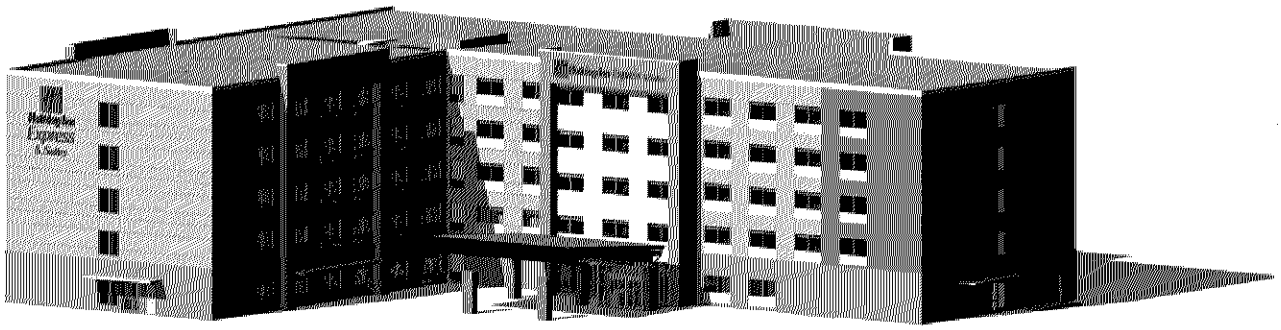
PL201700039 PL2017-39

RAMAKER & ASSOCIATES, INC.

STORM WATER MANAGEMENT PLAN



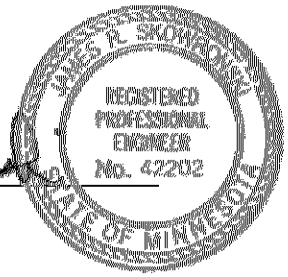
HOLIDAY INN EXPRESS & SUITES
BLOOMINGTON, MINNESOTA

PREPARED FOR:
HAWKEYE HOTELS

RAMAKER & ASSOCIATES, INC.
JOB NUMBER: 33476

Bloomington Engineering
Ok for rate control and volume.
Provide Water Quality calculations. Add note to confirm WS#7 is direct runoff and update rate control calculations.
SWS 3/27/2017

SITE:	13th Avenue South & 78th Street East Bloomington, Minnesota 55425
PREPARED FOR:	Hawkeye Hotels 1601 N. Roosevelt Ave Burlington, IA 52601
PREPARED BY:	Ramaker & Associates, Inc. 855 Community Drive Sauk City, Wisconsin 53583 Telephone: (608) 643-4100 Facsimile: (608) 643-7999
RAMAKER JOB NUMBER:	33476
DATE OF REPORT ISSUANCE:	March 14, 2017



James R. Skowronski, P.E.
Civil Engineer

Eric D. Kaul
Civil Project Manager

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SECTION 1

PROJECT GENERAL INFORMATION

1.1 INTRODUCTION AND PROJECT DESCRIPTION

Ramaker & Associates, Inc. (Ramaker) was hired to complete Civil/Site design services for the property located East and West of the corner at 13th Avenue South and 78th Street East, hereinafter referred to as "the project area."

The +/- 3.29 acre project area is located on the south side of 78th Street East and the east and west sides of 13th Avenue South. The project area currently consists of multiple hotel buildings and asphalt parking lots with grass areas. Large portions of the existing site drain towards the surrounding streets.

The proposed redevelopment of the site will involve the construction of an approximately 19,500 SF hotel building, consisting of 5 stories and 171 units, and a redesigned parking area. As a part of this project, new storm sewer piping will need to be installed along with an underground system for detention and infiltration.

1.2 PROPOSED PROJECT SCHEDULE

The proposed construction schedule will be as follows, but can be subject to change:

- May 2017 – Construction Bidding Time
- May/June 2017 - Beginning of Construction
- Spring 2018 – Construction Complete/Opening of Hotel

SECTION 2

SITE PROPERTIES AND EXISTING CONDITIONS

2.1 SITE TOPOGRAPHY

The topography of the existing project area is split between draining from north to south and south to north. Portions of the site draining from south to north are captured by existing storm sewer infrastructure within the site, with additional portion draining directly to 78th Street to the North. The portion of the site that drains from north to south has an area that drains to a low grass area and the remainder drains directly into 13th Avenue South. The slopes within the existing project area are gentle slopes, varying between 0.5% and 1.5%.

2.2 SOIL AND GROUND COVER CONDITIONS

A geotechnical exploration took place at the site on February 27, 2017. Nine soil borings were advanced to approximate depths ranging from 15 to 40 feet BGS.

According to the geotechnical soil borings completed by Ramaker & Associates, the site consists of 1' – 6' of Fill/Topsoil/Clayey Silt which is classified as Type C soil, with all borings encountering sand beneath this layer. This sand can be classified as a Type B soil with an approximate infiltration rate of 0.8 inches/hour. The geotechnical boring logs have been included as Appendix B in this stormwater management plan.

The project area currently consists of multiple hotel buildings and asphalt parking lots with grass areas. Large portions of the existing site drain towards the streets.

2.3 EXISTING CONDITIONS WATERSHEDS AND RUNOFF TRIBUTARIES

This +/- 3.29 acre project area is located within the City of Bloomington. The property consists of 4 existing watersheds with a total area of 3.29 acres. A map showing the watersheds of the existing conditions is included in this report as Appendix C.

SECTION 3

STORM WATER DESIGN CRITERIA

3.1 REGULATIONS

Section 4 of the City of Bloomington Comprehensive Surface Water Management Plan (SWMP) as well as typical MPCA regulations were used as a guideline for the design of this storm sewer system.

3.2 DEVELOPMENT CRITERIA

Using Section 4.A of the City of Bloomington SWMP, it was determined that this redevelopment project shall not increase the 1, 10 or 100 year storm event rates from existing to proposed conditions. In addition, this redevelopment project shall achieve a net reduction from pre-project conditions (on an average annual basis) of stormwater discharge volume.

Using Section 4.B. of the City of Bloomington SWMP, it was determined that this redevelopment project would need to achieve a net reduction from pre-project conditions (on an average annual basis) of stormwater discharges of total suspended solids (TSS) and total phosphorus (TP). The design of this project has also attempted to remove at least 80% TSS from proposed conditions and at least 60% phosphorus removal

In addition to the requirements listed above, an MPCA construction site stormwater permit will be required for this project. The permit will be applied for once approvals have been received from the City and once the start of construction has been scheduled.

3.3 HYDROLOGIC CRITERIA

Drainage Areas – The total watershed area for this project is approximately 3.29 acres. These 3.29 acres contain four (4) watersheds in the existing conditions (see Appendix C) but was broken down into ten (10) different watersheds for the proposed site conditions. A map showing the location of all watersheds under proposed conditions is included as Appendix D.

Watershed soils – The soil types for this property consist of topsoil/fill/clayey silt classified as Type C Soil for the first 1' – 6'. Beneath this layer is sand classified as Type B soils. Please refer to the attached geotechnical boring logs for additional soil conditions.

Pre/post project land use – The existing land use for this project area are multiple asphalt parking lots with several buildings. Once this project is completed, the land use will be commercial use with a five (5) story hotel building with 171 units and a redesigned asphalt parking lot.

Runoff coefficients – Each watershed for this project had a weighted curve number (runoff coefficient) determined for both the existing conditions and the proposed conditions. These curve numbers are presented on page 2 of the HydroCAD report in the attached appendix E and F.

Rainfall Intensity & Design Frequencies – The City of Bloomington requirements state that redevelopment projects shall utilize a Soil Conservation Service (SCS) Type II distribution for the design storms. The frequencies used were the 99%, 10%, and 1% storm events. The respective rainfall intensities were then used in the computer program HydroCAD to model the storm sewer system under these storm events.

3.4 HYDRAULIC CRITERIA

3.4.1 Storm Sewer Piping – The proposed storm sewer pipes on this site will mostly consist of high density polyethylene (HDPE) pipes with a few reinforced concrete pipes (RCP) where needed. These pipes are laid out as indicated on the provided civil plan sheets.

3.4.2 Storm Sewer Inlets/Outlets – The storm sewer structures on this project will be constructed from reinforced concrete. These structures are laid out as indicated on the provided civil plan sheets.

3.4.3 Streets, Curb and Gutter – Asphaltic concrete will be utilized for the parking area and related entryways/aisles for the parking lot. The parking lot will be designed for drainage to or from the curb and gutter system and over the asphaltic concrete parking lot to the proposed storm inlets.

3.4.4 Underground Retention/Detention system – The proposed storm system design will utilize a prefabricated underground retention/detention system to meet the infiltration requirements of the site as well as limit the peak runoff flow rates from the site. This prefabricated system will be an ADS Stormtech MC-3500 system with several inlet control structures and one reinforced concrete outlet structure. Some areas of at the edge of the site will drain directly off-site, but the flows off-site in these areas will be compensated for within the proposed underground system.

3.4.5 Floodplain and Wetlands – According to the Federal Emergency Management Agency (FEMA) map number 27053C0457F, revised on November 4, 2016; this project is determined to be outside the 0.2% annual chance floodplain.

3.4.6 Erosion and Sedimentation – Prior to any land disturbing activity, a stone tracking pad will be installed at the northeast entrance of the project, off of 78th Street East. Silt fence will be installed along the disturbance limits of the project and inlet protection will be installed and maintained on all existing and proposed inlets, until final stabilization occurs.

Within 14 days of grading, any areas with exposed soil that have not been restored will have temporary hay mulch spread to reduce erosion. Permanent seeding or sod will be in place within a week of project completion and erosion matting will be used in areas where slopes are equal to or greater than 4:1 slope.

SECTION 4
SUMMARY OF RESULTS

4.1 STORMWATER QUANTITY RESULTS

Hydrographs were developed for the 1-, 10- and 100-year, 24 hour design storms with both the pre- and post-development conditions for the project area in order to verify that this redevelopment project and its resultant runoff would meet the discharge rate requirements for the City of Bloomington. Below is a summary of the results obtained from the project's hydraulic model for the above-referenced design storms. The flow listed is what the site has contributed pre-development compared to post-development and is not a comprehensive analysis of the actual flows in the city storm sewer.

STORM FREQUENCY (YEARS)	RAINFALL (INCHES)	PRE-DEVELOPMENT Q (CFS)	POST-DEVELOPMENT Q (CFS)
1	2.4	3.49	1.74
10	4.2	7.92	3.34
100	7.5	22.31	16.20

A complete set of calculation results are provided for both Pre and Post-Developed Conditions as Appendices E and F.

4.2 WATER QUALITY PROTECTION

This report summarizes the City of Bloomington rules and regulations that were undertaken as requirements for this proposed project. The City requirements state that any redevelopment project that creates one or more acres of new and/or fully reconstructed impervious surfaces shall capture and retain on-site 1.0 inch of runoff from the new and/or fully reconstructed impervious surfaces. This project will create approximately 105,475 square feet of new or reconstructed impervious surfaces, requiring approximately 8,790 cubic feet of water to be retained on-site.

In order to meet this retention requirement, an underground HDPE chamber system and outlet structure has been designed to serve as retention/detention/infiltration facilities. A layout of approximately 126 chambers with 18 end-caps will be constructed at an underground elevation of 816.45' (bottom of chamber). The outlet control device will retain water in the 9-inch stone layer below the chambers (815.70' – 816.45'), as well as in the chambers from elevation 816.45' to 817.70' (elevation of first orifice at outlet control structure). This will result in a storage depth of approximately 2-feet (24 inches) which would have a draw down time of approximately 30 hours due to the sandy soils on-site and their 0.8 inches/hour infiltration rate. Using this underground system, a total volume of approximately 9,280 cubic feet of water will be retained and infiltrated on-site (see Appendix G for ADS Cumulative Storage Calculations spreadsheet).

In order to protect the groundwater located within the area of this project, a number of stormwater runoff pretreatment devices/methods have been provided. The main pretreatment device will be an isolator row within the proposed underground retention/detention system to remove TSS and allow for easy maintenance of the proposed underground system. In addition, the groundwater in the area of this site is very deep compared to the bottom of the proposed chamber system, so this gap will allow the water to infiltrate through the native soils and treat Total Phosphorus from the runoff before combining with the groundwater in the area.

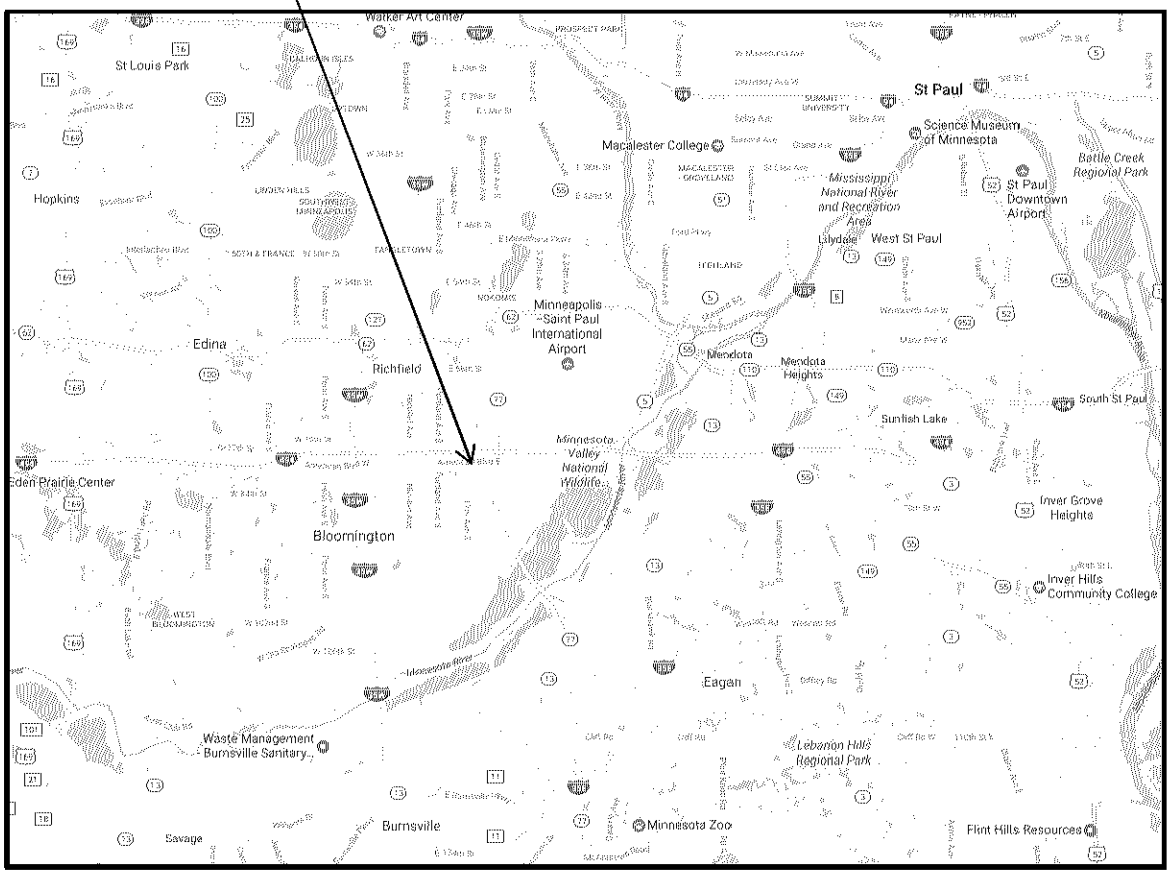
REFERENCES

- City of Bloomington Comprehensive Surface Water Management Plan (SWMP)
- Federal Emergency Management Agency (FEMA) - http://www.fema.gov/
- Minnesota Pollution Control Agency (MPCA)
- HydroCAD computer program
- Minnesota Special & Impaired Waters online database - https://www.pca.state.mn.us/water/stormwater-special-and-impaired-waters-search

APPENDIX A
VICINITY MAP

Source: www.google.com/maps

PROJECT LOCATION



APPENDIX B
GEOTECHNICAL SOIL BORINGS

PL201700039 PL2017-39

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B1
Drill Start Date: 02/21/17
Drill End Date: 02/21/17
Boring Depth (ft BGS): 41
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 19
Depth of Collapse (ft BGS): Not Reported

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
												Asphalt Crushed gravel
1	0	1.5	13	M	3	4	3	7	FILL		1	Dark brown clayey silt and fine to coarse sand with trace fine to coarse gravel and trace construction debris (concrete, asphalt)
											2	
2	2	3.5	13	M	1	1	3	4	TOPSOIL		3	Black/dark brown clayey silt with some fine to medium sand and trace plant debris
									ML		4	Dark brown clayey silt with some fine to coarse sand
3	4.5	6	13	M	1	5	3	8	SP-SM		5	Brown fine to medium sand with little silt
											6	
4	7	8.5	13	M	1	3	4	7			7	Brown fine to coarse sand with trace silt
											8	
5	9.5	11	13	M	3	3	3	6			9	
											10	
6	12	13.5	13	M	4	4	5	9			11	
											12	
7	14.5	16	12	M	3	5	4	9			13	
											14	
											15	
											16	
									SP		17	Brown fine to coarse sand with trace fine to coarse gravel, and trace silt
											18	
										▼	19	
											20	
8	19.5	21	12	W	3	4	3	7			21	

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RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B1
Drill Start Date: 02/21/17
Drill End Date: 02/21/17
Boring Depth (ft BGS): 41
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 19
Depth of Collapse (ft BGS): Not Reported

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
											22	Brown fine to coarse sand with trace fine to coarse gravel, and trace silt
											23	
											24	
9	24.5	26	12	W	5	14	8	22			25	
											26	
											27	
											28	
											29	
10	29.5	31	12	W	5	8	14	22			30	
									SP		31	
											32	
											33	
											34	
11	34.5	36	8	W	8	11	10	21			35	
											36	
											37	
											38	
											39	
											40	
12	39.5	41	12	W	7	8	7	15			41	

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RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B2
Drill Start Date: 02/28/17
Drill End Date: 02/28/17
Boring Depth (ft BGS): 41
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 19
Depth of Collapse (ft BGS): Not Reported

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
1	0	1.5	11	M	1	4	4	8	---			Topsoil
									FILL			Dark brown/black clayey silt with some fine to coarse sand, trace fine to coasre gravel, and trace plant debris
2	2	3.5	11	M	1	2	2	4				
												Brown fine to coarse sand with trace fine gravel and trace silt
3	4.5	6	12	M	1	5	4	9				
												Brown fine to coarse sand with trace silt
4	7	8.5	12	M	1	2	2	4				
5	9.5	11	12	M	2	2	2	4				
6	12	13.5	0	M	2	3	5	8	SP			No Recovery; presumably same as above
7	14.5	16	12	M	4	8	6	14				Brown fine to coarse sand with trace fine to coarse gravel and trace silt
										▼		
8	19.5	21	12	W	2	7	5	12				

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B2
Drill Start Date: 02/28/17
Drill End Date: 02/28/17
Boring Depth (ft BGS): 41
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 19
Depth of Collapse (ft BGS): Not Reported

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
											22	Brown fine to coarse sand with trace fine to coarse gravel and trace silt (contined)
											23	
											24	
9	24.5	26	2	W	2	13	8	21			25	
											26	
											27	
											28	
											29	
10	29.5	31	11	W	5	8	8	16			30	
									SP		31	
											32	
											33	
											34	
11	34.5	36	12	W	5	7	6	13			35	
											36	
											37	
											38	
											39	
											40	
12	39.5	41	12	W	6	11	9	20			41	

RAMAKER & ASSOCIATES, INC.

PL201700039 PL2017-39

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B3
Drill Start Date: 02/21/17
Drill End Date: 02/21/17
Boring Depth (ft BGS): 25
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 22
Depth of Collapse (ft BGS): 9

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
1	0	1.5	6	M	20	12	8	20	FILL			Asphalt
												Black fine to coarse sand with some fine to coarse gravel and some asphalt
									TOPSOIL			Black clayey silt with some fine to coarse sand
2	2	3.5	12	M	4	6	4	10	ML			Dark brown clayey silt with some fine to coarse sand
												Brown fine to coarse sand with trace silt
3	4.5	6	12	M	3	4	4	8				
4	7	8.5	6	M	2	4	5	9				
5	9.5	11	14	M	4	4	4	8				
6	12	13.5	12	M	4	4	4	8	SP			
7	14.5	16	12	M	4	6	4	10				Brown fine to coarse sand with trace fine gravel and trace silt
										▼		Brown fine to coarse sand with trace silt
8	19.5	21	12	W	3	5	3	8				

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B3
Drill Start Date: 02/21/17
Drill End Date: 02/21/17
Boring Depth (ft BGS): 25
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 22
Depth of Collapse (ft BGS): 9

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
									SP		22 23 24 25	Brown fine to coarse sand with trace silt (continued)
9	23.5	25	6	W	2	5	3	8				
											26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41	

RAMAKER & ASSOCIATES, INC.

PL201700039 PL2017-39

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B4
Drill Start Date: 02/21/17
Drill End Date: 02/21/17
Boring Depth (ft BGS): 25
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 23
Depth of Collapse (ft BGS): 10

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
1	0	1.5	15	M	3	9	9	18	FILL			Asphalt
											1	Crushed gravel
									TOPSOIL			Black clayey silt with some fine to coarse sand
2	2	3.5	13	M	7	4	1	5			2	
									ML		3	Dark brown clayey silt with some fine to coarse sand
											4	
3	4.5	6	12	M	2	4	4	8				
											5	Brown fine to coarse sand with trace silt
4	7	8.5	12	M	1	2	2	4			6	
											7	
5	9.5	11	13	M	1	5	3	8			8	
											9	
6	12	13.5	13	M	5	6	9	15	SP		10	
											11	
7	14.5	16	14	M	4	8	5	13			12	
											13	Brown fine to coarse sand with trace fine to coarse gravel and trace silt
											14	
											15	
											16	
											17	
											18	
										▼	19	
8	19.5	21	12	W	2	6	4	10			20	
											21	

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B4
Drill Start Date: 02/21/17
Drill End Date: 02/21/17
Boring Depth (ft BGS): 25
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 23
Depth of Collapse (ft BGS): 10

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
									SP		22 23 24 25	Brown fine to coarse sand with trace fine to coarse gravel and trace silt (continued)
9	23.5	25	12	W	6	9	8	17				
											26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41	

RAMAKER & ASSOCIATES, INC.

PL201700039 PL2017-39

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 826 (per Survey)

Boring Number: B5
Drill Start Date: 02/22/17
Drill End Date: 02/22/17
Boring Depth (ft BGS): 25
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 20
Depth of Collapse (ft BGS): 10

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
												Asphalt
1	0	1.5	12	M	3	20	7	27				Crushed gravel
											1	Dark brown fine to coarse sand with little silt
												Black/dark brown clayey silt with some fine to coarse sand and trace fine to coarse gravel
2	2	3.5	13	M	8	15	15	30	FILL		2 3 4	
											5	
3	4.5	6	12	M	15	10	10	20			6	Light brown fine to coarse sand and fine to coarse gravel with some construction debris (concrete) and trace silt
											7	Brown fine to coarse sand with trace silt
4	7	8.5	12	M	6	6	5	11			8 9	
											10	
5	9.5	11	12	M	2	3	2	5			11 12	
											13	
6	12	13.5	12	M	5	6	7	13			14	
									SP		15	
7	14.5	16	12	M	5	7	7	14			16	
											17 18	Brown fine to coarse sand with trace fine gravel and trace silt
										▼	19	
8	19.5	21	12	W	1	5	4	9			20 21	

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 826 (per Survey)

Boring Number: B5
Drill Start Date: 02/22/17
Drill End Date: 02/22/17
Boring Depth (ft BGS): 25
GW Depth During (ft BGS): 19
GW Depth After (ft BGS): 20
Depth of Collapse (ft BGS): 10

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
									SP		22 23 24 25	Brown fine to coarse sand with trace fine gravel and trace silt (continued)
9	23.5	25	12	W	5	7	5	12				
											26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41	

RAMAKER & ASSOCIATES, INC.

PL201700039 PL2017-39

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 825 (per Survey)

Boring Number: B6
Drill Start Date: 02/22/17
Drill End Date: 02/22/17
Boring Depth (ft BGS): 16
GW Depth During (ft BGS): Not Encountered
GW Depth After (ft BGS): Not Encountered
Depth of Collapse (ft BGS): 6

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
												Asphalt
												Crushed gravel with concrete debris
1	0	1.5	13	M	4	4	6	10	FILL			Dark brown/black clayey silt with some fine to coarse sand
									TOPSOIL			
2	2	3.5	13	M	1	3	4	7	ML			Brown clayey silt with some fine to coarse sand and trace plant debris
												Brown fine to coarse sand with trace silt
3	4.5	6	13	M	3	5	5	10				
4	7	8.5	12	M	1	2	2	4				
5	9.5	11	12	M	1	3	2	5	SP			
6	12	13.5	13	M	3	5	6	11				
7	14.5	16	13	M	2	5	3	8				

PL201700039 PL2017-39

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 823 (per Survey)

Boring Number: B7
Drill Start Date: 02/28/17
Drill End Date: 02/28/17
Boring Depth (ft BGS): 26
GW Depth During (ft BGS): 18
GW Depth After (ft BGS): 20
Depth of Collapse (ft BGS): 8

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
1	0	1.5	14	M	1	2	3	5	TOPSOIL		1	Black clayey silt with some fine to coarse sand and trace plant debris
											2	
2	2	3.5	12	M	1	2	2	4	SP-SM		3	Brown fine to coarse sand with little silt
											4	
3	4.5	6	12	M	2	3	3	6			5	
											6	
											7	Brown fine to coarse sand with trace silt
4	7	8.5	12	M	2	2	3	5			8	
											9	
5	9.5	11	12	M	1	3	4	7			10	
											11	
6	12	13.5	12	M	2	4	4	8			12	
									SP		13	
											14	
7	14.5	16	13	M	2	7	9	16			15	Brown fine to caorse sand with trace fine gravel and trace silt
											16	
											17	
										▼	18	
											19	
8	19.5	21	12	W	1	5	6	11			20	
											21	

RAMAKER & ASSOCIATES, INC.

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 823 (per Survey)

Boring Number: B7
Drill Start Date: 02/28/17
Drill End Date: 02/28/17
Boring Depth (ft BGS): 26
GW Depth During (ft BGS): 18
GW Depth After (ft BGS): 20
Depth of Collapse (ft BGS): 8

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
									SP		22 23 24 25 26	Brown fine to caorse sand with trace fine gravel and trace silt (continued)
9	24.5	26	12	W	4	5	7	12				
											27 28 29 30 31 32 33 34 35 36 37 38 39 40 41	

RAMAKER & ASSOCIATES, INC.

PL201700039 PL2017-39

Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 824.5 (per Survey)

Boring Number: B8
Drill Start Date: 02/28/17
Drill End Date: 02/28/17
Boring Depth (ft BGS): 16
GW Depth During (ft BGS): Not Encountered
GW Depth After (ft BGS): Not Encountered
Depth of Collapse (ft BGS): 7

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
1	0	1.5	13	M	12	12	14	26	TOPSOIL		1	Black clayey silt with some fine to coarse sand and trace plant debris
											2	
2	2	3.5	13	M	1	3	3	6	ML		3	Dark brown clayey silt with some fine to coarse sand
											4	Brown fine to coarse sand with trace silt
3	4.5	6	12	M	1	4	3	7			5	
											6	
4	7	8.5	12	M	1	3	4	7			7	
											8	
											9	
5	9.5	11	13	M	3	5	4	9	SP		10	
											11	
6	12	13.5	13	M	3	5	6	11			12	
											13	
7	14.5	16	13	M	2	8	6	14			14	
											15	
											16	
											17	
											18	
											19	
											20	
											21	

PL201700039 PL2017-39

RAMAKER & ASSOCIATES, INC.

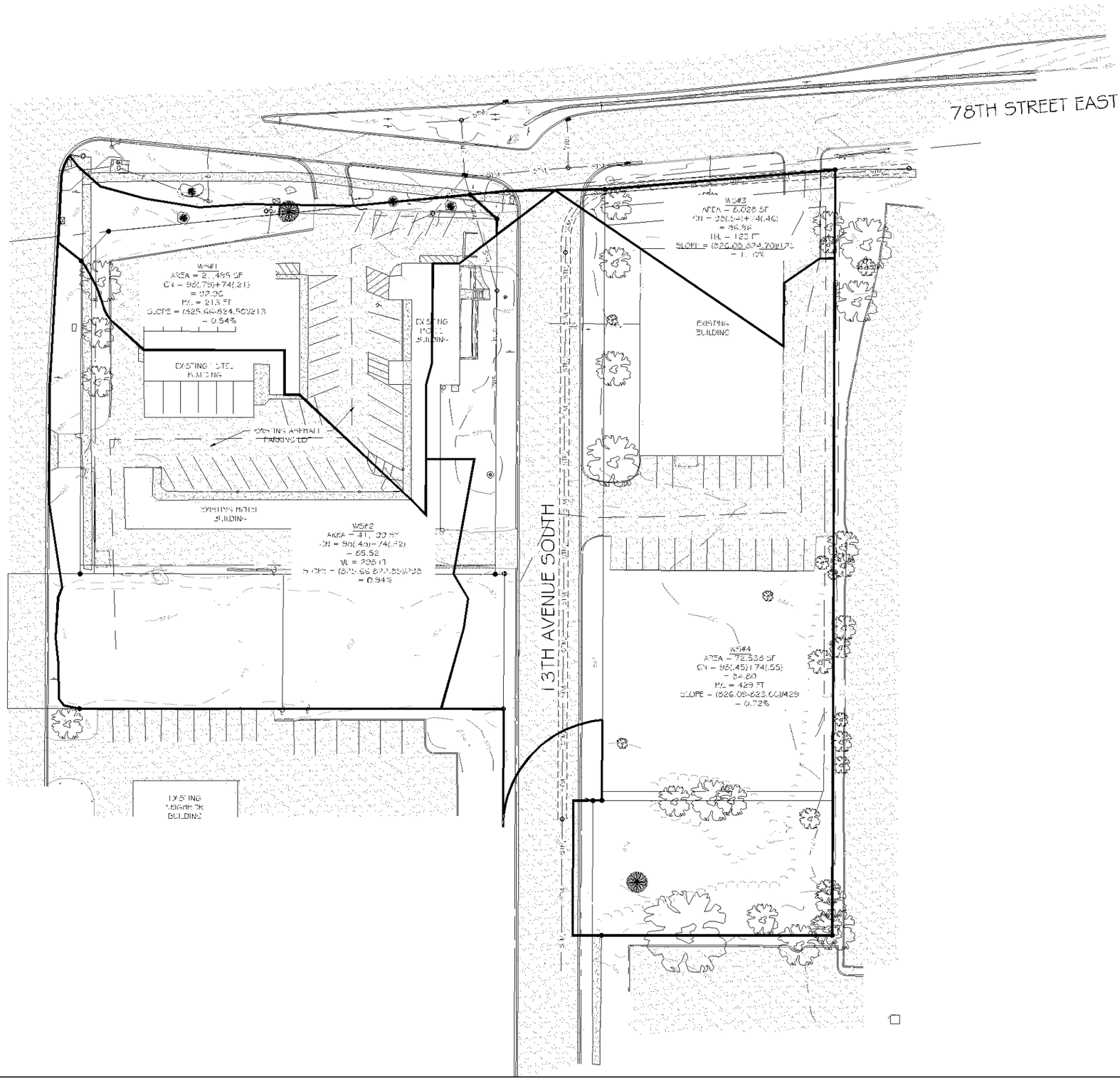
Project Number: 33476
Project Name: Holiday Inn Express Hotel
Address: 1225 East 78th Street
City, State: Bloomington, Minnesota
County: Hennepin
Sample Method: Split Spoon
Elevation (ft AMSL): Approx. 826 (per Survey)

Boring Number: B9
Drill Start Date: 02/28/17
Drill End Date: 02/28/17
Boring Depth (ft BGS): 16
GW Depth During (ft BGS): Not Encountered
GW Depth After (ft BGS): Not Encountered
Depth of Collapse (ft BGS): 7

▼ = Water Level

Sample Number	Sample From (ft)	Sample To (ft)	Recovery (in)	Moisture	Blow Counts			N-Value	USCS Classification	Water	Depth (ft) BGS	Description
1	0	1.5	13	M	5	10	15	25	TOPSOIL/FILL		1	Black clayey silt with some fine to caorse sand and trace plant debris
											2	
2	2	3.5	12	M	3	3	3	6	SP-SM		3	Dark brown fine to coarse sand with little silt
											4	
3	4.5	6	12	M	1	4	3	7			5	Brown fine to coarse sand with trace silt
											6	
4	7	8.5	13	M	1	2	3	5			7	
											8	
5	9.5	11	12	M	1	5	3	8	SP		9	
											10	
6	12	13.5	13	M	2	5	6	11			11	
											12	
7	14.5	16	12	M	2	6	6	12			13	
											14	
											15	Brown fine to coarse sand with trace fine gravel and trace silt
											16	
											17	
											18	
											19	
											20	
											21	

APPENDIX C
EXISTING CONDITIONS WATERSHED MAP



CITIES EDGE ARCHITECTS
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NORTH

Certificator # Seal:

MARK	DATE	DESCRIPTION

DATE ISSUED: 03/15/2017
ISSUE PHASE: CITY REVIEW

PROJECT TITLE:
HOLIDAY INN EXPRESS
5 STORIES
171 UNITS

PROJECT OWNER:
HAWKEYE HOTELS

PROJECT LOCATION:
BLOOMINGTON, MN

SHEET TITLE:
EXISTING WATERSHEDS

0 .5 30' 60'
11 x 17": 1" = 60'
22" x 34": 1" = 30'

PROJECT NUMBER: 33476
SHEET NUMBER: SW100

APPENDIX D

PROPOSED CONDITIONS WATERSHED MAP

PL201700039 PL2017-39

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78TH STREET EAST

12TH AVENUE SOUTH

13TH AVENUE SOUTH

EX STRM MH
RIM=871.45'
INV (N)=814.80'

EX STRM CB
RIM=824.01'

24 LF STORM SEWER

EX STRM MH
RIM=824.34'
INV=818.76'

EX STRM CB
RIM=874.06'
INV (N)=819.50'
SUMP INV=818.26

58 LF STORM SEWER

EX STRM MH
RIM=870.00'
INV (W)=813.00'

215 LF 60" STORM SEWER

315 LF 60" RCP STORM SEWER (EXISTING)

EX STRM MH
RIM=873.12'
INV (N)=812.70'

WS#1 (ROOF)
AREA = 19,585 SF
CN = 98
HL = 205 FT
SLOPE = ..0 %

WS#2 (PORTE COCHERE)
AREA = ..114 SF
CN = 98
HL = 47 FT
SLOPE = 1.6%

WS#3
AREA = 25,775 SF
CN = 88(.85)+74(.15)
=94.4
HL = ..68 FT
SLOPE = (825.04-822.75)/169
= ..35%

WS#4
AREA = 15,427 SF
CN = 98(.68)+74(.32)
=90.55
HL = 128 FT
SLOPE = (825.10-822.41)/..25
= 2..%

WS#5
AREA = 6,463 SF
CN = 98(.55)+74(.15)
=94.6
HL = 81 FT
SLOPE = (825.49-824.82)/8..
= .45%

WS#6
AREA = ..6,410 SF
CN = 98(.78)+74(.22)
=97.2
HL = 172 FT
SLOPE = (823.95-823.23)/172
= 1.58%

WS#7
AREA = 66,961 SF
CN = 98(.92)+74(.08)
=96.08
HL = 143 FT
SLOPE = (825.15-823.33)/149
= 1.22%

WS#8
AREA = 15,732 SF
CN = 98(.25)+74(.75)
=80
HL = 275 FT
SLOPE = (879.00-874.06)/2..
= ..79%

WS#9
AREA = 11,425 SF
CN = 98(.29)+74(.71)
=79.52
HL = 277 FT
SLOPE = (829.00-823.00)/2787
= 2.10%

WS#10
AREA = 5,..30 SF
CN = 98(.41)+74(.59)
=83.57
HL = 30.31 FT
SLOPE = (875.13-872.66)/80.31
= 3.20%

NORTH

Certificate # Seal:

MARK	DATE	DESCRIPTION

DATE ISSUED: 03/15/2017
ISSUE PHASE: CITY REVIEW

PROJECT TITLE:
HOLIDAY INN EXPRESS
5 STORIES
171 UNITS

PROJECT OWNER:
HAWKEYE HOTELS

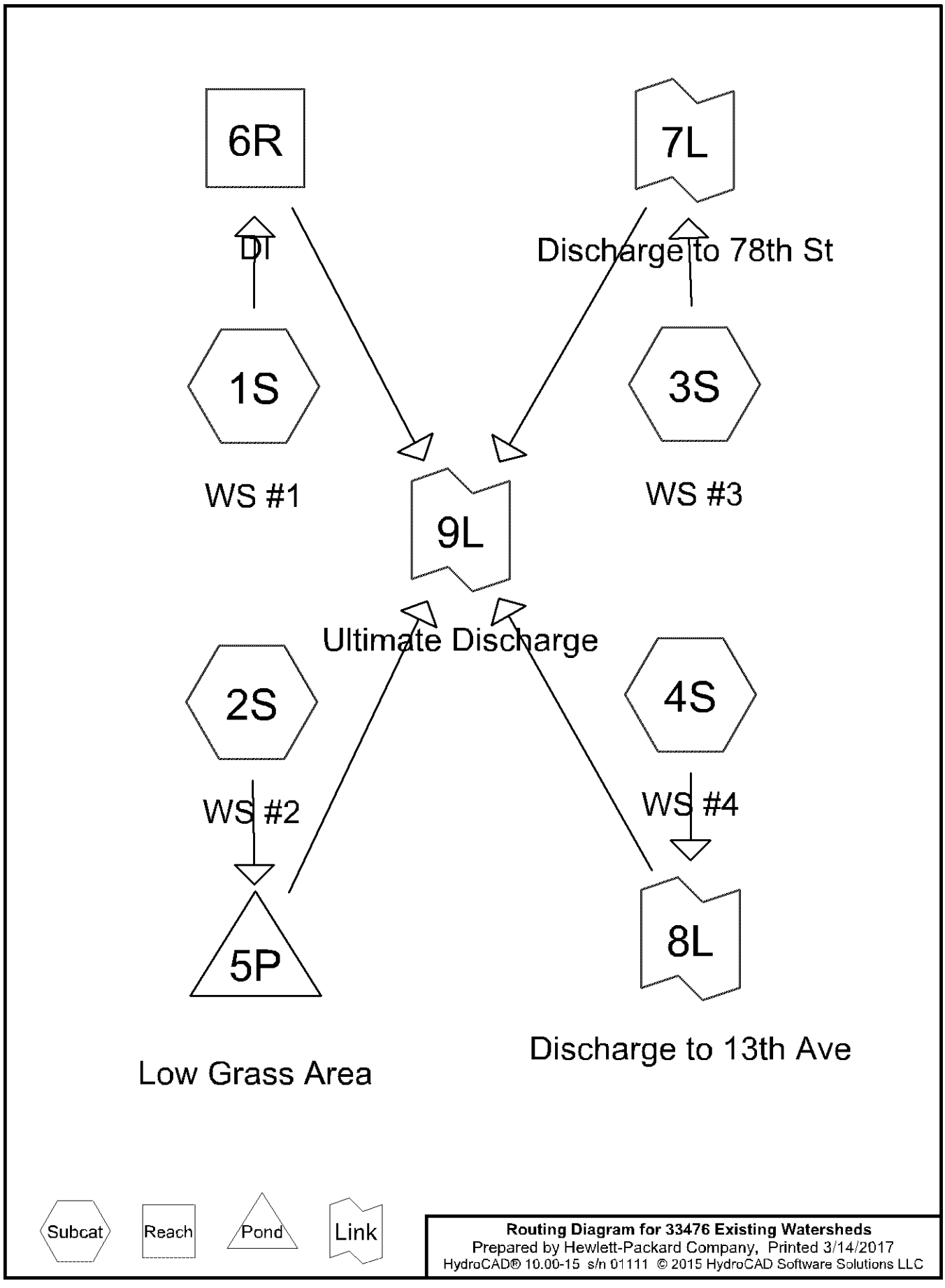
PROJECT LOCATION:
BLOOMINGTON, MN

SHEET TITLE:
PROPOSED WATERSHEDS

0 15 30' 60'
11" x 17" : 1" = 60'
22" x 34" : 1" = 30'

PROJECT NUMBER: 33476
SHEET NUMBER: SW200

APPENDIX E
CALCULATION RESULTS FOR EXISTING CONDITIONS


6R
7L
DI
Discharge to 78th St
1S
3S
WS #1
WS #3
9L
Ultimate Discharge
2S
4S
WS #2
WS #4
5P
8L
Low Grass Area
Discharge to 13th Ave
Subcat
Reach
Pond
Link
Routing Diagram for 33476 Existing Watersheds
Prepared by Hewlett-Packard Company, Printed 3/14/2017
HydroCAD® 10.00-15 s/n 01111 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.693	98	impervious (1S, 2S, 3S, 4S)
1.596	74	pervious (1S, 2S, 3S, 4S)
3.289	**86**	**TOTAL AREA**

Soil Listing (all nodes)

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

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	1.693	1.693	impervious	1S, 2S, 3S, 4S
0.000	0.000	0.000	0.000	1.596	1.596	pervious	1S, 2S, 3S, 4S
0.000	**0.000**	**0.000**	**0.000**	**3.289**	**3.289**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	6R	821.00	819.50	27.0	0.0556	0.012	12.0	0.0	0.0

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WS #1 Runoff Area=21,495 sf 79.00% Impervious Runoff Depth=1.69"
Flow Length=213' Slope=0.0054 '/' Tc=7.7 min CN=93 Runoff=1.32 cfs 0.069 af

Subcatchment 2S: WS #2 Runoff Area=41,199 sf 48.00% Impervious Runoff Depth=1.16"
Flow Length=298' Slope=0.0094 '/' Tc=10.2 min CN=86 Runoff=1.65 cfs 0.092 af

Subcatchment 3S: WS #3 Runoff Area=8,028 sf 54.00% Impervious Runoff Depth=1.23"
Flow Length=125' Slope=0.0011 '/' Tc=14.3 min CN=87 Runoff=0.30 cfs 0.019 af

Subcatchment 4S: WS #4 Runoff Area=72,538 sf 45.00% Impervious Runoff Depth=1.10"
Flow Length=429' Slope=0.0072 '/' Tc=16.1 min CN=85 Runoff=2.26 cfs 0.153 af

Reach 6R: DI Avg. Flow Depth=0.26' Max Vel=8.24 fps Inflow=1.32 cfs 0.069 af
12.0" Round Pipe n=0.012 L=27.0' S=0.0556 '/' Capacity=9.10 cfs Outflow=1.32 cfs 0.069 af

Pond 5P: Low Grass Area Peak Elev=822.98' Storage=1,676 cf Inflow=1.65 cfs 0.092 af
Discarded=0.15 cfs 0.092 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.092 af

Link 7L: Discharge to 78th St Inflow=0.30 cfs 0.019 af
Primary=0.30 cfs 0.019 af

Link 8L: Discharge to 13th Ave Inflow=2.26 cfs 0.153 af
Primary=2.26 cfs 0.153 af

Link 9L: Ultimate Discharge Inflow=3.49 cfs 0.241 af
Primary=3.49 cfs 0.241 af

Total Runoff Area = 3.289 ac Runoff Volume = 0.332 af Average Runoff Depth = 1.21"
48.53% Pervious = 1.596 ac 51.47% Impervious = 1.693 ac

Summary for Subcatchment 1S: WS #1

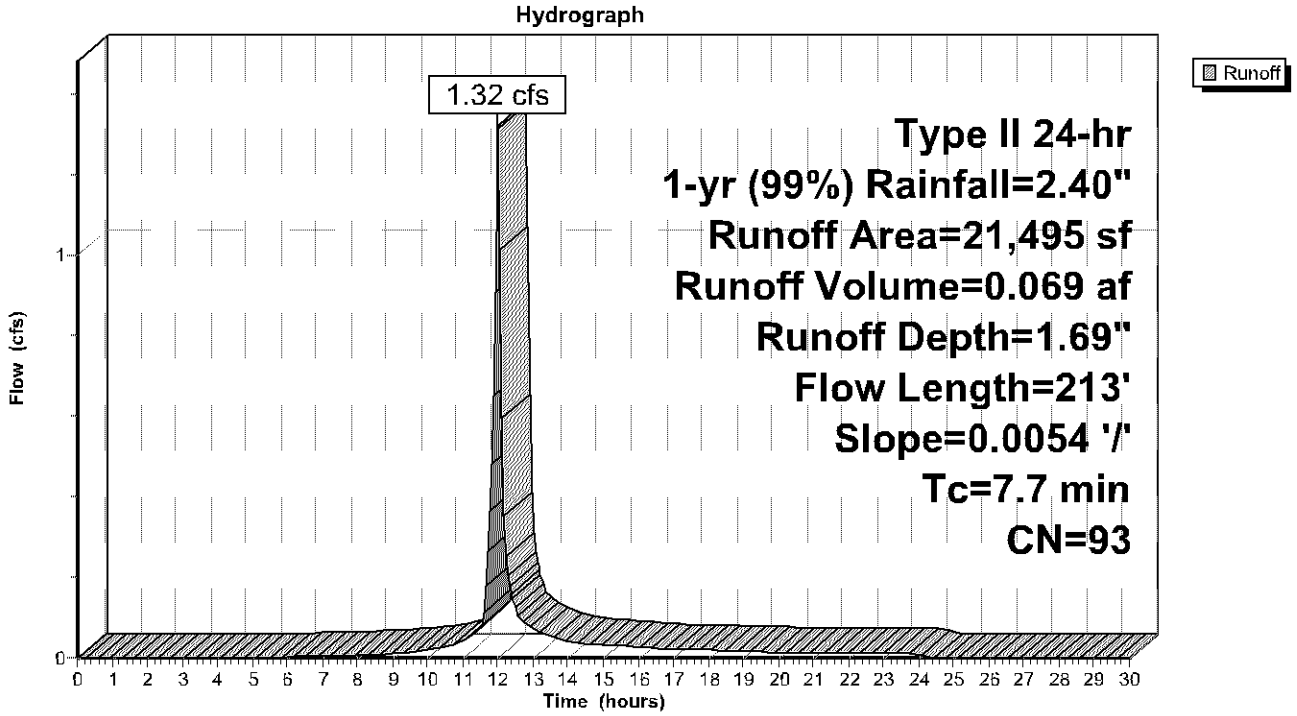
Runoff = 1.32 cfs @ 11.99 hrs, Volume= 0.069 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	16,981	98	impervious
*	4,514	74	pervious
	21,495	93	Weighted Average
	4,514		21.00% Pervious Area
	16,981		79.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	213	0.0054	0.46		**Lag/CN Method,**

Subcatchment 1S: WS #1



Summary for Subcatchment 2S: WS #2

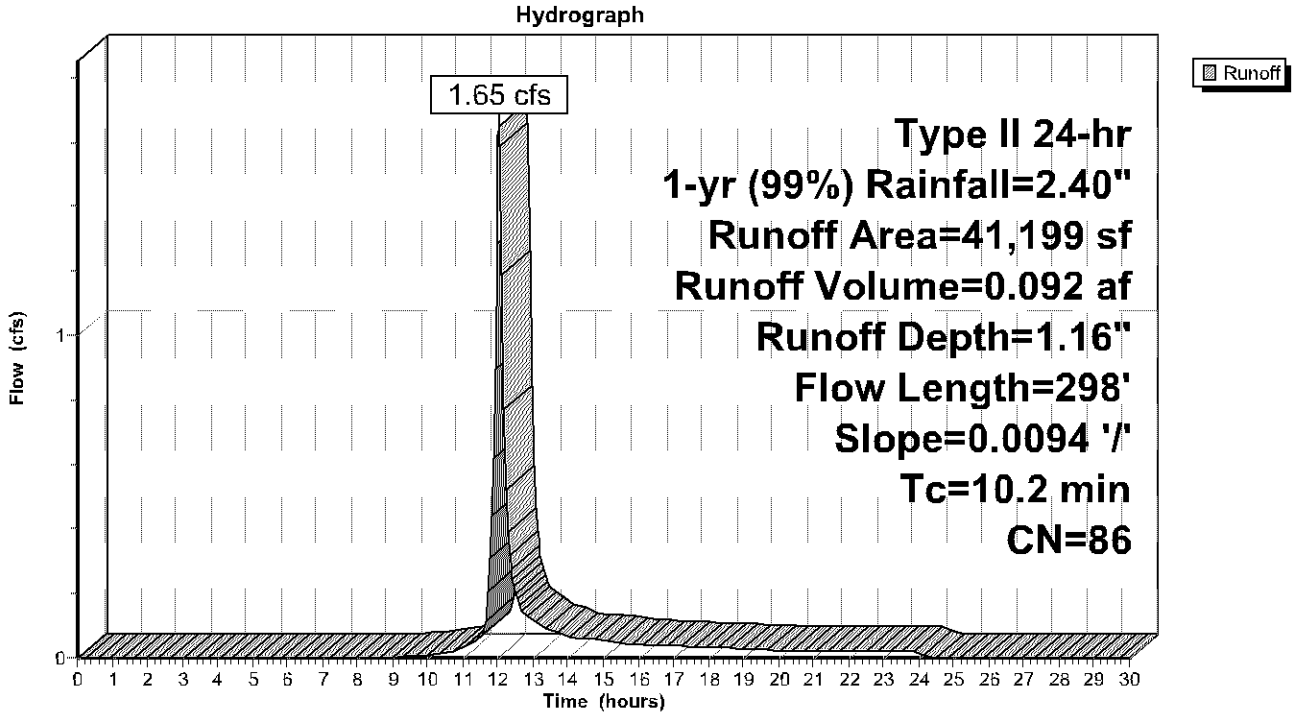
Runoff = 1.65 cfs @ 12.02 hrs, Volume= 0.092 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	19,776	98	impervious
*	21,423	74	pervious
	41,199	86	Weighted Average
	21,423		52.00% Pervious Area
	19,776		48.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	298	0.0094	0.49		**Lag/CN Method,**

