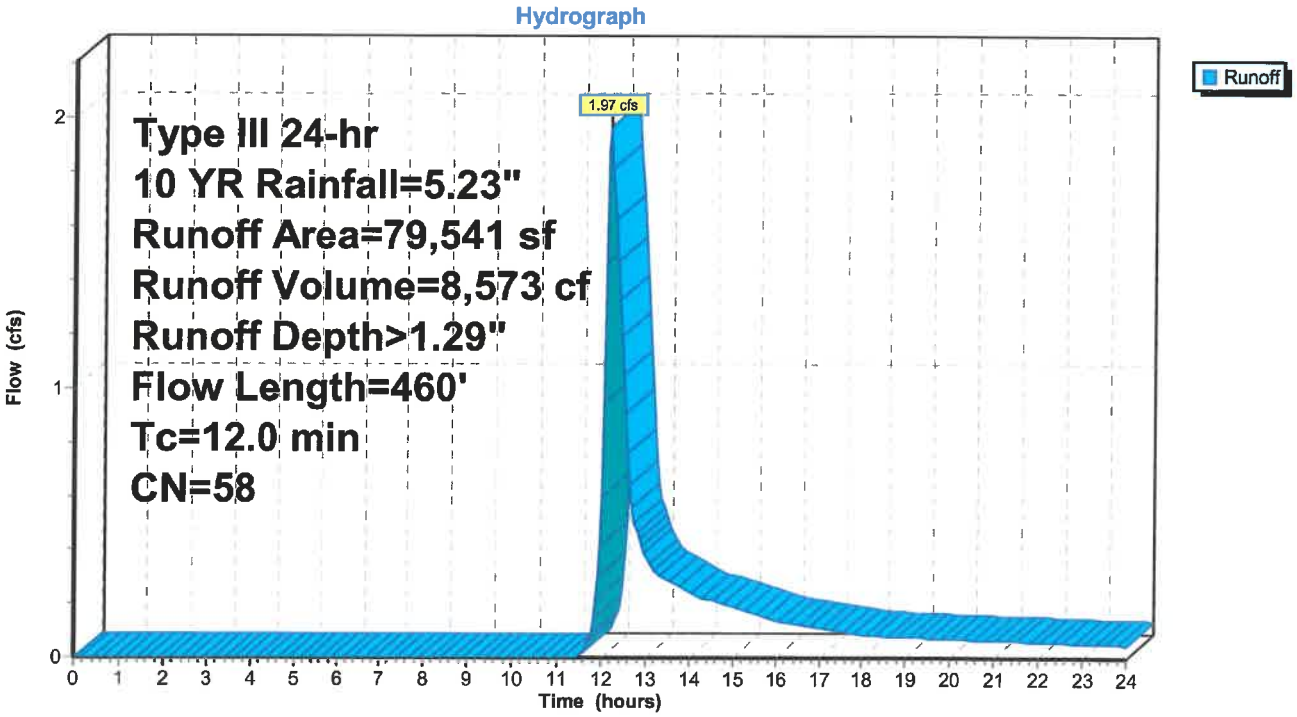
Runoff = 1.97 cfs @ 12.19 hrs, Volume= 8,573 cf, Depth> 1.29"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

Subcatchment 16S: TO BASIN



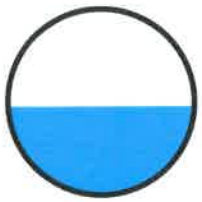
Summary for Reach 17R: DMH 6 TO DMH 5

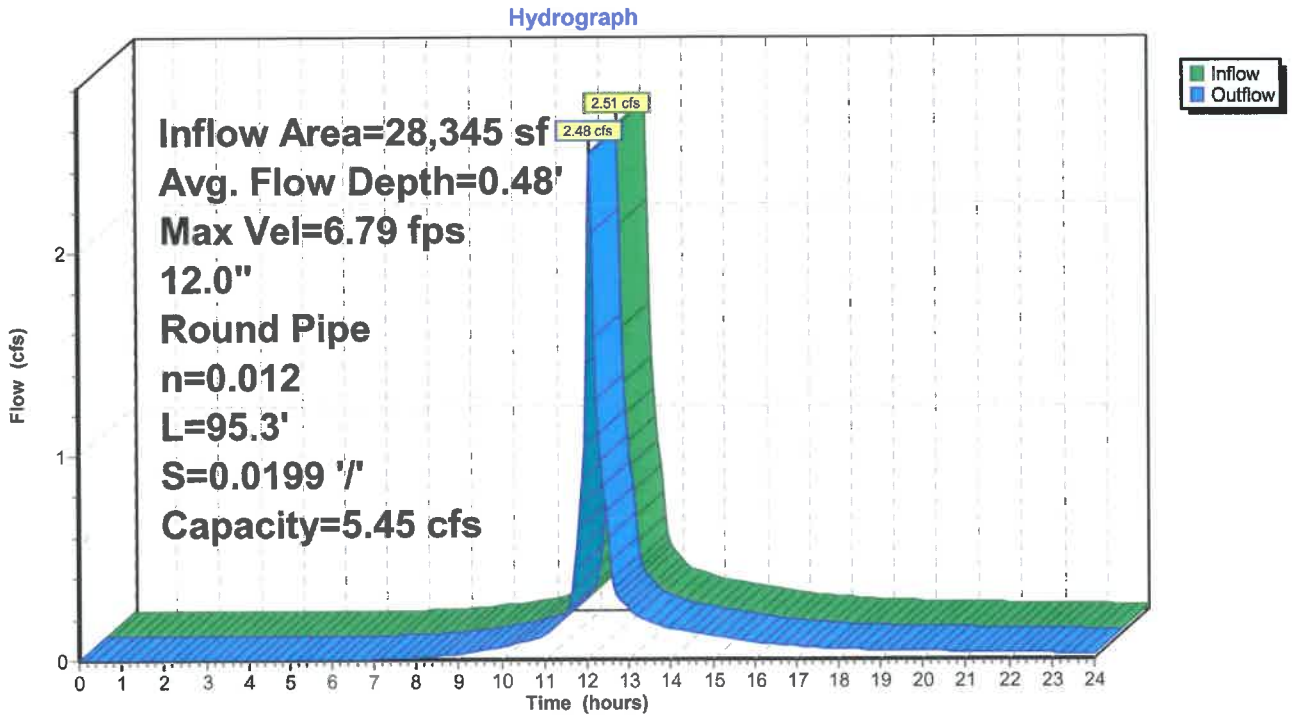
Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 3.38" for 10 YR event
Inflow = 2.51 cfs @ 12.09 hrs, Volume= 7,975 cf
Outflow = 2.48 cfs @ 12.10 hrs, Volume= 7,974 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.79 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.7 min

Peak Storage= 35 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 95.3' Slope= 0.0199 '/'
Inlet Invert= 310.25', Outlet Invert= 308.35'





Summary for Subcatchment 17S: To Off Site

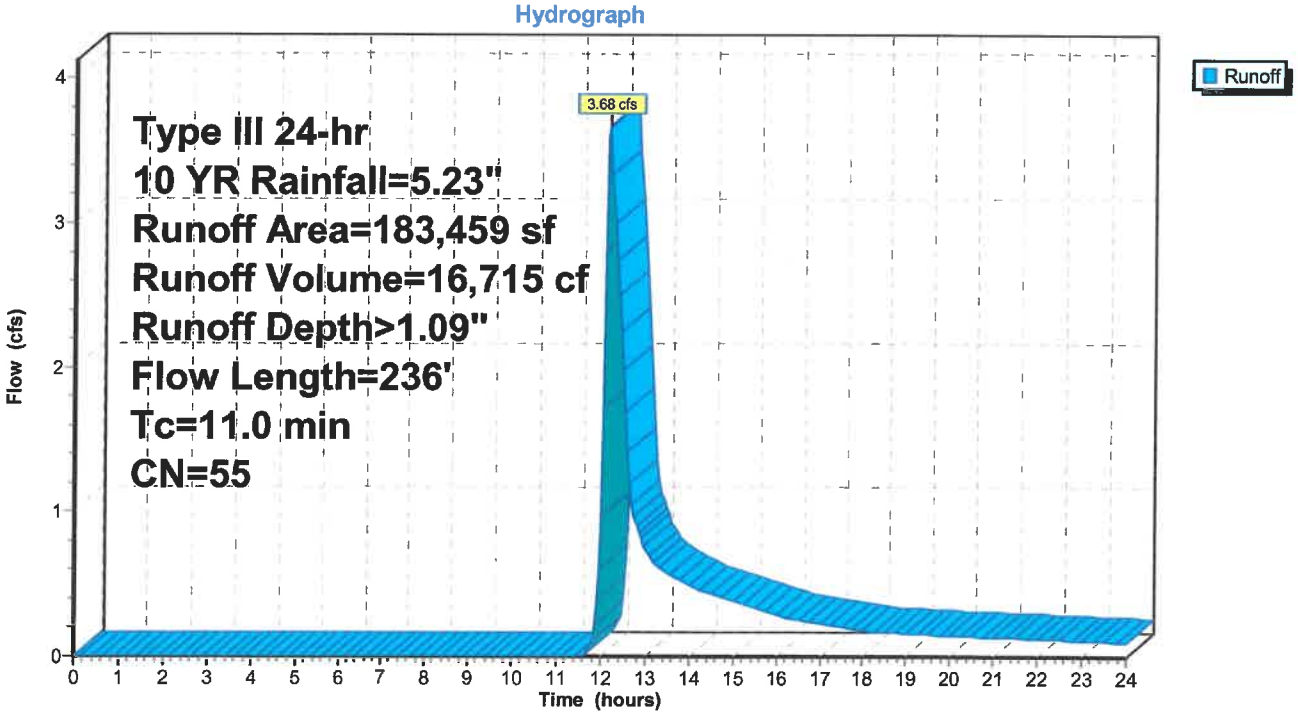
Runoff = 3.68 cfs @ 12.18 hrs, Volume= 16,715 cf, Depth> 1.09"

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 YR Rainfall=5.23"

Area (sf)	CN	Description
183,459	55	Woods, Good, HSG B
183,459		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	236	Total			

Subcatchment 17S: To Off Site



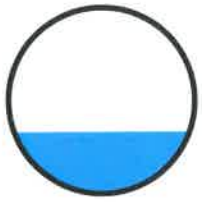
Summary for Reach 18R: CB 10 TO DMH 6

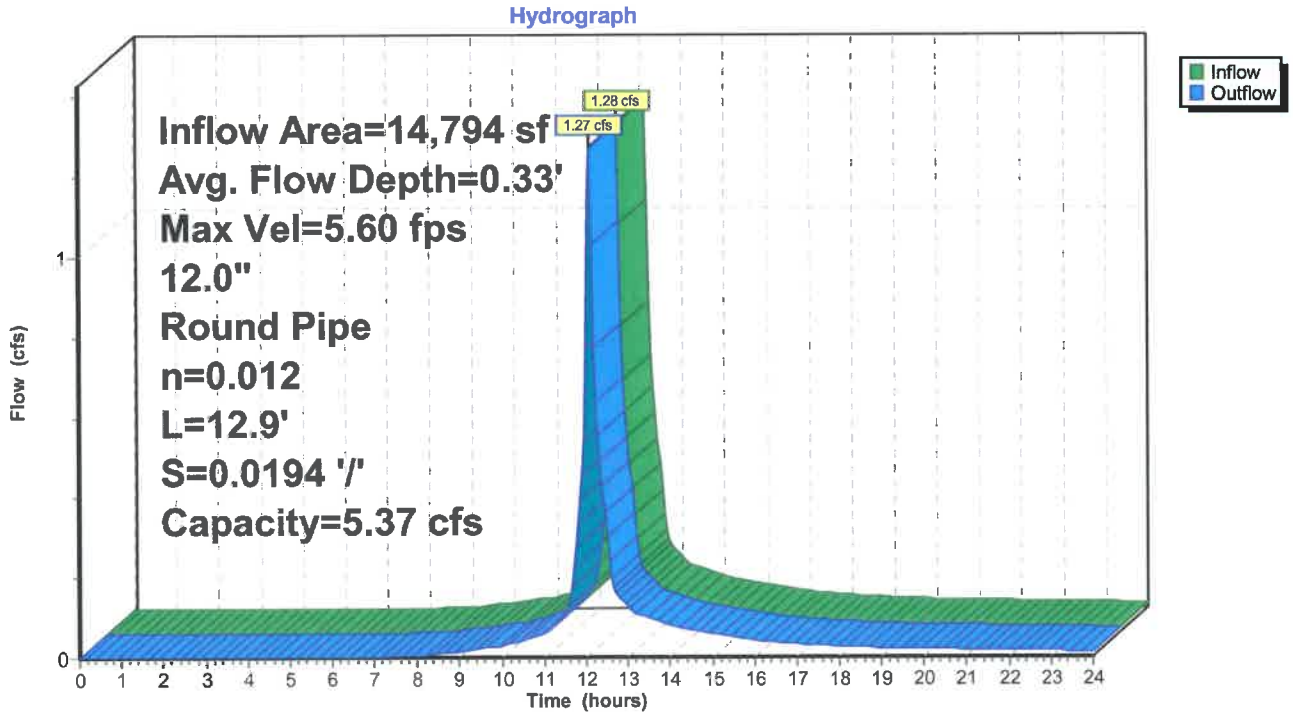
Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 3.28" for 10 YR event
Inflow = 1.28 cfs @ 12.09 hrs, Volume= 4,047 cf
Outflow = 1.27 cfs @ 12.09 hrs, Volume= 4,047 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.60 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 12.9' Slope= 0.0194 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'





Summary for Reach 19R: CB 9 TO DMH 6

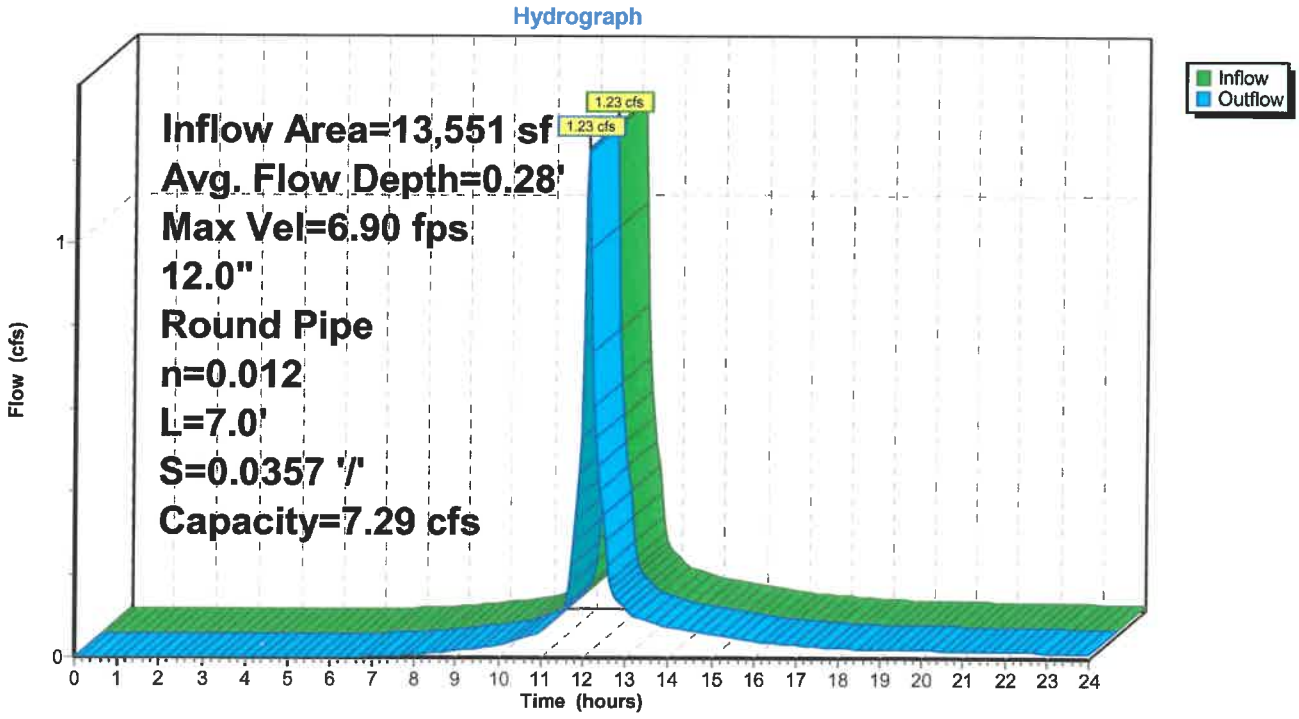
Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 3.48" for 10 YR event
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 3,928 cf
Outflow = 1.23 cfs @ 12.09 hrs, Volume= 3,928 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.90 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.0' Slope= 0.0357 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'

Reach 19R: CB 9 TO DMH 6



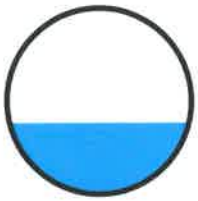
Summary for Reach 20R: DMH 6 to Basin

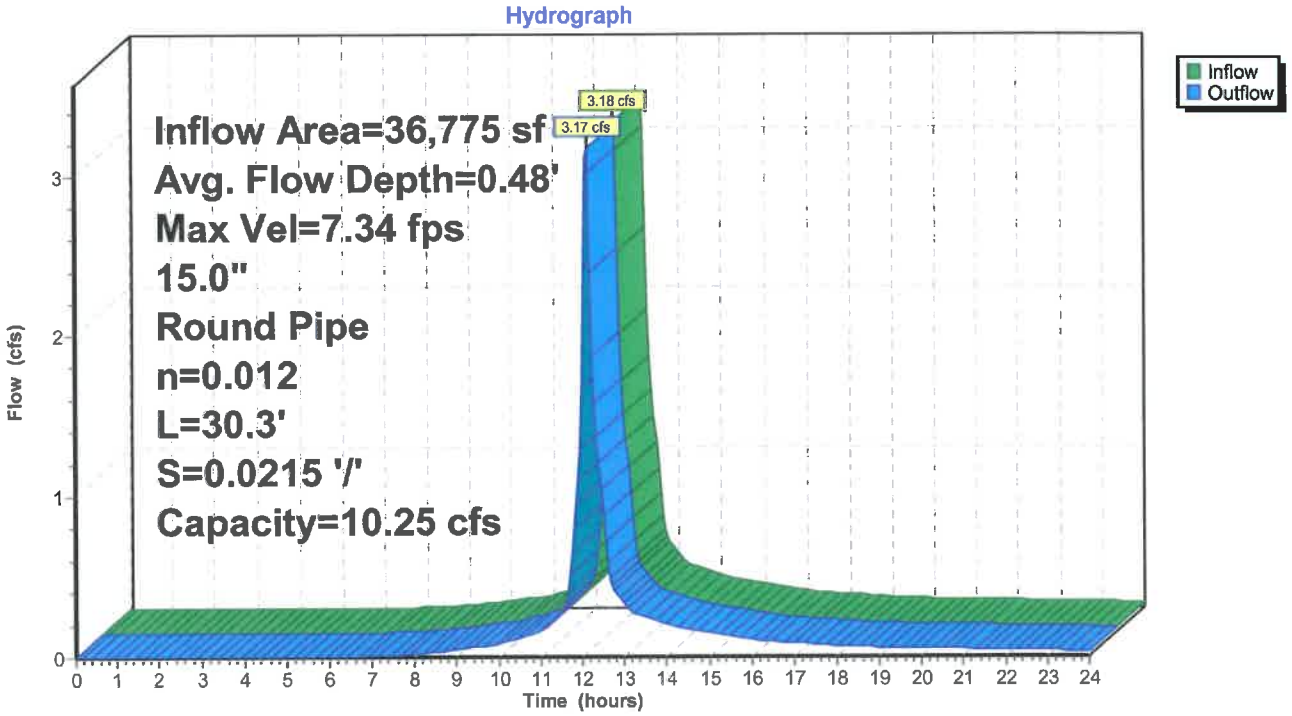
Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 3.47" for 10 YR event
Inflow = 3.18 cfs @ 12.12 hrs, Volume= 10,620 cf
Outflow = 3.17 cfs @ 12.12 hrs, Volume= 10,620 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.34 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.48 fps, Avg. Travel Time= 0.2 min

Peak Storage= 13 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 1.22'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.3' Slope= 0.0215 '/'
Inlet Invert= 305.65', Outlet Invert= 305.00'





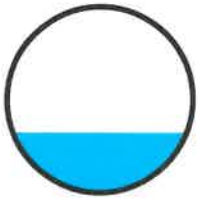
Summary for Reach 21R: 24" ADS

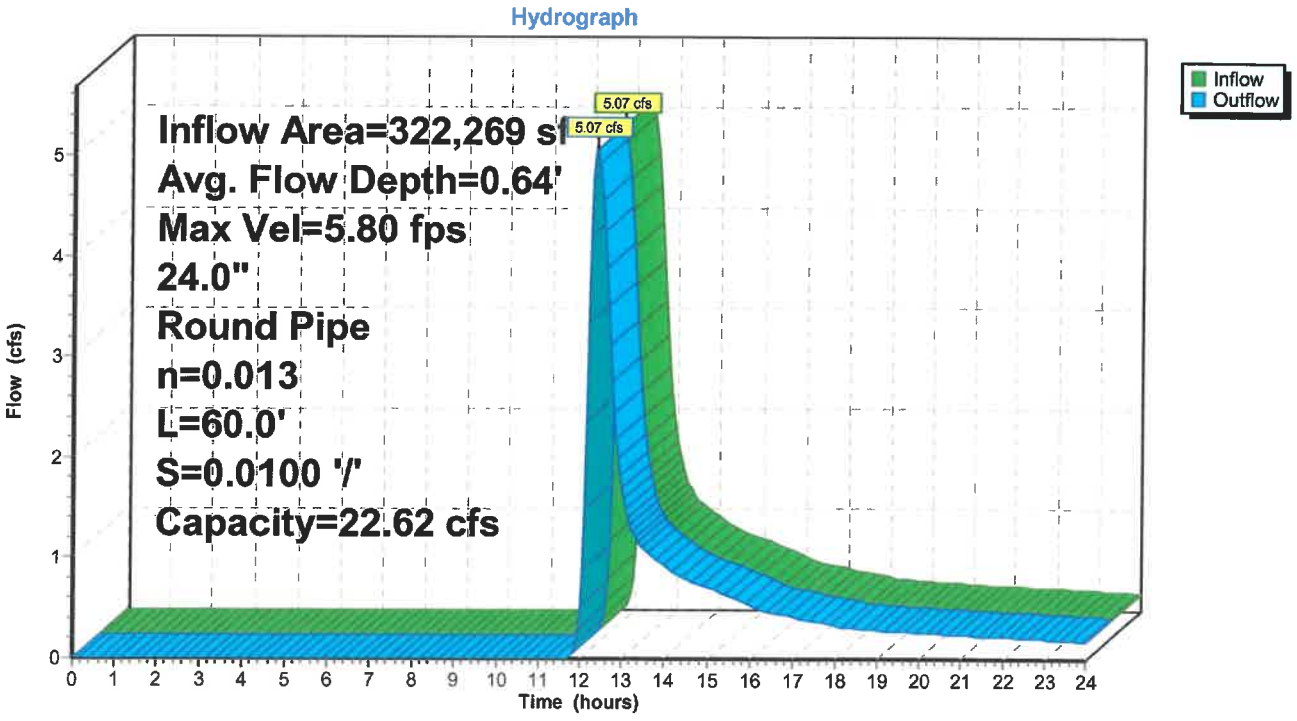
Inflow Area = 322,269 sf, 0.00% Impervious, Inflow Depth > 1.09" for 10 YR event
Inflow = 5.07 cfs @ 12.37 hrs, Volume= 29,254 cf
Outflow = 5.07 cfs @ 12.37 hrs, Volume= 29,247 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.80 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.87 fps, Avg. Travel Time= 0.3 min

Peak Storage= 52 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.64' , Surface Width= 1.87'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 22.62 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 310.00', Outlet Invert= 309.40'



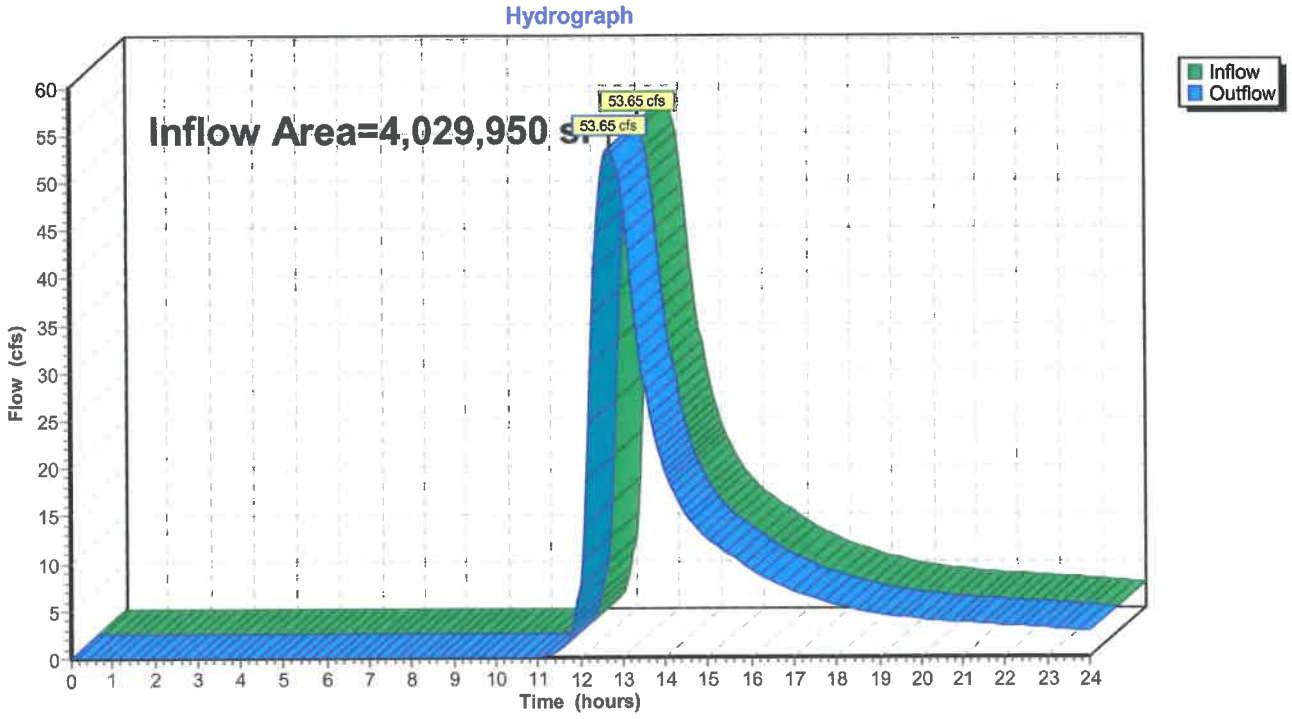


Summary for Reach EV1: To Wetland

Inflow Area = 4,029,950 sf, 4.03% Impervious, Inflow Depth > 1.47" for 10 YR event
Inflow = 53.65 cfs @ 12.71 hrs, Volume= 492,224 cf
Outflow = 53.65 cfs @ 12.71 hrs, Volume= 492,224 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV1: To Wetland

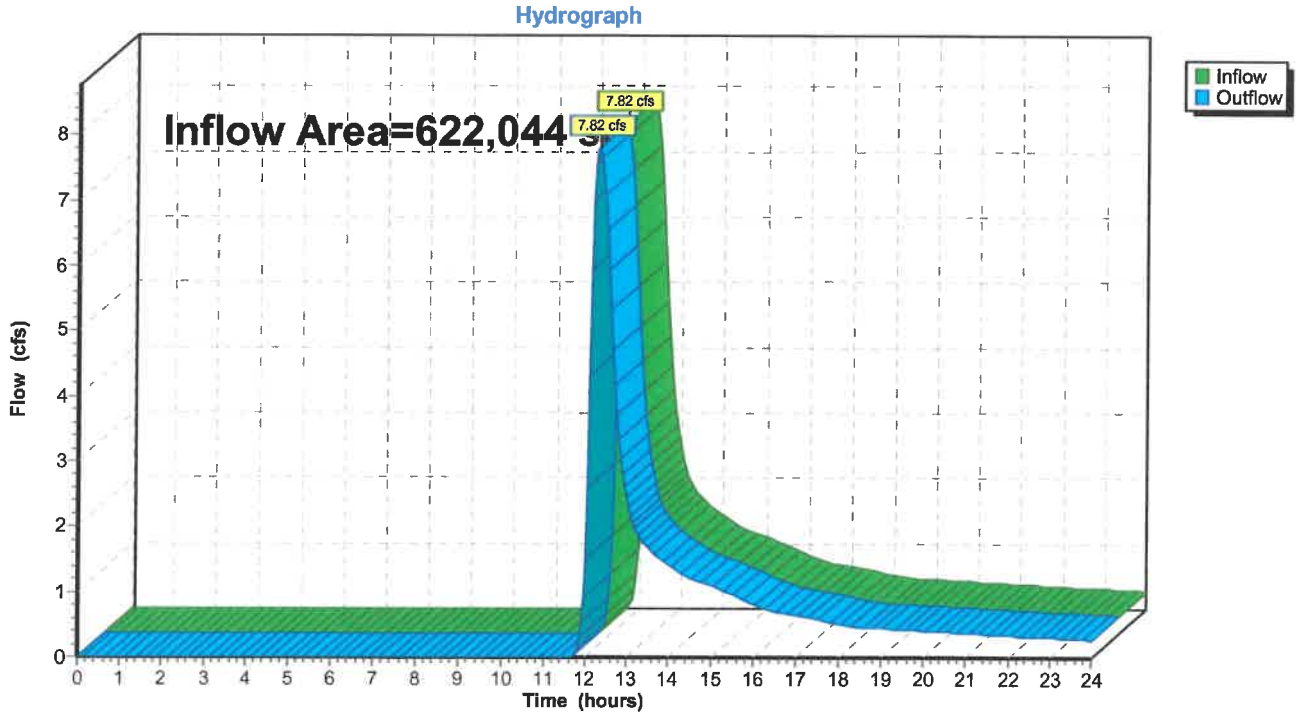


Summary for Reach EV2: To Offsite

Inflow Area = 622,044 sf, 3.64% Impervious, Inflow Depth > 0.89" for 10 YR event
Inflow = 7.82 cfs @ 12.32 hrs, Volume= 45,962 cf
Outflow = 7.82 cfs @ 12.32 hrs, Volume= 45,962 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV2: To Offsite



Summary for Pond 1P: Forebay

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 4.95" for 25 YR event
Inflow = 4.25 cfs @ 12.15 hrs, Volume= 15,348 cf
Outflow = 4.21 cfs @ 12.16 hrs, Volume= 13,213 cf, Atten= 1%, Lag= 0.4 min
Primary = 4.21 cfs @ 12.16 hrs, Volume= 13,213 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 282.58' @ 12.16 hrs Surf.Area= 1,672 sf Storage= 2,283 cf

Plug-Flow detention time= 95.2 min calculated for 13,213 cf (86% of inflow)
Center-of-Mass det. time= 35.4 min (829.4 - 794.0)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

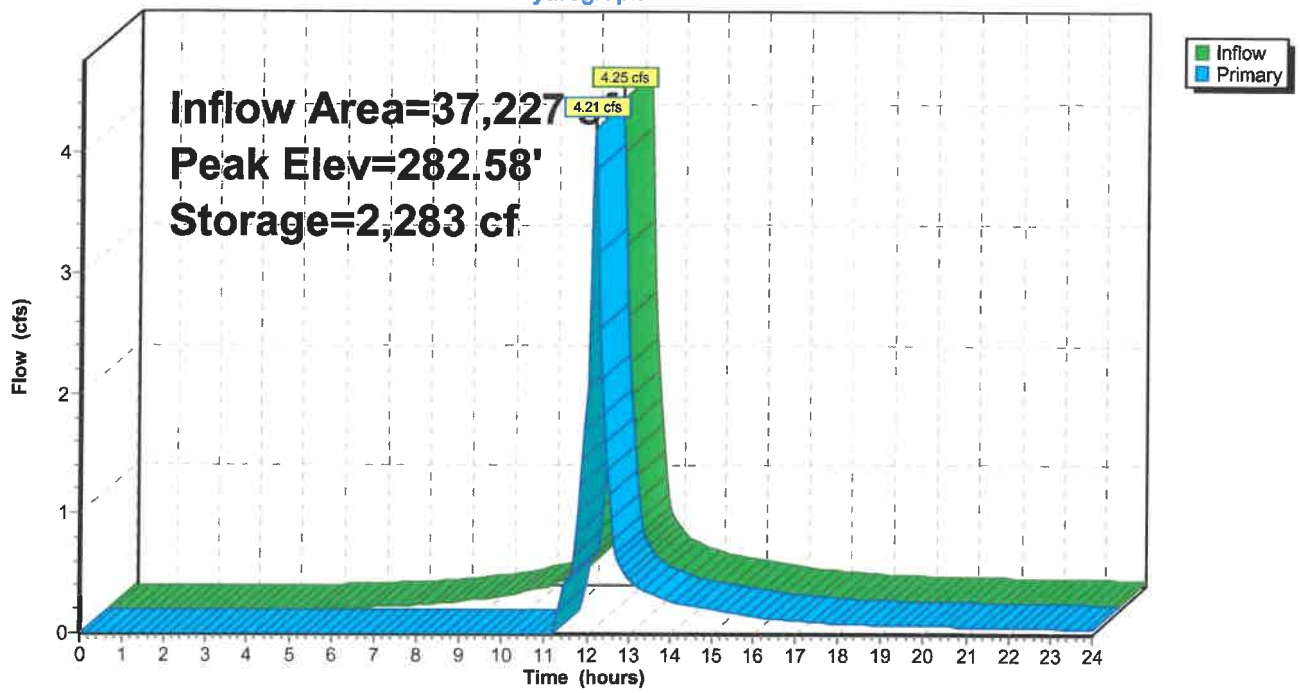
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	282.50'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.13 cfs @ 12.16 hrs HW=282.58' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 4.13 cfs @ 0.90 fps)

Pond 1P: Forebay

Hydrograph



Summary for Reach 1R: 4'x 1' Box Culvert

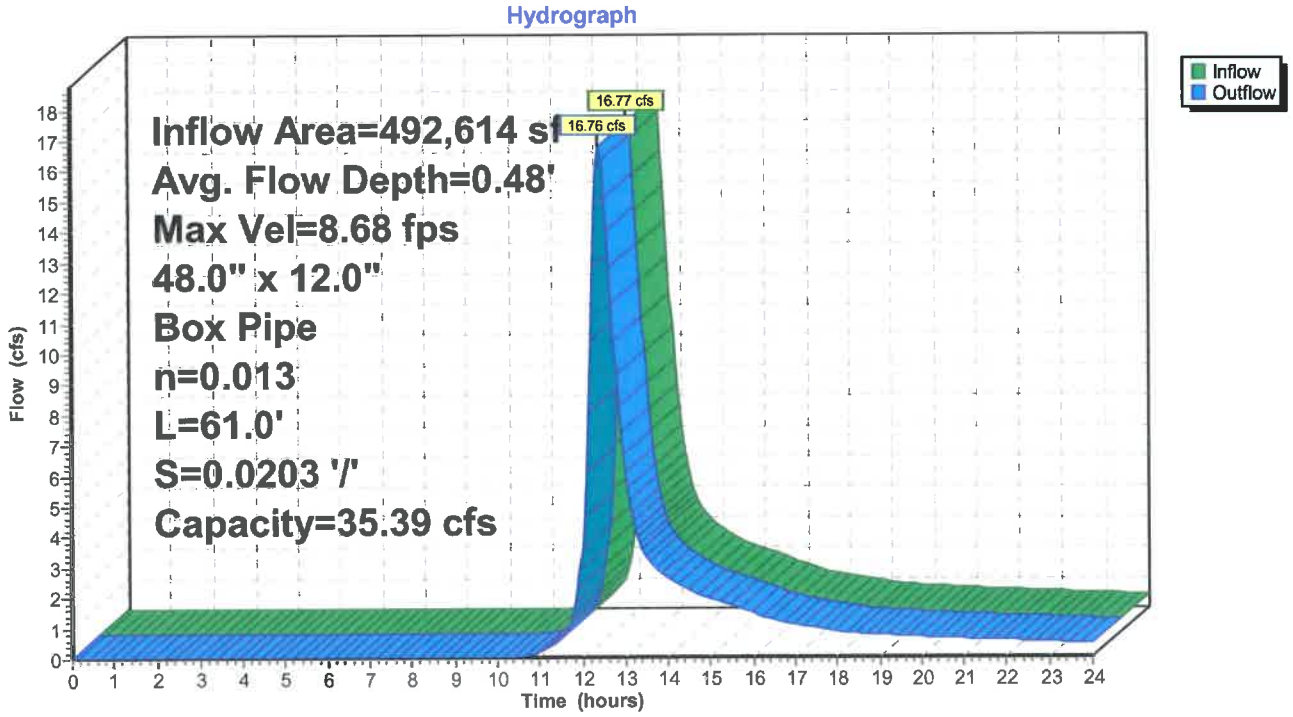
Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 2.25" for 25 YR event
Inflow = 16.77 cfs @ 12.42 hrs, Volume= 92,290 cf
Outflow = 16.76 cfs @ 12.42 hrs, Volume= 92,274 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.68 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.27 fps, Avg. Travel Time= 0.3 min

Peak Storage= 118 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'

Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

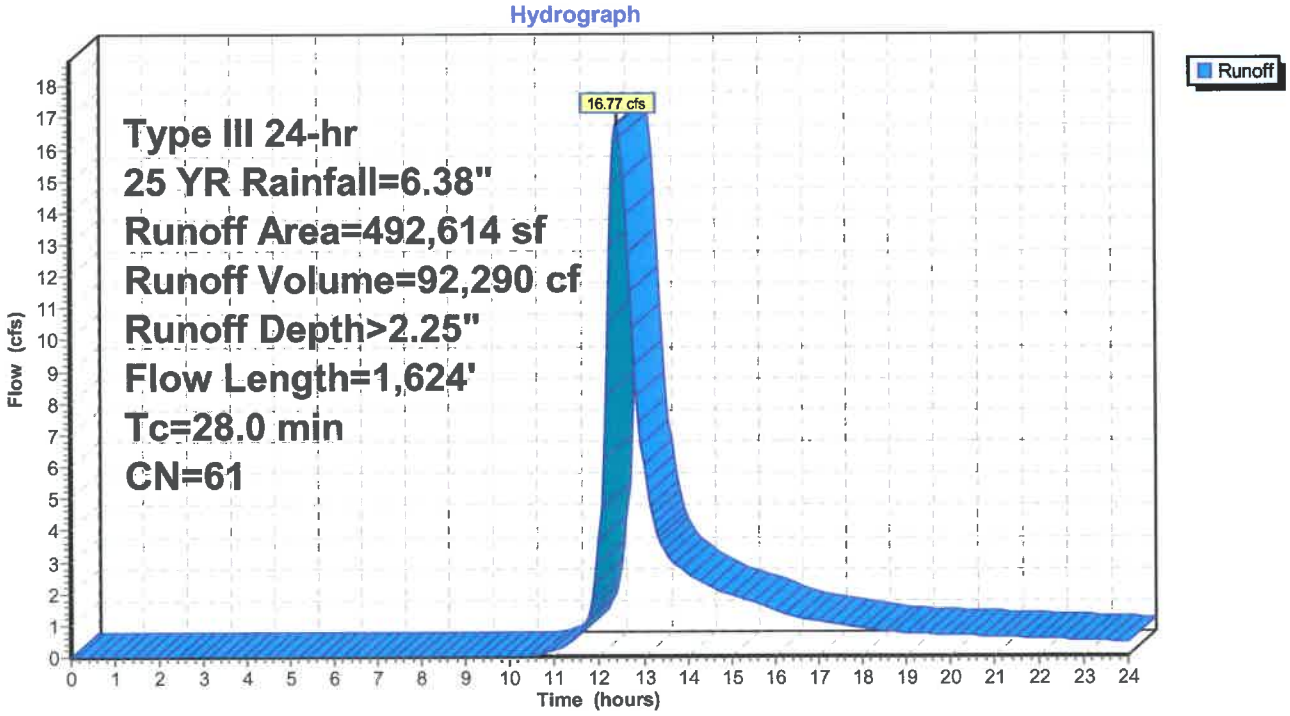
Runoff = 16.77 cfs @ 12.42 hrs, Volume= 92,290 cf, Depth> 2.25"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.5	880	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
28.0	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Pond 2P: Basin 1

Inflow Area = 152,892 sf, 17.50% Impervious, Inflow Depth > 2.41" for 25 YR event
Inflow = 8.18 cfs @ 12.17 hrs, Volume= 30,752 cf
Outflow = 0.20 cfs @ 20.33 hrs, Volume= 8,597 cf, Atten= 98%, Lag= 489.1 min
Discarded = 0.20 cfs @ 20.33 hrs, Volume= 8,597 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 284.86' @ 20.33 hrs Surf.Area= 7,233 sf Storage= 22,558 cf

Plug-Flow detention time= 357.4 min calculated for 8,597 cf (28% of inflow)
Center-of-Mass det. time= 223.9 min (1,078.9 - 855.0)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

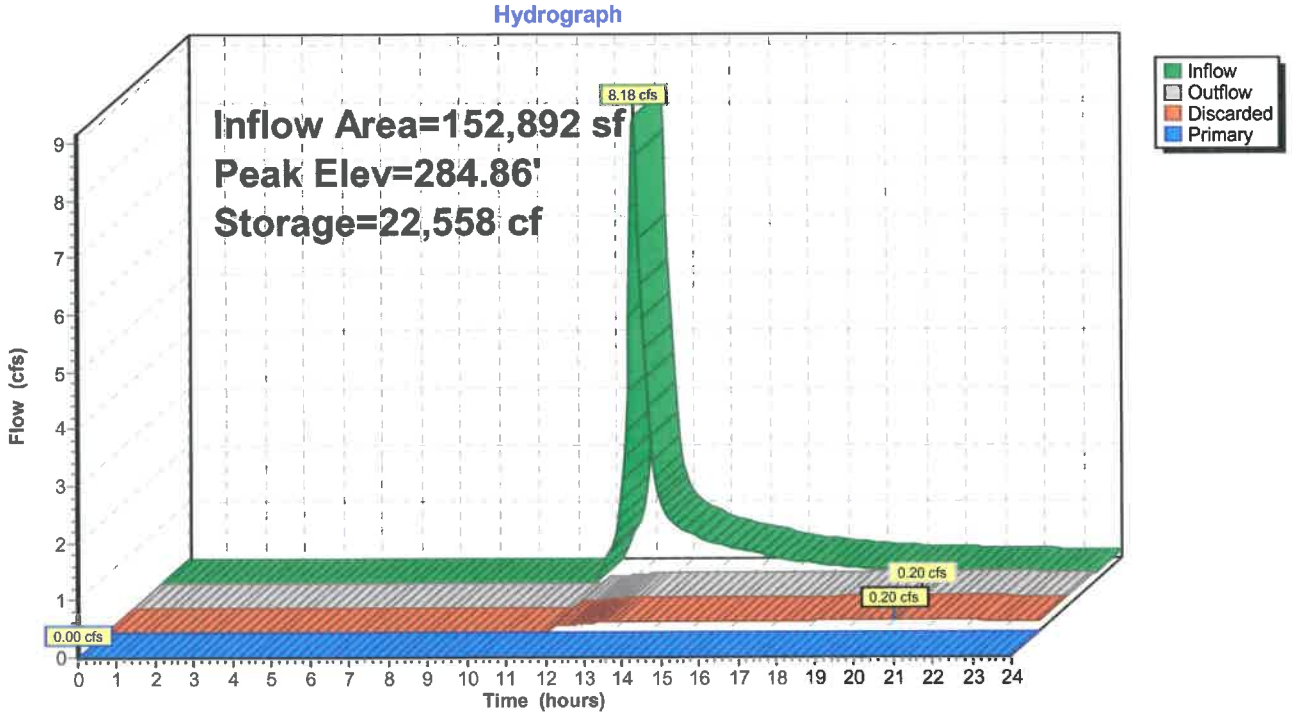
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	288.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	**1.100 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.20 cfs @ 20.33 hrs HW=284.86' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Basin 1



Summary for Reach 2R: Culvert

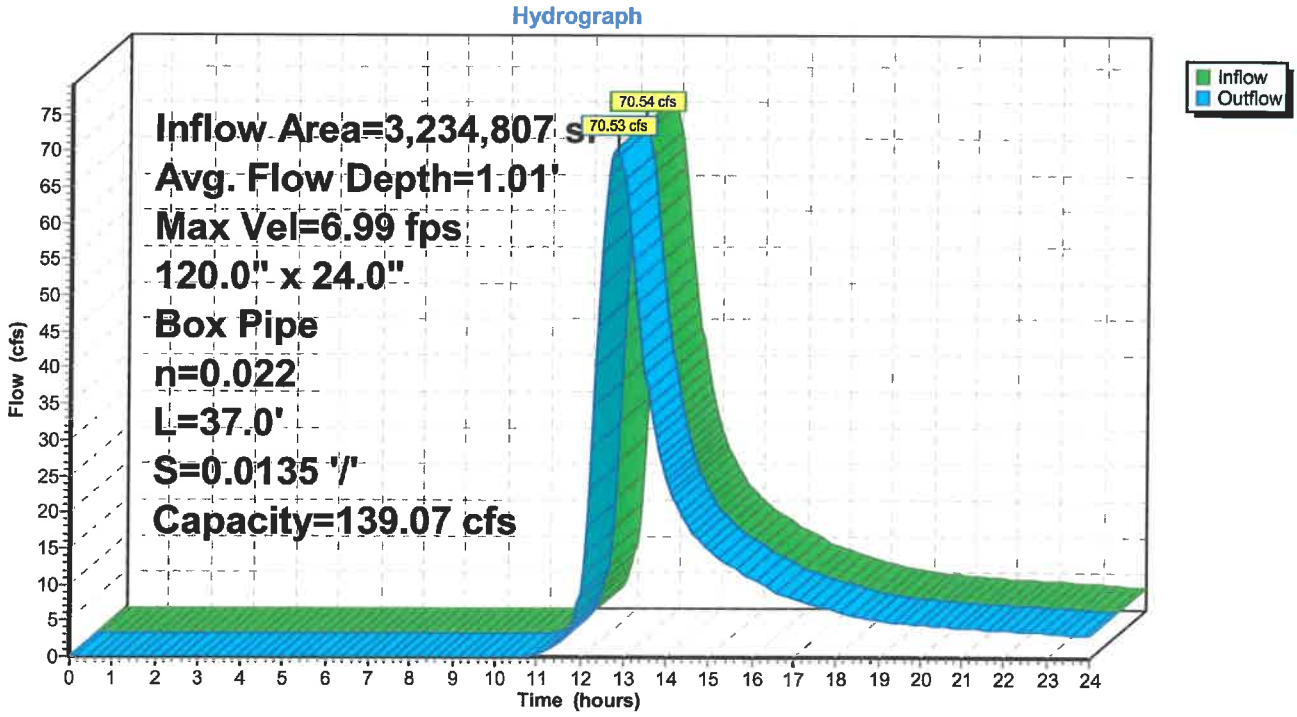
Inflow Area = 3,234,807 sf, 4.20% Impervious, Inflow Depth > 2.23" for 25 YR event
Inflow = 70.54 cfs @ 12.81 hrs, Volume= 601,180 cf
Outflow = 70.53 cfs @ 12.82 hrs, Volume= 601,109 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.99 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.12 fps, Avg. Travel Time= 0.2 min

Peak Storage= 373 cf @ 12.82 hrs
Average Depth at Peak Storage= 1.01' , Surface Width= 10.00'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 139.07 cfs

120.0" W x 24.0" H Box Pipe
n= 0.022 Earth, clean & straight
Length= 37.0' Slope= 0.0135 '/'
Inlet Invert= 292.00', Outlet Invert= 291.50'

Reach 2R: Culvert



Summary for Subcatchment 2S: To Proposed Culvert

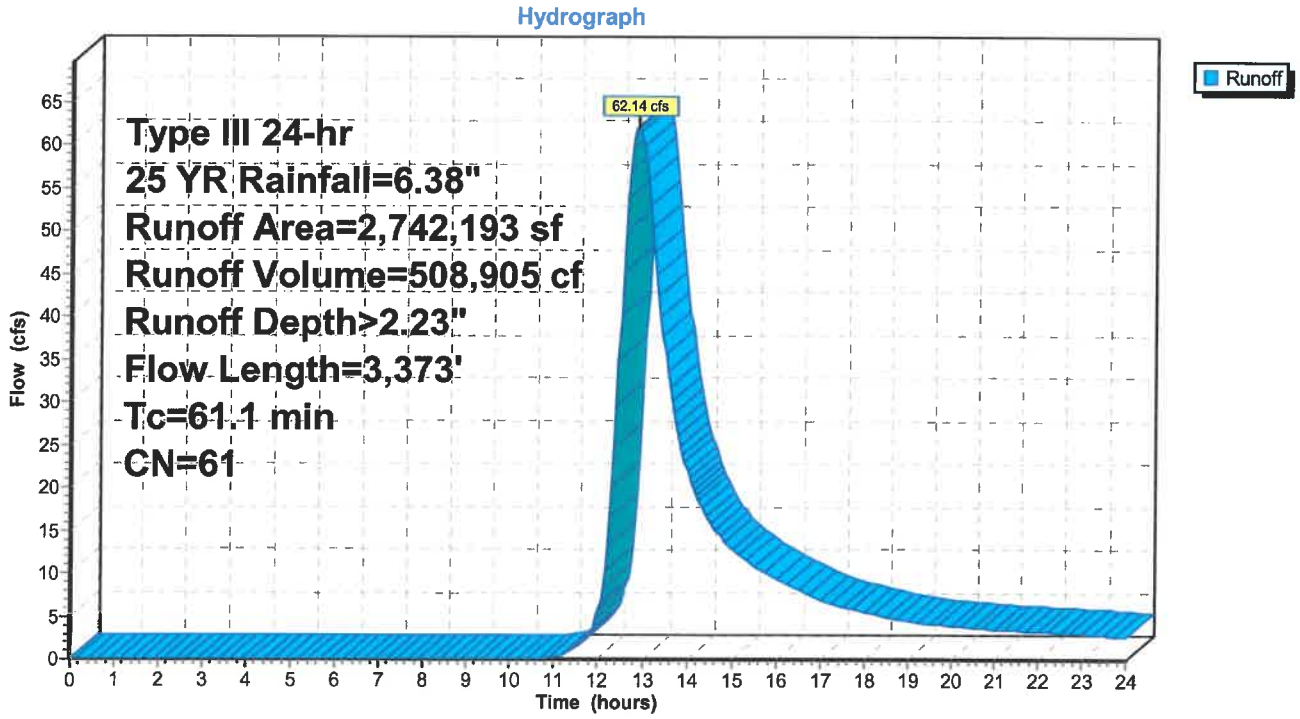
Runoff = 62.14 cfs @ 12.87 hrs, Volume= 508,905 cf, Depth> 2.23"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
1,862,663	55	Woods, Good, HSG B
533,264	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,742,193	61	Weighted Average
2,655,501		96.84% Pervious Area
86,692		3.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.9	366	0.1000	1.58		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
47.4	2,957	0.0100	1.04	1.25	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
61.1	3,373	Total			

Subcatchment 2S: To Proposed Culvert



Summary for Pond 3P: Forebay

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.53" for 25 YR event
Inflow = 4.12 cfs @ 12.12 hrs, Volume= 13,894 cf
Outflow = 4.12 cfs @ 12.12 hrs, Volume= 11,629 cf, Atten= 0%, Lag= 0.3 min
Primary = 4.12 cfs @ 12.12 hrs, Volume= 11,629 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 305.57' @ 12.12 hrs Surf.Area= 1,781 sf Storage= 2,389 cf

Plug-Flow detention time= 101.6 min calculated for 11,604 cf (84% of inflow)
Center-of-Mass det. time= 35.8 min (838.8 - 802.9)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

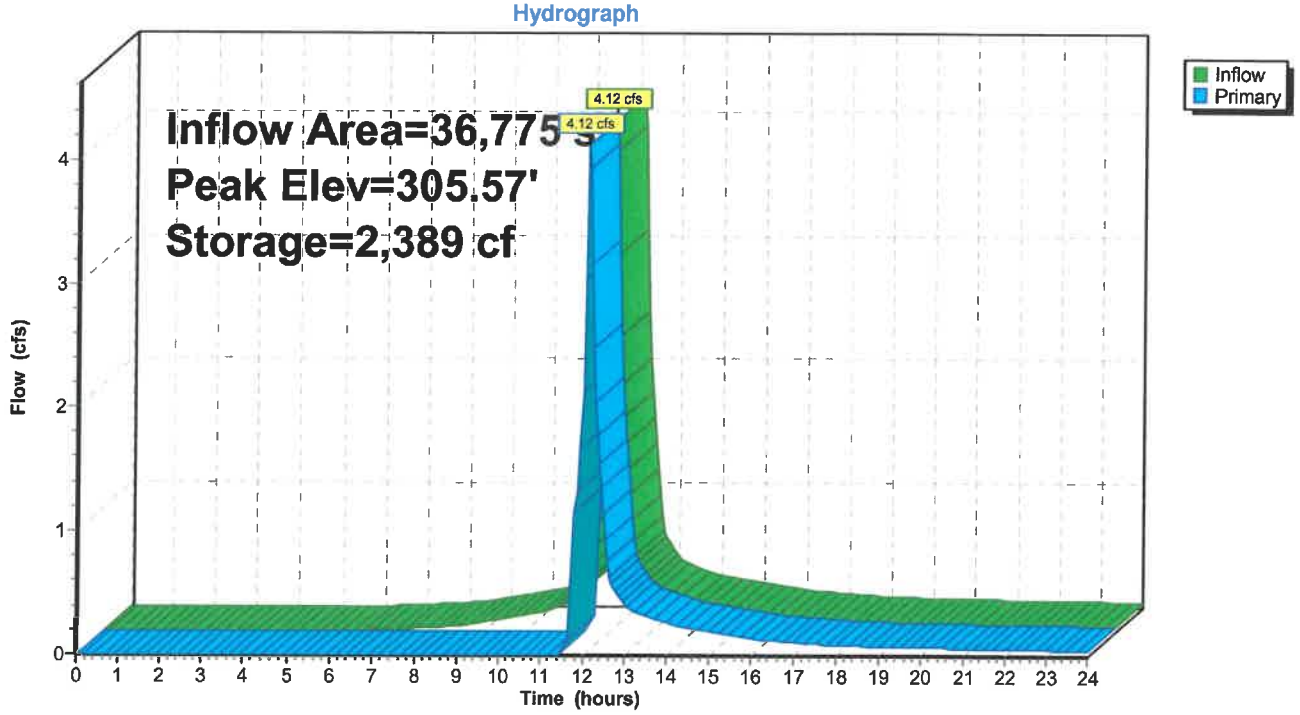
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	**65.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.91 cfs @ 12.12 hrs HW=305.57' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 3.91 cfs @ 0.86 fps)

Pond 3P: Forebay

Hydrograph



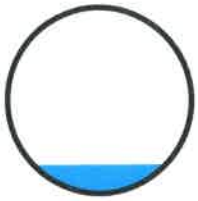
Summary for Reach 3R: CB1 to DMH 1

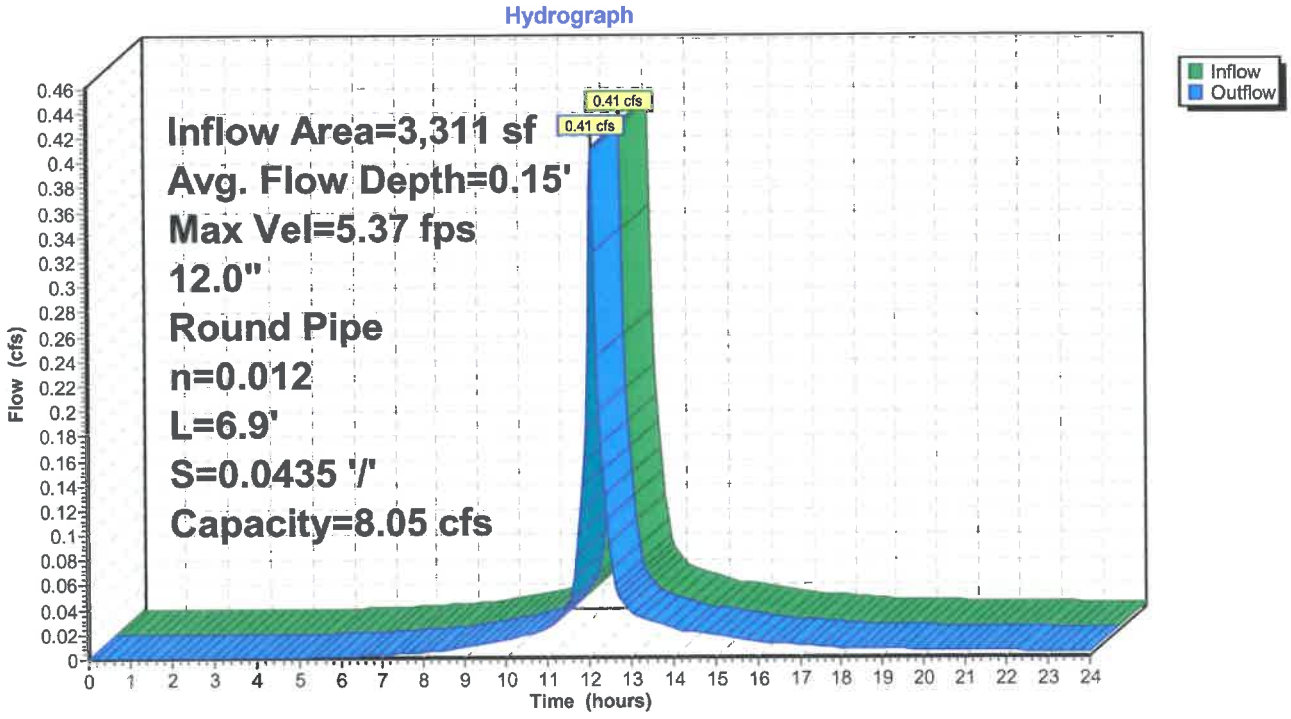
Inflow Area = 3,311 sf, 69.56% Impervious, Inflow Depth > 4.88" for 25 YR event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,346 cf
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,346 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.79 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 0.72'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'





Summary for Subcatchment 3S: To 24" ADS

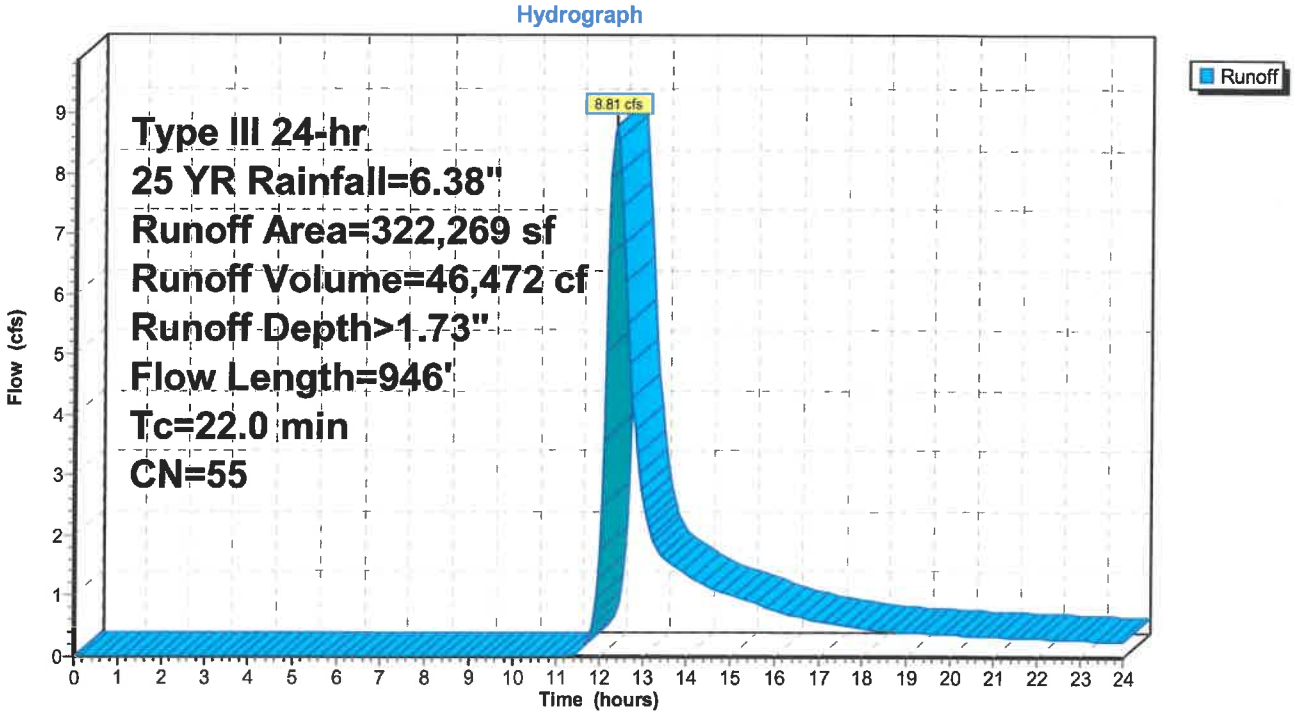
Runoff = 8.81 cfs @ 12.34 hrs, Volume= 46,472 cf, Depth> 1.73"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
322,269	55	Woods, Good, HSG B
322,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.0	946	Total			

Subcatchment 3S: To 24" ADS



Summary for Pond 4P: Basin 2

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 2.56" for 25 YR event
Inflow = 7.10 cfs @ 12.15 hrs, Volume= 24,834 cf
Outflow = 0.22 cfs @ 17.73 hrs, Volume= 9,768 cf, Atten= 97%, Lag= 335.1 min
Discarded = 0.22 cfs @ 17.73 hrs, Volume= 9,768 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 306.10' @ 17.73 hrs Surf.Area= 8,787 sf Storage= 16,580 cf

Plug-Flow detention time= 347.4 min calculated for 9,768 cf (39% of inflow)
Center-of-Mass det. time= 220.1 min (1,074.5 - 854.4)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	45,905 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

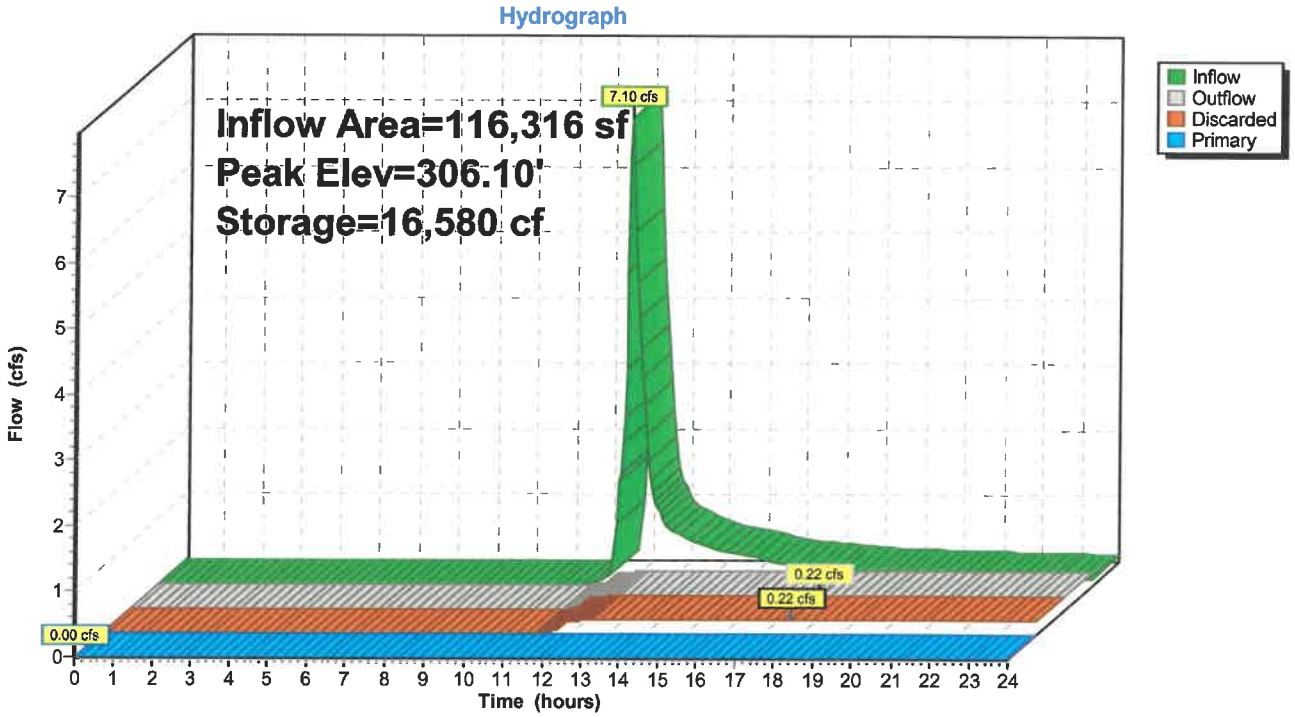
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	**1.100 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.22 cfs @ 17.73 hrs HW=306.10' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Basin 2



Summary for Reach 4R: CB2 to DMH 1

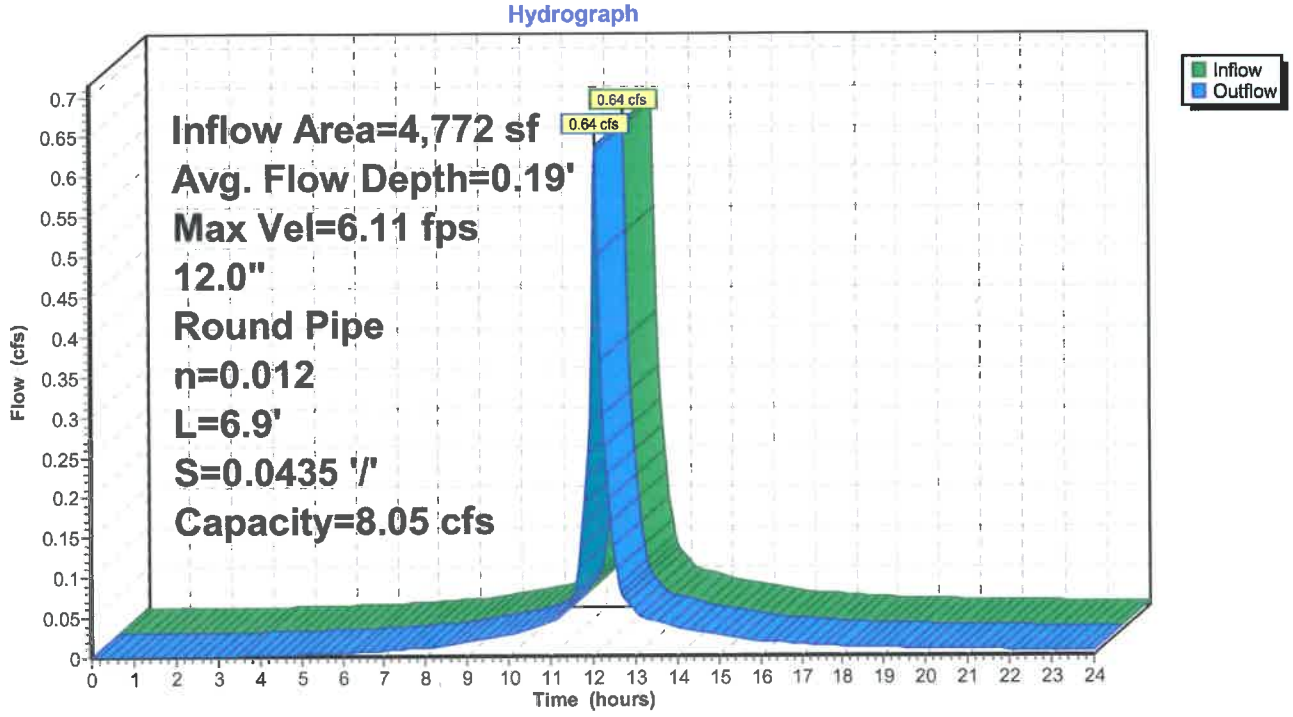
Inflow Area = 4,772 sf, 83.28% Impervious, Inflow Depth > 5.44" for 25 YR event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,163 cf
Outflow = 0.64 cfs @ 12.09 hrs, Volume= 2,163 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.11 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.02 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.79'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'

