
M E M O

TO: City of Madison

FROM: Aaron Koch

DATE: 08/21/2025

RE: Stormwater Management for proposed Leo Living Development

Pinnacle Engineering Group has reviewed the proposed development located southeast of the Portage Rd & Hoepker Rd intersection with regards to stormwater management. While a final report will be generated with the engineering construction documents at a later date, this memo shall serve as evidence of the appropriate initial sizing of the proposed facilities for the development.

The design criteria for the site is as follows:

- City of Madison: Chapter 37 of the City Code of Ordinances
- Wisconsin Department of Natural Resources: NR 216 & NR 151
- Water Quantity: The City Ordinance requires that predevelopment peak runoff rates be maintained for the 1-year 24-hour, 2-year 24-hour storm event, 5-year 24-hour storm event, 10-year 24-hour storm event, 100-year 24-hour storm event, and 200-year 24-hour storm event, and that the site safely passes the 500-year 24-hour storm event.
- Water Quality: Both the City Ordinance and NR 151 require removal of 80% of the annual total suspended solids (TSS) load for new development, as compared to no runoff management controls.

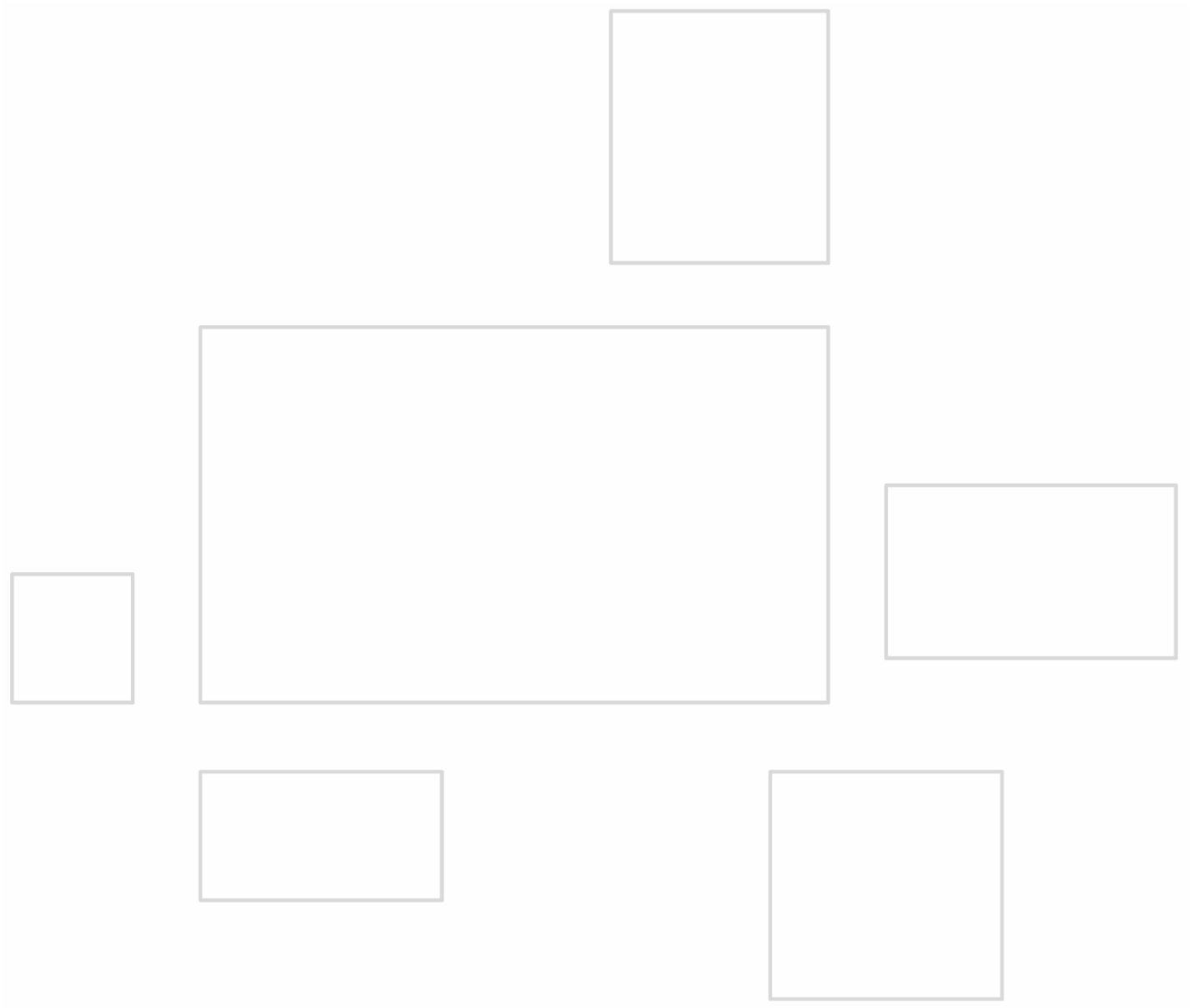
Existing runoff is divided into two sections. Area 1 flows northeast towards existing wetlands. These wetlands are part of a larger existing kettle. Area 2 flows south towards an existing ditch that directs runoff towards culverts along Portage Road.

There is a large kettle located partially within the property, but mostly north of the site. Altering this feature may cause concern for surrounding properties, especially the home located directly east of the site. The drainage area to the existing wetland kettle is about 163 ac, the project will develop approximately 10% of that area. The kettle is deep and does not overflow with the 200-year storm event, as it stores over 40 ac-ft. The development will fill approximately 25% of the existing kettle volume. An overflow pipe will be installed from the kettle to maintain the existing water level, meaning proposed conditions will be similar to existing conditions. Drainage from the north part of the site will be treated in a stormwater pond before discharging to the existing wetlands. Depending on existing soils, the pond could be a bioretention pond or wet detention pond.

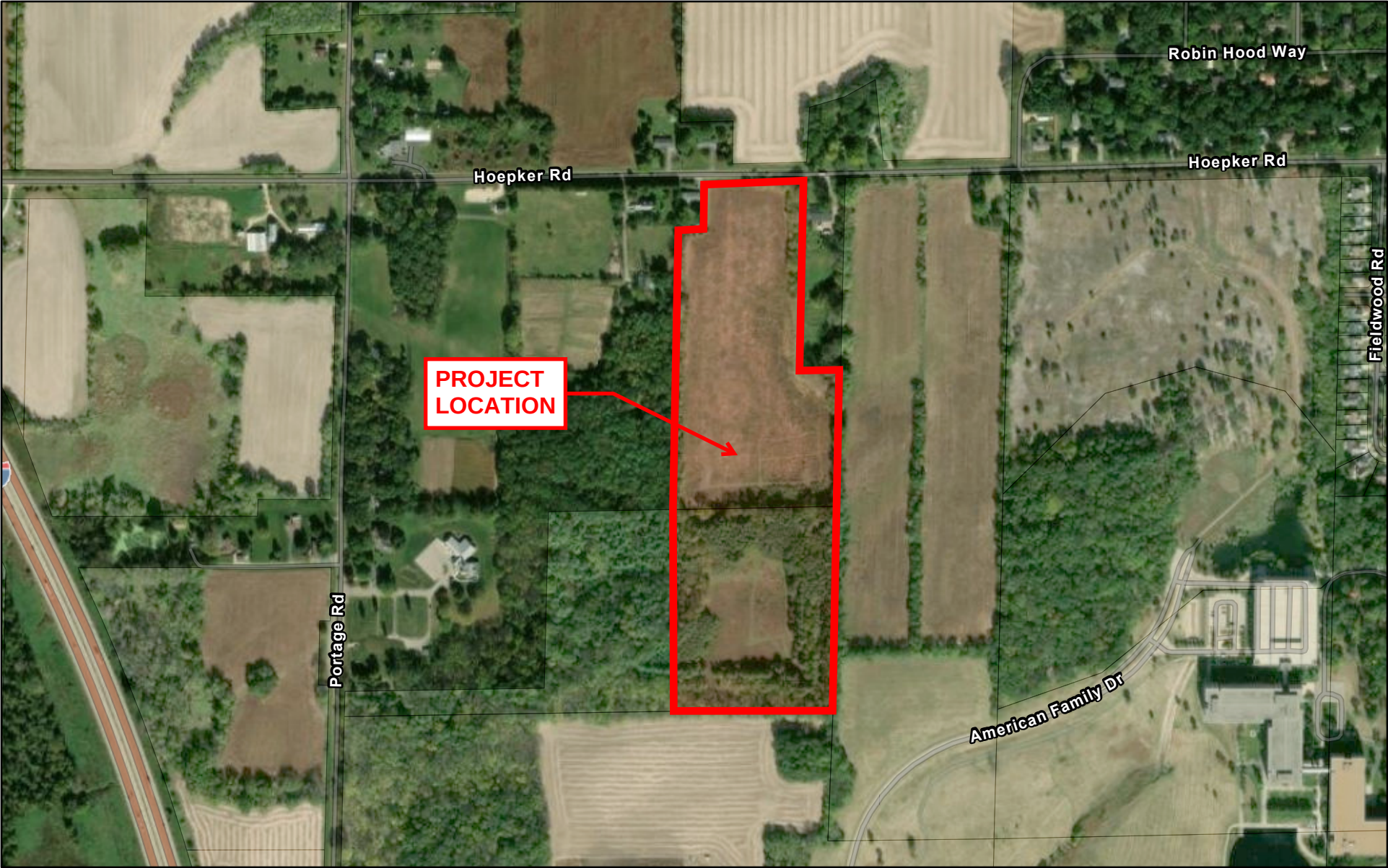
Two additional ponds are proposed as a part of the development. The southwest and southeast ponds will treat runoff flowing south. The west portion of the site will remain undeveloped and therefore will not require treatment. There will also be a small area of the development that will be undetained for stormwater purposes. Based on initial modeling, the ponds appear to be adequate to serve the development and meet both City and DNR stormwater goals.

Please do not hesitate to contact me with any questions on this initial study. Thank you.

APPENDIX 1 MAPS



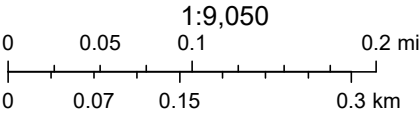
GIS MAP - CITY OF MADISON



8/14/2025

- Tax Parcels (Assessor Property Information)
- World Imagery
- Low Resolution 15m Imagery

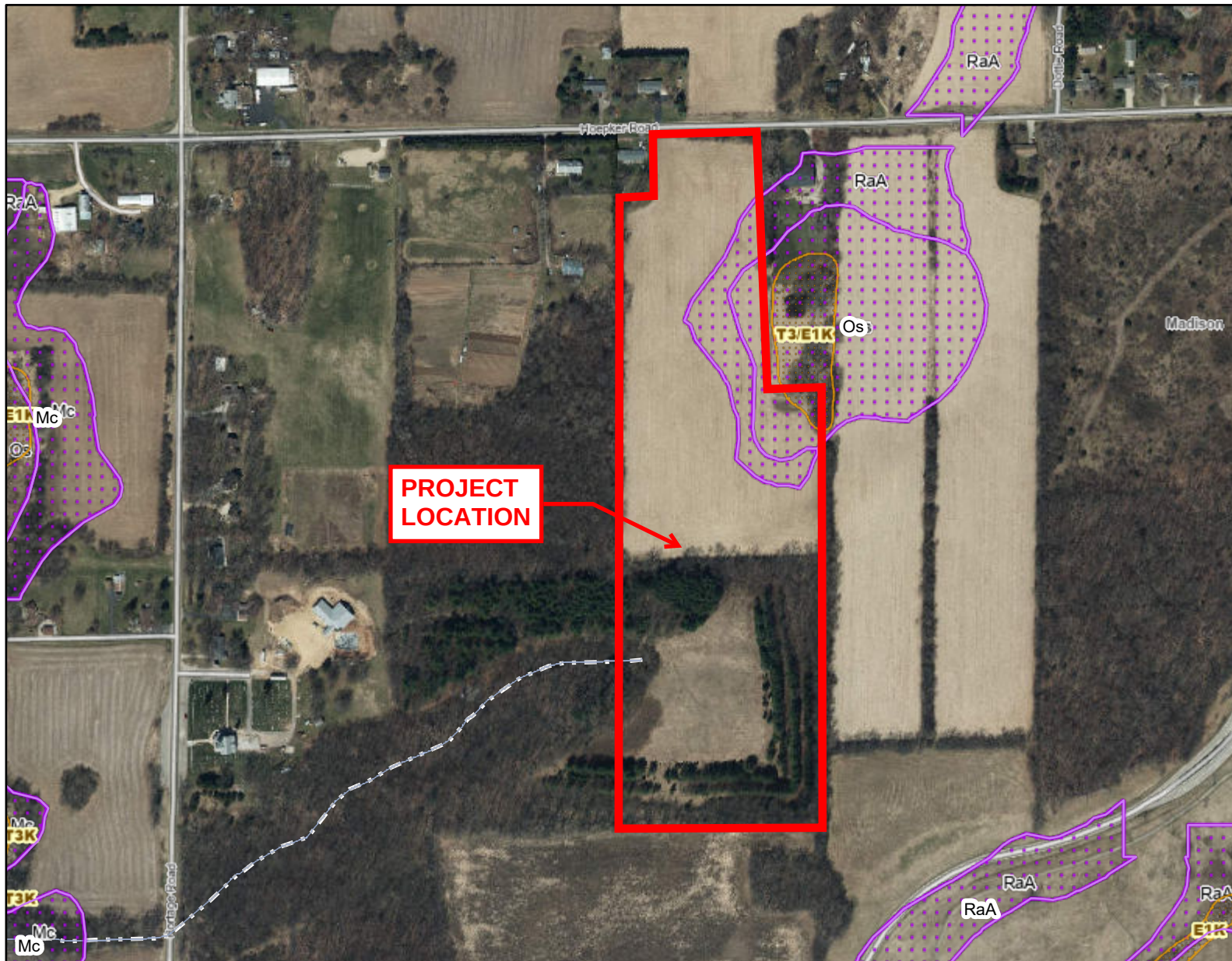
- High Resolution 60cm Imagery
- High Resolution 30cm Imagery
- Citations



Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar



**WISCONSIN
DEPARTMENT OF
NATURAL RESOURCES**



Legend: (some map layers may not be displayed)

- Wetland Indicators
- Wetland Class Areas
- Wetland Indicators
- Rivers and Streams
- Intermittent Streams
- 24K Intermittent Streams
- 24K Streams and Rivers
- City or Village
- County Boundaries
- County and Local Roads
- Local Road
- Latest Leaf Off Imagery

Notes:



Map: 0 425 850 Feet
0 125 250 Meters

Service Layer Credits:
Wetland Indicators & Soils: Surface Water Data Viewer Team, Latest Leaf Off: , Cities, Roads & Boundaries: , Surface Water (Cached): WIDNR, USGS, and other data, Wetland Inventory NWI (Dynamic): Calvin Lawrence, Dennis Weise, Nina Rihn

Map projection: NAD 1983 HARN Wisconsin TM

This map is a product generated by a DNR web mapping application.

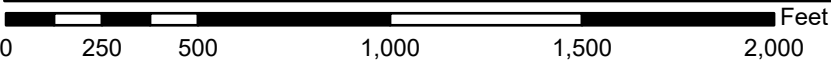
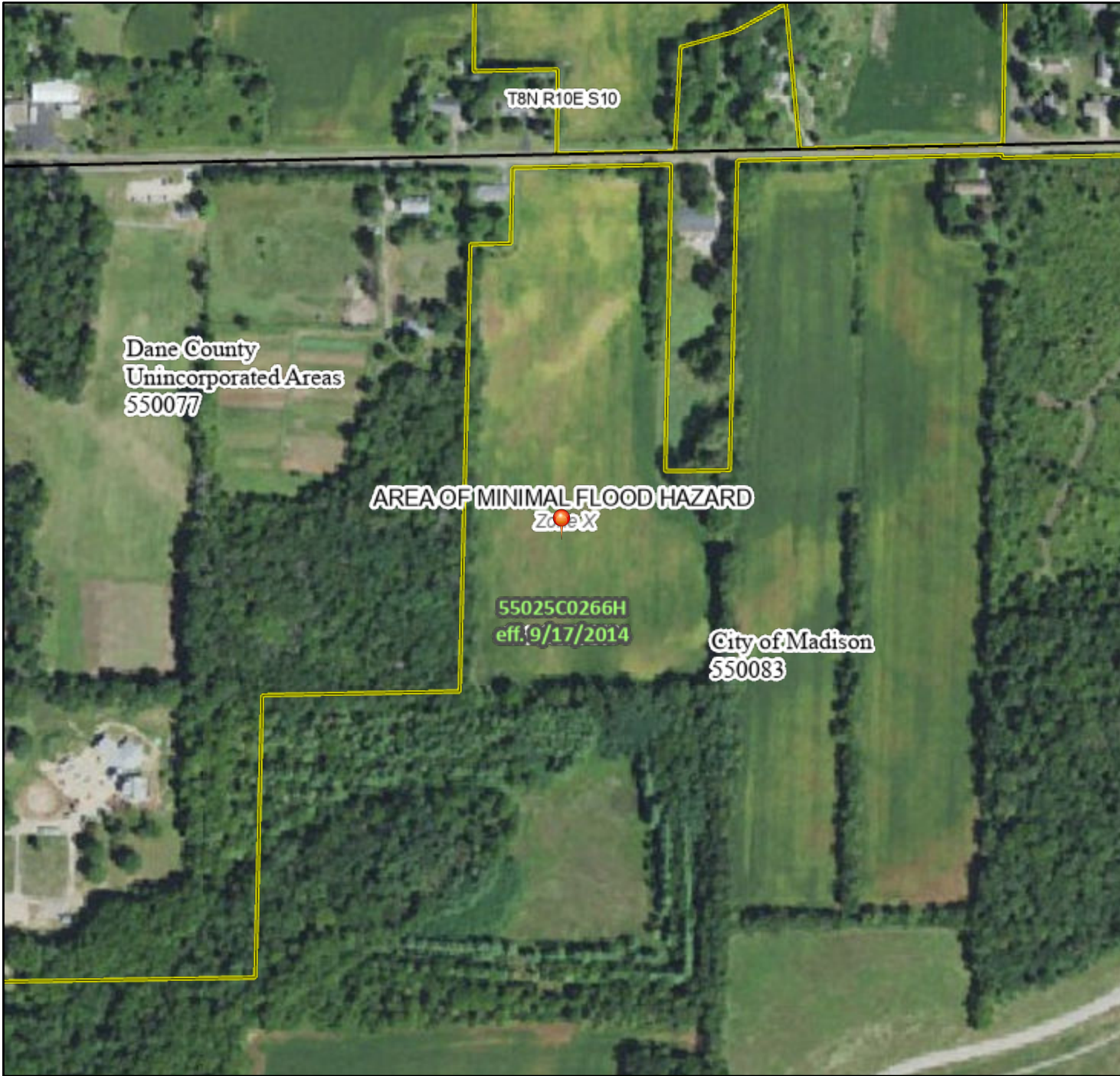
This map is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The user is solely responsible for verifying the accuracy of information before using for any purpose. By using this product for any purpose user agrees to be bound by all disclaimers found here: <https://dnr.wisconsin.gov/legal>

Date Printed: 8/14/2025 4:34 PM

National Flood Hazard Layer FIRMMette



89°18'15"W 43°9'57"N



1:6,000

89°17'38"W 43°9'30"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **8/14/2025 at 9:41 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Soil Map—Dane County, Wisconsin



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Dane County, Wisconsin

Survey Area Data: Version 23, Sep 3, 2024

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

Date(s) aerial images were photographed: Aug 4, 2022—Sep 13, 2022

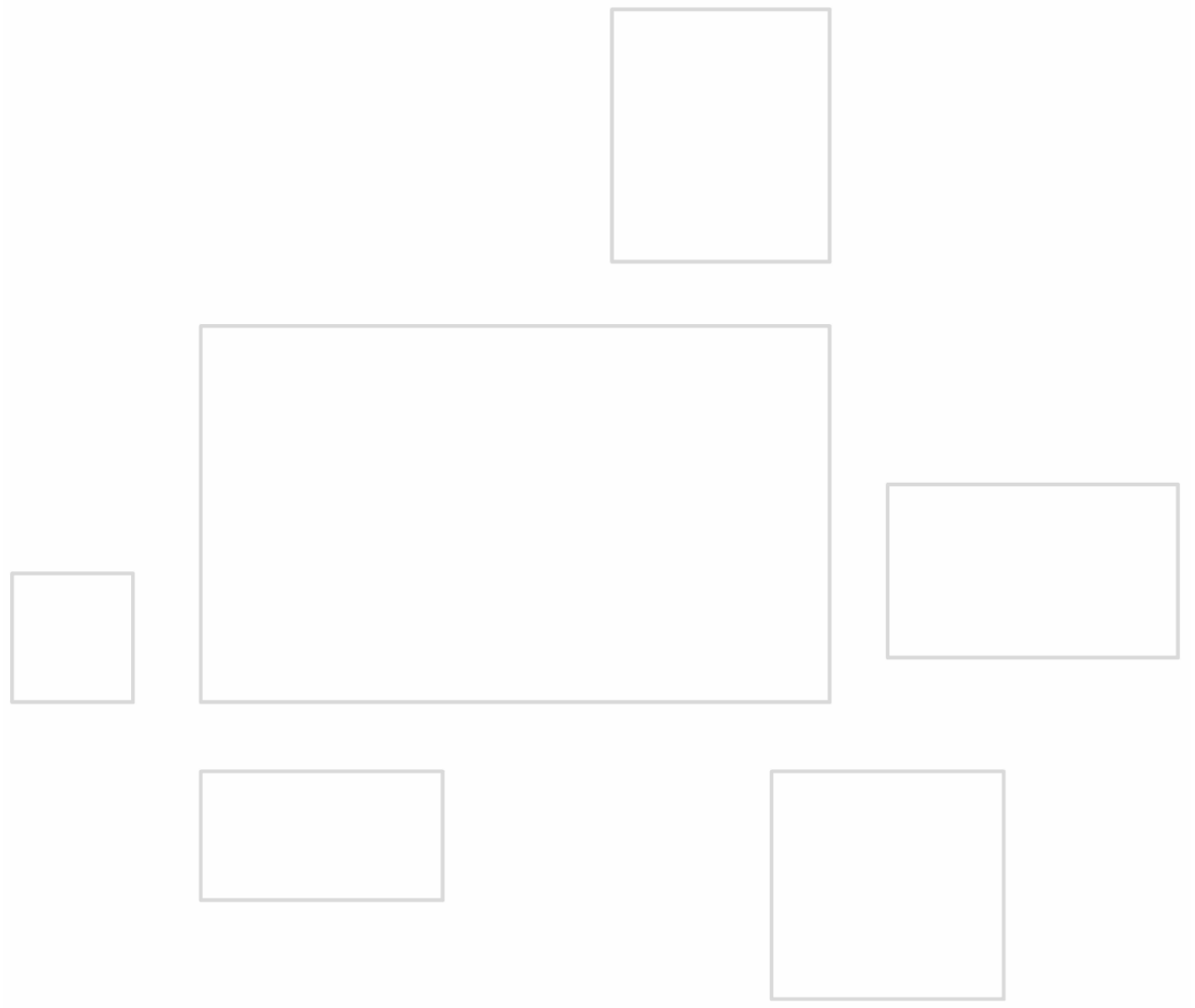
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

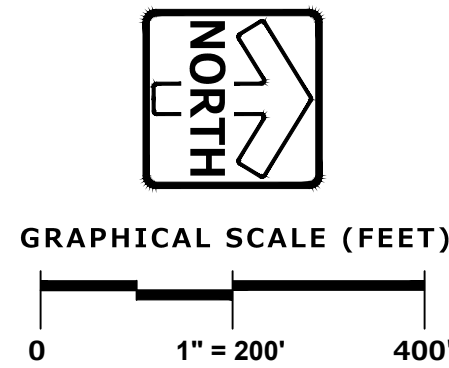
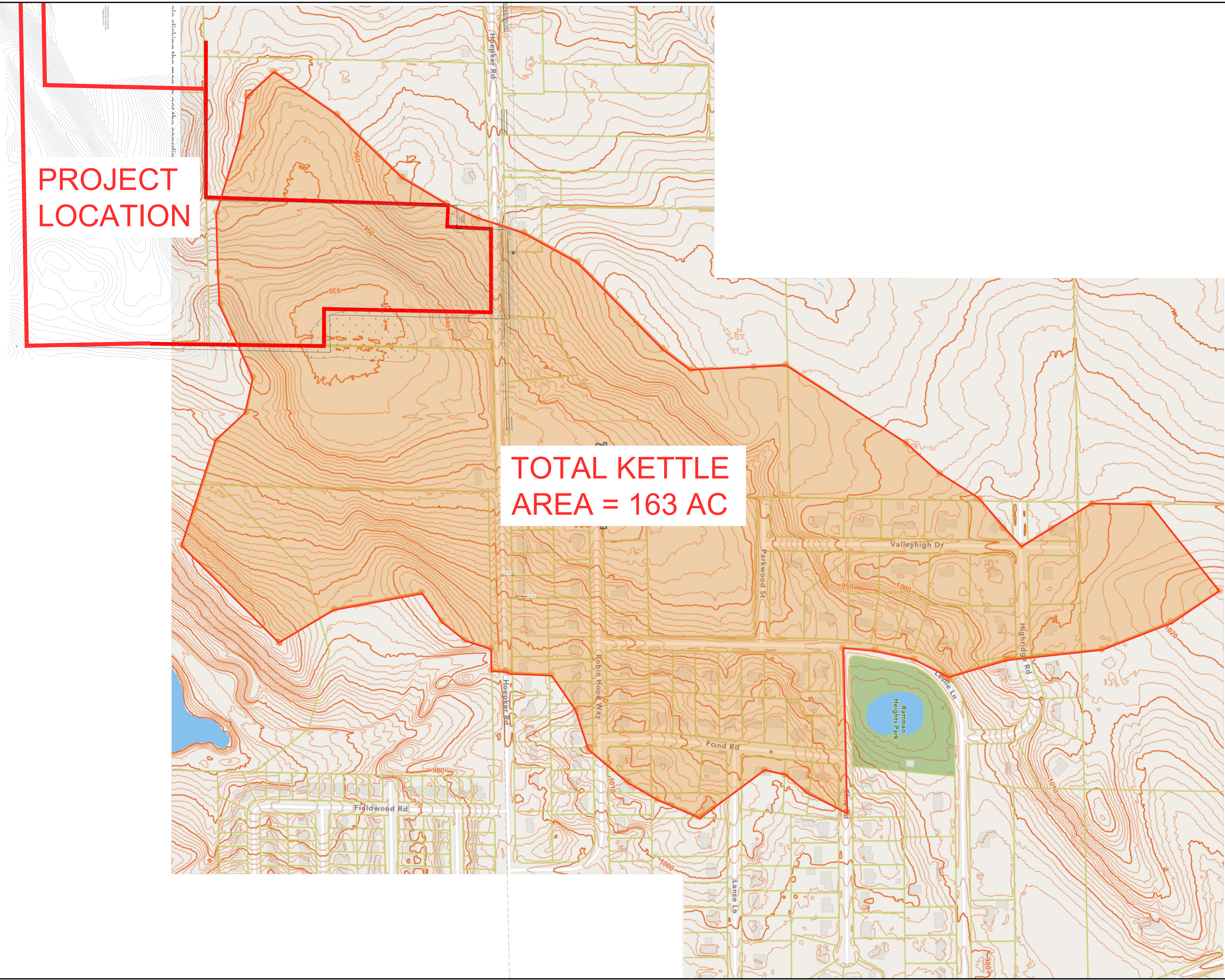
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
DnB	Dodge silt loam, 2 to 6 percent slopes	7.4	19.0%
DnC2	Dodge silt loam, 6 to 12 percent slopes, eroded	0.3	0.7%
KdD2	Kidder loam, 12 to 20 percent slopes, eroded	7.5	19.4%
MdC2	McHenry silt loam, 6 to 12 percent slopes, eroded	5.4	13.8%
MdD2	McHenry silt loam, 12 to 20 percent slopes, eroded	3.5	8.9%
Os	Orion silt loam, wet	1.7	4.5%
PnB	Plano silt loam, till substratum, 2 to 6 percent slopes	2.9	7.6%
RaA	Radford silt loam, 0 to 3 percent slopes	2.1	5.4%
RnB	Ringwood silt loam, 2 to 6 percent slopes	8.1	20.7%
Totals for Area of Interest		38.9	100.0%

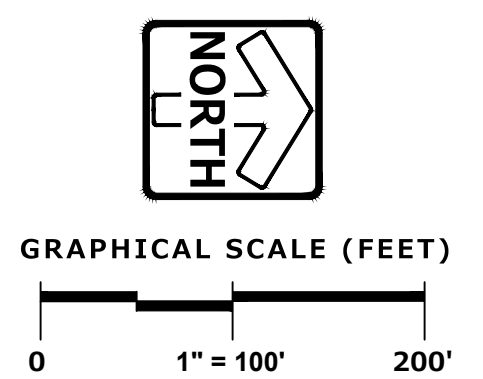
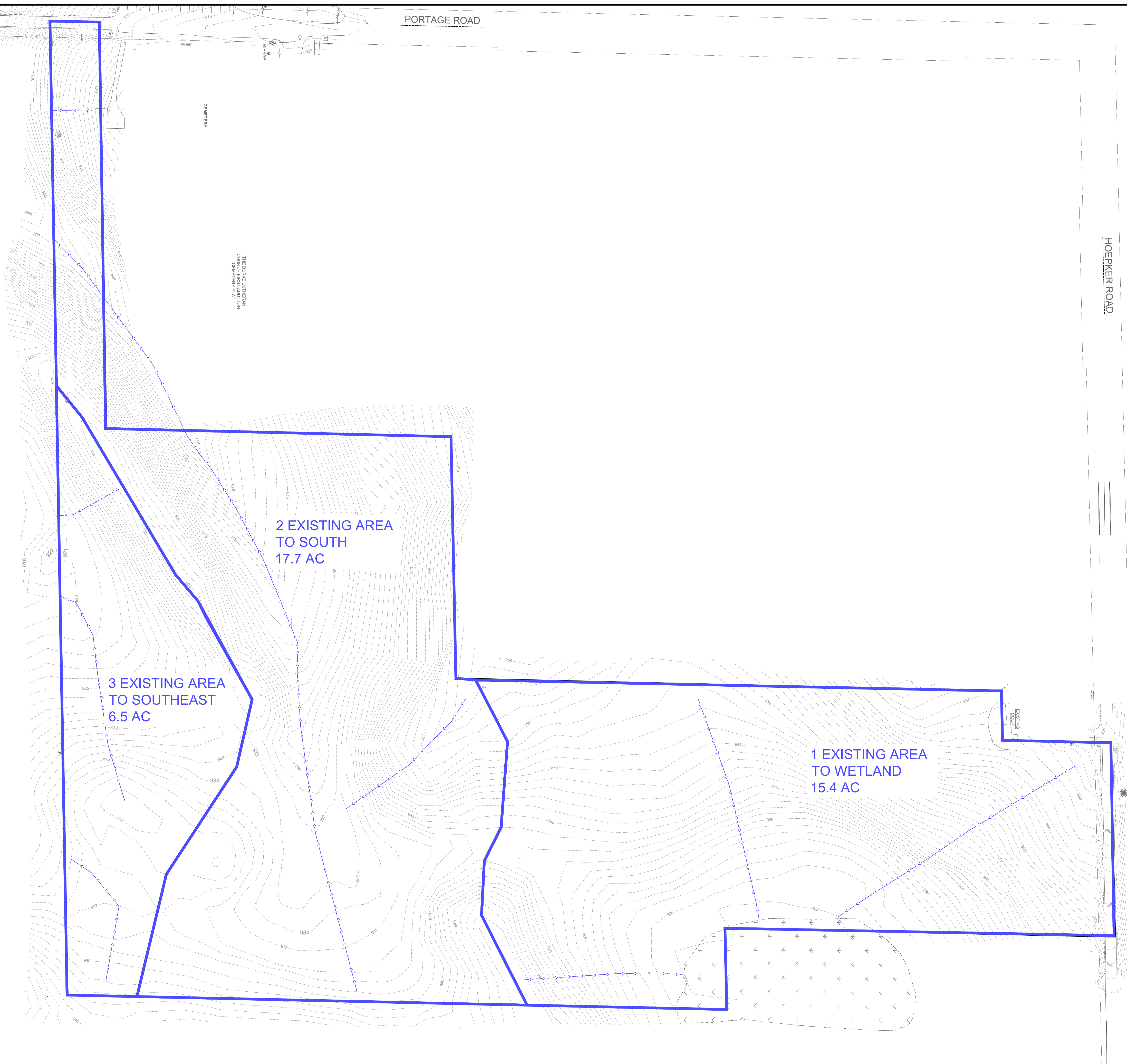
APPENDIX 2

HYDROLOGY EXHIBITS



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LEO MADISON - EXISTING HYDROLOGY EXHIBIT

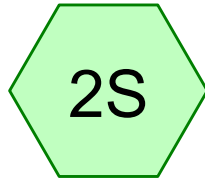
PINNACLE ENGINEERING GROUP

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

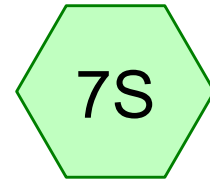
PLAN | DESIGN | DELIVER

PEGJOB# 5511.00

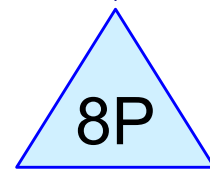
08/21/25



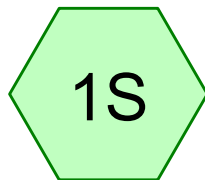
EX AREA TO SE



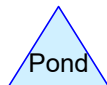
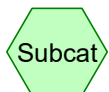
EXIST AREA TO
NORTH KETTLE



EX NORTH KETTLE



EX AREA TO SOUTH



Routing Diagram for LEO MADISON

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LEO MADISON

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YEAR	MSE 24-hr	4	Default	24.00	1	2.49	2
2	2-YEAR	MSE 24-hr	4	Default	24.00	1	2.84	2
3	5-YEAR	MSE 24-hr	4	Default	24.00	1	3.45	2
4	10-YEAR	MSE 24-hr	4	Default	24.00	1	4.09	2
5	25-YEAR	MSE 24-hr	4	Default	24.00	1	5.02	2
6	100-YEAR	MSE 24-hr	4	Default	24.00	1	6.66	2
7	200-YEAR	MSE 24-hr	4	Default	24.00	1	7.53	2
8	500-YEAR	MSE 24-hr	4	Default	24.00	1	8.94	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
59.000	72	1/3 acre lots, 30% imp, HSG B (7S)
104.000	68	CROPLAND PER CITY ORDINANCE B SOIL (7S)
3.000	61	GRASSLAND PER CITY ORDINANCE GROUP B (1S, 2S)
21.200	55	WOODLAND PER CITY ORDINANCE GROUP B (1S, 2S)
187.200	68	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
59.000	HSG B	7S
0.000	HSG C	
0.000	HSG D	
128.200	Other	1S, 2S, 7S
187.200		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.000	59.000	0.000	0.000	0.000	59.000	1/3 acre lots, 30% imp
0.000	0.000	0.000	0.000	104.000	104.000	CROPLAND PER CITY ORDINANCE B SOIL
0.000	0.000	0.000	0.000	3.000	3.000	GRASSLAND PER CITY ORDINANCE GROUP B
0.000	0.000	0.000	0.000	21.200	21.200	WOODLAND PER CITY ORDINANCE GROUP B
0.000	59.000	0.000	0.000	128.200	187.200	TOTAL AREA

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MSE 24-hr 4 1-YEAR Rainfall=2.49"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>0.08"
Tc=20.0 min CN=56 Runoff=0.37 cfs 0.117 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>0.08"
Tc=10.0 min CN=56 Runoff=0.15 cfs 0.043 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>0.37"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=32.41 cfs 5.030 af

Pond 8P: EX NORTH KETTLE Peak Elev=930.05' Storage=2.628 af Inflow=32.41 cfs 5.030 af
Outflow=5.17 cfs 3.032 af

Total Runoff Area = 187.200 ac Runoff Volume = 5.190 af Average Runoff Depth = 0.33"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 0.37 cfs @ 13.14 hrs, Volume= 0.117 af, Depth> 0.08"

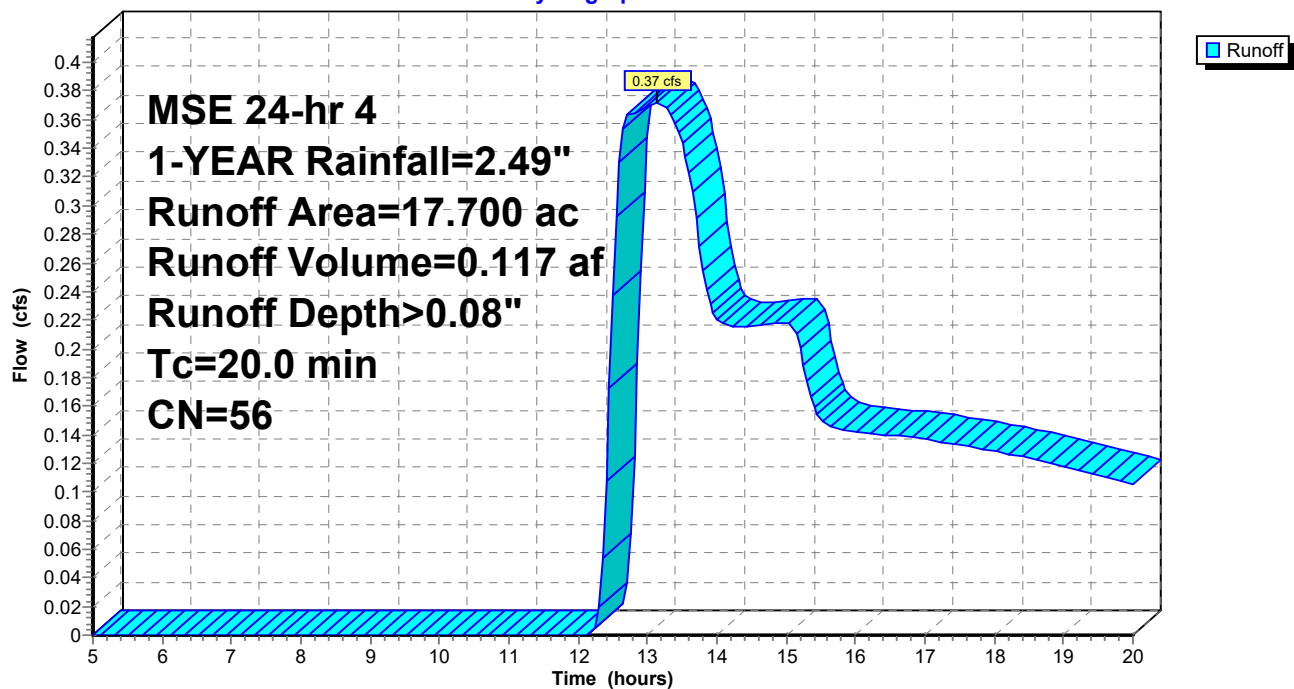
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 0.15 cfs @ 12.55 hrs, Volume= 0.043 af, Depth> 0.08"

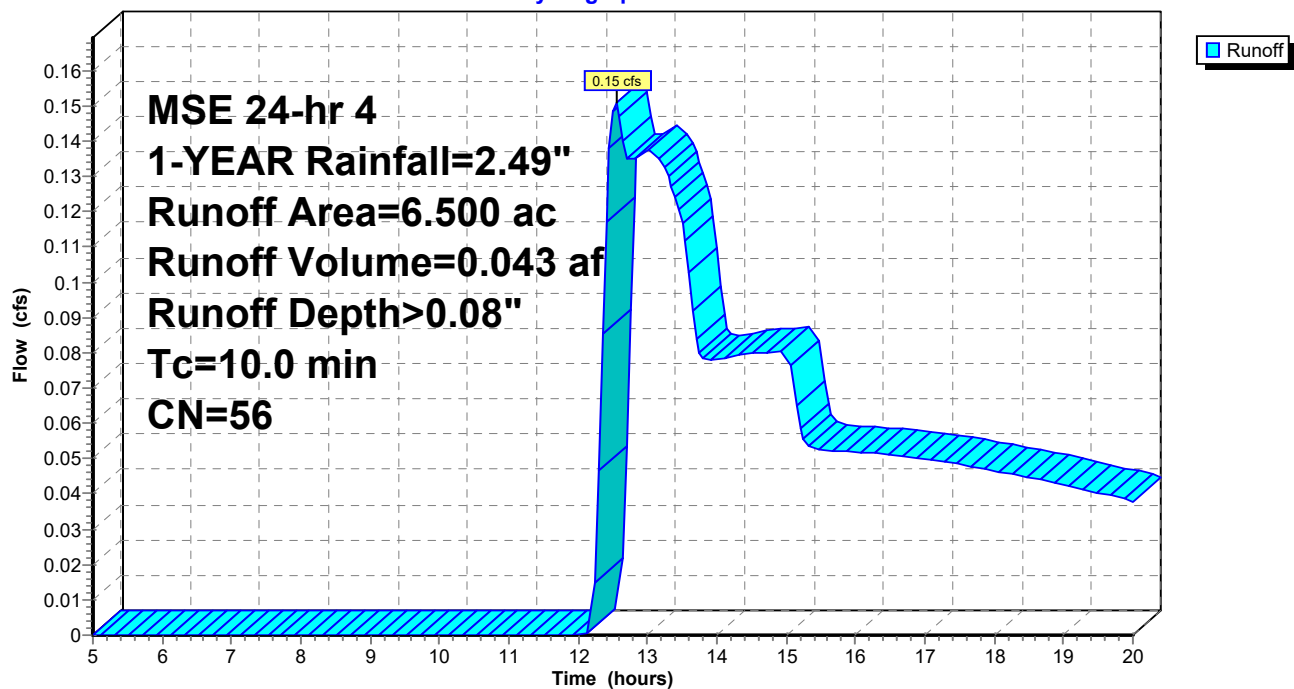
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 32.41 cfs @ 12.75 hrs, Volume= 5.030 af, Depth> 0.37"
 Routed to Pond 8P : EX NORTH KETTLE

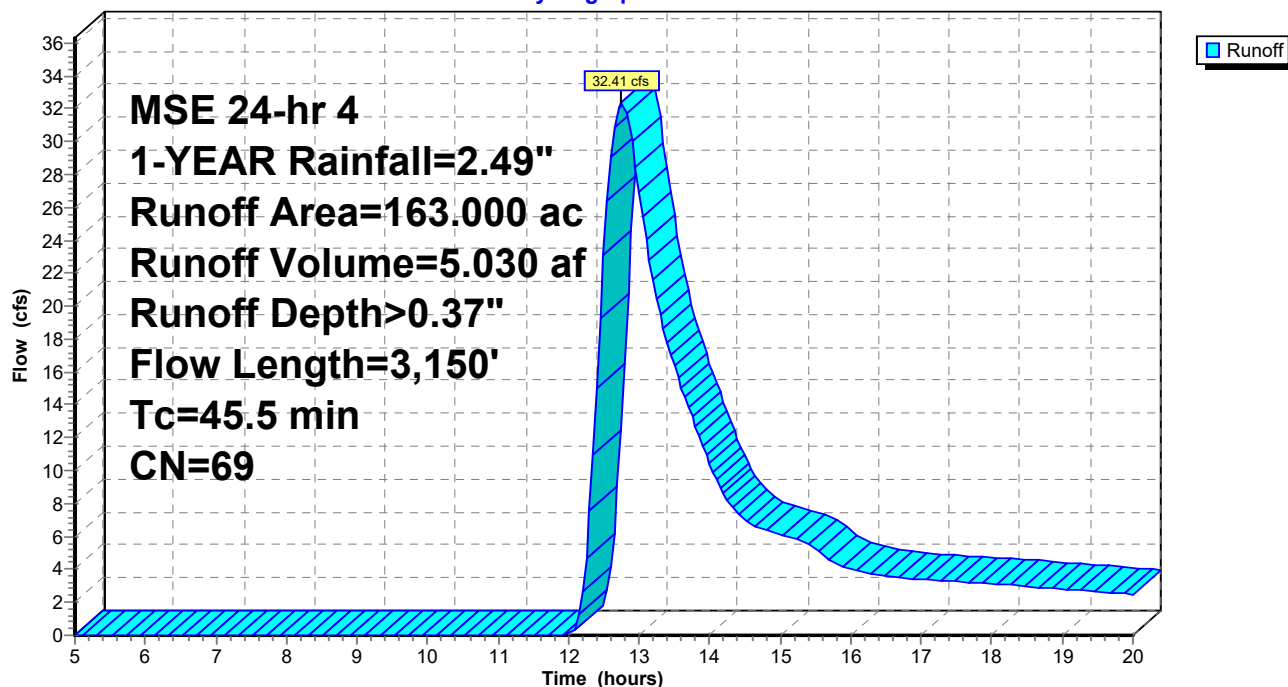
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 0.37" for 1-YEAR event
 Inflow = 32.41 cfs @ 12.75 hrs, Volume= 5.030 af
 Outflow = 5.17 cfs @ 15.52 hrs, Volume= 3.032 af, Atten= 84%, Lag= 165.9 min
 Discarded = 5.17 cfs @ 15.52 hrs, Volume= 3.032 af

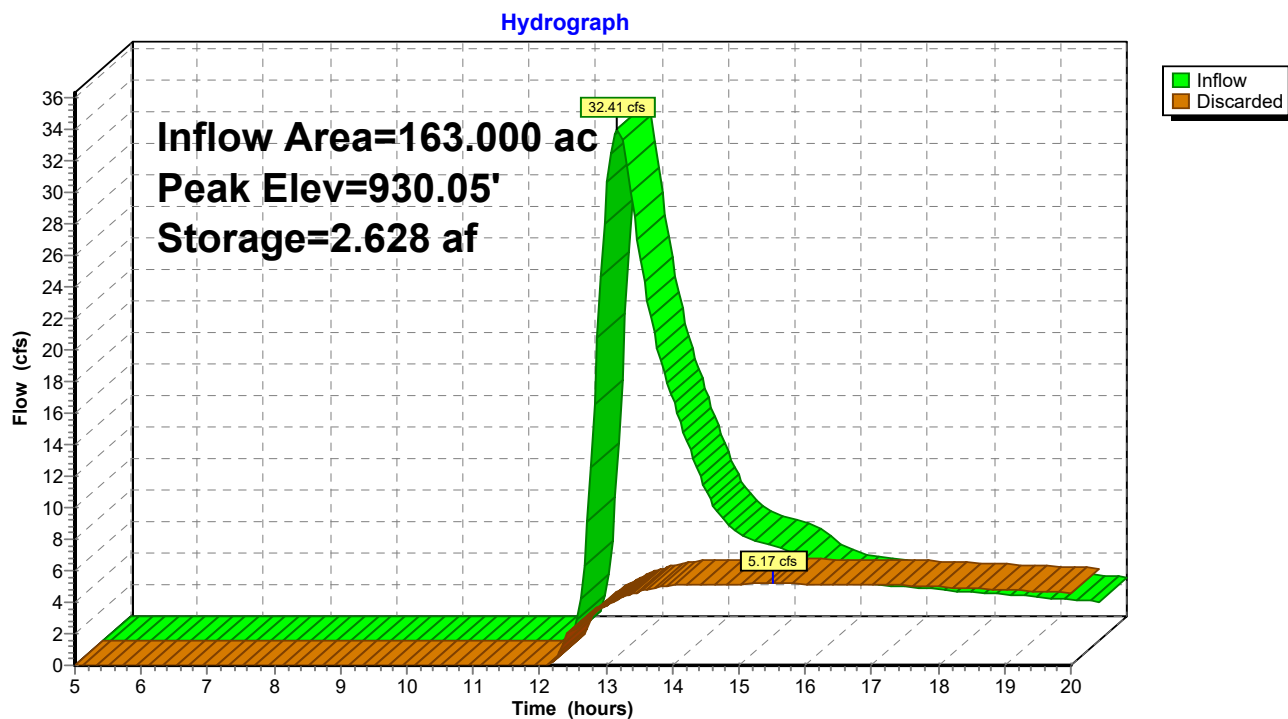
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 930.05' @ 15.52 hrs Surf.Area= 3.846 ac Storage= 2.628 af

Plug-Flow detention time= 194.4 min calculated for 3.032 af (60% of inflow)
 Center-of-Mass det. time= 113.5 min (978.3 - 864.9)

Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=5.17 cfs @ 15.52 hrs HW=930.05' (Free Discharge)
 ↑**1=Exfiltration** (Controls 5.17 cfs)

Pond 8P: EX NORTH KETTLE

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MSE 24-hr 4 2-YEAR Rainfall=2.84"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>0.15"
Tc=20.0 min CN=56 Runoff=1.09 cfs 0.222 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>0.15"
Tc=10.0 min CN=56 Runoff=0.46 cfs 0.082 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>0.53"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=49.74 cfs 7.152 af

Pond 8P: EX NORTH KETTLE Peak Elev=930.44' Storage=4.216 af Inflow=49.74 cfs 7.152 af
Outflow=5.74 cfs 3.472 af

Total Runoff Area = 187.200 ac Runoff Volume = 7.457 af Average Runoff Depth = 0.48"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

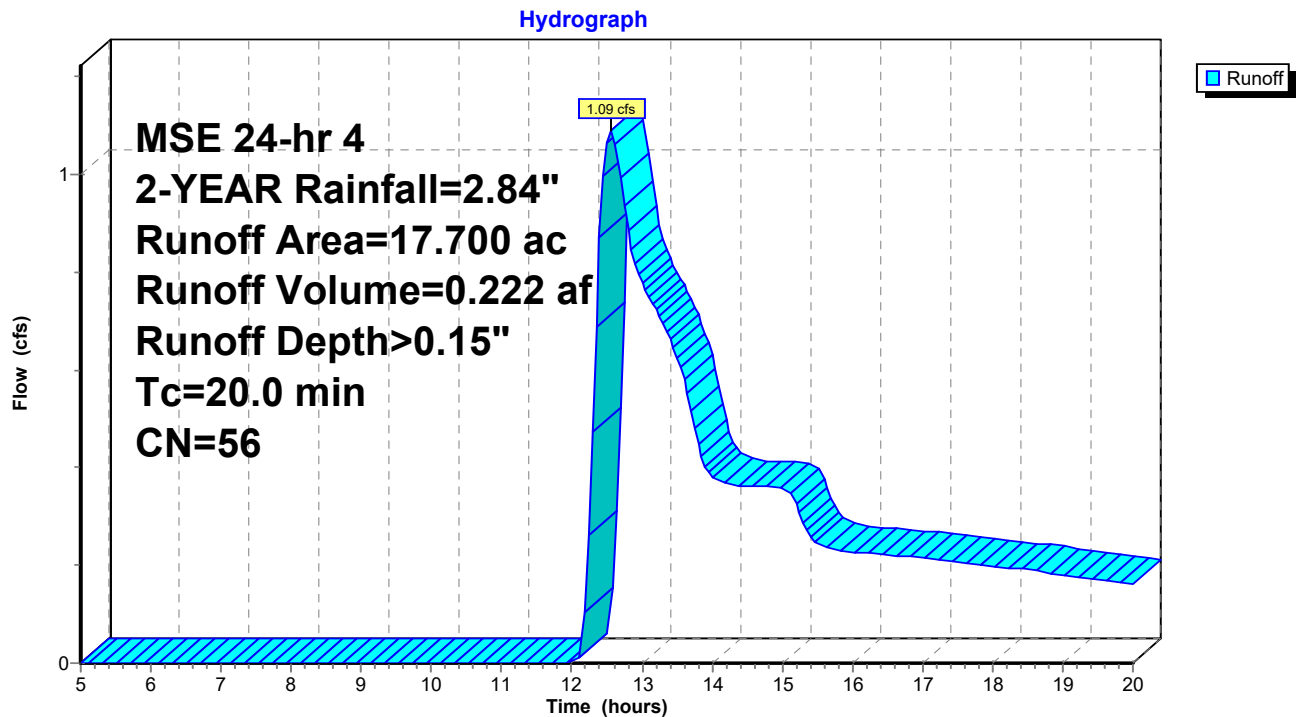
Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 1.09 cfs @ 12.56 hrs, Volume= 0.222 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 0.46 cfs @ 12.38 hrs, Volume= 0.082 af, Depth> 0.15"

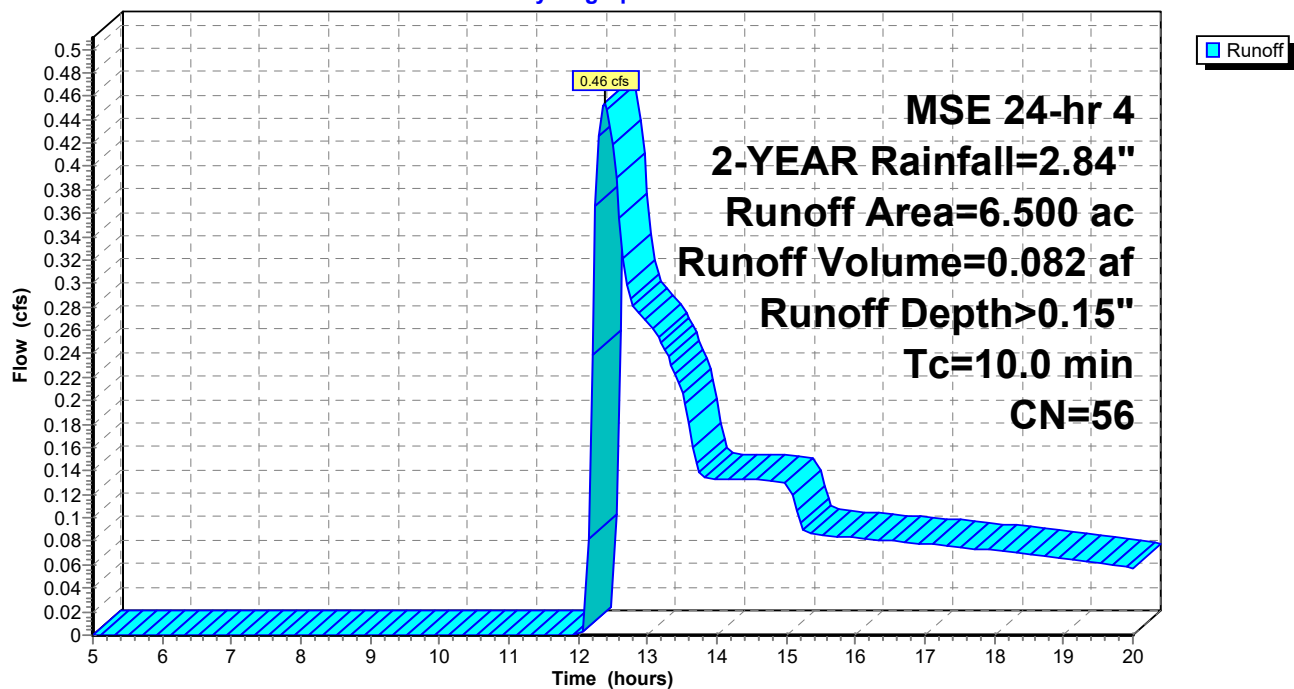
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 49.74 cfs @ 12.72 hrs, Volume= 7.152 af, Depth> 0.53"
 Routed to Pond 8P : EX NORTH KETTLE

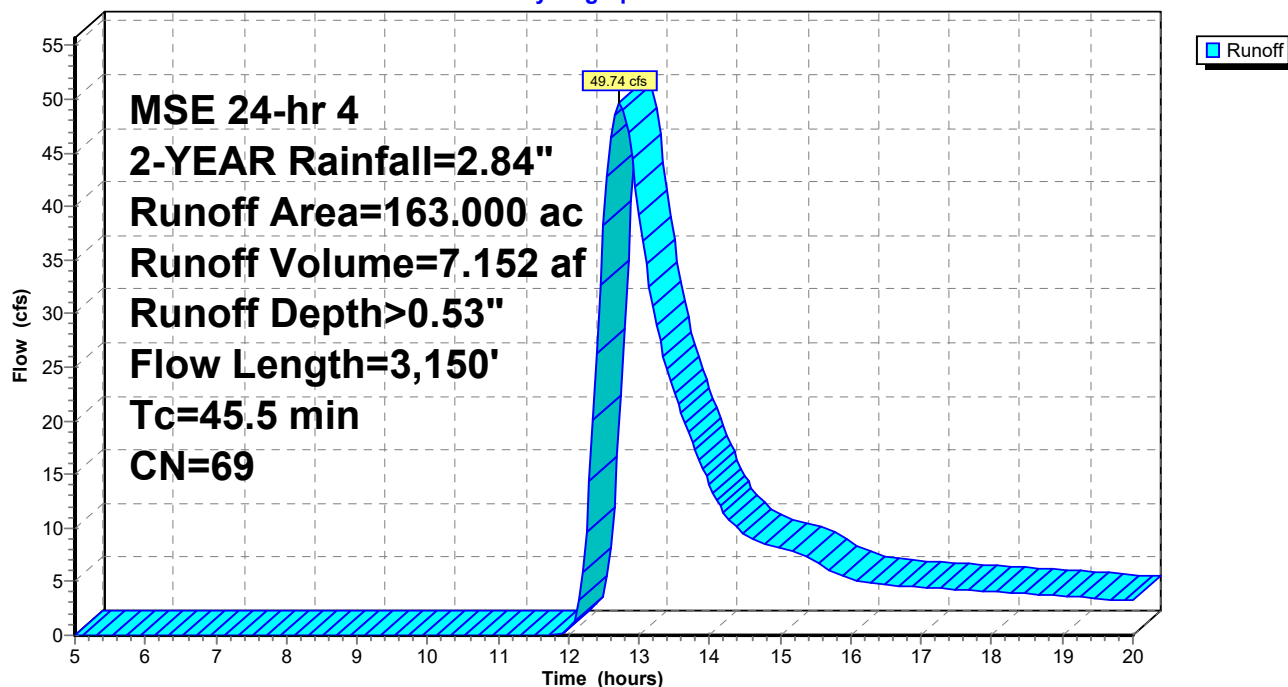
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 0.53" for 2-YEAR event
 Inflow = 49.74 cfs @ 12.72 hrs, Volume= 7.152 af
 Outflow = 5.74 cfs @ 15.79 hrs, Volume= 3.472 af, Atten= 88%, Lag= 183.9 min
 Discarded = 5.74 cfs @ 15.79 hrs, Volume= 3.472 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 930.44' @ 15.79 hrs Surf.Area= 4.226 ac Storage= 4.216 af

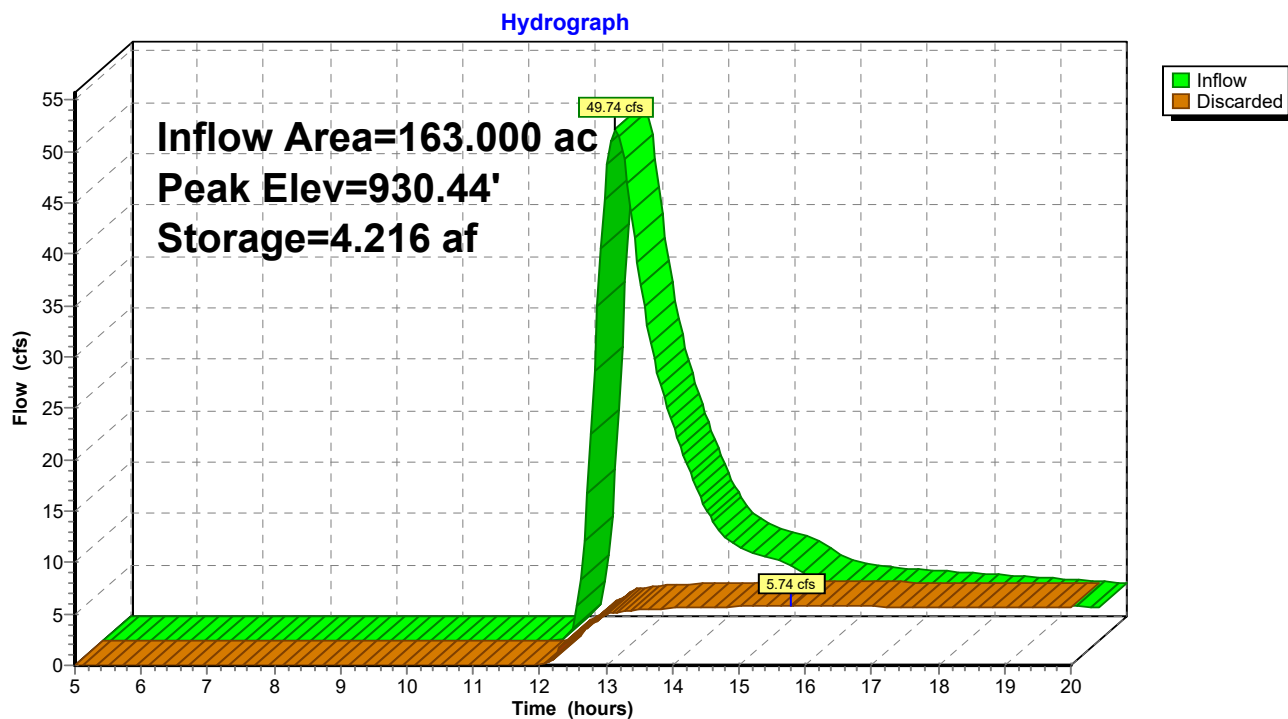
Plug-Flow detention time= 208.4 min calculated for 3.460 af (48% of inflow)
 Center-of-Mass det. time= 121.3 min (978.1 - 856.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=5.74 cfs @ 15.79 hrs HW=930.44' (Free Discharge)

↑**1=Exfiltration** (Controls 5.74 cfs)

Pond 8P: EX NORTH KETTLE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 5-YEAR Rainfall=3.45"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>0.32"
Tc=20.0 min CN=56 Runoff=3.53 cfs 0.472 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>0.32"
Tc=10.0 min CN=56 Runoff=1.70 cfs 0.175 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>0.84"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=85.28 cfs 11.417 af

Pond 8P: EX NORTH KETTLE Peak Elev=931.17' Storage=7.574 af Inflow=85.28 cfs 11.417 af
Outflow=6.88 cfs 4.197 af

Total Runoff Area = 187.200 ac Runoff Volume = 12.064 af Average Runoff Depth = 0.77"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 3.53 cfs @ 12.41 hrs, Volume= 0.472 af, Depth> 0.32"

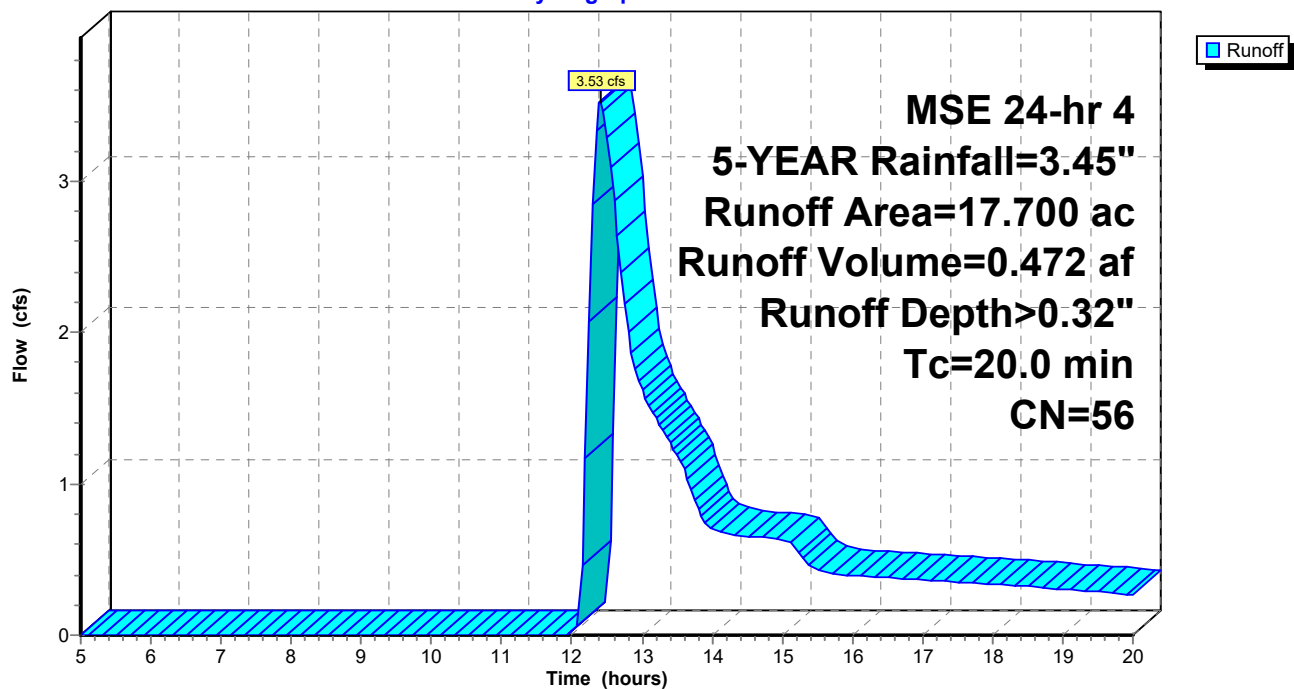
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



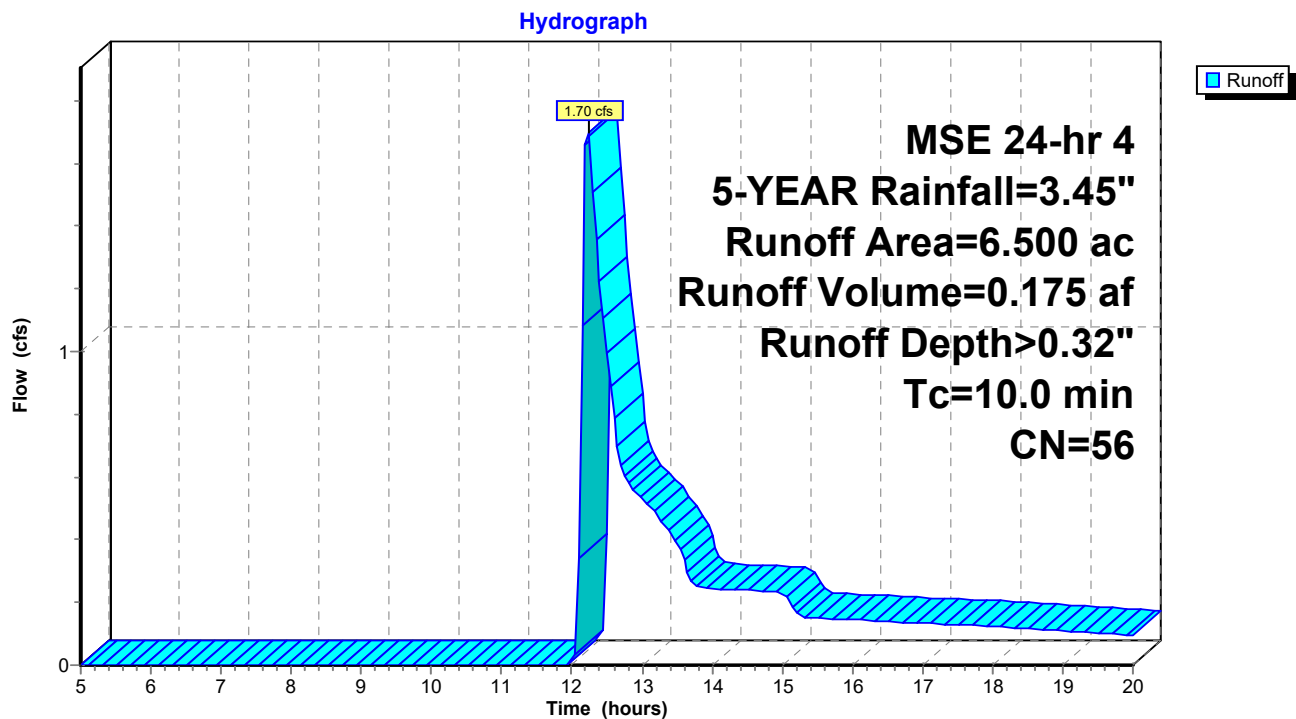
Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 1.70 cfs @ 12.23 hrs, Volume= 0.175 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 85.28 cfs @ 12.69 hrs, Volume= 11.417 af, Depth> 0.84"
 Routed to Pond 8P : EX NORTH KETTLE