Subcatchment 2S: WS #2



Summary for Subcatchment 3S: WS #3

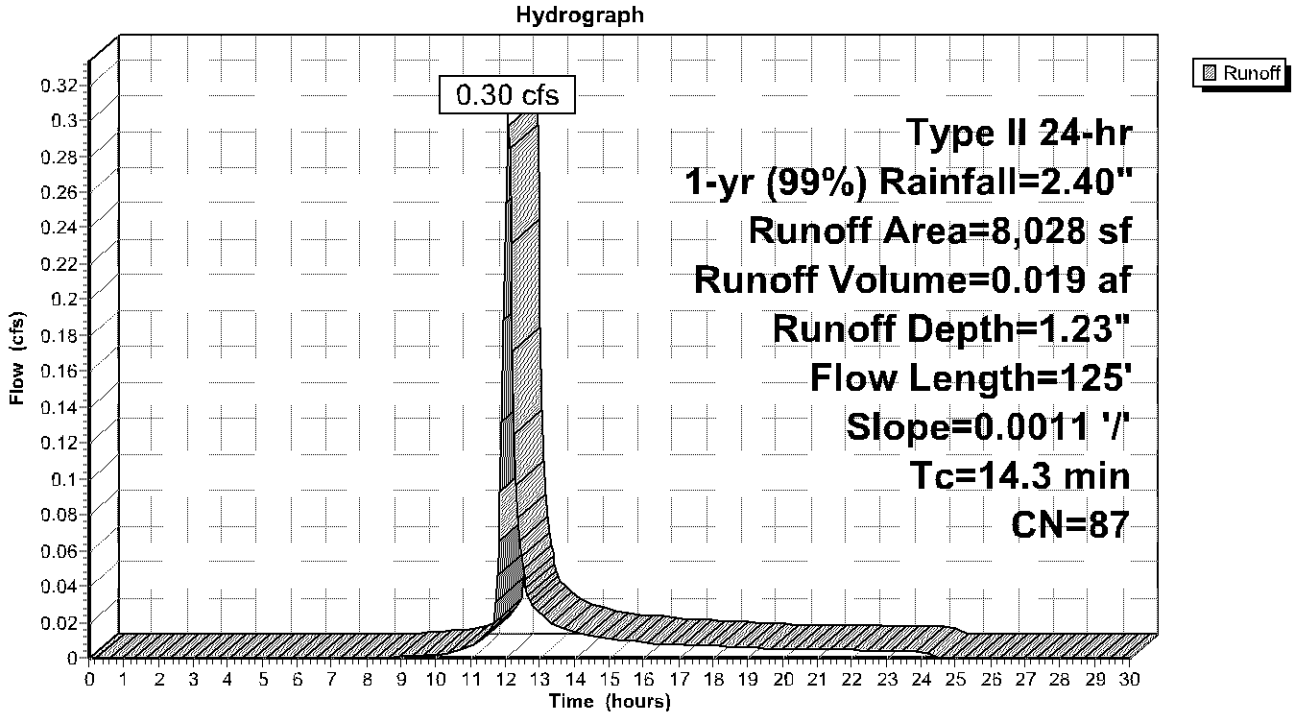
Runoff = 0.30 cfs @ 12.06 hrs, Volume= 0.019 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	4,335	98	impervious
*	3,693	74	pervious
	8,028	87	Weighted Average
	3,693		46.00% Pervious Area
	4,335		54.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	125	0.0011	0.15		**Lag/CN Method,**

Subcatchment 3S: WS #3



Summary for Subcatchment 4S: WS #4

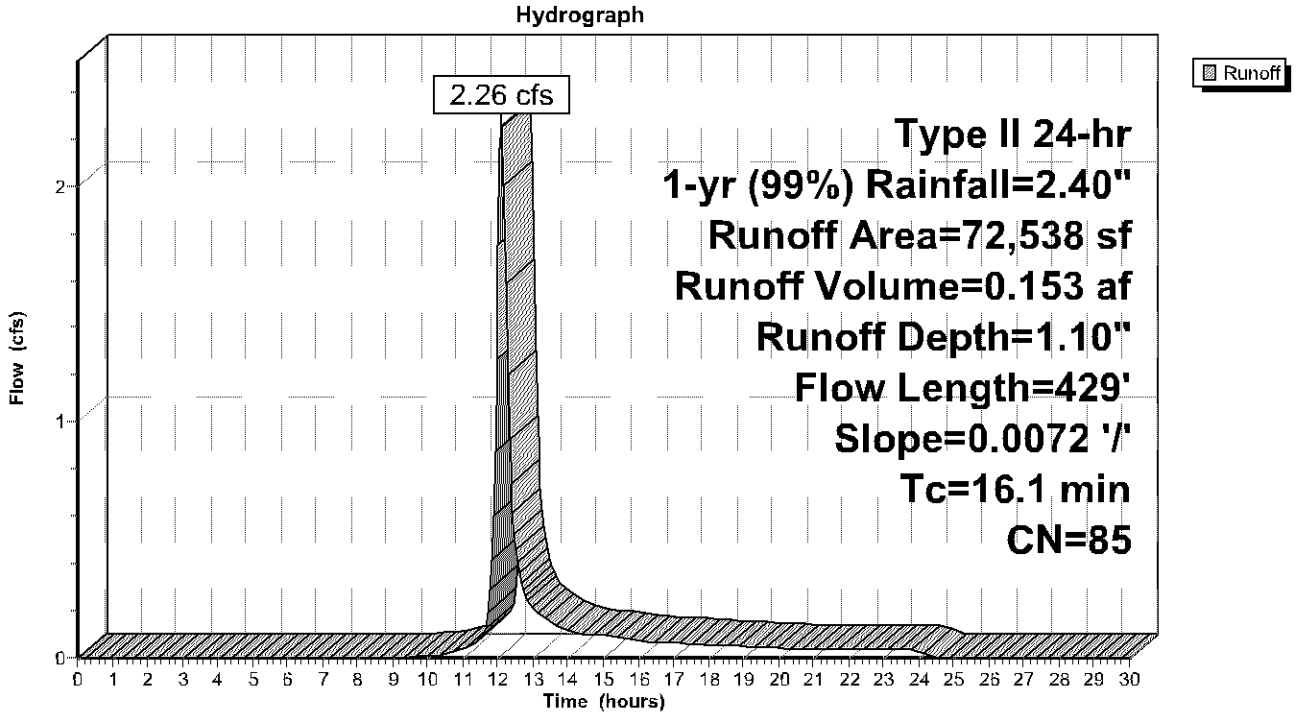
Runoff = 2.26 cfs @ 12.09 hrs, Volume= 0.153 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	32,642	98	impervious
*	39,896	74	pervious
	72,538	85	Weighted Average
	39,896		55.00% Pervious Area
	32,642		45.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	429	0.0072	0.44		**Lag/CN Method,**

Subcatchment 4S: WS #4



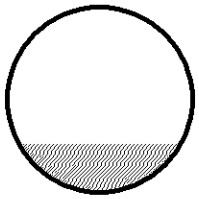
Summary for Reach 6R: DI

Inflow Area = 0.493 ac, 79.00% Impervious, Inflow Depth = 1.69" for 1-yr (99%) event
Inflow = 1.32 cfs @ 11.99 hrs, Volume= 0.069 af
Outflow = 1.32 cfs @ 11.99 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.1 min

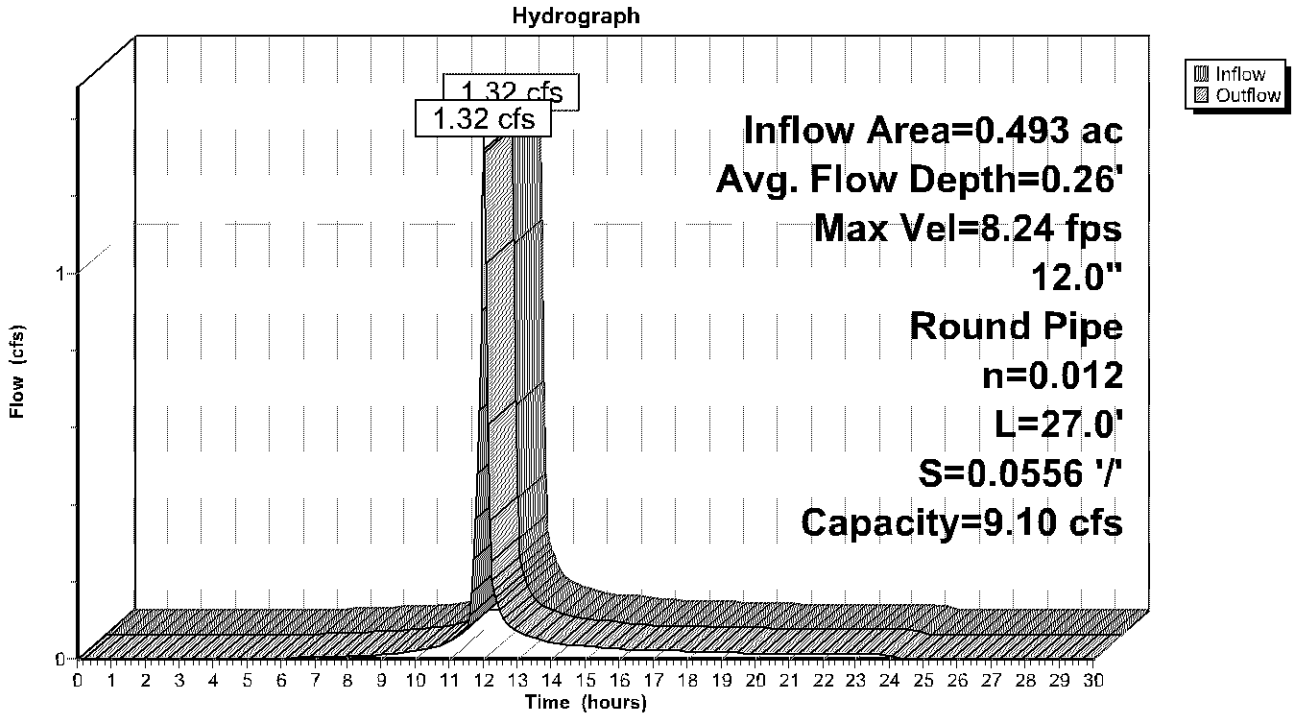
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.24 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.44 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.10 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 27.0' Slope= 0.0556 '/'
Inlet Invert= 821.00', Outlet Invert= 819.50'



Reach 6R: DI



Summary for Pond 5P: Low Grass Area

Inflow Area = 0.946 ac, 48.00% Impervious, Inflow Depth = 1.16" for 1-yr (99%) event
Inflow = 1.65 cfs @ 12.02 hrs, Volume= 0.092 af
Outflow = 0.15 cfs @ 12.65 hrs, Volume= 0.092 af, Atten= 91%, Lag= 37.6 min
Discarded = 0.15 cfs @ 12.65 hrs, Volume= 0.092 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 822.98' @ 12.65 hrs Surf.Area= 8,355 sf Storage= 1,676 cf

Plug-Flow detention time= 107.0 min calculated for 0.091 af (100% of inflow)
Center-of-Mass det. time= 106.9 min (943.2 - 836.4)

Volume	Invert	Avail.Storage	Storage Description
#1	822.70'	6,485 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

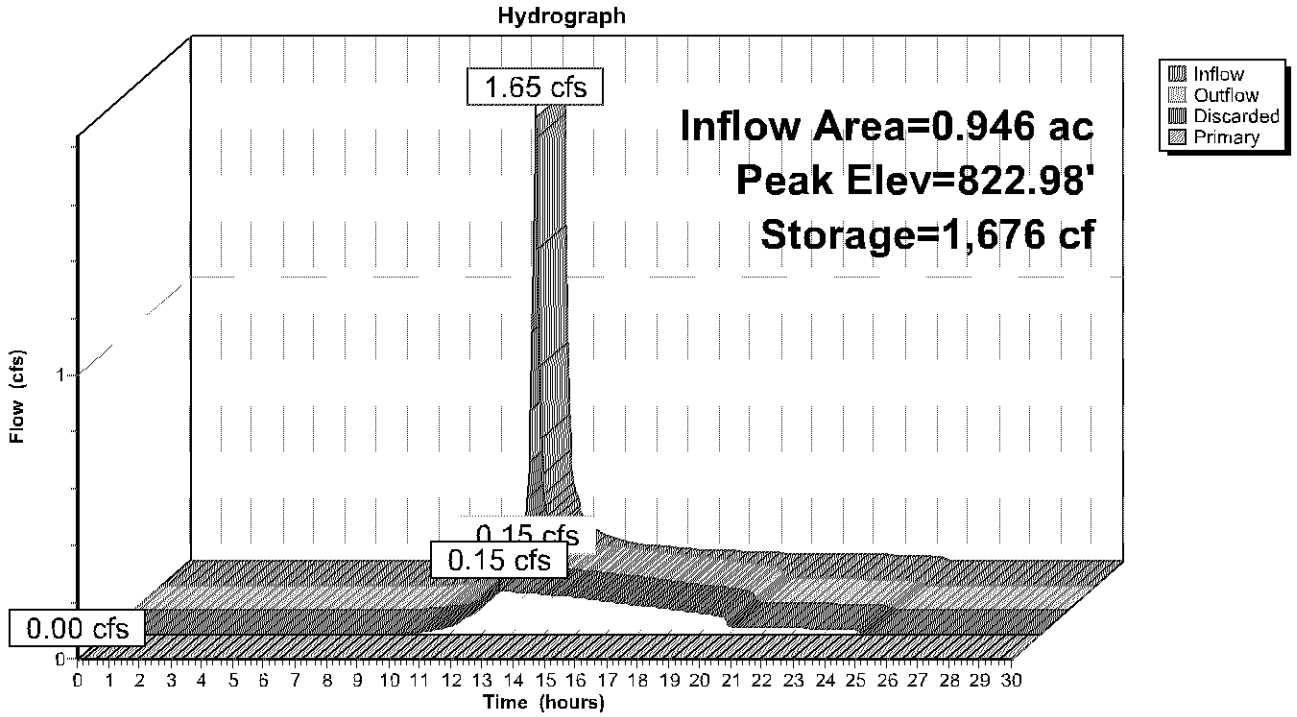
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
822.70	3,500	0	0
823.00	8,651	1,823	1,823
823.50	10,000	4,663	6,485

Device	Routing	Invert	Outlet Devices
#1	Discarded	822.70'	**0.800 in/hr Exfiltration over Surface area**
#2	Primary	823.34'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.15 cfs @ 12.65 hrs HW=822.98' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=822.70' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Low Grass Area

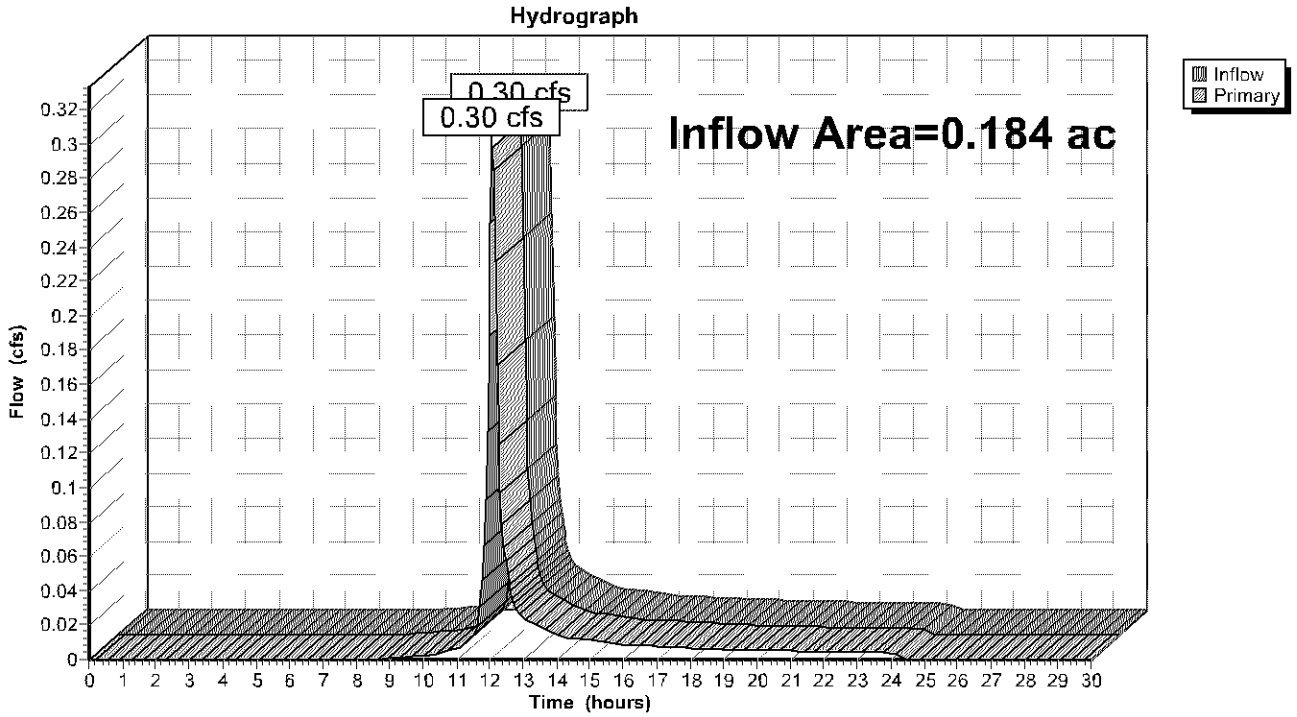


Summary for Link 7L: Discharge to 78th St

Inflow Area = 0.184 ac, 54.00% Impervious, Inflow Depth = 1.23" for 1-yr (99%) event
Inflow = 0.30 cfs @ 12.06 hrs, Volume= 0.019 af
Primary = 0.30 cfs @ 12.06 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 7L: Discharge to 78th St

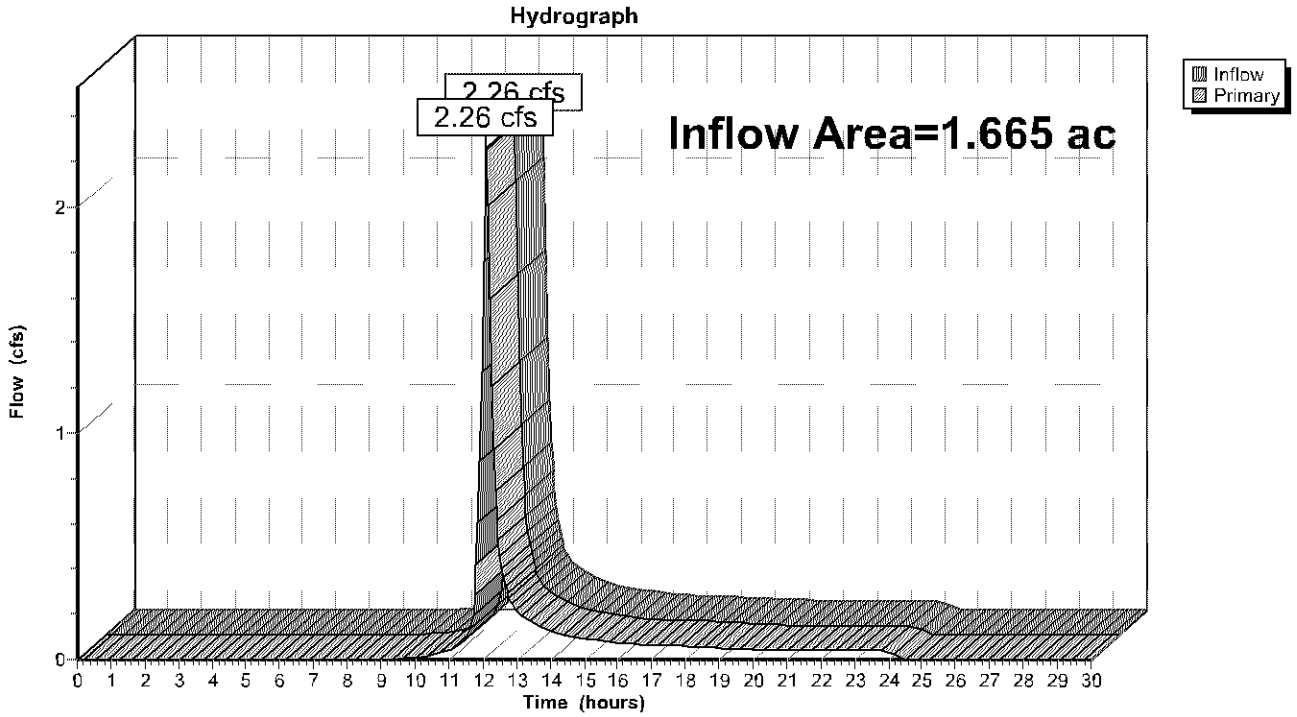


Summary for Link 8L: Discharge to 13th Ave

Inflow Area = 1.665 ac, 45.00% Impervious, Inflow Depth = 1.10" for 1-yr (99%) event
Inflow = 2.26 cfs @ 12.09 hrs, Volume= 0.153 af
Primary = 2.26 cfs @ 12.09 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 8L: Discharge to 13th Ave

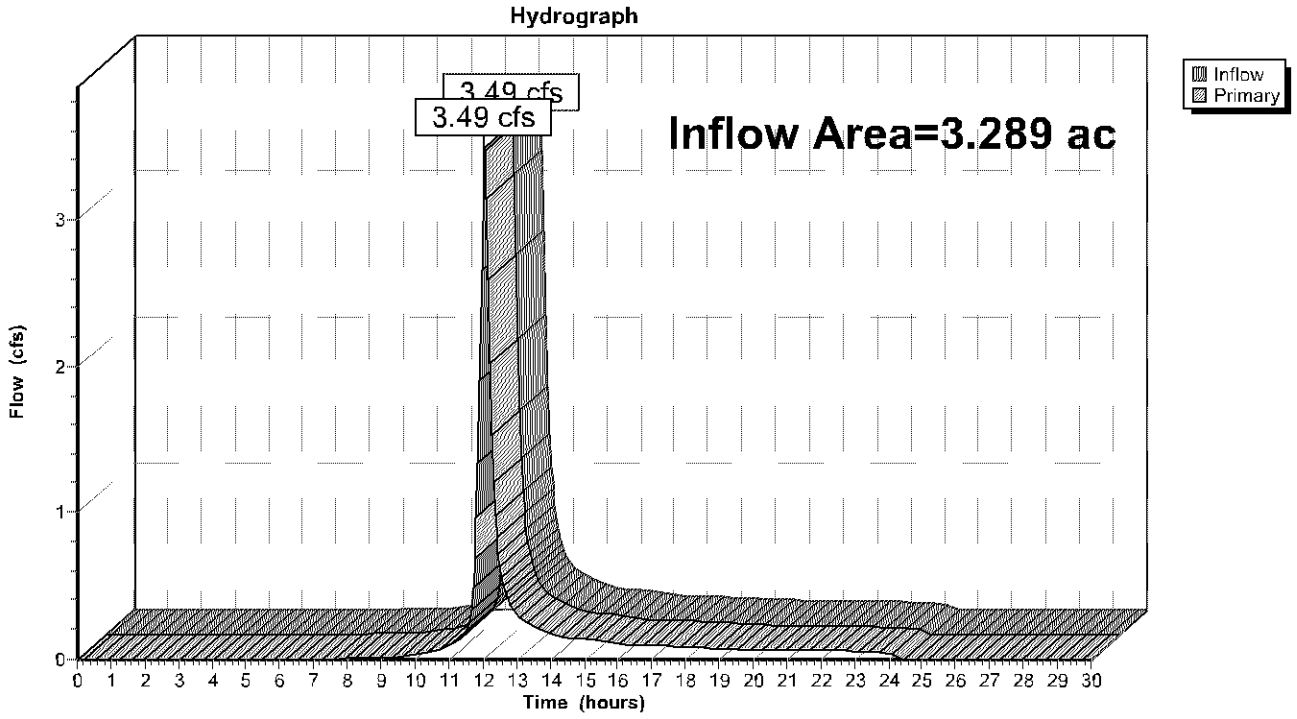


Summary for Link 9L: Ultimate Discharge

Inflow Area = 3.289 ac, 51.47% Impervious, Inflow Depth = 0.88" for 1-yr (99%) event
Inflow = 3.49 cfs @ 12.04 hrs, Volume= 0.241 af
Primary = 3.49 cfs @ 12.04 hrs, Volume= 0.241 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 9L: Ultimate Discharge



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WS #1 Runoff Area=21,495 sf 79.00% Impervious Runoff Depth=3.41"
Flow Length=213' Slope=0.0054 '/' Tc=7.7 min CN=93 Runoff=2.57 cfs 0.140 af

Subcatchment 2S: WS #2 Runoff Area=41,199 sf 48.00% Impervious Runoff Depth=2.73"
Flow Length=298' Slope=0.0094 '/' Tc=10.2 min CN=86 Runoff=3.82 cfs 0.215 af

Subcatchment 3S: WS #3 Runoff Area=8,028 sf 54.00% Impervious Runoff Depth=2.82"
Flow Length=125' Slope=0.0011 '/' Tc=14.3 min CN=87 Runoff=0.67 cfs 0.043 af

Subcatchment 4S: WS #4 Runoff Area=72,538 sf 45.00% Impervious Runoff Depth=2.64"
Flow Length=429' Slope=0.0072 '/' Tc=16.1 min CN=85 Runoff=5.42 cfs 0.366 af

Reach 6R: DI Avg. Flow Depth=0.36' Max Vel=9.93 fps Inflow=2.57 cfs 0.140 af
12.0" Round Pipe n=0.012 L=27.0' S=0.0556 '/' Capacity=9.10 cfs Outflow=2.57 cfs 0.140 af

Pond 5P: Low Grass Area Peak Elev=823.34' Storage=4,887 cf Inflow=3.82 cfs 0.215 af
Discarded=0.18 cfs 0.215 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.215 af

Link 7L: Discharge to 78th St Inflow=0.67 cfs 0.043 af
Primary=0.67 cfs 0.043 af

Link 8L: Discharge to 13th Ave Inflow=5.42 cfs 0.366 af
Primary=5.42 cfs 0.366 af

Link 9L: Ultimate Discharge Inflow=7.92 cfs 0.550 af
Primary=7.92 cfs 0.550 af

Total Runoff Area = 3.289 ac Runoff Volume = 0.765 af Average Runoff Depth = 2.79"
48.53% Pervious = 1.596 ac 51.47% Impervious = 1.693 ac

Summary for Subcatchment 1S: WS #1

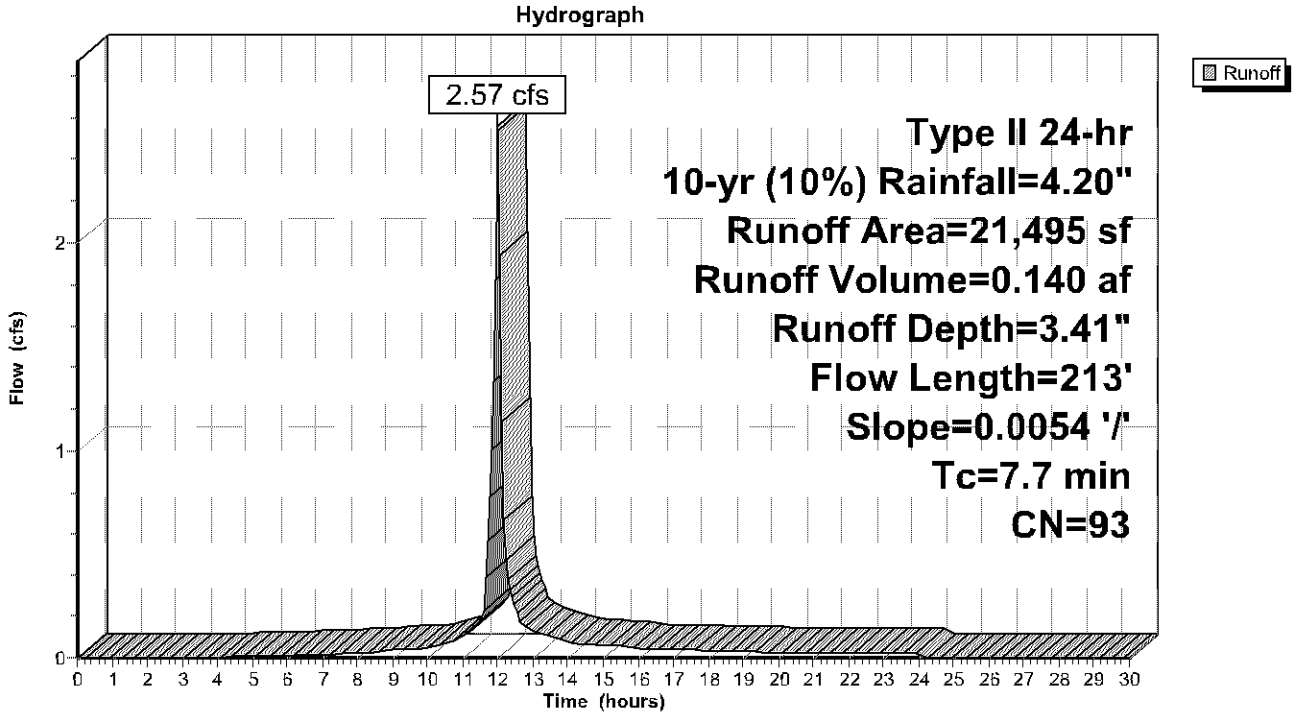
Runoff = 2.57 cfs @ 11.99 hrs, Volume= 0.140 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	16,981	98	impervious
*	4,514	74	pervious
	21,495	93	Weighted Average
	4,514		21.00% Pervious Area
	16,981		79.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	213	0.0054	0.46		**Lag/CN Method,**

Subcatchment 1S: WS #1



Summary for Subcatchment 2S: WS #2

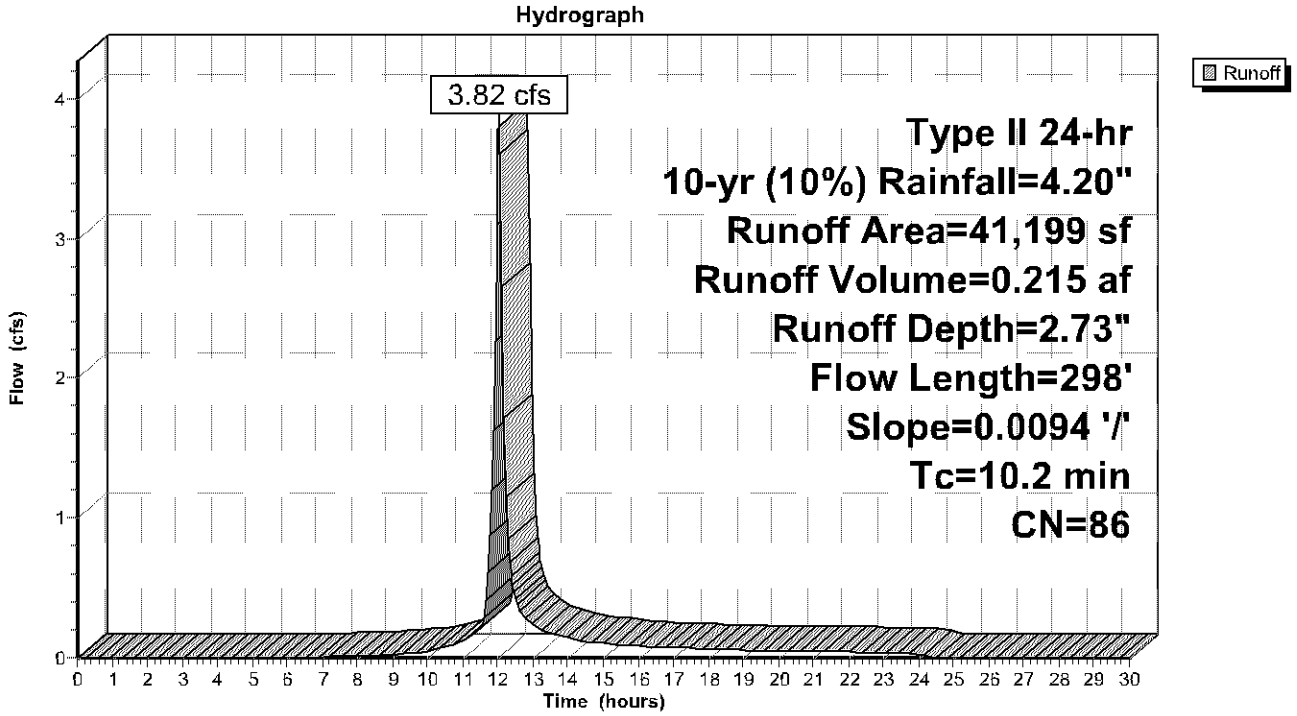
Runoff = 3.82 cfs @ 12.01 hrs, Volume= 0.215 af, Depth= 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	19,776	98	impervious
*	21,423	74	pervious
	41,199	86	Weighted Average
	21,423		52.00% Pervious Area
	19,776		48.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	298	0.0094	0.49		**Lag/CN Method,**

Subcatchment 2S: WS #2



Summary for Subcatchment 3S: WS #3

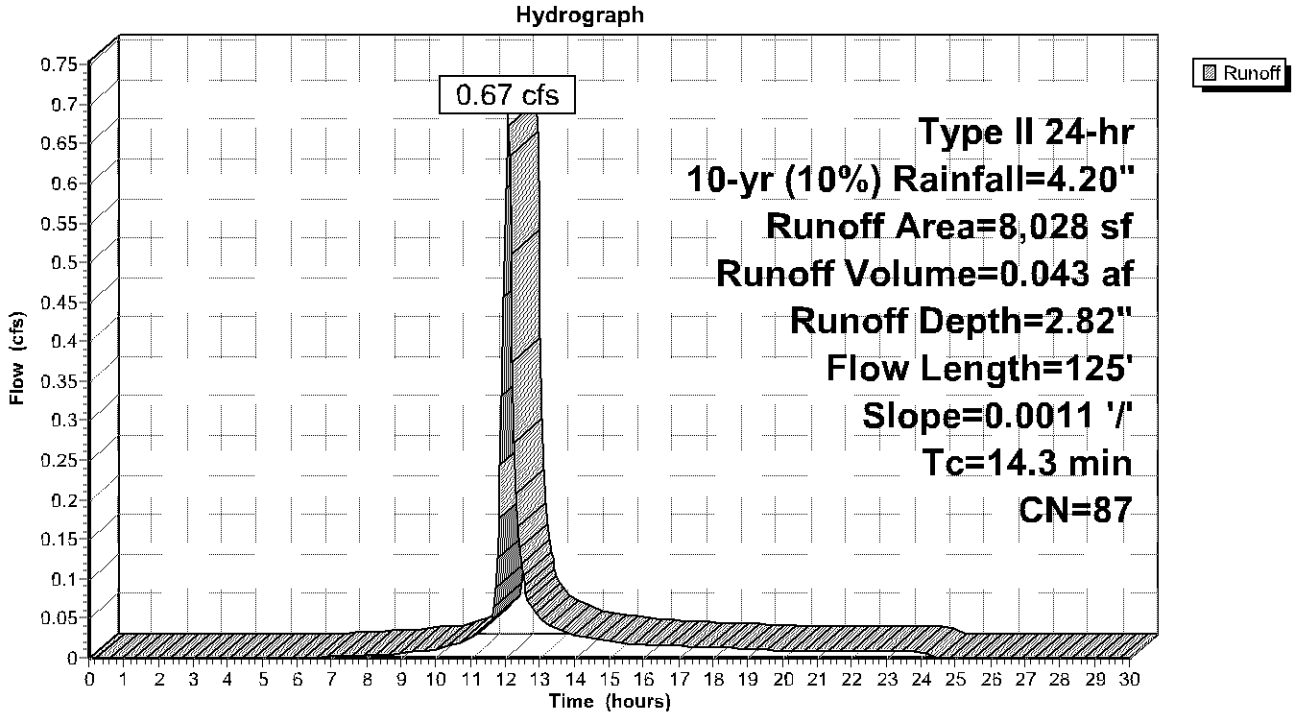
Runoff = 0.67 cfs @ 12.06 hrs, Volume= 0.043 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	4,335	98	impervious
*	3,693	74	pervious
	8,028	87	Weighted Average
	3,693		46.00% Pervious Area
	4,335		54.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	125	0.0011	0.15		**Lag/CN Method,**

Subcatchment 3S: WS #3



Summary for Subcatchment 4S: WS #4

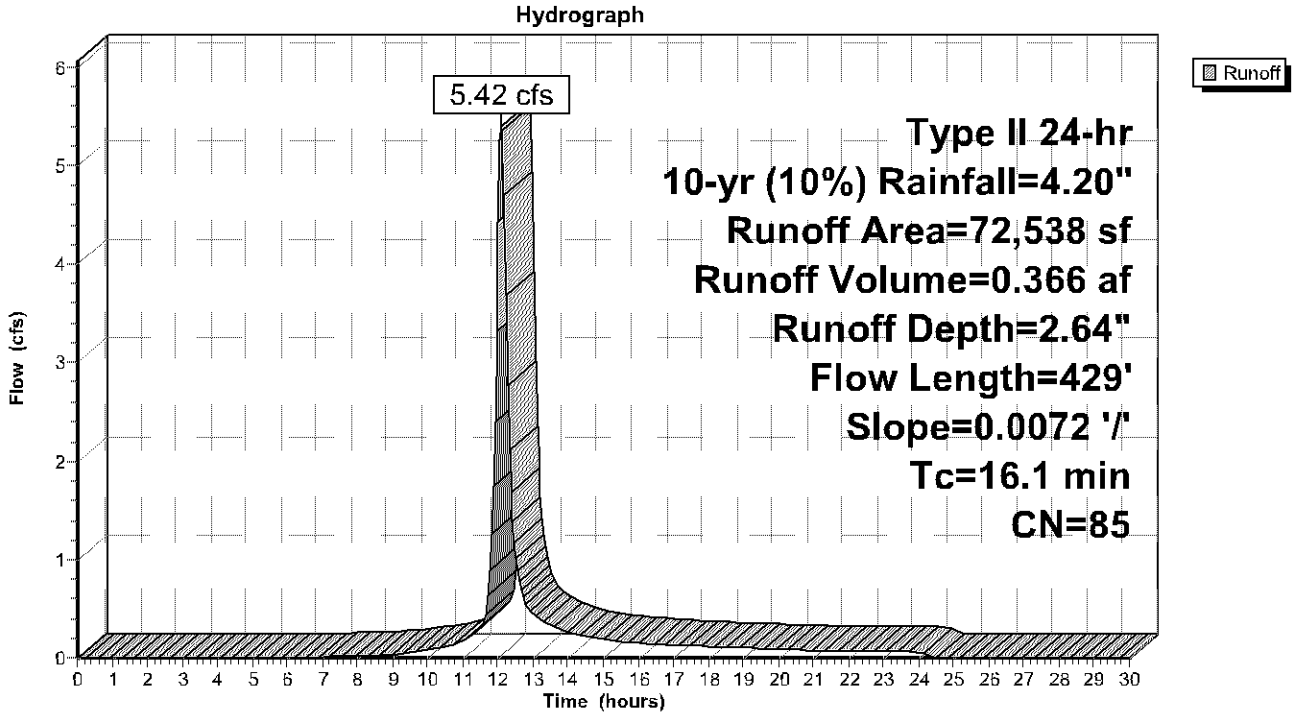
Runoff = 5.42 cfs @ 12.08 hrs, Volume= 0.366 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	32,642	98	impervious
*	39,896	74	pervious
	72,538	85	Weighted Average
	39,896		55.00% Pervious Area
	32,642		45.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	429	0.0072	0.44		**Lag/CN Method,**

Subcatchment 4S: WS #4



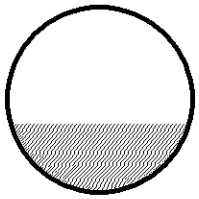
Summary for Reach 6R: DI

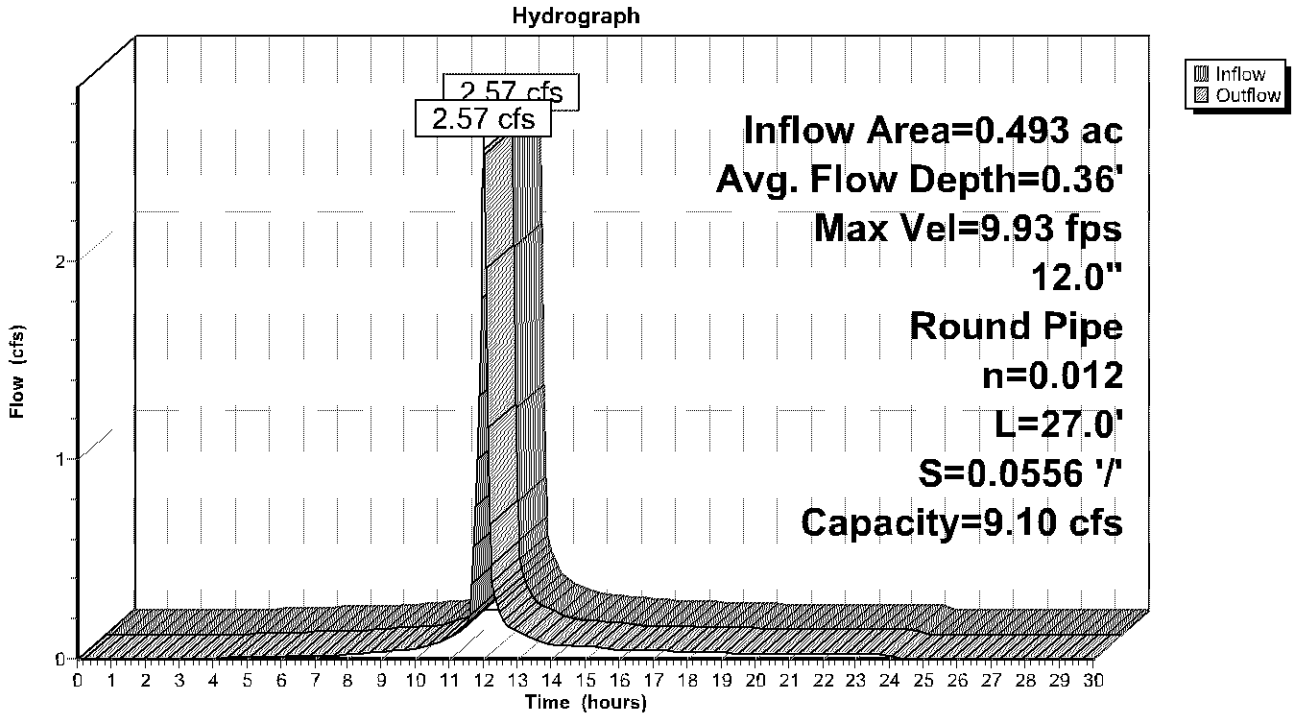
Inflow Area = 0.493 ac, 79.00% Impervious, Inflow Depth = 3.41" for 10-yr (10%) event
Inflow = 2.57 cfs @ 11.99 hrs, Volume= 0.140 af
Outflow = 2.57 cfs @ 11.99 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.93 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.93 fps, Avg. Travel Time= 0.2 min

Peak Storage= 7 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.10 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 27.0' Slope= 0.0556 '/'
Inlet Invert= 821.00', Outlet Invert= 819.50'





Summary for Pond 5P: Low Grass Area

Inflow Area = 0.946 ac, 48.00% Impervious, Inflow Depth = 2.73" for 10-yr (10%) event
Inflow = 3.82 cfs @ 12.01 hrs, Volume= 0.215 af
Outflow = 0.18 cfs @ 13.54 hrs, Volume= 0.215 af, Atten= 95%, Lag= 91.3 min
Discarded = 0.18 cfs @ 13.54 hrs, Volume= 0.215 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 823.34' @ 13.54 hrs Surf.Area= 9,559 sf Storage= 4,887 cf

Plug-Flow detention time= 281.3 min calculated for 0.215 af (100% of inflow)
Center-of-Mass det. time= 281.2 min (1,093.2 - 812.0)

Volume	Invert	Avail.Storage	Storage Description
#1	822.70'	6,485 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

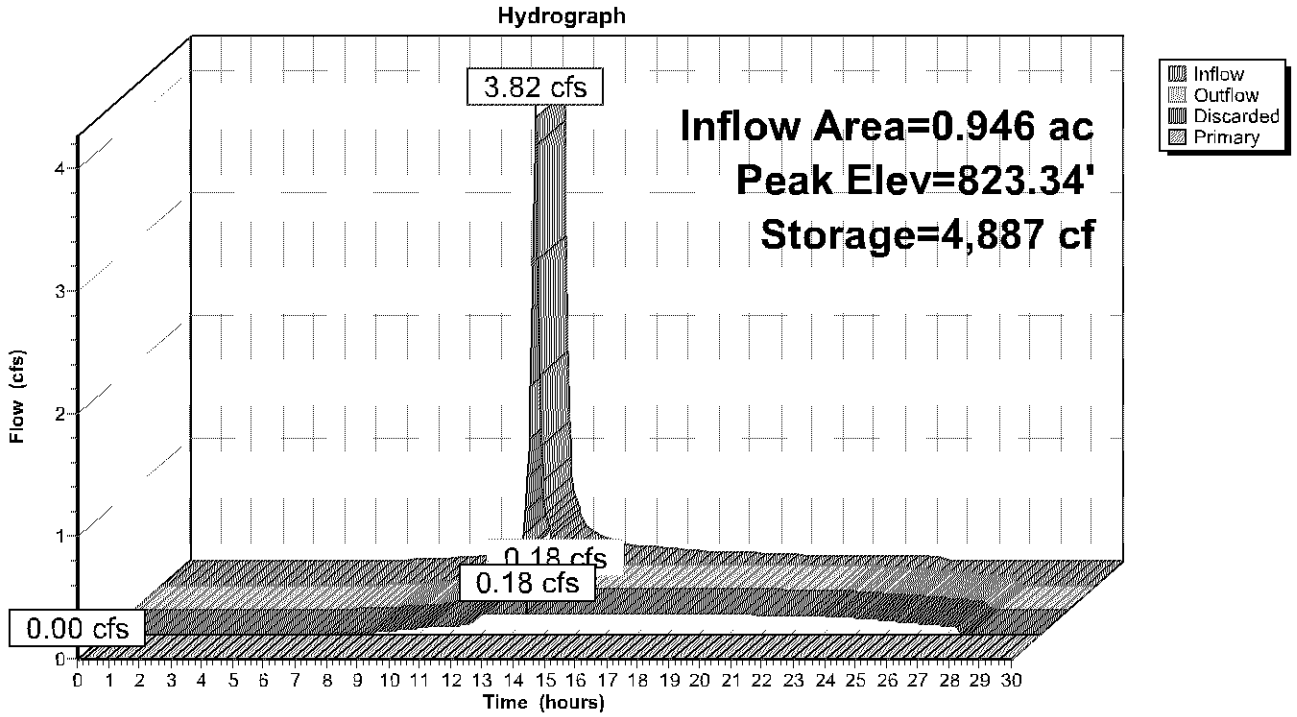
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
822.70	3,500	0	0
823.00	8,651	1,823	1,823
823.50	10,000	4,663	6,485

Device	Routing	Invert	Outlet Devices
#1	Discarded	822.70'	**0.800 in/hr Exfiltration over Surface area**
#2	Primary	823.34'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.18 cfs @ 13.54 hrs HW=823.34' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=822.70' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Low Grass Area

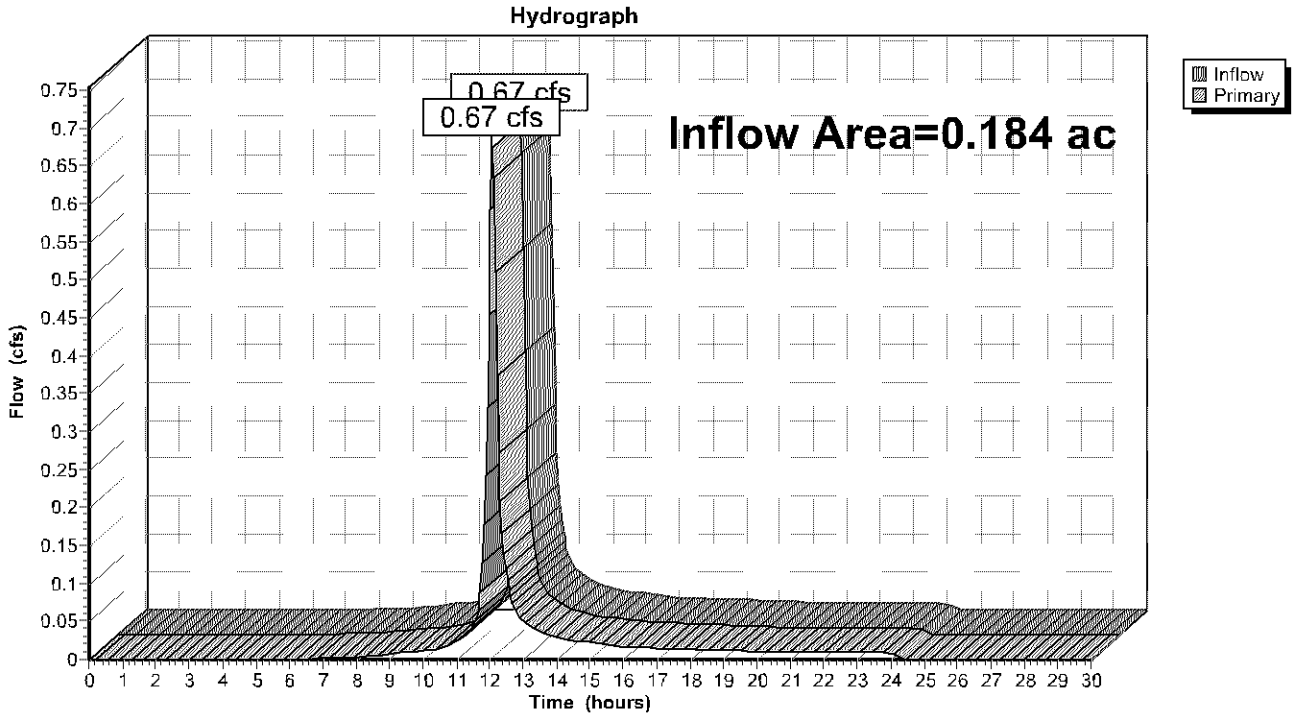


Summary for Link 7L: Discharge to 78th St

Inflow Area = 0.184 ac, 54.00% Impervious, Inflow Depth = 2.82" for 10-yr (10%) event
Inflow = 0.67 cfs @ 12.06 hrs, Volume= 0.043 af
Primary = 0.67 cfs @ 12.06 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 7L: Discharge to 78th St

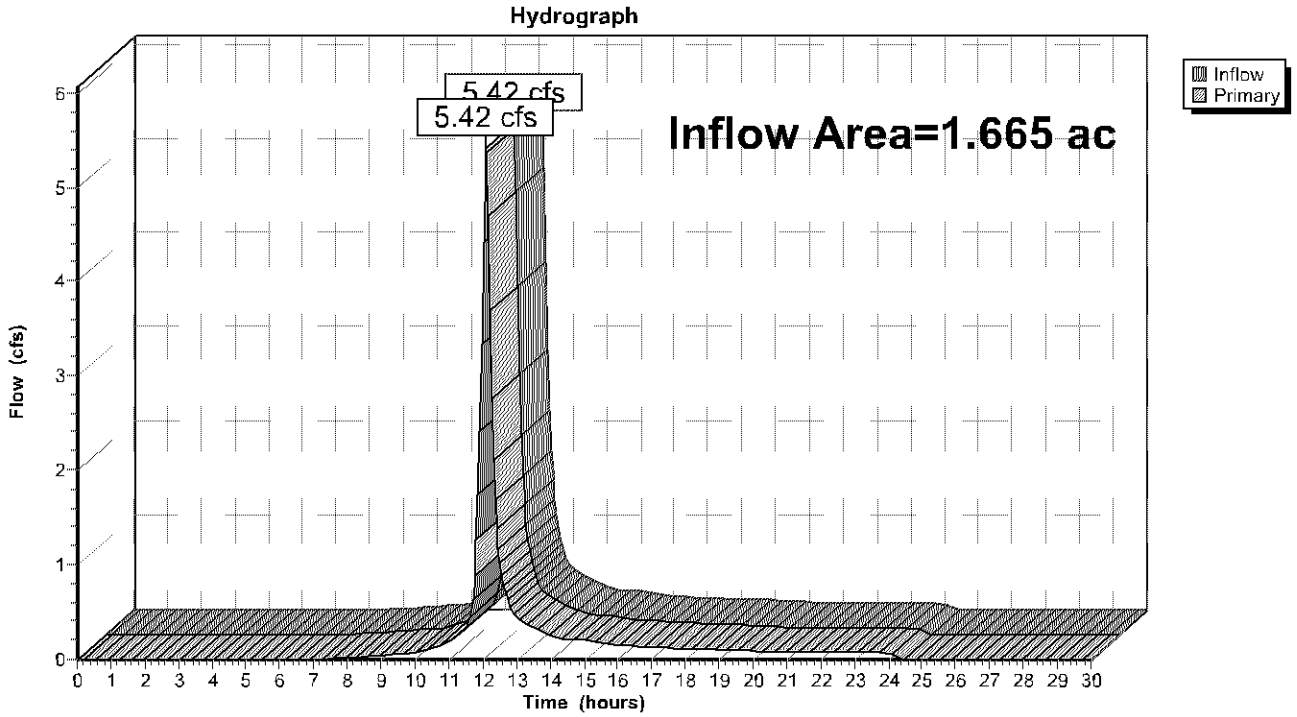


Summary for Link 8L: Discharge to 13th Ave

Inflow Area = 1.665 ac, 45.00% Impervious, Inflow Depth = 2.64" for 10-yr (10%) event
Inflow = 5.42 cfs @ 12.08 hrs, Volume= 0.366 af
Primary = 5.42 cfs @ 12.08 hrs, Volume= 0.366 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 8L: Discharge to 13th Ave

