STORMWATER MANAGEMENT PLAN

Frame Park Commons
City of Waukesha, Waukesha County, Wisconsin
PEG Project Number: 1545.00-WI

Prepared for:

BEAR DEVELOPMENT

11/06/2019

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INTRODUCTION

The proposed Frame Park Commons development site is located in the City of Waukesha, Waukesha County, WI. A location map that illustrates the tract of land is included in **Appendix 1**.

This stormwater management plan has been designed to accommodate the two multifamily sites with the two proposed buildings and the supporting infrastructures including parking lots & drive lanes. The sites have been divided into two lots, the West and the East lot. Each site will include combining existing lots to create the overall lot boundary via the proposed certified survey map. The West lot consists of a 18,000 S.F. building with 52 units, and the East lot a 15,000 S.F. building with 20 units.

DESIGN CRITERIA

Waukesha Municipal Code: .....Chapter 32: Stormwater Management and Erosion Control

Wisconsin Department of Natural Resources:..... NR 216 & NR 151.12

Water Quality: Removal of 40% of the annual total suspended solids (TSS) load for onsite areas.

Water Quantity: The Waukesha Municipal Code dictates that the 1-yr, 2-yr, 10-yr & 100-yr, 24-hr post-development runoff rates shall not exceed the 1-yr, 2-yr, 10-yr & 100-yr, 24-hr pre-development runoff rate.

Infiltration: The project site has been deemed to be exempt from requirements as it is a redevelopment.

ANALYSIS METHODS

HydroCAD® (Version 10.00) software has been used to analyze stormwater characteristics for this stormwater management plan. HydroCAD uses the accepted TR-55 methodology for determining peak discharge runoff rates. Existing ground cover Curve Numbers were selected from the Waukesha Municipal Code, Section 32.11. The Code of Ordinances Performance Standards specifies a maximum grassland curve number of 78.

Stormwater modeling was conducted using 1-yr, 2-yr, 10-yr, and 100-year storm events with respective rainfall amounts of 2.40, 2.70, 3.81, and 6.18 inches in accordance with Chapter 32, Table 3 of the Waukesha Municipal Code.

TSS reduction characteristics for the proposed water quality facilities were determined using WinSLAMM® (Version 10.4) Source Loading and Management Model.

PRE-DEVELOPMENT CONDITIONS

The existing site comprises of a single proposed West lot & an East lot. Each site will include combining existing lots to create the overall lot boundary via the proposed certified survey map.

The West Lot contains multiple existing buildings, parking lot areas and grassland. The site generally slopes from to east to west. The western edge of the site drains onto an extended 2:1 slope down to a depression and eventually overtopping into East Moreland Boulevard and getting into the public storm sewer. A contributing watershed map and supporting hydrologic modeling output for the existing conditions is located in **Appendix 2**.

The East lot contains multiple parking lot areas and grassland. The site is divided into a Northern & Southern drainage area. The northern area sheet flows to White Rock Avenue and gets into the public storm sewer. The southern area has a storm sewer system that is connected directly to the public storm sewer into Niagara Street. A contributing watershed map and supporting hydrologic modeling output for the existing conditions is located in **Appendix 2**.

POST-DEVELOPMENT CONDITIONS

The onsite areas are based on the total disturbed areas from the proposed design at both sites. A contributing watershed map and supporting hydrologic modeling output for the proposed conditions is located in **Appendix 3**.

Peak Runoff Rate Attenuation, Water Quality & Infiltration - West Lot

Design post-development release rates for the proposed project have been calculated based on the output of the existing conditions Hydrologic Modeling. Stormwater runoff peak rates will be controlled through the usage of a ADS Stormtech MC-4500 chamber system. The underground chamber system has been situated to collect the onsite storm sewer outfalls and overland relief routing. Post development peak runoff rate attenuation will be achieved through the outlet control device and available storm water detention volume provided by the underground chamber system.

Design post-development release rates for the proposed development have been computed for the proposed watershed. Presentation of pertinent values from the modeling is contained within the following tables:

PRE-DEVELOPMENT (EXISTING WEST LOT) SUMMARY

Node	Area (ac)	CN	Tc (min)	1-year Peak	2-year Peak	10-year Peak	100-year Peak
E1	0.419	91	6	1.12 cfs	1.31 cfs	2.02 cfs	3.52 cfs
E2	0.812	91	6	2.17 cfs	2.54 cfs	3.91 cfs	6.81 cfs
TOTAL*	**1.23**	**N/A**	**N/A**	**1.89 cfs***	**2.71 cfs***	**5.03 cfs***	**9.01 cfs***

*TOTAL INCLUDES REDUCTION FROM PEAKS DUE TO DEPRESSION BUILD UP

POST-DEVELOPMENT (PROPOSED WEST LOT) SUMMARY

Node	Area (ac)	CN	Tc (min)	1-year Peak	2-year Peak	10-year Peak	100-year Peak
A1 (COMPOSITE)	1.09	95	6	3.43 cfs	3.93 cfs	5.75 cfs	9.58 cfs
A2 (UNDETAINED)	0.14	86	6	0.29 cfs	0.35 cfs	0.58 cfs	1.09 cfs
PR (DISCHARGE)	**1.23**	**N/A**	**N/A**	**1.87 cfs**	**2.34 cfs**	**4.43 cfs**	**8.74 cfs**

COMPARISON OF PROPOSED TO ALLOWABLE PEAK FLOWS

Discharge Point		Peak Flow 1-year (cfs)	Peak Flow 2-year (cfs)	Peak Flow 10-year (cfs)	Peak Flow 100-year (cfs)
CHAMBER	PROPOSED*	1.87	2.34	4.43	8.74
	ALLOWABLE	1.89	2.71	5.03	9.01
	MEETS CODE (?)	**YES**	**YES**	**YES**	**YES**

*THE PROPOSED MODELS FOR THE STORM EVENTS CAN BE FOUND IN **APPENDIX 3**. POST-DEVELOPMENT RELEASE RATES ARE TAKEN FROM PROPOSED WEST BUILDING IN THE HYDROCAD SUMMARY RESULTS

Runoff Water Quality

Post-development water quality will be obtained within the underground chamber system isolator row and an Up-Flo filter. Most of the impervious surfaces will be captured and conveyed into the chamber system per the current civil design. The primary conveyance will be accomplished through the onsite storm sewer. Undetained areas have also been included in the total calculations as they will not be treated.

WinSLAMM modeling indicates that the chamber system and the Up-Flo filter will remove 55.3% TSS prior to runoff leaving the site, as compared to the required removal of 40.0%. Refer to **Appendix 4** for WinSLAMM modeling input/output summaries.

Stormwater Infiltration

Stormwater Infiltration has not been incorporated into this storm water management plan due to the site being classified as redevelopment, and redevelopment sites are exempt from NR 151 infiltration requirements.

Peak Runoff Rate Attenuation, Water Quality & Infiltration - East Lot

Design post-development release rates for the proposed project have been calculated based on the output of the existing conditions Hydrologic Modeling. Stormwater runoff peak rates will be controlled through the usage of a dry detention pond. The pond has been situated to collect the onsite storm sewer outfalls and overland relief routing. Post development peak runoff rate attenuation will be achieved through the outlet control device and available storm water detention volume provided by the pond.

Design post-development release rates for the proposed development have been computed for the proposed watershed. Presentation of pertinent values from the modeling is contained within the following tables:

PRE-DEVELOPMENT (EXISTING EAST LOT) SUMMARY

Node	Area (ac)	CN	Tc (min)	1-year Peak	2-year Peak	10-year Peak	100-year Peak
E3	0.407	84	6	0.64 cfs	0.79 cfs	1.36 cfs	2.63 cfs
E4	0.703	91	6	1.60 cfs	1.88 cfs	2.92 cfs	5.10 cfs
TOTAL	**1.11**	**N/A**	**N/A**	**2.24 cfs**	**2.66 cfs**	**4.27 cfs**	**7.73 cfs**

POST-DEVELOPMENT (PROPOSED EAST LOT) SUMMARY

Node	Area (ac)	CN	Tc (min)	1-year Peak	2-year Peak	10-year Peak	100-year Peak
A3 (COMPOSITE)	1.11	90	6	2.83 cfs	3.34 cfs	5.22 cfs	9.20 cfs
PR (DISCHARGE)	**1.11**	**N/A**	**N/A**	**1.60 cfs**	**1.75 cfs**	**2.24 cfs**	**4.66 cfs**
PEAK (ELEV.)	N/A	N/A	N/A	49.24 ft	49.42 ft	50.10 ft	51.20 ft

COMPARISON OF PROPOSED TO ALLOWABLE PEAK FLOWS

Discharge Point		Peak Flow 1-year (cfs)	Peak Flow 2-year (cfs)	Peak Flow 10-year (cfs)	Peak Flow 100-year (cfs)
POND	PROPOSED*	1.60	1.75	2.24	4.66
	ALLOWABLE	1.60	1.88	2.92	5.10
	MEETS CODE (?)	**YES**	**YES**	**YES**	**YES**

*THE PROPOSED MODELS FOR THE STORM EVENTS CAN BE FOUND IN **APPENDIX 3**. POST-DEVELOPMENT RELEASE RATES ARE TAKEN FROM PROPOSED EAST BUILDING IN THE HYDROCAD SUMMARY RESULTS.

Runoff Water Quality

Post-development water quality will be obtained by an Up-Flo filter. The impervious surfaces will be captured and conveyed into the pond and through the Up-Flo filter per the current civil design. The primary conveyance will be accomplished through the onsite storm sewer.

WinSLAMM modeling indicates that the Up-Flo filter will remove 51.0% TSS prior to runoff leaving the site, as compared to the required removal of 40.0%. Refer to **Appendix 4** for WinSLAMM modeling input/output summaries.

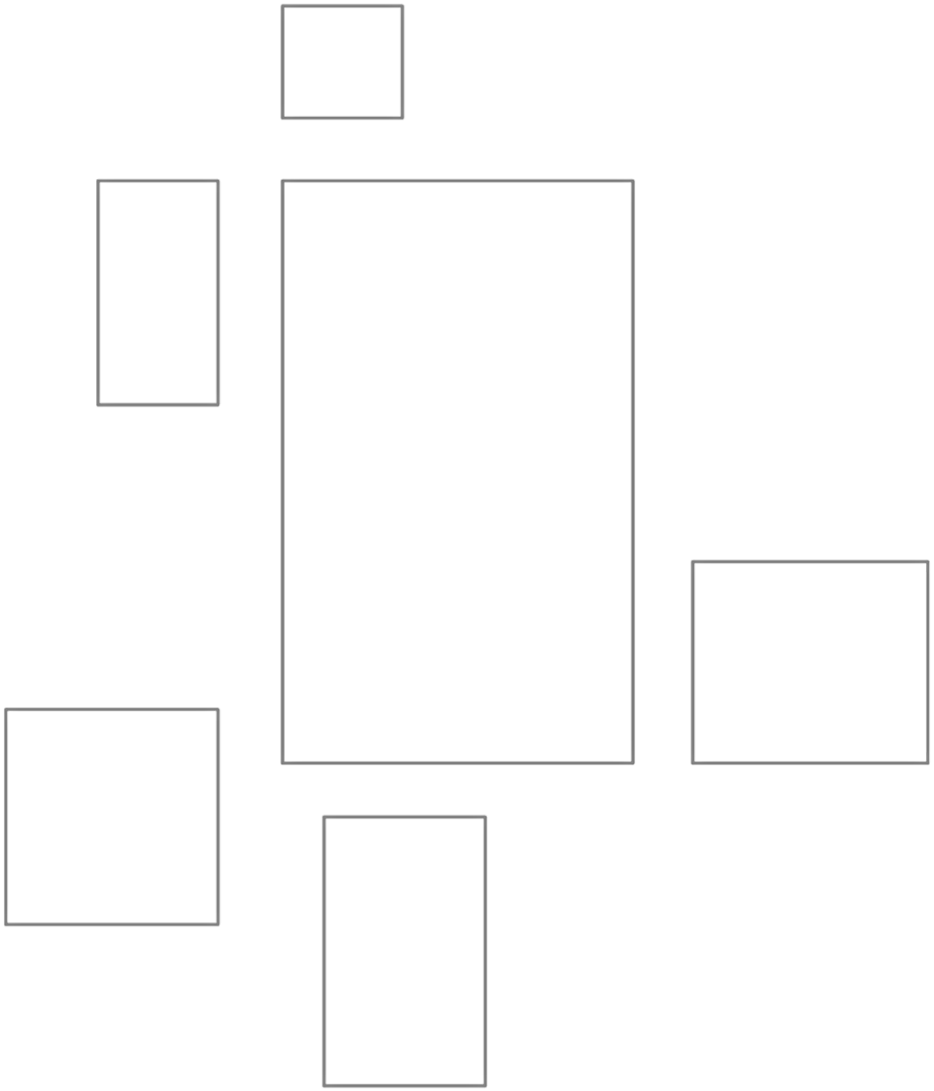
Stormwater Infiltration

Stormwater Infiltration has not been incorporated into this storm water management plan due to the site being classified as redevelopment, and redevelopment sites are exempt from NR 151 infiltration requirements.

CONCLUSION

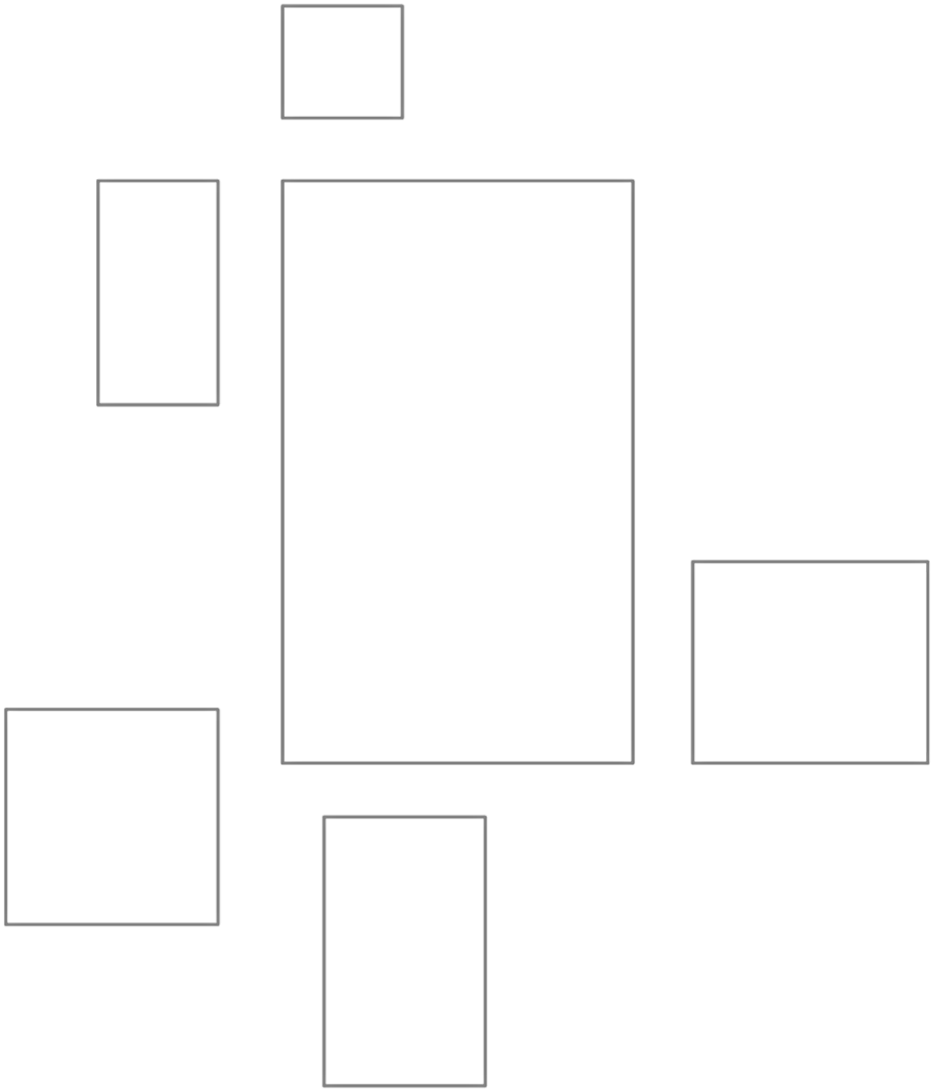
The stormwater management features for the Frame Park Commons development have been designed to comply with Waukesha Municipal Code and WDNR technical standards NR151 and NR216. Proposed runoff rates will be reduced as required to ensure downstream conveyance capacity. Storm water runoff from the development site will be treated to remove required total suspended solids annually through a chamber isolator row and 2 Up-Flo filters. It is believed the sites meet criteria set forth in WDNR NR 151 to be exempt from infiltration requirements; therefore, infiltration measures have not been included in this storm water management plan.

(Appendices Follow)



1 Appendix


FRAME PARK COMMONS
VICINITY MAP
Legend
FRAME PARK COMMONS
White Rock Elementary School
Rock St
Whiterock Ave
E Moreland Blvd
Eales Ave
FRAME PARK COMMONS
Elm St
White Rock Ave
Niagara St
N
600 ft
Google Earth
© 2018 Google



2 Appendix

EAST MORELAND BOULEVARD
STATE TRUNK HIGHWAY "18"
(FORMERLY KNOWN AS LOCUST STREET)

EAST MORELAND BOULEVARD
STATE TRUNK HIGHWAY "18"
(FORMERLY KNOWN AS BROOKFIELD AVENUE)

CANADIAN NATIONAL RAILROAD

E1 - NORTH EXISTING TO EAST MORELAND BLVD STORM 0.42 ACRES

E2 - SOUTH EXISTING TO DEPRESSION AT CANADIAN NATIONAL RAIL ROAD THEN TO EAST MORELAND BLVD STORM 0.81 ACRES

E3 - NORTH EXISTING TO WHITE ROCK AVE STORM 0.41 ACRES

E4 - SOUTH EXISTING TO NIAGARA STREET STORM 0.71 ACRES

WHITE ROCK AVENUE
(66' PUBLIC R.O.W.)
(FORMERLY KNOWN AS VERMONT STREET)

ELM STREET
(50' PUBLIC R.O.W.)
(FORMERLY KNOWN AS WAVERLY AVENUE)

EALES AVENUE
(VARIABLE PUBLIC R.O.W.)
(FORMERLY KNOWN AS COLUMBIA AVENUE)

NIAGARA STREET
(VARIABLE PUBLIC R.O.W.)

OWNER: SANCHEZ

OWNER: HERRMANN

NORTH

GRAPHICAL SCALE (FEET)

0 1" = 60' 120'

Z:\PROJECTS\2018\1545.00-WI\CAD\EXHIBITS\1545.00-WI EXISTING DRAINAGE AREAS.DWG 11/6/2019 3:16 PM

1545.00 FRAME PARK COMMONS - EX DRAINAGE AREA MAP

11/06/2019

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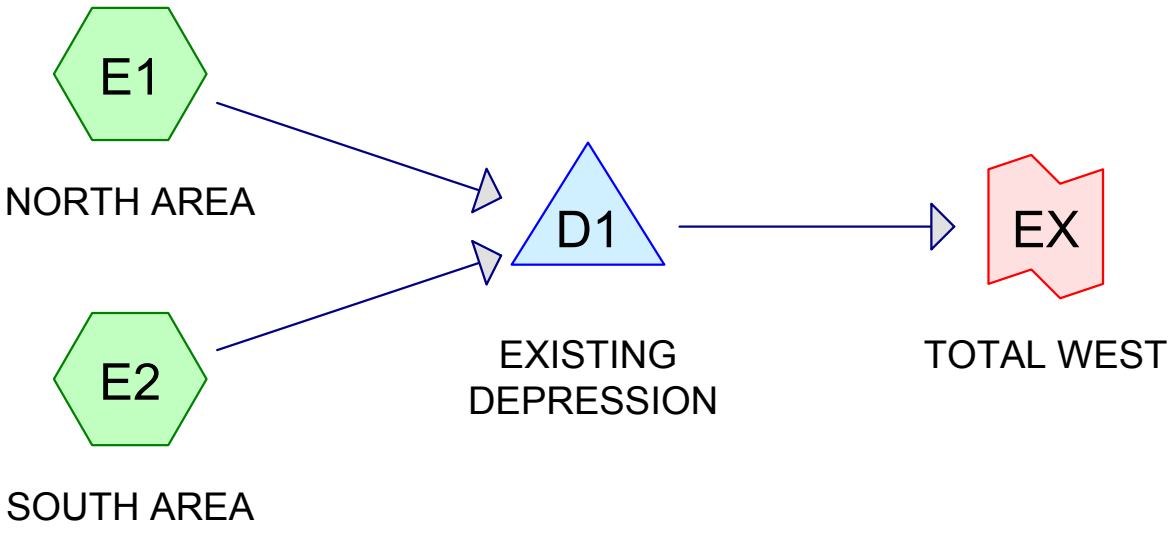
PLAN | DESIGN | DELIVER **PEG JOB#** 1545.00



Subcat Reach Pond Link

Routing Diagram for 1545.00-WI EXISTING WEST BUILDING
Prepared by Microsoft, Printed 11/6/2019

Summary for Subcatchment E1: NORTH AREA

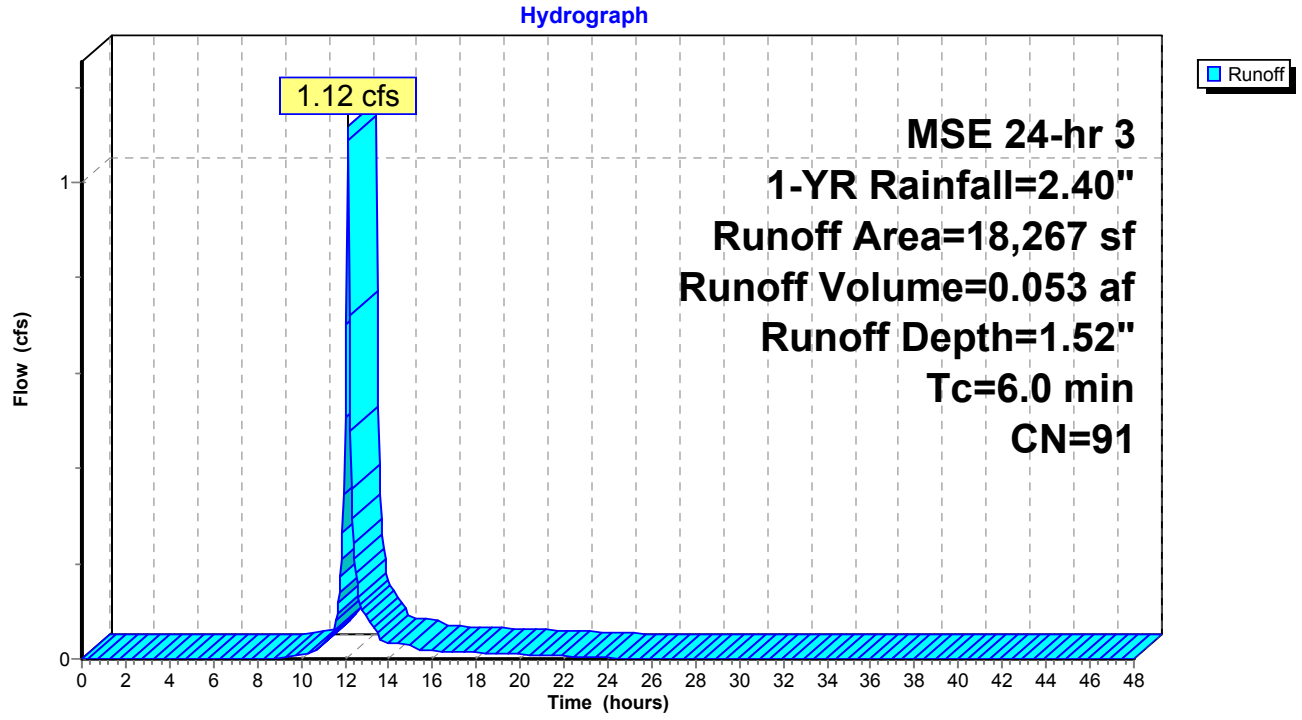
Runoff = 1.12 cfs @ 12.13 hrs, Volume= 0.053 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	6,227	78	>75% Grass cover, Good, HSG D
*	10,015	98	Paved parking, HSG D
*	2,025	98	Roof - Old Bldg
	18,267	91	Weighted Average
	6,227		34.09% Pervious Area
	12,040		65.91% Impervious Area

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

Subcatchment E1: NORTH AREA



Summary for Subcatchment E2: SOUTH AREA

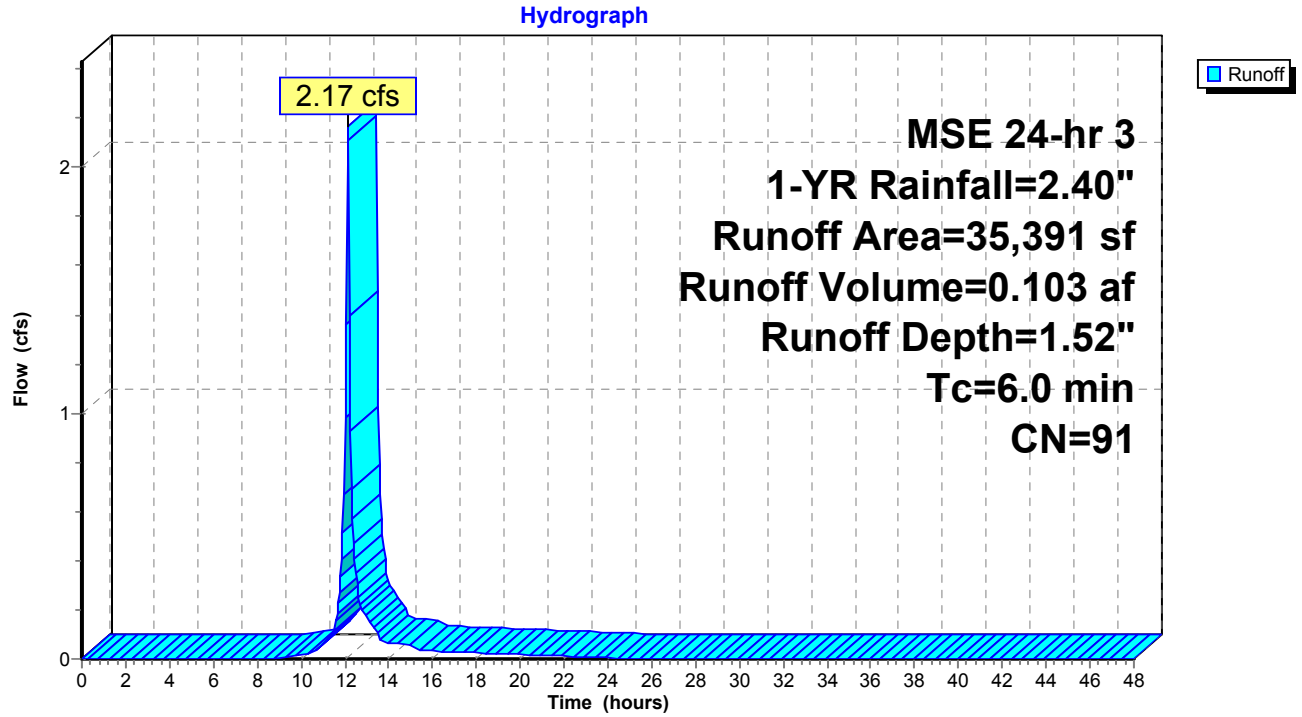
Runoff = 2.17 cfs @ 12.13 hrs, Volume= 0.103 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	12,153	78	>75% Grass cover, Good, HSG D
*	4,404	98	Paved parking, HSG D
	2,486	98	Roofs, HSG D
*	1,665	91	Gravel roads, HSG D
*	14,683	98	Roof - Old Bldg
	35,391	91	Weighted Average
	13,818		39.04% Pervious Area
	21,573		60.96% Impervious Area

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

Subcatchment E2: SOUTH AREA



Summary for Pond D1: EXISTING DEPRESSION

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 1.52" for 1-YR event
Inflow = 3.29 cfs @ 12.13 hrs, Volume= 0.156 af
Outflow = 1.89 cfs @ 12.22 hrs, Volume= 0.105 af, Atten= 42%, Lag= 5.6 min
Primary = 1.89 cfs @ 12.22 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 42.67' @ 12.22 hrs Surf.Area= 4,165 sf Storage= 2,905 cf

Plug-Flow detention time= 130.1 min calculated for 0.105 af (67% of inflow)
Center-of-Mass det. time= 56.0 min (849.9 - 793.8)

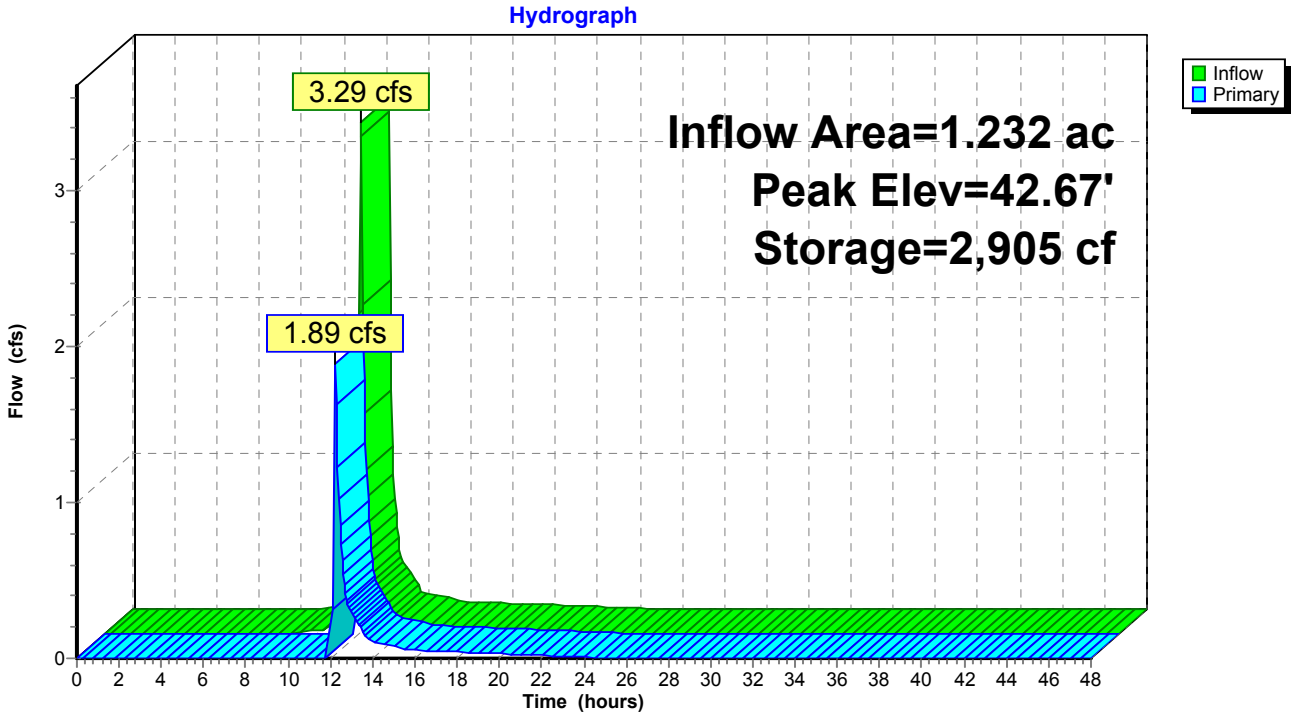
Volume	Invert	Avail.Storage	Storage Description
#1	41.40'	4,439 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.40	566	0	0
42.00	2,103	801	801
43.00	5,174	3,639	4,439