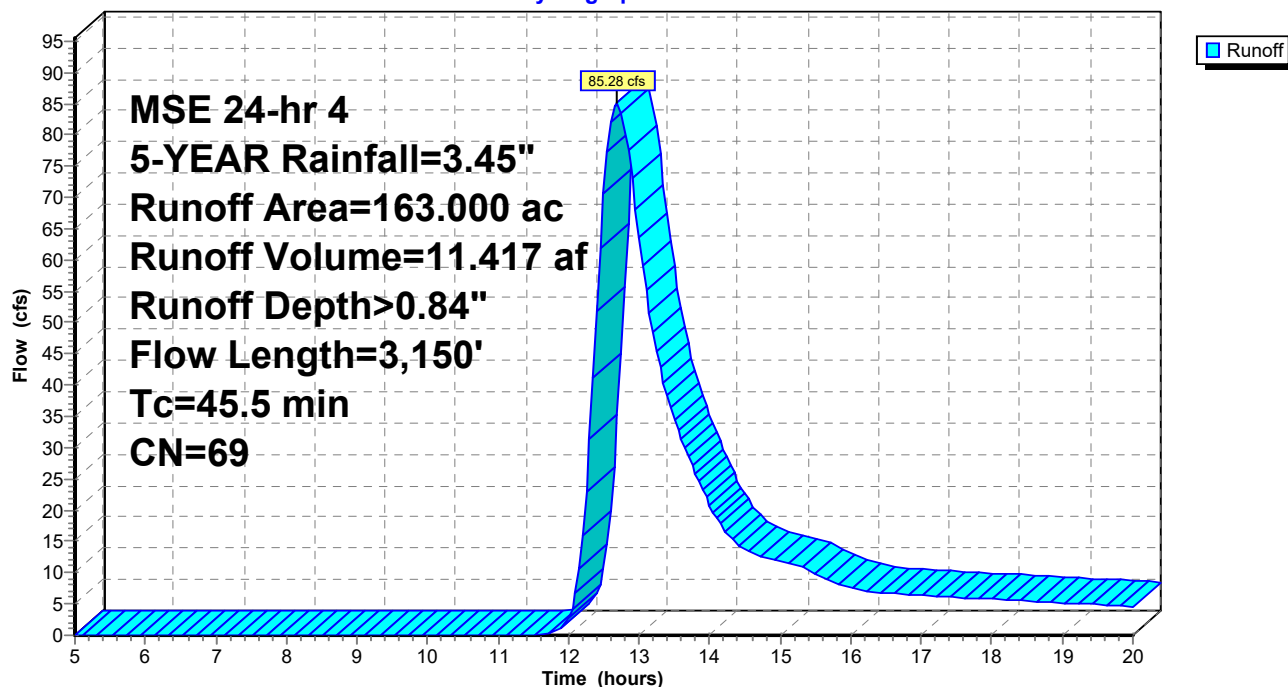
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 0.84" for 5-YEAR event
 Inflow = 85.28 cfs @ 12.69 hrs, Volume= 11.417 af
 Outflow = 6.88 cfs @ 16.38 hrs, Volume= 4.197 af, Atten= 92%, Lag= 221.2 min
 Discarded = 6.88 cfs @ 16.38 hrs, Volume= 4.197 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.17' @ 16.38 hrs Surf.Area= 4.979 ac Storage= 7.574 af

Plug-Flow detention time= 219.5 min calculated for 4.184 af (37% of inflow)
 Center-of-Mass det. time= 130.2 min (977.3 - 847.1)

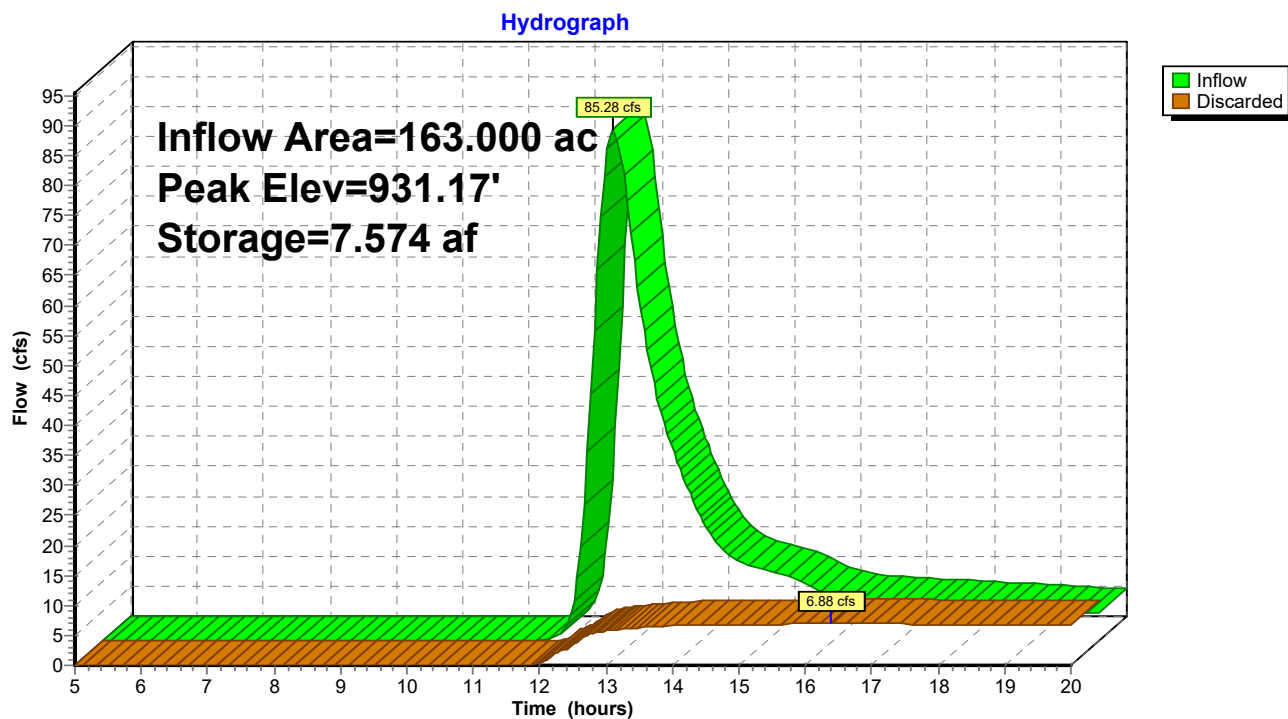
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=6.88 cfs @ 16.38 hrs HW=931.17' (Free Discharge)

↑**1=Exfiltration** (Controls 6.88 cfs)

Pond 8P: EX NORTH KETTLE

LEO MADISON*MSE 24-hr 4 10-YEAR Rainfall=4.09"*

Prepared by Pinnacle Engineering Group

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>0.55"
Tc=20.0 min CN=56 Runoff=7.66 cfs 0.811 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>0.55"
Tc=10.0 min CN=56 Runoff=3.95 cfs 0.300 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>1.22"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=127.84 cfs 16.507 af

Pond 8P: EX NORTH KETTLE Peak Elev=931.94' Storage=11.722 af Inflow=127.84 cfs 16.507 af
Outflow=8.19 cfs 5.017 af

Total Runoff Area = 187.200 ac Runoff Volume = 17.617 af Average Runoff Depth = 1.13"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 7.66 cfs @ 12.37 hrs, Volume= 0.811 af, Depth> 0.55"

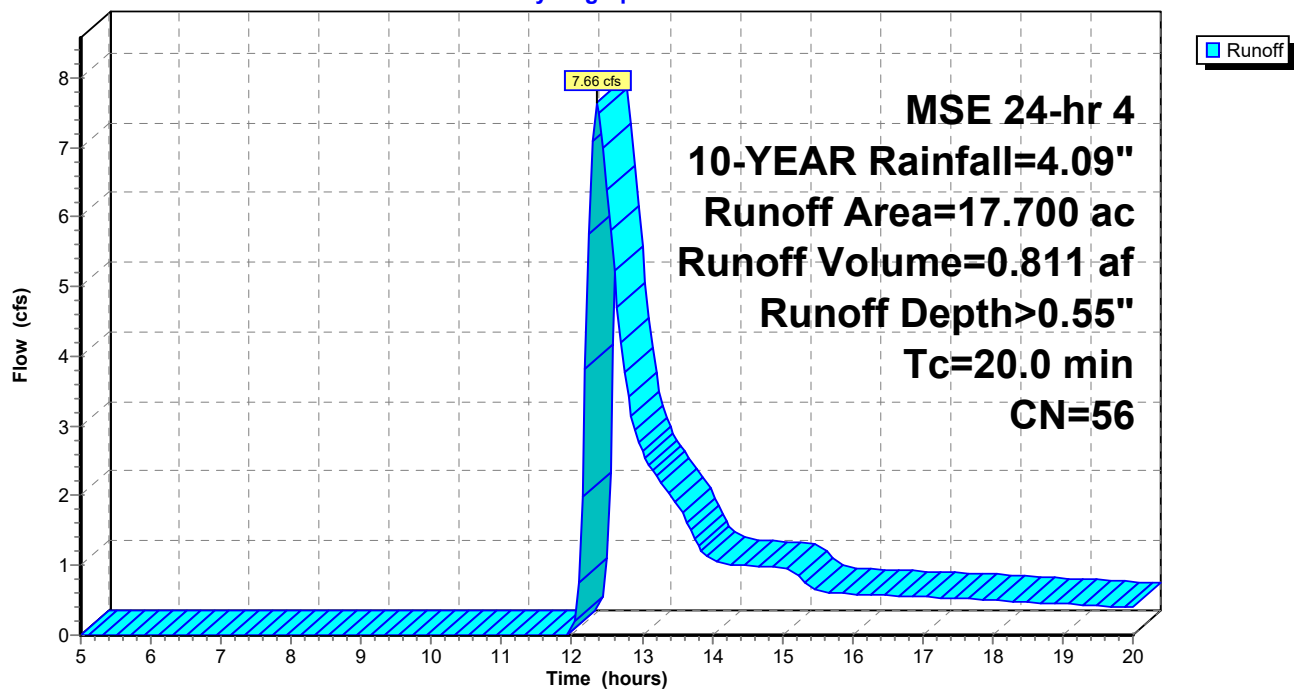
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 3.95 cfs @ 12.21 hrs, Volume= 0.300 af, Depth> 0.55"

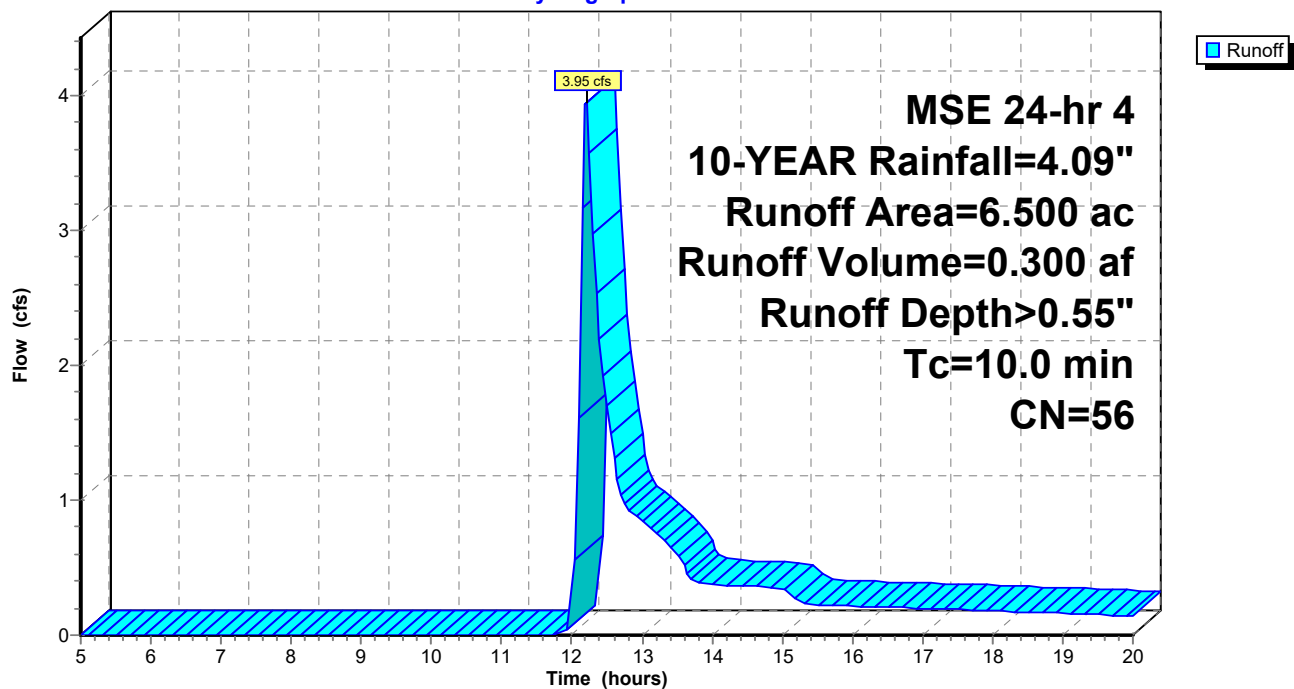
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 127.84 cfs @ 12.68 hrs, Volume= 16.507 af, Depth> 1.22"
 Routed to Pond 8P : EX NORTH KETTLE

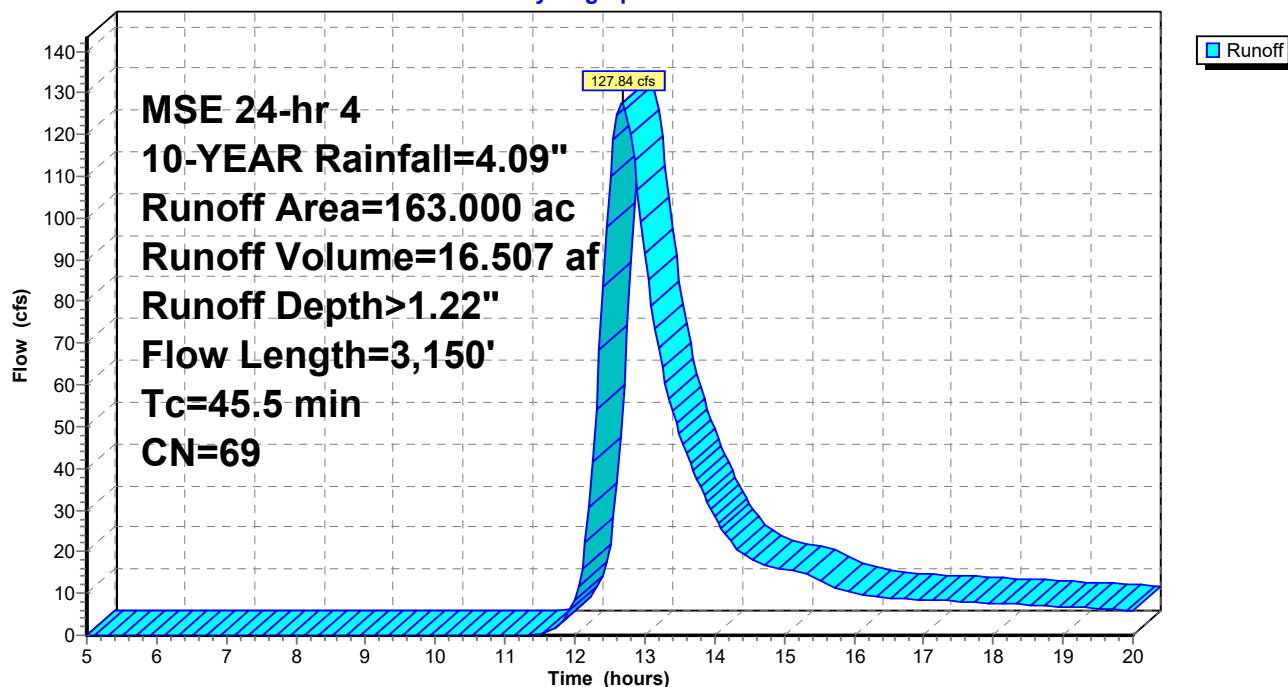
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 1.22" for 10-YEAR event
 Inflow = 127.84 cfs @ 12.68 hrs, Volume= 16.507 af
 Outflow = 8.19 cfs @ 17.37 hrs, Volume= 5.017 af, Atten= 94%, Lag= 281.6 min
 Discarded = 8.19 cfs @ 17.37 hrs, Volume= 5.017 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.94' @ 17.37 hrs Surf.Area= 5.837 ac Storage= 11.722 af

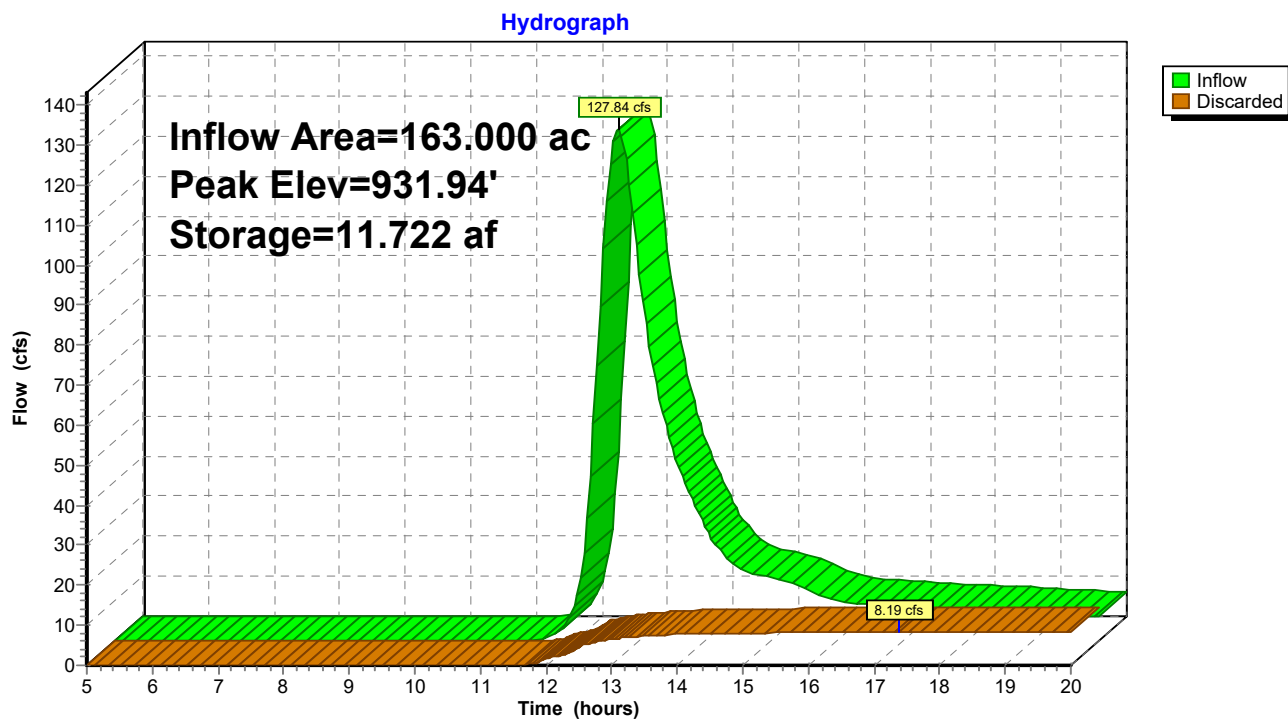
Plug-Flow detention time= 226.1 min calculated for 5.017 af (30% of inflow)
 Center-of-Mass det. time= 136.4 min (976.4 - 840.1)

Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=8.19 cfs @ 17.37 hrs HW=931.94' (Free Discharge)

↑**1=Exfiltration** (Controls 8.19 cfs)

Pond 8P: EX NORTH KETTLE

LEO MADISON*MSE 24-hr 4 25-YEAR Rainfall=5.02"*

Prepared by Pinnacle Engineering Group

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>0.96"
Tc=20.0 min CN=56 Runoff=15.56 cfs 1.416 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>0.96"
Tc=10.0 min CN=56 Runoff=8.00 cfs 0.523 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>1.82"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=196.23 cfs 24.746 af

Pond 8P: EX NORTH KETTLE Peak Elev=933.00' Storage=18.605 af Inflow=196.23 cfs 24.746 af
Outflow=10.20 cfs 6.284 af

Total Runoff Area = 187.200 ac Runoff Volume = 26.684 af Average Runoff Depth = 1.71"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 15.56 cfs @ 12.34 hrs, Volume= 1.416 af, Depth> 0.96"

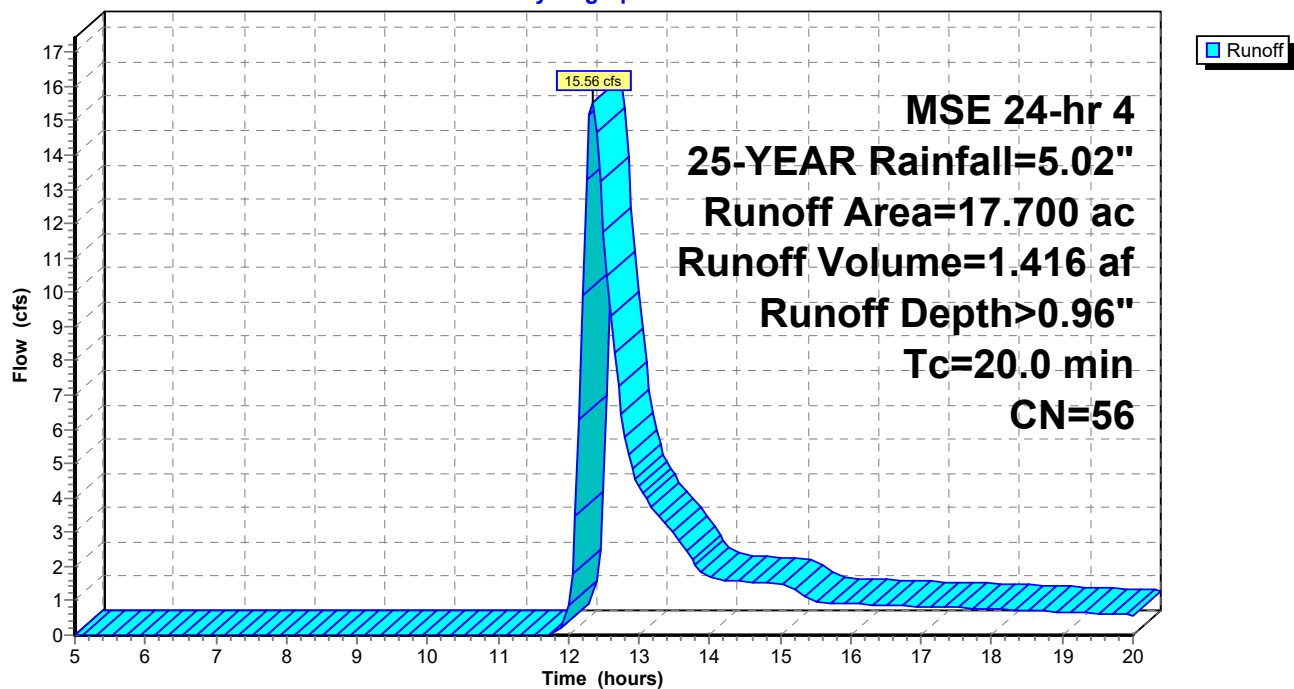
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 8.00 cfs @ 12.20 hrs, Volume= 0.523 af, Depth> 0.96"

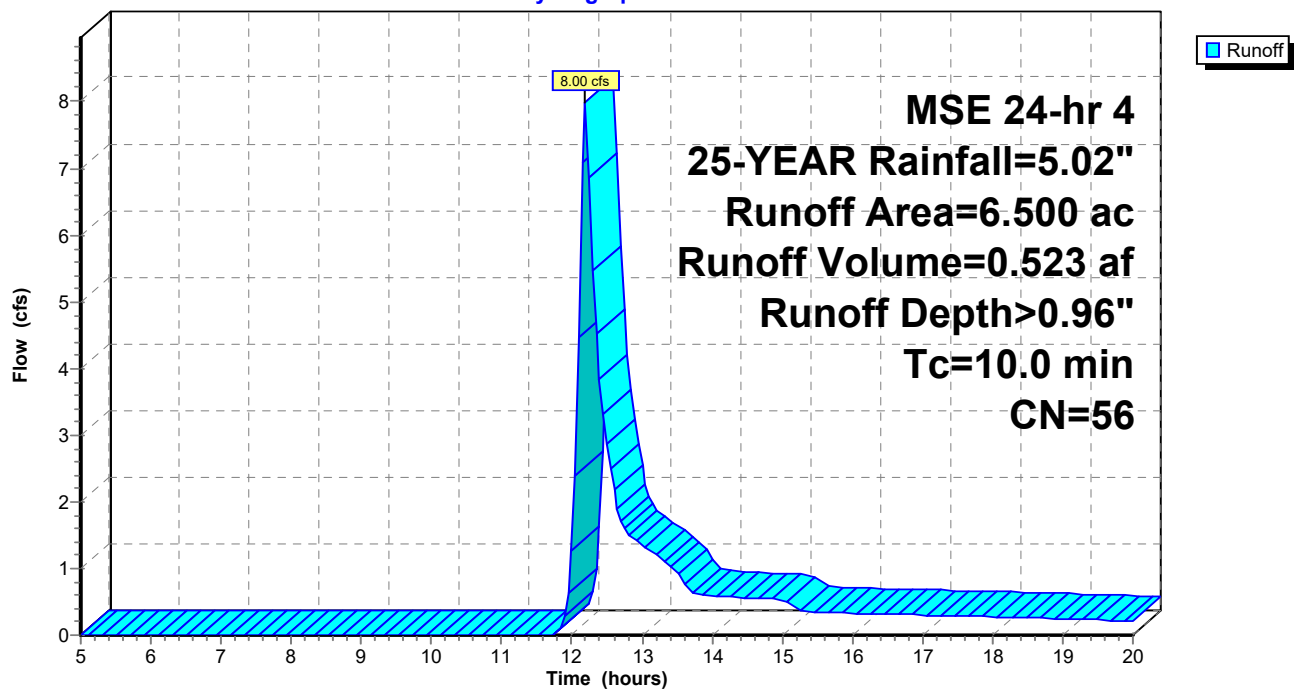
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



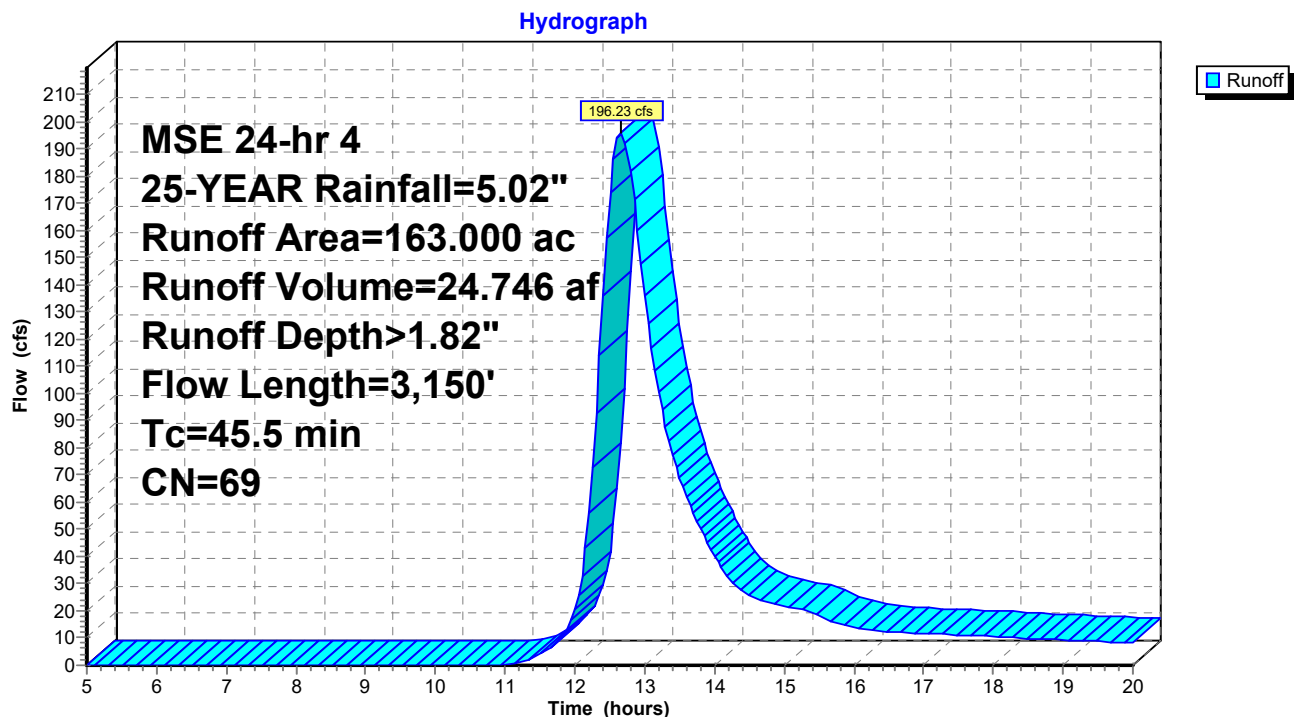
Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 196.23 cfs @ 12.66 hrs, Volume= 24.746 af, Depth> 1.82"
 Routed to Pond 8P : EX NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 1.82" for 25-YEAR event
 Inflow = 196.23 cfs @ 12.66 hrs, Volume= 24.746 af
 Outflow = 10.20 cfs @ 18.29 hrs, Volume= 6.284 af, Atten= 95%, Lag= 337.8 min
 Discarded = 10.20 cfs @ 18.29 hrs, Volume= 6.284 af

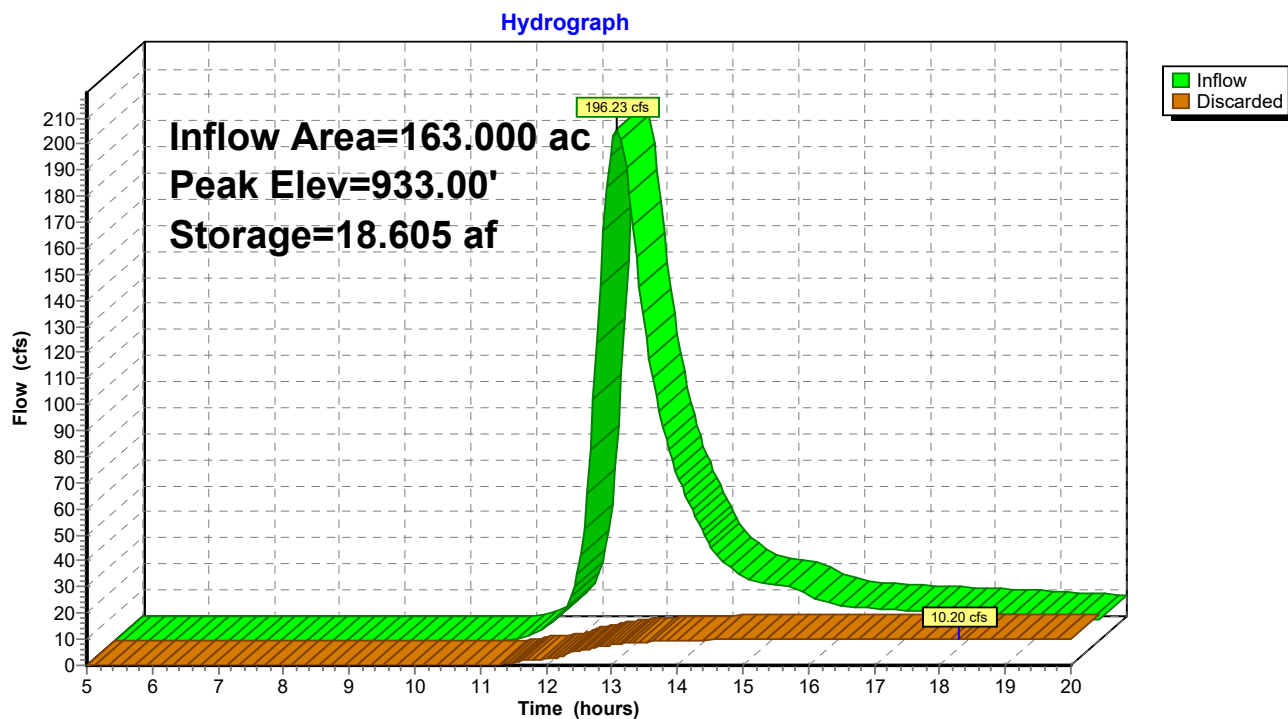
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 933.00' @ 18.29 hrs Surf.Area= 7.137 ac Storage= 18.605 af

Plug-Flow detention time= 231.4 min calculated for 6.284 af (25% of inflow)
 Center-of-Mass det. time= 141.6 min (974.2 - 832.7)

Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=10.19 cfs @ 18.29 hrs HW=933.00' (Free Discharge)
 ↑**1=Exfiltration** (Controls 10.19 cfs)

Pond 8P: EX NORTH KETTLE

LEO MADISON*MSE 24-hr 4 100-YEAR Rainfall=6.66"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>1.85"
Tc=20.0 min CN=56 Runoff=33.04 cfs 2.729 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>1.86"
Tc=10.0 min CN=56 Runoff=16.65 cfs 1.007 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>3.02"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=329.21 cfs 40.960 af

Pond 8P: EX NORTH KETTLE Peak Elev=934.67' Storage=32.406 af Inflow=329.21 cfs 40.960 af
Outflow=13.81 cfs 8.624 af

Total Runoff Area = 187.200 ac Runoff Volume = 44.696 af Average Runoff Depth = 2.87"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 33.04 cfs @ 12.32 hrs, Volume= 2.729 af, Depth> 1.85"

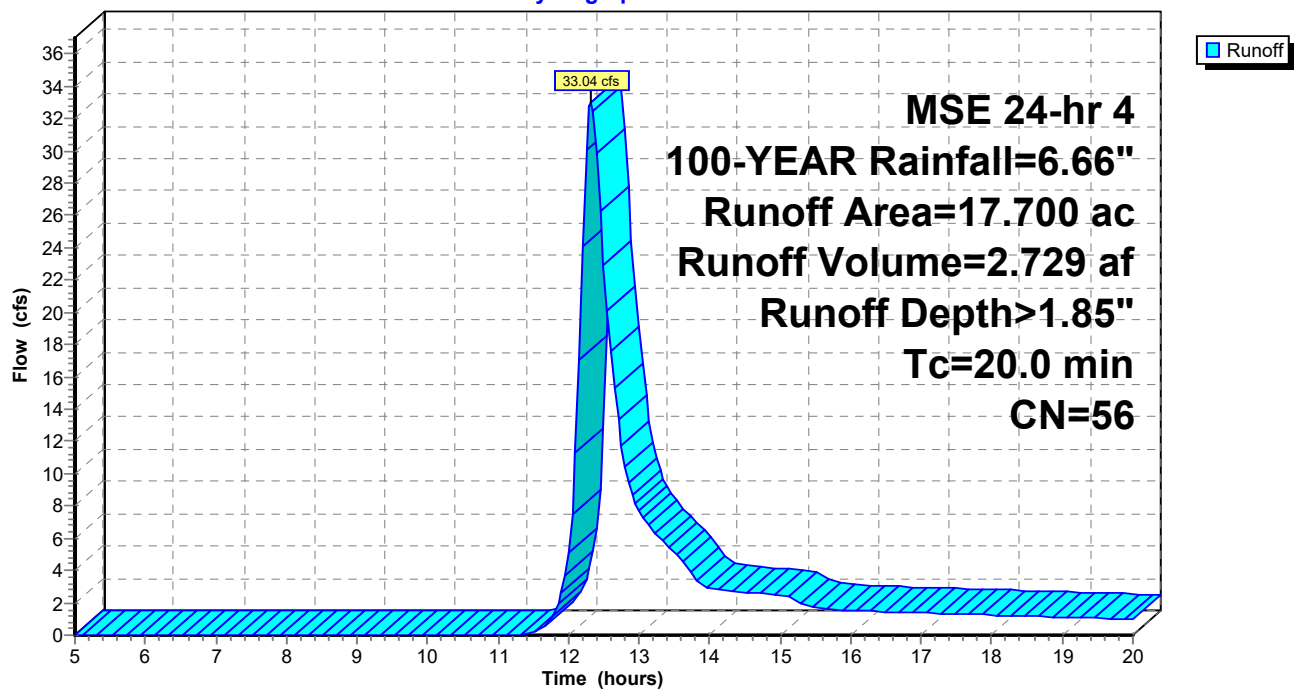
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 16.65 cfs @ 12.19 hrs, Volume= 1.007 af, Depth> 1.86"

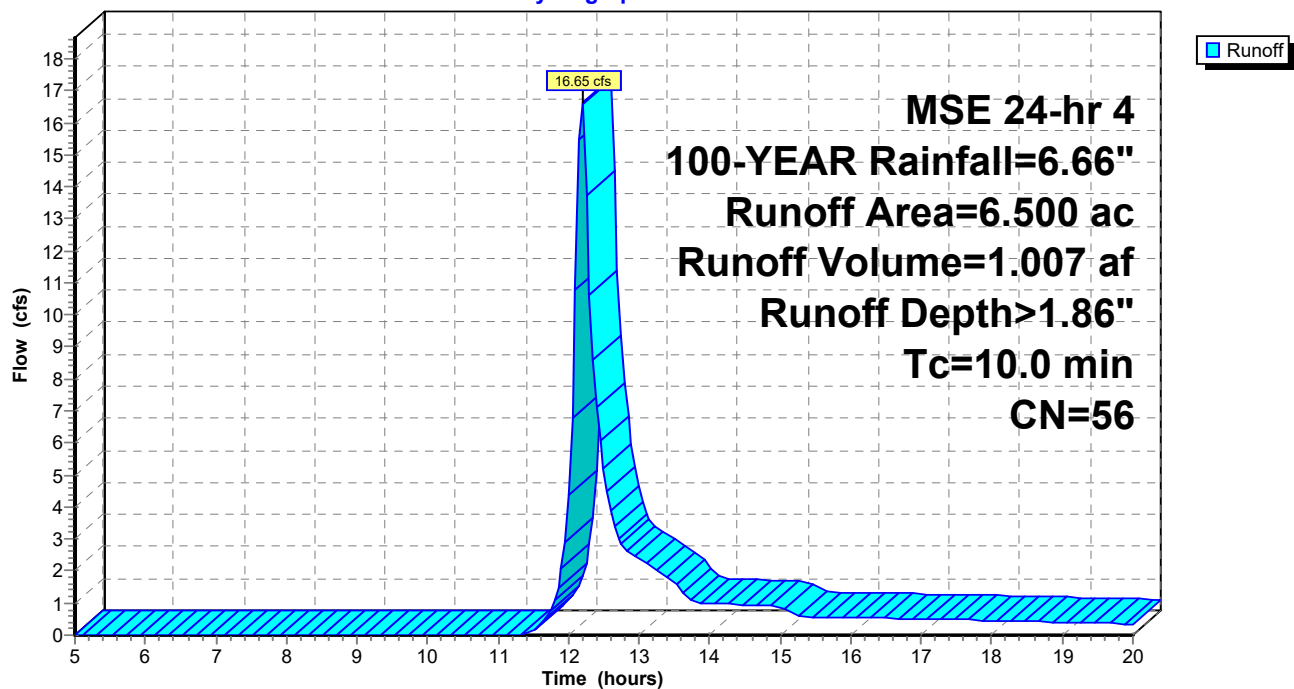
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MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 329.21 cfs @ 12.64 hrs, Volume= 40.960 af, Depth> 3.02"
 Routed to Pond 8P : EX NORTH KETTLE

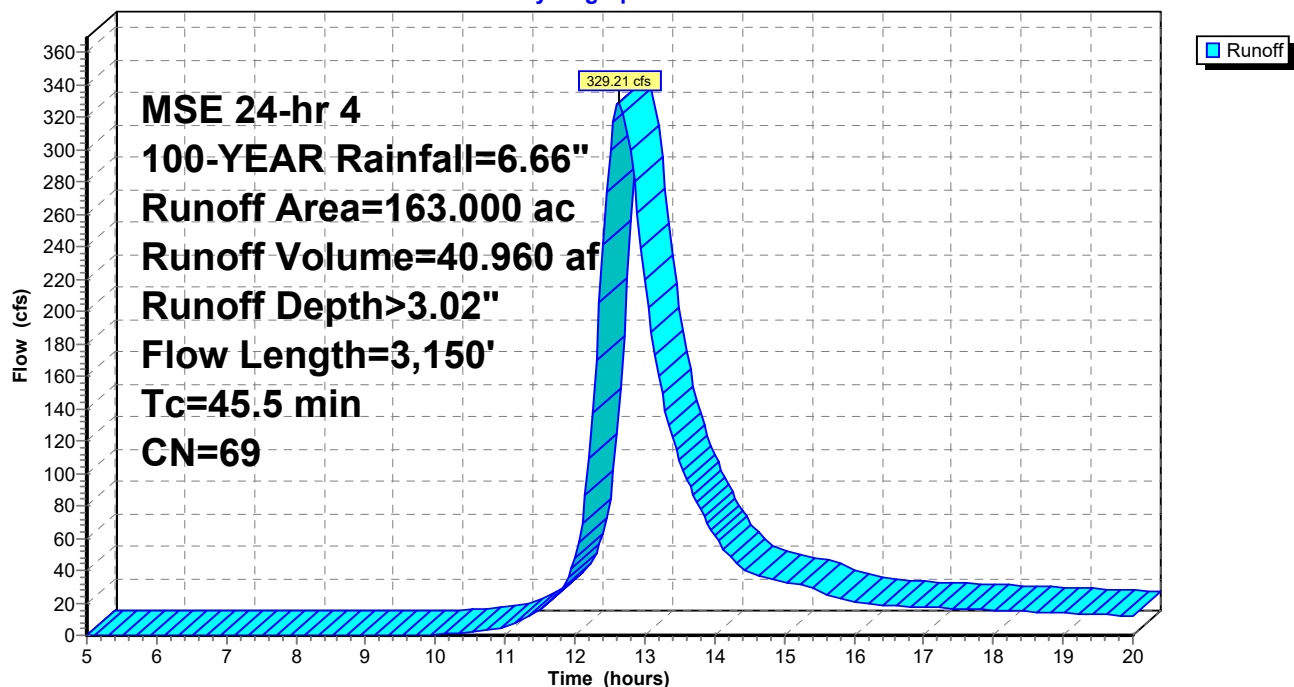
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 3.02" for 100-YEAR event
 Inflow = 329.21 cfs @ 12.64 hrs, Volume= 40.960 af
 Outflow = 13.81 cfs @ 19.05 hrs, Volume= 8.624 af, Atten= 96%, Lag= 384.6 min
 Discarded = 13.81 cfs @ 19.05 hrs, Volume= 8.624 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 934.67' @ 19.05 hrs Surf.Area= 9.444 ac Storage= 32.406 af

Plug-Flow detention time= 238.4 min calculated for 8.624 af (21% of inflow)
 Center-of-Mass det. time= 145.6 min (969.2 - 823.6)

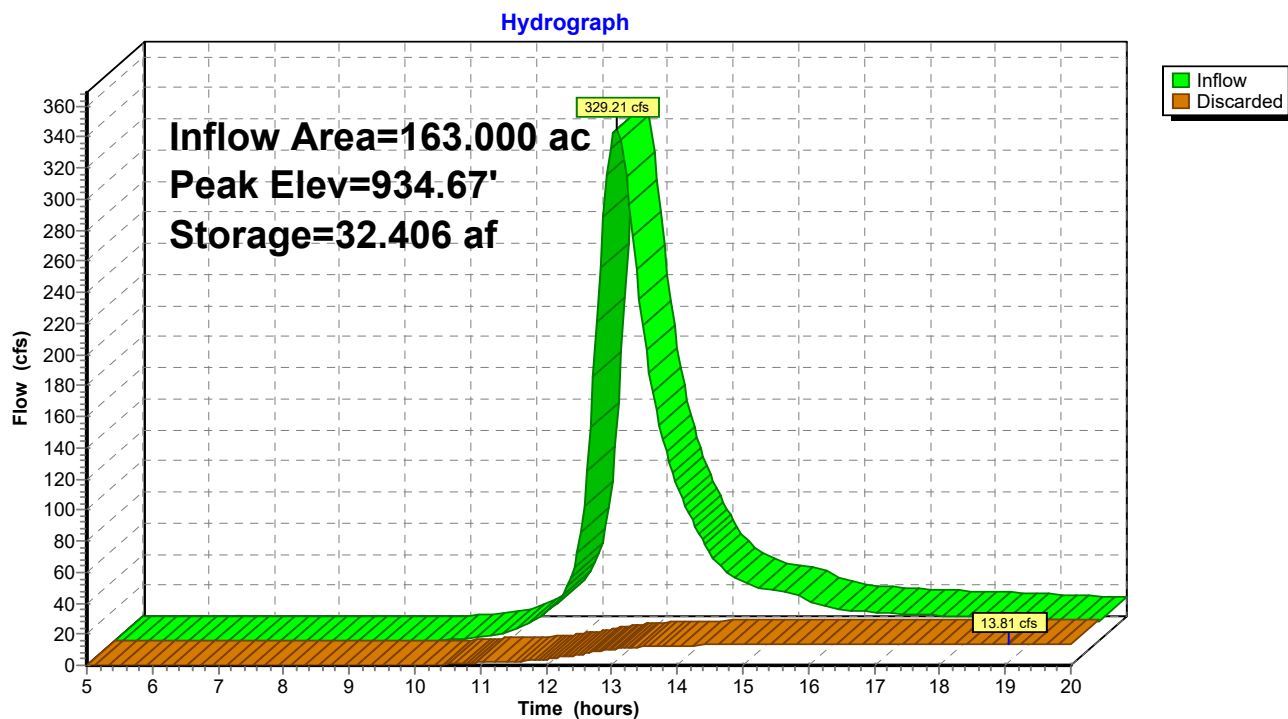
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=13.81 cfs @ 19.05 hrs HW=934.67' (Free Discharge)

↑**1=Exfiltration** (Controls 13.81 cfs)

Pond 8P: EX NORTH KETTLE

LEO MADISON*MSE 24-hr 4 200-YEAR Rainfall=7.53"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>2.39"
Tc=20.0 min CN=56 Runoff=43.48 cfs 3.522 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>2.40"
Tc=10.0 min CN=56 Runoff=21.80 cfs 1.299 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>3.69"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=403.79 cfs 50.169 af

Pond 8P: EX NORTH KETTLE Peak Elev=935.46' Storage=40.325 af Inflow=403.79 cfs 50.169 af
Outflow=15.72 cfs 9.890 af

Total Runoff Area = 187.200 ac Runoff Volume = 54.989 af Average Runoff Depth = 3.52"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 43.48 cfs @ 12.31 hrs, Volume= 3.522 af, Depth> 2.39"

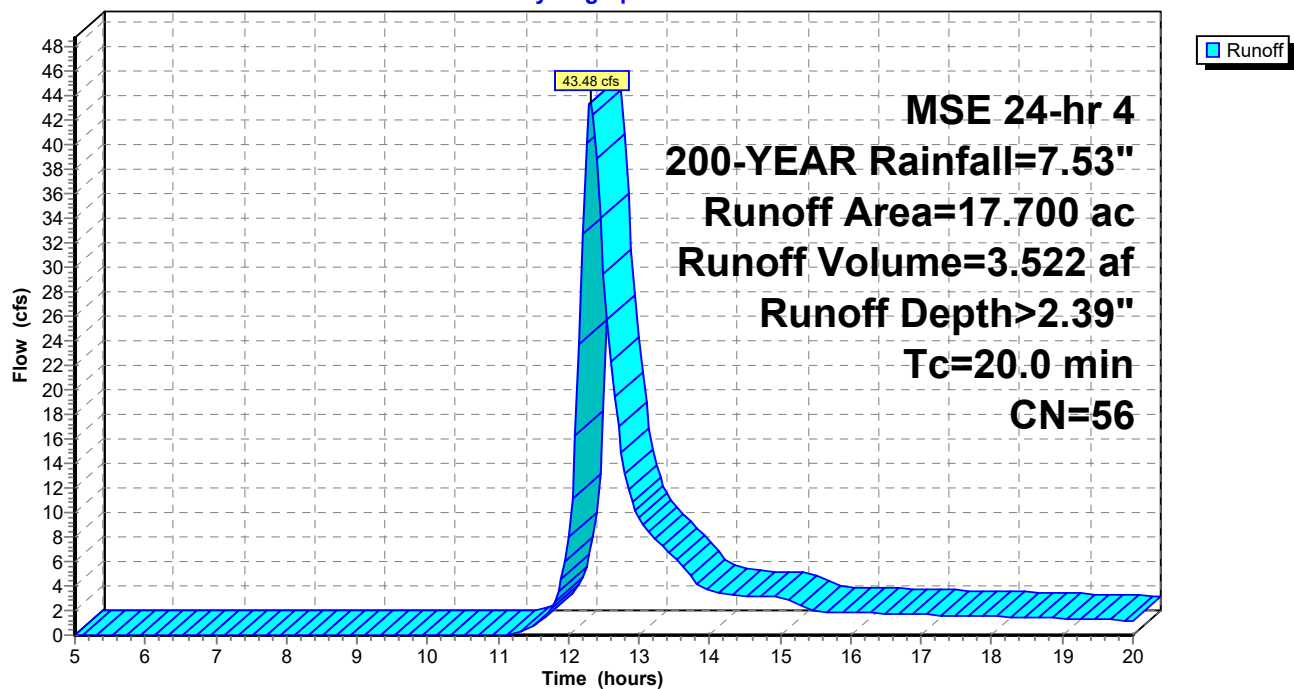
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 21.80 cfs @ 12.19 hrs, Volume= 1.299 af, Depth> 2.40"

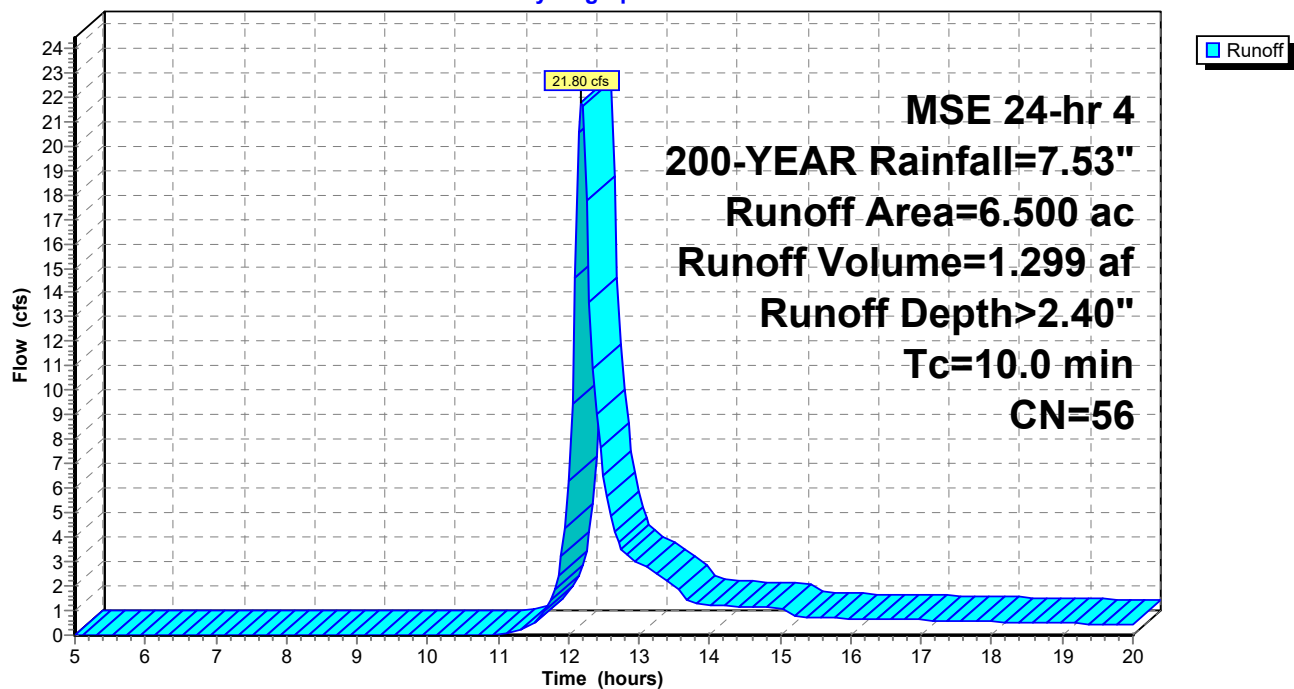
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 403.79 cfs @ 12.63 hrs, Volume= 50.169 af, Depth> 3.69"
 Routed to Pond 8P : EX NORTH KETTLE

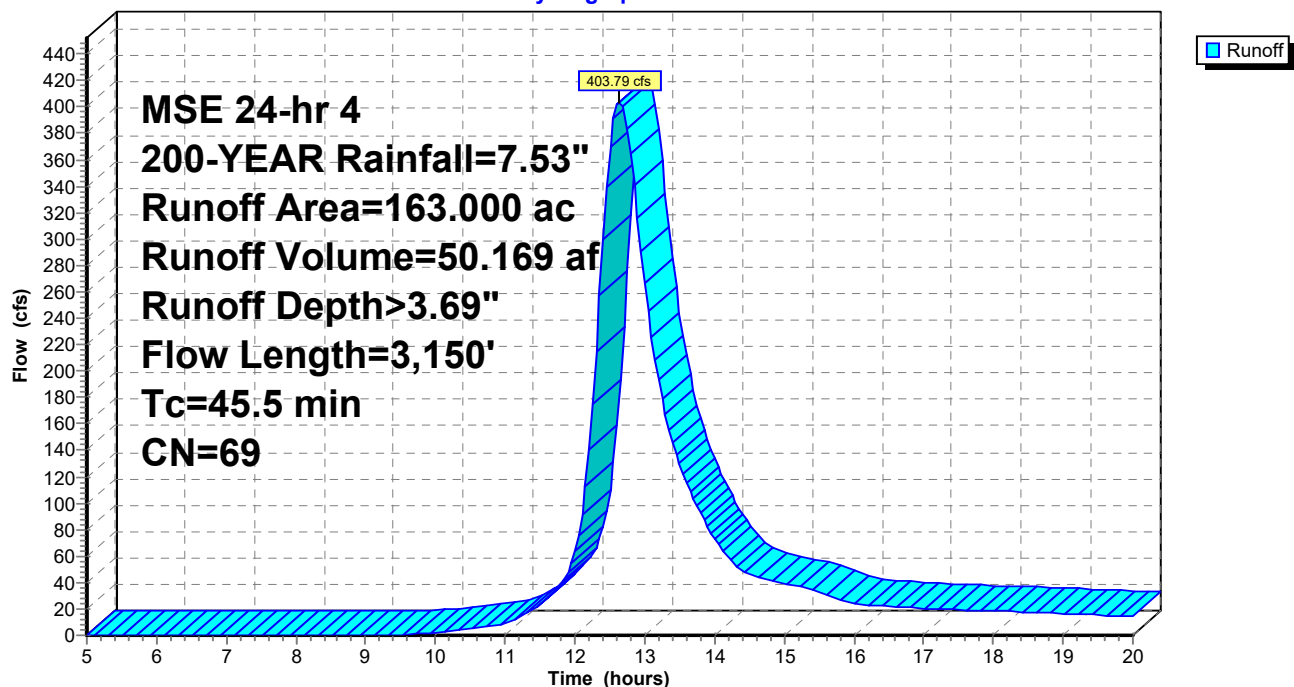
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 3.69" for 200-YEAR event
 Inflow = 403.79 cfs @ 12.63 hrs, Volume= 50.169 af
 Outflow = 15.72 cfs @ 19.28 hrs, Volume= 9.890 af, Atten= 96%, Lag= 399.1 min
 Discarded = 15.72 cfs @ 19.28 hrs, Volume= 9.890 af

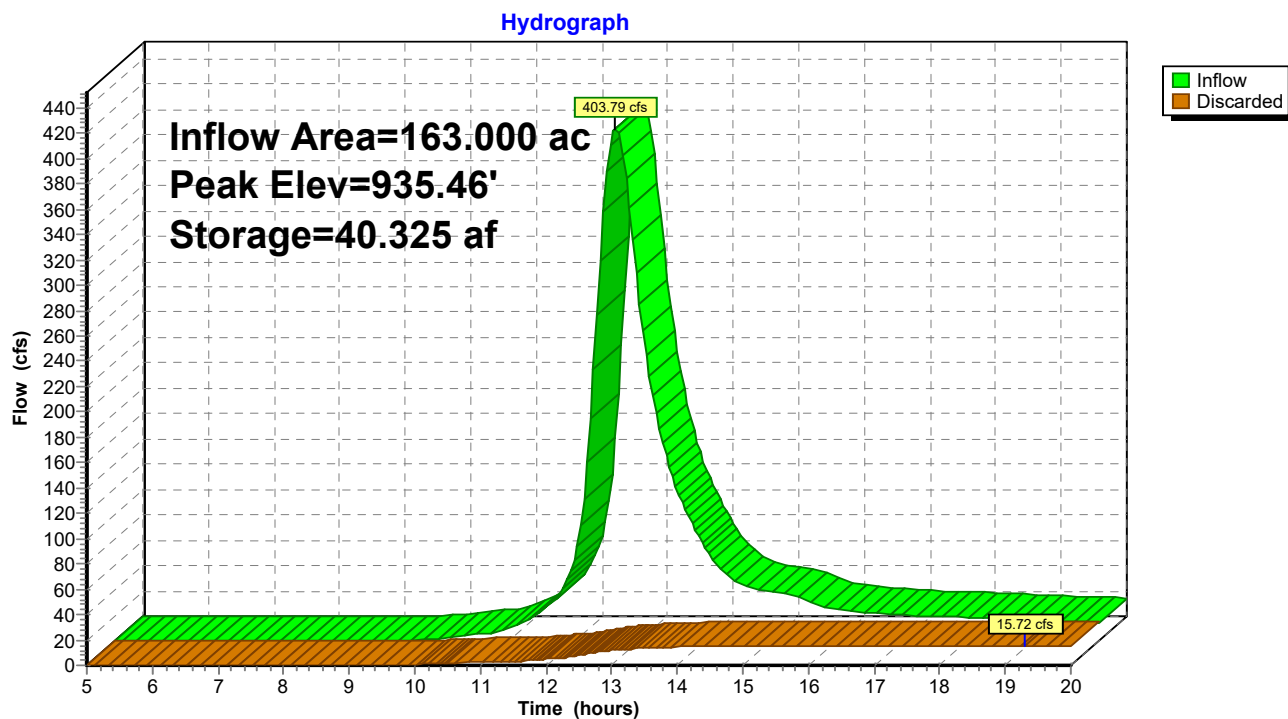
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 935.46' @ 19.28 hrs Surf.Area= 10.646 ac Storage= 40.325 af

Plug-Flow detention time= 241.9 min calculated for 9.890 af (20% of inflow)
 Center-of-Mass det. time= 146.4 min (966.4 - 820.0)

Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=15.72 cfs @ 19.28 hrs HW=935.46' (Free Discharge)
 ↑**1=Exfiltration** (Controls 15.72 cfs)

Pond 8P: EX NORTH KETTLE

LEO MADISON*MSE 24-hr 4 500-YEAR Rainfall=8.94"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX AREA TO SOUTH Runoff Area=17.700 ac 0.00% Impervious Runoff Depth>3.33"
Tc=20.0 min CN=56 Runoff=61.62 cfs 4.914 af

Subcatchment2S: EX AREA TO SE Runoff Area=6.500 ac 0.00% Impervious Runoff Depth>3.34"
Tc=10.0 min CN=56 Runoff=30.72 cfs 1.811 af

Subcatchment7S: EXIST AREA TO Runoff Area=163.000 ac 10.86% Impervious Runoff Depth>4.84"
Flow Length=3,150' Tc=45.5 min CN=69 Runoff=528.84 cfs 65.709 af

Pond 8P: EX NORTH KETTLE Peak Elev=936.63' Storage=53.800 af Inflow=528.84 cfs 65.709 af
Outflow=18.78 cfs 11.932 af

Total Runoff Area = 187.200 ac Runoff Volume = 72.434 af Average Runoff Depth = 4.64"
90.54% Pervious = 169.500 ac 9.46% Impervious = 17.700 ac

Summary for Subcatchment 1S: EX AREA TO SOUTH

Runoff = 61.62 cfs @ 12.31 hrs, Volume= 4.914 af, Depth> 3.33"

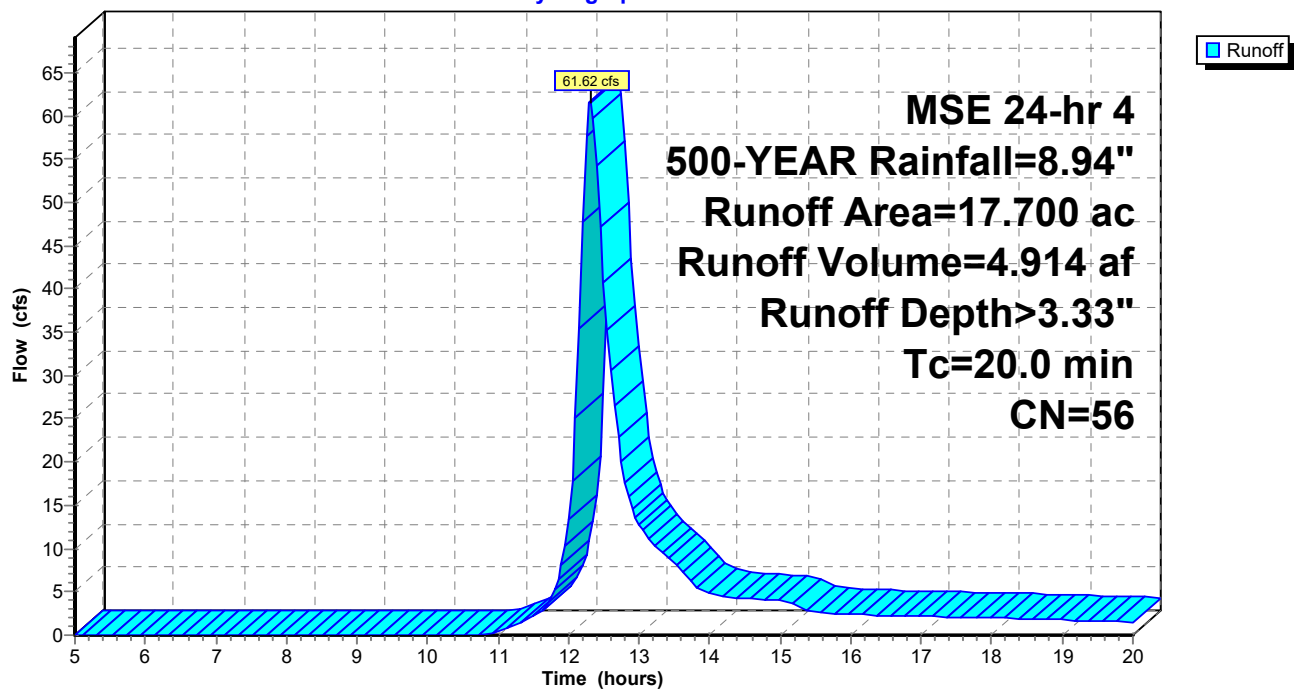
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 15.700	55	WOODLAND PER CITY ORDINANCE GROUP B
* 2.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
17.700	56	Weighted Average
17.700		100.00% Pervious Area

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

Subcatchment 1S: EX AREA TO SOUTH

Hydrograph



Summary for Subcatchment 2S: EX AREA TO SE

Runoff = 30.72 cfs @ 12.18 hrs, Volume= 1.811 af, Depth> 3.34"

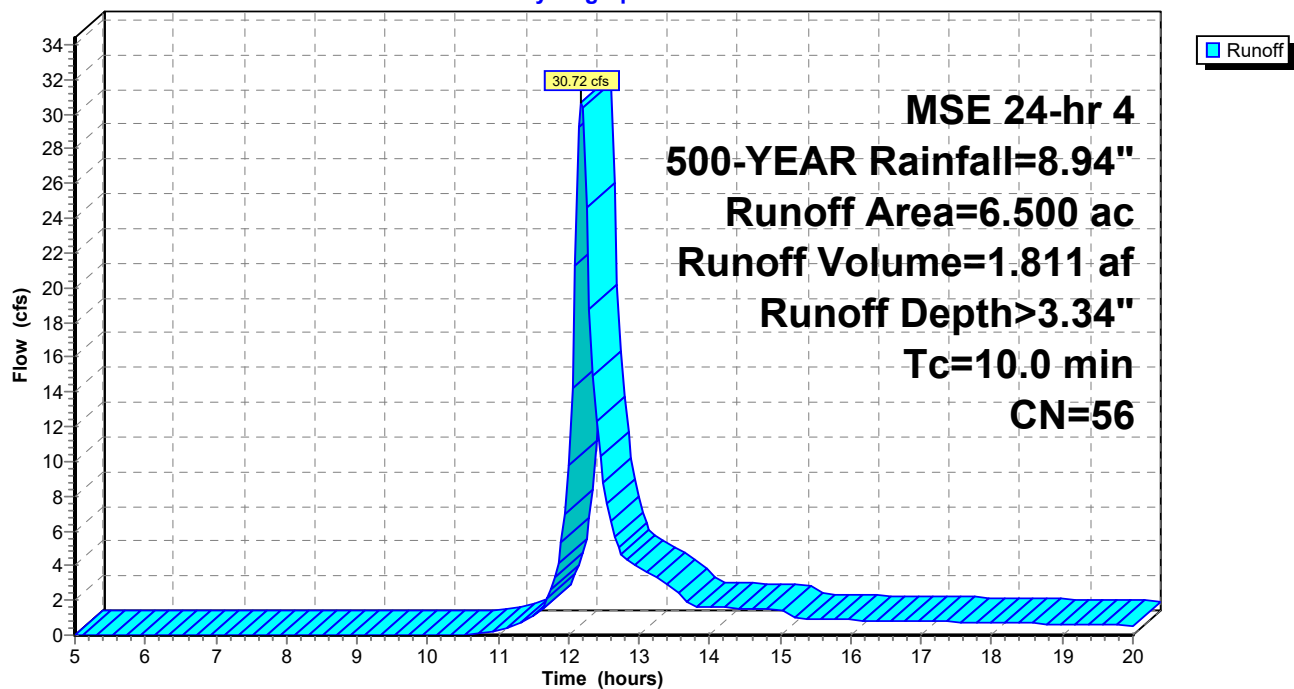
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 5.500	55	WOODLAND PER CITY ORDINANCE GROUP B
* 1.000	61	GRASSLAND PER CITY ORDINANCE GROUP B
6.500	56	Weighted Average
6.500		100.00% Pervious Area