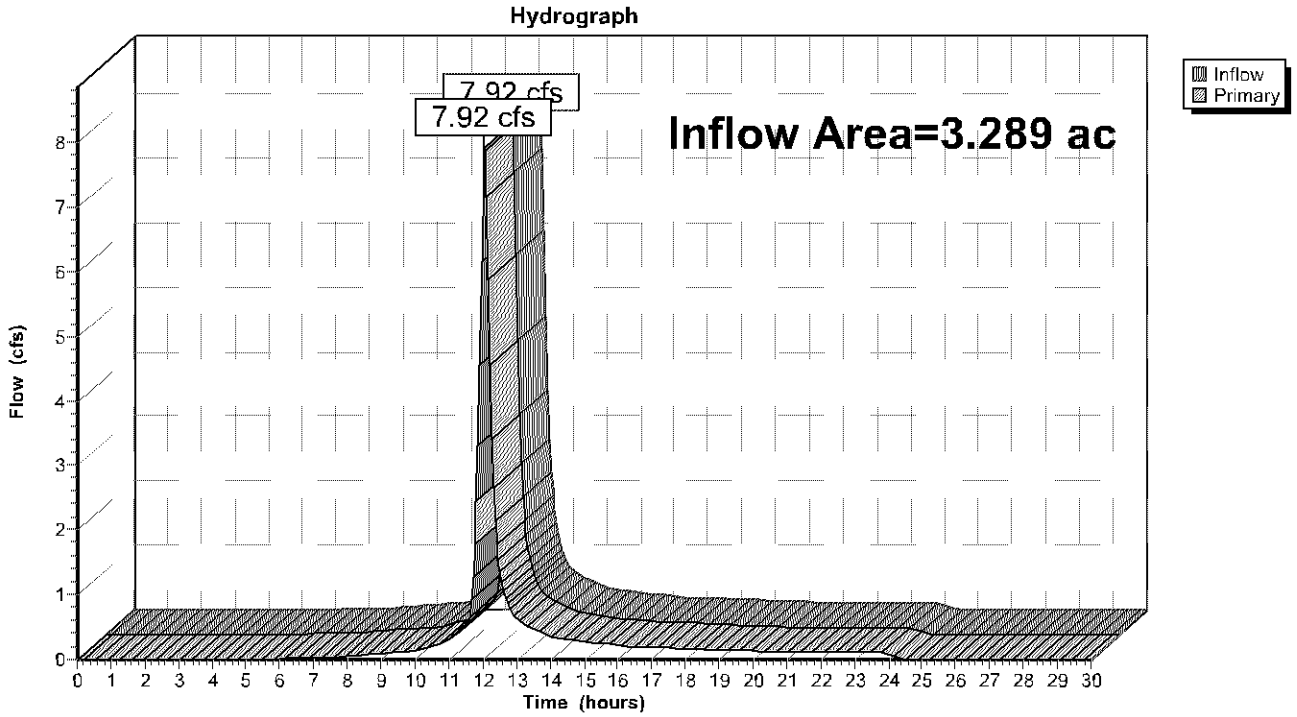


Summary for Link 9L: Ultimate Discharge

Inflow Area = 3.289 ac, 51.47% Impervious, Inflow Depth = 2.01" for 10-yr (10%) event
Inflow = 7.92 cfs @ 12.04 hrs, Volume= 0.550 af
Primary = 7.92 cfs @ 12.04 hrs, Volume= 0.550 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 9L: Ultimate Discharge



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WS #1 Runoff Area=21,495 sf 79.00% Impervious Runoff Depth=6.67"
Flow Length=213' Slope=0.0054 '/' Tc=7.7 min CN=93 Runoff=4.81 cfs 0.274 af

Subcatchment 2S: WS #2 Runoff Area=41,199 sf 48.00% Impervious Runoff Depth=5.85"
Flow Length=298' Slope=0.0094 '/' Tc=10.2 min CN=86 Runoff=7.88 cfs 0.461 af

Subcatchment 3S: WS #3 Runoff Area=8,028 sf 54.00% Impervious Runoff Depth=5.96"
Flow Length=125' Slope=0.0011 '/' Tc=14.3 min CN=87 Runoff=1.38 cfs 0.092 af

Subcatchment 4S: WS #4 Runoff Area=72,538 sf 45.00% Impervious Runoff Depth=5.73"
Flow Length=429' Slope=0.0072 '/' Tc=16.1 min CN=85 Runoff=11.43 cfs 0.795 af

Reach 6R: DI Avg. Flow Depth=0.52' Max Vel=11.71 fps Inflow=4.81 cfs 0.274 af
12.0" Round Pipe n=0.012 L=27.0' S=0.0556 '/' Capacity=9.10 cfs Outflow=4.80 cfs 0.274 af

Pond 5P: Low Grass Area Peak Elev=823.55' Storage=6,485 cf Inflow=7.88 cfs 0.461 af
Discarded=0.19 cfs 0.282 af Primary=6.77 cfs 0.176 af Outflow=6.96 cfs 0.458 af

Link 7L: Discharge to 78th St Inflow=1.38 cfs 0.092 af
Primary=1.38 cfs 0.092 af

Link 8L: Discharge to 13th Ave Inflow=11.43 cfs 0.795 af
Primary=11.43 cfs 0.795 af

Link 9L: Ultimate Discharge Inflow=22.31 cfs 1.337 af
Primary=22.31 cfs 1.337 af

Total Runoff Area = 3.289 ac Runoff Volume = 1.622 af Average Runoff Depth = 5.92"
48.53% Pervious = 1.596 ac 51.47% Impervious = 1.693 ac

Summary for Subcatchment 1S: WS #1

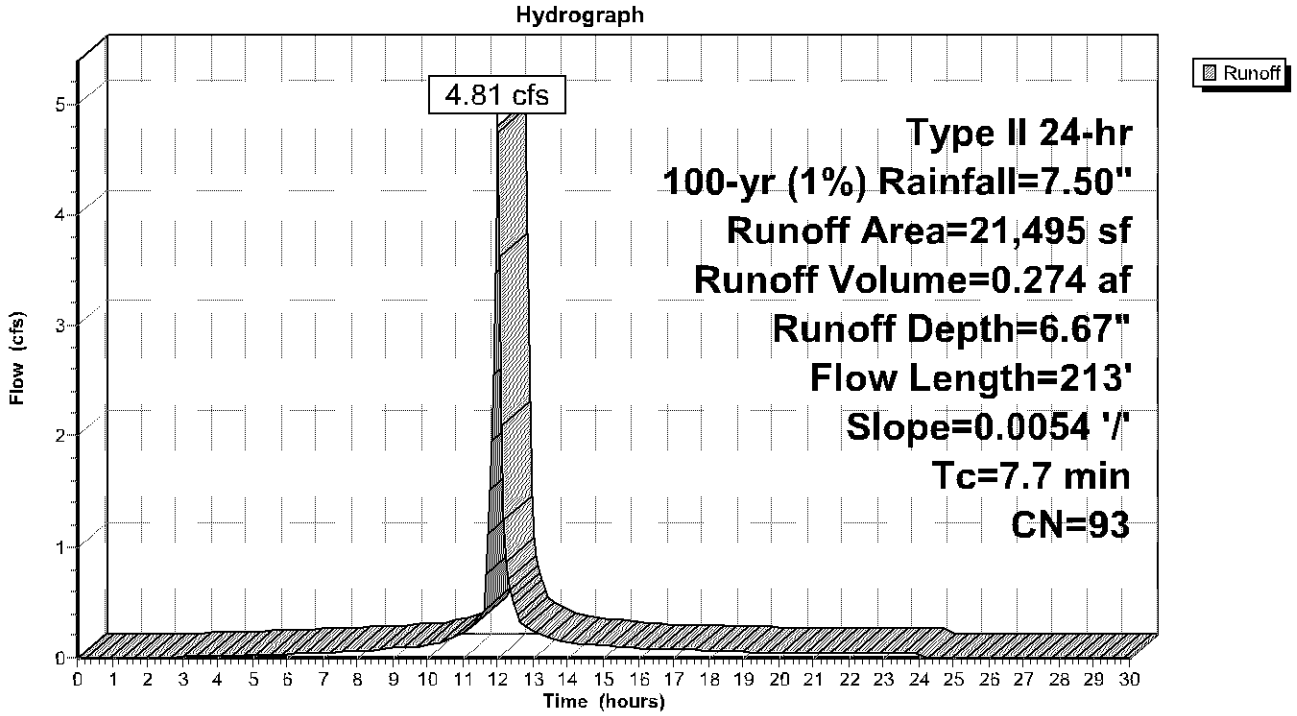
Runoff = 4.81 cfs @ 11.98 hrs, Volume= 0.274 af, Depth= 6.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	16,981	98	impervious
*	4,514	74	pervious
	21,495	93	Weighted Average
	4,514		21.00% Pervious Area
	16,981		79.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	213	0.0054	0.46		**Lag/CN Method,**

Subcatchment 1S: WS #1



Summary for Subcatchment 2S: WS #2

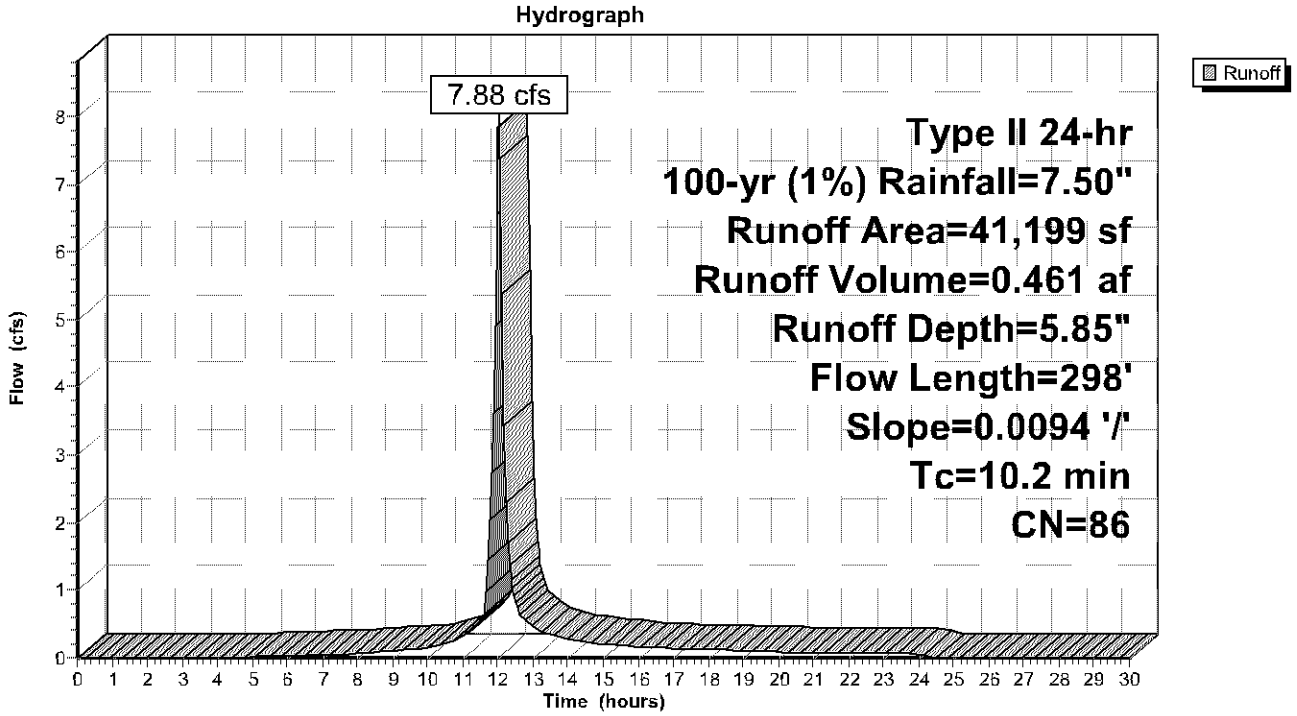
Runoff = 7.88 cfs @ 12.01 hrs, Volume= 0.461 af, Depth= 5.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	19,776	98	impervious
*	21,423	74	pervious
	41,199	86	Weighted Average
	21,423		52.00% Pervious Area
	19,776		48.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	298	0.0094	0.49		**Lag/CN Method,**

Subcatchment 2S: WS #2



Summary for Subcatchment 3S: WS #3

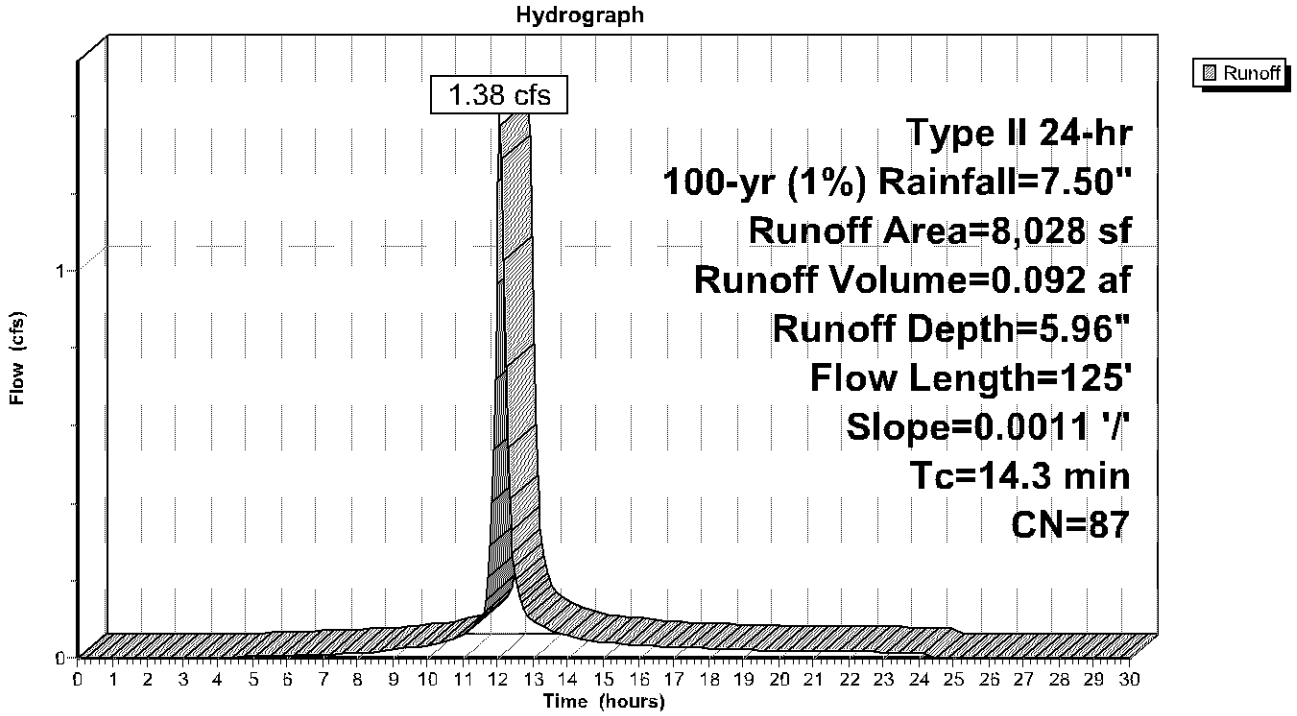
Runoff = 1.38 cfs @ 12.06 hrs, Volume= 0.092 af, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	4,335	98	impervious
*	3,693	74	pervious
	8,028	87	Weighted Average
	3,693		46.00% Pervious Area
	4,335		54.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	125	0.0011	0.15		**Lag/CN Method,**

Subcatchment 3S: WS #3



Summary for Subcatchment 4S: WS #4

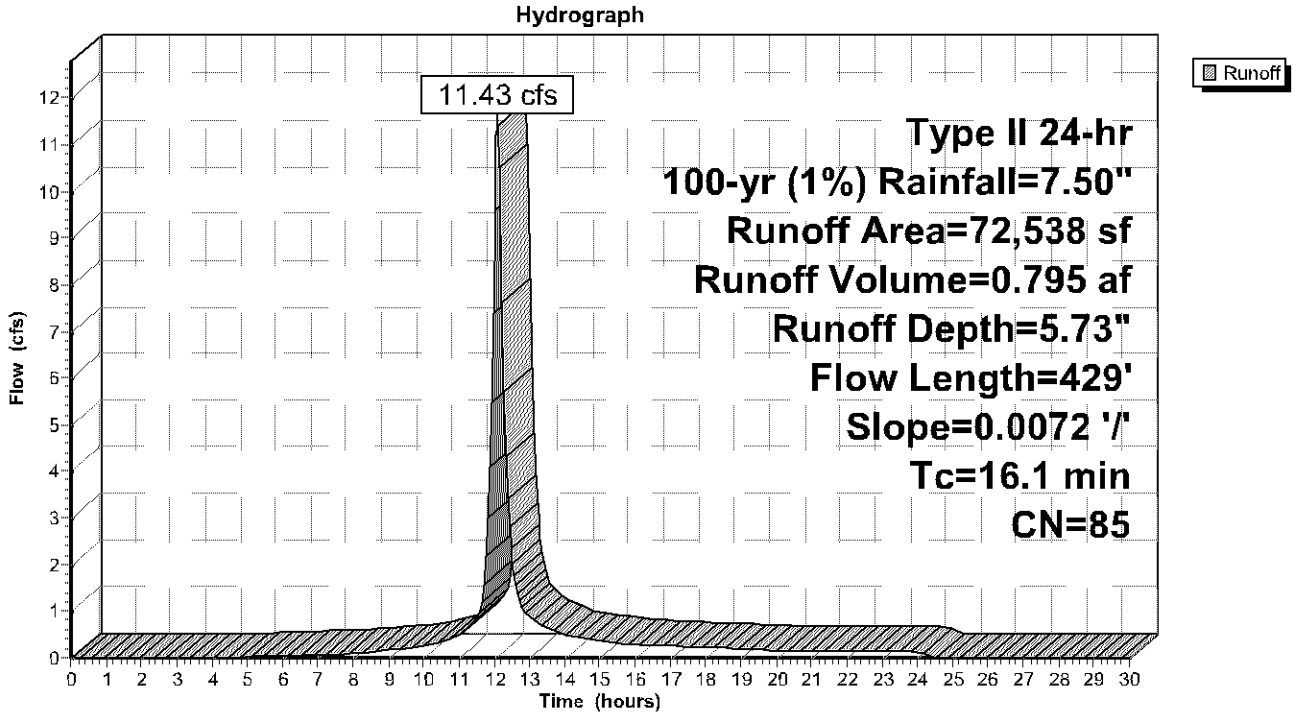
Runoff = 11.43 cfs @ 12.08 hrs, Volume= 0.795 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	32,642	98	impervious
*	39,896	74	pervious
	72,538	85	Weighted Average
	39,896		55.00% Pervious Area
	32,642		45.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	429	0.0072	0.44		**Lag/CN Method,**

Subcatchment 4S: WS #4



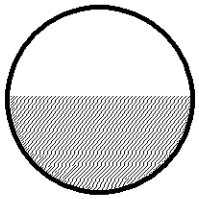
Summary for Reach 6R: DI

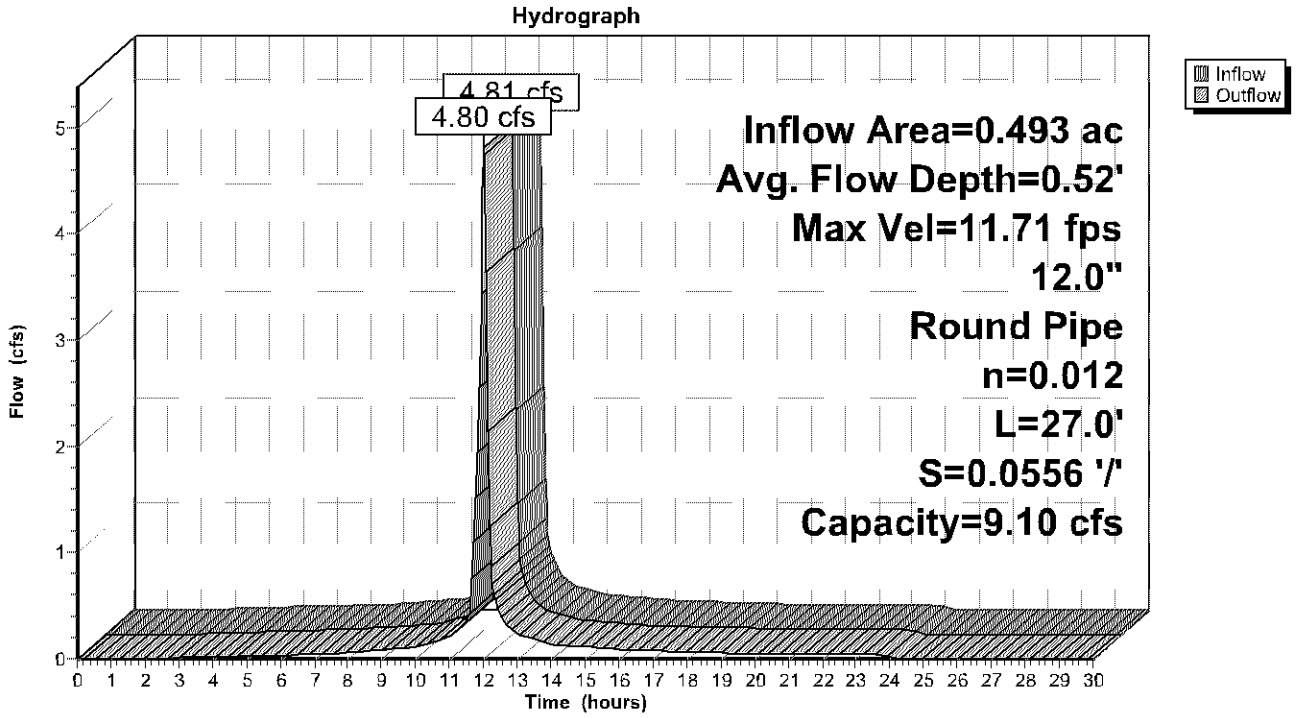
Inflow Area = 0.493 ac, 79.00% Impervious, Inflow Depth = 6.67" for 100-yr (1%) event
Inflow = 4.81 cfs @ 11.98 hrs, Volume= 0.274 af
Outflow = 4.80 cfs @ 11.99 hrs, Volume= 0.274 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.71 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.53 fps, Avg. Travel Time= 0.1 min

Peak Storage= 11 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.10 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 27.0' Slope= 0.0556 '/'
Inlet Invert= 821.00', Outlet Invert= 819.50'





Summary for Pond 5P: Low Grass Area

Inflow Area = 0.946 ac, 48.00% Impervious, Inflow Depth = 5.85" for 100-yr (1%) event
Inflow = 7.88 cfs @ 12.01 hrs, Volume= 0.461 af
Outflow = 6.96 cfs @ 12.09 hrs, Volume= 0.458 af, Atten= 12%, Lag= 4.5 min
Discarded = 0.19 cfs @ 12.08 hrs, Volume= 0.282 af
Primary = 6.77 cfs @ 12.09 hrs, Volume= 0.176 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 823.55' @ 12.09 hrs Surf.Area= 10,000 sf Storage= 6,485 cf

Plug-Flow detention time= 192.3 min calculated for 0.458 af (99% of inflow)
Center-of-Mass det. time= 188.3 min (978.9 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1	822.70'	6,485 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

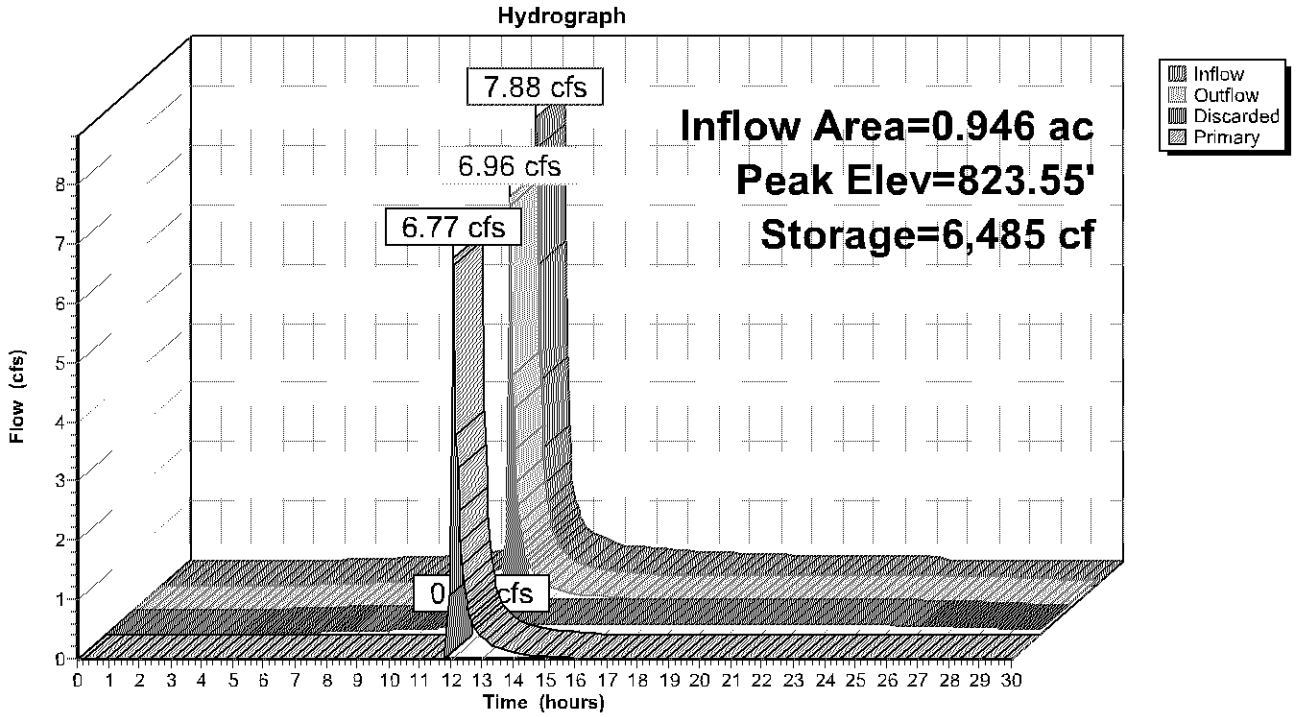
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
822.70	3,500	0	0
823.00	8,651	1,823	1,823
823.50	10,000	4,663	6,485

Device	Routing	Invert	Outlet Devices
#1	Discarded	822.70'	**0.800 in/hr Exfiltration over Surface area**
#2	Primary	823.34'	**30.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.19 cfs @ 12.08 hrs HW=823.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=6.40 cfs @ 12.09 hrs HW=823.54' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 6.40 cfs @ 1.05 fps)

Pond 5P: Low Grass Area

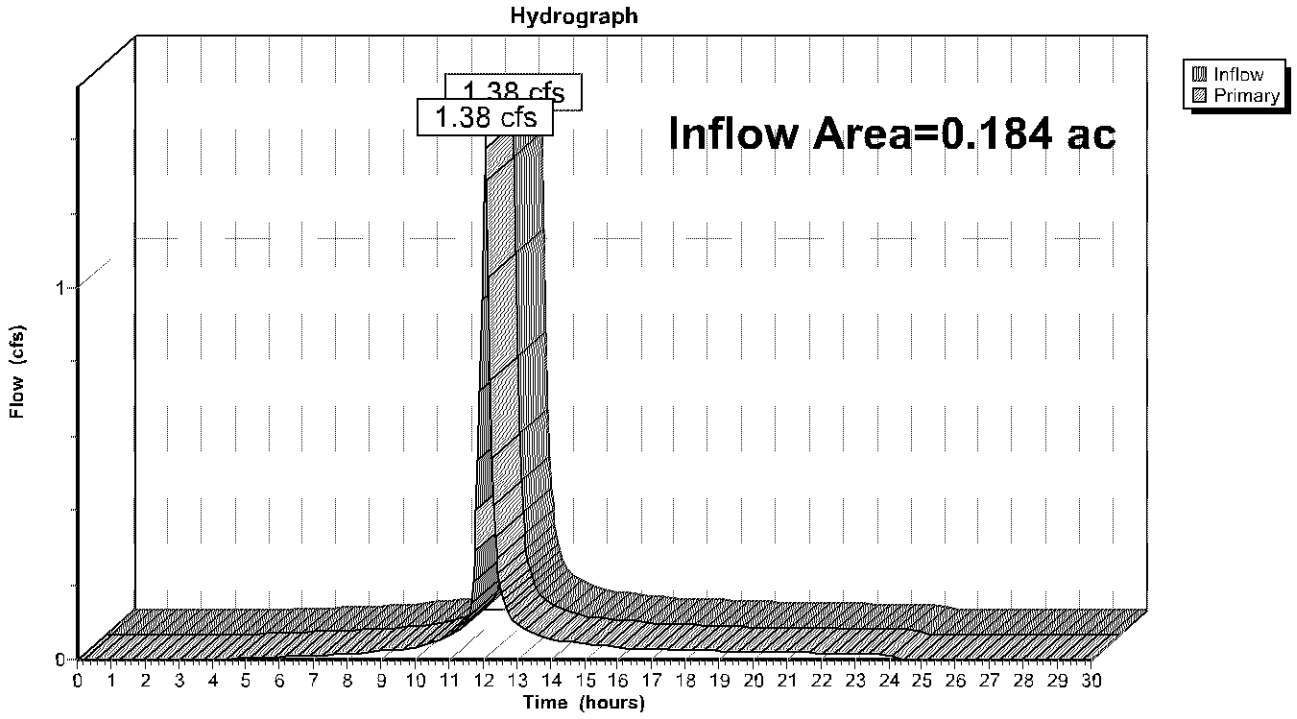


Summary for Link 7L: Discharge to 78th St

Inflow Area = 0.184 ac, 54.00% Impervious, Inflow Depth = 5.96" for 100-yr (1%) event
Inflow = 1.38 cfs @ 12.06 hrs, Volume= 0.092 af
Primary = 1.38 cfs @ 12.06 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 7L: Discharge to 78th St

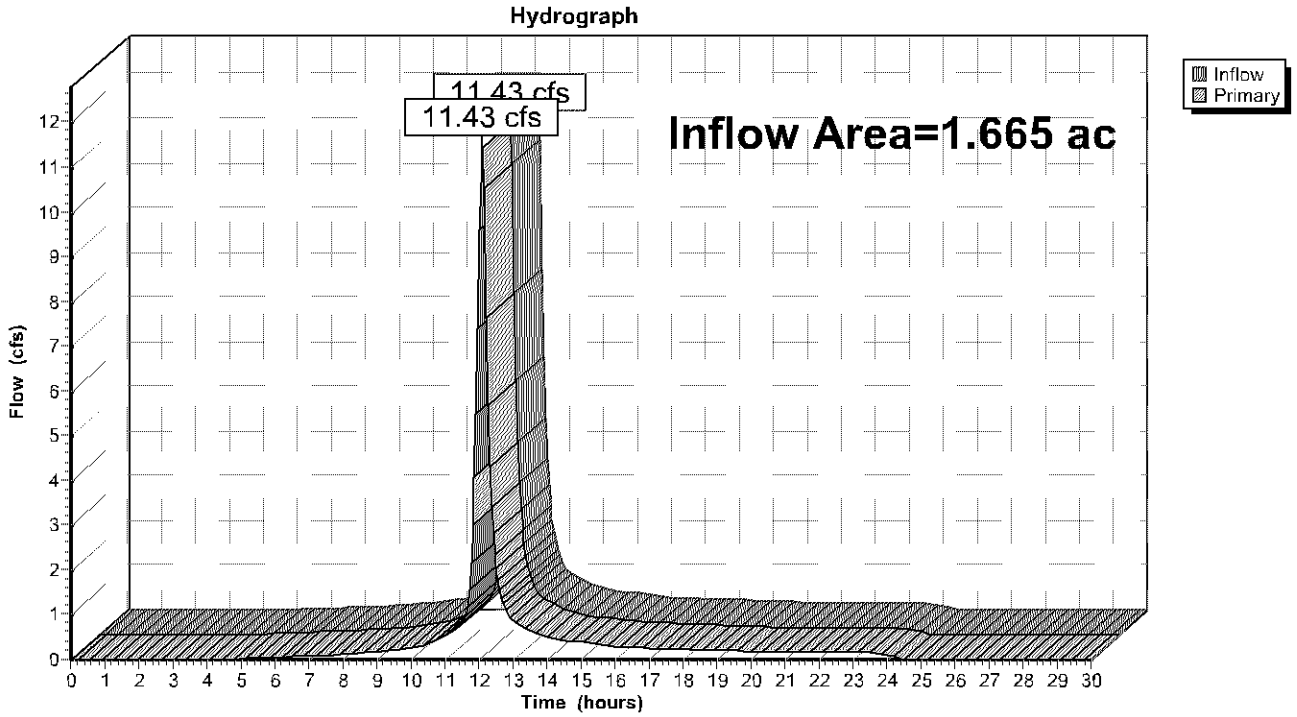


Summary for Link 8L: Discharge to 13th Ave

Inflow Area = 1.665 ac, 45.00% Impervious, Inflow Depth = 5.73" for 100-yr (1%) event
Inflow = 11.43 cfs @ 12.08 hrs, Volume= 0.795 af
Primary = 11.43 cfs @ 12.08 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 8L: Discharge to 13th Ave

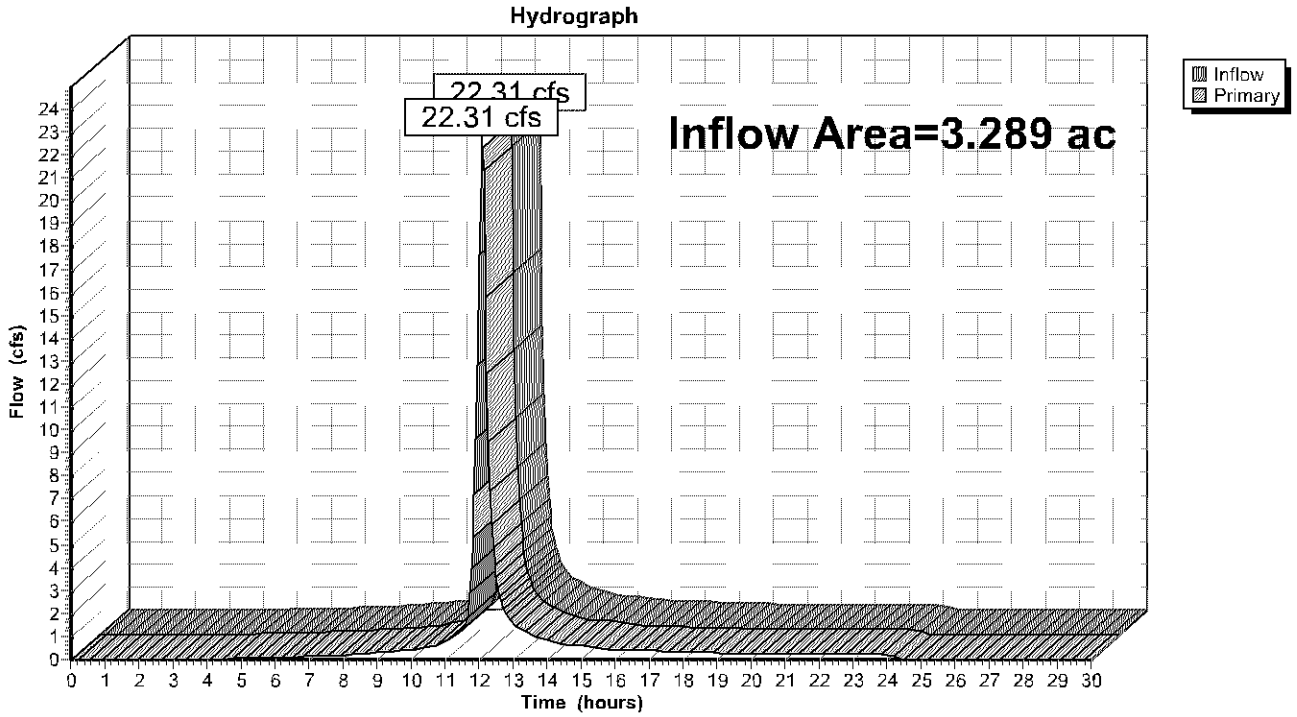


Summary for Link 9L: Ultimate Discharge

Inflow Area = 3.289 ac, 51.47% Impervious, Inflow Depth = 4.88" for 100-yr (1%) event
Inflow = 22.31 cfs @ 12.07 hrs, Volume= 1.337 af
Primary = 22.31 cfs @ 12.07 hrs, Volume= 1.337 af, Atten= 0%, Lag= 0.0 min

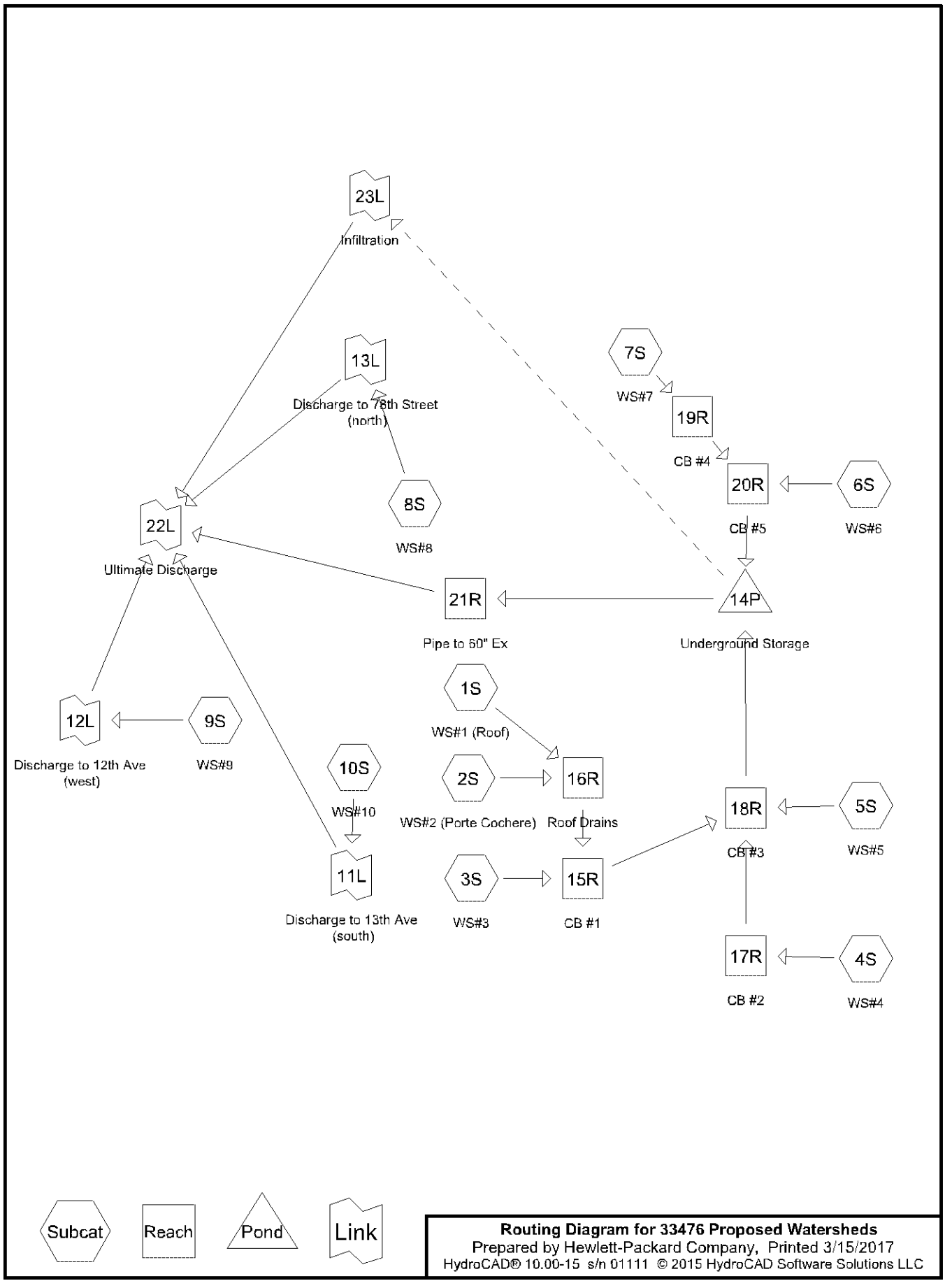
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 9L: Ultimate Discharge



APPENDIX F

CALCULATION RESULTS FOR PROPOSED CONDITIONS



Routing Diagram for 33476 Proposed Watersheds
Prepared by Hewlett-Packard Company, Printed 3/15/2017

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.399	98	(1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S)
0.890	74	(3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S)
3.289	**92**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
3.289	Other	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S
3.289		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	3.289	3.289		1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S
0.000	**0.000**	**0.000**	**0.000**	**3.289**	**3.289**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	15R	819.19	818.01	236.0	0.0050	0.013	18.0	0.0	0.0
2	16R	820.73	819.19	154.0	0.0100	0.013	12.0	0.0	0.0
3	17R	818.81	818.01	159.0	0.0050	0.013	12.0	0.0	0.0
4	18R	818.01	817.96	10.0	0.0050	0.013	24.0	0.0	0.0
5	19R	819.80	818.52	64.0	0.0200	0.013	12.0	0.0	0.0
6	20R	818.52	817.96	28.0	0.0200	0.013	12.0	0.0	0.0
7	21R	814.73	814.35	33.0	0.0115	0.013	18.0	0.0	0.0

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WS#1 (Roof) Runoff Area=19,588 sf 100.00% Impervious Runoff Depth=2.17"
Flow Length=205' Slope=0.0100 '/' Tc=4.2 min CN=98 Runoff=1.57 cfs 0.081 af

Subcatchment 2S: WS#2 (Porte Cochere) Runoff Area=1,114 sf 100.00% Impervious Runoff Depth=2.17"
Flow Length=47' Slope=0.0100 '/' Tc=1.3 min CN=98 Runoff=0.09 cfs 0.005 af

Subcatchment 3S: WS#3 Runoff Area=25,775 sf 85.00% Impervious Runoff Depth=1.77"
Flow Length=169' Slope=0.0135 '/' Tc=3.9 min CN=94 Runoff=1.86 cfs 0.087 af

Subcatchment 4S: WS#4 Runoff Area=15,447 sf 68.00% Impervious Runoff Depth=1.44"
Flow Length=128' Slope=0.0211 '/' Tc=3.0 min CN=90 Runoff=0.97 cfs 0.043 af

Subcatchment 5S: WS#5 Runoff Area=26,661 sf 92.00% Impervious Runoff Depth=1.96"
Flow Length=149' Slope=0.0122 '/' Tc=3.3 min CN=96 Runoff=2.08 cfs 0.100 af

Subcatchment 6S: WS#6 Runoff Area=16,410 sf 78.00% Impervious Runoff Depth=1.69"
Flow Length=172' Slope=0.0158 '/' Tc=3.8 min CN=93 Runoff=1.15 cfs 0.053 af

Subcatchment 7S: WS#7 Runoff Area=6,468 sf 85.00% Impervious Runoff Depth=1.77"
Flow Length=81' Slope=0.0145 '/' Tc=2.1 min CN=94 Runoff=0.47 cfs 0.022 af

Subcatchment 8S: WS#8 Runoff Area=15,232 sf 25.00% Impervious Runoff Depth=0.82"
Flow Length=275' Slope=0.0179 '/' Tc=8.5 min CN=80 Runoff=0.45 cfs 0.024 af

Subcatchment 9S: WS#9 Runoff Area=11,425 sf 23.00% Impervious Runoff Depth=0.82"
Flow Length=277' Slope=0.0216 '/' Tc=7.7 min CN=80 Runoff=0.35 cfs 0.018 af

Subcatchment 10S: WS#10 Runoff Area=5,140 sf 40.99% Impervious Runoff Depth=1.04"
Flow Length=80' Slope=0.0320 '/' Tc=2.1 min CN=84 Runoff=0.24 cfs 0.010 af

Reach 15R: CB #1 Avg. Flow Depth=0.71' Max Vel=4.09 fps Inflow=3.44 cfs 0.173 af
18.0" Round Pipe n=0.013 L=236.0' S=0.0050 '/' Capacity=7.43 cfs Outflow=3.20 cfs 0.173 af

Reach 16R: Roof Drains Avg. Flow Depth=0.47' Max Vel=4.43 fps Inflow=1.65 cfs 0.086 af
12.0" Round Pipe n=0.013 L=154.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=1.58 cfs 0.086 af

Reach 17R: CB #2 Avg. Flow Depth=0.42' Max Vel=2.98 fps Inflow=0.97 cfs 0.043 af
12.0" Round Pipe n=0.013 L=159.0' S=0.0050 '/' Capacity=2.53 cfs Outflow=0.90 cfs 0.043 af

Reach 18R: CB #3 Avg. Flow Depth=0.85' Max Vel=4.74 fps Inflow=6.08 cfs 0.316 af
24.0" Round Pipe n=0.013 L=10.0' S=0.0050 '/' Capacity=16.00 cfs Outflow=6.06 cfs 0.316 af

Reach 19R: CB #4 Avg. Flow Depth=0.21' Max Vel=3.98 fps Inflow=0.47 cfs 0.022 af
12.0" Round Pipe n=0.013 L=64.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=0.47 cfs 0.022 af

Reach 20R: CB #5 Avg. Flow Depth=0.39' Max Vel=5.68 fps Inflow=1.61 cfs 0.075 af
12.0" Round Pipe n=0.013 L=28.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=1.60 cfs 0.075 af

Reach 21R: Pipe to 60" Ex Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
18.0" Round Pipe n=0.013 L=33.0' S=0.0115 '/' Capacity=11.27 cfs Outflow=0.00 cfs 0.000 af

Pond 14P: Underground Storage Peak Elev=817.12' Storage=6,054 cf Inflow=7.65 cfs 0.391 af
Primary=0.00 cfs 0.000 af Secondary=0.80 cfs 0.391 af Outflow=0.80 cfs 0.391 af

Link 11L: Discharge to 13th Ave (south) Inflow=0.24 cfs 0.010 af
Primary=0.24 cfs 0.010 af

Link 12L: Discharge to 12th Ave (west) Inflow=0.35 cfs 0.018 af
Primary=0.35 cfs 0.018 af

Link 13L: Discharge to 78th Street (north) Inflow=0.45 cfs 0.024 af
Primary=0.45 cfs 0.024 af

Link 22L: Ultimate Discharge Inflow=1.74 cfs 0.443 af
Primary=1.74 cfs 0.443 af

Link 23L: Infiltration Inflow=0.80 cfs 0.391 af
Primary=0.80 cfs 0.391 af

Total Runoff Area = 3.289 ac Runoff Volume = 0.443 af Average Runoff Depth = 1.62"
27.07% Pervious = 0.890 ac 72.93% Impervious = 2.399 ac

Summary for Subcatchment 1S: WS#1 (Roof)

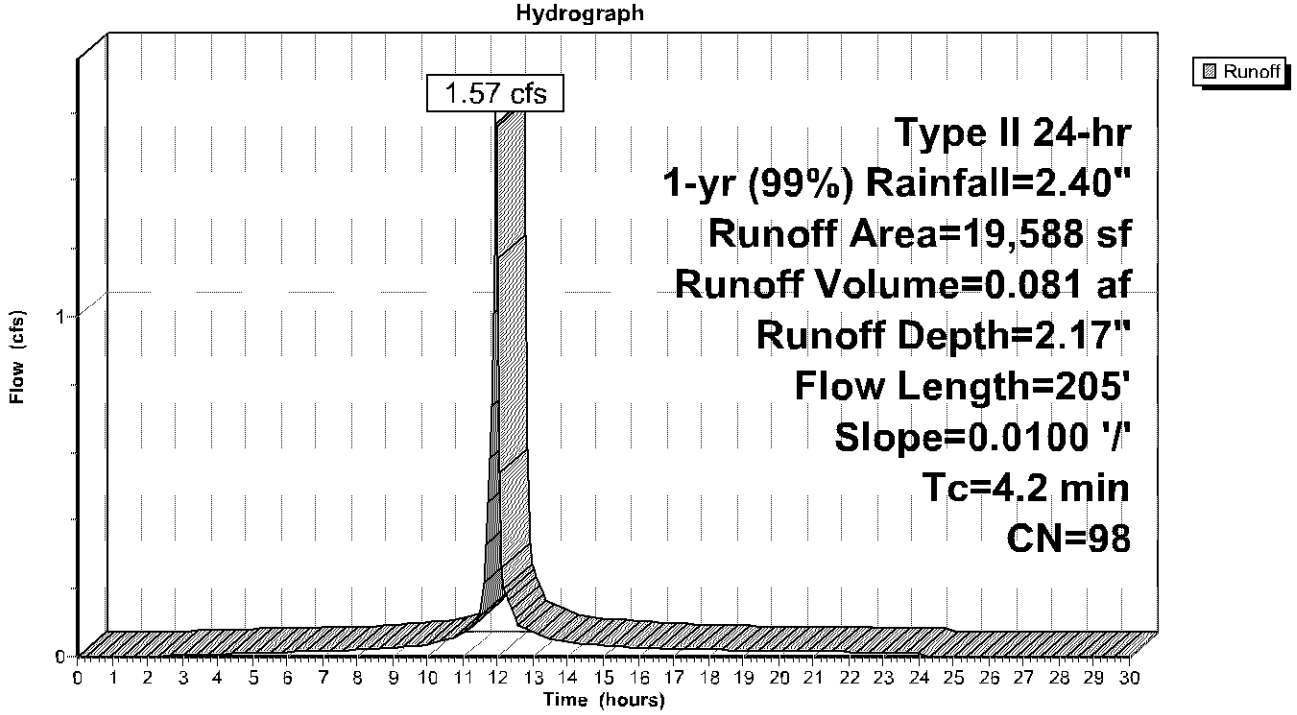
Runoff = 1.57 cfs @ 11.94 hrs, Volume= 0.081 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	19,588	98	
	19,588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	205	0.0100	0.81		**Lag/CN Method,**

Subcatchment 1S: WS#1 (Roof)



Summary for Subcatchment 2S: WS#2 (Porte Cochere)