Reach 4R: CB2 to DMH 1



Summary for Subcatchment 4S: To CB 1

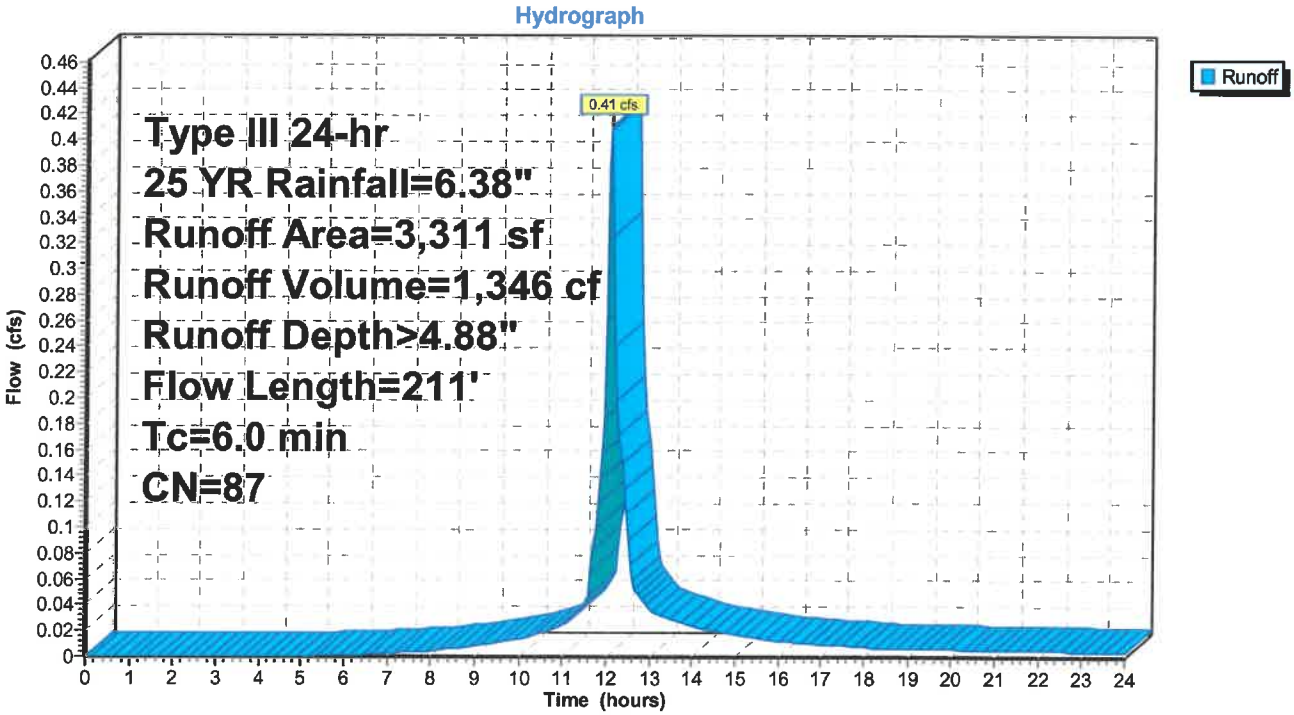
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,346 cf, Depth> 4.88"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
2,303	98	Paved roads w/curbs & sewers, HSG B
1,008	61	>75% Grass cover, Good, HSG B
3,311	87	Weighted Average
1,008		30.44% Pervious Area
2,303		69.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.0	161	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	211	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: To CB 1



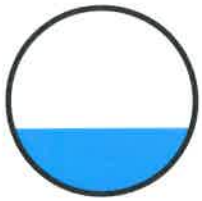
Summary for Reach 5R: DMH1 to DMH 2

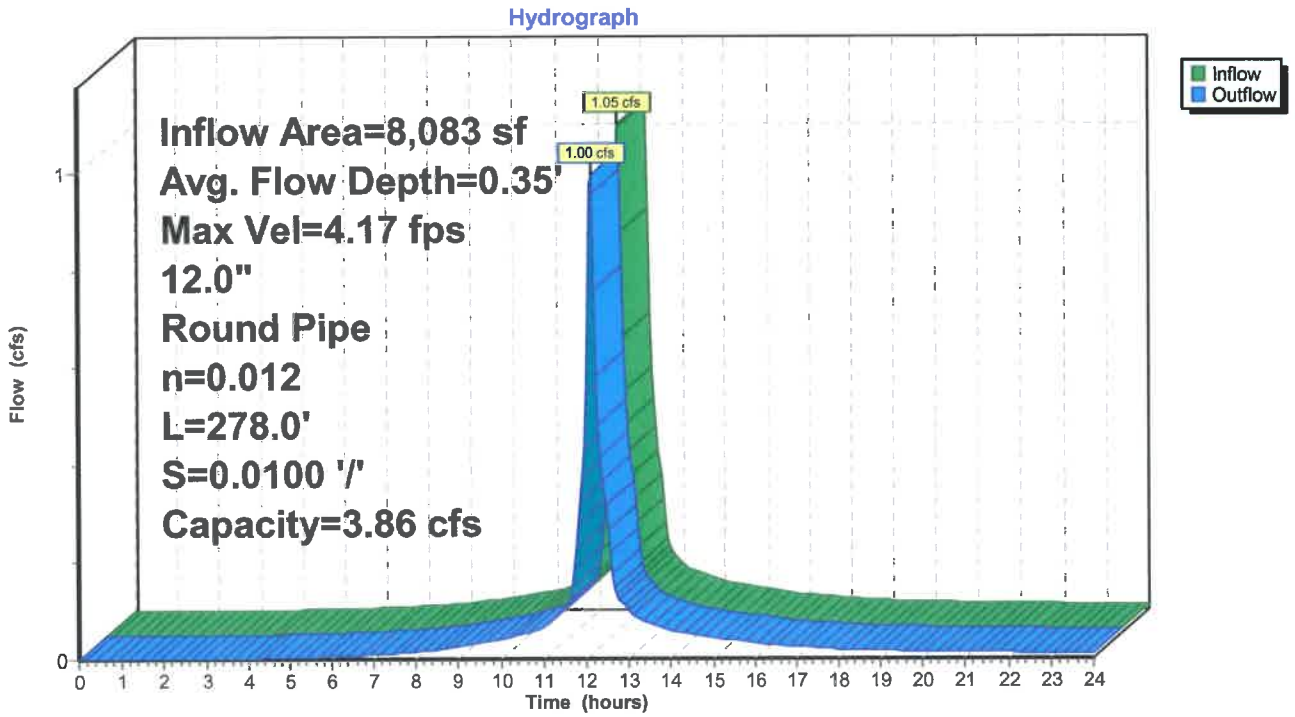
Inflow Area = 8,083 sf, 77.66% Impervious, Inflow Depth > 5.21" for 25 YR event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 3,509 cf
Outflow = 1.00 cfs @ 12.12 hrs, Volume= 3,506 cf, Atten= 5%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.17 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 3.4 min

Peak Storage= 69 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.35' , Surface Width= 0.96'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 278.0' Slope= 0.0100 '/'
Inlet Invert= 290.68', Outlet Invert= 287.90'





Summary for Subcatchment 5S: To CB 2

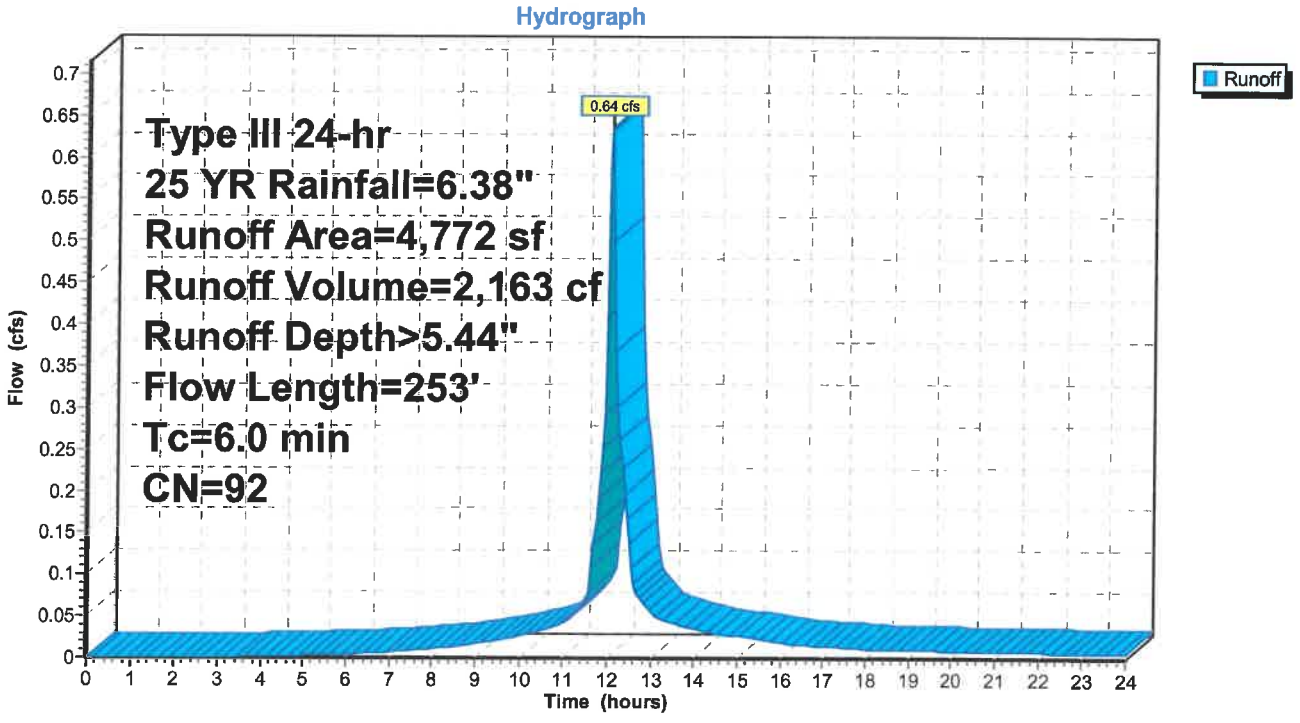
Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,163 cf, Depth> 5.44"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
3,974	98	Paved roads w/curbs & sewers, HSG B
798	61	>75% Grass cover, Good, HSG B
4,772	92	Weighted Average
798		16.72% Pervious Area
3,974		83.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.2	203	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	253	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: To CB 2



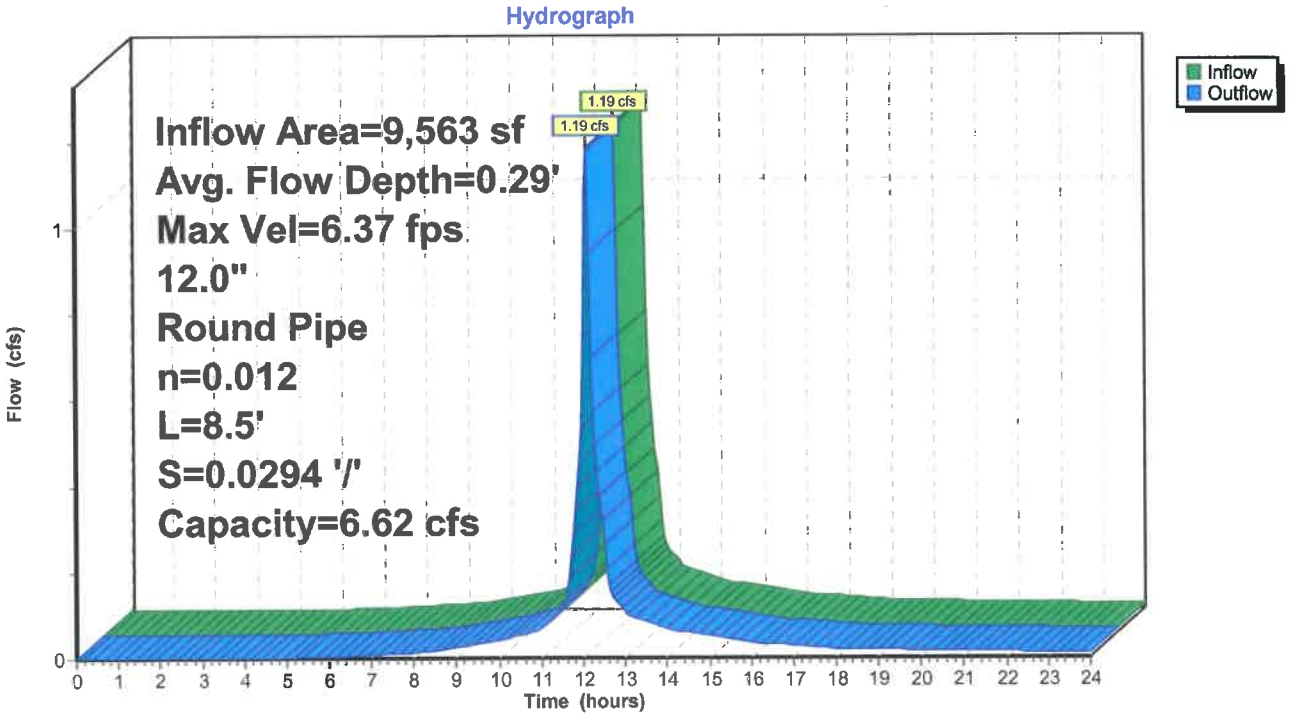
Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 9,563 sf, 69.08% Impervious, Inflow Depth > 4.88" for 25 YR event
Inflow = 1.19 cfs @ 12.09 hrs, Volume= 3,887 cf
Outflow = 1.19 cfs @ 12.09 hrs, Volume= 3,887 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.13 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.62 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 8.5' Slope= 0.0294 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 6S: To CB 3

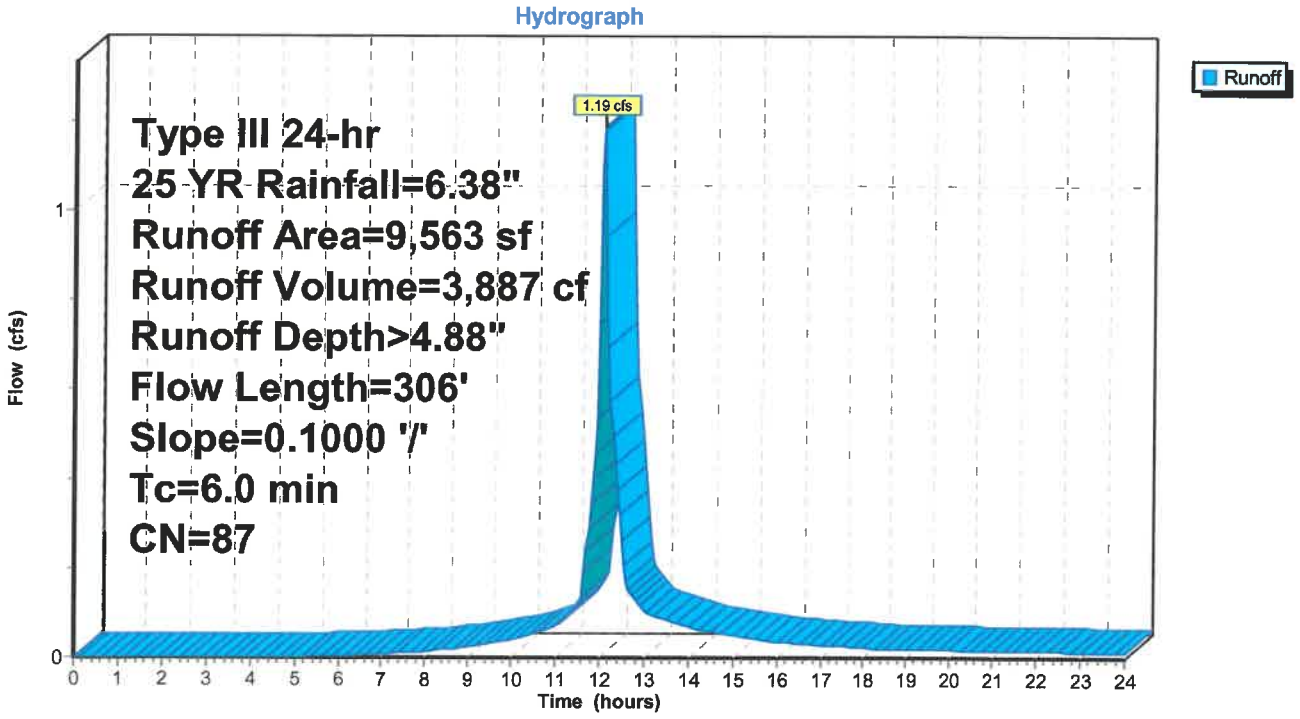
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 3,887 cf, Depth> 4.88"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
2,957	61	>75% Grass cover, Good, HSG B
9,563	87	Weighted Average
2,957		30.92% Pervious Area
6,606		69.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6S: To CB 3



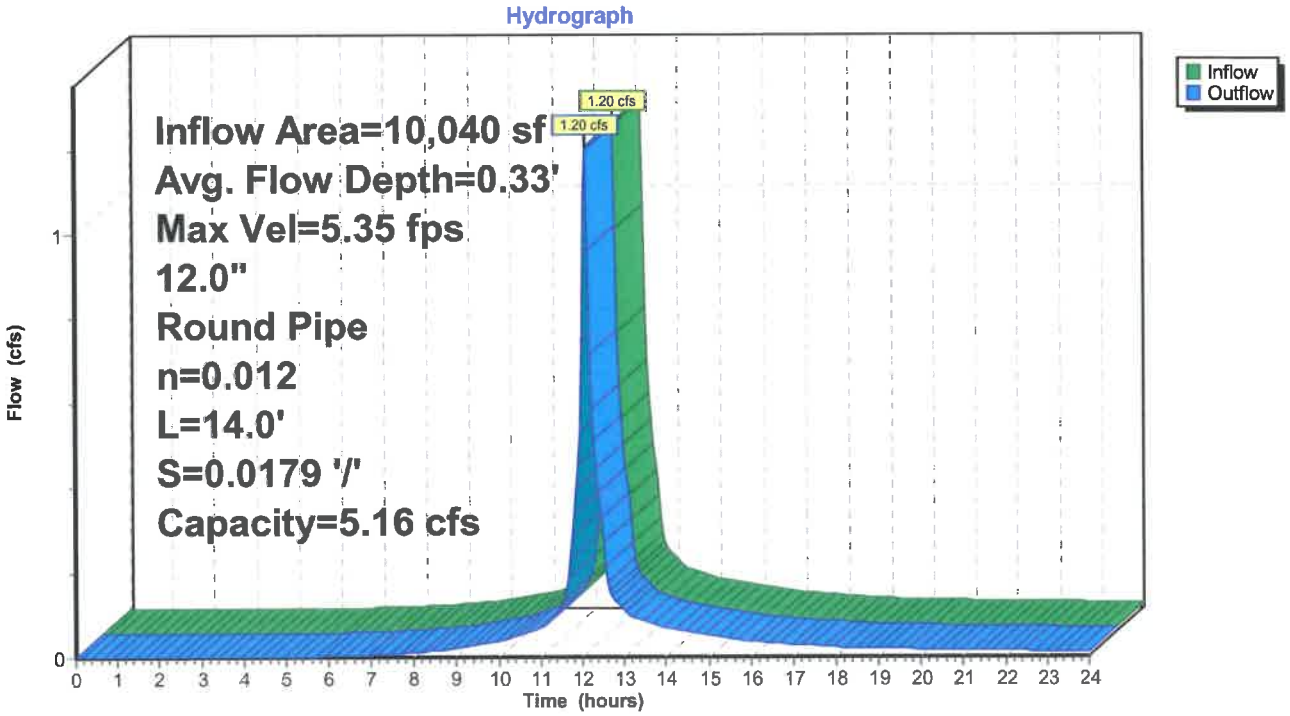
Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 10,040 sf, 65.80% Impervious, Inflow Depth > 4.66" for 25 YR event
Inflow = 1.20 cfs @ 12.09 hrs, Volume= 3,898 cf
Outflow = 1.20 cfs @ 12.09 hrs, Volume= 3,897 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.35 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.81 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.16 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 14.0' Slope= 0.0179 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 7S: To CB 4

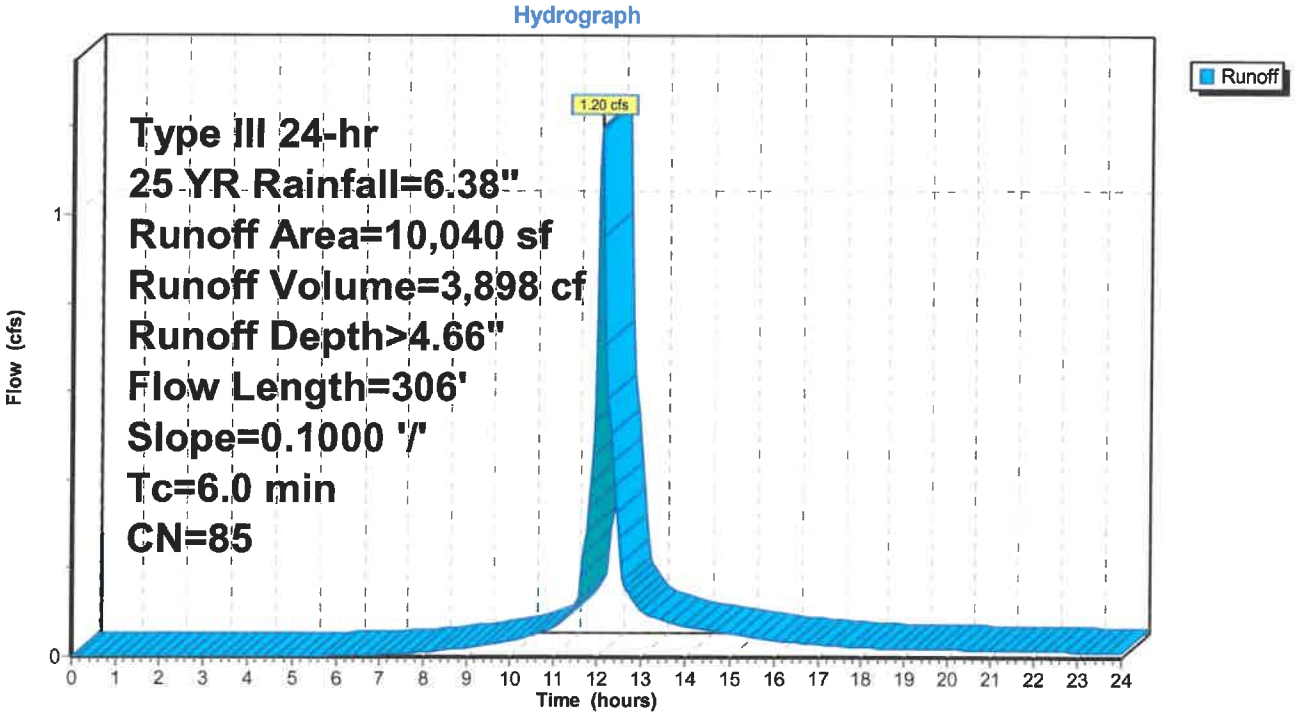
Runoff = 1.20 cfs @ 12.09 hrs, Volume= 3,898 cf, Depth> 4.66"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
3,434	61	>75% Grass cover, Good, HSG B
10,040	85	Weighted Average
3,434		34.20% Pervious Area
6,606		65.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: To CB 4



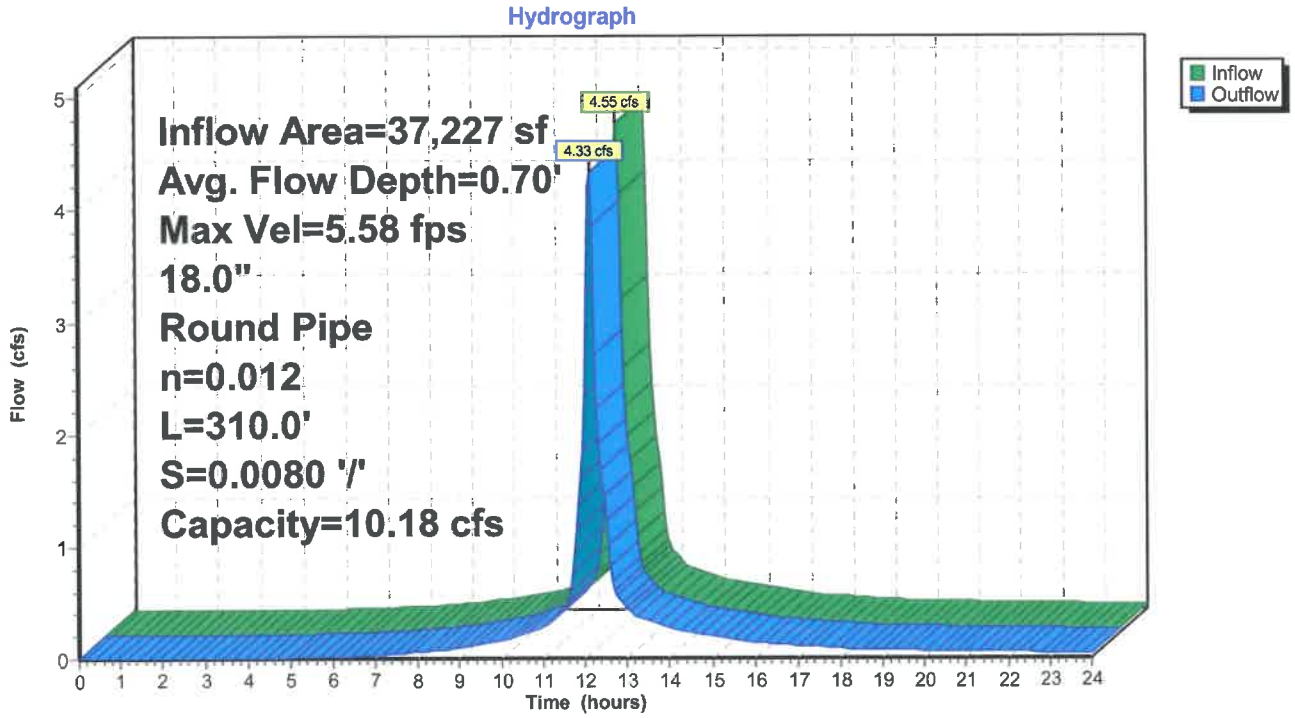
Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 4.95" for 25 YR event
Inflow = 4.55 cfs @ 12.10 hrs, Volume= 15,370 cf
Outflow = 4.33 cfs @ 12.13 hrs, Volume= 15,357 cf, Atten= 5%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.58 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 2.8 min

Peak Storage= 250 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 310.0' Slope= 0.0080 '/'
Inlet Invert= 287.40', Outlet Invert= 284.92'



Summary for Subcatchment 8S: To CB 6

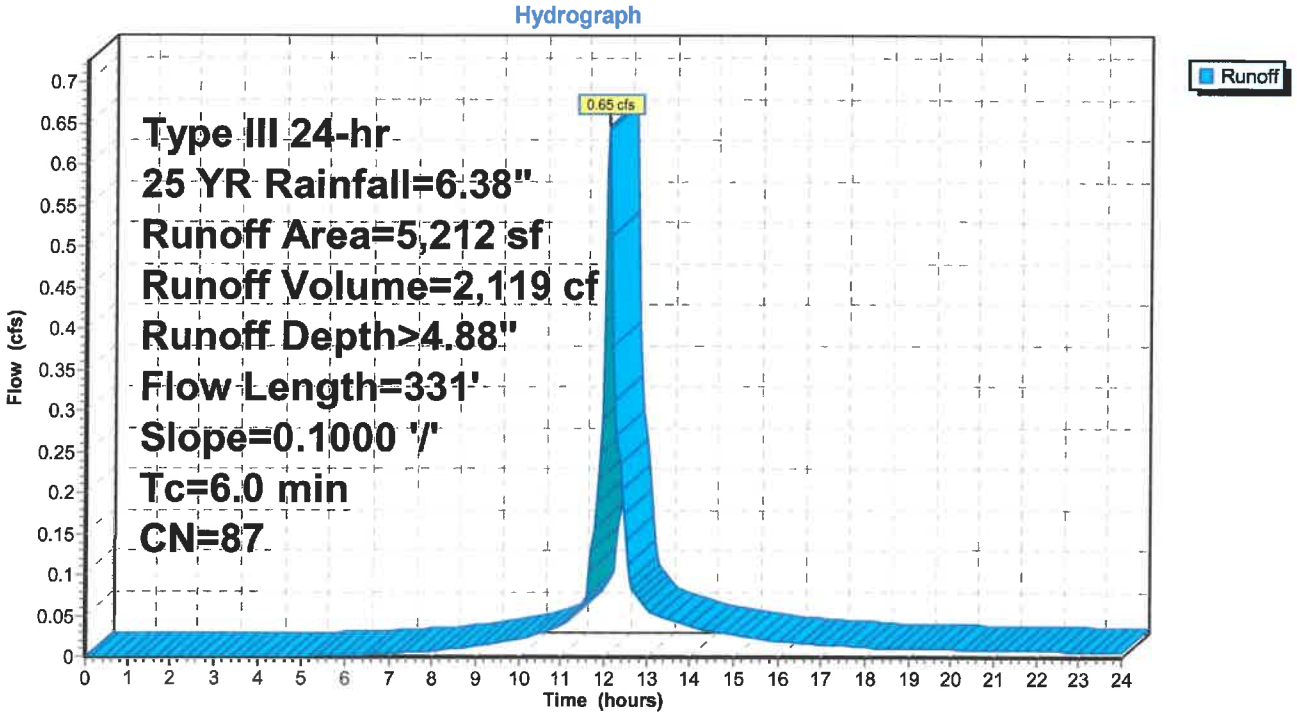
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 2,119 cf, Depth> 4.88"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
1,579	61	>75% Grass cover, Good, HSG B
5,212	87	Weighted Average
1,579		30.30% Pervious Area
3,633		69.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8S: To CB 6



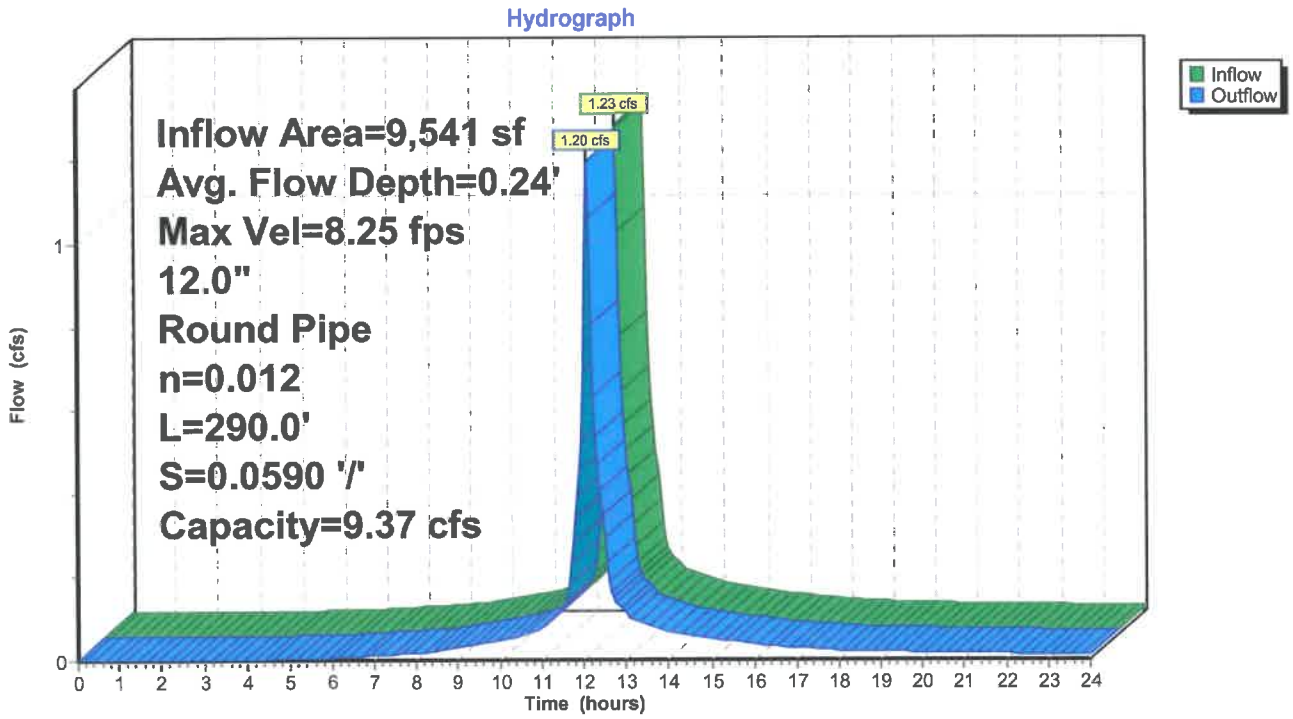
Summary for Reach 9R: DMH 3 to DMH 2

Inflow Area = 9,541 sf, 76.16% Impervious, Inflow Depth > 5.13" for 25 YR event
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 4,081 cf
Outflow = 1.20 cfs @ 12.10 hrs, Volume= 4,079 cf, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.25 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.67 fps, Avg. Travel Time= 1.8 min

Peak Storage= 43 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 290.0' Slope= 0.0590 '/'
Inlet Invert= 305.00', Outlet Invert= 287.90'



Summary for Subcatchment 9S: To CB 5

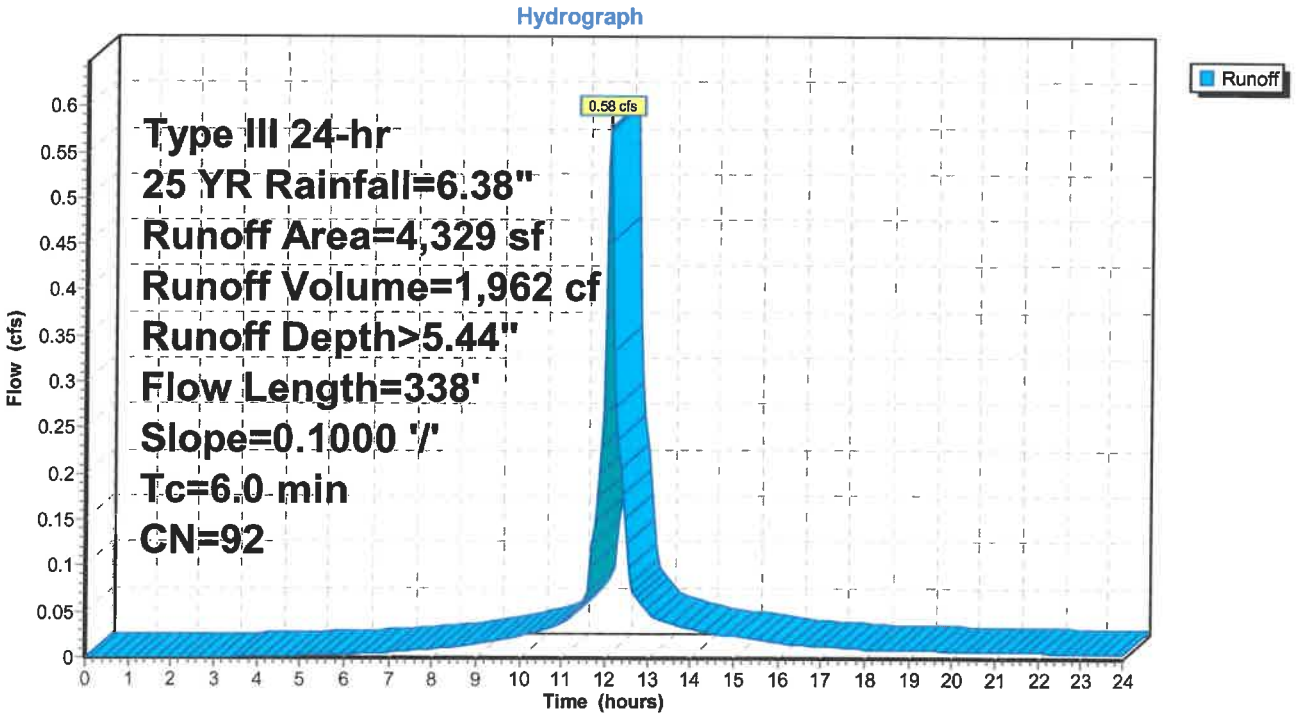
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 1,962 cf, Depth> 5.44"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
696	61	>75% Grass cover, Good, HSG B
4,329	92	Weighted Average
696		16.08% Pervious Area
3,633		83.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: To CB 5



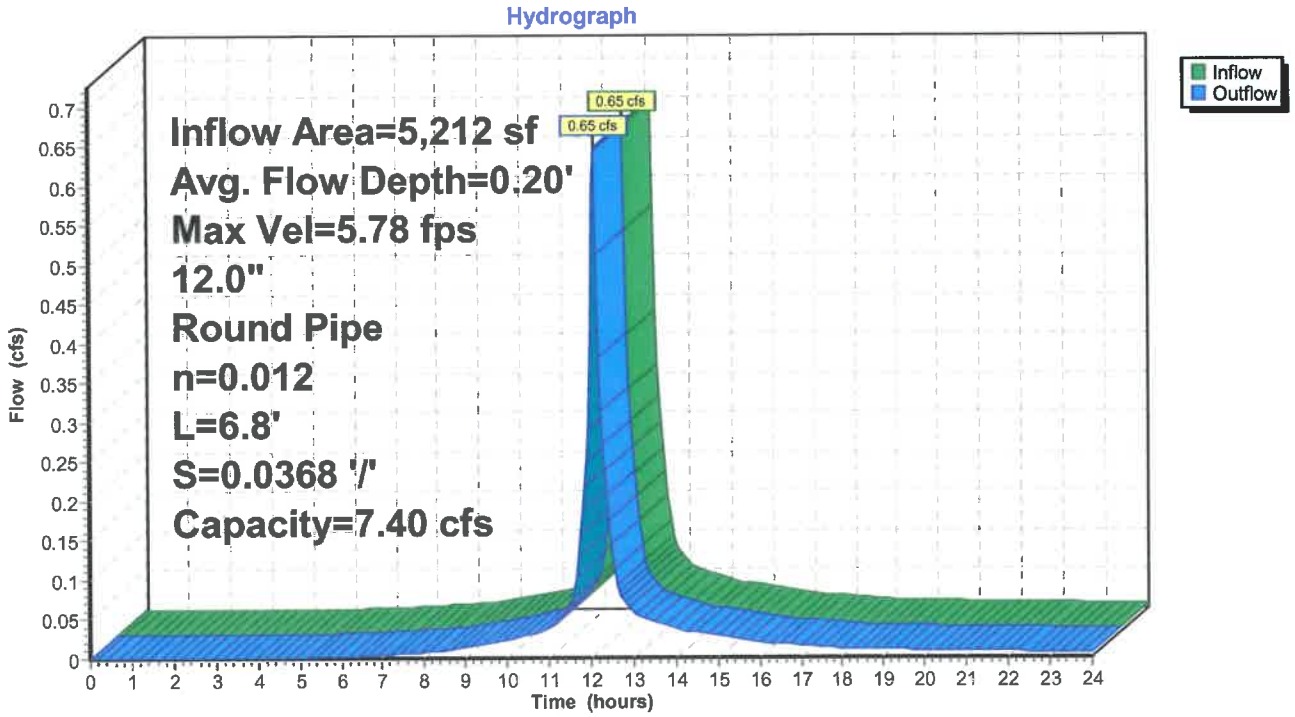
Summary for Reach 10R: CB6 to DMH 3

Inflow Area = 5,212 sf, 69.70% Impervious, Inflow Depth > 4.88" for 25 YR event
Inflow = 0.65 cfs @ 12.09 hrs, Volume= 2,119 cf
Outflow = 0.65 cfs @ 12.09 hrs, Volume= 2,119 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.78 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.40 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.8' Slope= 0.0368 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Summary for Subcatchment 10S: To CB 7

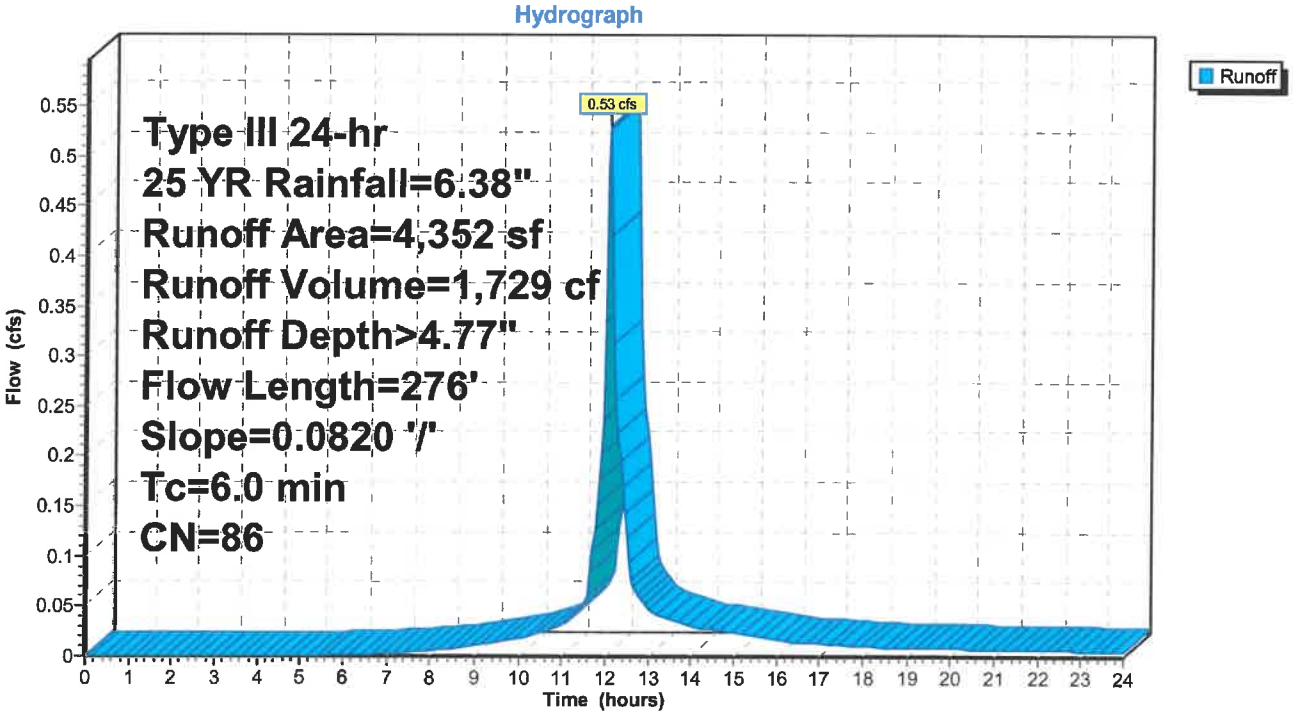
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf, Depth> 4.77"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: To CB 7



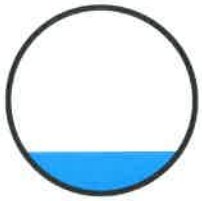
Summary for Reach 11R: CB5 to DMH 3

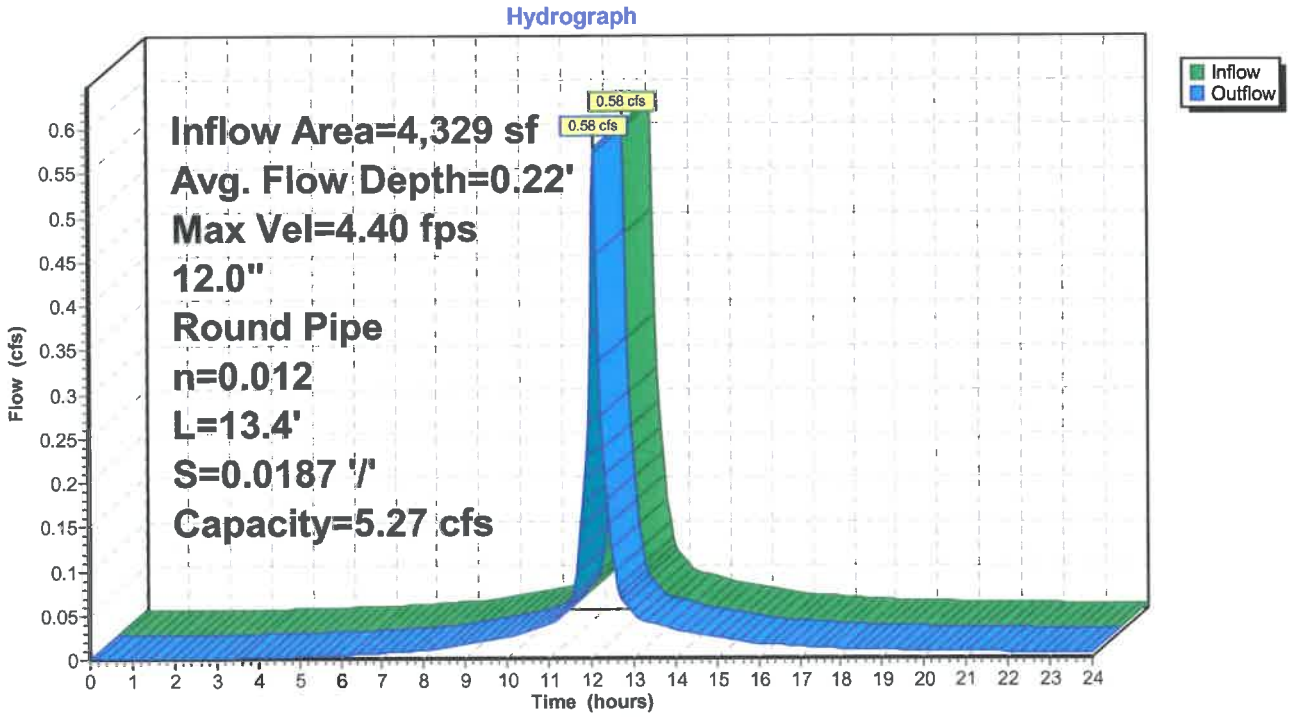
Inflow Area = 4,329 sf, 83.92% Impervious, Inflow Depth > 5.44" for 25 YR event
Inflow = 0.58 cfs @ 12.09 hrs, Volume= 1,962 cf
Outflow = 0.58 cfs @ 12.09 hrs, Volume= 1,962 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.40 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 0.83'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'





Summary for Subcatchment 11S: To CB 8

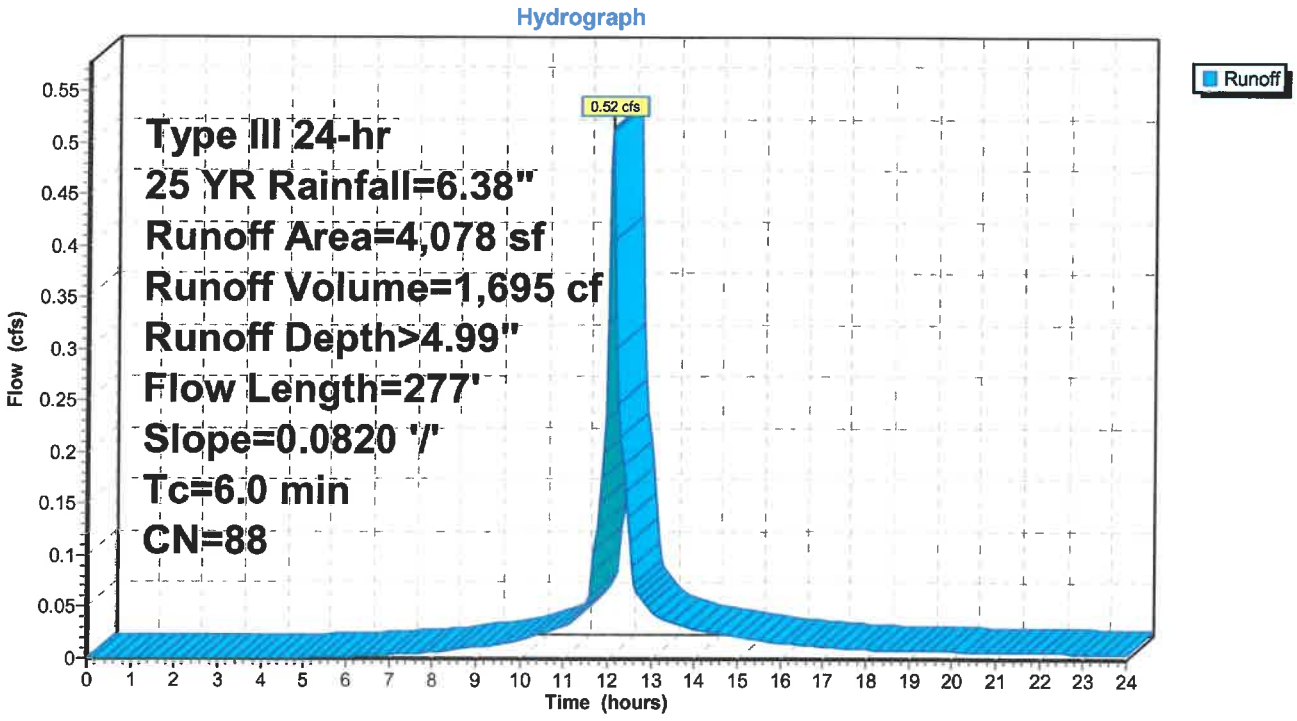
Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,695 cf, Depth> 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 11S: To CB 8



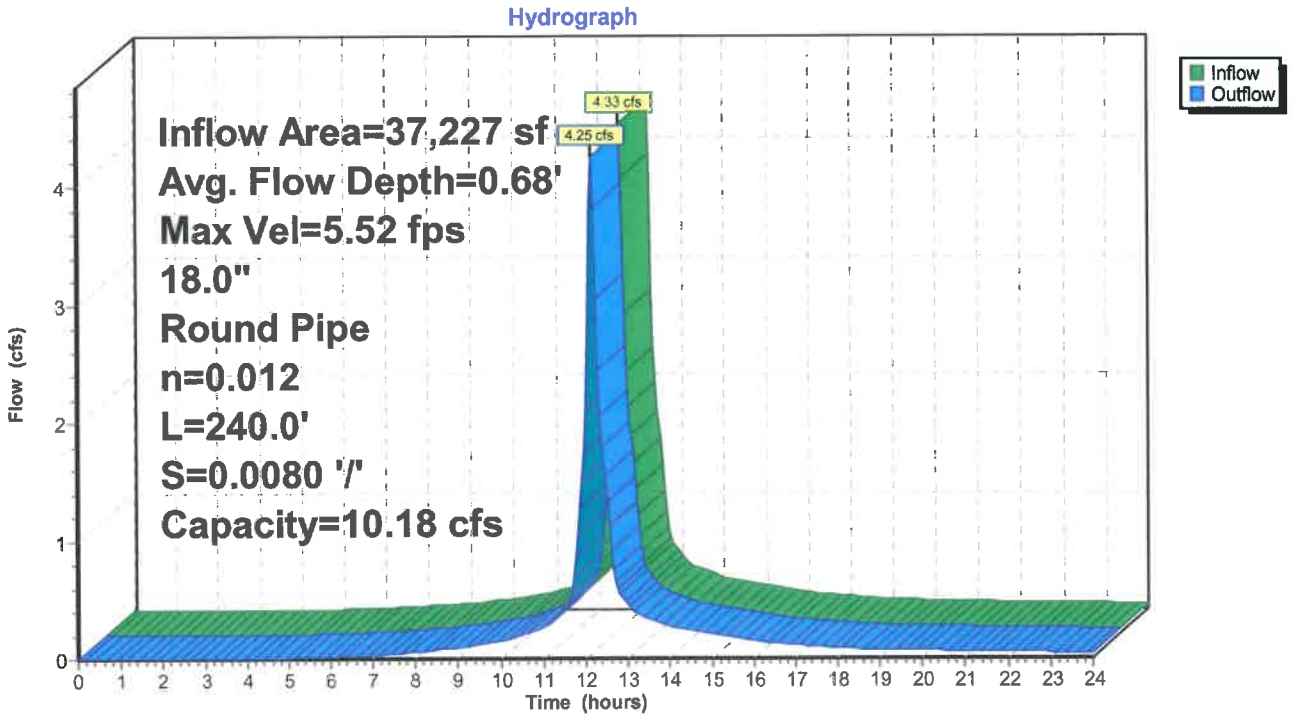
Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 4.95" for 25 YR event
Inflow = 4.33 cfs @ 12.13 hrs, Volume= 15,357 cf
Outflow = 4.25 cfs @ 12.15 hrs, Volume= 15,348 cf, Atten= 2%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.52 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.85 fps, Avg. Travel Time= 2.2 min

Peak Storage= 188 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.68' , Surface Width= 1.49'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 240.0' Slope= 0.0080 '/'
Inlet Invert= 284.92', Outlet Invert= 283.00'



Summary for Subcatchment 12S: To CB 9

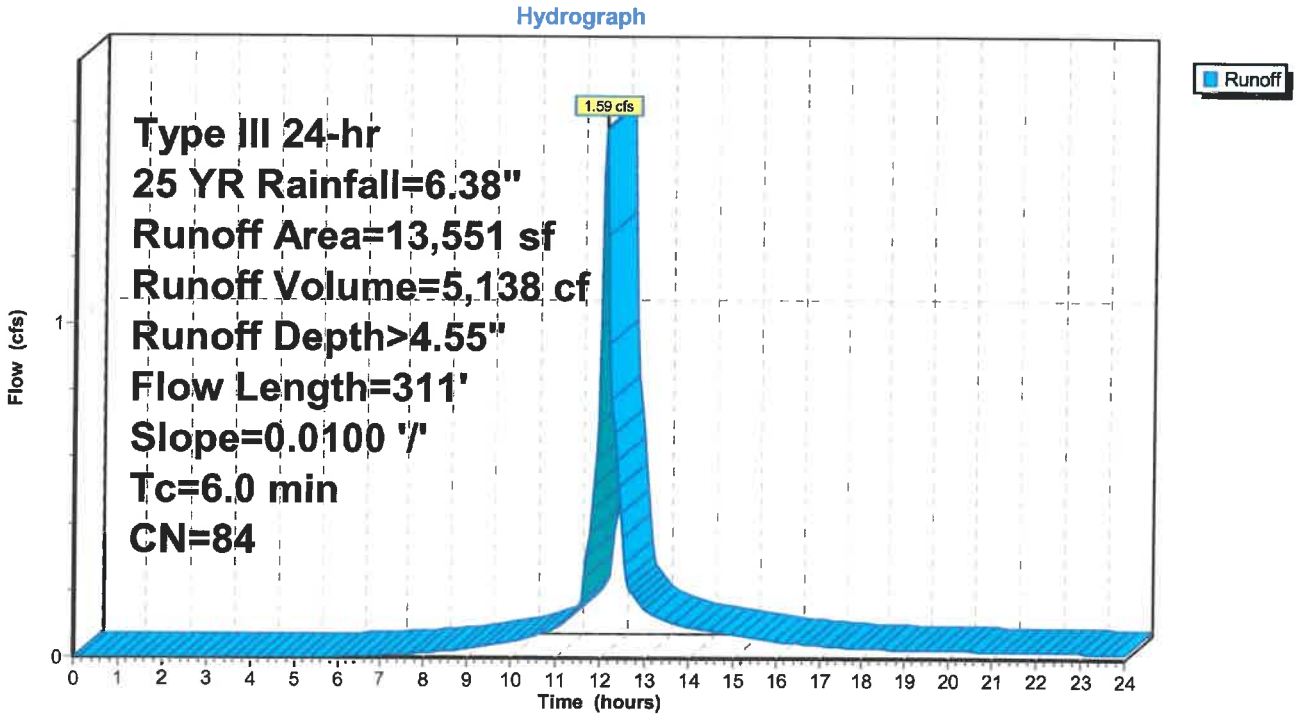
Runoff = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf, Depth> 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 12S: To CB 9



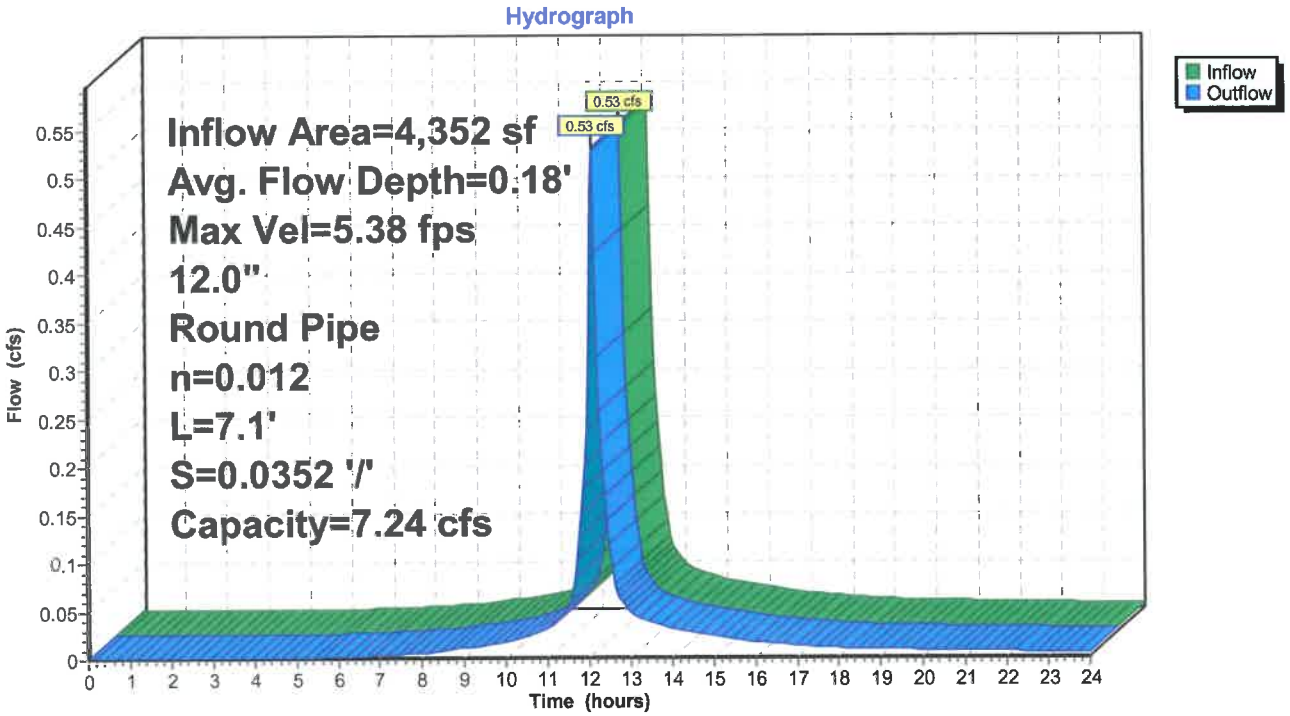
Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 4.77" for 25 YR event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf
Outflow = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.38 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 0.77'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.1' Slope= 0.0352 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 13S: To CB 10

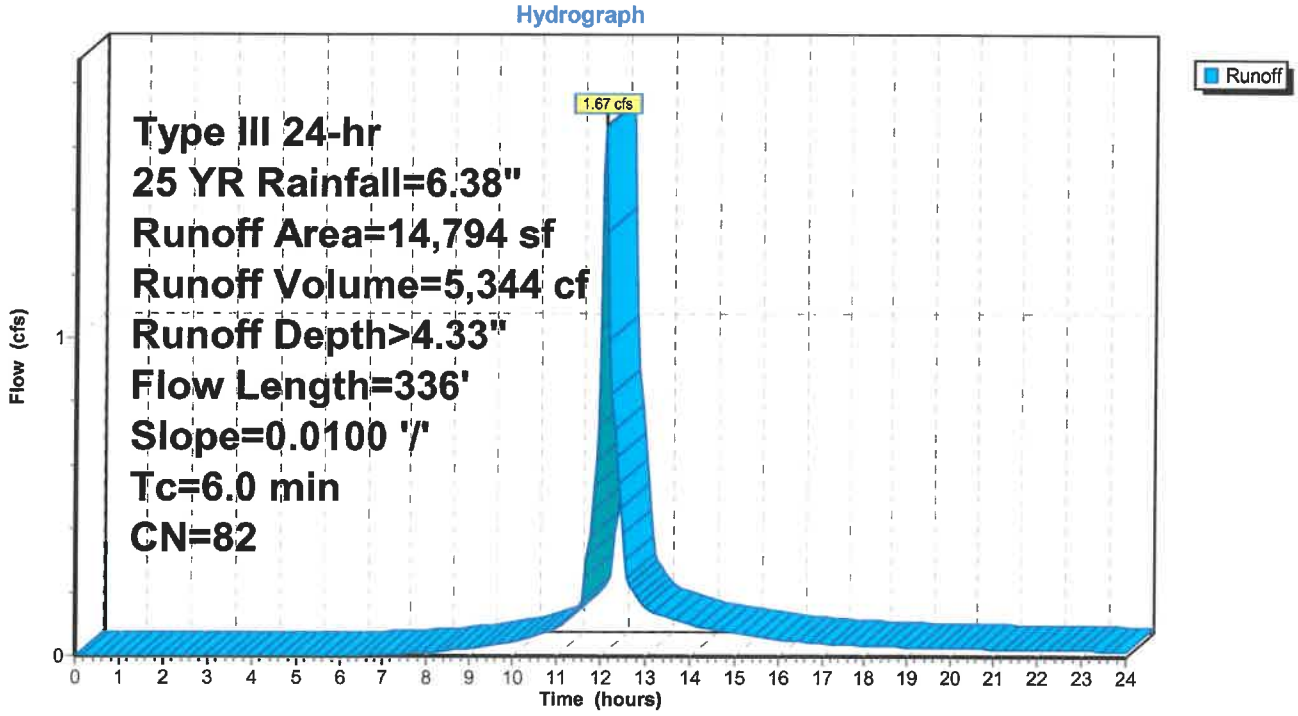
Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf, Depth> 4.33"

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 YR Rainfall=6.38"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: To CB 10



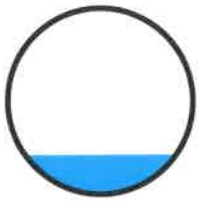
Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 4.99" for 25 YR event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,695 cf
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 1,695 cf, Atten= 0%, Lag= 0.1 min

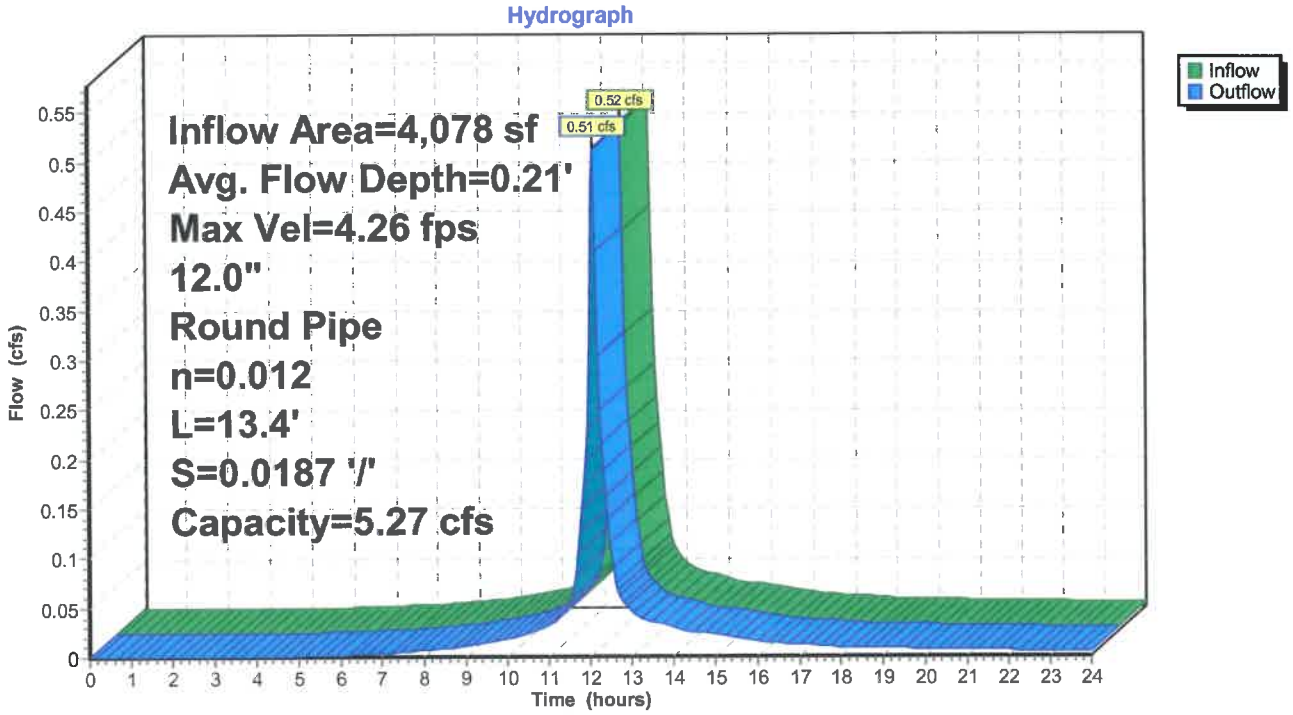
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.82'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Reach 14R: CB 8 TO DMH 4