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

Subcatchment 2S: EX AREA TO SE

Hydrograph



Summary for Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Runoff = 528.84 cfs @ 12.62 hrs, Volume= 65.709 af, Depth> 4.84"
 Routed to Pond 8P : EX NORTH KETTLE

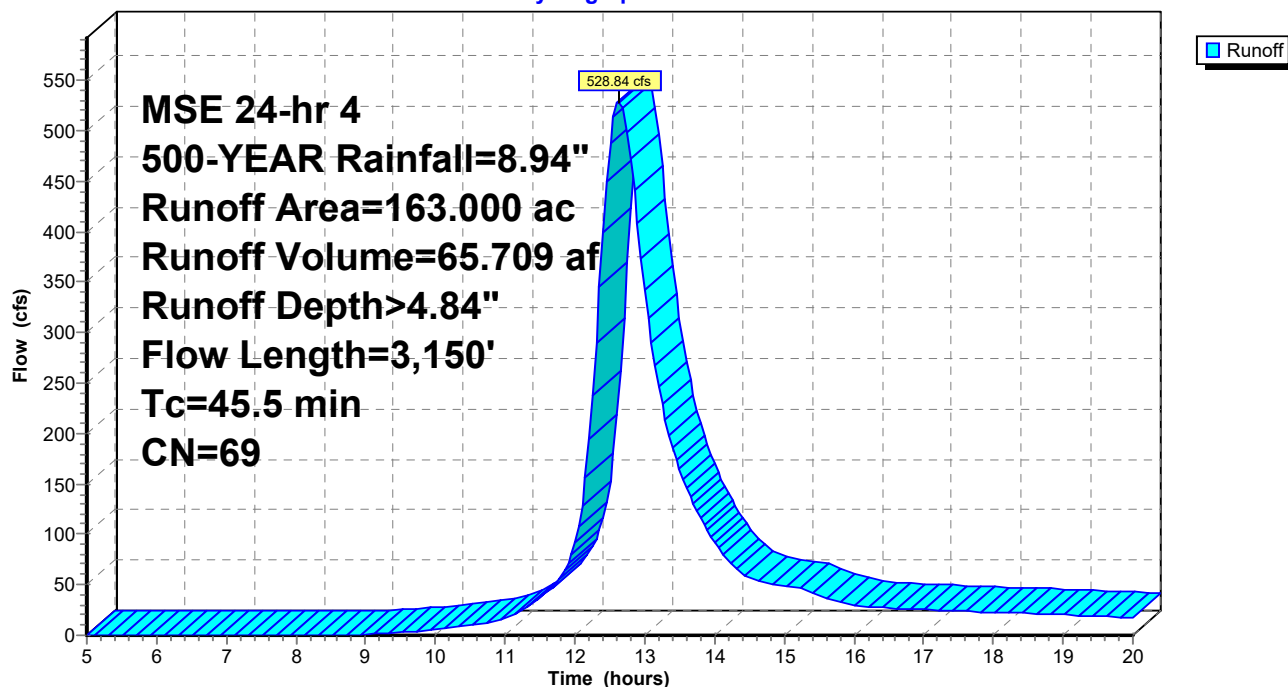
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 104.000	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
163.000	69	Weighted Average
145.300		89.14% Pervious Area
17.700		10.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, 100
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 7S: EXIST AREA TO NORTH KETTLE

Hydrograph



Summary for Pond 8P: EX NORTH KETTLE

Inflow Area = 163.000 ac, 10.86% Impervious, Inflow Depth > 4.84" for 500-YEAR event
 Inflow = 528.84 cfs @ 12.62 hrs, Volume= 65.709 af
 Outflow = 18.78 cfs @ 19.56 hrs, Volume= 11.932 af, Atten= 96%, Lag= 416.0 min
 Discarded = 18.78 cfs @ 19.56 hrs, Volume= 11.932 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 936.63' @ 19.56 hrs Surf.Area= 12.549 ac Storage= 53.800 af

Plug-Flow detention time= 247.5 min calculated for 11.892 af (18% of inflow)
 Center-of-Mass det. time= 147.2 min (962.2 - 815.0)

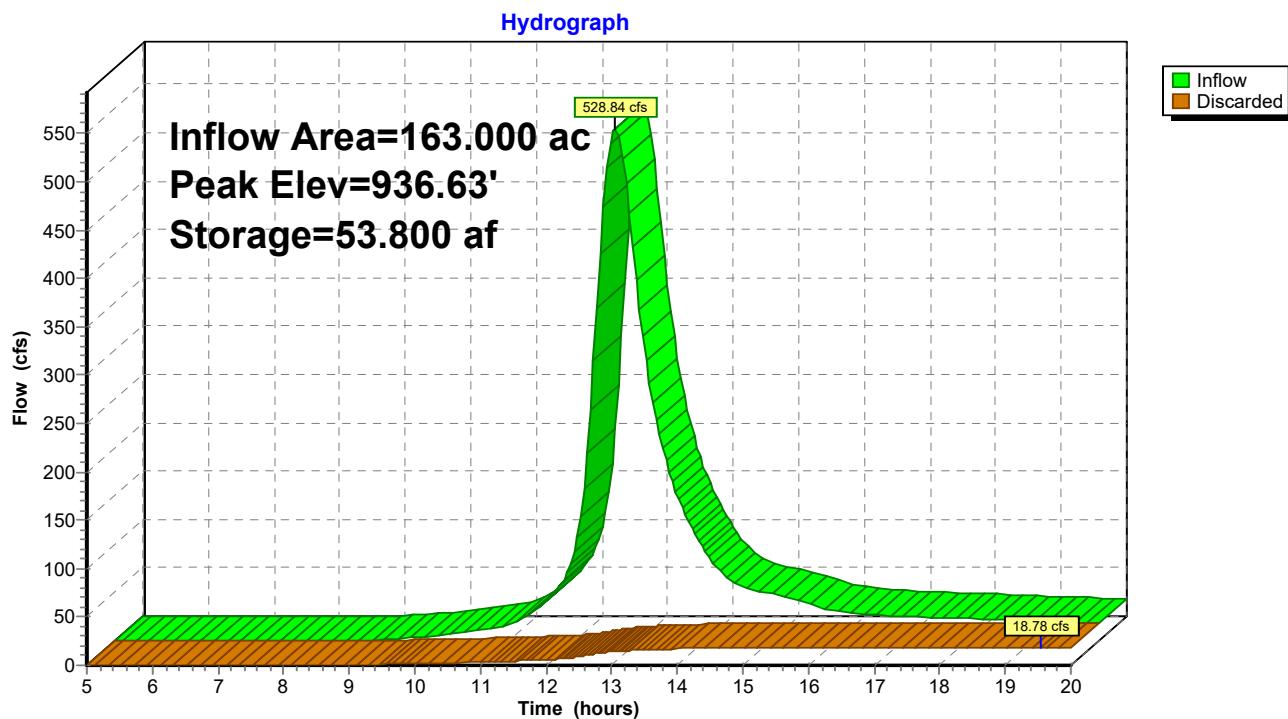
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	72.707 af	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.300	0.000	0.000	1.300
930.00	3.800	2.441	2.441	3.800
938.00	15.000	70.266	72.707	15.007

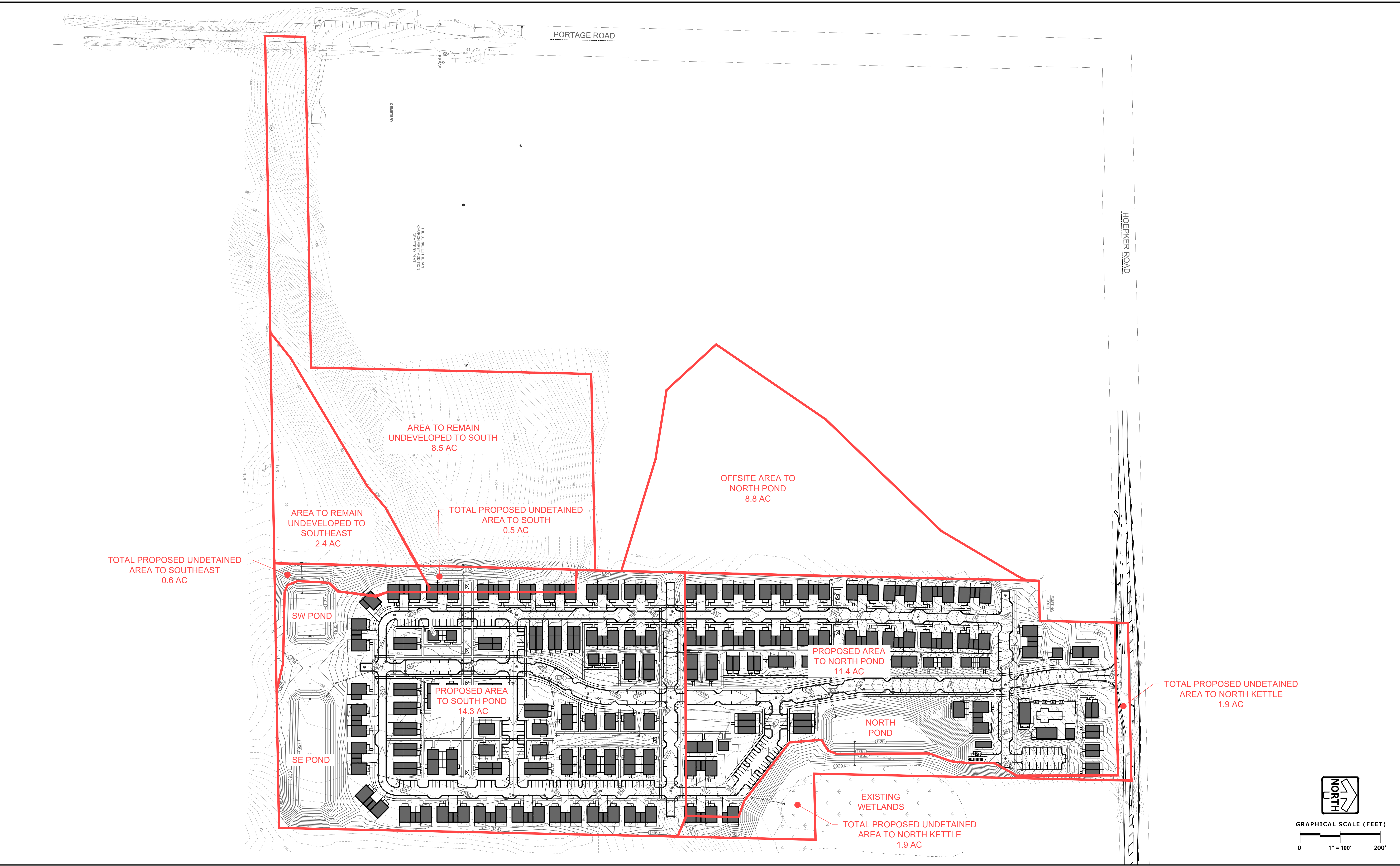
Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'

Discarded OutFlow Max=18.78 cfs @ 19.56 hrs HW=936.63' (Free Discharge)

↑**1=Exfiltration** (Controls 18.78 cfs)

Pond 8P: EX NORTH KETTLE

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LEO MADISON - PROPOSED HYDROLOGY EXHIBIT

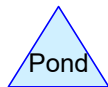
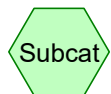
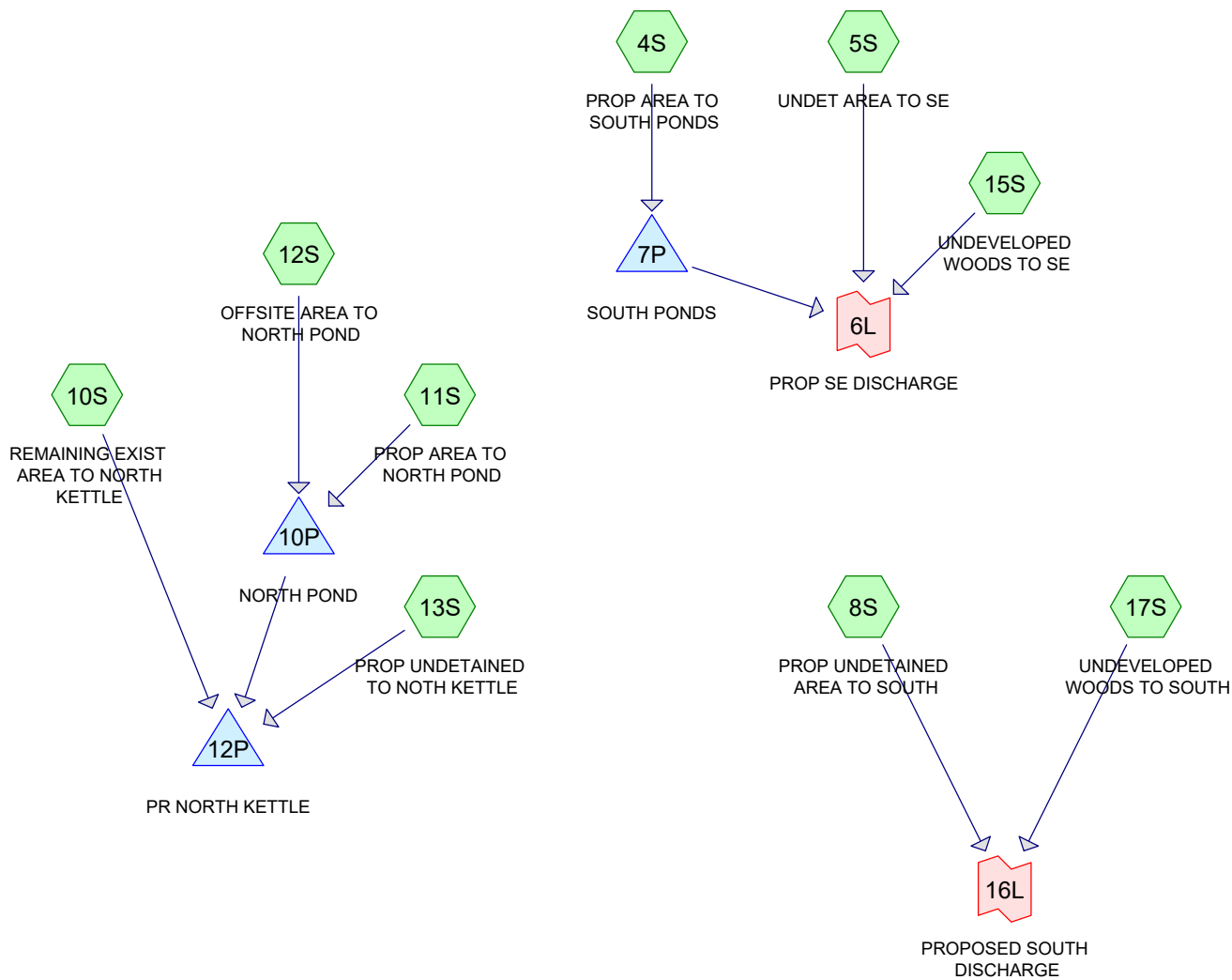
PINNACLE ENGINEERING GROUP

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PLAN | DESIGN | DELIVER

PEGJOB# 5511.00

08/21/25



Routing Diagram for LEO MADISON

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LEO MADISON

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YEAR	MSE 24-hr	4	Default	24.00	1	2.49	2
2	2-YEAR	MSE 24-hr	4	Default	24.00	1	2.84	2
3	5-YEAR	MSE 24-hr	4	Default	24.00	1	3.45	2
4	10-YEAR	MSE 24-hr	4	Default	24.00	1	4.09	2
5	25-YEAR	MSE 24-hr	4	Default	24.00	1	5.02	2
6	100-YEAR	MSE 24-hr	4	Default	24.00	1	6.66	2
7	200-YEAR	MSE 24-hr	4	Default	24.00	1	7.53	2
8	500-YEAR	MSE 24-hr	4	Default	24.00	1	8.94	2

LEO MADISON

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
59.000	72	1/3 acre lots, 30% imp, HSG B (10S)
26.400	85	1/8 acre lots, 65% imp, HSG B (4S, 11S, 13S)
88.600	68	CROPLAND PER CITY ORDINANCE B SOIL (10S, 12S)
0.950	61	GRASS (5S, 8S)
0.150	98	IMPERVIOUS (5S, 8S)
1.200	61	POND AREA >75% Grass cover, Good, HSG B (4S)
10.900	55	WOODLAND PER CITY ORDINANCE GROUP B (15S, 17S)
187.200	71	TOTAL AREA

LEO MADISON

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
86.600	HSG B	4S, 10S, 11S, 13S
0.000	HSG C	
0.000	HSG D	
100.600	Other	5S, 8S, 10S, 12S, 15S, 17S
187.200		TOTAL AREA

LEO MADISON

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.000	59.000	0.000	0.000	0.000	59.000	1/3 acre lots, 30% imp
0.000	26.400	0.000	0.000	0.000	26.400	1/8 acre lots, 65% imp
0.000	0.000	0.000	0.000	88.600	88.600	CROPLAND PER CITY ORDINANCE B SOIL
0.000	0.000	0.000	0.000	0.950	0.950	GRASS
0.000	0.000	0.000	0.000	0.150	0.150	IMPERVIOUS
0.000	1.200	0.000	0.000	0.000	1.200	POND AREA >75% Grass cover, Good
0.000	0.000	0.000	0.000	10.900	10.900	WOODLAND PER CITY ORDINANCE GROUP B
0.000	86.600	0.000	0.000	100.600	187.200	TOTAL AREA

LEO MADISON

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	7P	927.00	923.80	80.0	0.0400	0.013	0.0	18.0	0.0	
2	10P	929.00	928.70	60.0	0.0050	0.013	0.0	36.0	0.0	
3	12P	931.00	928.20	1,400.0	0.0020	0.013	0.0	48.0	0.0	

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MSE 24-hr 4 1-YEAR Rainfall=2.49"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>0.99"
Tc=6.0 min CN=83 Runoff=23.49 cfs 1.175 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>0.24"
Flow Length=300' Tc=10.3 min CN=64 Runoff=0.12 cfs 0.012 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>0.35"
Tc=6.0 min CN=68 Runoff=0.24 cfs 0.015 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>0.40"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=30.90 cfs 4.654 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>1.10"
Tc=6.0 min CN=85 Runoff=20.93 cfs 1.050 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>0.35"
Flow Length=600' Tc=13.9 min CN=68 Runoff=2.92 cfs 0.254 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>1.10"
Tc=6.0 min CN=85 Runoff=3.49 cfs 0.175 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>0.07"
Tc=10.0 min CN=55 Runoff=0.04 cfs 0.013 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>0.07"
Tc=20.0 min CN=55 Runoff=0.14 cfs 0.046 af

Pond 7P: SOUTH PONDS Peak Elev=928.63' Storage=47,650 cf Inflow=23.49 cfs 1.175 af
Discarded=0.13 cfs 0.081 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.081 af

Pond 10P: NORTH POND Peak Elev=931.07' Storage=41,418 cf Inflow=22.29 cfs 1.304 af
Outflow=0.58 cfs 0.374 af

Pond 12P: PR NORTH KETTLE Peak Elev=930.29' Storage=2.871 af Inflow=31.81 cfs 5.202 af
Discarded=4.21 cfs 2.576 af Primary=0.00 cfs 0.000 af Outflow=4.21 cfs 2.576 af

Link 6L: PROP SE DISCHARGE Inflow=0.12 cfs 0.025 af
Primary=0.12 cfs 0.025 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=0.24 cfs 0.061 af
Primary=0.24 cfs 0.061 af

Total Runoff Area = 187.200 ac Runoff Volume = 7.394 af Average Runoff Depth = 0.47"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

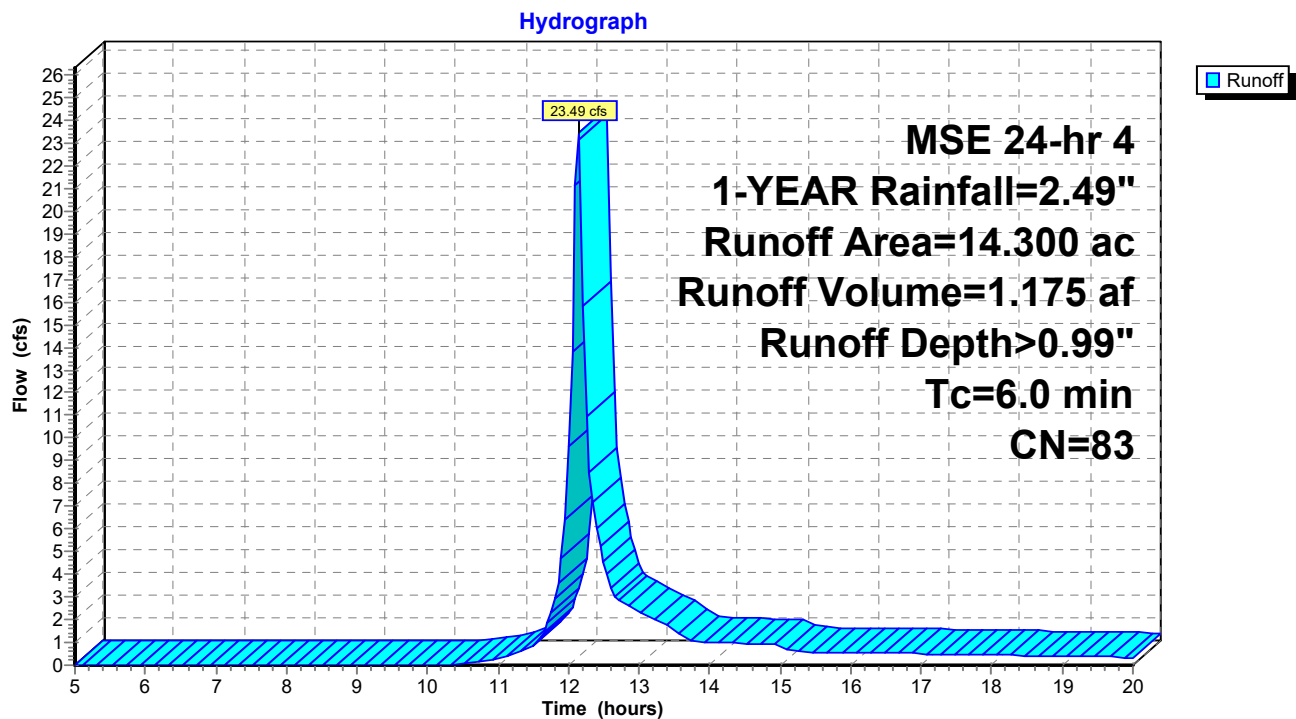
Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 23.49 cfs @ 12.14 hrs, Volume= 1.175 af, Depth> 0.99"
 Routed to Pond 7P : SOUTH PONDS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 0.12 cfs @ 12.24 hrs, Volume= 0.012 af, Depth> 0.24"
 Routed to Link 6L : PROP SE DISCHARGE

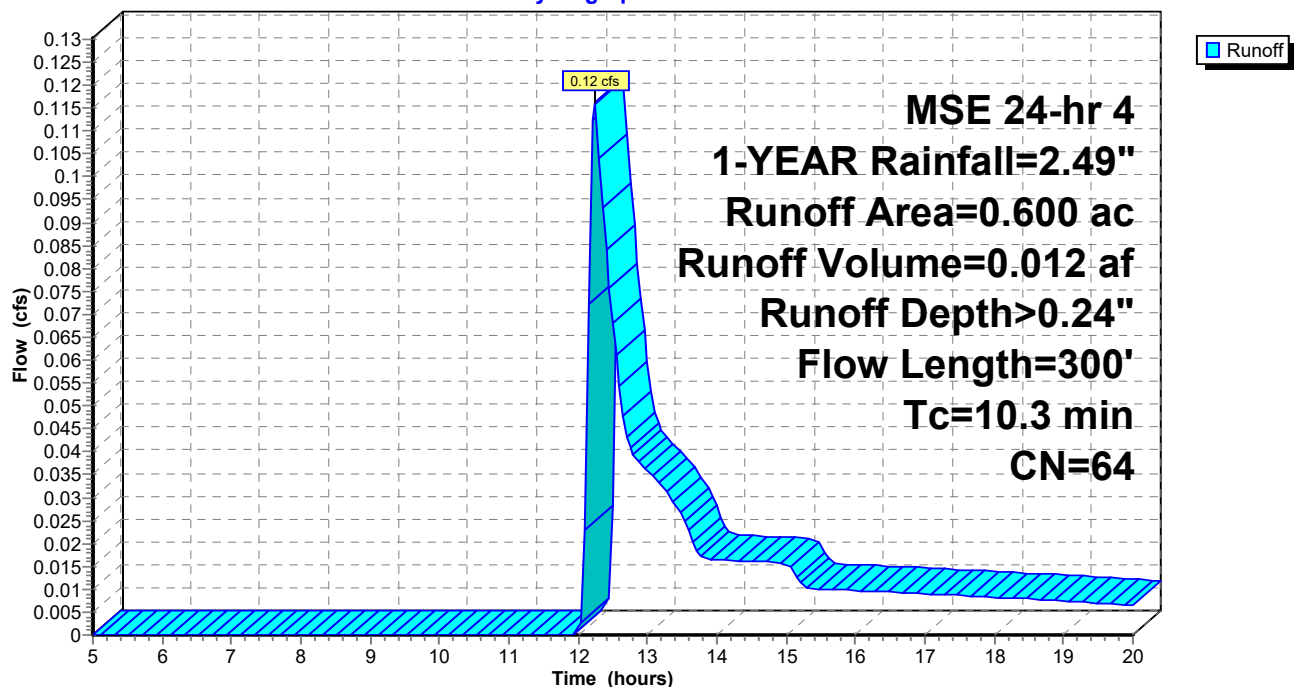
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

Hydrograph



Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Runoff = 0.24 cfs @ 12.15 hrs, Volume= 0.015 af, Depth> 0.35"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

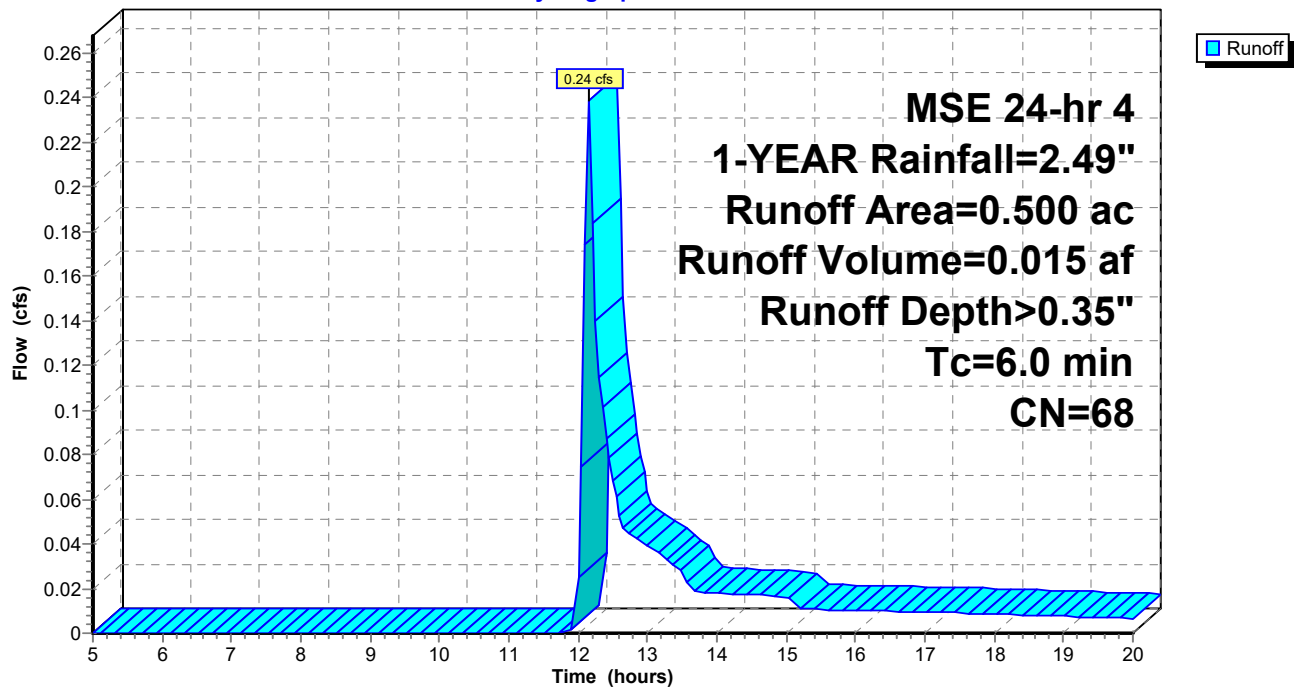
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Hydrograph



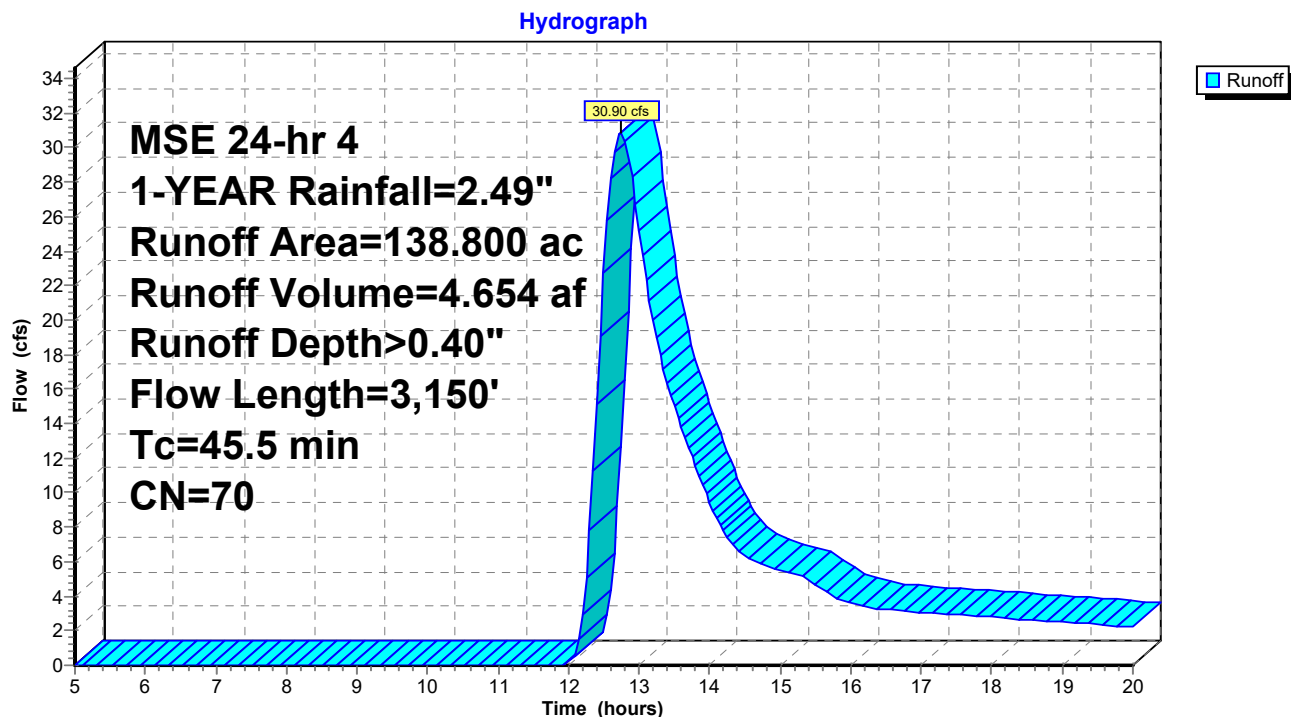
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 30.90 cfs @ 12.74 hrs, Volume= 4.654 af, Depth> 0.40"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

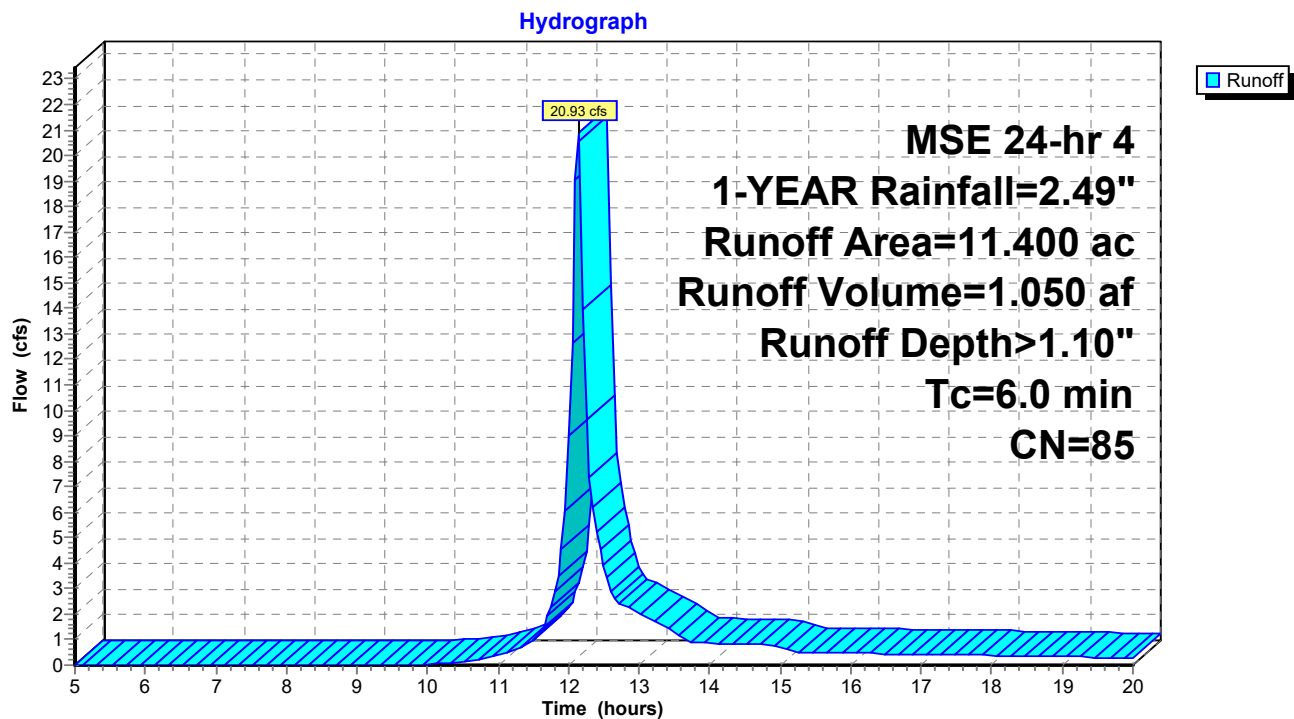
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 20.93 cfs @ 12.13 hrs, Volume= 1.050 af, Depth> 1.10"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

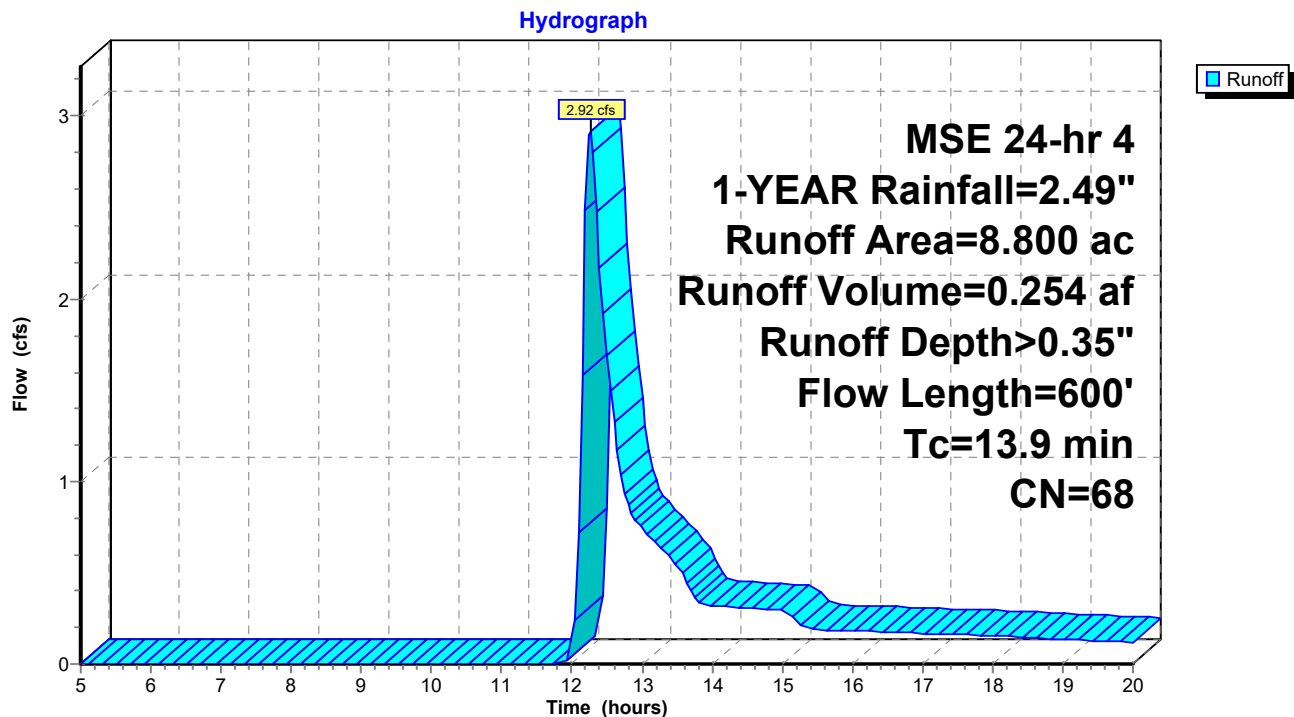
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 2.92 cfs @ 12.27 hrs, Volume= 0.254 af, Depth> 0.35"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

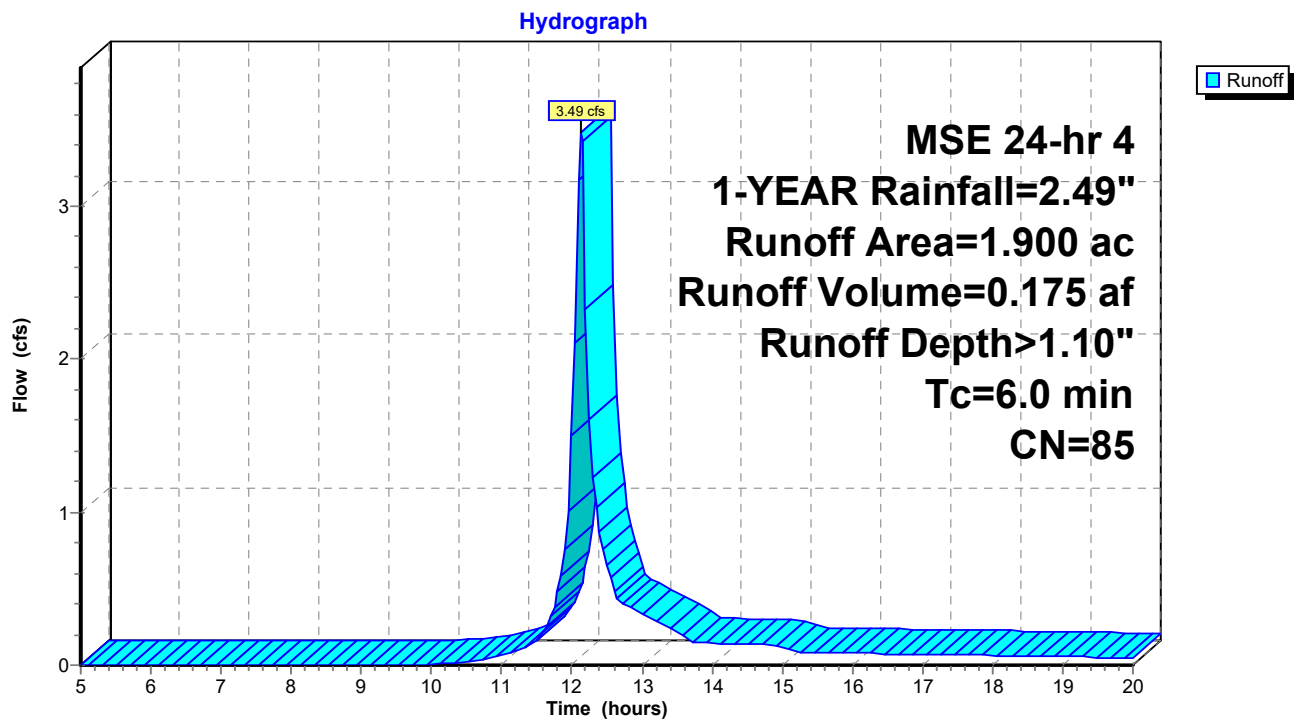
Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 3.49 cfs @ 12.13 hrs, Volume= 0.175 af, Depth> 1.10"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 0.04 cfs @ 13.11 hrs, Volume= 0.013 af, Depth> 0.07"
 Routed to Link 6L : PROP SE DISCHARGE

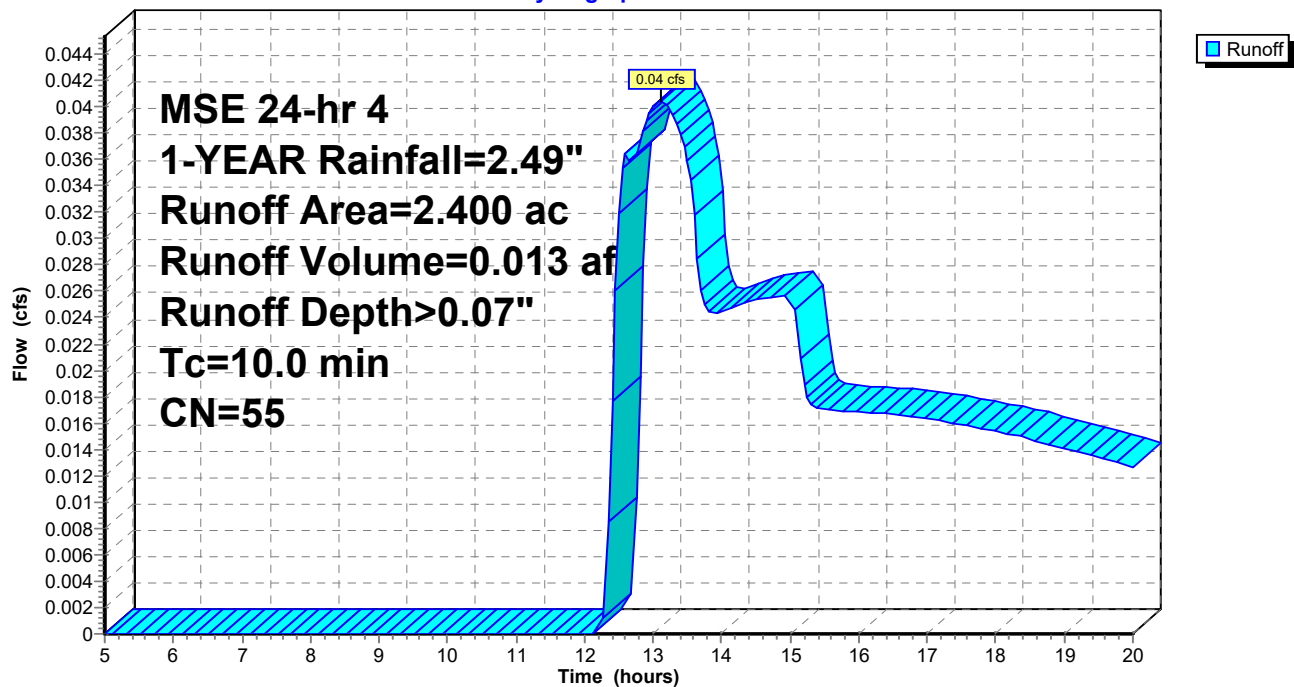
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Hydrograph



Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 0.14 cfs @ 13.27 hrs, Volume= 0.046 af, Depth> 0.07"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

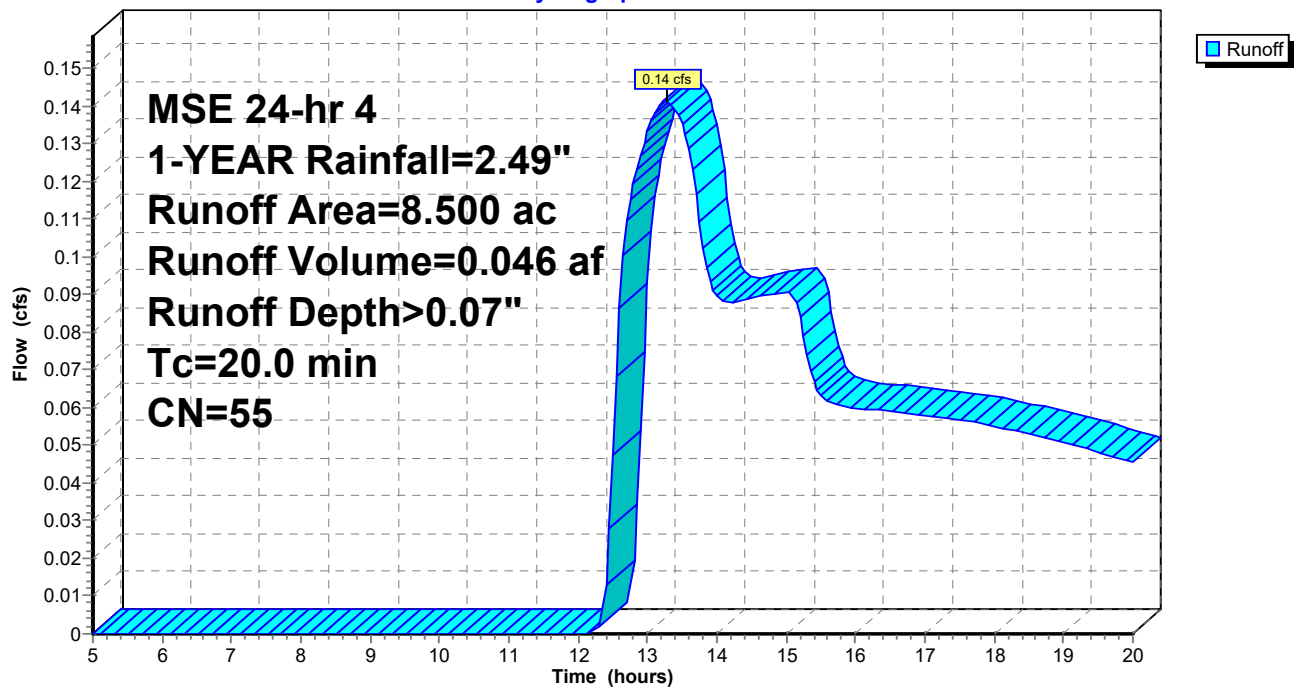
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-YEAR Rainfall=2.49"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 0.99" for 1-YEAR event
 Inflow = 23.49 cfs @ 12.14 hrs, Volume= 1.175 af
 Outflow = 0.13 cfs @ 20.00 hrs, Volume= 0.081 af, Atten= 99%, Lag= 471.9 min
 Discarded = 0.13 cfs @ 20.00 hrs, Volume= 0.081 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 928.63' @ 20.00 hrs Surf.Area= 32,970 sf Storage= 47,650 cf

Plug-Flow detention time= 277.9 min calculated for 0.081 af (7% of inflow)
 Center-of-Mass det. time= 169.8 min (969.0 - 799.3)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.13 cfs @ 20.00 hrs HW=928.63' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.13 cfs of 2.89 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 0.13 cfs @ 5.99 fps)

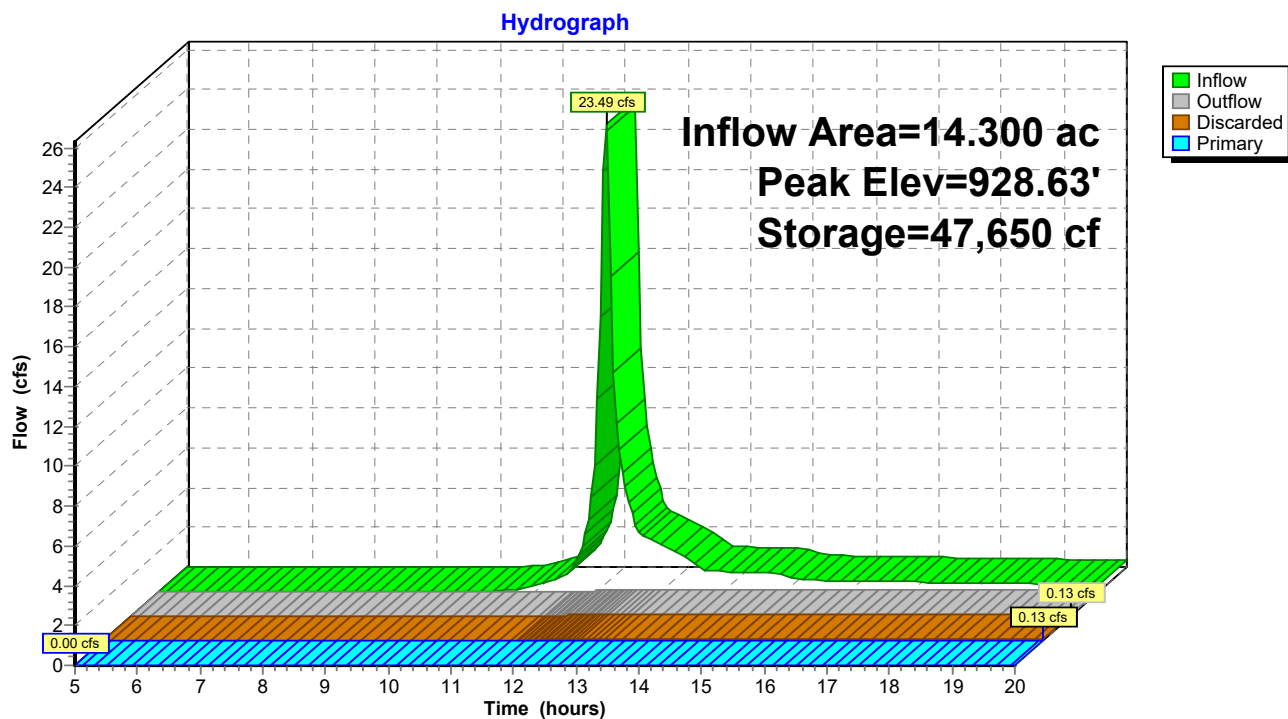
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=927.00' (Free Discharge)

↑ **2=Culvert** (Controls 0.00 cfs)

↑ **4=Orifice/Grate** (Controls 0.00 cfs)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS



Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 0.77" for 1-YEAR event
 Inflow = 22.29 cfs @ 12.14 hrs, Volume= 1.304 af
 Outflow = 0.58 cfs @ 17.14 hrs, Volume= 0.374 af, Atten= 97%, Lag= 300.0 min
 Primary = 0.58 cfs @ 17.14 hrs, Volume= 0.374 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.07' @ 17.14 hrs Surf.Area= 23,005 sf Storage= 41,418 cf

Plug-Flow detention time= 251.5 min calculated for 0.374 af (29% of inflow)
 Center-of-Mass det. time= 161.1 min (965.4 - 804.3)

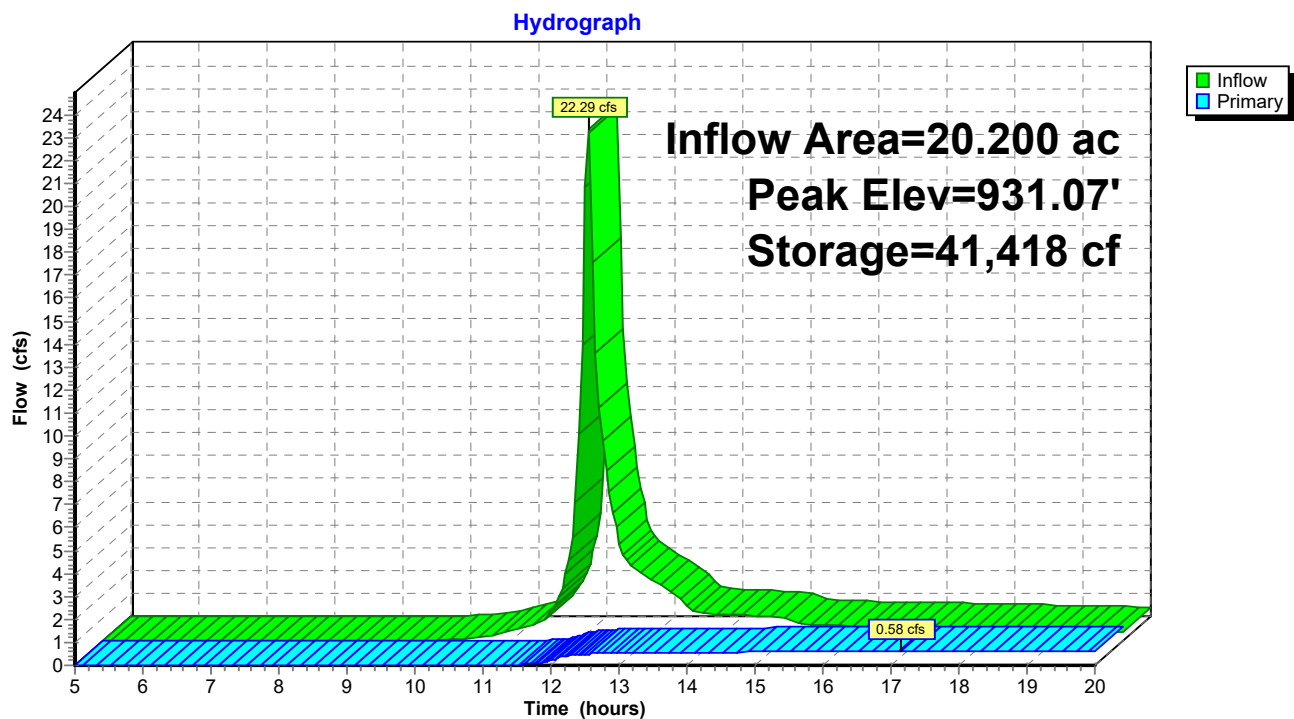
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' SideZ 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=0.58 cfs @ 17.14 hrs HW=931.07' (Free Discharge)

1=Culvert (Passes 0.58 cfs of 19.33 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.58 cfs @ 6.64 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Orifice/Grate (Controls 0.00 cfs)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[79] Warning: Submerged Pond 10P Primary device # 1 INLET by 1.29'

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 0.39" for 1-YEAR event
 Inflow = 31.81 cfs @ 12.74 hrs, Volume= 5.202 af
 Outflow = 4.21 cfs @ 16.03 hrs, Volume= 2.576 af, Atten= 87%, Lag= 197.2 min
 Discarded = 4.21 cfs @ 16.03 hrs, Volume= 2.576 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 930.29' @ 16.03 hrs Surf.Area= 3.104 ac Storage= 2.871 af

Plug-Flow detention time= 204.5 min calculated for 2.576 af (50% of inflow)
 Center-of-Mass det. time= 109.2 min (976.1 - 867.0)

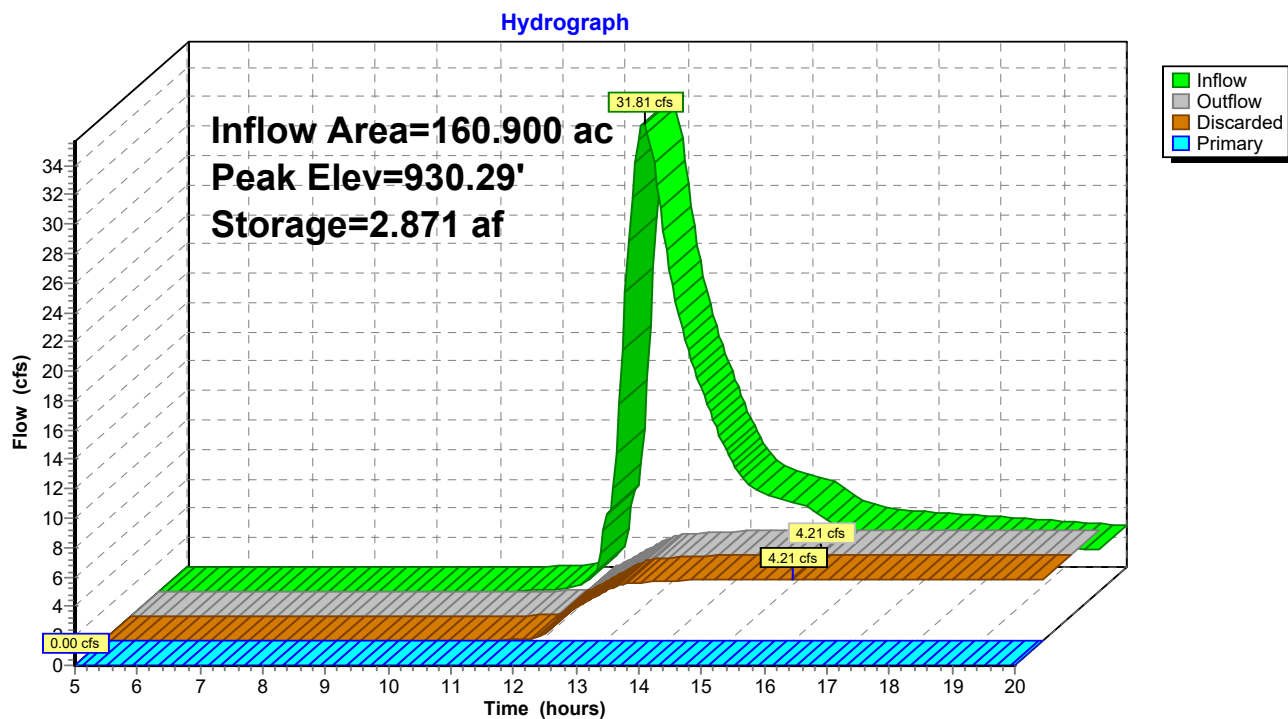
Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf

Discarded OutFlow Max=4.21 cfs @ 16.03 hrs HW=930.29' (Free Discharge)
 ↑1=**Exfiltration** (Controls 4.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=929.00' (Free Discharge)
 ↑2=**Culvert** (Controls 0.00 cfs)

Pond 12P: PR NORTH KETTLE



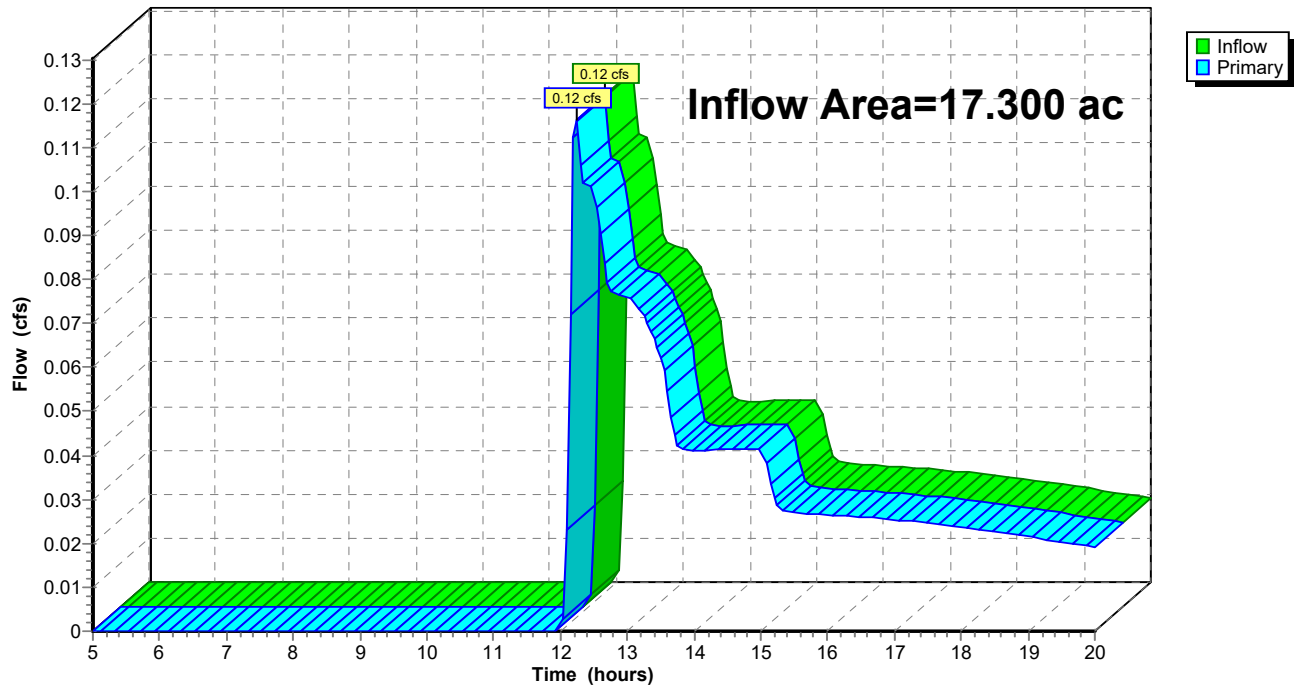
Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 0.02" for 1-YEAR event
Inflow = 0.12 cfs @ 12.24 hrs, Volume= 0.025 af
Primary = 0.12 cfs @ 12.24 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

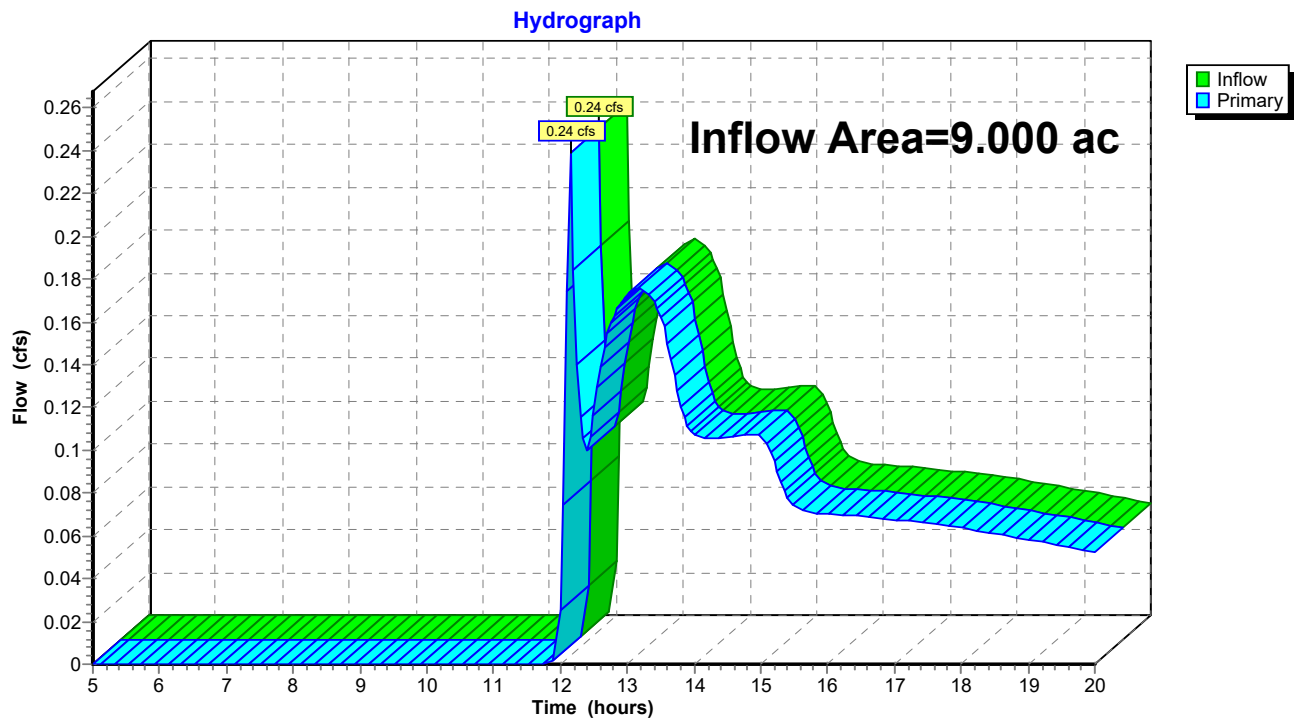
Hydrograph



Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 0.08" for 1-YEAR event
Inflow = 0.24 cfs @ 12.15 hrs, Volume= 0.061 af
Primary = 0.24 cfs @ 12.15 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 2-YEAR Rainfall=2.84"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>1.24"
Tc=6.0 min CN=83 Runoff=29.59 cfs 1.483 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>0.36"
Flow Length=300' Tc=10.3 min CN=64 Runoff=0.23 cfs 0.018 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>0.50"
Tc=6.0 min CN=68 Runoff=0.38 cfs 0.021 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>0.57"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=46.46 cfs 6.542 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>1.38"
Tc=6.0 min CN=85 Runoff=25.96 cfs 1.308 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>0.50"
Flow Length=600' Tc=13.9 min CN=68 Runoff=4.67 cfs 0.365 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>1.38"
Tc=6.0 min CN=85 Runoff=4.33 cfs 0.218 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>0.13"
Tc=10.0 min CN=55 Runoff=0.13 cfs 0.026 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>0.13"
Tc=20.0 min CN=55 Runoff=0.41 cfs 0.093 af

Pond 7P: SOUTH PONDS Peak Elev=929.01' Storage=60,593 cf Inflow=29.59 cfs 1.483 af
Discarded=0.15 cfs 0.091 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.091 af

Pond 10P: NORTH POND Peak Elev=931.64' Storage=54,877 cf Inflow=28.59 cfs 1.673 af
Outflow=0.66 cfs 0.429 af

Pond 12P: PR NORTH KETTLE Peak Elev=930.77' Storage=4.418 af Inflow=47.54 cfs 7.188 af
Discarded=4.72 cfs 2.912 af Primary=0.00 cfs 0.000 af Outflow=4.72 cfs 2.912 af

Link 6L: PROP SE DISCHARGE Inflow=0.29 cfs 0.044 af
Primary=0.29 cfs 0.044 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=0.48 cfs 0.113 af
Primary=0.48 cfs 0.113 af