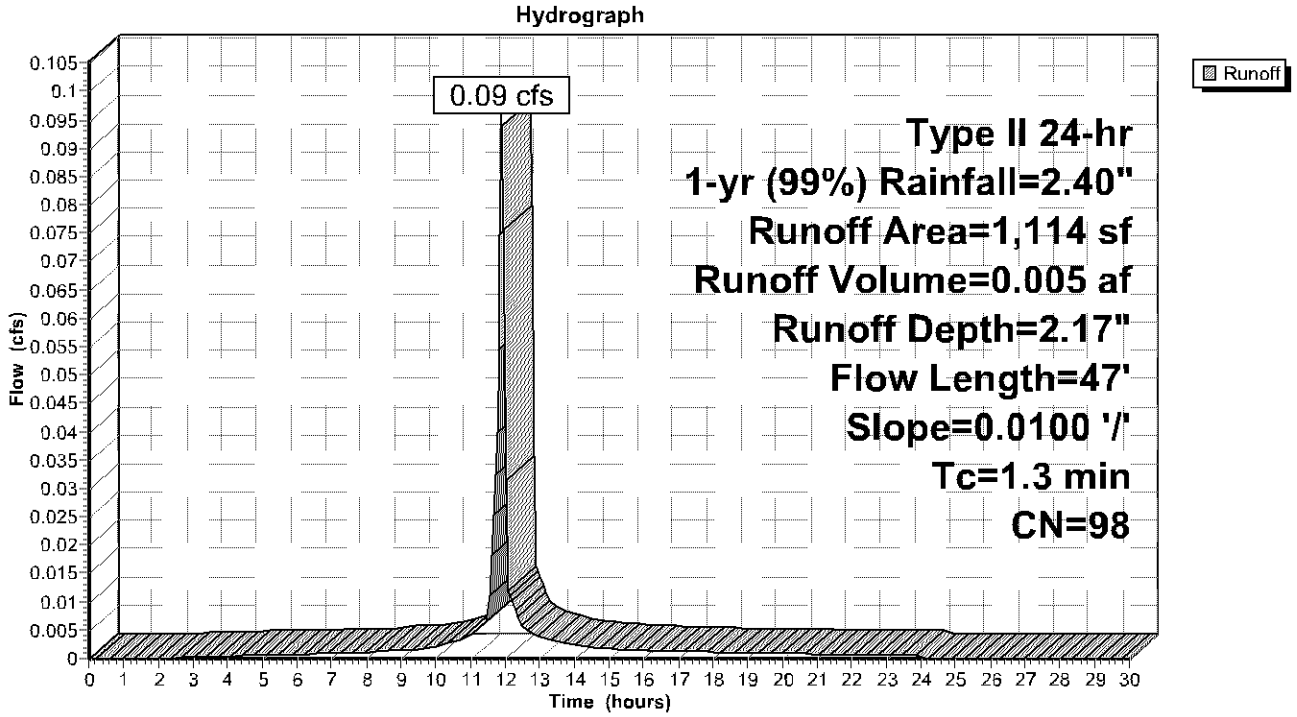
Runoff = 0.09 cfs @ 11.90 hrs, Volume= 0.005 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	1,114	98	
	1,114		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	47	0.0100	0.60		**Lag/CN Method,**

Subcatchment 2S: WS#2 (Porte Cochere)



Summary for Subcatchment 3S: WS#3

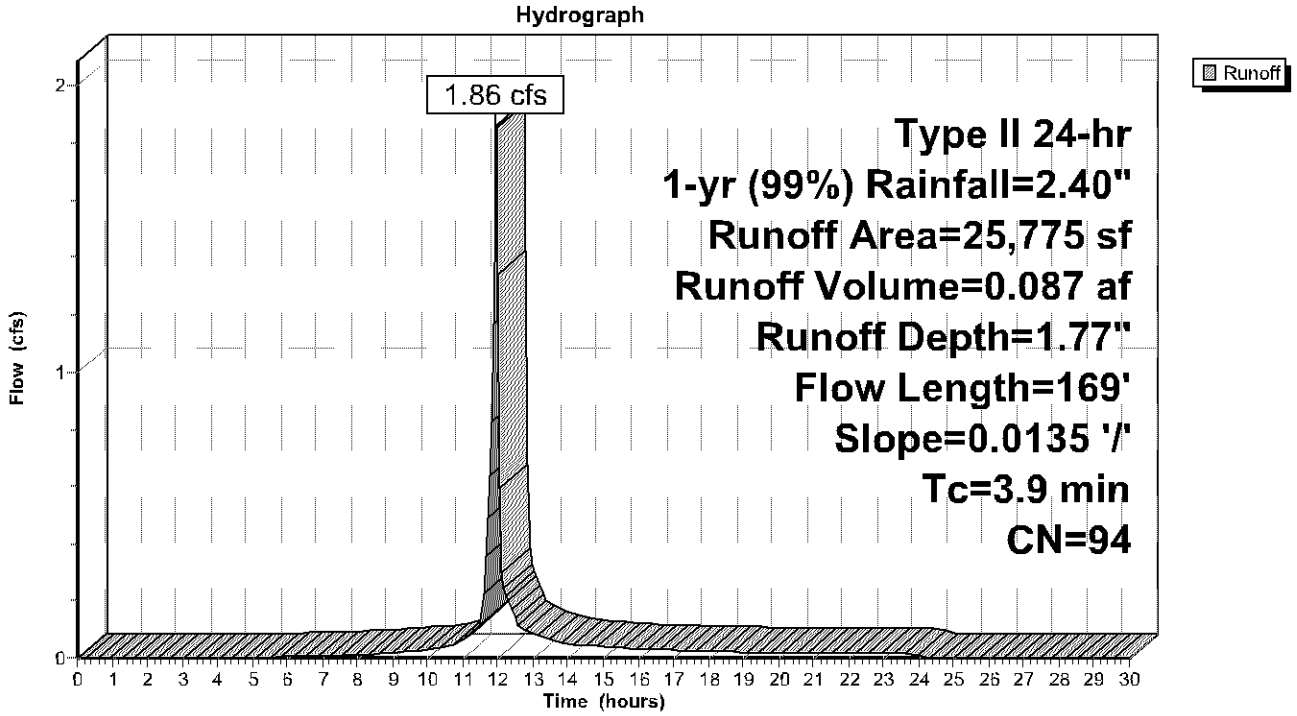
Runoff = 1.86 cfs @ 11.94 hrs, Volume= 0.087 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	21,909	98	
*	3,866	74	
	25,775	94	Weighted Average
	3,866		15.00% Pervious Area
	21,909		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	169	0.0135	0.73		**Lag/CN Method,**

Subcatchment 3S: WS#3



Summary for Subcatchment 4S: WS#4

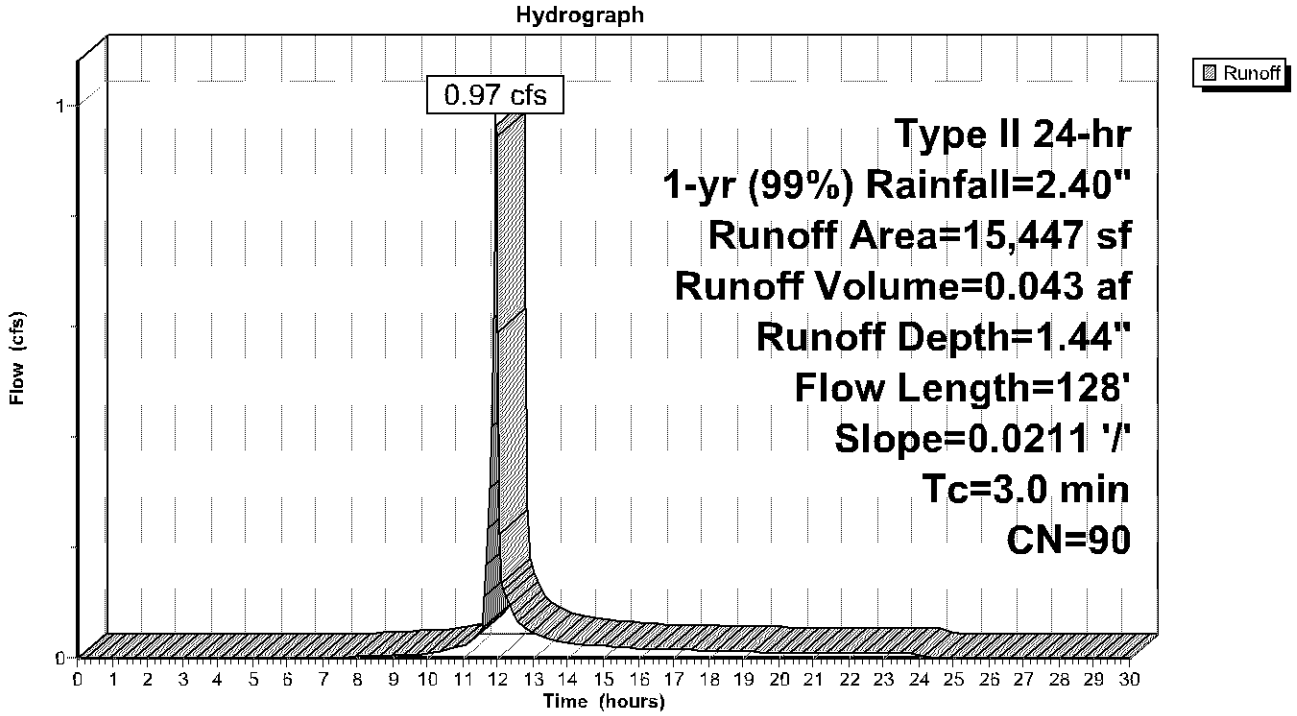
Runoff = 0.97 cfs @ 11.94 hrs, Volume= 0.043 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	10,504	98	
*	4,943	74	
	15,447	90	Weighted Average
	4,943		32.00% Pervious Area
	10,504		68.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	128	0.0211	0.72		**Lag/CN Method,**

Subcatchment 4S: WS#4



Summary for Subcatchment 5S: WS#5

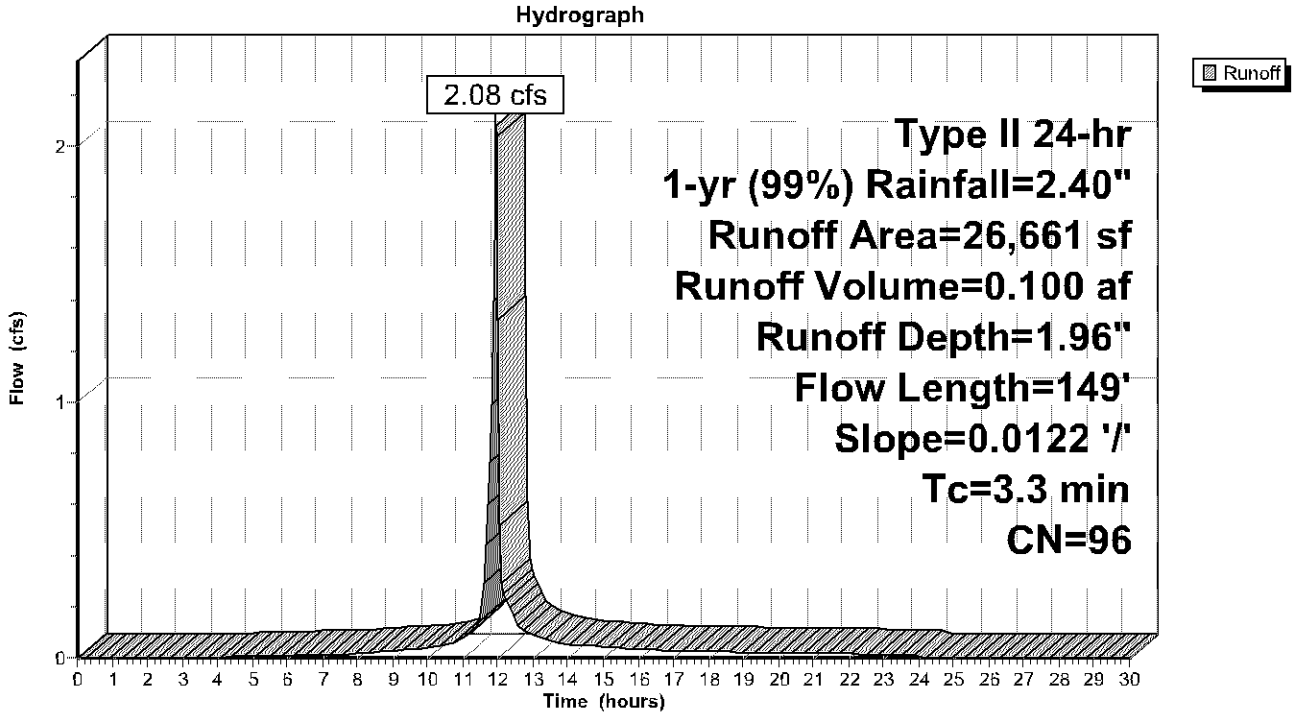
Runoff = 2.08 cfs @ 11.93 hrs, Volume= 0.100 af, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	24,528	98	
*	2,133	74	
	26,661	96	Weighted Average
	2,133		8.00% Pervious Area
	24,528		92.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	149	0.0122	0.75		**Lag/CN Method,**

Subcatchment 5S: WS#5



Summary for Subcatchment 6S: WS#6

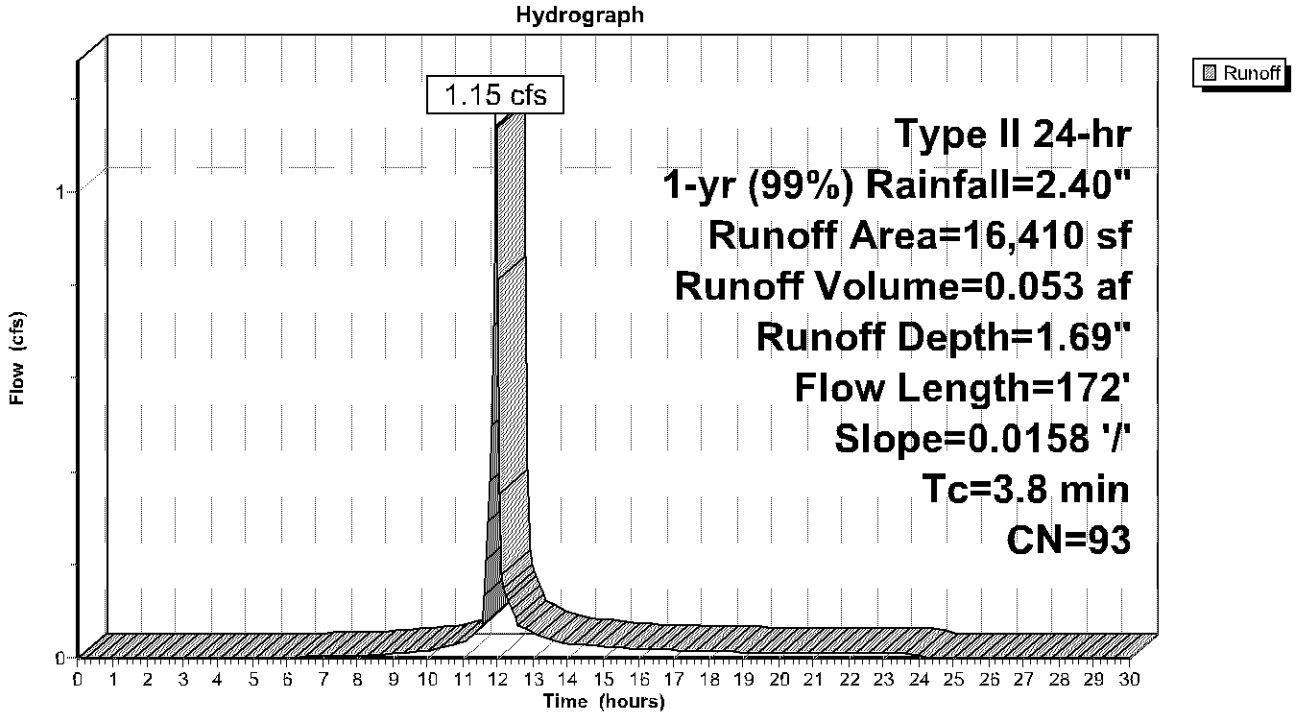
Runoff = 1.15 cfs @ 11.94 hrs, Volume= 0.053 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	12,800	98	
*	3,610	74	
	16,410	93	Weighted Average
	3,610		22.00% Pervious Area
	12,800		78.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	172	0.0158	0.75		**Lag/CN Method,**

Subcatchment 6S: WS#6



Summary for Subcatchment 7S: WS#7

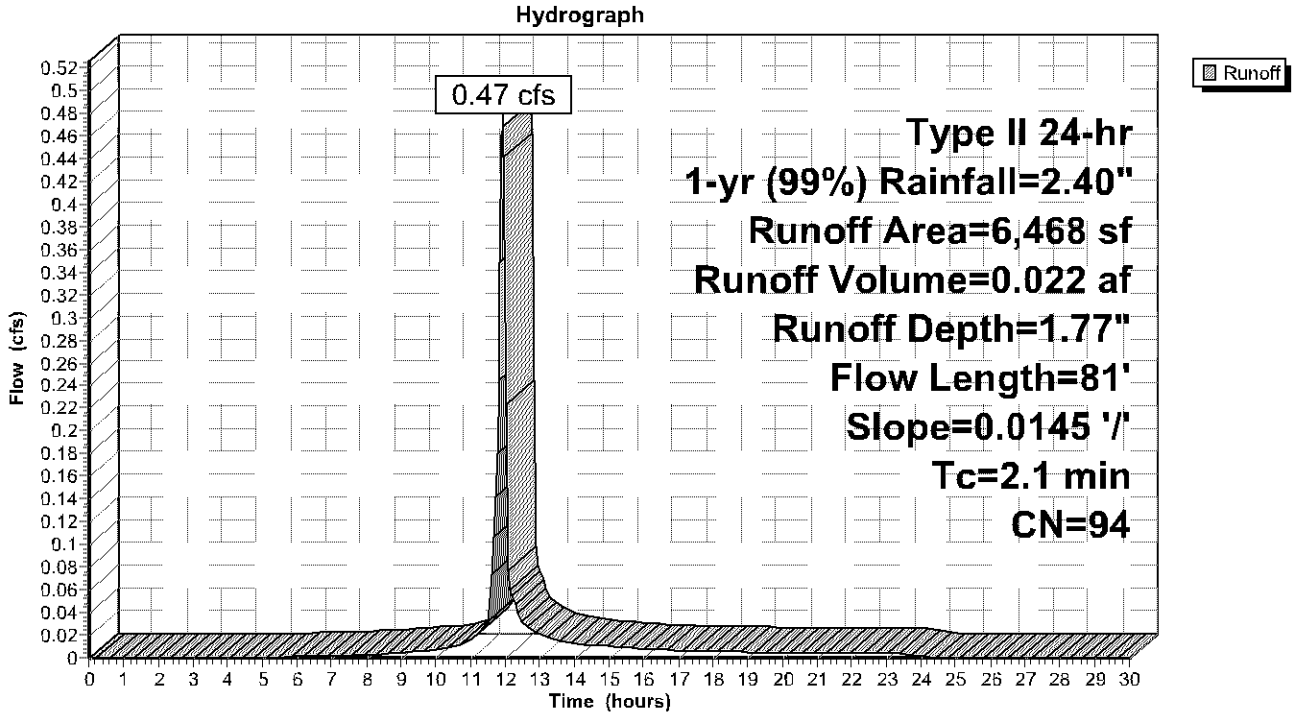
Runoff = 0.47 cfs @ 11.92 hrs, Volume= 0.022 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	5,498	98	
*	970	74	
	6,468	94	Weighted Average
	970		15.00% Pervious Area
	5,498		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	81	0.0145	0.65		**Lag/CN Method,**

Subcatchment 7S: WS#7



Summary for Subcatchment 8S: WS#8

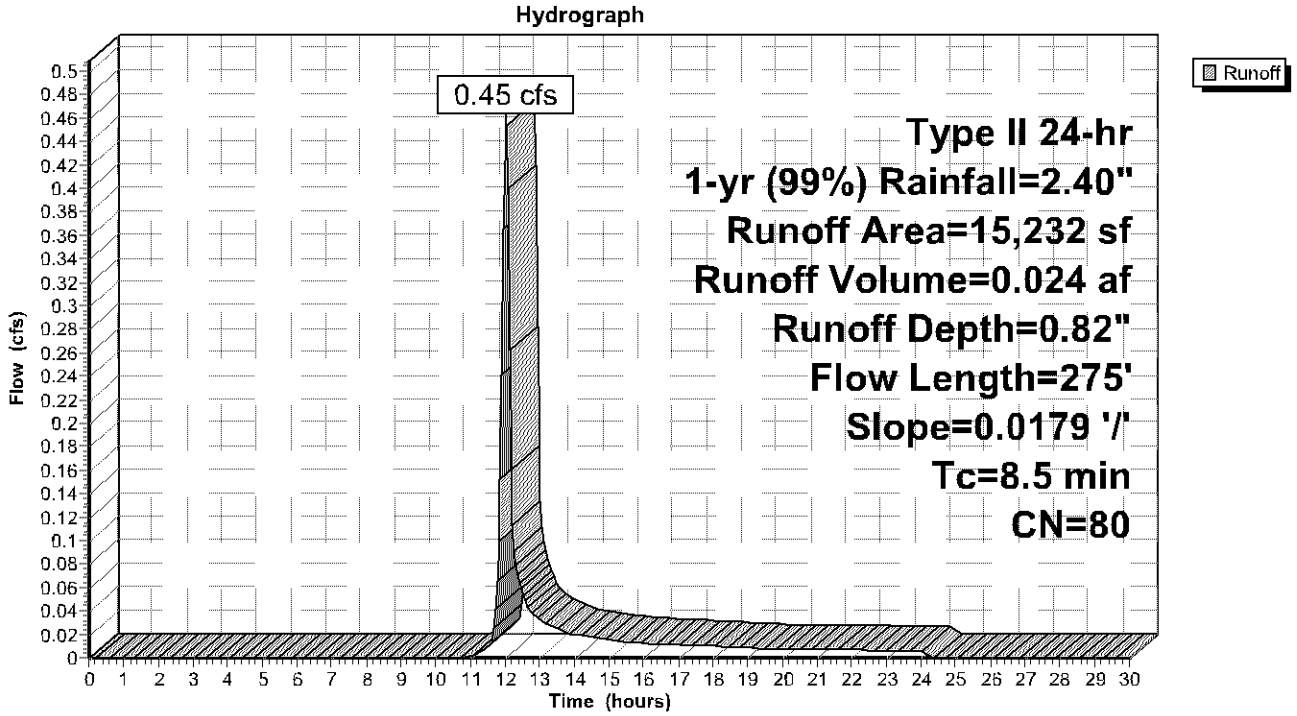
Runoff = 0.45 cfs @ 12.01 hrs, Volume= 0.024 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	3,808	98	
*	11,424	74	
	15,232	80	Weighted Average
	11,424		75.00% Pervious Area
	3,808		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	275	0.0179	0.54		**Lag/CN Method,**

Subcatchment 8S: WS#8



Summary for Subcatchment 9S: WS#9

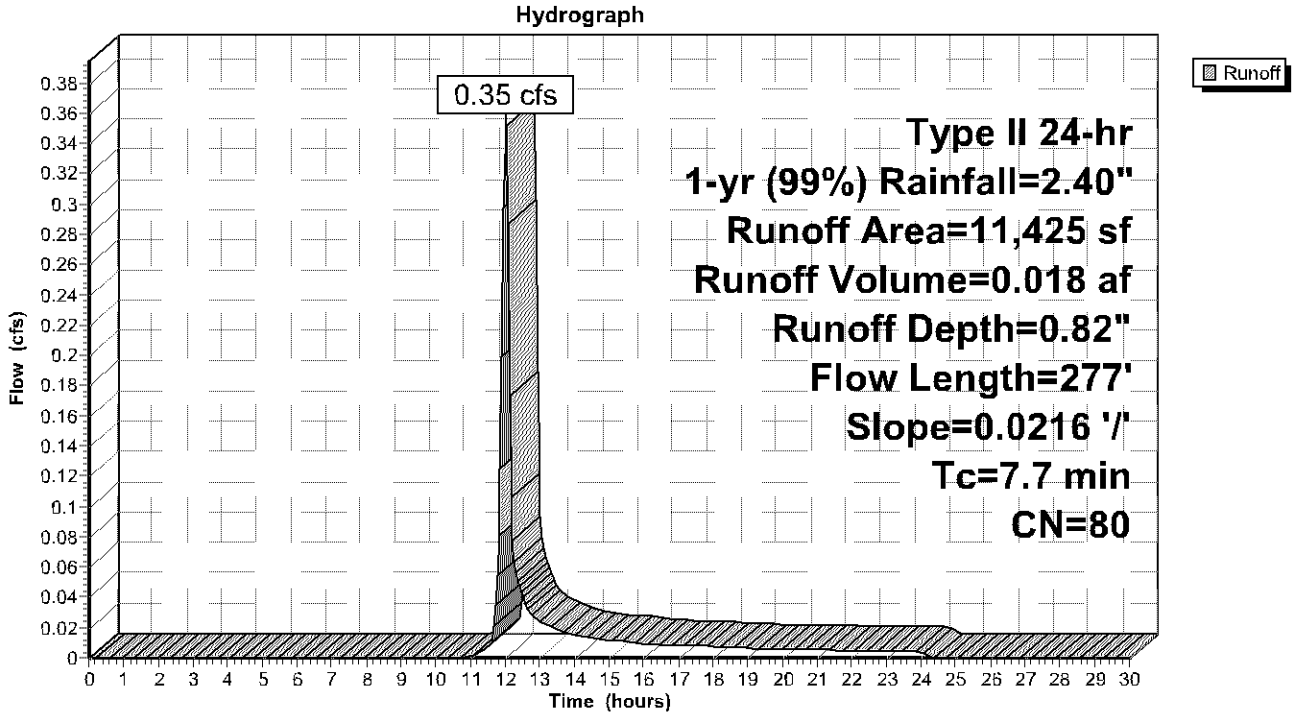
Runoff = 0.35 cfs @ 12.00 hrs, Volume= 0.018 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	2,628	98	
*	8,797	74	
	11,425	80	Weighted Average
	8,797		77.00% Pervious Area
	2,628		23.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	277	0.0216	0.60		**Lag/CN Method,**

Subcatchment 9S: WS#9



Summary for Subcatchment 10S: WS#10

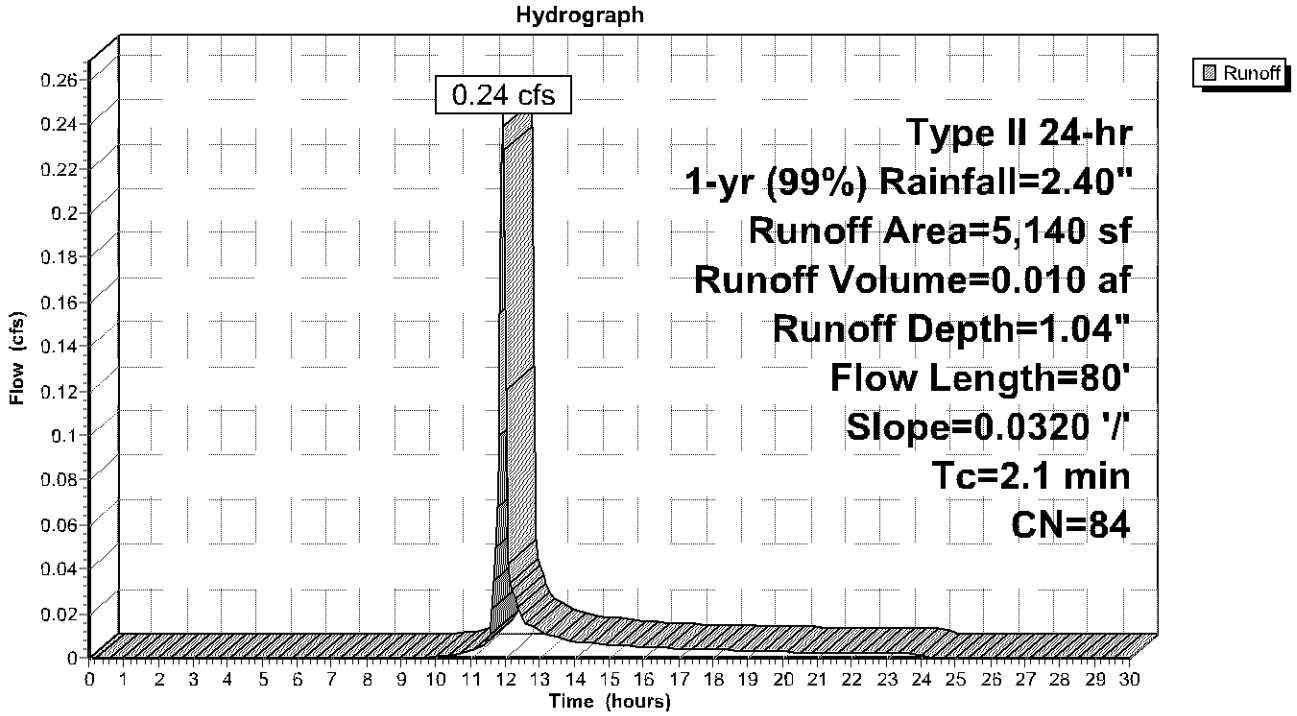
Runoff = 0.24 cfs @ 11.93 hrs, Volume= 0.010 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr (99%) Rainfall=2.40"

	Area (sf)	CN	Description
*	2,107	98	
*	3,033	74	
	5,140	84	Weighted Average
	3,033		59.01% Pervious Area
	2,107		40.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	80	0.0320	0.65		**Lag/CN Method,**

Subcatchment 10S: WS#10



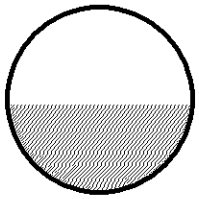
Summary for Reach 15R: CB #1

Inflow Area = 1.067 ac, 91.68% Impervious, Inflow Depth = 1.95" for 1-yr (99%) event
Inflow = 3.44 cfs @ 11.95 hrs, Volume= 0.173 af
Outflow = 3.20 cfs @ 11.97 hrs, Volume= 0.173 af, Atten= 7%, Lag= 1.6 min

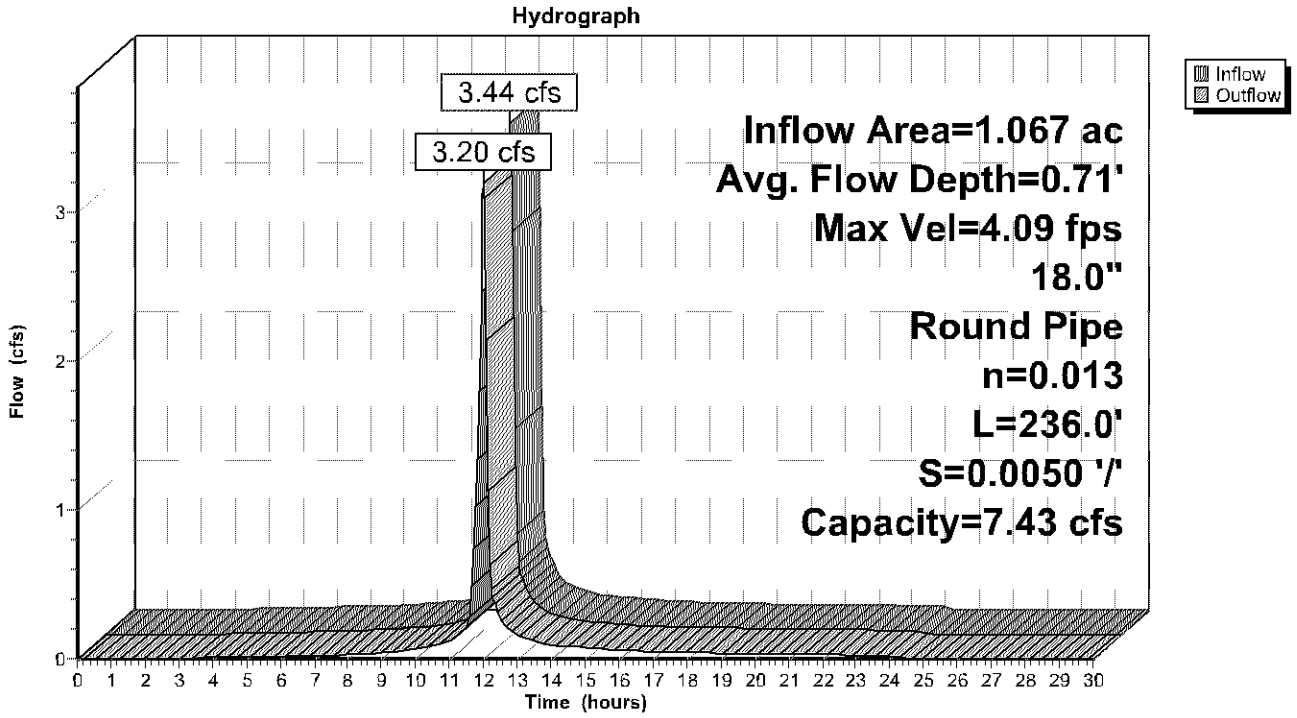
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.09 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 3.4 min

Peak Storage= 193 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.43 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 236.0' Slope= 0.0050 '/'
Inlet Invert= 819.19', Outlet Invert= 818.01'



Reach 15R: CB #1



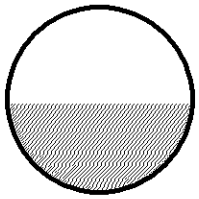
Summary for Reach 16R: Roof Drains

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth = 2.17" for 1-yr (99%) event
Inflow = 1.65 cfs @ 11.94 hrs, Volume= 0.086 af
Outflow = 1.58 cfs @ 11.95 hrs, Volume= 0.086 af, Atten= 4%, Lag= 0.7 min

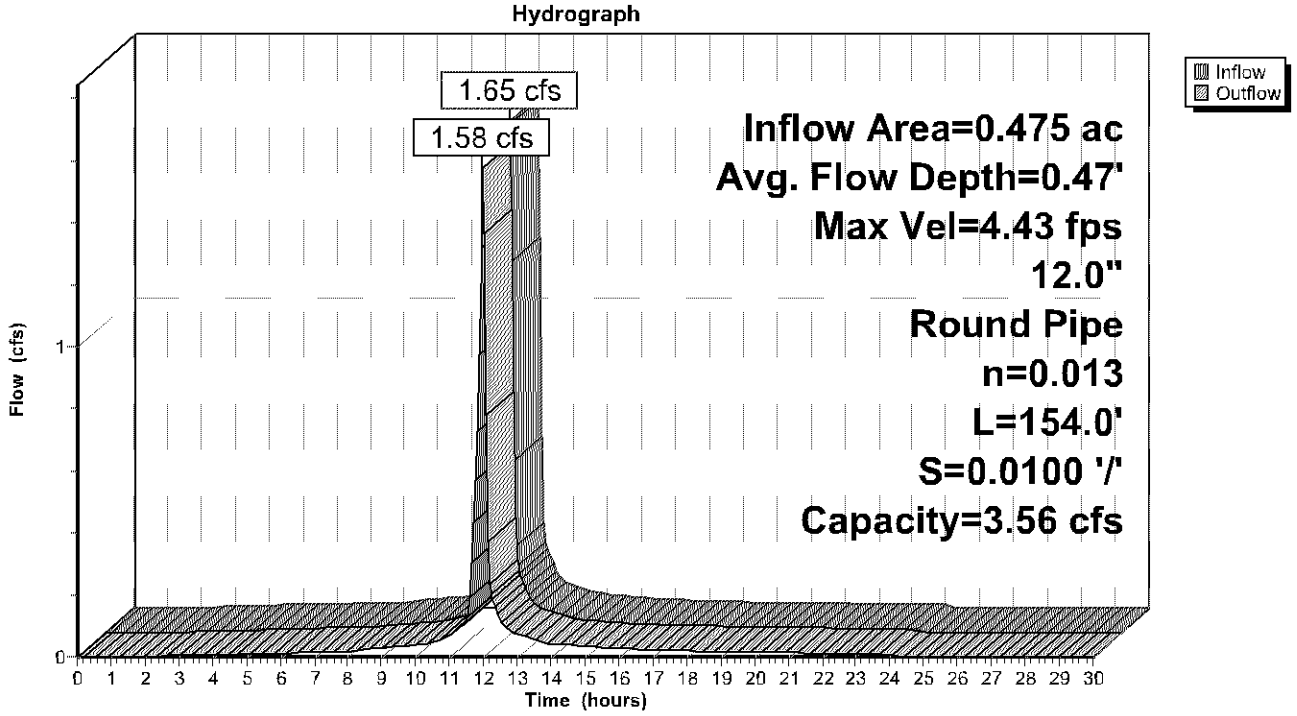
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.43 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 2.0 min

Peak Storage= 57 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 154.0' Slope= 0.0100 '/'
Inlet Invert= 820.73', Outlet Invert= 819.19'



Reach 16R: Roof Drains



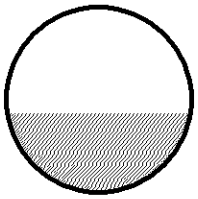
Summary for Reach 17R: CB #2

Inflow Area = 0.355 ac, 68.00% Impervious, Inflow Depth = 1.44" for 1-yr (99%) event
Inflow = 0.97 cfs @ 11.94 hrs, Volume= 0.043 af
Outflow = 0.90 cfs @ 11.95 hrs, Volume= 0.043 af, Atten= 7%, Lag= 1.1 min

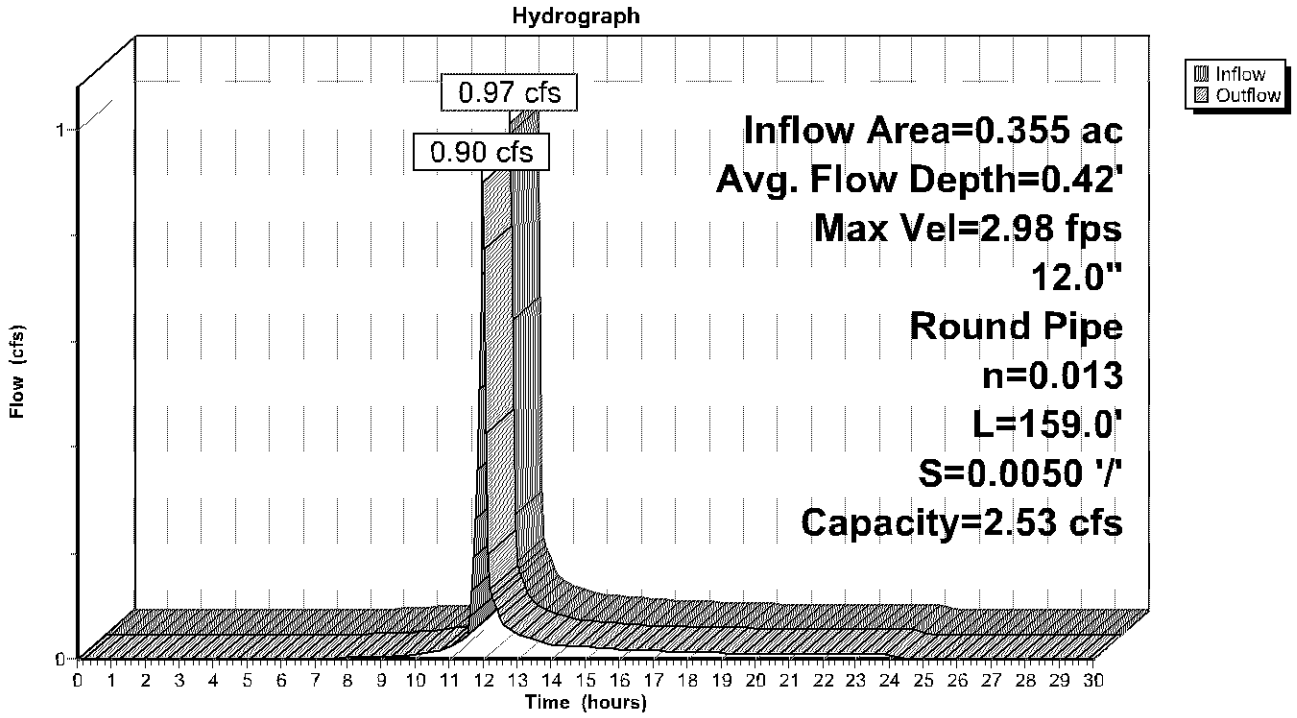
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 3.0 min

Peak Storage= 50 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.53 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 159.0' Slope= 0.0050 '/'
Inlet Invert= 818.81', Outlet Invert= 818.01'



Reach 17R: CB #2



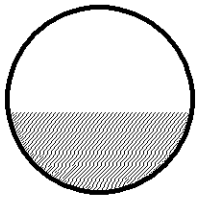
Summary for Reach 18R: CB #3

Inflow Area = 2.034 ac, 87.65% Impervious, Inflow Depth = 1.87" for 1-yr (99%) event
Inflow = 6.08 cfs @ 11.95 hrs, Volume= 0.316 af
Outflow = 6.06 cfs @ 11.95 hrs, Volume= 0.316 af, Atten= 0%, Lag= 0.0 min

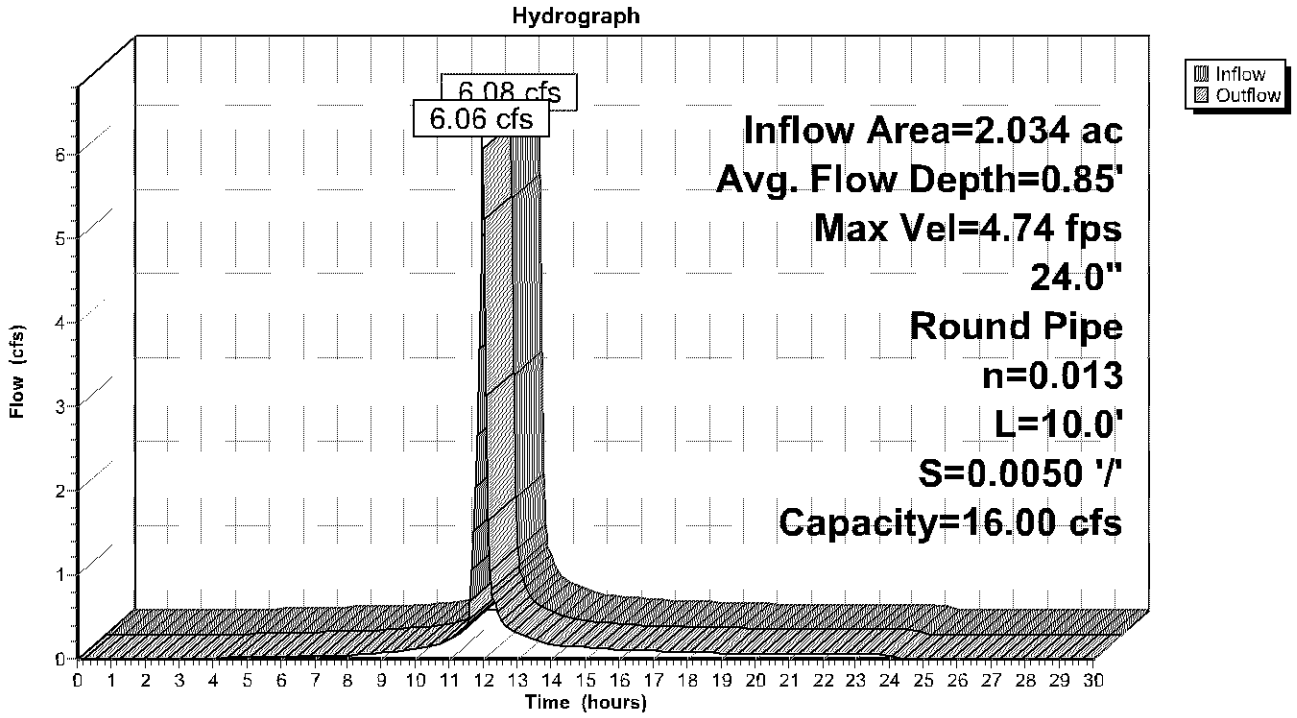
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.74 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 0.1 min

Peak Storage= 13 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 16.00 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 10.0' Slope= 0.0050 '/'
Inlet Invert= 818.01', Outlet Invert= 817.96'



Reach 18R: CB #3



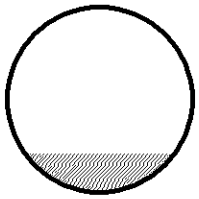
Summary for Reach 19R: CB #4

Inflow Area = 0.148 ac, 85.00% Impervious, Inflow Depth = 1.77" for 1-yr (99%) event
Inflow = 0.47 cfs @ 11.92 hrs, Volume= 0.022 af
Outflow = 0.47 cfs @ 11.93 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.5 min

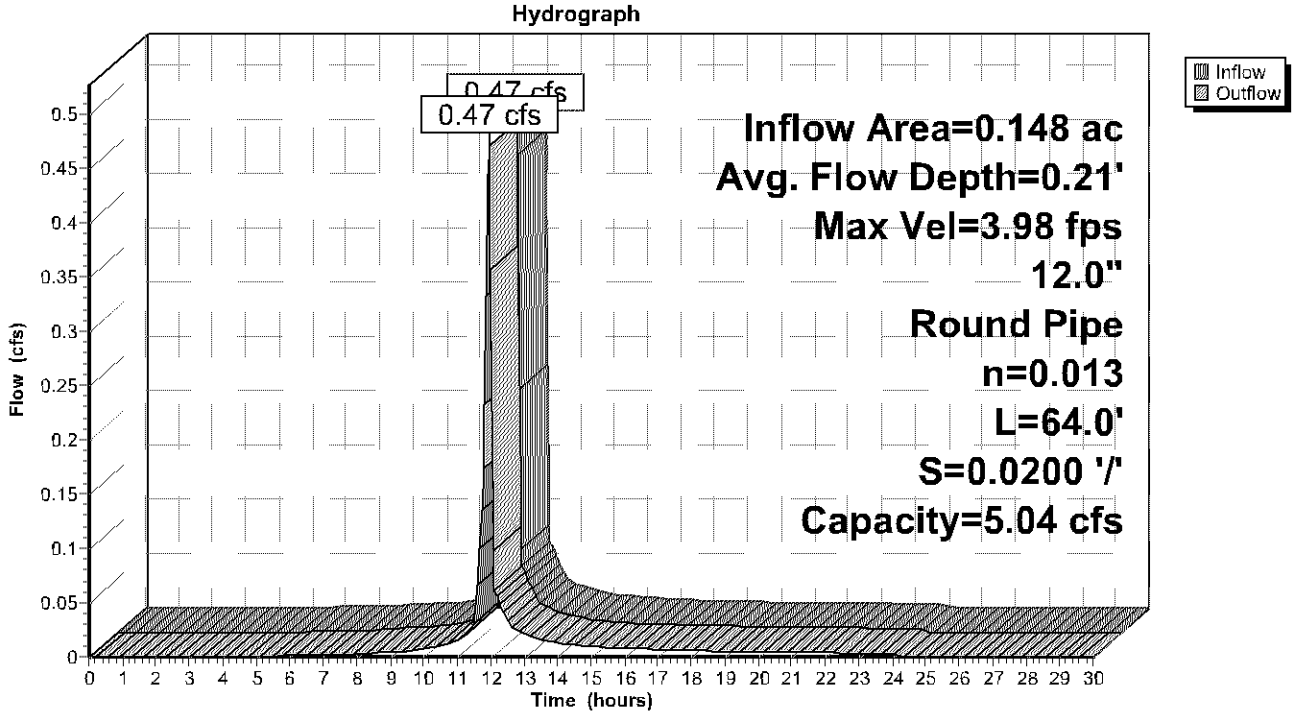
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.98 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 0.9 min

Peak Storage= 7 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 64.0' Slope= 0.0200 '/'
Inlet Invert= 819.80', Outlet Invert= 818.52'



Reach 19R: CB #4



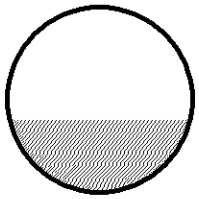
Summary for Reach 20R: CB #5

Inflow Area = 0.525 ac, 79.98% Impervious, Inflow Depth = 1.71" for 1-yr (99%) event
Inflow = 1.61 cfs @ 11.94 hrs, Volume= 0.075 af
Outflow = 1.60 cfs @ 11.94 hrs, Volume= 0.075 af, Atten= 1%, Lag= 0.1 min

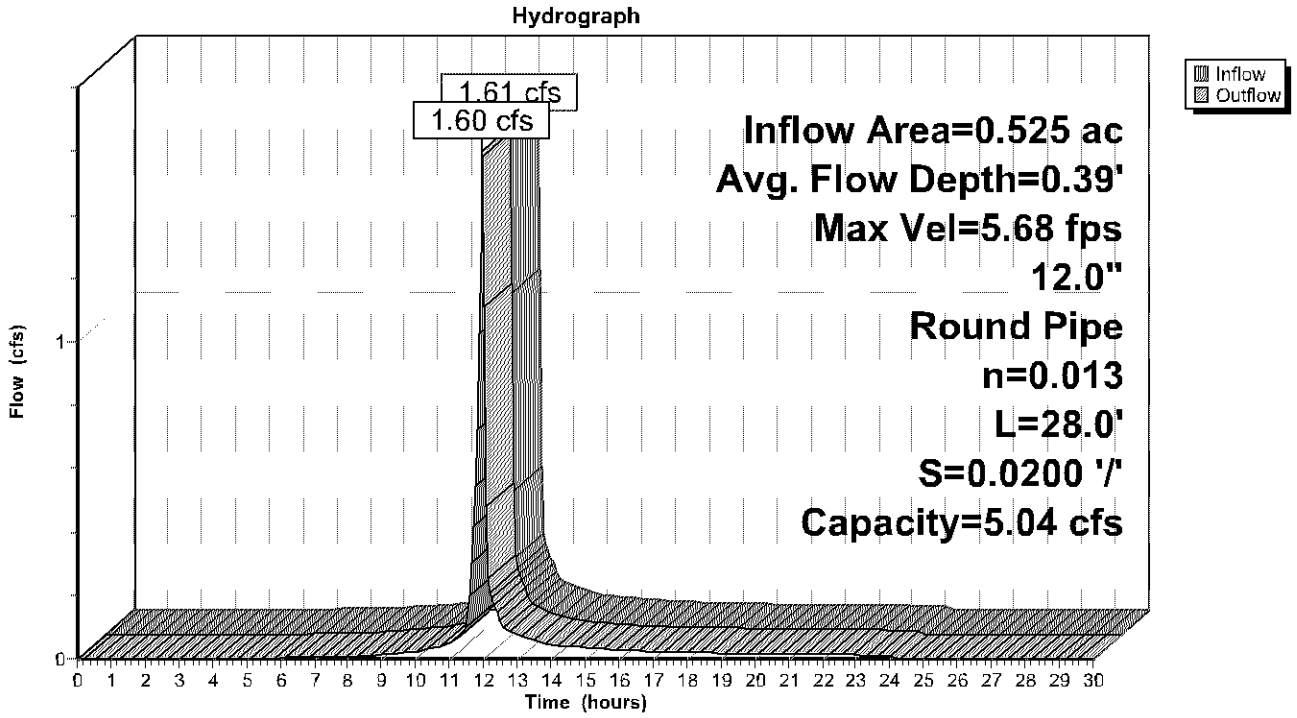
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.68 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 0.3 min

Peak Storage= 8 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 28.0' Slope= 0.0200 '/'
Inlet Invert= 818.52', Outlet Invert= 817.96'