Device	Routing	Invert	Outlet Devices
#1	Primary	42.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.78 cfs @ 12.22 hrs HW=42.66' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.78 cfs @ 1.09 fps)

Pond D1: EXISTING DEPRESSION

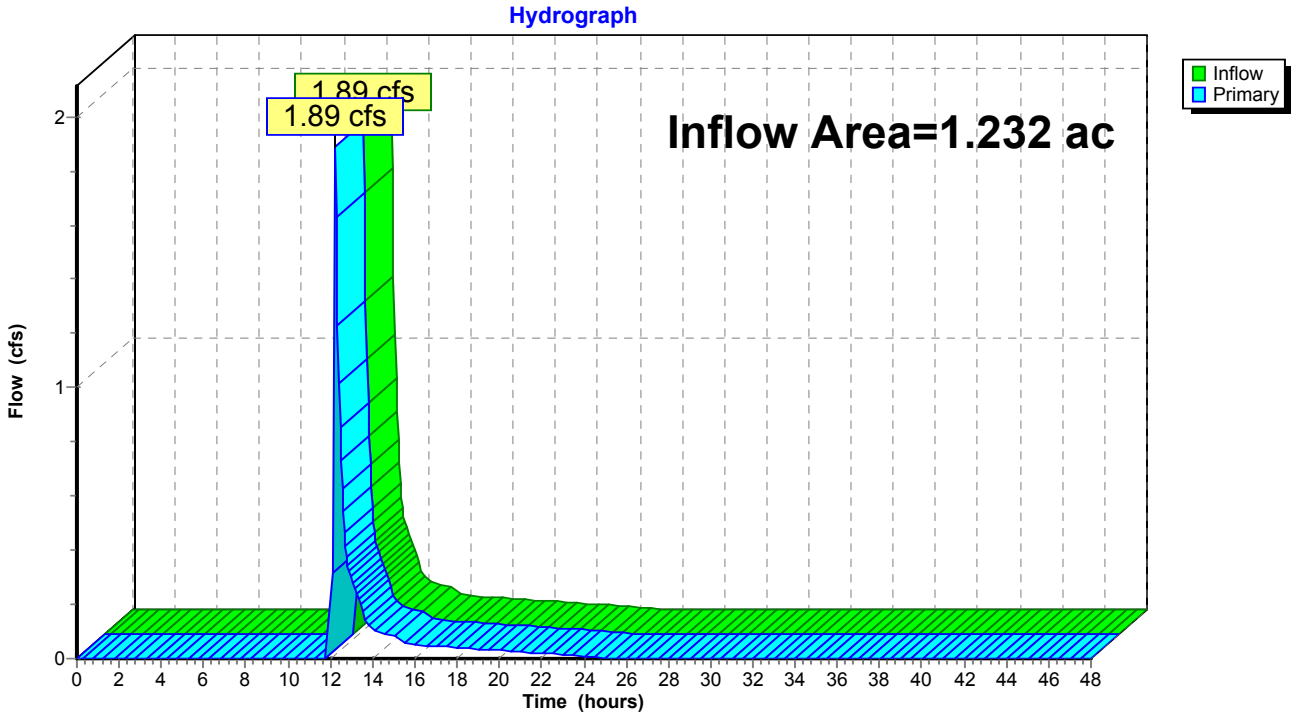


Summary for Link EX: TOTAL WEST

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 1.02" for 1-YR event
Inflow = 1.89 cfs @ 12.22 hrs, Volume= 0.105 af
Primary = 1.89 cfs @ 12.22 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL WEST



Summary for Subcatchment E1: NORTH AREA

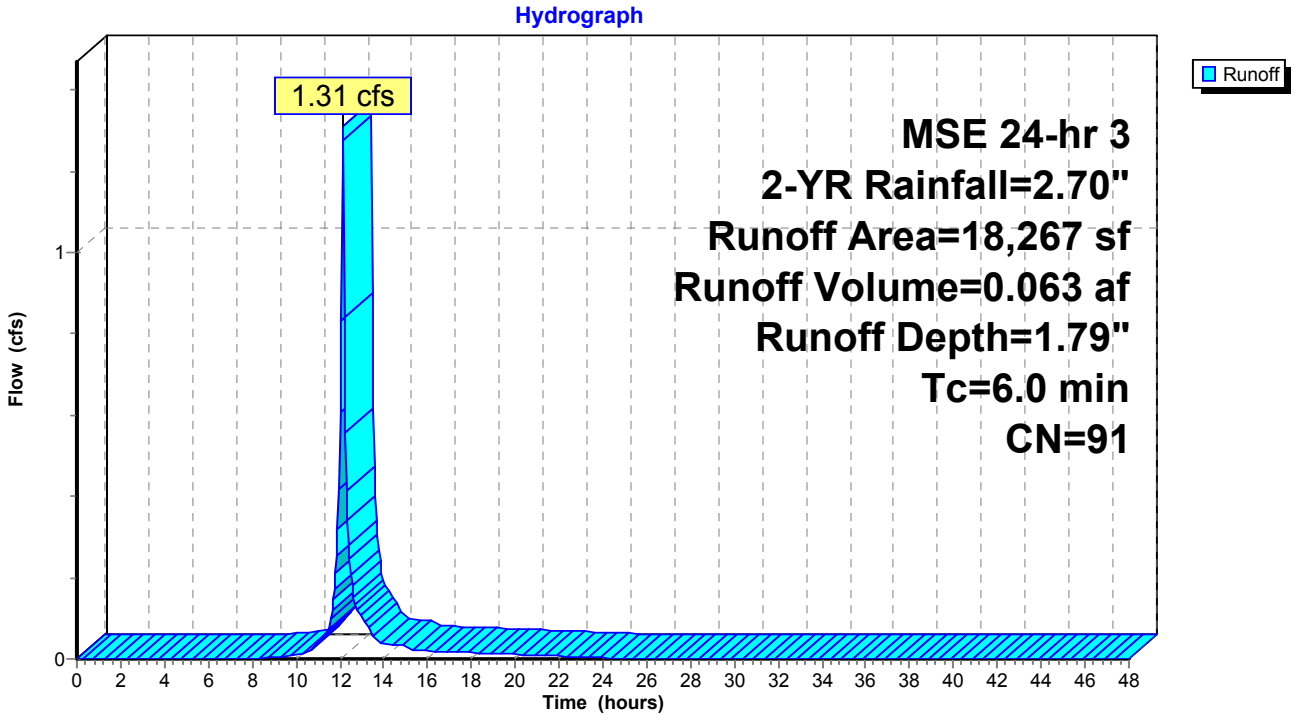
Runoff = 1.31 cfs @ 12.13 hrs, Volume= 0.063 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	6,227	78	>75% Grass cover, Good, HSG D
*	10,015	98	Paved parking, HSG D
*	2,025	98	Roof - Old Bldg
	18,267	91	Weighted Average
	6,227		34.09% Pervious Area
	12,040		65.91% Impervious Area

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

Subcatchment E1: NORTH AREA



Summary for Subcatchment E2: SOUTH AREA

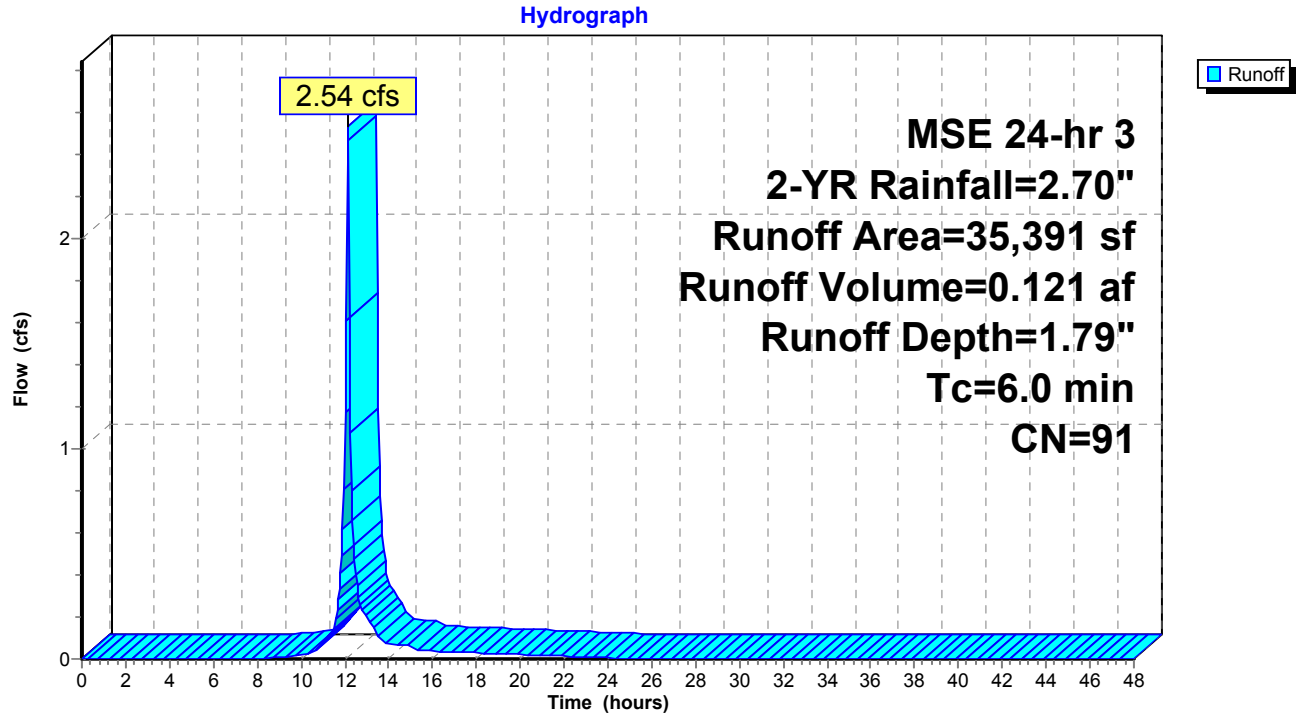
Runoff = 2.54 cfs @ 12.13 hrs, Volume= 0.121 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	12,153	78	>75% Grass cover, Good, HSG D
*	4,404	98	Paved parking, HSG D
	2,486	98	Roofs, HSG D
*	1,665	91	Gravel roads, HSG D
*	14,683	98	Roof - Old Bldg
	35,391	91	Weighted Average
	13,818		39.04% Pervious Area
	21,573		60.96% Impervious Area

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

Subcatchment E2: SOUTH AREA



Summary for Pond D1: EXISTING DEPRESSION

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 1.79" for 2-YR event
Inflow = 3.85 cfs @ 12.13 hrs, Volume= 0.184 af
Outflow = 2.71 cfs @ 12.20 hrs, Volume= 0.133 af, Atten= 29%, Lag= 4.4 min
Primary = 2.71 cfs @ 12.20 hrs, Volume= 0.133 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 42.72' @ 12.20 hrs Surf.Area= 4,305 sf Storage= 3,098 cf

Plug-Flow detention time= 117.1 min calculated for 0.133 af (72% of inflow)
Center-of-Mass det. time= 47.5 min (838.0 - 790.5)

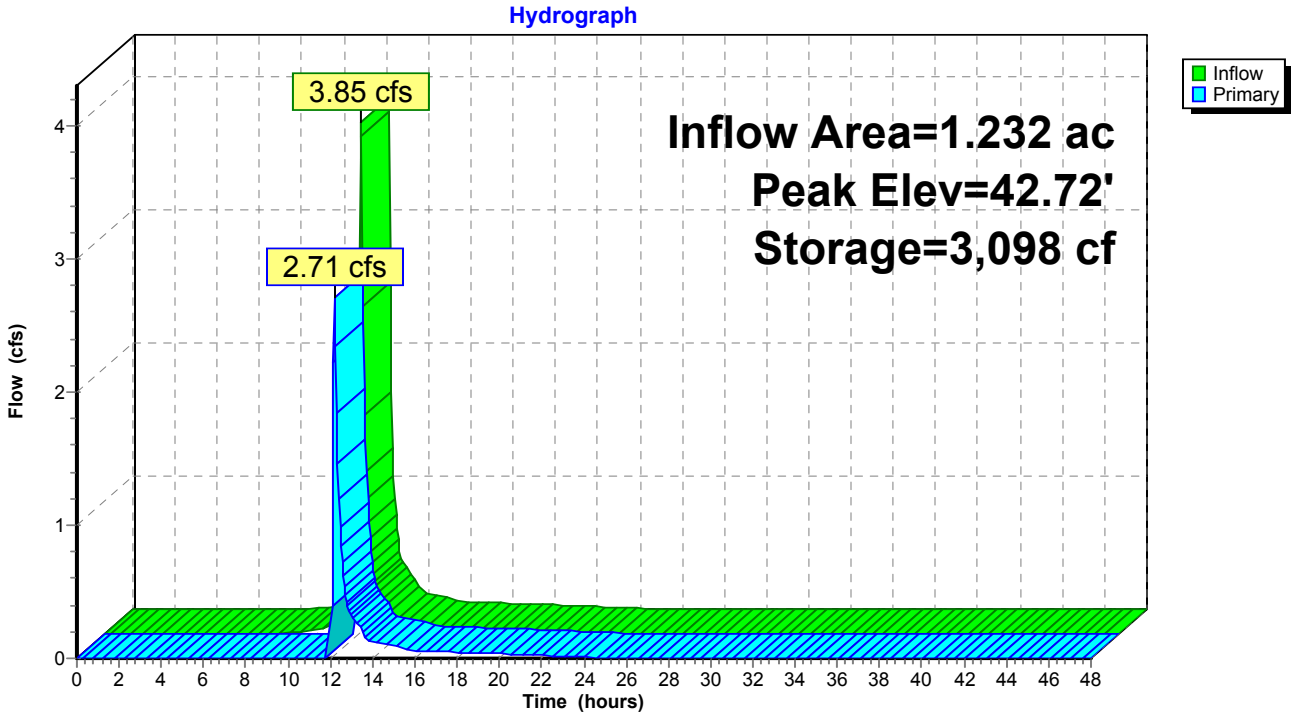
Volume	Invert	Avail.Storage	Storage Description
#1	41.40'	4,439 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.40	566	0	0
42.00	2,103	801	801
43.00	5,174	3,639	4,439

Device	Routing	Invert	Outlet Devices
#1	Primary	42.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=2.68 cfs @ 12.20 hrs HW=42.72' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.68 cfs @ 1.25 fps)

Pond D1: EXISTING DEPRESSION

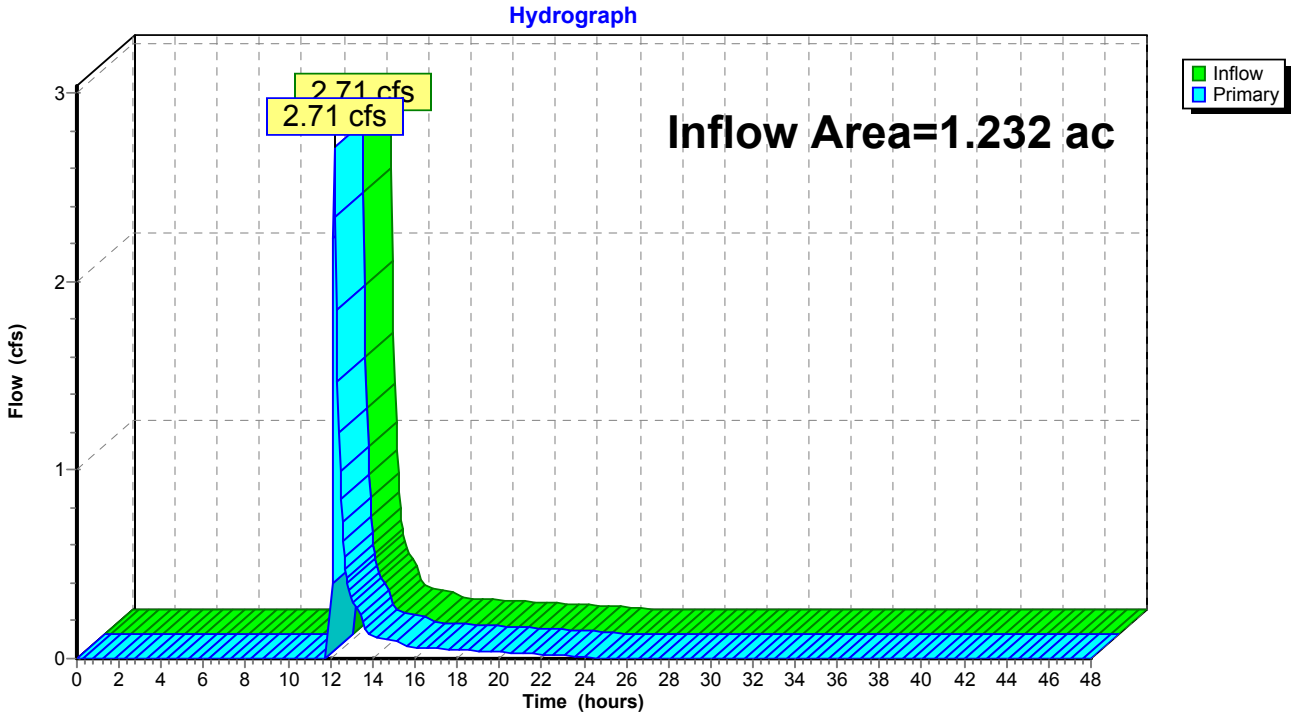


Summary for Link EX: TOTAL WEST

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 1.29" for 2-YR event
Inflow = 2.71 cfs @ 12.20 hrs, Volume= 0.133 af
Primary = 2.71 cfs @ 12.20 hrs, Volume= 0.133 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL WEST



Summary for Subcatchment E1: NORTH AREA

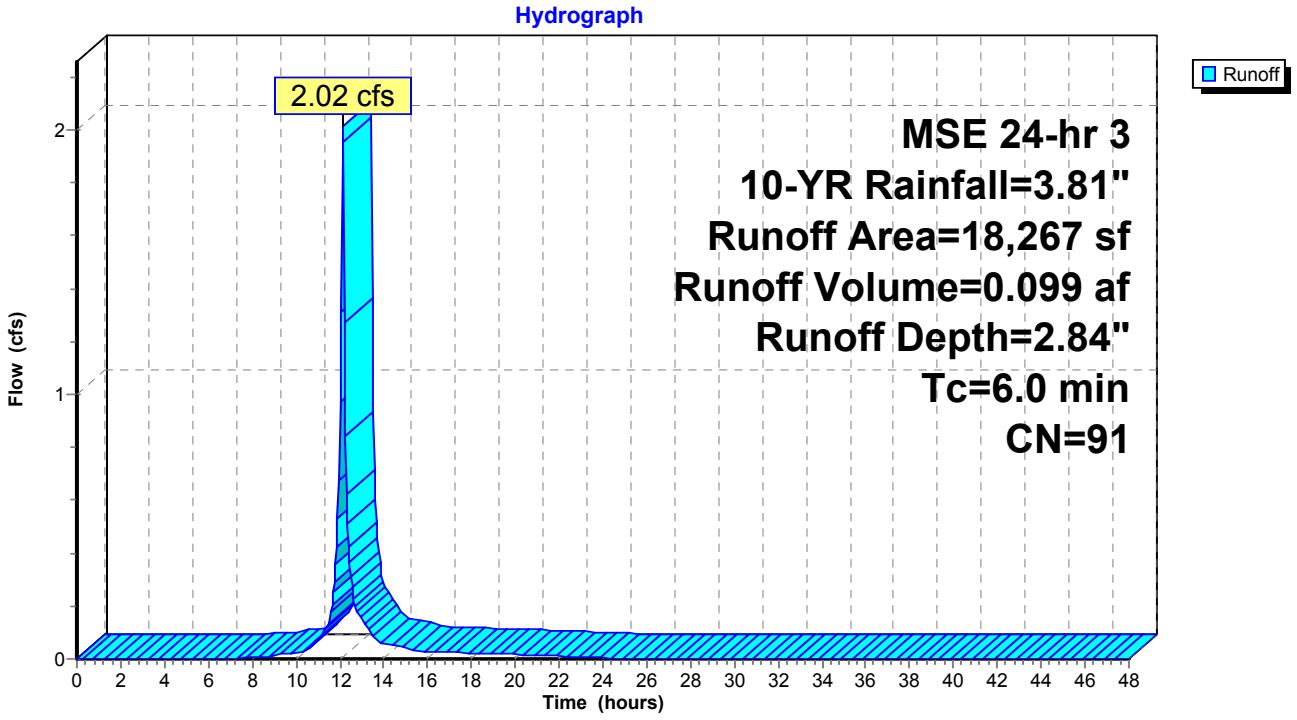
Runoff = 2.02 cfs @ 12.13 hrs, Volume= 0.099 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	6,227	78	>75% Grass cover, Good, HSG D
*	10,015	98	Paved parking, HSG D
*	2,025	98	Roof - Old Bldg
	18,267	91	Weighted Average
	6,227		34.09% Pervious Area
	12,040		65.91% Impervious Area

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

Subcatchment E1: NORTH AREA



Summary for Subcatchment E2: SOUTH AREA

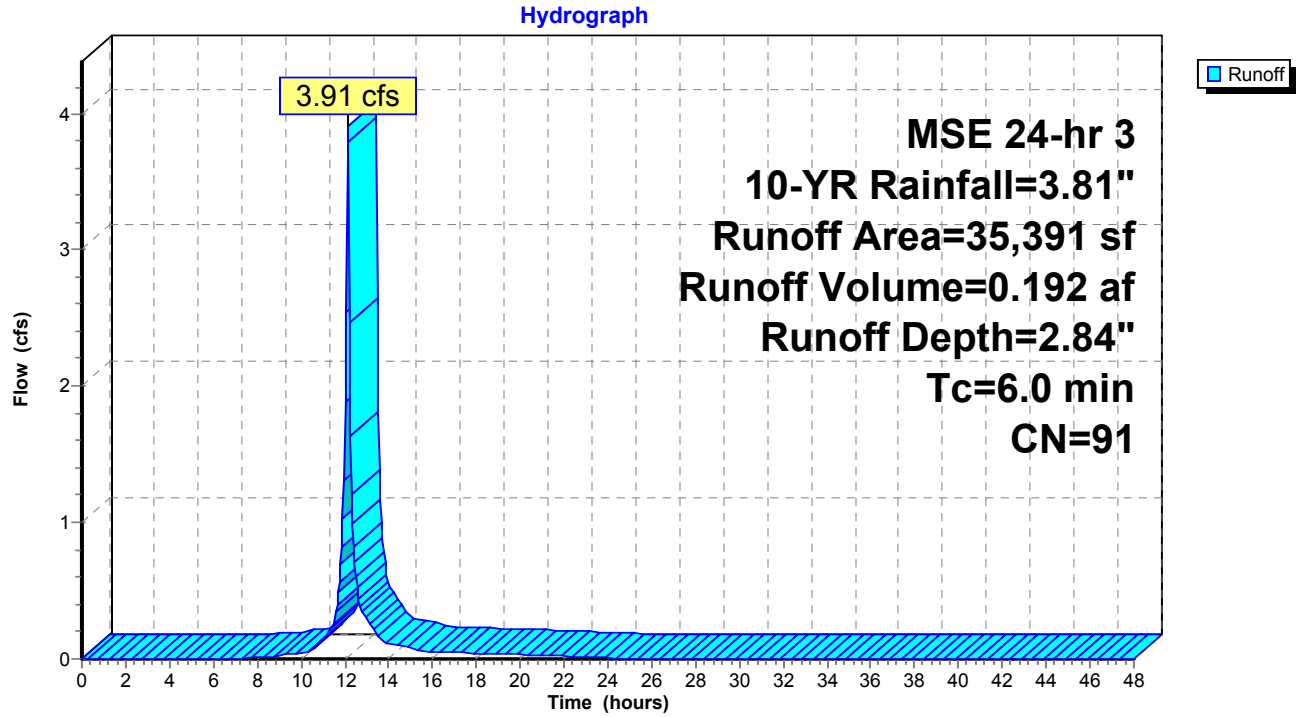
Runoff = 3.91 cfs @ 12.13 hrs, Volume= 0.192 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	12,153	78	>75% Grass cover, Good, HSG D
*	4,404	98	Paved parking, HSG D
	2,486	98	Roofs, HSG D
*	1,665	91	Gravel roads, HSG D
*	14,683	98	Roof - Old Bldg
	35,391	91	Weighted Average
	13,818		39.04% Pervious Area
	21,573		60.96% Impervious Area

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

Subcatchment E2: SOUTH AREA



Summary for Pond D1: EXISTING DEPRESSION

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 2.84" for 10-YR event
Inflow = 5.93 cfs @ 12.13 hrs, Volume= 0.291 af
Outflow = 5.03 cfs @ 12.17 hrs, Volume= 0.240 af, Atten= 15%, Lag= 2.5 min
Primary = 5.03 cfs @ 12.17 hrs, Volume= 0.240 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 42.83' @ 12.17 hrs Surf.Area= 4,643 sf Storage= 3,590 cf

Plug-Flow detention time= 91.8 min calculated for 0.240 af (82% of inflow)
Center-of-Mass det. time= 34.7 min (816.1 - 781.4)

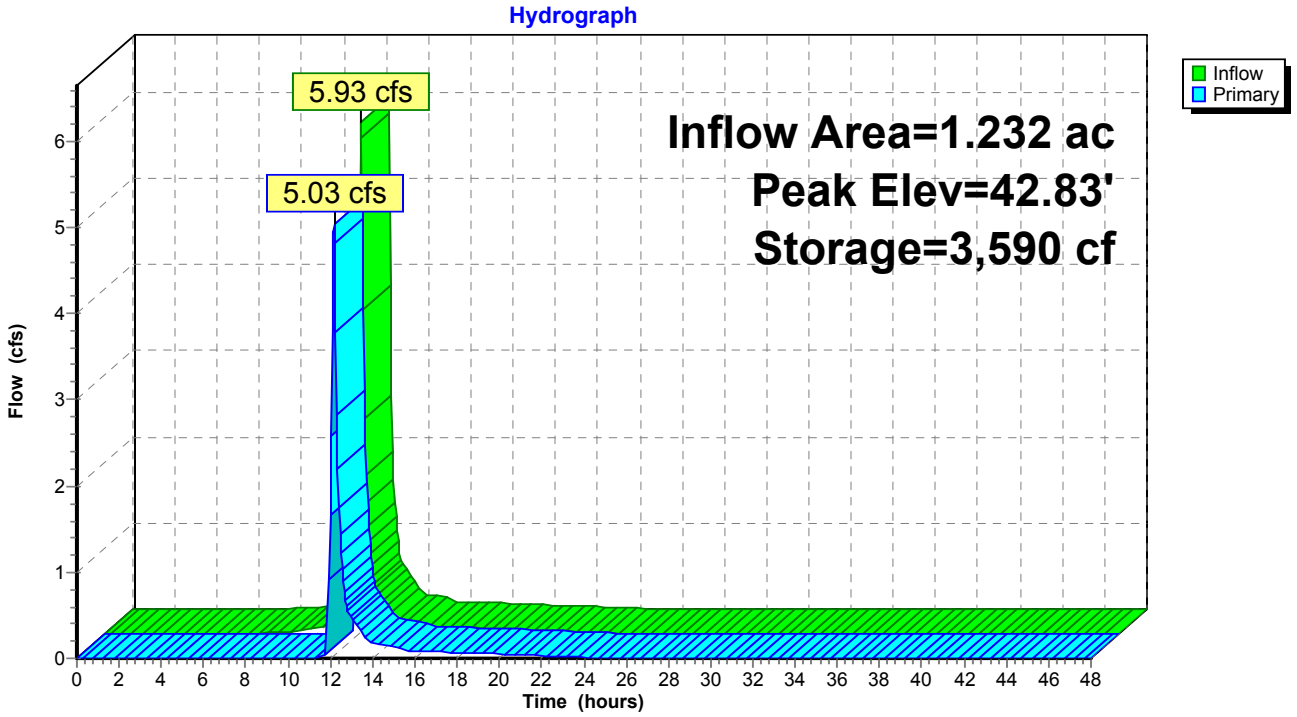
Volume	Invert	Avail.Storage	Storage Description
#1	41.40'	4,439 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.40	566	0	0
42.00	2,103	801	801
43.00	5,174	3,639	4,439

Device	Routing	Invert	Outlet Devices
#1	Primary	42.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.88 cfs @ 12.17 hrs HW=42.82' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.88 cfs @ 1.52 fps)

Pond D1: EXISTING DEPRESSION

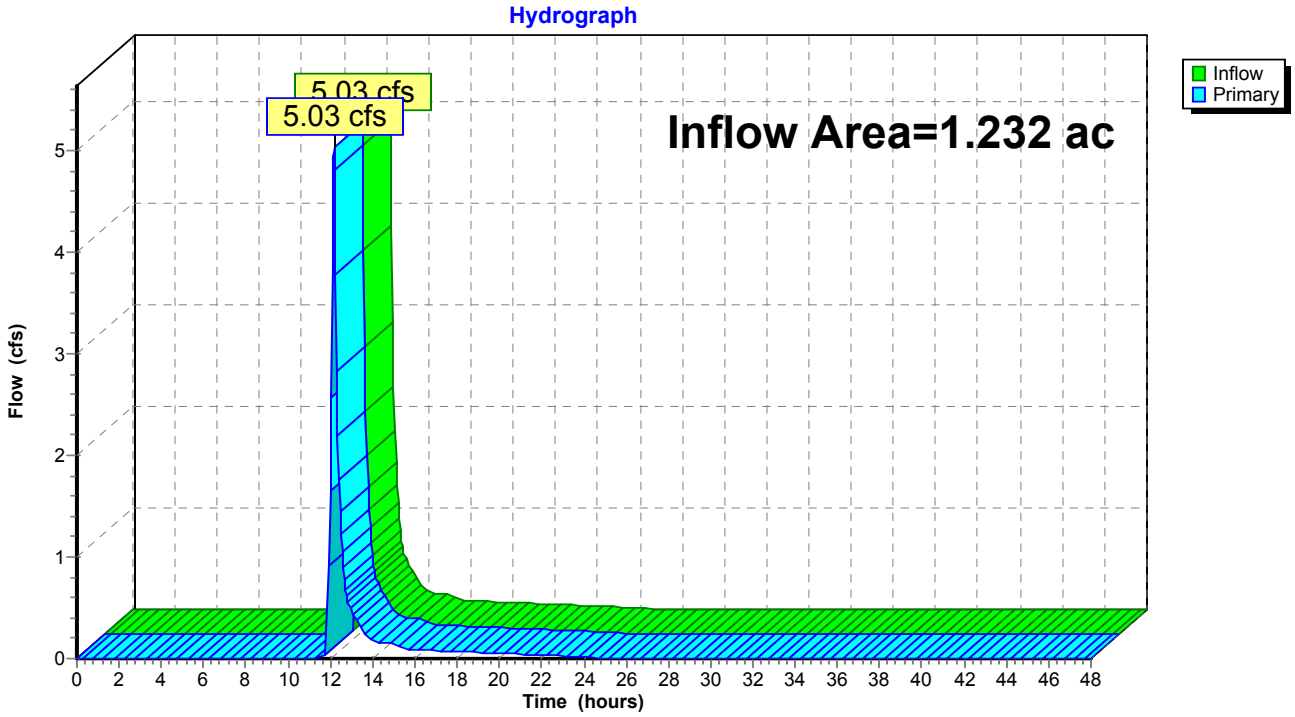


Summary for Link EX: TOTAL WEST

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 2.34" for 10-YR event
Inflow = 5.03 cfs @ 12.17 hrs, Volume= 0.240 af
Primary = 5.03 cfs @ 12.17 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL WEST