Summary for Subcatchment 14S: To Wetland

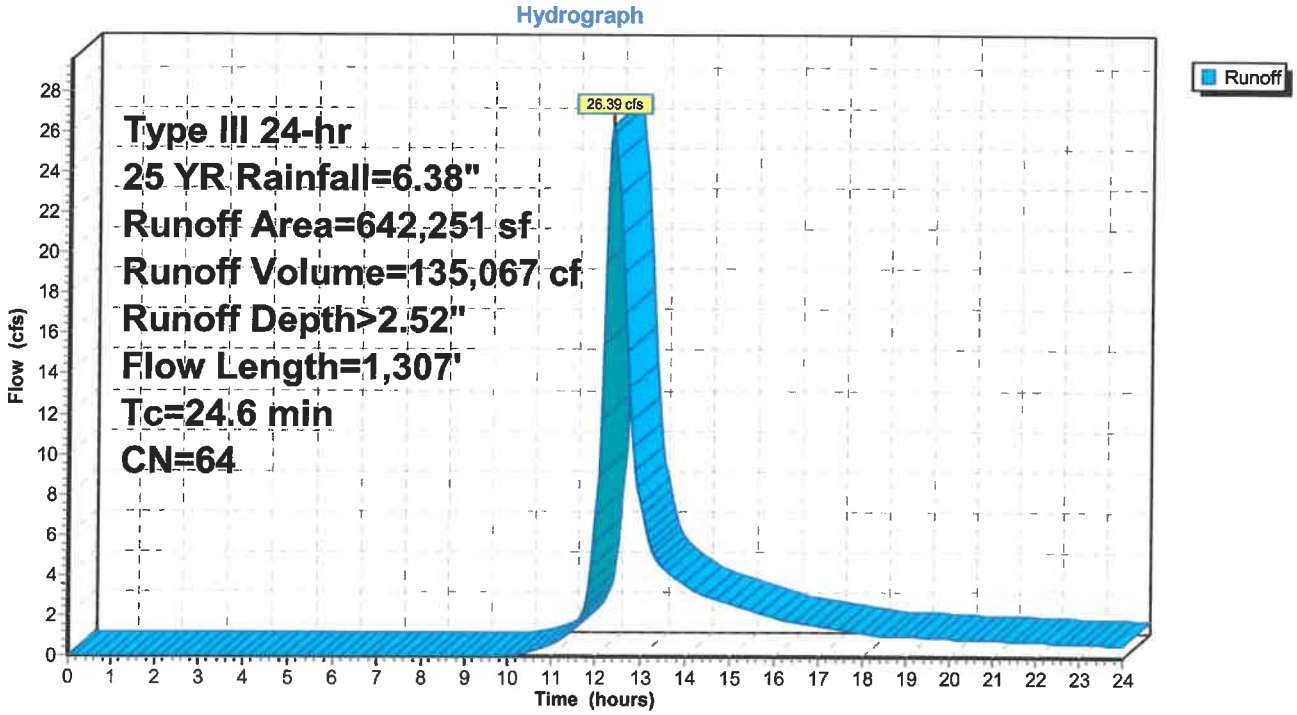
Runoff = 26.39 cfs @ 12.36 hrs, Volume= 135,067 cf, Depth> 2.52"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
358,166	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
642,251	64	Weighted Average
642,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

Subcatchment 14S: To Wetland



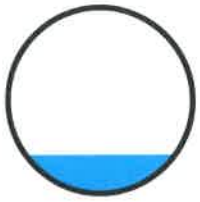
Summary for Reach 15R: DMH 4 TO DMH 5

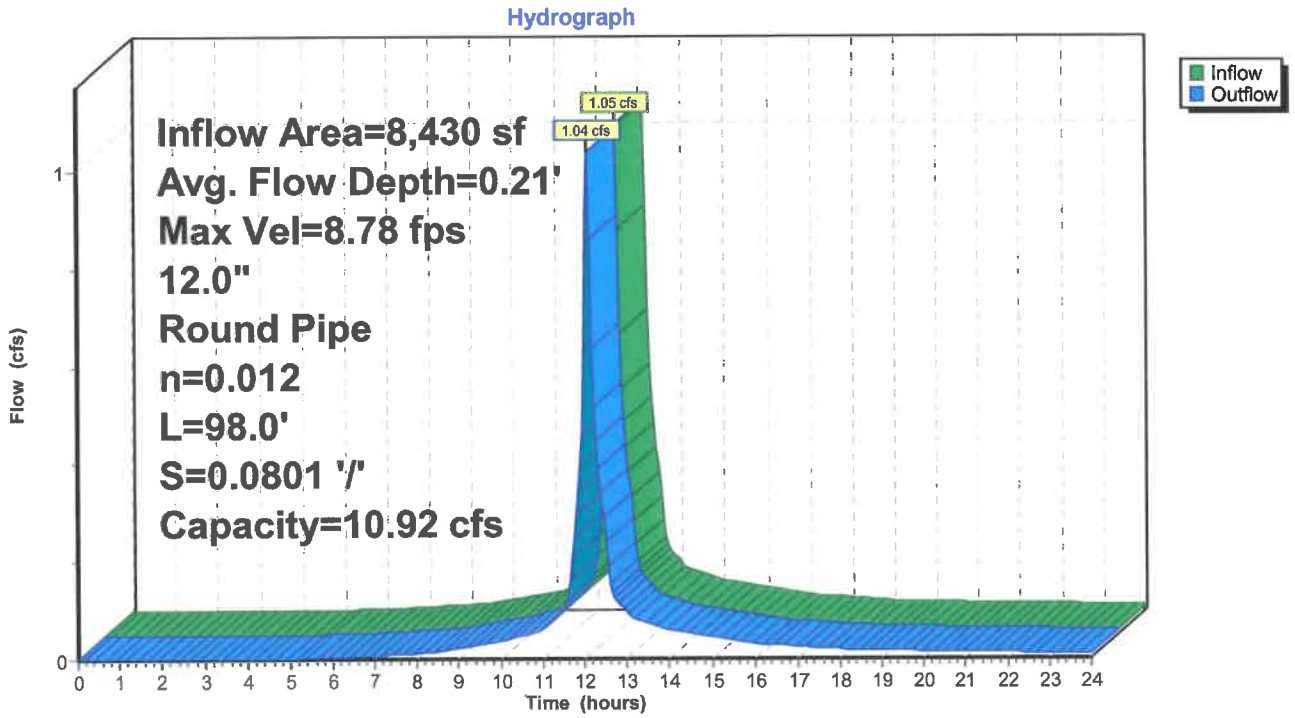
Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 4.87" for 25 YR event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 3,424 cf
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 3,424 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.78 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.90 fps, Avg. Travel Time= 0.6 min

Peak Storage= 12 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.81'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 98.0' Slope= 0.0801 '/'
Inlet Invert= 316.20', Outlet Invert= 308.35'





Summary for Subcatchment 15S: TO BASIN

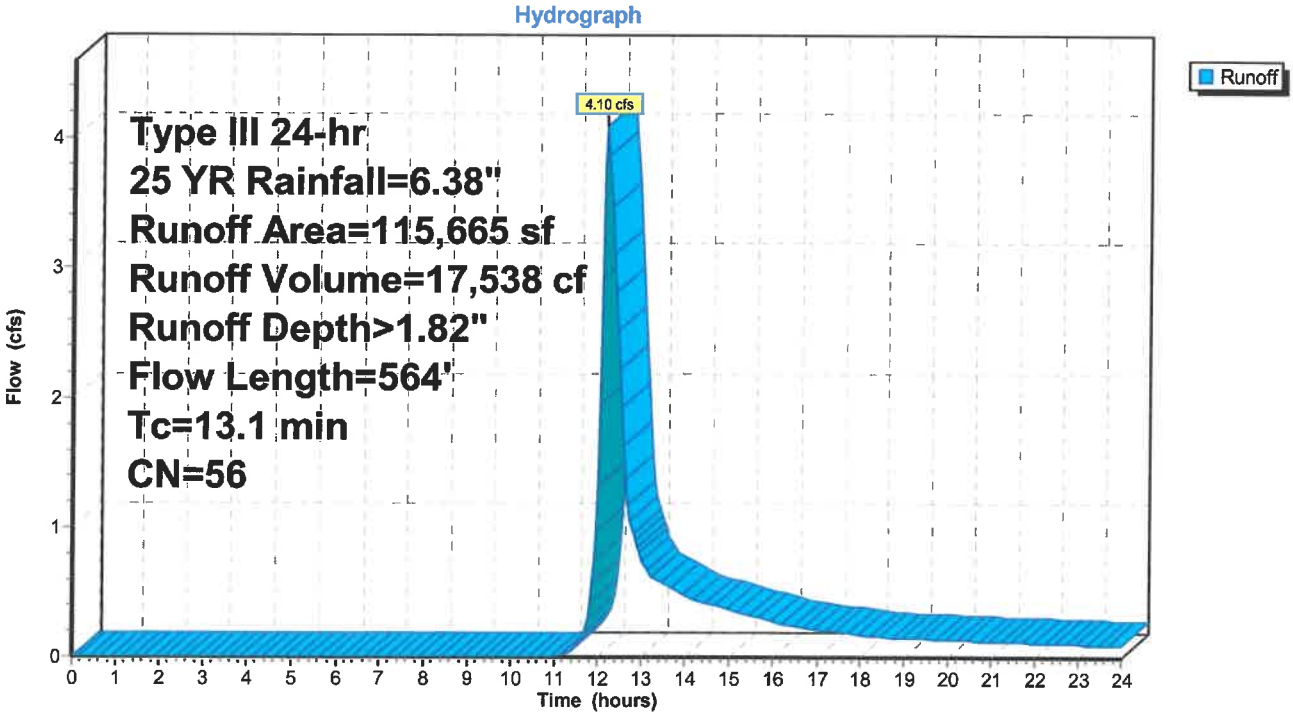
Runoff = 4.10 cfs @ 12.20 hrs, Volume= 17,538 cf, Depth> 1.82"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
94,222	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
115,665	56	Weighted Average
115,665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

Subcatchment 15S: TO BASIN



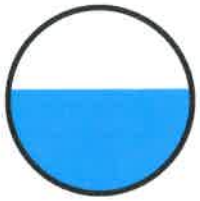
Summary for Reach 16R: DMH 5 TO DMH 6

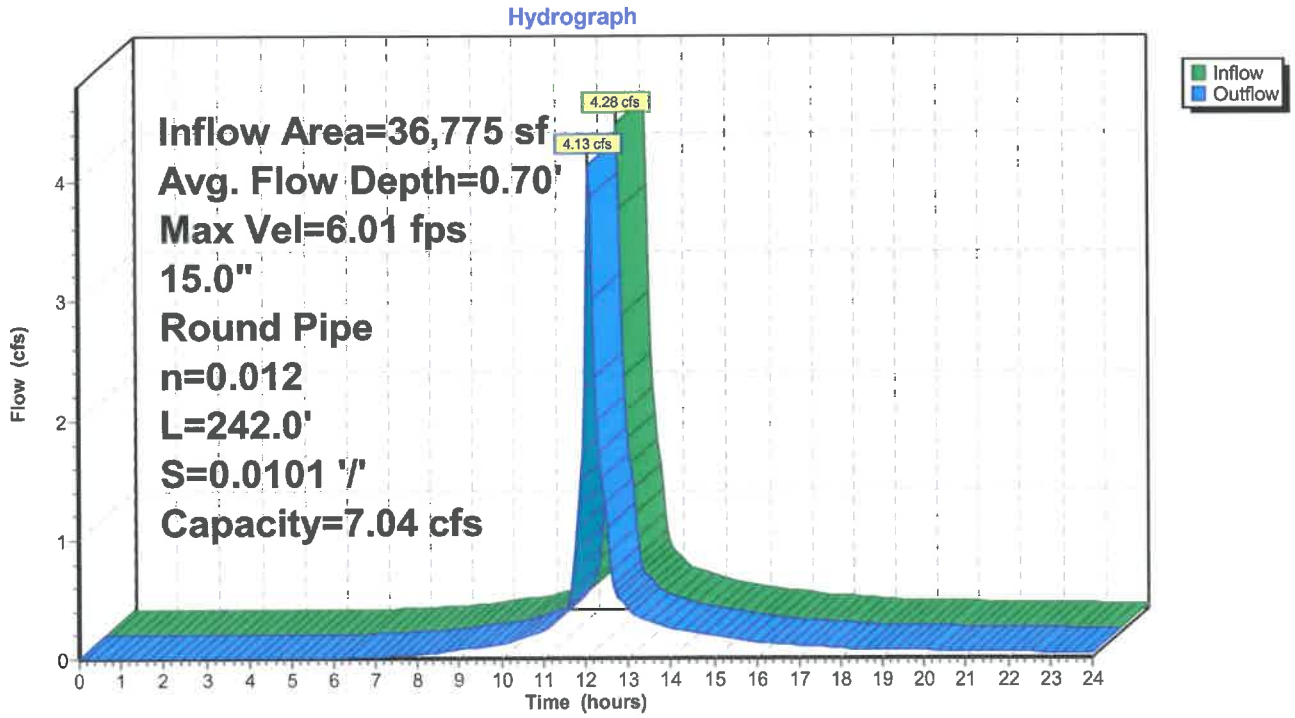
Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.54" for 25 YR event
Inflow = 4.28 cfs @ 12.10 hrs, Volume= 13,903 cf
Outflow = 4.13 cfs @ 12.11 hrs, Volume= 13,895 cf, Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.01 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 2.0 min

Peak Storage= 172 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 1.24'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 242.0' Slope= 0.0101 '/'
Inlet Invert= 308.10', Outlet Invert= 305.65'





Summary for Subcatchment 16S: TO BASIN

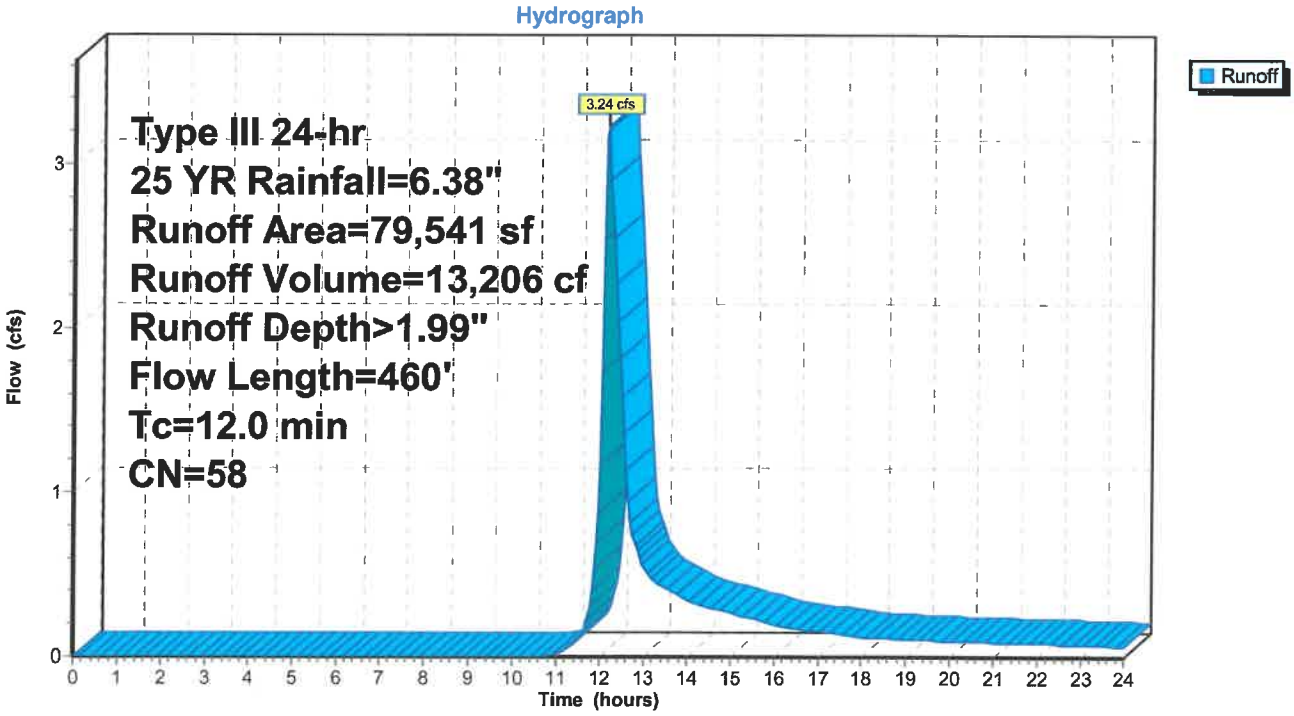
Runoff = 3.24 cfs @ 12.18 hrs, Volume= 13,206 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

Subcatchment 16S: TO BASIN



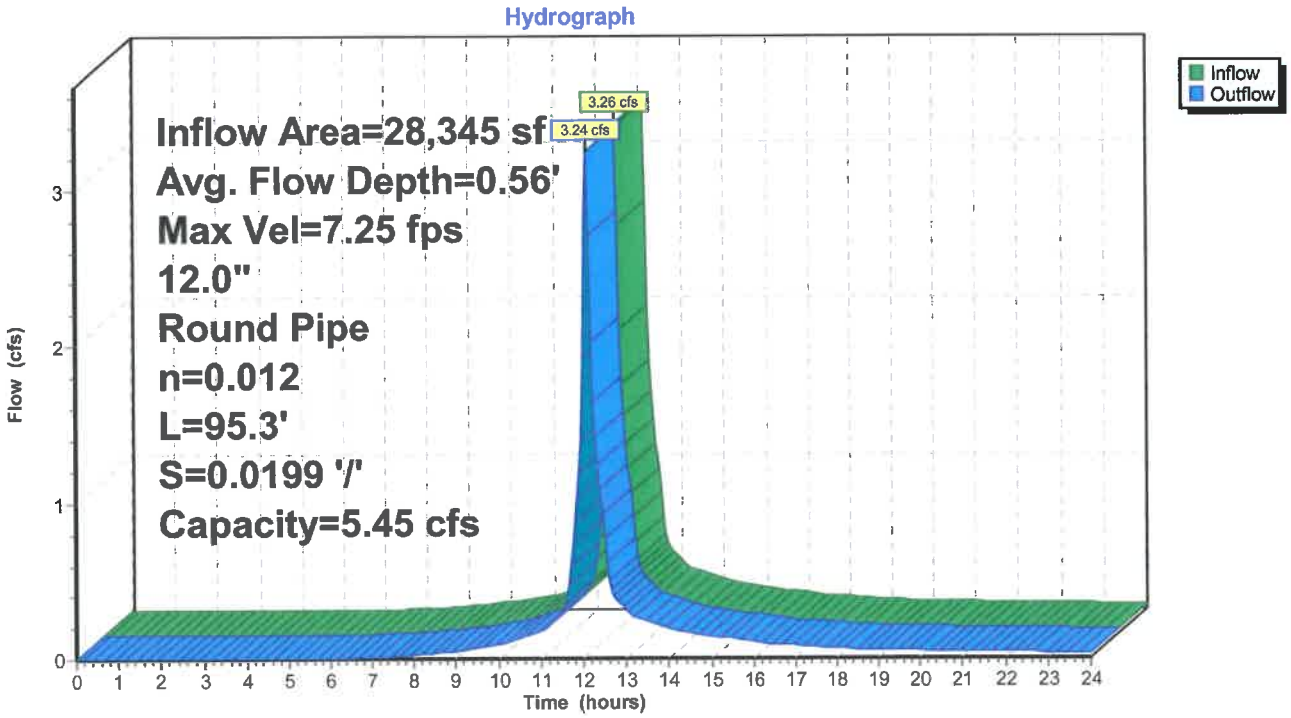
Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 4.44" for 25 YR event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,482 cf
Outflow = 3.24 cfs @ 12.10 hrs, Volume= 10,479 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.25 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.52 fps, Avg. Travel Time= 0.6 min

Peak Storage= 43 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.56' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 95.3' Slope= 0.0199 '/'
Inlet Invert= 310.25', Outlet Invert= 308.35'



Summary for Subcatchment 17S: To Off Site

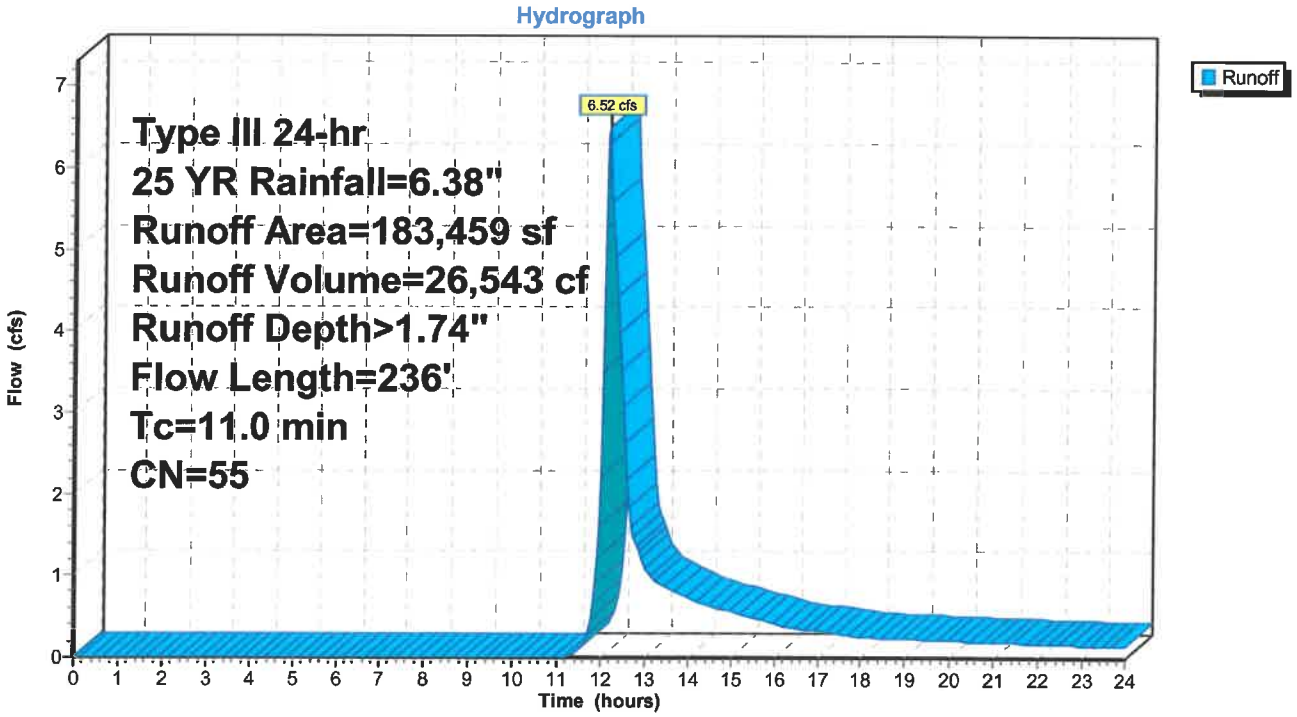
Runoff = 6.52 cfs @ 12.17 hrs, Volume= 26,543 cf, Depth> 1.74"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
183,459	55	Woods, Good, HSG B
183,459		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	236	Total			

Subcatchment 17S: To Off Site



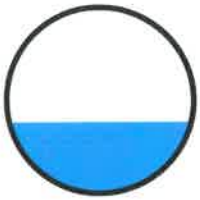
Summary for Reach 18R: CB 10 TO DMH 6

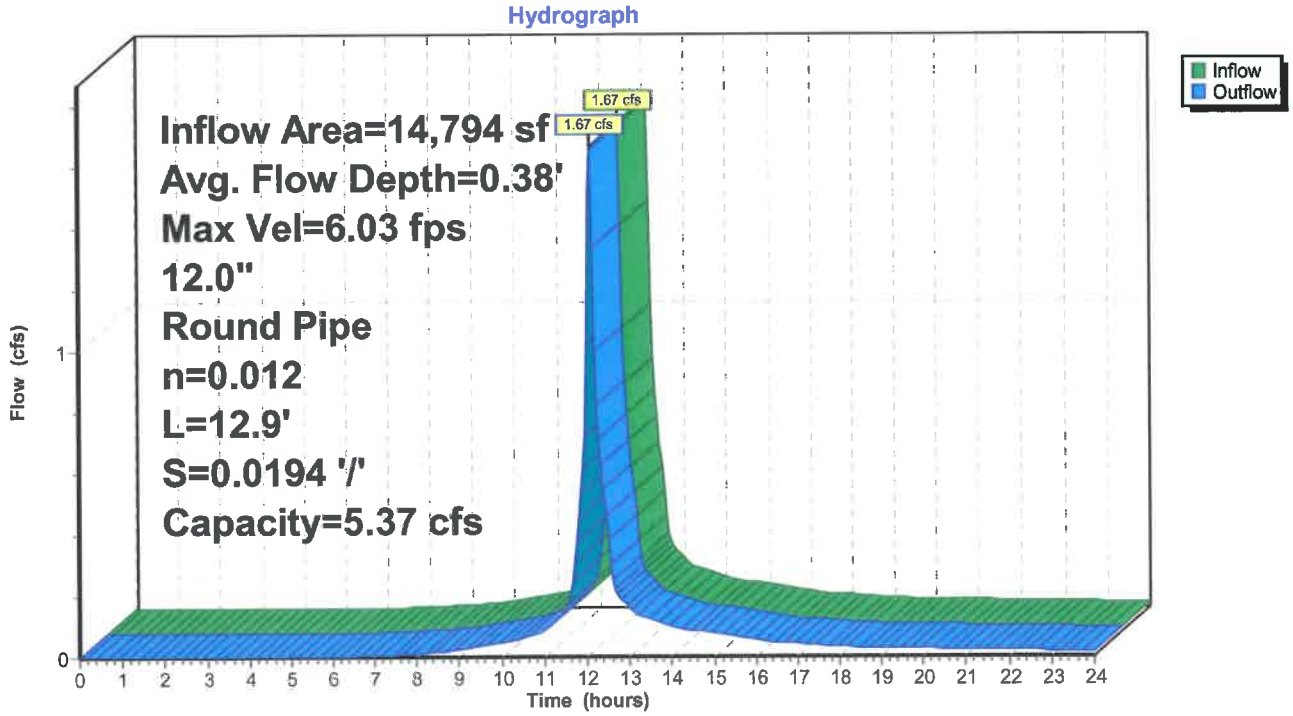
Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 4.33" for 25 YR event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf
Outflow = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.03 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.08 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 0.97'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 12.9' Slope= 0.0194 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'





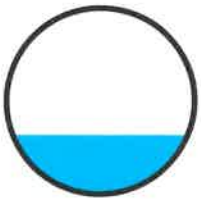
Summary for Reach 19R: CB 9 TO DMH 6

Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 4.55" for 25 YR event
Inflow = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf
Outflow = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf, Atten= 0%, Lag= 0.0 min

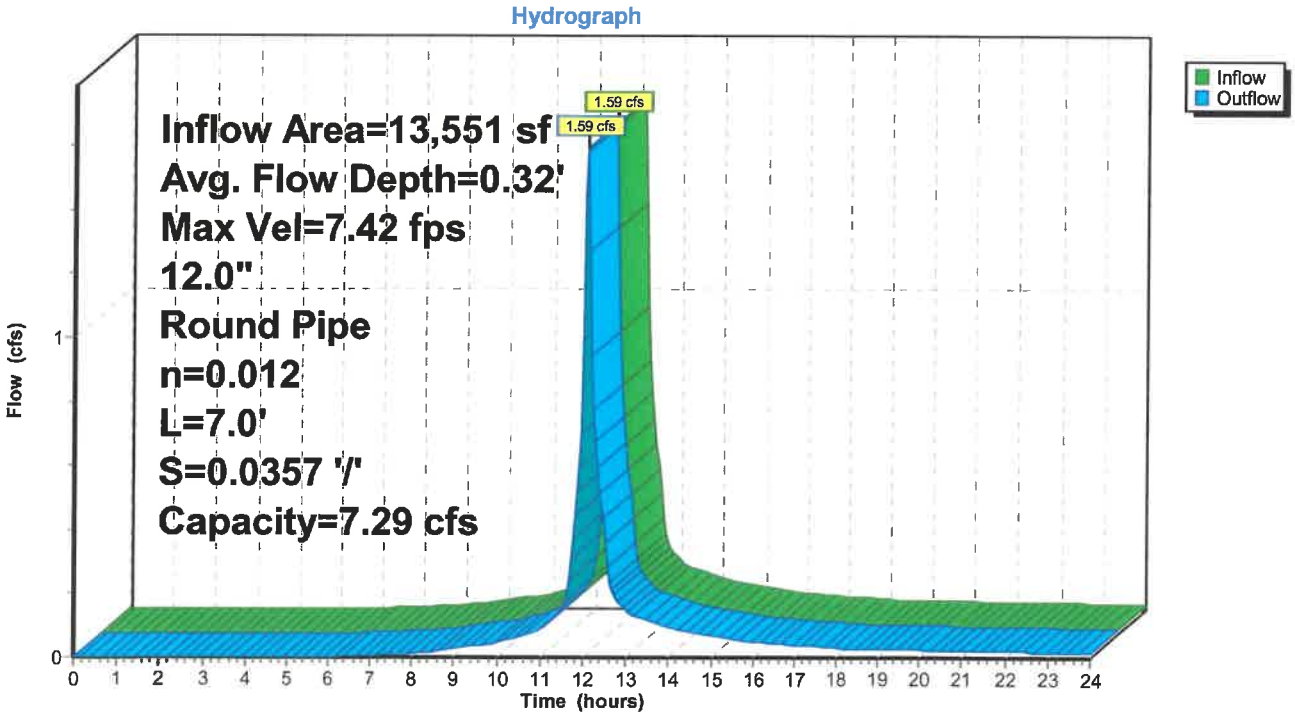
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.42 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.52 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32' , Surface Width= 0.93'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.0' Slope= 0.0357 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'



Reach 19R: CB 9 TO DMH 6



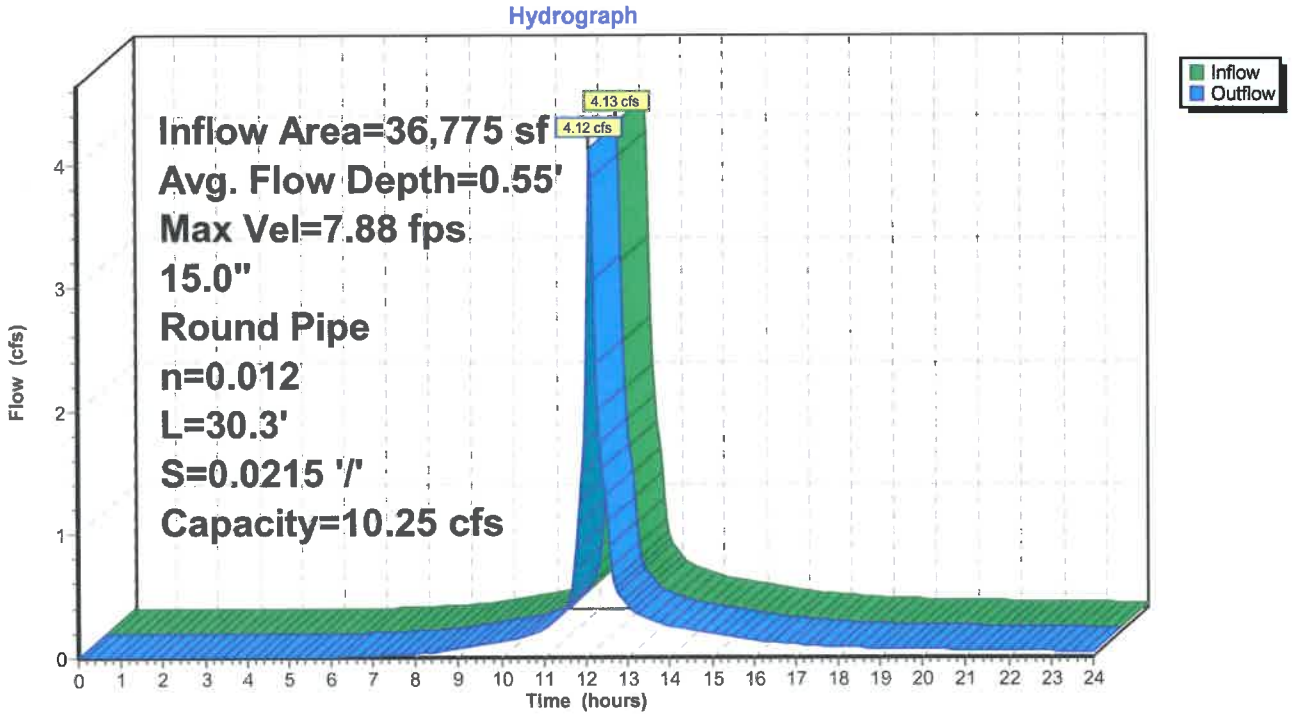
Summary for Reach 20R: DMH 6 to Basin

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.53" for 25 YR event
Inflow = 4.13 cfs @ 12.11 hrs, Volume= 13,895 cf
Outflow = 4.12 cfs @ 12.12 hrs, Volume= 13,894 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.88 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.55' , Surface Width= 1.24'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.3' Slope= 0.0215 '/'
Inlet Invert= 305.65', Outlet Invert= 305.00'



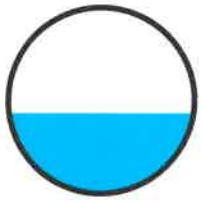
Summary for Reach 21R: 24" ADS

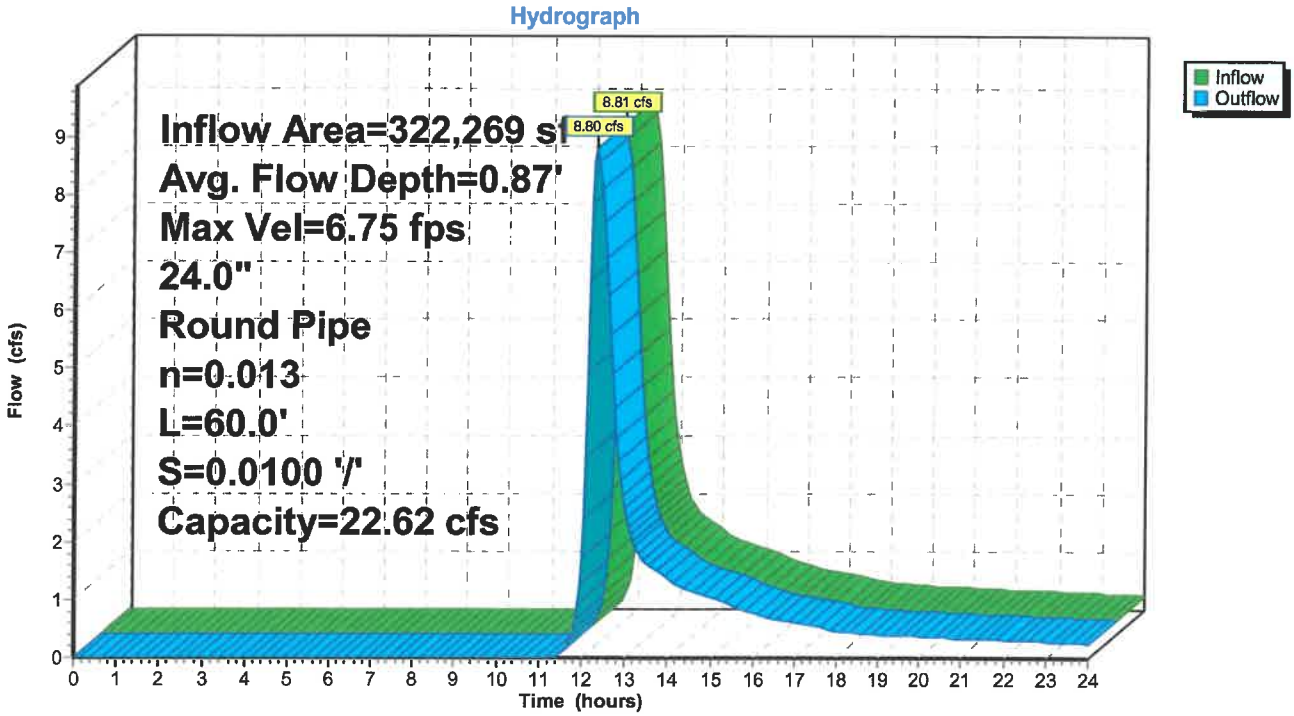
Inflow Area = 322,269 sf, 0.00% Impervious, Inflow Depth > 1.73" for 25 YR event
Inflow = 8.81 cfs @ 12.34 hrs, Volume= 46,472 cf
Outflow = 8.80 cfs @ 12.35 hrs, Volume= 46,463 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.75 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.20 fps, Avg. Travel Time= 0.3 min

Peak Storage= 78 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.87' , Surface Width= 1.98'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 22.62 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 310.00', Outlet Invert= 309.40'



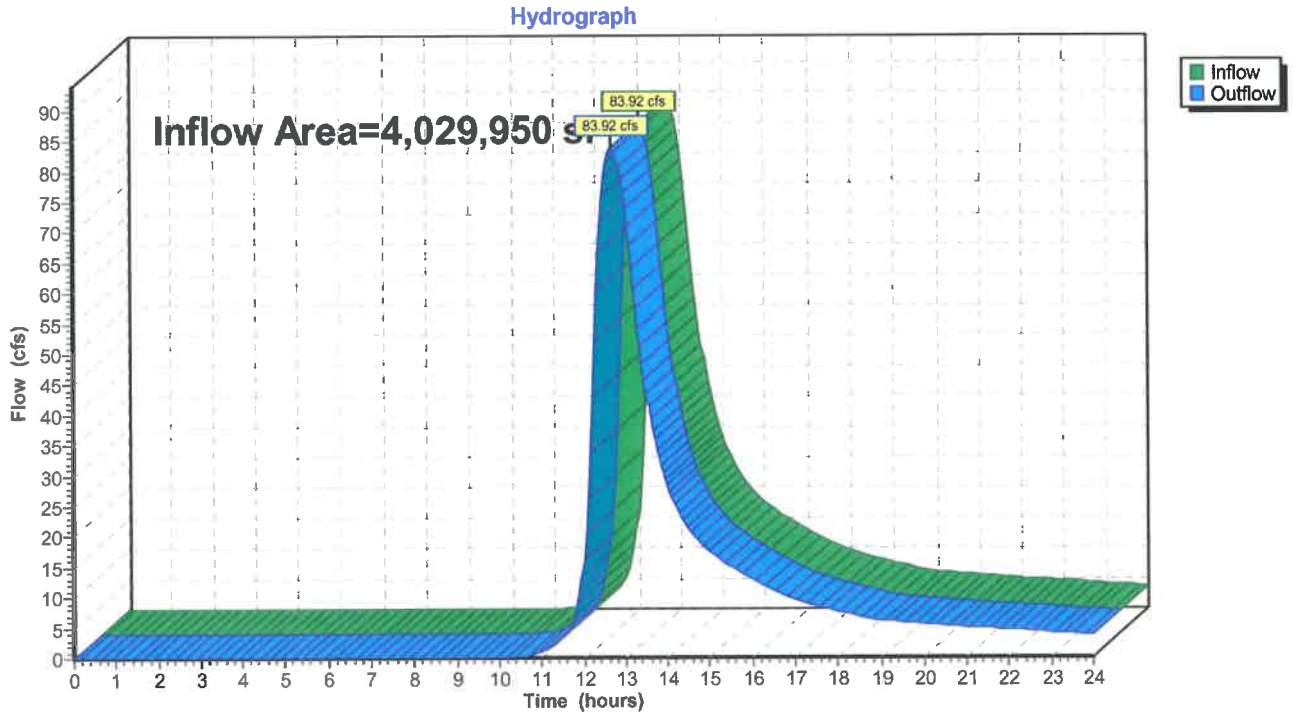


Summary for Reach EV1: To Wetland

Inflow Area = 4,029,950 sf, 4.03% Impervious, Inflow Depth > 2.19" for 25 YR event
Inflow = 83.92 cfs @ 12.69 hrs, Volume= 736,176 cf
Outflow = 83.92 cfs @ 12.69 hrs, Volume= 736,176 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV1: To Wetland



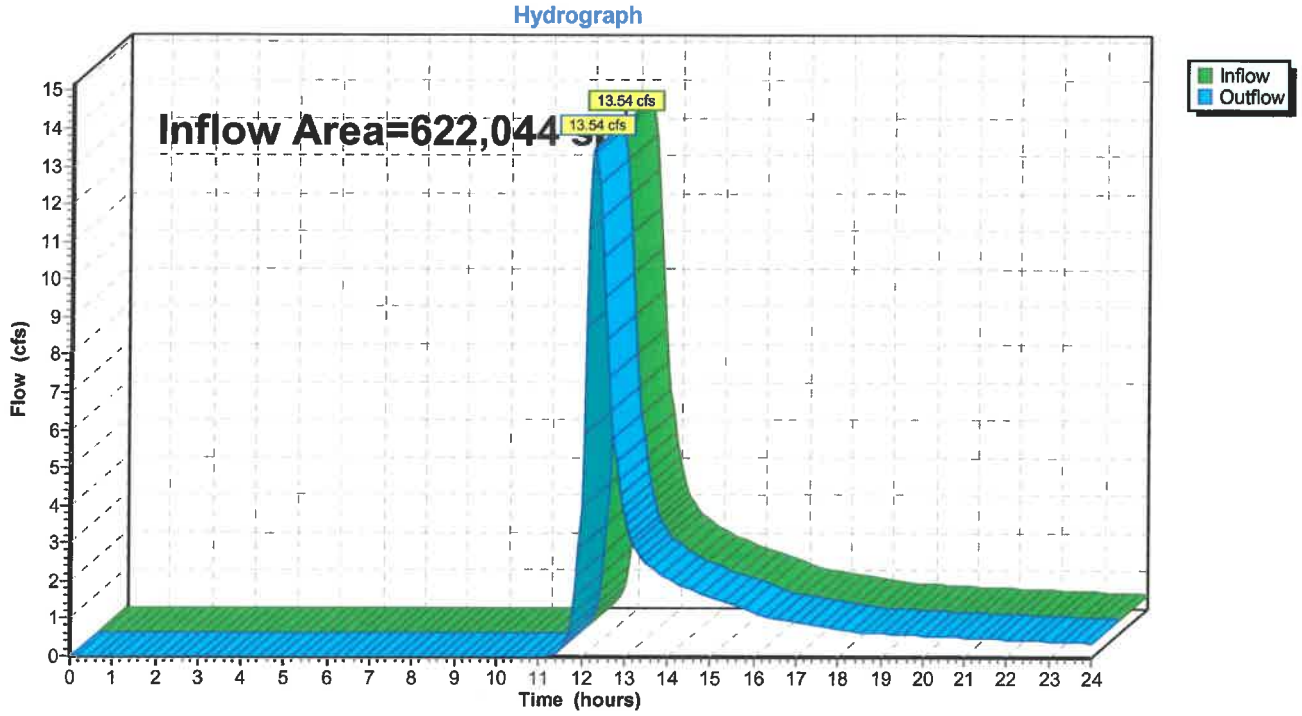
Summary for Reach EV2: To Offsite

Inflow Area = 622,044 sf, 3.64% Impervious, Inflow Depth > 1.41" for 25 YR event
Inflow = 13.54 cfs @ 12.29 hrs, Volume= 73,006 cf
Outflow = 13.54 cfs @ 12.29 hrs, Volume= 73,006 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV2: To Offsite

Hydrograph



Summary for Pond 1P: Forebay

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 6.67" for 100 YR event
Inflow = 5.67 cfs @ 12.15 hrs, Volume= 20,698 cf
Outflow = 5.61 cfs @ 12.15 hrs, Volume= 18,553 cf, Atten= 1%, Lag= 0.2 min
Primary = 5.61 cfs @ 12.15 hrs, Volume= 18,553 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 282.59' @ 12.15 hrs Surf.Area= 1,677 sf Storage= 2,307 cf

Plug-Flow detention time= 80.2 min calculated for 18,553 cf (90% of inflow)
Center-of-Mass det. time= 31.1 min (816.9 - 785.9)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

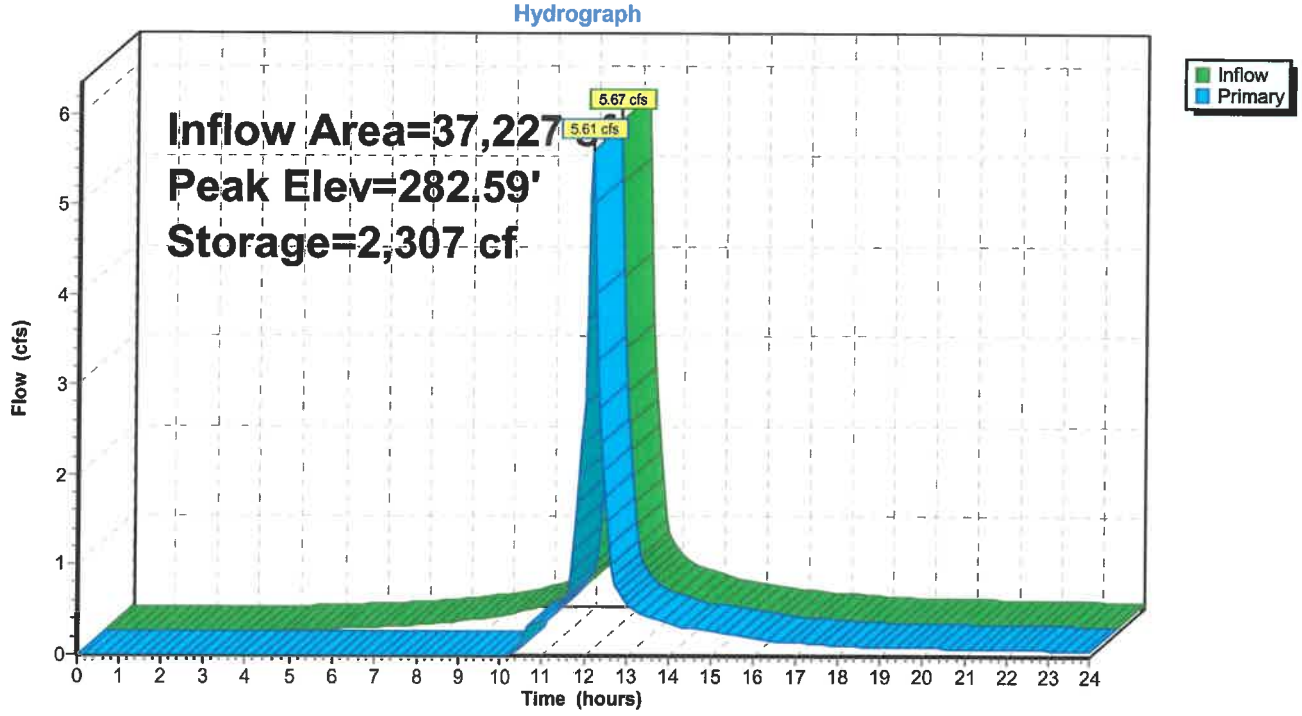
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	282.50'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.38 cfs @ 12.15 hrs HW=282.59' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 5.38 cfs @ 0.99 fps)

Pond 1P: Forebay

Hydrograph



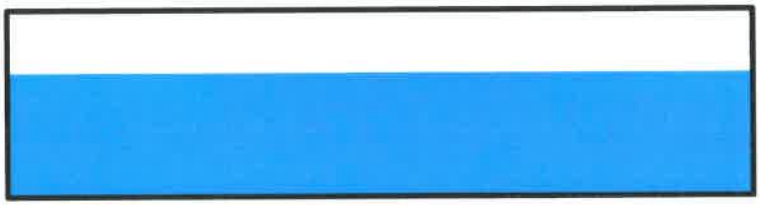
Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 3.54" for 100 YR event
Inflow = 27.16 cfs @ 12.41 hrs, Volume= 145,513 cf
Outflow = 27.14 cfs @ 12.41 hrs, Volume= 145,493 cf, Atten= 0%, Lag= 0.2 min

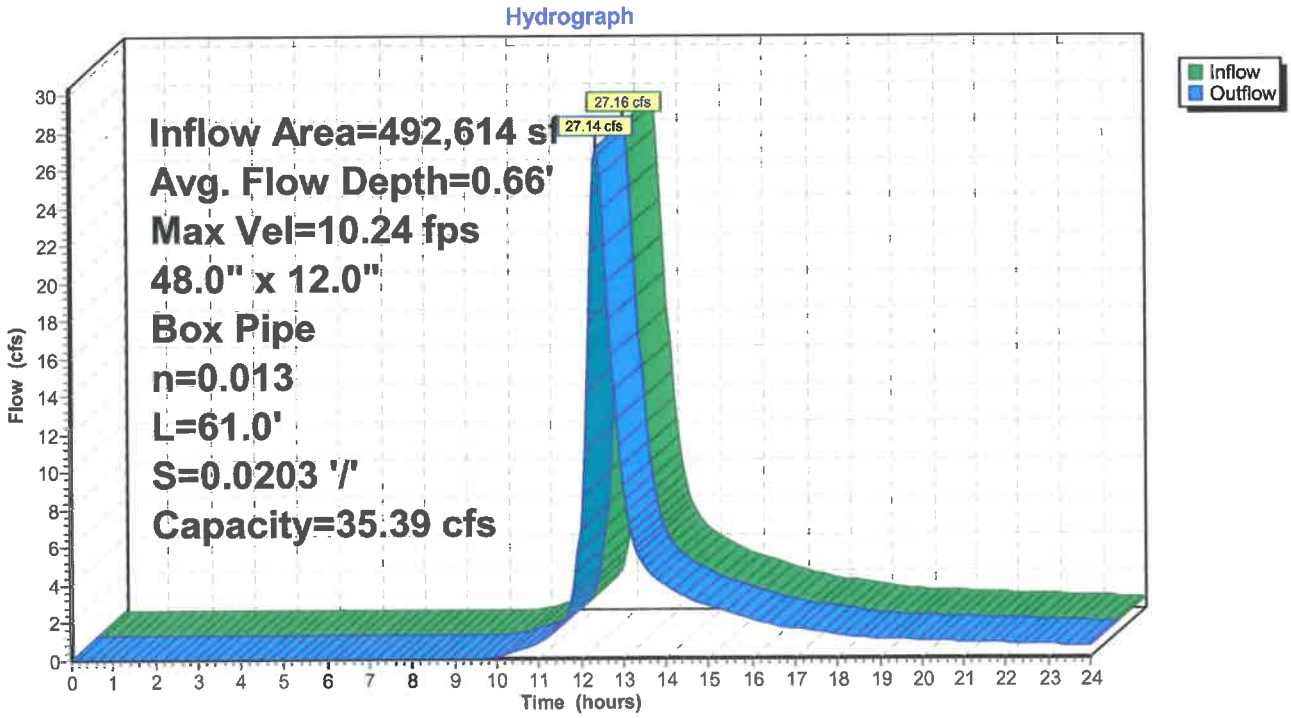
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.24 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.73 fps, Avg. Travel Time= 0.3 min

Peak Storage= 162 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.66' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'



Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

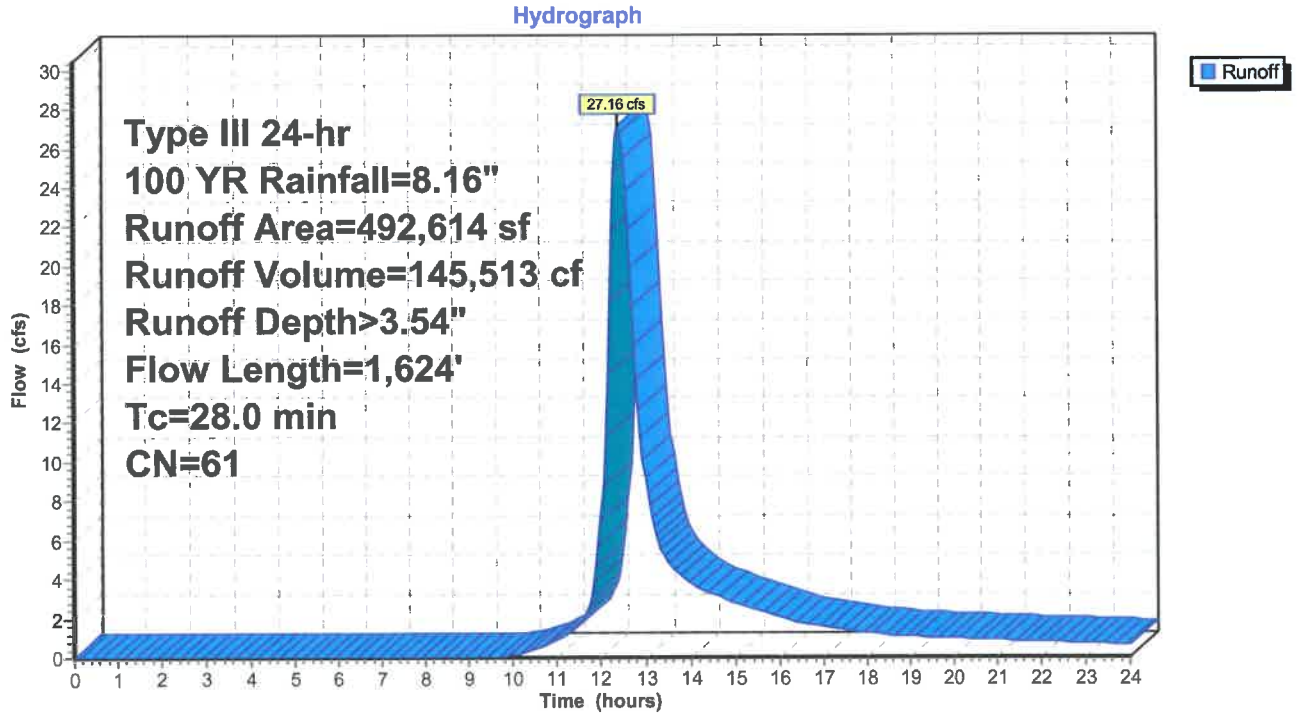
Runoff = 27.16 cfs @ 12.41 hrs, Volume= 145,513 cf, Depth> 3.54"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.5	880	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
28.0	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Pond 2P: Basin 1

Inflow Area = 152,892 sf, 17.50% Impervious, Inflow Depth > 3.72" for 100 YR event
Inflow = 12.53 cfs @ 12.17 hrs, Volume= 47,432 cf
Outflow = 0.25 cfs @ 21.88 hrs, Volume= 10,788 cf, Atten= 98%, Lag= 582.4 min
Discarded = 0.25 cfs @ 21.88 hrs, Volume= 10,788 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 286.66' @ 21.88 hrs Surf.Area= 8,665 sf Storage= 36,842 cf

Plug-Flow detention time= 361.3 min calculated for 10,788 cf (23% of inflow)
Center-of-Mass det. time= 226.3 min (1,068.9 - 842.6)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

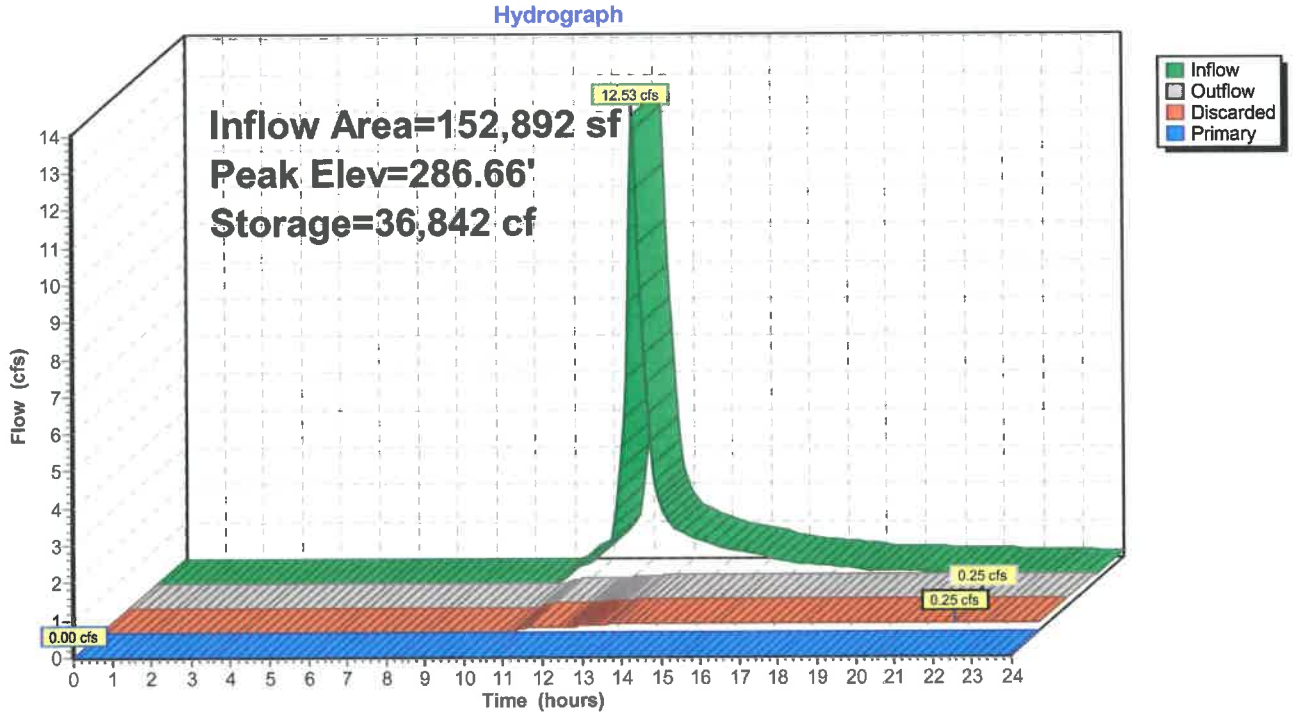
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	288.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	281.00'	**1.100 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.25 cfs @ 21.88 hrs HW=286.66' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Basin 1



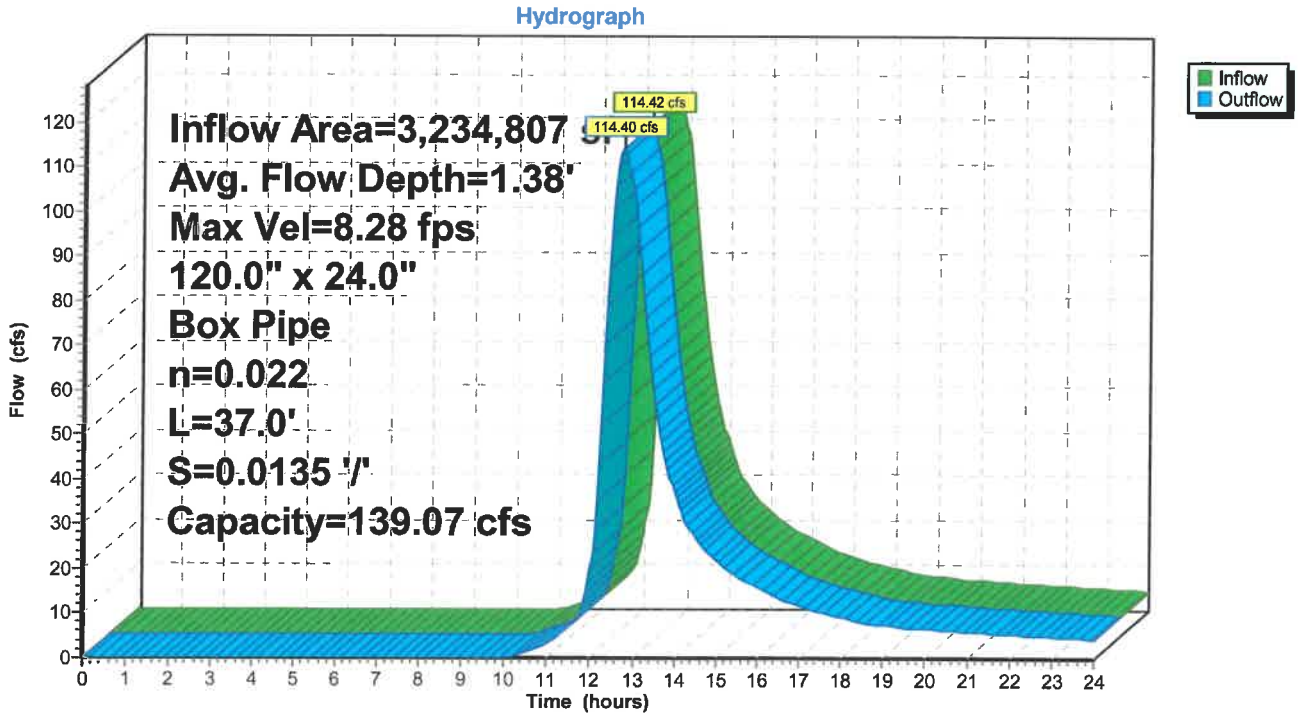
Summary for Reach 2R: Culvert

Inflow Area = 3,234,807 sf, 4.20% Impervious, Inflow Depth > 3.52" for 100 YR event
Inflow = 114.42 cfs @ 12.79 hrs, Volume= 948,621 cf
Outflow = 114.40 cfs @ 12.79 hrs, Volume= 948,535 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.28 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.55 fps, Avg. Travel Time= 0.2 min

Peak Storage= 511 cf @ 12.79 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 10.00'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 139.07 cfs

120.0" W x 24.0" H Box Pipe
n= 0.022 Earth, clean & straight
Length= 37.0' Slope= 0.0135 '/'
Inlet Invert= 292.00', Outlet Invert= 291.50'



Summary for Subcatchment 2S: To Proposed Culvert

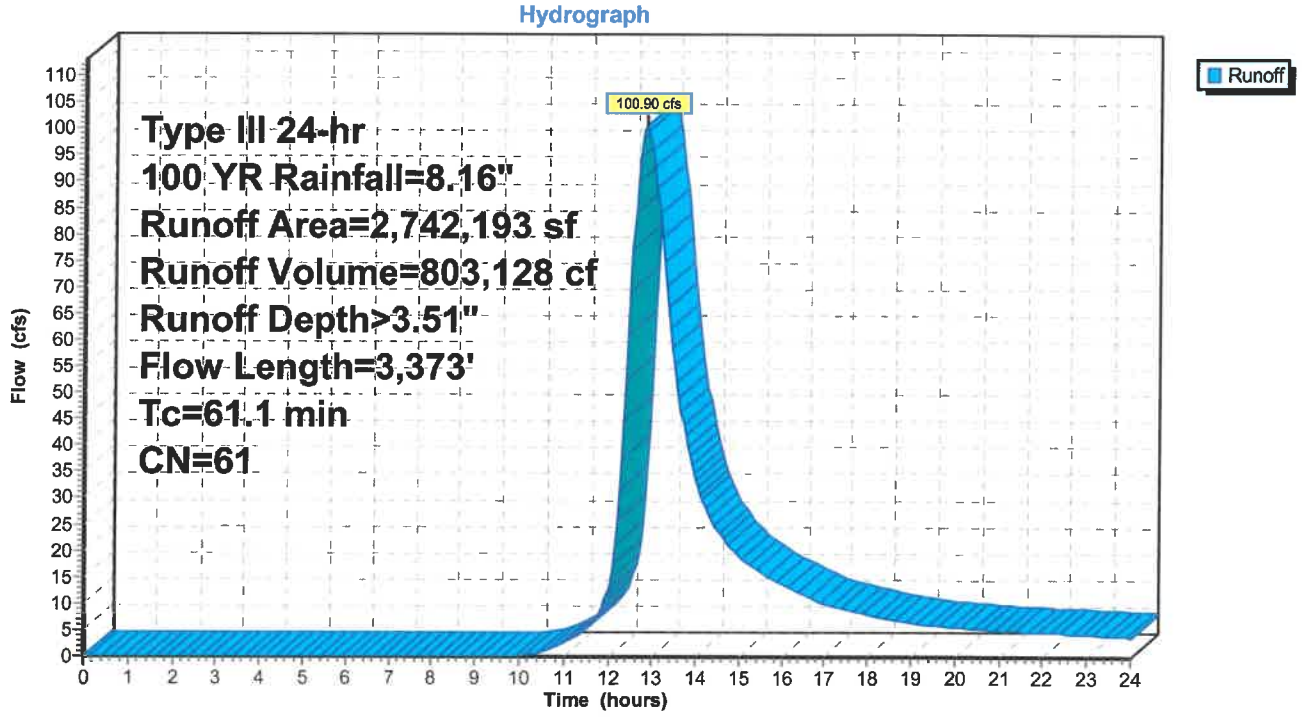
Runoff = 100.90 cfs @ 12.85 hrs, Volume= 803,128 cf, Depth> 3.51"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
1,862,663	55	Woods, Good, HSG B
533,264	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,742,193	61	Weighted Average
2,655,501		96.84% Pervious Area
86,692		3.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.9	366	0.1000	1.58		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
47.4	2,957	0.0100	1.04	1.25	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
61.1	3,373	Total			

Subcatchment 2S: To Proposed Culvert



Summary for Pond 3P: Forebay

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 6.23" for 100 YR event
Inflow = 5.59 cfs @ 12.11 hrs, Volume= 19,077 cf
Outflow = 5.56 cfs @ 12.12 hrs, Volume= 16,811 cf, Atten= 1%, Lag= 0.4 min
Primary = 5.56 cfs @ 12.12 hrs, Volume= 16,811 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 305.59' @ 12.12 hrs Surf.Area= 1,785 sf Storage= 2,417 cf

Plug-Flow detention time= 85.1 min calculated for 16,811 cf (88% of inflow)
Center-of-Mass det. time= 31.0 min (825.1 - 794.1)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

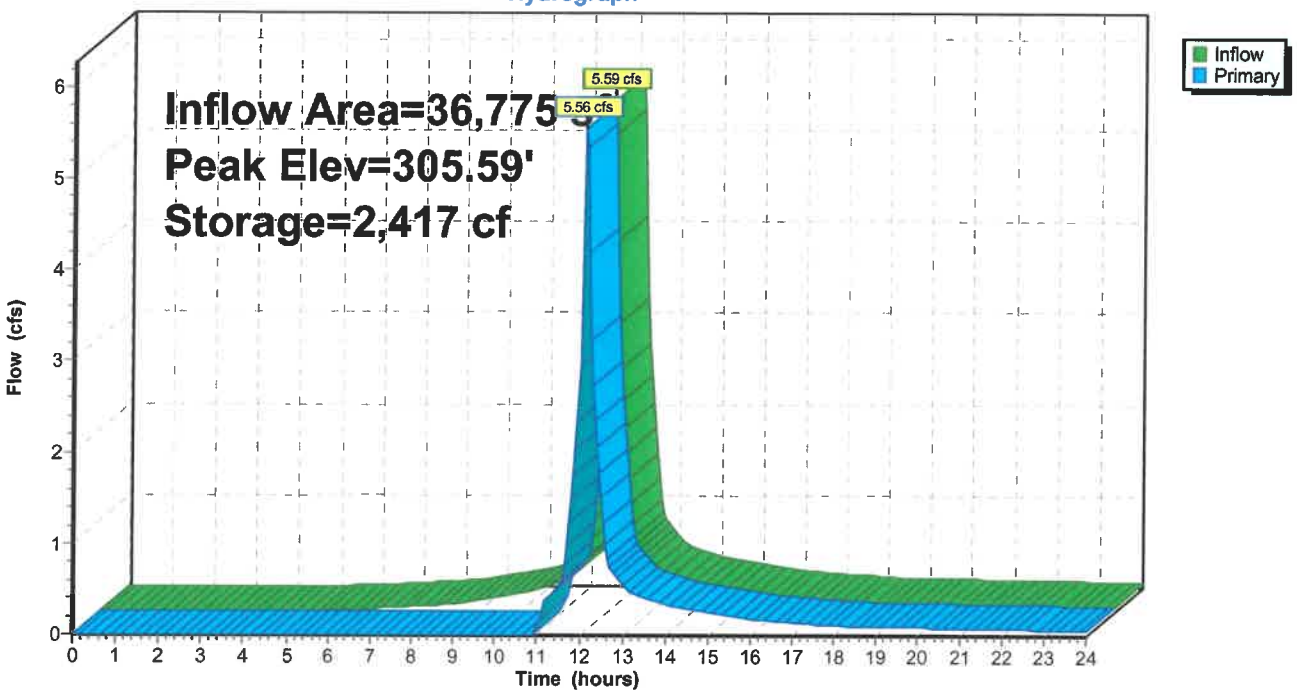
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	**65.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.30 cfs @ 12.12 hrs HW=305.59' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 5.30 cfs @ 0.96 fps)