Reach 20R: CB #5



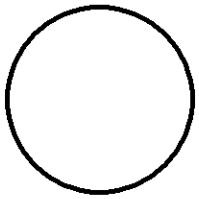
Summary for Reach 21R: Pipe to 60" Ex

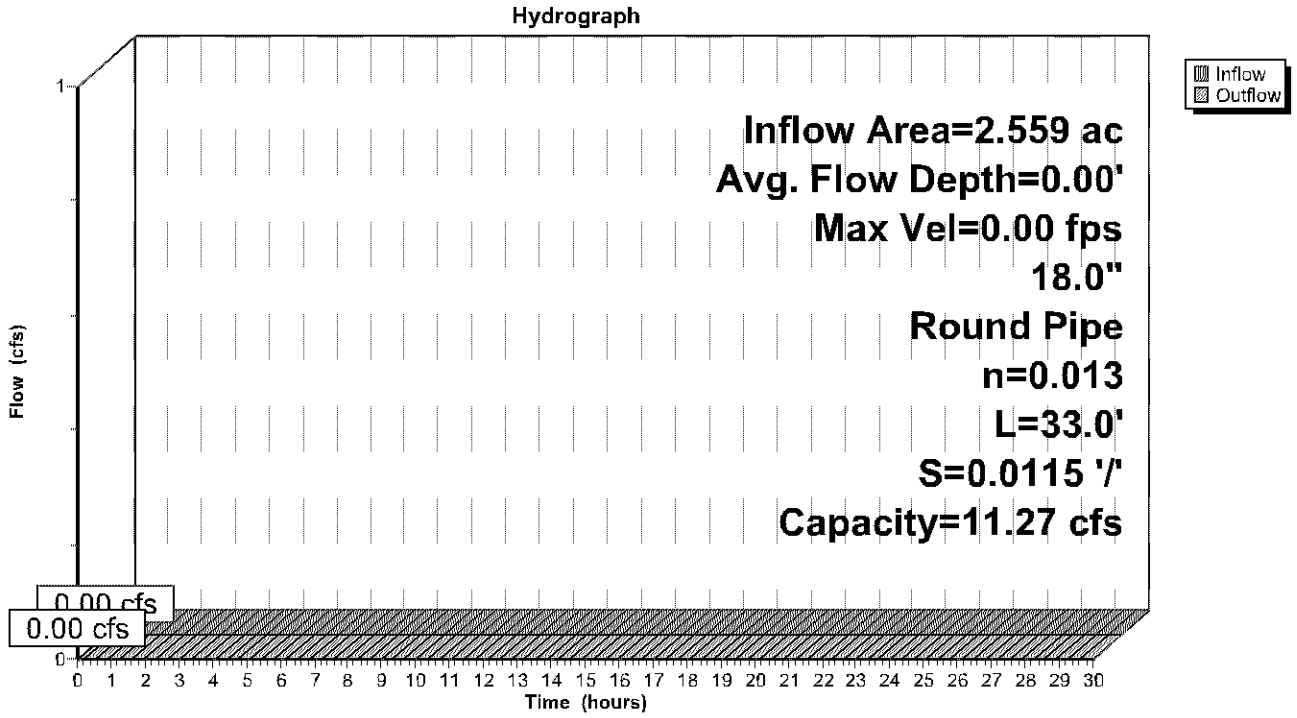
Inflow Area = 2.559 ac, 86.07% Impervious, Inflow Depth = 0.00" for 1-yr (99%) event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.27 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 33.0' Slope= 0.0115 '/'
Inlet Invert= 814.73', Outlet Invert= 814.35'





Summary for Pond 14P: Underground Storage

Inflow Area = 2.559 ac, 86.07% Impervious, Inflow Depth = 1.83" for 1-yr (99%) event
Inflow = 7.65 cfs @ 11.95 hrs, Volume= 0.391 af
Outflow = 0.80 cfs @ 11.65 hrs, Volume= 0.391 af, Atten= 90%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.80 cfs @ 11.65 hrs, Volume= 0.391 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 817.12' @ 12.35 hrs Surf.Area= 6,975 sf Storage= 6,054 cf

Plug-Flow detention time= 49.9 min calculated for 0.390 af (100% of inflow)
Center-of-Mass det. time= 49.8 min (835.5 - 785.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	815.70'	9,696 cf	**65.75'W x 106.08'L x 5.50'H Field A** 38,361 cf Overall - 14,122 cf Embedded = 24,239 cf x 40.0% Voids
#2A	816.45'	14,122 cf	**ADS_StormTech MC-3500 d +Cap** x 126 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 9 Rows of 14 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		23,818 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Secondary	815.70'	**0.80 cfs Exfiltration at all elevations**
#2	Primary	817.70'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	818.45'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	819.25'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=815.70' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.80 cfs @ 11.65 hrs HW=815.77' (Free Discharge)
- **1=Exfiltration** (Exfiltration Controls 0.80 cfs)

Pond 14P: Underground Storage - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

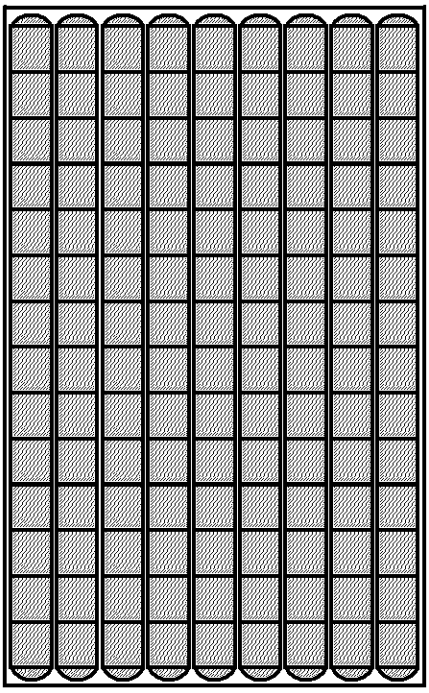
14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length
9 Rows x 77.0" Wide + 9.0" Spacing x 8 + 12.0" Side Stone x 2 = 65.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

126 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 9 Rows = 14,122.1 cf Chamber Storage

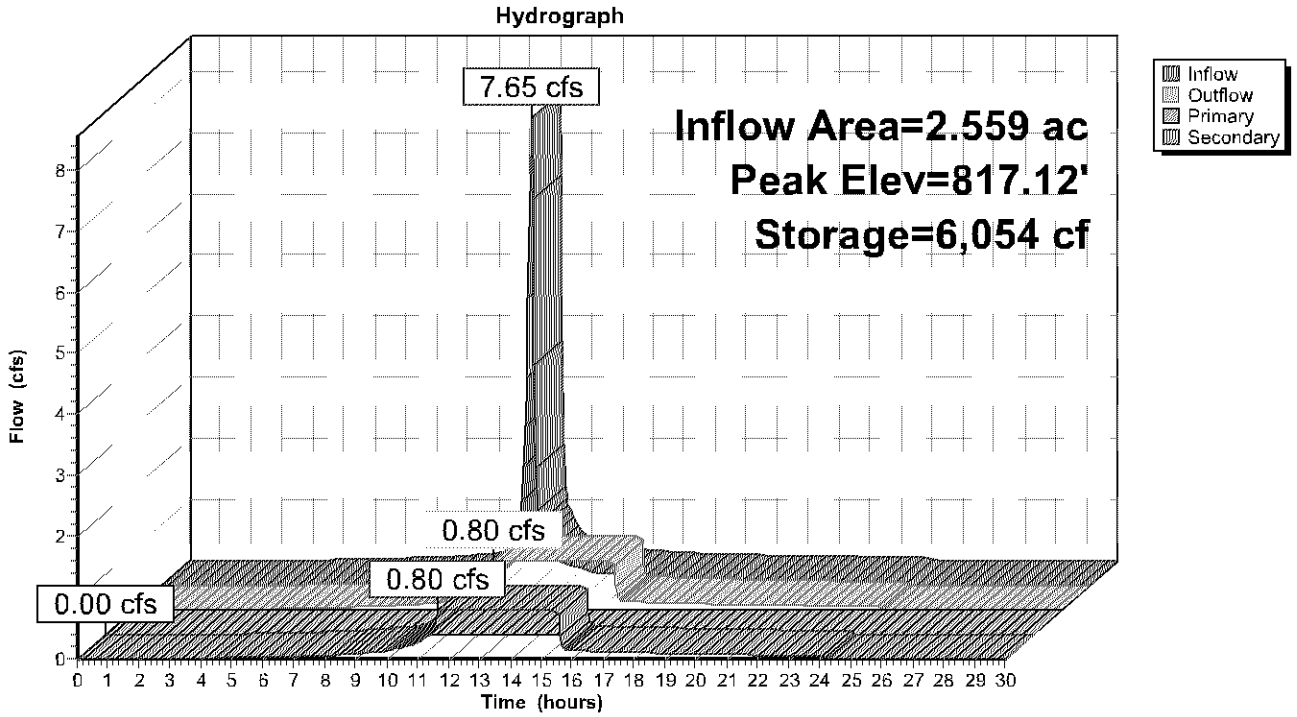
38,361.2 cf Field - 14,122.1 cf Chambers = 24,239.0 cf Stone x 40.0% Voids = 9,695.6 cf Stone Storage

Chamber Storage + Stone Storage = 23,817.8 cf = 0.547 af
Overall Storage Efficiency = 62.1%

126 Chambers
1,420.8 cy Field
897.7 cy Stone



Pond 14P: Underground Storage

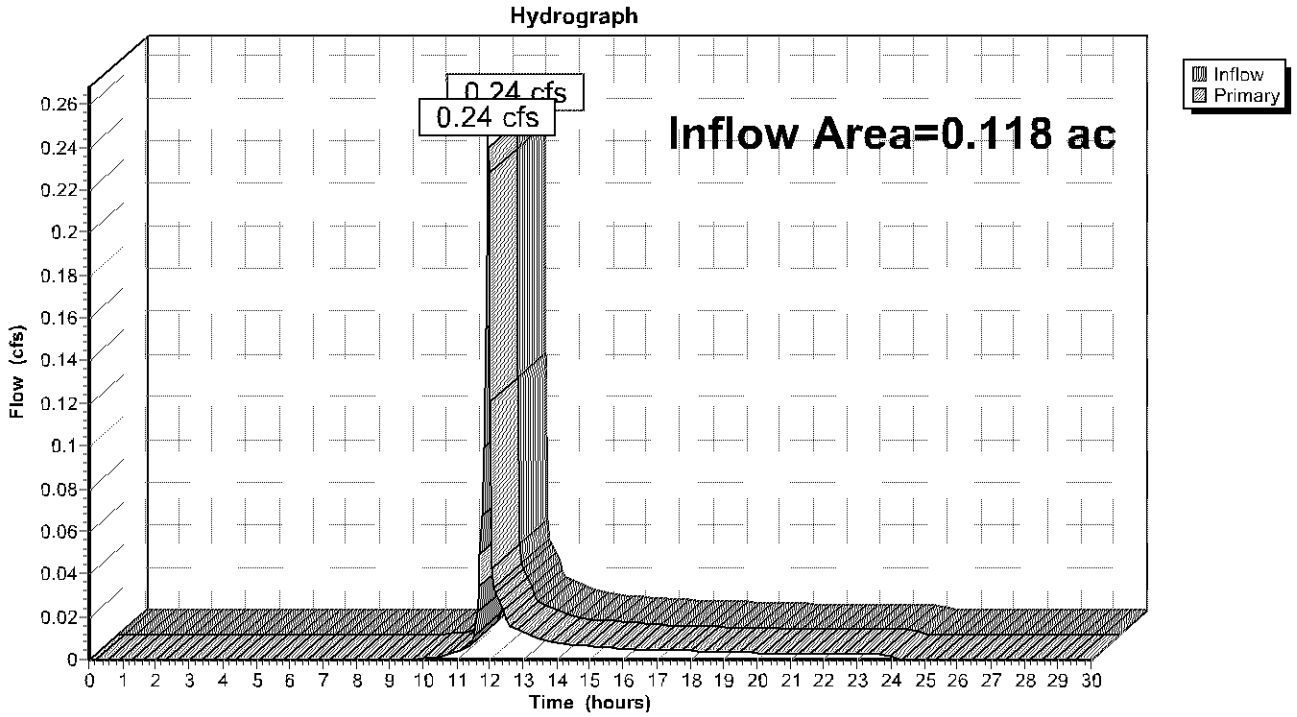


Summary for Link 11L: Discharge to 13th Ave (south)

Inflow Area = 0.118 ac, 40.99% Impervious, Inflow Depth = 1.04" for 1-yr (99%) event
Inflow = 0.24 cfs @ 11.93 hrs, Volume= 0.010 af
Primary = 0.24 cfs @ 11.93 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 11L: Discharge to 13th Ave (south)

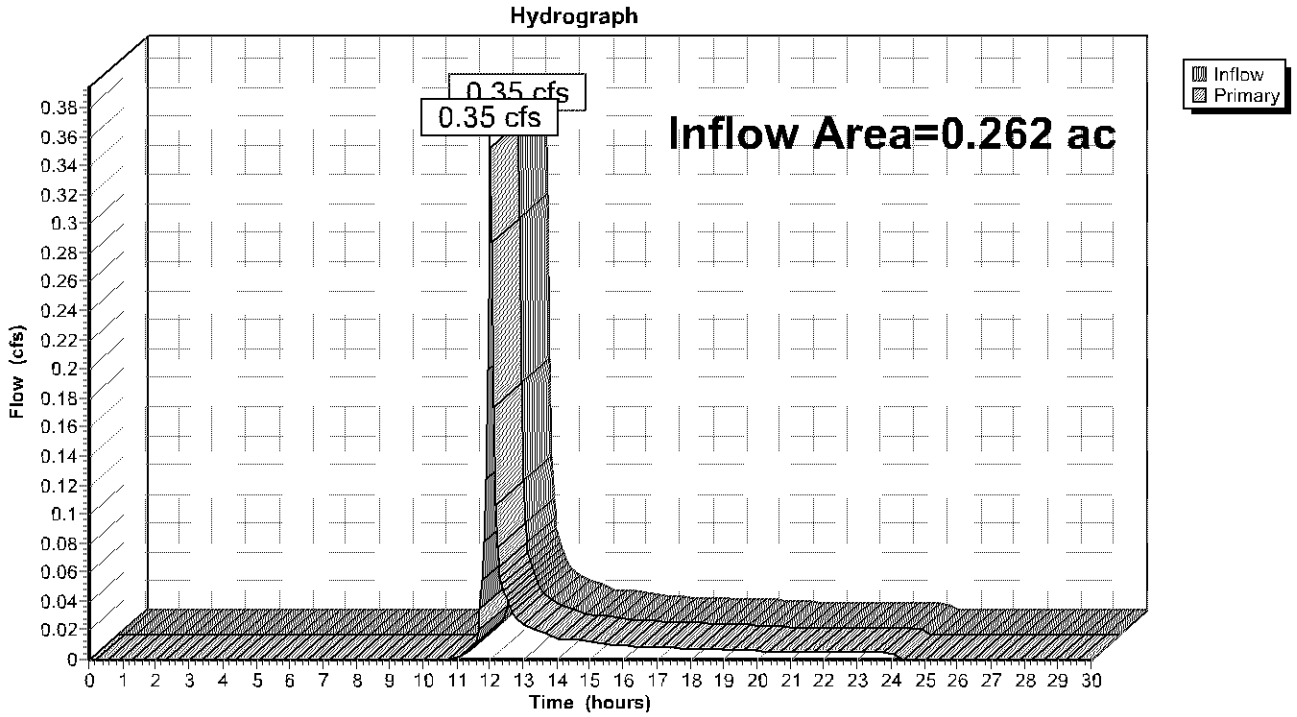


Summary for Link 12L: Discharge to 12th Ave (west)

Inflow Area = 0.262 ac, 23.00% Impervious, Inflow Depth = 0.82" for 1-yr (99%) event
Inflow = 0.35 cfs @ 12.00 hrs, Volume= 0.018 af
Primary = 0.35 cfs @ 12.00 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 12L: Discharge to 12th Ave (west)

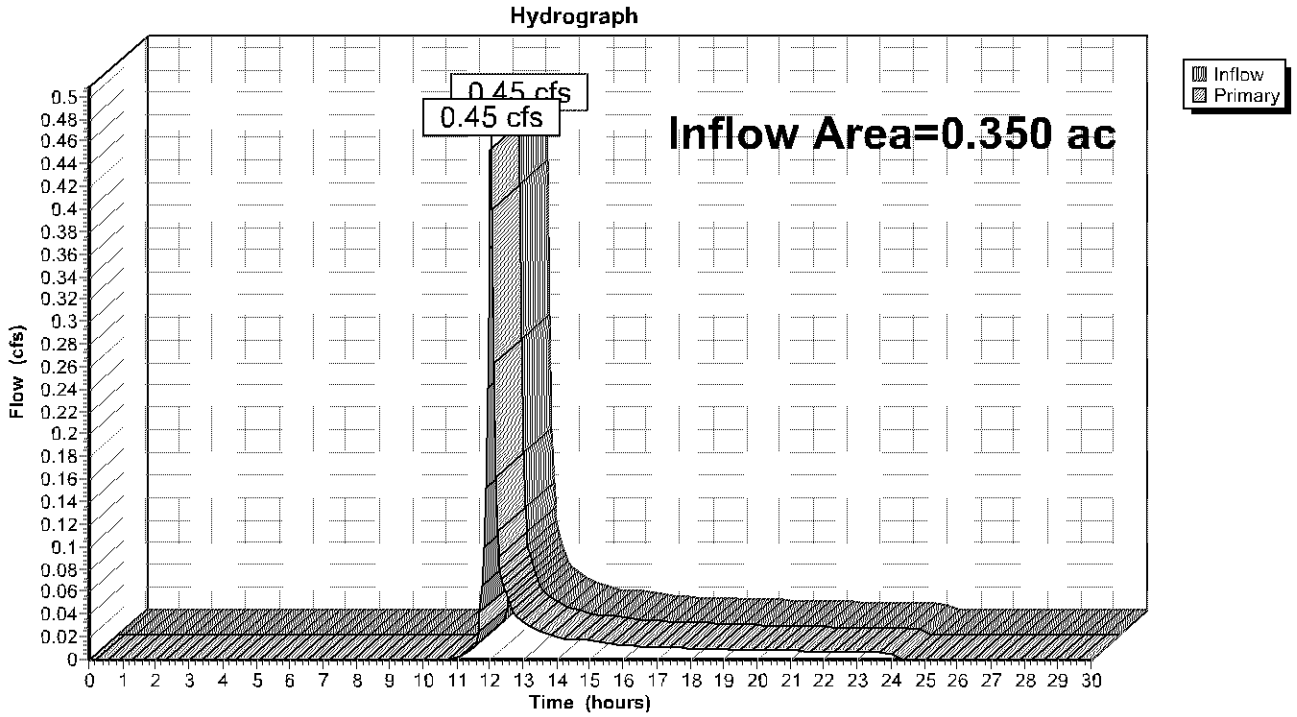


Summary for Link 13L: Discharge to 78th Street (north)

Inflow Area = 0.350 ac, 25.00% Impervious, Inflow Depth = 0.82" for 1-yr (99%) event
Inflow = 0.45 cfs @ 12.01 hrs, Volume= 0.024 af
Primary = 0.45 cfs @ 12.01 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 13L: Discharge to 78th Street (north)

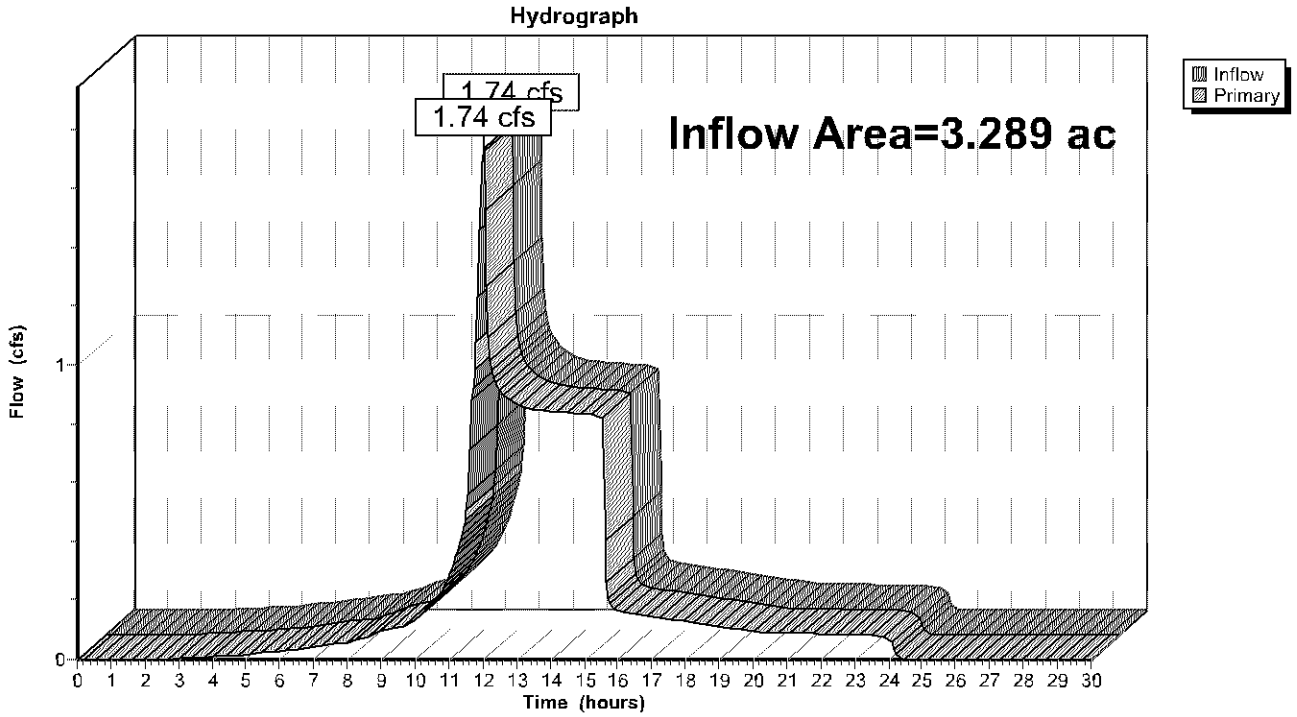


Summary for Link 22L: Ultimate Discharge

Inflow Area = 3.289 ac, 72.93% Impervious, Inflow Depth = 1.62" for 1-yr (99%) event
Inflow = 1.74 cfs @ 11.98 hrs, Volume= 0.443 af
Primary = 1.74 cfs @ 11.98 hrs, Volume= 0.443 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 22L: Ultimate Discharge

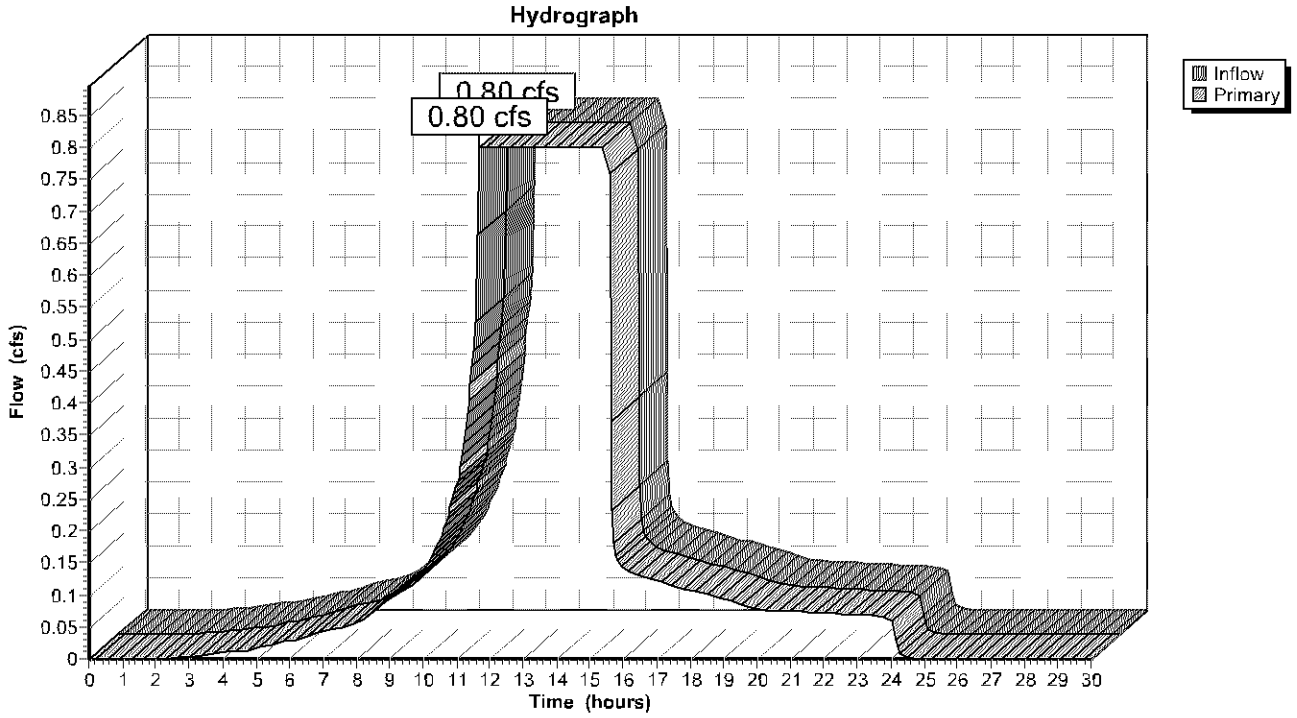


Summary for Link 23L: Infiltration

Inflow = 0.80 cfs @ 11.65 hrs, Volume= 0.391 af
Primary = 0.80 cfs @ 11.65 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 23L: Infiltration



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WS#1 (Roof) Runoff Area=19,588 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=205' Slope=0.0100 '/' Tc=4.2 min CN=98 Runoff=2.79 cfs 0.149 af

Subcatchment 2S: WS#2 (Porte Cochere) Runoff Area=1,114 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=47' Slope=0.0100 '/' Tc=1.3 min CN=98 Runoff=0.17 cfs 0.008 af

Subcatchment 3S: WS#3 Runoff Area=25,775 sf 85.00% Impervious Runoff Depth=3.52"
Flow Length=169' Slope=0.0135 '/' Tc=3.9 min CN=94 Runoff=3.53 cfs 0.174 af

Subcatchment 4S: WS#4 Runoff Area=15,447 sf 68.00% Impervious Runoff Depth=3.11"
Flow Length=128' Slope=0.0211 '/' Tc=3.0 min CN=90 Runoff=1.99 cfs 0.092 af

Subcatchment 5S: WS#5 Runoff Area=26,661 sf 92.00% Impervious Runoff Depth=3.74"
Flow Length=149' Slope=0.0122 '/' Tc=3.3 min CN=96 Runoff=3.80 cfs 0.191 af

Subcatchment 6S: WS#6 Runoff Area=16,410 sf 78.00% Impervious Runoff Depth=3.41"
Flow Length=172' Slope=0.0158 '/' Tc=3.8 min CN=93 Runoff=2.21 cfs 0.107 af

Subcatchment 7S: WS#7 Runoff Area=6,468 sf 85.00% Impervious Runoff Depth=3.52"
Flow Length=81' Slope=0.0145 '/' Tc=2.1 min CN=94 Runoff=0.89 cfs 0.044 af

Subcatchment 8S: WS#8 Runoff Area=15,232 sf 25.00% Impervious Runoff Depth=2.21"
Flow Length=275' Slope=0.0179 '/' Tc=8.5 min CN=80 Runoff=1.24 cfs 0.064 af

Subcatchment 9S: WS#9 Runoff Area=11,425 sf 23.00% Impervious Runoff Depth=2.21"
Flow Length=277' Slope=0.0216 '/' Tc=7.7 min CN=80 Runoff=0.96 cfs 0.048 af

Subcatchment 10S: WS#10 Runoff Area=5,140 sf 40.99% Impervious Runoff Depth=2.55"
Flow Length=80' Slope=0.0320 '/' Tc=2.1 min CN=84 Runoff=0.56 cfs 0.025 af

Reach 15R: CB #1 Avg. Flow Depth=1.04' Max Vel=4.70 fps Inflow=6.33 cfs 0.331 af
18.0" Round Pipe n=0.013 L=236.0' S=0.0050 '/' Capacity=7.43 cfs Outflow=5.94 cfs 0.331 af

Reach 16R: Roof Drains Avg. Flow Depth=0.68' Max Vel=5.05 fps Inflow=2.93 cfs 0.157 af
12.0" Round Pipe n=0.013 L=154.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=2.82 cfs 0.157 af

Reach 17R: CB #2 Avg. Flow Depth=0.66' Max Vel=3.55 fps Inflow=1.99 cfs 0.092 af
12.0" Round Pipe n=0.013 L=159.0' S=0.0050 '/' Capacity=2.53 cfs Outflow=1.88 cfs 0.092 af

Reach 18R: CB #3 Avg. Flow Depth=1.25' Max Vel=5.54 fps Inflow=11.47 cfs 0.613 af
24.0" Round Pipe n=0.013 L=10.0' S=0.0050 '/' Capacity=16.00 cfs Outflow=11.45 cfs 0.613 af

Reach 19R: CB #4 Avg. Flow Depth=0.28' Max Vel=4.80 fps Inflow=0.89 cfs 0.044 af
12.0" Round Pipe n=0.013 L=64.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=0.88 cfs 0.044 af

Reach 20R: CB #5 Avg. Flow Depth=0.57' Max Vel=6.71 fps Inflow=3.09 cfs 0.151 af
12.0" Round Pipe n=0.013 L=28.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=3.08 cfs 0.151 af

Reach 21R: Pipe to 60" Ex Avg. Flow Depth=0.24' Max Vel=3.39 fps Inflow=0.60 cfs 0.065 af
18.0" Round Pipe n=0.013 L=33.0' S=0.0115 '/' Capacity=11.27 cfs Outflow=0.60 cfs 0.065 af

Pond 14P: Underground Storage Peak Elev=818.35' Storage=13,020 cf Inflow=14.50 cfs 0.764 af
Primary=0.60 cfs 0.065 af Secondary=0.80 cfs 0.699 af Outflow=1.40 cfs 0.764 af

Link 11L: Discharge to 13th Ave (south) Inflow=0.56 cfs 0.025 af
Primary=0.56 cfs 0.025 af

Link 12L: Discharge to 12th Ave (west) Inflow=0.96 cfs 0.048 af
Primary=0.96 cfs 0.048 af

Link 13L: Discharge to 78th Street (north) Inflow=1.24 cfs 0.064 af
Primary=1.24 cfs 0.064 af

Link 22L: Ultimate Discharge Inflow=3.34 cfs 0.902 af
Primary=3.34 cfs 0.902 af

Link 23L: Infiltration Inflow=0.80 cfs 0.699 af
Primary=0.80 cfs 0.699 af

Total Runoff Area = 3.289 ac Runoff Volume = 0.902 af Average Runoff Depth = 3.29"
27.07% Pervious = 0.890 ac 72.93% Impervious = 2.399 ac

Summary for Subcatchment 1S: WS#1 (Roof)

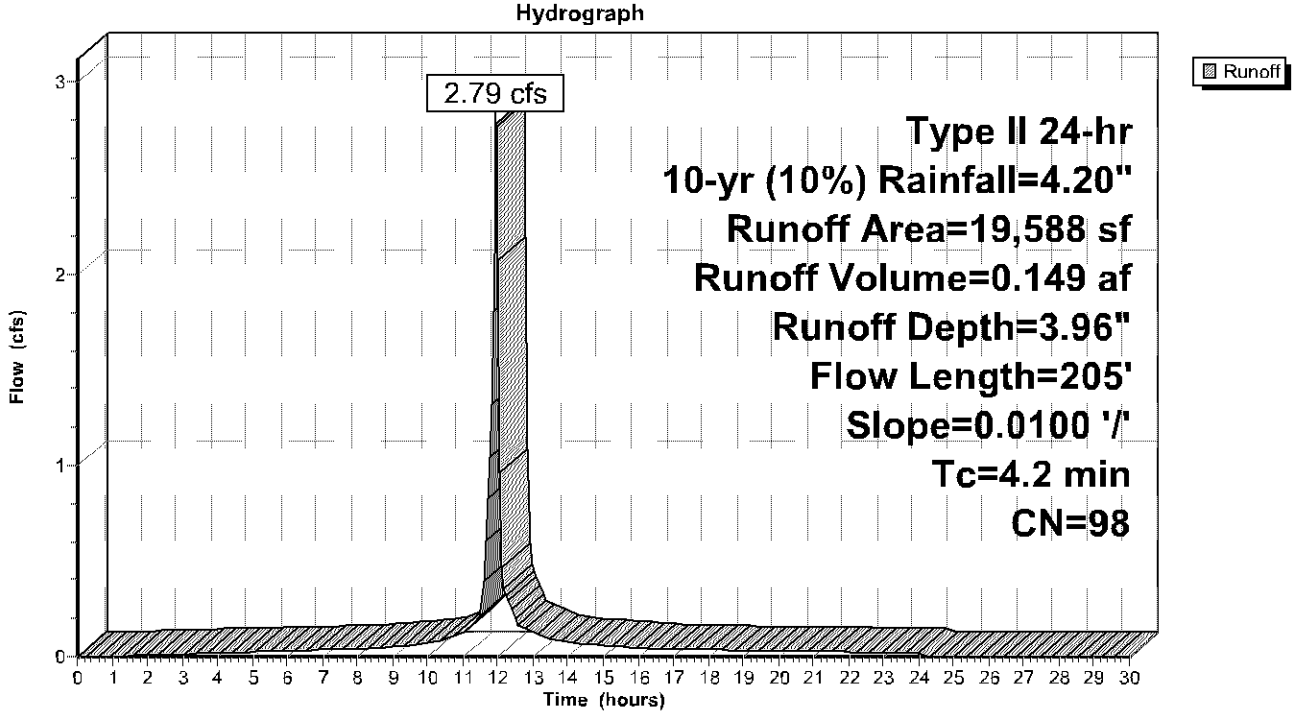
Runoff = 2.79 cfs @ 11.94 hrs, Volume= 0.149 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	19,588	98	
	19,588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	205	0.0100	0.81		**Lag/CN Method,**

Subcatchment 1S: WS#1 (Roof)



Summary for Subcatchment 2S: WS#2 (Porte Cochere)

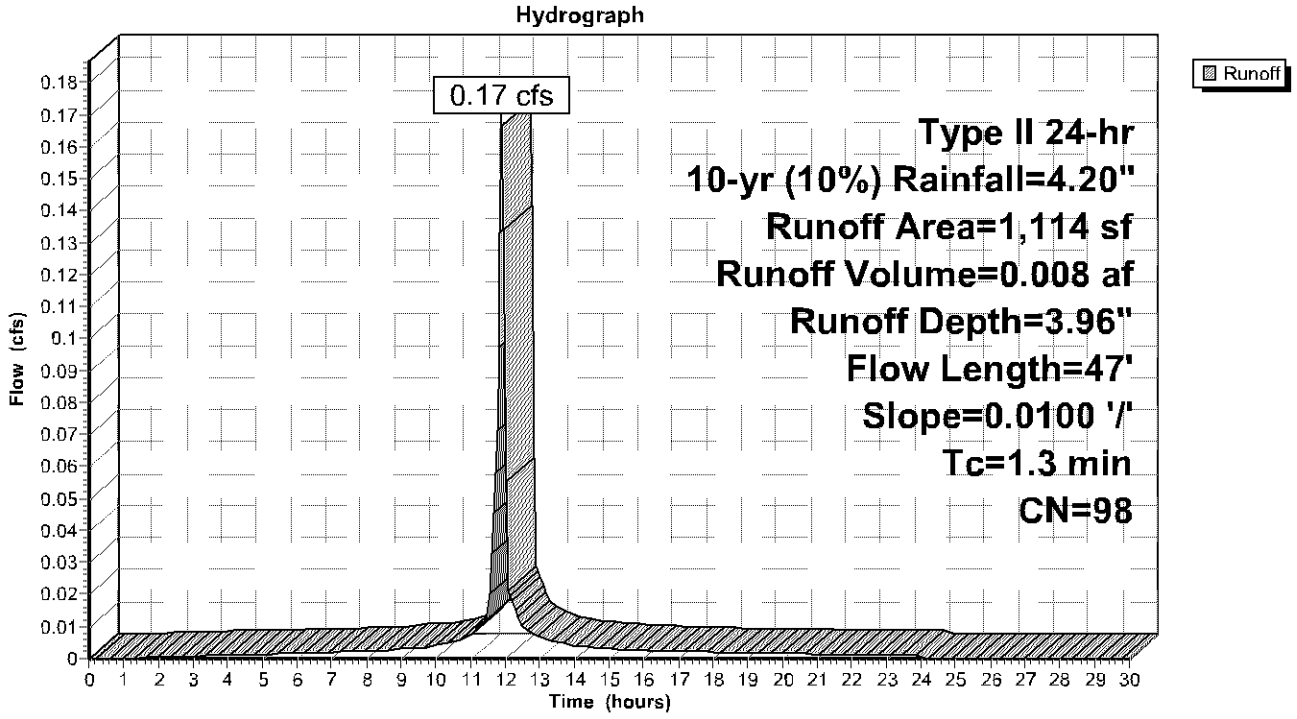
Runoff = 0.17 cfs @ 11.90 hrs, Volume= 0.008 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	1,114	98	
	1,114		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	47	0.0100	0.60		**Lag/CN Method,**

Subcatchment 2S: WS#2 (Porte Cochere)



Summary for Subcatchment 3S: WS#3

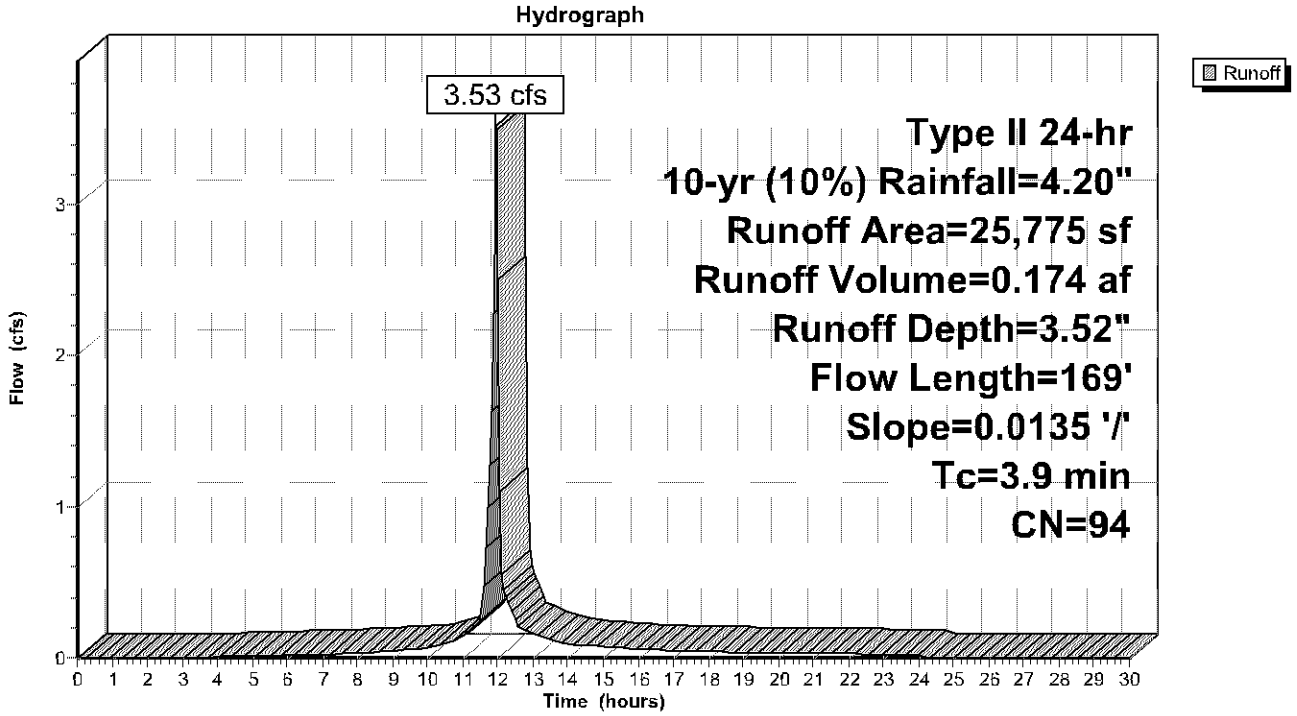
Runoff = 3.53 cfs @ 11.94 hrs, Volume= 0.174 af, Depth= 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	21,909	98	
*	3,866	74	
	25,775	94	Weighted Average
	3,866		15.00% Pervious Area
	21,909		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	169	0.0135	0.73		**Lag/CN Method,**

Subcatchment 3S: WS#3



Summary for Subcatchment 4S: WS#4

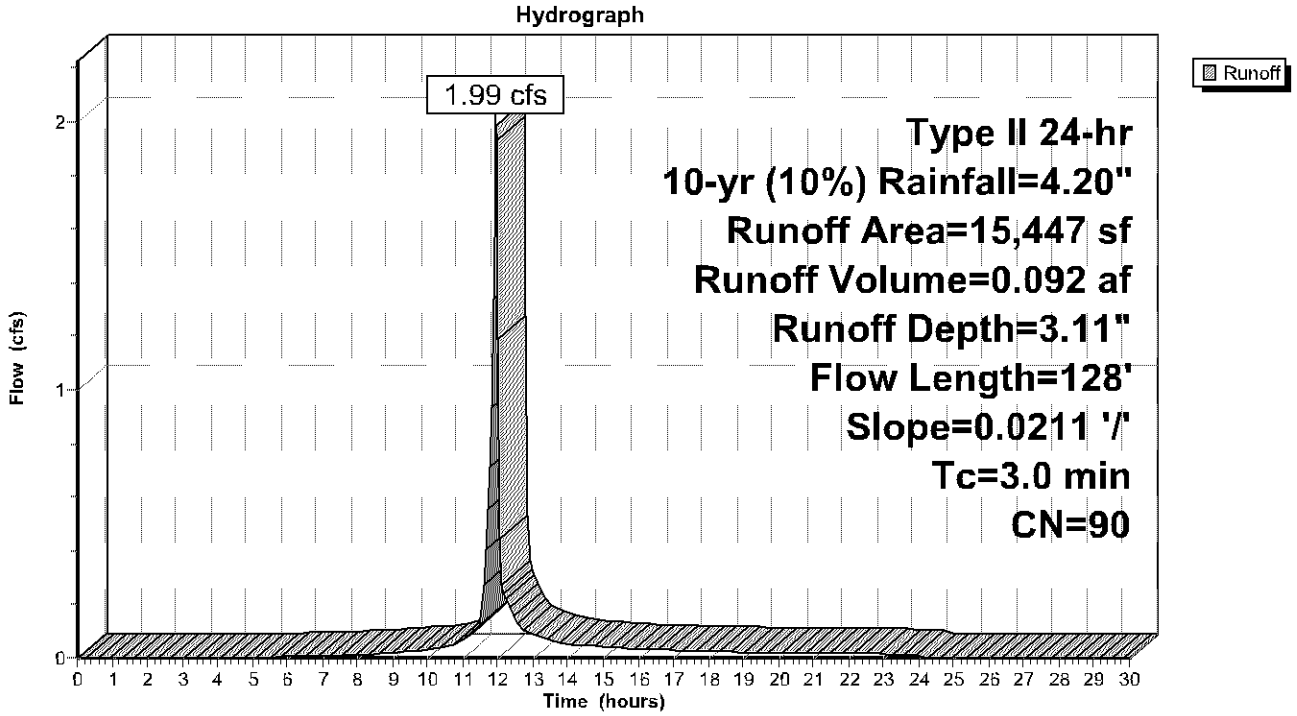
Runoff = 1.99 cfs @ 11.93 hrs, Volume= 0.092 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	10,504	98	
*	4,943	74	
	15,447	90	Weighted Average
	4,943		32.00% Pervious Area
	10,504		68.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	128	0.0211	0.72		**Lag/CN Method,**

Subcatchment 4S: WS#4



Summary for Subcatchment 5S: WS#5

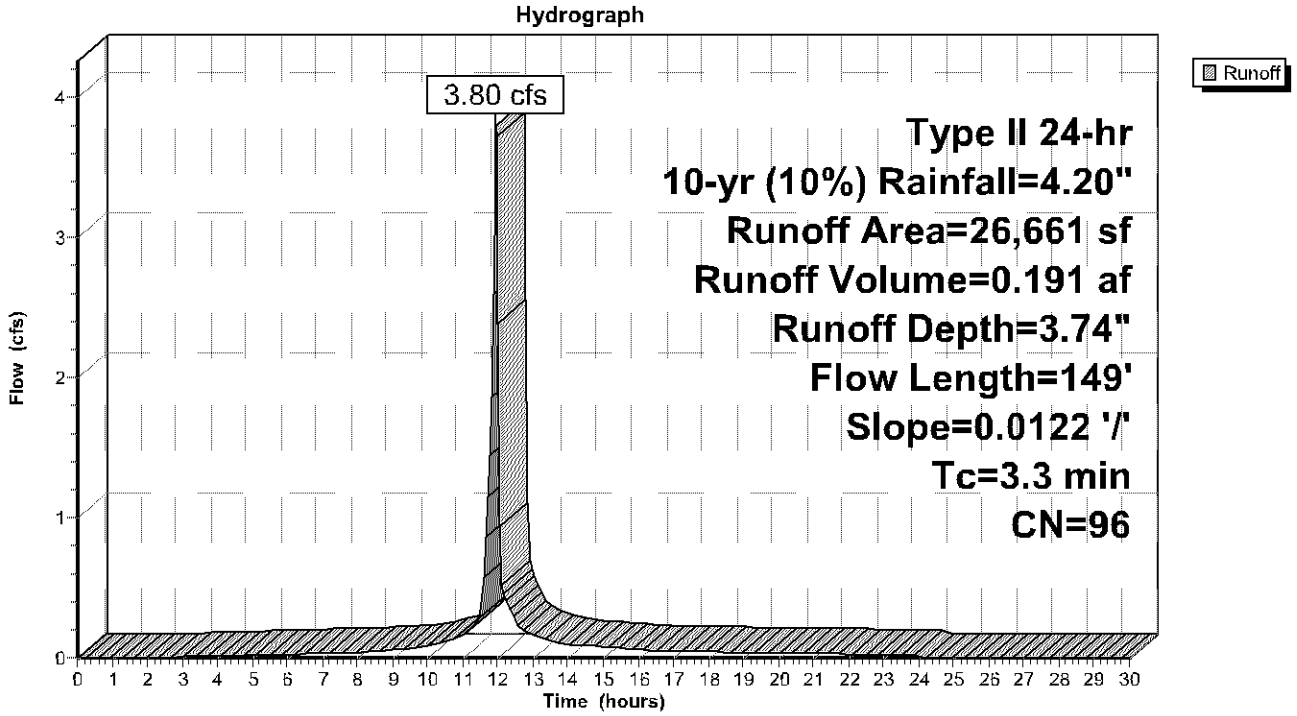
Runoff = 3.80 cfs @ 11.93 hrs, Volume= 0.191 af, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	24,528	98	
*	2,133	74	
	26,661	96	Weighted Average
	2,133		8.00% Pervious Area
	24,528		92.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	149	0.0122	0.75		**Lag/CN Method,**

Subcatchment 5S: WS#5



Summary for Subcatchment 6S: WS#6

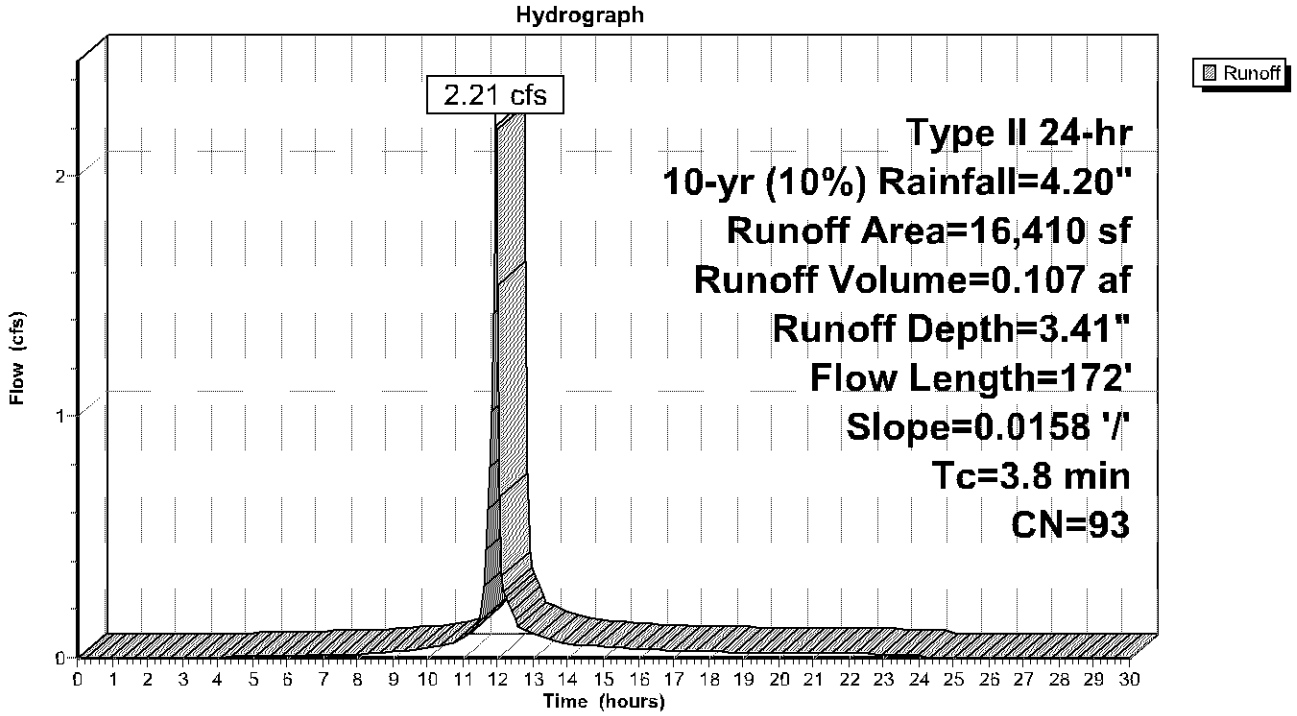
Runoff = 2.21 cfs @ 11.94 hrs, Volume= 0.107 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	12,800	98	
*	3,610	74	
	16,410	93	Weighted Average
	3,610		22.00% Pervious Area
	12,800		78.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	172	0.0158	0.75		**Lag/CN Method,**