Summary for Subcatchment E1: NORTH AREA

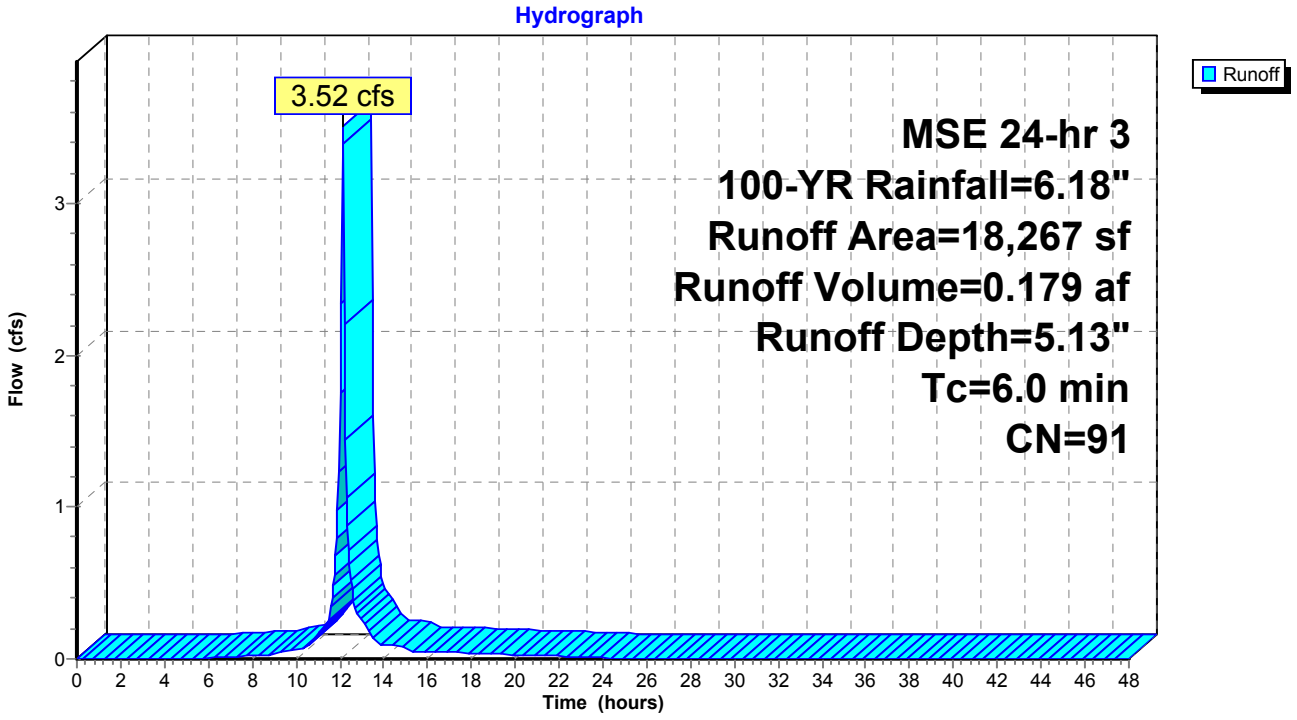
Runoff = 3.52 cfs @ 12.13 hrs, Volume= 0.179 af, Depth= 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	6,227	78	>75% Grass cover, Good, HSG D
*	10,015	98	Paved parking, HSG D
*	2,025	98	Roof - Old Bldg
	18,267	91	Weighted Average
	6,227		34.09% Pervious Area
	12,040		65.91% Impervious Area

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

Subcatchment E1: NORTH AREA



Summary for Subcatchment E2: SOUTH AREA

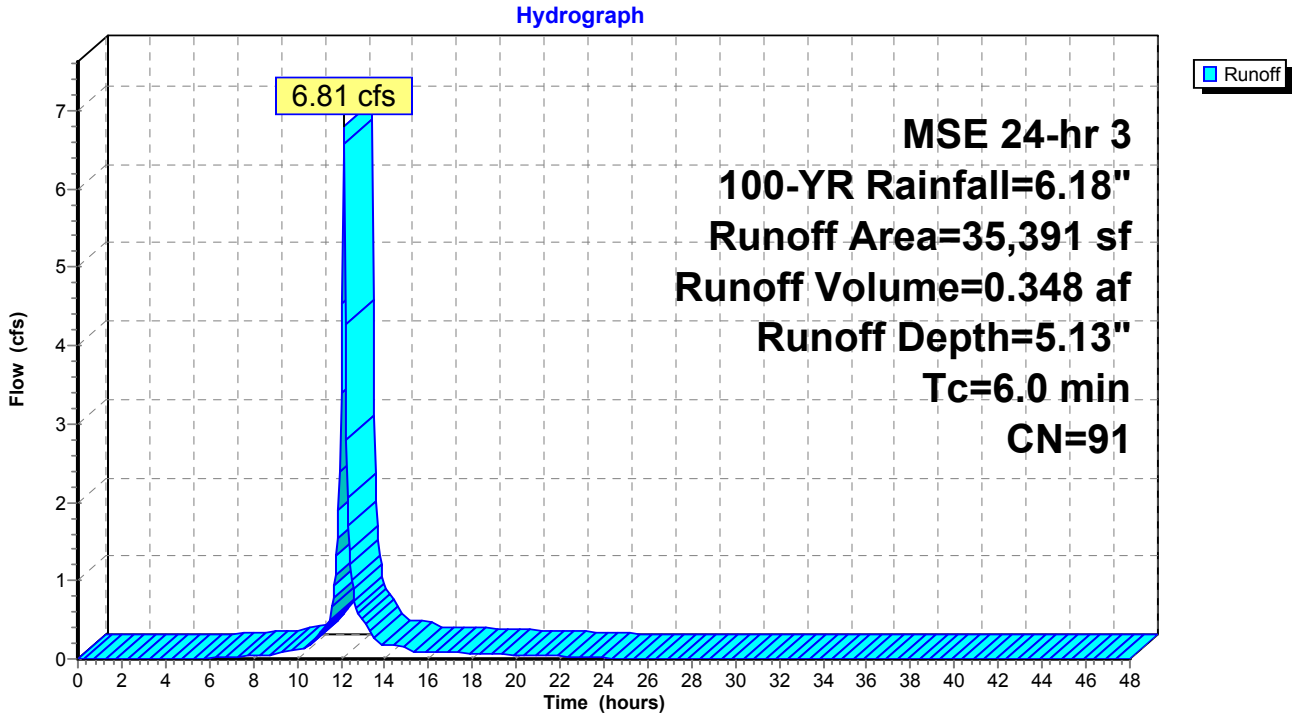
Runoff = 6.81 cfs @ 12.13 hrs, Volume= 0.348 af, Depth= 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	12,153	78	>75% Grass cover, Good, HSG D
*	4,404	98	Paved parking, HSG D
	2,486	98	Roofs, HSG D
*	1,665	91	Gravel roads, HSG D
*	14,683	98	Roof - Old Bldg
	35,391	91	Weighted Average
	13,818		39.04% Pervious Area
	21,573		60.96% Impervious Area

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

Subcatchment E2: SOUTH AREA



Summary for Pond D1: EXISTING DEPRESSION

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 5.13" for 100-YR event
Inflow = 10.33 cfs @ 12.13 hrs, Volume= 0.527 af
Outflow = 9.01 cfs @ 12.16 hrs, Volume= 0.476 af, Atten= 13%, Lag= 2.2 min
Primary = 9.01 cfs @ 12.16 hrs, Volume= 0.476 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 42.98' @ 12.16 hrs Surf.Area= 5,117 sf Storage= 4,344 cf

Plug-Flow detention time= 68.9 min calculated for 0.476 af (90% of inflow)
Center-of-Mass det. time= 27.9 min (797.8 - 769.8)

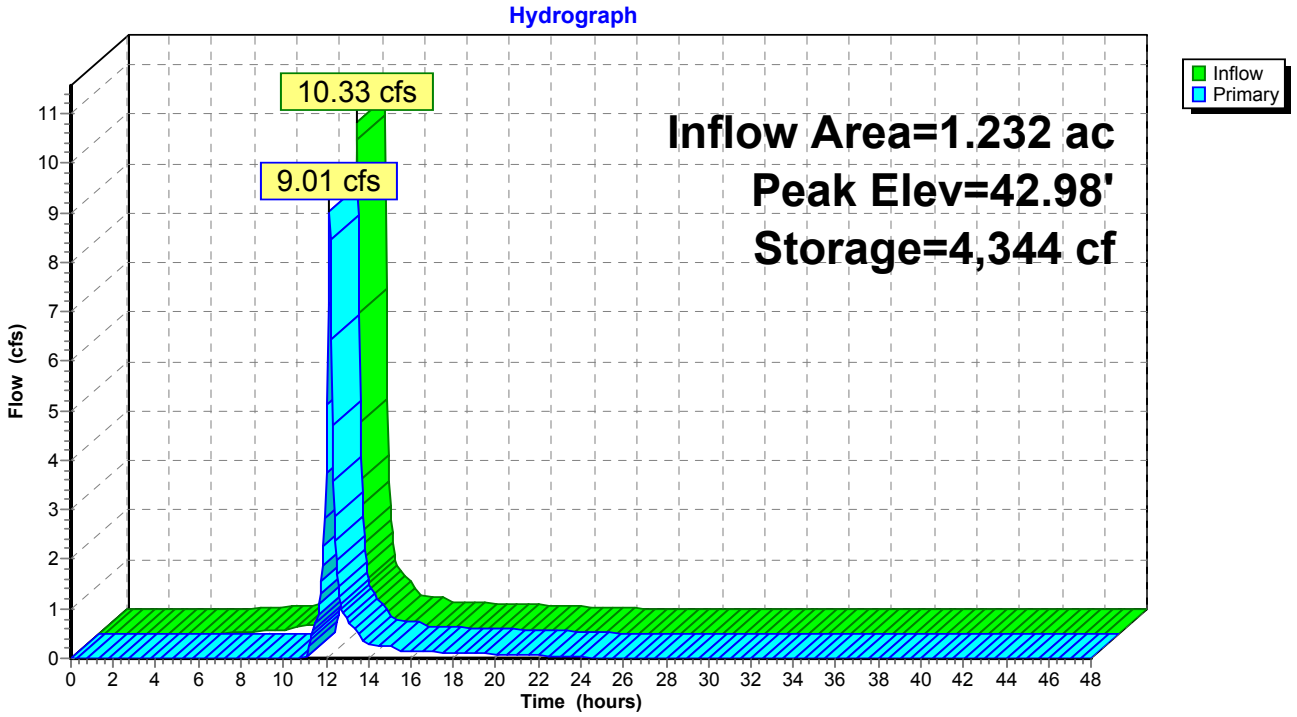
Volume	Invert	Avail.Storage	Storage Description
#1	41.40'	4,439 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.40	566	0	0
42.00	2,103	801	801
43.00	5,174	3,639	4,439

Device	Routing	Invert	Outlet Devices
#1	Primary	42.50'	**10.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=8.78 cfs @ 12.16 hrs HW=42.97' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 8.78 cfs @ 1.86 fps)

Pond D1: EXISTING DEPRESSION

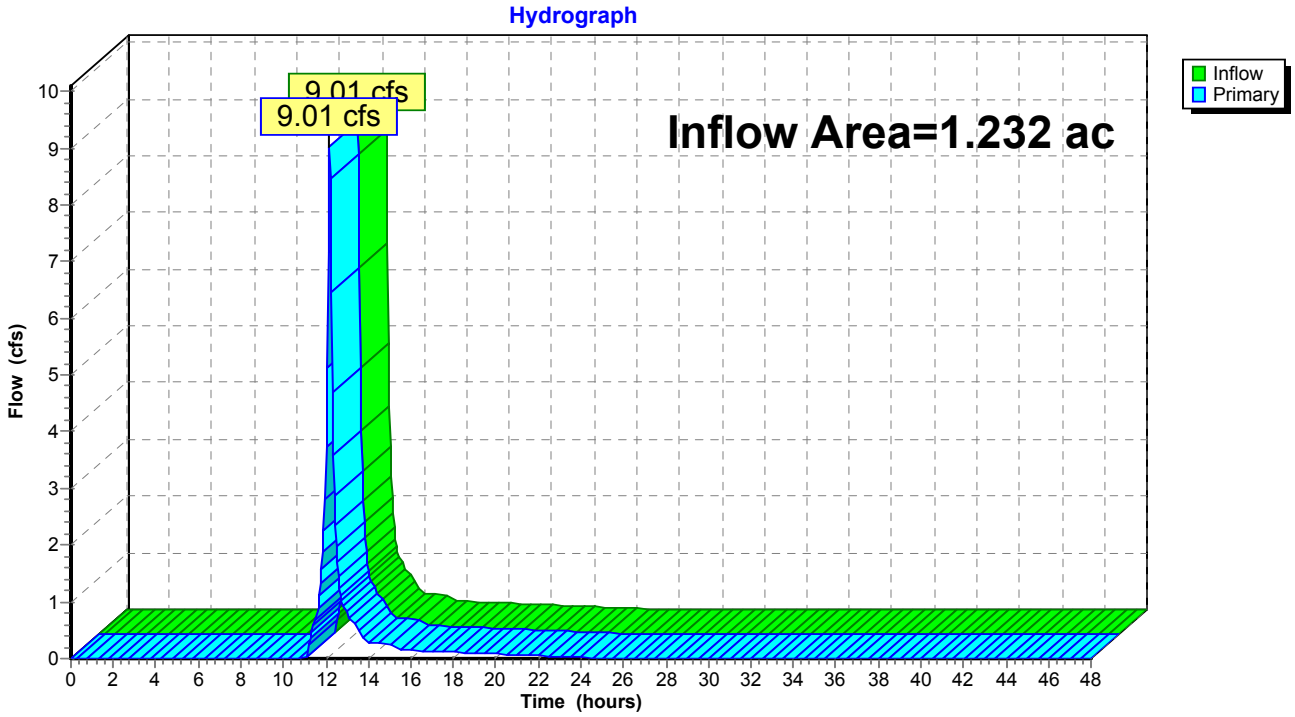


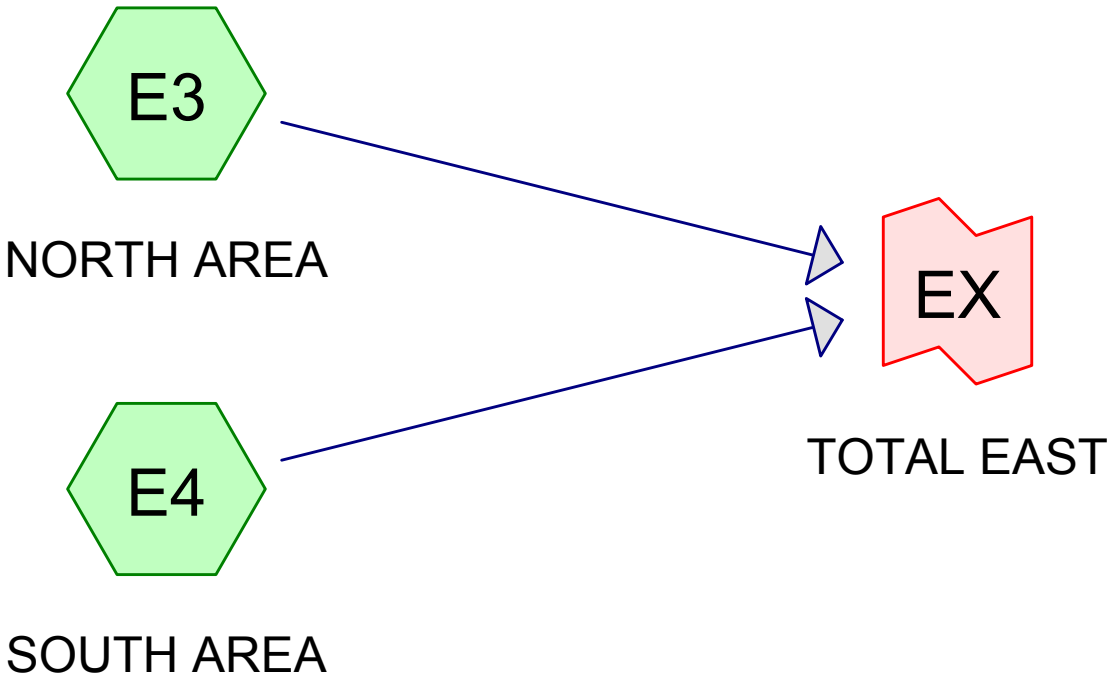
Summary for Link EX: TOTAL WEST

Inflow Area = 1.232 ac, 62.64% Impervious, Inflow Depth = 4.63" for 100-YR event
Inflow = 9.01 cfs @ 12.16 hrs, Volume= 0.476 af
Primary = 9.01 cfs @ 12.16 hrs, Volume= 0.476 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL WEST





Subcat Reach Pond Link

Routing Diagram for 1545.00-WI EXISTING EAST BUILDING
Prepared by Microsoft, Printed 11/6/2019

Summary for Subcatchment E3: NORTH AREA

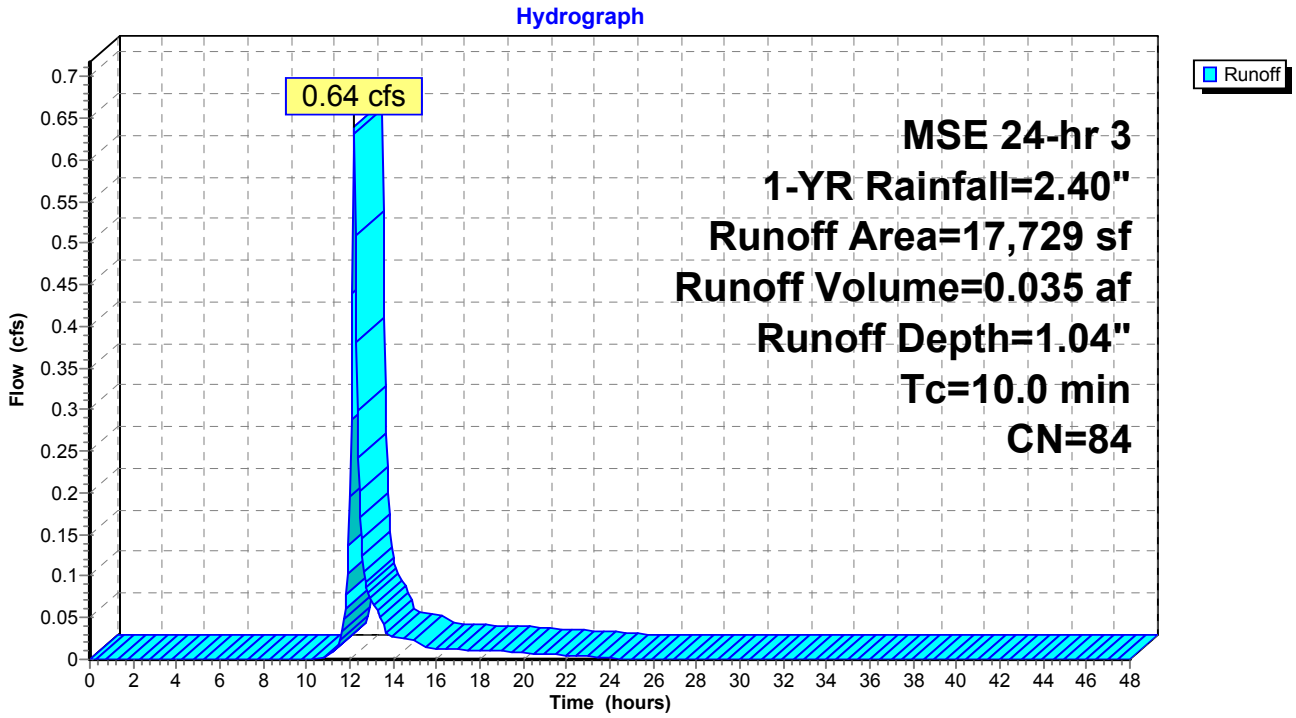
Runoff = 0.64 cfs @ 12.18 hrs, Volume= 0.035 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	12,071	78	>75% Grass cover, Good, HSG D
*	5,658	98	Paved parking, HSG D
	17,729	84	Weighted Average
	12,071		68.09% Pervious Area
	5,658		31.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E3: NORTH AREA



Summary for Subcatchment E4: SOUTH AREA

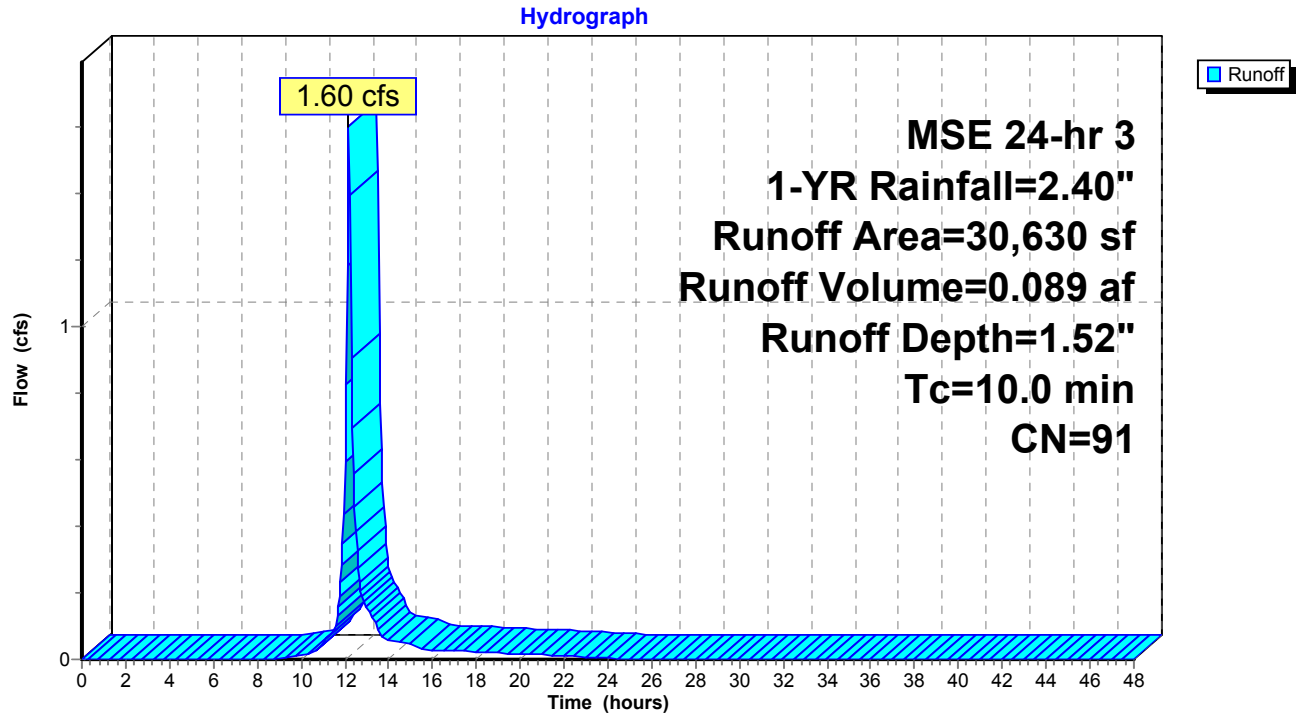
Runoff = 1.60 cfs @ 12.18 hrs, Volume= 0.089 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	10,364	78	>75% Grass cover, Good, HSG D
*	20,266	98	Paved parking, HSG D
	30,630	91	Weighted Average
	10,364		33.84% Pervious Area
	20,266		66.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E4: SOUTH AREA

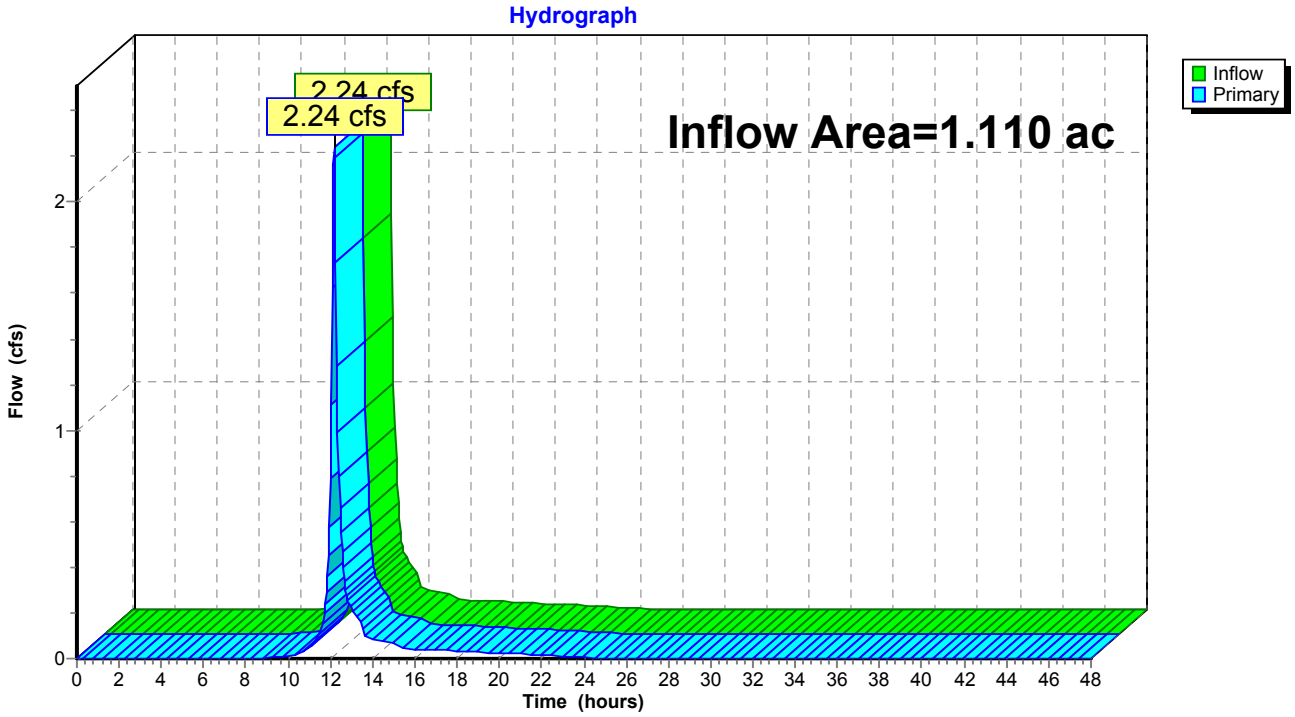


Summary for Link EX: TOTAL EAST

Inflow Area = 1.110 ac, 53.61% Impervious, Inflow Depth = 1.34" for 1-YR event
Inflow = 2.24 cfs @ 12.18 hrs, Volume= 0.124 af
Primary = 2.24 cfs @ 12.18 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL EAST



Summary for Subcatchment E3: NORTH AREA

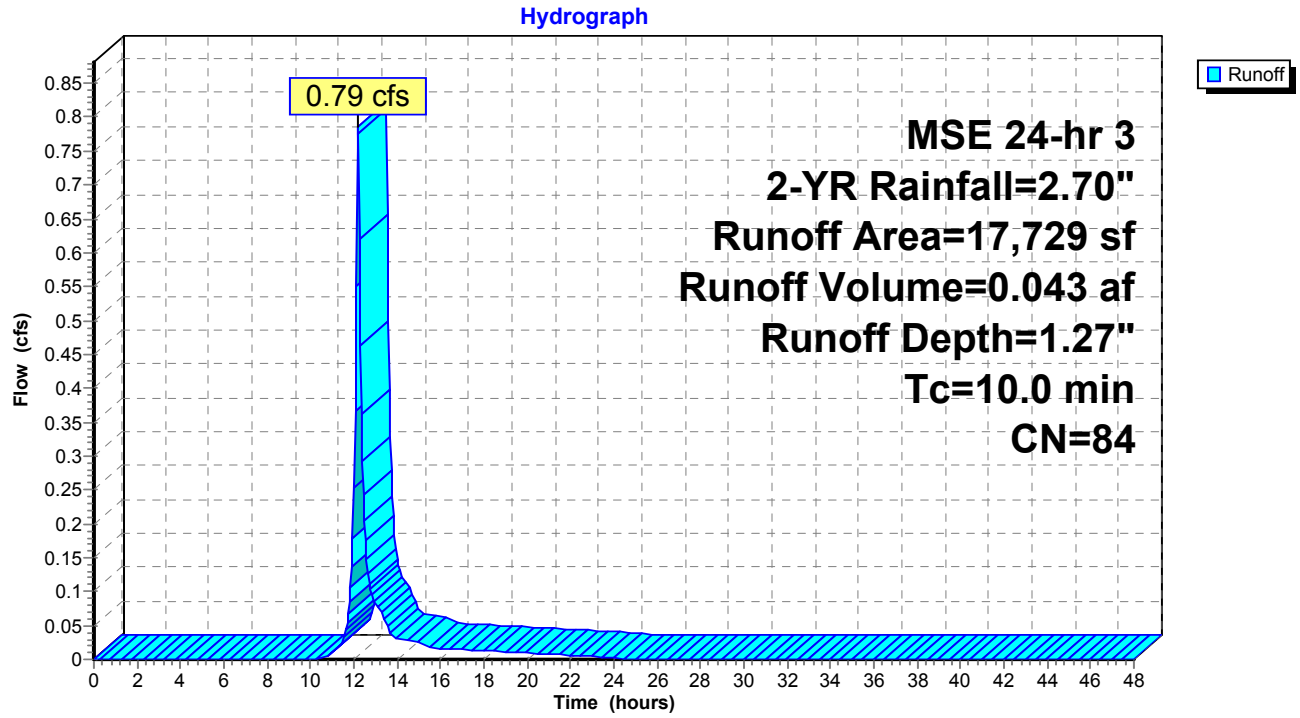
Runoff = 0.79 cfs @ 12.18 hrs, Volume= 0.043 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	12,071	78	>75% Grass cover, Good, HSG D
*	5,658	98	Paved parking, HSG D
	17,729	84	Weighted Average
	12,071		68.09% Pervious Area
	5,658		31.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E3: NORTH AREA