Pond 3P: Forebay

Hydrograph



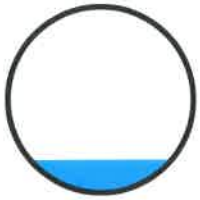
Summary for Reach 3R: CB1 to DMH 1

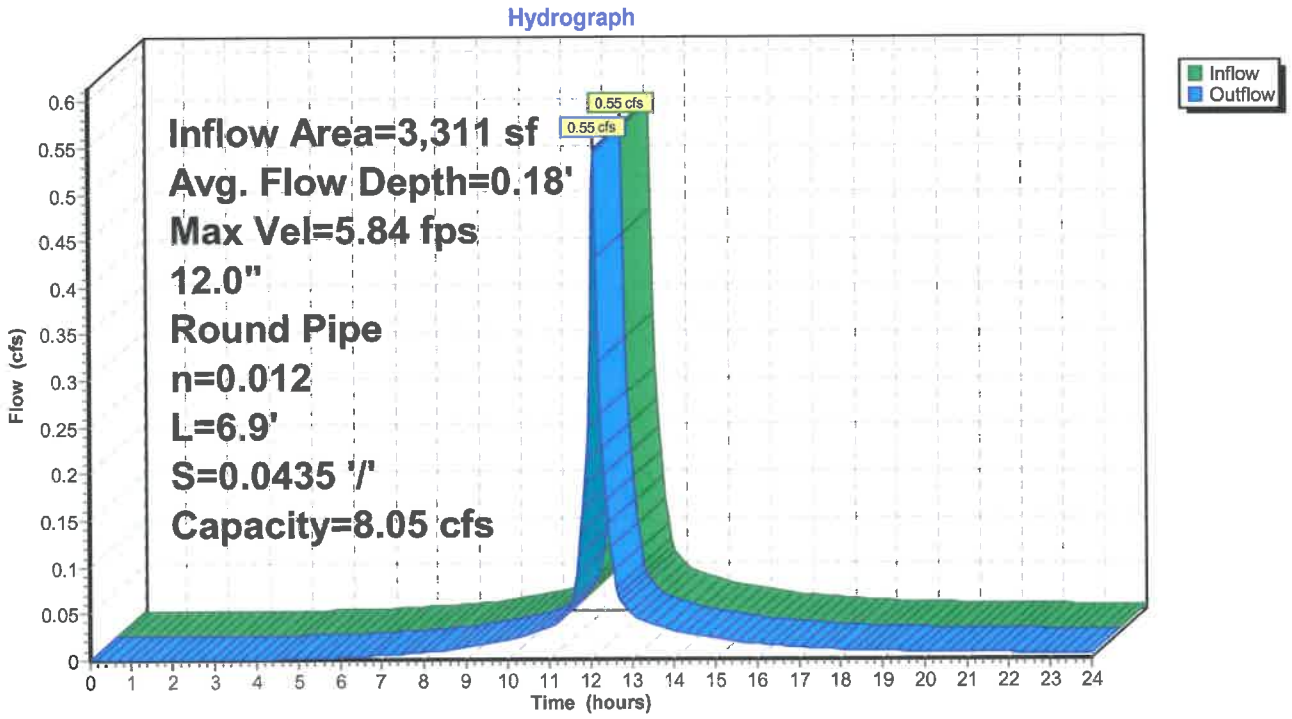
Inflow Area = 3,311 sf, 69.56% Impervious, Inflow Depth > 6.60" for 100 YR event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,821 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,821 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.84 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 0.76'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'





Summary for Subcatchment 3S: To 24" ADS

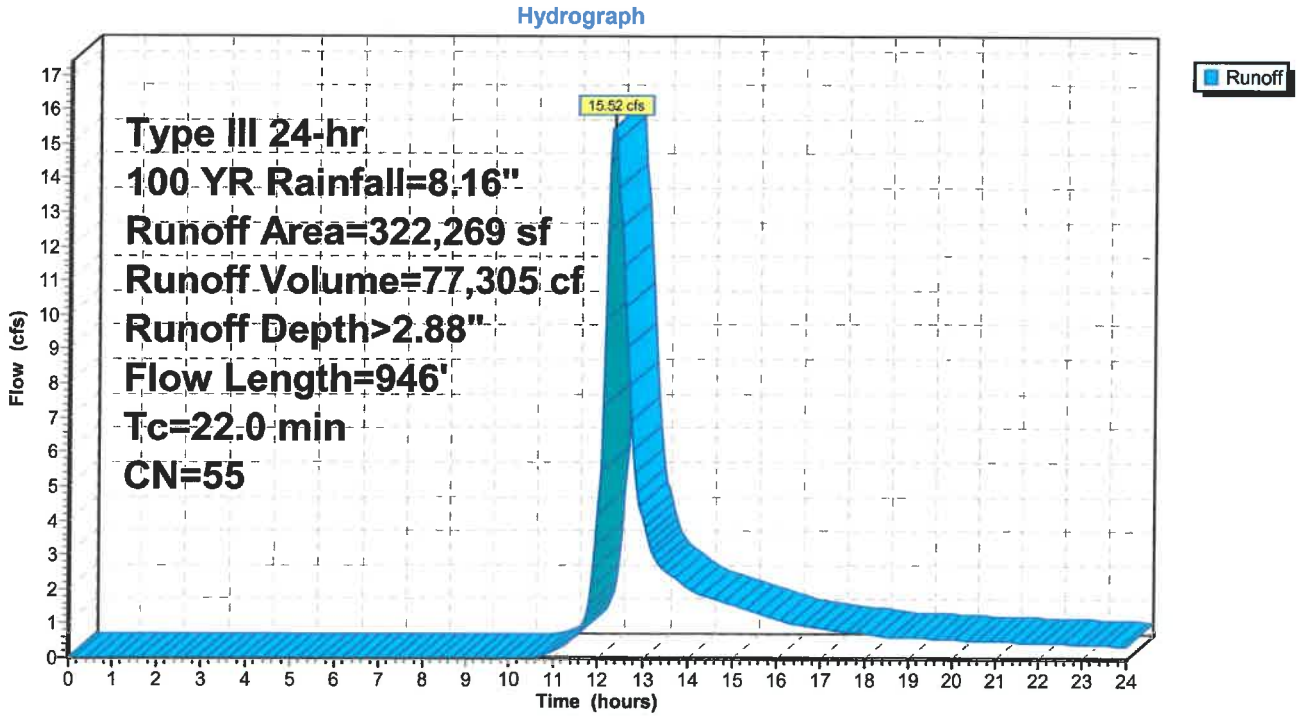
Runoff = 15.52 cfs @ 12.33 hrs, Volume= 77,305 cf, Depth> 2.88"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
322,269	55	Woods, Good, HSG B
322,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.0	946	Total			

Subcatchment 3S: To 24" ADS



Summary for Pond 4P: Basin 2

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 3.94" for 100 YR event
Inflow = 10.73 cfs @ 12.15 hrs, Volume= 38,156 cf
Outflow = 0.25 cfs @ 19.17 hrs, Volume= 11,346 cf, Atten= 98%, Lag= 421.5 min
Discarded = 0.25 cfs @ 19.17 hrs, Volume= 11,346 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 307.30' @ 19.17 hrs Surf.Area= 9,875 sf Storage= 27,694 cf

Plug-Flow detention time= 346.7 min calculated for 11,323 cf (30% of inflow)
Center-of-Mass det. time= 221.0 min (1,062.0 - 841.0)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	45,905 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

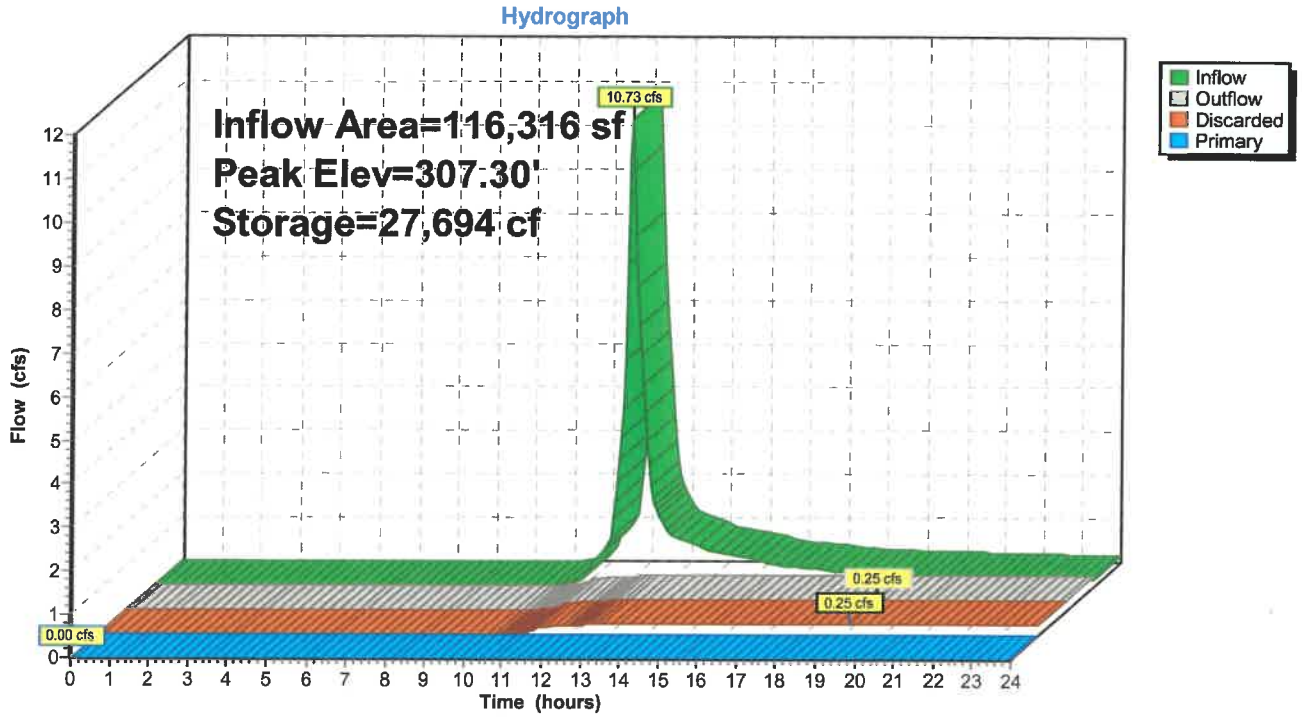
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	304.00'	**1.100 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.25 cfs @ 19.17 hrs HW=307.30' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Basin 2



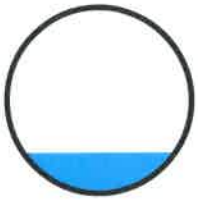
Summary for Reach 4R: CB2 to DMH 1

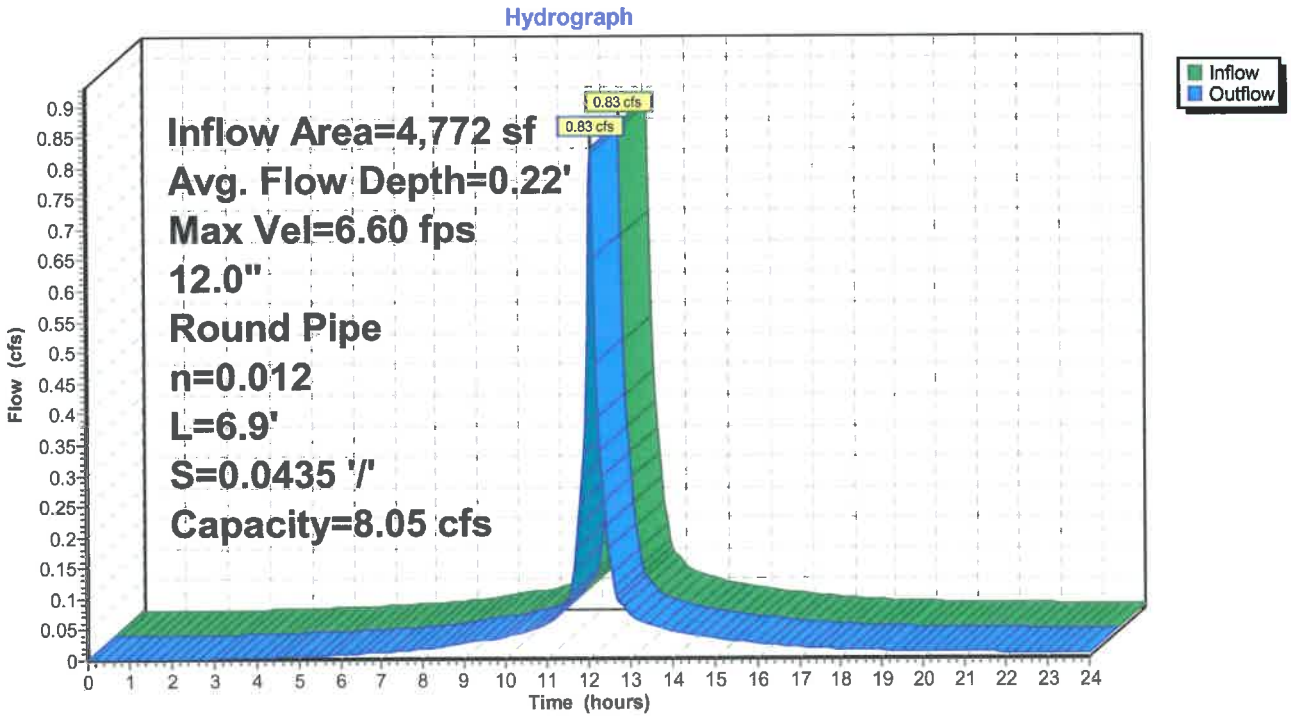
Inflow Area = 4,772 sf, 83.28% Impervious, Inflow Depth > 7.20" for 100 YR event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 2,862 cf
Outflow = 0.83 cfs @ 12.09 hrs, Volume= 2,862 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.60 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.17 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 0.82'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'





Summary for Subcatchment 4S: To CB 1

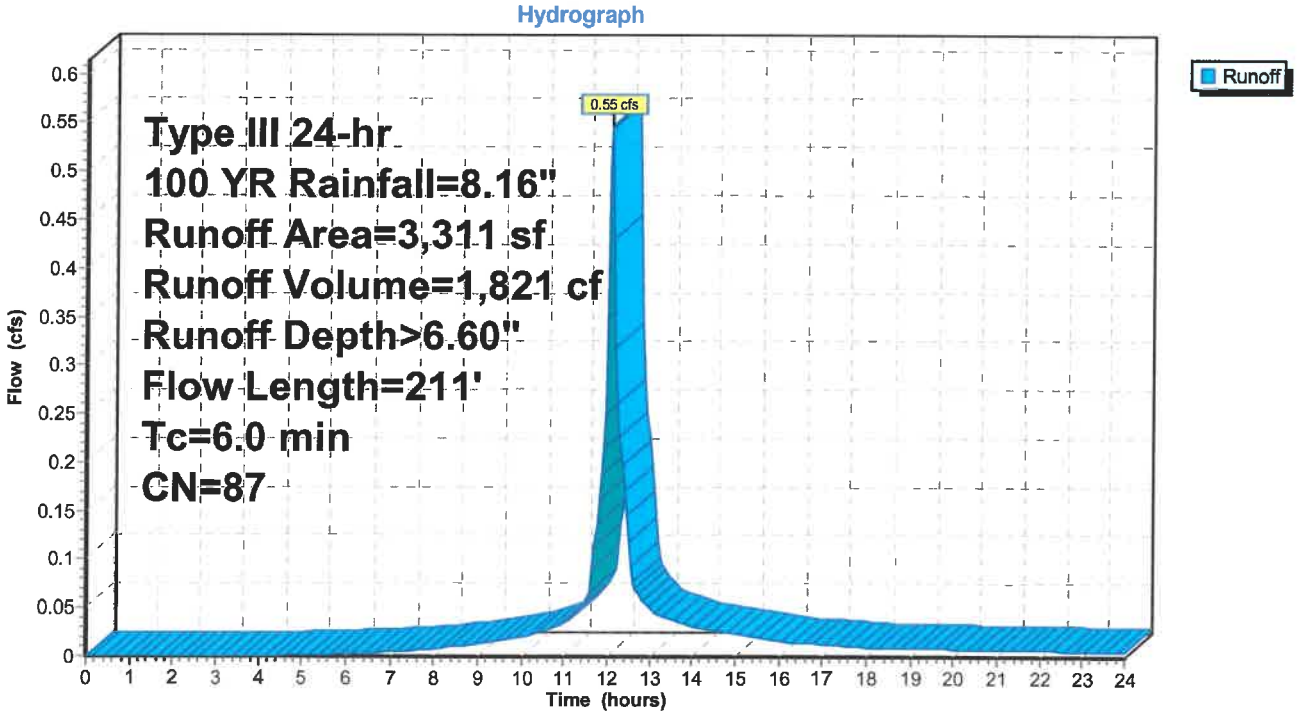
Runoff = 0.55 cfs @ 12.09 hrs, Volume= 1,821 cf, Depth> 6.60"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
2,303	98	Paved roads w/curbs & sewers, HSG B
1,008	61	>75% Grass cover, Good, HSG B
3,311	87	Weighted Average
1,008		30.44% Pervious Area
2,303		69.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.0	161	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	211	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: To CB 1



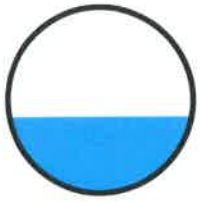
Summary for Reach 5R: DMH1 to DMH 2

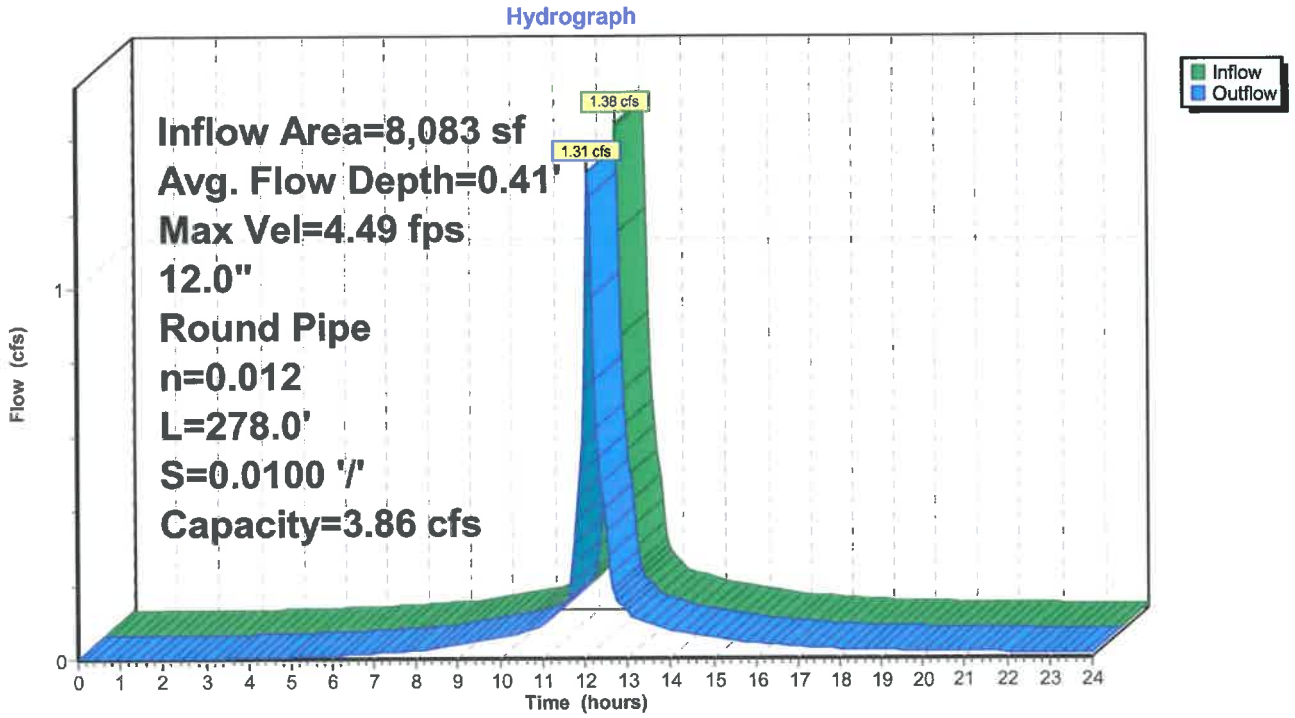
Inflow Area = 8,083 sf, 77.66% Impervious, Inflow Depth > 6.95" for 100 YR event
Inflow = 1.38 cfs @ 12.09 hrs, Volume= 4,683 cf
Outflow = 1.31 cfs @ 12.12 hrs, Volume= 4,679 cf, Atten= 5%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.49 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 3.1 min

Peak Storage= 85 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 0.98'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 278.0' Slope= 0.0100 '/'
Inlet Invert= 290.68', Outlet Invert= 287.90'





Summary for Subcatchment 5S: To CB 2

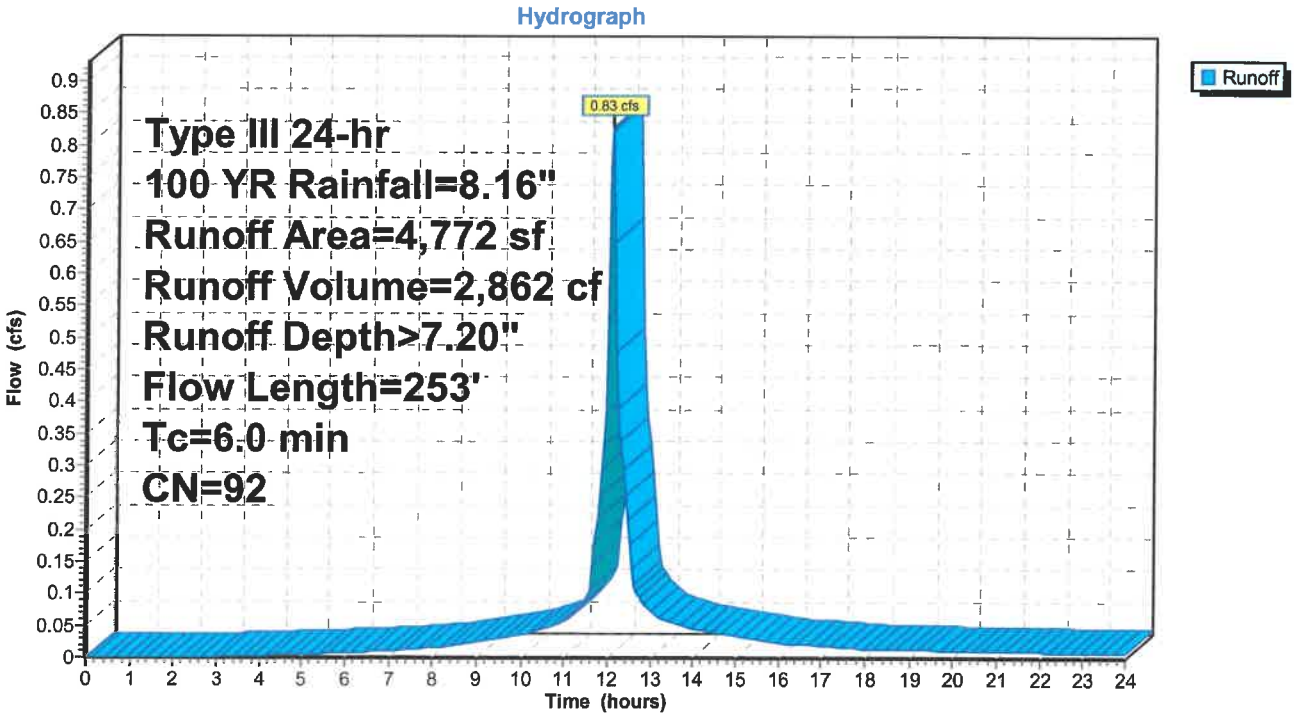
Runoff = 0.83 cfs @ 12.09 hrs, Volume= 2,862 cf, Depth> 7.20"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
3,974	98	Paved roads w/curbs & sewers, HSG B
798	61	>75% Grass cover, Good, HSG B
4,772	92	Weighted Average
798		16.72% Pervious Area
3,974		83.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.2	203	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	253	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: To CB 2



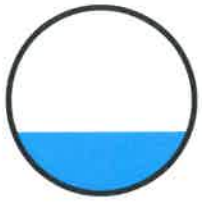
Summary for Reach 6R: CB3 to DMH 2

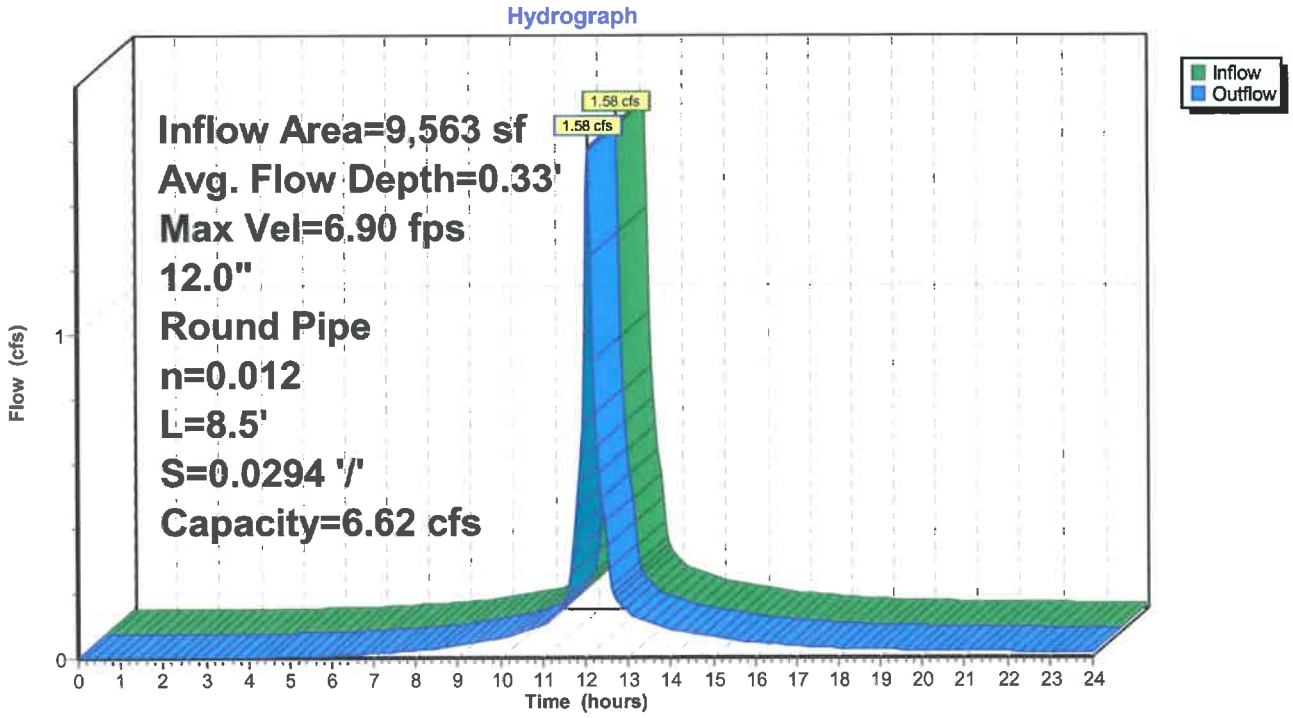
Inflow Area = 9,563 sf, 69.08% Impervious, Inflow Depth > 6.60" for 100 YR event
Inflow = 1.58 cfs @ 12.09 hrs, Volume= 5,260 cf
Outflow = 1.58 cfs @ 12.09 hrs, Volume= 5,260 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.90 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.30 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.62 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 8.5' Slope= 0.0294 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'





Summary for Subcatchment 6S: To CB 3

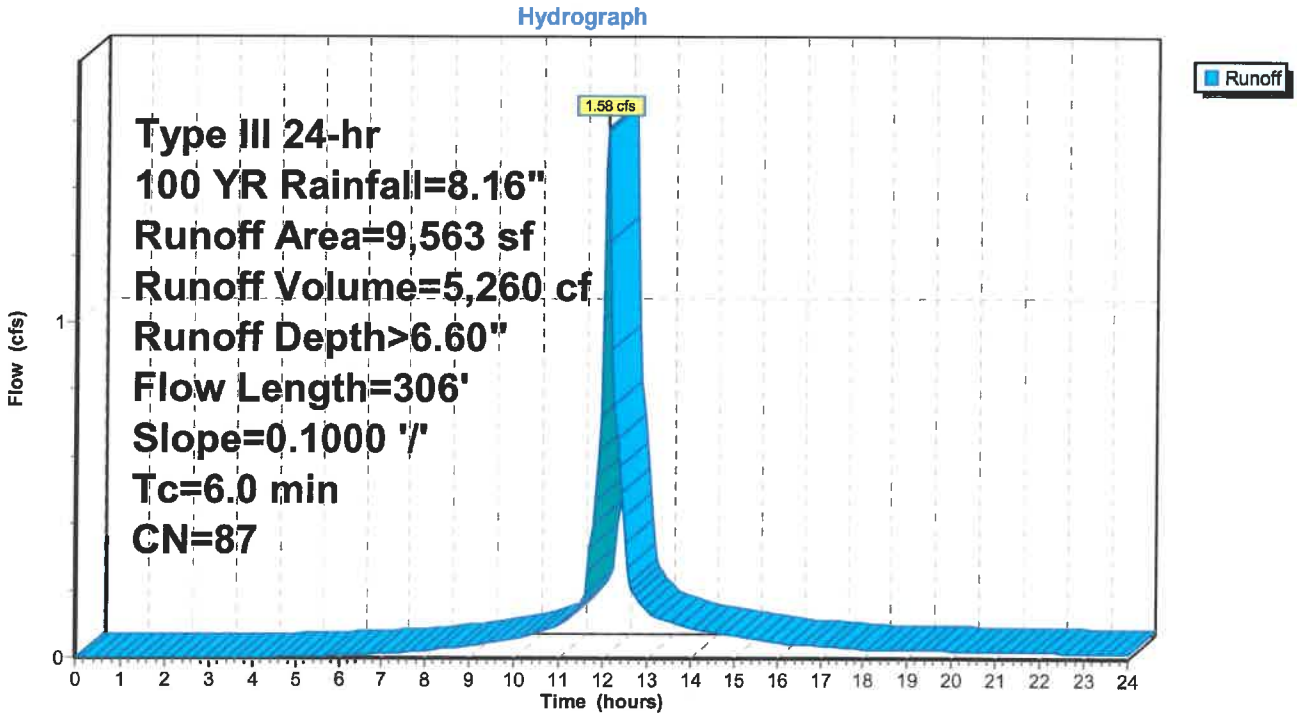
Runoff = 1.58 cfs @ 12.09 hrs, Volume= 5,260 cf, Depth> 6.60"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
2,957	61	>75% Grass cover, Good, HSG B
9,563	87	Weighted Average
2,957		30.92% Pervious Area
6,606		69.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6S: To CB 3



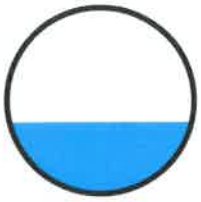
Summary for Reach 7R: CB4 to DMH 2

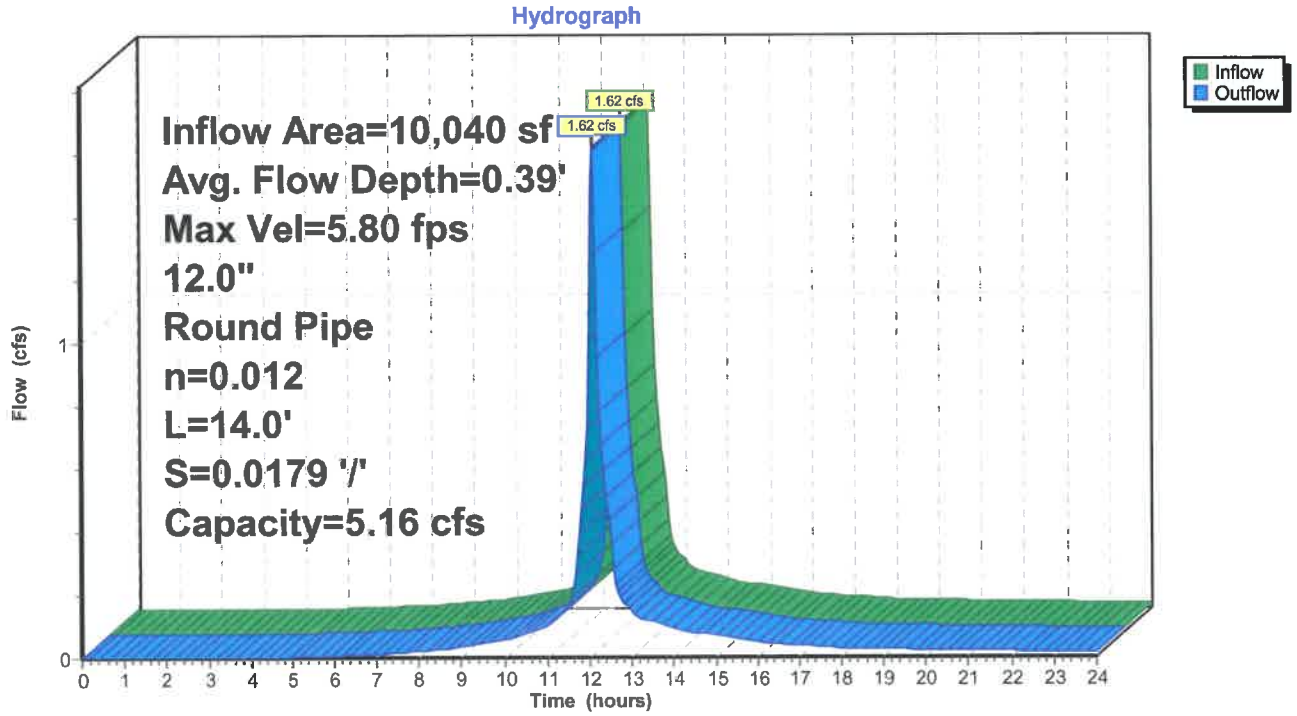
Inflow Area = 10,040 sf, 65.80% Impervious, Inflow Depth > 6.36" for 100 YR event
Inflow = 1.62 cfs @ 12.09 hrs, Volume= 5,324 cf
Outflow = 1.62 cfs @ 12.09 hrs, Volume= 5,324 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.80 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.95 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 0.97'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.16 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 14.0' Slope= 0.0179 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'





Summary for Subcatchment 7S: To CB 4

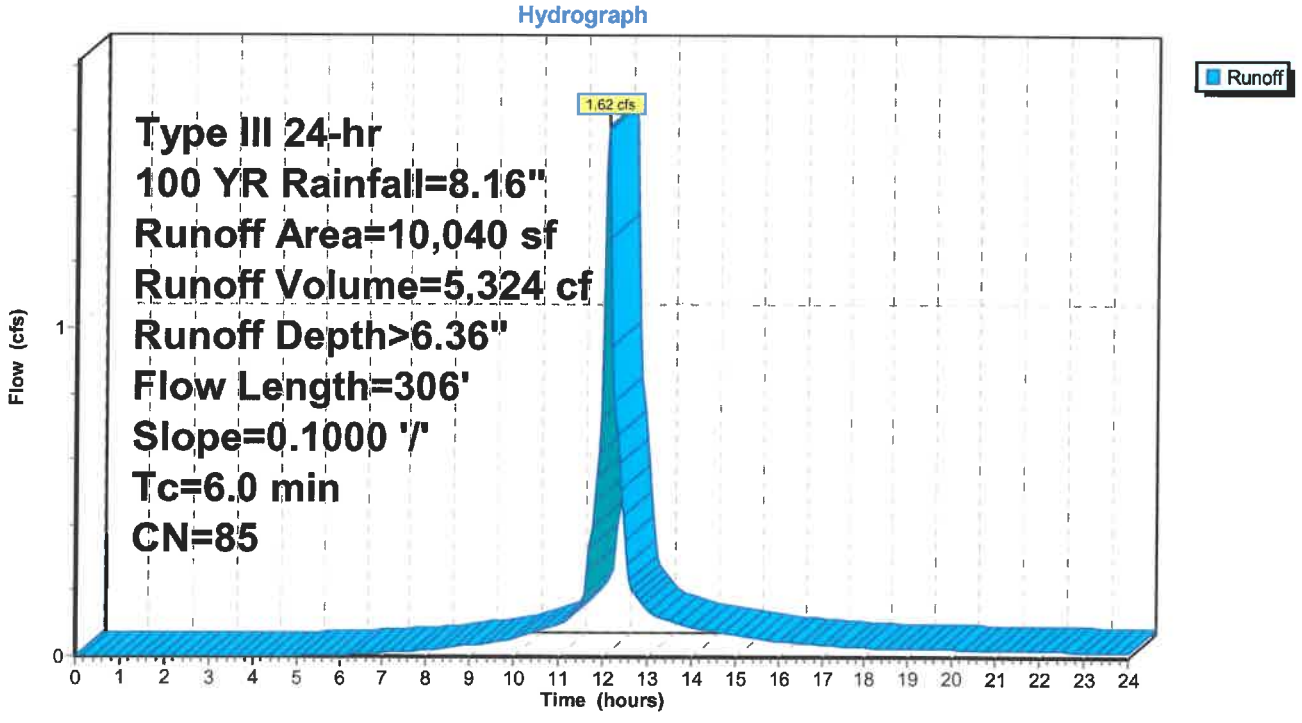
Runoff = 1.62 cfs @ 12.09 hrs, Volume= 5,324 cf, Depth> 6.36"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
3,434	61	>75% Grass cover, Good, HSG B
10,040	85	Weighted Average
3,434		34.20% Pervious Area
6,606		65.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: To CB 4



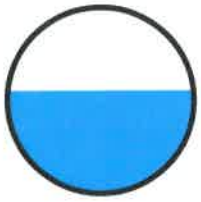
Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 6.68" for 100 YR event
Inflow = 6.05 cfs @ 12.10 hrs, Volume= 20,724 cf
Outflow = 5.80 cfs @ 12.12 hrs, Volume= 20,709 cf, Atten= 4%, Lag= 1.5 min

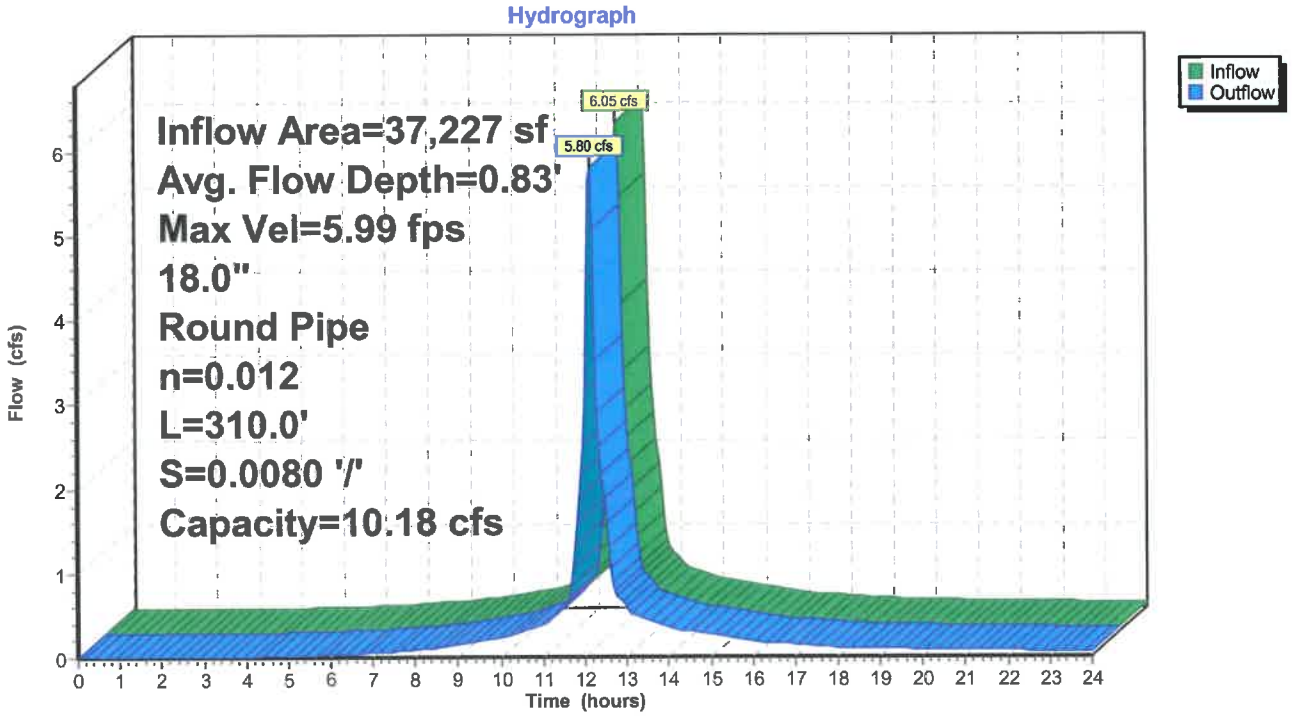
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.99 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 2.01 fps, Avg. Travel Time= 2.6 min

Peak Storage= 310 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.83' , Surface Width= 1.49'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 310.0' Slope= 0.0080 '/'
Inlet Invert= 287.40', Outlet Invert= 284.92'



Reach 8R: DMH 2 TO DMH 7



Summary for Subcatchment 8S: To CB 6

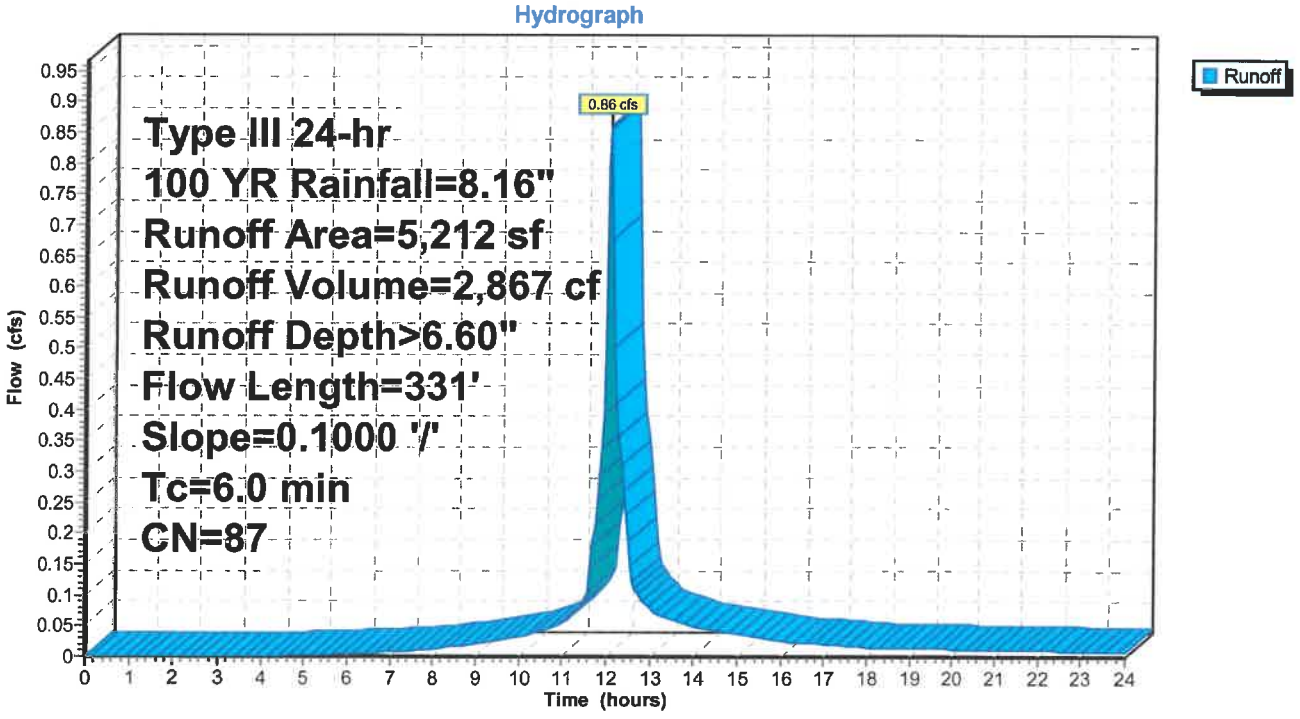
Runoff = 0.86 cfs @ 12.09 hrs, Volume= 2,867 cf, Depth> 6.60"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
1,579	61	>75% Grass cover, Good, HSG B
5,212	87	Weighted Average
1,579		30.30% Pervious Area
3,633		69.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8S: To CB 6



Summary for Reach 9R: DMH 3 to DMH 2

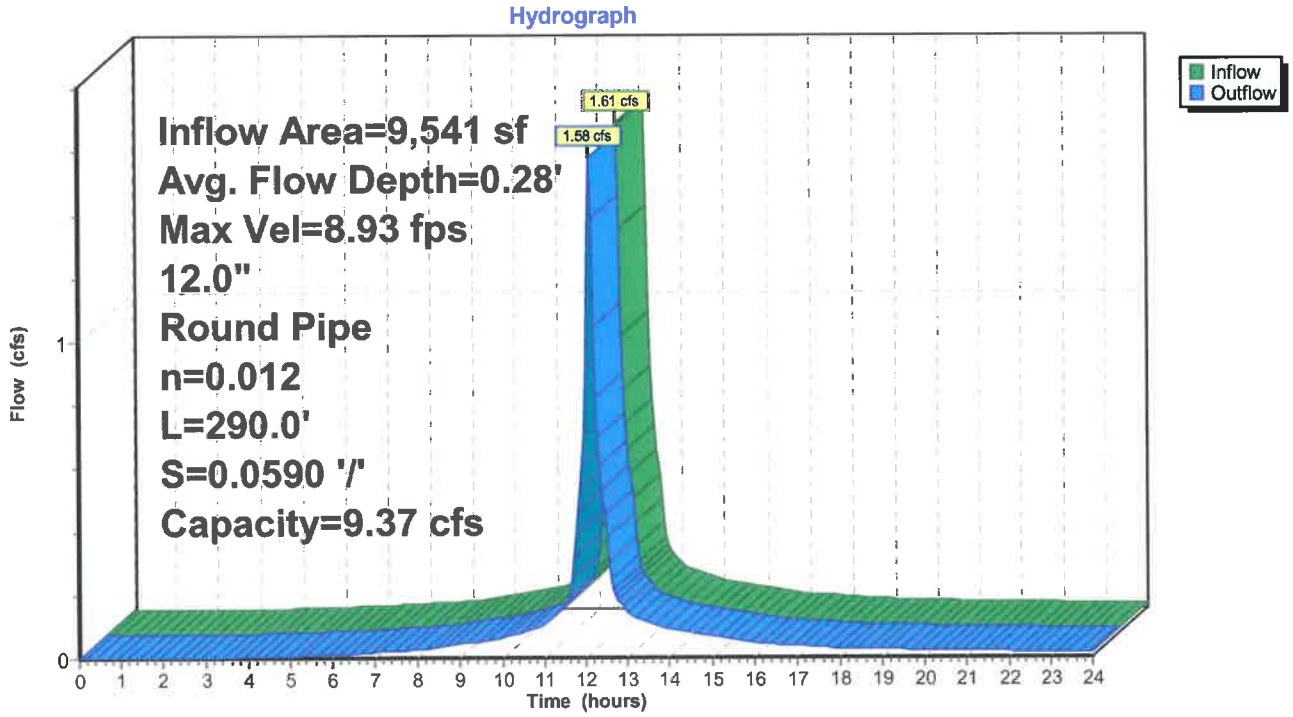
Inflow Area = 9,541 sf, 76.16% Impervious, Inflow Depth > 6.87" for 100 YR event
Inflow = 1.61 cfs @ 12.09 hrs, Volume= 5,463 cf
Outflow = 1.58 cfs @ 12.10 hrs, Volume= 5,461 cf, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.93 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.90 fps, Avg. Travel Time= 1.7 min

Peak Storage= 53 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 290.0' Slope= 0.0590 '/'
Inlet Invert= 305.00', Outlet Invert= 287.90'

Reach 9R: DMH 3 to DMH 2



Summary for Subcatchment 9S: To CB 5

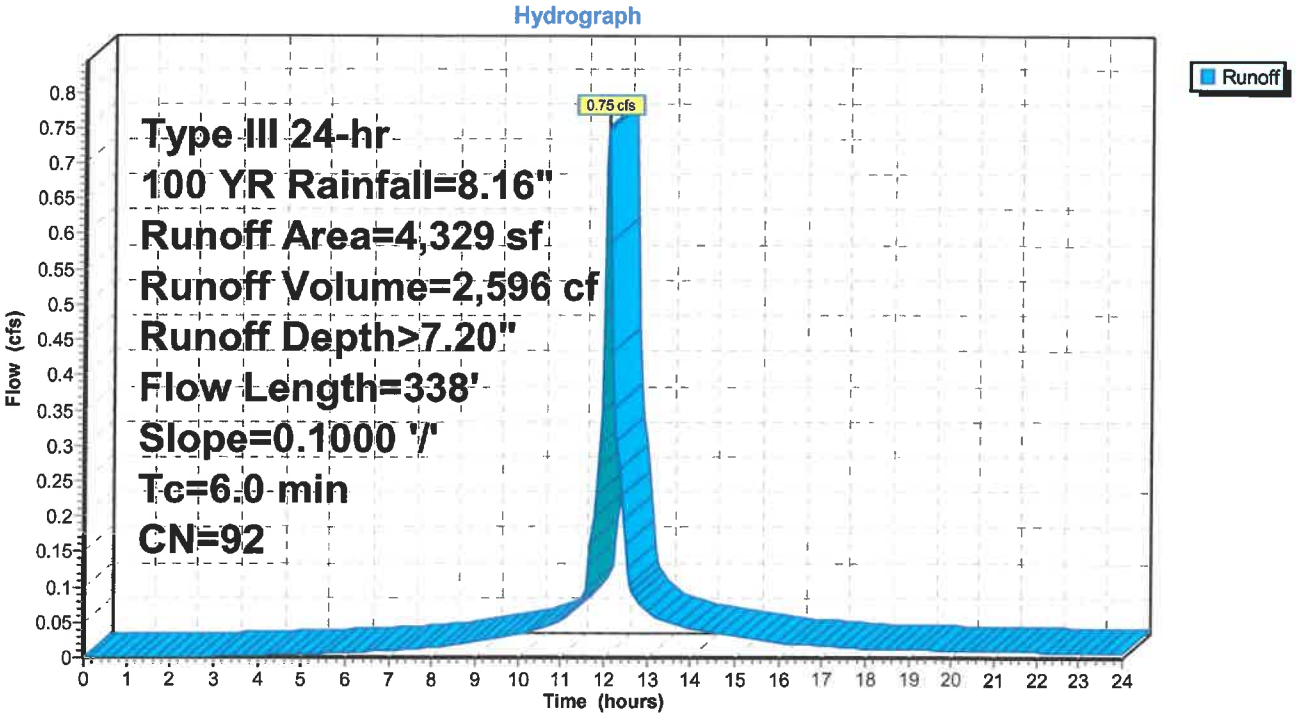
Runoff = 0.75 cfs @ 12.09 hrs, Volume= 2,596 cf, Depth> 7.20"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
696	61	>75% Grass cover, Good, HSG B
4,329	92	Weighted Average
696		16.08% Pervious Area
3,633		83.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: To CB 5



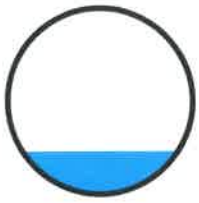
Summary for Reach 10R: CB6 to DMH 3

Inflow Area = 5,212 sf, 69.70% Impervious, Inflow Depth > 6.60" for 100 YR event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 2,867 cf
Outflow = 0.86 cfs @ 12.09 hrs, Volume= 2,867 cf, Atten= 0%, Lag= 0.0 min

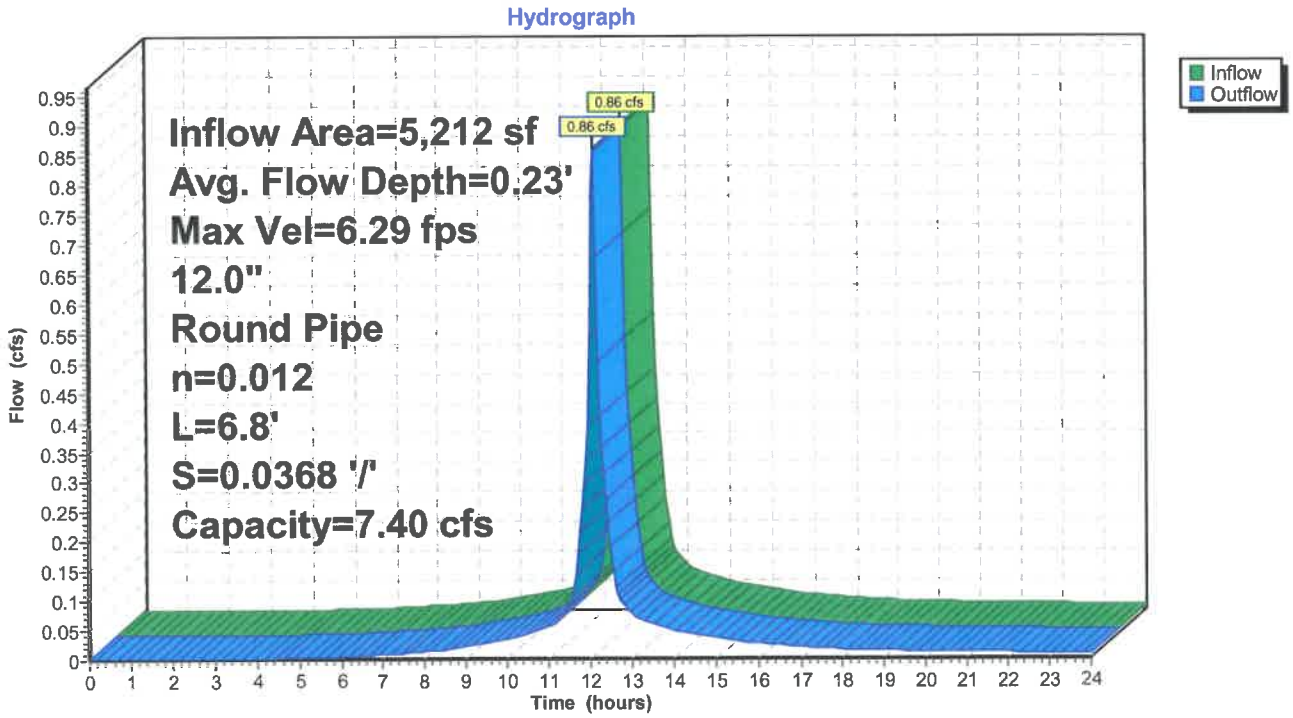
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.29 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.08 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 0.84'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.40 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.8' Slope= 0.0368 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Reach 10R: CB6 to DMH 3



Summary for Subcatchment 10S: To CB 7

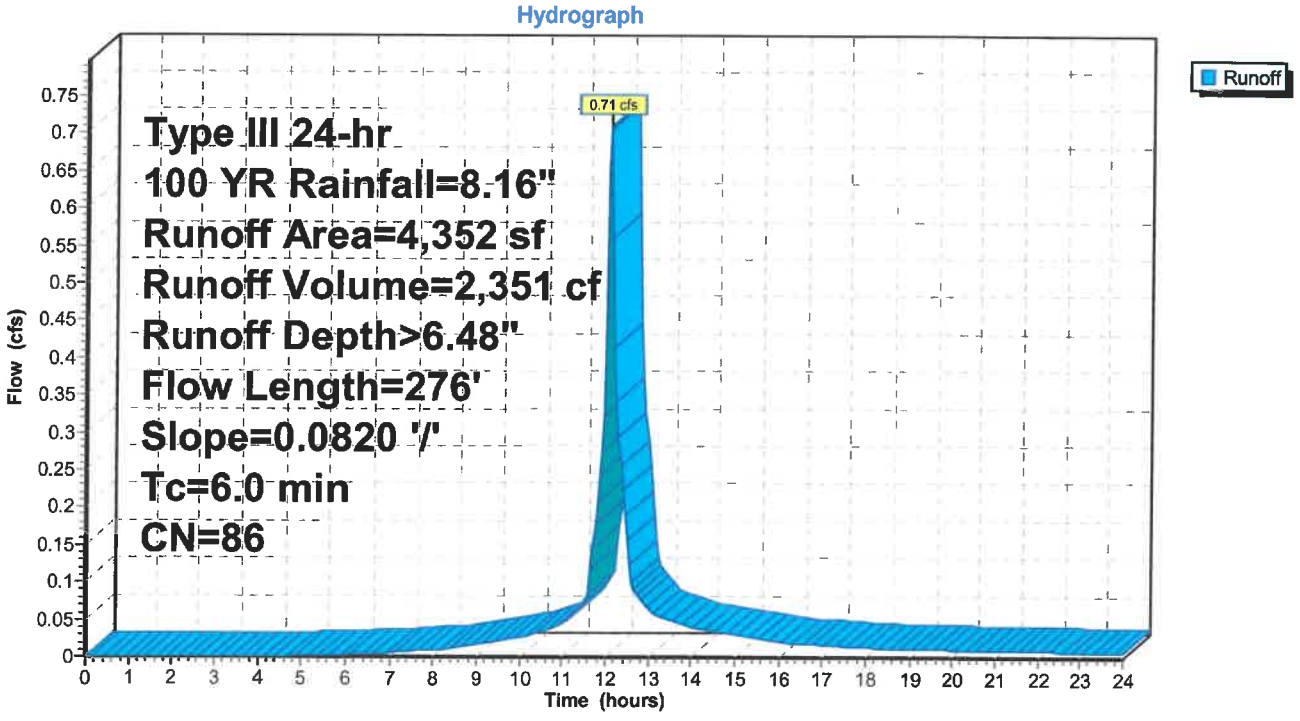
Runoff = 0.71 cfs @ 12.09 hrs, Volume= 2,351 cf, Depth> 6.48"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: To CB 7



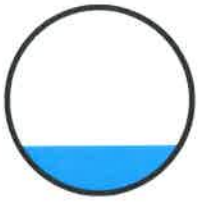
Summary for Reach 11R: CB5 to DMH 3

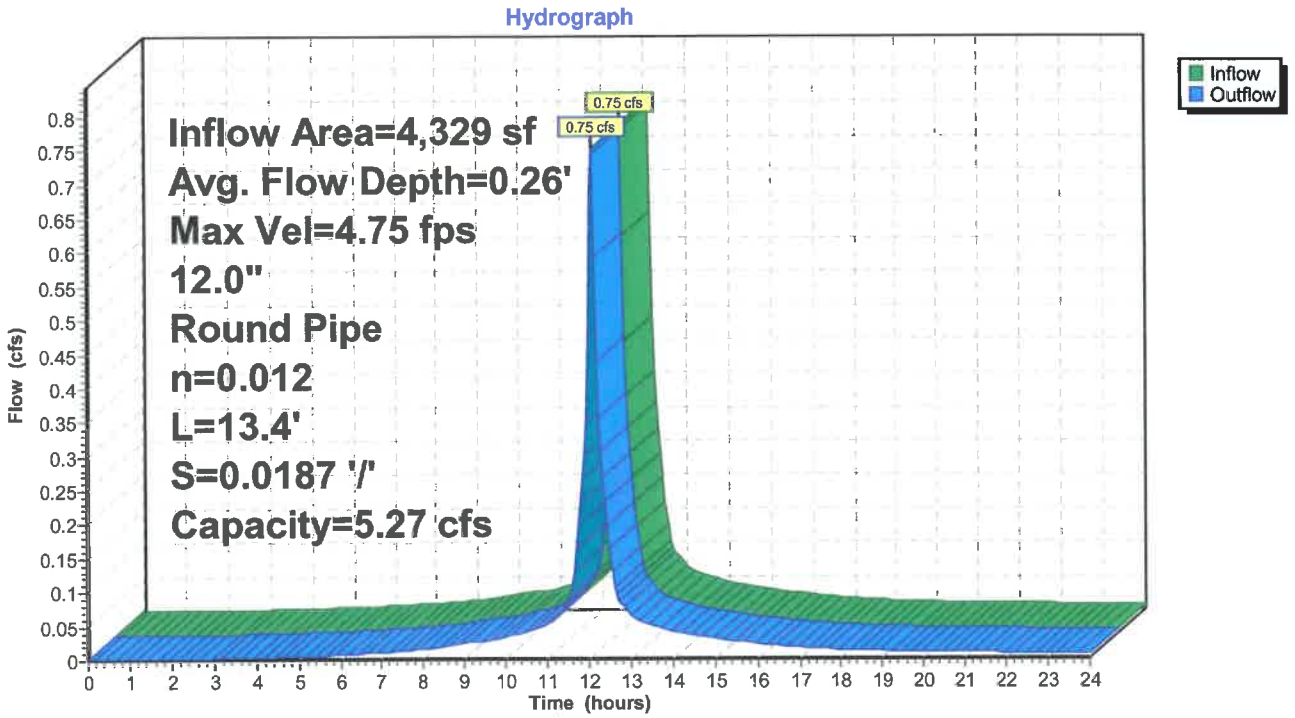
Inflow Area = 4,329 sf, 83.92% Impervious, Inflow Depth > 7.20" for 100 YR event
Inflow = 0.75 cfs @ 12.09 hrs, Volume= 2,596 cf
Outflow = 0.75 cfs @ 12.09 hrs, Volume= 2,596 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.75 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 0.87'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'





Summary for Subcatchment 11S: To CB 8

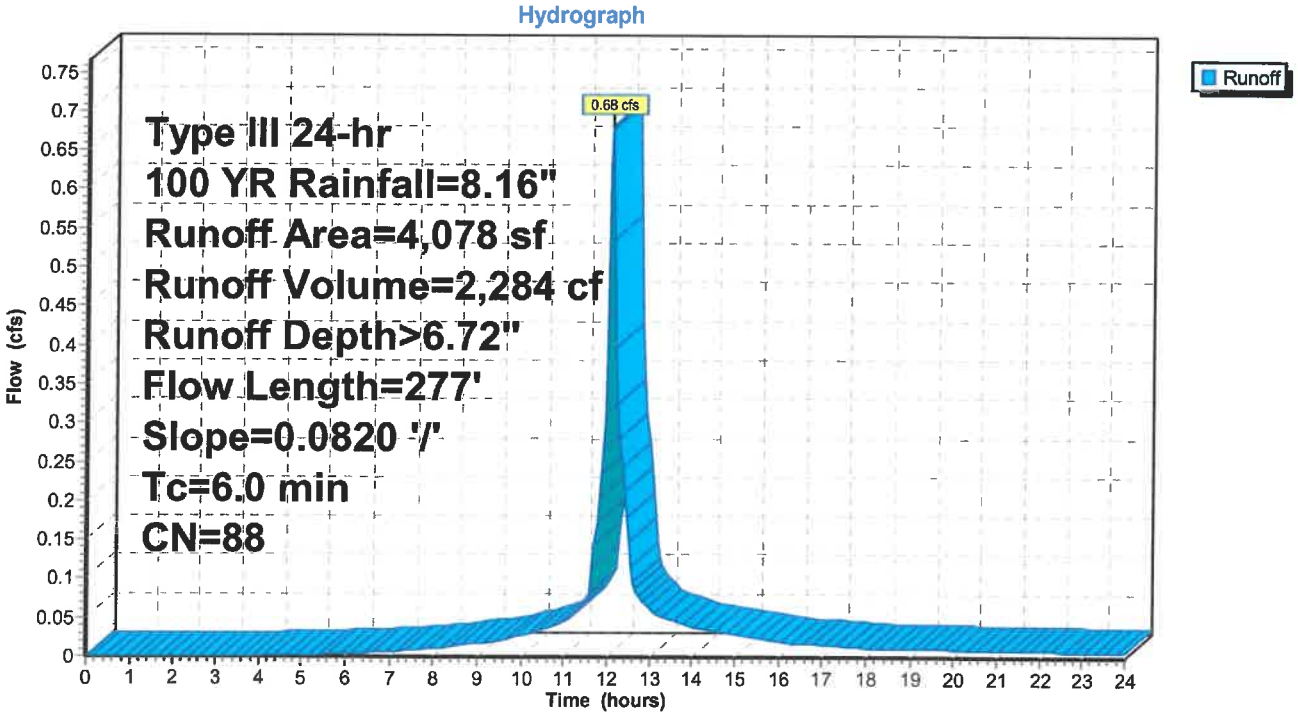
Runoff = 0.68 cfs @ 12.09 hrs, Volume= 2,284 cf, Depth> 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.16"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 11S: To CB 8



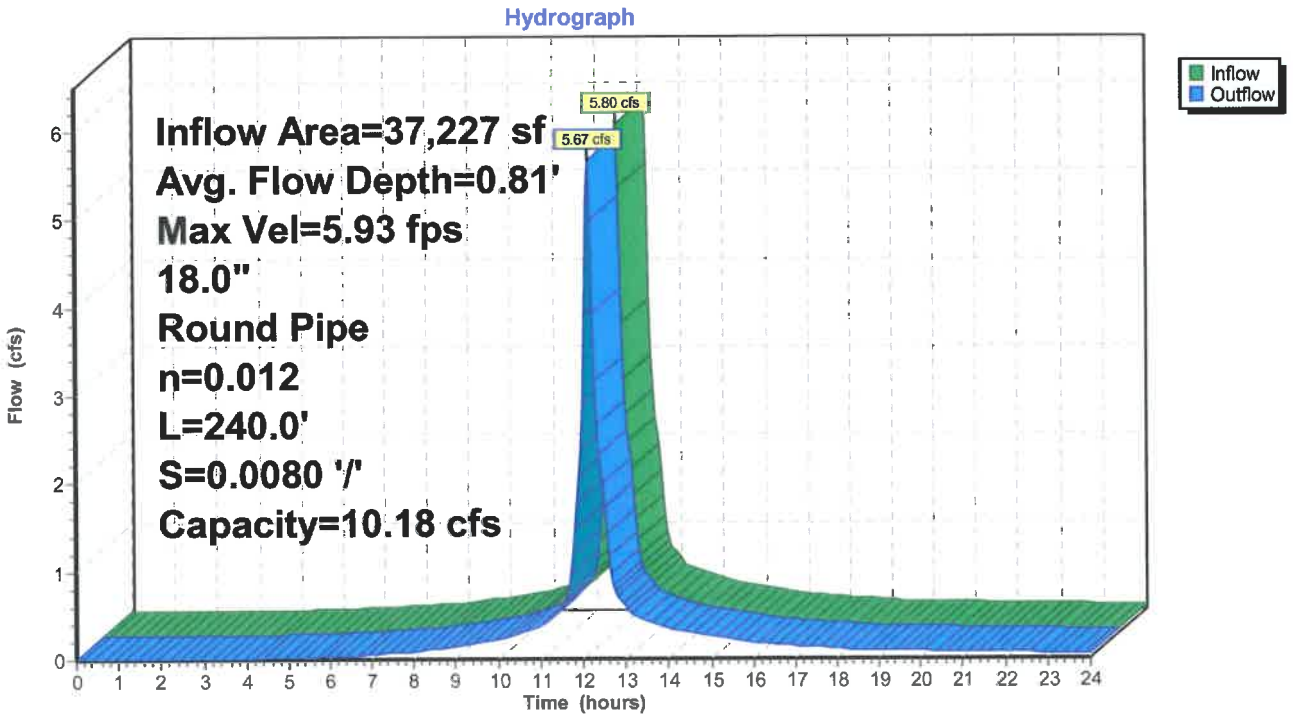
Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 6.68" for 100 YR event
Inflow = 5.80 cfs @ 12.12 hrs, Volume= 20,709 cf
Outflow = 5.67 cfs @ 12.15 hrs, Volume= 20,698 cf, Atten= 2%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.93 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.01 fps, Avg. Travel Time= 2.0 min