Subcatchment 6S: WS#6



Summary for Subcatchment 7S: WS#7

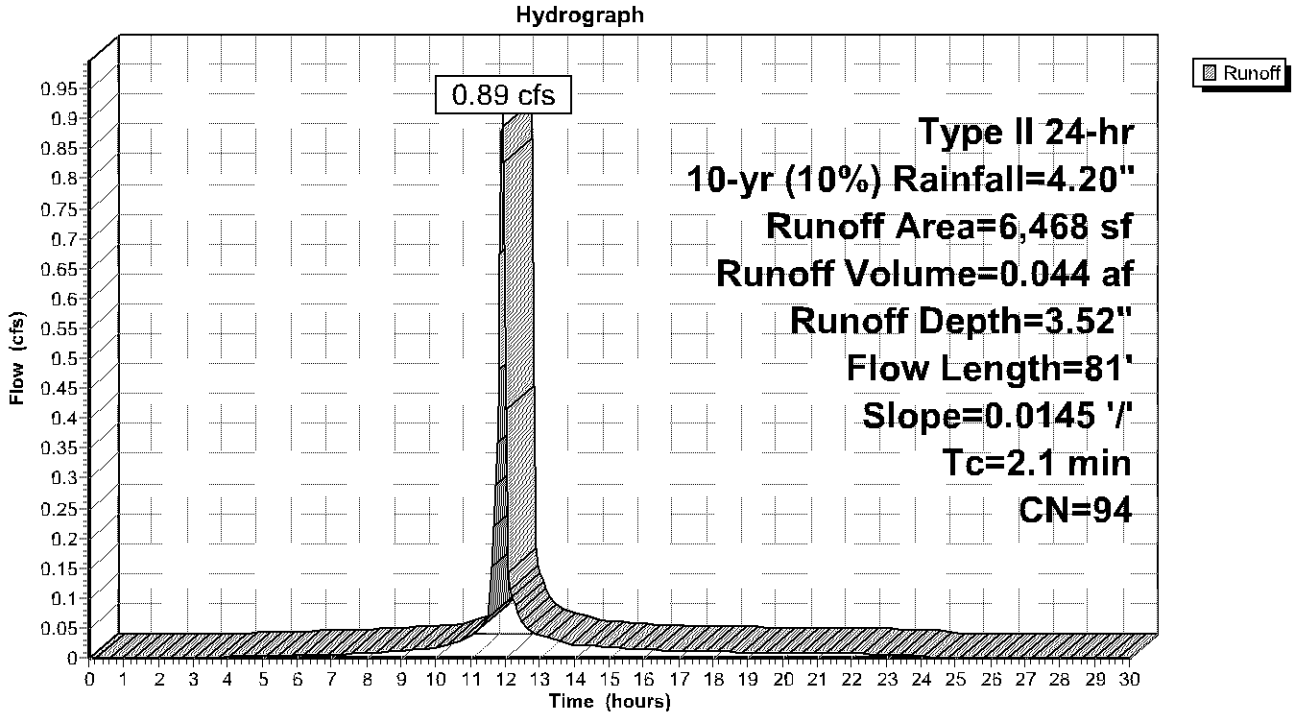
Runoff = 0.89 cfs @ 11.91 hrs, Volume= 0.044 af, Depth= 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	5,498	98	
*	970	74	
	6,468	94	Weighted Average
	970		15.00% Pervious Area
	5,498		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	81	0.0145	0.65		**Lag/CN Method,**

Subcatchment 7S: WS#7



Summary for Subcatchment 8S: WS#8

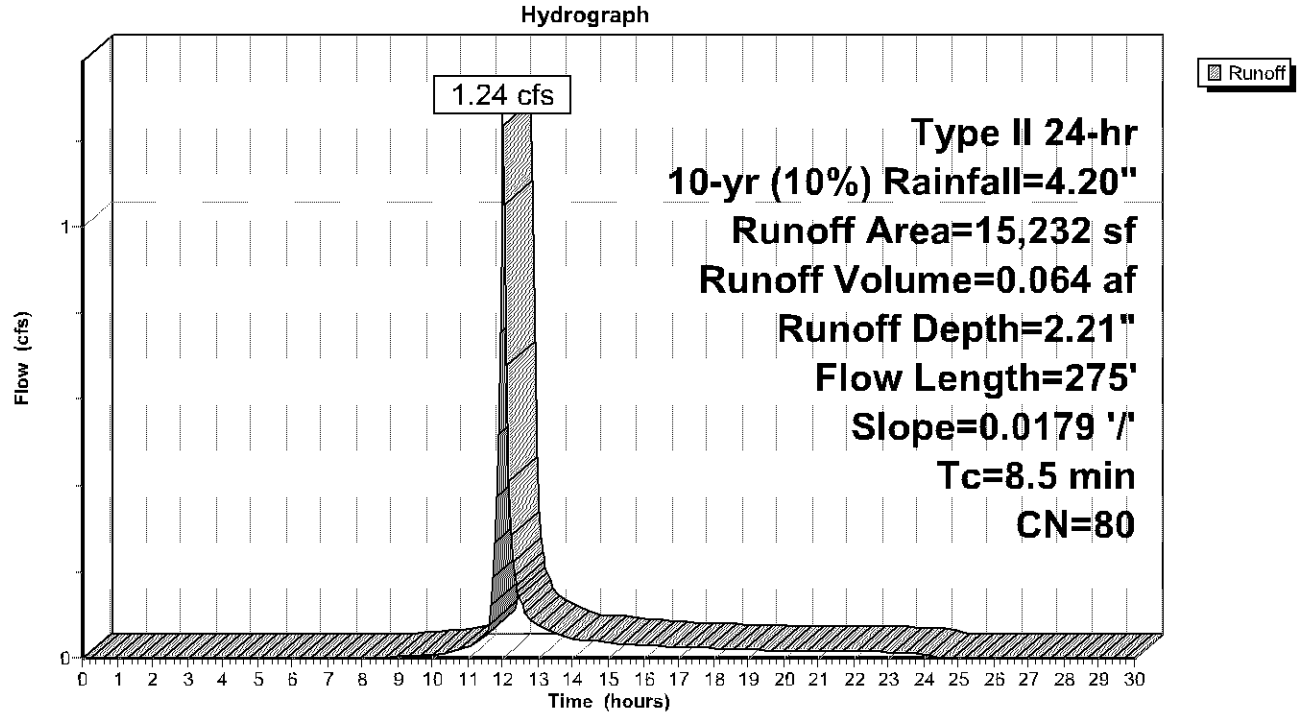
Runoff = 1.24 cfs @ 12.00 hrs, Volume= 0.064 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	3,808	98	
*	11,424	74	
	15,232	80	Weighted Average
	11,424		75.00% Pervious Area
	3,808		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	275	0.0179	0.54		**Lag/CN Method,**

Subcatchment 8S: WS#8



Summary for Subcatchment 9S: WS#9

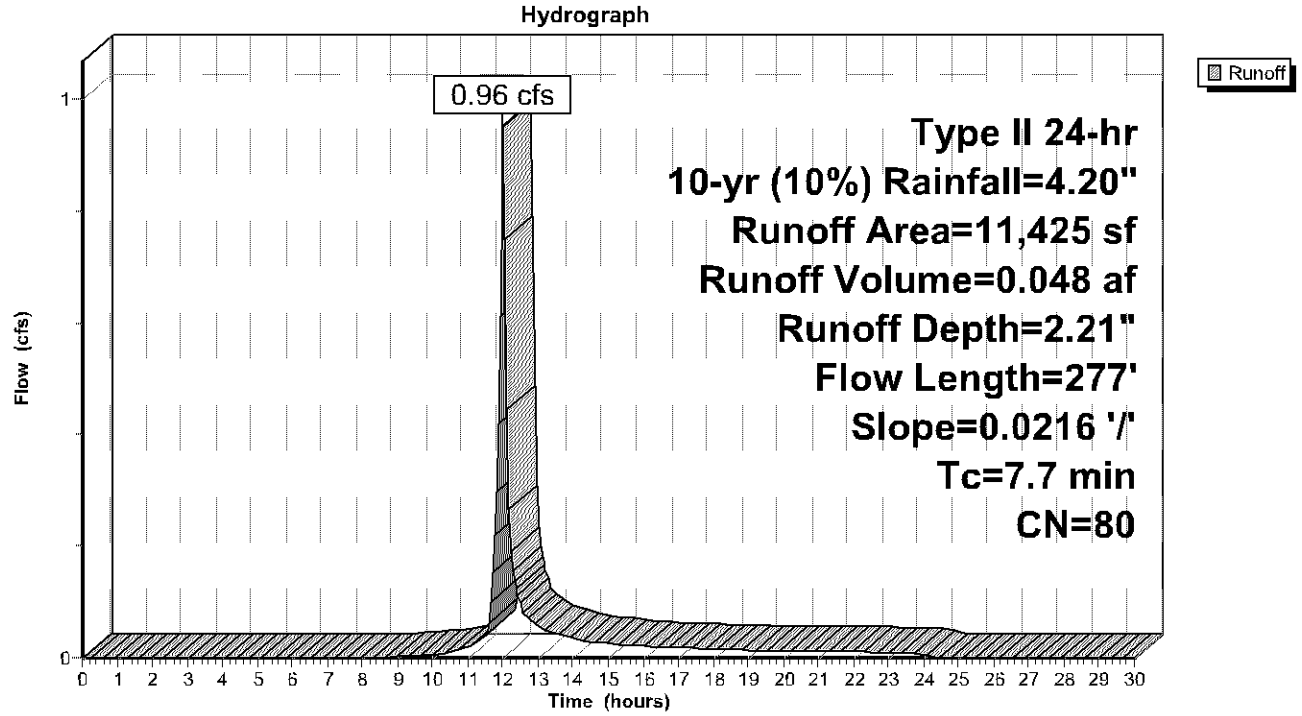
Runoff = 0.96 cfs @ 11.99 hrs, Volume= 0.048 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	2,628	98	
*	8,797	74	
	11,425	80	Weighted Average
	8,797		77.00% Pervious Area
	2,628		23.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	277	0.0216	0.60		**Lag/CN Method,**

Subcatchment 9S: WS#9



Summary for Subcatchment 10S: WS#10

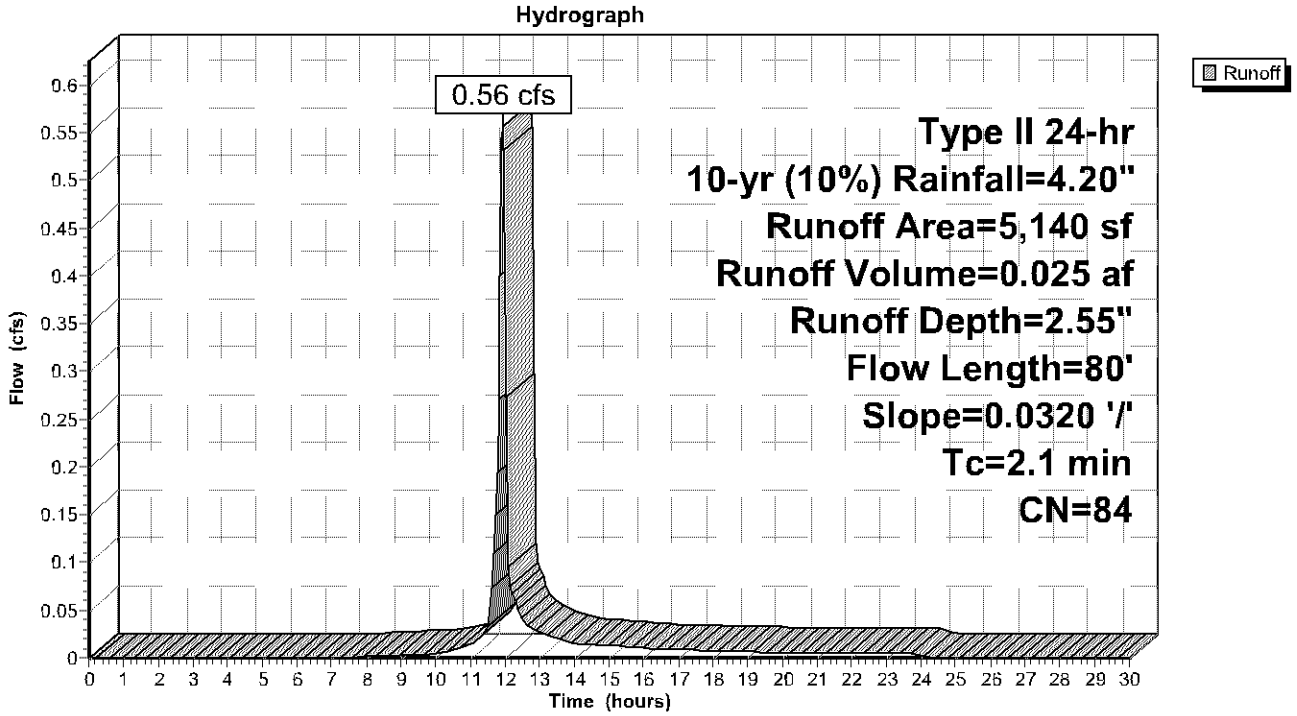
Runoff = 0.56 cfs @ 11.92 hrs, Volume= 0.025 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr (10%) Rainfall=4.20"

	Area (sf)	CN	Description
*	2,107	98	
*	3,033	74	
	5,140	84	Weighted Average
	3,033		59.01% Pervious Area
	2,107		40.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	80	0.0320	0.65		**Lag/CN Method,**

Subcatchment 10S: WS#10



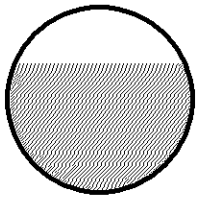
Summary for Reach 15R: CB #1

Inflow Area = 1.067 ac, 91.68% Impervious, Inflow Depth = 3.72" for 10-yr (10%) event
Inflow = 6.33 cfs @ 11.94 hrs, Volume= 0.331 af
Outflow = 5.94 cfs @ 11.97 hrs, Volume= 0.331 af, Atten= 6%, Lag= 1.3 min

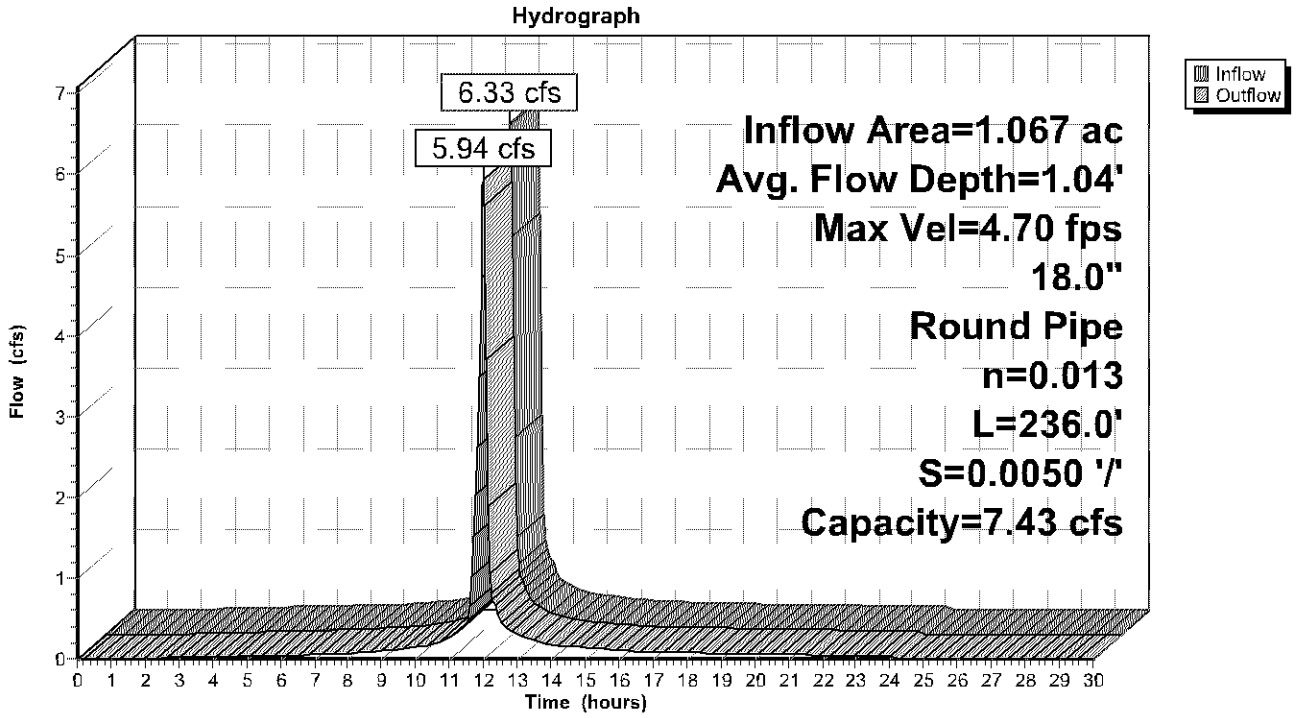
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.70 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 2.8 min

Peak Storage= 310 cf @ 11.95 hrs
Average Depth at Peak Storage= 1.04'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.43 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 236.0' Slope= 0.0050 '/'
Inlet Invert= 819.19', Outlet Invert= 818.01'



Reach 15R: CB #1



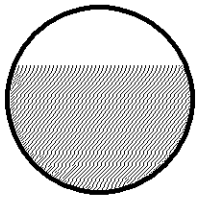
Summary for Reach 16R: Roof Drains

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth = 3.96" for 10-yr (10%) event
Inflow = 2.93 cfs @ 11.94 hrs, Volume= 0.157 af
Outflow = 2.82 cfs @ 11.95 hrs, Volume= 0.157 af, Atten= 4%, Lag= 0.6 min

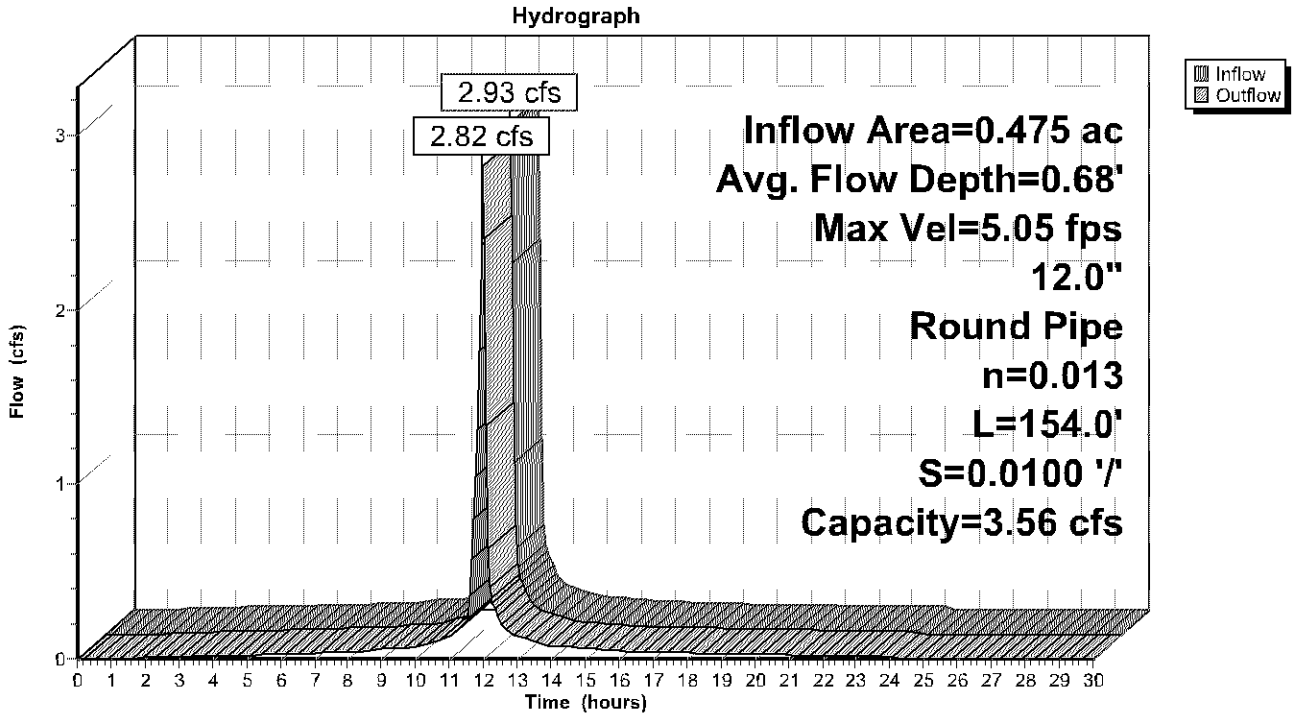
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.05 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.54 fps, Avg. Travel Time= 1.7 min

Peak Storage= 88 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 154.0' Slope= 0.0100 '/'
Inlet Invert= 820.73', Outlet Invert= 819.19'



Reach 16R: Roof Drains



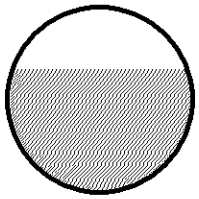
Summary for Reach 17R: CB #2

Inflow Area = 0.355 ac, 68.00% Impervious, Inflow Depth = 3.11" for 10-yr (10%) event
Inflow = 1.99 cfs @ 11.93 hrs, Volume= 0.092 af
Outflow = 1.88 cfs @ 11.95 hrs, Volume= 0.092 af, Atten= 5%, Lag= 0.9 min

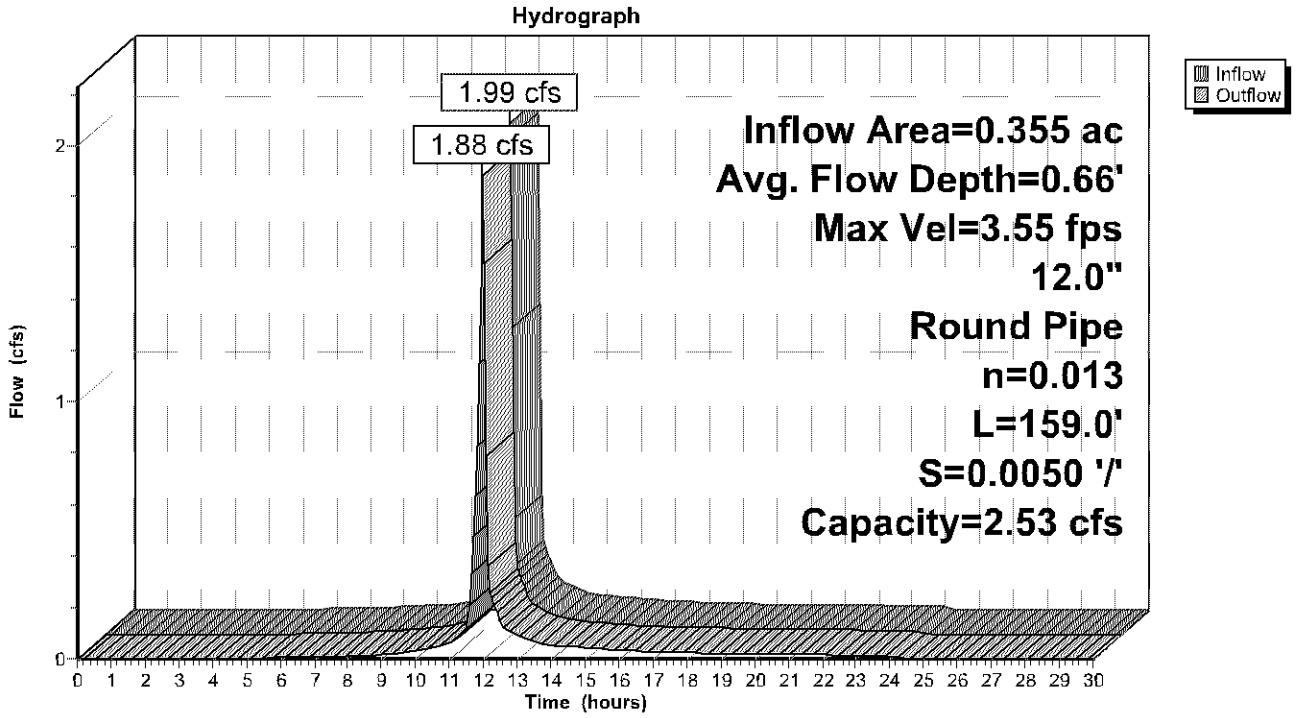
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.55 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 2.5 min

Peak Storage= 87 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.53 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 159.0' Slope= 0.0050 '/'
Inlet Invert= 818.81', Outlet Invert= 818.01'



Reach 17R: CB #2



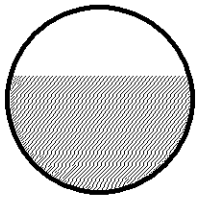
Summary for Reach 18R: CB #3

Inflow Area = 2.034 ac, 87.65% Impervious, Inflow Depth = 3.62" for 10-yr (10%) event
Inflow = 11.47 cfs @ 11.95 hrs, Volume= 0.613 af
Outflow = 11.45 cfs @ 11.95 hrs, Volume= 0.613 af, Atten= 0%, Lag= 0.0 min

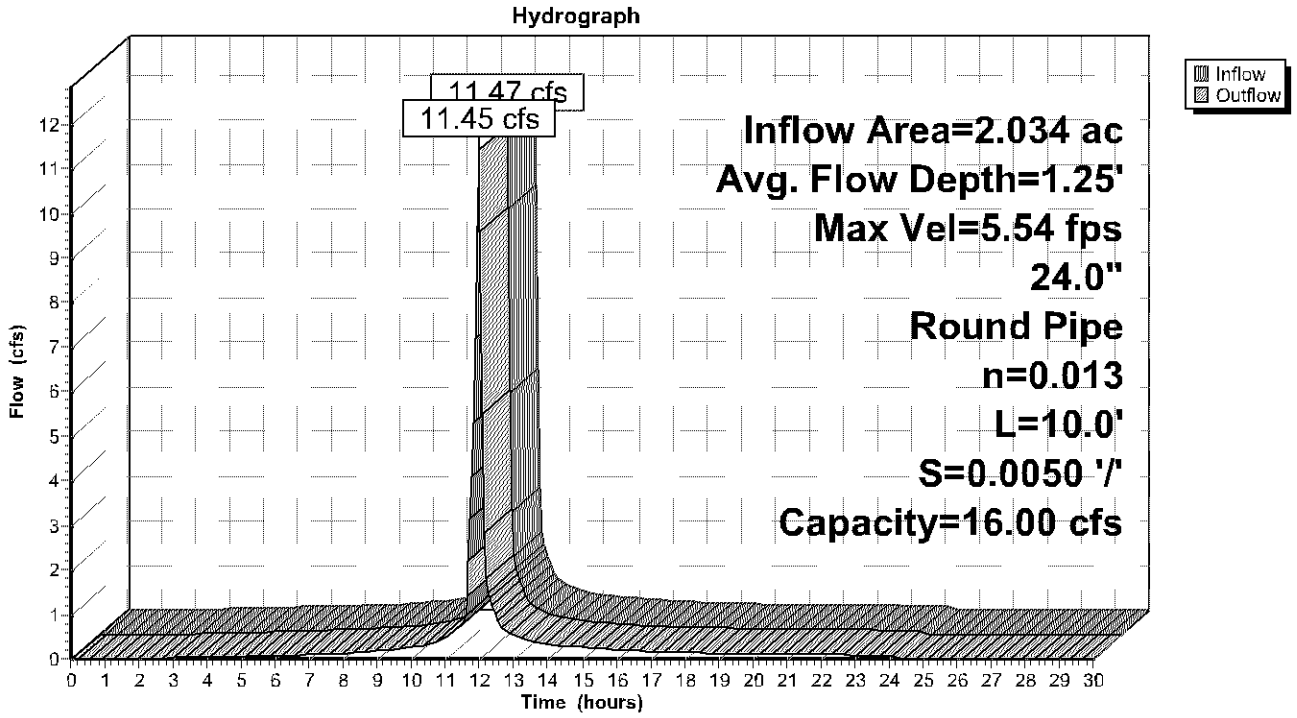
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.54 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 0.1 min

Peak Storage= 21 cf @ 11.95 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 16.00 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 10.0' Slope= 0.0050 '/'
Inlet Invert= 818.01', Outlet Invert= 817.96'



Reach 18R: CB #3



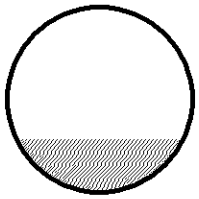
Summary for Reach 19R: CB #4

Inflow Area = 0.148 ac, 85.00% Impervious, Inflow Depth = 3.52" for 10-yr (10%) event
Inflow = 0.89 cfs @ 11.91 hrs, Volume= 0.044 af
Outflow = 0.88 cfs @ 11.92 hrs, Volume= 0.044 af, Atten= 2%, Lag= 0.5 min

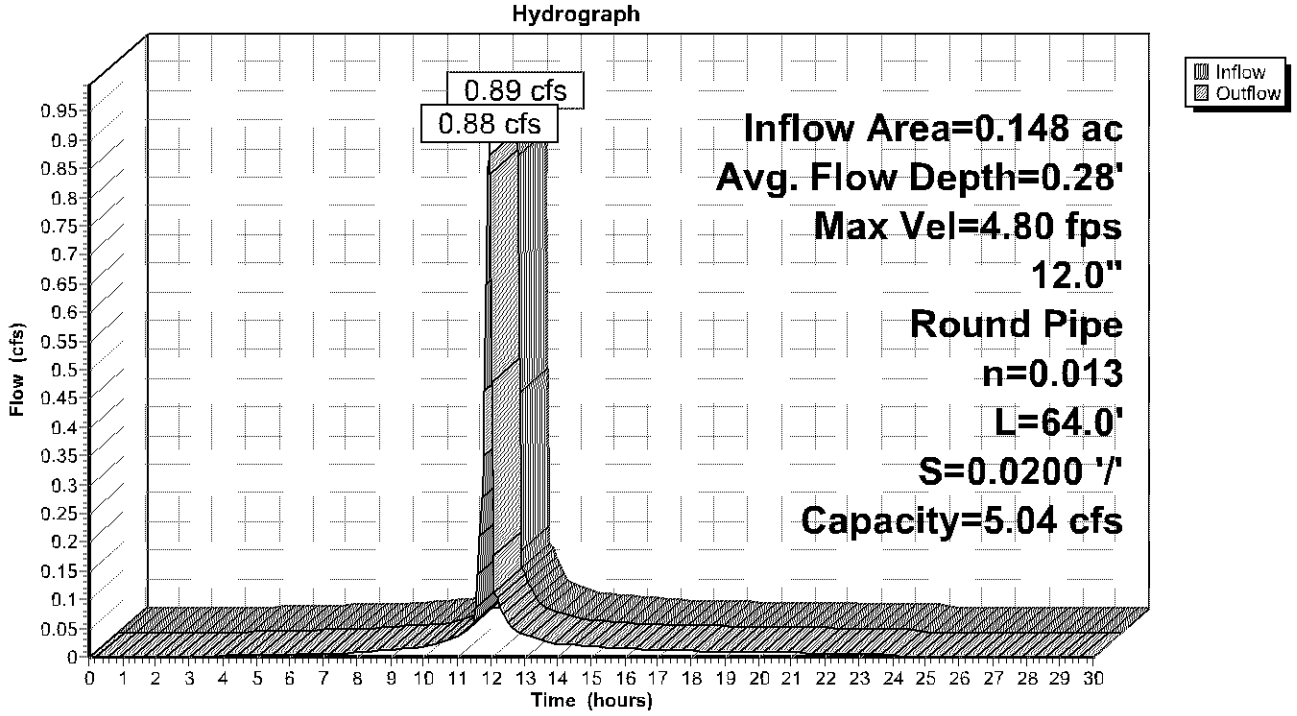
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.80 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 0.8 min

Peak Storage= 12 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 64.0' Slope= 0.0200 '/'
Inlet Invert= 819.80', Outlet Invert= 818.52'



Reach 19R: CB #4



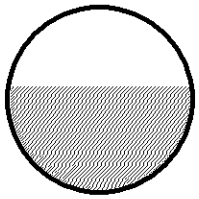
Summary for Reach 20R: CB #5

Inflow Area = 0.525 ac, 79.98% Impervious, Inflow Depth = 3.44" for 10-yr (10%) event
Inflow = 3.09 cfs @ 11.94 hrs, Volume= 0.151 af
Outflow = 3.08 cfs @ 11.94 hrs, Volume= 0.151 af, Atten= 0%, Lag= 0.1 min

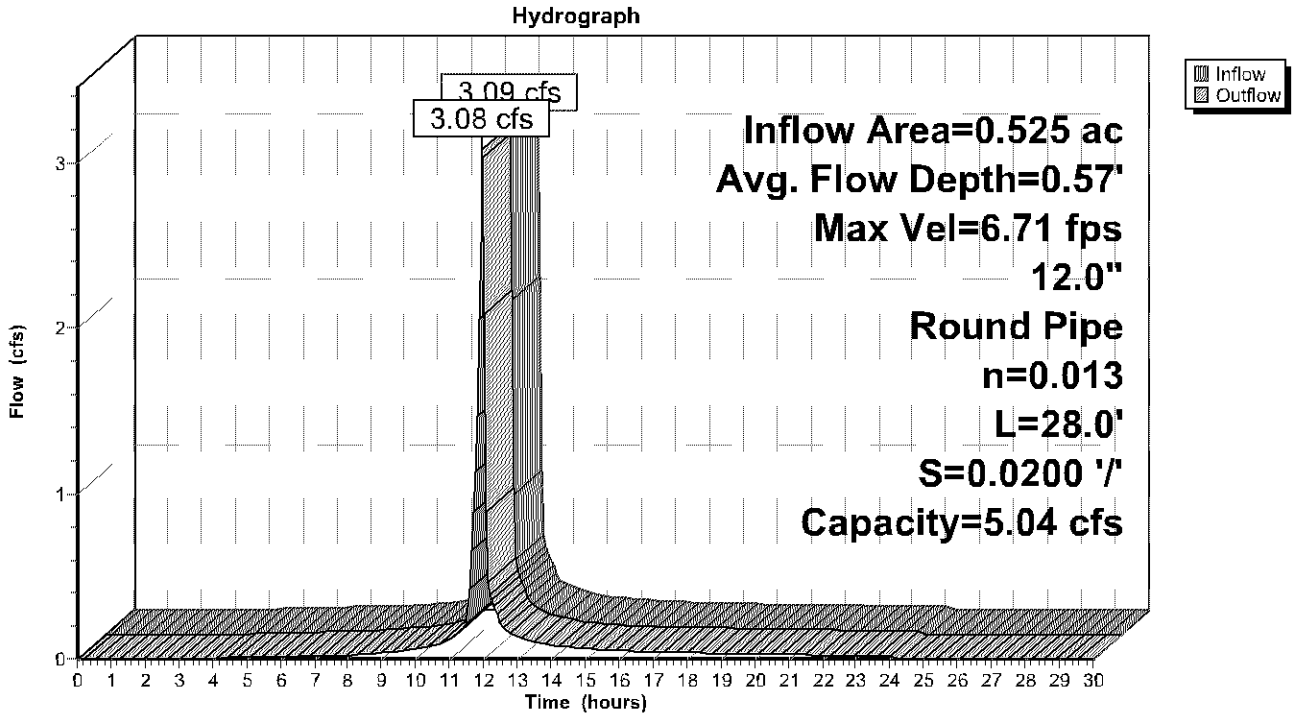
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.71 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.95 fps, Avg. Travel Time= 0.2 min

Peak Storage= 13 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 28.0' Slope= 0.0200 '/'
Inlet Invert= 818.52', Outlet Invert= 817.96'



Reach 20R: CB #5



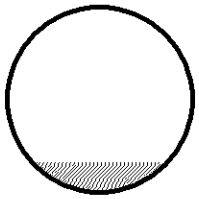
Summary for Reach 21R: Pipe to 60" Ex

Inflow Area = 2.559 ac, 86.07% Impervious, Inflow Depth = 0.30" for 10-yr (10%) event
Inflow = 0.60 cfs @ 12.37 hrs, Volume= 0.065 af
Outflow = 0.60 cfs @ 12.40 hrs, Volume= 0.065 af, Atten= 0%, Lag= 1.4 min

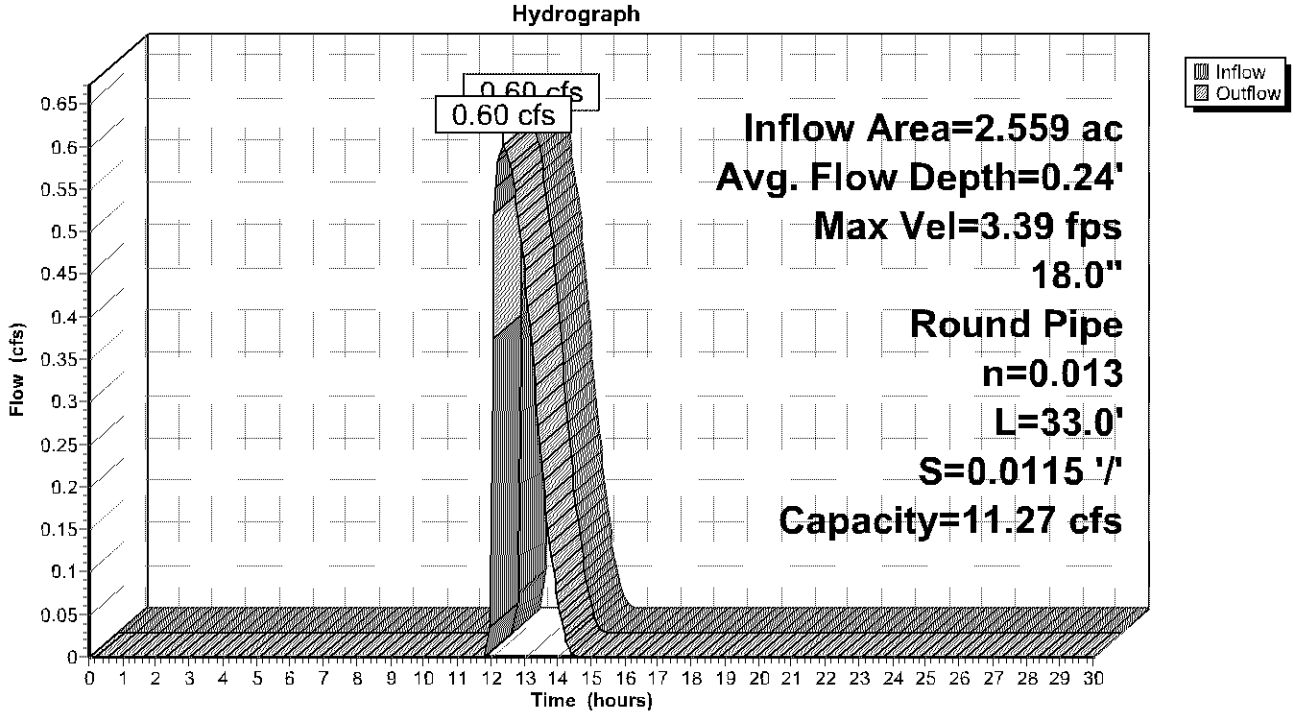
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.39 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.50 fps, Avg. Travel Time= 0.2 min

Peak Storage= 6 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.27 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 33.0' Slope= 0.0115 '/'
Inlet Invert= 814.73', Outlet Invert= 814.35'



Reach 21R: Pipe to 60" Ex



Summary for Pond 14P: Underground Storage

Inflow Area = 2.559 ac, 86.07% Impervious, Inflow Depth = 3.58" for 10-yr (10%) event
Inflow = 14.50 cfs @ 11.95 hrs, Volume= 0.764 af
Outflow = 1.40 cfs @ 12.37 hrs, Volume= 0.764 af, Atten= 90%, Lag= 25.7 min
Primary = 0.60 cfs @ 12.37 hrs, Volume= 0.065 af
Secondary = 0.80 cfs @ 11.30 hrs, Volume= 0.699 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 818.35' @ 12.37 hrs Surf.Area= 6,975 sf Storage= 13,020 cf

Plug-Flow detention time= 97.3 min calculated for 0.763 af (100% of inflow)
Center-of-Mass det. time= 97.1 min (866.1 - 769.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	815.70'	9,696 cf	**65.75'W x 106.08'L x 5.50'H Field A** 38,361 cf Overall - 14,122 cf Embedded = 24,239 cf x 40.0% Voids
#2A	816.45'	14,122 cf	**ADS_StormTech MC-3500 d +Cap** x 126 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 9 Rows of 14 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		23,818 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Secondary	815.70'	**0.80 cfs Exfiltration at all elevations**
#2	Primary	817.70'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	818.45'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	819.25'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=0.60 cfs @ 12.37 hrs HW=818.35' (Free Discharge)
- **2=Orifice/Grate** (Orifice Controls 0.60 cfs @ 3.05 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.80 cfs @ 11.30 hrs HW=815.76' (Free Discharge)
- **1=Exfiltration** (Exfiltration Controls 0.80 cfs)

Pond 14P: Underground Storage - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

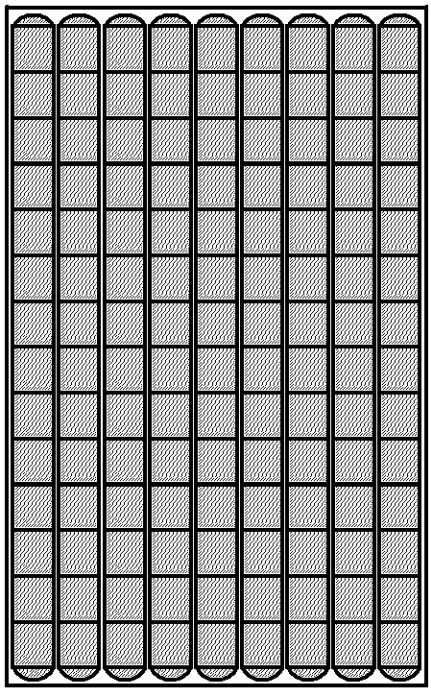
14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length
9 Rows x 77.0" Wide + 9.0" Spacing x 8 + 12.0" Side Stone x 2 = 65.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

126 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 9 Rows = 14,122.1 cf Chamber Storage

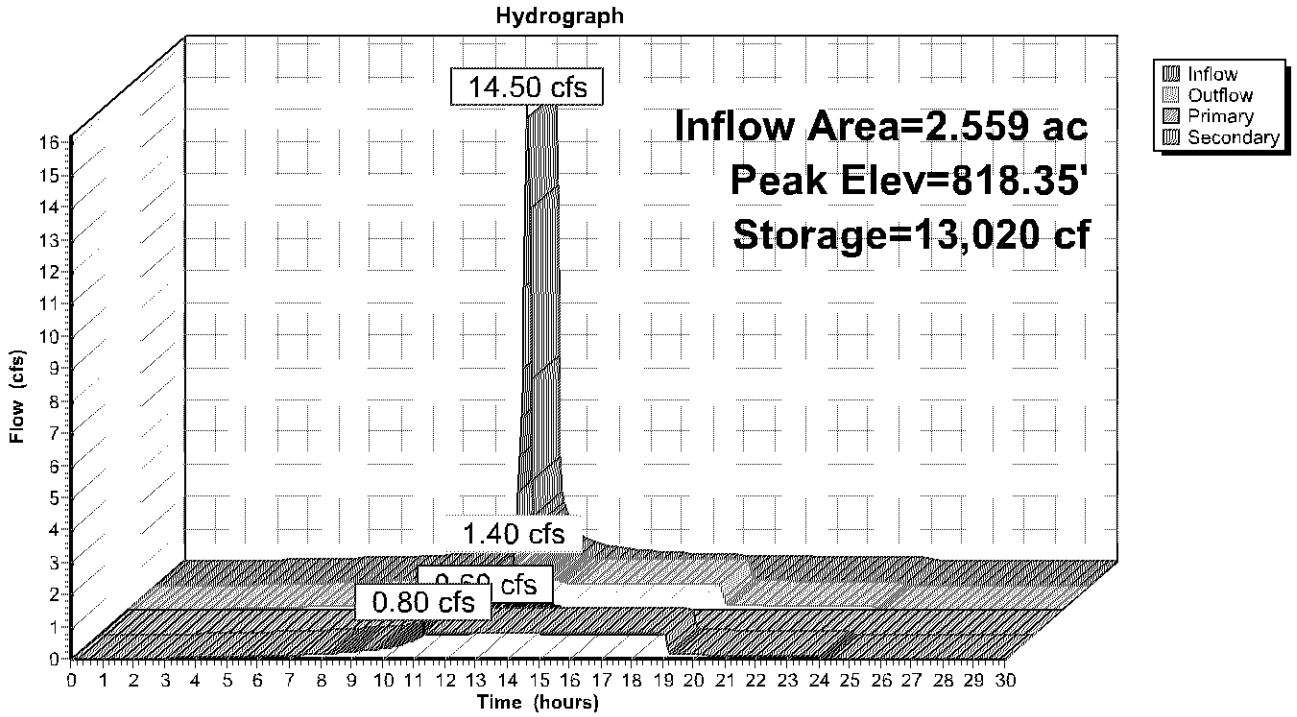
38,361.2 cf Field - 14,122.1 cf Chambers = 24,239.0 cf Stone x 40.0% Voids = 9,695.6 cf Stone Storage

Chamber Storage + Stone Storage = 23,817.8 cf = 0.547 af
Overall Storage Efficiency = 62.1%

126 Chambers
1,420.8 cy Field
897.7 cy Stone



Pond 14P: Underground Storage

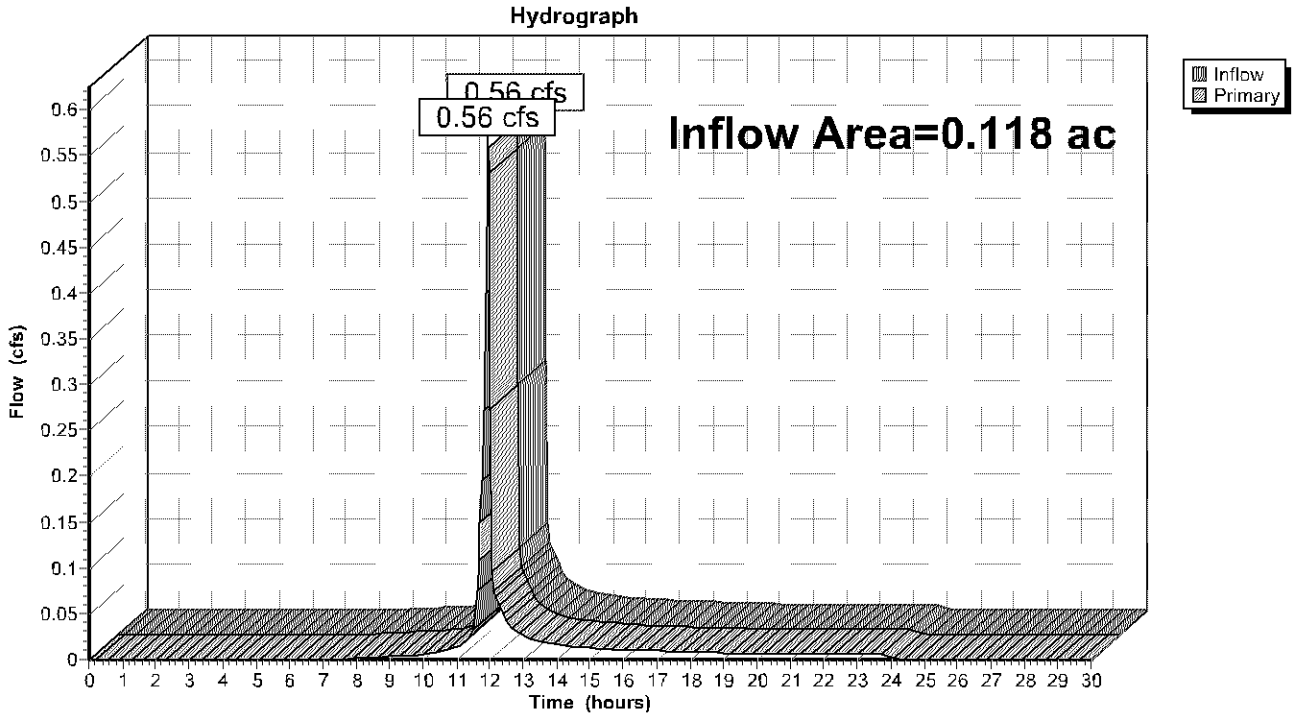


Summary for Link 11L: Discharge to 13th Ave (south)

Inflow Area = 0.118 ac, 40.99% Impervious, Inflow Depth = 2.55" for 10-yr (10%) event
Inflow = 0.56 cfs @ 11.92 hrs, Volume= 0.025 af
Primary = 0.56 cfs @ 11.92 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 11L: Discharge to 13th Ave (south)

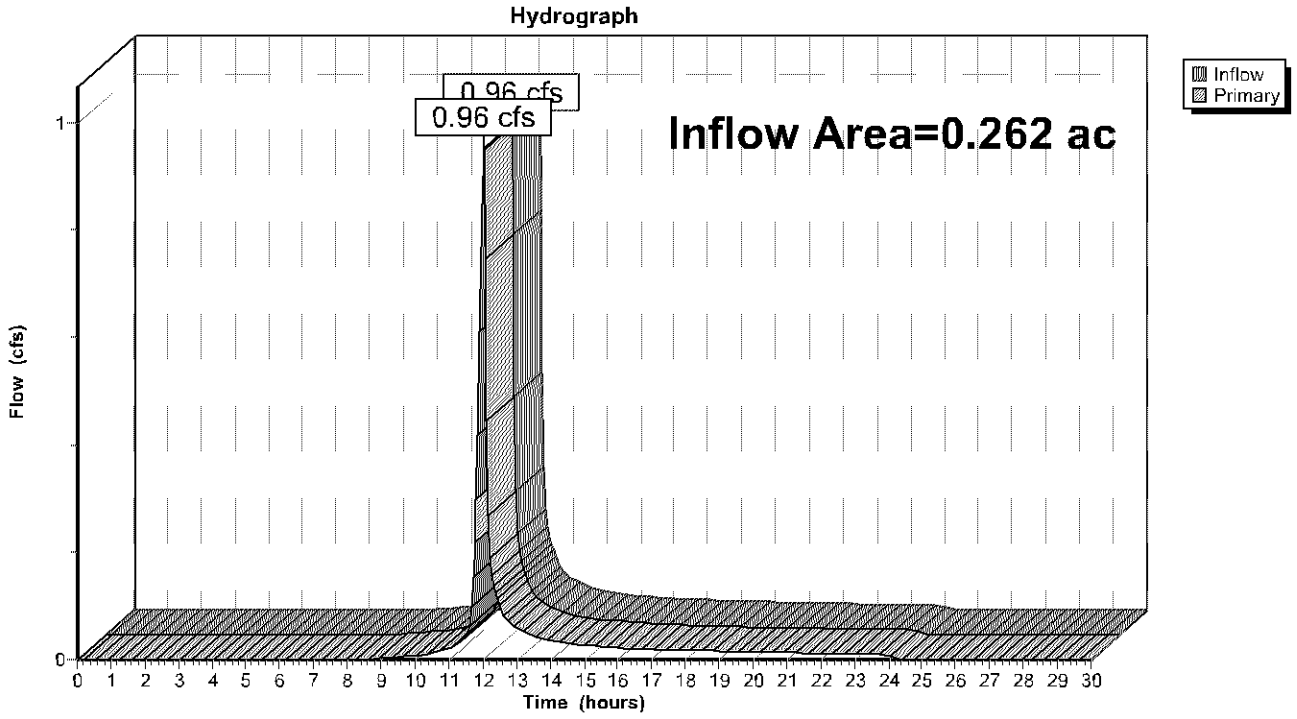


Summary for Link 12L: Discharge to 12th Ave (west)

Inflow Area = 0.262 ac, 23.00% Impervious, Inflow Depth = 2.21" for 10-yr (10%) event
Inflow = 0.96 cfs @ 11.99 hrs, Volume= 0.048 af
Primary = 0.96 cfs @ 11.99 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 12L: Discharge to 12th Ave (west)