Summary for Subcatchment E4: SOUTH AREA

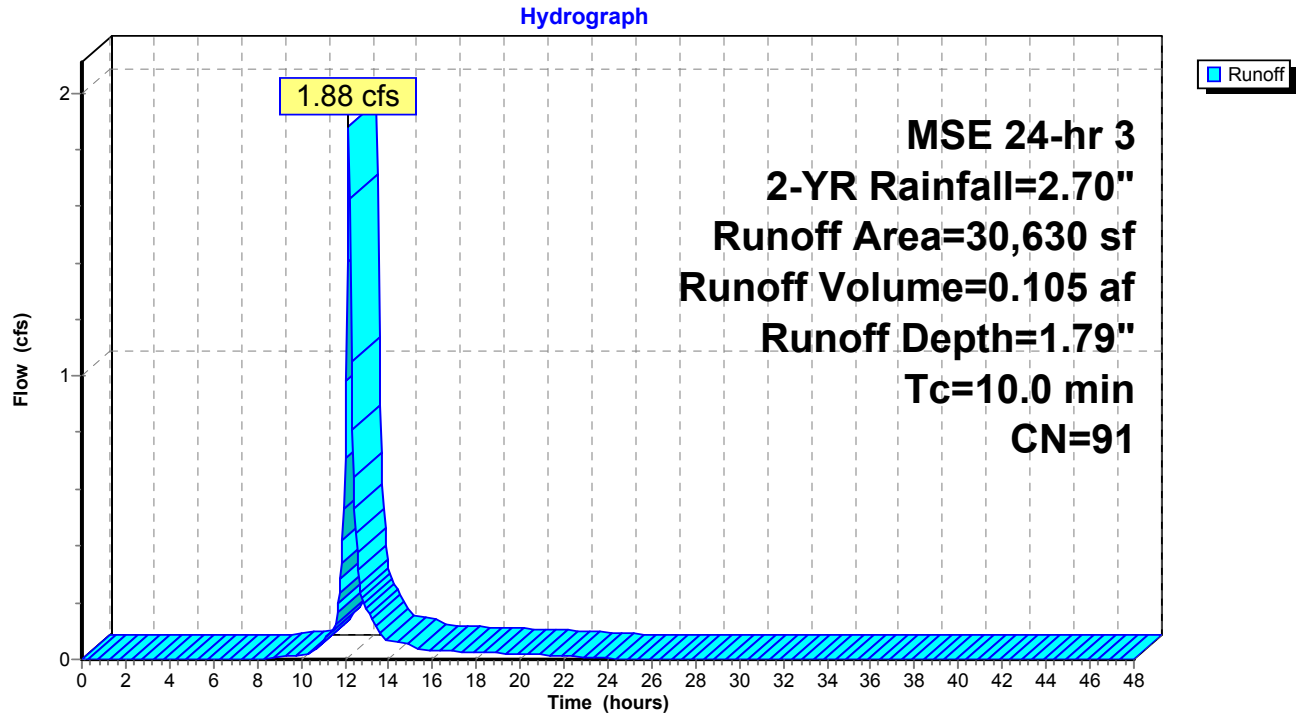
Runoff = 1.88 cfs @ 12.17 hrs, Volume= 0.105 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	10,364	78	>75% Grass cover, Good, HSG D
*	20,266	98	Paved parking, HSG D
	30,630	91	Weighted Average
	10,364		33.84% Pervious Area
	20,266		66.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E4: SOUTH AREA

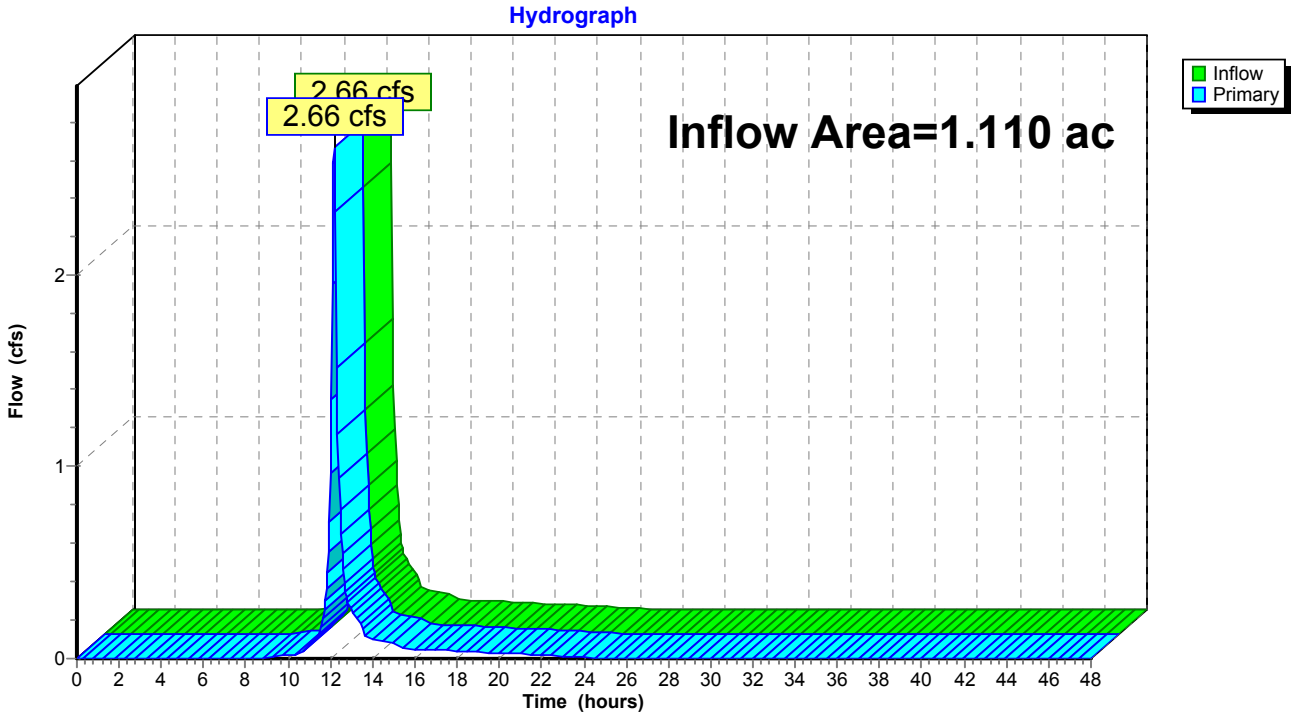


Summary for Link EX: TOTAL EAST

Inflow Area = 1.110 ac, 53.61% Impervious, Inflow Depth = 1.60" for 2-YR event
Inflow = 2.66 cfs @ 12.18 hrs, Volume= 0.148 af
Primary = 2.66 cfs @ 12.18 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL EAST



Summary for Subcatchment E3: NORTH AREA

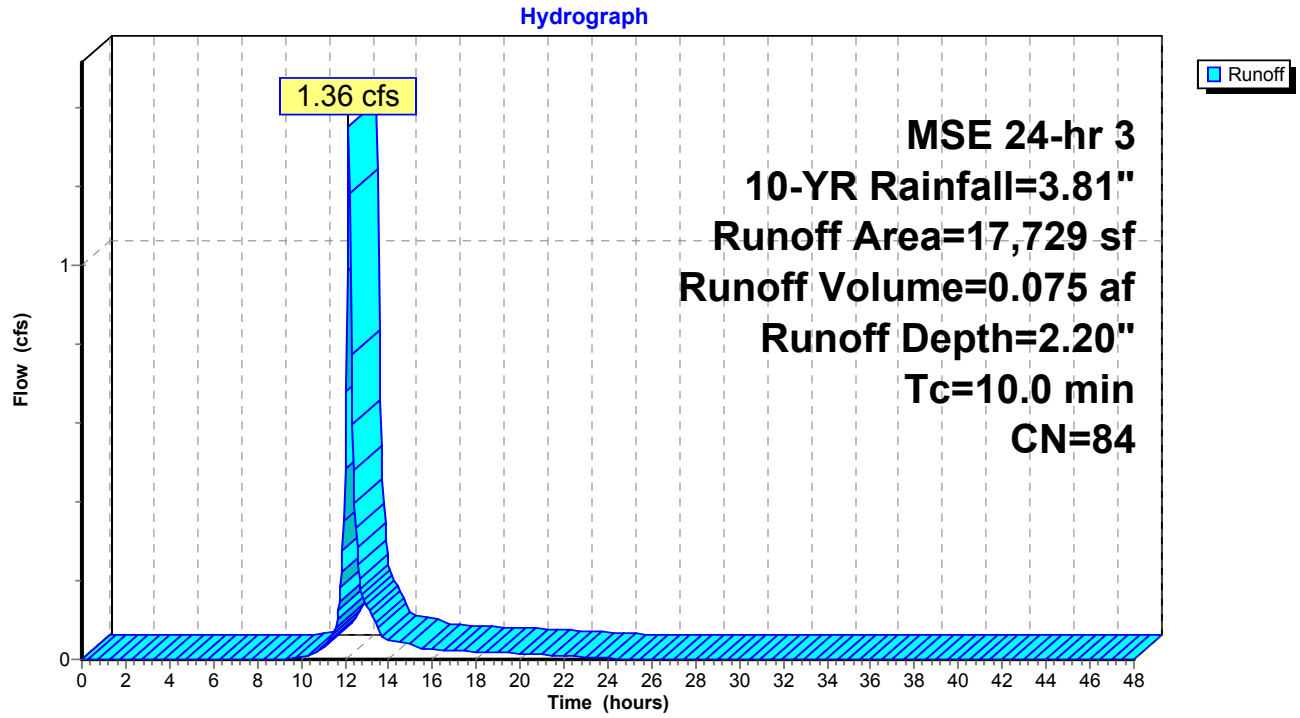
Runoff = 1.36 cfs @ 12.18 hrs, Volume= 0.075 af, Depth= 2.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	12,071	78	>75% Grass cover, Good, HSG D
*	5,658	98	Paved parking, HSG D
	17,729	84	Weighted Average
	12,071		68.09% Pervious Area
	5,658		31.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E3: NORTH AREA



Summary for Subcatchment E4: SOUTH AREA

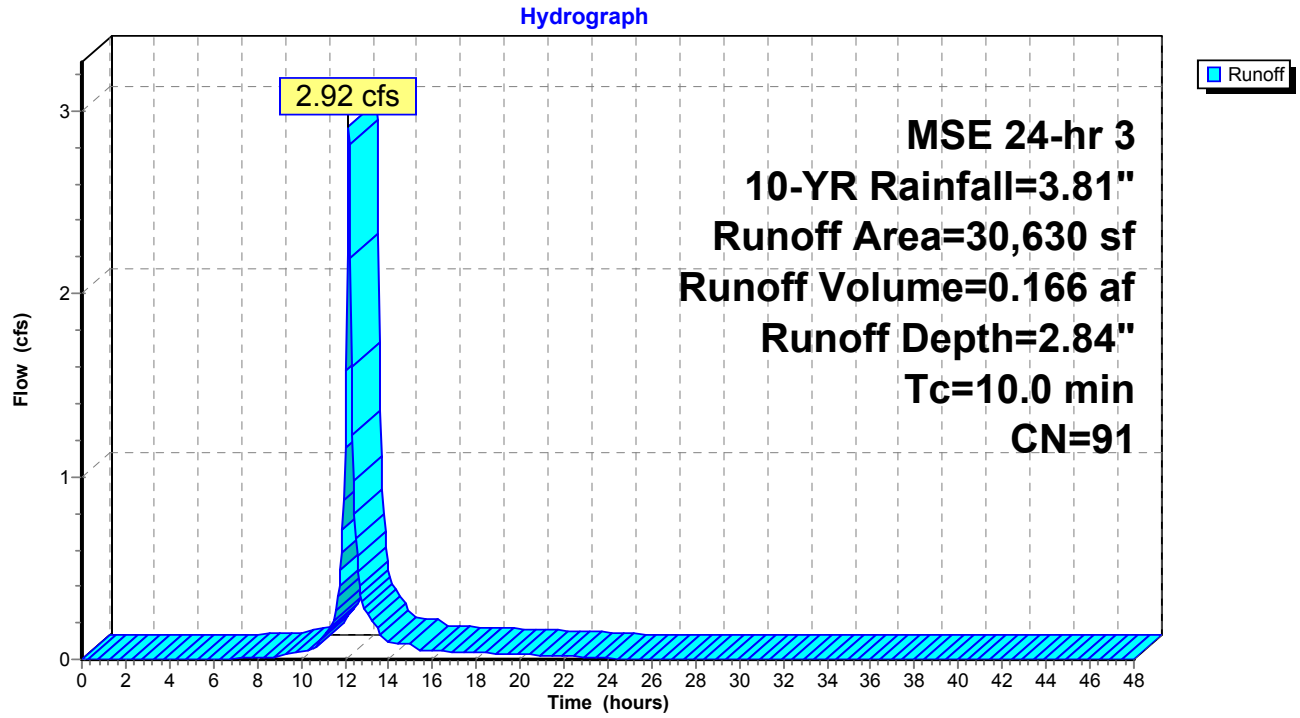
Runoff = 2.92 cfs @ 12.17 hrs, Volume= 0.166 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	10,364	78	>75% Grass cover, Good, HSG D
*	20,266	98	Paved parking, HSG D
	30,630	91	Weighted Average
	10,364		33.84% Pervious Area
	20,266		66.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E4: SOUTH AREA

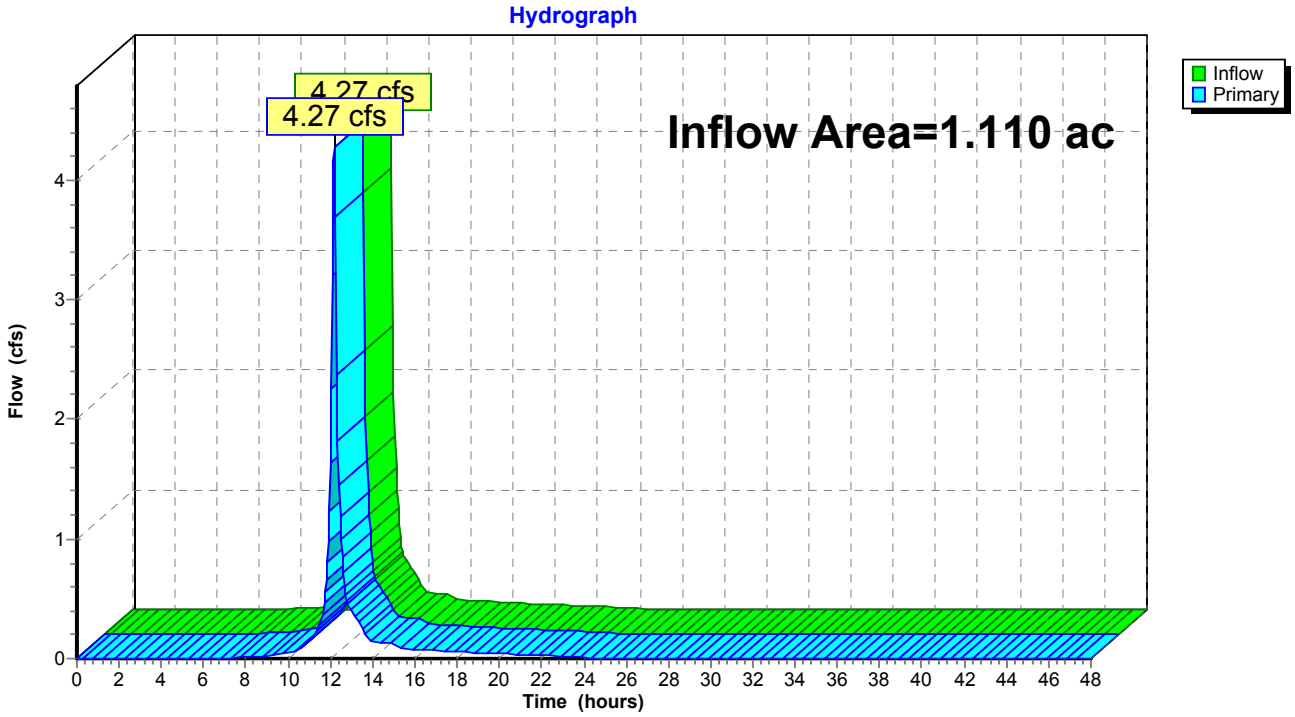


Summary for Link EX: TOTAL EAST

Inflow Area = 1.110 ac, 53.61% Impervious, Inflow Depth = 2.60" for 10-YR event
Inflow = 4.27 cfs @ 12.17 hrs, Volume= 0.241 af
Primary = 4.27 cfs @ 12.17 hrs, Volume= 0.241 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL EAST



Summary for Subcatchment E3: NORTH AREA

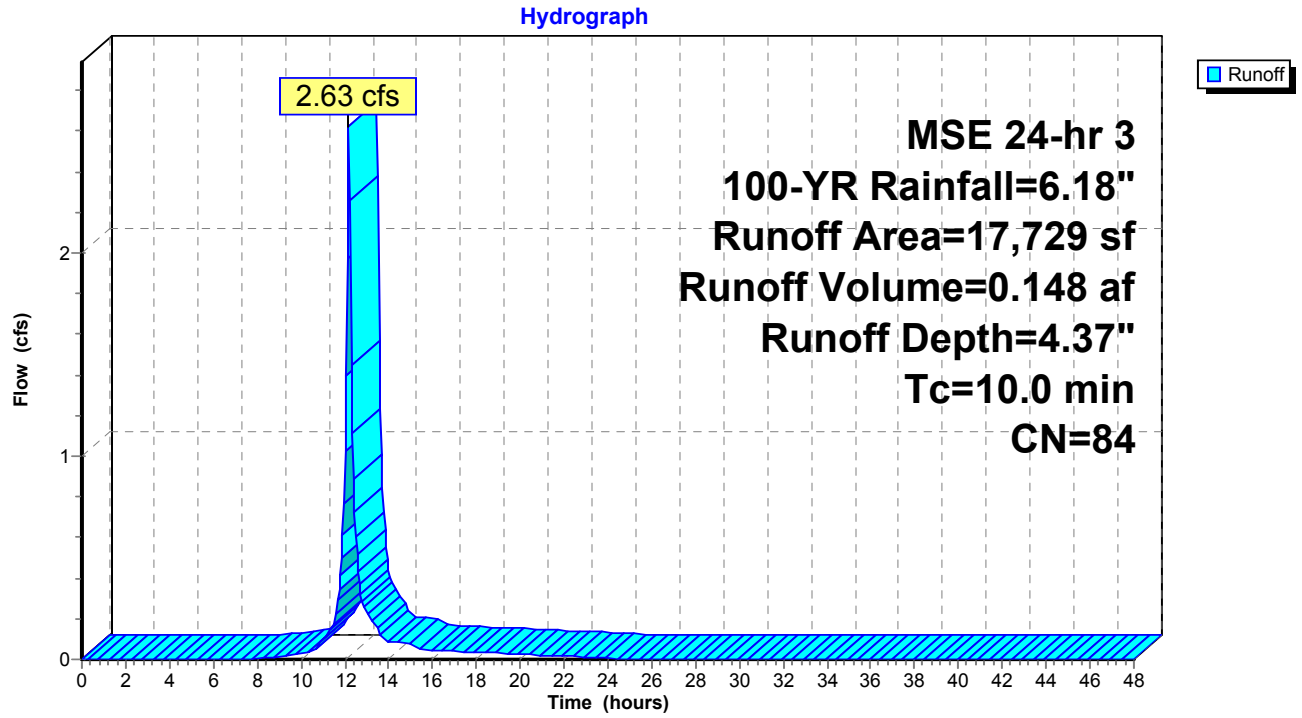
Runoff = 2.63 cfs @ 12.17 hrs, Volume= 0.148 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	12,071	78	>75% Grass cover, Good, HSG D
*	5,658	98	Paved parking, HSG D
	17,729	84	Weighted Average
	12,071		68.09% Pervious Area
	5,658		31.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E3: NORTH AREA



Summary for Subcatchment E4: SOUTH AREA

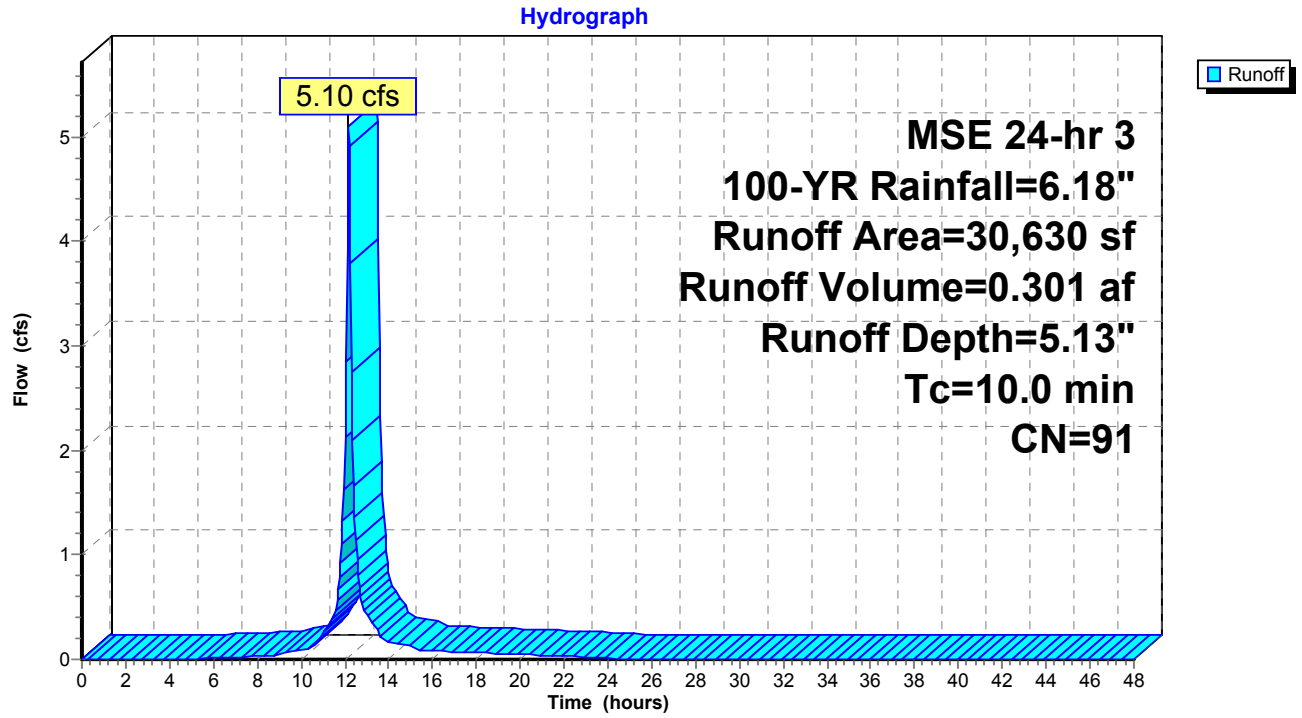
Runoff = 5.10 cfs @ 12.17 hrs, Volume= 0.301 af, Depth= 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	10,364	78	>75% Grass cover, Good, HSG D
*	20,266	98	Paved parking, HSG D
	30,630	91	Weighted Average
	10,364		33.84% Pervious Area
	20,266		66.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry, CONS**

Subcatchment E4: SOUTH AREA

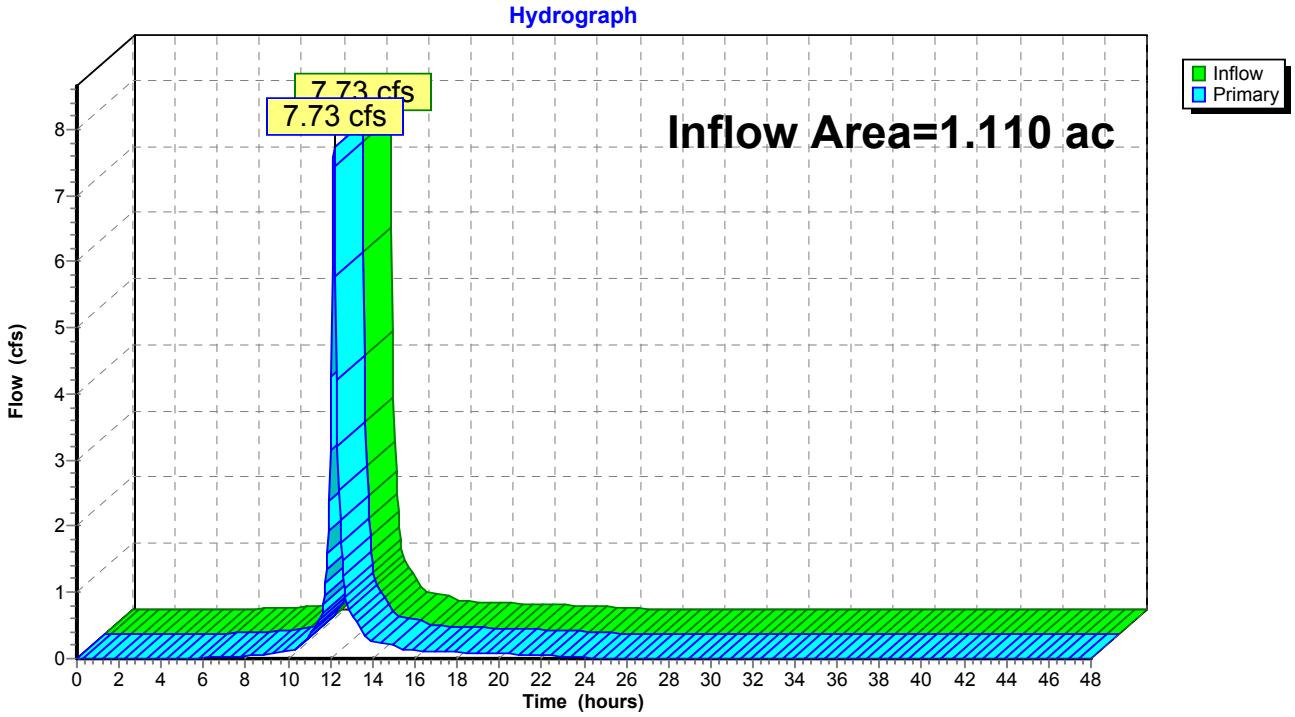


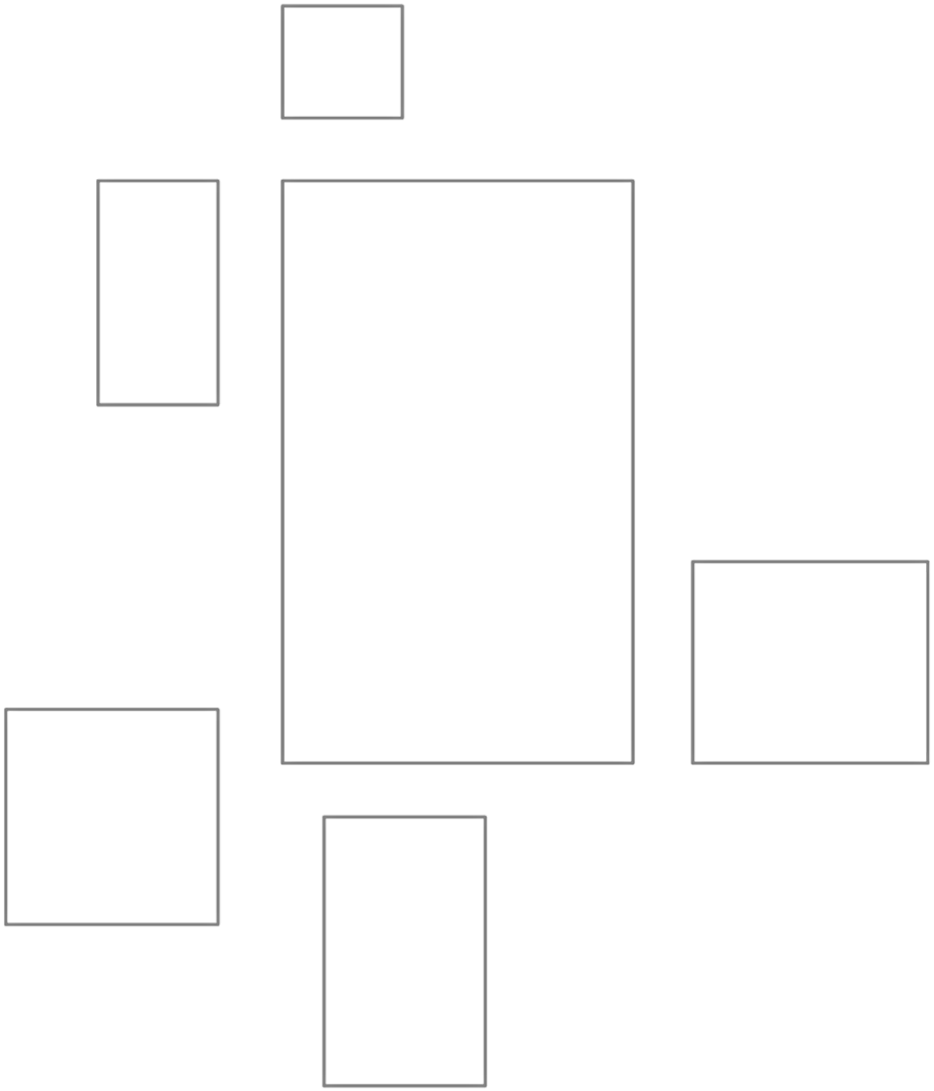
Summary for Link EX: TOTAL EAST

Inflow Area = 1.110 ac, 53.61% Impervious, Inflow Depth = 4.85" for 100-YR event
Inflow = 7.73 cfs @ 12.17 hrs, Volume= 0.449 af
Primary = 7.73 cfs @ 12.17 hrs, Volume= 0.449 af, Atten= 0%, Lag= 0.0 min

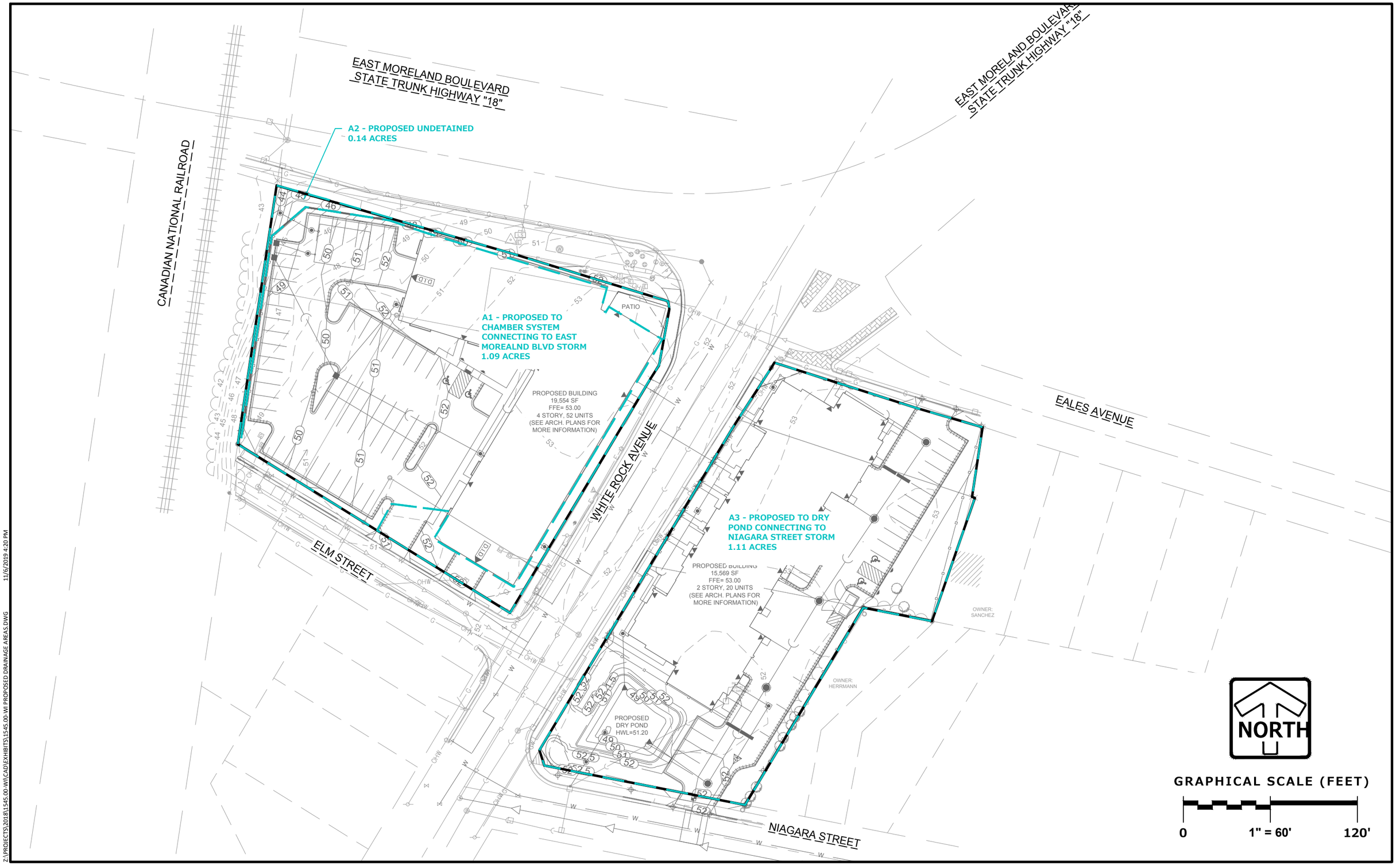
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link EX: TOTAL EAST