Peak Storage= 233 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.81' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 240.0' Slope= 0.0080 '/'
Inlet Invert= 284.92', Outlet Invert= 283.00'



Summary for Subcatchment 12S: To CB 9

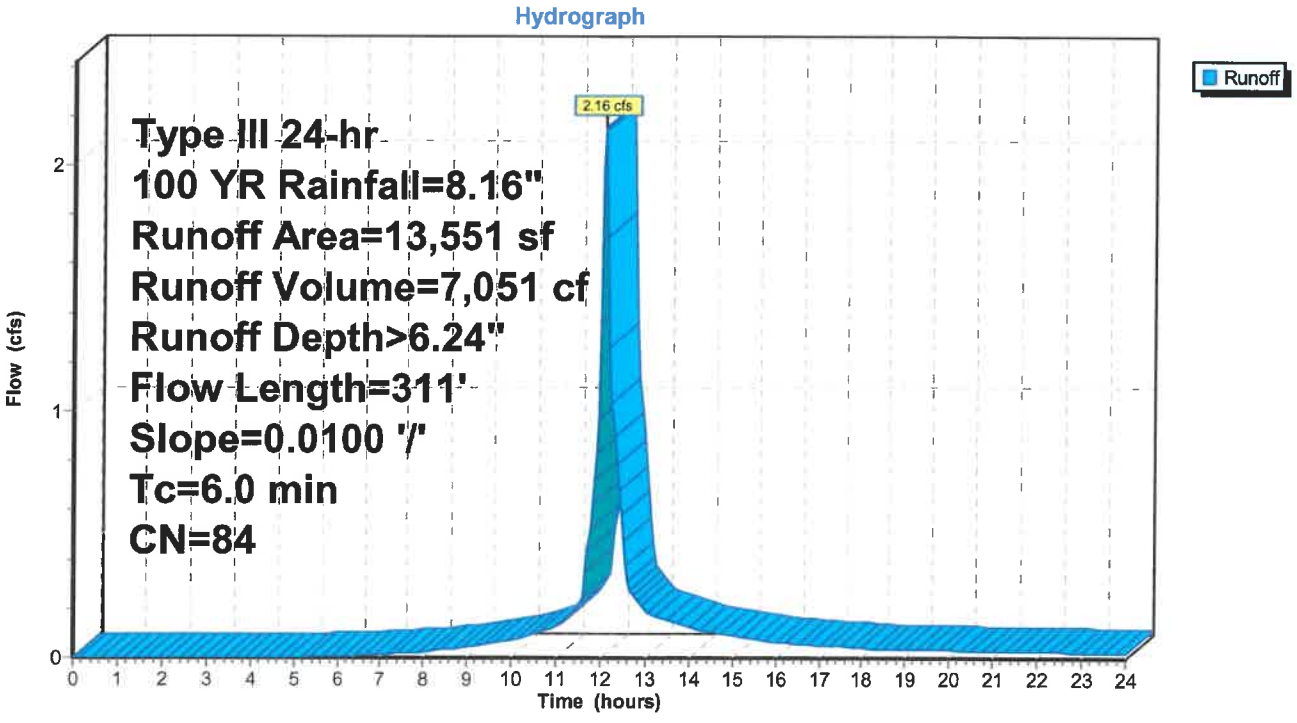
Runoff = 2.16 cfs @ 12.09 hrs, Volume= 7,051 cf, Depth> 6.24"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 12S: To CB 9



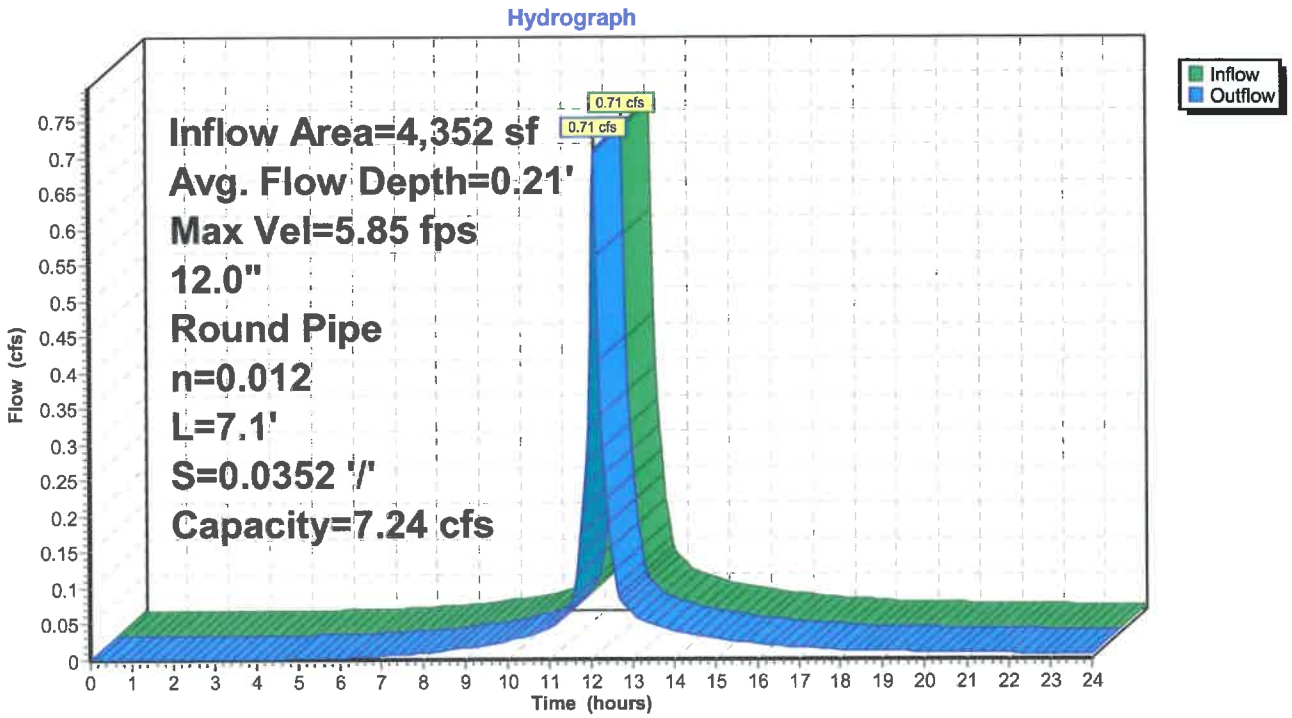
Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 6.48" for 100 YR event
Inflow = 0.71 cfs @ 12.09 hrs, Volume= 2,351 cf
Outflow = 0.71 cfs @ 12.09 hrs, Volume= 2,351 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.85 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.82'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.1' Slope= 0.0352 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 13S: To CB 10

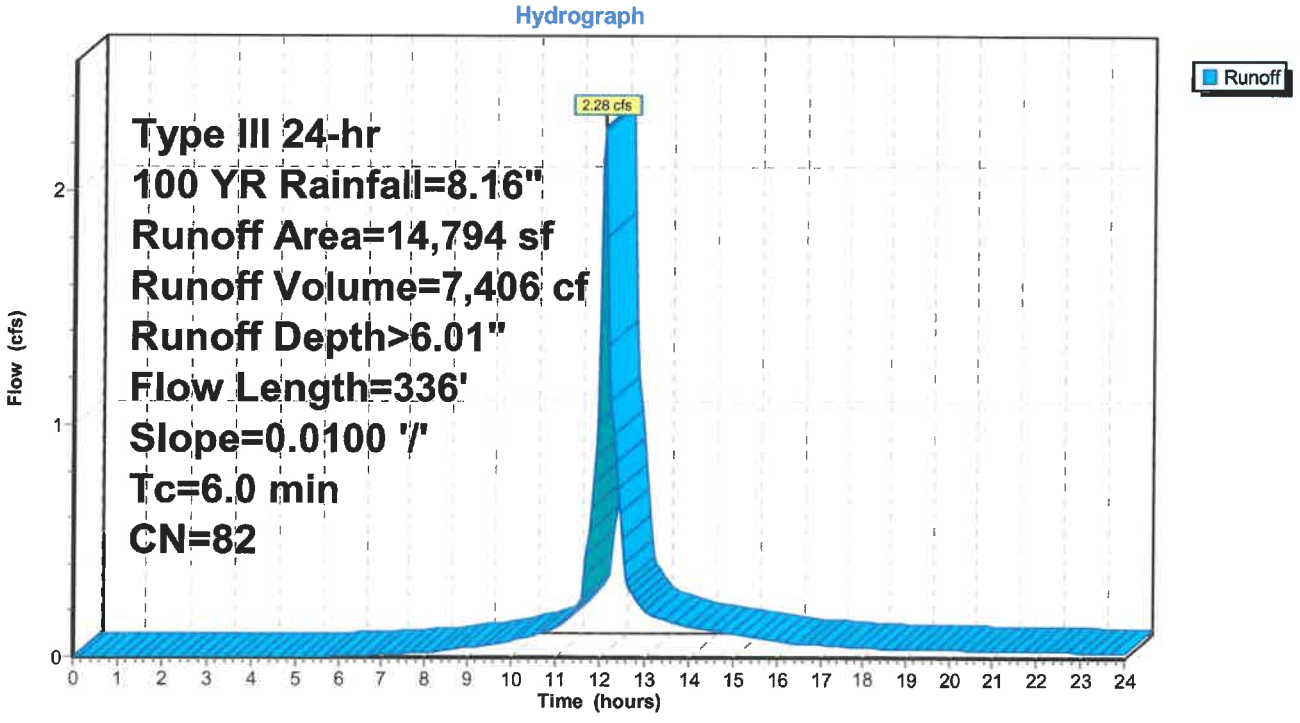
Runoff = 2.28 cfs @ 12.09 hrs, Volume= 7,406 cf, Depth> 6.01"

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 YR Rainfall=8.16"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: To CB 10



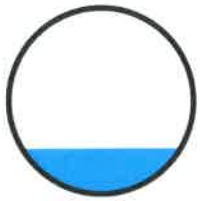
Summary for Reach 14R: CB 8 TO DMH 4

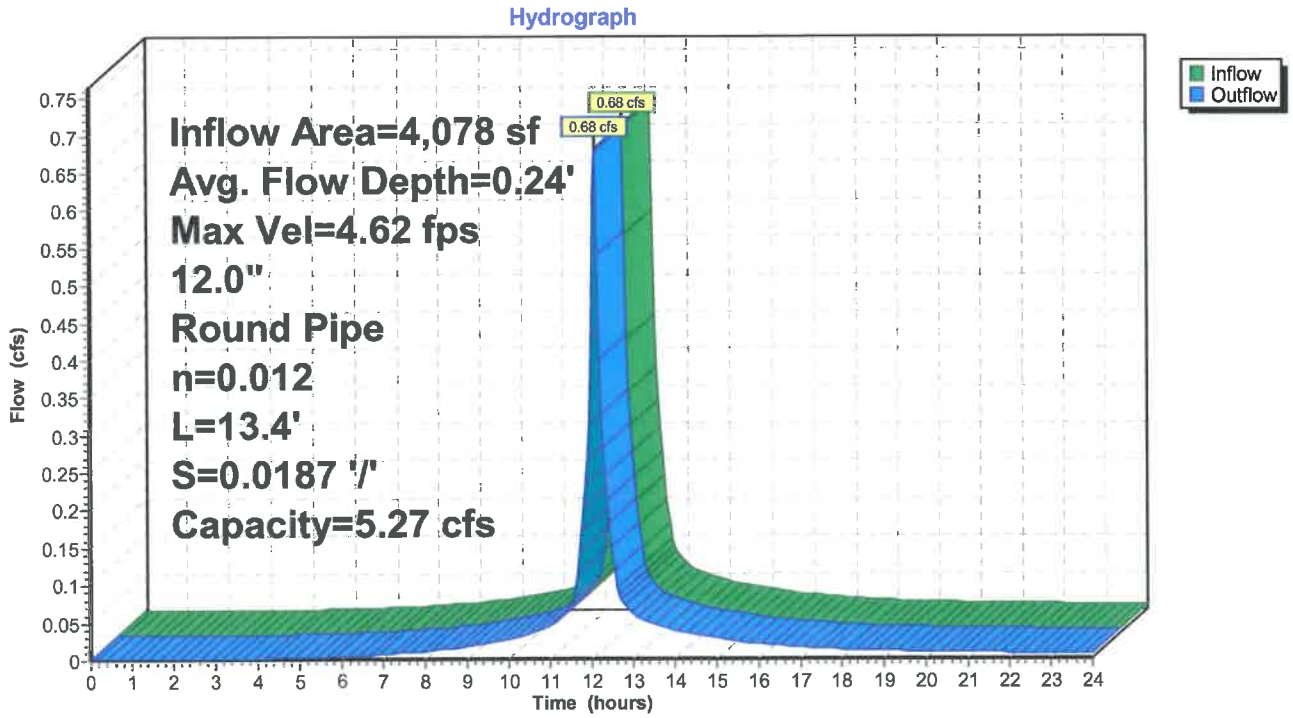
Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 6.72" for 100 YR event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 2,284 cf
Outflow = 0.68 cfs @ 12.09 hrs, Volume= 2,284 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.62 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'





Summary for Subcatchment 14S: To Wetland

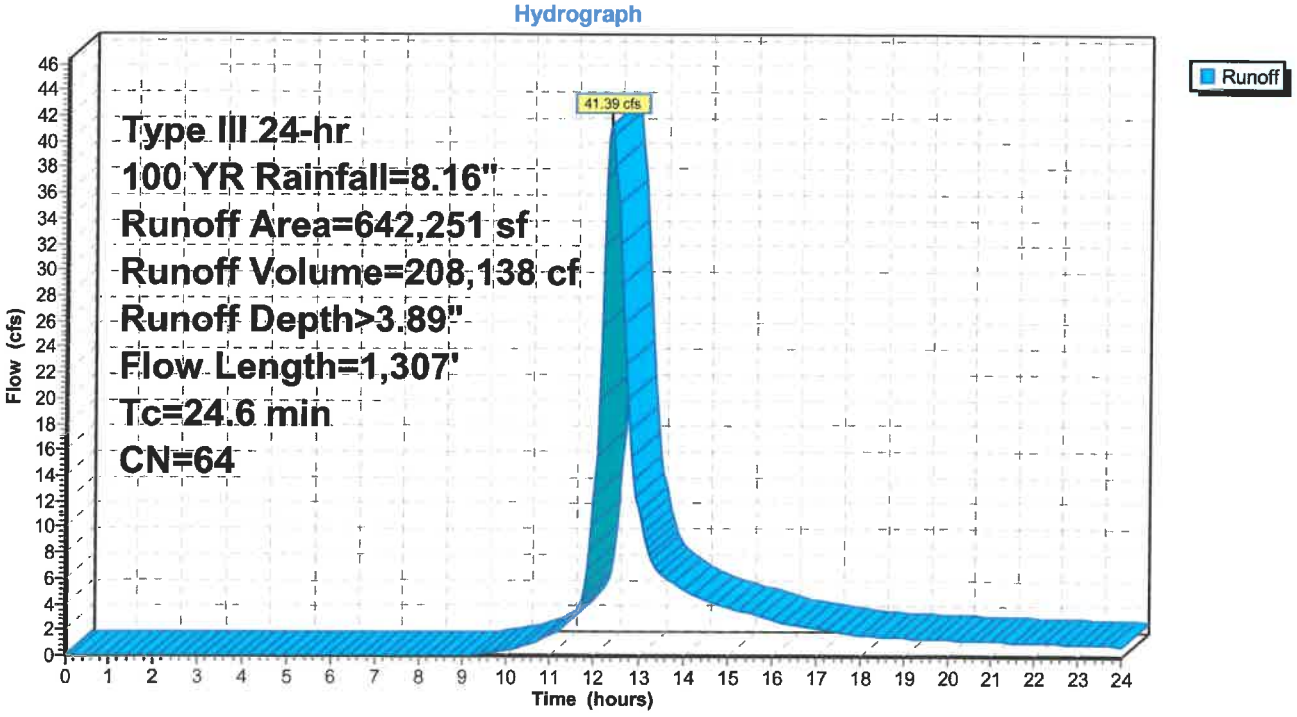
Runoff = 41.39 cfs @ 12.35 hrs, Volume= 208,138 cf, Depth> 3.89"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
358,166	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
642,251	64	Weighted Average
642,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

Subcatchment 14S: To Wetland



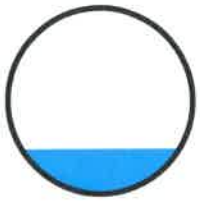
Summary for Reach 15R: DMH 4 TO DMH 5

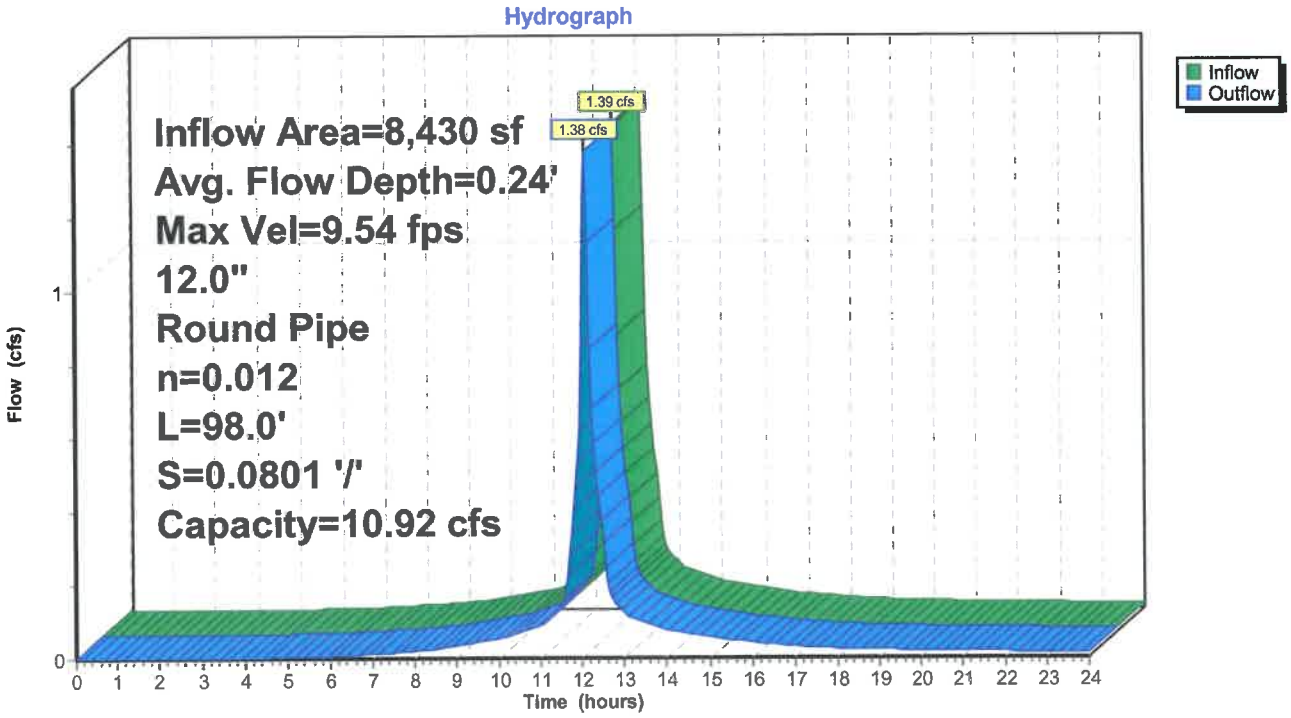
Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 6.60" for 100 YR event
Inflow = 1.39 cfs @ 12.09 hrs, Volume= 4,634 cf
Outflow = 1.38 cfs @ 12.09 hrs, Volume= 4,634 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.54 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.13 fps, Avg. Travel Time= 0.5 min

Peak Storage= 14 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 98.0' Slope= 0.0801 '/'
Inlet Invert= 316.20', Outlet Invert= 308.35'





Summary for Subcatchment 15S: TO BASIN

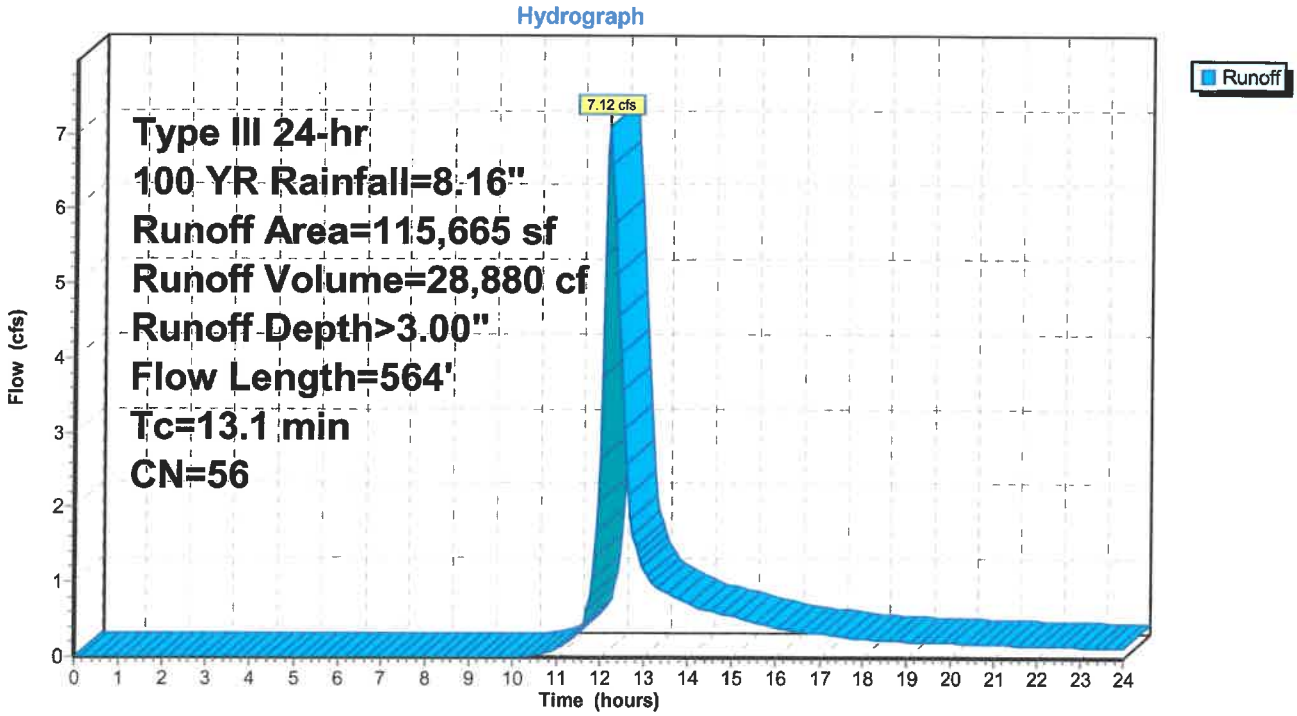
Runoff = 7.12 cfs @ 12.20 hrs, Volume= 28,880 cf, Depth> 3.00"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
94,222	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
115,665	56	Weighted Average
115,665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

Subcatchment 15S: TO BASIN



Summary for Reach 16R: DMH 5 TO DMH 6

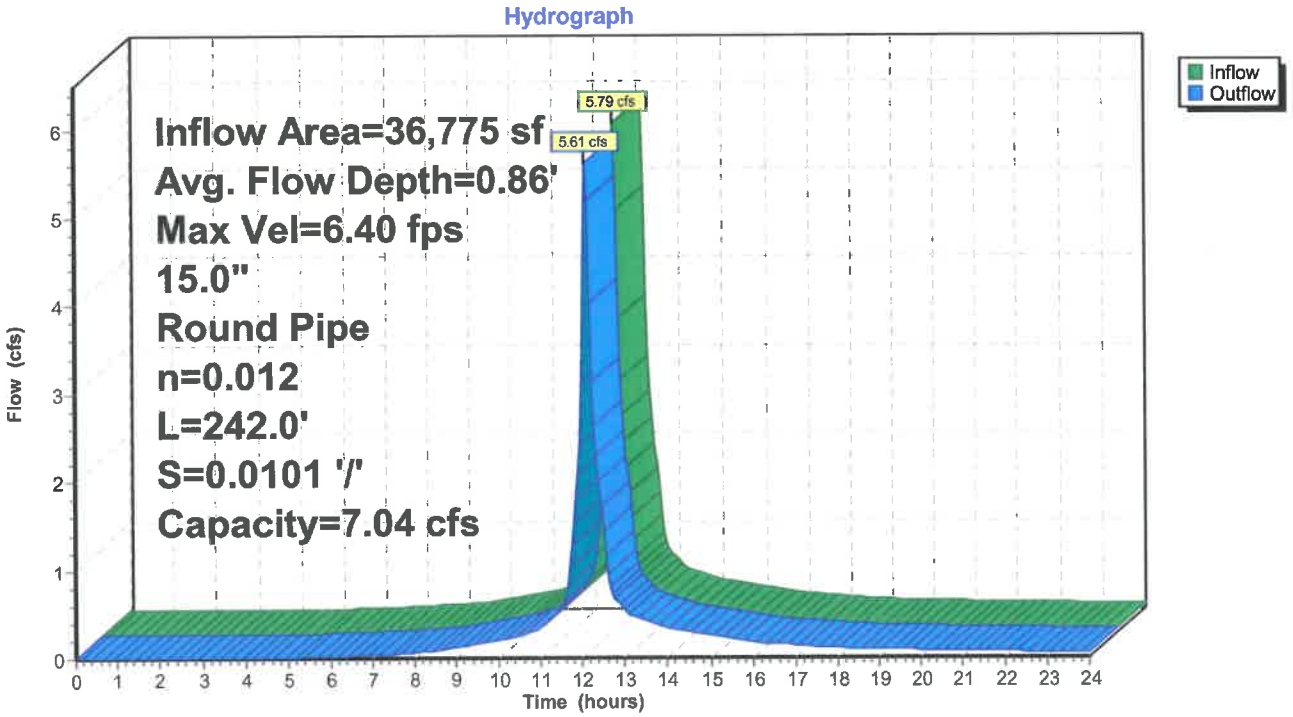
Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 6.23" for 100 YR event
Inflow = 5.79 cfs @ 12.09 hrs, Volume= 19,088 cf
Outflow = 5.61 cfs @ 12.11 hrs, Volume= 19,078 cf, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.40 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 1.8 min

Peak Storage= 218 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.86' , Surface Width= 1.16'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 242.0' Slope= 0.0101 '/'
Inlet Invert= 308.10', Outlet Invert= 305.65'

Reach 16R: DMH 5 TO DMH 6



Summary for Subcatchment 16S: TO BASIN

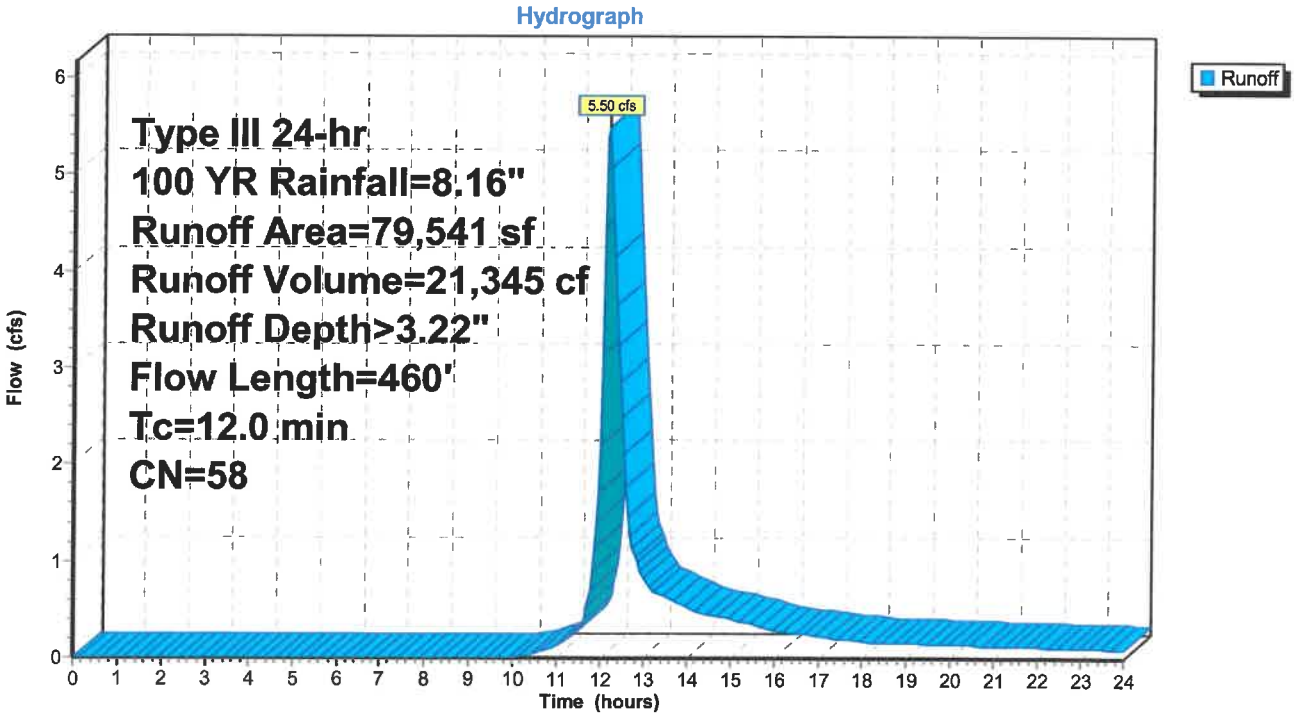
Runoff = 5.50 cfs @ 12.17 hrs, Volume= 21,345 cf, Depth> 3.22"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

Subcatchment 16S: TO BASIN



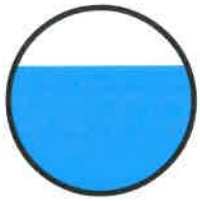
Summary for Reach 17R: DMH 6 TO DMH 5

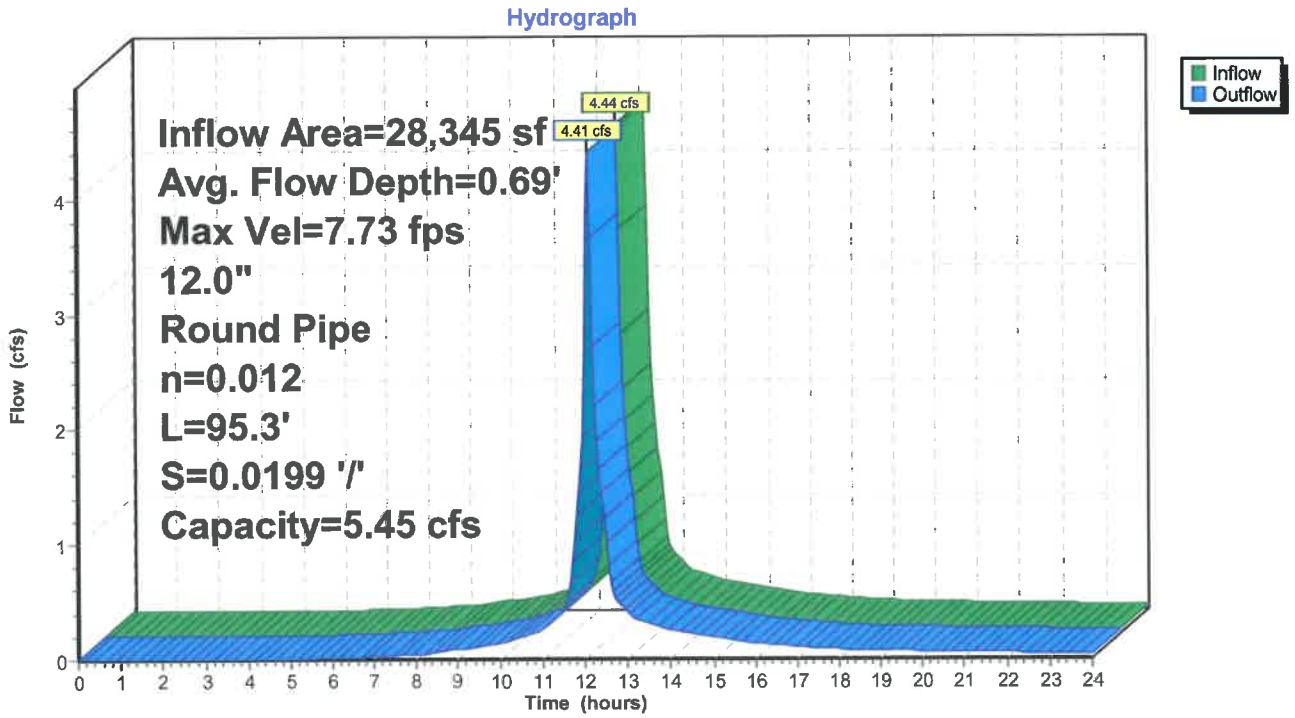
Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 6.12" for 100 YR event
Inflow = 4.44 cfs @ 12.09 hrs, Volume= 14,457 cf
Outflow = 4.41 cfs @ 12.10 hrs, Volume= 14,455 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.73 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.73 fps, Avg. Travel Time= 0.6 min

Peak Storage= 55 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.69' , Surface Width= 0.93'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 95.3' Slope= 0.0199 '/'
Inlet Invert= 310.25', Outlet Invert= 308.35'





Summary for Subcatchment 17S: To Off Site

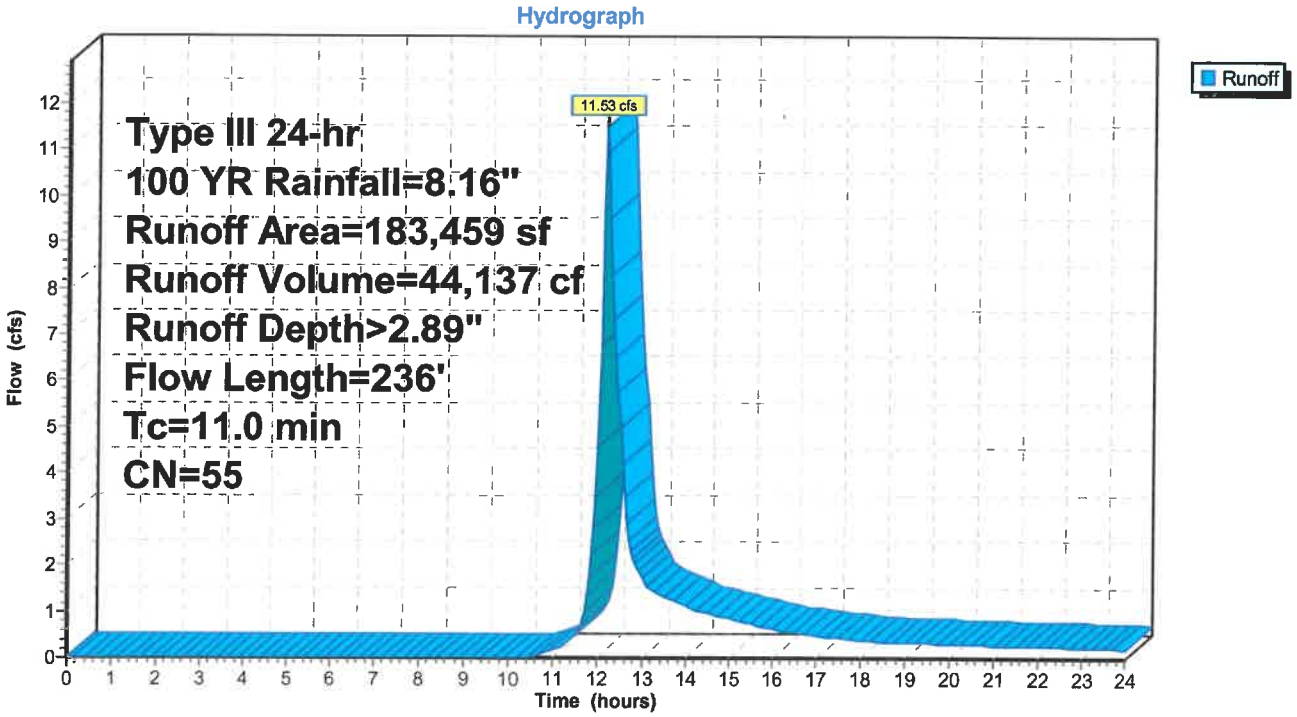
Runoff = 11.53 cfs @ 12.16 hrs, Volume= 44,137 cf, Depth> 2.89"

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 YR Rainfall=8.16"

Area (sf)	CN	Description
183,459	55	Woods, Good, HSG B
183,459		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	236	Total			

Subcatchment 17S: To Off Site



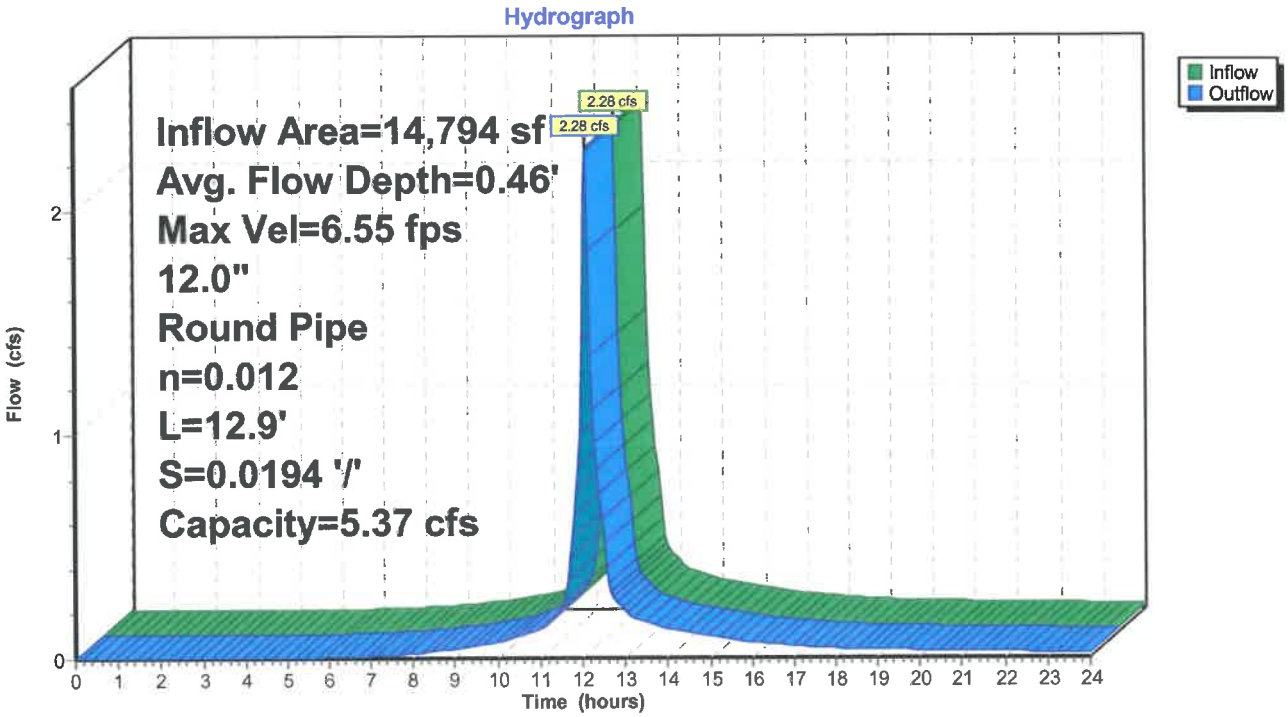
Summary for Reach 18R: CB 10 TO DMH 6

Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 6.01" for 100 YR event
Inflow = 2.28 cfs @ 12.09 hrs, Volume= 7,406 cf
Outflow = 2.28 cfs @ 12.09 hrs, Volume= 7,406 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.55 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.24 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 12.9' Slope= 0.0194 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'



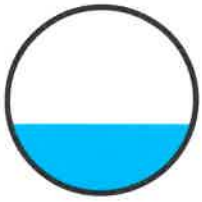
Summary for Reach 19R: CB 9 TO DMH 6

Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 6.24" for 100 YR event
Inflow = 2.16 cfs @ 12.09 hrs, Volume= 7,051 cf
Outflow = 2.16 cfs @ 12.09 hrs, Volume= 7,051 cf, Atten= 0%, Lag= 0.0 min

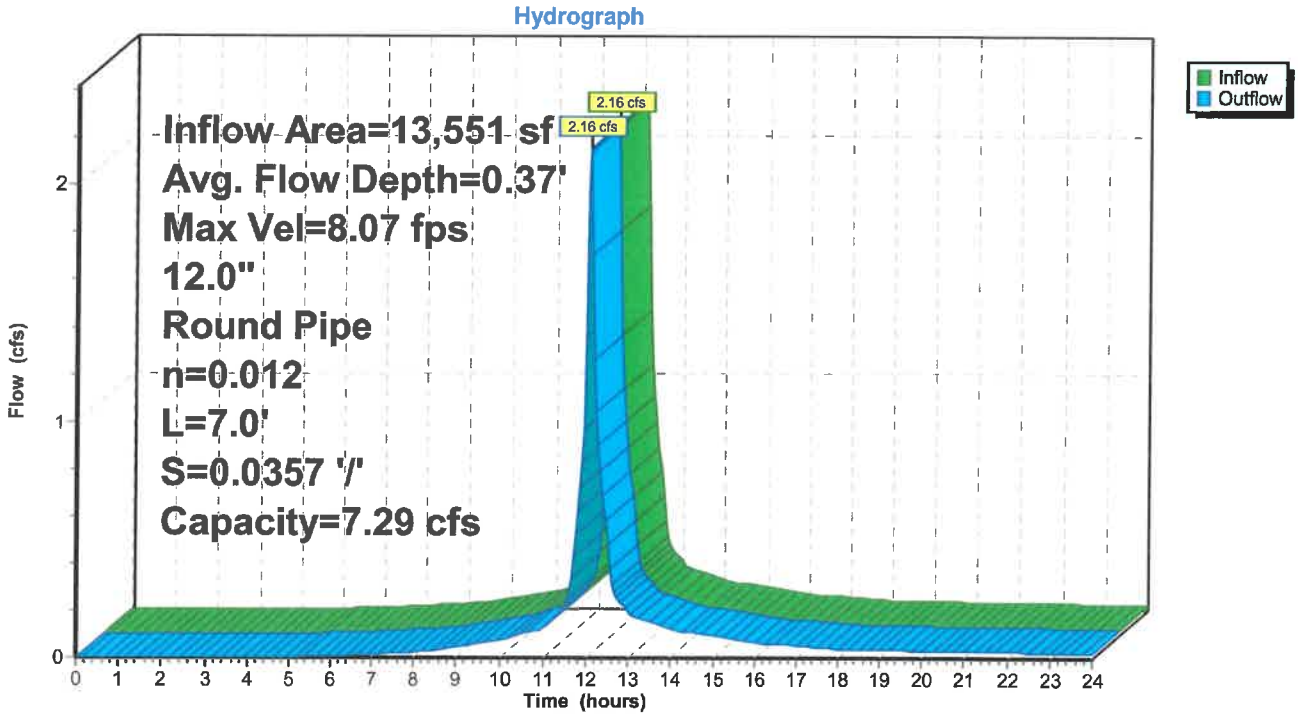
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.07 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.72 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 0.97'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.0' Slope= 0.0357 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'



Reach 19R: CB 9 TO DMH 6



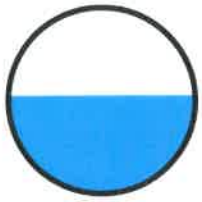
Summary for Reach 20R: DMH 6 to Basin

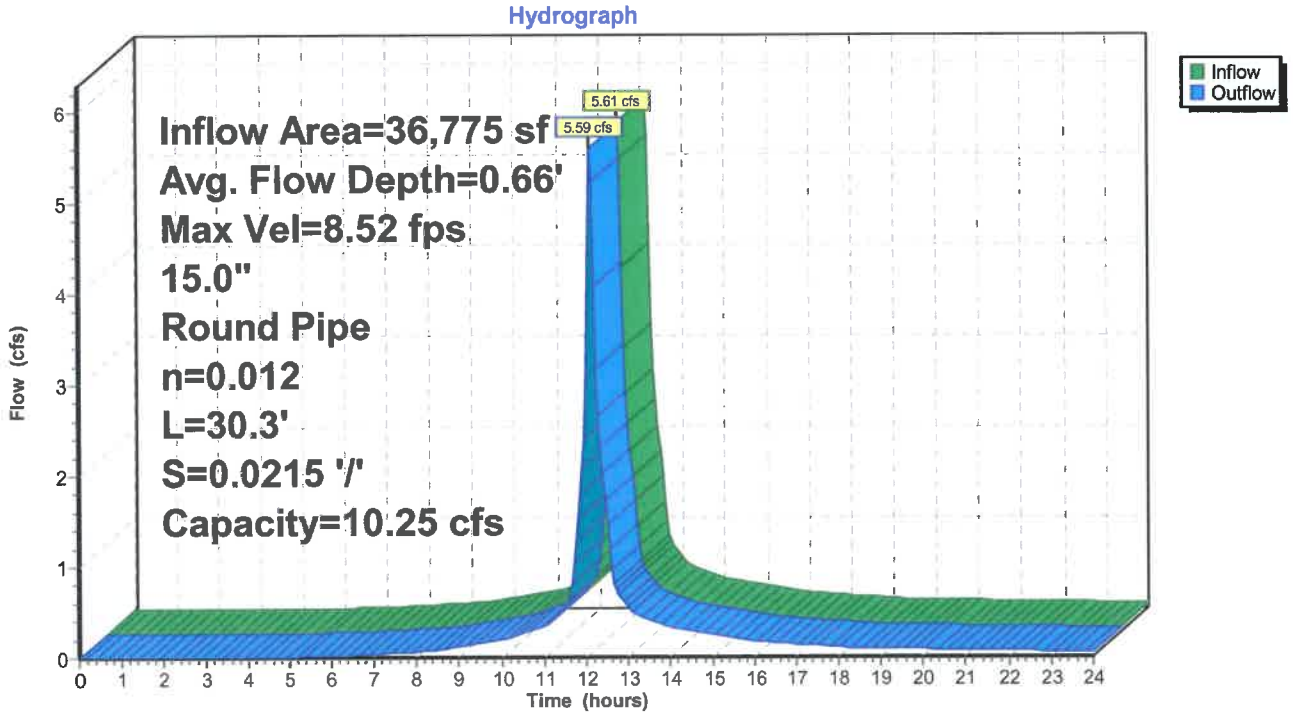
Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 6.23" for 100 YR event
Inflow = 5.61 cfs @ 12.11 hrs, Volume= 19,078 cf
Outflow = 5.59 cfs @ 12.11 hrs, Volume= 19,077 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.52 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.88 fps, Avg. Travel Time= 0.2 min

Peak Storage= 20 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.66' , Surface Width= 1.25'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.3' Slope= 0.0215 '/'
Inlet Invert= 305.65', Outlet Invert= 305.00'





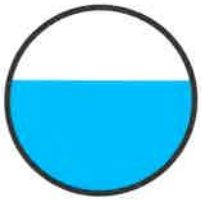
Summary for Reach 21R: 24" ADS

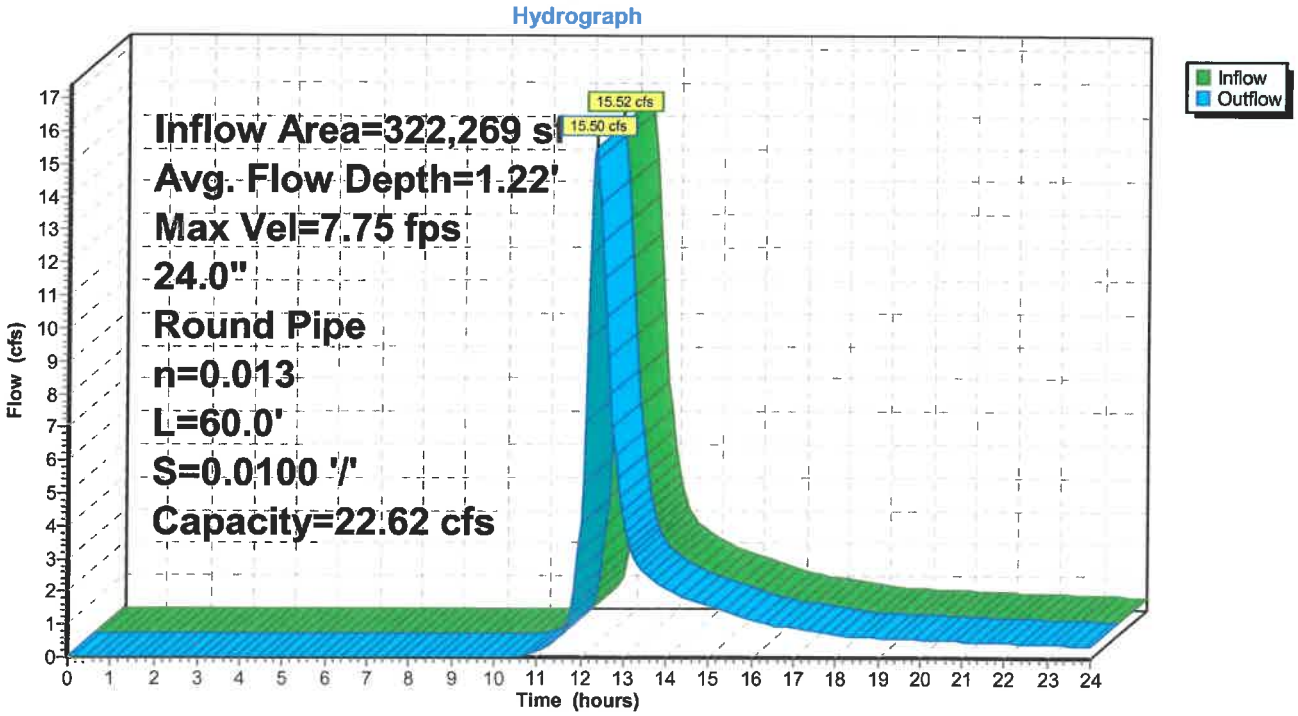
Inflow Area = 322,269 sf, 0.00% Impervious, Inflow Depth > 2.88" for 100 YR event
Inflow = 15.52 cfs @ 12.33 hrs, Volume= 77,305 cf
Outflow = 15.50 cfs @ 12.33 hrs, Volume= 77,294 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.75 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.58 fps, Avg. Travel Time= 0.3 min

Peak Storage= 120 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.22' , Surface Width= 1.95'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 22.62 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 310.00', Outlet Invert= 309.40'



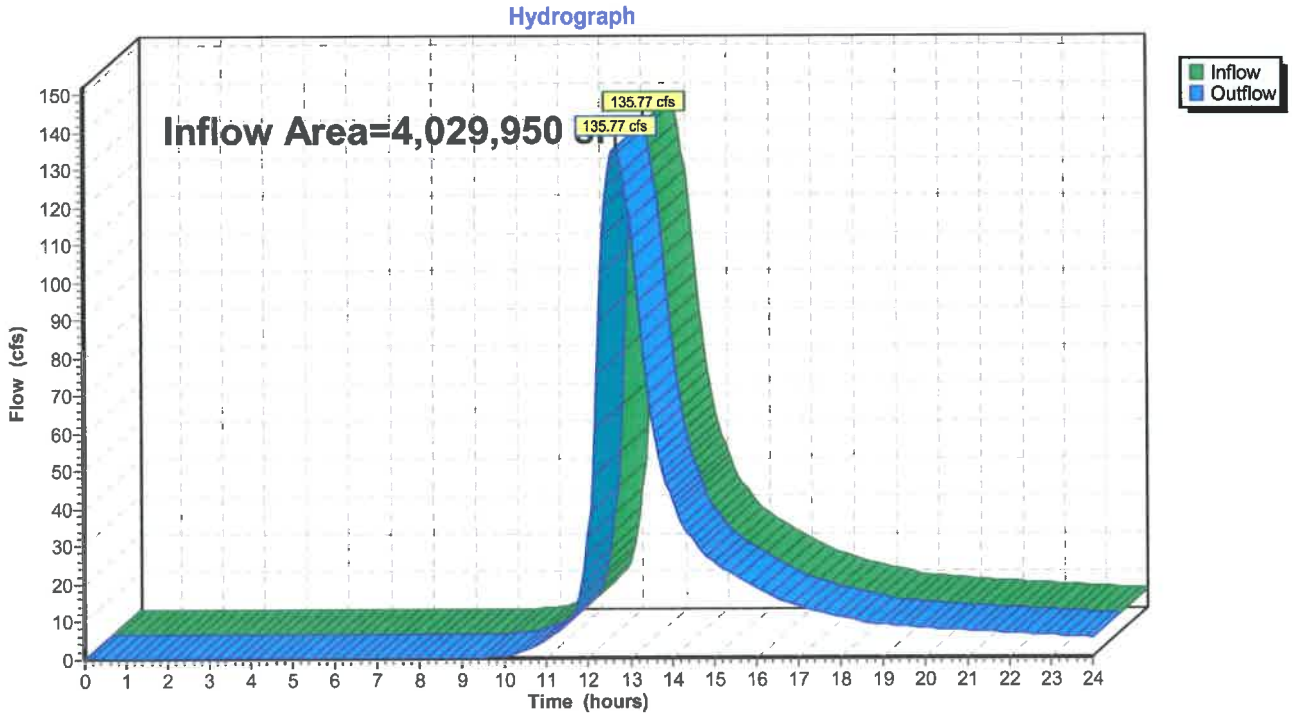


Summary for Reach EV1: To Wetland

Inflow Area = 4,029,950 sf, 4.03% Impervious, Inflow Depth > 3.44" for 100 YR event
Inflow = 135.77 cfs @ 12.67 hrs, Volume= 1,156,673 cf
Outflow = 135.77 cfs @ 12.67 hrs, Volume= 1,156,673 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV1: To Wetland

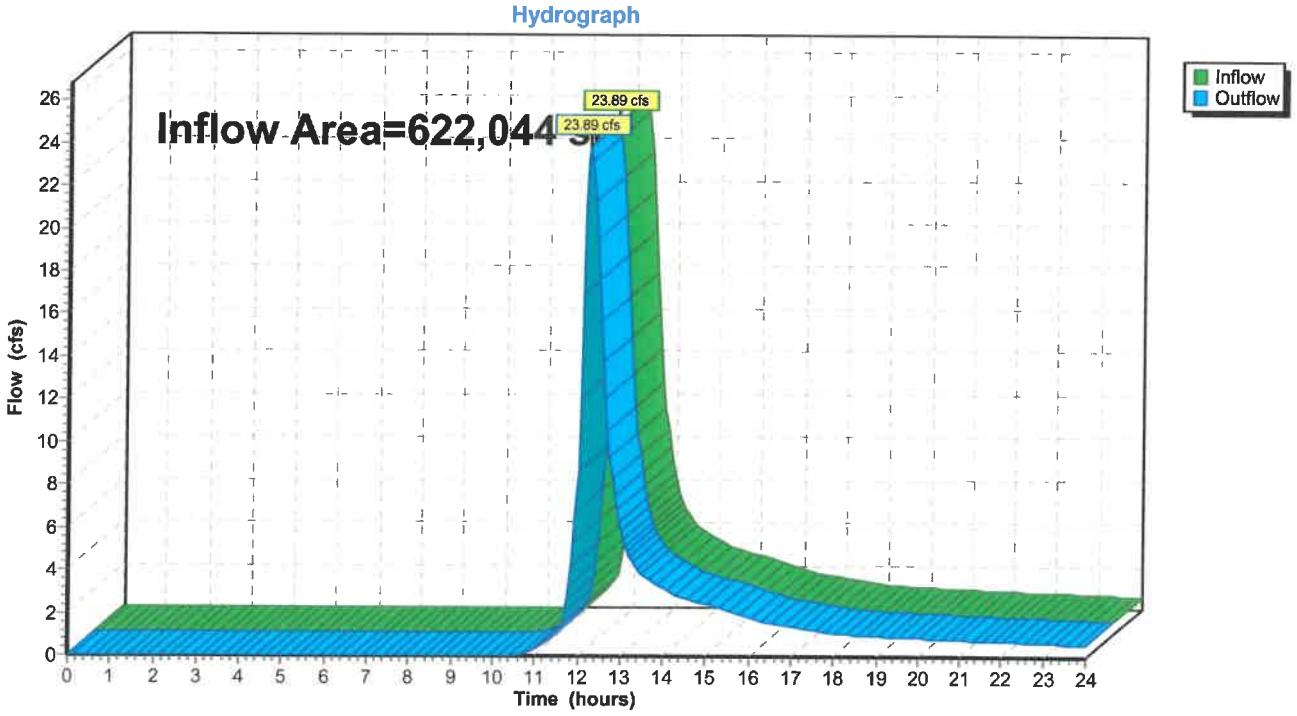


Summary for Reach EV2: To Offsite

Inflow Area = 622,044 sf, 3.64% Impervious, Inflow Depth > 2.34" for 100 YR event
Inflow = 23.89 cfs @ 12.26 hrs, Volume= 121,431 cf
Outflow = 23.89 cfs @ 12.26 hrs, Volume= 121,431 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV2: To Offsite



Stormwater Management

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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 8[2]
- 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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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.

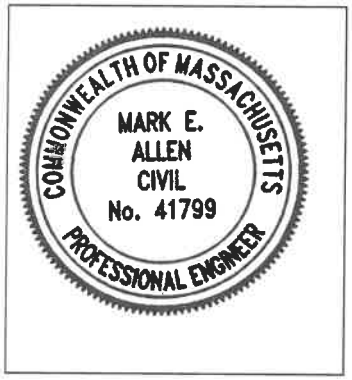
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



2/4/25

Signature and Date

Checklist

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

- [x] 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:

- [x] 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

- [x] No new untreated discharges
- [x] Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- [x] 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 Field[1]

■ 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 propriety 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.

STORMWATER MANAGEMENT COMPLIANCE

Standard #1 No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

- No new conveyances will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. The new stormwater discharges are treated and provided with hardened outfalls to avoid surface erosion.

Standard #2 Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

- See Table-Section 1, Page 1 - Summary of Peak Rates of Stormwater Runoff
  Post-development peak discharge rates do not exceed existing peak discharge rates.

Standard #3 Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures, including environmentally sensitive site design, low-impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

- Impervious area = proposed paved road, sidewalks, and houses
  Flow to Infiltration Basin 1 (10-Yr Storm)
  Impervious area HSG-B (0.35") = 26,755 sf = Req'd. recharge = 780.35 cf

  Basin 1 Volume = 49,192 cf

  Flow to Infiltration Basin 2
  Impervious area HSG-B (0.35") = 22,644 sf = Req'd. recharge = 660.45 cf

  Basin 2 Volume = 40,270 cf

  Capture Area Adjustment
  Site Total Impervious Area = 185,202 sf
  Impervious Area to Basins = 49,399 sf
  Adjustment Factor = 185,202/49,399 = 3.749
  3.749 x 1,440.8 cf (total of initial req't.) = **5,401.56 cf total required recharge**
  Basin 1+ 2 Vol. = **89,462 cf total provided recharge**

- **72 Hour max. drawdown (Static)**
  Infiltration Basin1- 49,192 cf/4,532 sf (bottom area) = 10.85'depth (130.2")/2.41"/hr *= **54 hours**

  Infiltration Basin 2 – 40,270 cf/7,004 sf (bottom area) = 5.75' depth (69")/2.41"/hr *= **28.6 hours**

  *1982 Rawls Rates - 2.41"/hr Loamy Sand (on-site soil tests)

Standard #4 Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and

c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

- **Pretreatment sizing (Forebay – 0.5"/Impervious Acre)**

  Forebay 1
  Impervious Paved Roadway = 26,755 sf x 0.5" (0.0417') = 1,116 cf req'd
  Forebay 1 Volume = 1,506 cf

  Forebay 2
  Impervious Paved Roadway = 22,644 sf x 0.5" (0.0417') = 944.25 cf req'd
  Forebay 2 Volume = 1,413 cf

- **Water Quality Volume – 1.0"**

  Infiltration Basin 1
  Impervious Paved Roadway = 26,755 sf x 1.0" (0.083') = 2,202 cf req'd
  Basin 1 Volume = 49,192 cf

  Infiltration Basin 2
  Impervious Paved Roadway = 22,644 sf x 1.0" (0.083') = 1879 cf req'd
  Basin 2 Volume = 40,270 cf

- **TSS Removal – 80% Min.**

  SEE ATTACHED SHEETS

Standard #5 For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

- Locus site does not meet the criteria to be designated as a "LUHPPL

Standard #6 Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

- Stormwater does not discharge within the Zone II or Interim Wellhead Protection Area of a public water supply or to any other critical area.

Standard #7 A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

- The site is not a redevelopment project.

Standard #8 A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

- The plan set includes notes and details to avoid sediment migration and construction period erosion. Detailed methods and schedules to be incorporated into the Storm Water Pollution Prevention Plan as required by the EPA/NPDES Construction Activities Permit prior to construction.

Standard #9 A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

- **Long-term operation and maintenance plan**

The proposed stormwater management system and the Best Management Practices (BMP's) are to be constructed in accordance with the approved site design plans. During the construction process the general site contractor and property owner shall be designated as the owners of the BMP's and will be responsible for their operation and maintenance. Once the BMP's are constructed they are to be protected from sedimentation until the site is stabilized and vegetated. Inspections should be performed routinely and after every major storm event. Any accumulated sediments and debris are to be removed and any eroded areas are to be re-graded and re-vegetated.

Post-Development Phase Ownership:
After the completion of the site construction, the entire drainage system will be the responsibility of the property owner Wall Street Corporation, P.O. Box 272, Westwood, MA 02090.

Emergency Fuel Spill Response:

In the event of a fuel spill the responsible party shall call 9-1-1. They shall follow local and state removal procedures for the contaminant. The responsible contractor shall also call the Bellingham Board of Health at (508) 966-5820, and the Mass DEP at (508) 792-7650. Any contaminated soil must be completely removed from the property and be delivered to a certified land fill.

Operation & Maintenance:
The following are the minimum maintenance criteria for the proposed BMP's. Responsible parties should however review the Mass DEP Stormwater Handbook for further explanation.

Deep Sump Hooded Catch Basins and Manholes & Oil Grit Chamber

The catch basin shall be inspected and cleaned twice per year (early spring/late fall) and after each major storm event. Also, any catch basin or manhole shall be cleaned out if 12 inches of sediment has accumulated. Inspections shall include structural integrity of hood, depth of sediment in sump and amount of trash and/or debris around grate. Any leaf litter and/or debris shall be removed from catch basin grates after each major storm event.

Sediment Forebay and Infiltration Basin

In the first few months of use inspect the basin after every major storm to ensure it is stabilized and functioning properly. Thereafter mow grass and inspect at least twice per year. Remove grass clippings and any accumulated organic matter and debris. Remove sediment within forebay when within six inches of weir crest. Perform maintenance only when dry – do not compact the basin bottom.

Standard #10

Illicit Discharge Compliance Statement

Owner: Wall Street Development Corporation
Address: P.O Box 272, Westwood, MA 02090
Tel. (617) 922-8730

Responsibility

Owners are responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

Engineer's Compliance Statement:

To the best of my knowledge, the submitted plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

For a redevelopment project (if applicable), all actions taken to identify and remove illicit discharges, including without limitation, visual screening, dye or smoke testing, and the removal of any sources of illicit discharges to the stormwater management system are documented and included with this statement.