Total Runoff Area = 187.200 ac Runoff Volume = 10.074 af Average Runoff Depth = 0.65"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

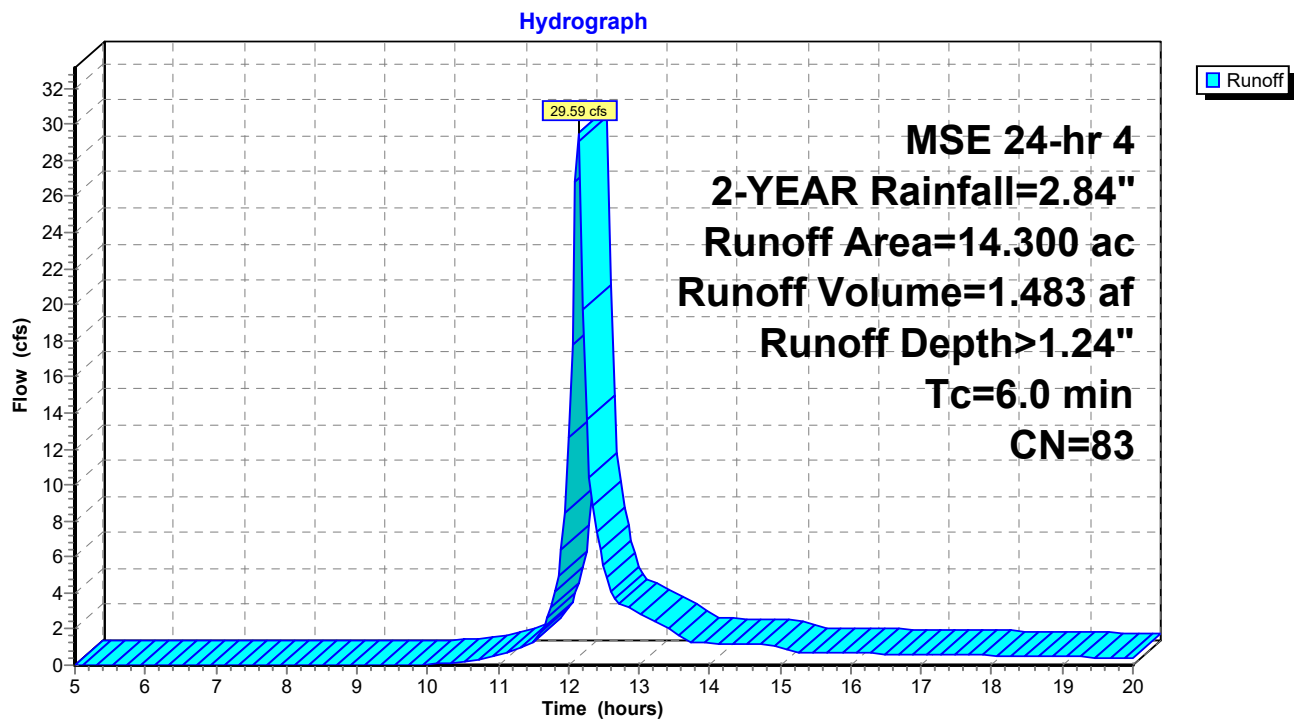
Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 29.59 cfs @ 12.13 hrs, Volume= 1.483 af, Depth> 1.24"
 Routed to Pond 7P : SOUTH PONDS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

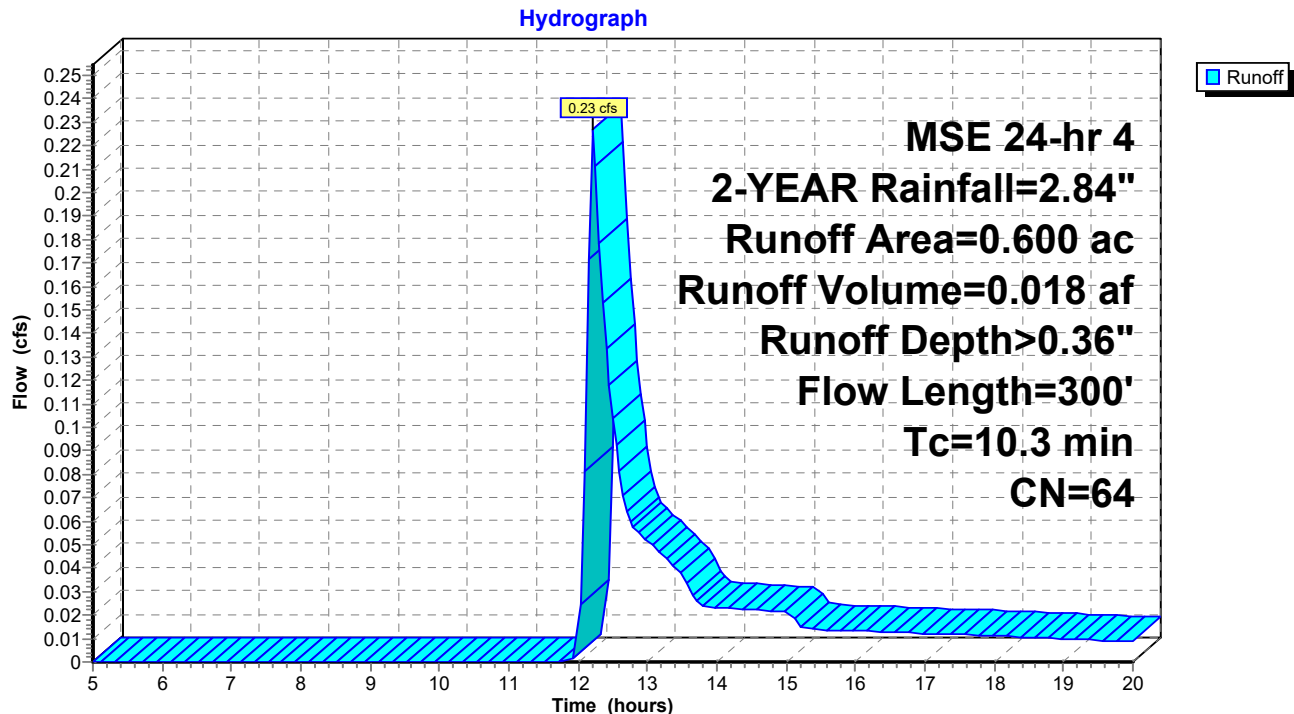
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 0.23 cfs @ 12.22 hrs, Volume= 0.018 af, Depth> 0.36"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Runoff = 0.38 cfs @ 12.15 hrs, Volume= 0.021 af, Depth> 0.50"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

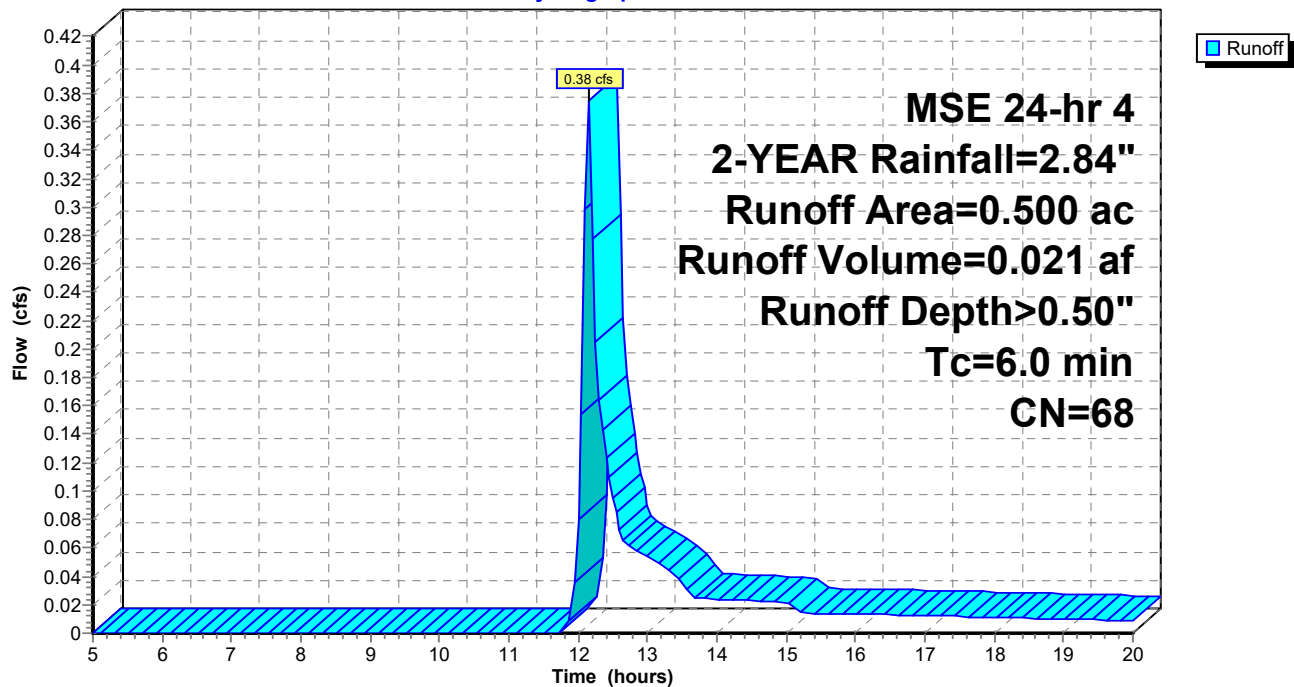
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Hydrograph



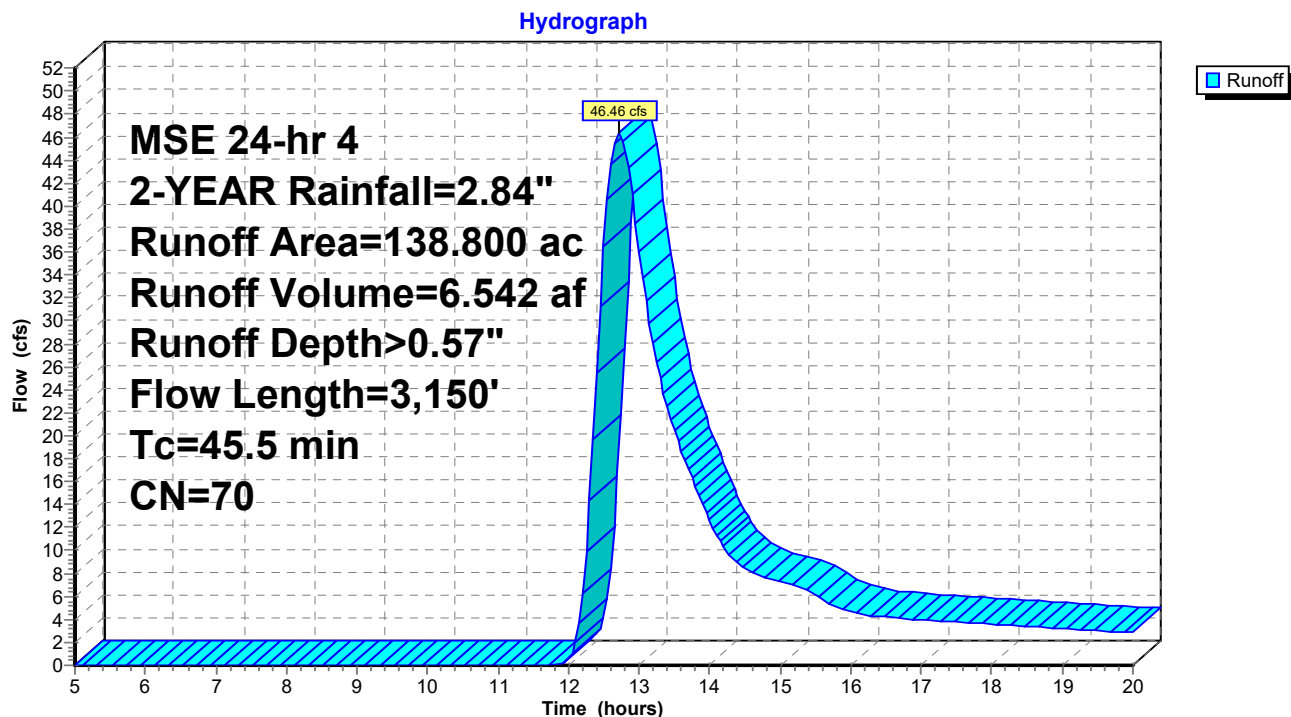
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 46.46 cfs @ 12.71 hrs, Volume= 6.542 af, Depth> 0.57"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

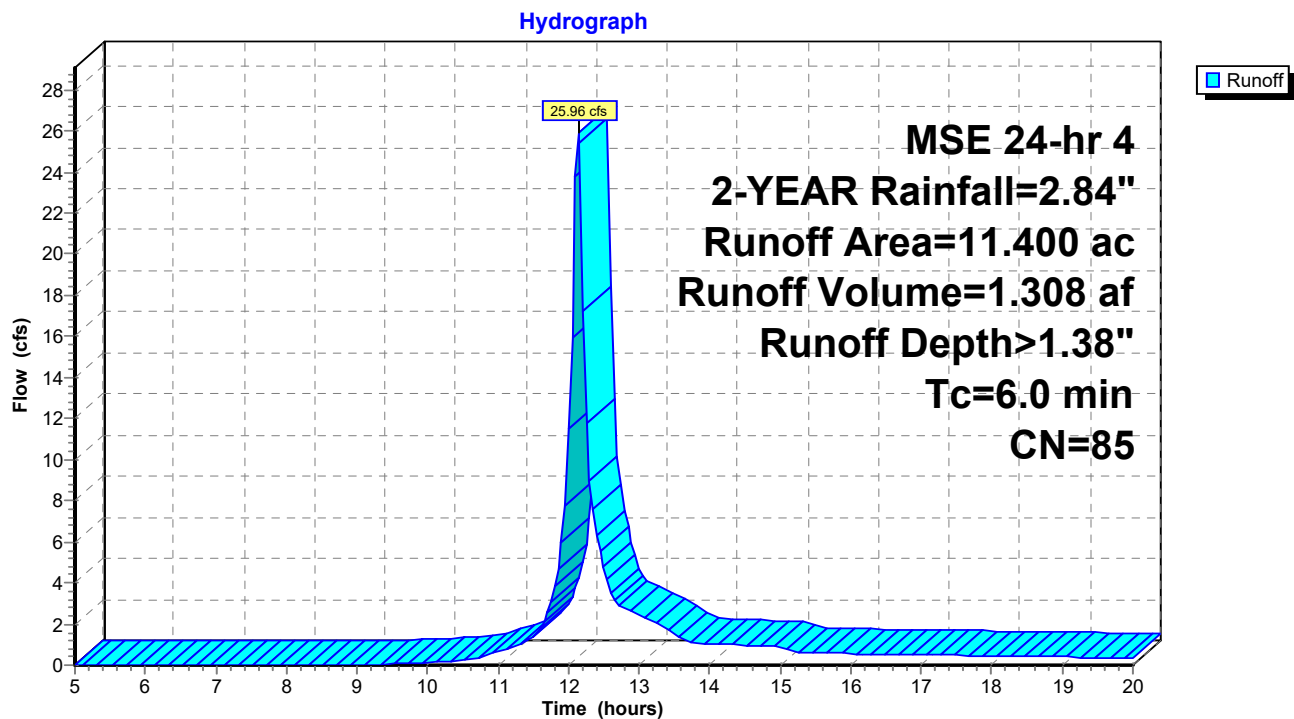
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 25.96 cfs @ 12.13 hrs, Volume= 1.308 af, Depth> 1.38"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

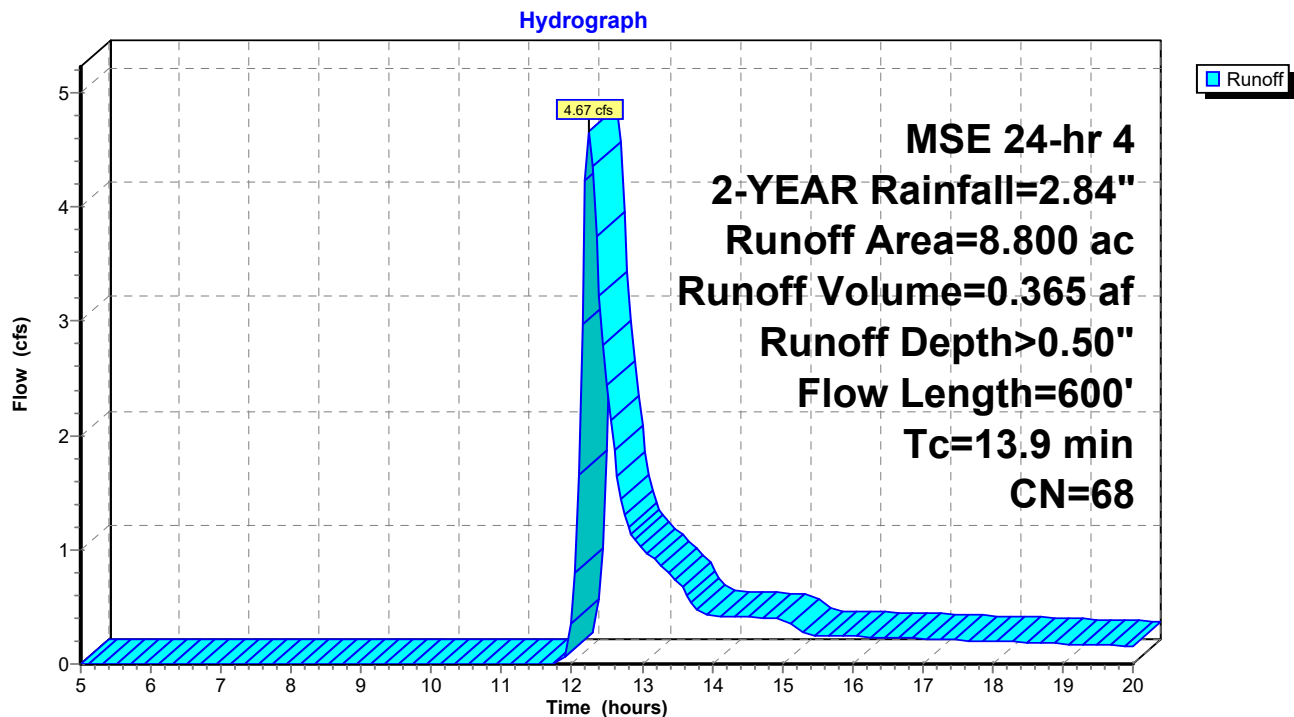
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 4.67 cfs @ 12.25 hrs, Volume= 0.365 af, Depth> 0.50"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

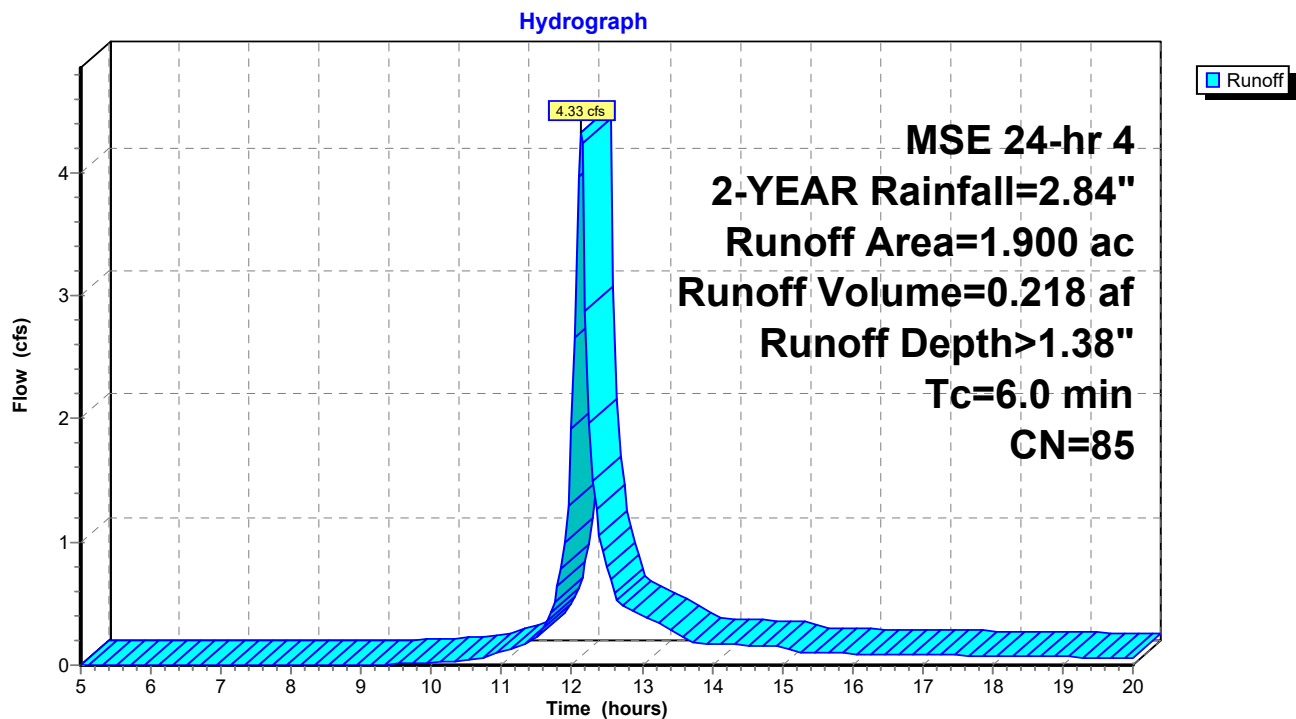
Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 4.33 cfs @ 12.13 hrs, Volume= 0.218 af, Depth> 1.38"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 0.13 cfs @ 12.43 hrs, Volume= 0.026 af, Depth> 0.13"
 Routed to Link 6L : PROP SE DISCHARGE

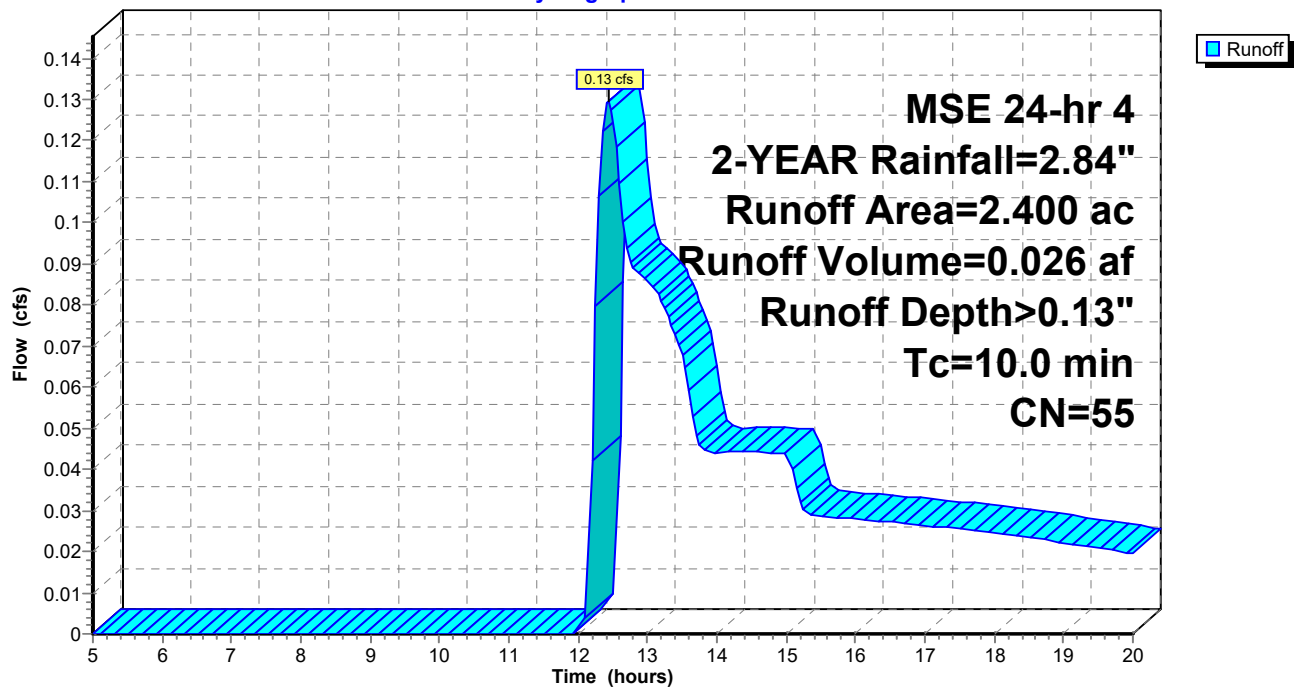
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Hydrograph



Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 0.41 cfs @ 12.60 hrs, Volume= 0.093 af, Depth> 0.13"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

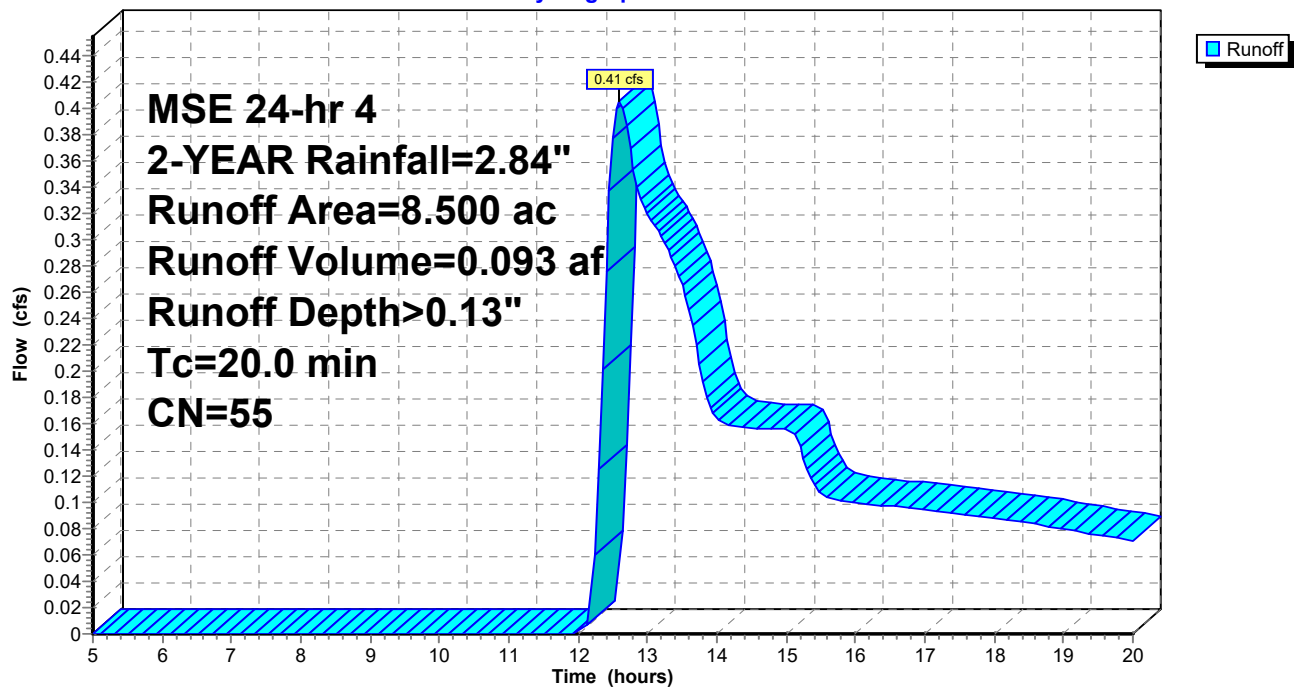
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-YEAR Rainfall=2.84"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 1.24" for 2-YEAR event
 Inflow = 29.59 cfs @ 12.13 hrs, Volume= 1.483 af
 Outflow = 0.15 cfs @ 20.00 hrs, Volume= 0.091 af, Atten= 100%, Lag= 471.9 min
 Discarded = 0.15 cfs @ 20.00 hrs, Volume= 0.091 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 929.01' @ 20.00 hrs Surf.Area= 34,723 sf Storage= 60,593 cf

Plug-Flow detention time= 287.2 min calculated for 0.091 af (6% of inflow)
 Center-of-Mass det. time= 171.5 min (966.3 - 794.9)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

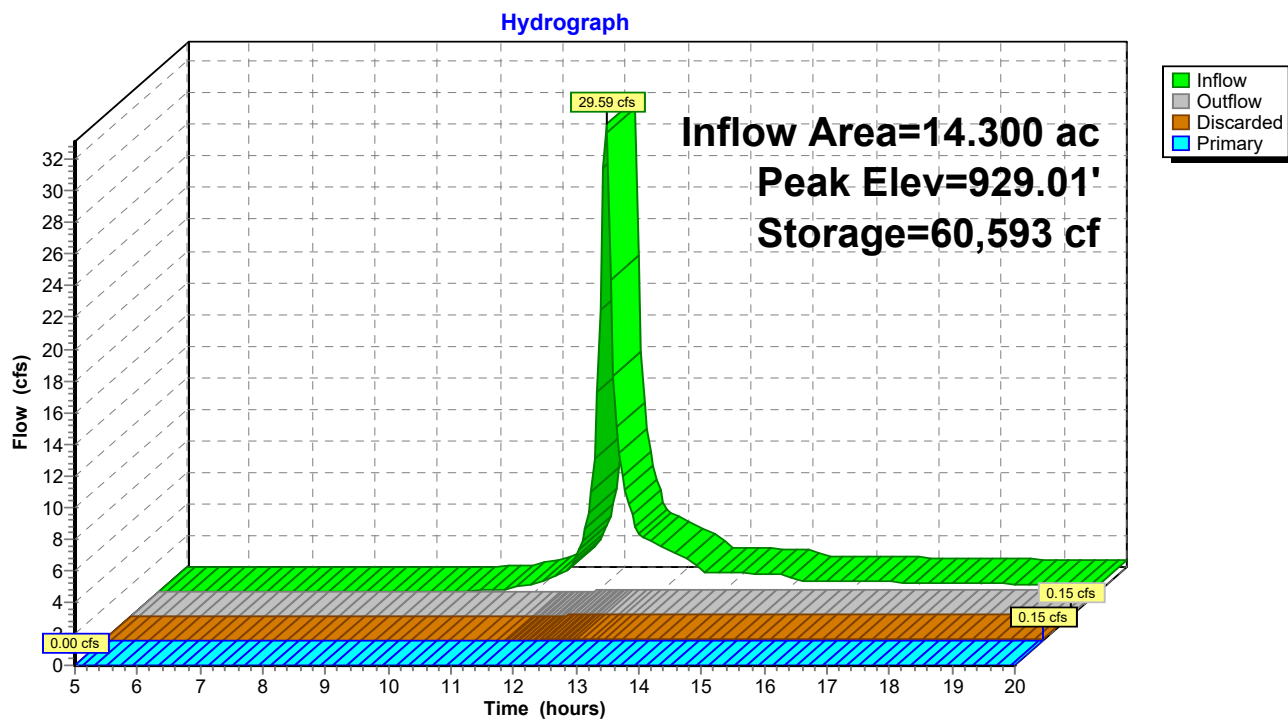
Discarded OutFlow Max=0.15 cfs @ 20.00 hrs HW=929.01' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.15 cfs of 3.08 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.15 cfs @ 6.69 fps)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=927.00' (Free Discharge)

↑ **2=Culvert** (Controls 0.00 cfs)
 ↑ **4=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS



Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 0.99" for 2-YEAR event
 Inflow = 28.59 cfs @ 12.14 hrs, Volume= 1.673 af
 Outflow = 0.66 cfs @ 17.82 hrs, Volume= 0.429 af, Atten= 98%, Lag= 340.7 min
 Primary = 0.66 cfs @ 17.82 hrs, Volume= 0.429 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.64' @ 17.82 hrs Surf.Area= 24,643 sf Storage= 54,877 cf

Plug-Flow detention time= 254.0 min calculated for 0.427 af (26% of inflow)
 Center-of-Mass det. time= 163.3 min (963.6 - 800.3)

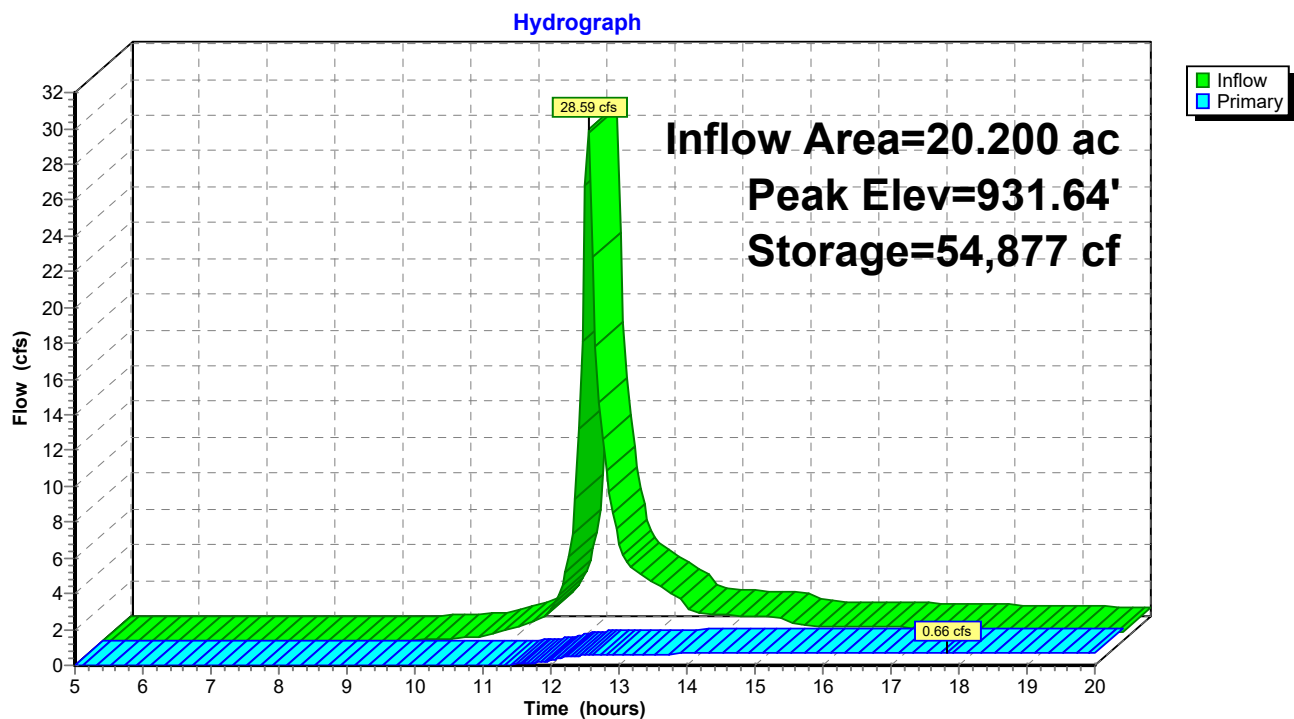
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 ' S Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' SideZ 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=0.66 cfs @ 17.82 hrs HW=931.64' (Free Discharge)

1=Culvert (Passes 0.66 cfs of 28.48 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.66 cfs @ 7.57 fps)
 3=Orifice/Grate (Controls 0.00 cfs)
 4=Orifice/Grate (Controls 0.00 cfs)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[79] Warning: Submerged Pond 10P Primary device # 1 INLET by 1.77'

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 0.54" for 2-YEAR event
 Inflow = 47.54 cfs @ 12.71 hrs, Volume= 7.188 af
 Outflow = 4.72 cfs @ 16.96 hrs, Volume= 2.912 af, Atten= 90%, Lag= 254.9 min
 Discarded = 4.72 cfs @ 16.96 hrs, Volume= 2.912 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 930.77' @ 16.96 hrs Surf.Area= 3.445 ac Storage= 4.418 af

Plug-Flow detention time= 213.6 min calculated for 2.903 af (40% of inflow)
 Center-of-Mass det. time= 116.4 min (975.2 - 858.8)

Volume	Invert	Avail.Storage	Storage Description
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#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)
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Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
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#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
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#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf
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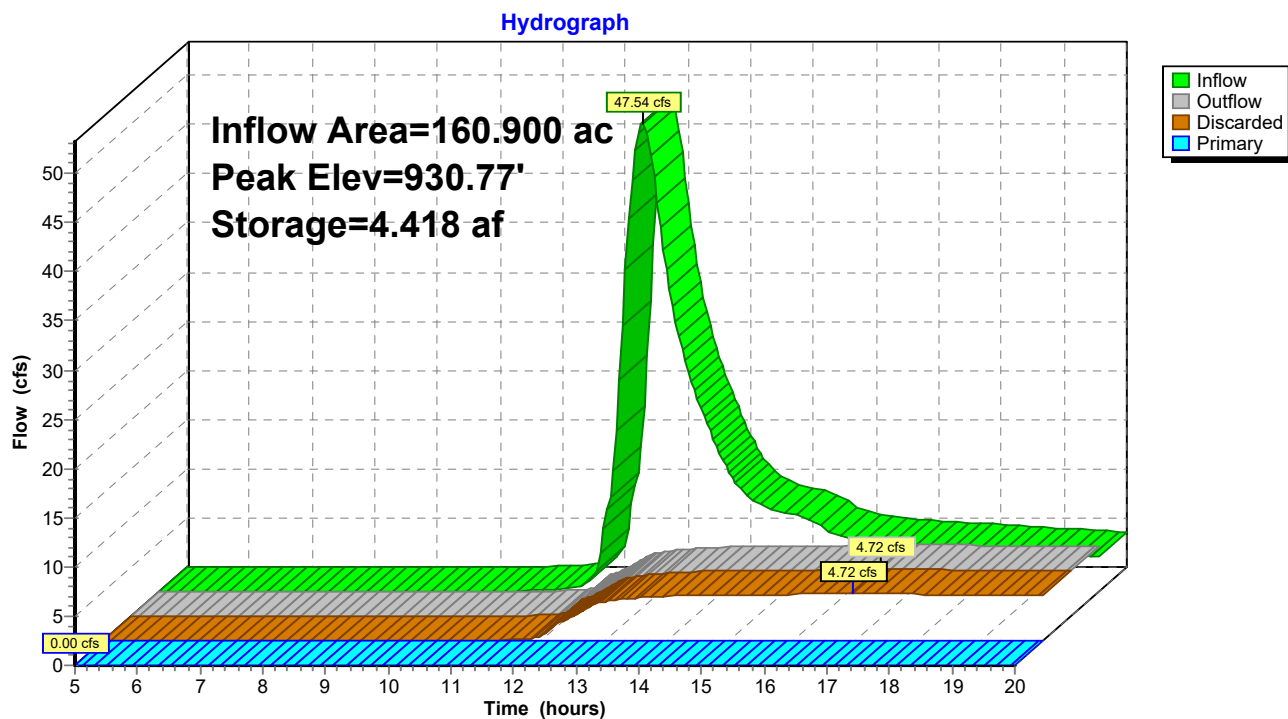
Discarded OutFlow Max=4.72 cfs @ 16.96 hrs HW=930.77' (Free Discharge)

↑**1=Exfiltration** (Controls 4.72 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=929.00' (Free Discharge)

↑**2=Culvert** (Controls 0.00 cfs)

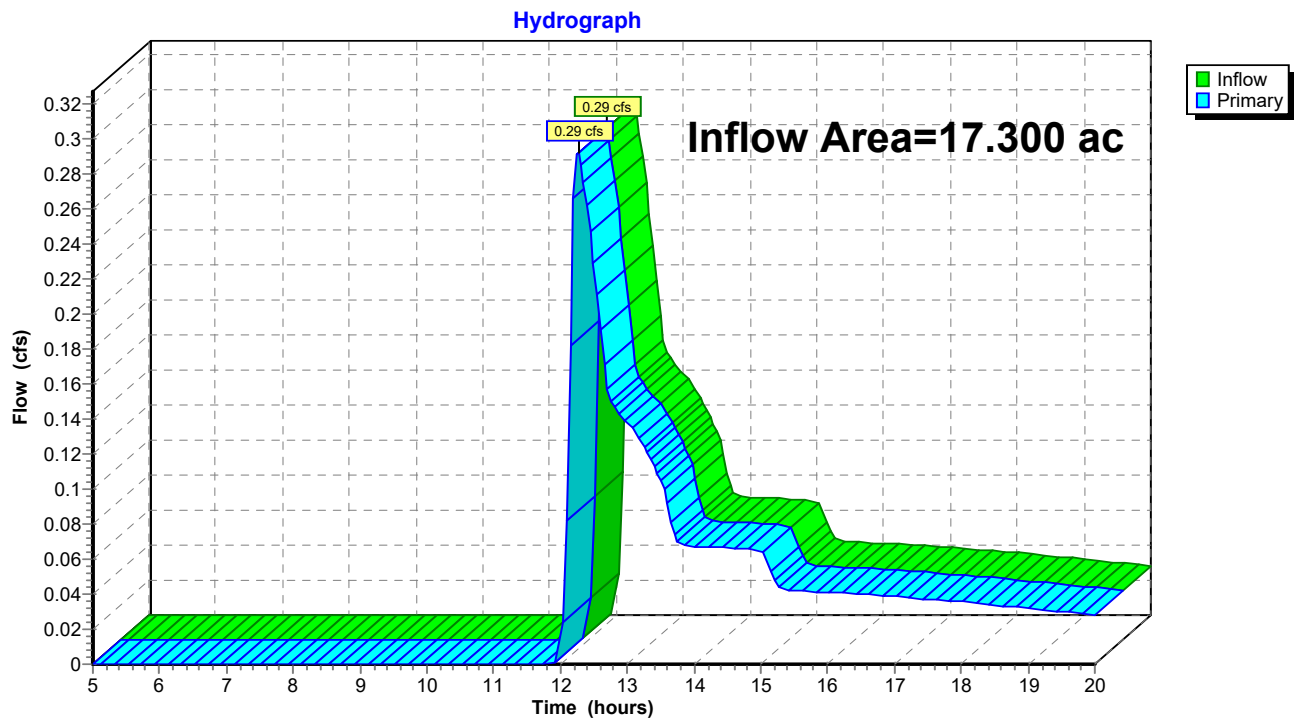
Pond 12P: PR NORTH KETTLE



Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 0.03" for 2-YEAR event
Inflow = 0.29 cfs @ 12.26 hrs, Volume= 0.044 af
Primary = 0.29 cfs @ 12.26 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

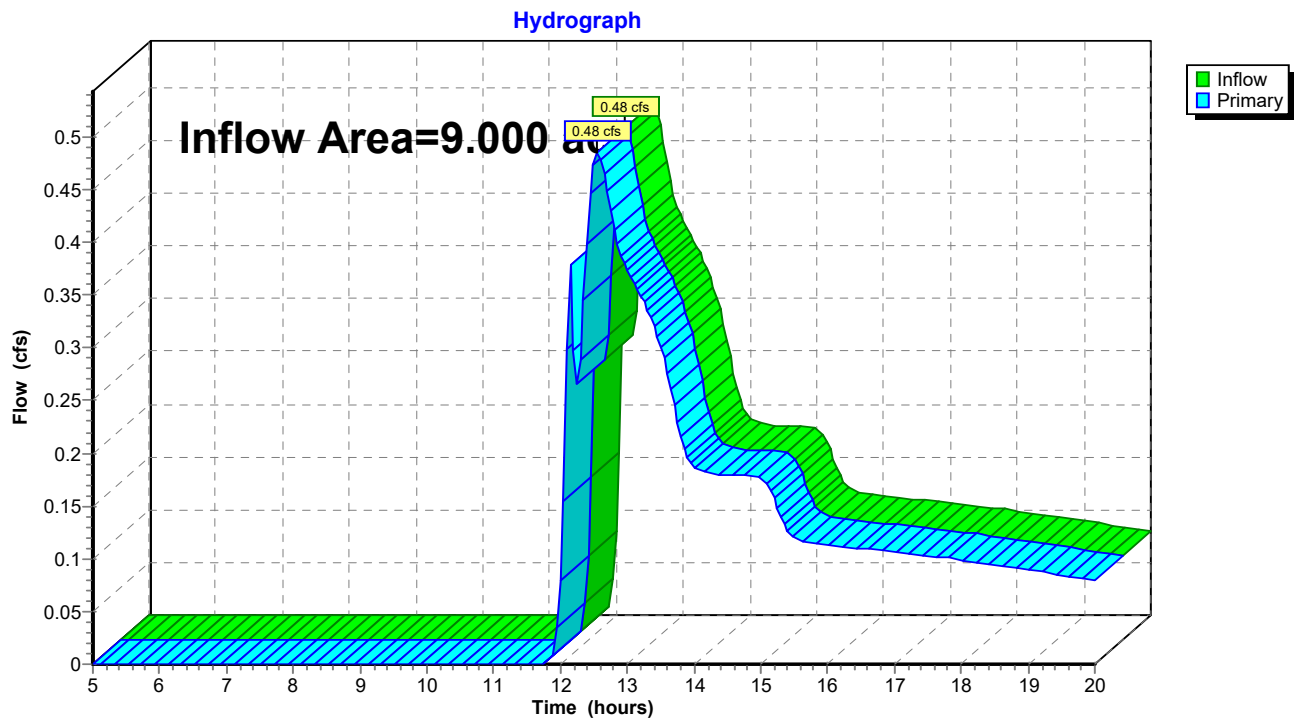
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 0.15" for 2-YEAR event
Inflow = 0.48 cfs @ 12.56 hrs, Volume= 0.113 af
Primary = 0.48 cfs @ 12.56 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

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Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 5-YEAR Rainfall=3.45"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>1.72"
Tc=6.0 min CN=83 Runoff=40.61 cfs 2.051 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>0.62"
Flow Length=300' Tc=10.3 min CN=64 Runoff=0.46 cfs 0.031 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>0.81"
Tc=6.0 min CN=68 Runoff=0.65 cfs 0.034 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>0.89"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=77.92 cfs 10.306 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>1.87"
Tc=6.0 min CN=85 Runoff=34.96 cfs 1.780 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>0.80"
Flow Length=600' Tc=13.9 min CN=68 Runoff=8.20 cfs 0.590 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>1.87"
Tc=6.0 min CN=85 Runoff=5.83 cfs 0.297 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>0.29"
Tc=10.0 min CN=55 Runoff=0.51 cfs 0.058 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>0.29"
Tc=20.0 min CN=55 Runoff=1.41 cfs 0.205 af

Pond 7P: SOUTH PONDS Peak Elev=929.67' Storage=84,578 cf Inflow=40.61 cfs 2.051 af
Discarded=0.17 cfs 0.108 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.108 af

Pond 10P: NORTH POND Peak Elev=932.38' Storage=73,918 cf Inflow=40.27 cfs 2.370 af
Outflow=1.40 cfs 0.834 af

Pond 12P: PR NORTH KETTLE Peak Elev=931.58' Storage=7.461 af Inflow=79.39 cfs 11.437 af
Discarded=5.68 cfs 3.514 af Primary=1.60 cfs 0.706 af Outflow=7.28 cfs 4.220 af

Link 6L: PROP SE DISCHARGE Inflow=0.97 cfs 0.089 af
Primary=0.97 cfs 0.089 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=1.60 cfs 0.238 af
Primary=1.60 cfs 0.238 af

Total Runoff Area = 187.200 ac Runoff Volume = 15.351 af Average Runoff Depth = 0.98"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 40.61 cfs @ 12.13 hrs, Volume= 2.051 af, Depth> 1.72"
 Routed to Pond 7P : SOUTH PONDS

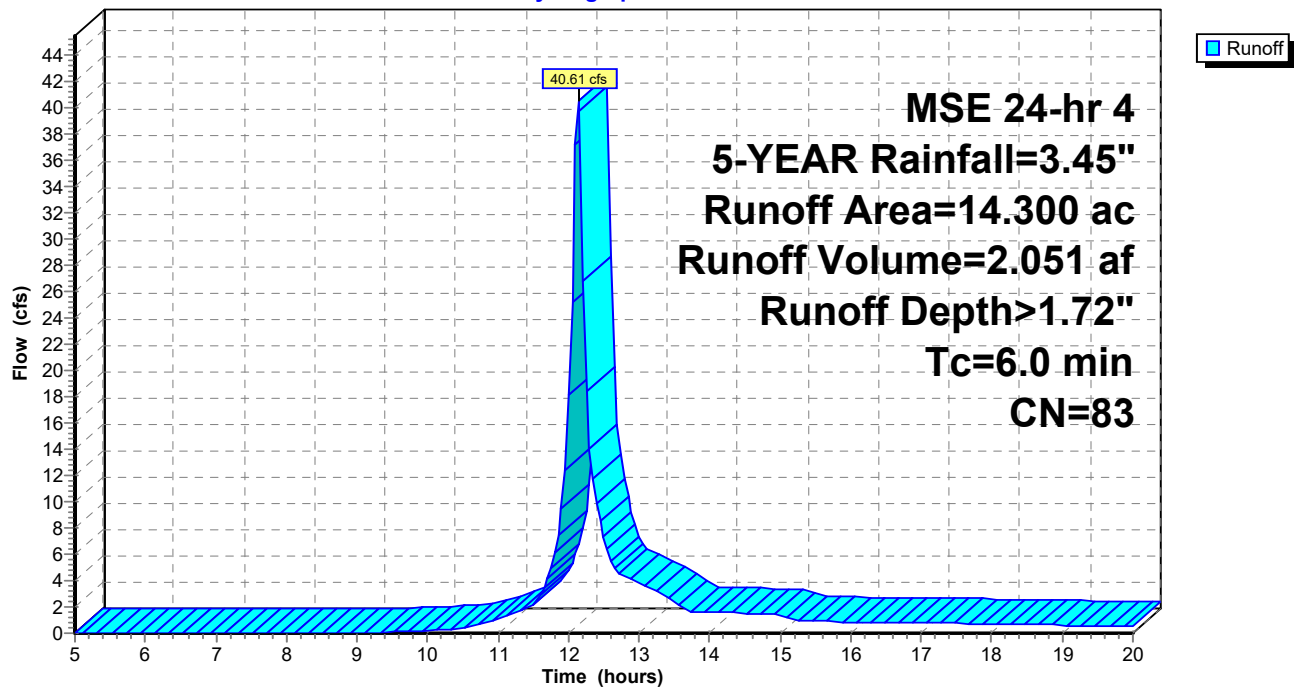
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

Hydrograph



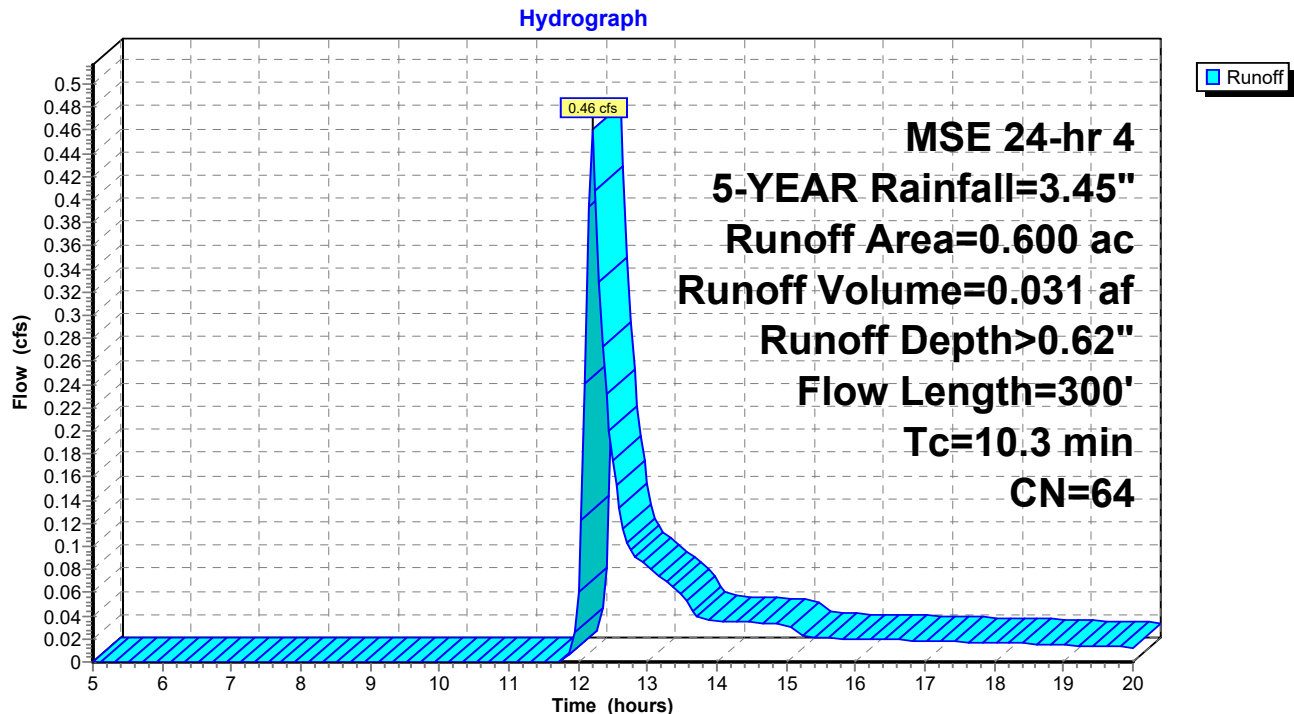
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 0.46 cfs @ 12.20 hrs, Volume= 0.031 af, Depth> 0.62"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Runoff = 0.65 cfs @ 12.14 hrs, Volume= 0.034 af, Depth> 0.81"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

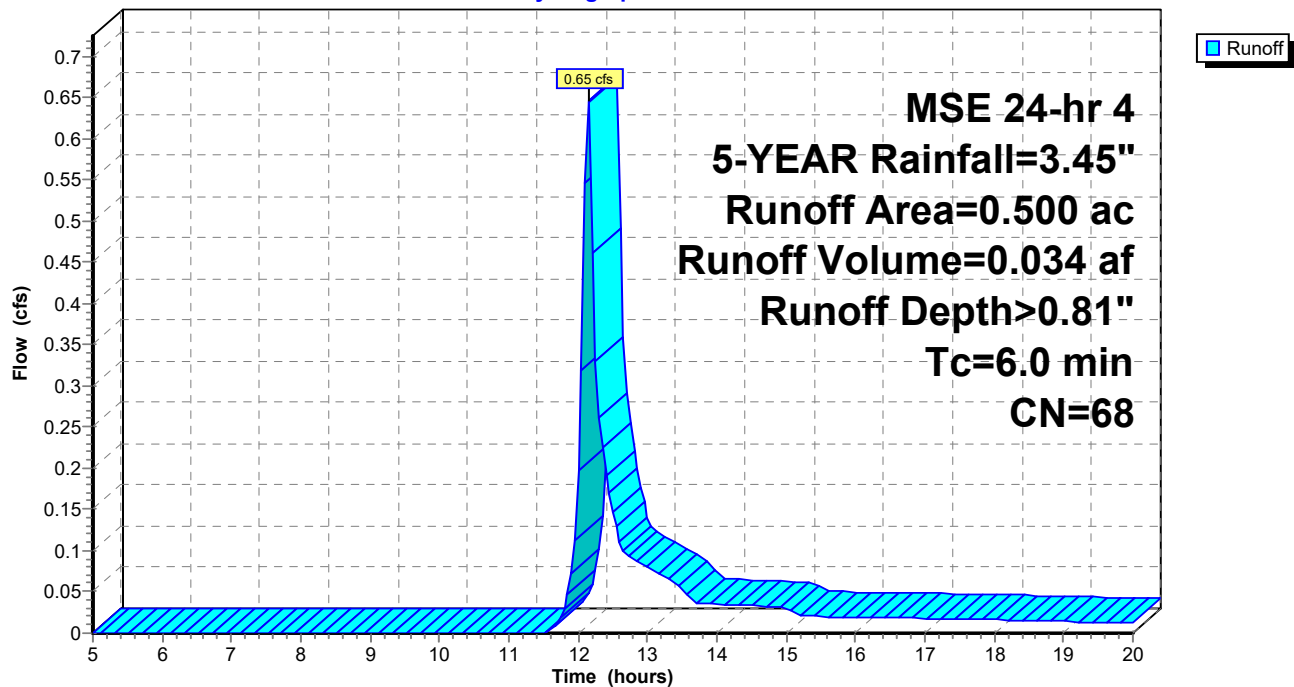
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Hydrograph



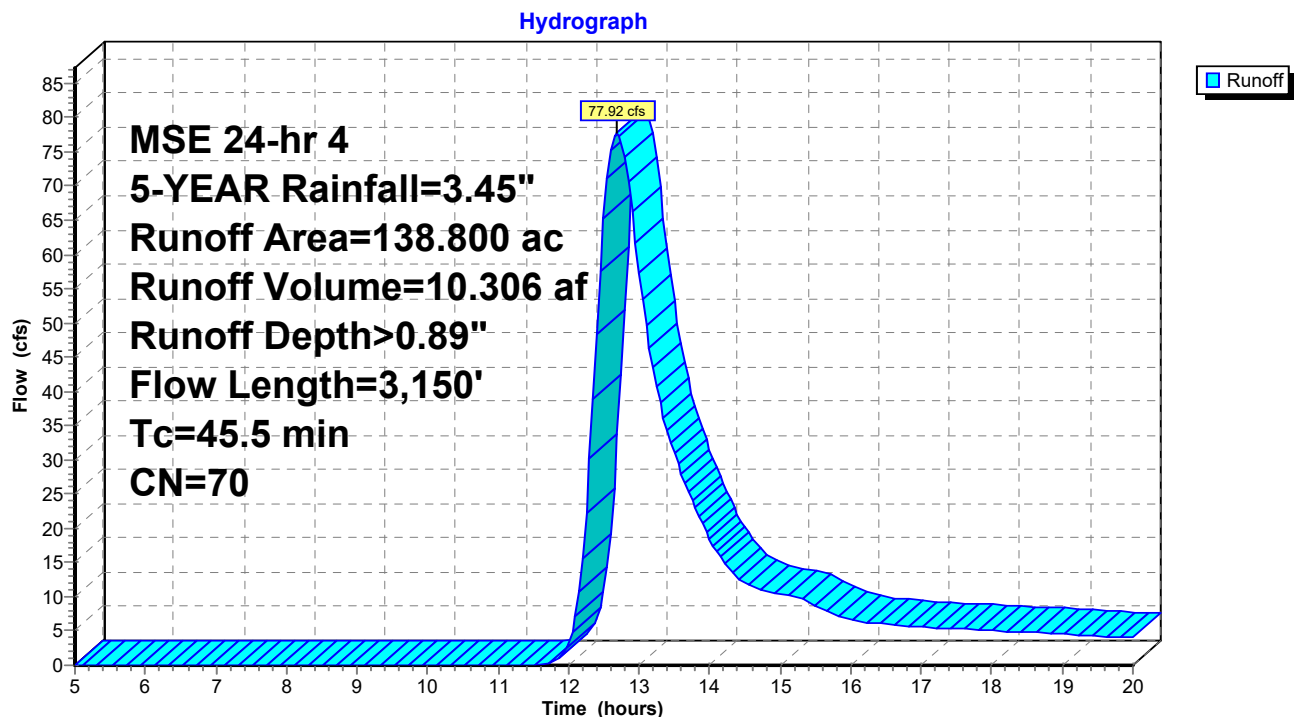
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 77.92 cfs @ 12.69 hrs, Volume= 10.306 af, Depth> 0.89"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 34.96 cfs @ 12.13 hrs, Volume= 1.780 af, Depth> 1.87"
 Routed to Pond 10P : NORTH POND

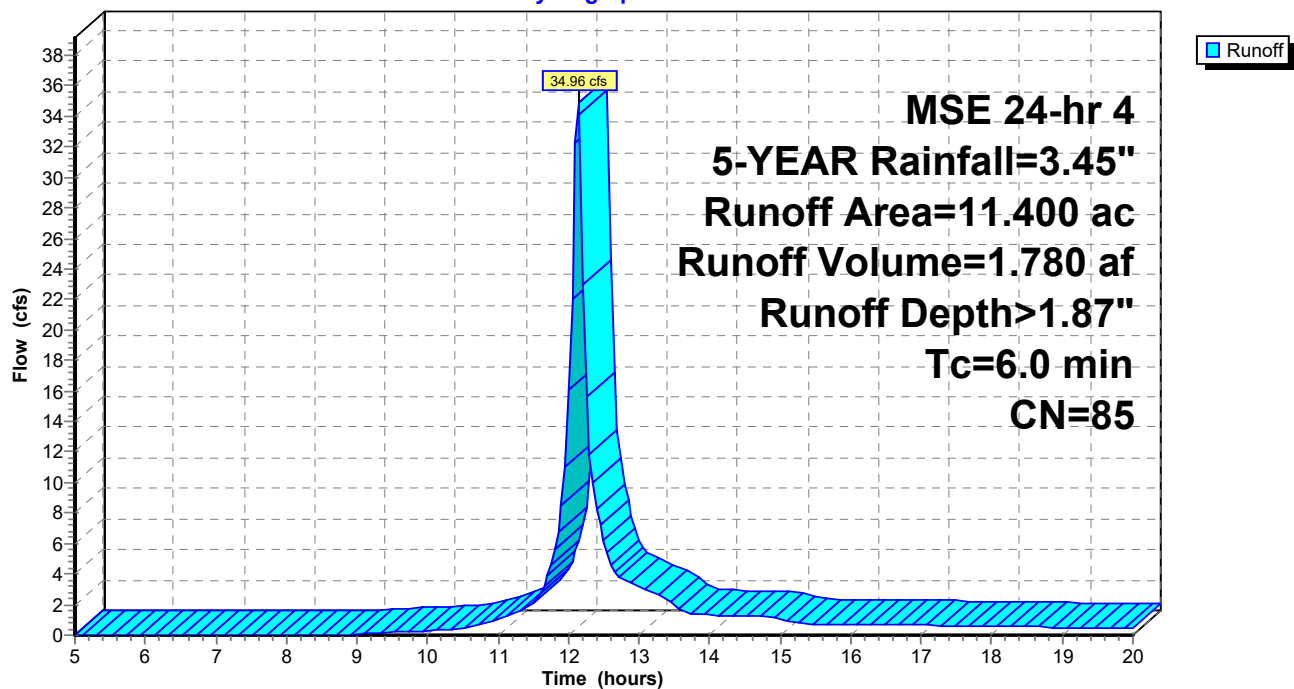
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

Hydrograph



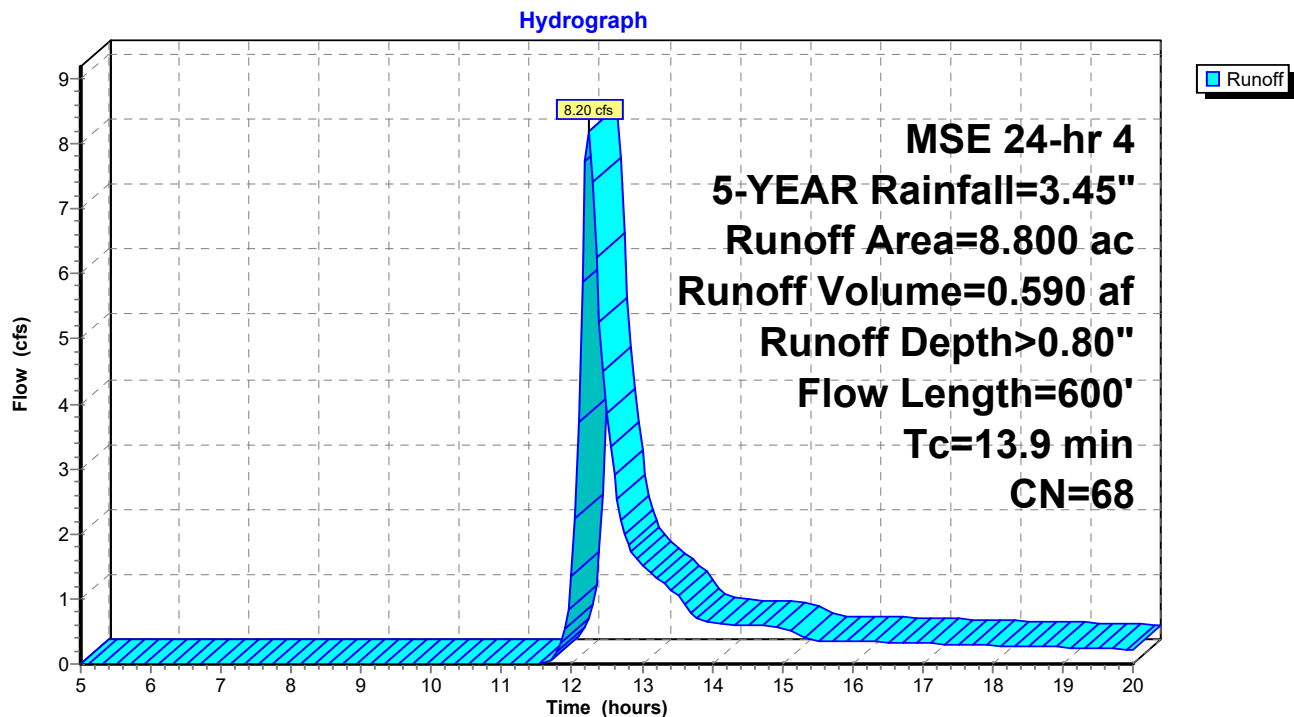
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 8.20 cfs @ 12.24 hrs, Volume= 0.590 af, Depth> 0.80"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 5.83 cfs @ 12.13 hrs, Volume= 0.297 af, Depth> 1.87"
 Routed to Pond 12P : PR NORTH KETTLE

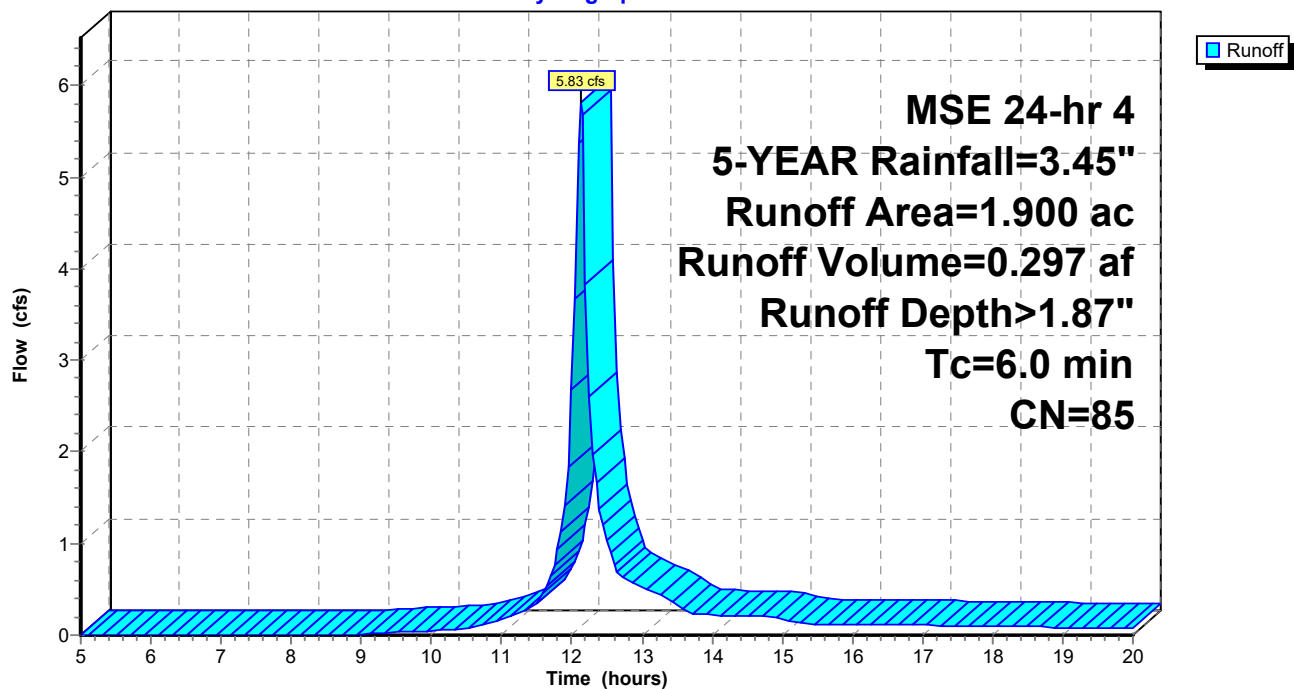
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Hydrograph



Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 0.51 cfs @ 12.25 hrs, Volume= 0.058 af, Depth> 0.29"
 Routed to Link 6L : PROP SE DISCHARGE

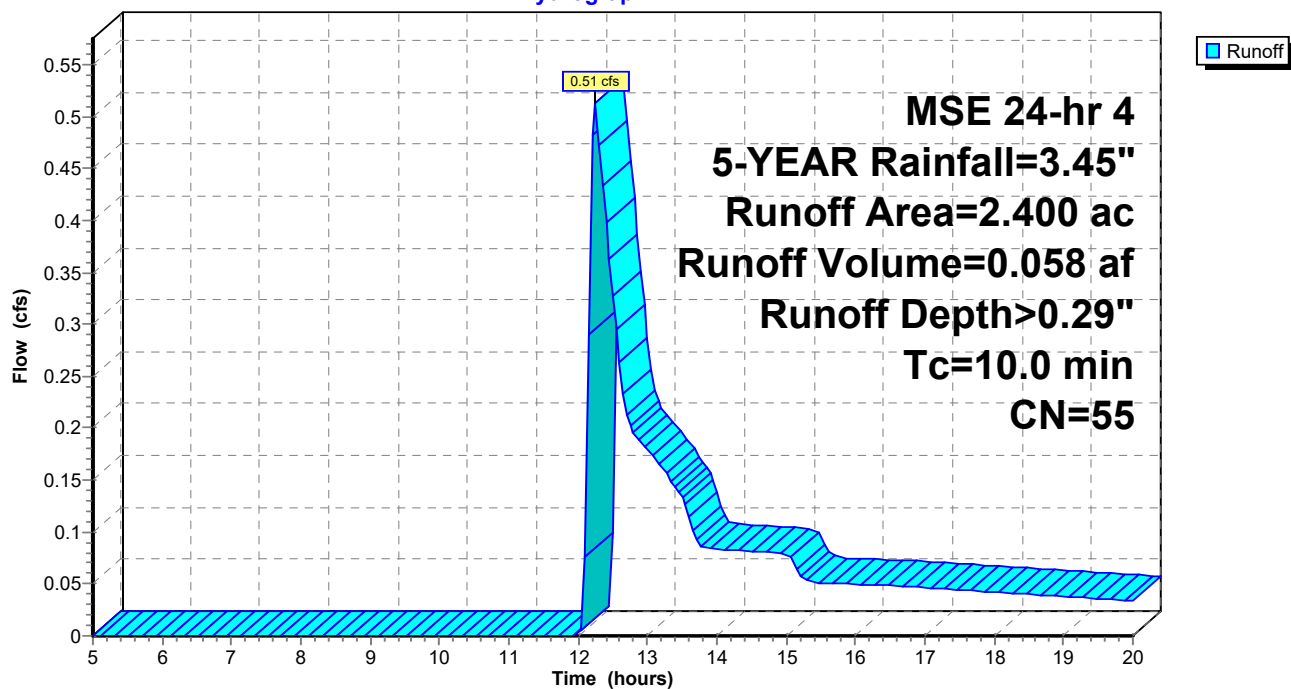
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Hydrograph



Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

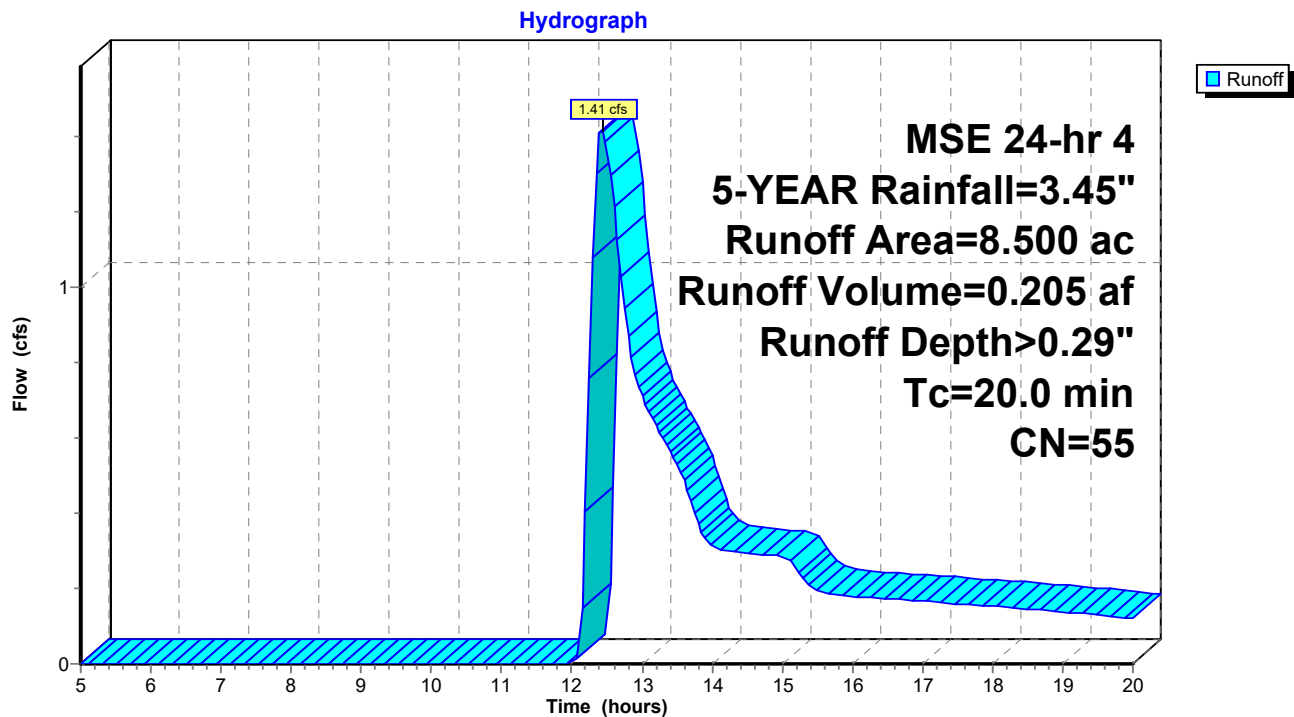
Runoff = 1.41 cfs @ 12.43 hrs, Volume= 0.205 af, Depth> 0.29"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-YEAR Rainfall=3.45"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 1.72" for 5-YEAR event
 Inflow = 40.61 cfs @ 12.13 hrs, Volume= 2.051 af
 Outflow = 0.17 cfs @ 20.00 hrs, Volume= 0.108 af, Atten= 100%, Lag= 472.0 min
 Discarded = 0.17 cfs @ 20.00 hrs, Volume= 0.108 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 929.67' @ 20.00 hrs Surf.Area= 37,756 sf Storage= 84,578 cf

Plug-Flow detention time= 306.7 min calculated for 0.108 af (5% of inflow)
 Center-of-Mass det. time= 172.8 min (961.5 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.17 cfs @ 20.00 hrs HW=929.67' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.17 cfs of 3.40 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 0.17 cfs @ 7.75 fps)

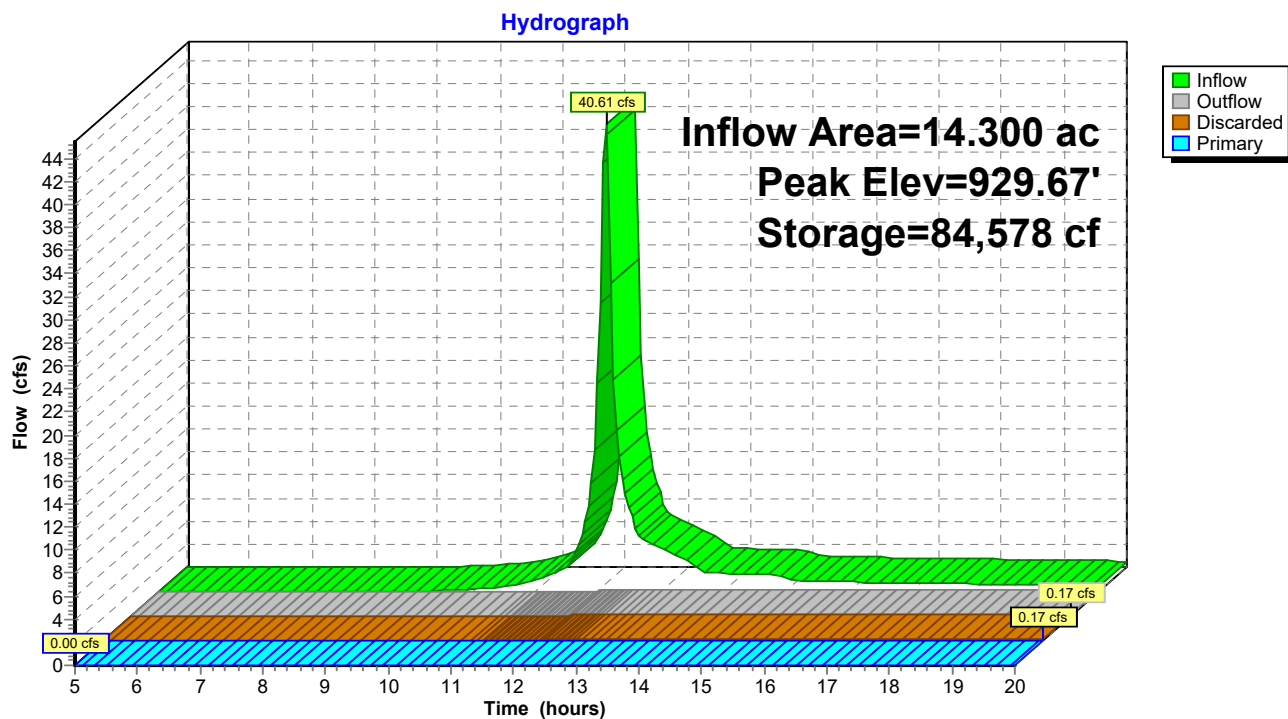
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=927.00' (Free Discharge)

↑ **2=Culvert** (Controls 0.00 cfs)

↑ **4=Orifice/Grate** (Controls 0.00 cfs)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS



Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 1.41" for 5-YEAR event
 Inflow = 40.27 cfs @ 12.14 hrs, Volume= 2.370 af
 Outflow = 1.40 cfs @ 15.12 hrs, Volume= 0.834 af, Atten= 97%, Lag= 178.8 min
 Primary = 1.40 cfs @ 15.12 hrs, Volume= 0.834 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 932.38' @ 15.12 hrs Surf.Area= 26,790 sf Storage= 73,918 cf

Plug-Flow detention time= 255.2 min calculated for 0.834 af (35% of inflow)
 Center-of-Mass det. time= 170.9 min (965.4 - 794.5)

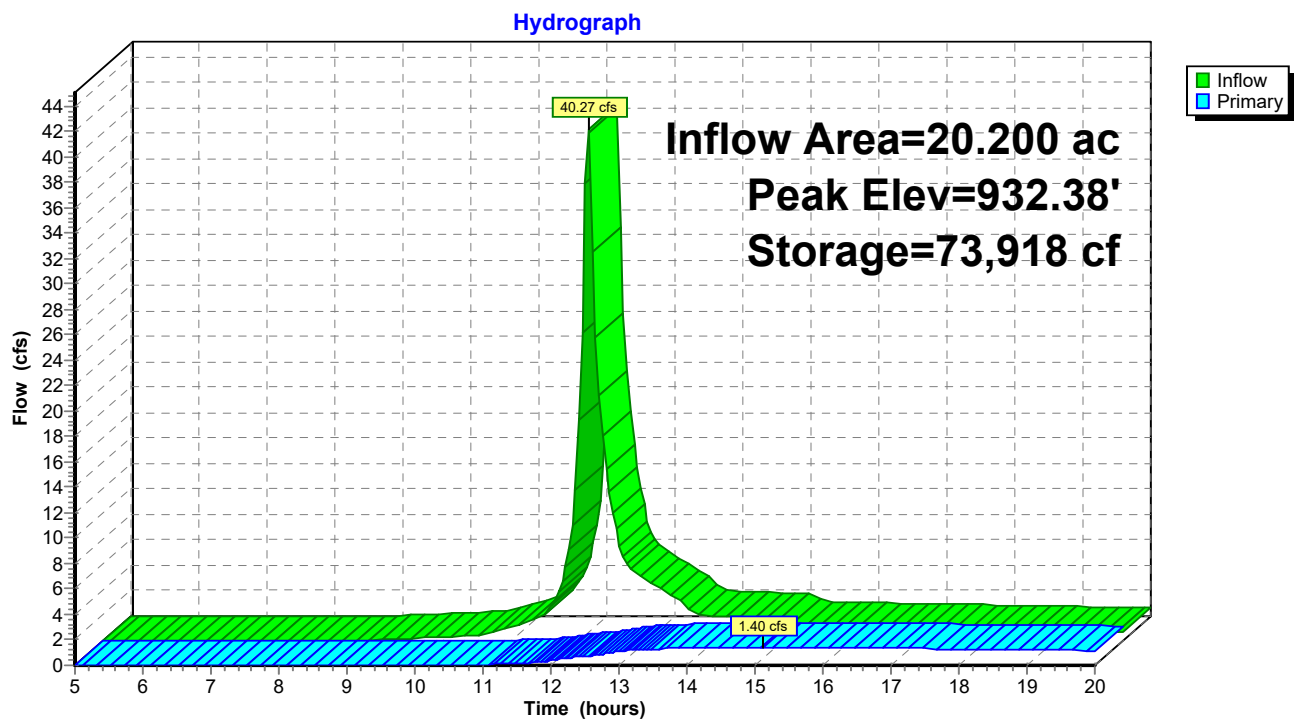
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' / SideZ 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=1.40 cfs @ 15.12 hrs HW=932.38' (Free Discharge)

1=Culvert (Passes 1.40 cfs of 40.31 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.75 cfs @ 8.63 fps)
 3=Orifice/Grate (Orifice Controls 0.65 cfs @ 3.32 fps)
 4=Orifice/Grate (Controls 0.00 cfs)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[79] Warning: Submerged Pond 10P Primary device # 1 INLET by 2.58'

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 0.85" for 5-YEAR event
 Inflow = 79.39 cfs @ 12.69 hrs, Volume= 11.437 af
 Outflow = 7.28 cfs @ 16.69 hrs, Volume= 4.220 af, Atten= 91%, Lag= 239.8 min
 Discarded = 5.68 cfs @ 16.69 hrs, Volume= 3.514 af
 Primary = 1.60 cfs @ 16.69 hrs, Volume= 0.706 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.58' @ 16.69 hrs Surf.Area= 4.073 ac Storage= 7.461 af

Plug-Flow detention time= 226.7 min calculated for 4.206 af (37% of inflow)
 Center-of-Mass det. time= 130.2 min (982.5 - 852.2)

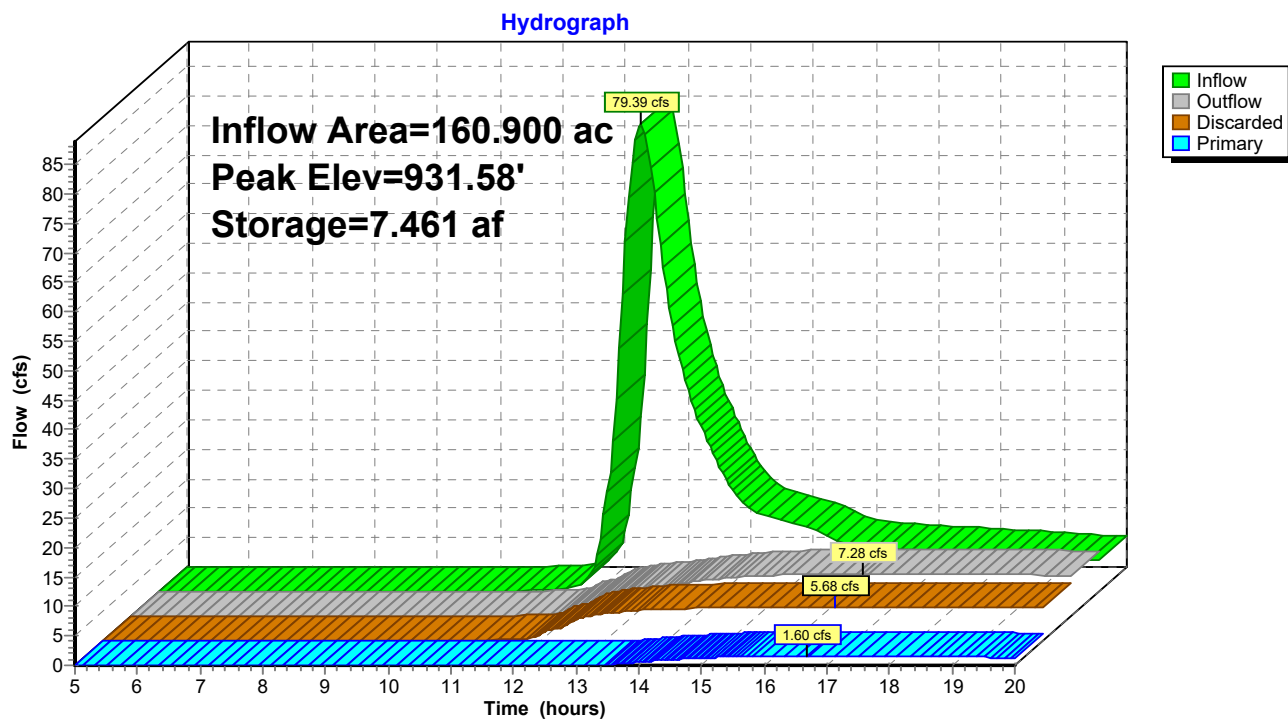
Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013. Flow Area= 12.57 sf

Discarded OutFlow Max=5.68 cfs @ 16.69 hrs HW=931.58' (Free Discharge)
 ↑1=Exfiltration (Controls 5.68 cfs)

Primary OutFlow Max=1.59 cfs @ 16.69 hrs HW=931.58' (Free Discharge)
 ↑2=Culvert (Barrel Controls 1.59 cfs @ 2.17 fps)

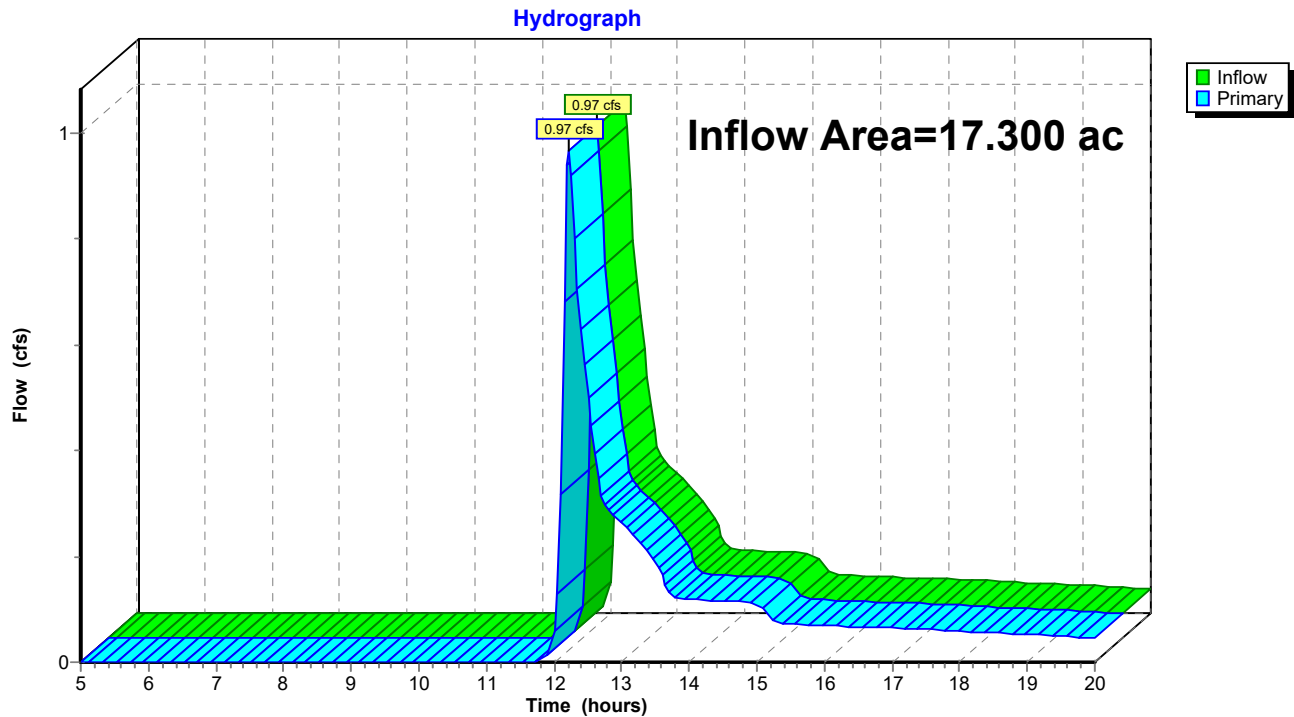
Pond 12P: PR NORTH KETTLE



Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 0.06" for 5-YEAR event
Inflow = 0.97 cfs @ 12.22 hrs, Volume= 0.089 af
Primary = 0.97 cfs @ 12.22 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min

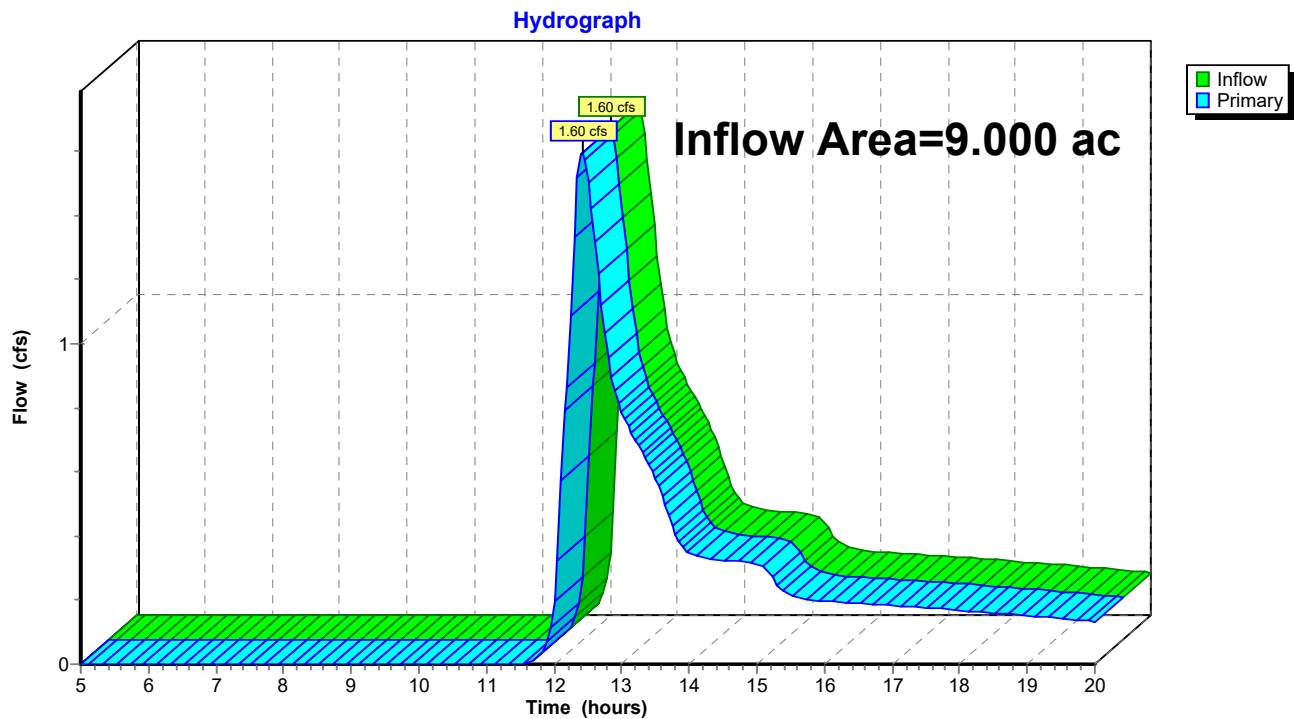
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 0.32" for 5-YEAR event
Inflow = 1.60 cfs @ 12.42 hrs, Volume= 0.238 af
Primary = 1.60 cfs @ 12.42 hrs, Volume= 0.238 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 10-YEAR Rainfall=4.09"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>2.25"
Tc=6.0 min CN=83 Runoff=52.51 cfs 2.677 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>0.94"
Flow Length=300' Tc=10.3 min CN=64 Runoff=0.75 cfs 0.047 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>1.18"
Tc=6.0 min CN=68 Runoff=0.97 cfs 0.049 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>1.28"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=115.14 cfs 14.769 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>2.42"
Tc=6.0 min CN=85 Runoff=44.59 cfs 2.296 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=600' Tc=13.9 min CN=68 Runoff=12.41 cfs 0.859 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>2.42"
Tc=6.0 min CN=85 Runoff=7.43 cfs 0.383 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>0.51"
Tc=10.0 min CN=55 Runoff=1.28 cfs 0.102 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>0.51"
Tc=20.0 min CN=55 Runoff=3.24 cfs 0.359 af

Pond 7P: SOUTH PONDS Peak Elev=930.35' Storage=111,158 cf Inflow=52.51 cfs 2.677 af
Discarded=0.19 cfs 0.124 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.124 af

Pond 10P: NORTH POND Peak Elev=933.09' Storage=93,704 cf Inflow=53.13 cfs 3.155 af
Outflow=2.95 cfs 1.282 af

Pond 12P: PR NORTH KETTLE Peak Elev=932.22' Storage=10.268 af Inflow=117.57 cfs 16.434 af
Discarded=6.51 cfs 4.037 af Primary=7.46 cfs 3.385 af Outflow=13.97 cfs 7.421 af

Link 6L: PROP SE DISCHARGE Inflow=2.03 cfs 0.149 af
Primary=2.03 cfs 0.149 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=3.54 cfs 0.408 af
Primary=3.54 cfs 0.408 af

Total Runoff Area = 187.200 ac Runoff Volume = 21.541 af Average Runoff Depth = 1.38"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

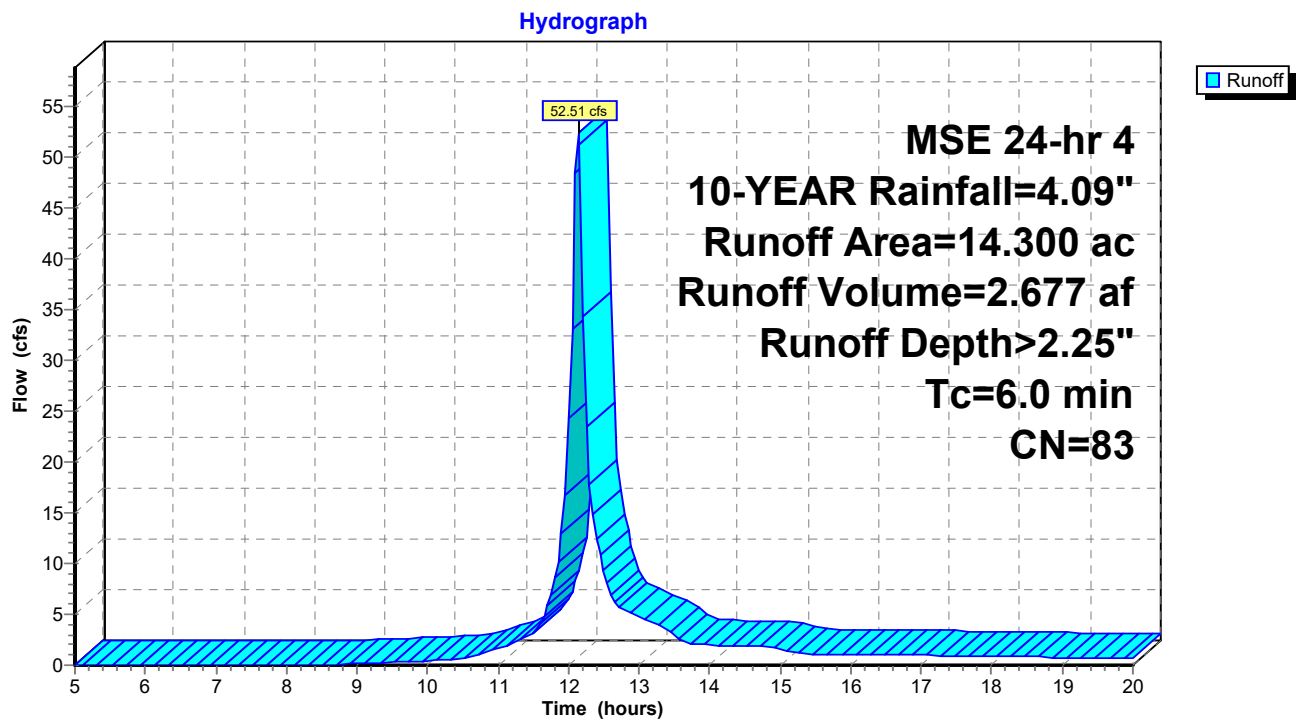
Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 52.51 cfs @ 12.13 hrs, Volume= 2.677 af, Depth> 2.25"
 Routed to Pond 7P : SOUTH PONDS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

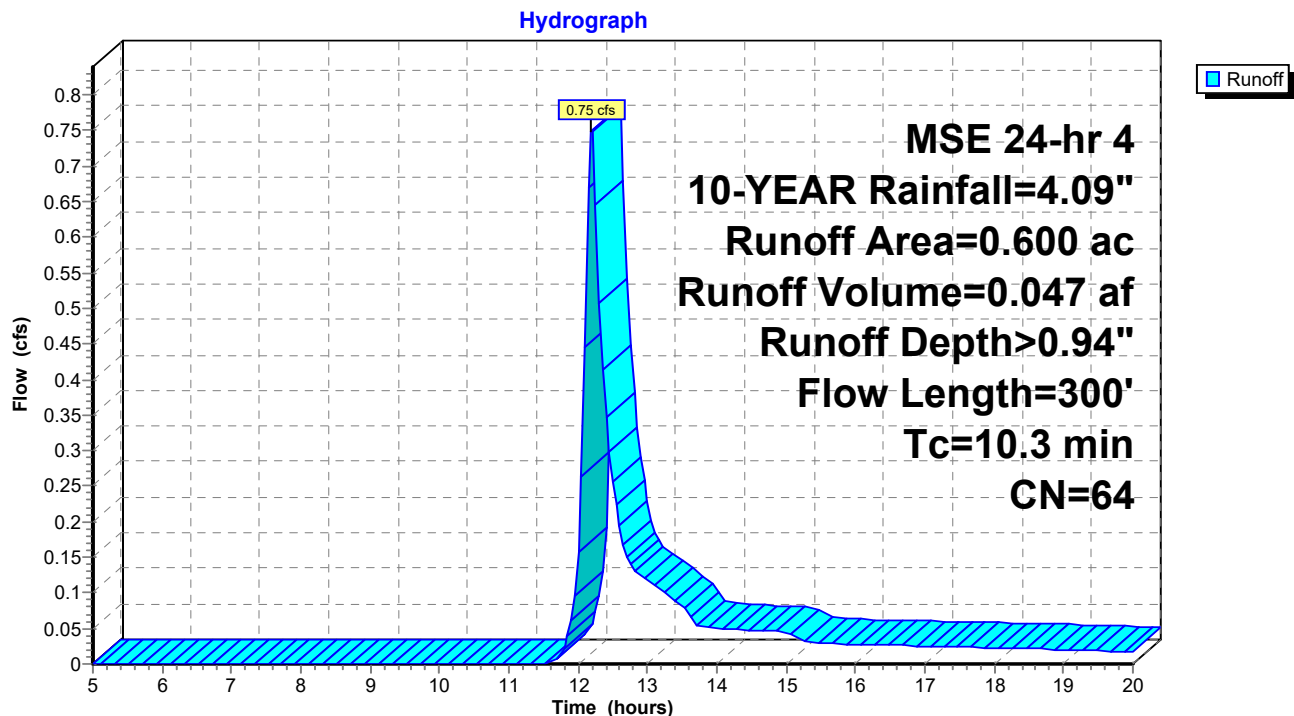
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 0.75 cfs @ 12.20 hrs, Volume= 0.047 af, Depth> 0.94"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

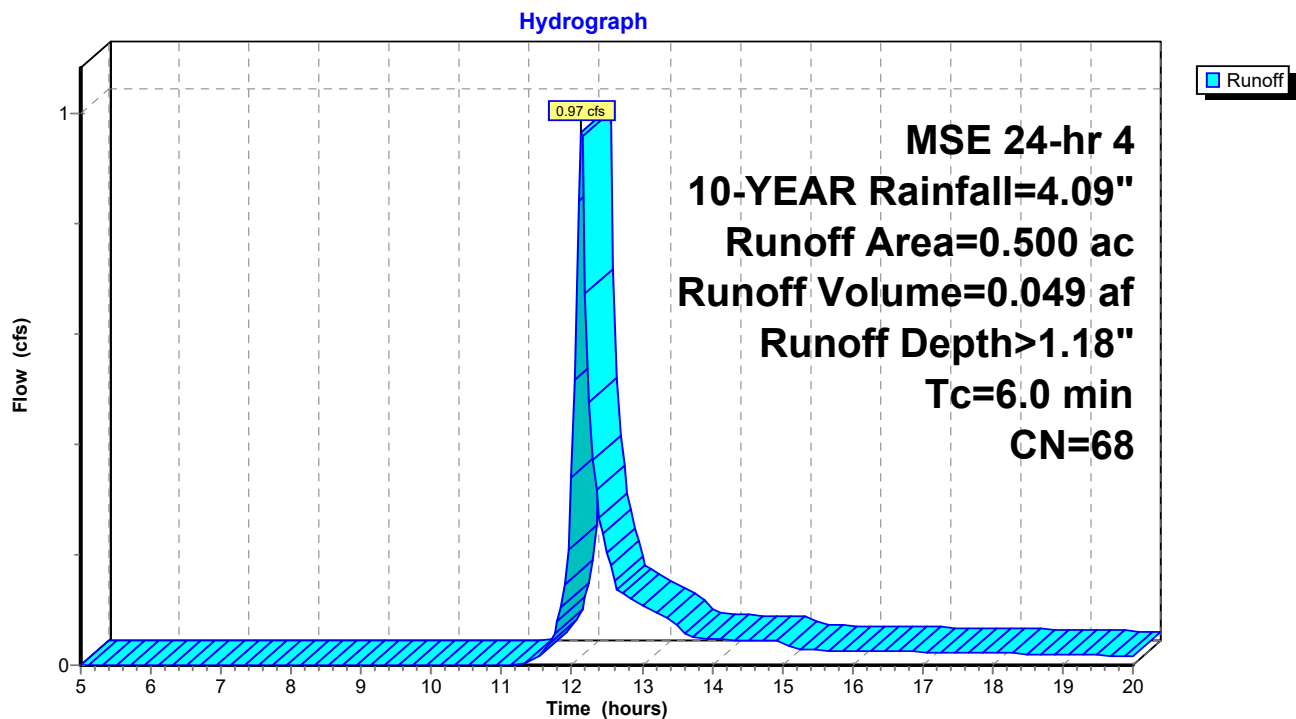
Runoff = 0.97 cfs @ 12.14 hrs, Volume= 0.049 af, Depth> 1.18"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

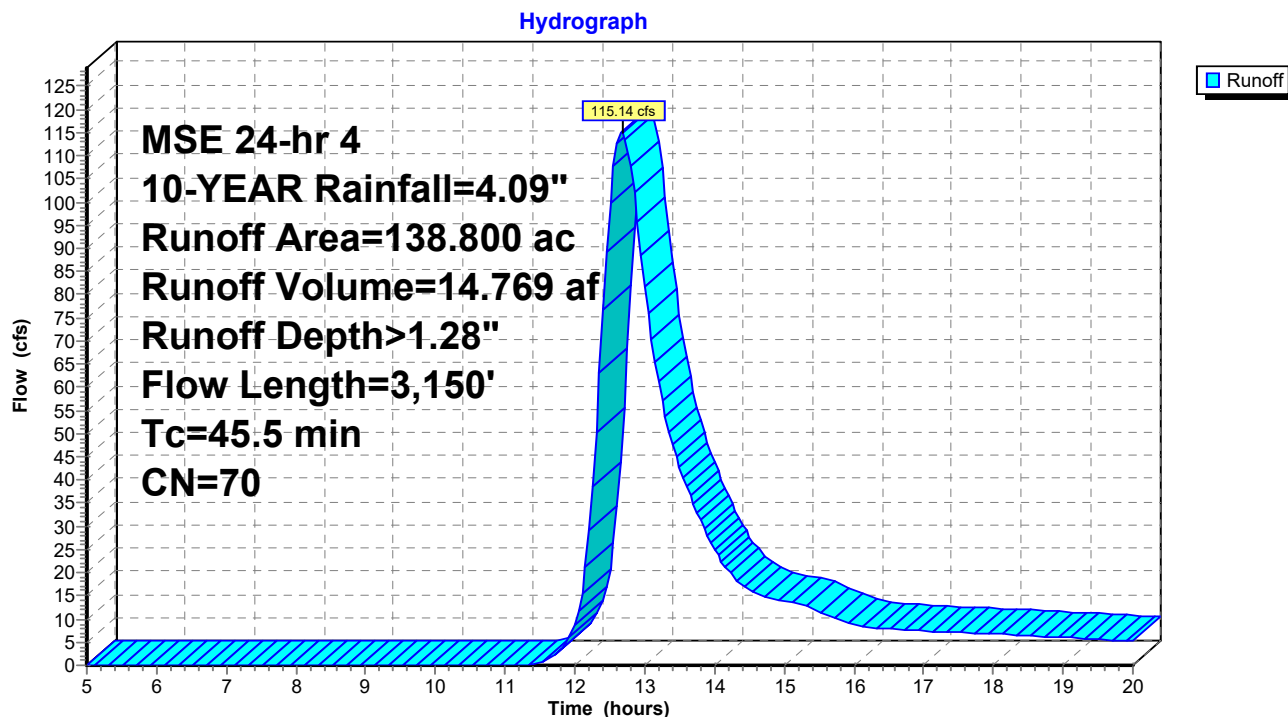
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 115.14 cfs @ 12.67 hrs, Volume= 14.769 af, Depth> 1.28"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

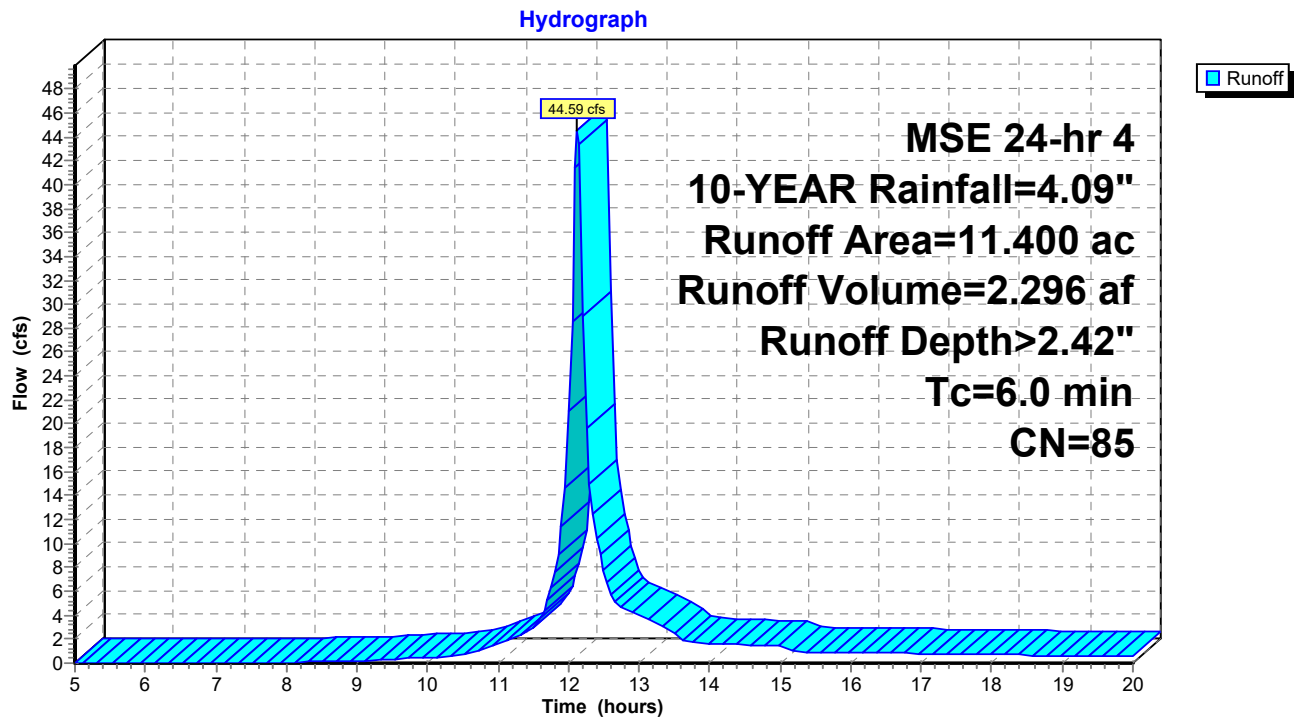
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 44.59 cfs @ 12.13 hrs, Volume= 2.296 af, Depth> 2.42"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

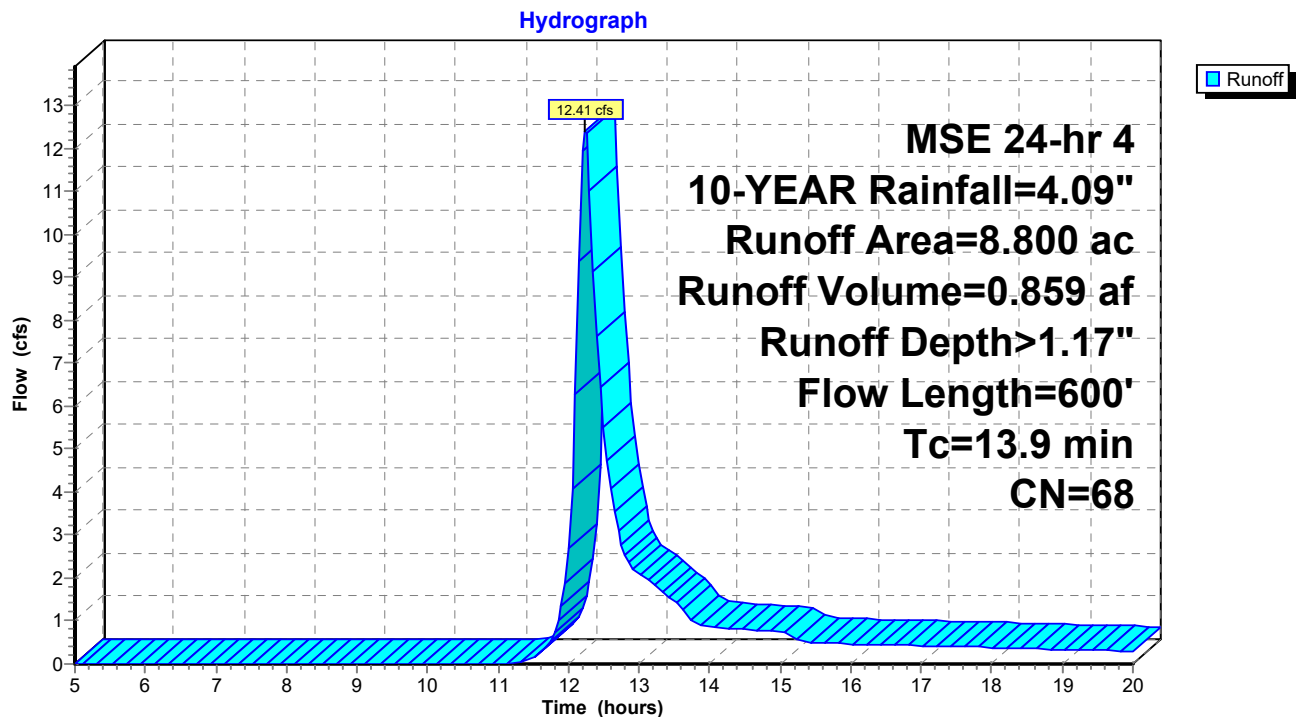
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 12.41 cfs @ 12.24 hrs, Volume= 0.859 af, Depth> 1.17"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 7.43 cfs @ 12.13 hrs, Volume= 0.383 af, Depth> 2.42"
 Routed to Pond 12P : PR NORTH KETTLE

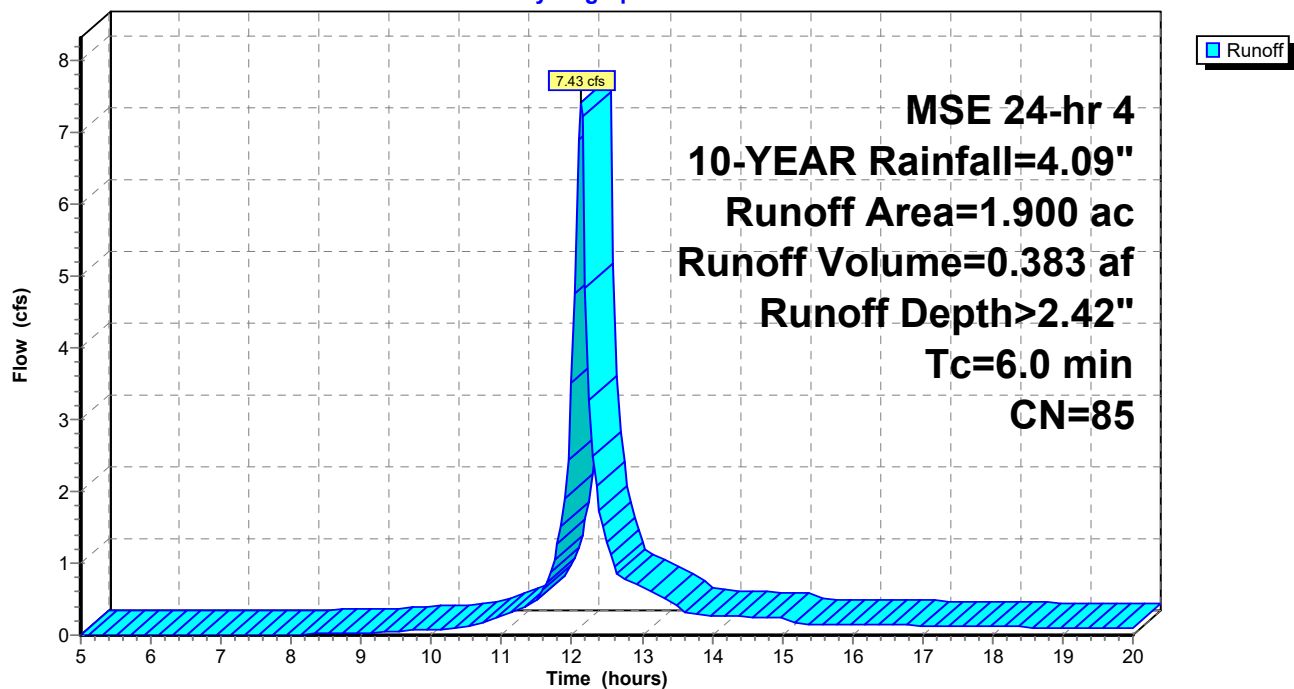
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Hydrograph



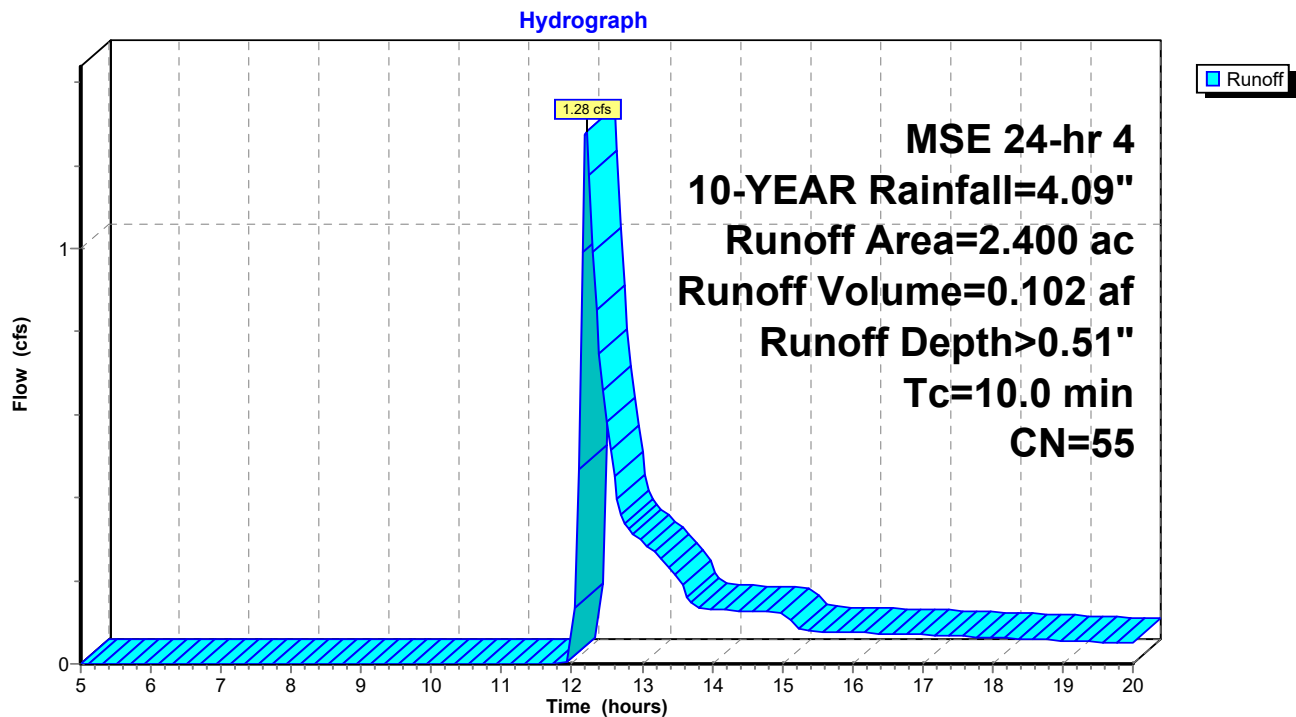
Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 1.28 cfs @ 12.21 hrs, Volume= 0.102 af, Depth> 0.51"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 3.24 cfs @ 12.37 hrs, Volume= 0.359 af, Depth> 0.51"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

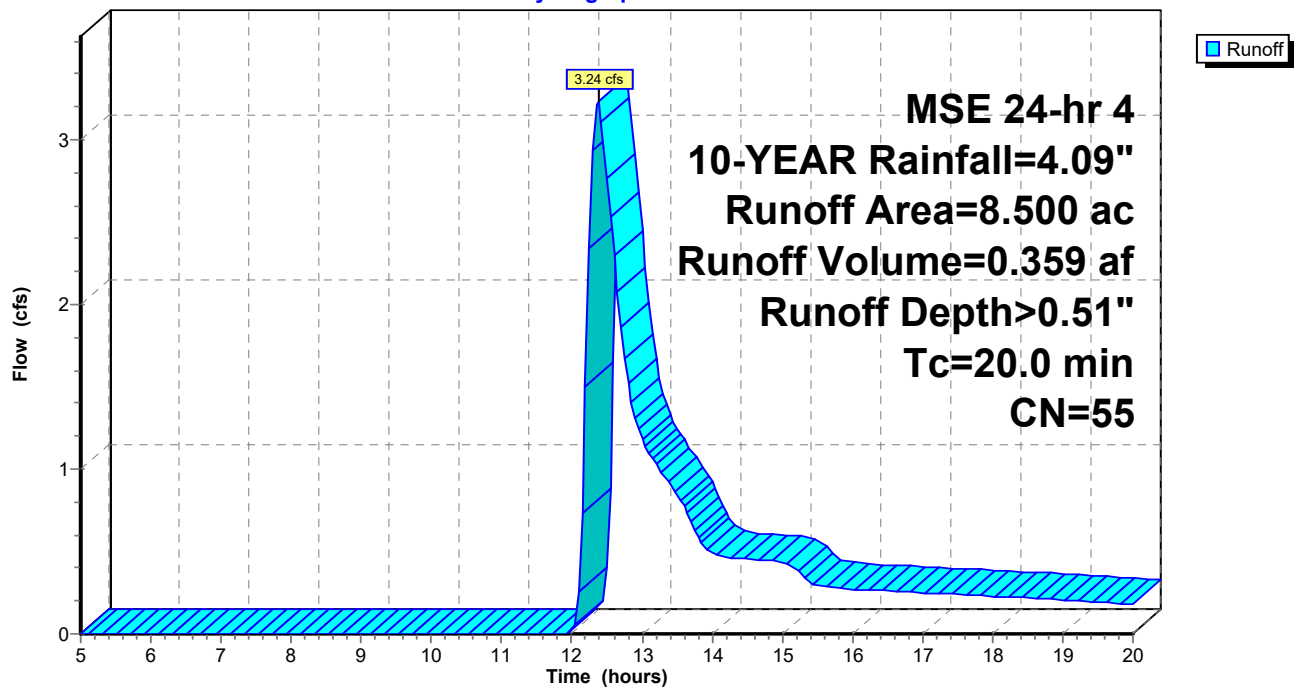
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-YEAR Rainfall=4.09"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 2.25" for 10-YEAR event
 Inflow = 52.51 cfs @ 12.13 hrs, Volume= 2.677 af
 Outflow = 0.19 cfs @ 20.00 hrs, Volume= 0.124 af, Atten= 100%, Lag= 472.1 min
 Discarded = 0.19 cfs @ 20.00 hrs, Volume= 0.124 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 930.35' @ 20.00 hrs Surf.Area= 40,856 sf Storage= 111,158 cf

Plug-Flow detention time= 325.6 min calculated for 0.123 af (5% of inflow)
 Center-of-Mass det. time= 172.8 min (956.4 - 783.6)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.19 cfs @ 20.00 hrs HW=930.35' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.19 cfs of 3.74 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 0.19 cfs @ 8.70 fps)

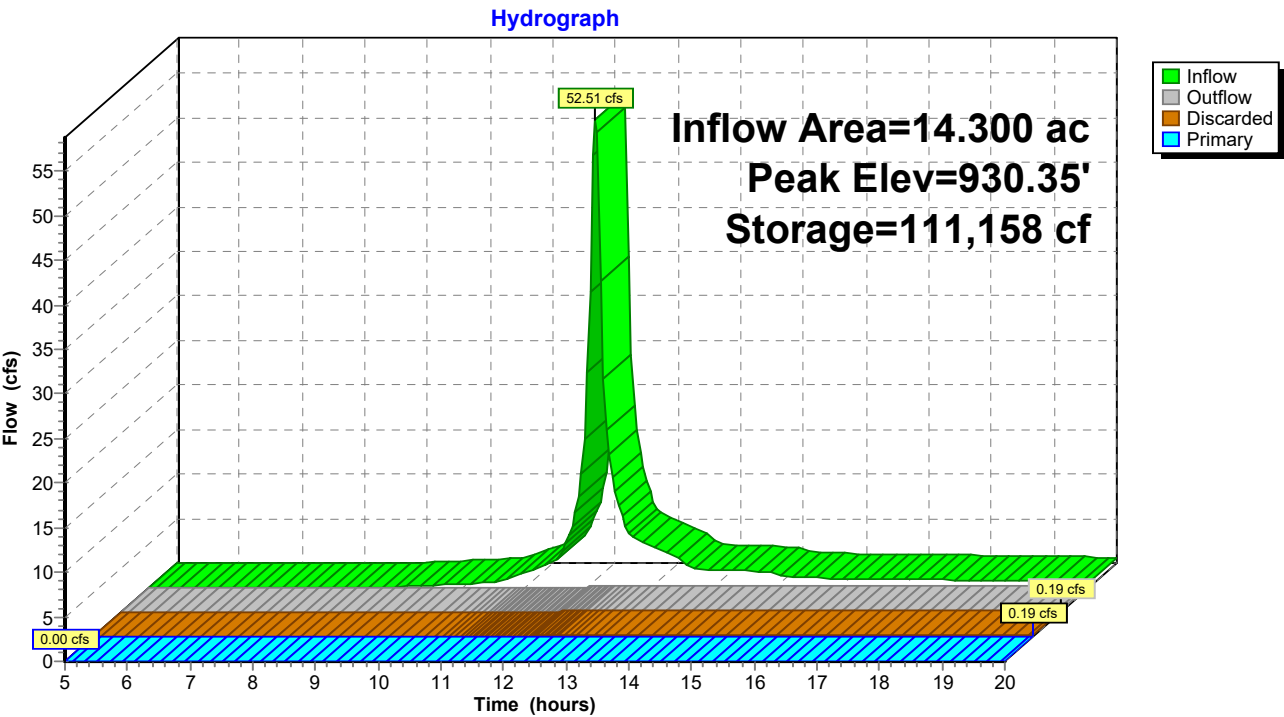
Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=927.00' (Free Discharge)

↑ **2=Culvert** (Controls 0.00 cfs)

↑ **4=Orifice/Grate** (Controls 0.00 cfs)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS



Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 1.87" for 10-YEAR event
 Inflow = 53.13 cfs @ 12.14 hrs, Volume= 3.155 af
 Outflow = 2.95 cfs @ 13.66 hrs, Volume= 1.282 af, Atten= 94%, Lag= 91.4 min
 Primary = 2.95 cfs @ 13.66 hrs, Volume= 1.282 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 933.09' @ 13.66 hrs Surf.Area= 28,853 sf Storage= 93,704 cf

Plug-Flow detention time= 239.0 min calculated for 1.282 af (41% of inflow)
 Center-of-Mass det. time= 158.6 min (948.4 - 789.8)

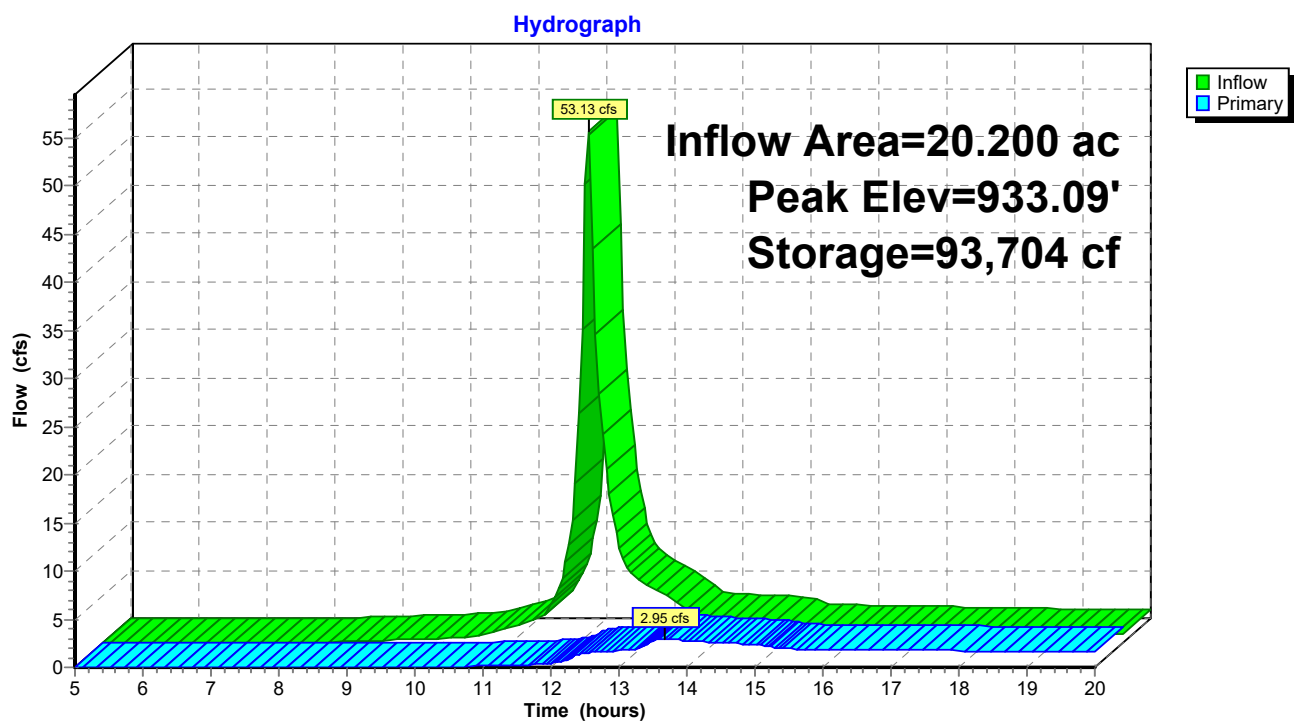
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' / SideZ 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=2.92 cfs @ 13.66 hrs HW=933.09' (Free Discharge)

1=Culvert (Passes 2.92 cfs of 48.02 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.83 cfs @ 9.53 fps)
 3=Orifice/Grate (Orifice Controls 1.03 cfs @ 5.25 fps)
 4=Orifice/Grate (Weir Controls 1.05 cfs @ 0.96 fps)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[79] Warning: Submerged Pond 10P Primary device # 1 INLET by 3.22'

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 1.23" for 10-YEAR event
 Inflow = 117.57 cfs @ 12.67 hrs, Volume= 16.434 af
 Outflow = 13.97 cfs @ 15.47 hrs, Volume= 7.421 af, Atten= 88%, Lag= 168.1 min
 Discarded = 6.51 cfs @ 15.47 hrs, Volume= 4.037 af
 Primary = 7.46 cfs @ 15.47 hrs, Volume= 3.385 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 932.22' @ 15.47 hrs Surf.Area= 4.611 ac Storage= 10.268 af

Plug-Flow detention time= 221.7 min calculated for 7.421 af (45% of inflow)
 Center-of-Mass det. time= 133.3 min (978.8 - 845.5)

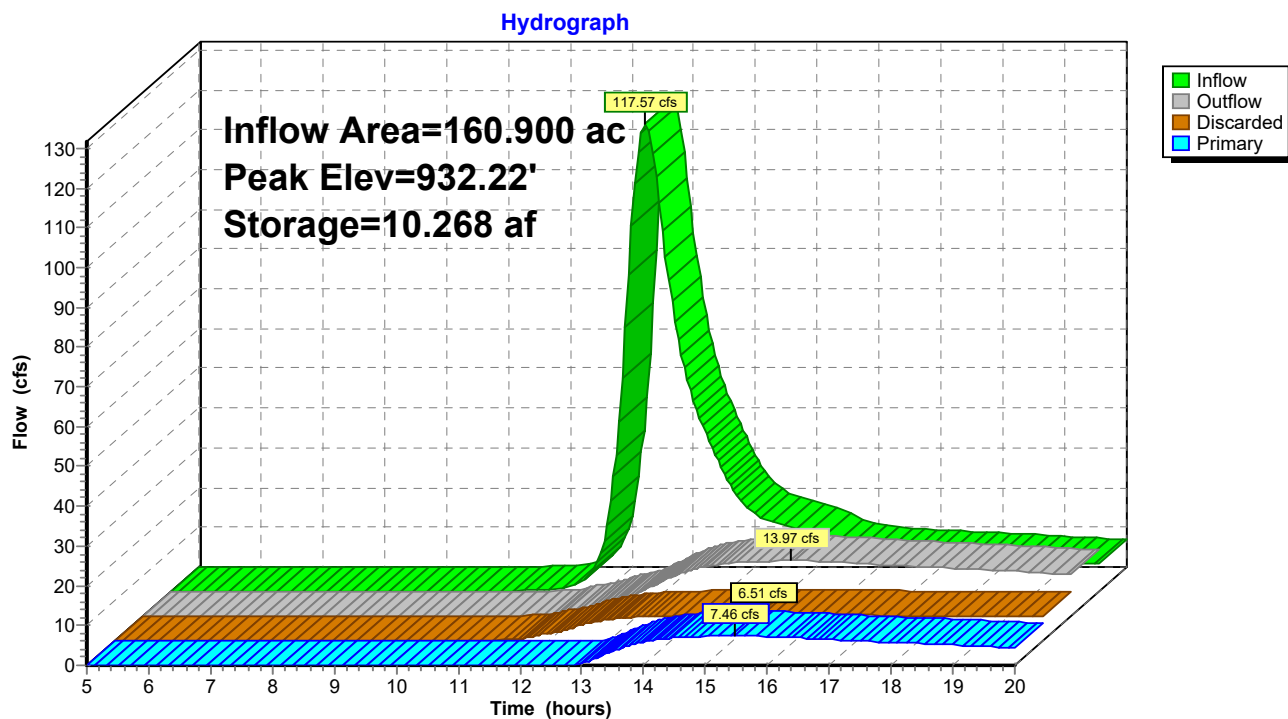
Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf

Discarded OutFlow Max=6.51 cfs @ 15.47 hrs HW=932.22' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 6.51 cfs)

Primary OutFlow Max=7.45 cfs @ 15.47 hrs HW=932.22' (Free Discharge)
 ↑ **2=Culvert** (Barrel Controls 7.45 cfs @ 3.42 fps)