3 Appendix



2:\PROJECTS\2018\1545.00-WI\CAD\EXHIBITS\1545.00-WI PROPOSED DRAINAGE AREAS.DWG 11/6/2019 4:20 PM

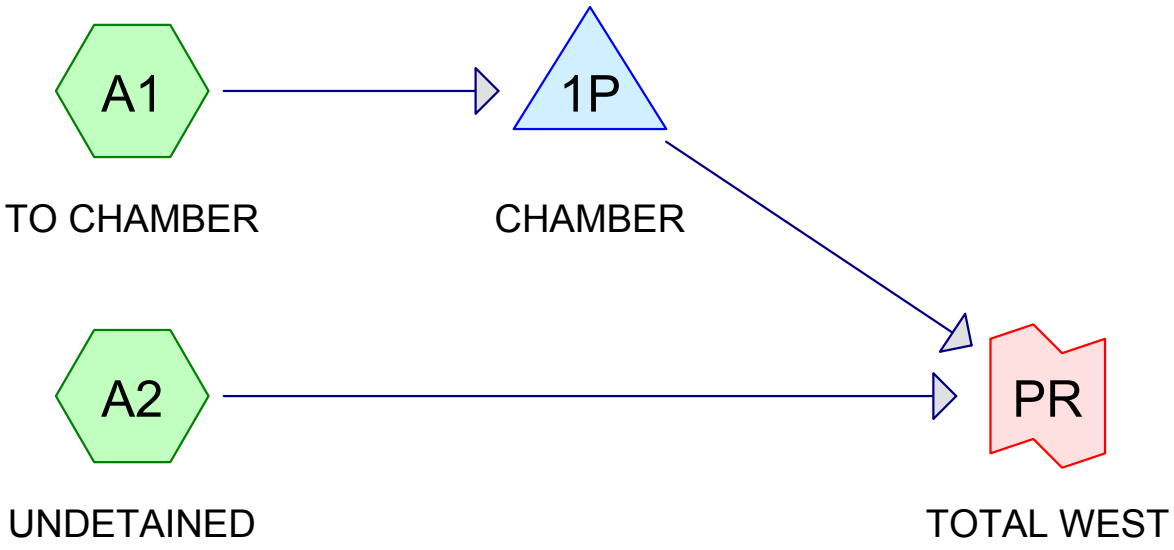
1545.00 FRAME PARK COMMONS - PROP DRAINAGE AREA MAP

11/06/2019

PINNACLE ENGINEERING GROUP

20725 WATERTOWN ROAD | SUITE 100 | BROOKFIELD, WI 53186 | WWW.PINNACLE-ENGR.COM |

PLAN | DESIGN | DELIVER **PEG JOB#** 1545.00



Subcat Reach Pond Link

Routing Diagram for 1545.00-WI PROPOSED WEST BUILDING
Prepared by Microsoft, Printed 11/6/2019

Summary for Subcatchment A1: TO CHAMBER

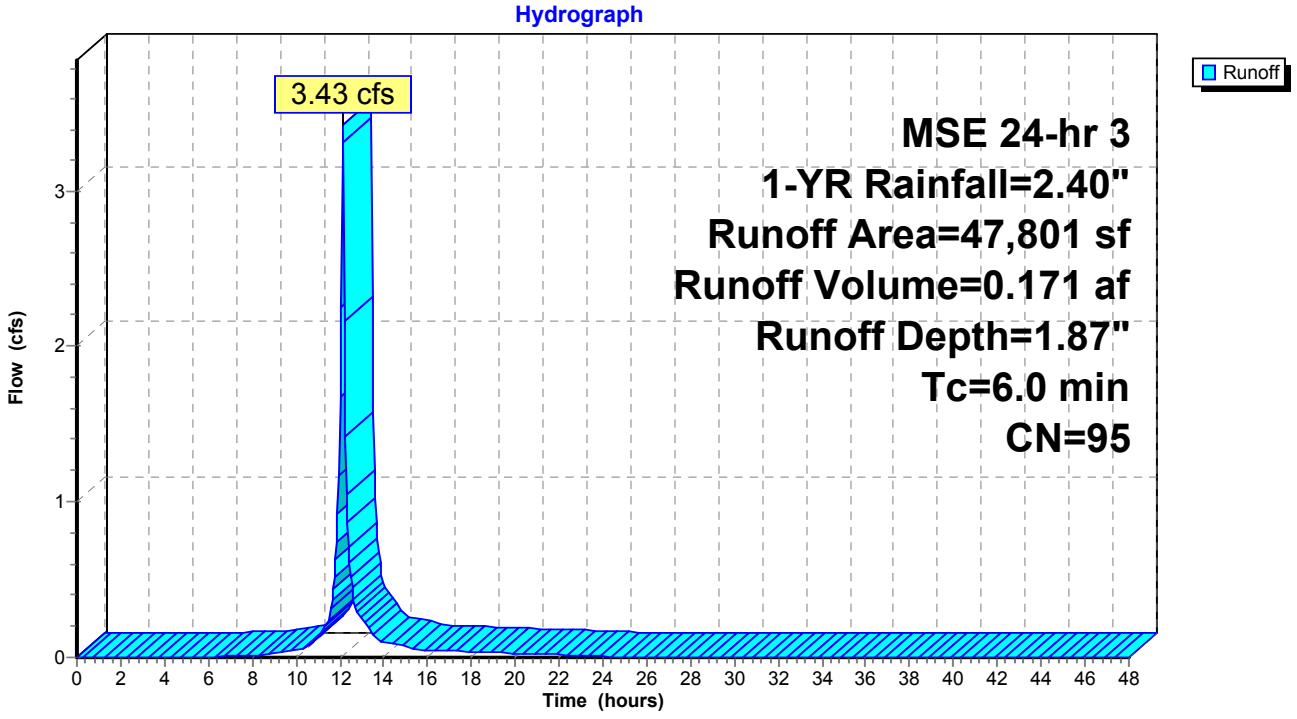
Runoff = 3.43 cfs @ 12.13 hrs, Volume= 0.171 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	6,604	78	>75% Grass cover, Good, HSG D
*	20,762	98	Paved parking, HSG D
	19,554	98	Roofs, HSG D
*	881	98	Sidewalk, HSG D
	47,801	95	Weighted Average
	6,604		13.82% Pervious Area
	41,197		86.18% Impervious Area

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

Subcatchment A1: TO CHAMBER



Summary for Subcatchment A2: UNDETAINED

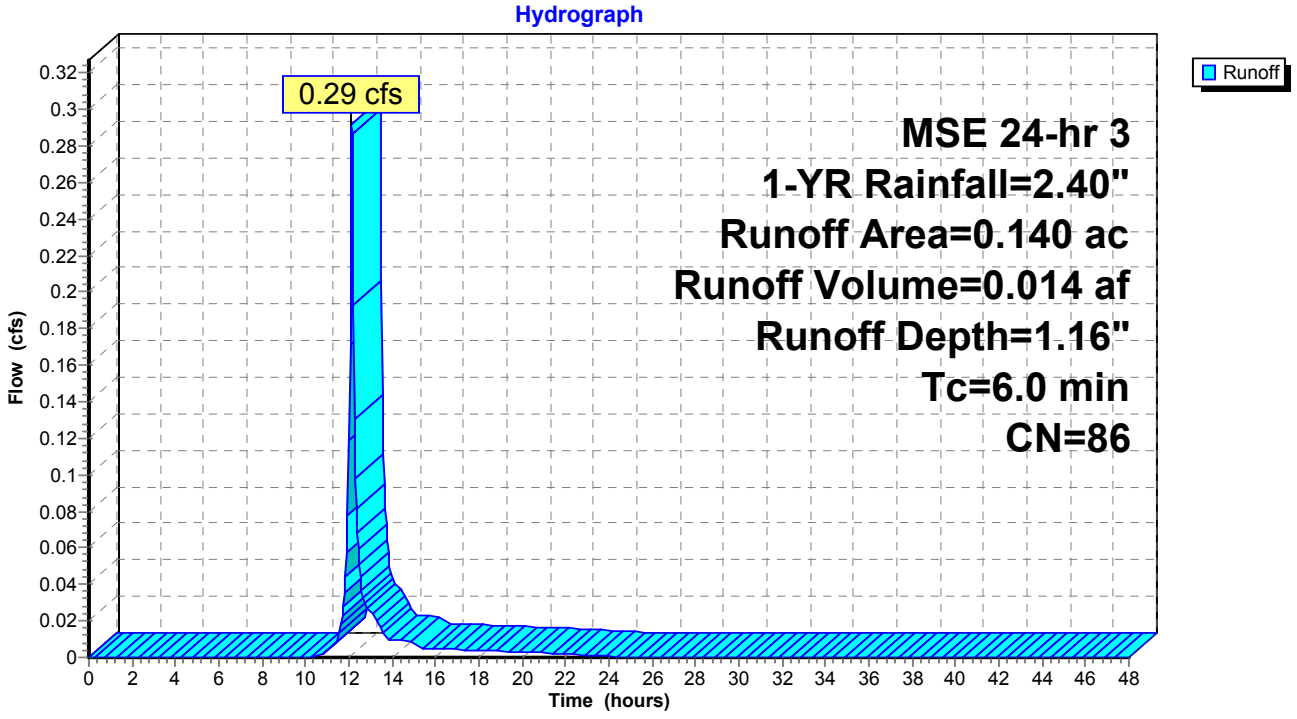
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 0.014 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (ac)	CN	Description
*	0.087	78	>75% Grass cover, Good, HSG D
*	0.032	98	Paved parking, HSG D
*	0.005	98	Sidewalk, HSG D
*	0.016	98	Terrace, HSG D
	0.140	86	Weighted Average
	0.087		62.14% Pervious Area
	0.053		37.86% Impervious Area

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

Subcatchment A2: UNDETAINED



Summary for Pond 1P: CHAMBER

Inflow Area = 1.097 ac, 86.18% Impervious, Inflow Depth = 1.87" for 1-YR event
Inflow = 3.43 cfs @ 12.13 hrs, Volume= 0.171 af
Outflow = 1.69 cfs @ 12.23 hrs, Volume= 0.166 af, Atten= 51%, Lag= 6.4 min
Primary = 1.69 cfs @ 12.23 hrs, Volume= 0.166 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 43.52' @ 12.23 hrs Surf.Area= 0.023 ac Storage= 0.040 af

Plug-Flow detention time= 35.7 min calculated for 0.166 af (97% of inflow)
Center-of-Mass det. time= 20.2 min (797.4 - 777.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	41.00'	0.040 af	**28.50'W x 35.29'L x 6.75'H Field A** 0.156 af Overall - 0.056 af Embedded = 0.100 af x 40.0% Voids
#2A	41.75'	0.056 af	**ADS_StormTech MC-4500 +Cap** x 21 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 7 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		0.096 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	41.00'	**12.0" Round Culvert** L= 24.6' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 41.00' / 40.75' S= 0.0102 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	41.50'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	43.55'	**9.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	44.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.69 cfs @ 12.23 hrs HW=43.51' (Free Discharge)
└**1=Culvert** (Passes 1.69 cfs of 5.36 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.69 cfs @ 6.31 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: CHAMBER - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

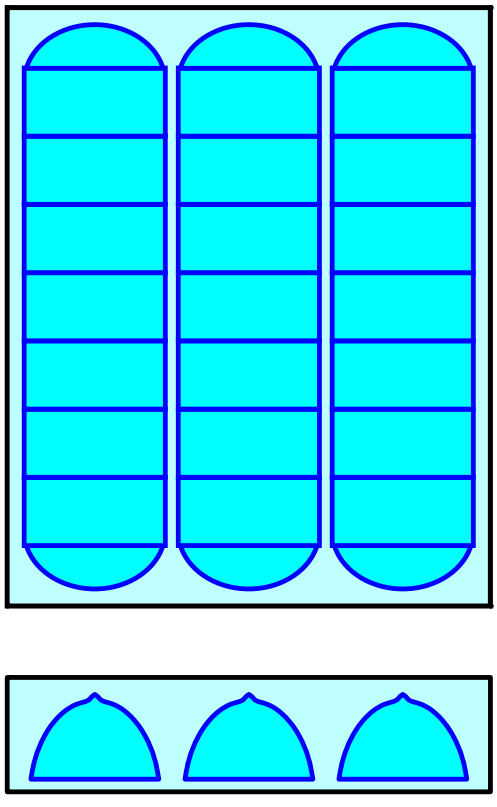
7 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 33.29' Row Length +12.0" End Stone x 2 = 35.29' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Base + 60.0" Chamber Height + 12.0" Cover = 6.75' Field Height

21 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 3 Rows = 2,450.5 cf Chamber Storage

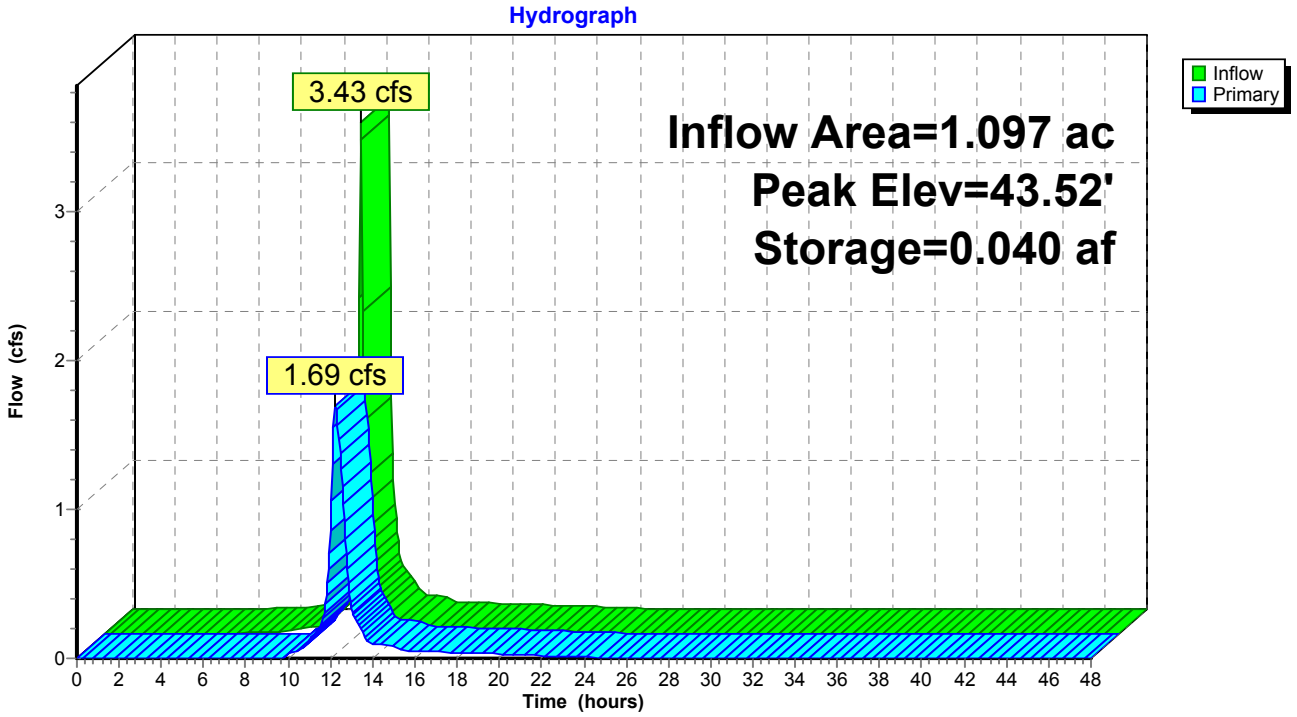
6,789.2 cf Field - 2,450.5 cf Chambers = 4,338.7 cf Stone x 40.0% Voids = 1,735.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,186.0 cf = 0.096 af
Overall Storage Efficiency = 61.7%
Overall System Size = 35.29' x 28.50' x 6.75'

21 Chambers
251.5 cy Field
160.7 cy Stone



Pond 1P: CHAMBER

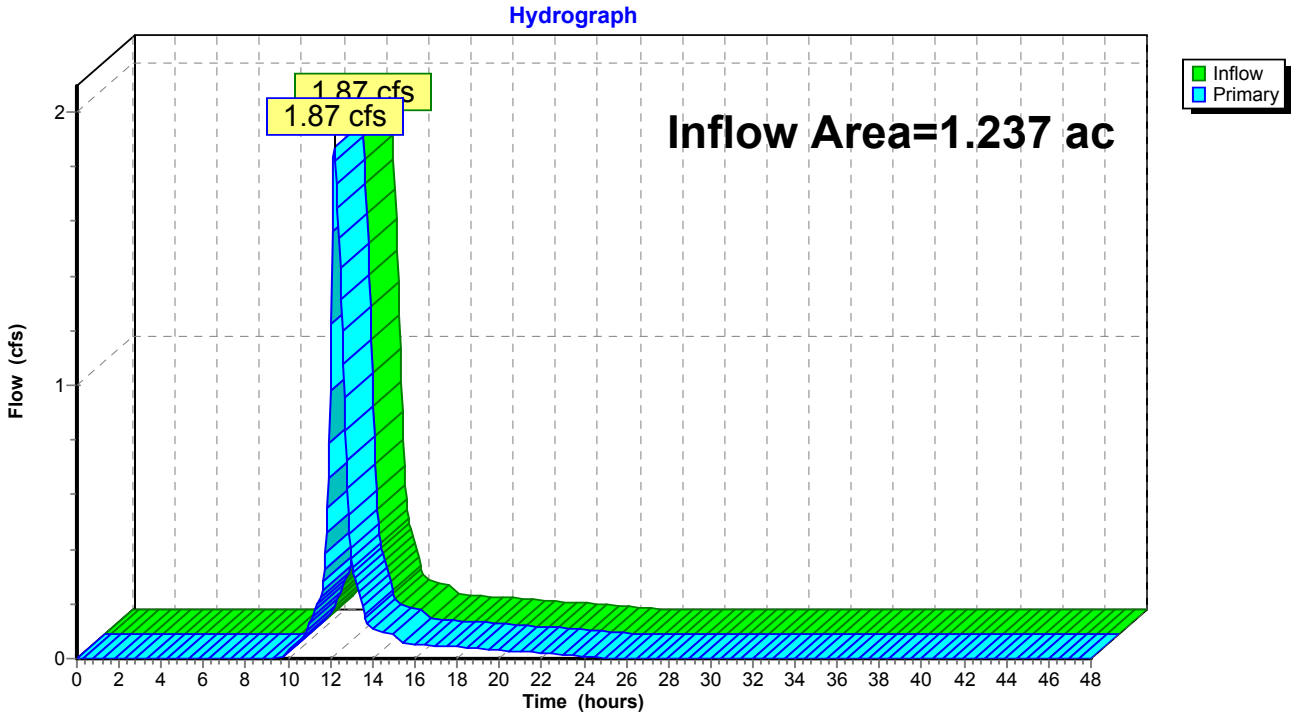


Summary for Link PR: TOTAL WEST

Inflow Area = 1.237 ac, 80.72% Impervious, Inflow Depth = 1.74" for 1-YR event
Inflow = 1.87 cfs @ 12.20 hrs, Volume= 0.180 af
Primary = 1.87 cfs @ 12.20 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL WEST



Summary for Subcatchment A1: TO CHAMBER

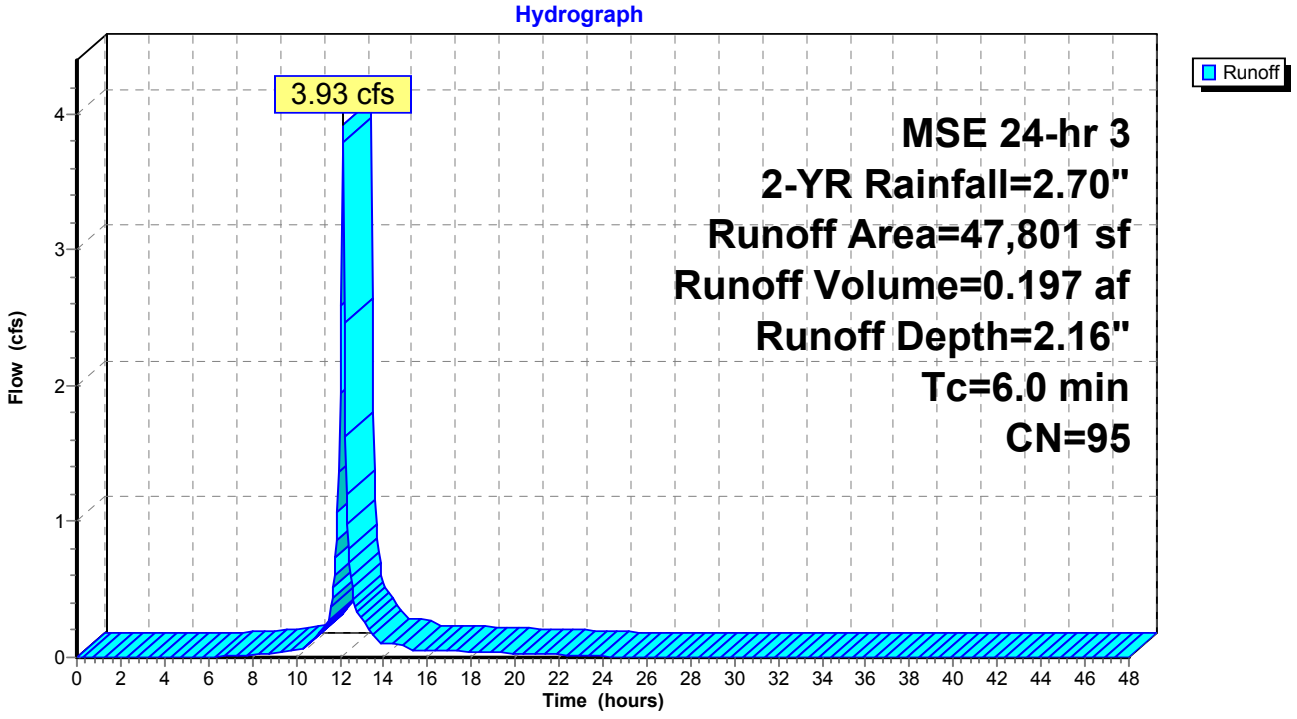
Runoff = 3.93 cfs @ 12.13 hrs, Volume= 0.197 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	6,604	78	>75% Grass cover, Good, HSG D
*	20,762	98	Paved parking, HSG D
	19,554	98	Roofs, HSG D
*	881	98	Sidewalk, HSG D
	47,801	95	Weighted Average
	6,604		13.82% Pervious Area
	41,197		86.18% Impervious Area

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

Subcatchment A1: TO CHAMBER



Summary for Subcatchment A2: UNDETAINED

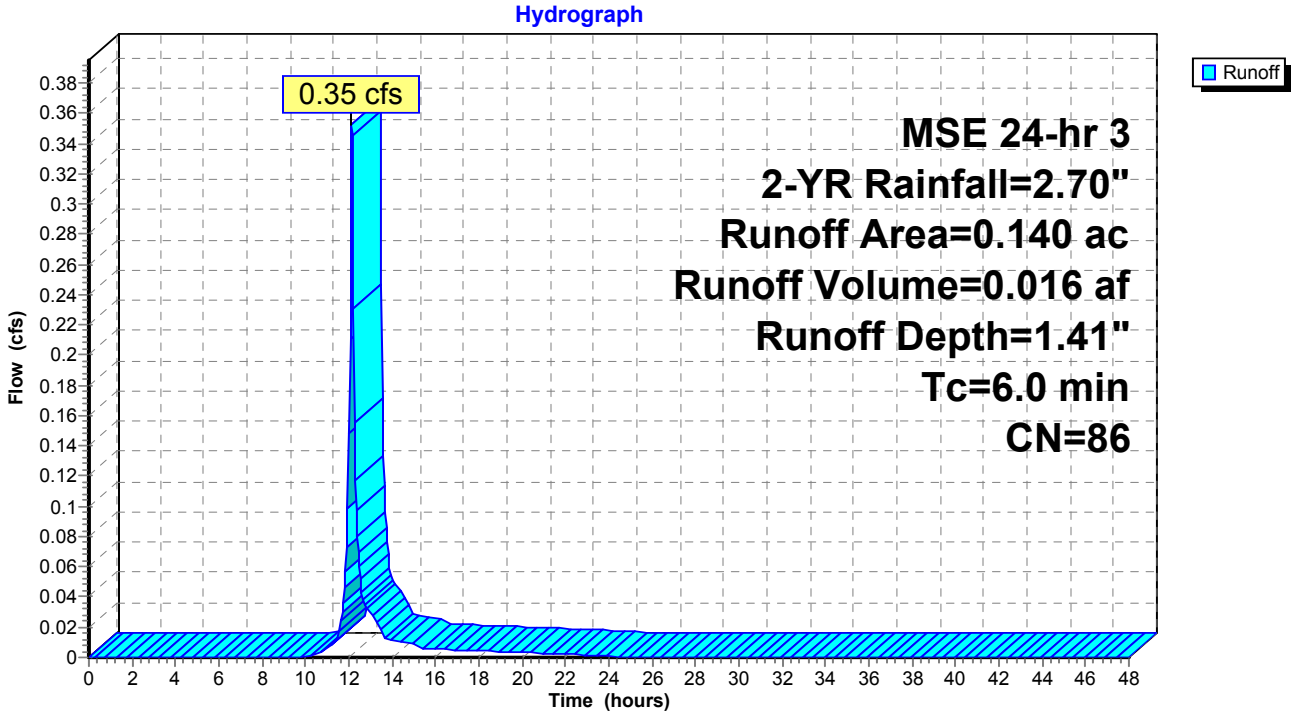
Runoff = 0.35 cfs @ 12.13 hrs, Volume= 0.016 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (ac)	CN	Description
*	0.087	78	>75% Grass cover, Good, HSG D
*	0.032	98	Paved parking, HSG D
*	0.005	98	Sidewalk, HSG D
*	0.016	98	Terrace, HSG D
	0.140	86	Weighted Average
	0.087		62.14% Pervious Area
	0.053		37.86% Impervious Area

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

Subcatchment A2: UNDETAINED



Summary for Pond 1P: CHAMBER

Inflow Area = 1.097 ac, 86.18% Impervious, Inflow Depth = 2.16" for 2-YR event
Inflow = 3.93 cfs @ 12.13 hrs, Volume= 0.197 af
Outflow = 2.14 cfs @ 12.22 hrs, Volume= 0.193 af, Atten= 45%, Lag= 5.6 min
Primary = 2.14 cfs @ 12.22 hrs, Volume= 0.193 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 43.86' @ 12.22 hrs Surf.Area= 0.023 ac Storage= 0.045 af

Plug-Flow detention time= 32.7 min calculated for 0.192 af (98% of inflow)
Center-of-Mass det. time= 19.8 min (794.2 - 774.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	41.00'	0.040 af	**28.50'W x 35.29'L x 6.75'H Field A** 0.156 af Overall - 0.056 af Embedded = 0.100 af x 40.0% Voids
#2A	41.75'	0.056 af	**ADS_StormTech MC-4500 +Cap** x 21 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 7 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		0.096 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	41.00'	**12.0" Round Culvert** L= 24.6' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 41.00' / 40.75' S= 0.0102 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	41.50'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	43.55'	**9.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	44.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.09 cfs @ 12.22 hrs HW=43.82' (Free Discharge)
└**1=Culvert** (Passes 2.09 cfs of 5.76 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.83 cfs @ 6.86 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.25 cfs @ 1.77 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: CHAMBER - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

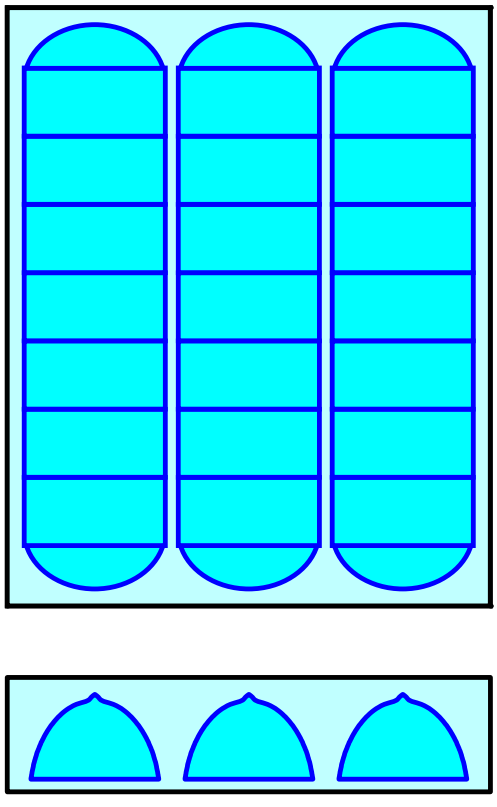
7 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 33.29' Row Length +12.0" End Stone x 2 = 35.29' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Base + 60.0" Chamber Height + 12.0" Cover = 6.75' Field Height

21 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 3 Rows = 2,450.5 cf Chamber Storage