Professional Engineer

2/14/25
Date

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

Version 1, Automated: Mar. 4, 2008

Location: Blackstone Street Bellingham MA

TSS Removal Calculation Worksheet

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

Total TSS Removal = 85%

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

Project: 00454 Blackstone Street Improvements
Prepared By: Jonathan Scanlon
Date: 2/14/2025

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

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

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

Version 1, Automated: Mar. 4, 2008

Location: Blackstone Street Bellingham MA

TSS Removal Calculation Worksheet

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

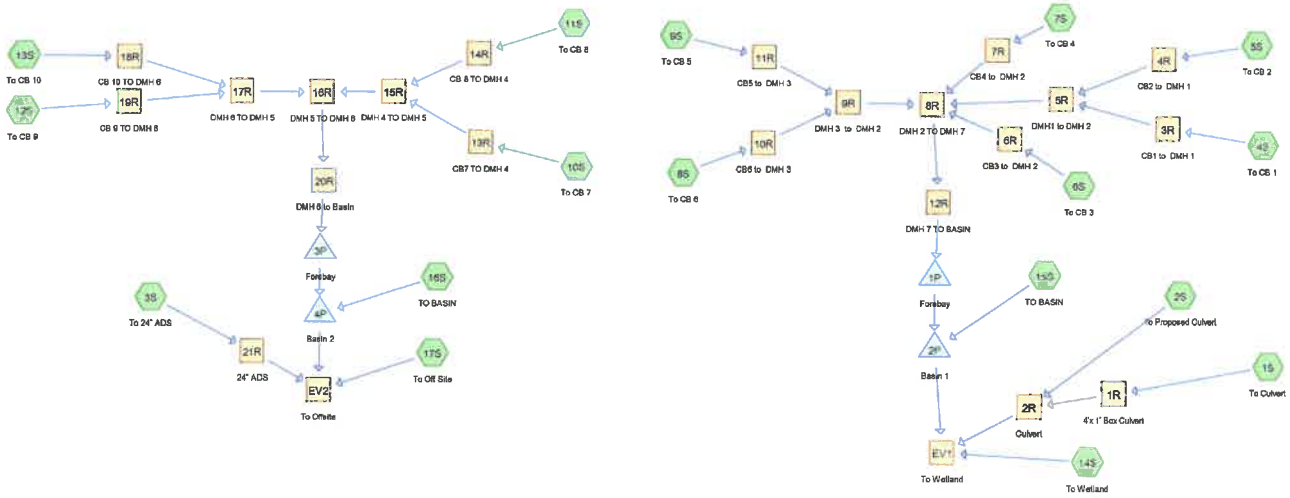
Total TSS Removal = 85%

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

Project: 00454 Blackstone Street Improvements
Prepared By: Jonathan Scanlon
Date: 2/14/2025

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

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



Subcat Reach Pond Link

Routing Diagram for 00454-PR -Winter

Prepared by {enter your company name here}, Printed 2/14/2025

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25 YR	Type III 24-hr		Default	24.00	1	6.38	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
499,000	61	>75% Grass cover, Good, HSG B (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S)
20,077	80	>75% Grass cover, Good, HSG D (2S)
142,134	98	Paved roads w/curbs & sewers, HSG B (1S, 2S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S)
39,866	98	Roofs, HSG B (1S, 2S)
3,202	98	Roofs, HSG D (2S)
3,153,792	55	Woods, Good, HSG B (1S, 2S, 3S, 14S, 15S, 16S, 17S)
793,923	77	Woods, Good, HSG D (2S, 14S)
4,651,994	**61**	**TOTAL AREA**

Summary for Pond 1P: Forebay

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 4.95" for 25 YR event
Inflow = 4.25 cfs @ 12.15 hrs, Volume= 15,348 cf
Outflow = 4.21 cfs @ 12.16 hrs, Volume= 13,213 cf, Atten= 1%, Lag= 0.4 min
Primary = 4.21 cfs @ 12.16 hrs, Volume= 13,213 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 282.58' @ 12.16 hrs Surf.Area= 1,672 sf Storage= 2,283 cf

Plug-Flow detention time= 95.2 min calculated for 13,213 cf (86% of inflow)
Center-of-Mass det. time= 35.4 min (829.4 - 794.0)

Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	18,194 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

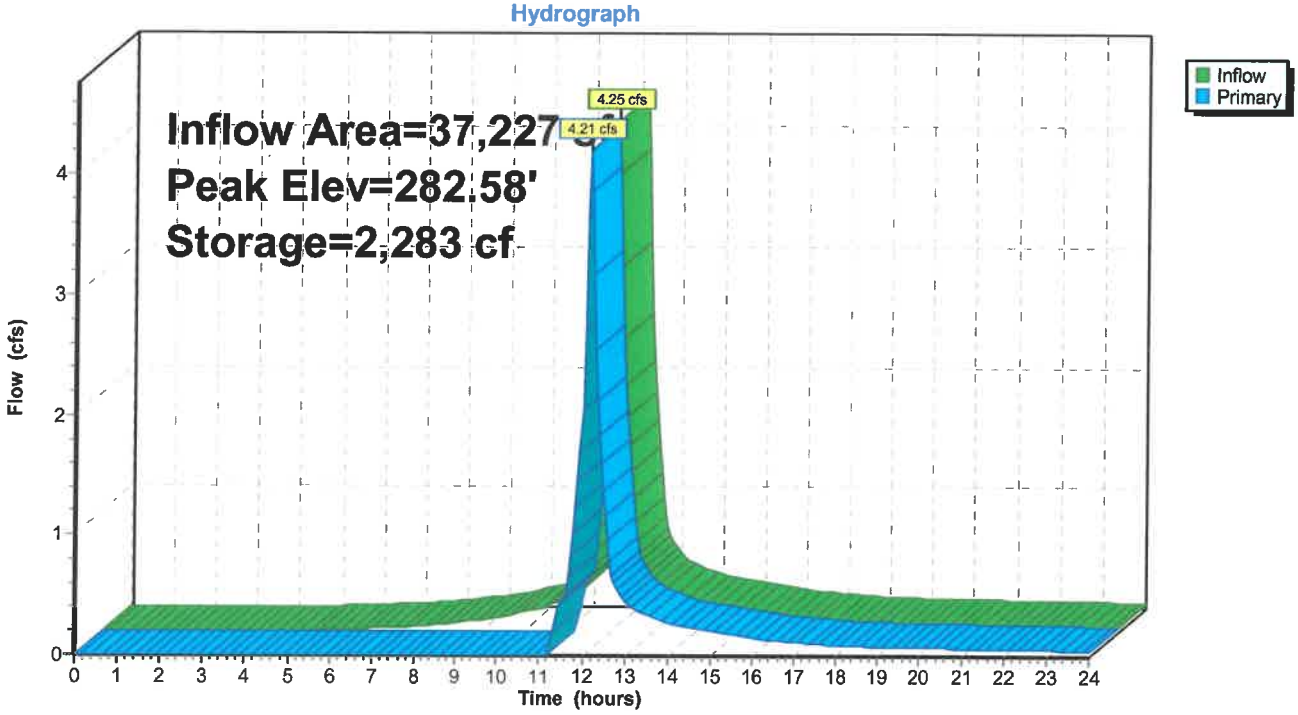
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	1,232	135.0	0	0	1,232
282.00	1,506	148.6	1,367	1,367	1,570
284.00	2,120	175.9	3,609	4,975	2,346
286.00	2,825	203.0	4,928	9,903	3,247
288.00	3,621	230.0	6,430	16,333	4,273
288.50	3,824	236.9	1,861	18,194	4,555

Device	Routing	Invert	Outlet Devices
#1	Primary	282.50'	**60.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.13 cfs @ 12.16 hrs HW=282.58' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 4.13 cfs @ 0.90 fps)

Pond 1P: Forebay

Hydrograph



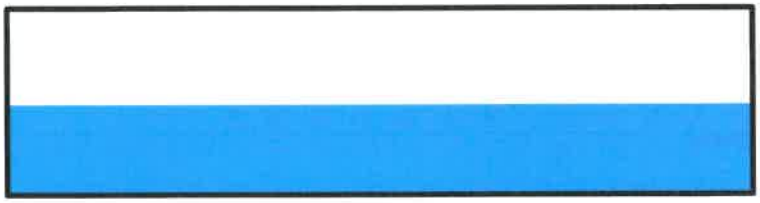
Summary for Reach 1R: 4'x 1' Box Culvert

Inflow Area = 492,614 sf, 9.97% Impervious, Inflow Depth > 2.25" for 25 YR event
Inflow = 16.77 cfs @ 12.42 hrs, Volume= 92,290 cf
Outflow = 16.76 cfs @ 12.42 hrs, Volume= 92,274 cf, Atten= 0%, Lag= 0.2 min

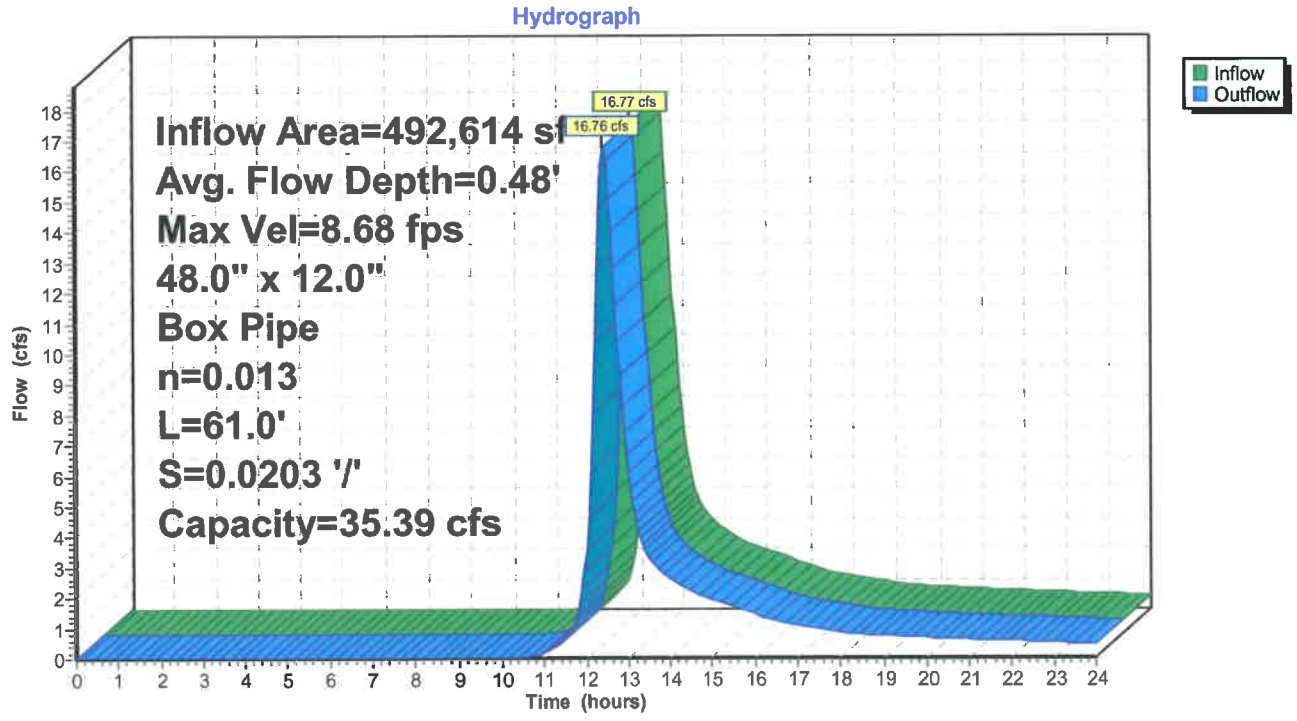
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.68 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.27 fps, Avg. Travel Time= 0.3 min

Peak Storage= 118 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 4.00'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 35.39 cfs

48.0" W x 12.0" H Box Pipe
n= 0.013 Concrete, trowel finish
Length= 61.0' Slope= 0.0203 '/'
Inlet Invert= 301.34', Outlet Invert= 300.10'



Reach 1R: 4'x 1' Box Culvert



Summary for Subcatchment 1S: To Culvert

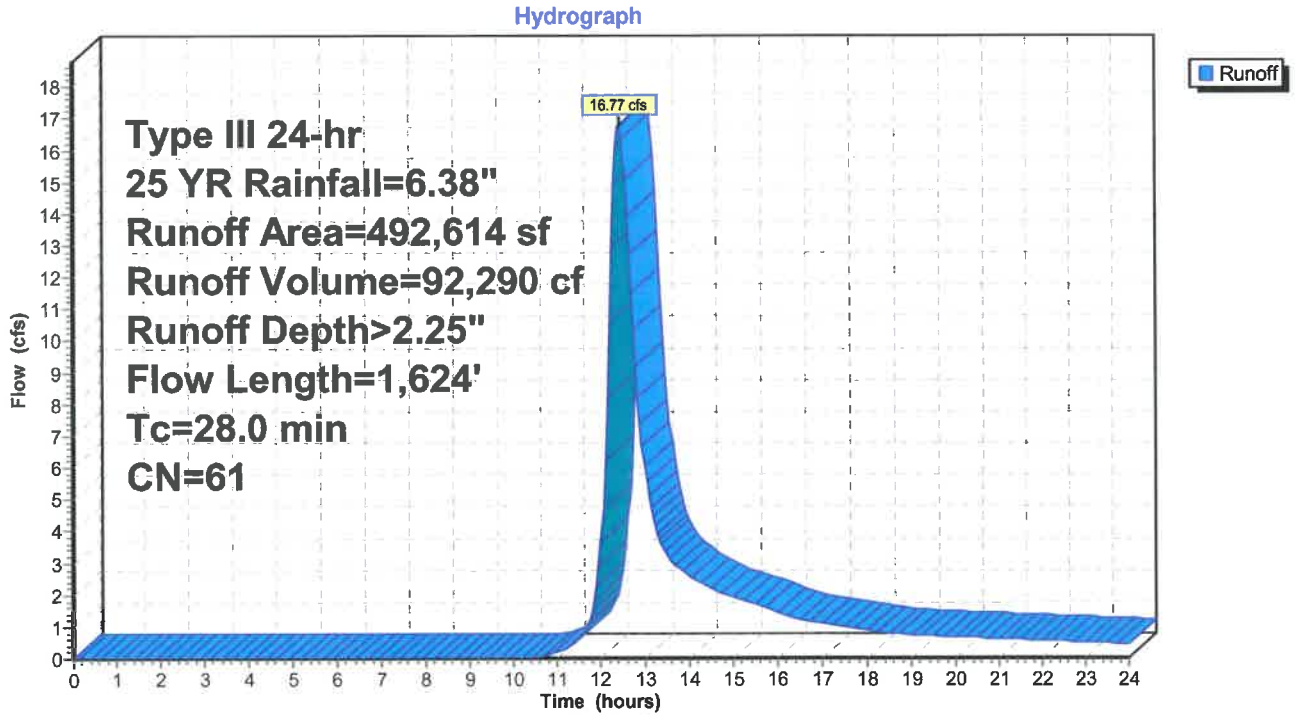
Runoff = 16.77 cfs @ 12.42 hrs, Volume= 92,290 cf, Depth> 2.25"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
34,861	98	Paved roads w/curbs & sewers, HSG B
14,250	98	Roofs, HSG B
288,899	55	Woods, Good, HSG B
154,604	61	>75% Grass cover, Good, HSG B
492,614	61	Weighted Average
443,503		90.03% Pervious Area
49,111		9.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
2.4	126	0.0317	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.5	880	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	568	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
28.0	1,624	Total			

Subcatchment 1S: To Culvert



Summary for Pond 2P: Basin 1

Inflow Area = 152,892 sf, 17.50% Impervious, Inflow Depth > 2.41" for 25 YR event
Inflow = 8.18 cfs @ 12.17 hrs, Volume= 30,752 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 285.93' @ 24.00 hrs Surf.Area= 8,073 sf Storage= 30,739 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

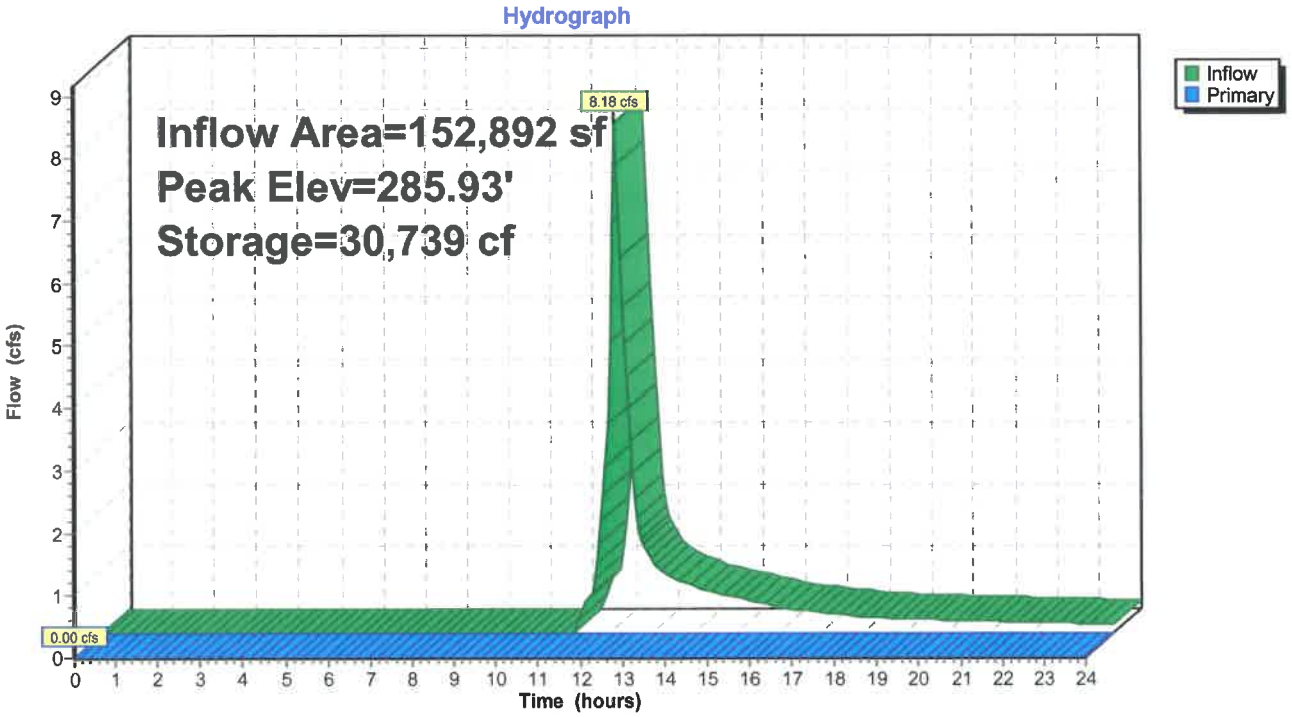
Volume	Invert	Avail.Storage	Storage Description
#1	281.00'	54,203 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
281.00	4,532	258.9	0	0	4,532
282.00	5,183	276.2	4,854	4,854	5,316
284.00	6,588	310.8	11,743	16,597	7,035
286.00	8,128	345.4	14,689	31,286	8,958
288.00	9,804	380.0	17,906	49,192	11,082
288.50	10,244	388.7	5,012	54,203	11,648

Device	Routing	Invert	Outlet Devices
#1	Primary	288.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=281.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Basin 1



Summary for Reach 2R: Culvert

Inflow Area = 3,234,807 sf, 4.20% Impervious, Inflow Depth > 2.23" for 25 YR event
Inflow = 70.54 cfs @ 12.81 hrs, Volume= 601,180 cf
Outflow = 70.53 cfs @ 12.82 hrs, Volume= 601,109 cf, Atten= 0%, Lag= 0.2 min

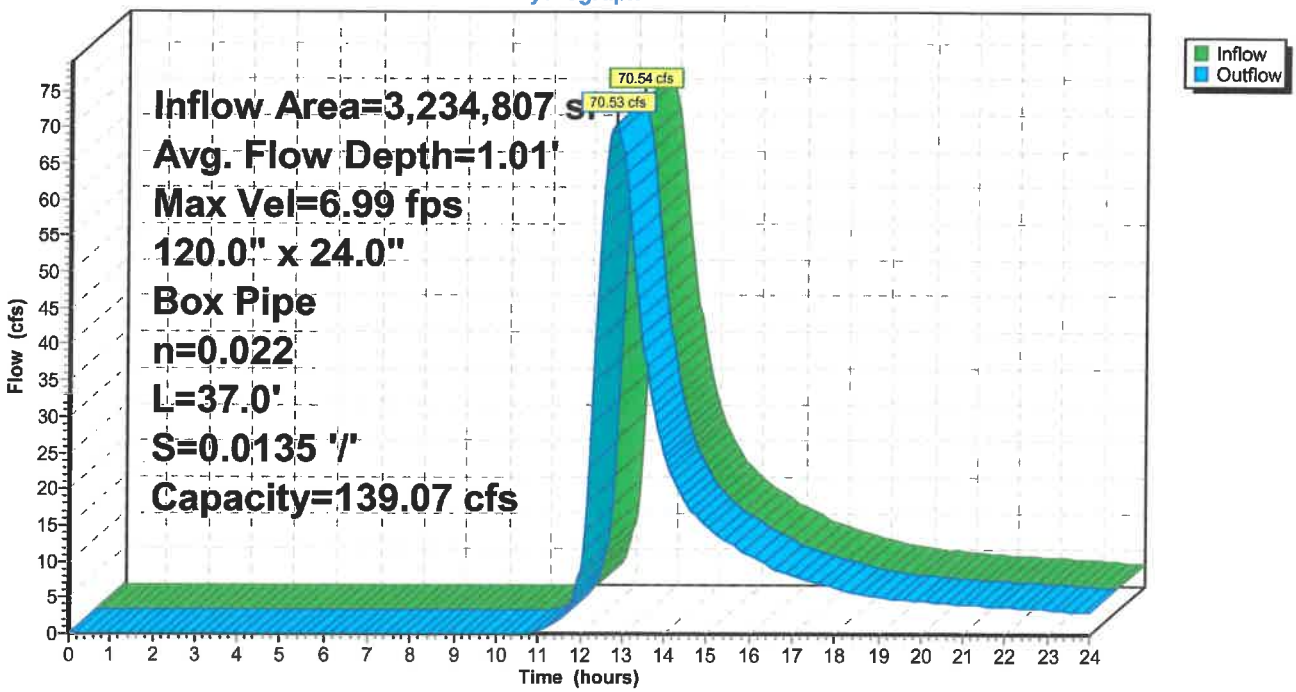
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.99 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.12 fps, Avg. Travel Time= 0.2 min

Peak Storage= 373 cf @ 12.82 hrs
Average Depth at Peak Storage= 1.01' , Surface Width= 10.00'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 139.07 cfs

120.0" W x 24.0" H Box Pipe
n= 0.022 Earth, clean & straight
Length= 37.0' Slope= 0.0135 '/'
Inlet Invert= 292.00', Outlet Invert= 291.50'

Reach 2R: Culvert

Hydrograph



Summary for Subcatchment 2S: To Proposed Culvert

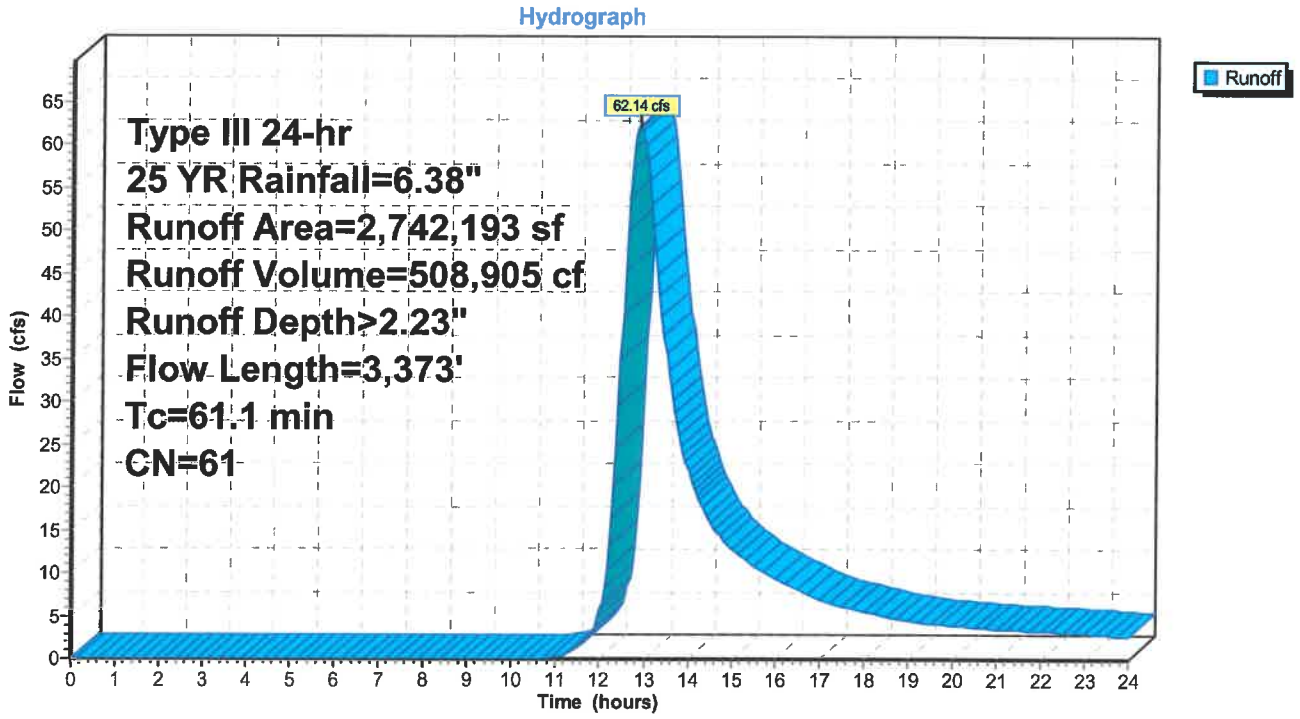
Runoff = 62.14 cfs @ 12.87 hrs, Volume= 508,905 cf, Depth> 2.23"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
57,874	98	Paved roads w/curbs & sewers, HSG B
1,862,663	55	Woods, Good, HSG B
533,264	77	Woods, Good, HSG D
25,616	98	Roofs, HSG B
3,202	98	Roofs, HSG D
20,077	80	>75% Grass cover, Good, HSG D
239,497	61	>75% Grass cover, Good, HSG B
2,742,193	61	Weighted Average
2,655,501		96.84% Pervious Area
86,692		3.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
3.9	366	0.1000	1.58		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
47.4	2,957	0.0100	1.04	1.25	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
61.1	3,373	Total			

Subcatchment 2S: To Proposed Culvert



Summary for Pond 3P: Forebay

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.53" for 25 YR event
Inflow = 4.12 cfs @ 12.12 hrs, Volume= 13,894 cf
Outflow = 4.12 cfs @ 12.12 hrs, Volume= 11,629 cf, Atten= 0%, Lag= 0.3 min
Primary = 4.12 cfs @ 12.12 hrs, Volume= 11,629 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 305.57' @ 12.12 hrs Surf.Area= 1,781 sf Storage= 2,389 cf

Plug-Flow detention time= 101.6 min calculated for 11,604 cf (84% of inflow)
Center-of-Mass det. time= 35.8 min (838.8 - 802.9)

Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	7,293 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

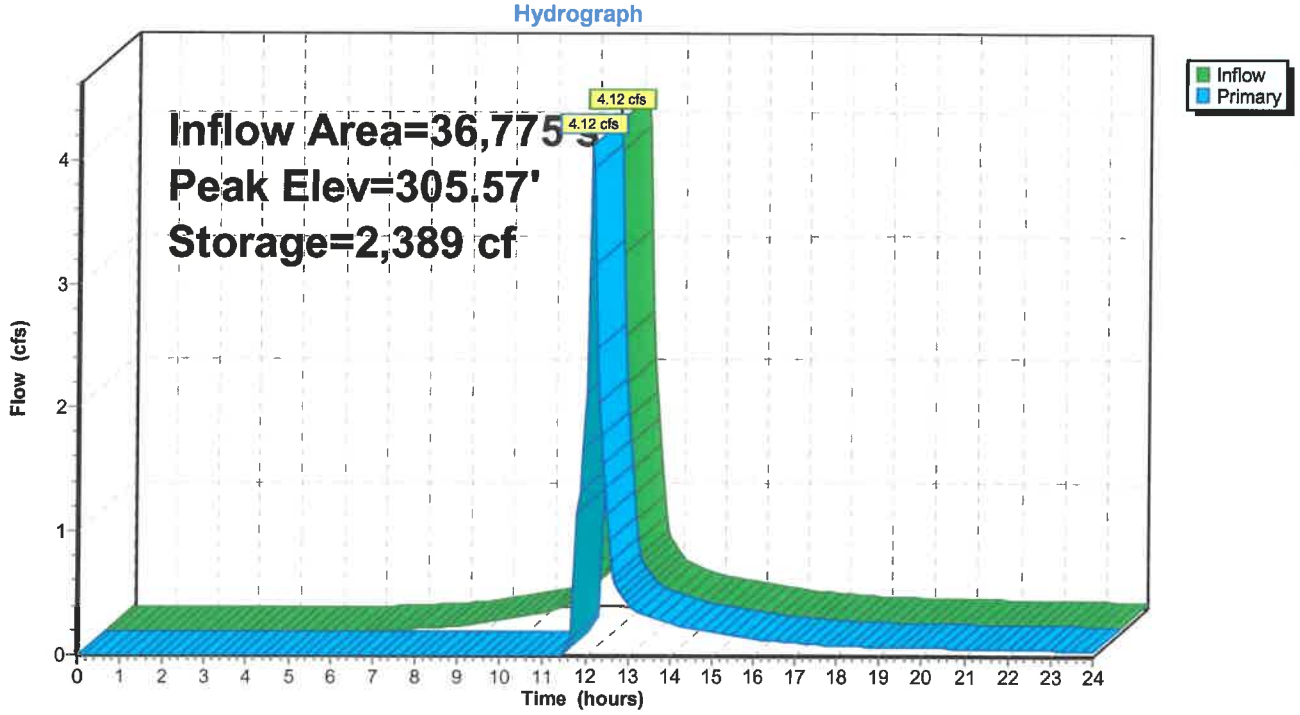
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	1,198	137.0	0	0	1,198
305.00	1,639	158.0	1,413	1,413	1,713
306.00	1,891	167.0	1,763	3,176	1,996
308.00	2,230	182.8	4,116	7,293	2,558

Device	Routing	Invert	Outlet Devices
#1	Primary	305.50'	**65.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.91 cfs @ 12.12 hrs HW=305.57' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 3.91 cfs @ 0.86 fps)

Pond 3P: Forebay

Hydrograph



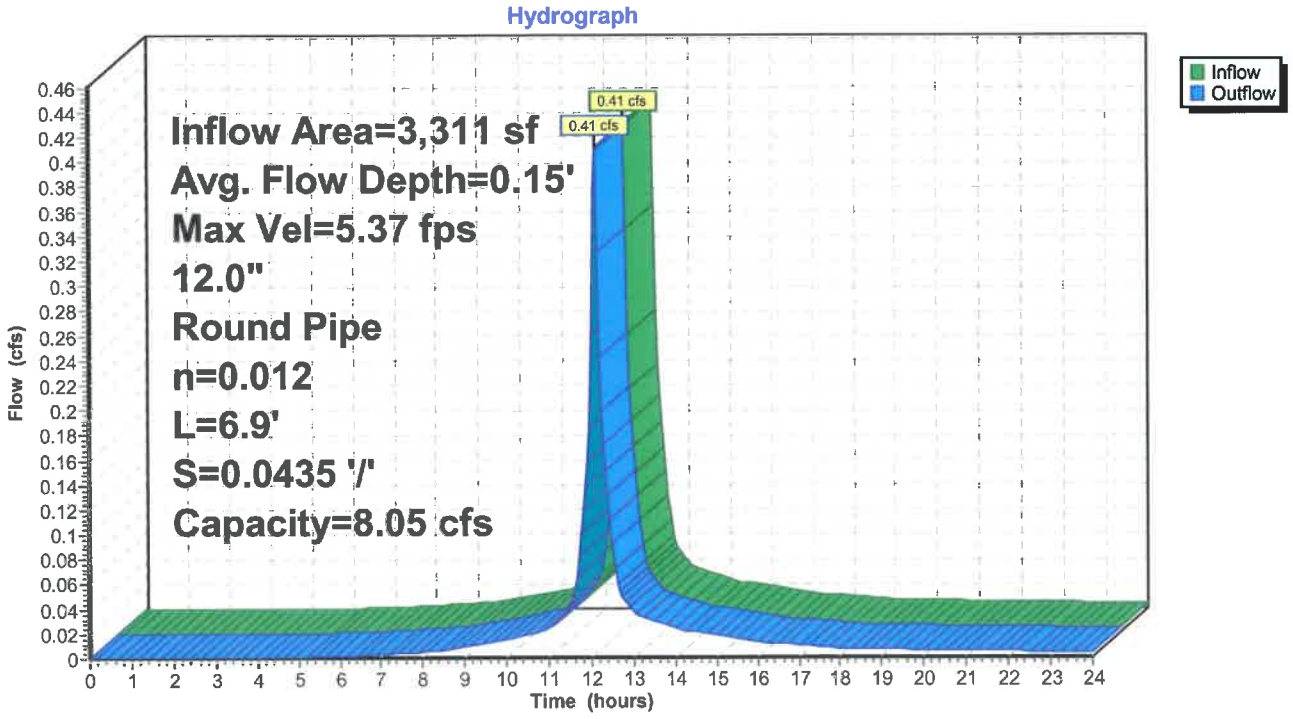
Summary for Reach 3R: CB1 to DMH 1

Inflow Area = 3,311 sf, 69.56% Impervious, Inflow Depth > 4.88" for 25 YR event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,346 cf
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,346 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.79 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 0.72'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'



Summary for Subcatchment 3S: To 24" ADS

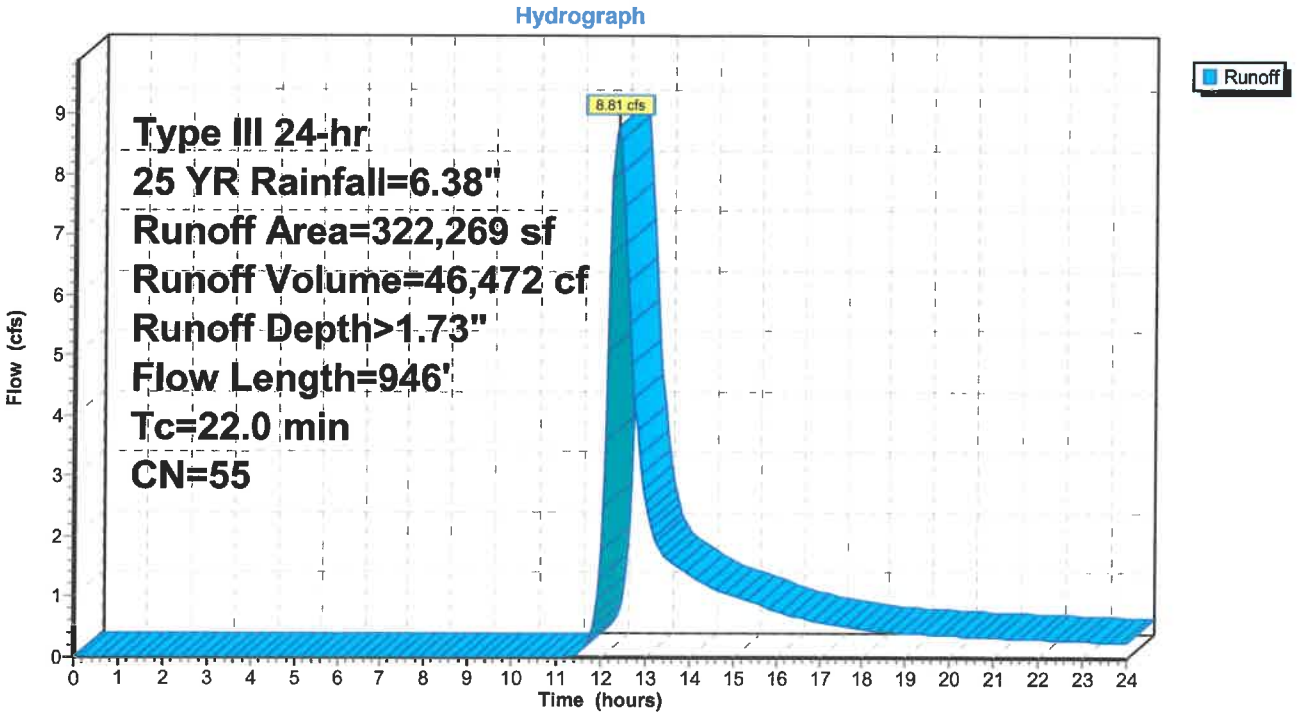
Runoff = 8.81 cfs @ 12.34 hrs, Volume= 46,472 cf, Depth> 1.73"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
322,269	55	Woods, Good, HSG B
322,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.22"
14.9	896	0.0401	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
22.0	946	Total			

Subcatchment 3S: To 24" ADS



Summary for Pond 4P: Basin 2

Inflow Area = 116,316 sf, 19.47% Impervious, Inflow Depth > 2.56" for 25 YR event
Inflow = 7.10 cfs @ 12.15 hrs, Volume= 24,834 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 307.00' @ 24.00 hrs Surf.Area= 9,600 sf Storage= 24,824 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

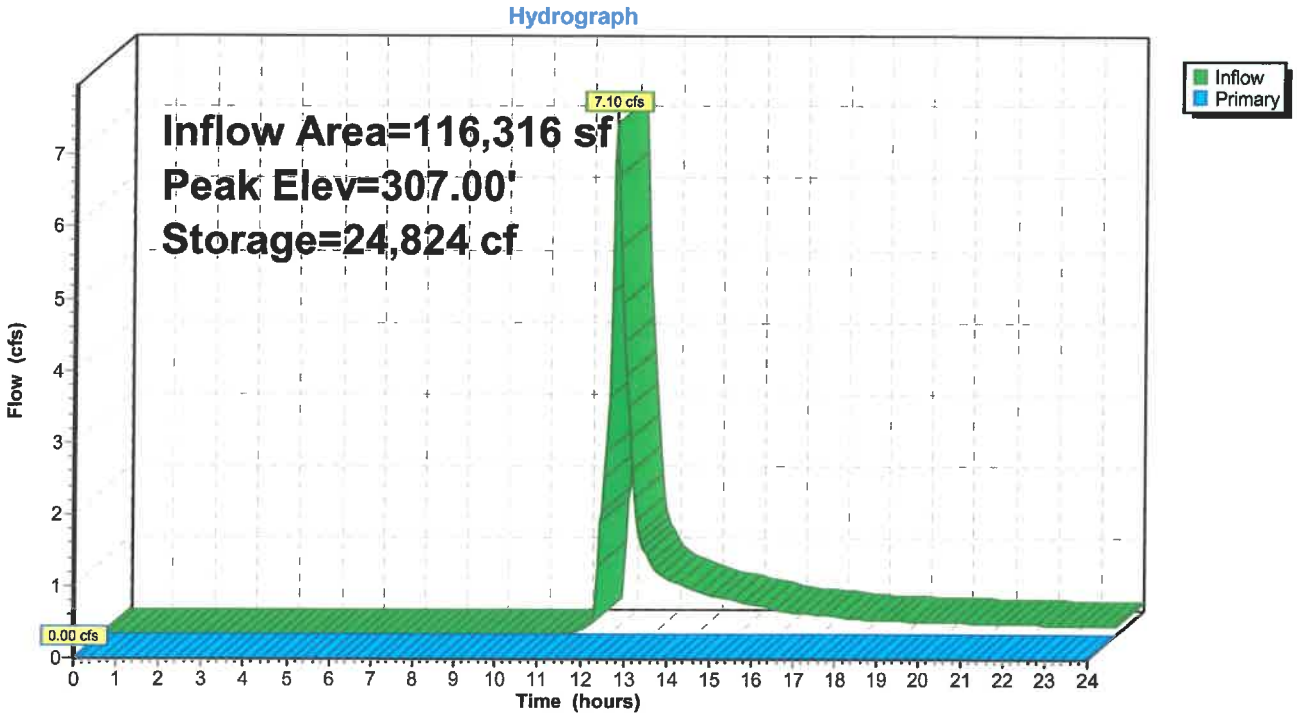
Volume	Invert	Avail.Storage	Storage Description
#1	304.00'	45,905 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
304.00	7,004	332.0	0	0	7,004
306.00	8,695	371.9	15,669	15,669	9,347
308.00	10,548	410.0	19,213	34,882	11,843
308.50	11,008	414.5	5,389	40,270	12,204
309.00	11,531	429.0	5,634	45,905	13,199

Device	Routing	Invert	Outlet Devices
#1	Primary	308.60'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=304.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Basin 2



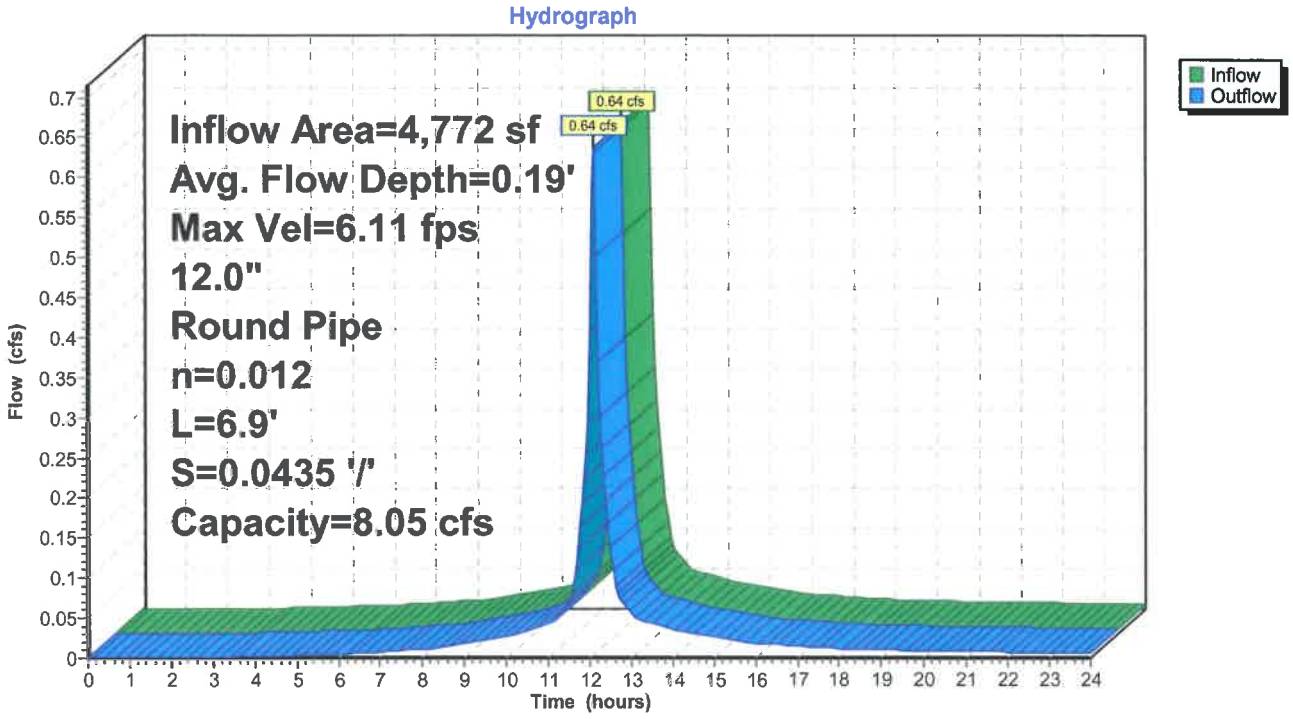
Summary for Reach 4R: CB2 to DMH 1

Inflow Area = 4,772 sf, 83.28% Impervious, Inflow Depth > 5.44" for 25 YR event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,163 cf
Outflow = 0.64 cfs @ 12.09 hrs, Volume= 2,163 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.11 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.02 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 0.79'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.05 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.9' Slope= 0.0435 '/'
Inlet Invert= 295.20', Outlet Invert= 294.90'



Summary for Subcatchment 4S: To CB 1

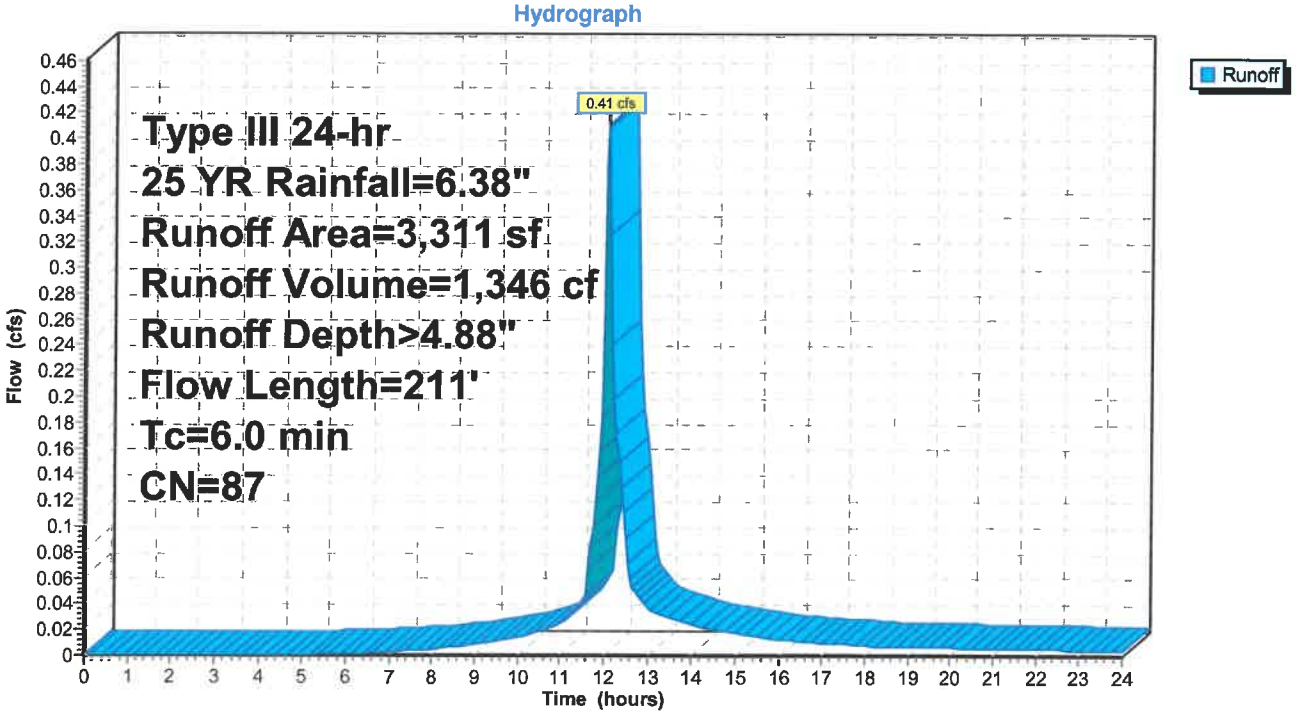
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,346 cf, Depth> 4.88"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
2,303	98	Paved roads w/curbs & sewers, HSG B
1,008	61	>75% Grass cover, Good, HSG B
3,311	87	Weighted Average
1,008		30.44% Pervious Area
2,303		69.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.0	161	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	211	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 4S: To CB 1



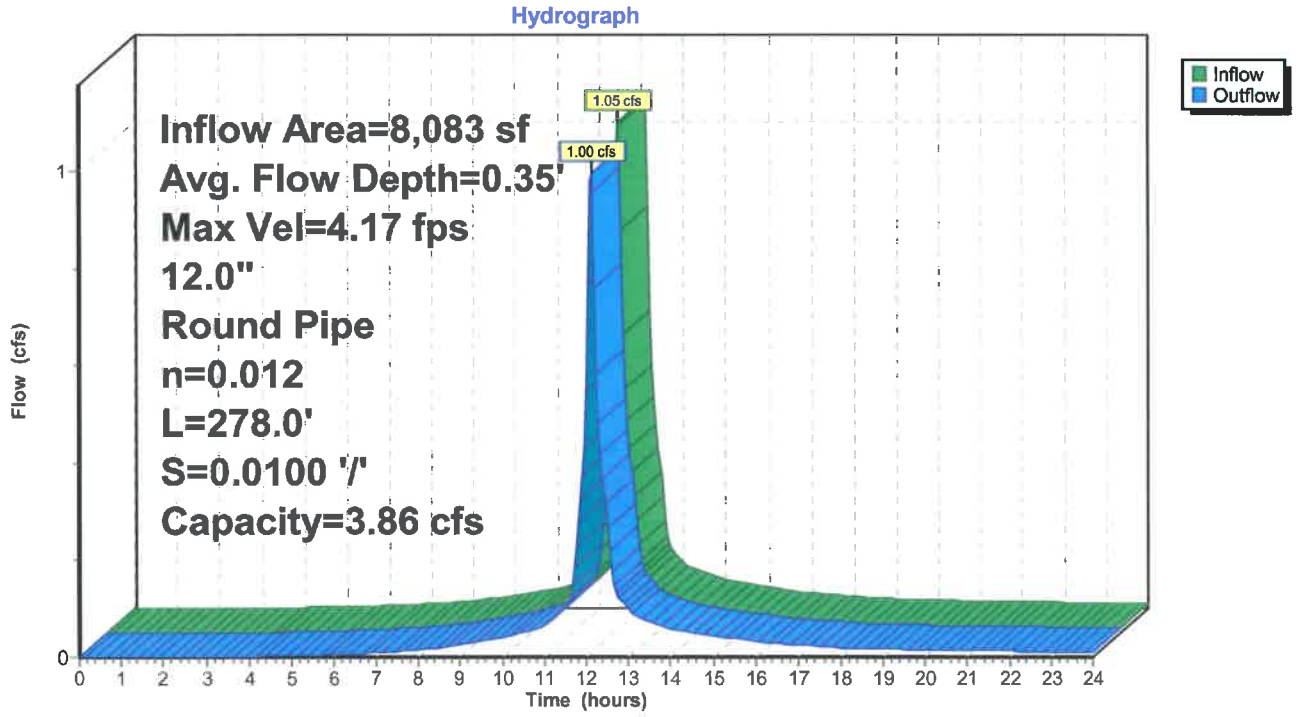
Summary for Reach 5R: DMH1 to DMH 2

Inflow Area = 8,083 sf, 77.66% Impervious, Inflow Depth > 5.21" for 25 YR event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 3,509 cf
Outflow = 1.00 cfs @ 12.12 hrs, Volume= 3,506 cf, Atten= 5%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.17 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 3.4 min

Peak Storage= 69 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.35' , Surface Width= 0.96'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.86 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 278.0' Slope= 0.0100 '/'
Inlet Invert= 290.68', Outlet Invert= 287.90'



Summary for Subcatchment 5S: To CB 2

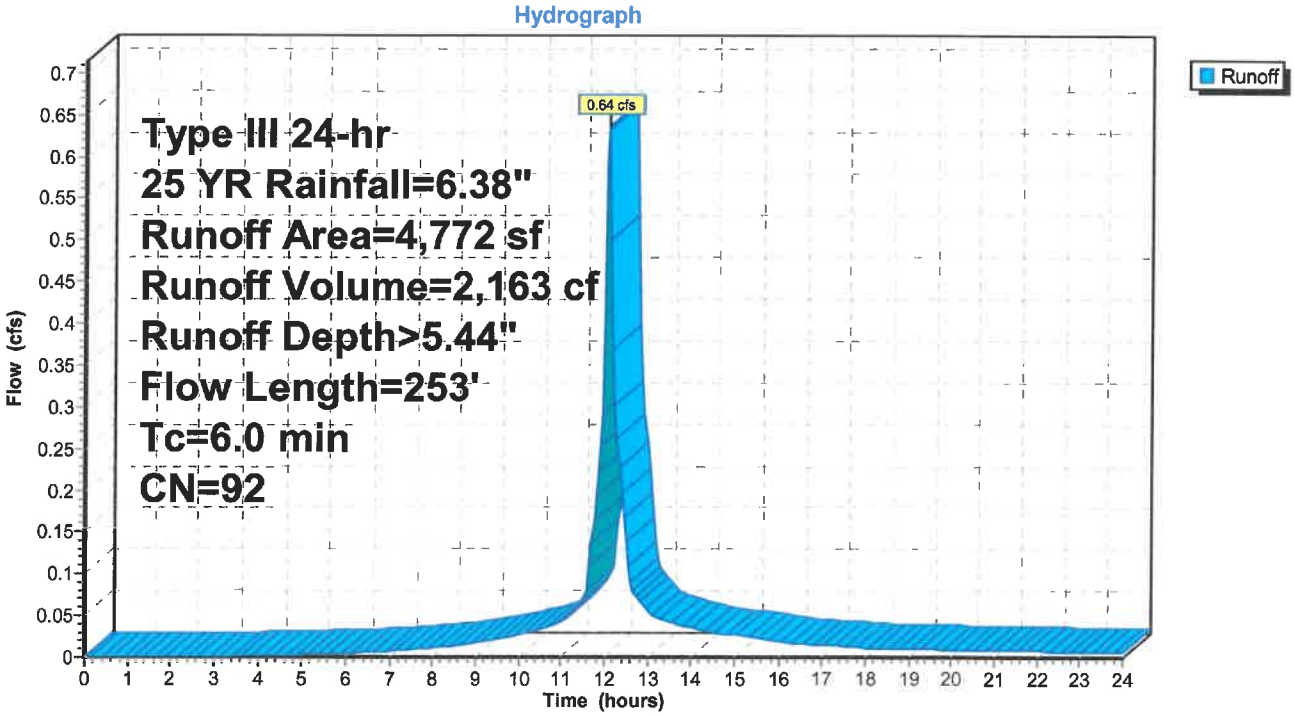
Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,163 cf, Depth> 5.44"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
3,974	98	Paved roads w/curbs & sewers, HSG B
798	61	>75% Grass cover, Good, HSG B
4,772	92	Weighted Average
798		16.72% Pervious Area
3,974		83.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0240	1.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
1.2	203	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	253	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: To CB 2



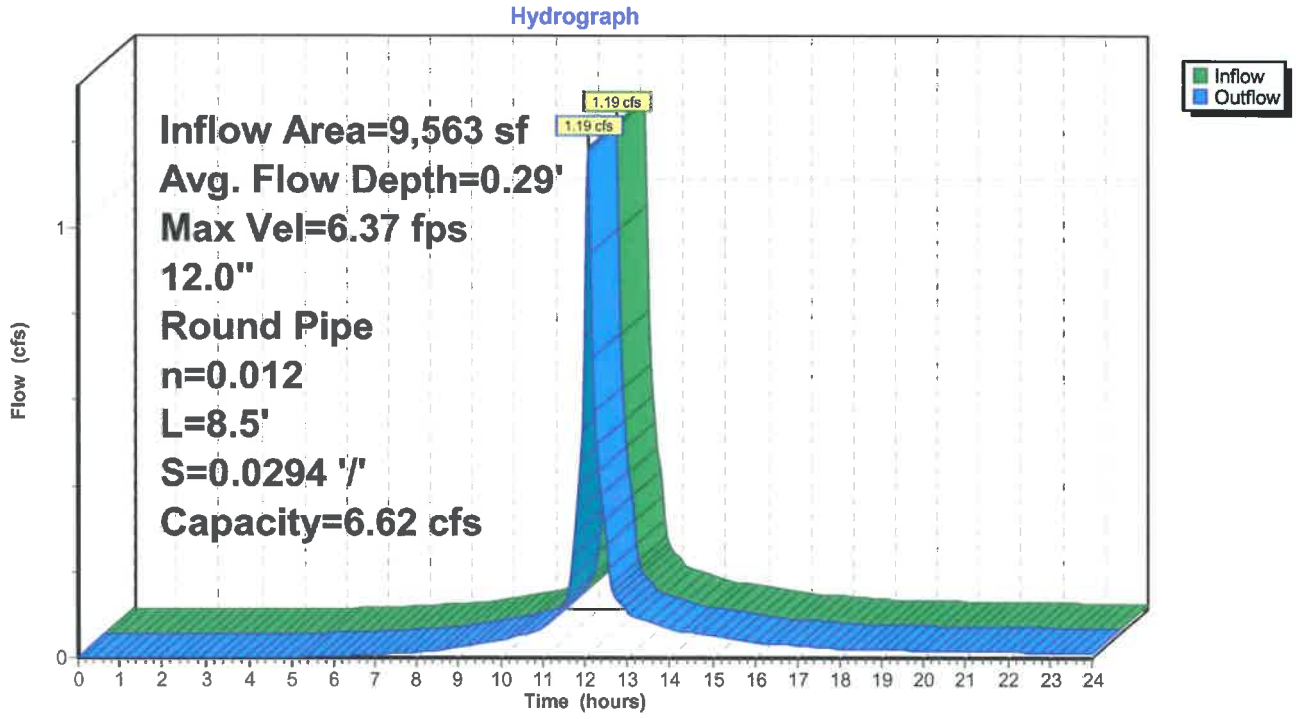
Summary for Reach 6R: CB3 to DMH 2

Inflow Area = 9,563 sf, 69.08% Impervious, Inflow Depth > 4.88" for 25 YR event
Inflow = 1.19 cfs @ 12.09 hrs, Volume= 3,887 cf
Outflow = 1.19 cfs @ 12.09 hrs, Volume= 3,887 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.13 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.62 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 8.5' Slope= 0.0294 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 6S: To CB 3

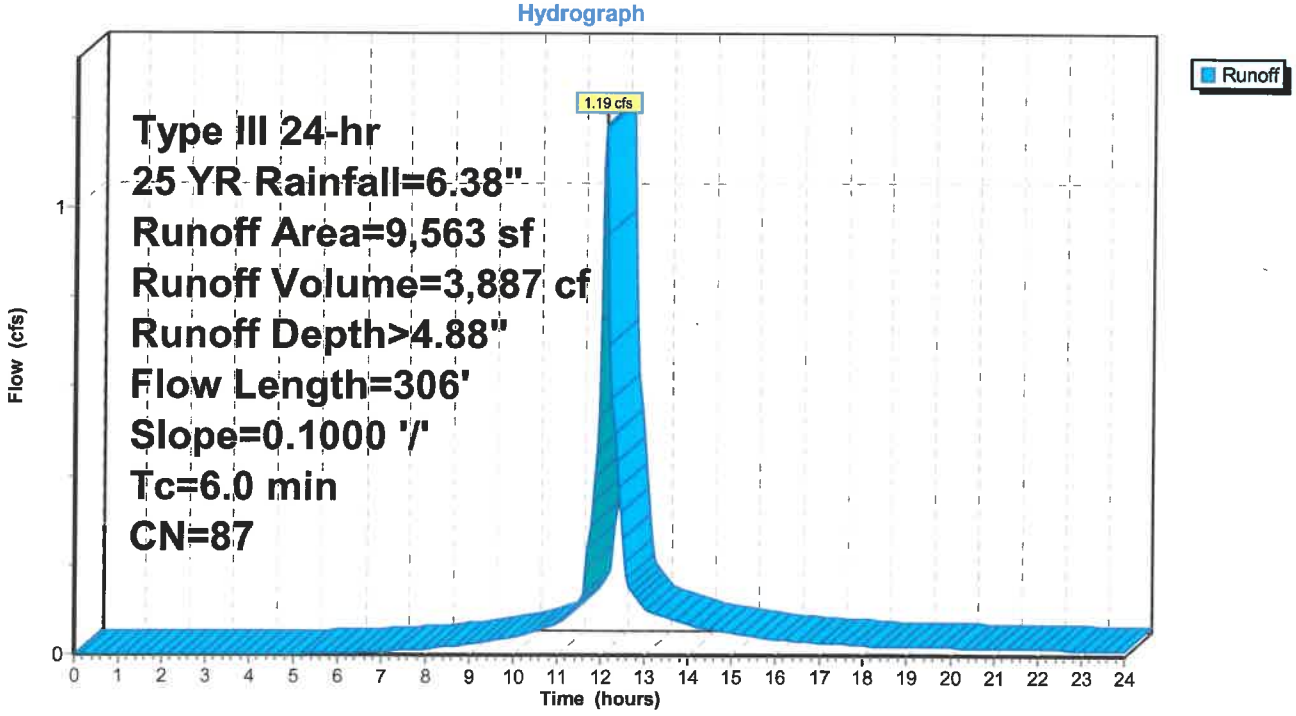
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 3,887 cf, Depth> 4.88"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
2,957	61	>75% Grass cover, Good, HSG B
9,563	87	Weighted Average
2,957		30.92% Pervious Area
6,606		69.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6S: To CB 3



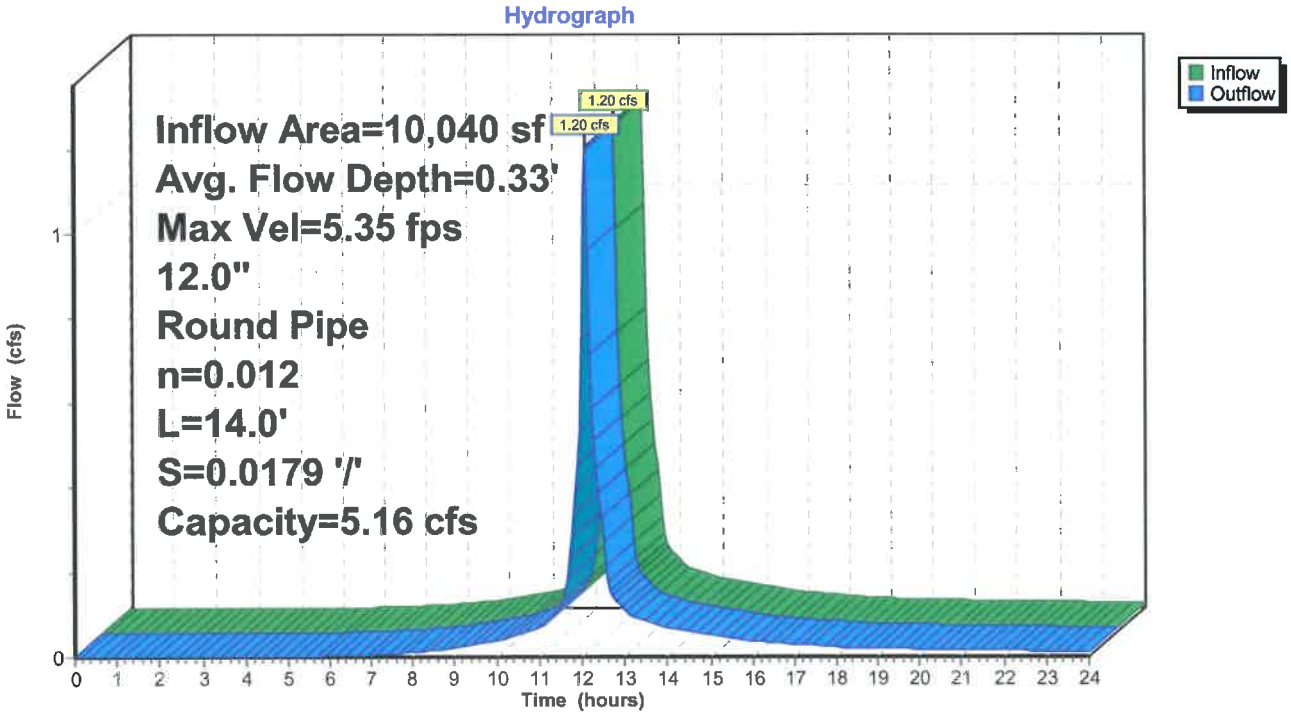
Summary for Reach 7R: CB4 to DMH 2

Inflow Area = 10,040 sf, 65.80% Impervious, Inflow Depth > 4.66" for 25 YR event
Inflow = 1.20 cfs @ 12.09 hrs, Volume= 3,898 cf
Outflow = 1.20 cfs @ 12.09 hrs, Volume= 3,897 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.35 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.81 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.16 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 14.0' Slope= 0.0179 '/'
Inlet Invert= 294.40', Outlet Invert= 294.15'



Summary for Subcatchment 7S: To CB 4

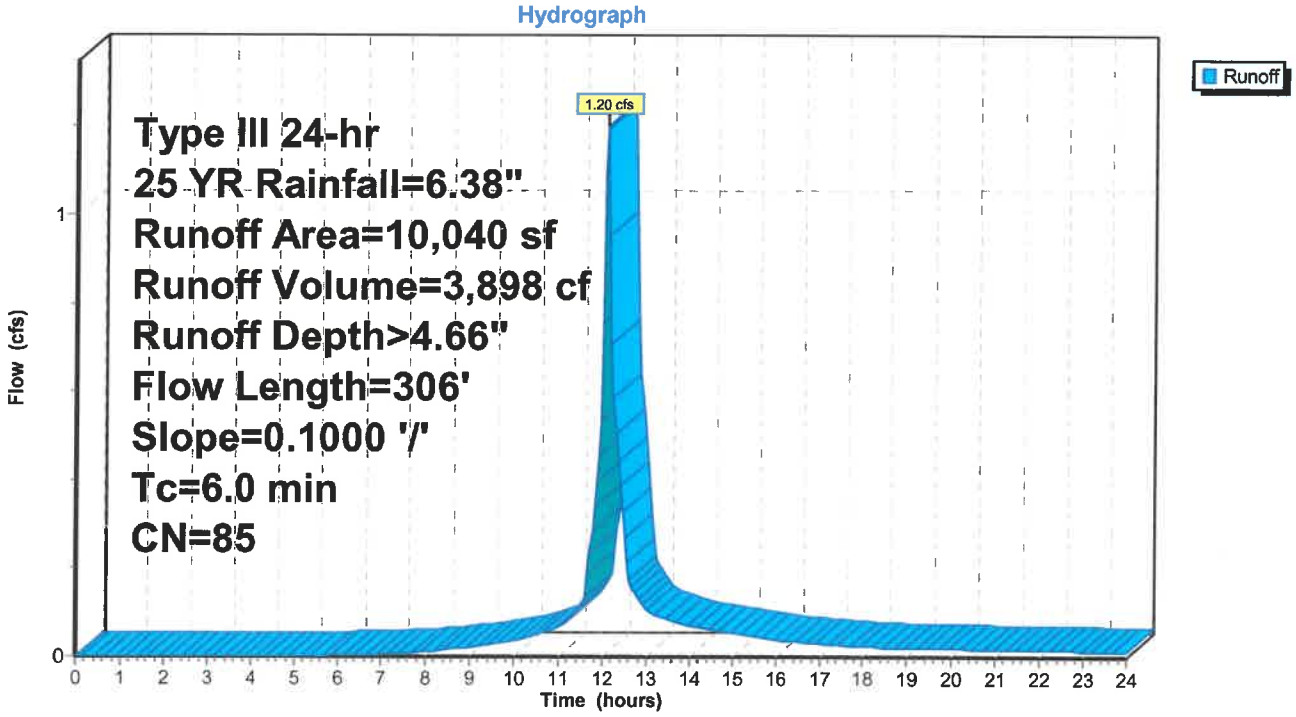
Runoff = 1.20 cfs @ 12.09 hrs, Volume= 3,898 cf, Depth> 4.66"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
6,606	98	Paved roads w/curbs & sewers, HSG B
3,434	61	>75% Grass cover, Good, HSG B
10,040	85	Weighted Average
3,434		34.20% Pervious Area
6,606		65.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	256	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	306	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7S: To CB 4



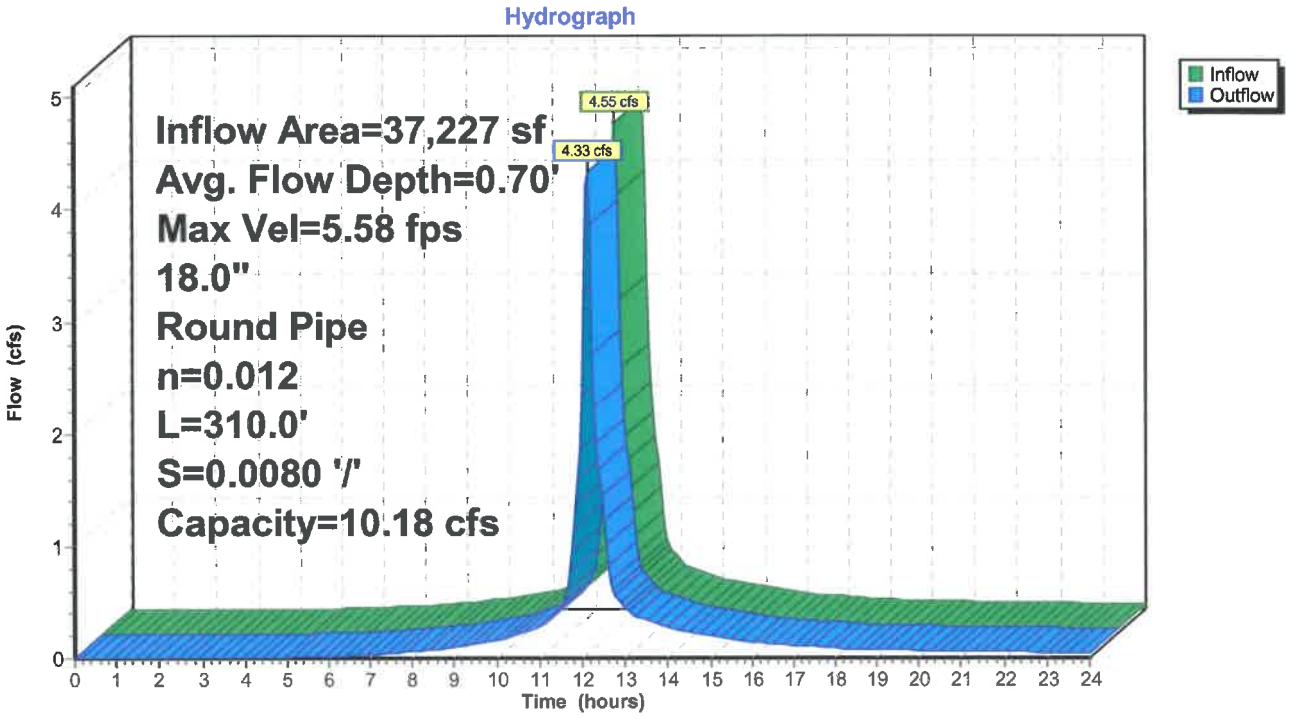
Summary for Reach 8R: DMH 2 TO DMH 7

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 4.95" for 25 YR event
Inflow = 4.55 cfs @ 12.10 hrs, Volume= 15,370 cf
Outflow = 4.33 cfs @ 12.13 hrs, Volume= 15,357 cf, Atten= 5%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.58 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 2.8 min

Peak Storage= 250 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 310.0' Slope= 0.0080 '/'
Inlet Invert= 287.40', Outlet Invert= 284.92'