Pond 12P: PR NORTH KETTLE



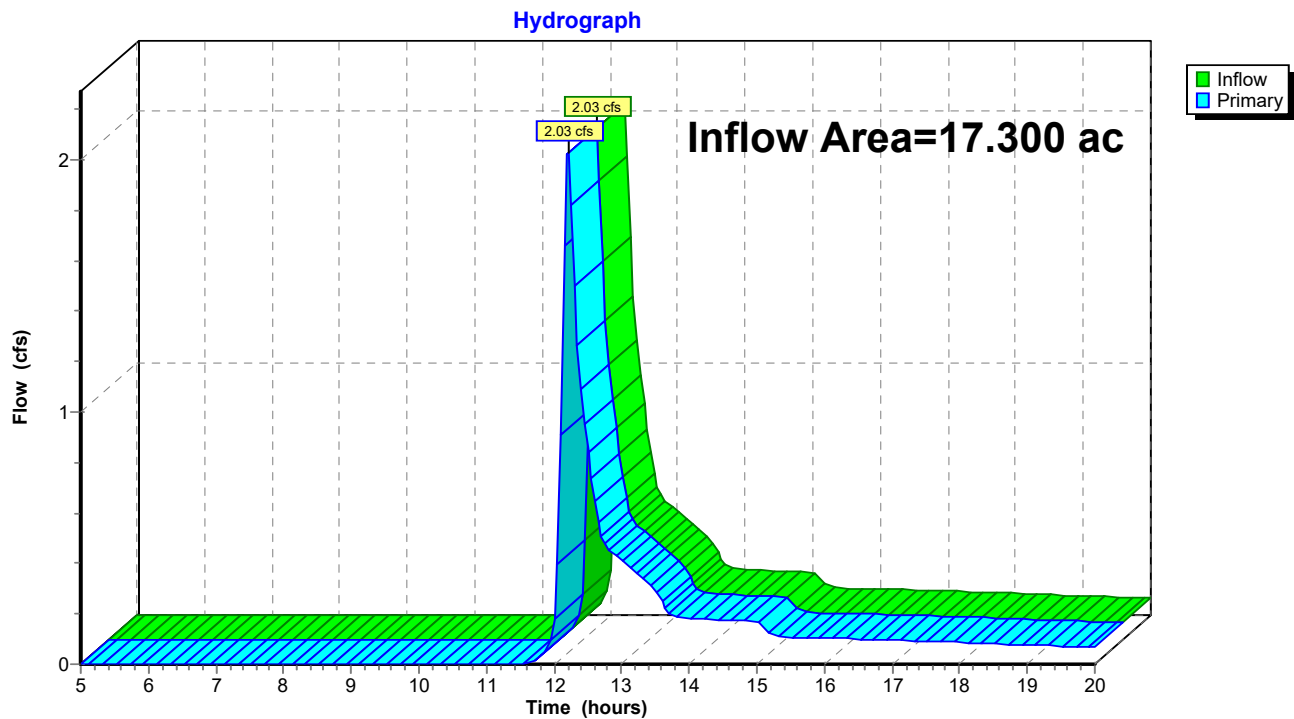
Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 0.10" for 10-YEAR event

Inflow = 2.03 cfs @ 12.21 hrs, Volume= 0.149 af

Primary = 2.03 cfs @ 12.21 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

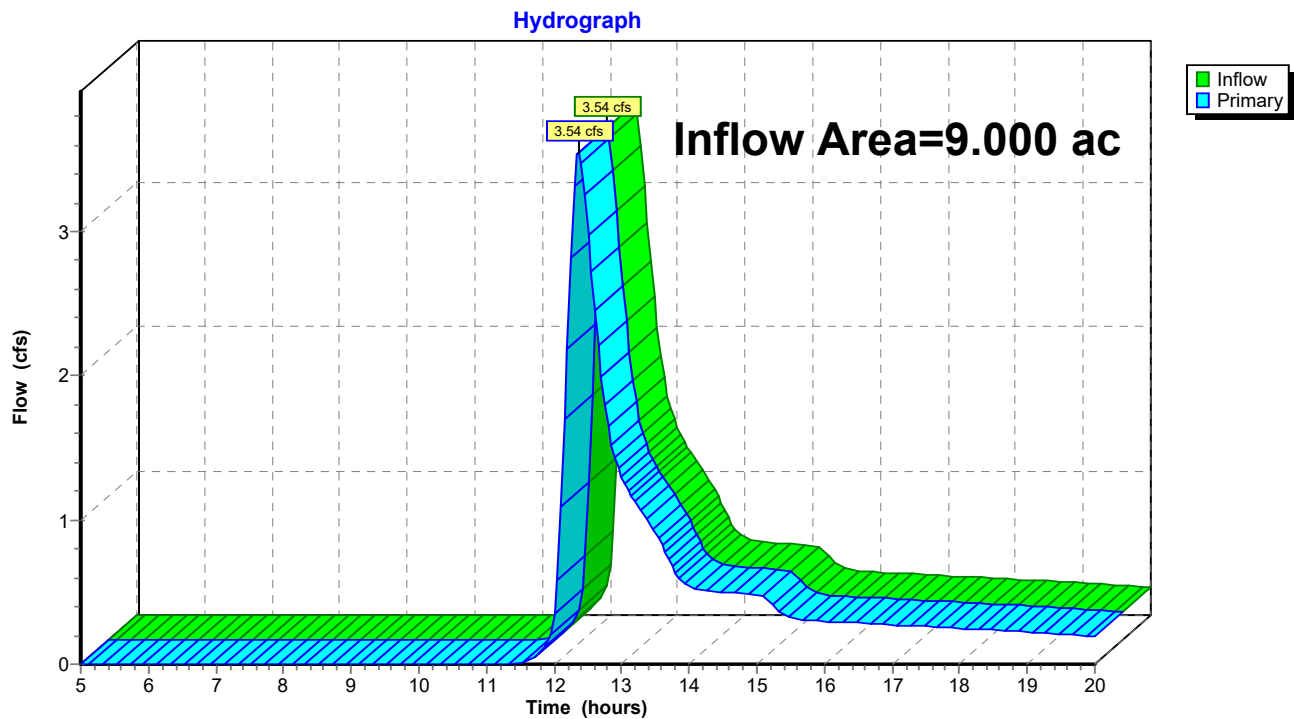
Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 0.54" for 10-YEAR event

Inflow = 3.54 cfs @ 12.36 hrs, Volume= 0.408 af

Primary = 3.54 cfs @ 12.36 hrs, Volume= 0.408 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 25-YEAR Rainfall=5.02"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>3.04"
Tc=6.0 min CN=83 Runoff=70.11 cfs 3.624 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>1.48"
Flow Length=300' Tc=10.3 min CN=64 Runoff=1.22 cfs 0.074 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>1.78"
Tc=6.0 min CN=68 Runoff=1.48 cfs 0.074 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>1.90"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=174.69 cfs 21.953 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>3.23"
Tc=6.0 min CN=85 Runoff=58.72 cfs 3.071 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>1.77"
Flow Length=600' Tc=13.9 min CN=68 Runoff=19.17 cfs 1.298 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>3.23"
Tc=6.0 min CN=85 Runoff=9.79 cfs 0.512 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>0.91"
Tc=10.0 min CN=55 Runoff=2.72 cfs 0.181 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>0.90"
Tc=20.0 min CN=55 Runoff=6.86 cfs 0.638 af

Pond 7P: SOUTH PONDS Peak Elev=930.71' Storage=125,948 cf Inflow=70.11 cfs 3.624 af
Discarded=0.20 cfs 0.139 af Primary=1.92 cfs 0.686 af Outflow=2.12 cfs 0.825 af

Pond 10P: NORTH POND Peak Elev=933.45' Storage=104,273 cf Inflow=72.53 cfs 4.369 af
Outflow=14.35 cfs 2.387 af

Pond 12P: PR NORTH KETTLE Peak Elev=933.13' Storage=14.807 af Inflow=189.68 cfs 24.852 af
Discarded=7.77 cfs 4.746 af Primary=21.68 cfs 9.261 af Outflow=29.45 cfs 14.006 af

Link 6L: PROP SE DISCHARGE Inflow=3.94 cfs 0.941 af
Primary=3.94 cfs 0.941 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=7.34 cfs 0.712 af
Primary=7.34 cfs 0.712 af

Total Runoff Area = 187.200 ac Runoff Volume = 31.425 af Average Runoff Depth = 2.01"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

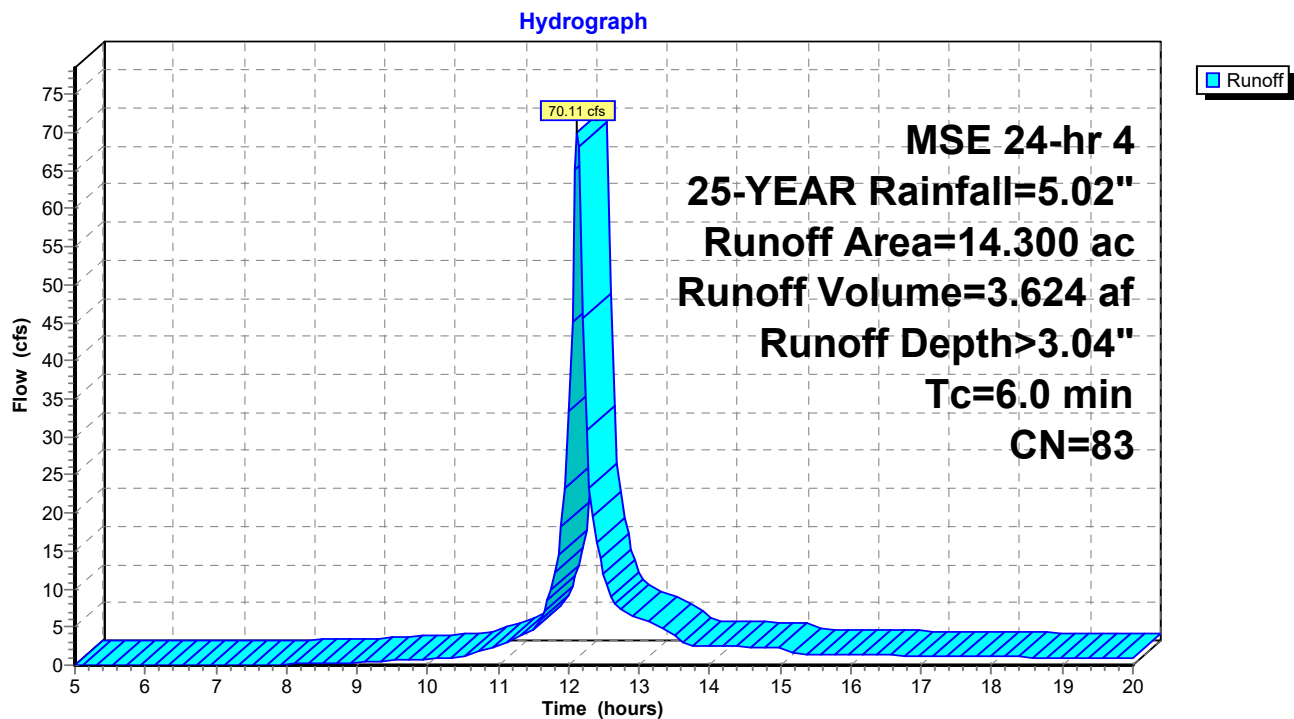
Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 70.11 cfs @ 12.13 hrs, Volume= 3.624 af, Depth> 3.04"
 Routed to Pond 7P : SOUTH PONDS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

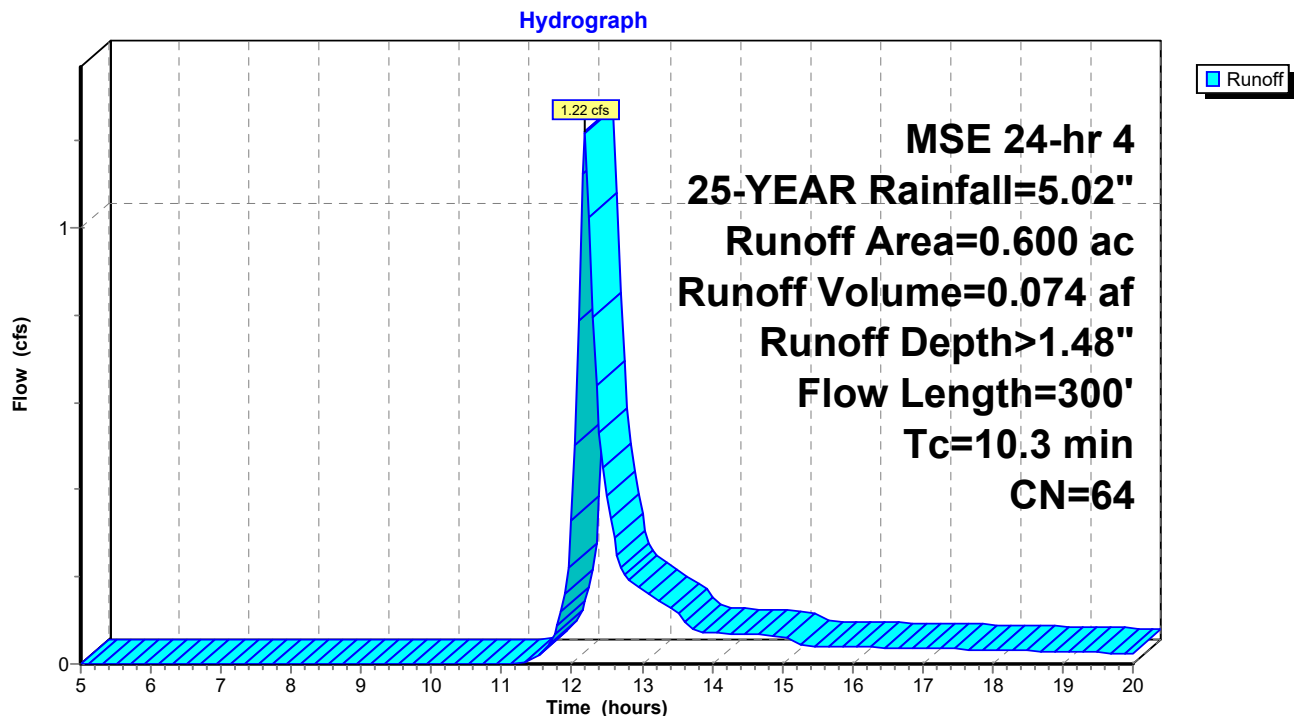
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 1.22 cfs @ 12.19 hrs, Volume= 0.074 af, Depth> 1.48"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

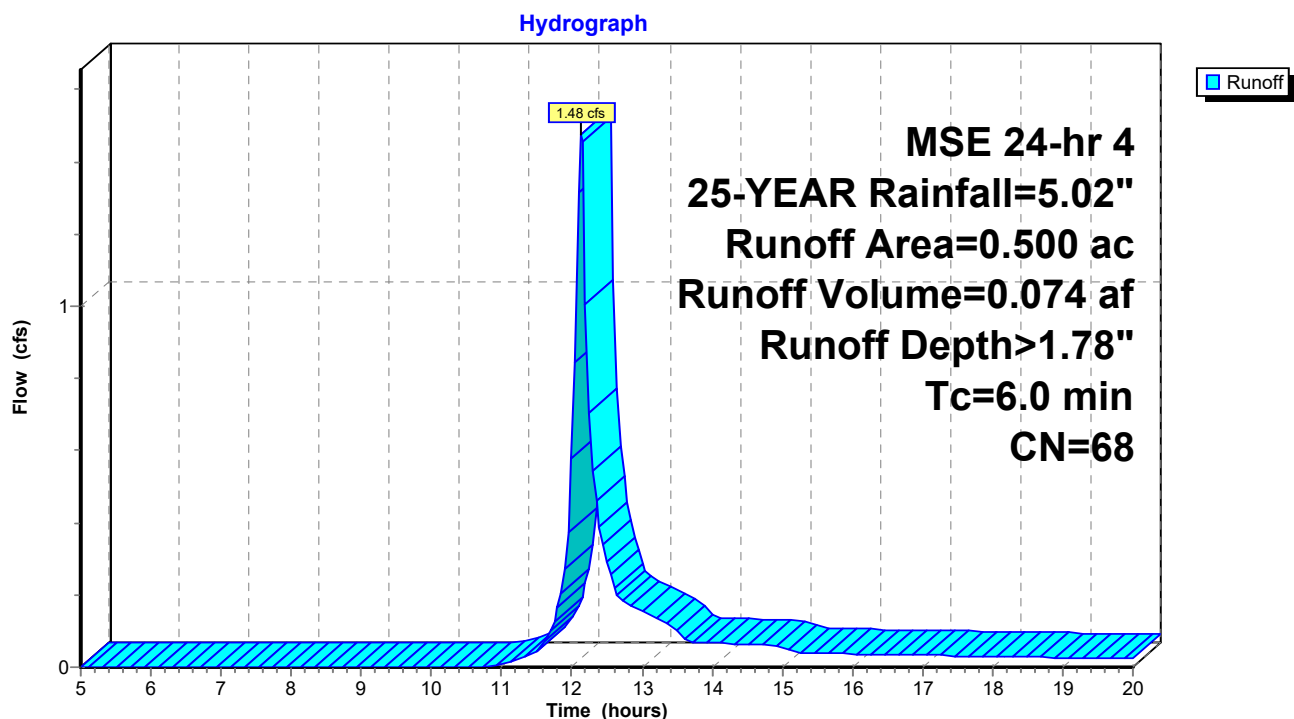
Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Runoff = 1.48 cfs @ 12.14 hrs, Volume= 0.074 af, Depth> 1.78"
 Routed to Link 16L : PROPOSED SOUTH DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

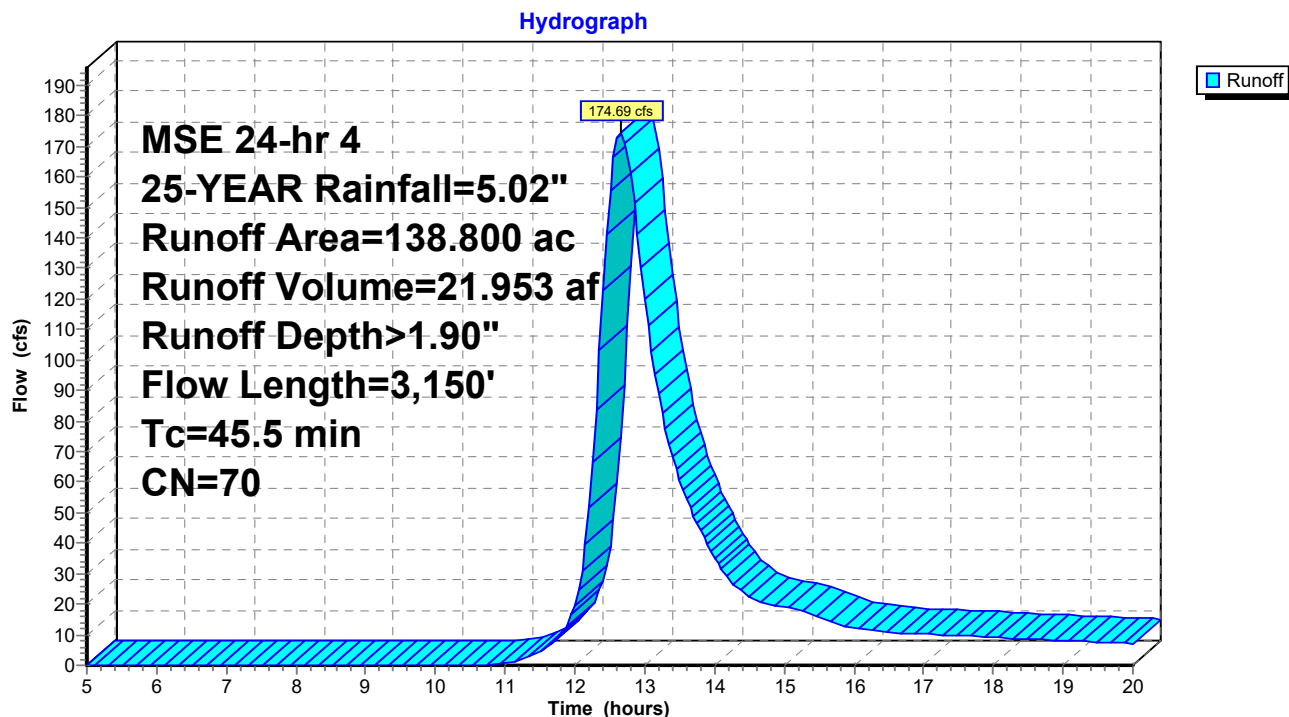
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 174.69 cfs @ 12.66 hrs, Volume= 21.953 af, Depth> 1.90"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

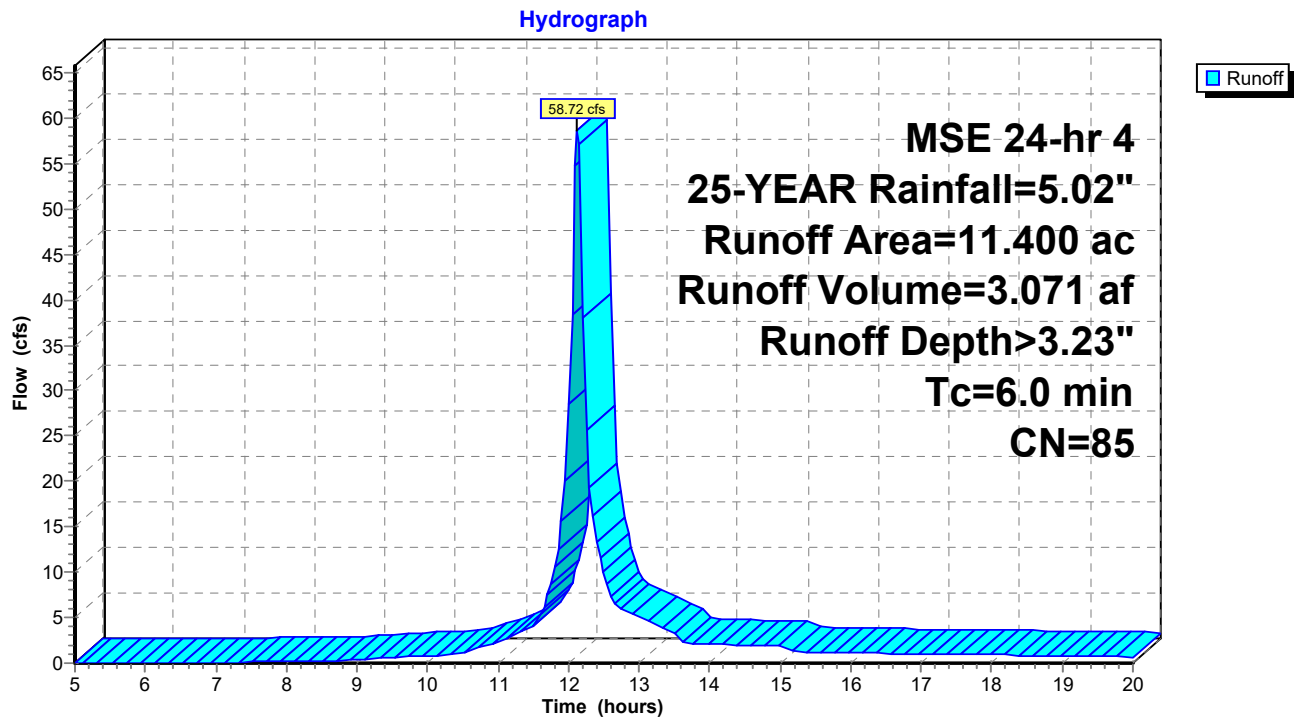
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 58.72 cfs @ 12.13 hrs, Volume= 3.071 af, Depth> 3.23"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

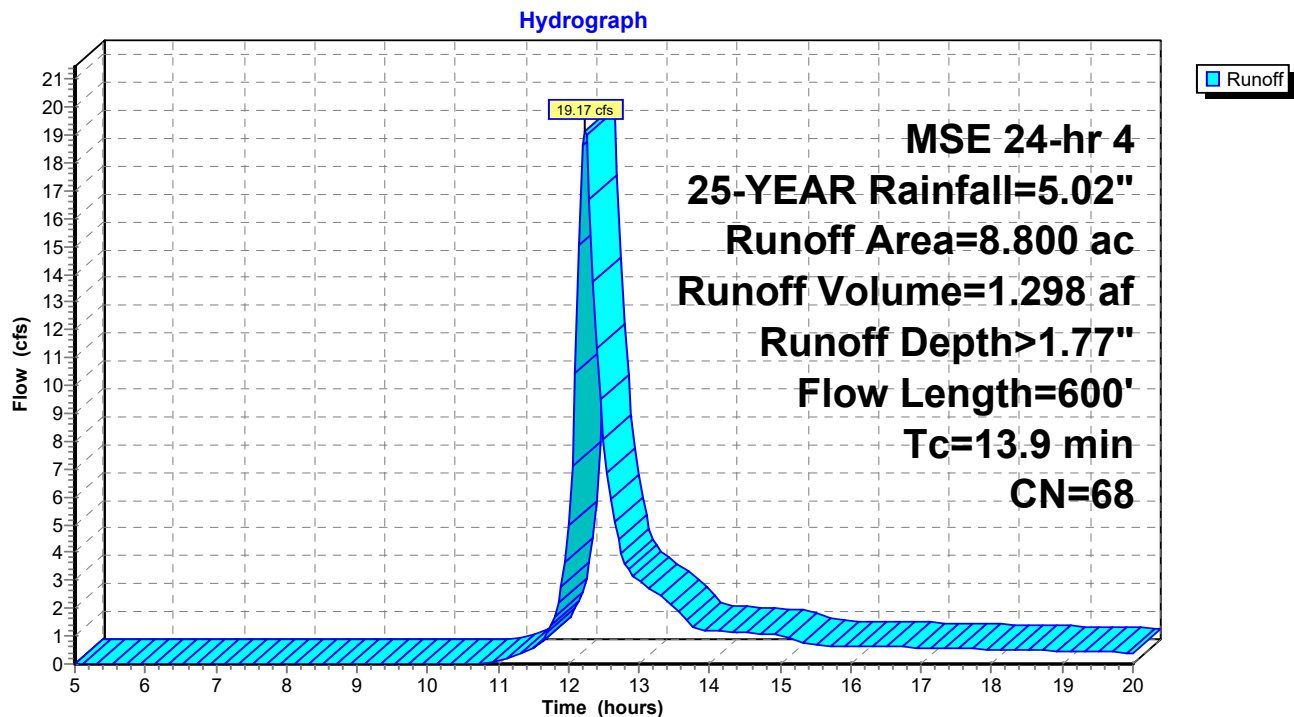
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 19.17 cfs @ 12.23 hrs, Volume= 1.298 af, Depth> 1.77"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

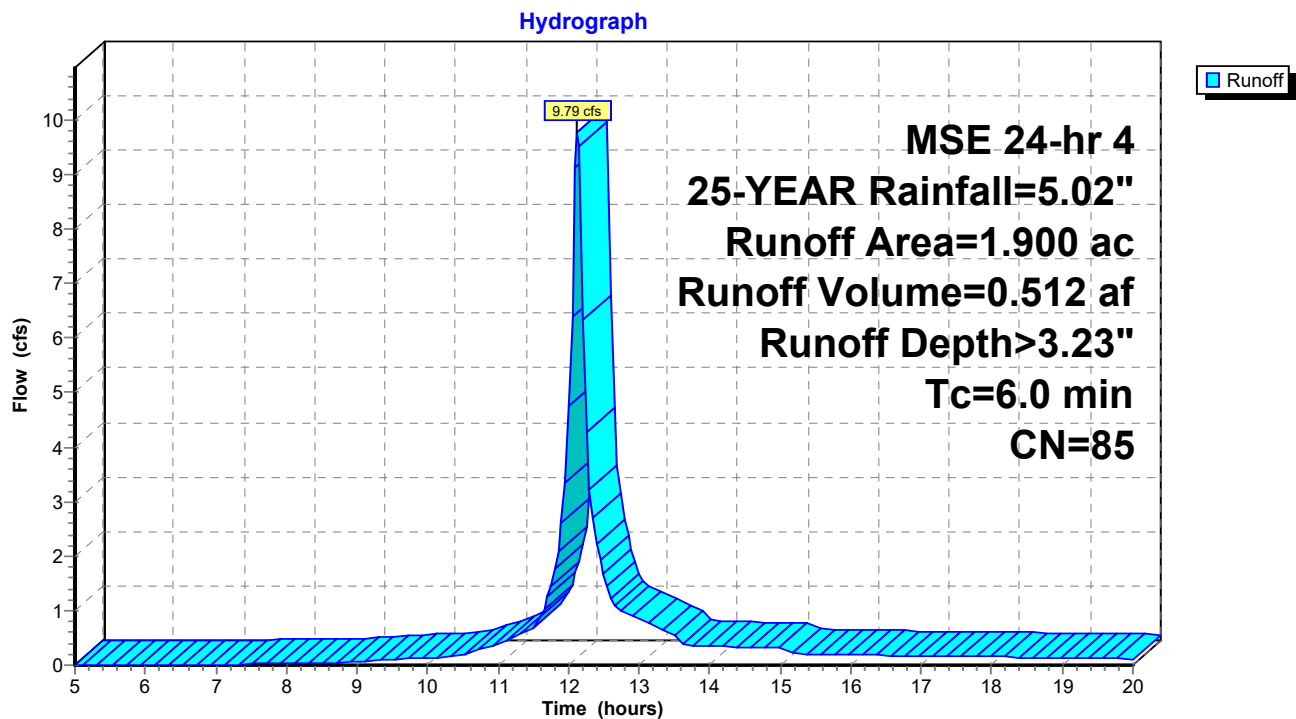
Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 9.79 cfs @ 12.13 hrs, Volume= 0.512 af, Depth> 3.23"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

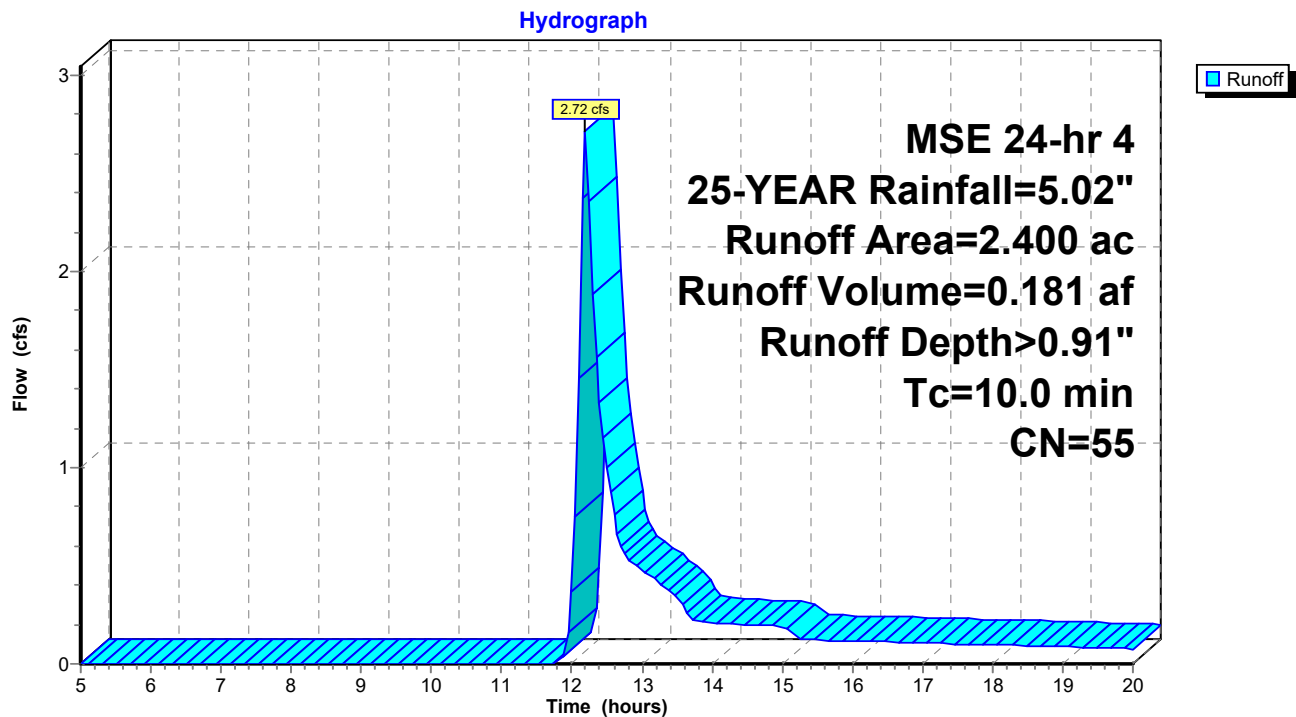
Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 2.72 cfs @ 12.20 hrs, Volume= 0.181 af, Depth> 0.91"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 6.86 cfs @ 12.34 hrs, Volume= 0.638 af, Depth> 0.90"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

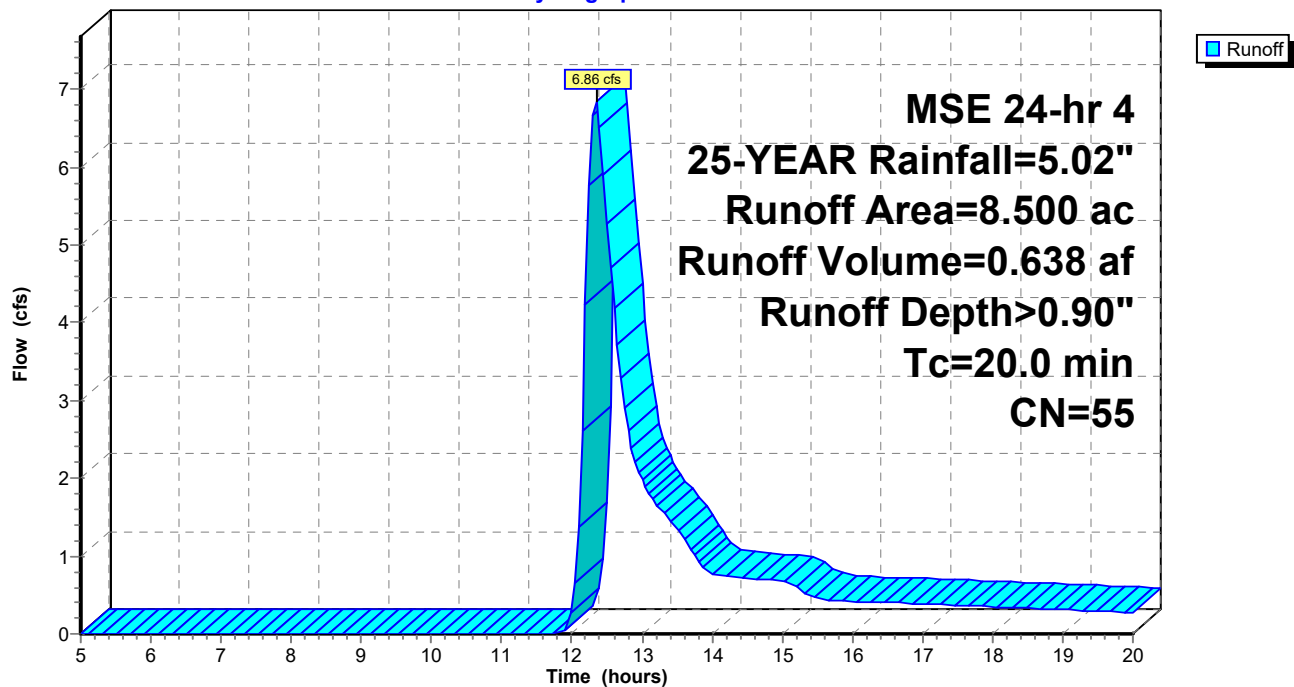
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-YEAR Rainfall=5.02"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 3.04" for 25-YEAR event
 Inflow = 70.11 cfs @ 12.13 hrs, Volume= 3.624 af
 Outflow = 2.12 cfs @ 15.04 hrs, Volume= 0.825 af, Atten= 97%, Lag= 174.6 min
 Discarded = 0.20 cfs @ 15.04 hrs, Volume= 0.139 af
 Primary = 1.92 cfs @ 15.04 hrs, Volume= 0.686 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 930.71' @ 15.04 hrs Surf.Area= 42,483 sf Storage= 125,948 cf

Plug-Flow detention time= 294.0 min calculated for 0.825 af (23% of inflow)
 Center-of-Mass det. time= 197.8 min (975.5 - 777.6)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

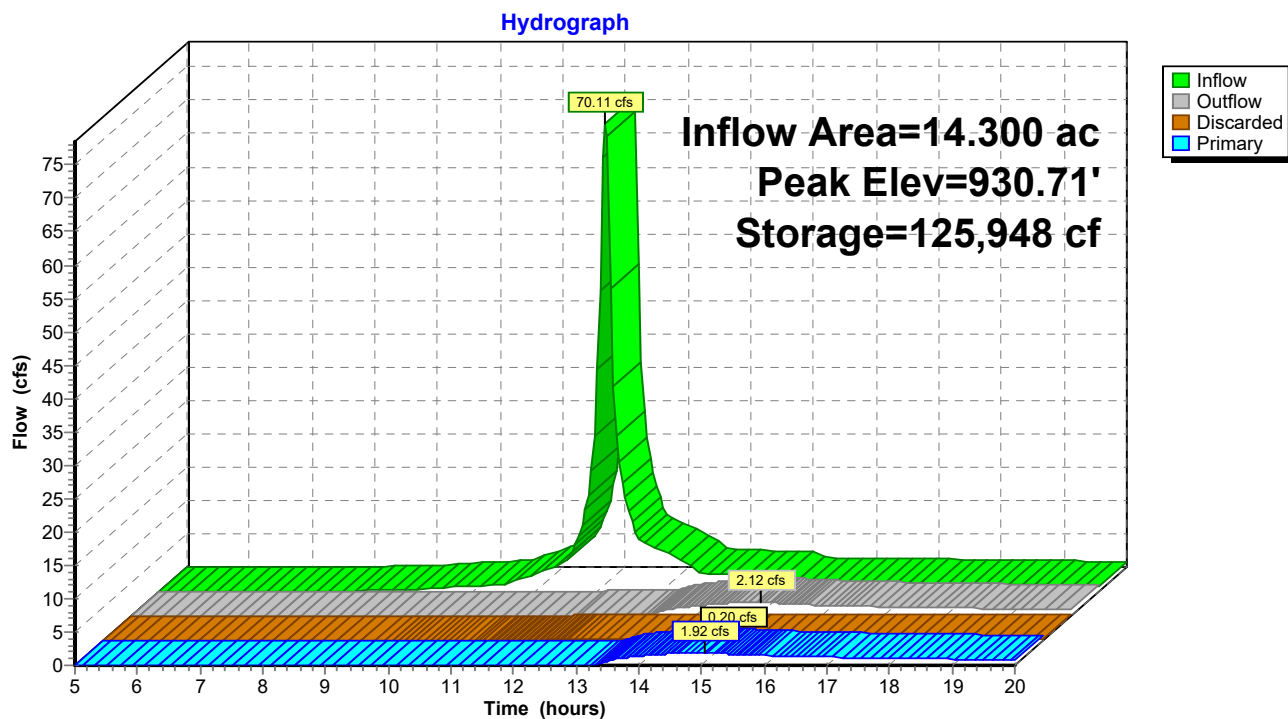
Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.20 cfs @ 15.04 hrs HW=930.71' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.20 cfs of 3.92 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 9.16 fps)

Primary OutFlow Max=1.91 cfs @ 15.04 hrs HW=930.71' (Free Discharge)

↑ **2=Culvert** (Passes 1.91 cfs of 14.63 cfs potential flow)
 ↑ **4=Orifice/Grate** (Weir Controls 1.91 cfs @ 1.48 fps)
 ↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS

Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 2.60" for 25-YEAR event
 Inflow = 72.53 cfs @ 12.14 hrs, Volume= 4.369 af
 Outflow = 14.35 cfs @ 12.58 hrs, Volume= 2.387 af, Atten= 80%, Lag= 26.3 min
 Primary = 14.35 cfs @ 12.58 hrs, Volume= 2.387 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 933.45' @ 12.58 hrs Surf.Area= 29,896 sf Storage= 104,273 cf

Plug-Flow detention time= 164.0 min calculated for 2.387 af (55% of inflow)
 Center-of-Mass det. time= 92.4 min (876.7 - 784.3)

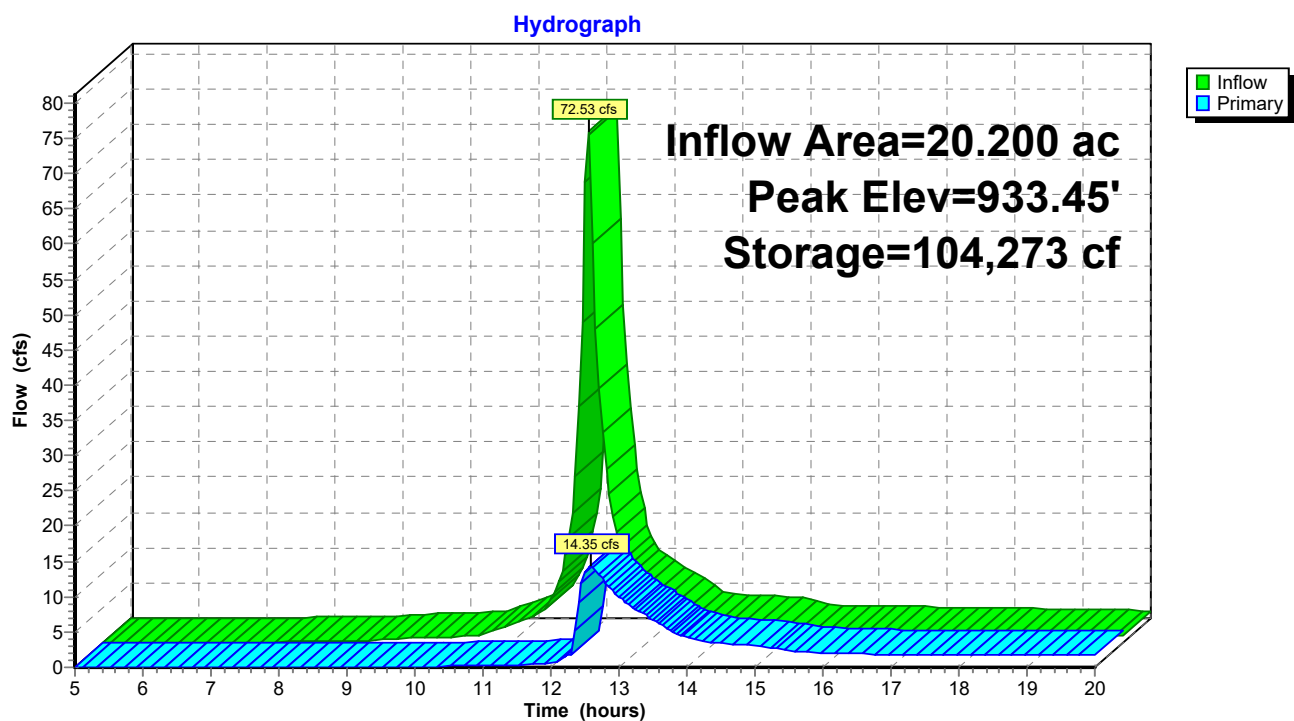
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' SideZ 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=14.27 cfs @ 12.58 hrs HW=933.45' (Free Discharge)

1=Culvert (Passes 14.27 cfs of 53.87 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.87 cfs @ 9.96 fps)
 3=Orifice/Grate (Orifice Controls 1.18 cfs @ 5.99 fps)
 4=Orifice/Grate (Weir Controls 12.23 cfs @ 2.18 fps)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[81] Warning: Exceeded Pond 10P by 0.01' @ 14.50 hrs

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 1.85" for 25-YEAR event
 Inflow = 189.68 cfs @ 12.65 hrs, Volume= 24.852 af
 Outflow = 29.45 cfs @ 14.32 hrs, Volume= 14.006 af, Atten= 84%, Lag= 100.3 min
 Discarded = 7.77 cfs @ 14.32 hrs, Volume= 4.746 af
 Primary = 21.68 cfs @ 14.32 hrs, Volume= 9.261 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 933.13' @ 14.32 hrs Surf.Area= 5.421 ac Storage= 14.807 af

Plug-Flow detention time= 201.4 min calculated for 13.960 af (56% of inflow)
 Center-of-Mass det. time= 127.5 min (961.8 - 834.3)

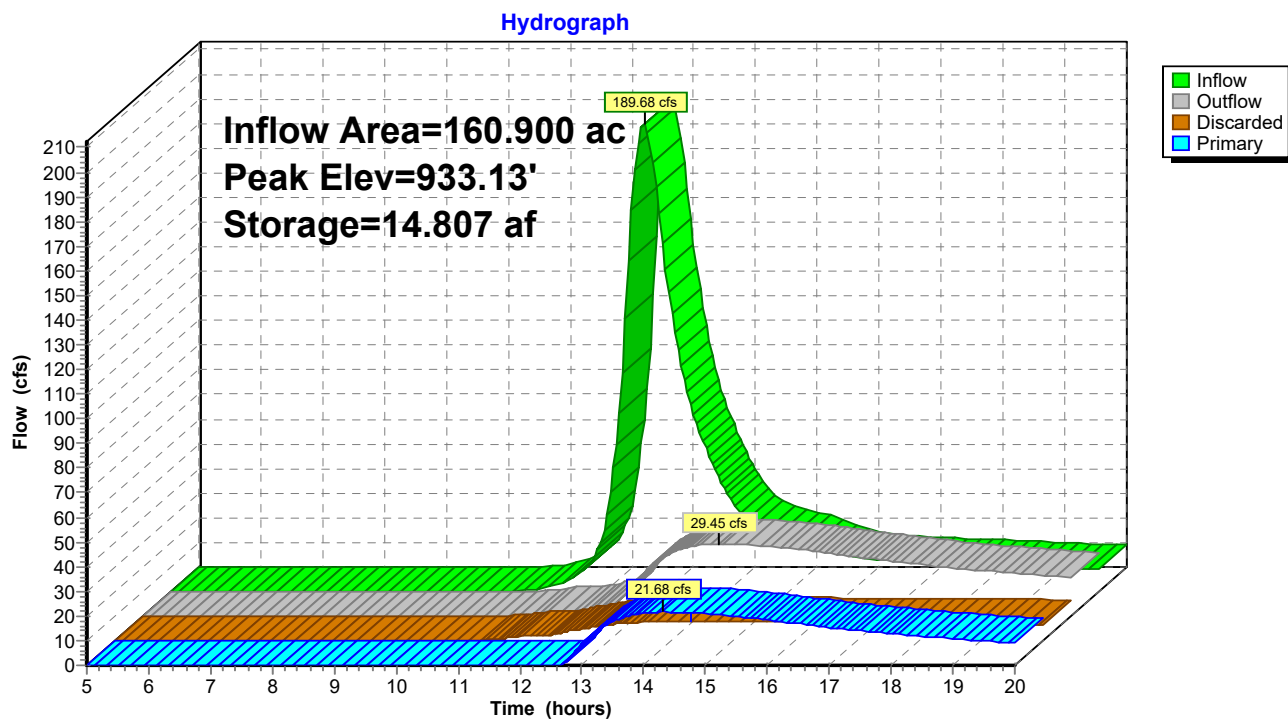
Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf

Discarded OutFlow Max=7.77 cfs @ 14.32 hrs HW=933.13' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 7.77 cfs)

Primary OutFlow Max=21.67 cfs @ 14.32 hrs HW=933.13' (Free Discharge)
 ↑ **2=Culvert** (Barrel Controls 21.67 cfs @ 4.63 fps)

Pond 12P: PR NORTH KETTLE



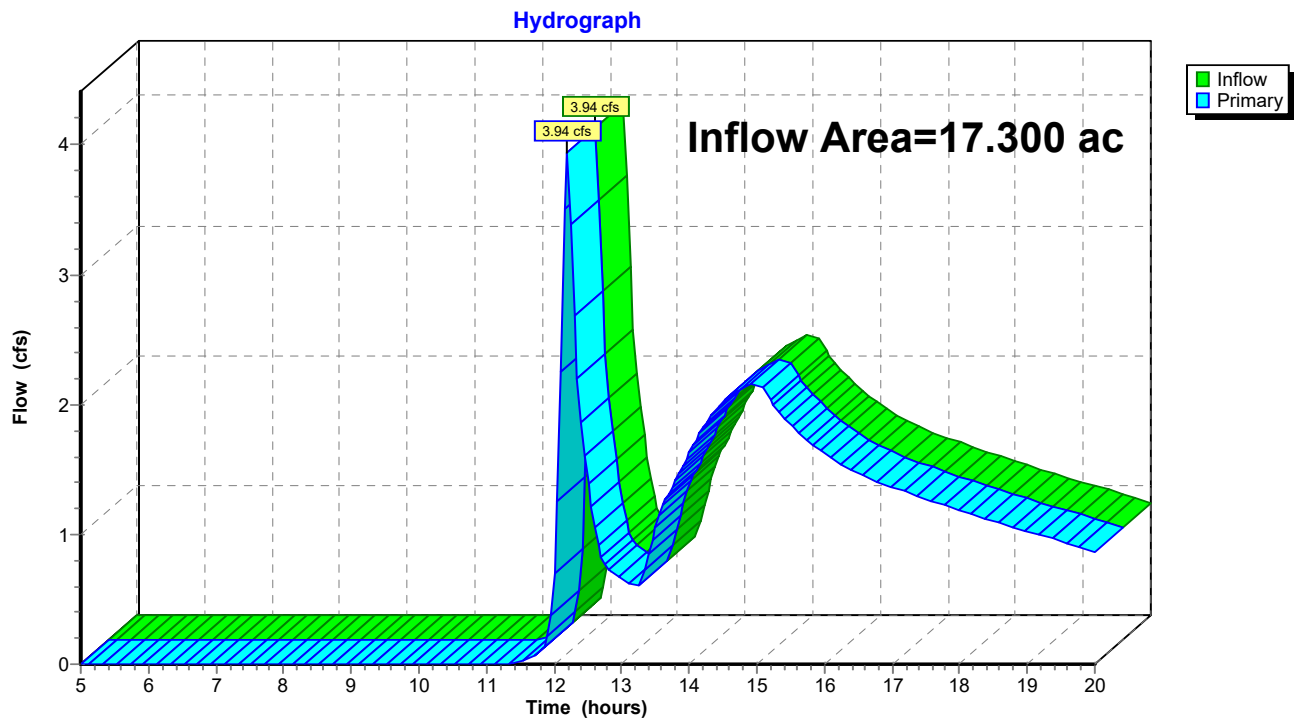
Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 0.65" for 25-YEAR event

Inflow = 3.94 cfs @ 12.20 hrs, Volume= 0.941 af

Primary = 3.94 cfs @ 12.20 hrs, Volume= 0.941 af, Atten= 0%, Lag= 0.0 min

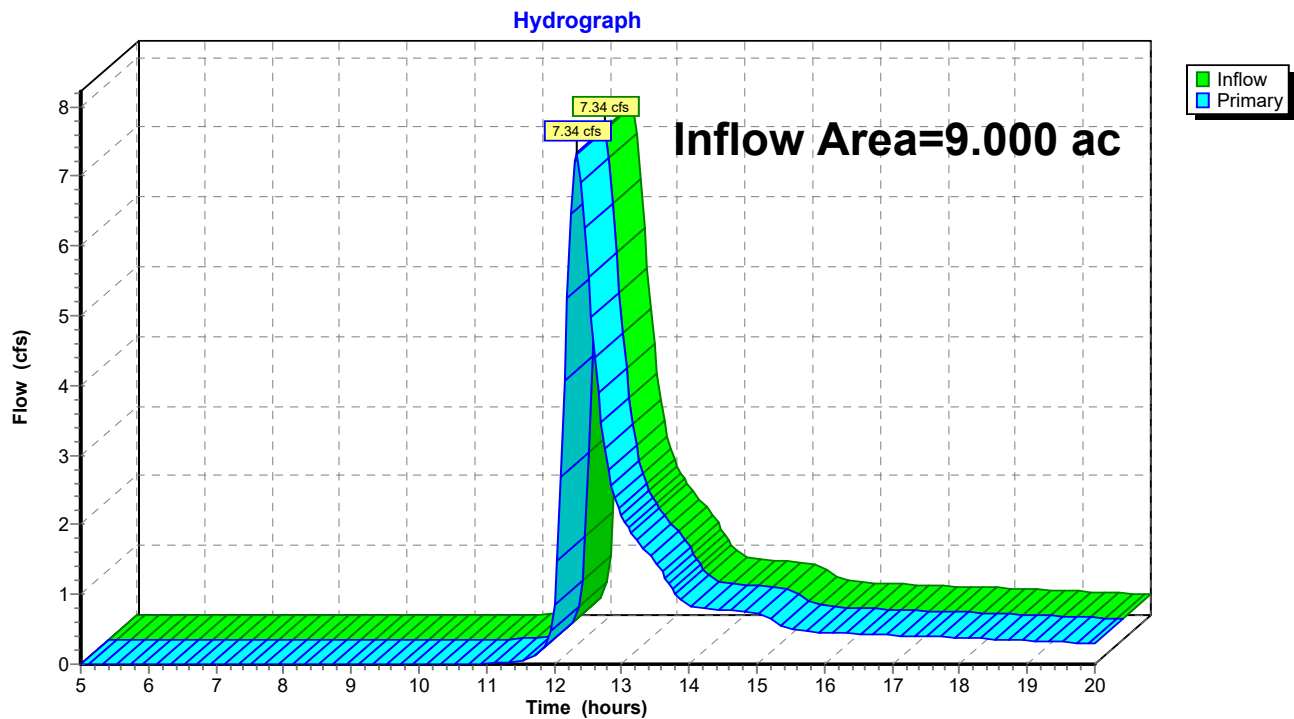
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 0.95" for 25-YEAR event
Inflow = 7.34 cfs @ 12.34 hrs, Volume= 0.712 af
Primary = 7.34 cfs @ 12.34 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 100-YEAR Rainfall=6.66"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>4.50"
Tc=6.0 min CN=83 Runoff=101.43 cfs 5.362 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>2.58"
Flow Length=300' Tc=10.3 min CN=64 Runoff=2.17 cfs 0.129 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>2.96"
Tc=6.0 min CN=68 Runoff=2.46 cfs 0.123 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>3.11"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=289.62 cfs 36.005 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>4.72"
Tc=6.0 min CN=85 Runoff=83.70 cfs 4.481 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>2.95"
Flow Length=600' Tc=13.9 min CN=68 Runoff=32.28 cfs 2.166 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>4.72"
Tc=6.0 min CN=85 Runoff=13.95 cfs 0.747 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>1.77"
Tc=10.0 min CN=55 Runoff=5.83 cfs 0.355 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>1.76"
Tc=20.0 min CN=55 Runoff=15.01 cfs 1.250 af

Pond 7P: SOUTH PONDS Peak Elev=931.17' Storage=146,086 cf Inflow=101.43 cfs 5.362 af
Discarded=0.21 cfs 0.151 af Primary=11.22 cfs 2.381 af Outflow=11.43 cfs 2.532 af

Pond 10P: NORTH POND Peak Elev=934.13' Storage=125,305 cf Inflow=107.90 cfs 6.647 af
Outflow=51.56 cfs 4.561 af

Pond 12P: PR NORTH KETTLE Peak Elev=934.60' Storage=23.811 af Inflow=321.27 cfs 41.314 af
Discarded=10.07 cfs 5.971 af Primary=52.17 cfs 21.720 af Outflow=62.24 cfs 27.691 af

Link 6L: PROP SE DISCHARGE Inflow=13.09 cfs 2.864 af
Primary=13.09 cfs 2.864 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=15.81 cfs 1.373 af
Primary=15.81 cfs 1.373 af

Total Runoff Area = 187.200 ac Runoff Volume = 50.619 af Average Runoff Depth = 3.24"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

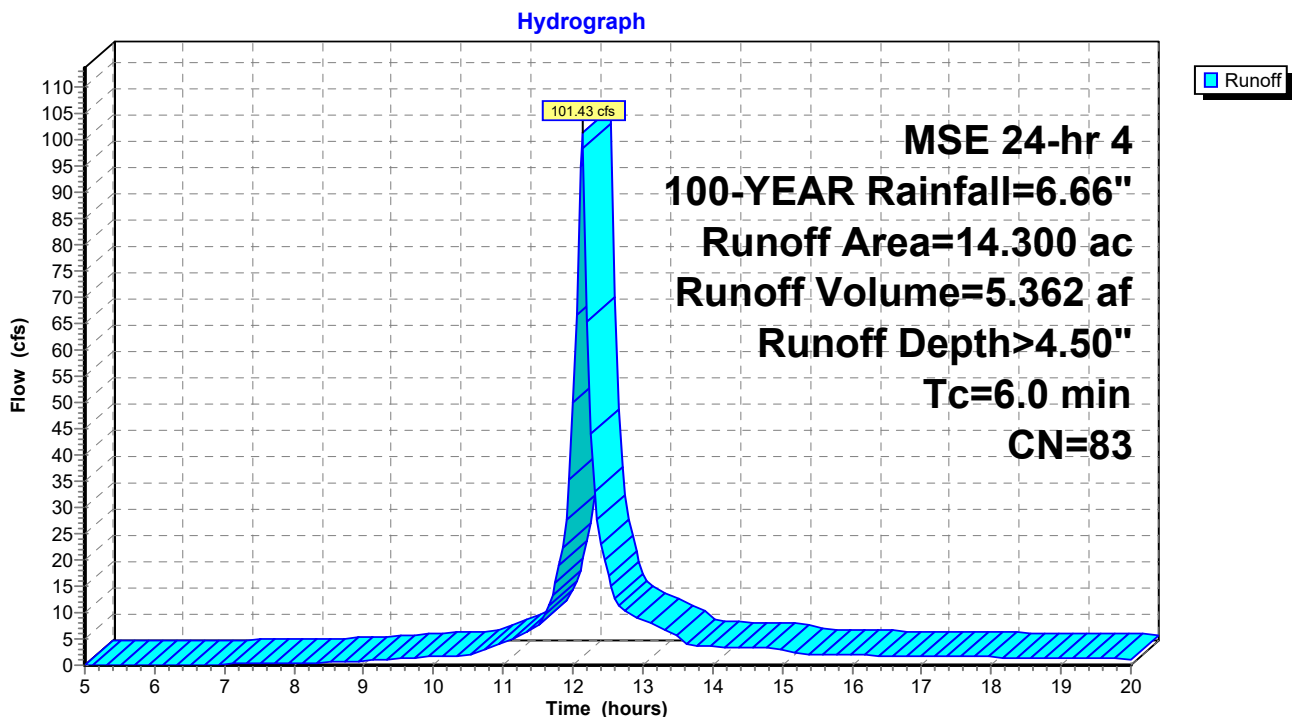
Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 101.43 cfs @ 12.13 hrs, Volume= 5.362 af, Depth> 4.50"
 Routed to Pond 7P : SOUTH PONDS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

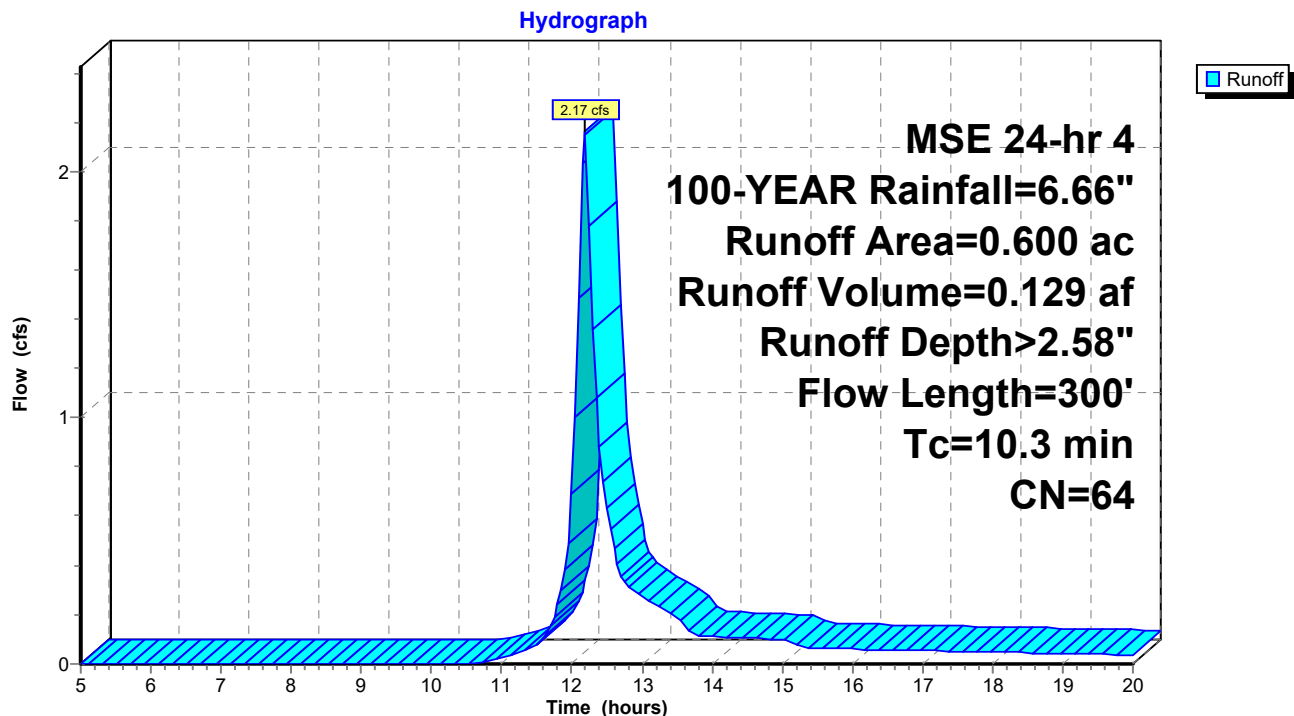
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 2.17 cfs @ 12.19 hrs, Volume= 0.129 af, Depth> 2.58"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

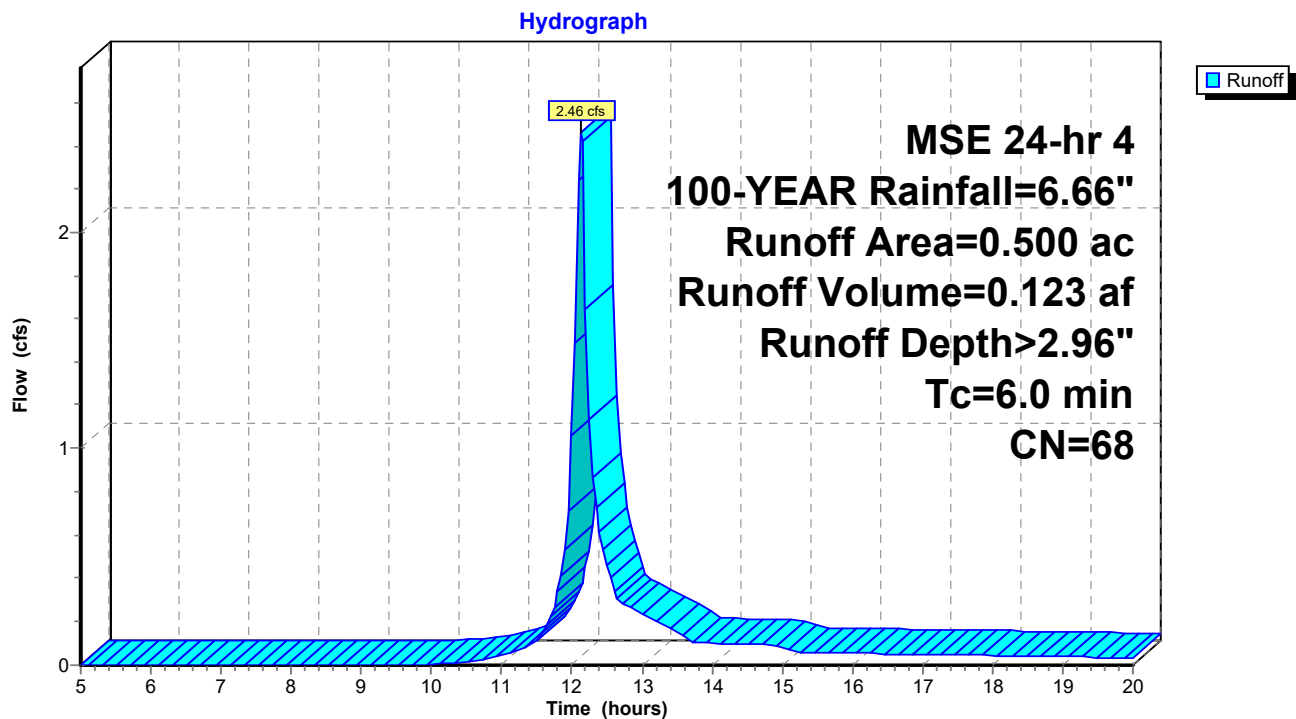
Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Runoff = 2.46 cfs @ 12.13 hrs, Volume= 0.123 af, Depth> 2.96"
 Routed to Link 16L : PROPOSED SOUTH DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

	Area (ac)	CN	Description
*	0.400	61	GRASS
*	0.100	98	IMPERVIOUS
	0.500	68	Weighted Average
	0.400		80.00% Pervious Area
	0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

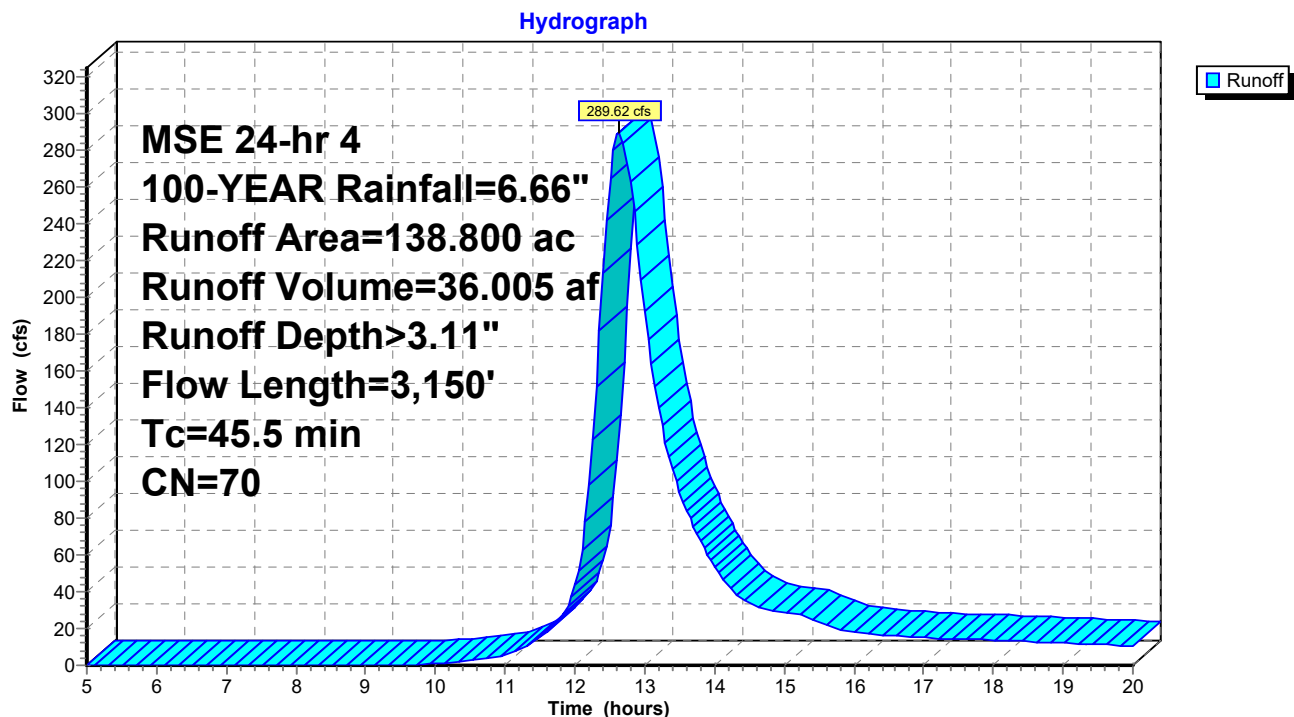
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 289.62 cfs @ 12.64 hrs, Volume= 36.005 af, Depth> 3.11"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