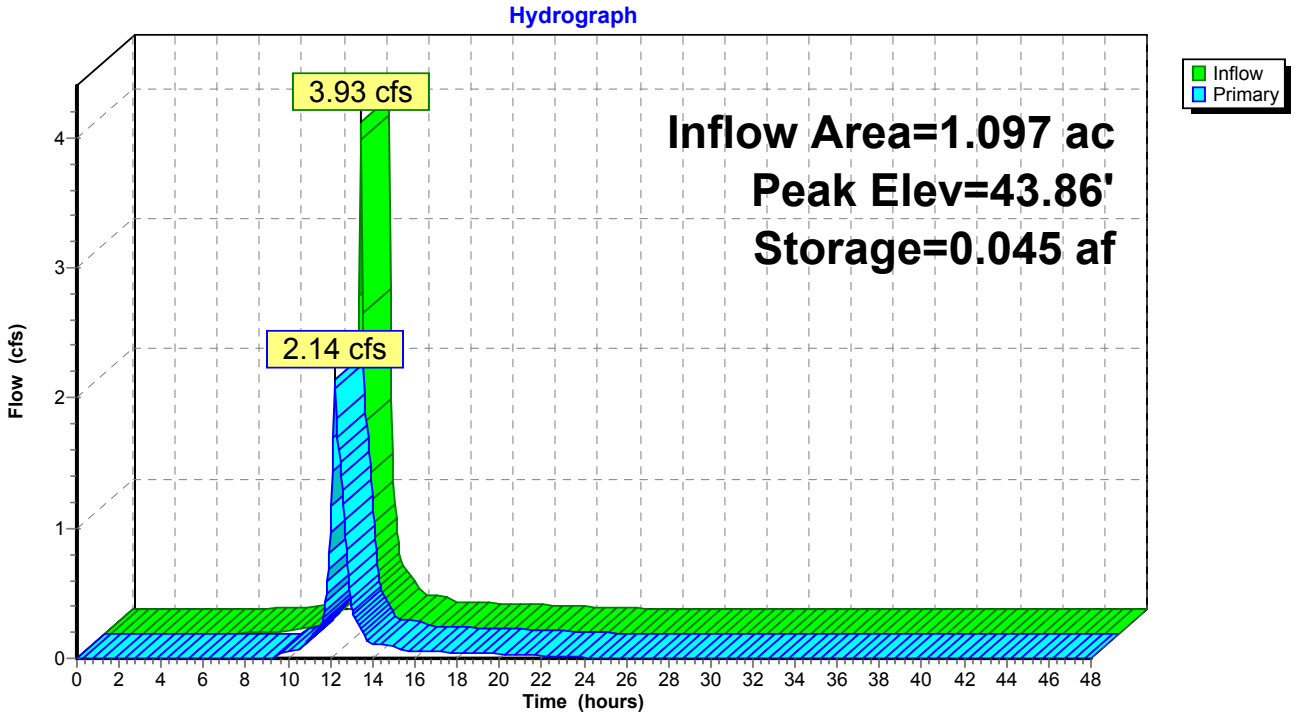
6,789.2 cf Field - 2,450.5 cf Chambers = 4,338.7 cf Stone x 40.0% Voids = 1,735.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,186.0 cf = 0.096 af
Overall Storage Efficiency = 61.7%
Overall System Size = 35.29' x 28.50' x 6.75'

21 Chambers
251.5 cy Field
160.7 cy Stone



Pond 1P: CHAMBER

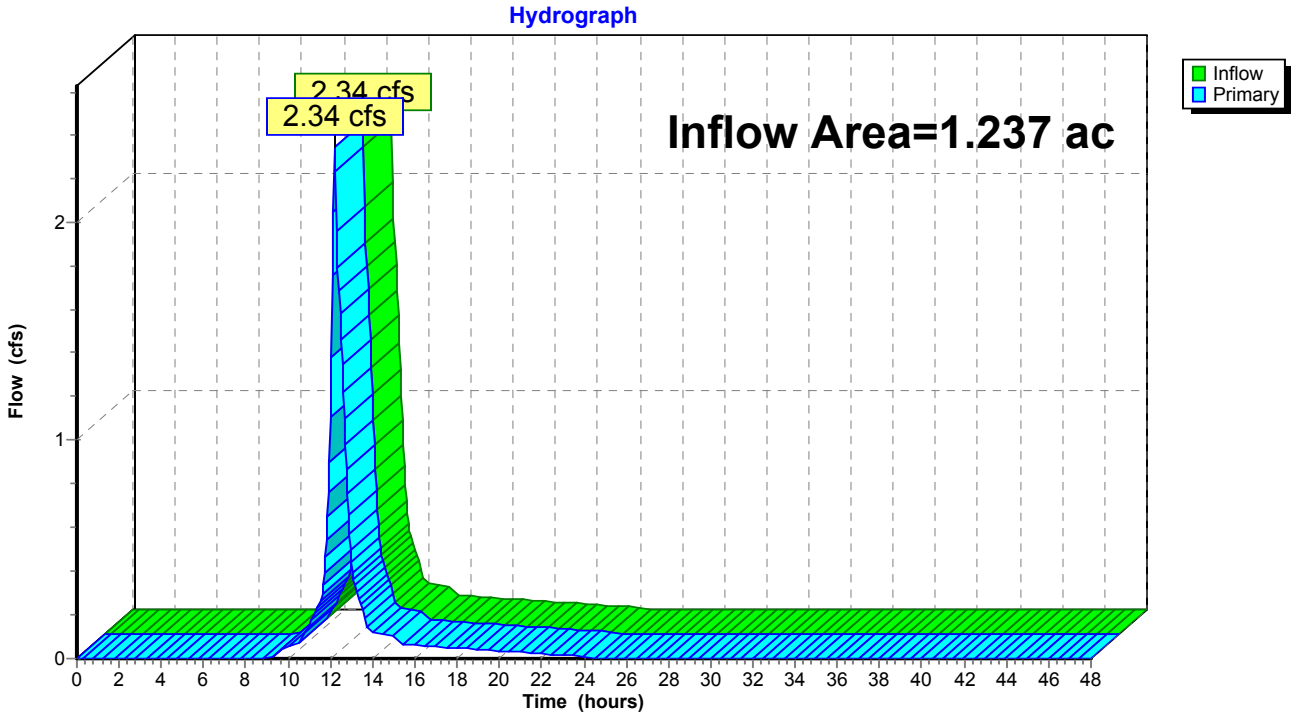


Summary for Link PR: TOTAL WEST

Inflow Area = 1.237 ac, 80.72% Impervious, Inflow Depth = 2.03" for 2-YR event
Inflow = 2.34 cfs @ 12.21 hrs, Volume= 0.209 af
Primary = 2.34 cfs @ 12.21 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL WEST



Summary for Subcatchment A1: TO CHAMBER

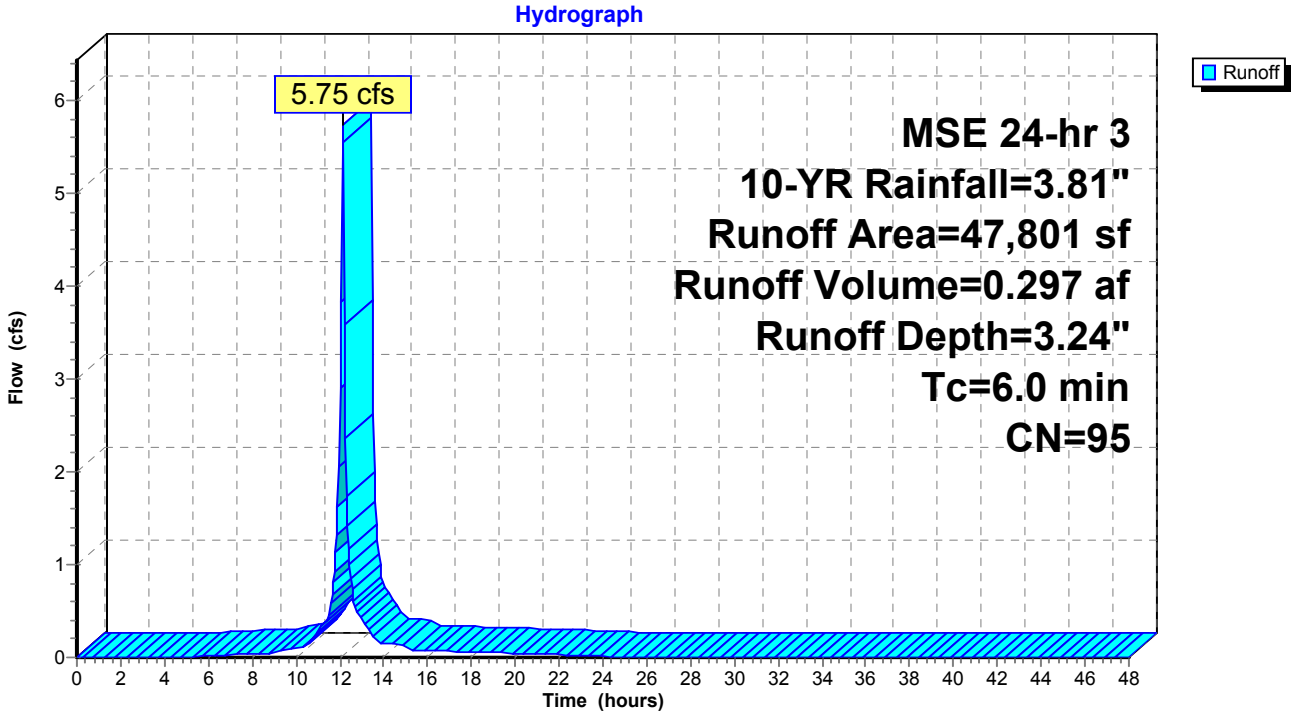
Runoff = 5.75 cfs @ 12.13 hrs, Volume= 0.297 af, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	6,604	78	>75% Grass cover, Good, HSG D
*	20,762	98	Paved parking, HSG D
	19,554	98	Roofs, HSG D
*	881	98	Sidewalk, HSG D
	47,801	95	Weighted Average
	6,604		13.82% Pervious Area
	41,197		86.18% Impervious Area

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

Subcatchment A1: TO CHAMBER



Summary for Subcatchment A2: UNDETAINED

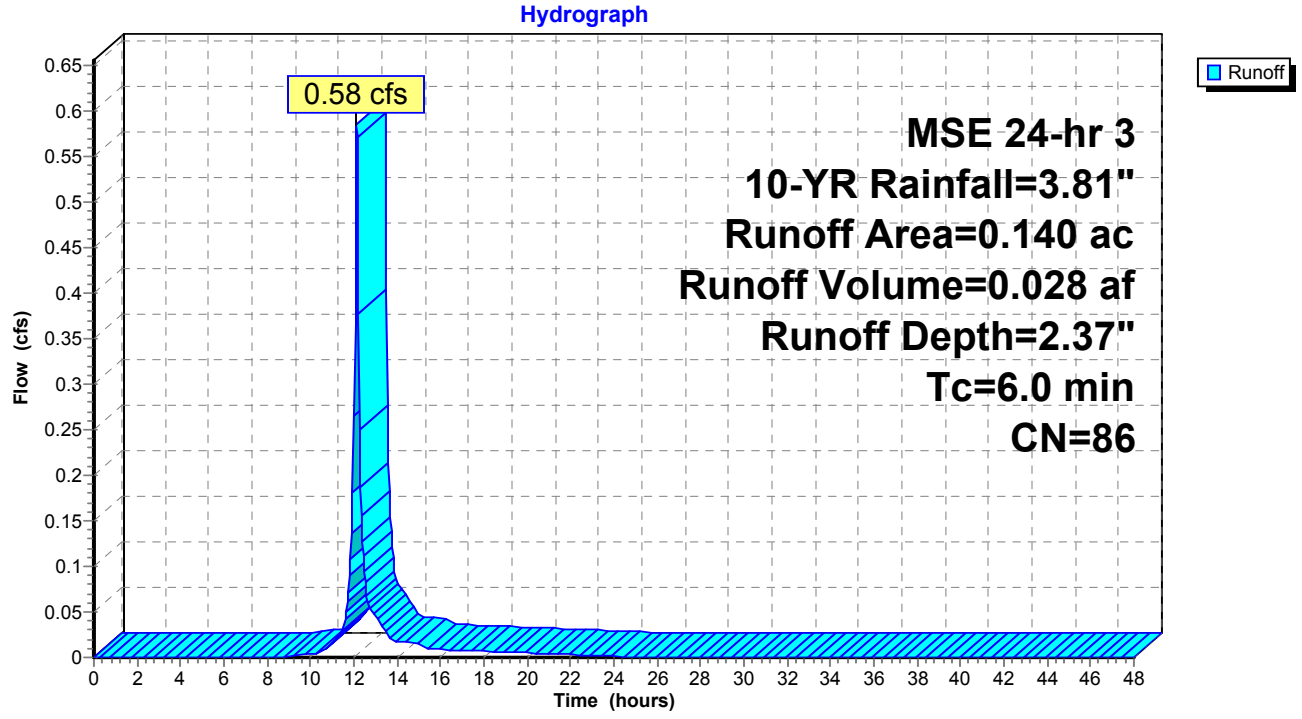
Runoff = 0.58 cfs @ 12.13 hrs, Volume= 0.028 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (ac)	CN	Description
*	0.087	78	>75% Grass cover, Good, HSG D
*	0.032	98	Paved parking, HSG D
*	0.005	98	Sidewalk, HSG D
*	0.016	98	Terrace, HSG D
	0.140	86	Weighted Average
	0.087		62.14% Pervious Area
	0.053		37.86% Impervious Area

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

Subcatchment A2: UNDETAINED



Summary for Pond 1P: CHAMBER

Inflow Area = 1.097 ac, 86.18% Impervious, Inflow Depth = 3.24" for 10-YR event
Inflow = 5.75 cfs @ 12.13 hrs, Volume= 0.297 af
Outflow = 4.03 cfs @ 12.20 hrs, Volume= 0.292 af, Atten= 30%, Lag= 4.2 min
Primary = 4.03 cfs @ 12.20 hrs, Volume= 0.292 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 44.67' @ 12.20 hrs Surf.Area= 0.023 ac Storage= 0.059 af

Plug-Flow detention time= 26.6 min calculated for 0.292 af (98% of inflow)
Center-of-Mass det. time= 17.6 min (784.2 - 766.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	41.00'	0.040 af	**28.50'W x 35.29'L x 6.75'H Field A** 0.156 af Overall - 0.056 af Embedded = 0.100 af x 40.0% Voids
#2A	41.75'	0.056 af	**ADS_StormTech MC-4500 +Cap** x 21 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 7 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		0.096 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	41.00'	**12.0" Round Culvert** L= 24.6' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 41.00' / 40.75' S= 0.0102 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	41.50'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	43.55'	**9.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	44.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.01 cfs @ 12.20 hrs HW=44.66' (Free Discharge)
└**1=Culvert** (Passes 4.01 cfs of 6.73 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.18 cfs @ 8.16 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.83 cfs @ 4.14 fps)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: CHAMBER - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

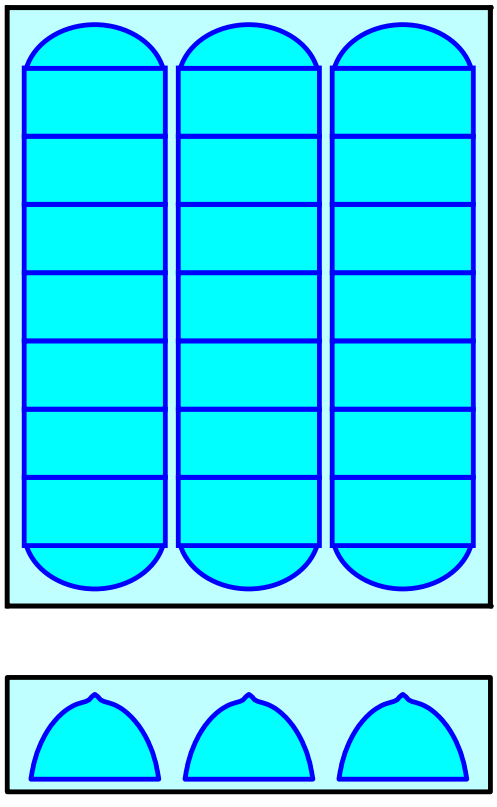
7 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 33.29' Row Length +12.0" End Stone x 2 = 35.29' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Base + 60.0" Chamber Height + 12.0" Cover = 6.75' Field Height

21 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 3 Rows = 2,450.5 cf Chamber Storage

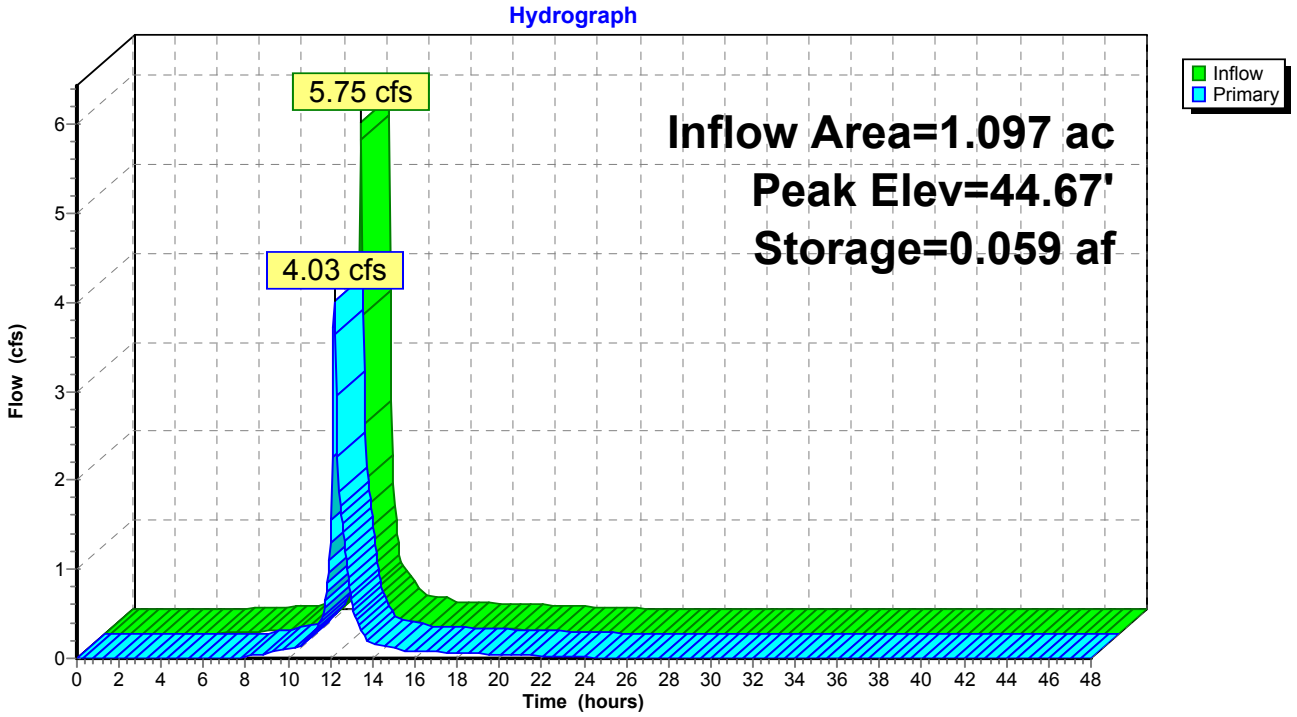
6,789.2 cf Field - 2,450.5 cf Chambers = 4,338.7 cf Stone x 40.0% Voids = 1,735.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,186.0 cf = 0.096 af
Overall Storage Efficiency = 61.7%
Overall System Size = 35.29' x 28.50' x 6.75'

21 Chambers
251.5 cy Field
160.7 cy Stone



Pond 1P: CHAMBER

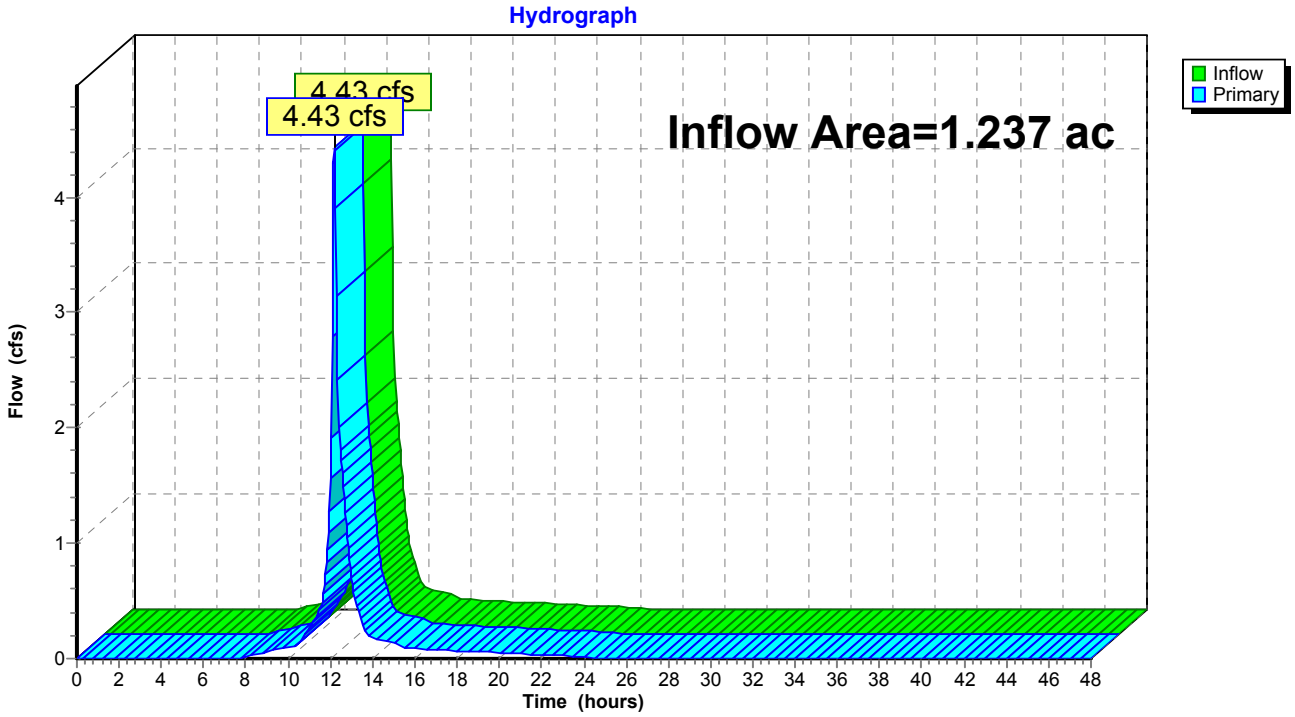


Summary for Link PR: TOTAL WEST

Inflow Area = 1.237 ac, 80.72% Impervious, Inflow Depth = 3.10" for 10-YR event
Inflow = 4.43 cfs @ 12.18 hrs, Volume= 0.320 af
Primary = 4.43 cfs @ 12.18 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL WEST



Summary for Subcatchment A1: TO CHAMBER

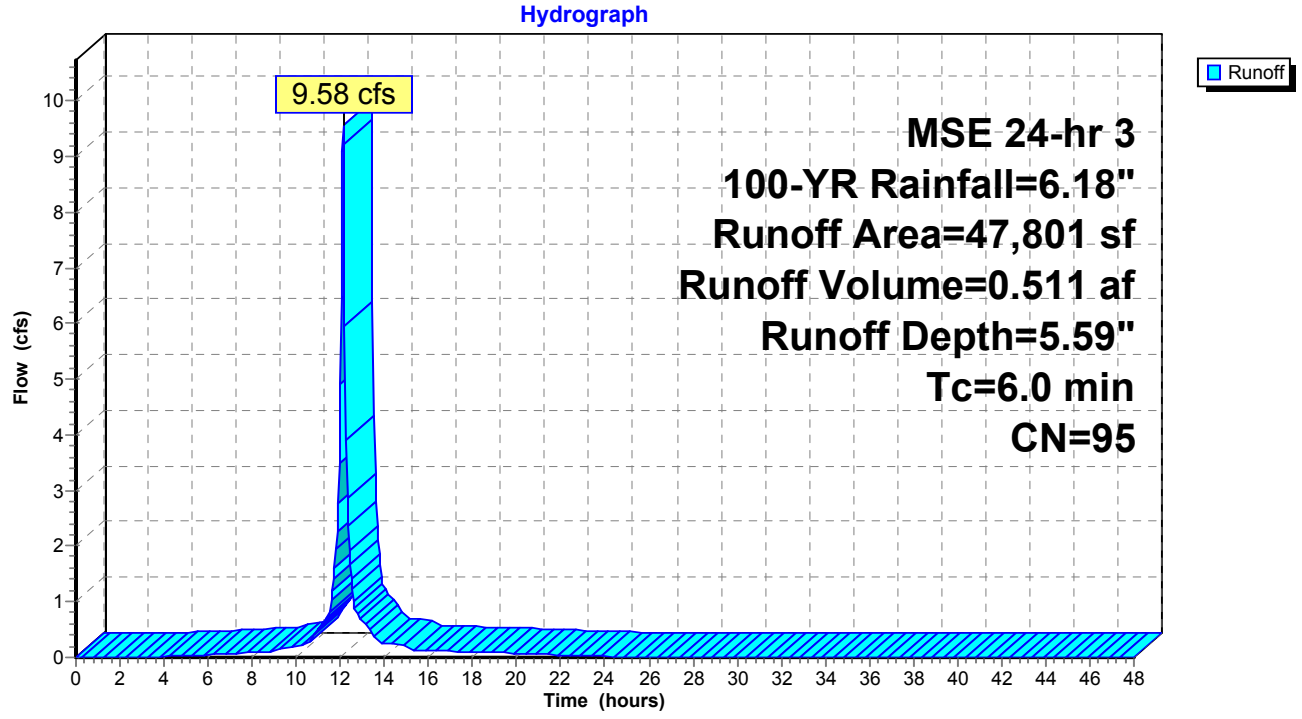
Runoff = 9.58 cfs @ 12.13 hrs, Volume= 0.511 af, Depth= 5.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	6,604	78	>75% Grass cover, Good, HSG D
*	20,762	98	Paved parking, HSG D
	19,554	98	Roofs, HSG D
*	881	98	Sidewalk, HSG D
	47,801	95	Weighted Average
	6,604		13.82% Pervious Area
	41,197		86.18% Impervious Area

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

Subcatchment A1: TO CHAMBER



Summary for Subcatchment A2: UNDETAINED

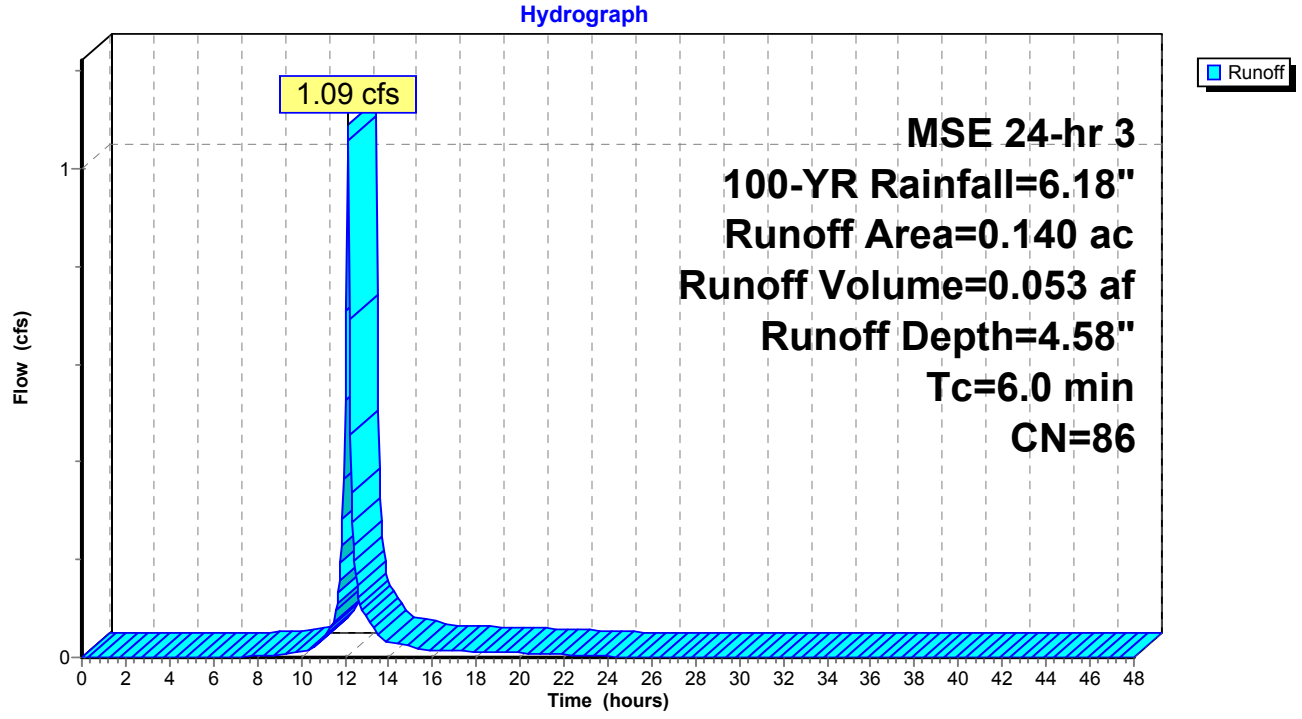
Runoff = 1.09 cfs @ 12.13 hrs, Volume= 0.053 af, Depth= 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (ac)	CN	Description
*	0.087	78	>75% Grass cover, Good, HSG D
*	0.032	98	Paved parking, HSG D
*	0.005	98	Sidewalk, HSG D
*	0.016	98	Terrace, HSG D
	0.140	86	Weighted Average
	0.087		62.14% Pervious Area
	0.053		37.86% Impervious Area

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

Subcatchment A2: UNDETAINED



Summary for Pond 1P: CHAMBER

Inflow Area = 1.097 ac, 86.18% Impervious, Inflow Depth = 5.59" for 100-YR event
Inflow = 9.58 cfs @ 12.13 hrs, Volume= 0.511 af
Outflow = 7.73 cfs @ 12.17 hrs, Volume= 0.507 af, Atten= 19%, Lag= 2.7 min
Primary = 7.73 cfs @ 12.17 hrs, Volume= 0.507 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 45.68' @ 12.17 hrs Surf.Area= 0.023 ac Storage= 0.074 af

Plug-Flow detention time= 20.5 min calculated for 0.507 af (99% of inflow)
Center-of-Mass det. time= 14.3 min (771.2 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	41.00'	0.040 af	**28.50'W x 35.29'L x 6.75'H Field A** 0.156 af Overall - 0.056 af Embedded = 0.100 af x 40.0% Voids
#2A	41.75'	0.056 af	**ADS_StormTech MC-4500 +Cap** x 21 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 7 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		0.096 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	41.00'	**12.0" Round Culvert** L= 24.6' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 41.00' / 40.75' S= 0.0102 '/' Cc= 0.900 n= 0.011 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	41.50'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	43.55'	**9.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	44.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=7.67 cfs @ 12.17 hrs HW=45.61' (Free Discharge)
└**1=Culvert** (Inlet Controls 7.67 cfs @ 9.77 fps)
├**2=Orifice/Grate** (Passes < 2.52 cfs potential flow)
├**3=Orifice/Grate** (Passes < 2.76 cfs potential flow)
└**4=Sharp-Crested Rectangular Weir** (Passes < 10.04 cfs potential flow)

Pond 1P: CHAMBER - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-4500 +Cap (ADS StormTech® MC-4500 with cap volume)
Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf
Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap
Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