Summary for Subcatchment 8S: To CB 6

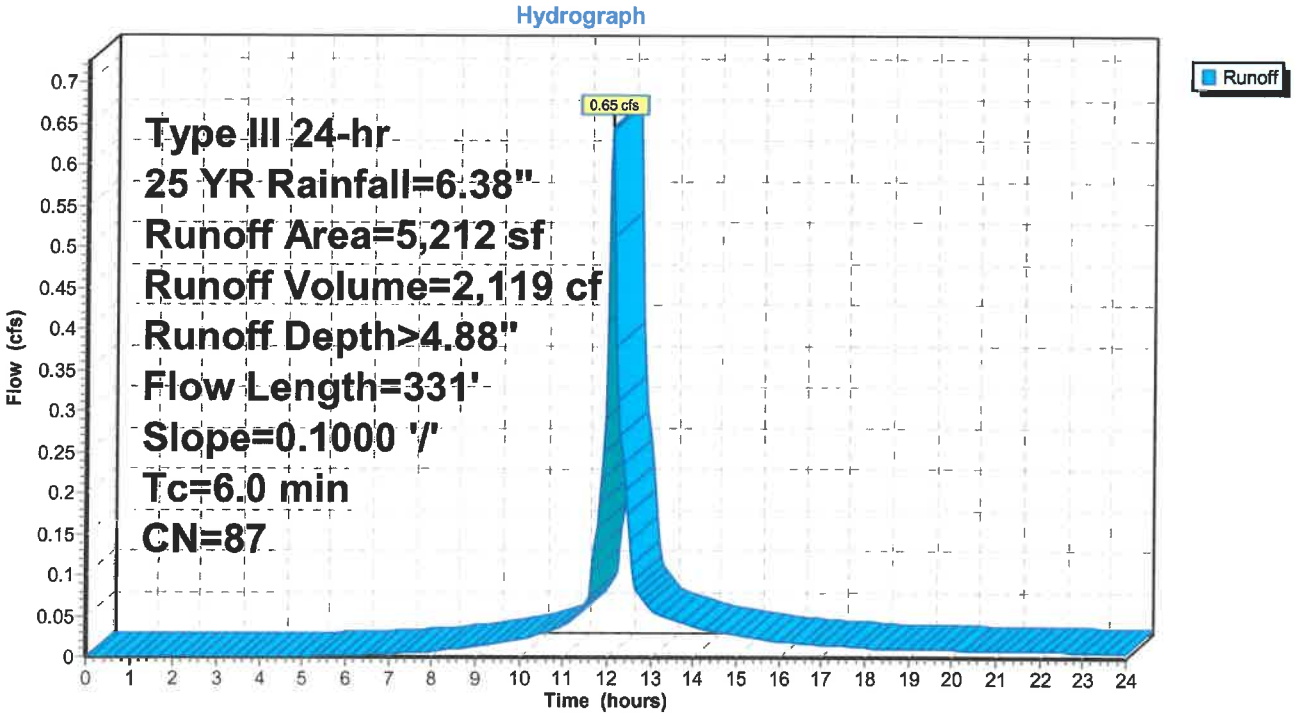
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 2,119 cf, Depth> 4.88"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
1,579	61	>75% Grass cover, Good, HSG B
5,212	87	Weighted Average
1,579		30.30% Pervious Area
3,633		69.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	281	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	331	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8S: To CB 6



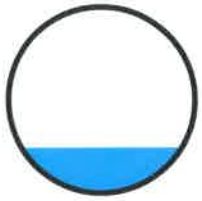
Summary for Reach 9R: DMH 3 to DMH 2

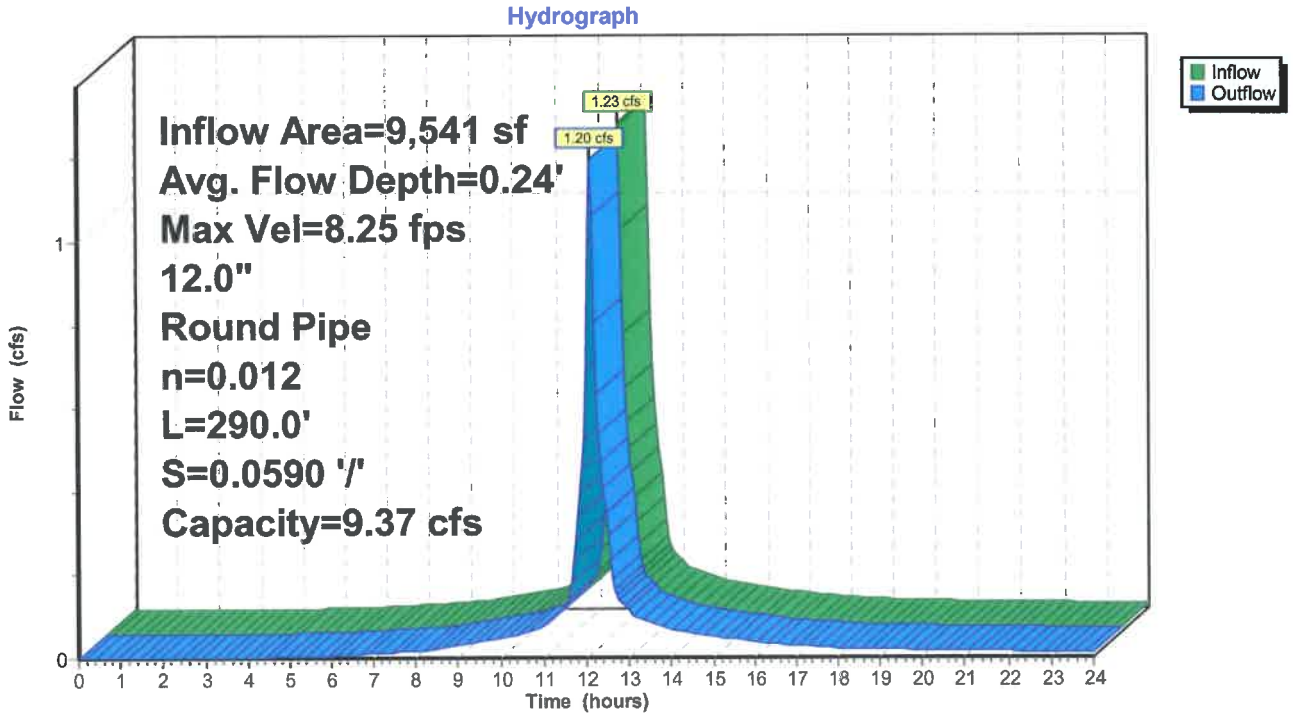
Inflow Area = 9,541 sf, 76.16% Impervious, Inflow Depth > 5.13" for 25 YR event
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 4,081 cf
Outflow = 1.20 cfs @ 12.10 hrs, Volume= 4,079 cf, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.25 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.67 fps, Avg. Travel Time= 1.8 min

Peak Storage= 43 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 290.0' Slope= 0.0590 '/'
Inlet Invert= 305.00', Outlet Invert= 287.90'





Summary for Subcatchment 9S: To CB 5

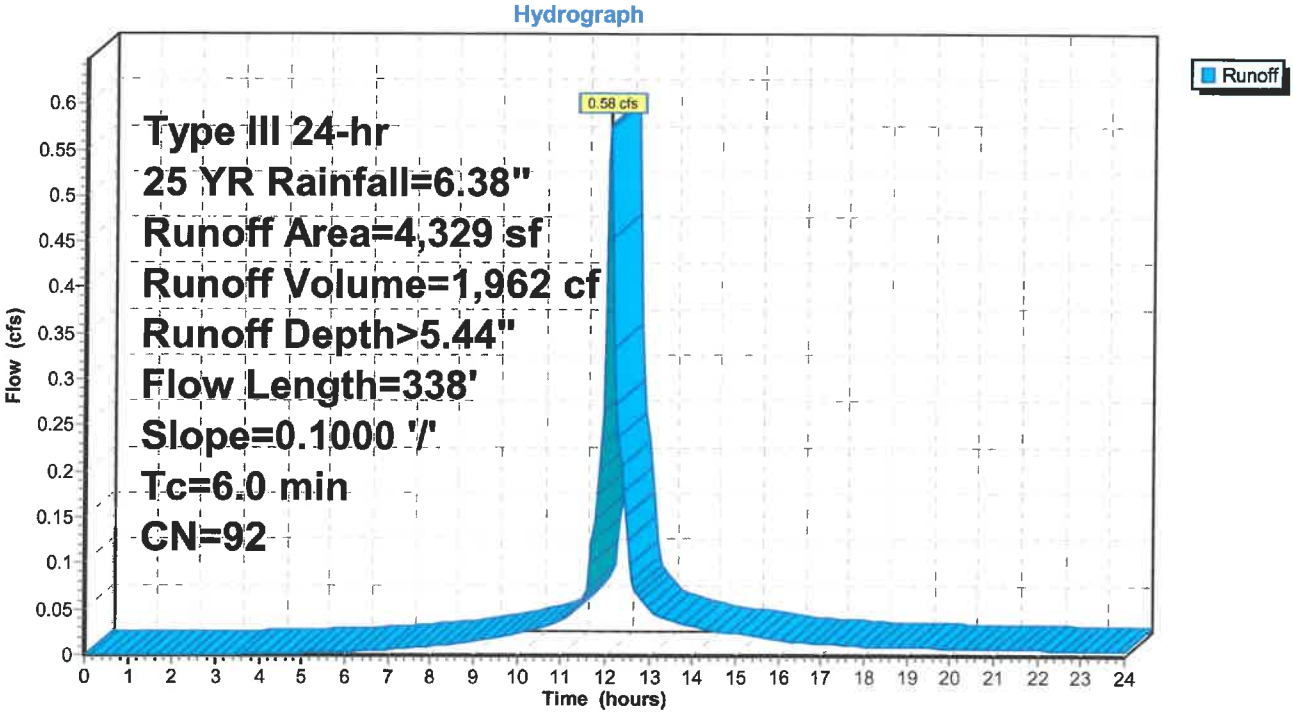
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 1,962 cf, Depth> 5.44"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
3,633	98	Paved roads w/curbs & sewers, HSG B
696	61	>75% Grass cover, Good, HSG B
4,329	92	Weighted Average
696		16.08% Pervious Area
3,633		83.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.29		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	288	0.1000	6.42		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	338	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 9S: To CB 5



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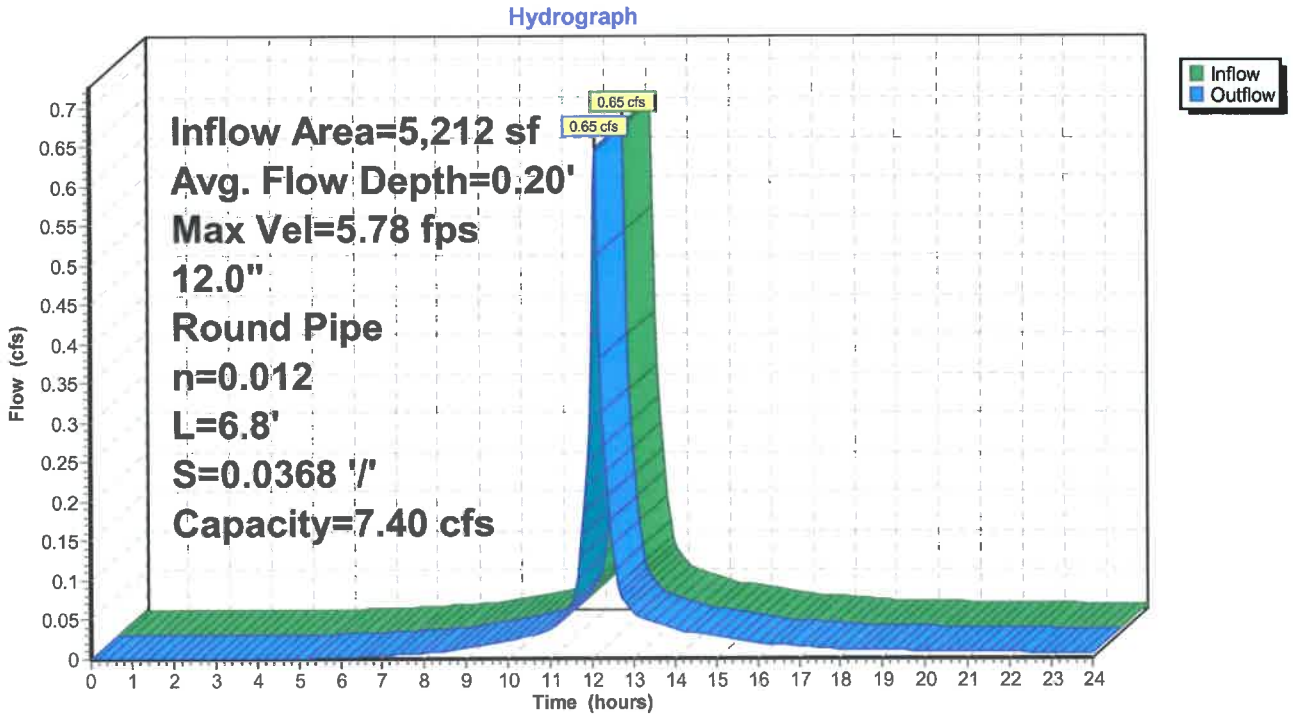
Summary for Reach 10R: CB6 to DMH 3

Inflow Area = 5,212 sf, 69.70% Impervious, Inflow Depth > 4.88" for 25 YR event
Inflow = 0.65 cfs @ 12.09 hrs, Volume= 2,119 cf
Outflow = 0.65 cfs @ 12.09 hrs, Volume= 2,119 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.78 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.80'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.40 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 6.8' Slope= 0.0368 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Summary for Subcatchment 10S: To CB 7

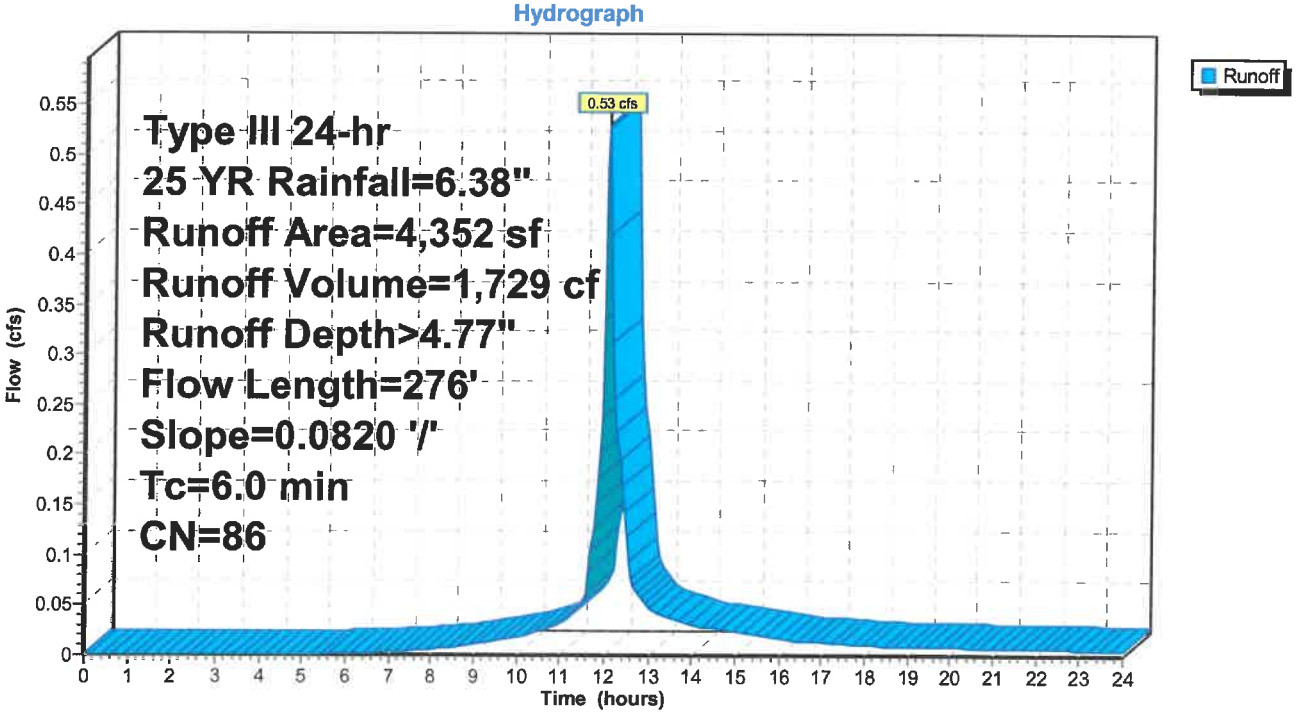
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf, Depth> 4.77"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,363	61	>75% Grass cover, Good, HSG B
4,352	86	Weighted Average
1,363		31.32% Pervious Area
2,989		68.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.6	226	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	276	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 10S: To CB 7



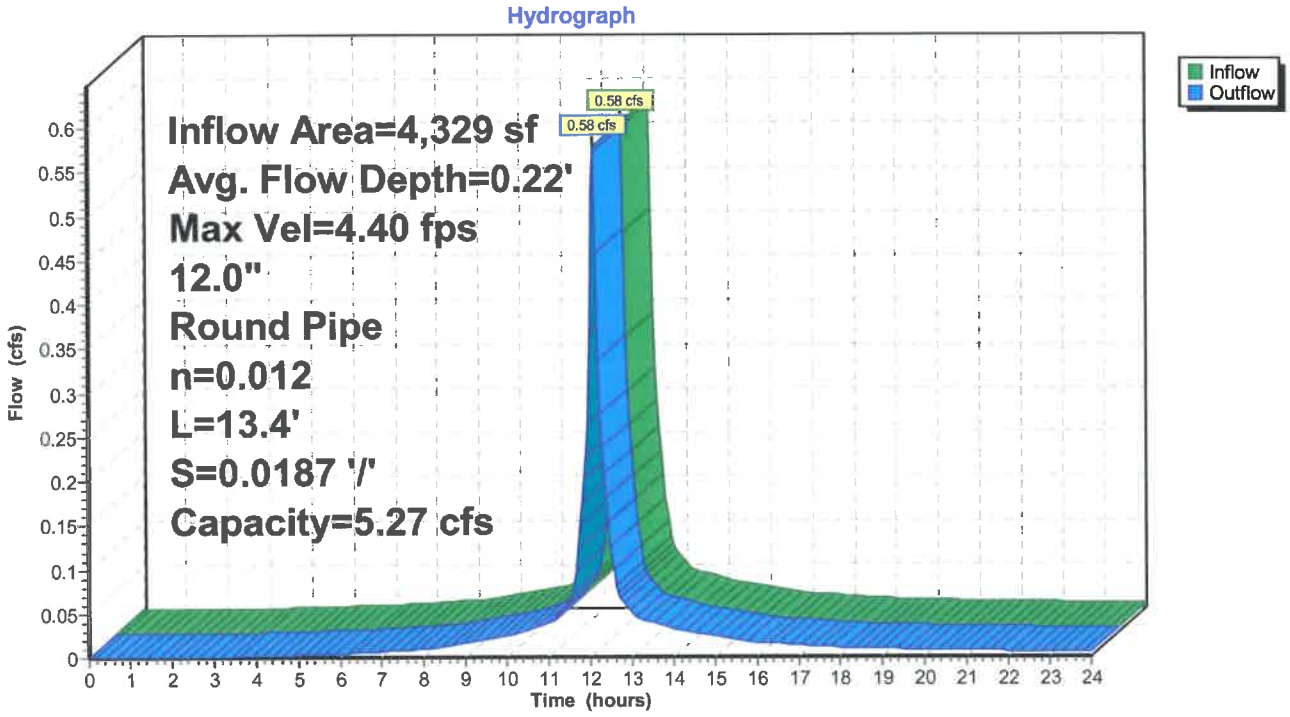
Summary for Reach 11R: CB5 to DMH 3

Inflow Area = 4,329 sf, 83.92% Impervious, Inflow Depth > 5.44" for 25 YR event
Inflow = 0.58 cfs @ 12.09 hrs, Volume= 1,962 cf
Outflow = 0.58 cfs @ 12.09 hrs, Volume= 1,962 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.40 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 0.83'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 311.25', Outlet Invert= 311.00'



Summary for Subcatchment 11S: To CB 8

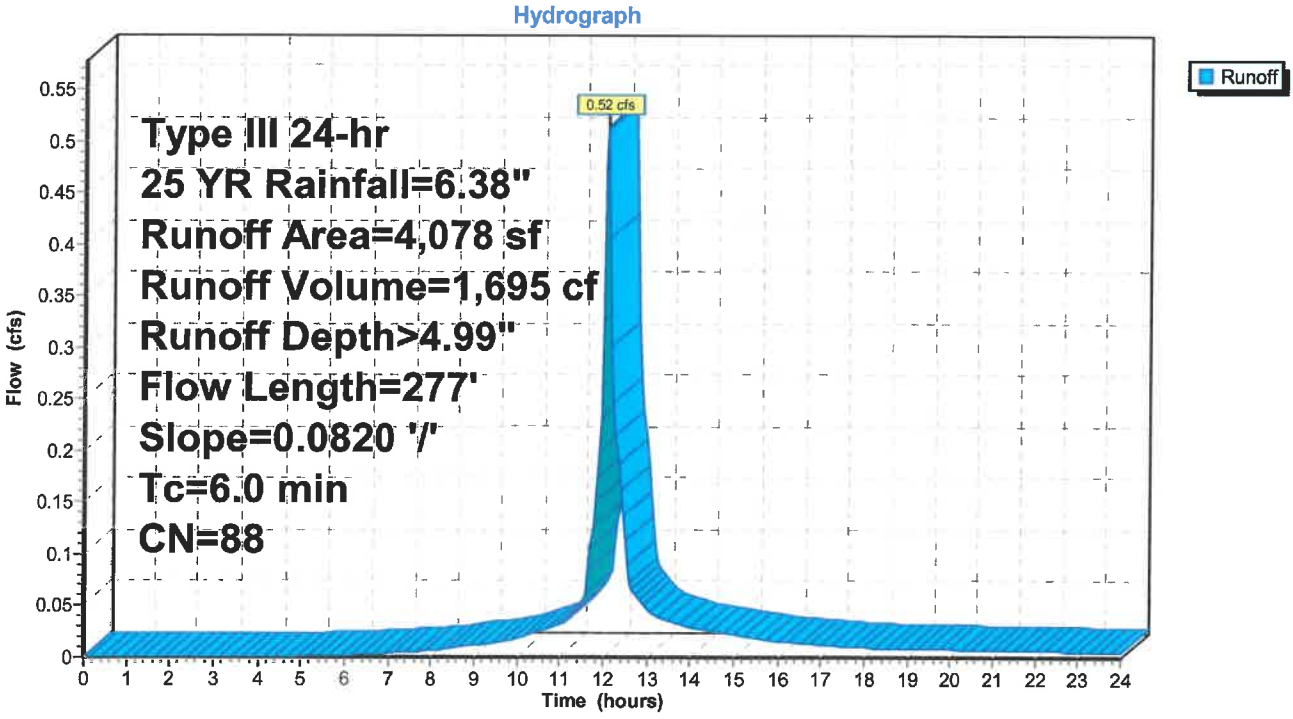
Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,695 cf, Depth> 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
2,989	98	Paved roads w/curbs & sewers, HSG B
1,089	61	>75% Grass cover, Good, HSG B
4,078	88	Weighted Average
1,089		26.70% Pervious Area
2,989		73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0820	2.11		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
0.7	227	0.0820	5.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	277	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 11S: To CB 8



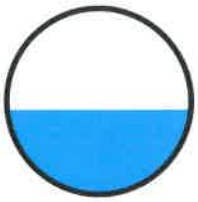
Summary for Reach 12R: DMH 7 TO BASIN

Inflow Area = 37,227 sf, 71.87% Impervious, Inflow Depth > 4.95" for 25 YR event
Inflow = 4.33 cfs @ 12.13 hrs, Volume= 15,357 cf
Outflow = 4.25 cfs @ 12.15 hrs, Volume= 15,348 cf, Atten= 2%, Lag= 1.4 min

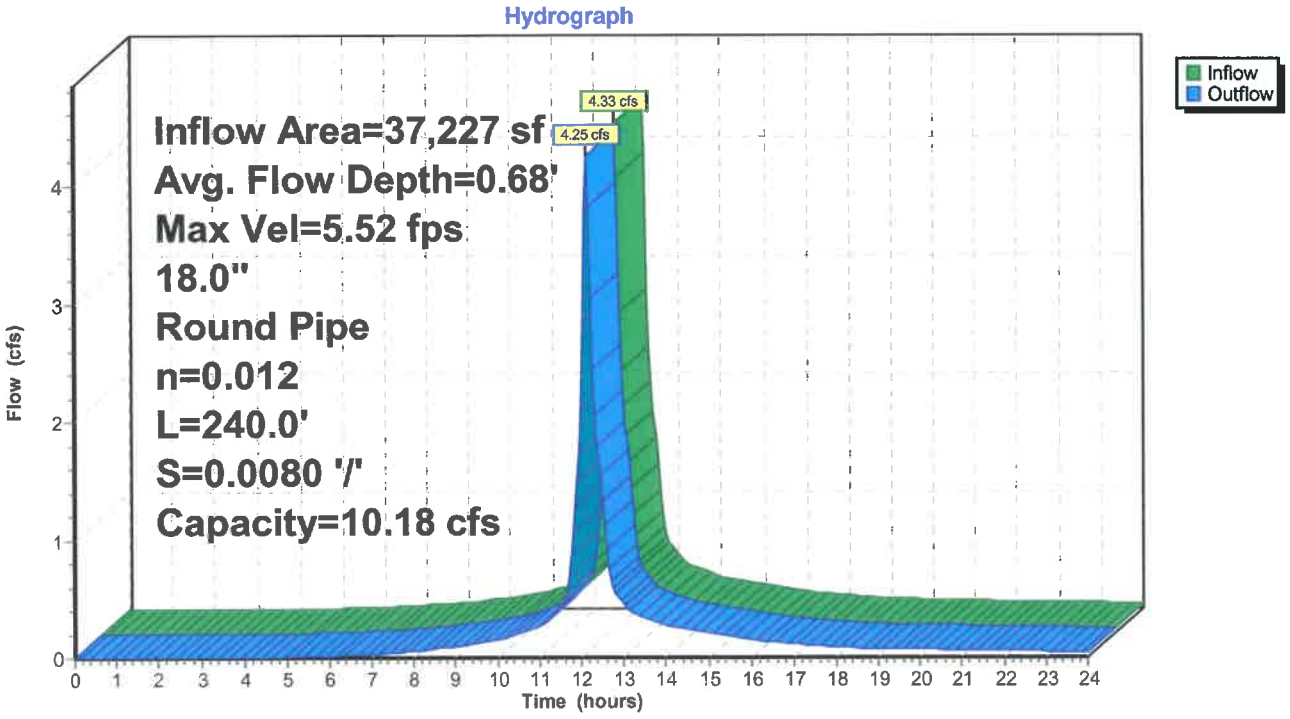
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.52 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.85 fps, Avg. Travel Time= 2.2 min

Peak Storage= 188 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.68' , Surface Width= 1.49'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.18 cfs

18.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 240.0' Slope= 0.0080 '/'
Inlet Invert= 284.92', Outlet Invert= 283.00'



Reach 12R: DMH 7 TO BASIN



Summary for Subcatchment 12S: To CB 9

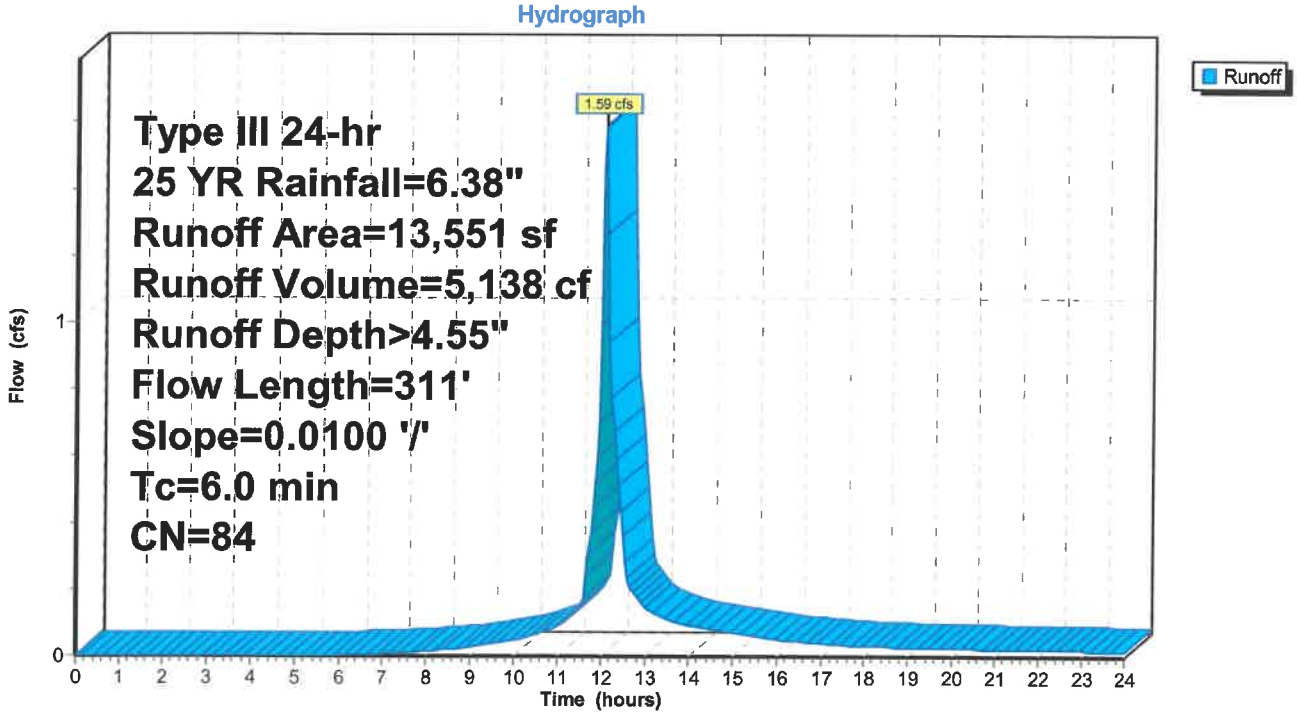
Runoff = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf, Depth> 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
8,333	98	Paved roads w/curbs & sewers, HSG B
5,218	61	>75% Grass cover, Good, HSG B
13,551	84	Weighted Average
5,218		38.51% Pervious Area
8,333		61.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.1	261	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	311	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 12S: To CB 9



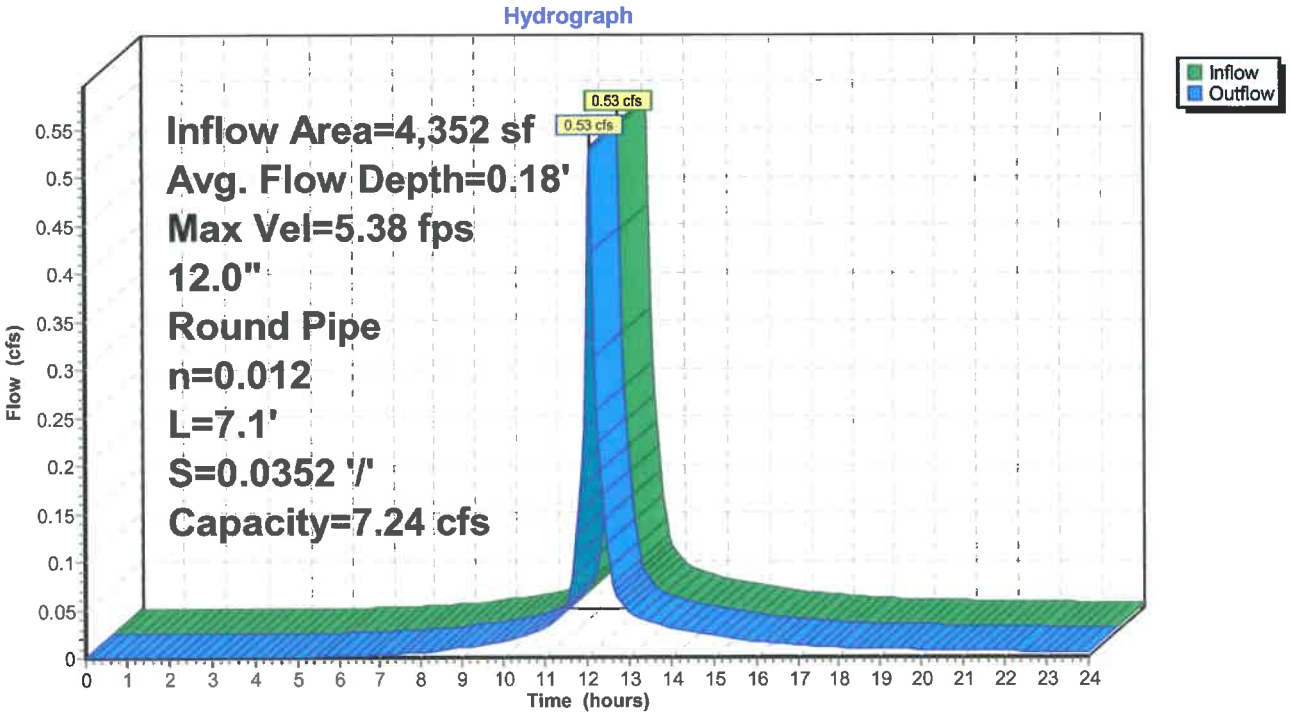
Summary for Reach 13R: CB7 TO DMH 4

Inflow Area = 4,352 sf, 68.68% Impervious, Inflow Depth > 4.77" for 25 YR event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf
Outflow = 0.53 cfs @ 12.09 hrs, Volume= 1,729 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.38 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 0.77'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.24 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.1' Slope= 0.0352 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 13S: To CB 10

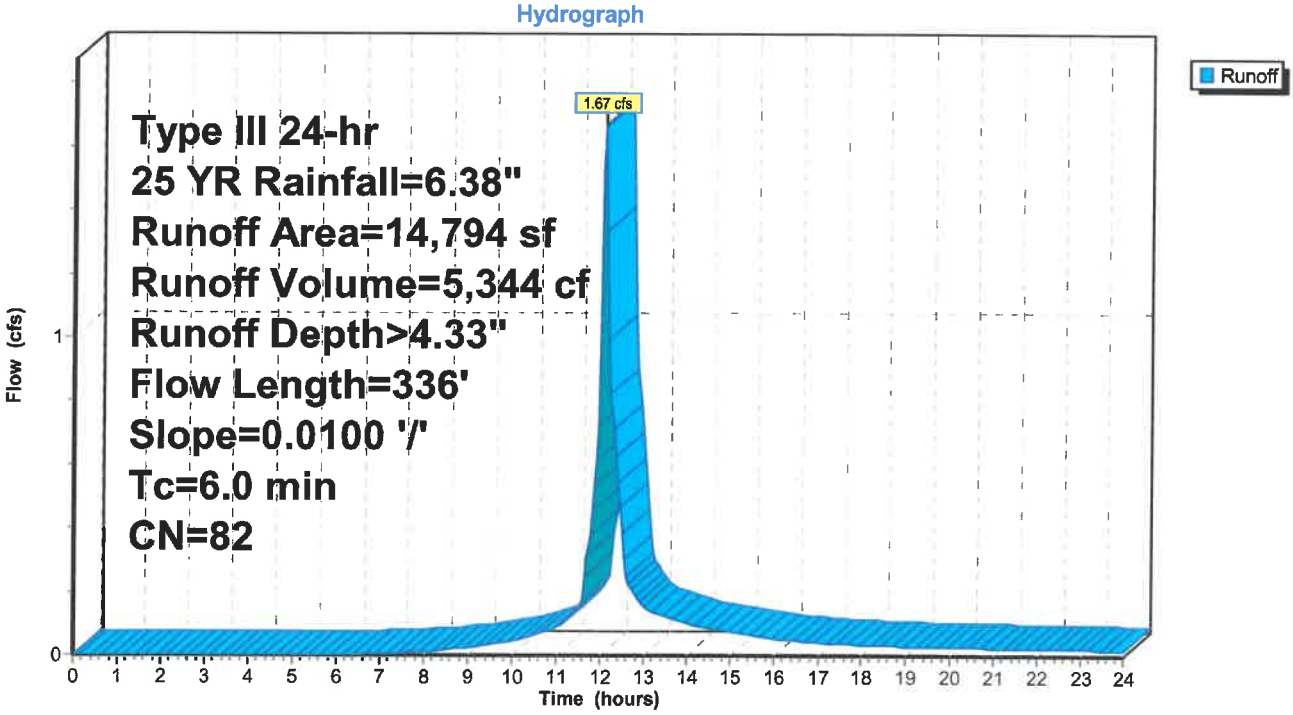
Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf, Depth> 4.33"

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 YR Rainfall=6.38"

	Area (sf)	CN	Description
*	8,333	98	Paved roads w/curbs & sewers, HSG B
	6,461	61	>75% Grass cover, Good, HSG B
	14,794	82	Weighted Average
	6,461		43.67% Pervious Area
	8,333		56.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.91		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.22"
2.3	286	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.2	336	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13S: To CB 10



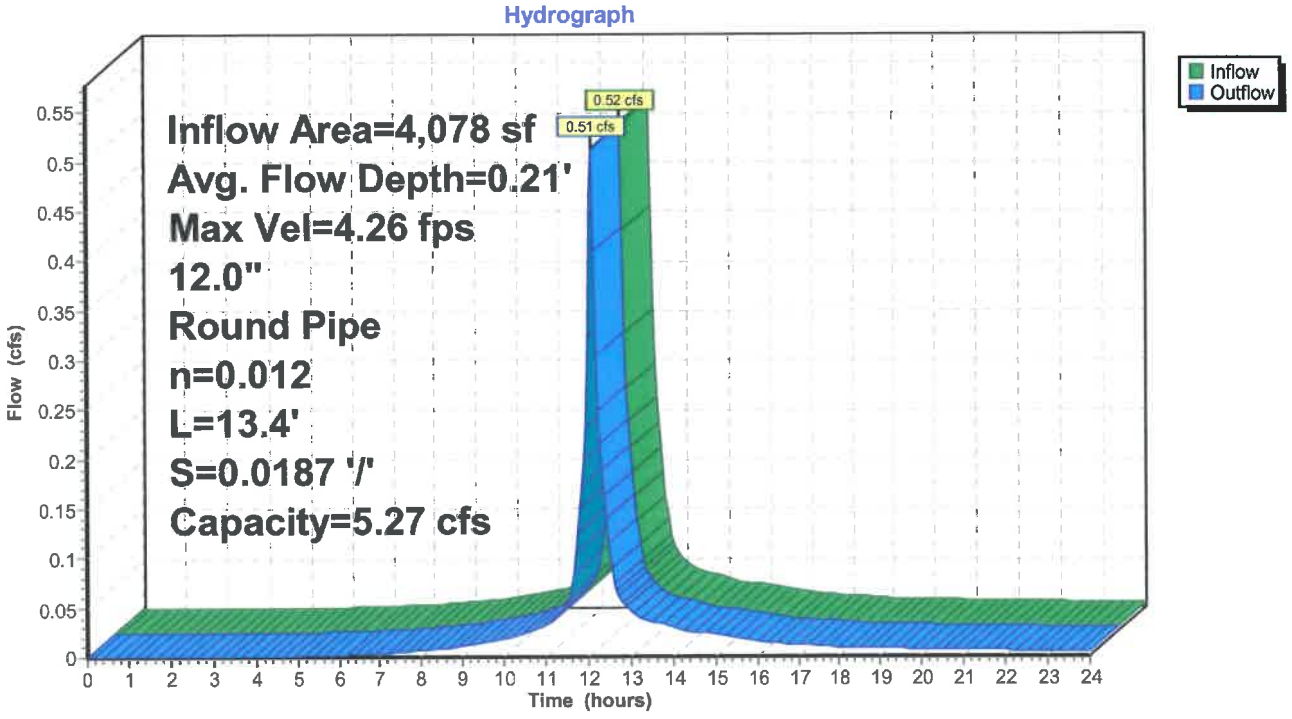
Summary for Reach 14R: CB 8 TO DMH 4

Inflow Area = 4,078 sf, 73.30% Impervious, Inflow Depth > 4.99" for 25 YR event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,695 cf
Outflow = 0.51 cfs @ 12.09 hrs, Volume= 1,695 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.82'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.27 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 13.4' Slope= 0.0187 '/'
Inlet Invert= 321.00', Outlet Invert= 320.75'



Summary for Subcatchment 14S: To Wetland

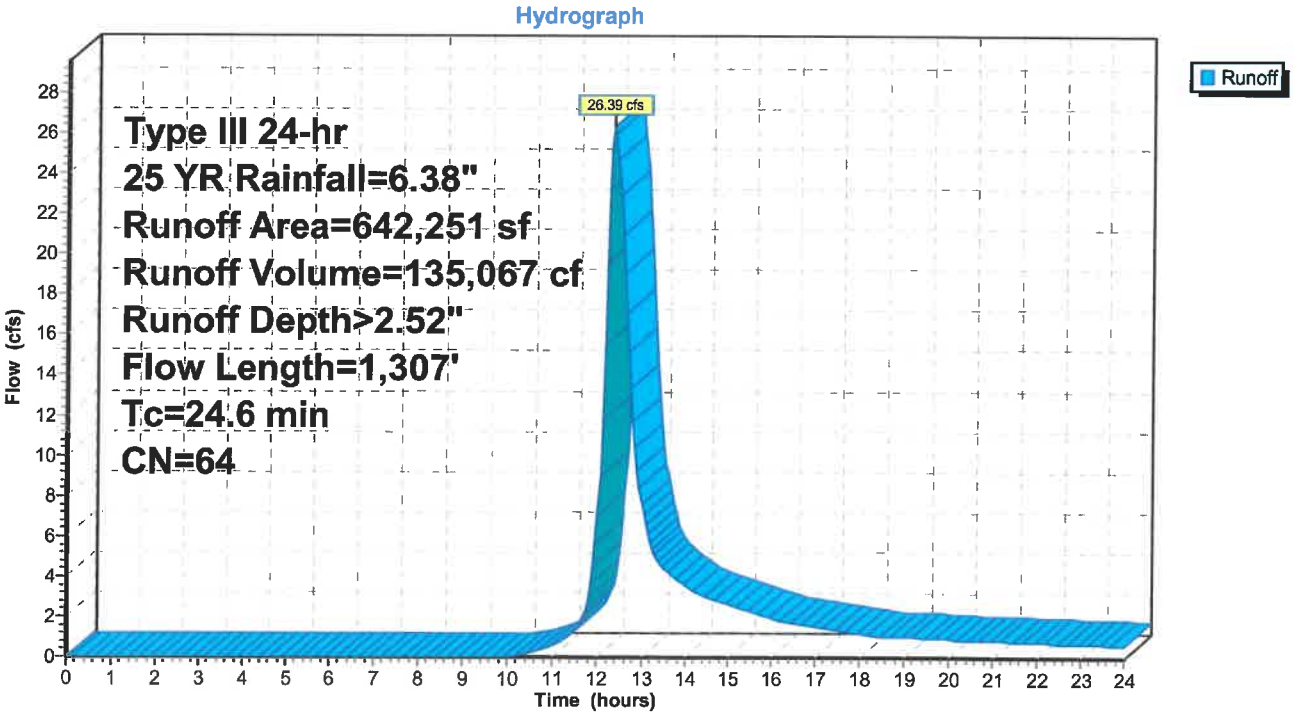
Runoff = 26.39 cfs @ 12.36 hrs, Volume= 135,067 cf, Depth> 2.52"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
358,166	55	Woods, Good, HSG B
260,659	77	Woods, Good, HSG D
23,426	61	>75% Grass cover, Good, HSG B
642,251	64	Weighted Average
642,251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0350	0.08		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.22"
7.9	648	0.0750	1.37		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
6.9	609	0.0200	1.47	1.76	**Channel Flow, Stream** Area= 1.2 sf Perim= 3.5' r= 0.34' n= 0.070 Medium-dense brush, winter
24.6	1,307	Total			

Subcatchment 14S: To Wetland



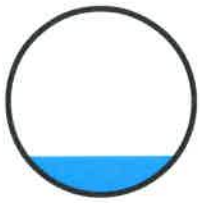
Summary for Reach 15R: DMH 4 TO DMH 5

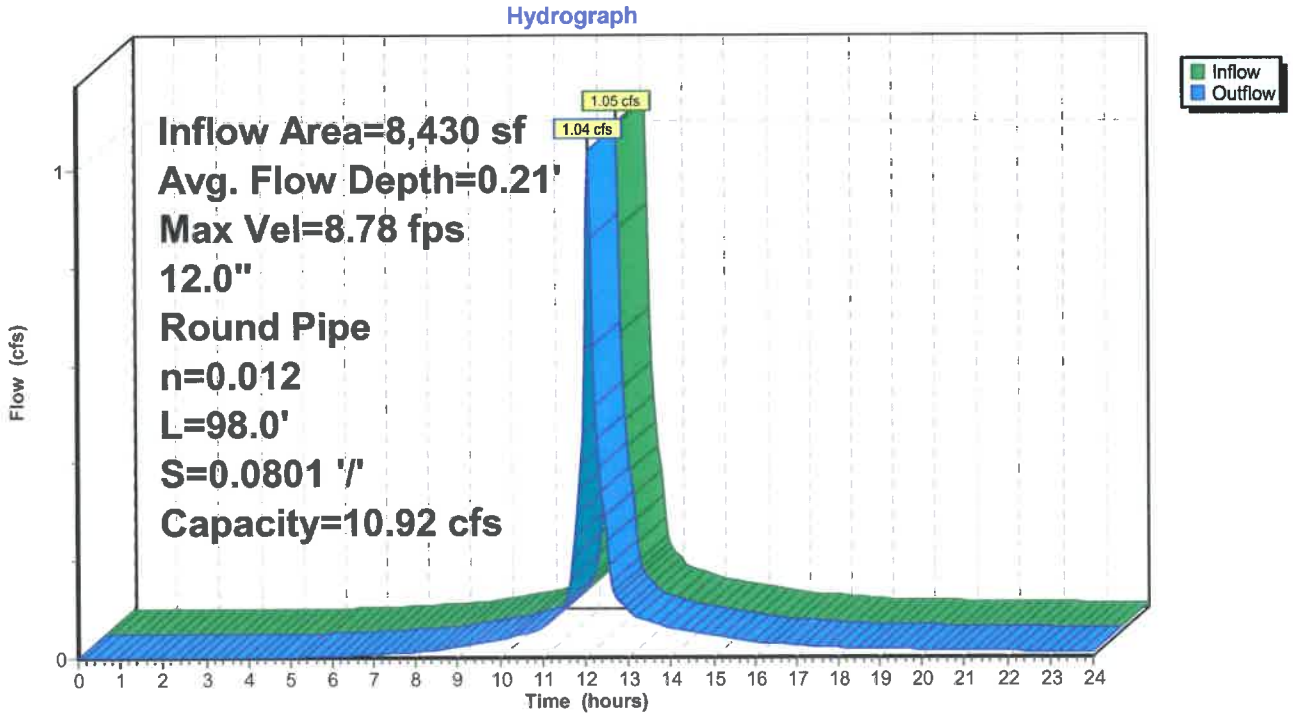
Inflow Area = 8,430 sf, 70.91% Impervious, Inflow Depth > 4.87" for 25 YR event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 3,424 cf
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 3,424 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.78 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.90 fps, Avg. Travel Time= 0.6 min

Peak Storage= 12 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 0.81'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.92 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 98.0' Slope= 0.0801 '/'
Inlet Invert= 316.20', Outlet Invert= 308.35'





Summary for Subcatchment 15S: TO BASIN

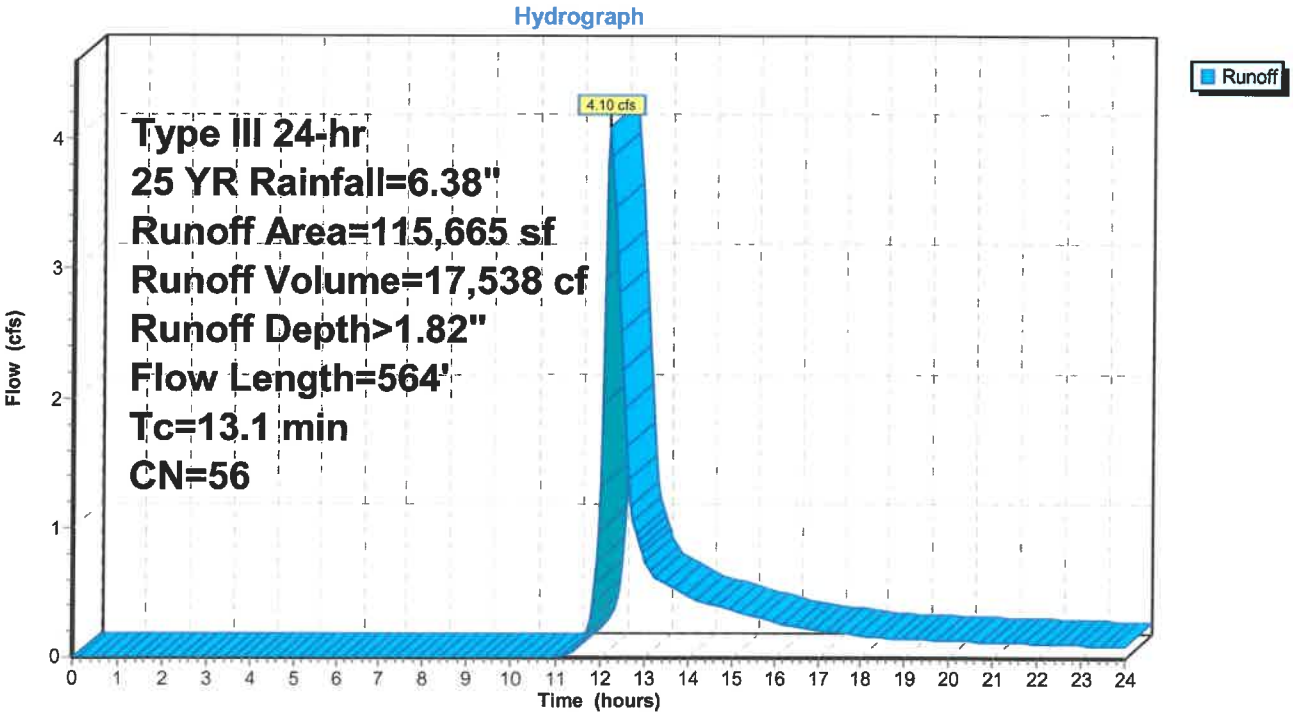
Runoff = 4.10 cfs @ 12.20 hrs, Volume= 17,538 cf, Depth> 1.82"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
94,222	55	Woods, Good, HSG B
21,443	61	>75% Grass cover, Good, HSG B
115,665	56	Weighted Average
115,665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0620	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
5.1	467	0.0931	1.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	47	0.3190	3.95		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.1	564	Total			

Subcatchment 15S: TO BASIN



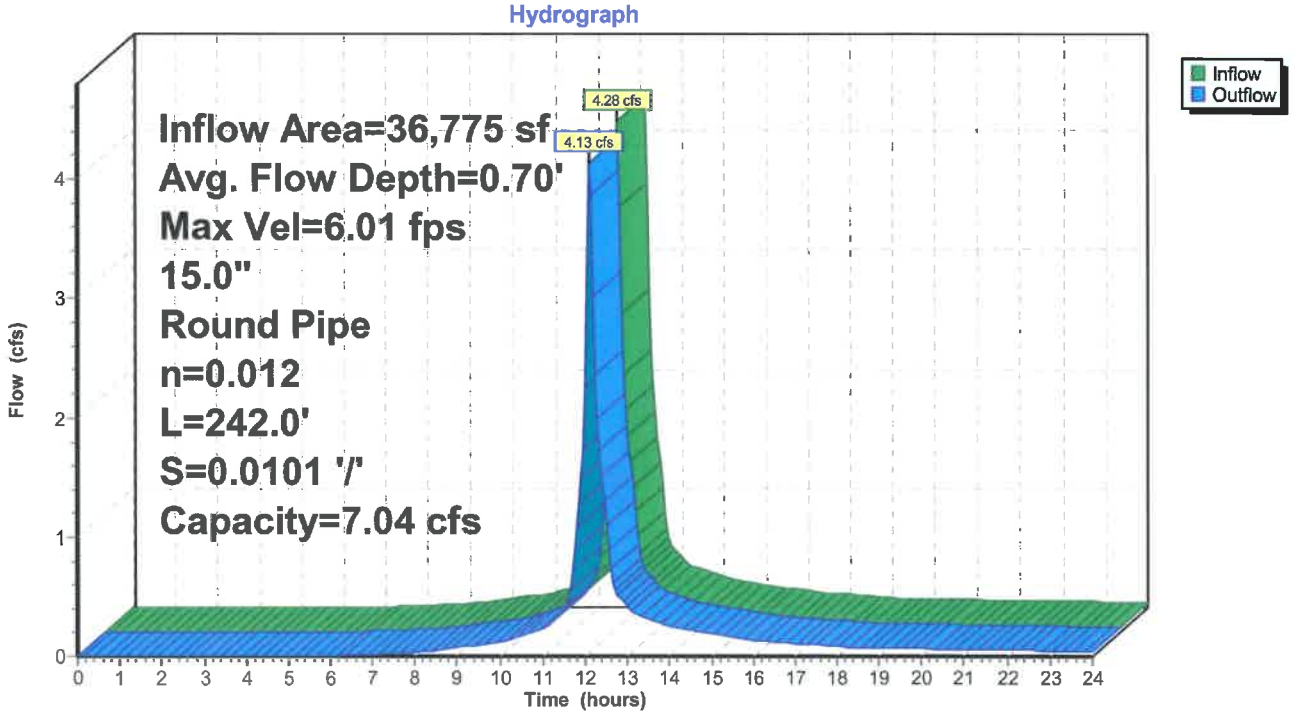
Summary for Reach 16R: DMH 5 TO DMH 6

Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.54" for 25 YR event
Inflow = 4.28 cfs @ 12.10 hrs, Volume= 13,903 cf
Outflow = 4.13 cfs @ 12.11 hrs, Volume= 13,895 cf, Atten= 3%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.01 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 2.0 min

Peak Storage= 172 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 1.24'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.04 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 242.0' Slope= 0.0101 '/'
Inlet Invert= 308.10', Outlet Invert= 305.65'



Summary for Subcatchment 16S: TO BASIN

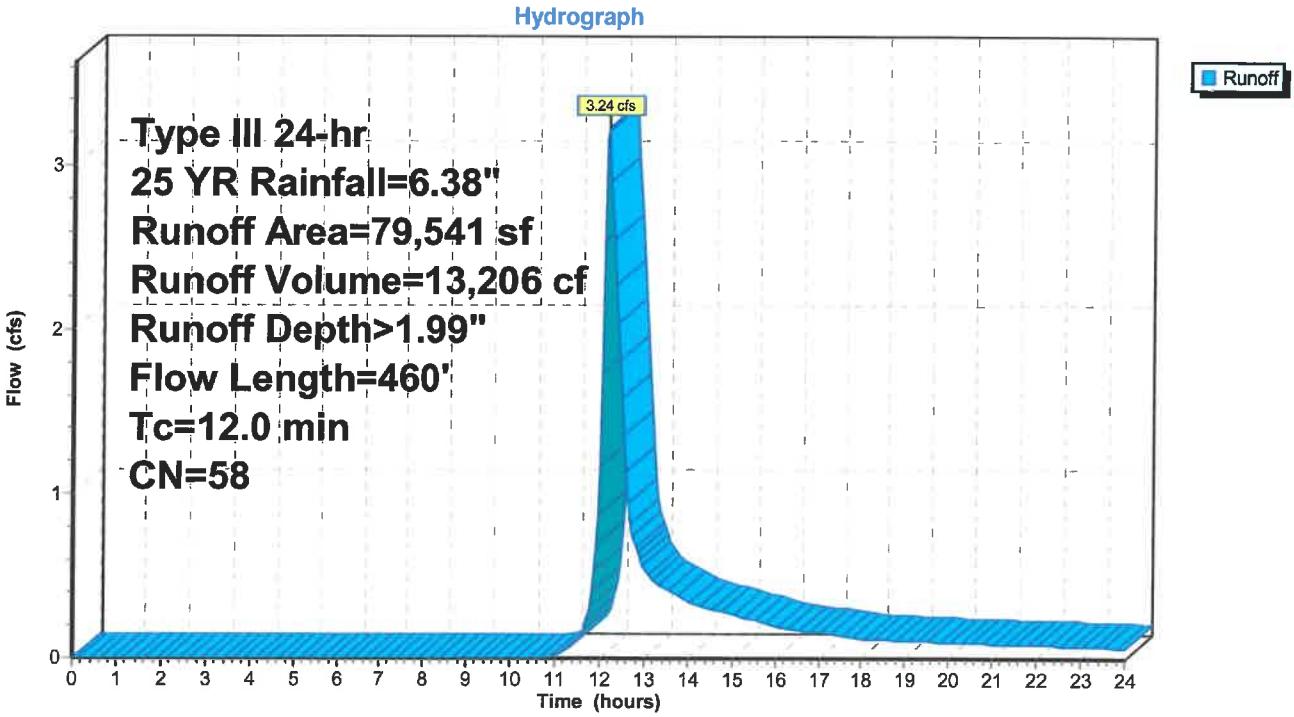
Runoff = 3.24 cfs @ 12.18 hrs, Volume= 13,206 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.38"

Area (sf)	CN	Description
35,427	61	>75% Grass cover, Good, HSG B
44,114	55	Woods, Good, HSG B
79,541	58	Weighted Average
79,541		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	391	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	19	0.3150	5.05		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.0	460	Total			

Subcatchment 16S: TO BASIN



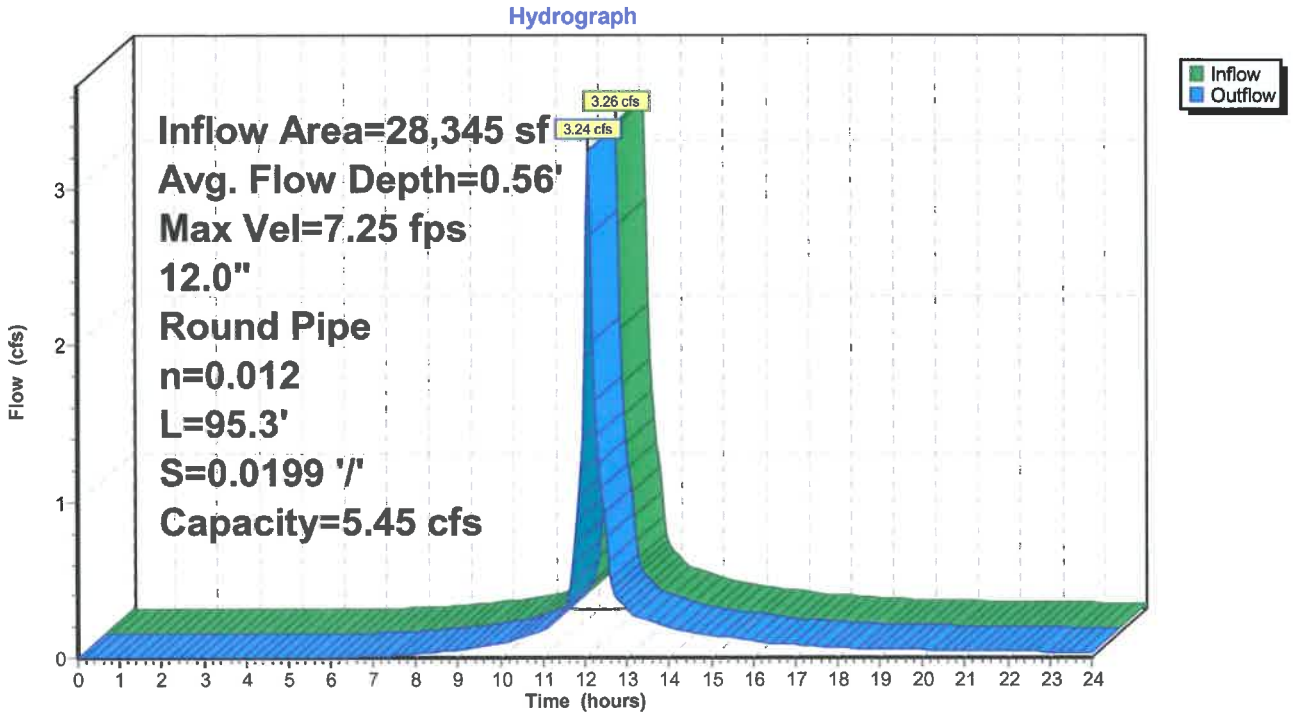
Summary for Reach 17R: DMH 6 TO DMH 5

Inflow Area = 28,345 sf, 58.80% Impervious, Inflow Depth > 4.44" for 25 YR event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,482 cf
Outflow = 3.24 cfs @ 12.10 hrs, Volume= 10,479 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.25 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.52 fps, Avg. Travel Time= 0.6 min

Peak Storage= 43 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.56' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.45 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 95.3' Slope= 0.0199 '/'
Inlet Invert= 310.25', Outlet Invert= 308.35'



Summary for Subcatchment 17S: To Off Site

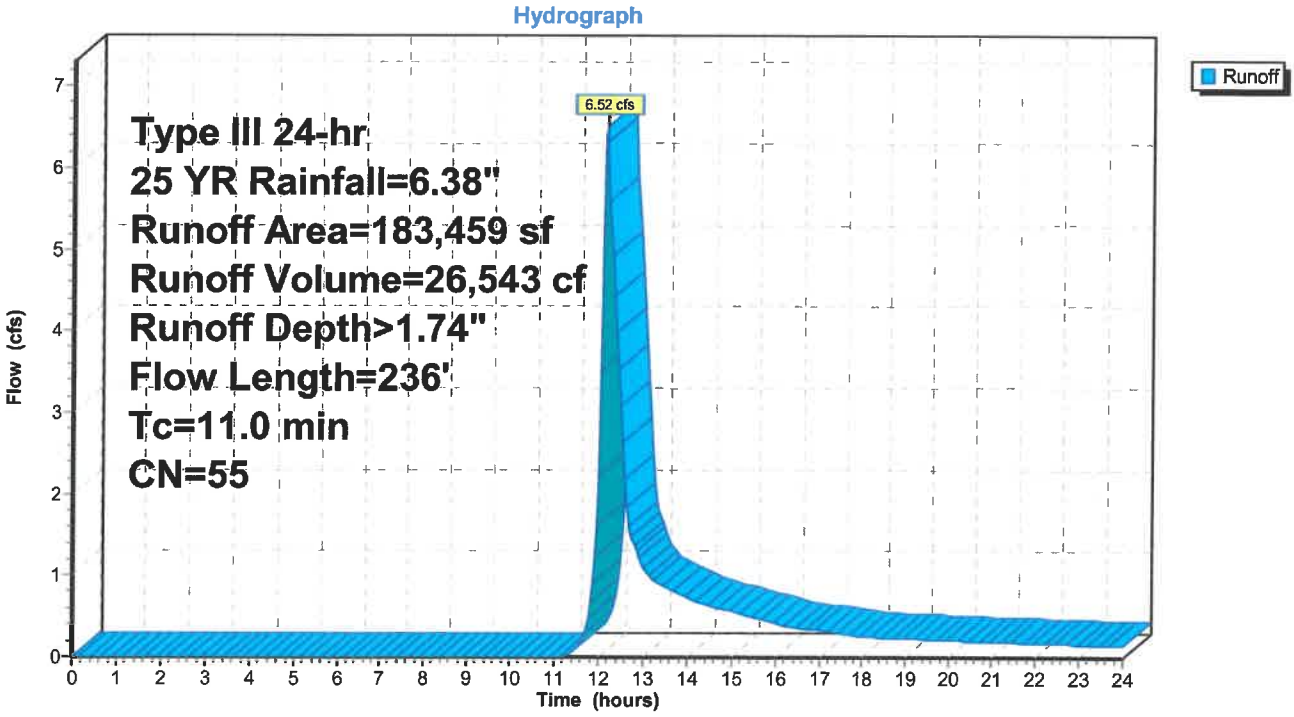
Runoff = 6.52 cfs @ 12.17 hrs, Volume= 26,543 cf, Depth> 1.74"

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 YR Rainfall=6.38"

Area (sf)	CN	Description
183,459	55	Woods, Good, HSG B
183,459		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
2.5	186	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	236	Total			

Subcatchment 17S: To Off Site



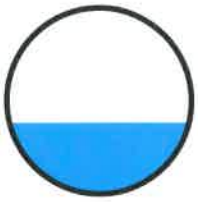
Summary for Reach 18R: CB 10 TO DMH 6

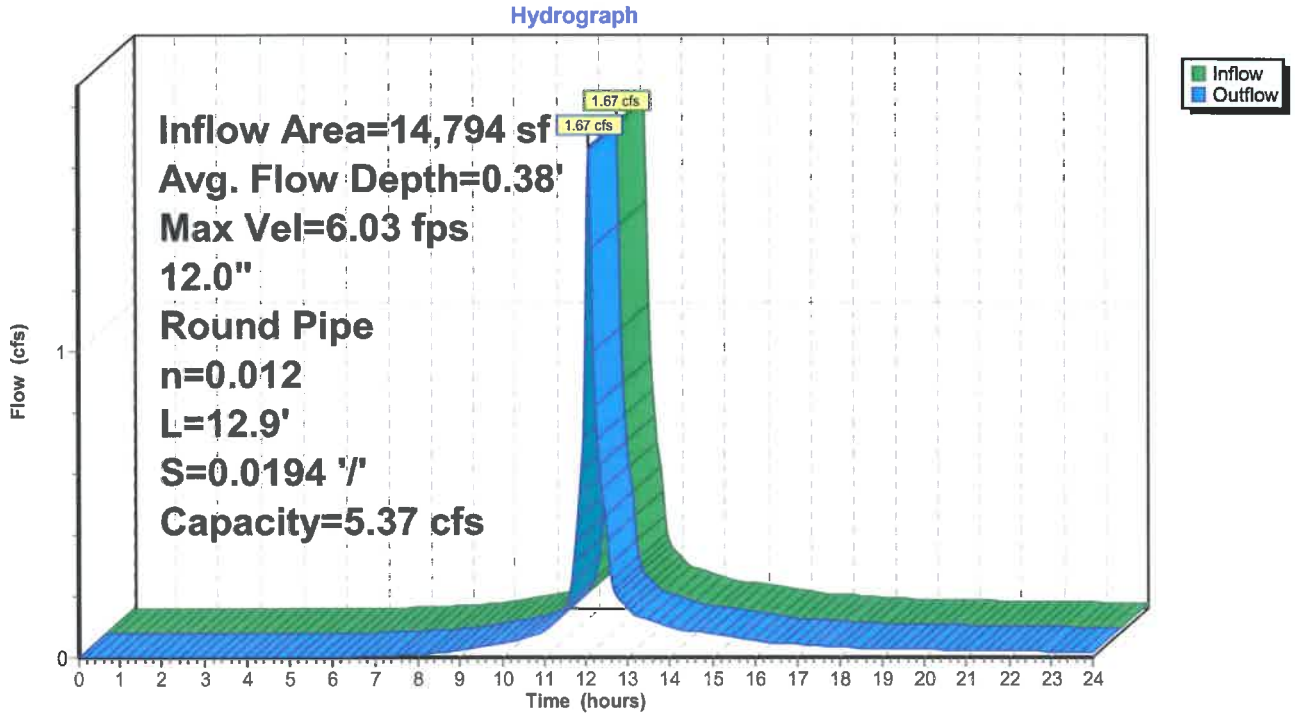
Inflow Area = 14,794 sf, 56.33% Impervious, Inflow Depth > 4.33" for 25 YR event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf
Outflow = 1.67 cfs @ 12.09 hrs, Volume= 5,344 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.03 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.08 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 0.97'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.37 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 12.9' Slope= 0.0194 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'