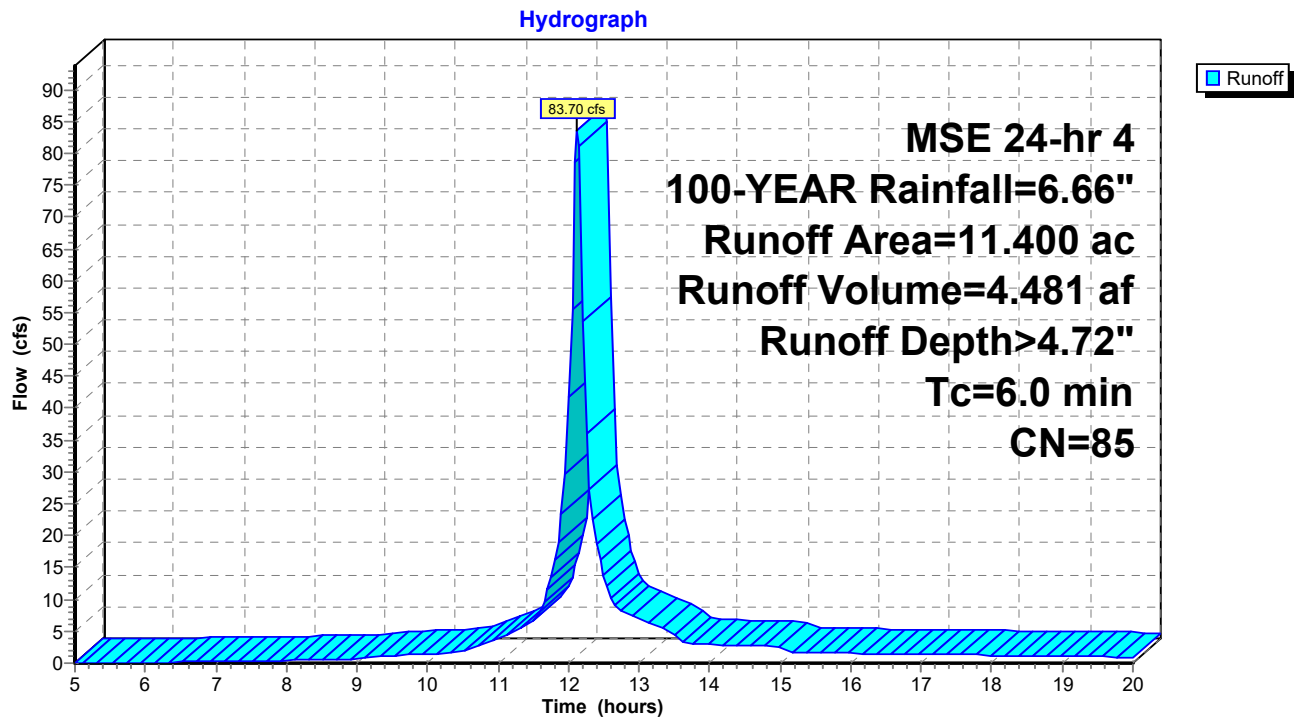
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 83.70 cfs @ 12.13 hrs, Volume= 4.481 af, Depth> 4.72"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

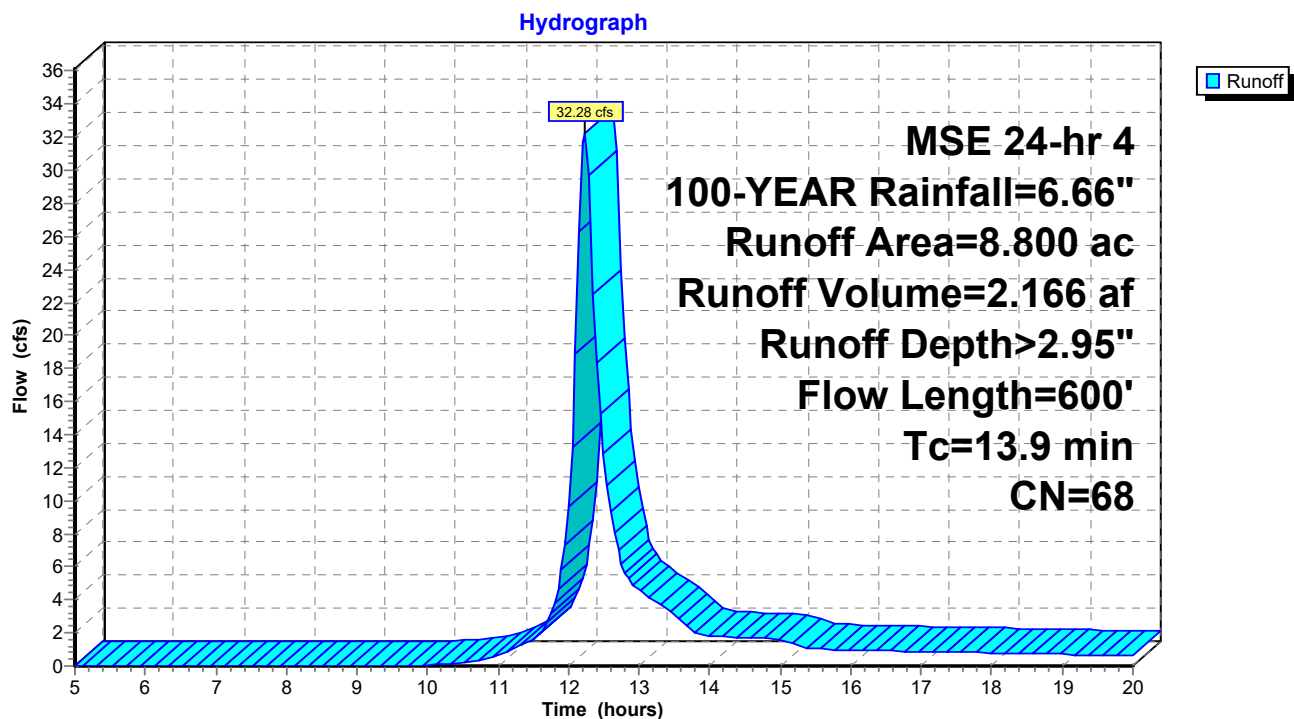
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 32.28 cfs @ 12.23 hrs, Volume= 2.166 af, Depth> 2.95"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 13.95 cfs @ 12.13 hrs, Volume= 0.747 af, Depth> 4.72"
 Routed to Pond 12P : PR NORTH KETTLE

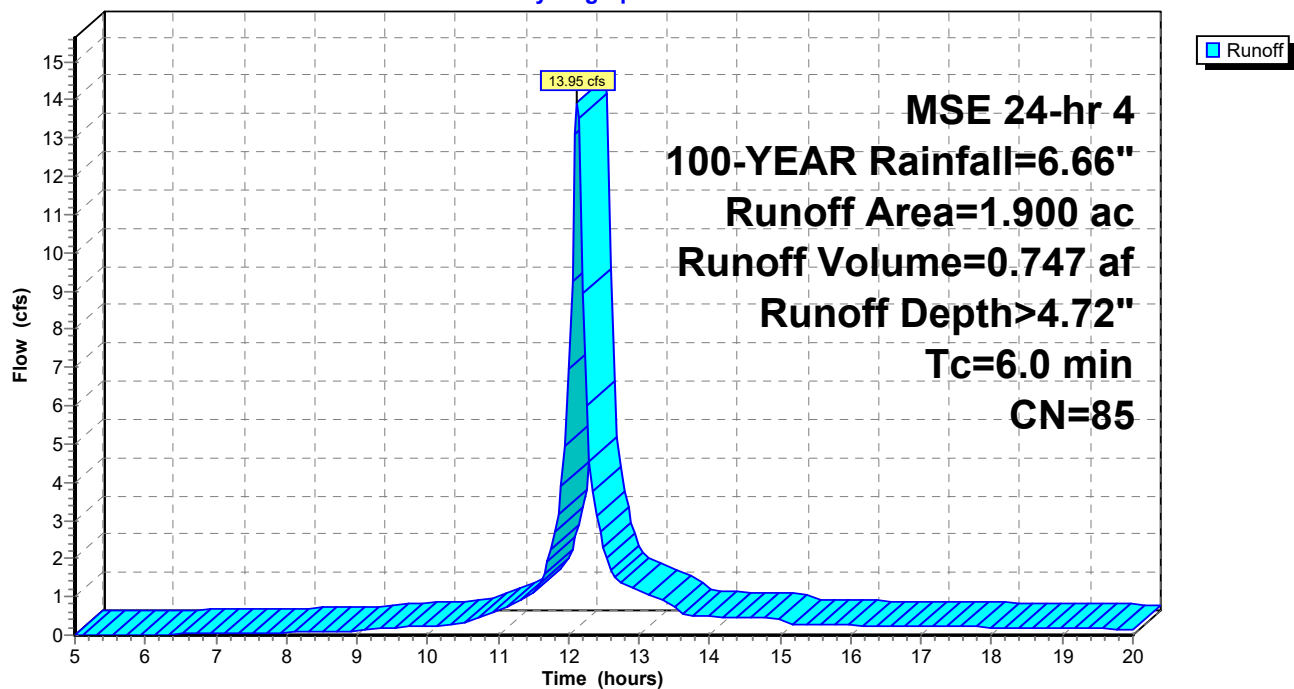
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Hydrograph



Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 5.83 cfs @ 12.19 hrs, Volume= 0.355 af, Depth> 1.77"
 Routed to Link 6L : PROP SE DISCHARGE

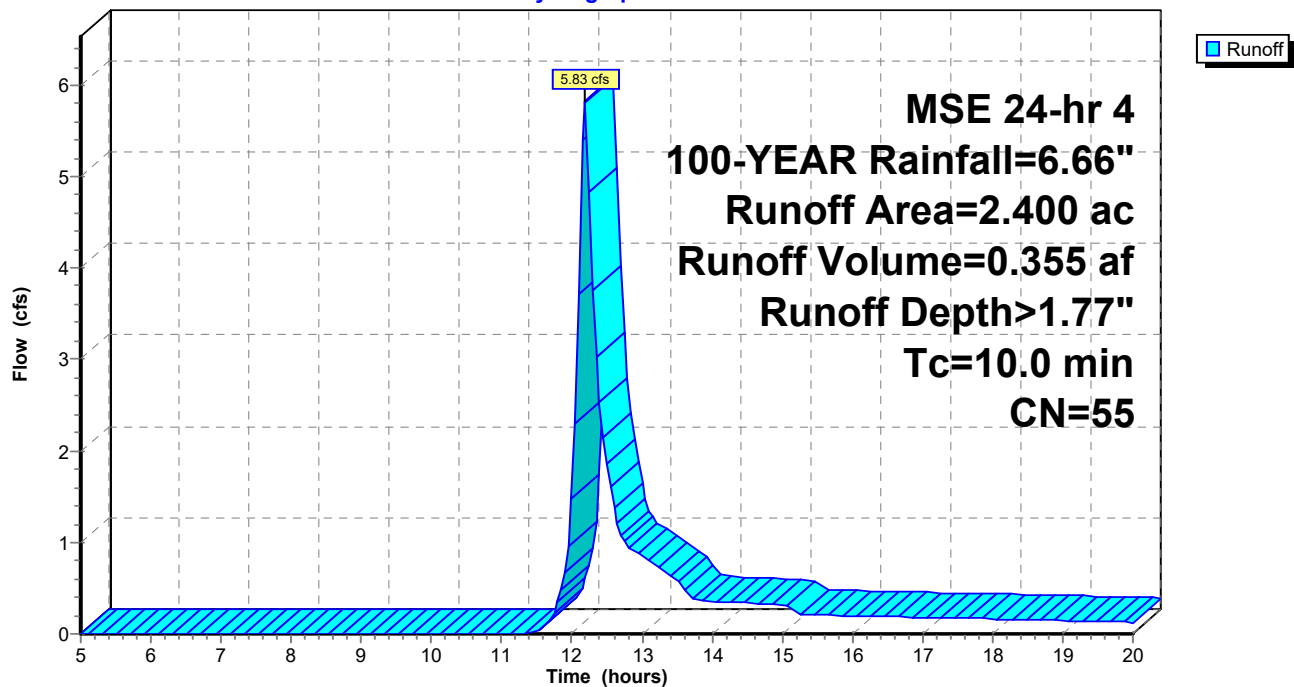
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Hydrograph



Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 15.01 cfs @ 12.32 hrs, Volume= 1.250 af, Depth> 1.76"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

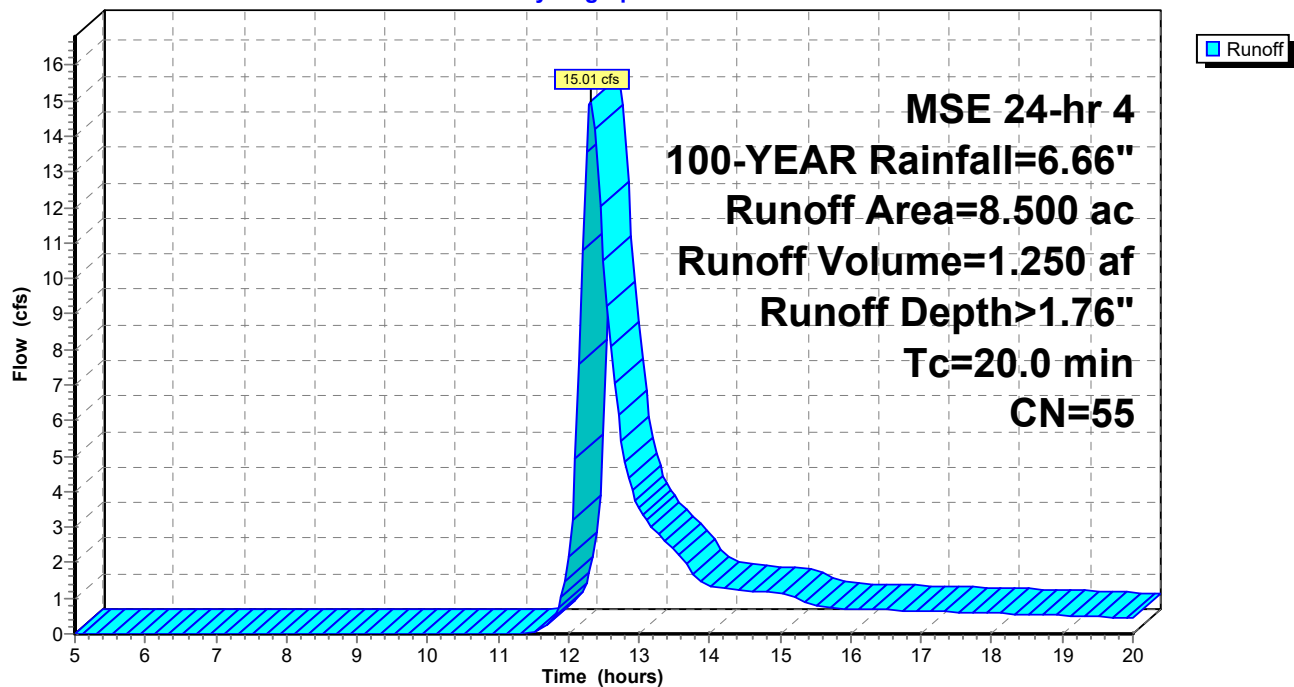
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-YEAR Rainfall=6.66"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 4.50" for 100-YEAR event
 Inflow = 101.43 cfs @ 12.13 hrs, Volume= 5.362 af
 Outflow = 11.43 cfs @ 12.65 hrs, Volume= 2.532 af, Atten= 89%, Lag= 31.1 min
 Discarded = 0.21 cfs @ 12.65 hrs, Volume= 0.151 af
 Primary = 11.22 cfs @ 12.65 hrs, Volume= 2.381 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.17' @ 12.65 hrs Surf.Area= 44,602 sf Storage= 146,086 cf

Plug-Flow detention time= 179.9 min calculated for 2.532 af (47% of inflow)
 Center-of-Mass det. time= 106.2 min (875.9 - 769.7)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

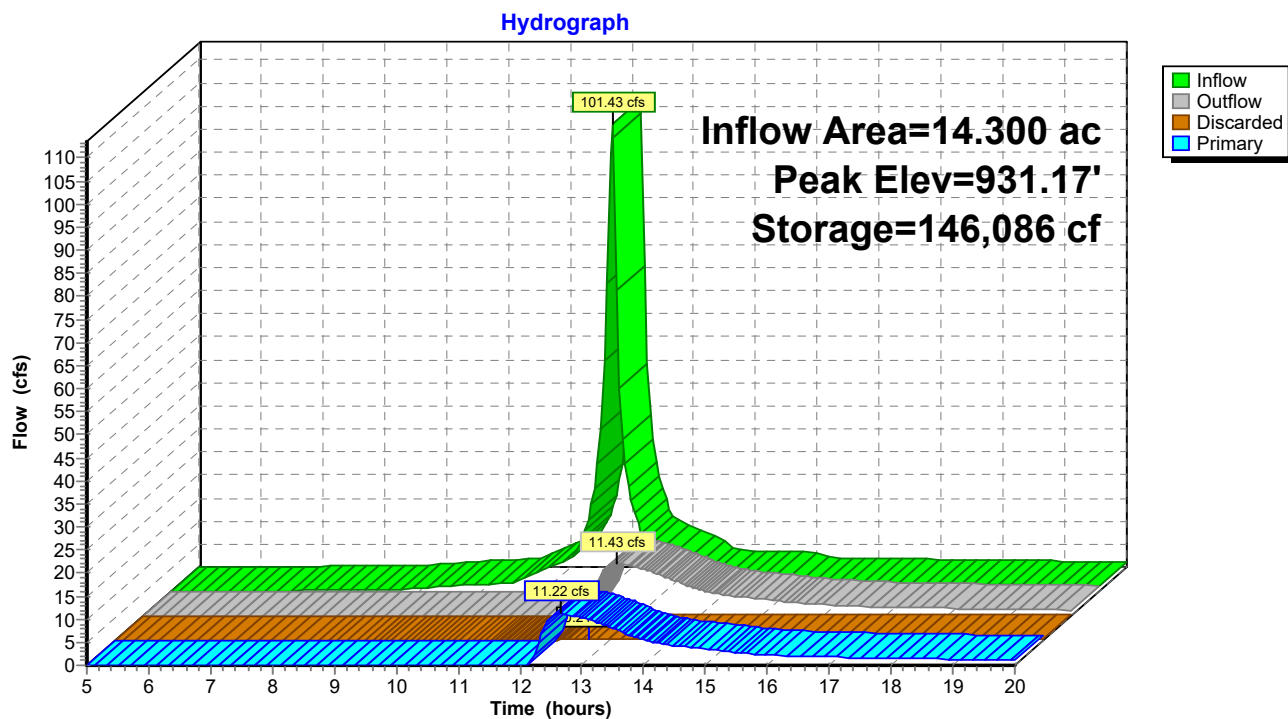
Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.21 cfs @ 12.65 hrs HW=931.17' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.21 cfs of 4.16 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.21 cfs @ 9.73 fps)

Primary OutFlow Max=11.21 cfs @ 12.65 hrs HW=931.17' (Free Discharge)

↑ **2=Culvert** (Passes 11.21 cfs of 15.73 cfs potential flow)
 ↑ **4=Orifice/Grate** (Weir Controls 11.21 cfs @ 2.67 fps)
 ↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS

Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 3.95" for 100-YEAR event
 Inflow = 107.90 cfs @ 12.14 hrs, Volume= 6.647 af
 Outflow = 51.56 cfs @ 12.32 hrs, Volume= 4.561 af, Atten= 52%, Lag= 10.8 min
 Primary = 51.56 cfs @ 12.32 hrs, Volume= 4.561 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 934.13' @ 12.32 hrs Surf.Area= 32,011 sf Storage= 125,305 cf

Plug-Flow detention time= 113.8 min calculated for 4.546 af (68% of inflow)
 Center-of-Mass det. time= 53.3 min (830.4 - 777.0)

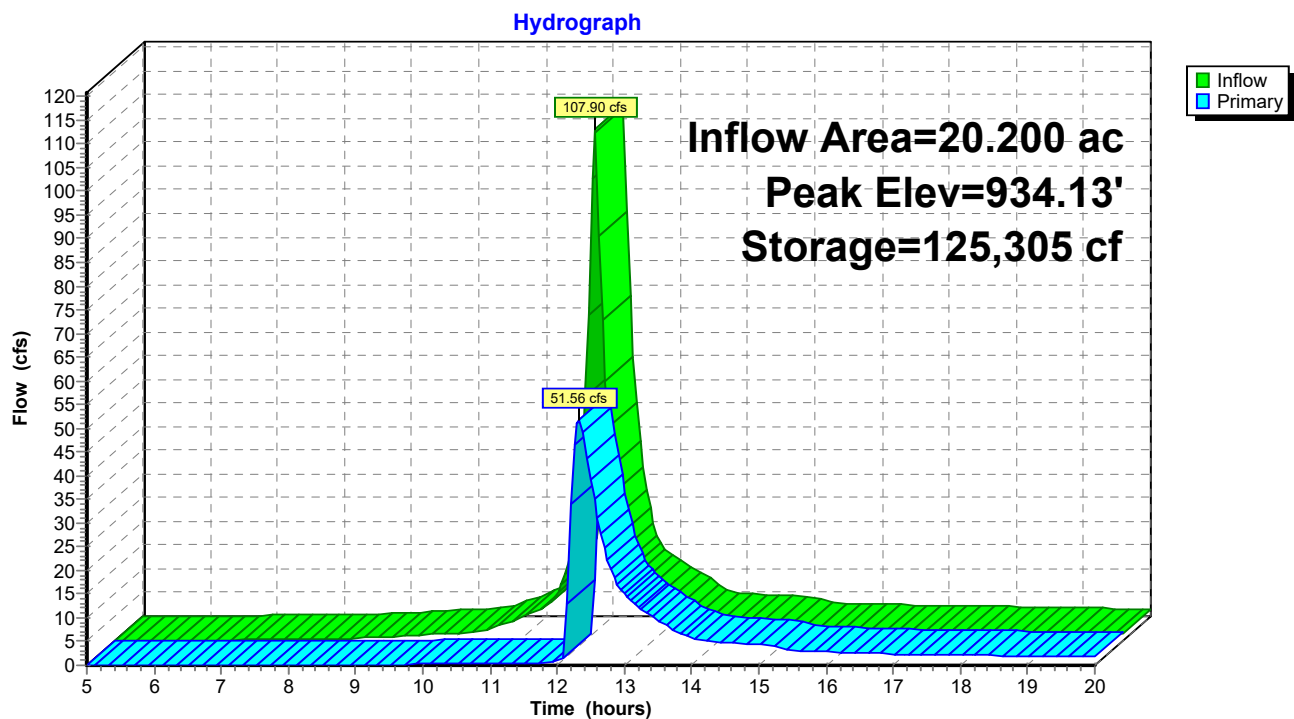
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' / SideZ 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=50.95 cfs @ 12.32 hrs HW=934.12' (Free Discharge)

1=Culvert (Passes 50.95 cfs of 63.41 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.94 cfs @ 10.71 fps)
 3=Orifice/Grate (Orifice Controls 1.41 cfs @ 7.17 fps)
 4=Orifice/Grate (Weir Controls 48.60 cfs @ 3.46 fps)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[81] Warning: Exceeded Pond 10P by 1.40' @ 14.10 hrs

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 3.08" for 100-YEAR event
 Inflow = 321.27 cfs @ 12.61 hrs, Volume= 41.314 af
 Outflow = 62.24 cfs @ 13.96 hrs, Volume= 27.691 af, Atten= 81%, Lag= 81.4 min
 Discarded = 10.07 cfs @ 13.96 hrs, Volume= 5.971 af
 Primary = 52.17 cfs @ 13.96 hrs, Volume= 21.720 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 934.60' @ 13.96 hrs Surf.Area= 6.873 ac Storage= 23.811 af

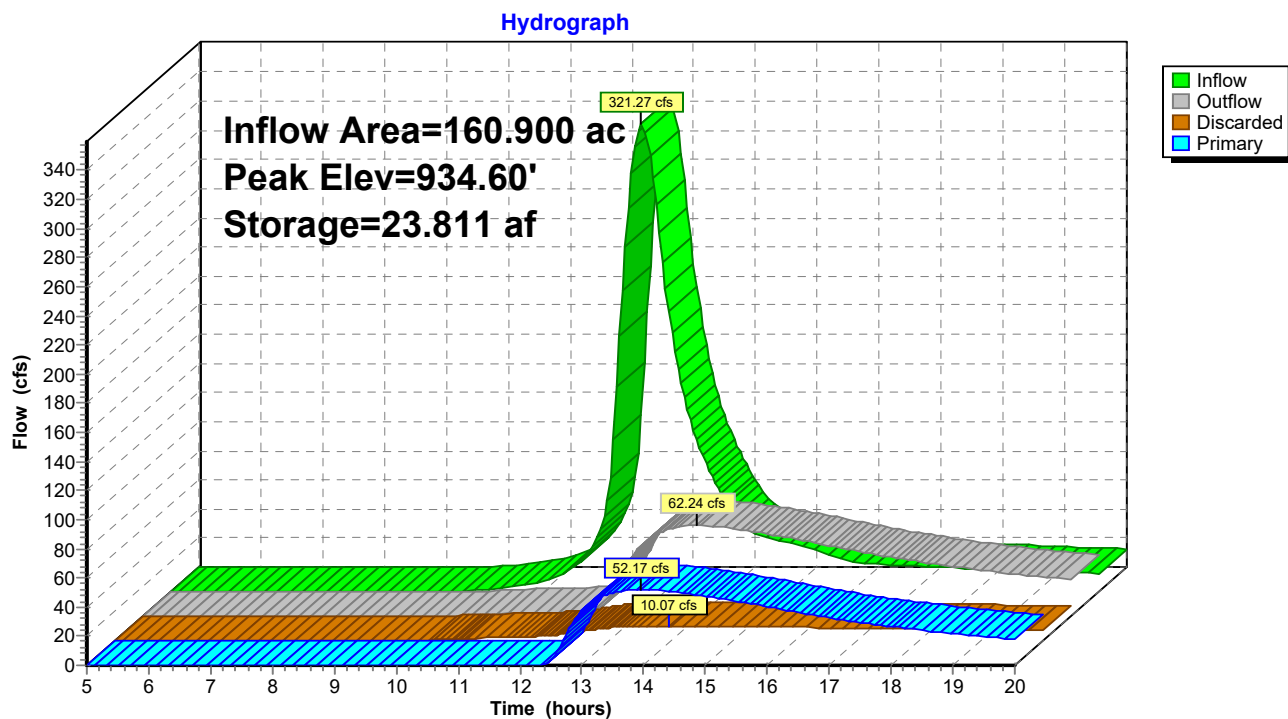
Plug-Flow detention time= 185.1 min calculated for 27.599 af (67% of inflow)
 Center-of-Mass det. time= 123.4 min (945.5 - 822.1)

Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907
Device	Routing	Invert	Outlet Devices	
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'	
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf	

Discarded OutFlow Max=10.07 cfs @ 13.96 hrs HW=934.60' (Free Discharge)
 ↑1=Exfiltration (Controls 10.07 cfs)

Primary OutFlow Max=52.17 cfs @ 13.96 hrs HW=934.60' (Free Discharge)
 ↑2=Culvert (Barrel Controls 52.17 cfs @ 5.78 fps)

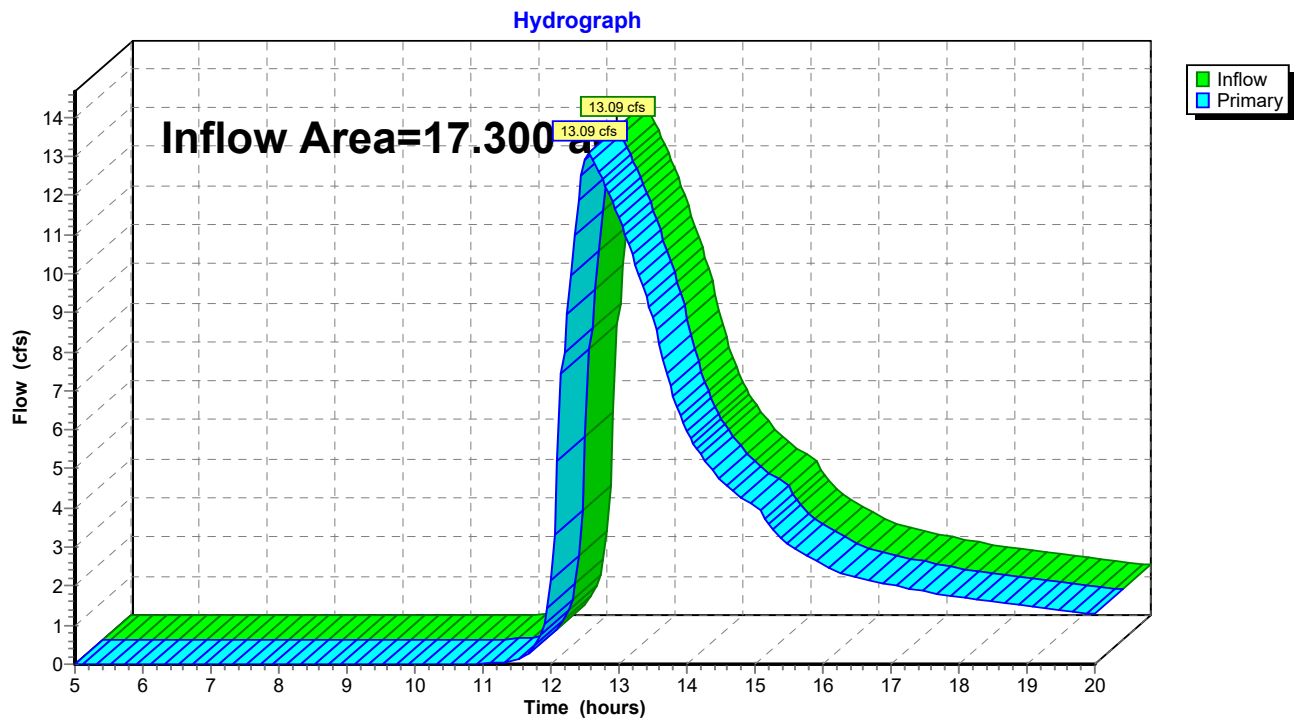
Pond 12P: PR NORTH KETTLE



Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 1.99" for 100-YEAR event
Inflow = 13.09 cfs @ 12.56 hrs, Volume= 2.864 af
Primary = 13.09 cfs @ 12.56 hrs, Volume= 2.864 af, Atten= 0%, Lag= 0.0 min

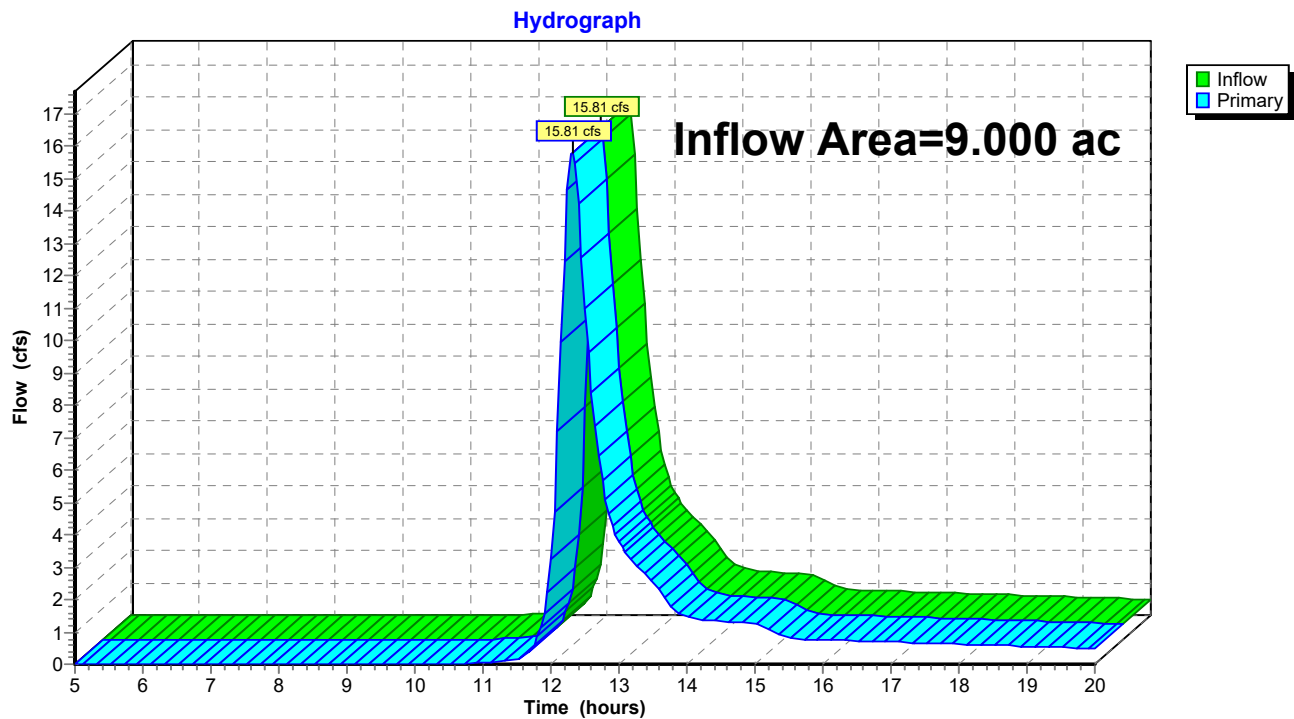
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 1.83" for 100-YEAR event
Inflow = 15.81 cfs @ 12.32 hrs, Volume= 1.373 af
Primary = 15.81 cfs @ 12.32 hrs, Volume= 1.373 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 200-YEAR Rainfall=7.53"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>5.29"
Tc=6.0 min CN=83 Runoff=118.05 cfs 6.306 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>3.21"
Flow Length=300' Tc=10.3 min CN=64 Runoff=2.70 cfs 0.161 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>3.64"
Tc=6.0 min CN=68 Runoff=3.01 cfs 0.152 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>3.80"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=353.78 cfs 43.955 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>5.52"
Tc=6.0 min CN=85 Runoff=96.91 cfs 5.244 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>3.63"
Flow Length=600' Tc=13.9 min CN=68 Runoff=39.83 cfs 2.660 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>5.52"
Tc=6.0 min CN=85 Runoff=16.15 cfs 0.874 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>2.30"
Tc=10.0 min CN=55 Runoff=7.69 cfs 0.460 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>2.29"
Tc=20.0 min CN=55 Runoff=19.91 cfs 1.622 af

Pond 7P: SOUTH PONDS Peak Elev=931.57' Storage=164,625 cf Inflow=118.05 cfs 6.306 af
Discarded=0.22 cfs 0.157 af Primary=15.68 cfs 3.304 af Outflow=15.90 cfs 3.461 af

Pond 10P: NORTH POND Peak Elev=934.49' Storage=137,017 cf Inflow=127.00 cfs 7.904 af
Outflow=67.95 cfs 5.799 af

Pond 12P: PR NORTH KETTLE Peak Elev=935.33' Storage=29.144 af Inflow=392.96 cfs 50.628 af
Discarded=11.33 cfs 6.666 af Primary=66.14 cfs 28.724 af Outflow=77.47 cfs 35.390 af

Link 6L: PROP SE DISCHARGE Inflow=21.64 cfs 3.925 af
Primary=21.64 cfs 3.925 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=20.90 cfs 1.773 af
Primary=20.90 cfs 1.773 af

Total Runoff Area = 187.200 ac Runoff Volume = 61.434 af Average Runoff Depth = 3.94"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

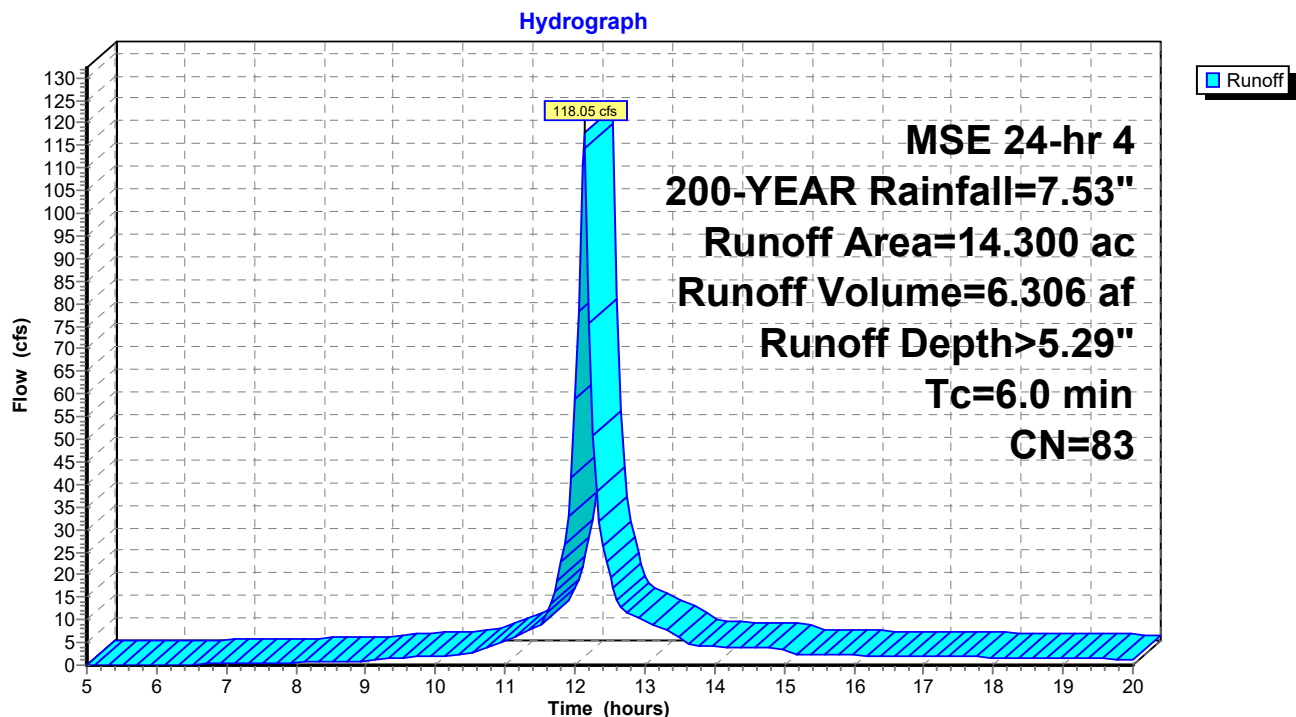
Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 118.05 cfs @ 12.13 hrs, Volume= 6.306 af, Depth> 5.29"
 Routed to Pond 7P : SOUTH PONDS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

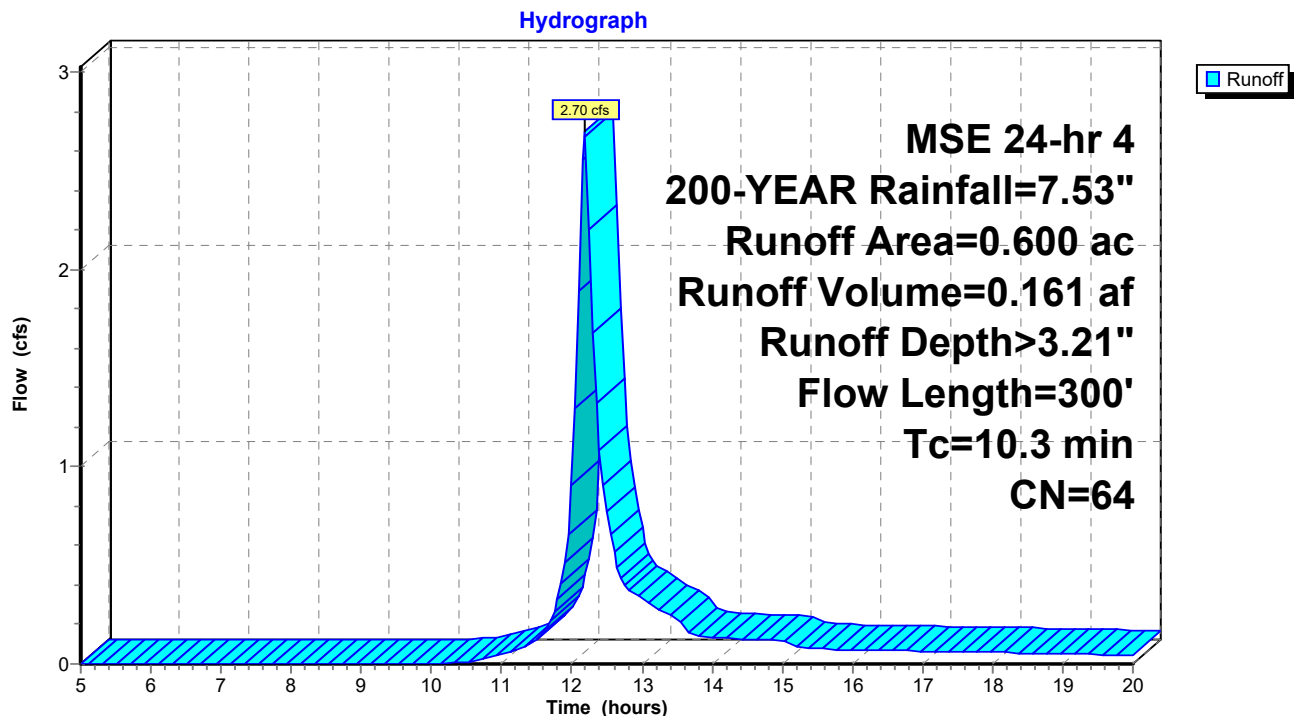
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 2.70 cfs @ 12.18 hrs, Volume= 0.161 af, Depth> 3.21"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

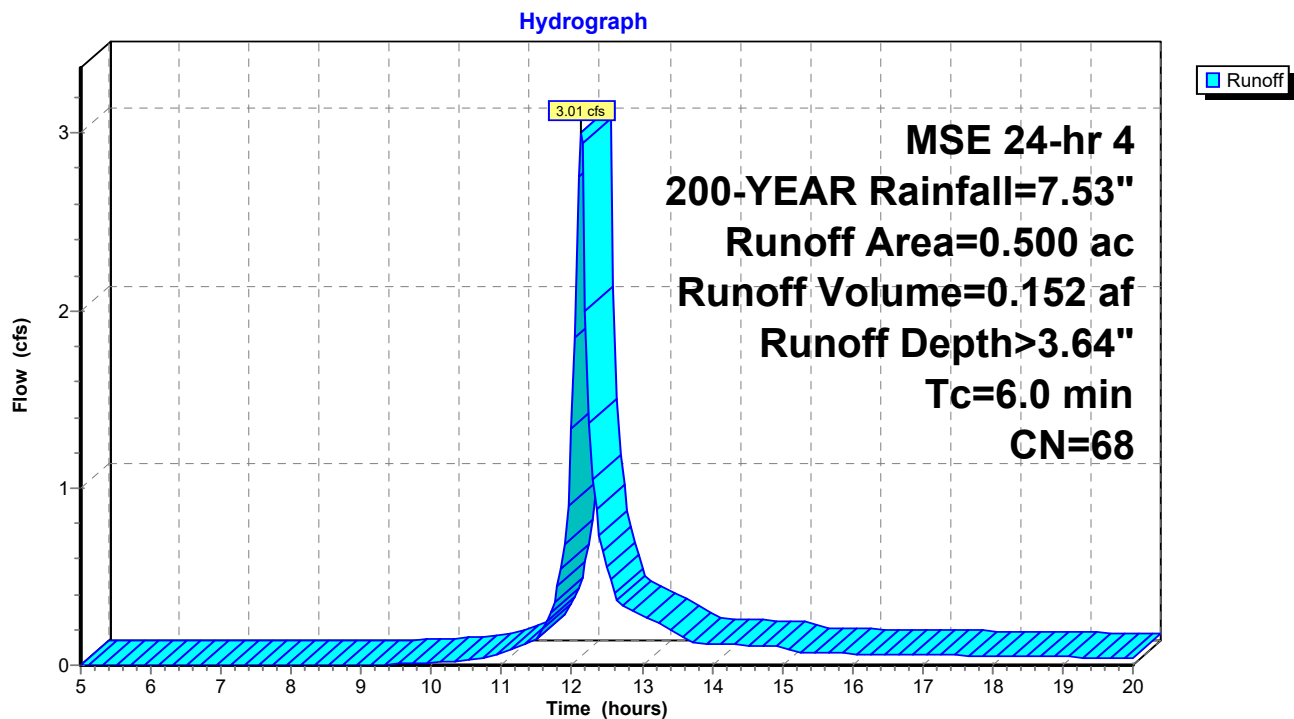
Runoff = 3.01 cfs @ 12.13 hrs, Volume= 0.152 af, Depth> 3.64"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

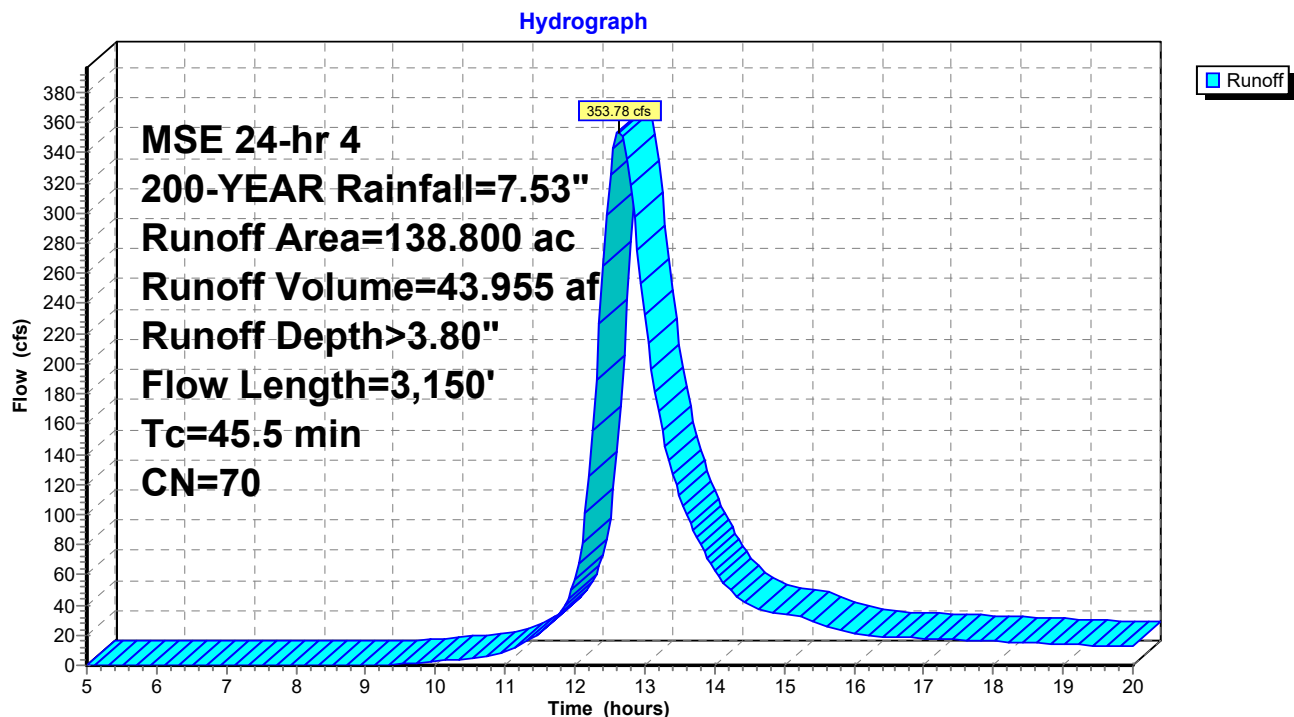
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 353.78 cfs @ 12.63 hrs, Volume= 43.955 af, Depth> 3.80"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

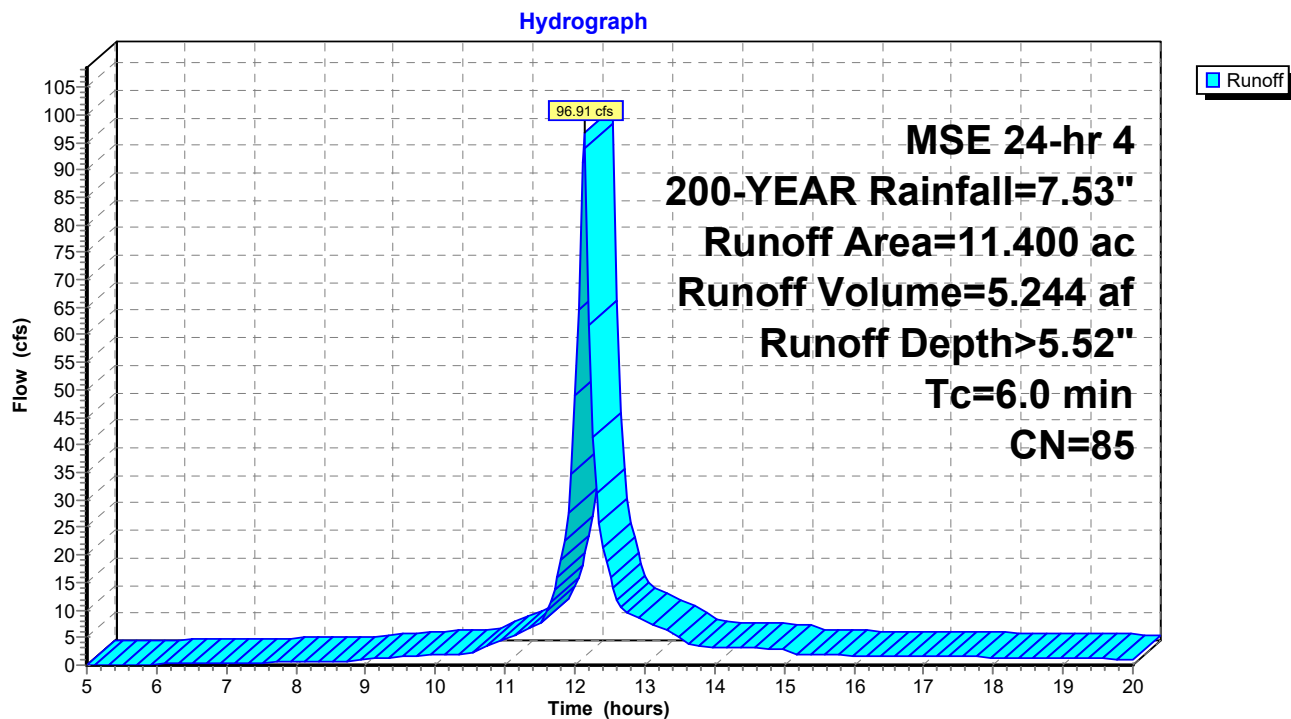
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 96.91 cfs @ 12.13 hrs, Volume= 5.244 af, Depth> 5.52"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 39.83 cfs @ 12.22 hrs, Volume= 2.660 af, Depth> 3.63"
 Routed to Pond 10P : NORTH POND

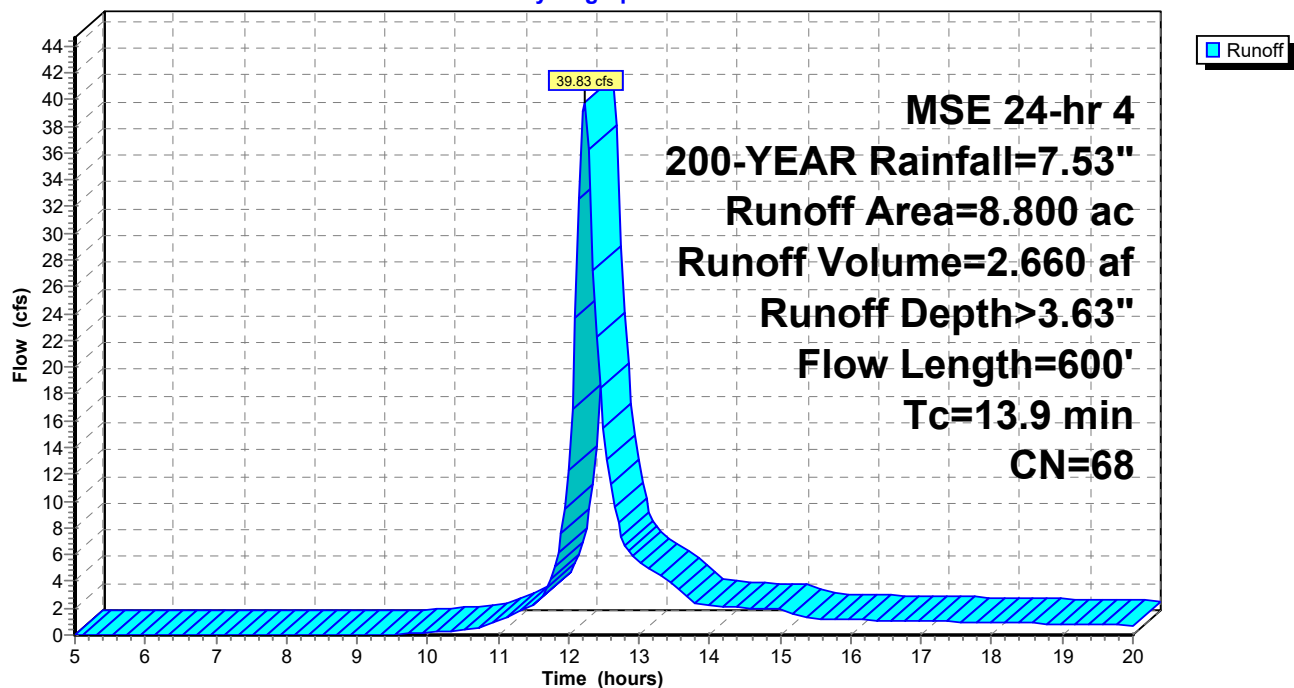
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

Hydrograph



Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 16.15 cfs @ 12.13 hrs, Volume= 0.874 af, Depth> 5.52"
 Routed to Pond 12P : PR NORTH KETTLE

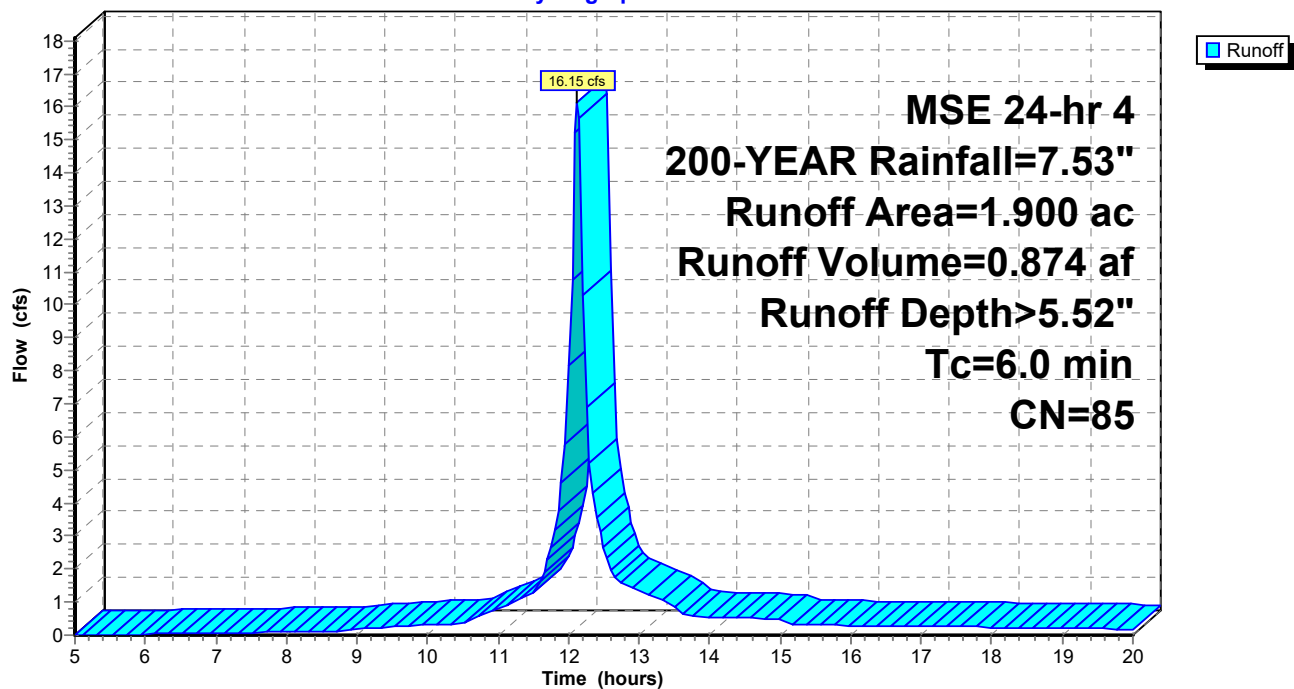
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Hydrograph



Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 7.69 cfs @ 12.19 hrs, Volume= 0.460 af, Depth> 2.30"
 Routed to Link 6L : PROP SE DISCHARGE

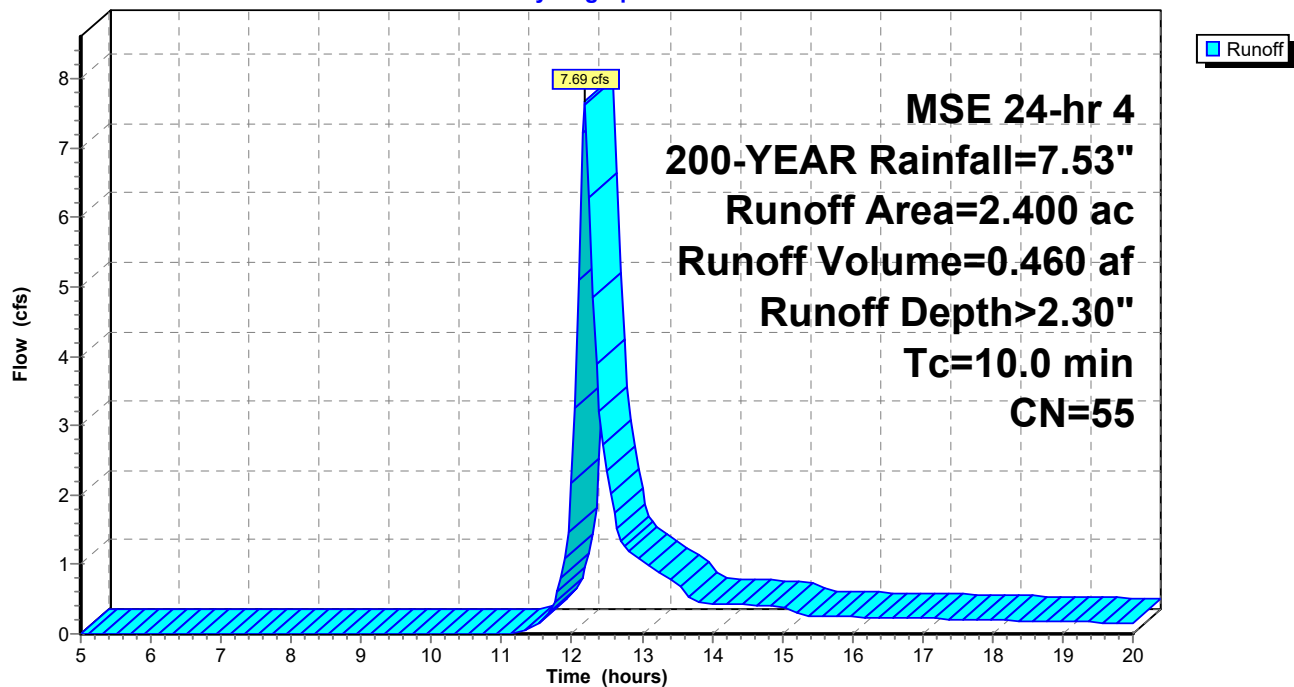
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Hydrograph



Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 19.91 cfs @ 12.32 hrs, Volume= 1.622 af, Depth> 2.29"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

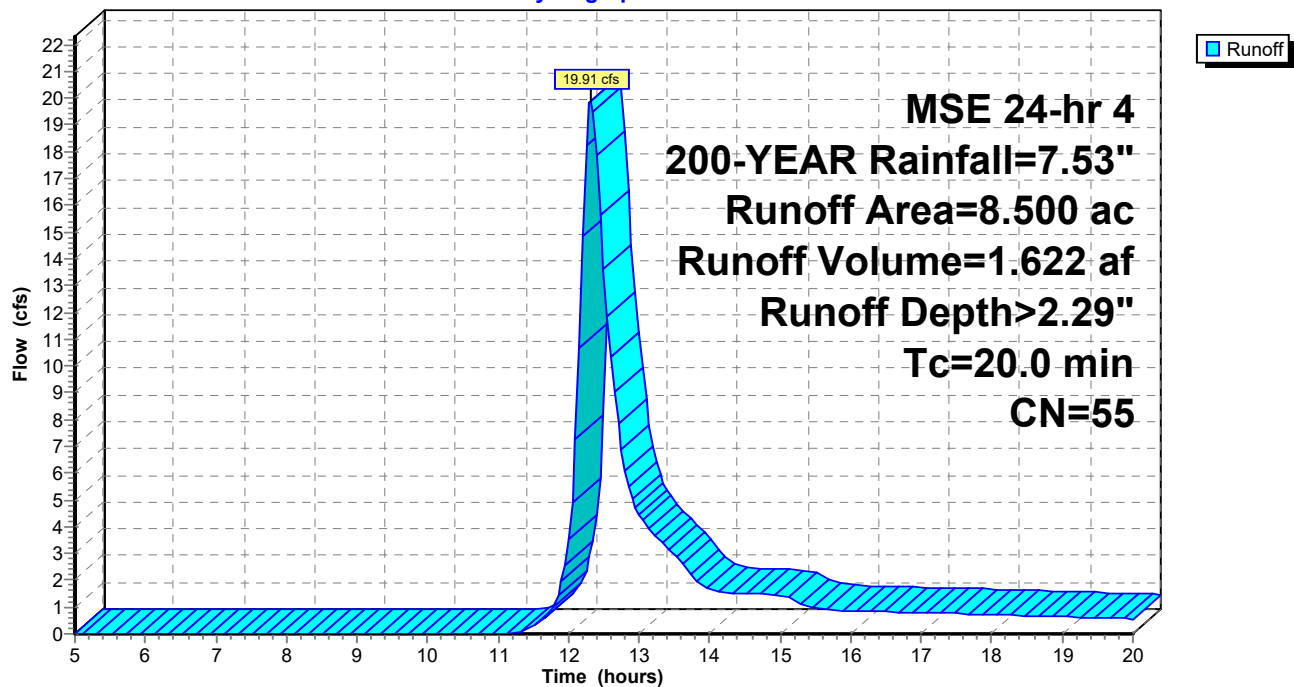
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 200-YEAR Rainfall=7.53"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 5.29" for 200-YEAR event
 Inflow = 118.05 cfs @ 12.13 hrs, Volume= 6.306 af
 Outflow = 15.90 cfs @ 12.57 hrs, Volume= 3.461 af, Atten= 87%, Lag= 26.6 min
 Discarded = 0.22 cfs @ 12.57 hrs, Volume= 0.157 af
 Primary = 15.68 cfs @ 12.57 hrs, Volume= 3.304 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 931.57' @ 12.57 hrs Surf.Area= 46,468 sf Storage= 164,625 cf

Plug-Flow detention time= 162.1 min calculated for 3.461 af (55% of inflow)
 Center-of-Mass det. time= 93.2 min (859.6 - 766.4)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

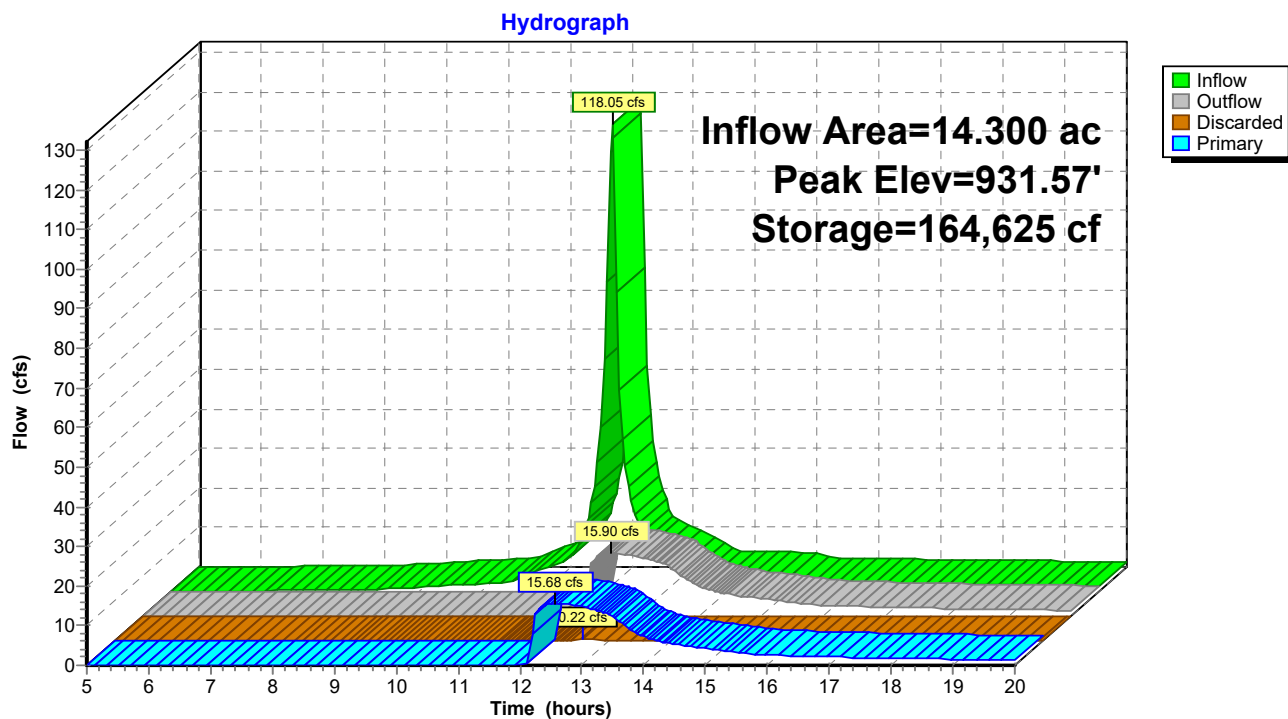
Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.22 cfs @ 12.57 hrs HW=931.57' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.22 cfs of 4.37 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.22 cfs @ 10.20 fps)