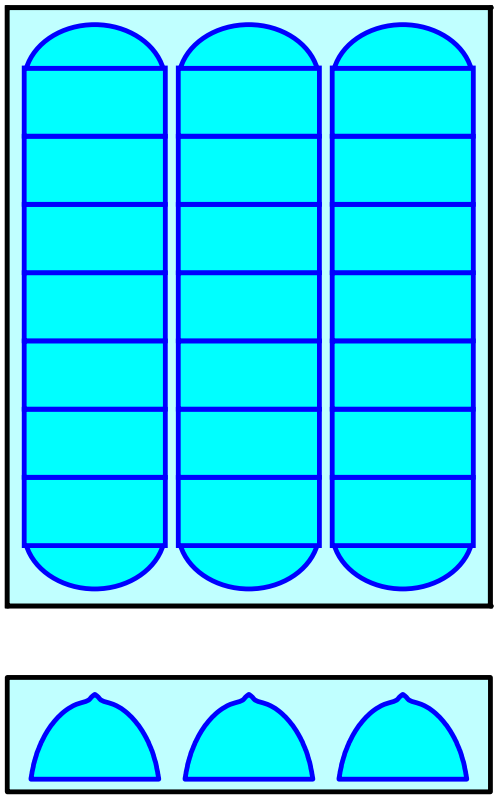
7 Chambers/Row x 4.02' Long +2.56' Cap Length x 2 = 33.29' Row Length +12.0" End Stone x 2 = 35.29' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Base + 60.0" Chamber Height + 12.0" Cover = 6.75' Field Height

21 Chambers x 106.5 cf + 35.7 cf Cap Volume x 2 x 3 Rows = 2,450.5 cf Chamber Storage

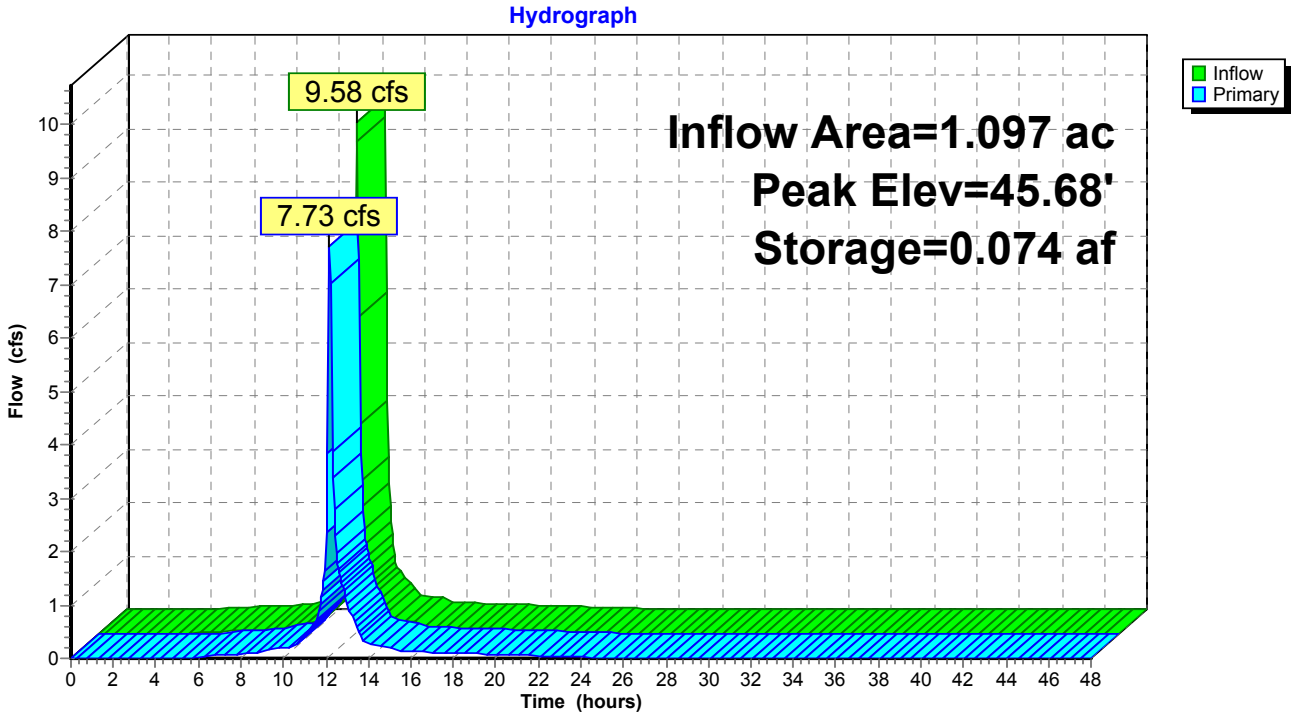
6,789.2 cf Field - 2,450.5 cf Chambers = 4,338.7 cf Stone x 40.0% Voids = 1,735.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,186.0 cf = 0.096 af
Overall Storage Efficiency = 61.7%
Overall System Size = 35.29' x 28.50' x 6.75'

21 Chambers
251.5 cy Field
160.7 cy Stone



Pond 1P: CHAMBER

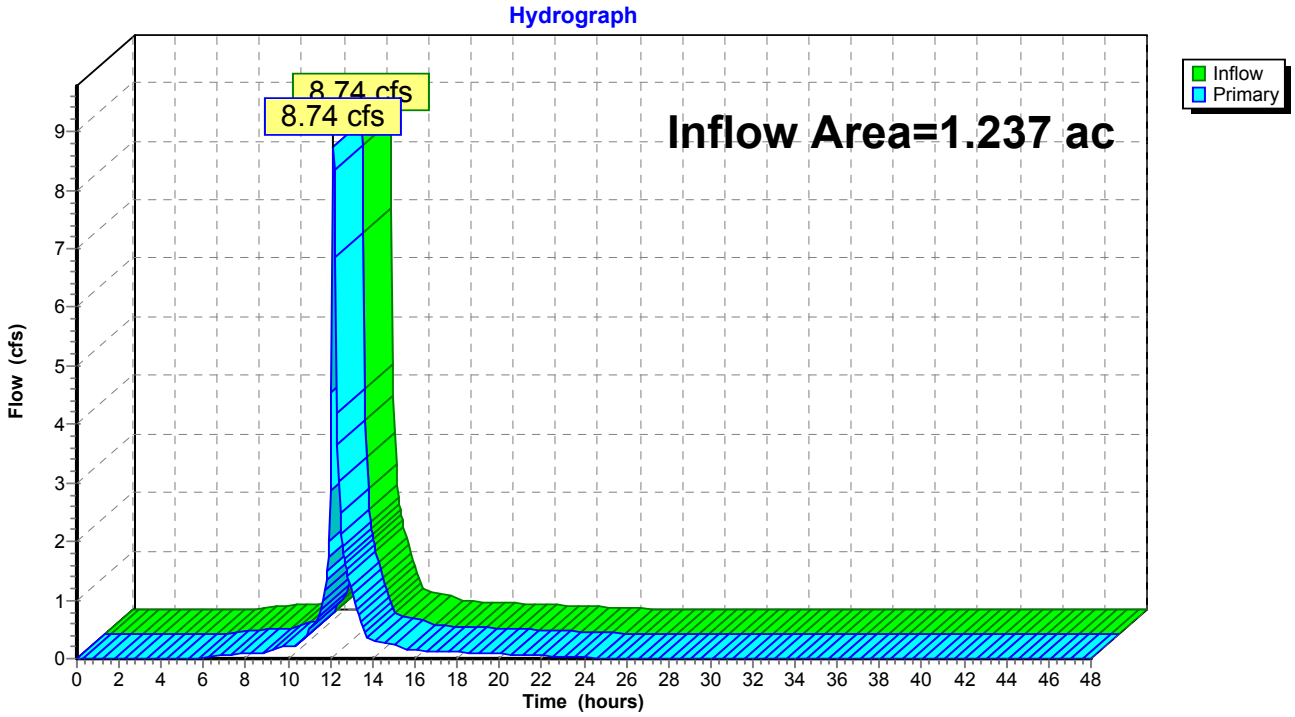


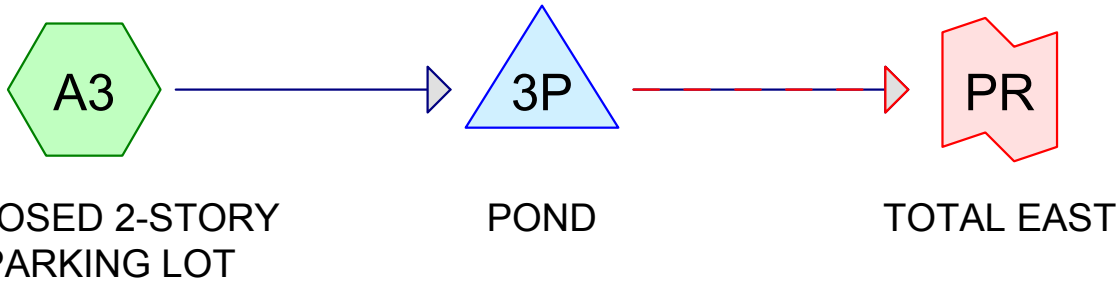
Summary for Link PR: TOTAL WEST

Inflow Area = 1.237 ac, 80.72% Impervious, Inflow Depth = 5.43" for 100-YR event
Inflow = 8.74 cfs @ 12.15 hrs, Volume= 0.560 af
Primary = 8.74 cfs @ 12.15 hrs, Volume= 0.560 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL WEST





Subcat Reach Pond Link

Routing Diagram for 1545.00-WI PROPOSED EAST BUILDING
Prepared by Microsoft, Printed 11/6/2019

Summary for Subcatchment A3: PROPOSED 2-STORY & PARKING LOT

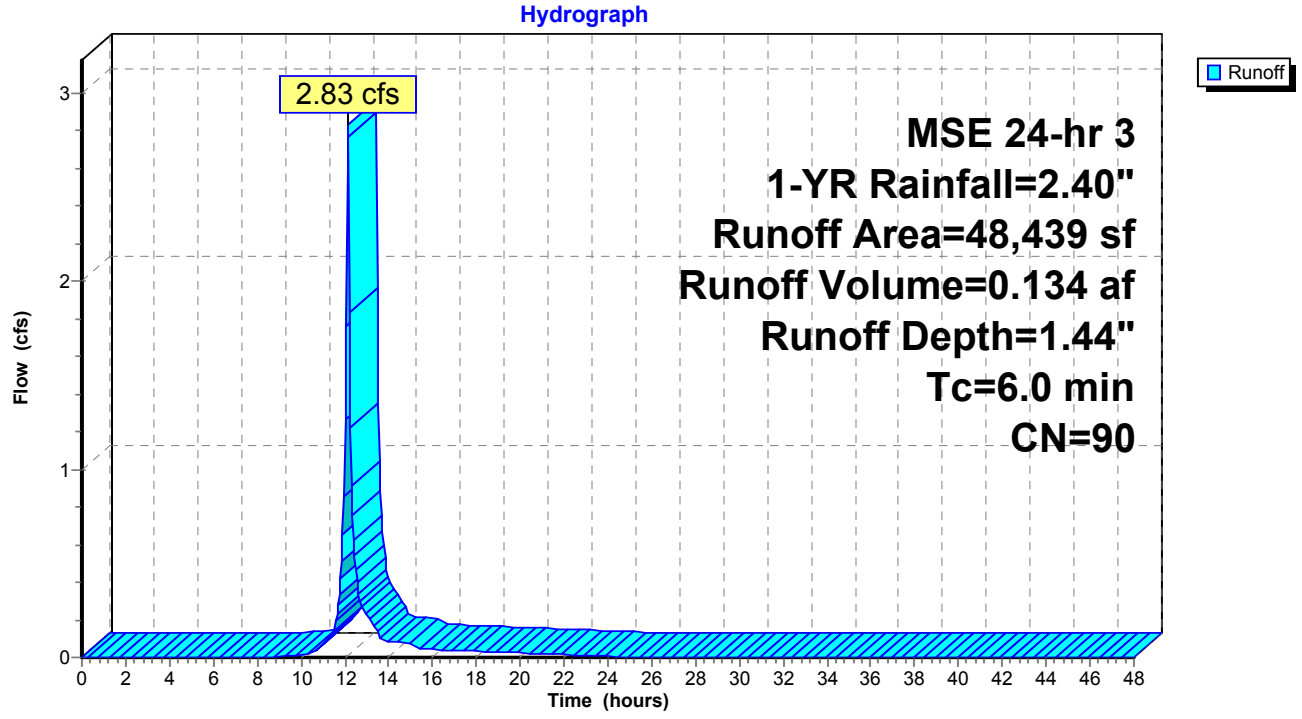
Runoff = 2.83 cfs @ 12.13 hrs, Volume= 0.134 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

	Area (sf)	CN	Description
*	18,208	78	75% Grass cover, Good, HSG D
	12,981	98	Paved parking, HSG D
	15,551	98	Roofs, HSG D
*	1,699	98	Sidewalk pavement, HSG D
	48,439	90	Weighted Average
	18,208		37.59% Pervious Area
	30,231		62.41% Impervious Area

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

Subcatchment A3: PROPOSED 2-STORY & PARKING LOT



Summary for Pond 3P: POND

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 1.44" for 1-YR event
Inflow = 2.83 cfs @ 12.13 hrs, Volume= 0.134 af
Outflow = 1.60 cfs @ 12.22 hrs, Volume= 0.134 af, Atten= 44%, Lag= 5.4 min
Primary = 1.60 cfs @ 12.22 hrs, Volume= 0.134 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 49.24' @ 12.22 hrs Surf.Area= 1,296 sf Storage= 871 cf

Plug-Flow detention time= 5.2 min calculated for 0.134 af (100% of inflow)
Center-of-Mass det. time= 5.2 min (802.4 - 797.2)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	8,951 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

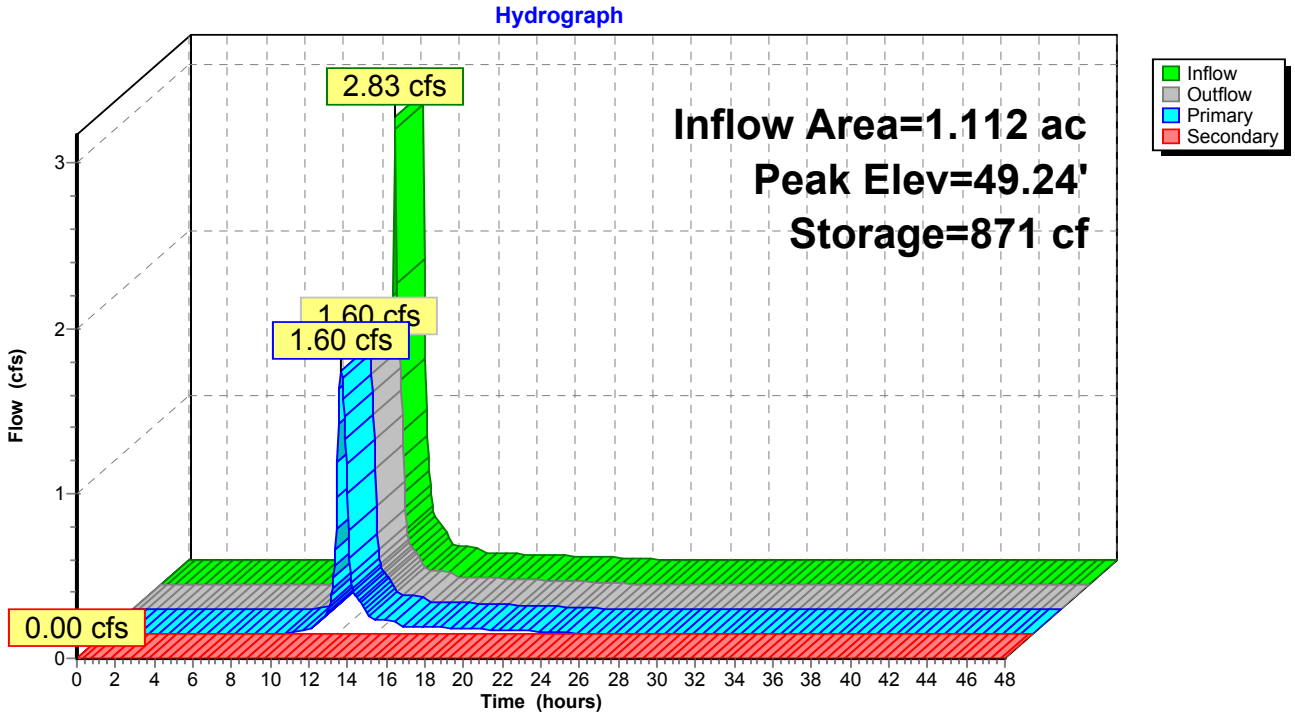
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	15	0	0
49.00	1,151	583	583
50.00	1,768	1,460	2,043
51.00	2,515	2,142	4,184
52.00	3,392	2,954	7,138
52.50	3,863	1,814	8,951

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**12.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 48.00' / 47.88' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	48.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	51.05'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	51.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.58 cfs @ 12.22 hrs HW=49.22' (Free Discharge)
└**1=Culvert** (Passes 1.58 cfs of 2.78 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.58 cfs @ 4.54 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: POND

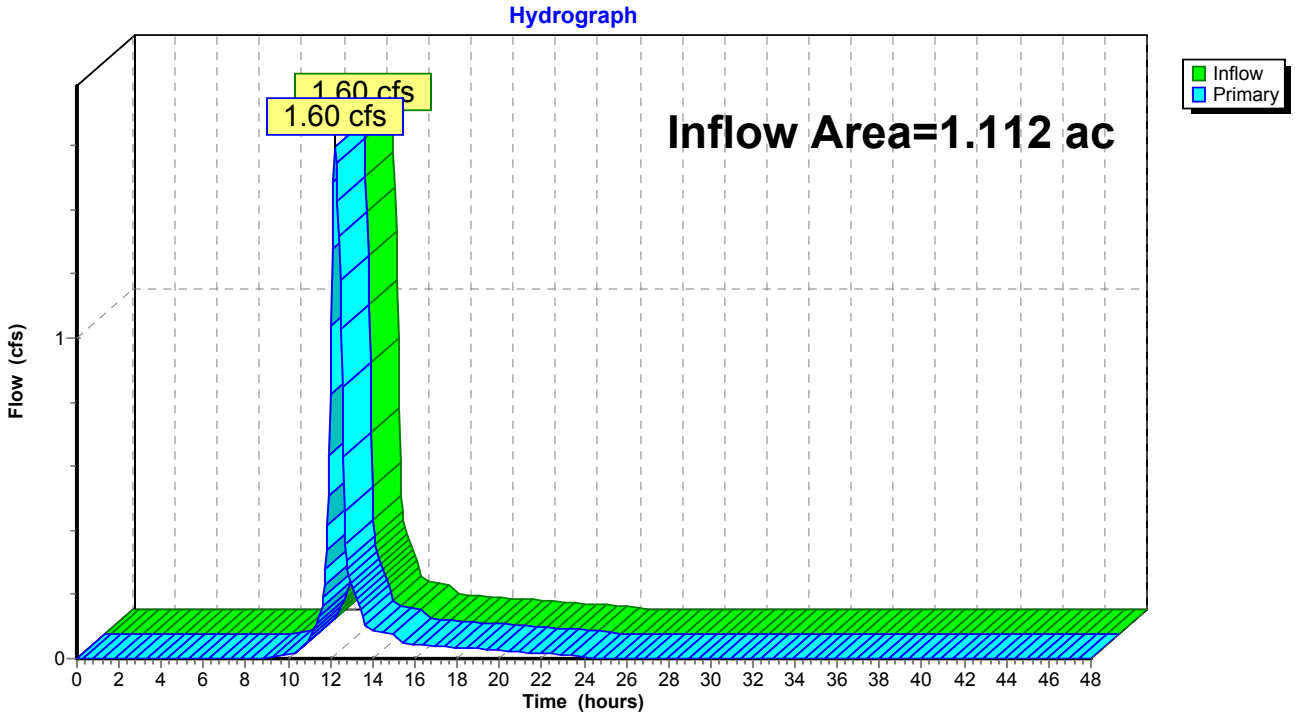

Hydrograph
Inflow
Outflow
Primary
Secondary
2.83 cfs
1.60 cfs
1.60 cfs
0.00 cfs
Inflow Area=1.112 ac
Peak Elev=49.24'
Storage=871 cf
Flow (cfs)
Time (hours)
0
1
2
3
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Link PR: TOTAL EAST

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 1.44" for 1-YR event
Inflow = 1.60 cfs @ 12.22 hrs, Volume= 0.134 af
Primary = 1.60 cfs @ 12.22 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL EAST



Summary for Subcatchment A3: PROPOSED 2-STORY & PARKING LOT

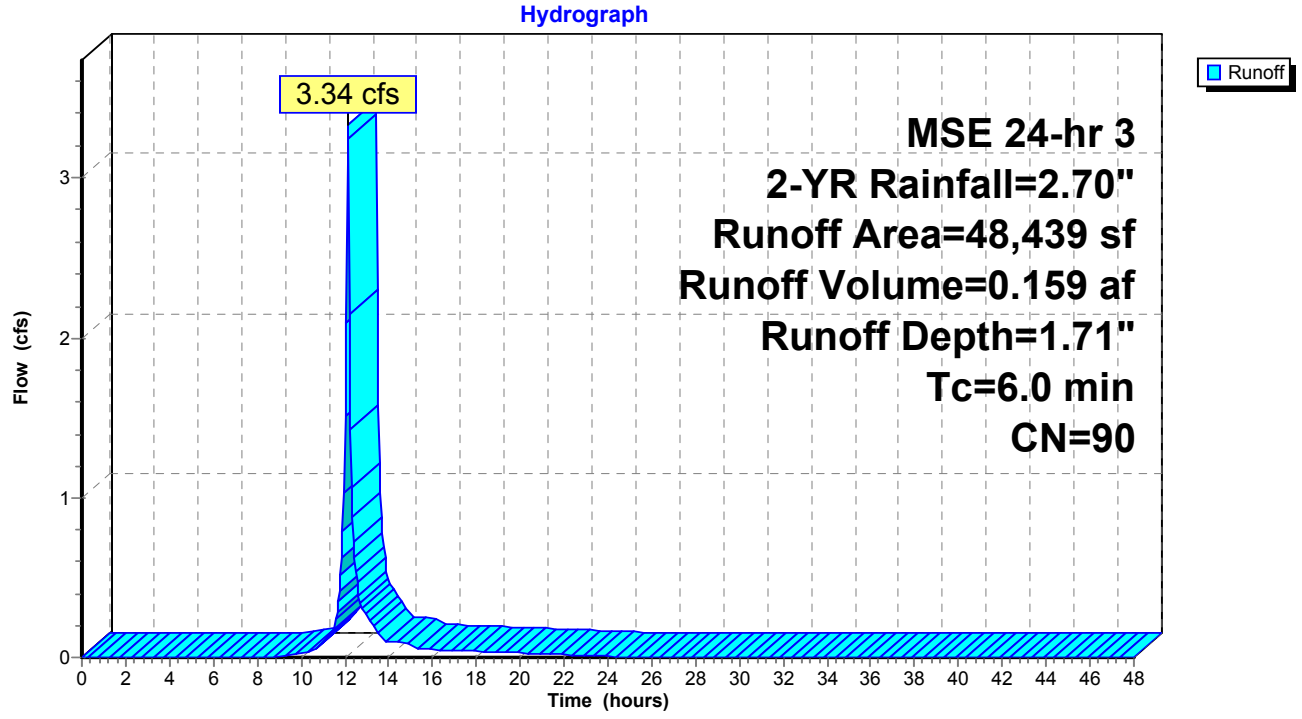
Runoff = 3.34 cfs @ 12.13 hrs, Volume= 0.159 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	18,208	78	75% Grass cover, Good, HSG D
	12,981	98	Paved parking, HSG D
	15,551	98	Roofs, HSG D
*	1,699	98	Sidewalk pavement, HSG D
	48,439	90	Weighted Average
	18,208		37.59% Pervious Area
	30,231		62.41% Impervious Area

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

Subcatchment A3: PROPOSED 2-STORY & PARKING LOT



Summary for Pond 3P: POND

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 1.71" for 2-YR event
Inflow = 3.34 cfs @ 12.13 hrs, Volume= 0.159 af
Outflow = 1.75 cfs @ 12.23 hrs, Volume= 0.159 af, Atten= 48%, Lag= 5.9 min
Primary = 1.75 cfs @ 12.23 hrs, Volume= 0.159 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 49.42' @ 12.23 hrs Surf.Area= 1,408 sf Storage= 1,116 cf

Plug-Flow detention time= 5.7 min calculated for 0.158 af (100% of inflow)
Center-of-Mass det. time= 5.7 min (799.5 - 793.8)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	8,951 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

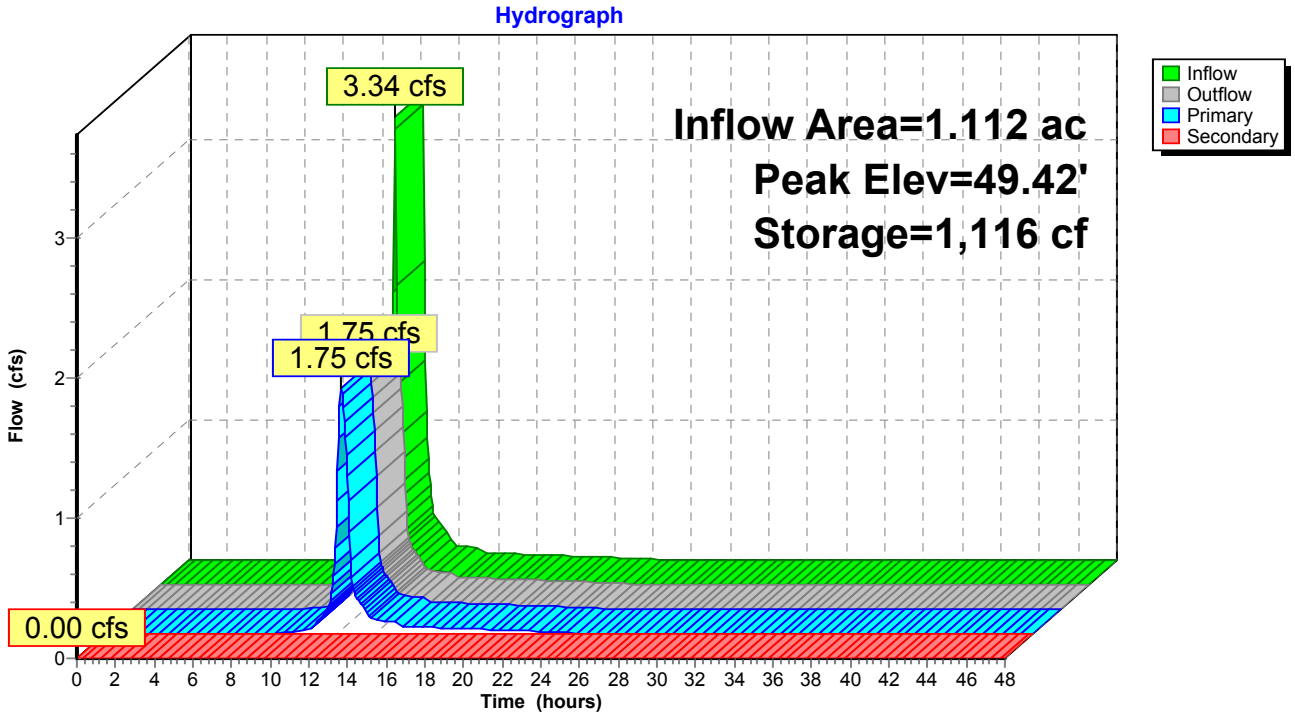
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	15	0	0
49.00	1,151	583	583
50.00	1,768	1,460	2,043
51.00	2,515	2,142	4,184
52.00	3,392	2,954	7,138
52.50	3,863	1,814	8,951

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**12.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 48.00' / 47.88' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	48.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	51.05'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	51.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.74 cfs @ 12.23 hrs HW=49.41' (Free Discharge)
└**1=Culvert** (Passes 1.74 cfs of 3.13 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.74 cfs @ 4.99 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: POND

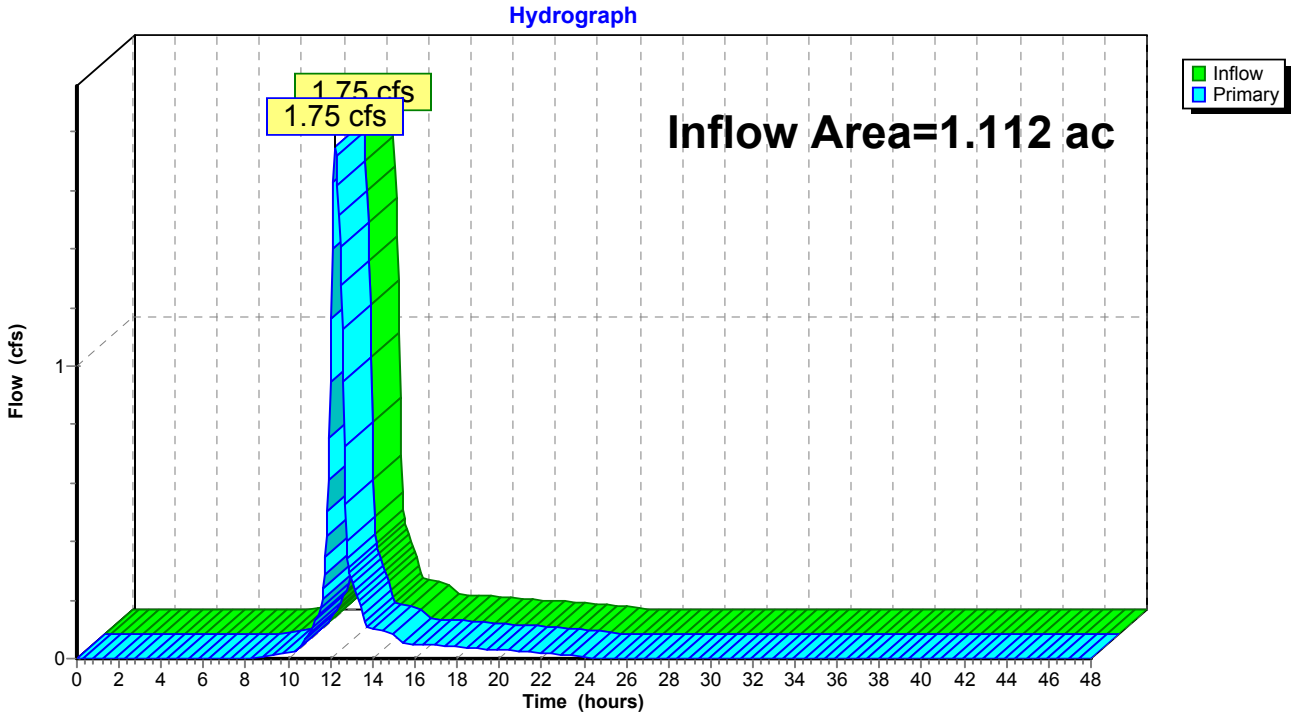

Hydrograph
3.34 cfs
1.75 cfs
1.75 cfs
0.00 cfs
Inflow Area=1.112 ac
Peak Elev=49.42'
Storage=1,116 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Link PR: TOTAL EAST

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 1.71" for 2-YR event
Inflow = 1.75 cfs @ 12.23 hrs, Volume= 0.159 af
Primary = 1.75 cfs @ 12.23 hrs, Volume= 0.159 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL EAST