Summary for Reach 19R: CB 9 TO DMH 6

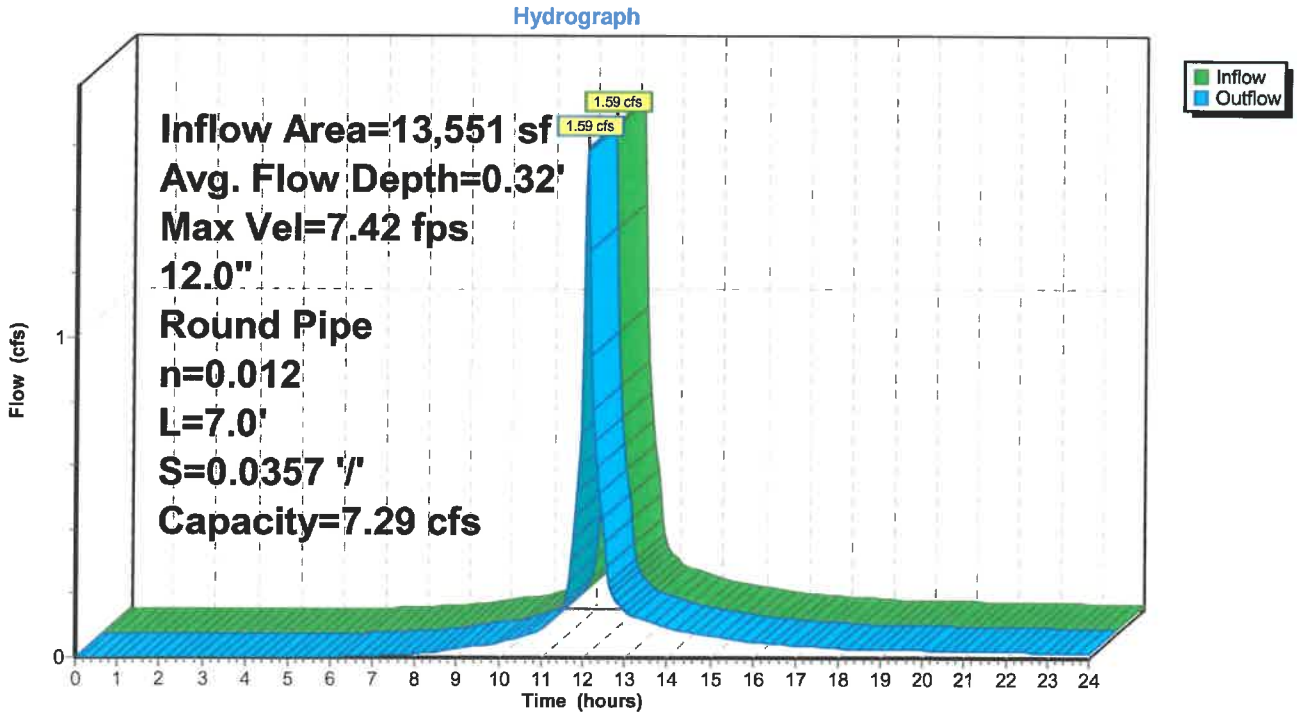
Inflow Area = 13,551 sf, 61.49% Impervious, Inflow Depth > 4.55" for 25 YR event
Inflow = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf
Outflow = 1.59 cfs @ 12.09 hrs, Volume= 5,138 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.42 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.52 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32' , Surface Width= 0.93'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.29 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 7.0' Slope= 0.0357 '/'
Inlet Invert= 310.50', Outlet Invert= 310.25'

Reach 19R: CB 9 TO DMH 6



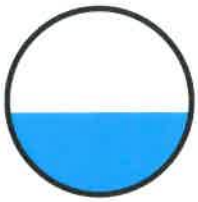
Summary for Reach 20R: DMH 6 to Basin

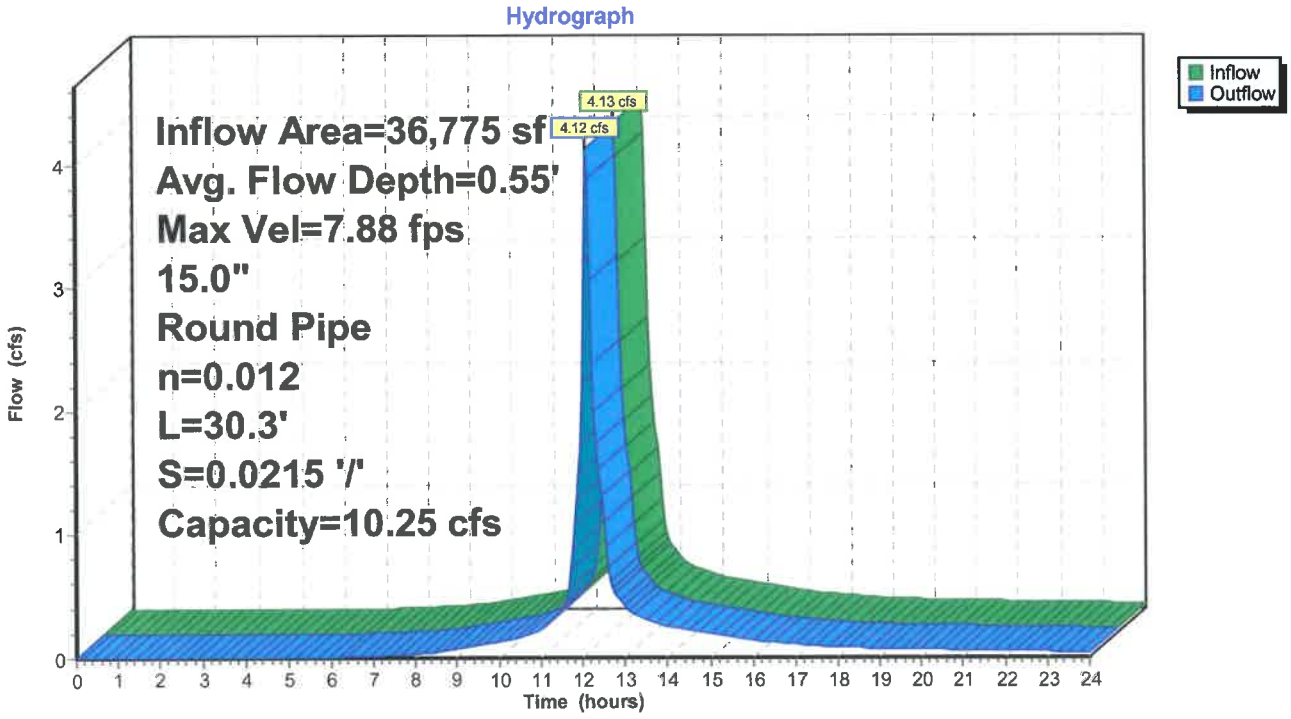
Inflow Area = 36,775 sf, 61.57% Impervious, Inflow Depth > 4.53" for 25 YR event
Inflow = 4.13 cfs @ 12.11 hrs, Volume= 13,895 cf
Outflow = 4.12 cfs @ 12.12 hrs, Volume= 13,894 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.88 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.55' , Surface Width= 1.24'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 10.25 cfs

15.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 30.3' Slope= 0.0215 '/'
Inlet Invert= 305.65', Outlet Invert= 305.00'





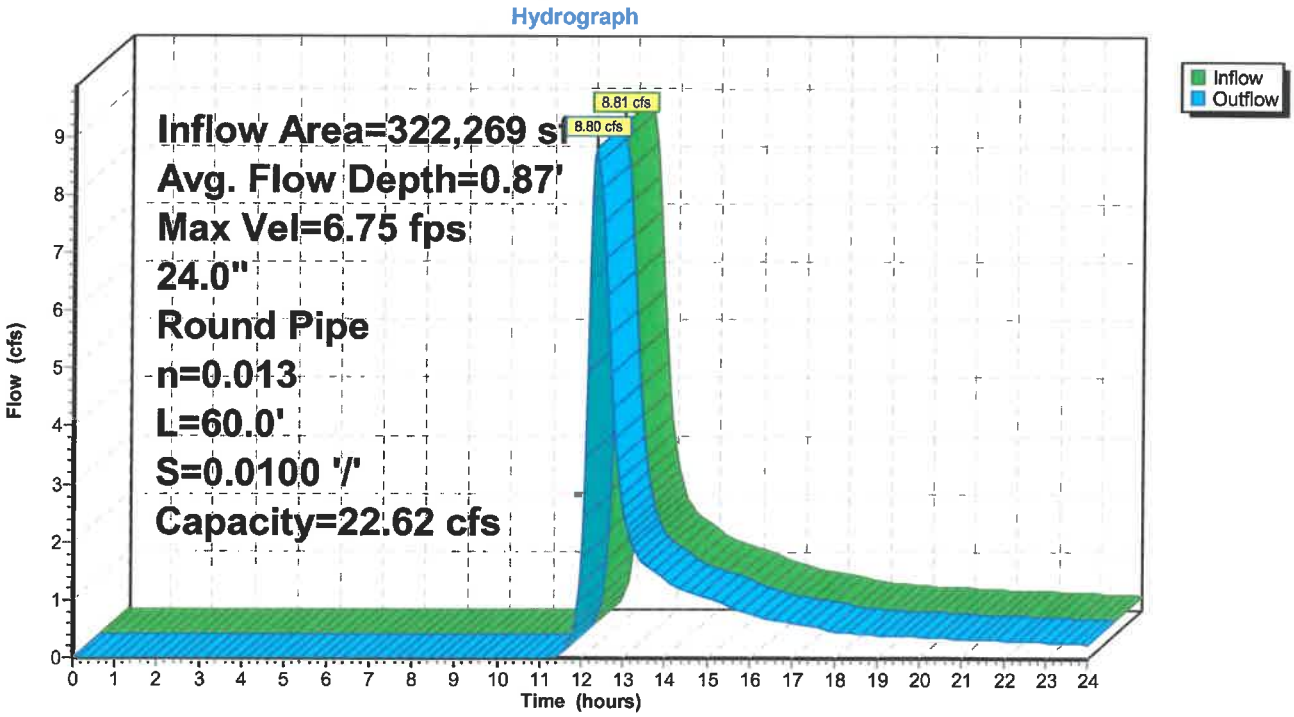
Summary for Reach 21R: 24" ADS

Inflow Area = 322,269 sf, 0.00% Impervious, Inflow Depth > 1.73" for 25 YR event
Inflow = 8.81 cfs @ 12.34 hrs, Volume= 46,472 cf
Outflow = 8.80 cfs @ 12.35 hrs, Volume= 46,463 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.75 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.20 fps, Avg. Travel Time= 0.3 min

Peak Storage= 78 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.87' , Surface Width= 1.98'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 22.62 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 310.00', Outlet Invert= 309.40'

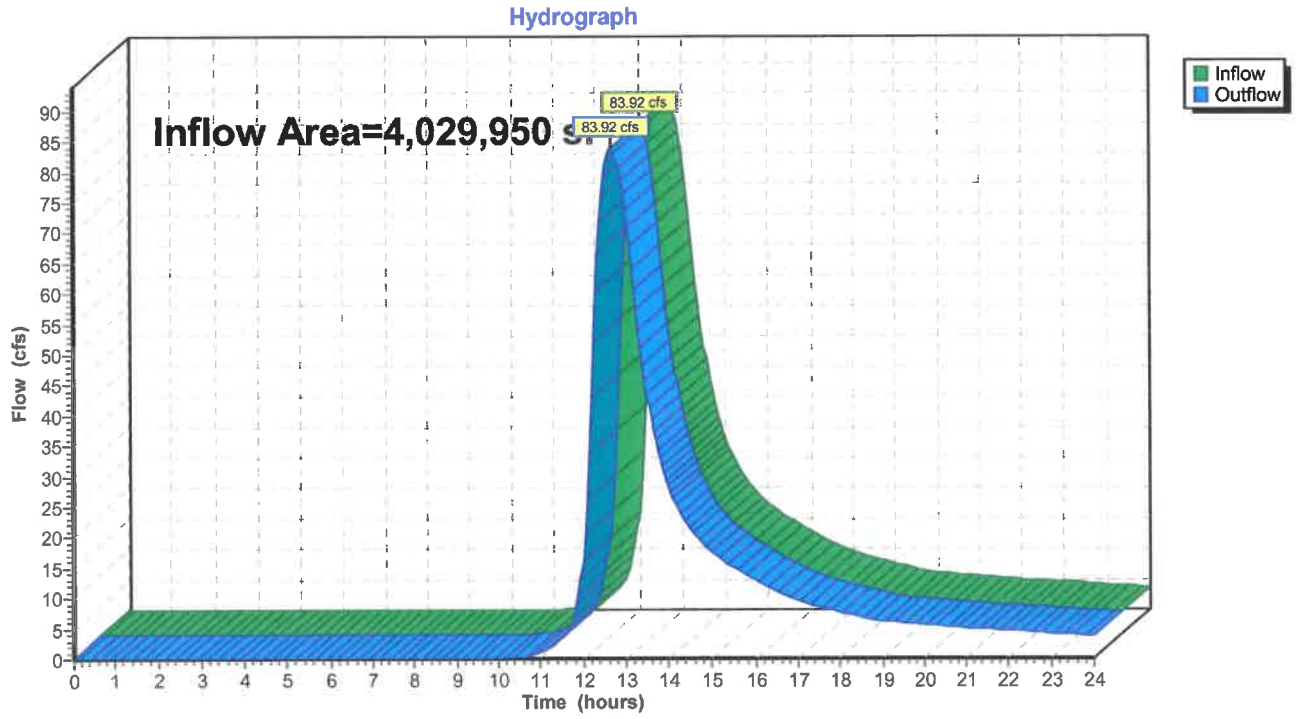


Summary for Reach EV1: To Wetland

Inflow Area = 4,029,950 sf, 4.03% Impervious, Inflow Depth > 2.19" for 25 YR event
Inflow = 83.92 cfs @ 12.69 hrs, Volume= 736,176 cf
Outflow = 83.92 cfs @ 12.69 hrs, Volume= 736,176 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV1: To Wetland

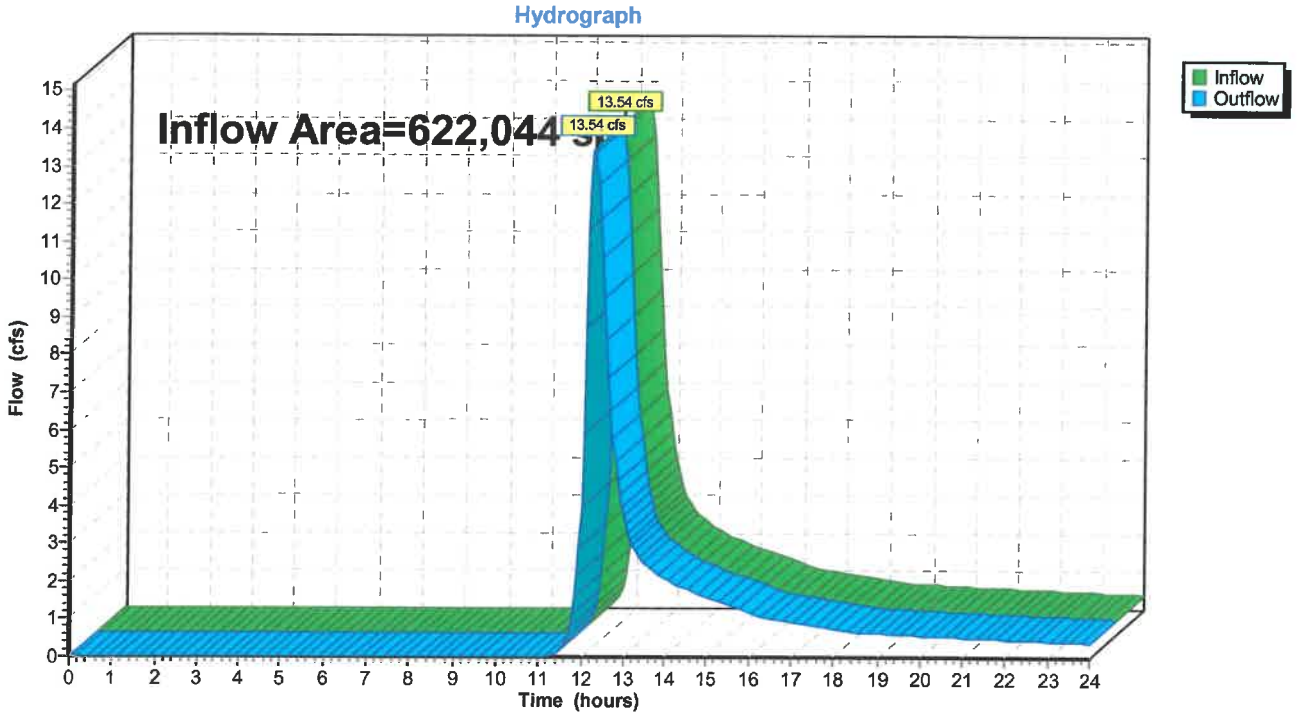


Summary for Reach EV2: To Offsite

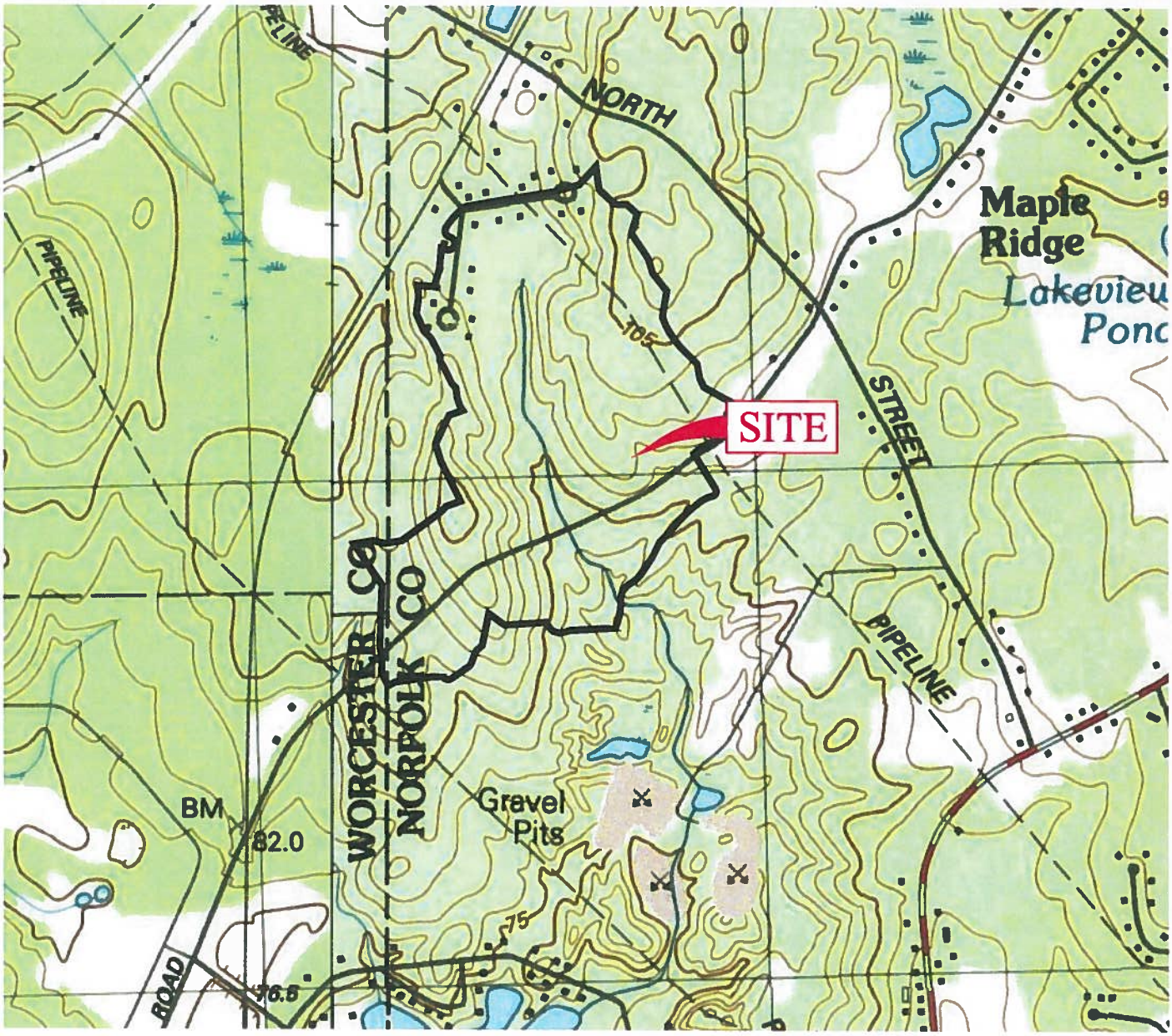
Inflow Area = 622,044 sf, 3.64% Impervious, Inflow Depth > 1.41" for 25 YR event
Inflow = 13.54 cfs @ 12.29 hrs, Volume= 73,006 cf
Outflow = 13.54 cfs @ 12.29 hrs, Volume= 73,006 cf, Atten= 0%, Lag= 0.0 min

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

Reach EV2: To Offsite



Supplemental Information



SCALE: 1" = 1000'

0 1000 2000 3000 4000

PORTION OF U.S.G.S. GEODETIC MAP

SITE: Blackstone Street
Bellingham, MA 02019

PREPARED BY: ALLEN ENGINEERING & ASSOCIATES, INC.
Civil Engineers • Surveyors
Land Development Consultants
140 Hartford Avenue East
Hopedale, Ma 01747
(508) 381-3212 • Phone
www.allen-ea.com

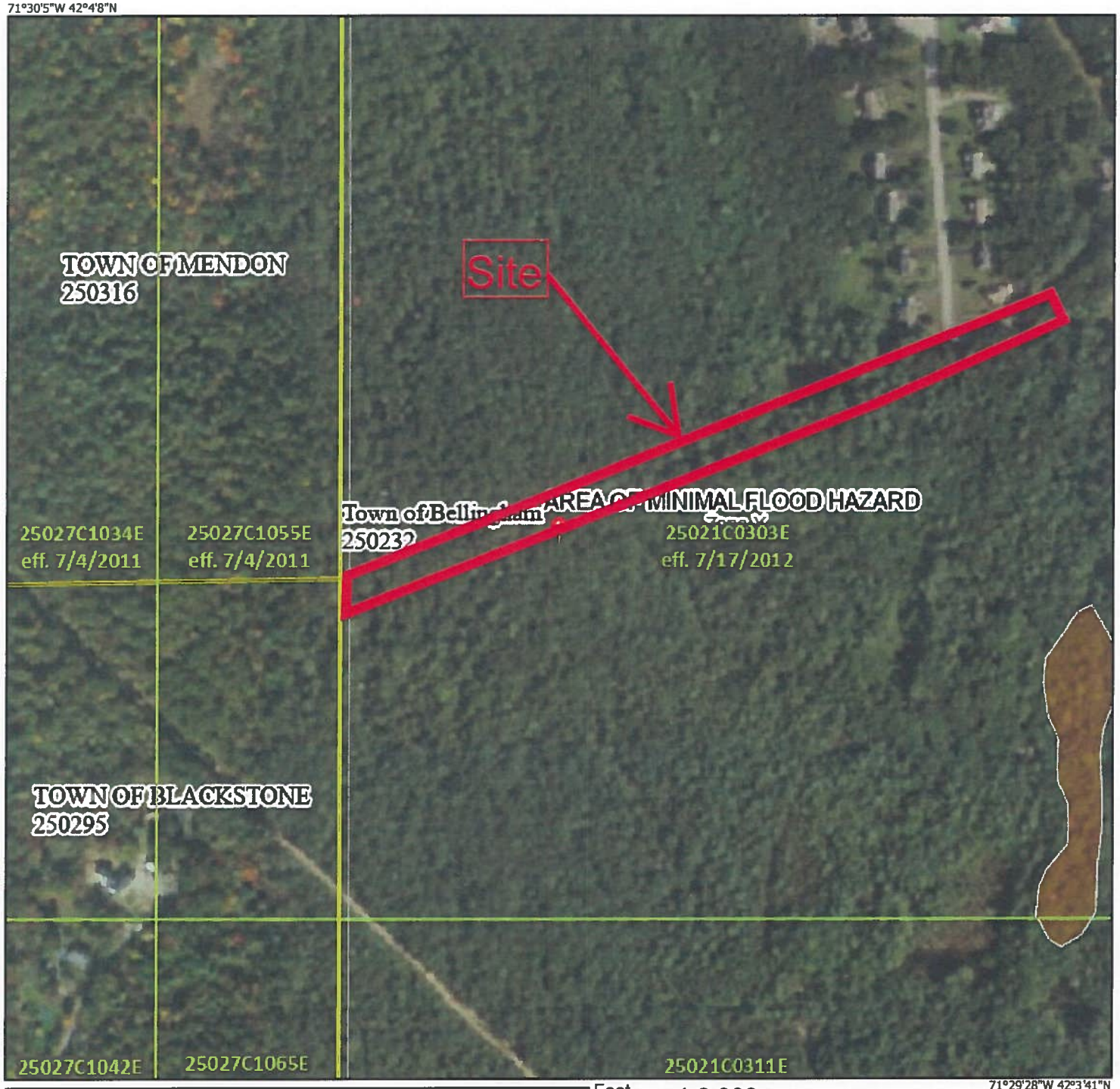
DATE: 1/28/2025

JOB NO: 00454

National Flood Hazard Layer FIRMette

FEMA

71°30'5"W 42°4'8"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- SPECIAL FLOOD HAZARD AREAS
  - Without Base Flood Elevation (BFE) Zone A, V, A99
  - With BFE or Depth Zone AE, AO, AH, VE, AR
  - Regulatory Floodway
- OTHER AREAS OF FLOOD HAZARD
  - 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile Zone
  - Future Conditions 1% Annual Chance Flood Hazard Zone X
  - Area with Reduced Flood Risk due to Levee. See Notes. Zone X
  - Area with Flood Risk due to Levee Zone D
- OTHER AREAS
  - NO SCREEN Area of Minimal Flood Hazard Zone X
  - Effective LOMRs
  - Area of Undetermined Flood Hazard Zone
- GENERAL STRUCTURES
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- OTHER FEATURES
  - 20.2 Cross Sections with 1% Annual Chance
  - 17.5 Water Surface Elevation
  - Coastal Transect
  - Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
- MAP PANELS
  - Digital Data Available
  - No Digital Data Available
  - Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/24/2025 at 9:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Commonwealth of Massachusetts
City/Town of Bellingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 01 (Hole #) | 11/12/24 (Date) | Am (Time) | _____ (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
   Property Line >10 feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ■ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7"	Ap	LS	10YR 3/1		Cnc : Dpl:						
7-18"	BW	LS	2.5YR 6/8		Cnc : Dpl:						
18-120"	C	LS	2.5Y 6/3		Cnc : Dpl:			25%			
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of Bellingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 02 (Hole #) | 11/12/24 (Date) | Am (Time) | _____ (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
Property Line >10 feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ■ Yes ☐ No If yes: _____ Depth to Weeping in Hole 122" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6"	Ap	LS	10YR 3/1		Cnc : Dpl:						
6-19"	Bw	LS	2.5YR 6/8		Cnc : Dpl:						
19-124"	C	LS	2.5Y 6/3	92"	Cnc : Dpl:			30%			
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of Bellingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 03 (Hole #) | 11/12/24 (Date) | Am (Time) | _____ (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
   Property Line >10 feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☑ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-120"	C	LS	2.5Y6/3		Cnc : Dpl:		25%				
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of Bellingham

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 04 (Hole #) | 11/12/24 (Date) | Am (Time) | _____ (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
Property Line >10 feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☑ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-27"	Fill	LS			Cnc : Dpl:						
27-122"	C	LS			Cnc : Dpl:		25%				
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

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 Norfolk and Suffolk Counties, Massachusetts; and Worcester County, Massachusetts, Southern Part

January 15, 2025

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.

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Contents

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.

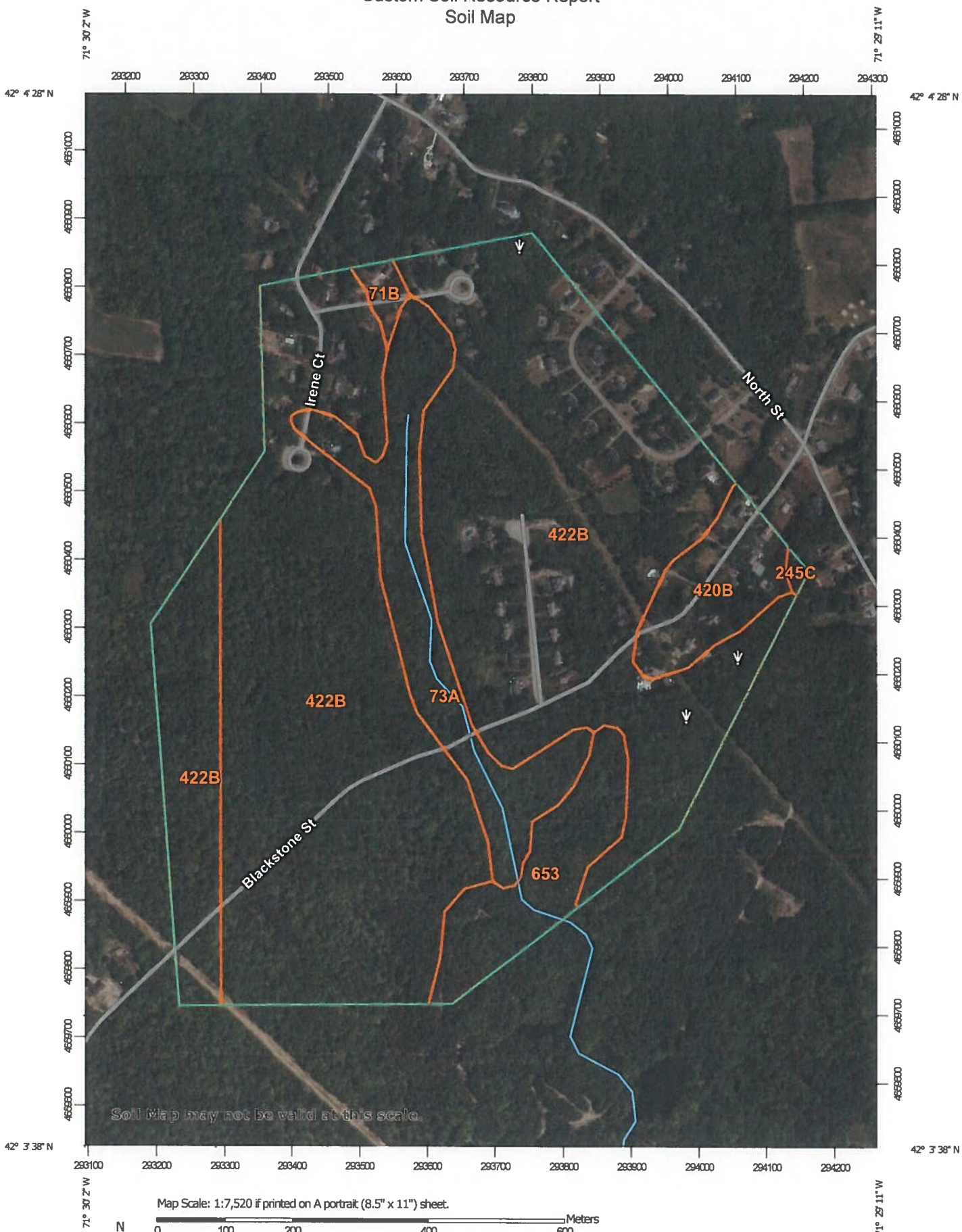
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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



Map Scale: 1:7,520 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

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 1:25,000.

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: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 20, Aug 27, 2024

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 17, Aug 27, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND

MAP INFORMATION

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
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	1.3	0.7%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	18.3	9.6%
245C	Hinckley loamy sand, 8 to 15 percent slopes	0.3	0.2%
420B	Canton fine sandy loam, 3 to 8 percent slopes	8.6	4.5%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	138.0	72.5%
653	Udorthents, sandy	10.6	5.6%
Subtotals for Soil Survey Area		**177.1**	**93.0%**
Totals for Area of Interest		**190.4**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	13.3	7.0%
Subtotals for Soil Survey Area		**13.3**	**7.0%**
Totals for Area of Interest		**190.4**	**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.

Norfolk and Suffolk Counties, Massachusetts

71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w69c
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony
Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Whitman, extremely stony
Percent of map unit: 8 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Paxton, extremely stony
Percent of map unit: 2 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

73A—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: 2w695
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Whitman, extremely stony, and similar soils: 81 percent
Minor components: 19 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitman, Extremely Stony

Setting
Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 7 to 38 inches to densic material
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY041MA - Very Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Ridgebury, extremely stony

Percent of map unit: 10 percent
Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions, outwash terraces, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Marshes, bogs, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Woodbridge, extremely stony

Percent of map unit: 1 percent

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

245C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Outwash deltas, moraines, outwash plains, kame terraces, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces, moraines
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, outwash terraces, moraines, eskers
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Canton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w818
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 4 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex

Hydric soil rating: No

Swansea

Percent of map unit: 4 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

653—Udorthents, sandy

Map Unit Setting

National map unit symbol: vky8
Elevation: 0 to 3,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Riser, tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Excavated and filled sandy glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Hydric soil rating: Unranked

Minor Components

Udorthents

Percent of map unit: 8 percent
Hydric soil rating: Unranked

Urban land

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Swansea

Percent of map unit: 2 percent
Landform: Bogs
Hydric soil rating: Yes

Worcester County, Massachusetts, Southern Part

422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w818
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 4 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 4 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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Location name: Bellingham, Massachusetts, USA*
Latitude: 42.0668°, Longitude: -71.4929°
Elevation: 311 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.329 (0.256-0.415)	0.397 (0.309-0.502)	0.508 (0.395-0.645)	0.601 (0.464-0.766)	0.728 (0.544-0.970)	0.824 (0.603-1.12)	0.924 (0.656-1.30)	1.04 (0.697-1.49)	1.19 (0.772-1.78)	1.32 (0.834-2.01)
10-min	0.466 (0.363-0.588)	0.562 (0.438-0.711)	0.720 (0.559-0.913)	0.851 (0.657-1.09)	1.03 (0.770-1.37)	1.17 (0.854-1.59)	1.31 (0.929-1.85)	1.47 (0.988-2.12)	1.69 (1.10-2.52)	1.87 (1.18-2.85)
15-min	0.548 (0.427-0.692)	0.662 (0.515-0.837)	0.848 (0.659-1.08)	1.00 (0.773-1.28)	1.21 (0.906-1.62)	1.37 (1.00-1.87)	1.54 (1.09-2.17)	1.72 (1.16-2.49)	1.99 (1.29-2.97)	2.20 (1.39-3.35)
30-min	0.748 (0.583-0.944)	0.904 (0.704-1.14)	1.16 (0.900-1.47)	1.37 (1.06-1.75)	1.66 (1.24-2.21)	1.88 (1.38-2.56)	2.11 (1.50-2.97)	2.36 (1.59-3.41)	2.72 (1.76-4.07)	3.01 (1.90-4.59)
60-min	0.947 (0.738-1.20)	1.14 (0.892-1.45)	1.47 (1.14-1.86)	1.74 (1.34-2.22)	2.11 (1.57-2.81)	2.39 (1.75-3.25)	2.68 (1.90-3.78)	3.00 (2.02-4.33)	3.46 (2.24-5.16)	3.82 (2.42-5.83)
2-hr	1.21 (0.953-1.52)	1.48 (1.16-1.86)	1.92 (1.50-2.42)	2.28 (1.77-2.89)	2.78 (2.09-3.68)	3.15 (2.32-4.26)	3.54 (2.53-4.98)	3.99 (2.70-5.72)	4.63 (3.01-6.88)	5.16 (3.27-7.82)
3-hr	1.40 (1.11-1.76)	1.72 (1.35-2.15)	2.23 (1.75-2.80)	2.65 (2.07-3.35)	3.24 (2.44-4.28)	3.68 (2.72-4.96)	4.14 (2.97-5.81)	4.67 (3.16-6.68)	5.45 (3.55-8.07)	6.10 (3.88-9.21)
6-hr	1.81 (1.43-2.25)	2.21 (1.75-2.74)	2.86 (2.26-3.57)	3.40 (2.67-4.27)	4.15 (3.16-5.46)	4.71 (3.51-6.34)	5.30 (3.85-7.44)	6.02 (4.09-8.55)	7.10 (4.64-10.4)	8.02 (5.12-12.0)
12-hr	2.30 (1.84-2.84)	2.80 (2.23-3.46)	3.61 (2.87-4.48)	4.29 (3.38-5.34)	5.22 (4.00-6.84)	5.90 (4.44-7.92)	6.65 (4.88-9.32)	7.57 (5.16-10.7)	8.98 (5.88-13.1)	10.2 (6.52-15.2)
24-hr	2.76 (2.22-3.38)	3.38 (2.71-4.14)	4.39 (3.51-5.40)	5.23 (4.15-6.47)	6.38 (4.92-8.32)	7.23 (5.48-9.67)	8.16 (6.03-11.4)	9.32 (6.38-13.1)	11.1 (7.30-16.1)	12.7 (8.13-18.7)
2-day	3.12 (2.52-3.79)	3.87 (3.13-4.72)	5.11 (4.11-6.24)	6.13 (4.90-7.54)	7.55 (5.86-9.78)	8.58 (6.54-11.4)	9.72 (7.23-13.5)	11.1 (7.66-15.5)	13.4 (8.82-19.3)	15.3 (9.86-22.5)
3-day	3.39 (2.75-4.11)	4.21 (3.41-5.10)	5.54 (4.47-6.74)	6.64 (5.33-8.13)	8.16 (6.35-10.5)	9.28 (7.08-12.3)	10.5 (7.82-14.5)	12.0 (8.30-16.7)	14.4 (9.55-20.7)	16.5 (10.7-24.2)
4-day	3.66 (2.98-4.42)	4.50 (3.66-5.45)	5.89 (4.77-7.14)	7.03 (5.66-8.58)	8.61 (6.71-11.1)	9.77 (7.47-12.9)	11.0 (8.22-15.2)	12.6 (8.73-17.5)	15.1 (10.0-21.6)	17.3 (11.2-25.2)
7-day	4.40 (3.60-5.29)	5.30 (4.34-6.38)	6.78 (5.52-8.18)	8.00 (6.47-9.71)	9.68 (7.57-12.3)	10.9 (8.36-14.2)	12.3 (9.12-16.7)	13.9 (9.64-19.1)	16.4 (10.9-23.3)	18.5 (12.0-26.8)
10-day	5.12 (4.20-6.13)	6.05 (4.96-7.25)	7.58 (6.19-9.11)	8.84 (7.17-10.7)	10.6 (8.29-13.4)	11.9 (9.10-15.4)	13.3 (9.84-17.8)	14.9 (10.4-20.4)	17.3 (11.5-24.5)	19.4 (12.6-27.9)
20-day	7.23 (5.98-8.60)	8.22 (6.79-9.78)	9.84 (8.09-11.8)	11.2 (9.13-13.4)	13.0 (10.2-16.3)	14.4 (11.1-18.4)	15.9 (11.7-21.0)	17.5 (12.2-23.7)	19.7 (13.2-27.6)	21.5 (14.0-30.8)
30-day	8.97 (7.45-10.6)	10.0 (8.29-11.9)	11.7 (9.64-13.9)	13.1 (10.7-15.6)	15.0 (11.8-18.6)	16.4 (12.6-20.8)	17.9 (13.2-23.4)	19.5 (13.7-26.2)	21.5 (14.4-30.0)	23.1 (15.0-32.9)
45-day	11.1 (9.28-13.1)	12.2 (10.2-14.4)	13.9 (11.6-16.5)	15.4 (12.7-18.3)	17.4 (13.7-21.4)	18.9 (14.6-23.7)	20.4 (15.1-26.4)	21.9 (15.4-29.3)	23.7 (16.0-32.9)	25.0 (16.3-35.4)
60-day	12.9 (10.8-15.2)	14.0 (11.7-16.5)	15.8 (13.2-18.7)	17.3 (14.3-20.6)	19.4 (15.3-23.7)	21.0 (16.2-26.2)	22.5 (16.6-28.8)	23.9 (16.9-31.9)	25.5 (17.2-35.2)	26.5 (17.3-37.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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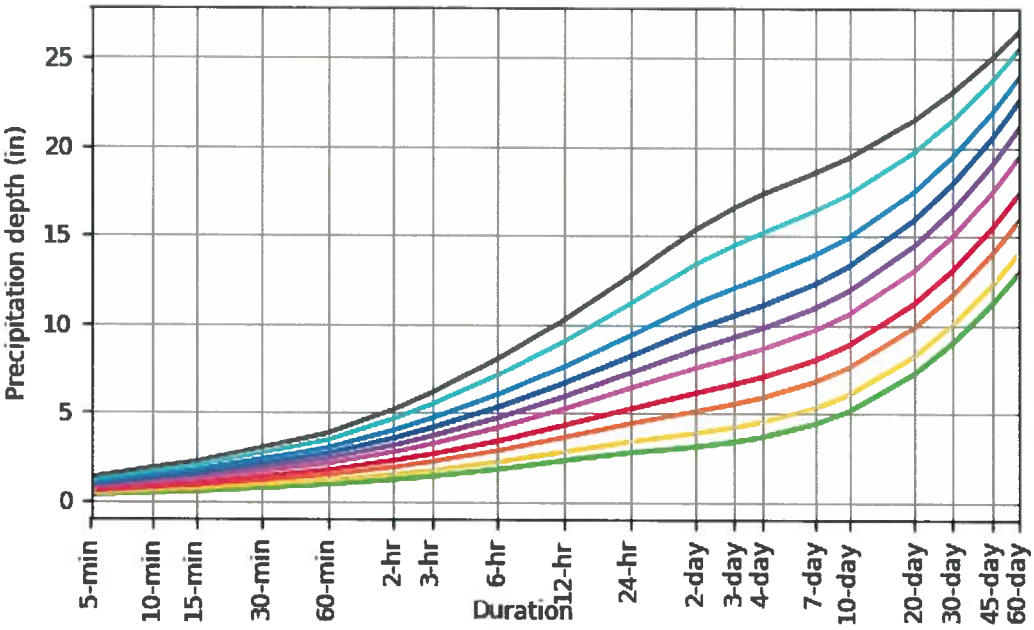
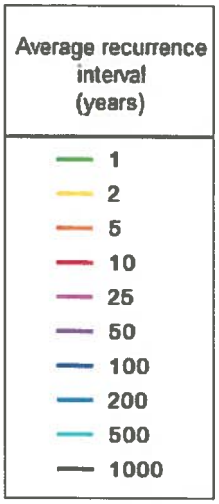
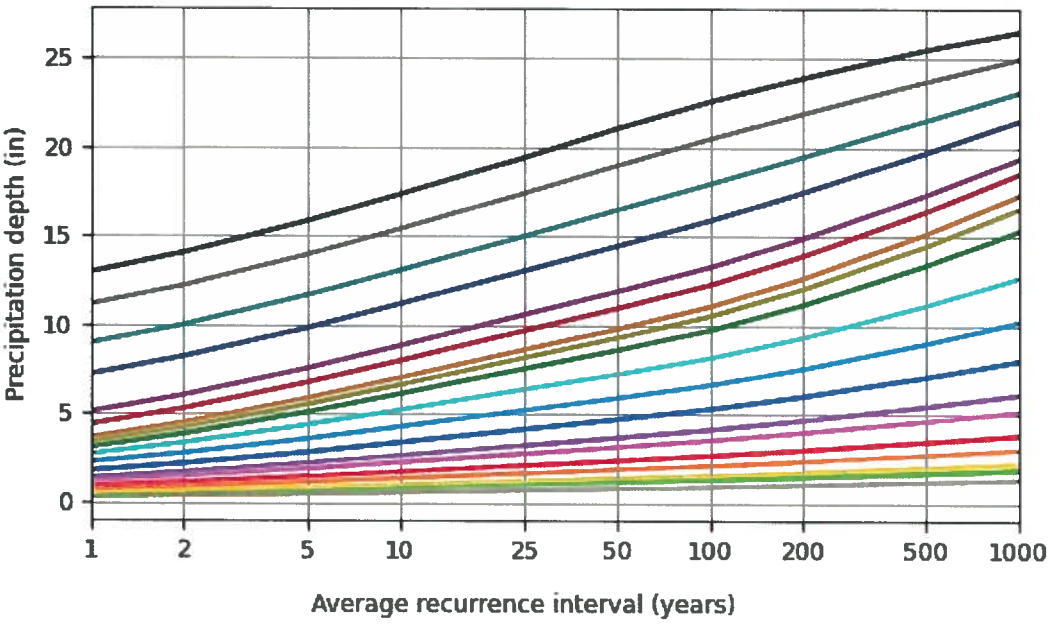
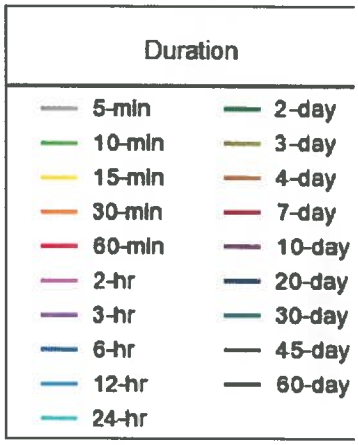
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.0668°, Longitude: -71.4929°









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Created (GMT): Mon Nov 25 15:15:28 2024

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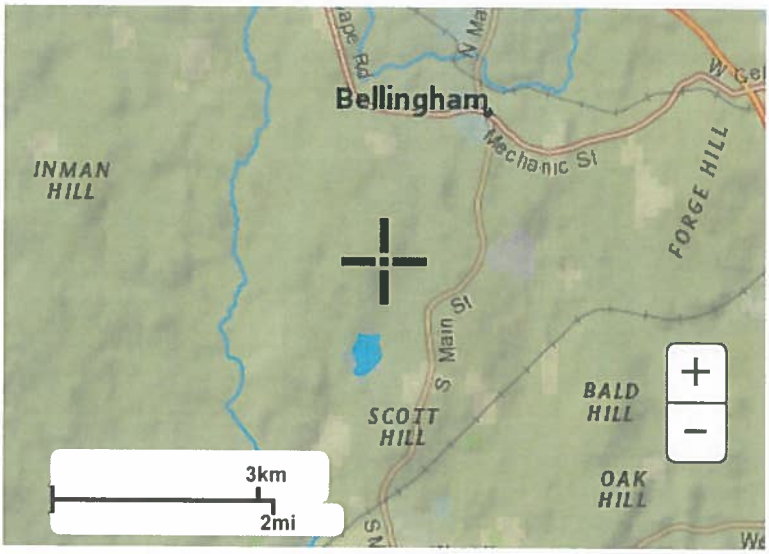
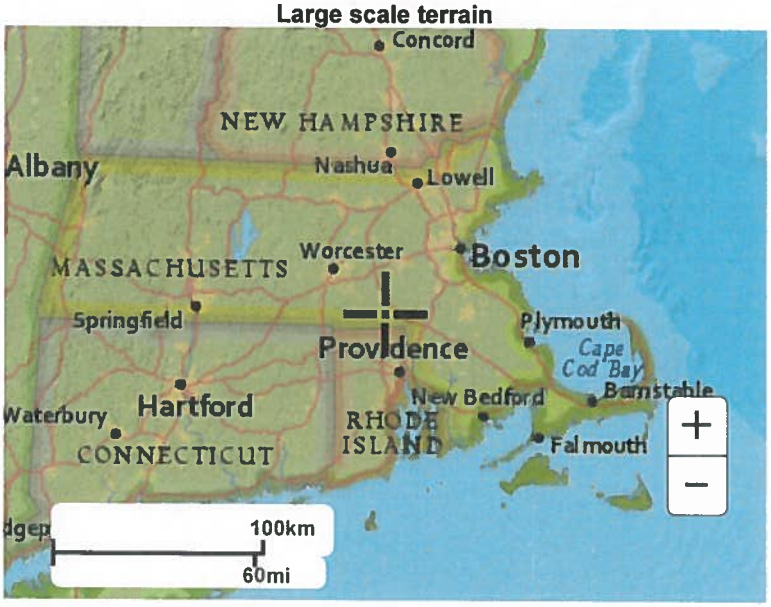
Maps & aerials

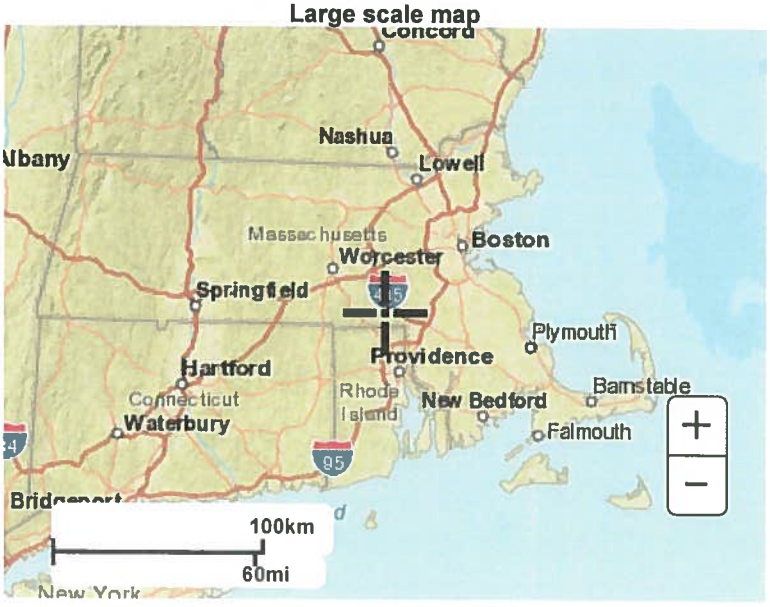
Small scale terrain



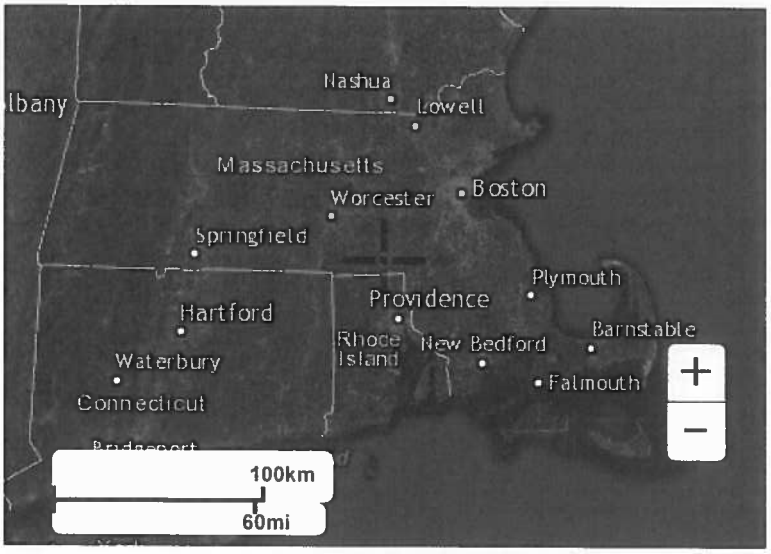
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Location name: Bellingham, Massachusetts, USA*
Latitude: 42.0668°, Longitude: -71.4929°
Elevation: 311 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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60-min	0.947 (0.738-1.20)	1.14 (0.892-1.45)	1.47 (1.14-1.86)	1.74 (1.34-2.22)	2.11 (1.57-2.81)	2.39 (1.75-3.25)	2.68 (1.90-3.78)	3.00 (2.02-4.33)	3.46 (2.24-5.16)	3.82 (2.42-5.83)
2-hr	1.21 (0.953-1.52)	1.48 (1.16-1.86)	1.92 (1.50-2.42)	2.28 (1.77-2.89)	2.78 (2.09-3.68)	3.15 (2.32-4.26)	3.54 (2.53-4.98)	3.99 (2.70-5.72)	4.63 (3.01-6.88)	5.16 (3.27-7.82)
3-hr	1.40 (1.11-1.76)	1.72 (1.35-2.15)	2.23 (1.75-2.80)	2.65 (2.07-3.35)	3.24 (2.44-4.28)	3.68 (2.72-4.96)	4.14 (2.97-5.81)	4.67 (3.16-6.68)	5.45 (3.55-8.07)	6.10 (3.88-9.21)
6-hr	1.81 (1.43-2.25)	2.21 (1.75-2.74)	2.86 (2.26-3.57)	3.40 (2.67-4.27)	4.15 (3.16-5.46)	4.71 (3.51-6.34)	5.30 (3.85-7.44)	6.02 (4.09-8.55)	7.10 (4.64-10.4)	8.02 (5.12-12.0)
12-hr	2.30 (1.84-2.84)	2.80 (2.23-3.46)	3.61 (2.87-4.48)	4.29 (3.38-5.34)	5.22 (4.00-6.84)	5.90 (4.44-7.92)	6.65 (4.88-9.32)	7.57 (5.16-10.7)	8.98 (5.88-13.1)	10.2 (6.52-15.2)
24-hr	2.76 (2.22-3.38)	3.38 (2.71-4.14)	4.39 (3.51-5.40)	5.23 (4.15-6.47)	6.38 (4.92-8.32)	7.23 (5.48-9.67)	8.16 (6.03-11.4)	9.32 (6.38-13.1)	11.1 (7.30-16.1)	12.7 (8.13-18.7)
2-day	3.12 (2.52-3.79)	3.87 (3.13-4.72)	5.11 (4.11-6.24)	6.13 (4.90-7.54)	7.55 (5.86-9.78)	8.58 (6.54-11.4)	9.72 (7.23-13.5)	11.1 (7.66-15.5)	13.4 (8.82-19.3)	15.3 (9.86-22.5)
3-day	3.39 (2.75-4.11)	4.21 (3.41-5.10)	5.54 (4.47-6.74)	6.64 (5.33-8.13)	8.16 (6.35-10.5)	9.28 (7.08-12.3)	10.5 (7.82-14.5)	12.0 (8.30-16.7)	14.4 (9.55-20.7)	16.5 (10.7-24.2)
4-day	3.66 (2.98-4.42)	4.50 (3.66-5.45)	5.89 (4.77-7.14)	7.03 (5.66-8.58)	8.61 (6.71-11.1)	9.77 (7.47-12.9)	11.0 (8.22-15.2)	12.6 (8.73-17.5)	15.1 (10.0-21.6)	17.3 (11.2-25.2)
7-day	4.40 (3.60-5.29)	5.30 (4.34-6.38)	6.78 (5.52-8.18)	8.00 (6.47-9.71)	9.68 (7.57-12.3)	10.9 (8.36-14.2)	12.3 (9.12-16.7)	13.9 (9.64-19.1)	16.4 (10.9-23.3)	18.5 (12.0-26.8)
10-day	5.12 (4.20-6.13)	6.05 (4.96-7.25)	7.58 (6.19-9.11)	8.84 (7.17-10.7)	10.6 (8.29-13.4)	11.9 (9.10-15.4)	13.3 (9.84-17.8)	14.9 (10.4-20.4)	17.3 (11.5-24.5)	19.4 (12.6-27.9)
20-day	7.23 (5.98-8.60)	8.22 (6.79-9.78)	9.84 (8.09-11.8)	11.2 (9.13-13.4)	13.0 (10.2-16.3)	14.4 (11.1-18.4)	15.9 (11.7-21.0)	17.5 (12.2-23.7)	19.7 (13.2-27.6)	21.5 (14.0-30.8)
30-day	8.97 (7.45-10.6)	10.0 (8.29-11.9)	11.7 (9.64-13.9)	13.1 (10.7-15.6)	15.0 (11.8-18.6)	16.4 (12.6-20.8)	17.9 (13.2-23.4)	19.5 (13.7-26.2)	21.5 (14.4-30.0)	23.1 (15.0-32.9)
45-day	11.1 (9.28-13.1)	12.2 (10.2-14.4)	13.9 (11.6-16.5)	15.4 (12.7-18.3)	17.4 (13.7-21.4)	18.9 (14.6-23.7)	20.4 (15.1-26.4)	21.9 (15.4-29.3)	23.7 (16.0-32.9)	25.0 (16.3-35.4)
60-day	12.9 (10.8-15.2)	14.0 (11.7-16.5)	15.8 (13.2-18.7)	17.3 (14.3-20.6)	19.4 (15.3-23.7)	21.0 (16.2-26.2)	22.5 (16.6-28.8)	23.9 (16.9-31.9)	25.5 (17.2-35.2)	26.5 (17.3-37.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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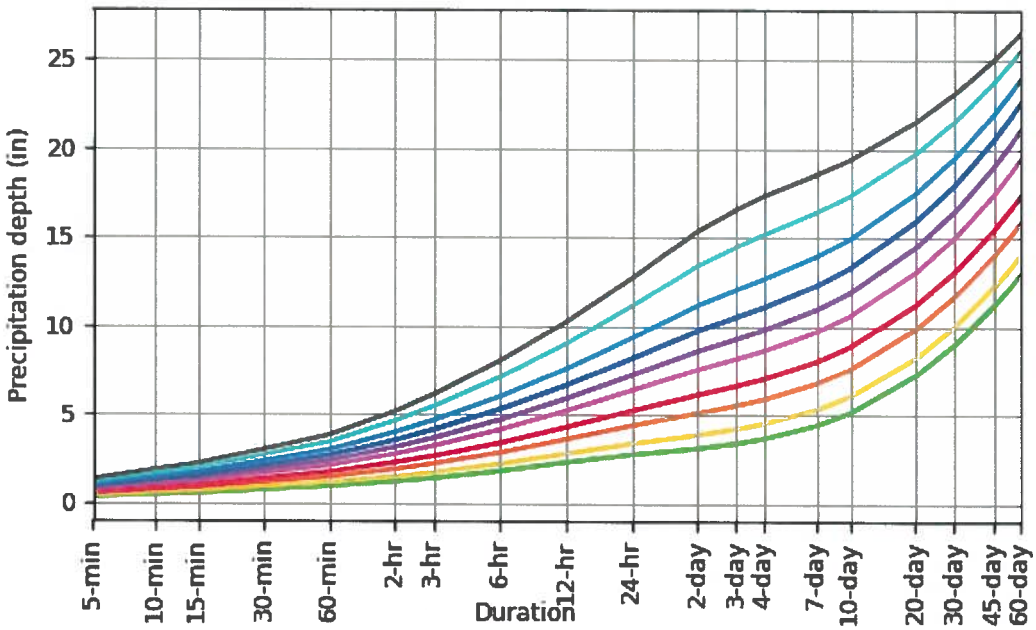
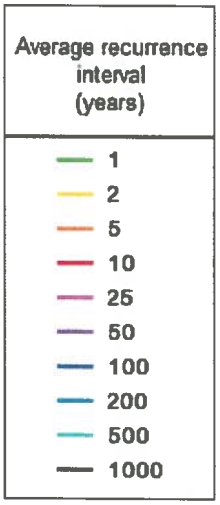
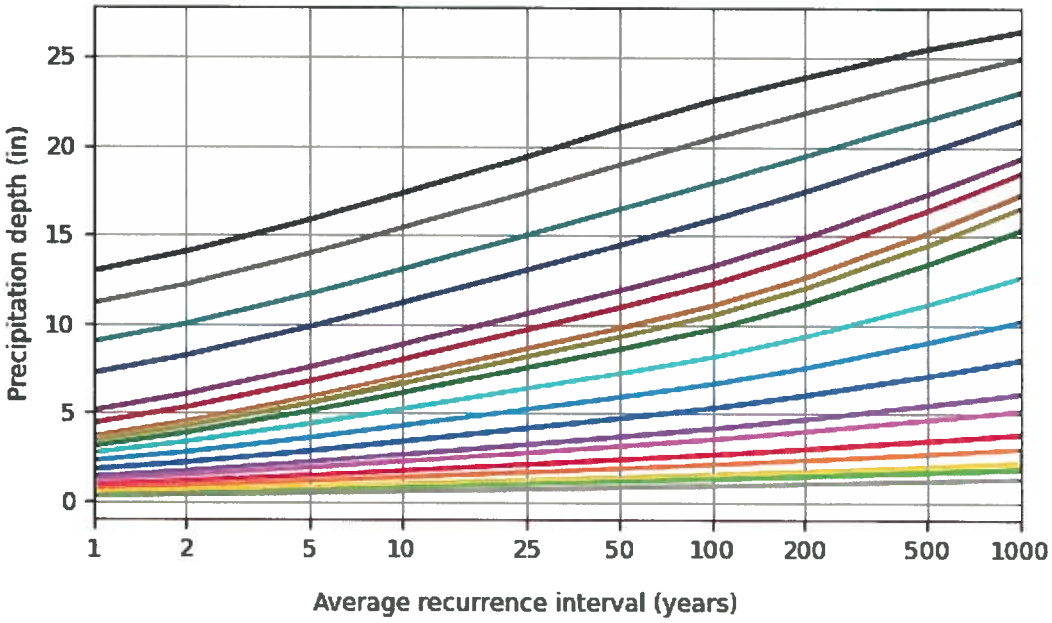
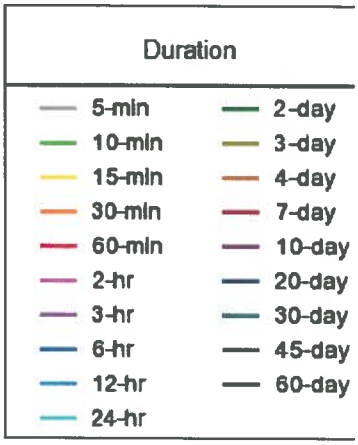
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.0668°, Longitude: -71.4929°









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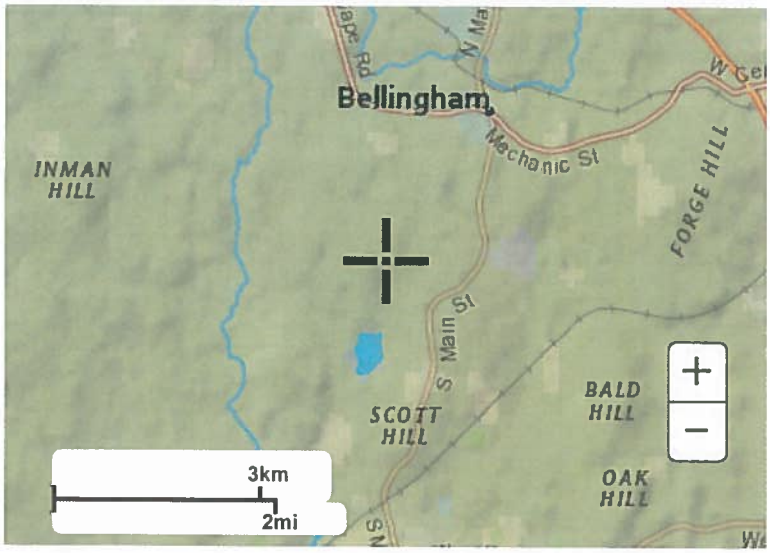
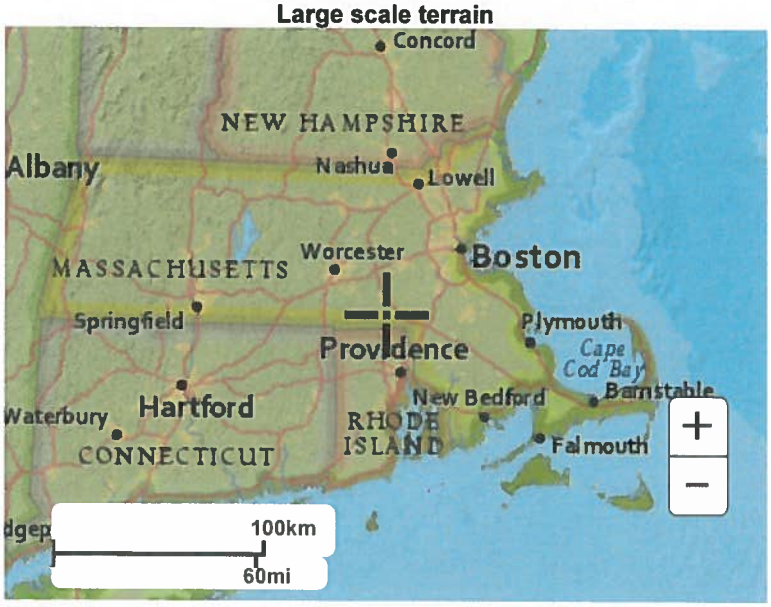
Maps & aerials

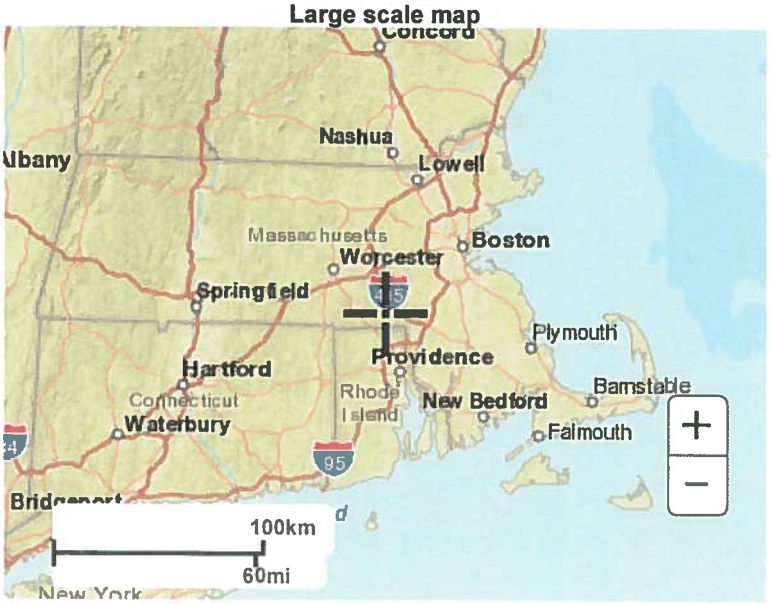
Small scale terrain



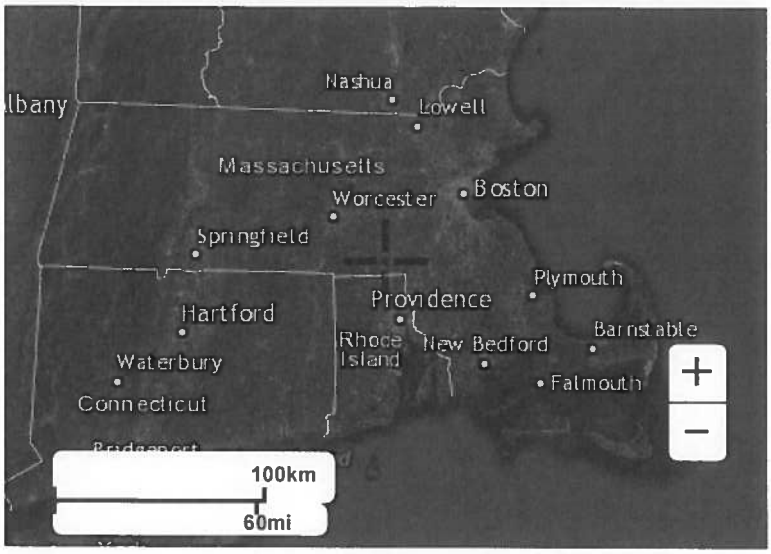
Large scale terrain



Large scale map



Large scale aerial



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