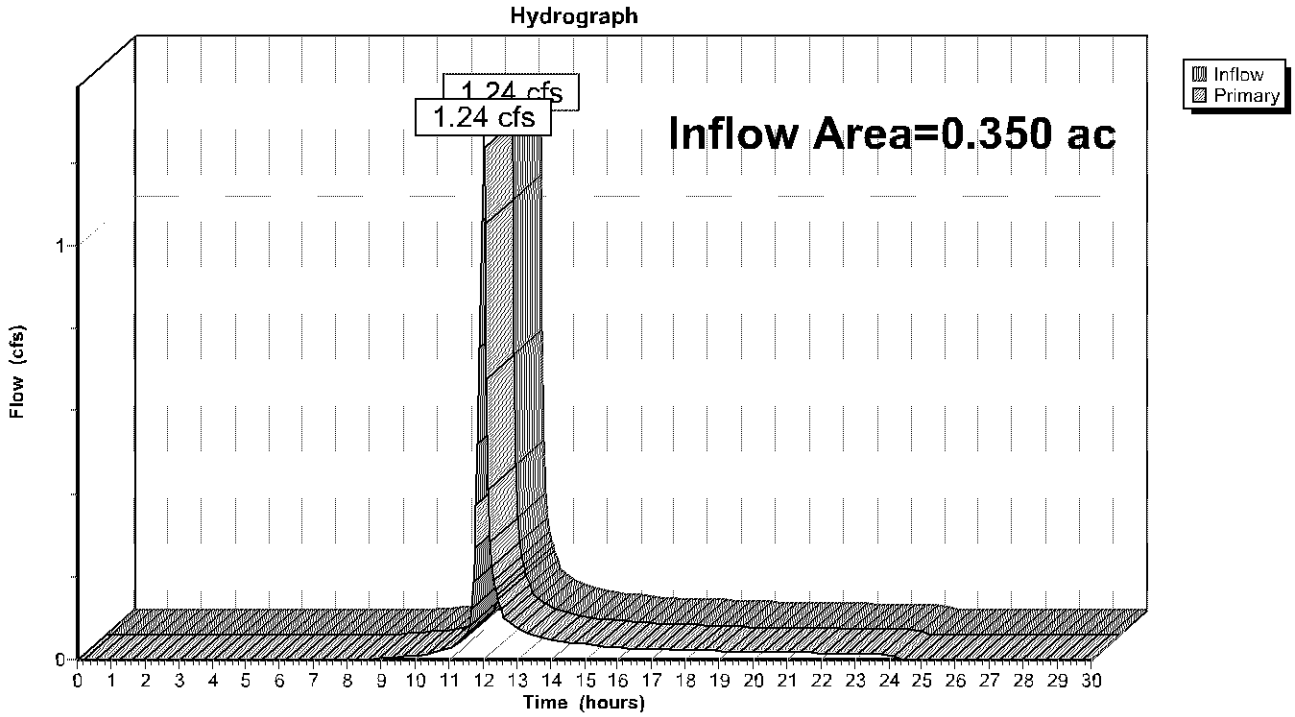


Summary for Link 13L: Discharge to 78th Street (north)

Inflow Area = 0.350 ac, 25.00% Impervious, Inflow Depth = 2.21" for 10-yr (10%) event
Inflow = 1.24 cfs @ 12.00 hrs, Volume= 0.064 af
Primary = 1.24 cfs @ 12.00 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 13L: Discharge to 78th Street (north)

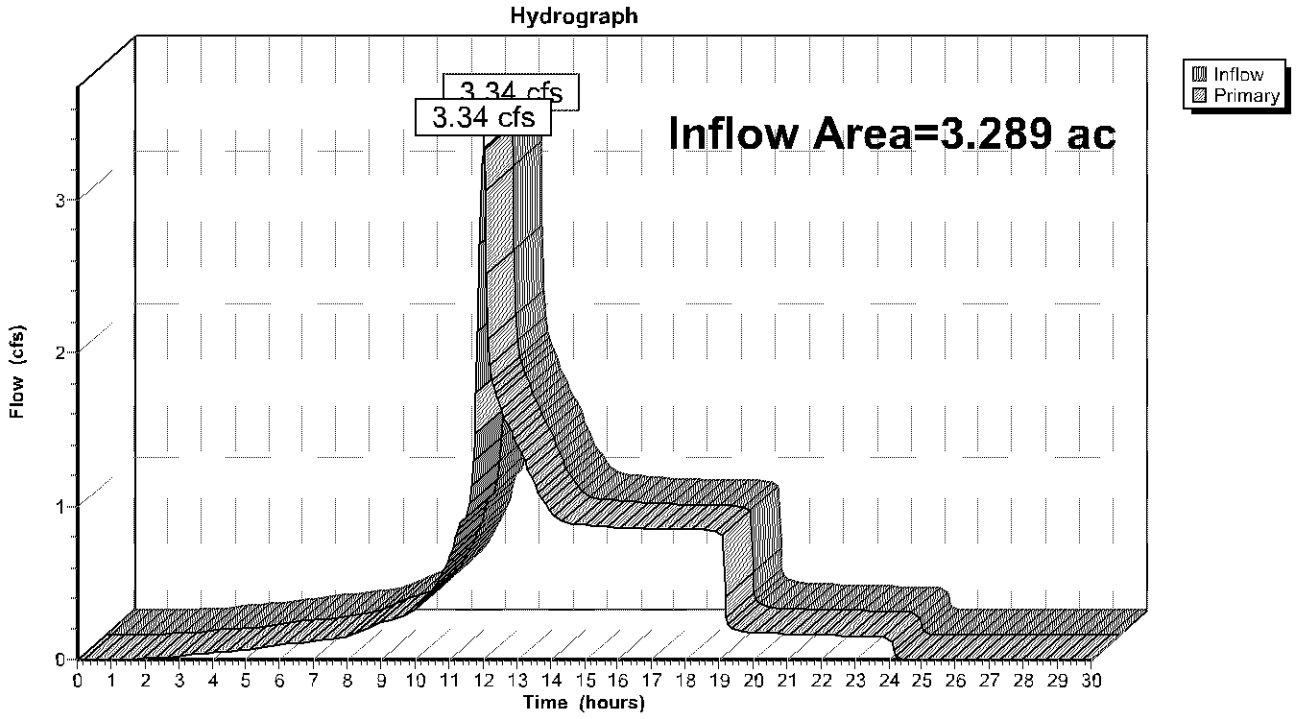


Summary for Link 22L: Ultimate Discharge

Inflow Area = 3.289 ac, 72.93% Impervious, Inflow Depth = 3.29" for 10-yr (10%) event
Inflow = 3.34 cfs @ 11.99 hrs, Volume= 0.902 af
Primary = 3.34 cfs @ 11.99 hrs, Volume= 0.902 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 22L: Ultimate Discharge

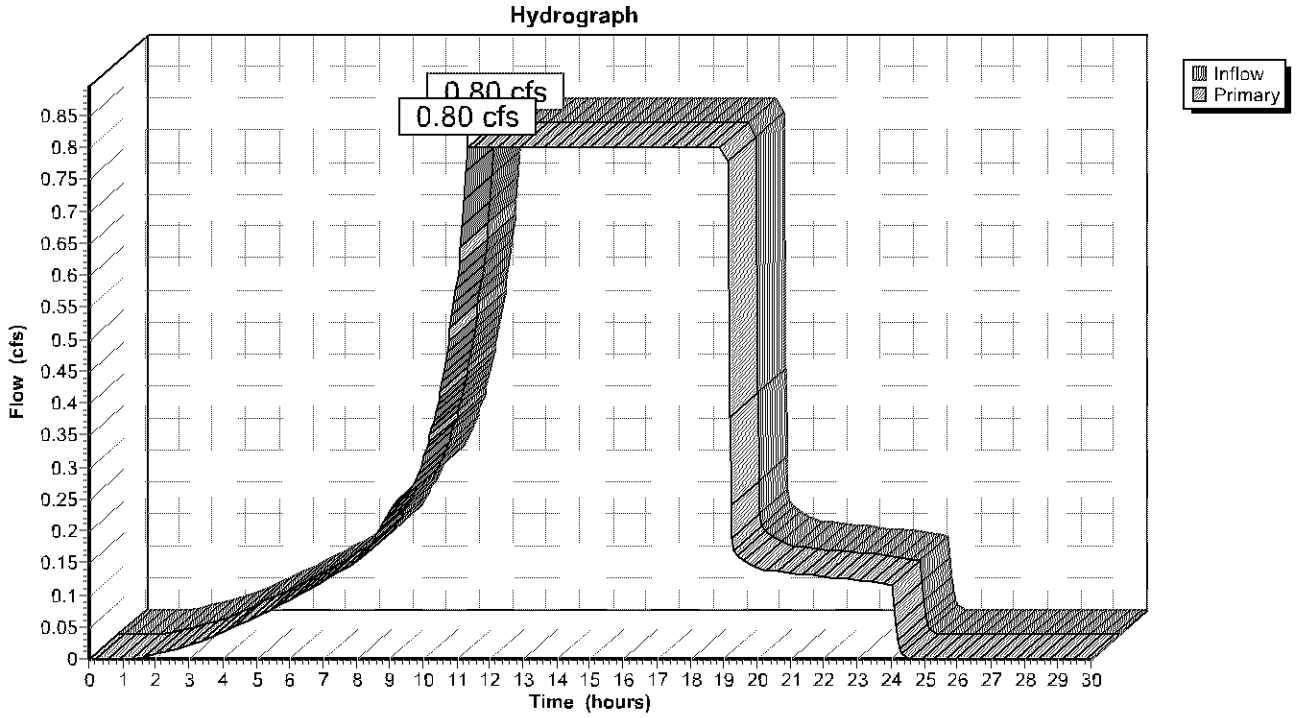


Summary for Link 23L: Infiltration

Inflow = 0.80 cfs @ 11.30 hrs, Volume= 0.699 af
Primary = 0.80 cfs @ 11.30 hrs, Volume= 0.699 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 23L: Infiltration



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: WS#1 (Roof) Runoff Area=19,588 sf 100.00% Impervious Runoff Depth=7.26"
Flow Length=205' Slope=0.0100 '/' Tc=4.2 min CN=98 Runoff=5.00 cfs 0.272 af

Subcatchment 2S: WS#2 (Porte Cochere) Runoff Area=1,114 sf 100.00% Impervious Runoff Depth=7.26"
Flow Length=47' Slope=0.0100 '/' Tc=1.3 min CN=98 Runoff=0.30 cfs 0.015 af

Subcatchment 3S: WS#3 Runoff Area=25,775 sf 85.00% Impervious Runoff Depth=6.78"
Flow Length=169' Slope=0.0135 '/' Tc=3.9 min CN=94 Runoff=6.52 cfs 0.335 af

Subcatchment 4S: WS#4 Runoff Area=15,447 sf 68.00% Impervious Runoff Depth=6.31"
Flow Length=128' Slope=0.0211 '/' Tc=3.0 min CN=90 Runoff=3.85 cfs 0.187 af

Subcatchment 5S: WS#5 Runoff Area=26,661 sf 92.00% Impervious Runoff Depth=7.02"
Flow Length=149' Slope=0.0122 '/' Tc=3.3 min CN=96 Runoff=6.90 cfs 0.358 af

Subcatchment 6S: WS#6 Runoff Area=16,410 sf 78.00% Impervious Runoff Depth=6.67"
Flow Length=172' Slope=0.0158 '/' Tc=3.8 min CN=93 Runoff=4.13 cfs 0.209 af

Subcatchment 7S: WS#7 Runoff Area=6,468 sf 85.00% Impervious Runoff Depth=6.78"
Flow Length=81' Slope=0.0145 '/' Tc=2.1 min CN=94 Runoff=1.65 cfs 0.084 af

Subcatchment 8S: WS#8 Runoff Area=15,232 sf 25.00% Impervious Runoff Depth=5.16"
Flow Length=275' Slope=0.0179 '/' Tc=8.5 min CN=80 Runoff=2.81 cfs 0.150 af

Subcatchment 9S: WS#9 Runoff Area=11,425 sf 23.00% Impervious Runoff Depth=5.16"
Flow Length=277' Slope=0.0216 '/' Tc=7.7 min CN=80 Runoff=2.16 cfs 0.113 af

Subcatchment 10S: WS#10 Runoff Area=5,140 sf 40.99% Impervious Runoff Depth=5.62"
Flow Length=80' Slope=0.0320 '/' Tc=2.1 min CN=84 Runoff=1.18 cfs 0.055 af

Reach 15R: CB #1 Avg. Flow Depth=1.50' Max Vel=4.79 fps Inflow=10.08 cfs 0.622 af
18.0" Round Pipe n=0.013 L=236.0' S=0.0050 '/' Capacity=7.43 cfs Outflow=7.43 cfs 0.622 af

Reach 16R: Roof Drains Avg. Flow Depth=1.00' Max Vel=5.15 fps Inflow=5.26 cfs 0.288 af
12.0" Round Pipe n=0.013 L=154.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=3.56 cfs 0.288 af

Reach 17R: CB #2 Avg. Flow Depth=1.00' Max Vel=3.67 fps Inflow=3.85 cfs 0.187 af
12.0" Round Pipe n=0.013 L=159.0' S=0.0050 '/' Capacity=2.53 cfs Outflow=2.53 cfs 0.187 af

Reach 18R: CB #3 Avg. Flow Depth=1.74' Max Vel=5.80 fps Inflow=16.83 cfs 1.167 af
24.0" Round Pipe n=0.013 L=10.0' S=0.0050 '/' Capacity=16.00 cfs Outflow=16.80 cfs 1.167 af

Reach 19R: CB #4 Avg. Flow Depth=0.39' Max Vel=5.71 fps Inflow=1.65 cfs 0.084 af
12.0" Round Pipe n=0.013 L=64.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=1.62 cfs 0.084 af

Reach 20R: CB #5 Avg. Flow Depth=1.00' Max Vel=7.30 fps Inflow=5.76 cfs 0.293 af
12.0" Round Pipe n=0.013 L=28.0' S=0.0200 '/' Capacity=5.04 cfs Outflow=5.28 cfs 0.293 af

Reach 21R: Pipe to 60" Ex Avg. Flow Depth=1.50' Max Vel=7.23 fps Inflow=13.56 cfs 0.471 af
18.0" Round Pipe n=0.013 L=33.0' S=0.0115 '/' Capacity=11.27 cfs Outflow=12.26 cfs 0.471 af

Pond 14P: Underground Storage Peak Elev=820.03' Storage=20,536 cf Inflow=21.94 cfs 1.460 af
Primary=13.56 cfs 0.471 af Secondary=0.80 cfs 0.989 af Outflow=14.36 cfs 1.460 af

Link 11L: Discharge to 13th Ave (south) Inflow=1.18 cfs 0.055 af
Primary=1.18 cfs 0.055 af

Link 12L: Discharge to 12th Ave (west) Inflow=2.16 cfs 0.113 af
Primary=2.16 cfs 0.113 af

Link 13L: Discharge to 78th Street (north) Inflow=2.81 cfs 0.150 af
Primary=2.81 cfs 0.150 af

Link 22L: Ultimate Discharge Inflow=16.20 cfs 1.778 af
Primary=16.20 cfs 1.778 af

Link 23L: Infiltration Inflow=0.80 cfs 0.989 af
Primary=0.80 cfs 0.989 af

Total Runoff Area = 3.289 ac Runoff Volume = 1.778 af Average Runoff Depth = 6.49"
27.07% Pervious = 0.890 ac 72.93% Impervious = 2.399 ac

Summary for Subcatchment 1S: WS#1 (Roof)

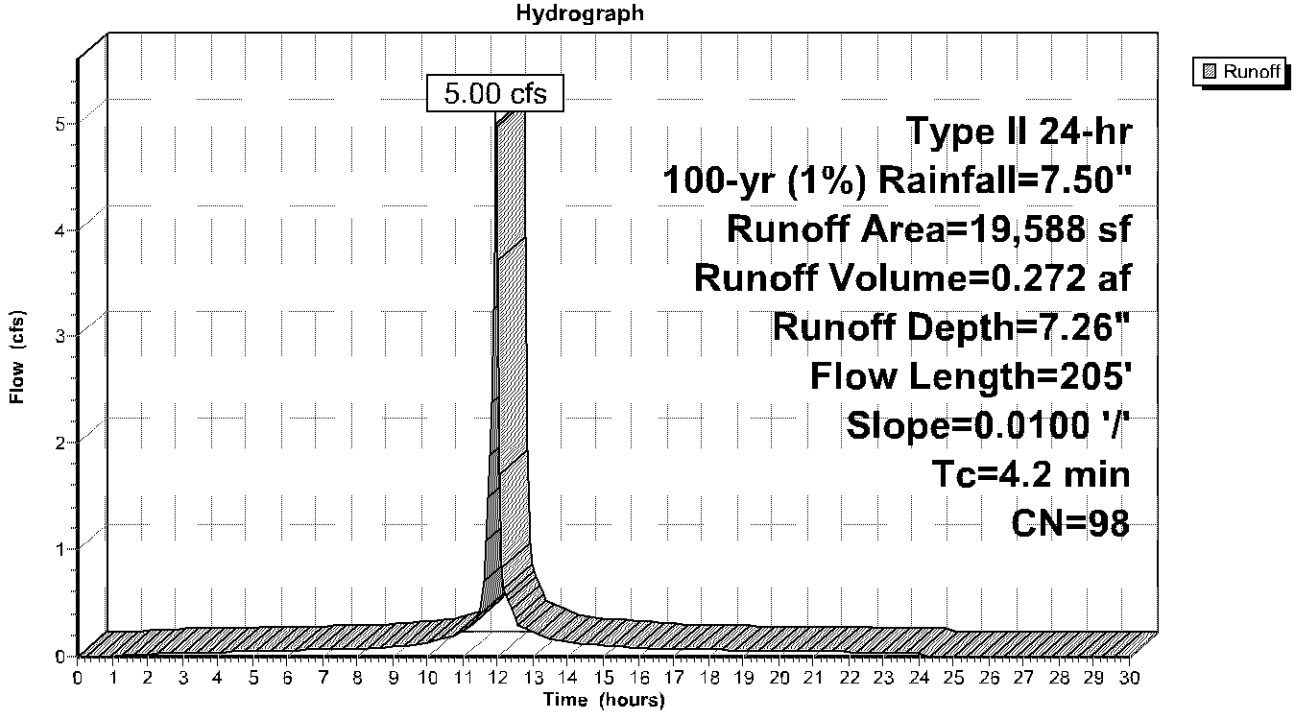
Runoff = 5.00 cfs @ 11.94 hrs, Volume= 0.272 af, Depth= 7.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	19,588	98	
	19,588		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	205	0.0100	0.81		**Lag/CN Method,**

Subcatchment 1S: WS#1 (Roof)



Summary for Subcatchment 2S: WS#2 (Porte Cochere)

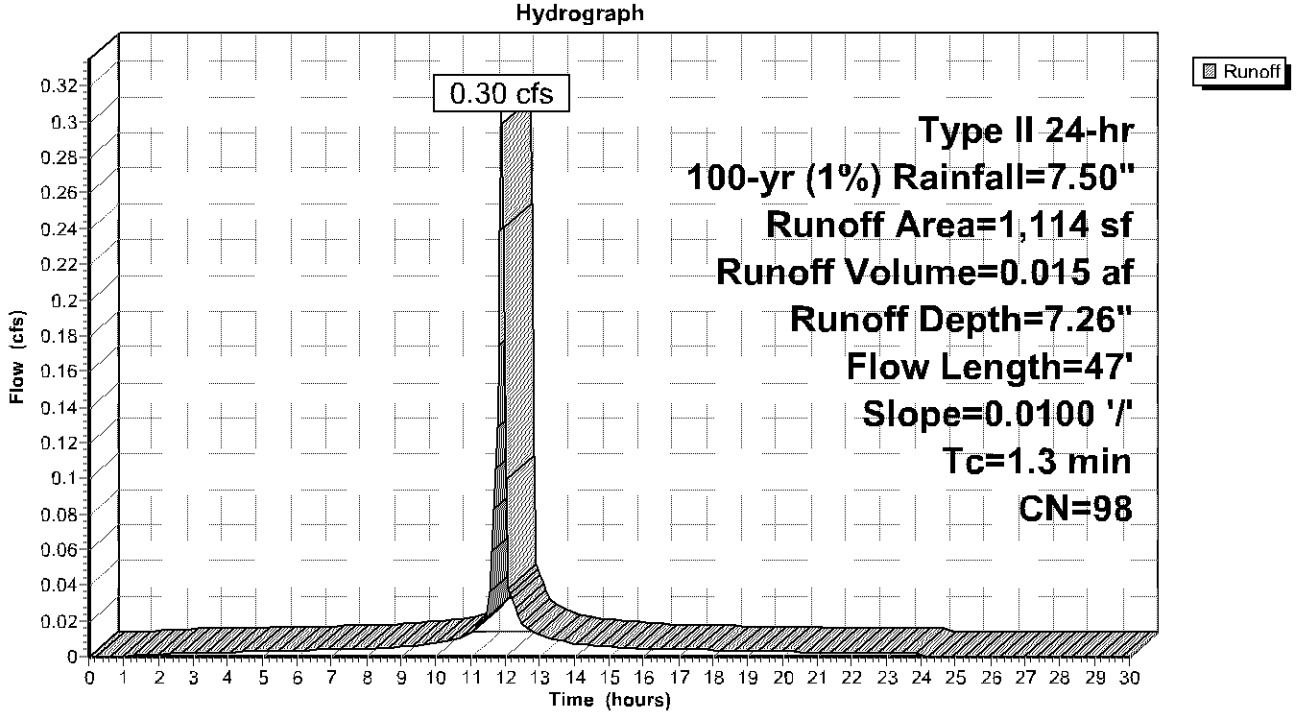
Runoff = 0.30 cfs @ 11.90 hrs, Volume= 0.015 af, Depth= 7.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	1,114	98	
	1,114		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	47	0.0100	0.60		**Lag/CN Method,**

Subcatchment 2S: WS#2 (Porte Cochere)



Summary for Subcatchment 3S: WS#3

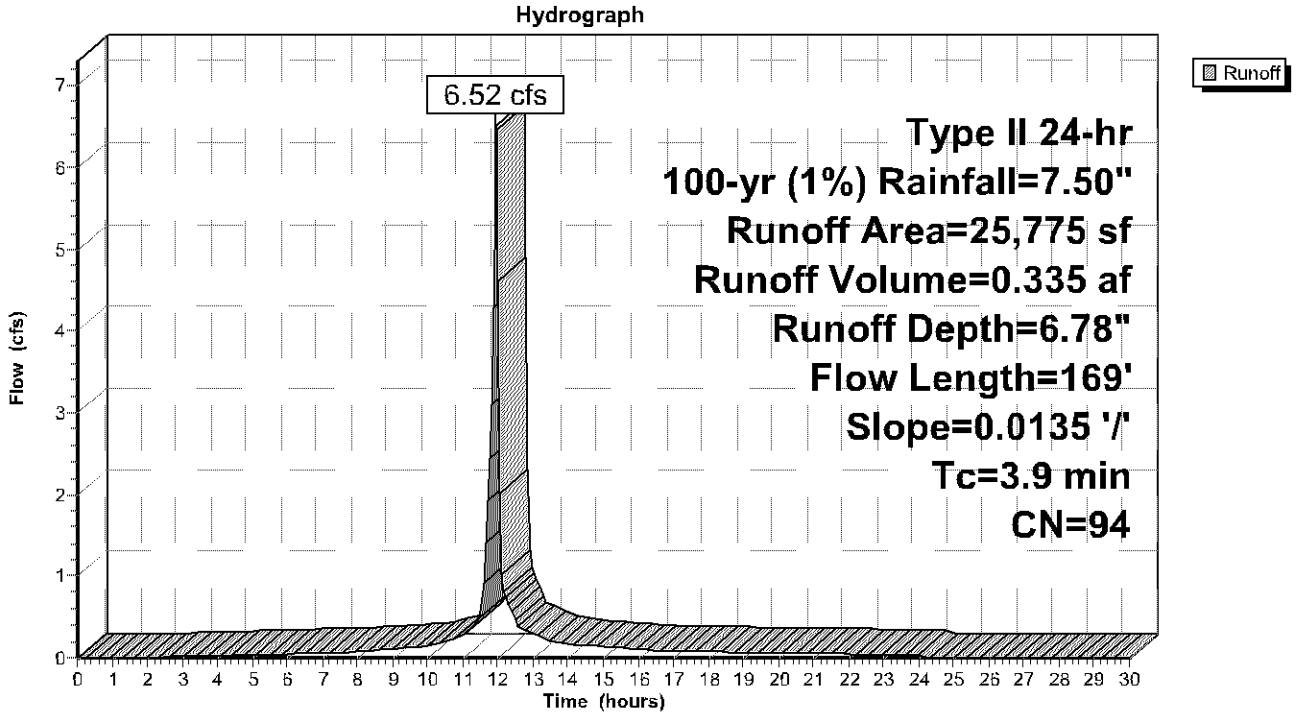
Runoff = 6.52 cfs @ 11.94 hrs, Volume= 0.335 af, Depth= 6.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	21,909	98	
*	3,866	74	
	25,775	94	Weighted Average
	3,866		15.00% Pervious Area
	21,909		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	169	0.0135	0.73		**Lag/CN Method,**

Subcatchment 3S: WS#3



Summary for Subcatchment 4S: WS#4

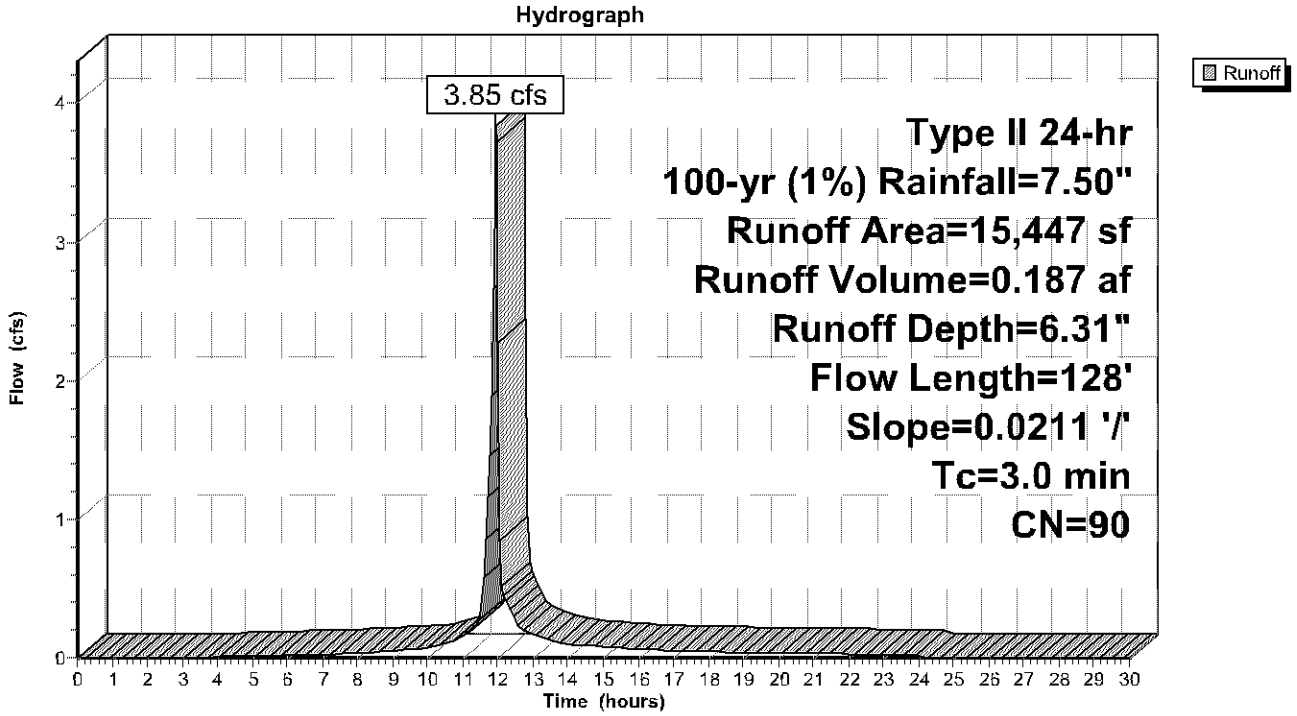
Runoff = 3.85 cfs @ 11.93 hrs, Volume= 0.187 af, Depth= 6.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	10,504	98	
*	4,943	74	
	15,447	90	Weighted Average
	4,943		32.00% Pervious Area
	10,504		68.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	128	0.0211	0.72		**Lag/CN Method,**

Subcatchment 4S: WS#4



Summary for Subcatchment 5S: WS#5

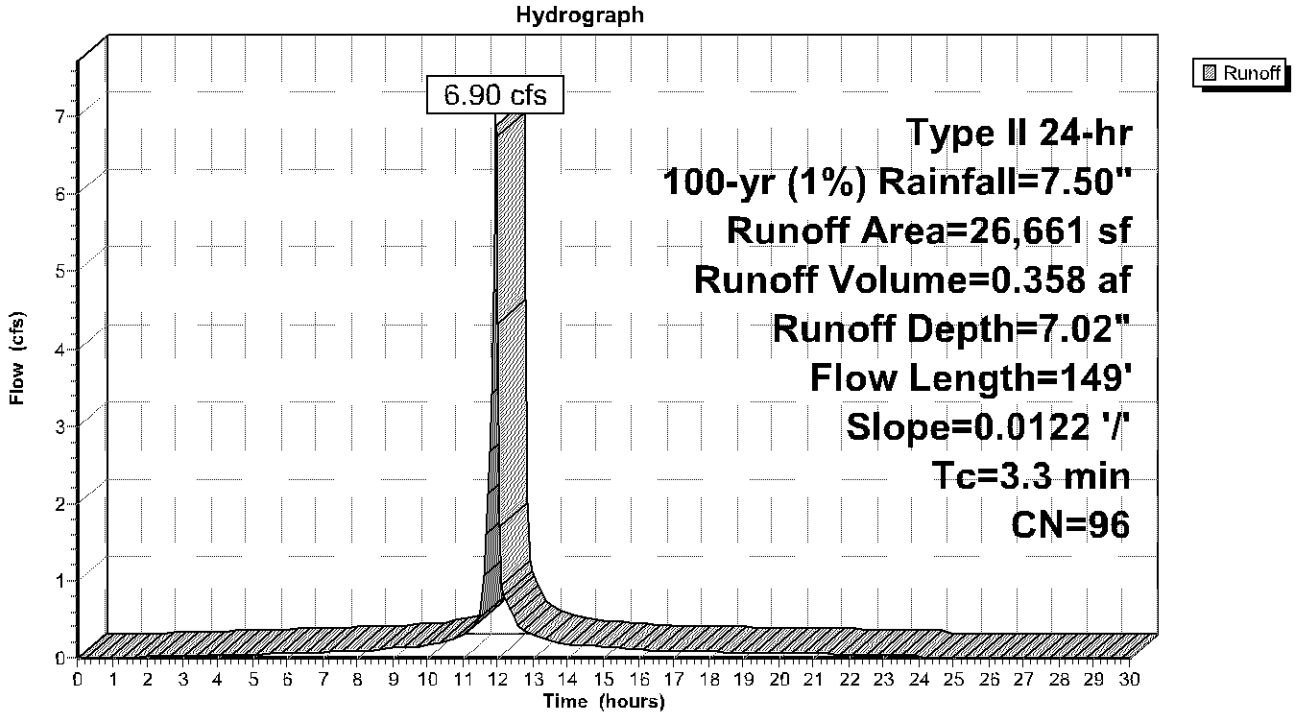
Runoff = 6.90 cfs @ 11.93 hrs, Volume= 0.358 af, Depth= 7.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	24,528	98	
*	2,133	74	
	26,661	96	Weighted Average
	2,133		8.00% Pervious Area
	24,528		92.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	149	0.0122	0.75		**Lag/CN Method,**

Subcatchment 5S: WS#5



Summary for Subcatchment 6S: WS#6

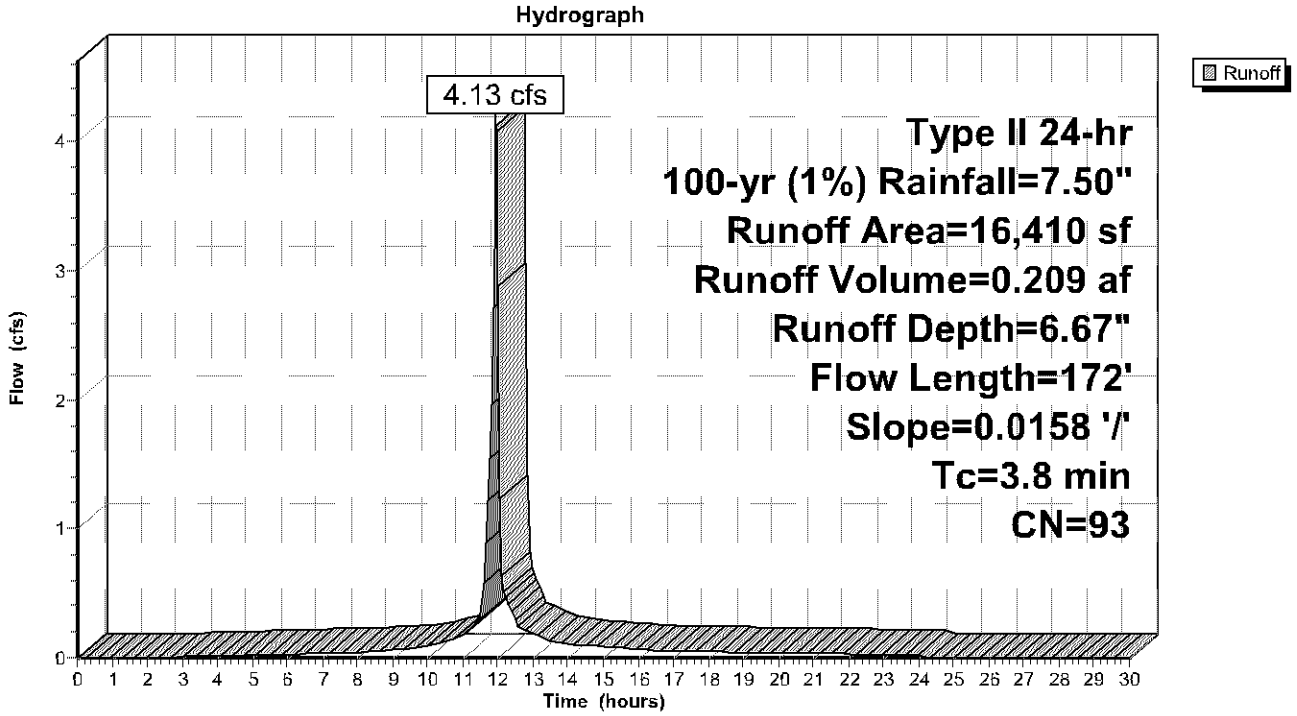
Runoff = 4.13 cfs @ 11.94 hrs, Volume= 0.209 af, Depth= 6.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	12,800	98	
*	3,610	74	
	16,410	93	Weighted Average
	3,610		22.00% Pervious Area
	12,800		78.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	172	0.0158	0.75		**Lag/CN Method,**

Subcatchment 6S: WS#6



Summary for Subcatchment 7S: WS#7

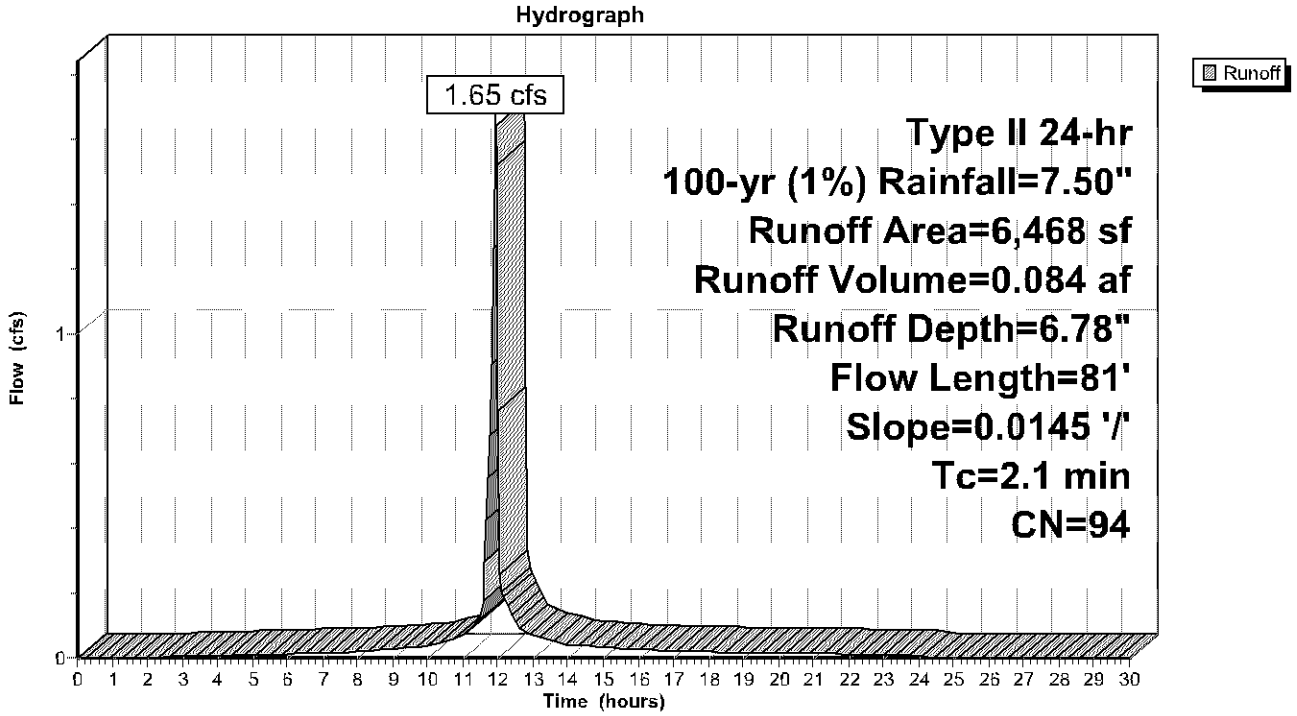
Runoff = 1.65 cfs @ 11.91 hrs, Volume= 0.084 af, Depth= 6.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	5,498	98	
*	970	74	
	6,468	94	Weighted Average
	970		15.00% Pervious Area
	5,498		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	81	0.0145	0.65		**Lag/CN Method,**

Subcatchment 7S: WS#7



Summary for Subcatchment 8S: WS#8

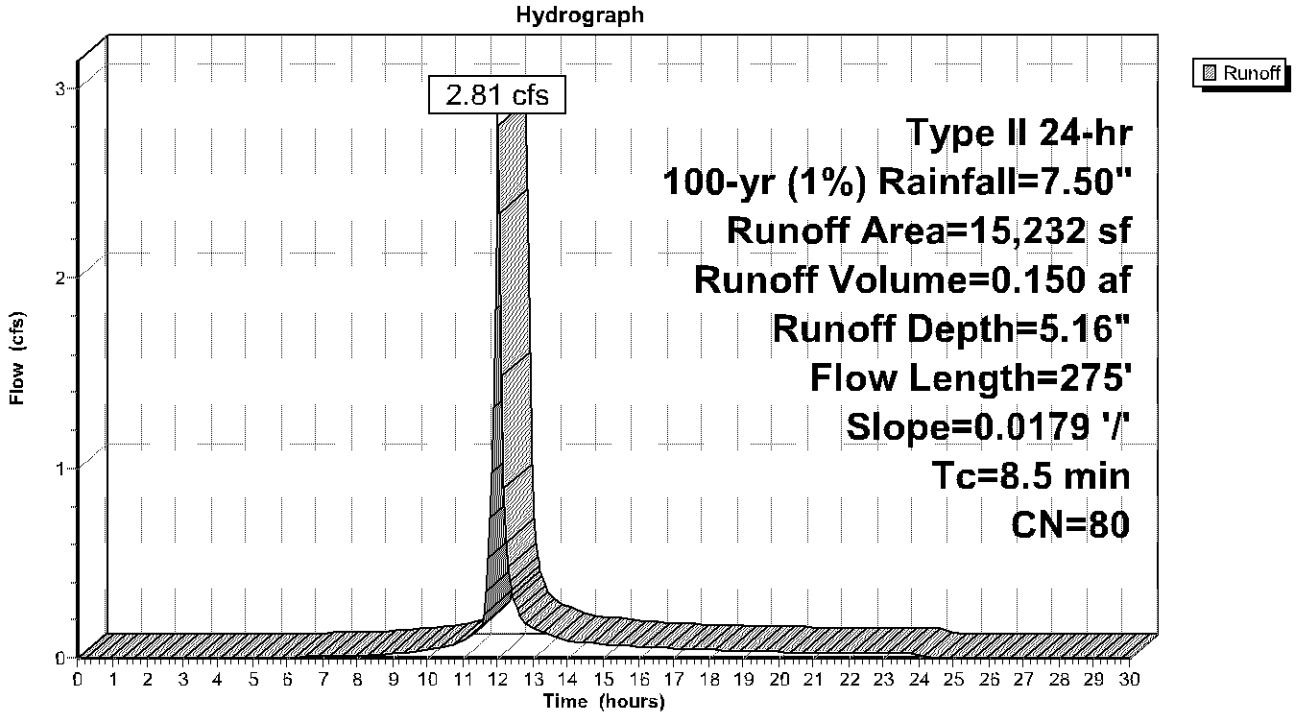
Runoff = 2.81 cfs @ 12.00 hrs, Volume= 0.150 af, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	3,808	98	
*	11,424	74	
	15,232	80	Weighted Average
	11,424		75.00% Pervious Area
	3,808		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	275	0.0179	0.54		**Lag/CN Method,**

Subcatchment 8S: WS#8



Summary for Subcatchment 9S: WS#9

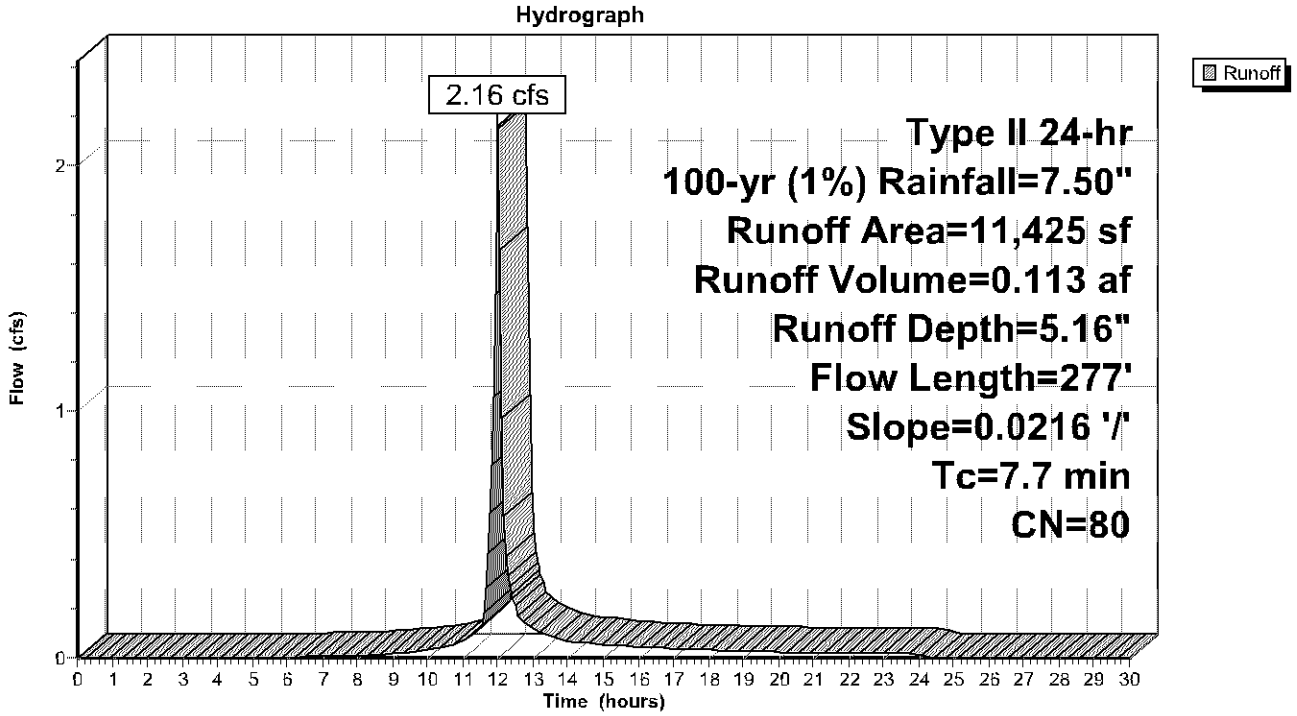
Runoff = 2.16 cfs @ 11.99 hrs, Volume= 0.113 af, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	2,628	98	
*	8,797	74	
	11,425	80	Weighted Average
	8,797		77.00% Pervious Area
	2,628		23.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	277	0.0216	0.60		**Lag/CN Method,**

Subcatchment 9S: WS#9



Summary for Subcatchment 10S: WS#10

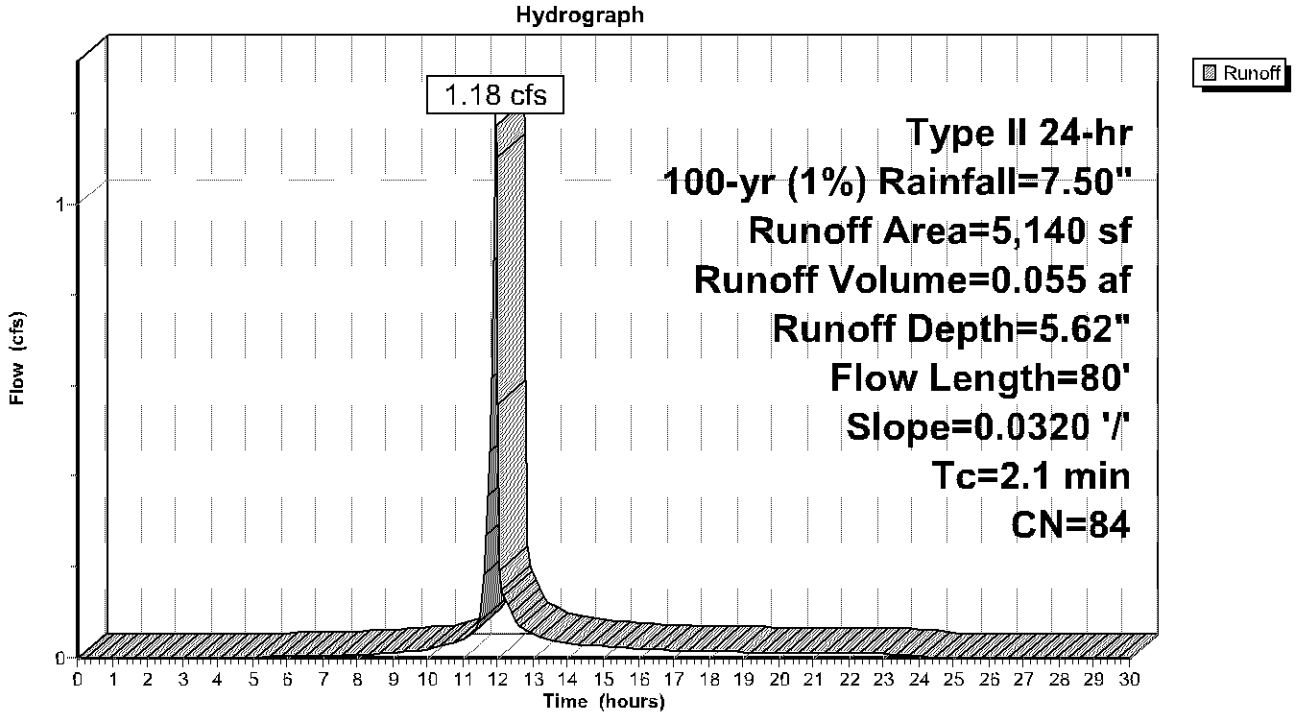
Runoff = 1.18 cfs @ 11.92 hrs, Volume= 0.055 af, Depth= 5.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr (1%) Rainfall=7.50"

	Area (sf)	CN	Description
*	2,107	98	
*	3,033	74	
	5,140	84	Weighted Average
	3,033		59.01% Pervious Area
	2,107		40.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	80	0.0320	0.65		**Lag/CN Method,**

Subcatchment 10S: WS#10



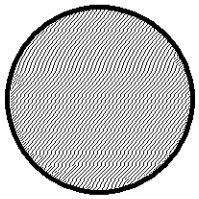
Summary for Reach 15R: CB #1

Inflow Area = 1.067 ac, 91.68% Impervious, Inflow Depth = 7.00" for 100-yr (1%) event
Inflow = 10.08 cfs @ 11.94 hrs, Volume= 0.622 af
Outflow = 7.43 cfs @ 11.95 hrs, Volume= 0.622 af, Atten= 26%, Lag= 0.6 min

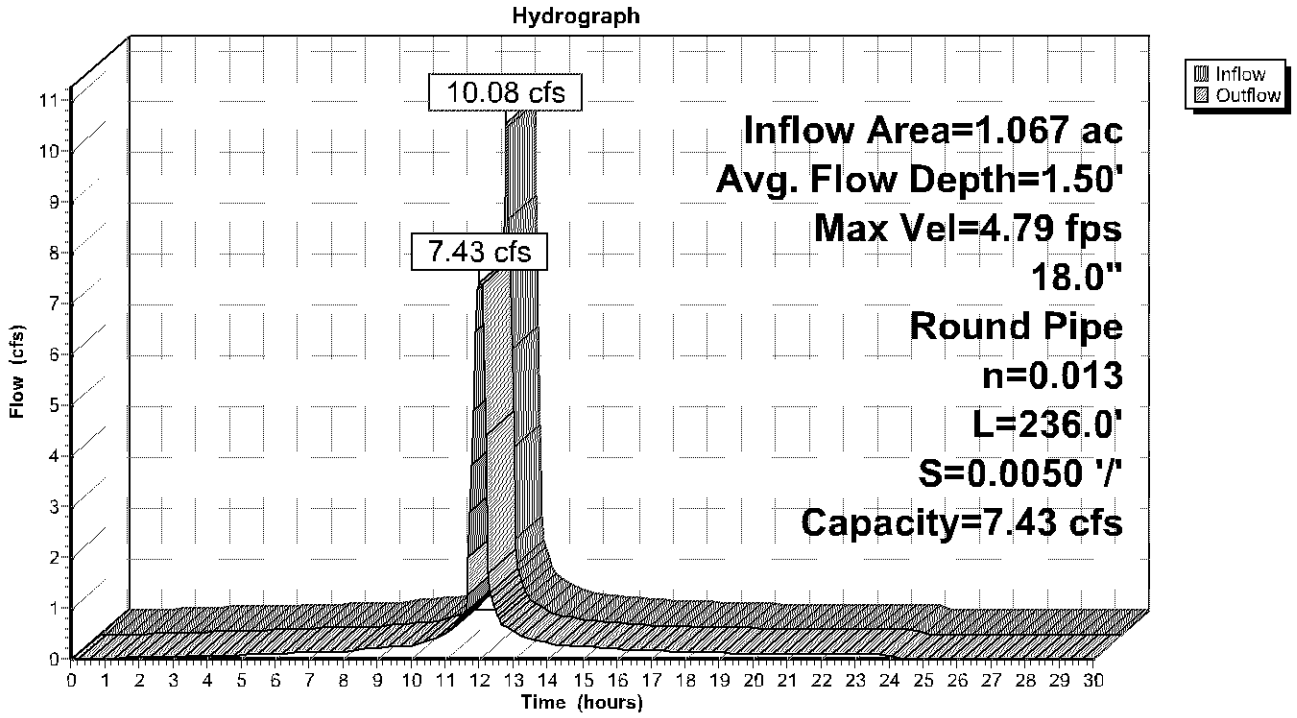
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.79 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 2.3 min