Summary for Subcatchment A3: PROPOSED 2-STORY & PARKING LOT

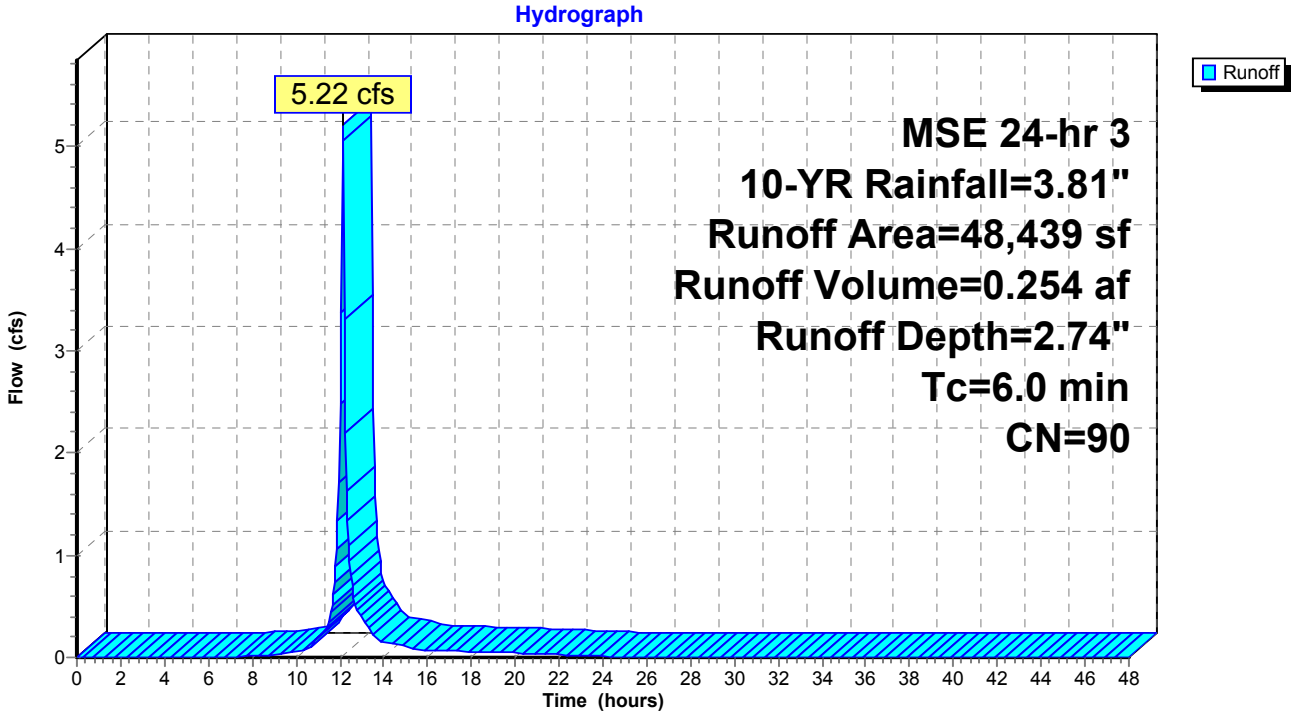
Runoff = 5.22 cfs @ 12.13 hrs, Volume= 0.254 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

	Area (sf)	CN	Description
*	18,208	78	75% Grass cover, Good, HSG D
	12,981	98	Paved parking, HSG D
	15,551	98	Roofs, HSG D
*	1,699	98	Sidewalk pavement, HSG D
	48,439	90	Weighted Average
	18,208		37.59% Pervious Area
	30,231		62.41% Impervious Area

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

Subcatchment A3: PROPOSED 2-STORY & PARKING LOT



Summary for Pond 3P: POND

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 2.74" for 10-YR event
Inflow = 5.22 cfs @ 12.13 hrs, Volume= 0.254 af
Outflow = 2.24 cfs @ 12.26 hrs, Volume= 0.254 af, Atten= 57%, Lag= 7.6 min
Primary = 2.24 cfs @ 12.26 hrs, Volume= 0.254 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 50.10' @ 12.26 hrs Surf.Area= 1,846 sf Storage= 2,230 cf

Plug-Flow detention time= 8.0 min calculated for 0.254 af (100% of inflow)
Center-of-Mass det. time= 8.0 min (792.4 - 784.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	8,951 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

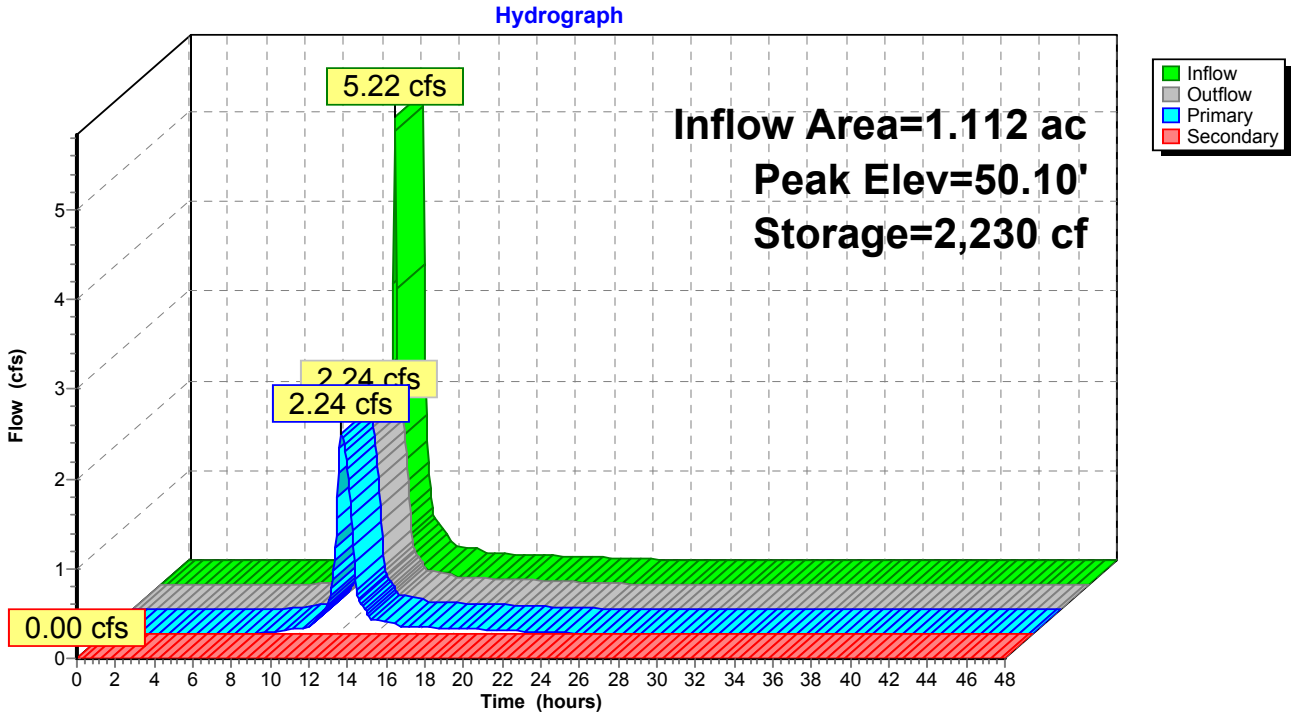
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	15	0	0
49.00	1,151	583	583
50.00	1,768	1,460	2,043
51.00	2,515	2,142	4,184
52.00	3,392	2,954	7,138
52.50	3,863	1,814	8,951

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**12.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 48.00' / 47.88' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	48.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	51.05'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	51.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.23 cfs @ 12.26 hrs HW=50.10' (Free Discharge)
└**1=Culvert** (Passes 2.23 cfs of 4.76 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.23 cfs @ 6.40 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: POND

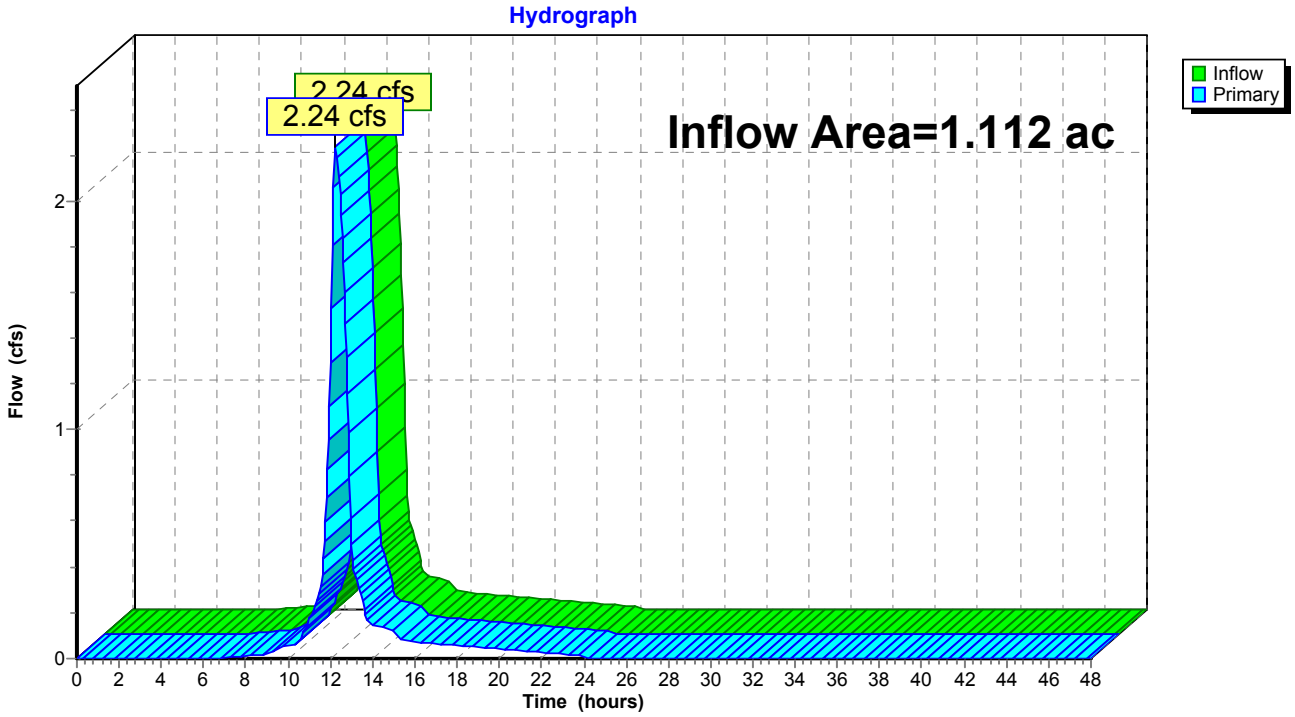

Hydrograph
5.22 cfs
2.24 cfs
0.00 cfs
Inflow Area=1.112 ac
Peak Elev=50.10'
Storage=2,230 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 1 2 3 4 5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Link PR: TOTAL EAST

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 2.74" for 10-YR event
Inflow = 2.24 cfs @ 12.26 hrs, Volume= 0.254 af
Primary = 2.24 cfs @ 12.26 hrs, Volume= 0.254 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link PR: TOTAL EAST



Summary for Subcatchment A3: PROPOSED 2-STORY & PARKING LOT

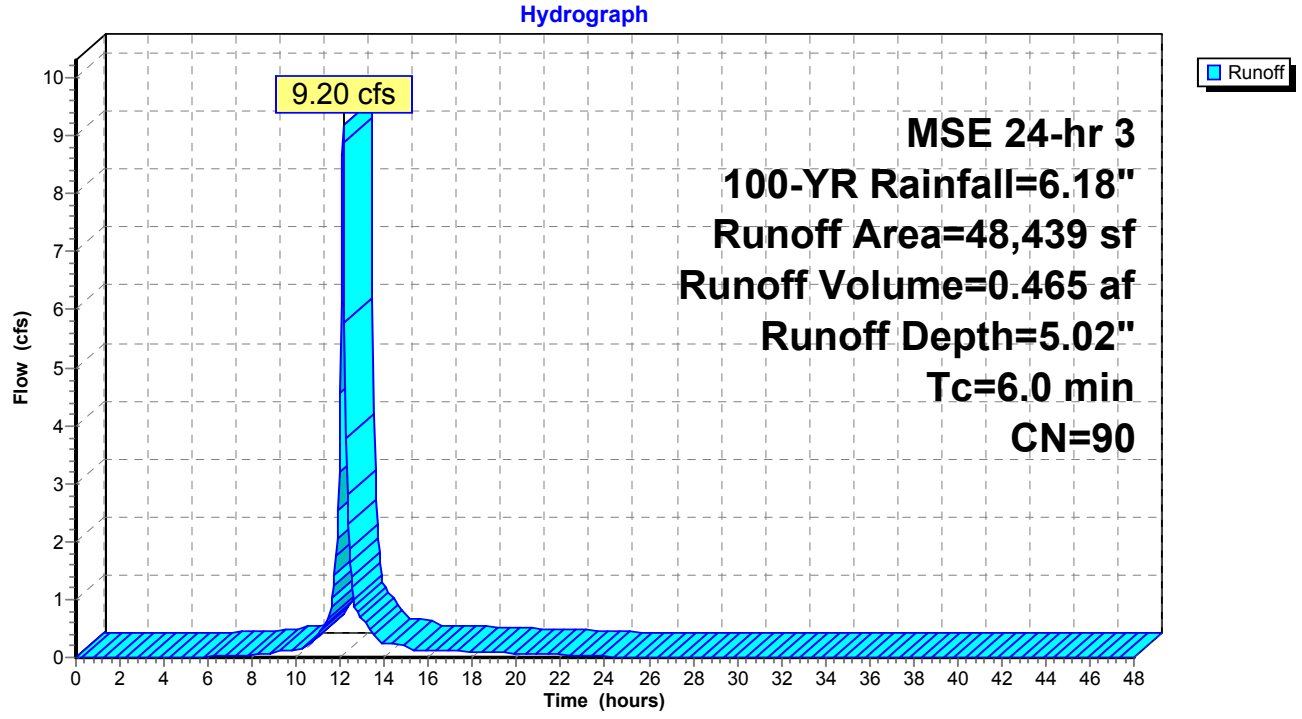
Runoff = 9.20 cfs @ 12.13 hrs, Volume= 0.465 af, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

	Area (sf)	CN	Description
*	18,208	78	75% Grass cover, Good, HSG D
	12,981	98	Paved parking, HSG D
	15,551	98	Roofs, HSG D
*	1,699	98	Sidewalk pavement, HSG D
	48,439	90	Weighted Average
	18,208		37.59% Pervious Area
	30,231		62.41% Impervious Area

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

Subcatchment A3: PROPOSED 2-STORY & PARKING LOT



Summary for Pond 3P: POND

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 5.02" for 100-YR event
Inflow = 9.20 cfs @ 12.13 hrs, Volume= 0.465 af
Outflow = 4.66 cfs @ 12.24 hrs, Volume= 0.465 af, Atten= 49%, Lag= 6.7 min
Primary = 4.66 cfs @ 12.24 hrs, Volume= 0.465 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 51.20' @ 12.24 hrs Surf.Area= 2,692 sf Storage= 4,708 cf

Plug-Flow detention time= 11.9 min calculated for 0.465 af (100% of inflow)
Center-of-Mass det. time= 11.9 min (784.4 - 772.5)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	8,951 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

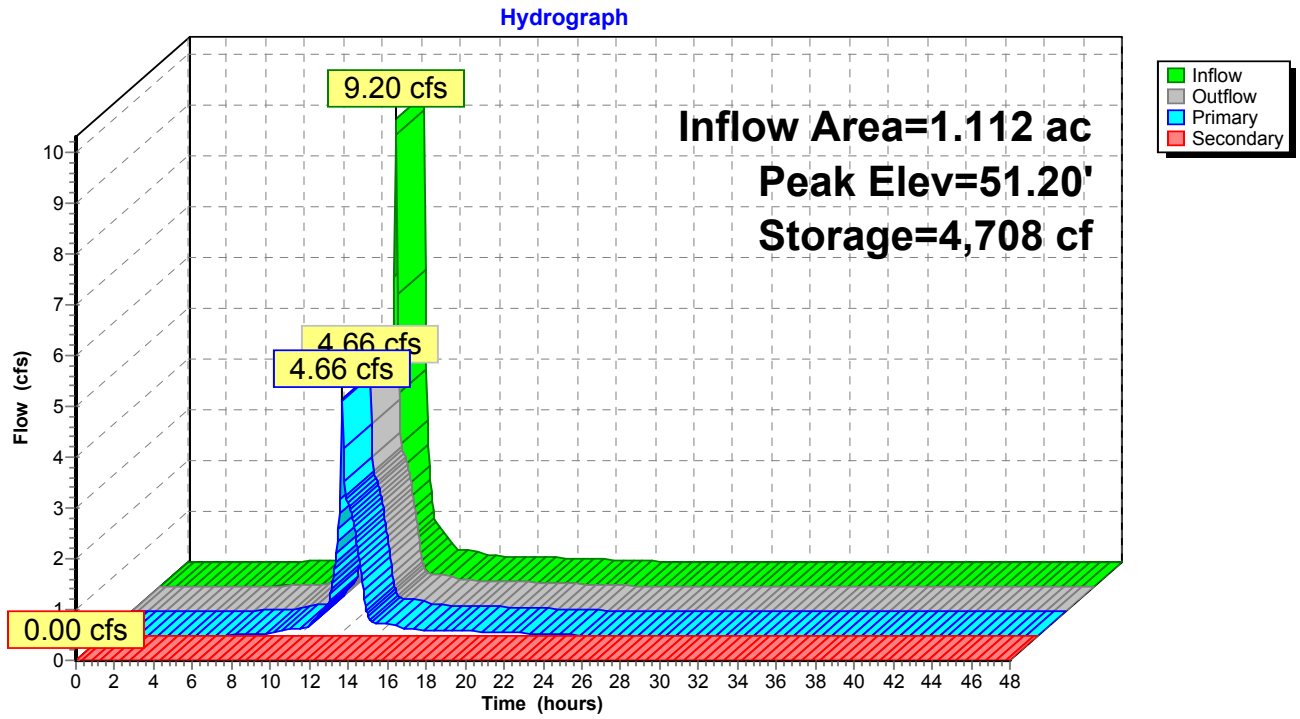
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
48.00	15	0	0
49.00	1,151	583	583
50.00	1,768	1,460	2,043
51.00	2,515	2,142	4,184
52.00	3,392	2,954	7,138
52.50	3,863	1,814	8,951

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**12.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 48.00' / 47.88' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	48.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	51.05'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	51.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.54 cfs @ 12.24 hrs HW=51.19' (Free Discharge)
└**1=Culvert** (Passes 4.54 cfs of 6.21 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.84 cfs @ 8.14 fps)
  └**3=Orifice/Grate** (Weir Controls 1.70 cfs @ 1.24 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=48.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: POND

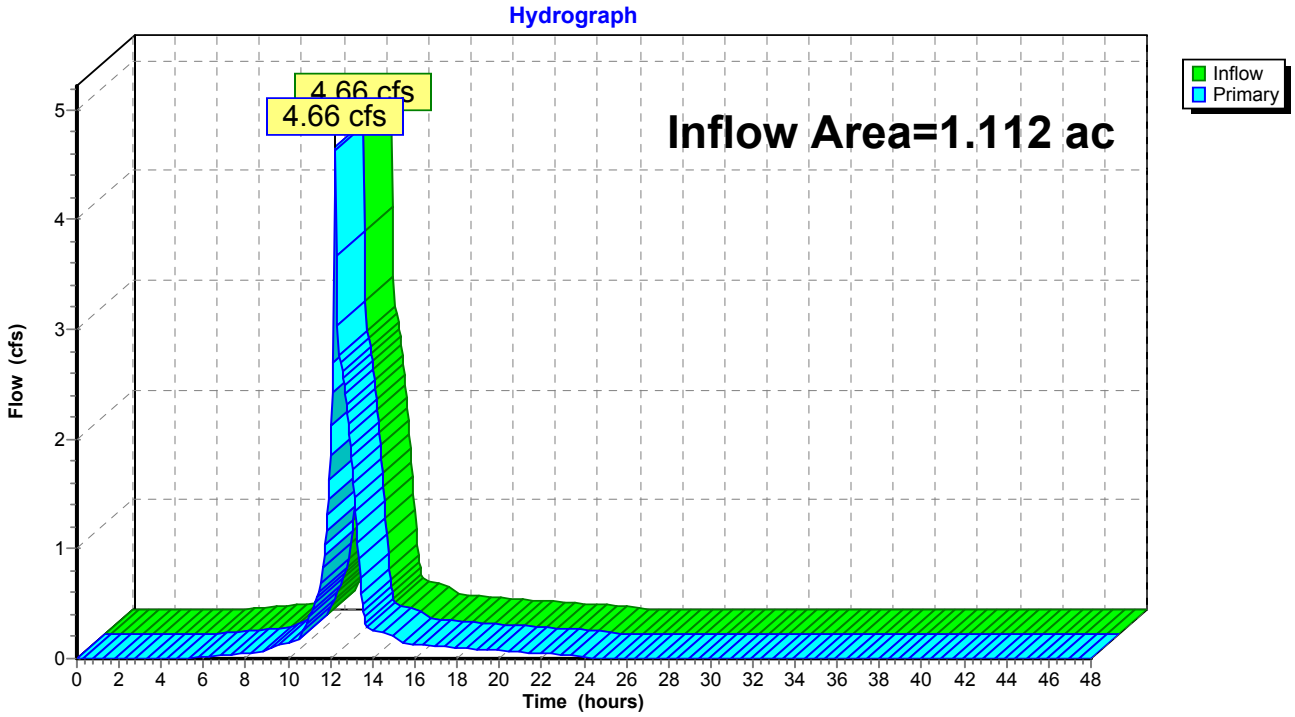

Hydrograph
9.20 cfs
4.66 cfs
4.66 cfs
0.00 cfs
Inflow Area=1.112 ac
Peak Elev=51.20'
Storage=4,708 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 1 2 3 4 5 6 7 8 9 10

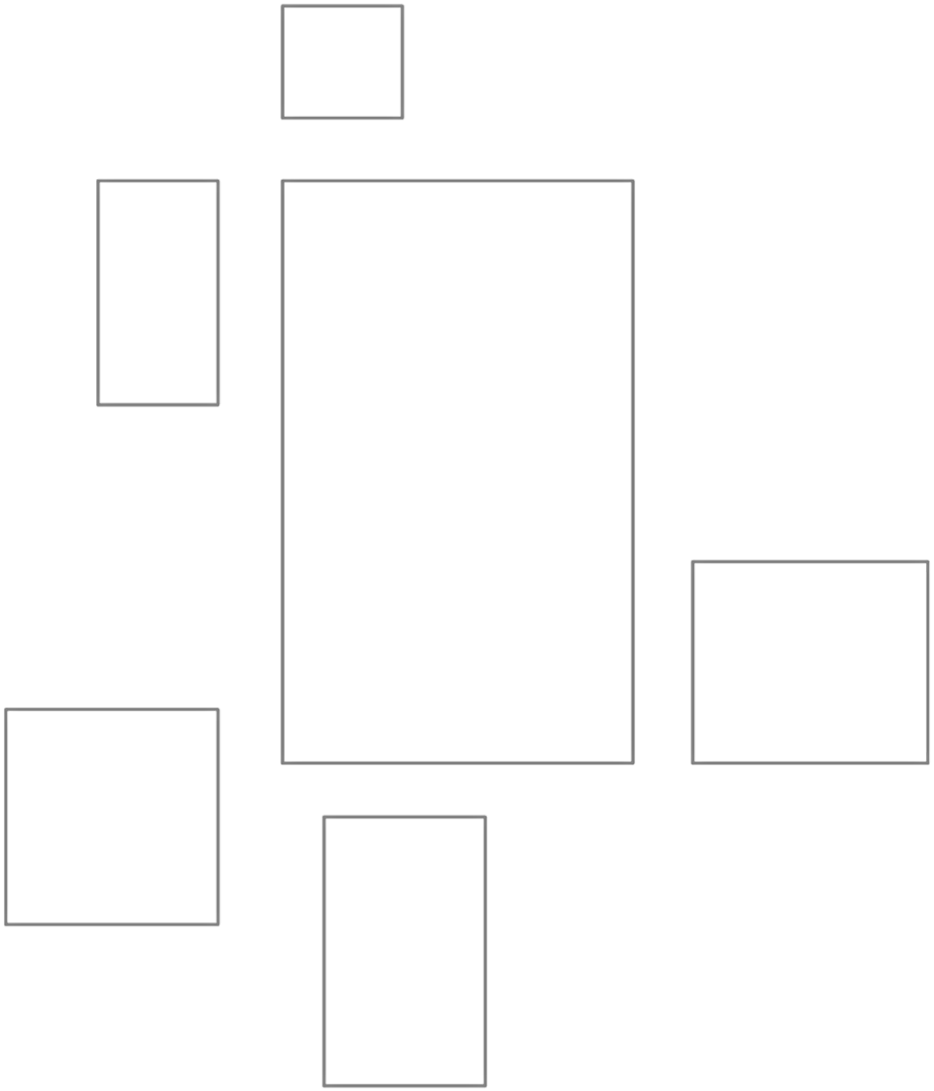
Summary for Link PR: TOTAL EAST

Inflow Area = 1.112 ac, 62.41% Impervious, Inflow Depth = 5.02" for 100-YR event
Inflow = 4.66 cfs @ 12.24 hrs, Volume= 0.465 af
Primary = 4.66 cfs @ 12.24 hrs, Volume= 0.465 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

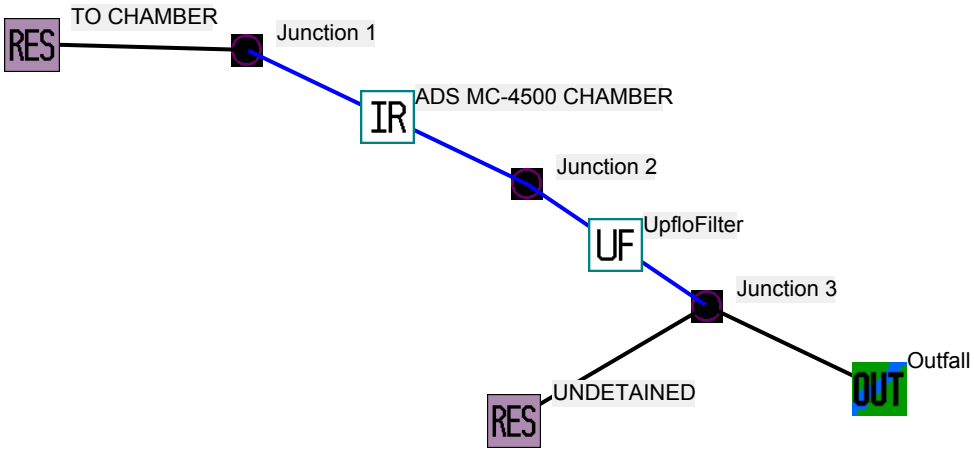
Link PR: TOTAL EAST





4 Appendix

1545.00-WI PROPOSED WEST BUILDING



Data file name: Z:\Projects\2018\1545.00-WI\DESIGN\SWMP\SLAMM\2019-11-06 1545.00-WI West Building.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WI Milwaukee 69.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 11-07-2019 Time: 08:13:17
Site information:

LU# 1 - Residential: TO CHAMBER Total area (ac): 1.098
  1 - Roofs 1: 0.449 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  13 - Paved Parking 1: 0.477 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  31 - Sidewalks 1: 0.020 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  51 - Small Landscaped Areas 1: 0.152 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Residential: UNDETAINED Total area (ac): 0.140
  25 - Driveways 1: 0.032 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  31 - Sidewalks 1: 0.005 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  32 - Sidewalks 2: 0.016 ac. Disconnected Normal Clayey Low Density Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  51 - Small Landscaped Areas 1: 0.087 ac. Normal Clayey Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

```
Control Practice 1:  Isolator Row CP# 1 (DS) - ADS MC-4500 CHAMBER
   Total available system length (ft) = 35
   Total available system width (ft) = 30
   Available height from chamber base to surface (ft) = 8.00
   Number of isolator rows = 1
   Native soil infiltration rate (in/hr) = 0.00
   Assumed stone porosity () = 0.40
   Sizing option:  Number of rows and row length
      Number of rows = 3
      Row length ftf) = 32
   Selected Chamber Information
      Chamber type:  MC-4500
      Chamber height (in):  60.00
      Chamber width (in):  109.00
      Chamber segment length (in):  48.30
      Final storage volume (cf):  3765.6
      Number of rows:  3
      Row length (ft):  32.0
      Total system length (ft):  96.0
      Total system width (ft):  27.3
      Number of chambers:  21
   Overflow weir invert elevation (ft) = 3.00
   Orifice 1 invert elevation (ft) = 0.00
   Orifice 1 diameter (ft) = 0.58
   Orifice 2 invert elevation (ft) = 1.85
   Orifice 2 diameter (ft) = 0.67


Control Practice 2:  Upflo Filter CP# 1 (DS) - UpfloFilter
   Media Type:  CPZ
   Fraction of Area Served by Upflo Filters (0-1):  1.0
   Height from Outlet Invert to Structure Top (ft):  4.0
   Sump Depth (ft):  2.00
   Sump Cleaning/Filter Replacement is not considered during the model run
   Solve for Given Conditions
   Number of filters:  2
```

SLAMM for Windows Version 10.4.1

Data file name: Z:\Projects\2018\1545.00-WI\DESIGN\SWMP\SLAMM\2019-11-06 1545.00-WI West Building.mdb
Data file description:
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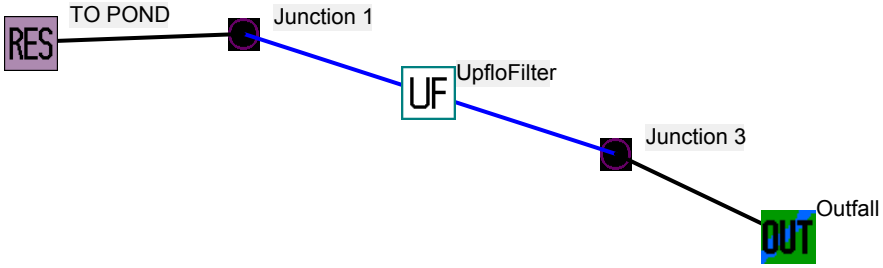
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Start of Winter Season: 12/02 End of Winter Season: 03/12
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 11-07-2019 Time of run: 07:36:55
Total Area Modeled (acres): 1.238
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	81368	-	88.77	450.9	-
Outfall Total with Controls:	72886	10.42%	44.37	201.9	55.22%
Annualized Total After Outfall Controls:	73898			204.7	

1545.00-WI PROPOSED EAST BUILDING



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Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 11-07-2019 Time: 08:20:39
Site information:

LU# 1 - Residential: TO POND Total area (ac): 1.112
  1 - Roofs 1: 0.357 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  13 - Paved Parking 1: 0.298 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  31 - Sidewalks 1: 0.039 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  51 - Small Landscaped Areas 1: 0.418 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Upflo Filter CP# 1 (DS) - UpfloFilter
  Media Type: CPZ
  Fraction of Area Served by Upflo Filters (0-1): 1.0
  Height from Outlet Invert to Structure Top (ft): 4.0
  Sump Depth (ft): 2.00
  Sump Cleaning/Filter Replacement is not considered during the model run
  Solve for Given Conditions
  Number of filters: 2

SLAMM for Windows Version 10.4.1

Data file name: Z:\Projects\2018\1545.00-WI\DESIGN\SWMP\SLAMM\2019-11-06 1545.00-WI East Building.mdb
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Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
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Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Start of Winter Season: 12/02 End of Winter Season: 03/12
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 11-07-2019 Time of run: 08:22:07
Total Area Modeled (acres): 1.112
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	58739	-	83.45	306.0	-
Outfall Total with Controls:	58804	-0.11%	40.80	149.8	51.05%
Annualized Total After Outfall Controls:	59620			151.9	