Primary OutFlow Max=15.67 cfs @ 12.57 hrs HW=931.57' (Free Discharge)

↑ **2=Culvert** (Passes 15.67 cfs of 16.64 cfs potential flow)
 ↑ **4=Orifice/Grate** (Orifice Controls 15.67 cfs @ 4.99 fps)
 ↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: SOUTH PONDS

Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 4.70" for 200-YEAR event
 Inflow = 127.00 cfs @ 12.14 hrs, Volume= 7.904 af
 Outflow = 67.95 cfs @ 12.29 hrs, Volume= 5.799 af, Atten= 46%, Lag= 9.0 min
 Primary = 67.95 cfs @ 12.29 hrs, Volume= 5.799 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 934.49' @ 12.29 hrs Surf.Area= 33,442 sf Storage= 137,017 cf

Plug-Flow detention time= 103.5 min calculated for 5.799 af (73% of inflow)
 Center-of-Mass det. time= 46.4 min (820.3 - 774.0)

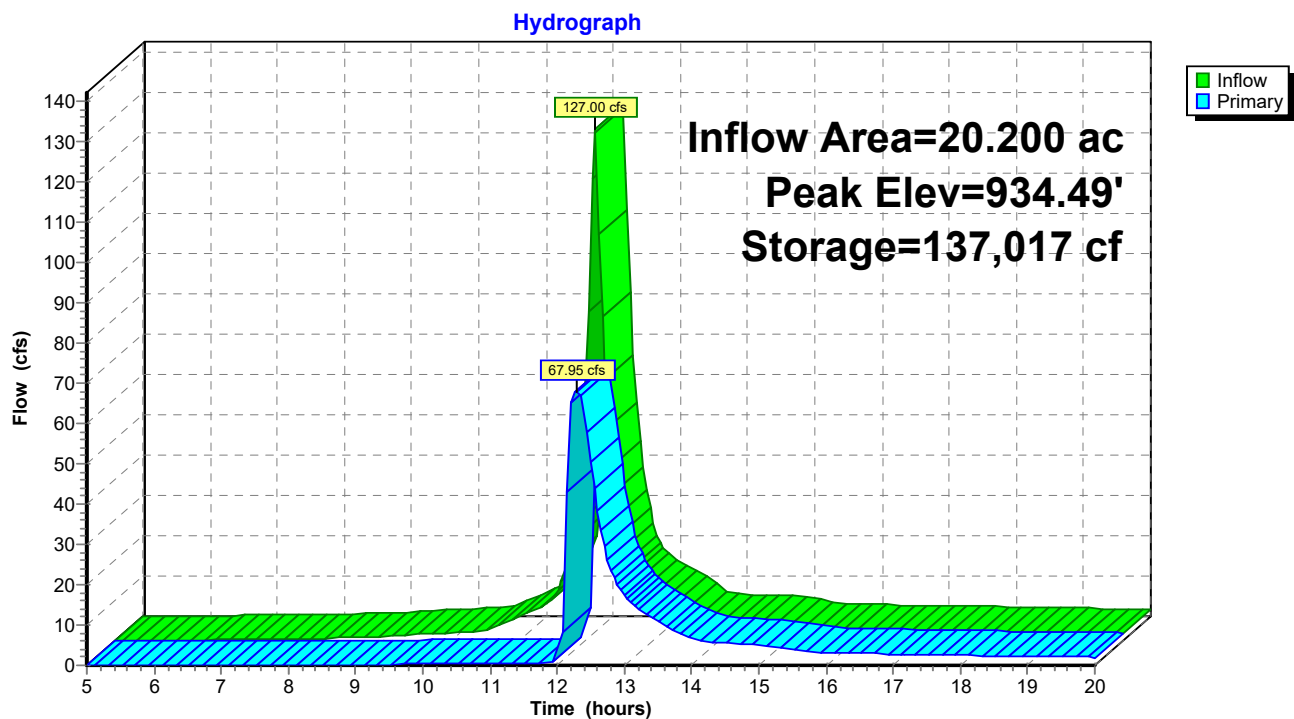
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 ' S Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' SideZ 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=67.90 cfs @ 12.29 hrs HW=934.48' (Free Discharge)

1=Culvert (Inlet Controls 67.90 cfs @ 9.61 fps)
 2=Orifice/Grate (Passes < 0.97 cfs potential flow)
 3=Orifice/Grate (Passes < 1.52 cfs potential flow)
 4=Orifice/Grate (Passes < 73.61 cfs potential flow)
 5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[81] Warning: Exceeded Pond 10P by 2.10' @ 14.05 hrs

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 3.78" for 200-YEAR event
 Inflow = 392.96 cfs @ 12.60 hrs, Volume= 50.628 af
 Outflow = 77.47 cfs @ 13.92 hrs, Volume= 35.390 af, Atten= 80%, Lag= 79.2 min
 Discarded = 11.33 cfs @ 13.92 hrs, Volume= 6.666 af
 Primary = 66.14 cfs @ 13.92 hrs, Volume= 28.724 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 935.33' @ 13.92 hrs Surf.Area= 7.664 ac Storage= 29.144 af

Plug-Flow detention time= 183.8 min calculated for 35.273 af (70% of inflow)
 Center-of-Mass det. time= 125.5 min (943.3 - 817.8)

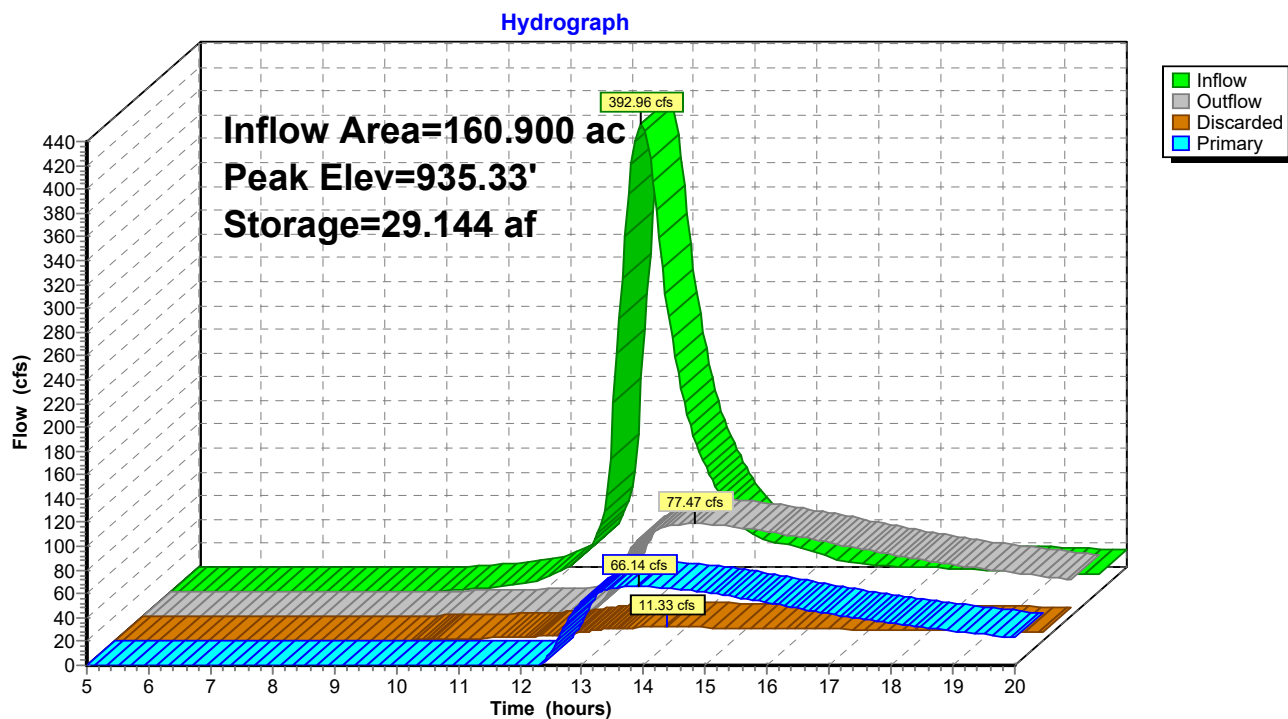
Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf

Discarded OutFlow Max=11.33 cfs @ 13.92 hrs HW=935.33' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 11.33 cfs)

Primary OutFlow Max=66.15 cfs @ 13.92 hrs HW=935.33' (Free Discharge)
 ↑ **2=Culvert** (Barrel Controls 66.15 cfs @ 6.05 fps)

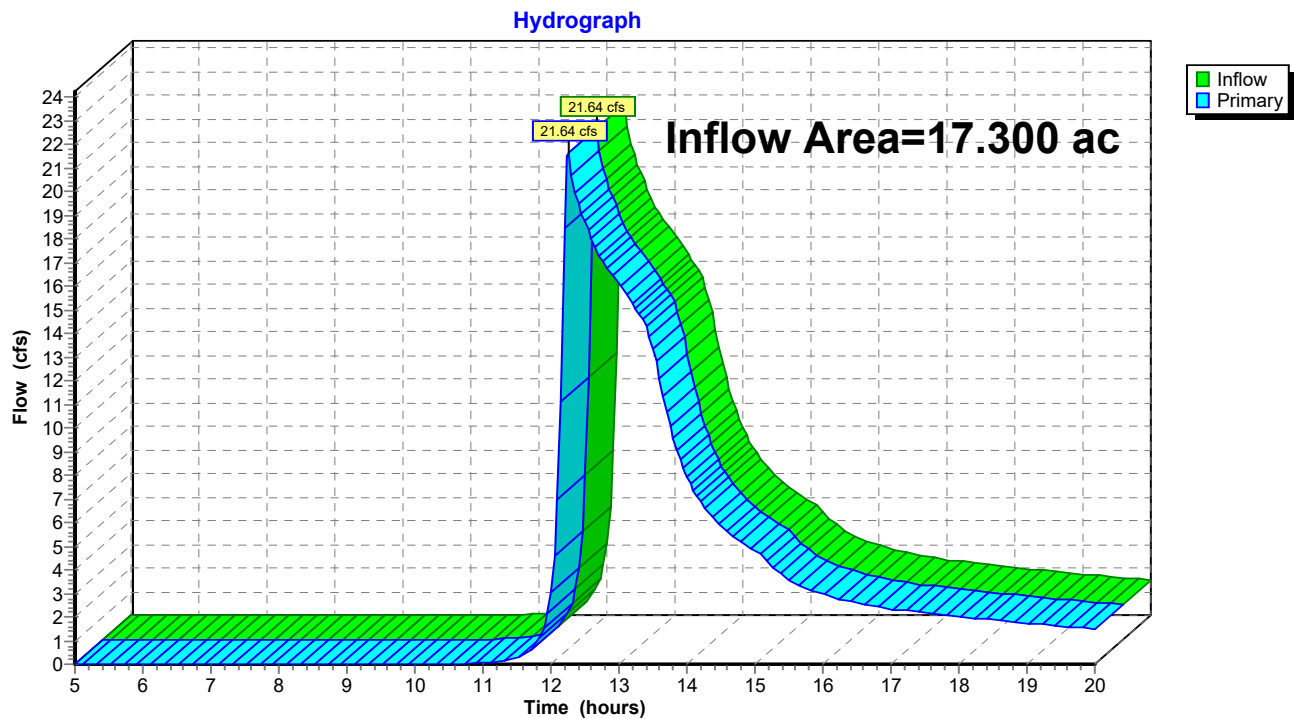
Pond 12P: PR NORTH KETTLE



Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 2.72" for 200-YEAR event
Inflow = 21.64 cfs @ 12.26 hrs, Volume= 3.925 af
Primary = 21.64 cfs @ 12.26 hrs, Volume= 3.925 af, Atten= 0%, Lag= 0.0 min

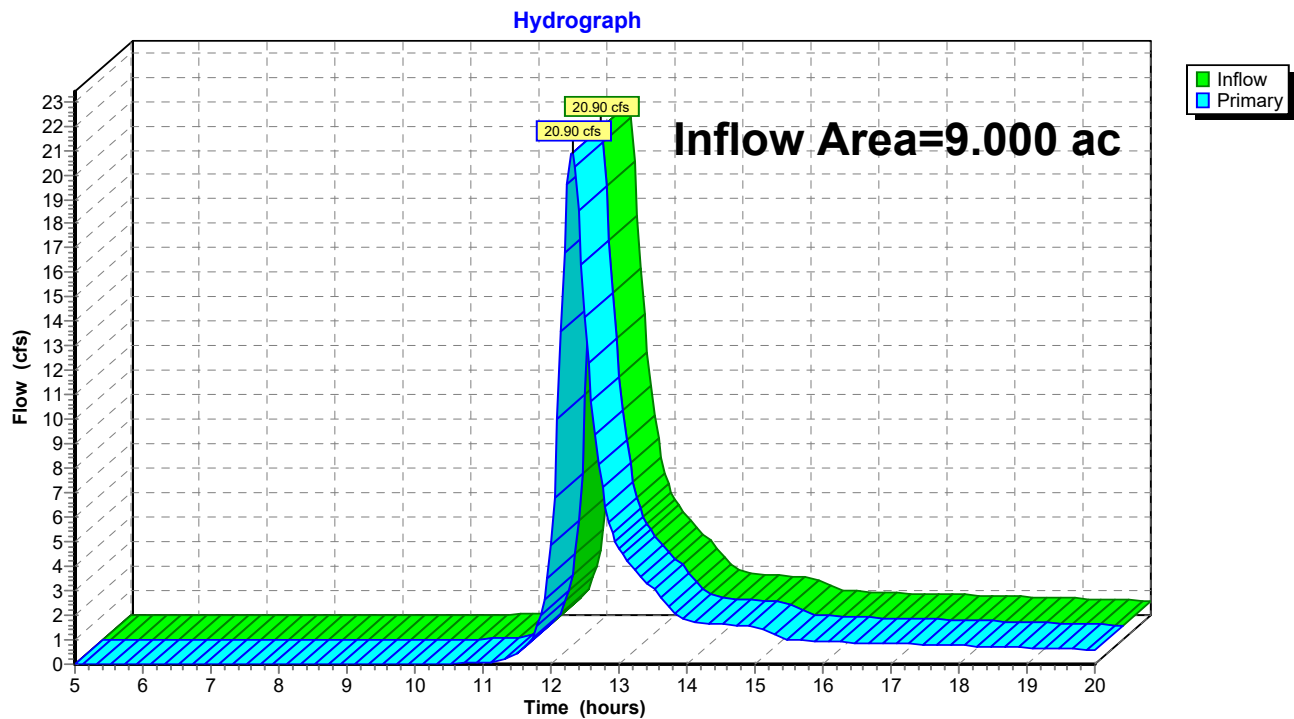
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 2.36" for 200-YEAR event
Inflow = 20.90 cfs @ 12.31 hrs, Volume= 1.773 af
Primary = 20.90 cfs @ 12.31 hrs, Volume= 1.773 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE

LEO MADISON

Prepared by Pinnacle Engineering Group

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MSE 24-hr 4 500-YEAR Rainfall=8.94"

Printed 8/21/2025

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment4S: PROP AREA TO Runoff Area=14.300 ac 59.55% Impervious Runoff Depth>6.59"
Tc=6.0 min CN=83 Runoff=144.90 cfs 7.856 af

Subcatchment5S: UNDET AREA TO SE Runoff Area=0.600 ac 8.33% Impervious Runoff Depth>4.29"
Flow Length=300' Tc=10.3 min CN=64 Runoff=3.61 cfs 0.215 af

Subcatchment8S: PROP UNDETAINED Runoff Area=0.500 ac 20.00% Impervious Runoff Depth>4.78"
Tc=6.0 min CN=68 Runoff=3.92 cfs 0.199 af

Subcatchment10S: REMAINING EXIST Runoff Area=138.800 ac 12.75% Impervious Runoff Depth>4.96"
Flow Length=3,150' Tc=45.5 min CN=70 Runoff=461.09 cfs 57.340 af

Subcatchment11S: PROP AREA TO Runoff Area=11.400 ac 65.00% Impervious Runoff Depth>6.83"
Tc=6.0 min CN=85 Runoff=118.22 cfs 6.492 af

Subcatchment12S: OFFSITE AREA TO Runoff Area=8.800 ac 0.00% Impervious Runoff Depth>4.77"
Flow Length=600' Tc=13.9 min CN=68 Runoff=52.15 cfs 3.497 af

Subcatchment13S: PROP UNDETAINED Runoff Area=1.900 ac 65.00% Impervious Runoff Depth>6.83"
Tc=6.0 min CN=85 Runoff=19.70 cfs 1.082 af

Subcatchment15S: UNDEVELOPED Runoff Area=2.400 ac 0.00% Impervious Runoff Depth>3.23"
Tc=10.0 min CN=55 Runoff=10.93 cfs 0.645 af

Subcatchment17S: UNDEVELOPED Runoff Area=8.500 ac 0.00% Impervious Runoff Depth>3.21"
Tc=20.0 min CN=55 Runoff=28.47 cfs 2.277 af

Pond 7P: SOUTH PONDS Peak Elev=932.32' Storage=200,472 cf Inflow=144.90 cfs 7.856 af
Discarded=0.24 cfs 0.168 af Primary=23.56 cfs 4.822 af Outflow=23.80 cfs 4.989 af

Pond 10P: NORTH POND Peak Elev=935.16' Storage=160,302 cf Inflow=158.19 cfs 9.988 af
Outflow=90.66 cfs 7.865 af

Pond 12P: PR NORTH KETTLE Peak Elev=936.56' Storage=39.392 af Inflow=525.00 cfs 66.287 af
Discarded=12.76 cfs 7.890 af Primary=74.02 cfs 39.229 af Outflow=86.77 cfs 47.120 af

Link 6L: PROP SE DISCHARGE Inflow=31.53 cfs 5.682 af
Primary=31.53 cfs 5.682 af

Link 16L: PROPOSED SOUTH DISCHARGE Inflow=29.76 cfs 2.476 af
Primary=29.76 cfs 2.476 af

Total Runoff Area = 187.200 ac Runoff Volume = 79.603 af Average Runoff Depth = 5.10"
81.30% Pervious = 152.190 ac 18.70% Impervious = 35.010 ac

Summary for Subcatchment 4S: PROP AREA TO SOUTH PONDS

Runoff = 144.90 cfs @ 12.13 hrs, Volume= 7.856 af, Depth> 6.59"
 Routed to Pond 7P : SOUTH PONDS

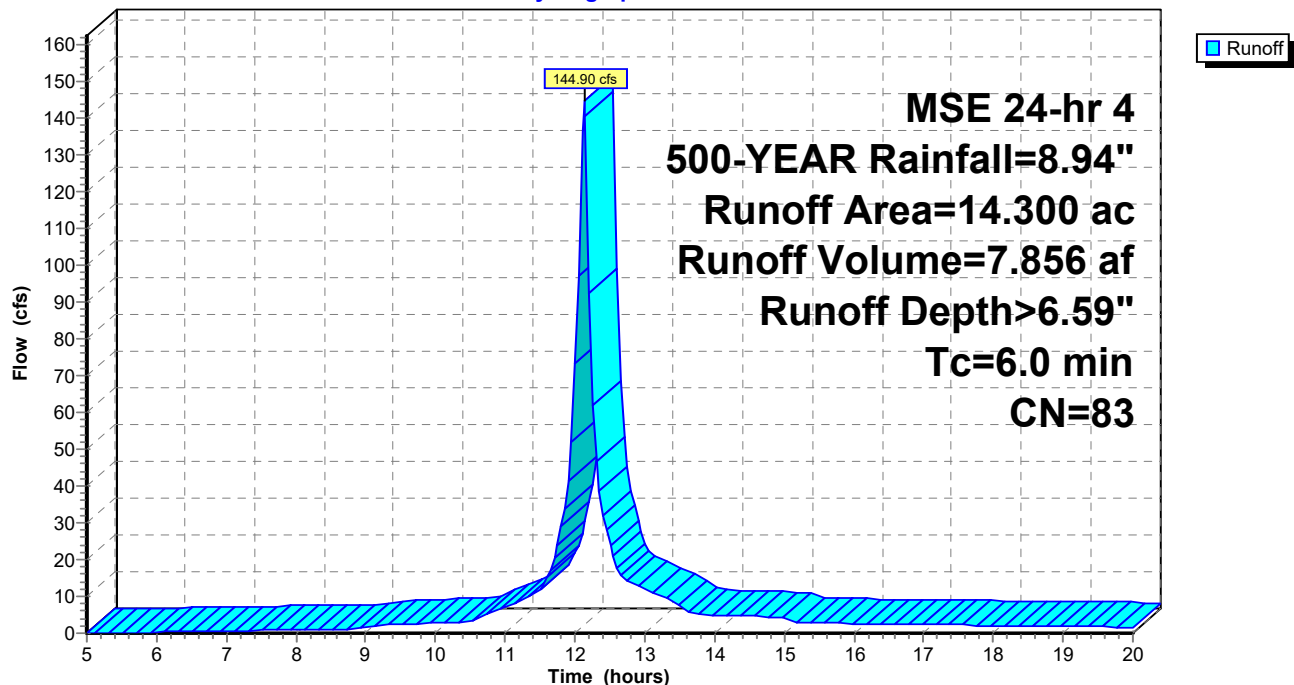
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
13.100	85	1/8 acre lots, 65% imp, HSG B
* 1.200	61	POND AREA >75% Grass cover, Good, HSG B
14.300	83	Weighted Average
5.785		40.45% Pervious Area
8.515		59.55% Impervious Area

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

Subcatchment 4S: PROP AREA TO SOUTH PONDS

Hydrograph



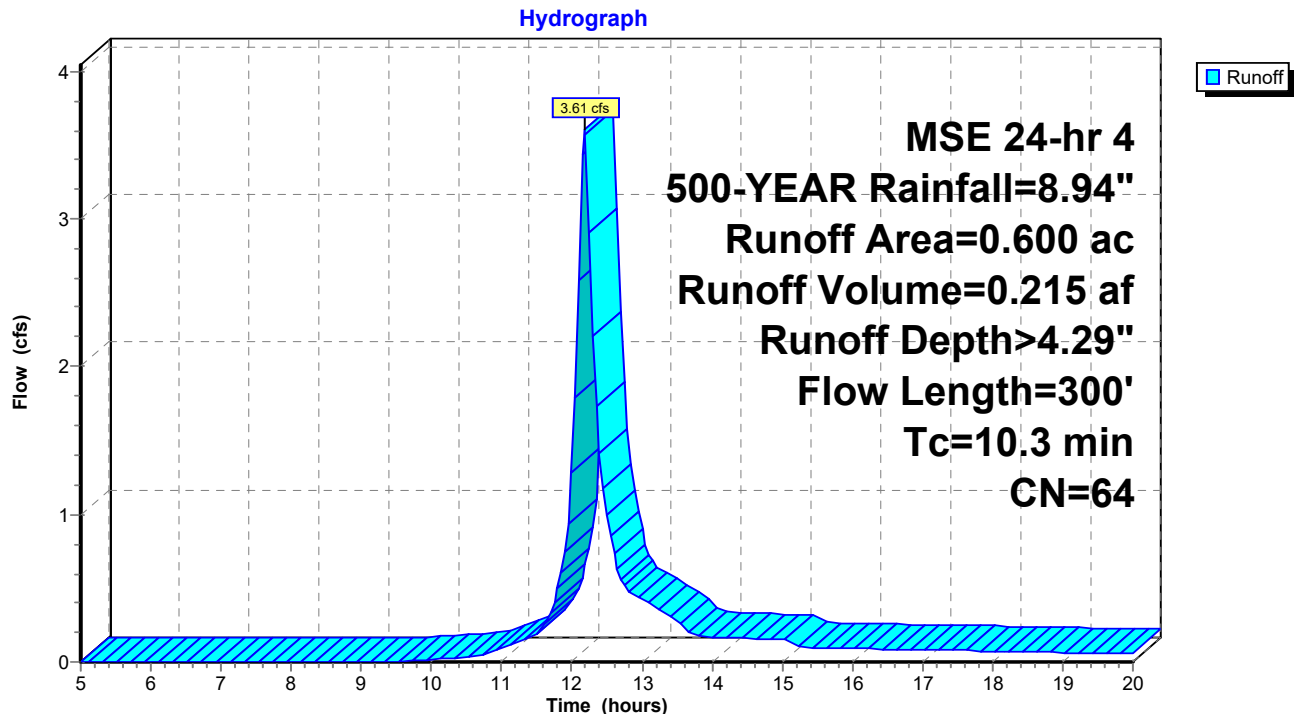
Summary for Subcatchment 5S: UNDET AREA TO SE

Runoff = 3.61 cfs @ 12.18 hrs, Volume= 0.215 af, Depth> 4.29"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 0.050	98	IMPERVIOUS
* 0.550	61	GRASS
0.600	64	Weighted Average
0.550		91.67% Pervious Area
0.050		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		Sheet Flow, SHEET Grass: Short n= 0.150 P2= 2.84"
6.6	50	0.0400	0.13		Sheet Flow, SHEET Grass: Dense n= 0.240 P2= 2.84"
1.3	200	0.0300	2.60		Shallow Concentrated Flow, SCF Grassed Waterway Kv= 15.0 fps
10.3	300	Total			

Subcatchment 5S: UNDET AREA TO SE

Summary for Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Runoff = 3.92 cfs @ 12.13 hrs, Volume= 0.199 af, Depth> 4.78"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

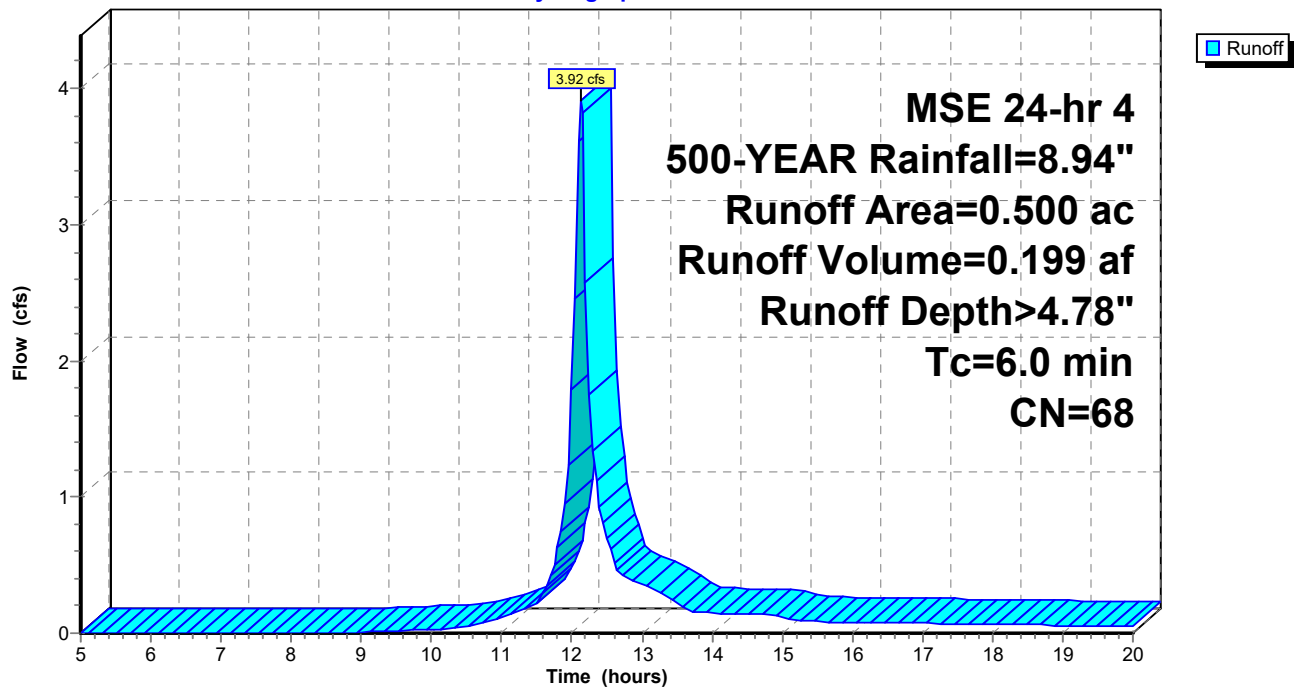
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 0.400	61	GRASS
* 0.100	98	IMPERVIOUS
0.500	68	Weighted Average
0.400		80.00% Pervious Area
0.100		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MIN PER TR-55

Subcatchment 8S: PROP UNDETAINED AREA TO SOUTH

Hydrograph



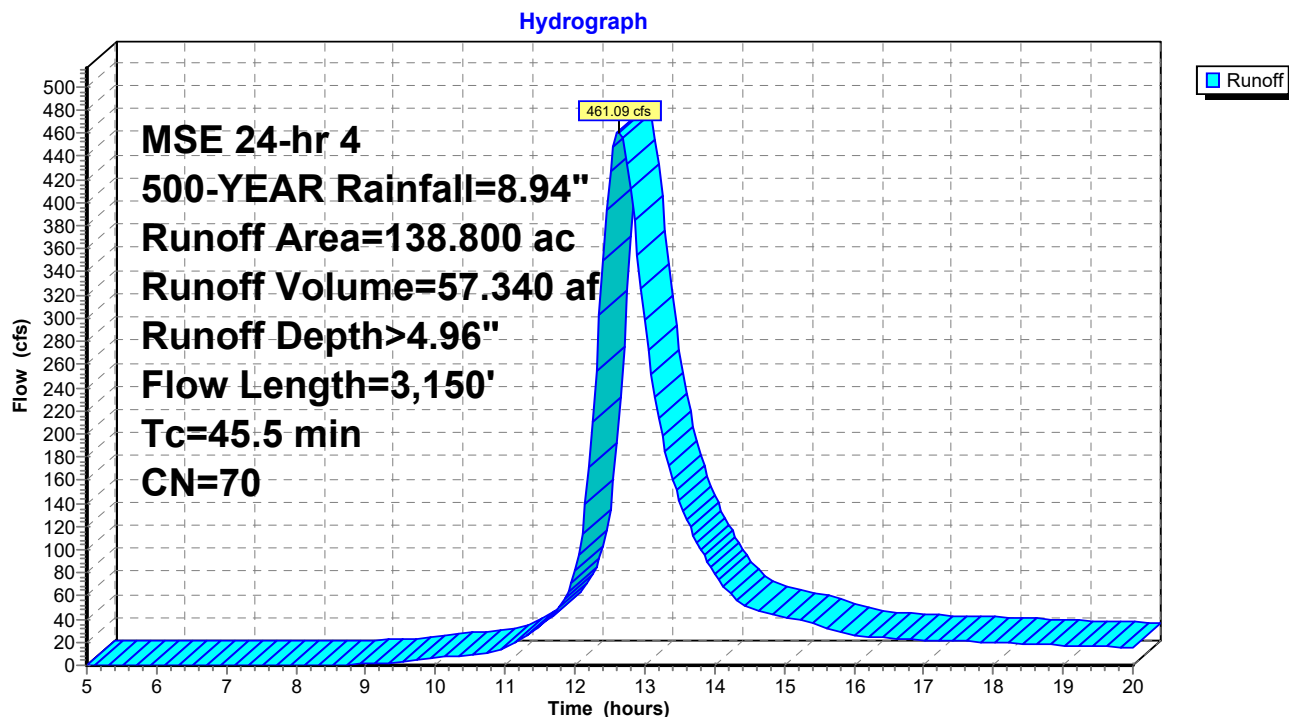
Summary for Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

Runoff = 461.09 cfs @ 12.62 hrs, Volume= 57.340 af, Depth> 4.96"
 Routed to Pond 12P : PR NORTH KETTLE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 79.800	68	CROPLAND PER CITY ORDINANCE B SOIL
59.000	72	1/3 acre lots, 30% imp, HSG B
138.800	70	Weighted Average
121.100		87.25% Pervious Area
17.700		12.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		Sheet Flow, Sheet
					Cultivated: Residue>20% n= 0.170 P2= 2.84"
35.7	3,050	0.0250	1.42		Shallow Concentrated Flow, SCF
					Cultivated Straight Rows Kv= 9.0 fps
45.5	3,150	Total			

Subcatchment 10S: REMAINING EXIST AREA TO NORTH KETTLE

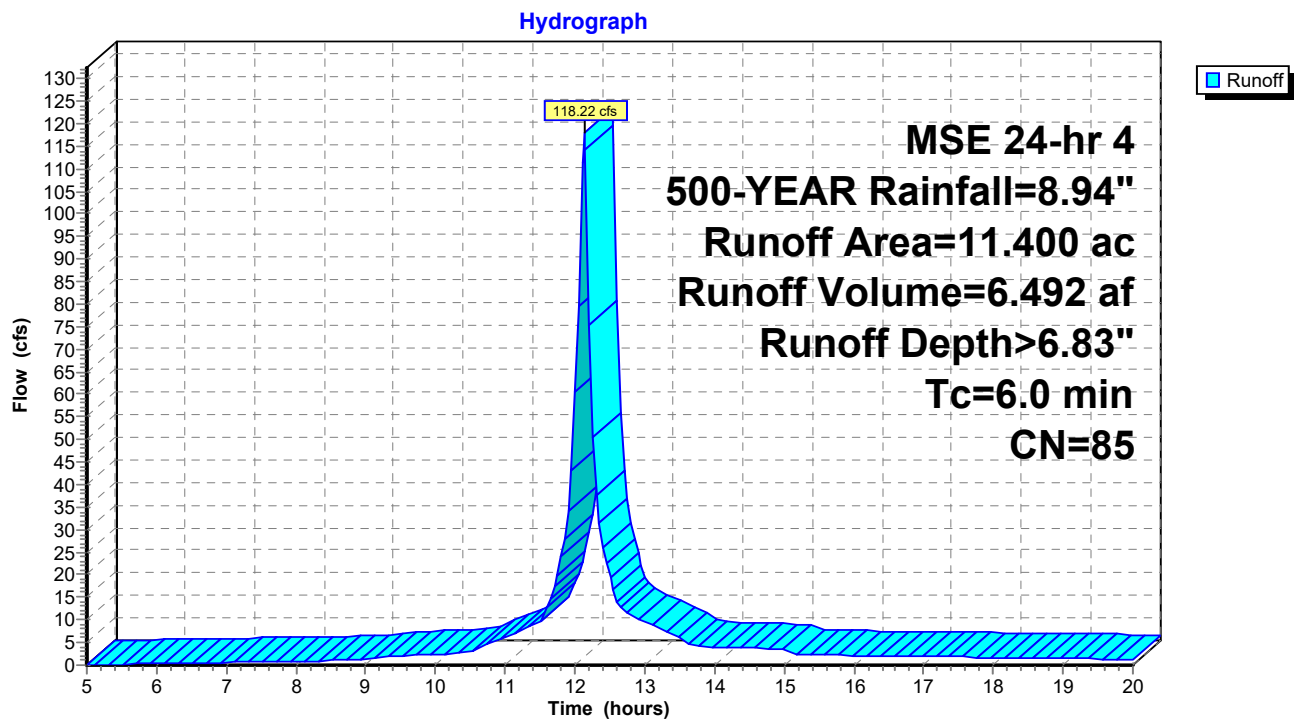
Summary for Subcatchment 11S: PROP AREA TO NORTH POND

Runoff = 118.22 cfs @ 12.13 hrs, Volume= 6.492 af, Depth> 6.83"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
11.400	85	1/8 acre lots, 65% imp, HSG B
3.990		35.00% Pervious Area
7.410		65.00% Impervious Area

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

Subcatchment 11S: PROP AREA TO NORTH POND

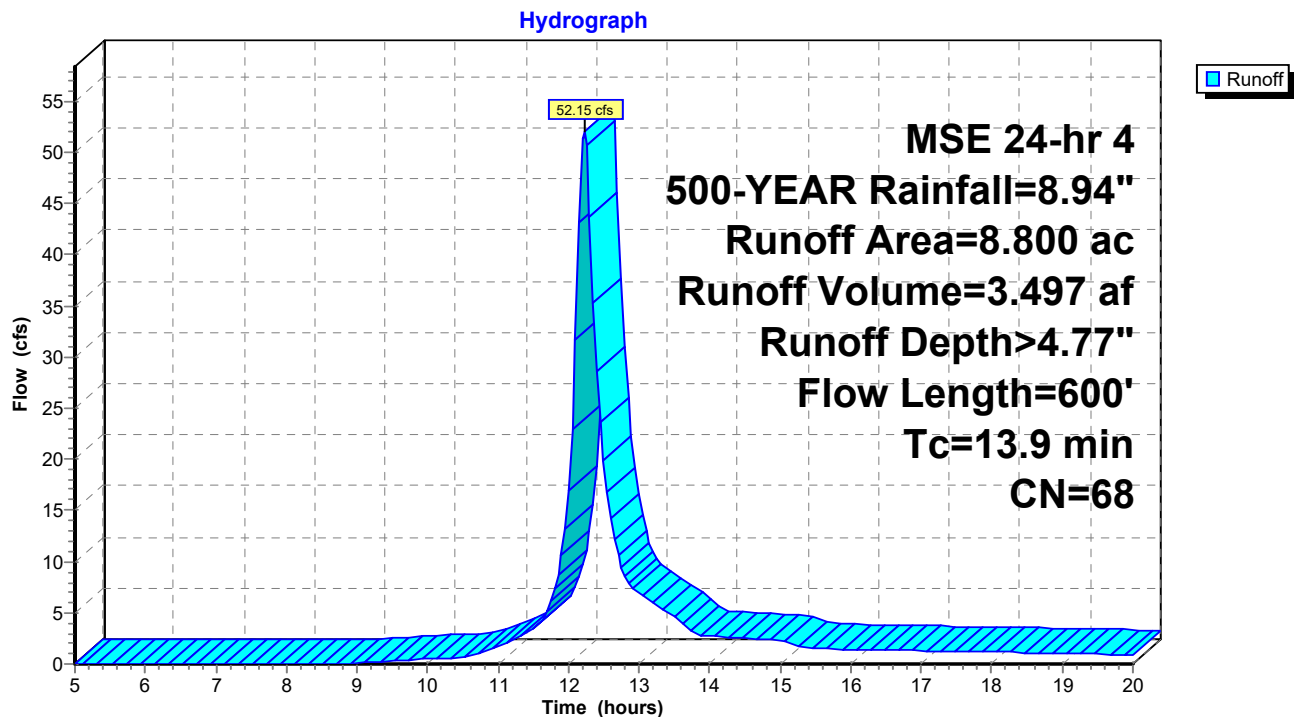
Summary for Subcatchment 12S: OFFSITE AREA TO NORTH POND

Runoff = 52.15 cfs @ 12.22 hrs, Volume= 3.497 af, Depth> 4.77"
 Routed to Pond 10P : NORTH POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 8.800	68	CROPLAND PER CITY ORDINANCE B SOIL
8.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0600	0.22		Sheet Flow, SHEET Cultivated: Residue>20% n= 0.170 P2= 2.84"
6.5	500	0.0200	1.27		Shallow Concentrated Flow, SCF Cultivated Straight Rows Kv= 9.0 fps
13.9	600	Total			

Subcatchment 12S: OFFSITE AREA TO NORTH POND

Summary for Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Runoff = 19.70 cfs @ 12.13 hrs, Volume= 1.082 af, Depth> 6.83"
 Routed to Pond 12P : PR NORTH KETTLE

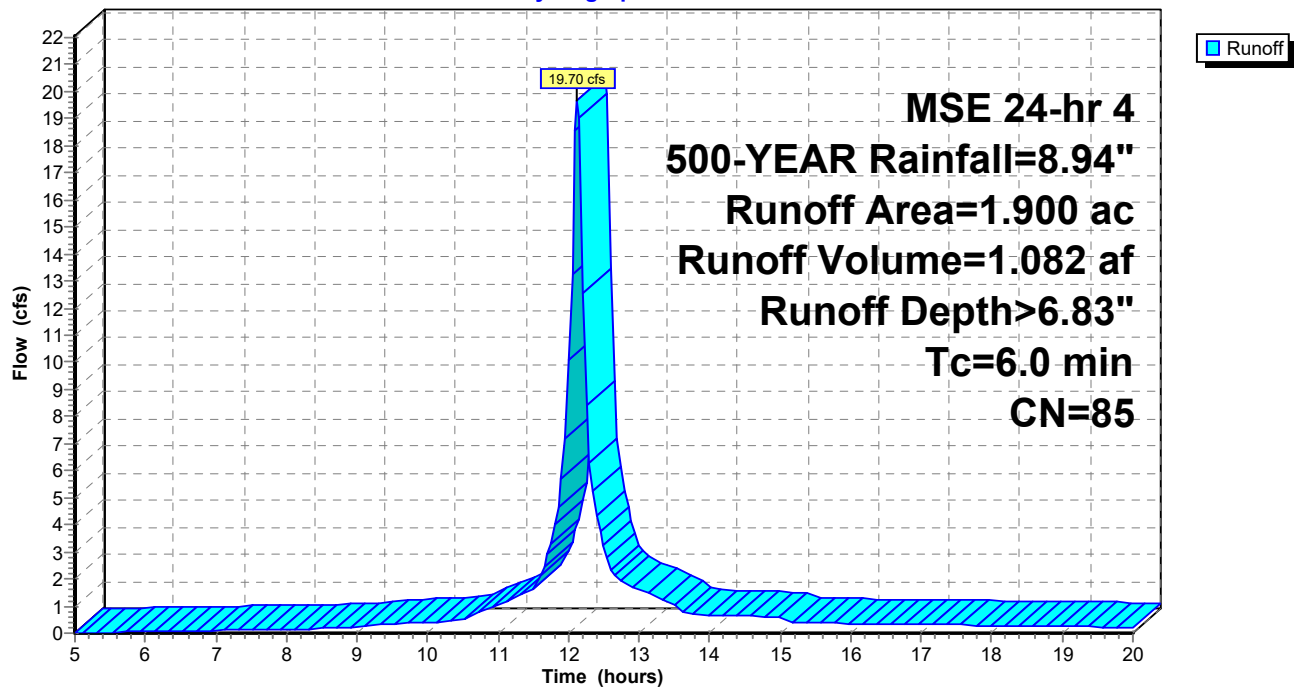
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
1.900	85	1/8 acre lots, 65% imp, HSG B
0.665		35.00% Pervious Area
1.235		65.00% Impervious Area

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

Subcatchment 13S: PROP UNDETAINED TO NOTH KETTLE

Hydrograph



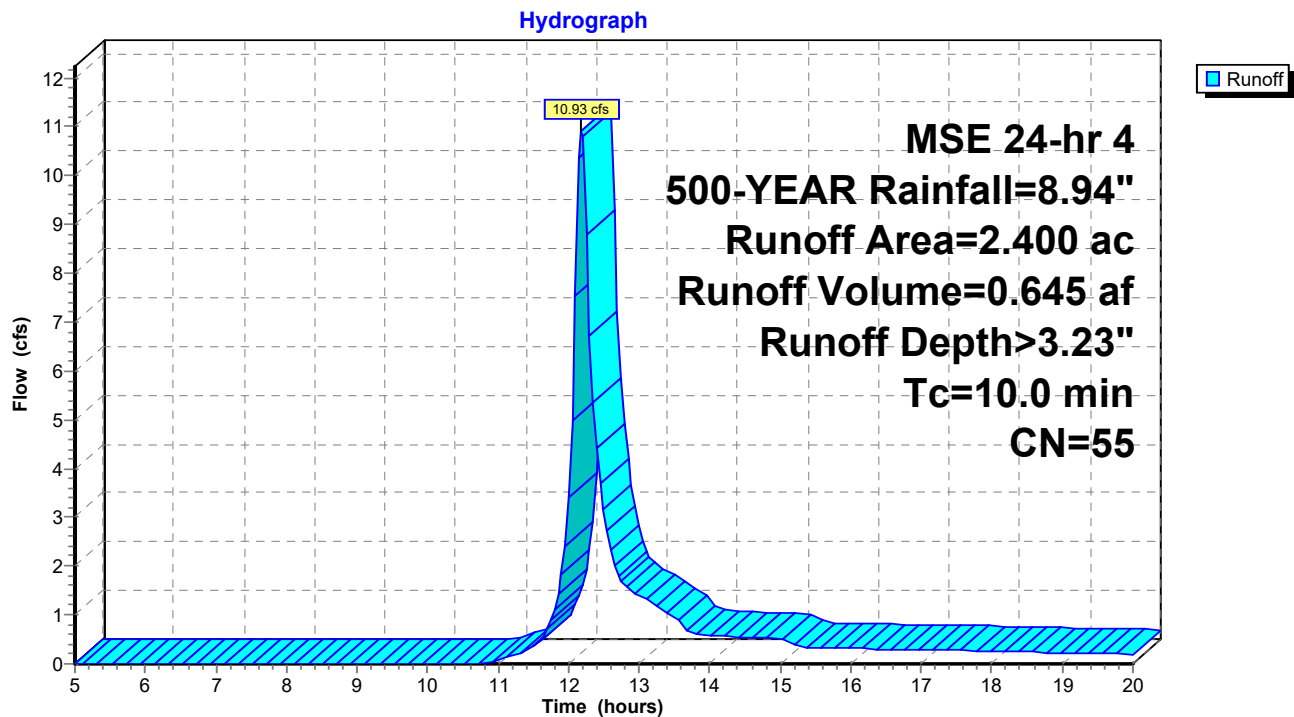
Summary for Subcatchment 15S: UNDEVELOPED WOODS TO SE

Runoff = 10.93 cfs @ 12.18 hrs, Volume= 0.645 af, Depth> 3.23"
 Routed to Link 6L : PROP SE DISCHARGE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 2.400	55	WOODLAND PER CITY ORDINANCE GROUP B
2.400		100.00% Pervious Area

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

Subcatchment 15S: UNDEVELOPED WOODS TO SE

Summary for Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Runoff = 28.47 cfs @ 12.31 hrs, Volume= 2.277 af, Depth> 3.21"

Routed to Link 16L : PROPOSED SOUTH DISCHARGE

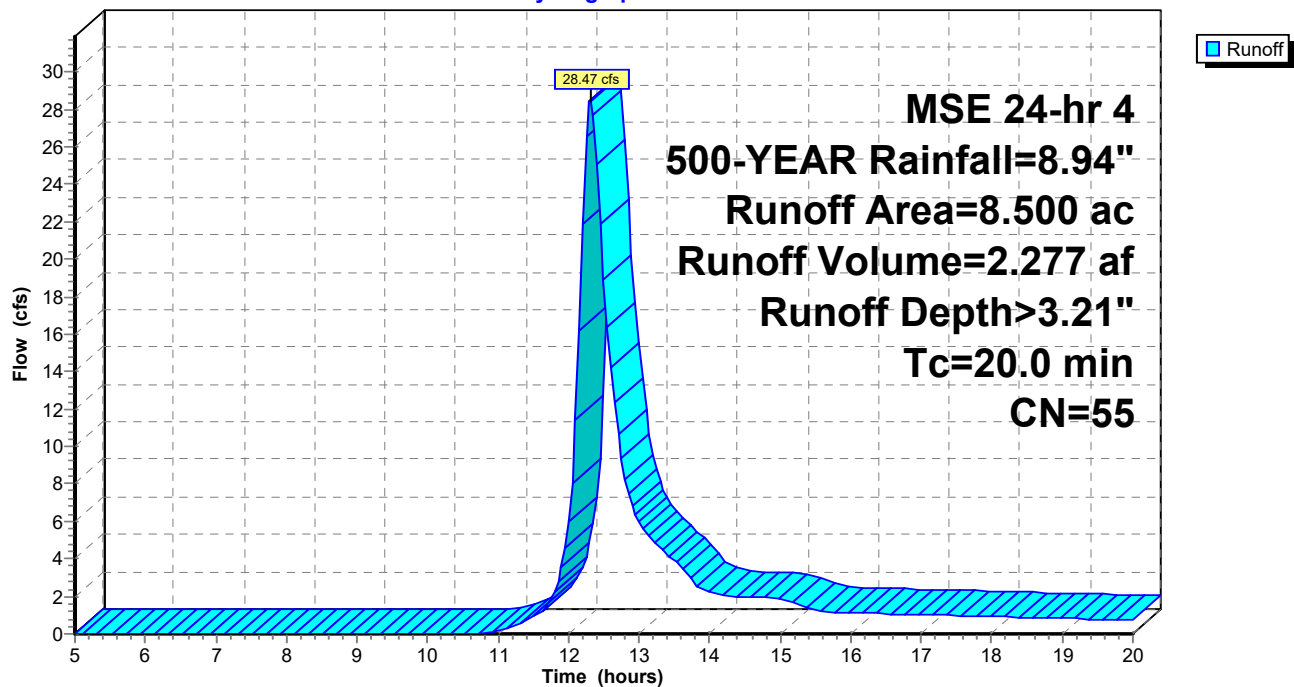
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 500-YEAR Rainfall=8.94"

Area (ac)	CN	Description
* 8.500	55	WOODLAND PER CITY ORDINANCE GROUP B
8.500		100.00% Pervious Area

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

Subcatchment 17S: UNDEVELOPED WOODS TO SOUTH

Hydrograph



Summary for Pond 7P: SOUTH PONDS

Inflow Area = 14.300 ac, 59.55% Impervious, Inflow Depth > 6.59" for 500-YEAR event
 Inflow = 144.90 cfs @ 12.13 hrs, Volume= 7.856 af
 Outflow = 23.80 cfs @ 12.50 hrs, Volume= 4.989 af, Atten= 84%, Lag= 22.6 min
 Discarded = 0.24 cfs @ 12.50 hrs, Volume= 0.168 af
 Primary = 23.56 cfs @ 12.50 hrs, Volume= 4.822 af
 Routed to Link 6L : PROP SE DISCHARGE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 932.32' @ 12.50 hrs Surf.Area= 49,879 sf Storage= 200,472 cf

Plug-Flow detention time= 153.1 min calculated for 4.989 af (64% of inflow)
 Center-of-Mass det. time= 89.7 min (851.6 - 761.9)

Volume	Invert	Avail.Storage	Storage Description
#1	927.00'	235,500 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
927.00	25,500	0	0
933.00	53,000	235,500	235,500

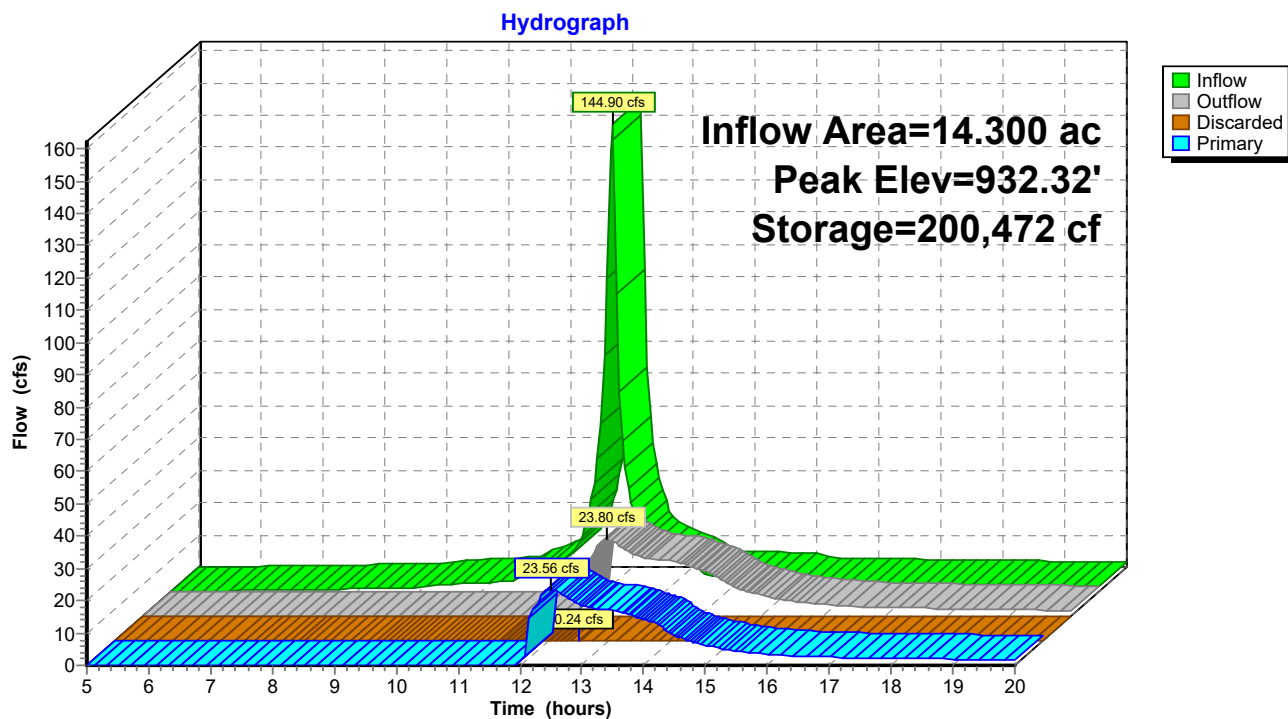
Device	Routing	Invert	Outlet Devices
#1	Discarded	927.00'	3.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	927.00'	18.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 927.00' / 923.80' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#3	Device 1	927.00'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 2	930.50'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	932.00'	10.0' long + 4.0 ' SideZ 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

Discarded OutFlow Max=0.24 cfs @ 12.50 hrs HW=932.32' (Free Discharge)

↑ **1=Exfiltration** (Passes 0.24 cfs of 4.76 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.24 cfs @ 11.02 fps)

Primary OutFlow Max=23.52 cfs @ 12.50 hrs HW=932.32' (Free Discharge)

↑ **2=Culvert** (Inlet Controls 18.19 cfs @ 10.29 fps)
 ↑ **4=Orifice/Grate** (Passes 18.19 cfs of 20.40 cfs potential flow)
 ↑ **5=Broad-Crested Rectangular Weir** (Weir Controls 5.33 cfs @ 1.48 fps)

Pond 7P: SOUTH PONDS

Summary for Pond 10P: NORTH POND

Inflow Area = 20.200 ac, 36.68% Impervious, Inflow Depth > 5.93" for 500-YEAR event
 Inflow = 158.19 cfs @ 12.14 hrs, Volume= 9.988 af
 Outflow = 90.66 cfs @ 12.28 hrs, Volume= 7.865 af, Atten= 43%, Lag= 8.3 min
 Primary = 90.66 cfs @ 12.28 hrs, Volume= 7.865 af
 Routed to Pond 12P : PR NORTH KETTLE

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 935.16' @ 12.28 hrs Surf.Area= 36,028 sf Storage= 160,302 cf

Plug-Flow detention time= 92.5 min calculated for 7.864 af (79% of inflow)
 Center-of-Mass det. time= 41.3 min (811.0 - 769.8)

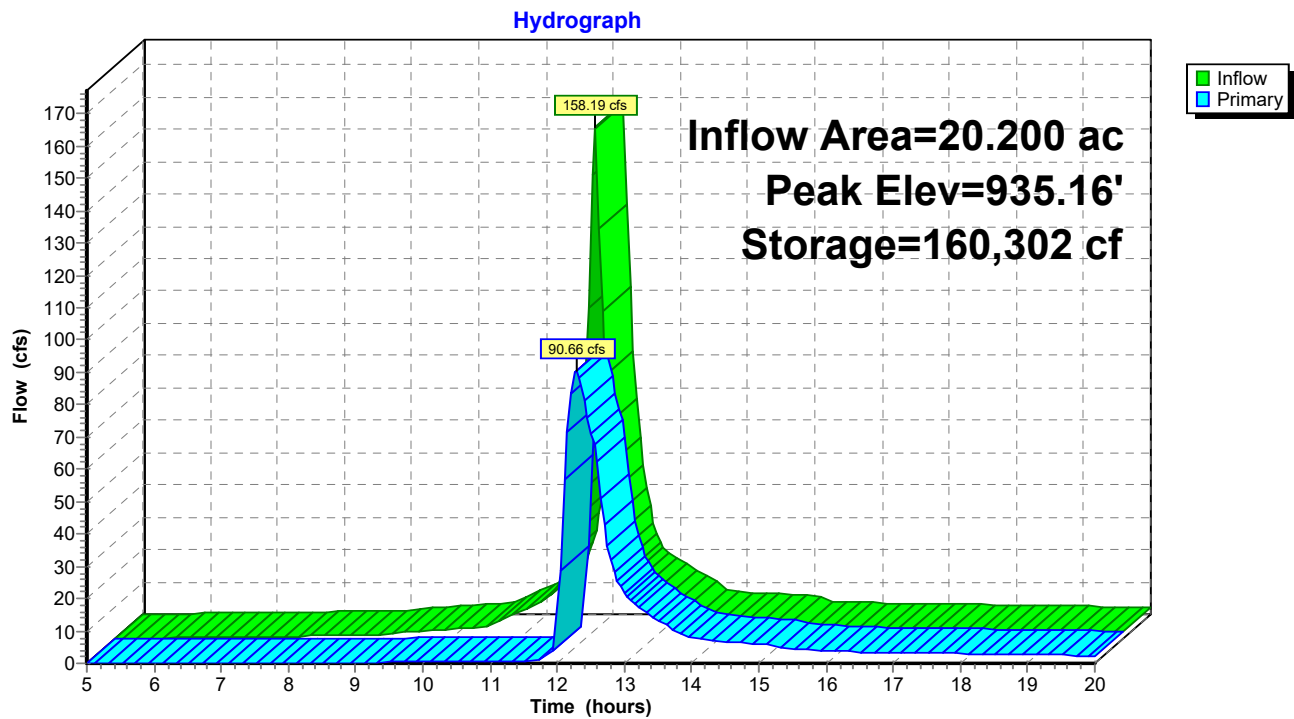
Volume	Invert	Avail.Storage	Storage Description
#1	929.00'	172,925 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
929.00	17,000	0	0
934.00	31,500	121,250	121,250
935.00	35,500	33,500	154,750
935.50	37,200	18,175	172,925

Device	Routing	Invert	Outlet Devices
#1	Primary	929.00'	36.0" Round Culvert L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 929.00' / 928.70' S= 0.0050 ' / Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#2	Device 1	929.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	931.65'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	933.00'	48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	934.50'	10.0' long + 4.0 ' /' SideZ 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=90.17 cfs @ 12.28 hrs HW=935.15' (Free Discharge)

1=Culvert (Inlet Controls 73.36 cfs @ 10.38 fps)
 2=Orifice/Grate (Passes < 1.03 cfs potential flow)
 3=Orifice/Grate (Passes < 1.70 cfs potential flow)
 4=Orifice/Grate (Passes < 88.63 cfs potential flow)
 5=Broad-Crested Rectangular Weir (Weir Controls 16.82 cfs @ 2.07 fps)

Pond 10P: NORTH POND

Summary for Pond 12P: PR NORTH KETTLE

[81] Warning: Exceeded Pond 10P by 3.29' @ 14.15 hrs

Inflow Area = 160.900 ac, 16.37% Impervious, Inflow Depth > 4.94" for 500-YEAR event
 Inflow = 525.00 cfs @ 12.59 hrs, Volume= 66.287 af
 Outflow = 86.77 cfs @ 15.54 hrs, Volume= 47.120 af, Atten= 83%, Lag= 176.7 min
 Discarded = 12.76 cfs @ 15.54 hrs, Volume= 7.890 af
 Primary = 74.02 cfs @ 15.54 hrs, Volume= 39.229 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 936.56' @ 14.02 hrs Surf.Area= 9.080 ac Storage= 39.392 af

Plug-Flow detention time= 195.8 min calculated for 46.963 af (71% of inflow)
 Center-of-Mass det. time= 139.5 min (952.0 - 812.5)

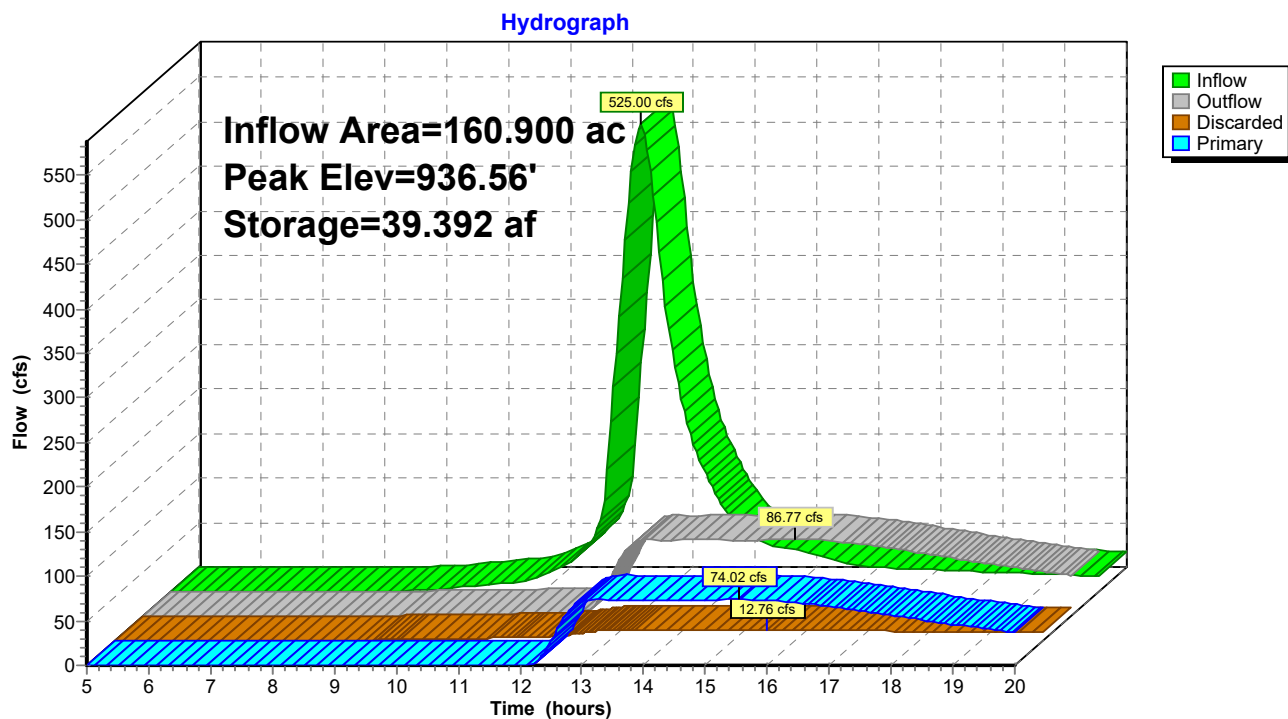
Volume	Invert	Avail.Storage	Storage Description	
#1	929.00'	53.781 af	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
929.00	1.200	0.000	0.000	1.200
930.00	2.900	1.988	1.988	2.900
938.00	10.900	51.793	53.781	10.907

Device	Routing	Invert	Outlet Devices
#1	Discarded	929.00'	1.630 in/hr Exfiltration X 0.80 over Horizontal area Conductivity to Groundwater Elevation = 900.00'
#2	Primary	931.00'	48.0" Round Culvert L= 1,400.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 931.00' / 928.20' S= 0.0020 '/' Cc= 0.900 n= 0.013, Flow Area= 12.57 sf

Discarded OutFlow Max=12.77 cfs @ 15.54 hrs HW=936.12' (Free Discharge)
 ↑1=Exfiltration (Controls 12.77 cfs)

Primary OutFlow Max=74.01 cfs @ 15.54 hrs HW=936.12' (Free Discharge)
 ↑2=Culvert (Barrel Controls 74.01 cfs @ 5.97 fps)

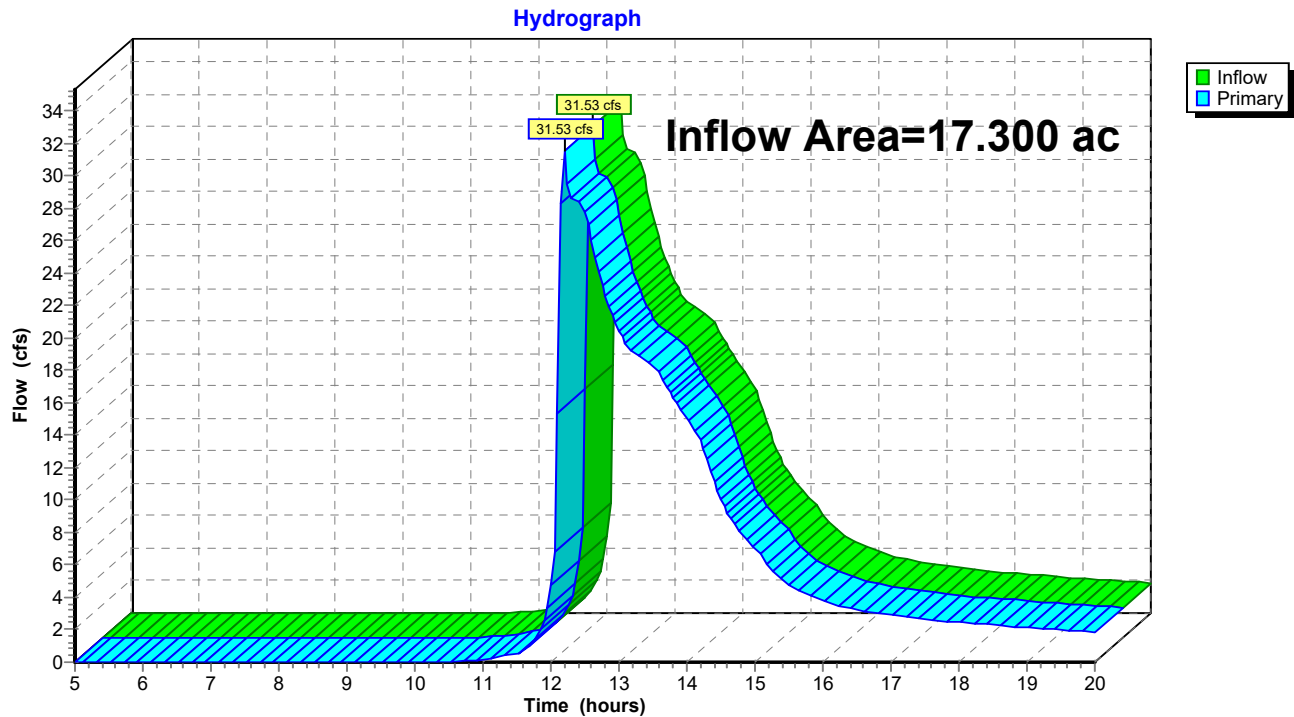
Pond 12P: PR NORTH KETTLE



Summary for Link 6L: PROP SE DISCHARGE

Inflow Area = 17.300 ac, 49.51% Impervious, Inflow Depth > 3.94" for 500-YEAR event
Inflow = 31.53 cfs @ 12.21 hrs, Volume= 5.682 af
Primary = 31.53 cfs @ 12.21 hrs, Volume= 5.682 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: PROP SE DISCHARGE

Summary for Link 16L: PROPOSED SOUTH DISCHARGE

Inflow Area = 9.000 ac, 1.11% Impervious, Inflow Depth > 3.30" for 500-YEAR event
Inflow = 29.76 cfs @ 12.30 hrs, Volume= 2.476 af
Primary = 29.76 cfs @ 12.30 hrs, Volume= 2.476 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 16L: PROPOSED SOUTH DISCHARGE