Peak Storage= 417 cf @ 11.90 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 7.43 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 236.0' Slope= 0.0050 '/'
Inlet Invert= 819.19', Outlet Invert= 818.01'



Reach 15R: CB #1



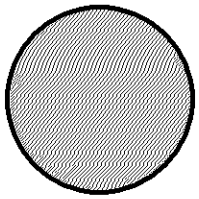
Summary for Reach 16R: Roof Drains

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth = 7.26" for 100-yr (1%) event
Inflow = 5.26 cfs @ 11.94 hrs, Volume= 0.288 af
Outflow = 3.56 cfs @ 11.95 hrs, Volume= 0.288 af, Atten= 32%, Lag= 0.6 min

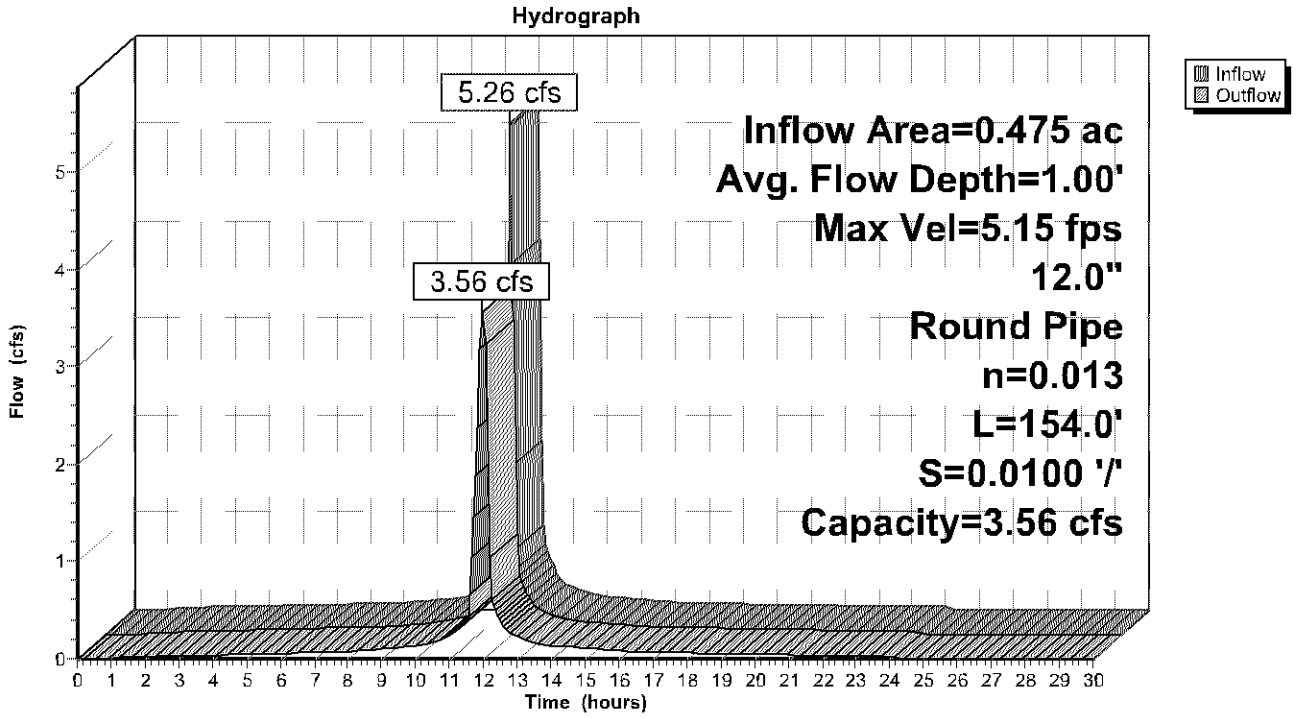
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.15 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.85 fps, Avg. Travel Time= 1.4 min

Peak Storage= 121 cf @ 11.90 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 154.0' Slope= 0.0100 '/'
Inlet Invert= 820.73', Outlet Invert= 819.19'



Reach 16R: Roof Drains



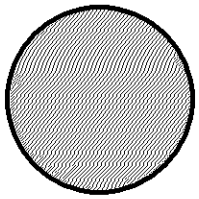
Summary for Reach 17R: CB #2

Inflow Area = 0.355 ac, 68.00% Impervious, Inflow Depth = 6.31" for 100-yr (1%) event
Inflow = 3.85 cfs @ 11.93 hrs, Volume= 0.187 af
Outflow = 2.53 cfs @ 11.95 hrs, Volume= 0.187 af, Atten= 34%, Lag= 1.1 min

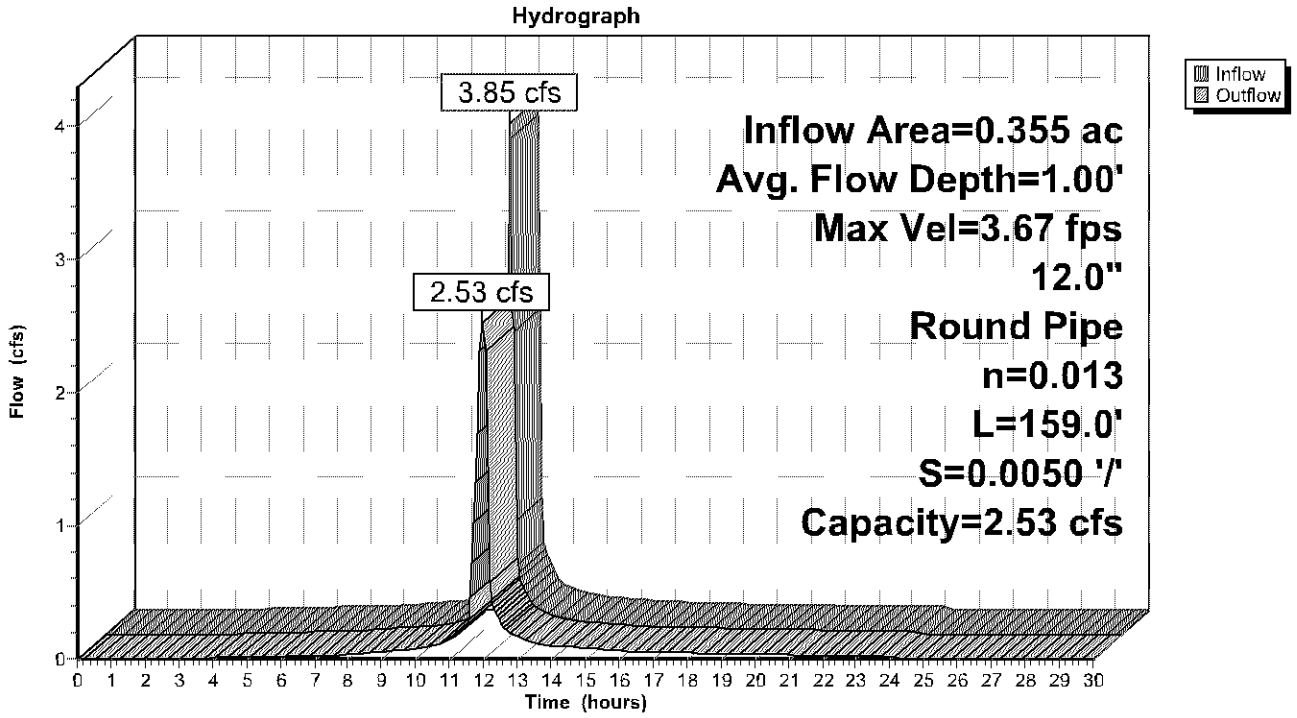
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.67 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 2.1 min

Peak Storage= 125 cf @ 11.90 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.53 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 159.0' Slope= 0.0050 '/'
Inlet Invert= 818.81', Outlet Invert= 818.01'



Reach 17R: CB #2



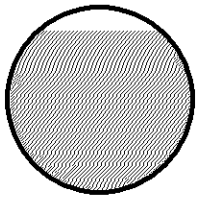
Summary for Reach 18R: CB #3

Inflow Area = 2.034 ac, 87.65% Impervious, Inflow Depth = 6.89" for 100-yr (1%) event
Inflow = 16.83 cfs @ 11.94 hrs, Volume= 1.167 af
Outflow = 16.80 cfs @ 11.94 hrs, Volume= 1.167 af, Atten= 0%, Lag= 0.0 min

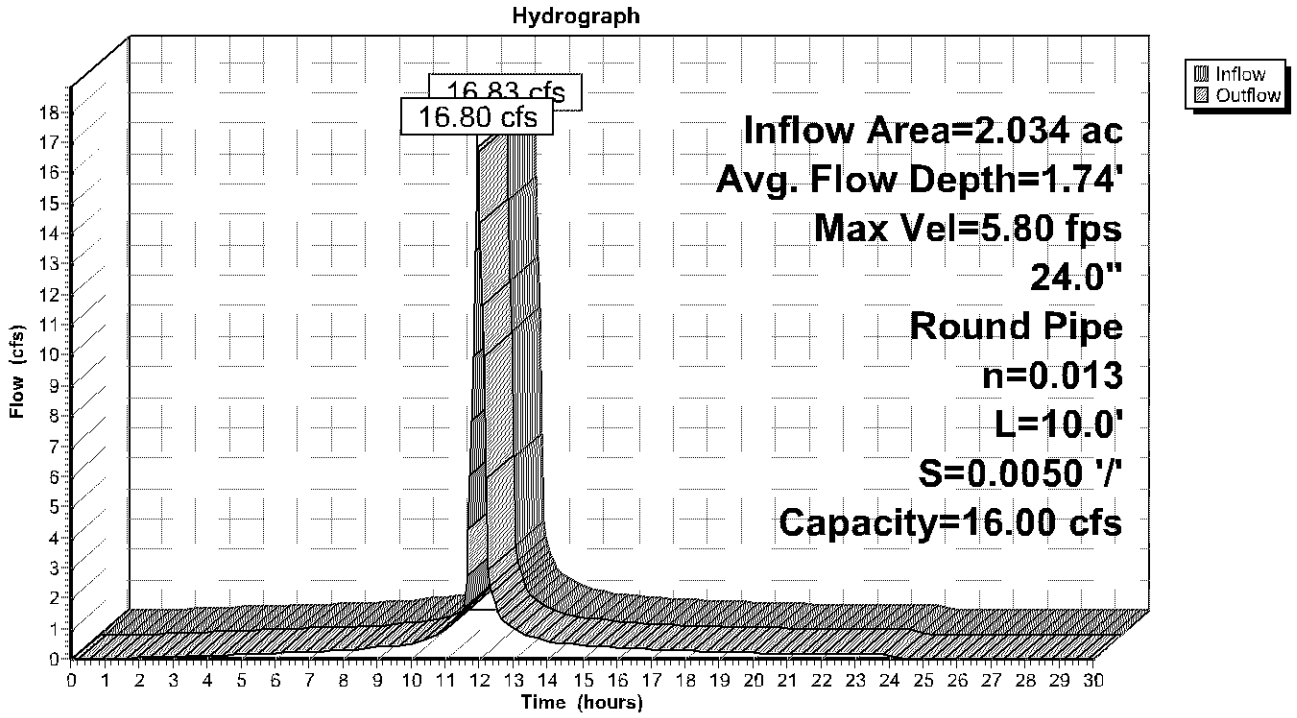
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.80 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 0.1 min

Peak Storage= 29 cf @ 11.94 hrs
Average Depth at Peak Storage= 1.74'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 16.00 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 10.0' Slope= 0.0050 '/'
Inlet Invert= 818.01', Outlet Invert= 817.96'



Reach 18R: CB #3



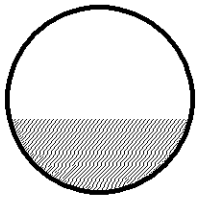
Summary for Reach 19R: CB #4

Inflow Area = 0.148 ac, 85.00% Impervious, Inflow Depth = 6.78" for 100-yr (1%) event
Inflow = 1.65 cfs @ 11.91 hrs, Volume= 0.084 af
Outflow = 1.62 cfs @ 11.92 hrs, Volume= 0.084 af, Atten= 1%, Lag= 0.4 min

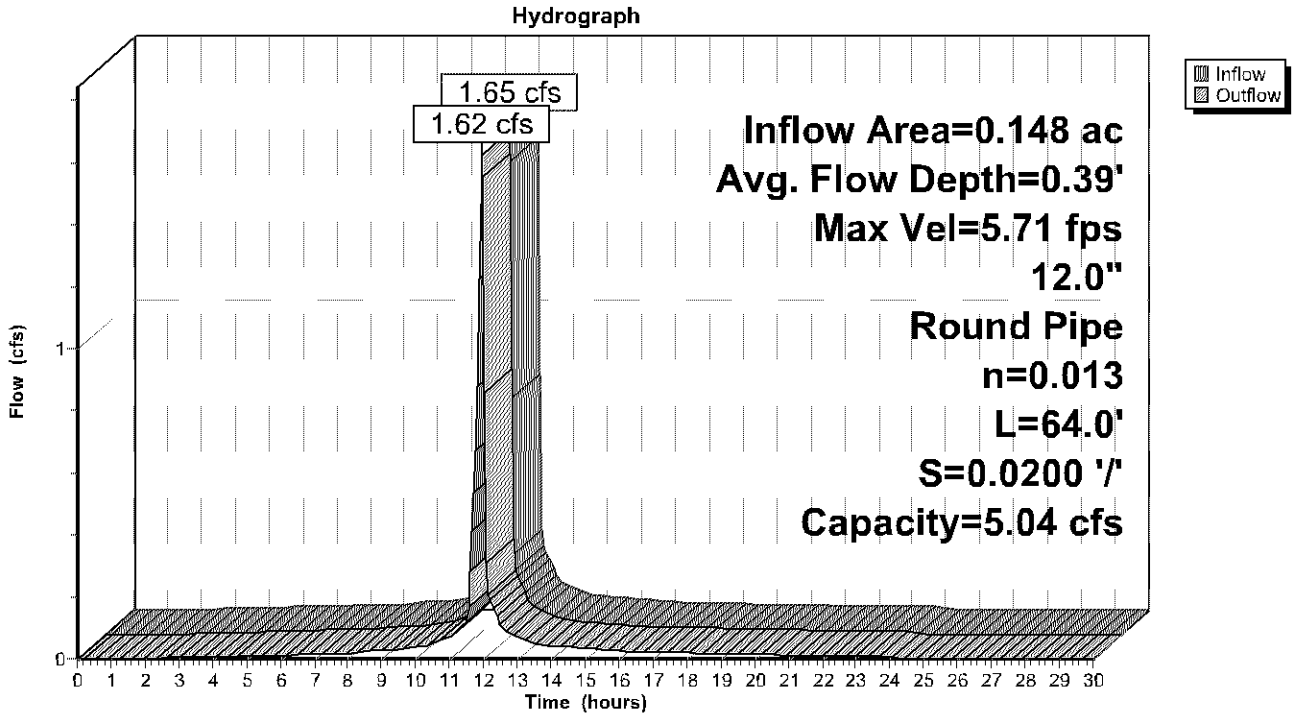
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.71 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 0.6 min

Peak Storage= 18 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 64.0' Slope= 0.0200 '/'
Inlet Invert= 819.80', Outlet Invert= 818.52'



Reach 19R: CB #4



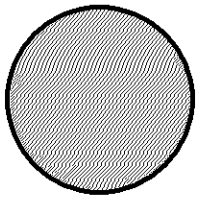
Summary for Reach 20R: CB #5

Inflow Area = 0.525 ac, 79.98% Impervious, Inflow Depth = 6.70" for 100-yr (1%) event
Inflow = 5.76 cfs @ 11.93 hrs, Volume= 0.293 af
Outflow = 5.28 cfs @ 11.92 hrs, Volume= 0.293 af, Atten= 8%, Lag= 0.0 min

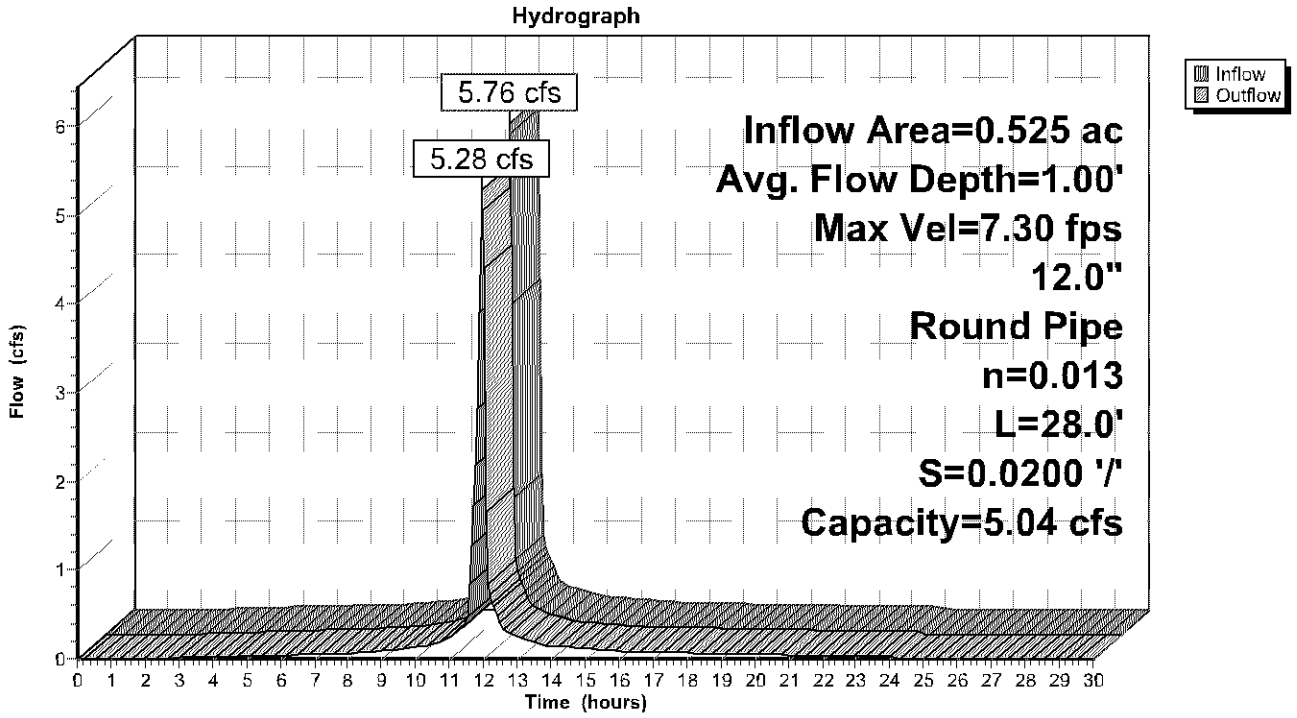
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.30 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.2 min

Peak Storage= 22 cf @ 11.94 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 28.0' Slope= 0.0200 '/'
Inlet Invert= 818.52', Outlet Invert= 817.96'



Reach 20R: CB #5



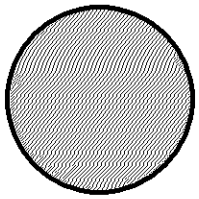
Summary for Reach 21R: Pipe to 60" Ex

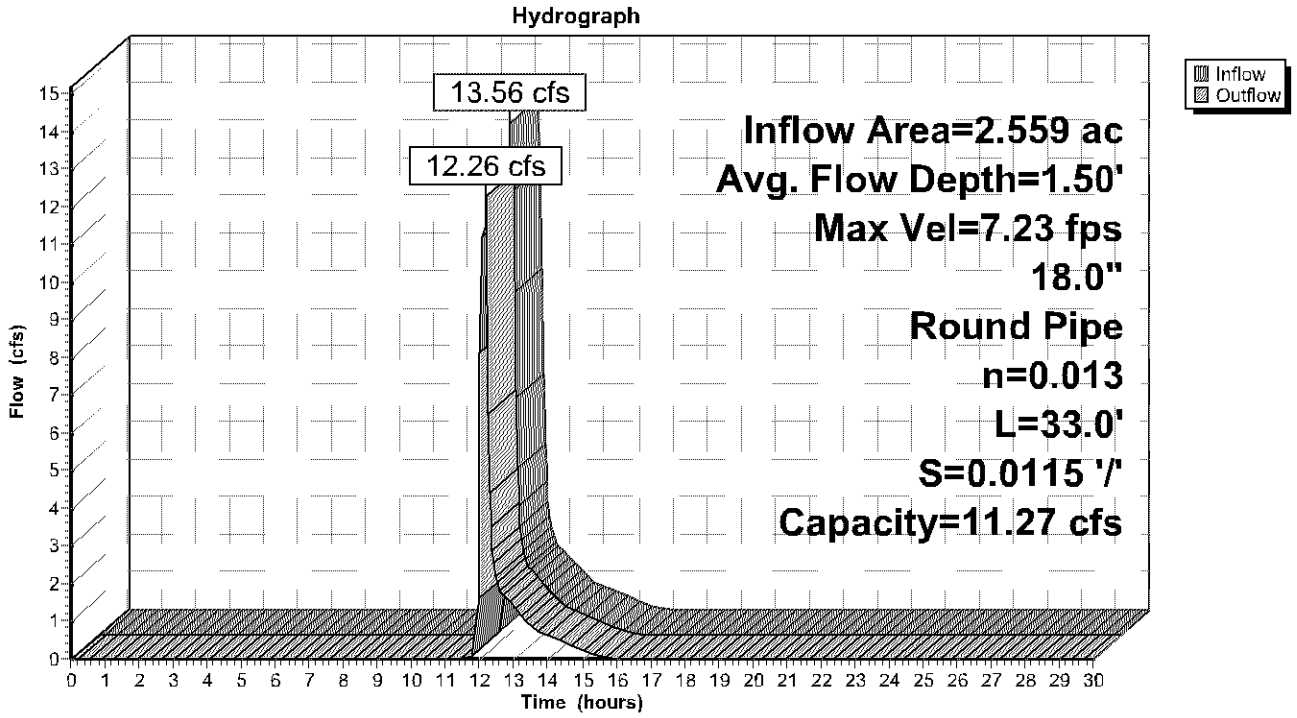
Inflow Area = 2.559 ac, 86.07% Impervious, Inflow Depth = 2.21" for 100-yr (1%) event
Inflow = 13.56 cfs @ 12.06 hrs, Volume= 0.471 af
Outflow = 12.26 cfs @ 12.13 hrs, Volume= 0.471 af, Atten= 10%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.23 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.35 fps, Avg. Travel Time= 0.2 min

Peak Storage= 61 cf @ 12.08 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.27 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 33.0' Slope= 0.0115 '/'
Inlet Invert= 814.73', Outlet Invert= 814.35'





Summary for Pond 14P: Underground Storage

Inflow Area = 2.559 ac, 86.07% Impervious, Inflow Depth = 6.85" for 100-yr (1%) event
Inflow = 21.94 cfs @ 11.93 hrs, Volume= 1.460 af
Outflow = 14.36 cfs @ 12.06 hrs, Volume= 1.460 af, Atten= 35%, Lag= 7.8 min
Primary = 13.56 cfs @ 12.06 hrs, Volume= 0.471 af
Secondary = 0.80 cfs @ 10.40 hrs, Volume= 0.989 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 820.03' @ 12.06 hrs Surf.Area= 6,975 sf Storage= 20,536 cf

Plug-Flow detention time= 85.2 min calculated for 1.458 af (100% of inflow)
Center-of-Mass det. time= 85.0 min (839.9 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	815.70'	9,696 cf	**65.75'W x 106.08'L x 5.50'H Field A** 38,361 cf Overall - 14,122 cf Embedded = 24,239 cf x 40.0% Voids
#2A	816.45'	14,122 cf	**ADS_StormTech MC-3500 d +Cap** x 126 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 9 Rows of 14 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		23,818 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Secondary	815.70'	**0.80 cfs Exfiltration at all elevations**
#2	Primary	817.70'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	818.45'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	819.25'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 5.0' Crest Height

Primary OutFlow Max=12.96 cfs @ 12.06 hrs HW=820.00' (Free Discharge)
- **2=Orifice/Grate** (Orifice Controls 1.35 cfs @ 6.90 fps)
- **3=Orifice/Grate** (Orifice Controls 1.08 cfs @ 5.49 fps)
- **4=Sharp-Crested Rectangular Weir** (Weir Controls 10.53 cfs @ 2.89 fps)

Secondary OutFlow Max=0.80 cfs @ 10.40 hrs HW=815.76' (Free Discharge)
- **1=Exfiltration** (Exfiltration Controls 0.80 cfs)

Pond 14P: Underground Storage - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap storage)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

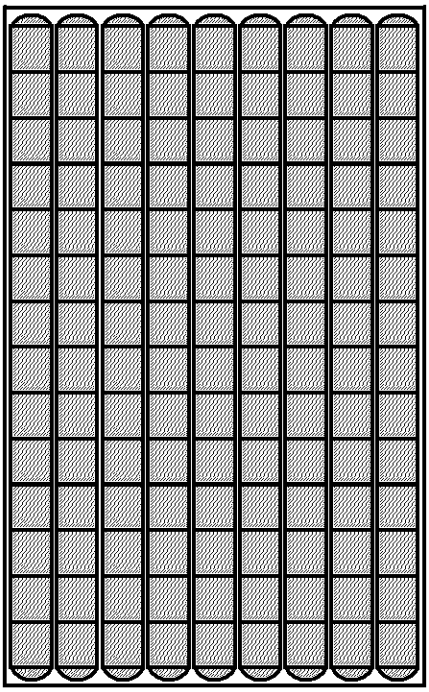
14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length
9 Rows x 77.0" Wide + 9.0" Spacing x 8 + 12.0" Side Stone x 2 = 65.75' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

126 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 9 Rows = 14,122.1 cf Chamber Storage

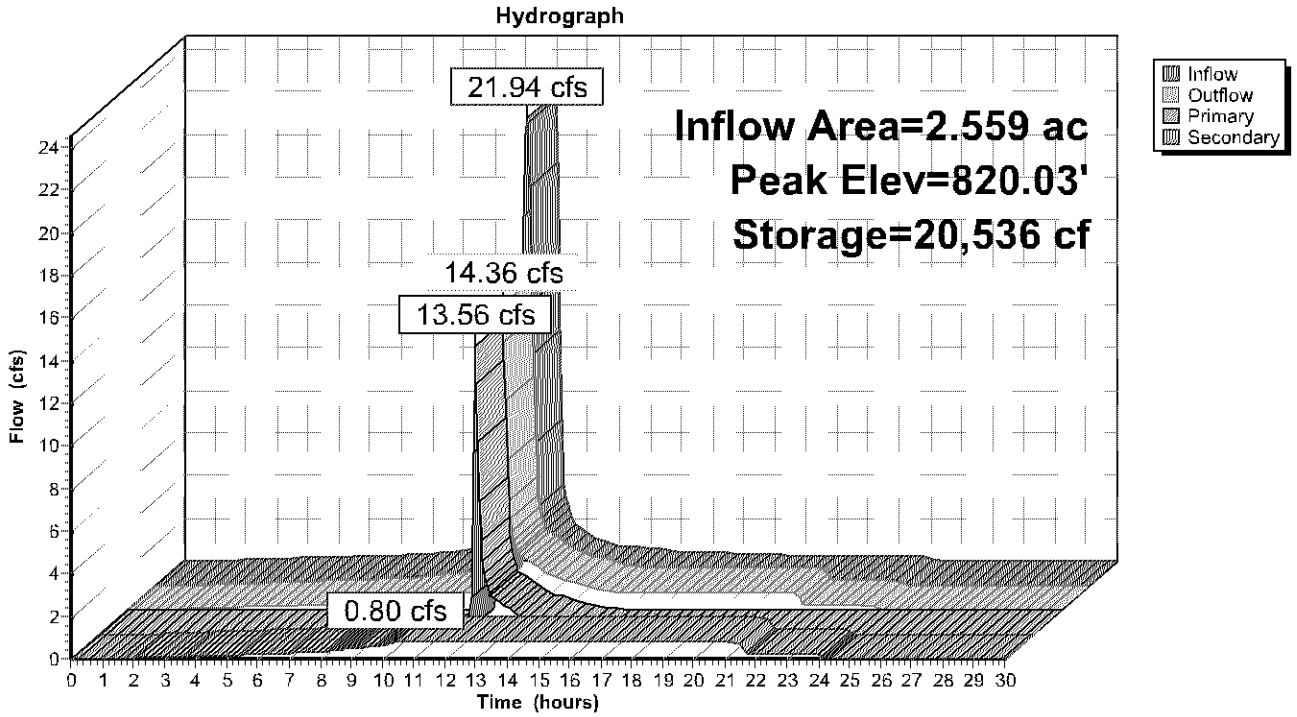
38,361.2 cf Field - 14,122.1 cf Chambers = 24,239.0 cf Stone x 40.0% Voids = 9,695.6 cf Stone Storage

Chamber Storage + Stone Storage = 23,817.8 cf = 0.547 af
Overall Storage Efficiency = 62.1%

126 Chambers
1,420.8 cy Field
897.7 cy Stone



Pond 14P: Underground Storage

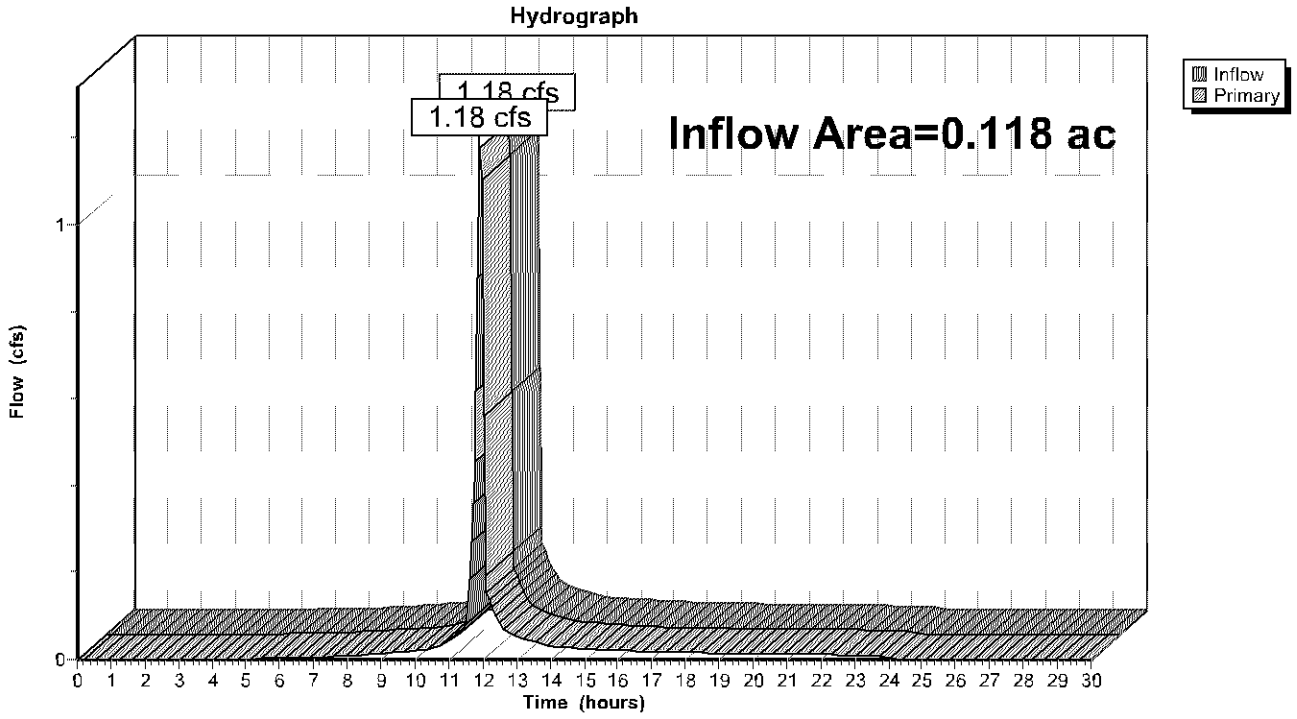


Summary for Link 11L: Discharge to 13th Ave (south)

Inflow Area = 0.118 ac, 40.99% Impervious, Inflow Depth = 5.62" for 100-yr (1%) event
Inflow = 1.18 cfs @ 11.92 hrs, Volume= 0.055 af
Primary = 1.18 cfs @ 11.92 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 11L: Discharge to 13th Ave (south)

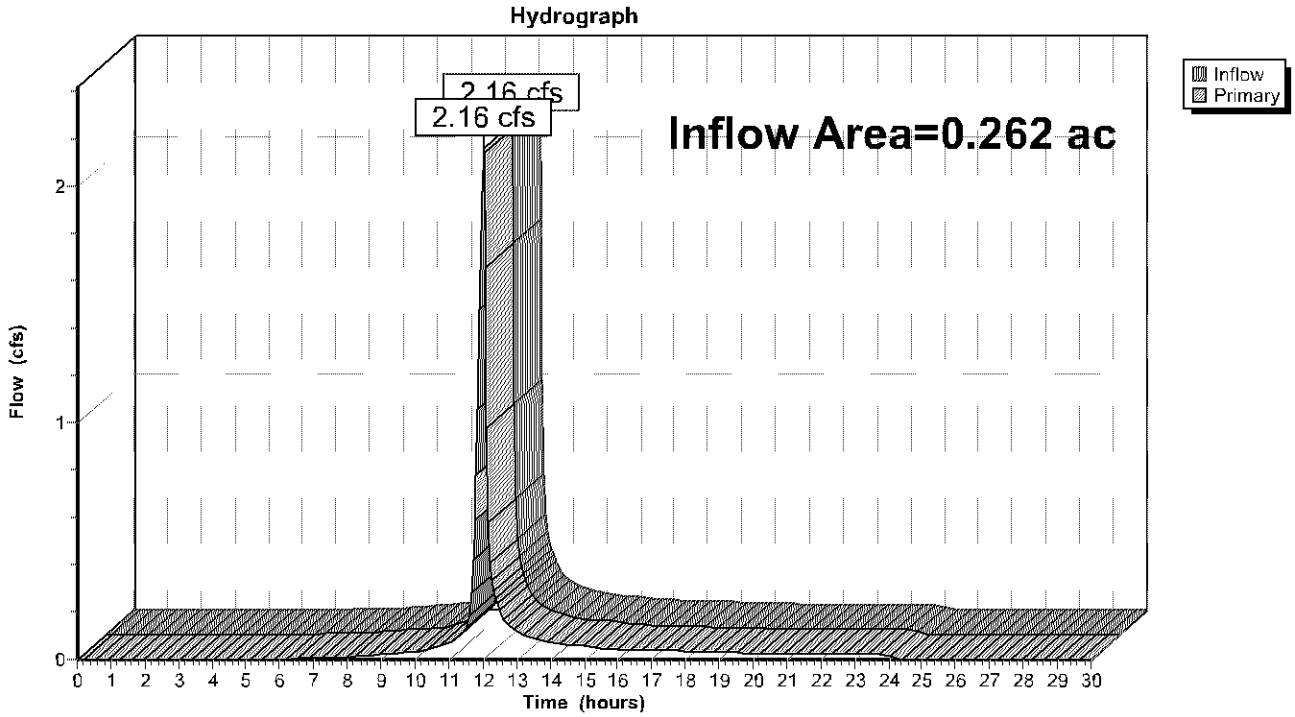


Summary for Link 12L: Discharge to 12th Ave (west)

Inflow Area = 0.262 ac, 23.00% Impervious, Inflow Depth = 5.16" for 100-yr (1%) event
Inflow = 2.16 cfs @ 11.99 hrs, Volume= 0.113 af
Primary = 2.16 cfs @ 11.99 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 12L: Discharge to 12th Ave (west)

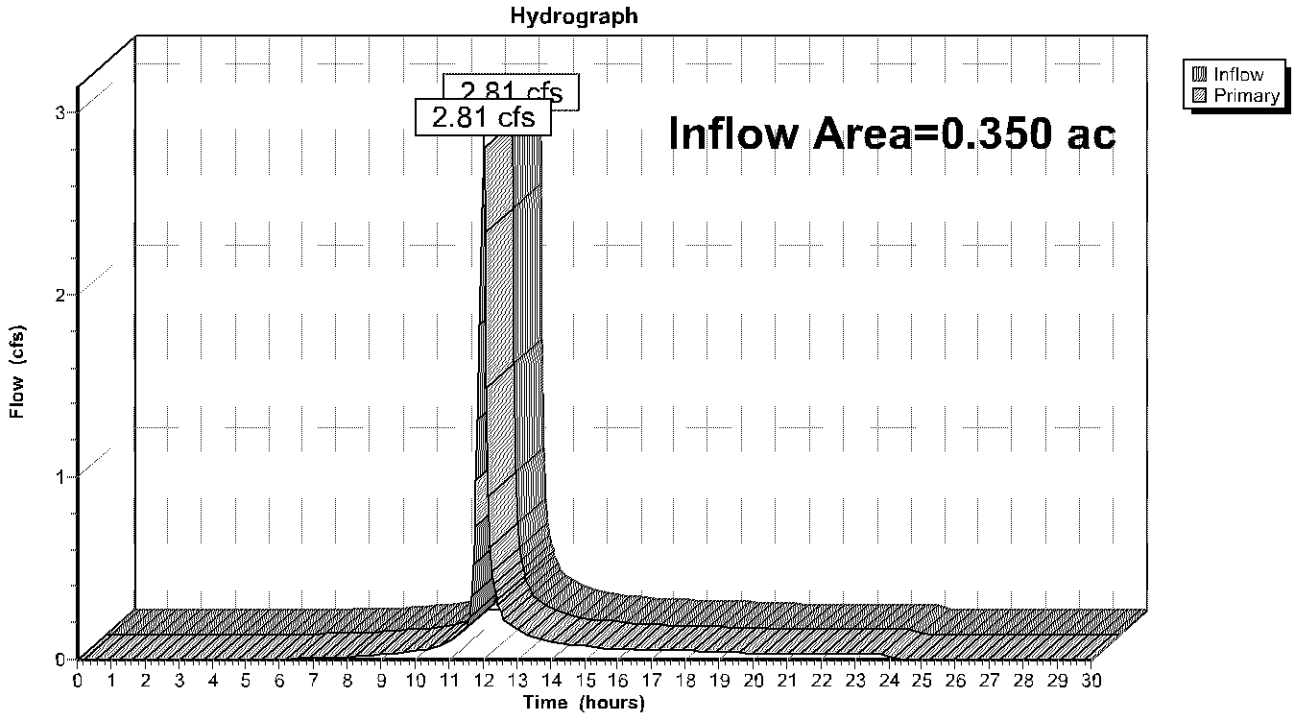


Summary for Link 13L: Discharge to 78th Street (north)

Inflow Area = 0.350 ac, 25.00% Impervious, Inflow Depth = 5.16" for 100-yr (1%) event
Inflow = 2.81 cfs @ 12.00 hrs, Volume= 0.150 af
Primary = 2.81 cfs @ 12.00 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 13L: Discharge to 78th Street (north)

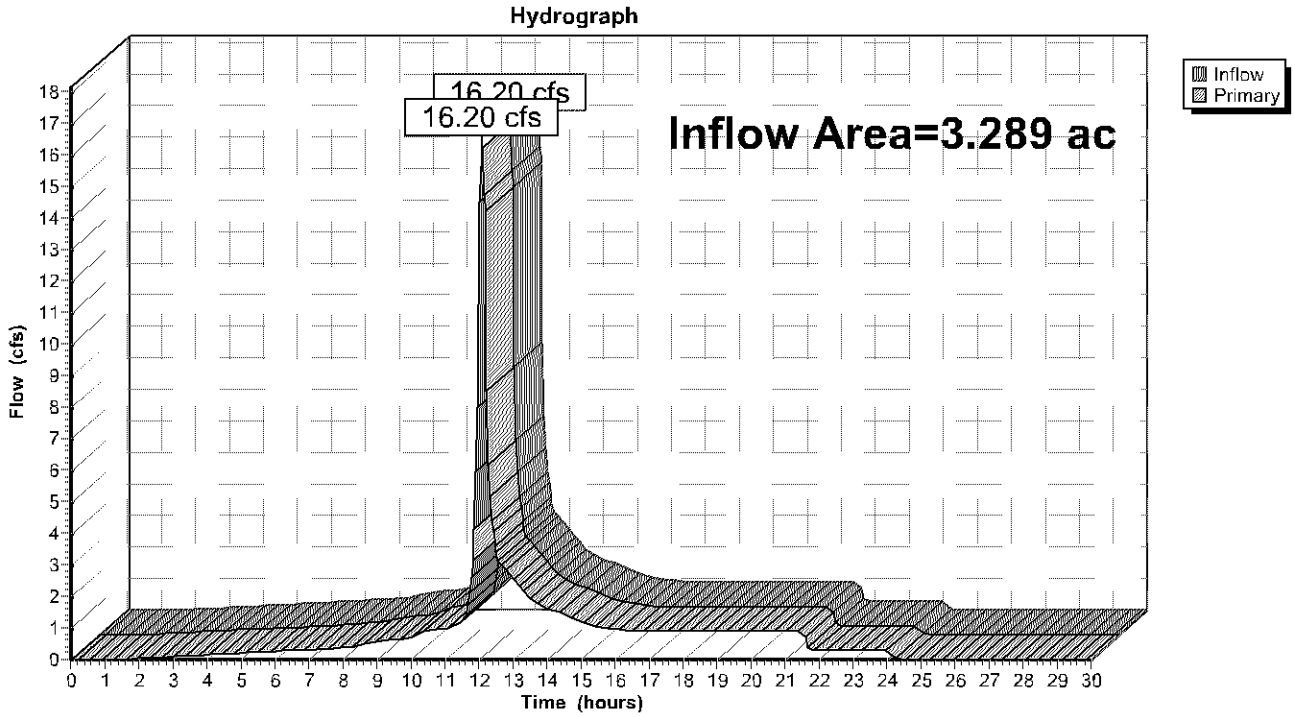


Summary for Link 22L: Ultimate Discharge

Inflow Area = 3.289 ac, 72.93% Impervious, Inflow Depth = 6.49" for 100-yr (1%) event
Inflow = 16.20 cfs @ 12.05 hrs, Volume= 1.778 af
Primary = 16.20 cfs @ 12.05 hrs, Volume= 1.778 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 22L: Ultimate Discharge

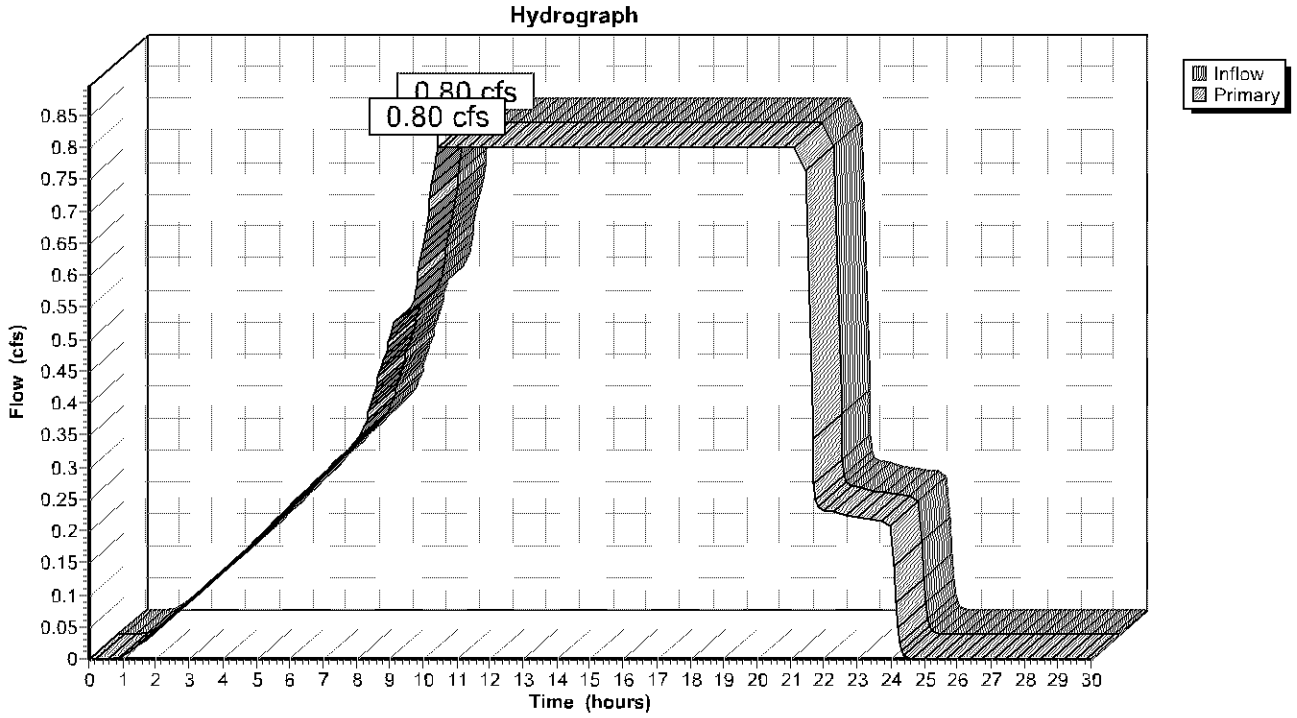


Summary for Link 23L: Infiltration

Inflow = 0.80 cfs @ 10.40 hrs, Volume= 0.989 af
Primary = 0.80 cfs @ 10.40 hrs, Volume= 0.989 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 23L: Infiltration



APPENDIX G

ADS CUMULATIVE STORAGE CALCULATIONS SPREADSHEET

Project: H.I.Ex & SUITES - Bloomington, MN

StormTech
A division of ADS

Chamber Model -	MC-3500	
Units -	Imperial	Click Here for Metric
Number of Chambers -	126	
Number of End Caps -	18	
Voids in the stone (porosity) -	40	%
Base of STONE Elevation -	815.70	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	6	in

☐ Include Perimeter Stone in Calculations

Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Single End Cap (cubic feet)	Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch, EC and Stone (cubic feet)	Cumulative System (cubic feet)	Elevation (feet)
66	0.00	0.00	0.00	0.00	225.81	225.81	23377.17	821.20
65	0.00	0.00	0.00	0.00	225.81	225.81	23151.35	821.12
64	0.00	0.00	0.00	0.00	225.81	225.81	22925.54	821.03
63	0.00	0.00	0.00	0.00	225.81	225.81	22699.73	820.95
62	0.00	0.00	0.00	0.00	225.81	225.81	22473.92	820.87
61	0.00	0.00	0.00	0.00	225.81	225.81	22248.10	820.78
60	0.00	0.00	0.00	0.00	225.81	225.81	22022.29	820.70
59	0.00	0.00	0.00	0.00	225.81	225.81	21796.48	820.62
58	0.00	0.00	0.00	0.00	225.81	225.81	21570.66	820.53
57	0.00	0.00	0.00	0.00	225.81	225.81	21344.85	820.45
56	0.00	0.00	0.00	0.00	225.81	225.81	21119.04	820.37
55	0.00	0.00	0.00	0.00	225.81	225.81	20893.23	820.28
54	0.06	0.00	7.32	0.00	222.89	230.20	20667.41	820.20
53	0.19	0.02	24.46	0.43	215.86	240.75	20437.21	820.12
52	0.29	0.04	37.04	0.68	210.73	248.44	20196.47	820.03
51	0.40	0.05	50.86	0.93	205.10	256.88	19948.02	819.95
50	0.69	0.07	86.58	1.22	190.69	278.49	19691.14	819.87
49	1.03	0.09	129.57	1.59	173.35	304.50	19412.65	819.78
48	1.25	0.11	157.44	1.93	162.06	321.43	19108.14	819.70
47	1.42	0.13	179.20	2.27	153.22	334.70	18786.71	819.62
46	1.57	0.14	198.21	2.60	145.49	346.30	18452.01	819.53
45	1.71	0.16	215.10	2.93	138.60	356.63	18105.71	819.45
44	1.83	0.18	230.39	3.27	132.35	366.01	17749.08	819.37
43	1.94	0.20	244.16	3.61	126.71	374.47	17383.07	819.28
42	2.04	0.22	257.14	3.93	121.38	382.46	17008.59	819.20
41	2.13	0.23	268.97	4.23	116.53	389.73	16626.14	819.12
40	2.22	0.25	280.25	4.51	111.91	396.67	16236.40	819.03
39	2.31	0.27	290.66	4.78	107.64	403.07	15839.73	818.95
38	2.38	0.28	300.48	5.04	103.60	409.12	15436.66	818.87
37	2.46	0.29	309.85	5.29	99.76	414.89	15027.53	818.78
36	2.53	0.31	318.55	5.54	96.18	420.27	14612.64	818.70
35	2.59	0.32	326.81	5.78	92.78	425.37	14192.37	818.62
34	2.66	0.33	334.66	6.02	89.54	430.22	13767.00	818.53
33	2.72	0.35	342.10	6.25	86.47	434.82	13336.78	818.45
32	2.77	0.36	349.18	6.48	83.55	439.21	12901.96	818.37
31	2.82	0.37	355.91	6.70	80.77	443.38	12462.75	818.28
30	2.88	0.38	362.31	6.92	78.12	447.35	12019.37	818.20
29	2.92	0.40	368.44	7.13	75.58	451.15	11572.02	818.12
28	2.97	0.41	374.21	7.34	73.20	454.74	11120.87	818.03
27	3.01	0.42	379.57	7.54	70.97	458.08	10666.13	817.95
26	3.05	0.43	384.71	7.73	68.83	461.28	10208.06	817.87
25	3.09	0.44	389.88	7.93	66.69	464.50	9746.78	817.78
24	3.13	0.45	394.45	8.11	64.79	467.35	9282.28	817.70
23	3.17	0.46	398.87	8.30	62.95	470.11	8814.93	817.62
22	3.20	0.47	403.13	8.47	61.17	472.77	8344.82	817.53
21	3.23	0.48	407.12	8.64	59.51	475.27	7872.04	817.45
20	3.26	0.49	410.94	8.81	57.92	477.66	7396.77	817.37
19	3.29	0.50	414.57	8.96	56.40	479.93	6919.11	817.28
18	3.32	0.51	418.06	9.12	54.94	482.12	6439.18	817.20
17	3.34	0.51	421.36	9.26	53.56	484.18	5957.06	817.12
16	3.37	0.52	424.45	9.40	52.27	486.12	5472.87	817.03
15	3.39	0.53	427.46	9.53	51.02	488.01	4986.75	816.95
14	3.41	0.54	430.23	9.66	49.86	489.75	4498.75	816.87
13	3.44	0.54	433.06	9.78	48.68	491.52	4009.00	816.78
12	3.46	0.55	435.67	9.89	47.59	493.15	3517.48	816.70
11	3.48	0.56	438.32	9.99	46.49	494.80	3024.33	816.62
10	3.51	0.59	441.64	10.71	44.87	497.22	2529.54	816.53
9	0.00	0.00	0.00	0.00	225.81	225.81	2032.31	816.45
8	0.00	0.00	0.00	0.00	225.81	225.81	1806.50	816.37
7	0.00	0.00	0.00	0.00	225.81	225.81	1580.69	816.28
6	0.00	0.00	0.00	0.00	225.81	225.81	1354.88	816.20
5	0.00	0.00	0.00	0.00	225.81	225.81	1129.06	816.12
4	0.00	0.00	0.00	0.00	225.81	225.81	903.25	816.03
3	0.00	0.00	0.00	0.00	225.81	225.81	677.44	815.95
2	0.00	0.00	0.00	0.00	225.81	225.81	451.63	815.87
1	0.00	0.00	0.00	0.00	225.81	225.81	225.81	815.78